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**CONSULTANCY SERVICES FOR uMWP-1: WATER CONVEYANCE  
INFRASTRUCTURE FOR 115 MONTHS**

<b>Bid Number:</b>	013/2022/PMID/UMWP-1/RFB
<b>Briefing Session:</b>	Compulsory
<b>Briefing Session Date and Time:</b>	27 October 2023 at 10:00 AM
<b>Briefing Session Venue:</b>	<p>The hybrid meeting arranged as follows:</p> <p>A. Online: Microsoft Teams meeting details: Meeting ID: 391 807 955 861 Passcode: irzmrK</p> <p>B. Physical meeting at the following venue: Byls Bridge Office Park Cnr Olievenhoutbosch Road and Jean Avenue Doringkloof Centurion 0157</p>
<b>Clarifications Deadline:</b>	8 December 2023 at 4:00 PM
<b>Closing Date and Time:</b>  <i>Bidders must submit their bids during office hours between 08:00am and 4:30pm, received by a TCTA representative.</i>	15 December 2023 at 2:00 PM
<b>Bid Validity Period:</b>	120 Calendar Days
<b>Bid Submission Physical Address:</b>	<p><i>Bid Submissions must be sent to:</i> Byls Bridge Office Park Cnr Olievenhoutbosch Road and Jean Avenue Doringkloof Centurion 0157</p> <p><i>Bid submission must be addressed to the Receiving Officer and marked RFB No. 013/2022/PMID/UMWP-1/RFB</i></p>

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<b>ANNEXURES</b>	<b>SBD</b>	<b>DESCRIPTION</b>
<i>A</i>	<i>N/A</i>	<i>COMPANY EXPERIENCE</i>
<i>B</i>	<i>N/A</i>	<i>PERSONNEL EXPERIENCE: CVS OF KEY PERSONNEL</i>
<i>C</i>	<i>N/A</i>	<i>SANAS VERIFIED B-BBEE CERTIFICATE(S) OR SWORN AFFIDAVIT(S)</i>
<i>D</i>	<i>N/A</i>	<i>JOINT VENTURE AGREEMENT OR MEMORANDUM OF UNDERSTANDING AND DECLARATION OF JOINT AND SEVERAL LIABILITY</i>
<i>E</i>	<i>N/A</i>	<i>POWER OF ATTORNEY AND AUTHORITY FOR SIGNATORY</i>
<i>F</i>	<i>N/A</i>	<i>LETTER OF OFFER BY THE BIDDER</i>
<i>G</i>	<i>N/A</i>	<i>SUMMARY OF COST ESTIMATE</i>
<i>H</i>	<i>N/A</i>	<i>PERSONNEL COSTS</i>
<i>I</i>	<i>N/A</i>	<i>PERSONNEL BILLING RATES</i>
<i>J</i>	<i>N/A</i>	<i>PERSONNEL MARK-UP FACTORS</i>
<i>K</i>	<i>N/A</i>	<i>DIRECT REIMBURSABLE COSTS</i>
<i>L</i>	<i>N/A</i>	<i>CASH FLOW</i>
<i>M</i>	<i>N/A</i>	<i>MANPOWER SCHEDULE</i>
<i>N</i>	<i>N/A</i>	<i>PROGRAMME AND CHARTS</i>

<i>O</i>	<i>1</i>	<i>REQUEST FOR BID</i>
<i>P</i>	<i>4</i>	<i>BIDDERS DISCLOSURE</i>
<i>Q</i>	<i>6.1</i>	<i>IN TERMS OF PPR 2022</i>
<i>R</i>	<i>N/A</i>	<i>PROOF OF REGISTRATION WITH NATIONAL TREASURY CENTRAL SUPPLIER DATABASE (CSD)</i>
<i>S</i>	<i>N/A</i>	<i>AGREEMENT FORM AND APPENDICES AND THE CONDITIONS OF THE CLIENT/CONSULTANT MODEL SERVICES AGREEMENT</i>



## 1. DEFINITIONS, ACRONYMS AND ABBREVIATIONS

<b>B-BBEE</b>	Broad Based Black Economic Empowerment in terms of the Broad Based Black Economic Empowerment Act 53 of 2003 (B-BBEE Act).
<b>B-BBEE STATUS OF LEVEL OF CONTRIBUTOR</b>	The B-BBEE status received by a measured entity issued in terms of section 9(1) of the B-BBEE Act.
<b>BID SUBMISSION</b>	A bidder's written proposal in response to an Invitation for Bids (Request for Bids/Quotations/ Information etc.).
<b>BLACK PEOPLE</b>	Africans, Coloureds and Indians as defined in the Broad Based Black Economic Empowerment Act 53 of 2003
<b>CONSORTIUM OR JOINT VENTURE</b>	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.
<b>CONSULTANT</b>	A professional person appointed to provide technical and specialist advice or to assist with the design and implementation of projects. The legal status of this person can be an individual, a partnership, a corporation or a company.
<b>CONTRACT</b>	A legal agreement or National Treasury issued Standard Bid Document Number 7 signed by TCTA and a successful bidder. This term does not refer to the actual bid process.
<b>CONTRACT MANAGER</b>	A representative from the Requesting Department that will be responsible for monitoring the day-to-day activities related to the contract.
<b>DESIGNATED SECTORS</b>	Sectors, sub-sectors or industries that have been designated by the Department of Trade and Industry in line with national development and industrial policies for local production, where only locally produced services, works or goods or locally manufactured goods meet the stipulated minimum threshold for local production and content.
<b>EME</b>	Means an Exempted Micro Enterprise in terms of a code of good practice on black economic empowerment issued in terms of

	section 9 (1) of the Broad-Based Black Economic Empowerment Act.
<b>FIRM PRICES</b>	Means the price that is only subject to adjustments in accordance with the actual increase or decrease resulting from the change, imposition, or abolition of customs or excise duty and any other duty, levy, or tax, which, in terms of the law or regulation, is binding on the bidder and demonstrably has an influence on the price of any supplies, or the rendering costs of any service, for the execution of the contract.
<b>HISTORICALLY DISADVANTAGED ENTITIES</b>	Means entities that are at least: <ul style="list-style-type: none"> <li>• 51% black owned;</li> <li>• 51% owned by black youth;</li> <li>• 51% owned by black women;</li> <li>• 51% owned by black people with disabilities;</li> <li>• 51% owned by black people in rural areas, underdeveloped areas or townships;</li> <li>• a co-operative that is 51% owned by black people;</li> <li>• 51% owned by black people who are military veterans.</li> </ul>
<b>LOWEST ACCEPTABLE TENDER</b>	Means a tender that complies with all specifications and conditions of tender and that has the lowest price compared to other tenders.
<b>PROCUREMENT SPECIALIST</b>	Any person in the TCTA's Procurement Unit who is responsible for managing a bid process from start to finish.
<b>PO</b>	A Purchase Order generated by the TCTA's Procurement Unit after the conclusion of a successful bid process authorizing the expenditure against an awarded contract.
<b>PRICE</b>	Means an amount of money for goods or services, and includes all applicable taxes less all unconditional discounts.
<b>QSE</b>	means a qualifying small business enterprise in terms of a code of good practice on black economic empowerment issued in terms of section 9 (1) of the Broad-Based Black Economic Empowerment

	Act.
<b>RD</b>	A Requesting Department within TCTA or its representative.
<b>SUPPLIER</b>	A juristic person or legal entity that provides goods or services to TCTA.
<b>SPECIFIC GOALS</b>	Means specific goals as contemplated in section 2(1)(d) of the Preferential Procurement Policy Framework Act which may include contracting with persons, or categories of persons, historically disadvantaged by unfair discrimination on the basis of race, gender and disability including the implementation of programmes of the Reconstruction and Development Programme as published in Government Gazette No. 16085 dated 23 November 1994.

## 2. PREPARATION OF BID SUBMISSIONS

- 2.1. Bidders are required to comply fully with this Request for Bid including annexures during submission to TCTA.
- 2.2. Bid Submissions must:
  - 2.2.1. Not be late and it must be delivered to the address stated on the front page. TCTA shall not accept nor be obliged to accept Bid Submissions submitted after the stipulated closing date and time even if such late submission is as a result of circumstances beyond the Bidder's control;
  - 2.2.2. Clearly reflect the Bid description and bid number on the outer packaging; and
  - 2.2.3. Contain a Firm Price.
- 2.3. TCTA reserves the right to reject bids that are not prepared in terms of section 2.2 and to not evaluate them. This section is subject to the provisions in the Conditions of Bid.
- 2.4. Bidders must provide 2 (two) hardcopies of the bid submission and one electronic copy on an unencrypted USB hard drive subject to the following:
  - 2.4.1. USB hard drives must not be password protected and must be free of any and all corruption and/or viruses.
  - 2.4.2. TCTA will not be liable to accept or evaluate any file that is not readable and accessible to the relevant bid committee. Bidders will not be allowed to remedy/fix/assess such USB or file after the bid closing date and the information will be deemed as not received.
  - 2.4.3. Only pdf documents and electronic copy (Microsoft Excel) of the price schedules will be accepted and not word, images or any other format not specified in this bid document.
  - 2.4.4. These provisions will be applied on a case-by-case basis within the sole discretion of the bid evaluation committee.

- 2.5. The bid submissions shall be duly completed and signed, and shall be submitted as follows:
- 2.5.1. One original bid submission shall be sealed in an envelope endorsed: "ORIGINAL BID SUBMISSION RFB No. 013/2022/PMID/UMWP-1/RFB CONSULTANCY SERVICES FOR uMWP-1: WATER CONVEYANCE INFRASTRUCTURE FOR 115 MONTHS".
  - 2.5.2. One copy bid submission shall be sealed in an envelope endorsed: "COPY BID SUBMISSION RFB No. 013/2022/PMID/UMWP-1/RFB CONSULTANCY SERVICES FOR uMWP-1: WATER CONVEYANCE INFRASTRUCTURE FOR 115 MONTHS".
  - 2.5.3. Electronic copy (Microsoft Excel) of the price schedules.
- 2.6. This Bid has 6 stages of evaluation summarised in the document below. Each stage reflects the process of evaluation. Bid submissions must be neat and legible and prepared in the same order as the stages of evaluation. Each stage must be clearly marked.
- 2.7. The bidder must complete and submit all the SBD forms in the annexures, and provide their Tax Compliance Status Pin or the Central Supplier Database Master Registration Number for TCTA to verify the bidder's tax compliance.

### **3. BACKGROUND**

The Mgeni Water Supply System (MWSS) serves the municipalities of eThekweni, uMgungundlovu, Msunduzi and the surrounding areas in KwaZulu-Natal (KZN). It consists of four major dams (Nagle, Midmar, Albert Falls and Inanda) and phases 1 and 2 of the Mooi Mgeni Transfer Scheme.

In 2015, the Department of Water and Sanitation (DWS) completed a technical feasibility study to determine long-term future water requirements in KZN. The study investigated the uMkhomazi Water Project – Phase One (uMWP-1), which will augment the MWSS with water from the uMkhomazi River – the river with the third-largest mean annual runoff in KZN. The system's yield is 398 million m<sup>3</sup>/a (2013), while the estimated water requirements are 480 million m<sup>3</sup>/a and 612 million m<sup>3</sup>/a in 2023 and 2040, respectively. The water requirements projection indicates that MWSS has been in deficit since 2016. Therefore, the system is under stress and will be augmented by uMWP-1.

The implementation of uMWP-1 involves the storage and transfer of about 220 million m<sup>3</sup>/a of raw water as follows:

- Smithfield Dam and Associated Infrastructure:
  - 81 m high Smithfield Dam with a spillway and the outlet Works in the uMkhomazi River near the town of Bulwer.
  - 26 m high saddle dam with a spillway.
  - Smithfield Dam reservoir boat ramp.
  - Three flow gauging weirs in the uMkhomazi River – one upstream and two downstream of Smithfield Dam.
  - Temporary and permanent access roads and security fences.
  - Borrow pits, quarries and waste disposal sites.
  - River diversion works.
  - Operator facilities – permanent houses, offices/control room, guard house; storage and workshop.
  - Realignment or diversion of major and minor roads and Eskom transmission lines.
  - Acquisition of land and rights to land.
  - Potential hydropower plant.

- Rehabilitation, biodiversity offsets and compensation.
- Catchment Management and Ecological Infrastructure Plan.
- Resettlement houses for the affected families/households.
- Water Conveyance Infrastructure (this RFB):
  - 32km long at 3.5m diameter transfer tunnel from Smithfield Dam reservoir to the uMlaza River valley.
  - 5km long at 2.6m diameter raw water pipeline from the outlet portal of the transfer tunnel above to the proposed Umgeni Water's Water Treatment Works in the uMlaza River valley.
  - Access roads, maintenance/service roads and security fences – permanent and temporary.
  - Borrow pits, quarries and waste disposal sites.
  - Acquisition of land and rights to land.
  - Potential hydropower plant.
  - Rehabilitation, biodiversity offsets and compensation.

Please note that a separate bid document will be issued for the Smithfield Dam and Associated Infrastructure.

### 3.1. **Company Experience**

The bidders should have company experience in the design and construction supervision/monitoring of tunnel infrastructure and welded steel pipeline projects completed. Please refer to the requirements and instructions on how to complete the form in Annexure A. TCTA will evaluate the bidder's company experience per **Stage 3: Functionality**.

### 3.2. **Personnel Experience: CVs of Key Personnel**

The bidder should provide the details of all the personnel who will execute the required services. In addition, the bidder is required to submit the CV of key personnel identified by TCTA for evaluation, i.e. **Stage 3: Functionality**. Please refer to the requirements and instructions on how to complete the forms and tables in Annexure B, including various appendices forming part of the FIDIC Client/Consultant Model Services Agreement (i.e. Annexure S: Agreement Form and appendices, and the Conditions of the Client/Consultant Model Services Agreement).

### 3.3. **SANAS Verified B-BBEE Certificate(s) or Sworn Affidavit(s)**

The bidder must provide the certificate(s) or affidavit(s) per the requirements of **Stage 4: Specific Goals** below.

### 3.4. **Joint Venture Agreement or Memorandum of Understanding and Declaration of Joint and Several Liability**

The bidder should provide the relevant agreement/memorandum and declaration (Annexure D) if bidding as a joint venture or consortium per the requirements of the Conditions Bid ("Joint venture or consortium agreement") below.

### 3.5. **Power of Attorney and Authority for Signatory**

The bidder should provide the relevant documents per Annexure E.

### **3.6. Letter of Offer by the Bidder**

The bidder must provide the letter of offer per the FIDIC Client/Consultant Model Services Agreement. Please refer to the requirements in Annexure F.

### **3.7. Summary of Cost Estimate**

The bidder must provide a summary of the estimate per the form/schedule in Annexure G, including various appendices forming part of the FIDIC Client/Consultant Model Services Agreement (i.e. Annexure S: Agreement Form and appendices, and the Conditions of the Client/Consultant Model Services Agreement).

### **3.8. Personnel Costs**

The bidder should provide the costs of all personnel per the forms/schedules in Annexure H. Please refer to the requirements and instructions on how to complete the forms/schedules in Annexure H.

### **3.9. Personnel Billing Rates**

The bidder should provide the billing rates for all personnel per the form/schedule in Annexure I. Please refer to the requirements and instructions on how to complete the form/schedule in Annexure I.

### **3.10. Personnel Mark-up Factors**

The bidder should provide the mark-up factors for all personnel per the form/schedule in Annexure J. Please refer to the requirements and instructions on how to complete the form/schedule in Annexure J.

### **3.11. Direct Reimbursable Costs**

The bidder should provide their direct reimbursable costs. Please refer to the requirements and instructions on how to complete the form/schedule in Annexure K, including various appendices forming part of the FIDIC Client/Consultant Model Services Agreement (i.e. Annexure S: Agreement Form and appendices, and the Conditions of the Client/Consultant Model Services Agreement).

### **3.12. Cash Flow**

The bidder should provide a cash flow based on the manpower schedule and programme and charts requirements below. Please refer to the requirements in Annexure L, including various appendices forming part of the FIDIC Client/Consultant Model Services Agreement (i.e. Annexure S: Agreement Form and appendices, and the Conditions of the Client/Consultant Model Services Agreement).

### **3.13. Manpower Schedule**

The bidder should provide a manpower or staffing form/schedule to execute the required services. Please refer to the requirements and instructions on how to complete the form/schedule in Annexure M, including various appendices forming part of the FIDIC Client/Consultant Model Services Agreement (i.e. Annexure S: Agreement Form and appendices, and the Conditions of the Client/Consultant Model Services Agreement).

### **3.14. Programme and Charts**

The bidder should provide charts and graphs for the execution of the services, i.e. time schedule of services (programme). Please refer to the requirements in Annexure N, including various appendices forming part of the FIDIC Client/Consultant Model Services Agreement (i.e. Annexure S: Agreement Form and appendices, and the Conditions of the Client/Consultant Model Services Agreement).

### **3.15. Proof of Registration with National Treasury Central Supplier Database (CSD)**

The bidder should provide proof of registration with National Treasury CSD in Annexure R.

### **3.16. AGREEMENT FORM AND APPENDICES AND THE CONDITIONS OF THE CLIENT/CONSULTANT MODEL SERVICES AGREEMENT**

The bidder must use the agreement form and appendices (Scope of Services; Personnel, Equipment, Facilities and Services of Others to be Provided by the Client; Remuneration and Payment; Time Schedule of Services; and The Conditions of the Client/Consultant Model Services Agreement) to compile the bid (Annexure S).

## **4. SCOPE OF WORK**

### **4.1. Detailed Description of Goods/Services**

Bidders will be required to provide engineering, project management, environmental, social and other specialist services under the following tasks:

- Task 1: Tender Design and Documentation
- Task 2: Detailed Design
- Task 3: Construction Supervision
- Task 4: Post-Construction Monitoring
- Task 5: Project Management
- Task 6: Black South Africans, Enterprise and Supplier Development Requirements

Refer to Appendix 1: Scope of Services forming part of the FIDIC Client/Consultant Model Services Agreement (i.e. annexure: Agreement Form and appendices, and the Conditions of the Client/Consultant Model Services Agreement).

### **4.2. Deliverables**

The key outputs will, amongst other things, include the following:

- Develop the construction and operation EMP and other plans.
- Undertake tender design and documentation, detailed design, construction supervision and post-construction monitoring.
- Development of black South Africans, enterprises, and suppliers.
- Assess and close the above.
- Perform project management on all the above.

Refer to various appendices forming part of the FIDIC Client/Consultant Model Services Agreement (i.e. annexure: Agreement Form and appendices, and the Conditions of the Client/Consultant Model Services Agreement).

## 5. STAGE 1: ATTENDANCE OF COMPULSORY BRIEFING SESSION

TCTA will refer to the attendance register of the Briefing Session to confirm if a bidder attended the compulsory briefing session.

**Failure to attend a compulsory briefing session will result in a bidder being disqualified at this stage and not evaluated further.**

## 6. STAGE 2: RETURNABLES

**ALL RETURNABLES ARE REQUIRED FOR PURPOSES OF EVALUATION IRRESPECTIVE OF WHETHER THEY ARE DESIGNATED MANDATORY OR NOT.**

No.	Document Type	Description	Status
1	Functionality	Company Experience	Non-Mandatory
2	Functionality	Personnel Experience: CVs of Key Personnel	Non-Mandatory
3	Compliance	SANAS verified B-BBEE certificate(s) or Sworn Affidavit(s)	Non-Mandatory
4	Agreement	Joint Venture Agreement or Memorandum of Understanding and Declaration of Joint and Several Liability	Non-Mandatory
5	Agreement	Power of Attorney and Authority for Signatory	Non-Mandatory
6	Price	Letter of Offer by the Bidder	Mandatory
7	Price	Summary of Cost Estimate	Mandatory
8	Price	Personnel Costs	Non-Mandatory
9	Price	Personnel Billing Rates	Non-Mandatory
10	Price	Personnel Mark-Up Factors	Non-Mandatory
11	Price	Direct Reimbursable Costs	Non-Mandatory
12	Price	Cash Flow	Non-Mandatory
13	Price	Manpower Schedule	Non-Mandatory
14	Compliance	Programme and Charts	Non-Mandatory
15	SBD1	Request for Bid (SBD 1)	Non-Mandatory
16	SBD4	Bidder's Disclosure (SBD 4)	Mandatory
17	SBD6.1	In Terms of PPR 2022 (SBD 6.1)	Mandatory
18	Compliance	Proof of Registration with National Treasury Central Supplier Database (CSD)	Non-Mandatory

**Any bidder who fails to submit a non-mandatory document will receive zero points where that document is linked to specific functionality criteria. Any bidder who fails to submit a mandatory document will be disqualified at this stage and not evaluated further.**



## 7. STAGE 3: FUNCTIONALITY

TCTA will evaluate the submissions for functional capacity and capability. TCTA will evaluate the submissions in terms of the functional criteria set out below.

No.	Functionality	Maximum score
<b>1</b>	<b>Company Experience: (1) and (2) (Refer to Annexure A)</b>	
1.1	<p>Design and construction supervision/monitoring of <b>tunnel</b> infrastructure projects <b>completed*</b> (<math>\geq 3</math> m inside diameter and <math>\geq 5</math> km long) in medium-hard rock.</p> <p>OR</p> <p>Design and the award of the construction tender/contract of <b>tunnel</b> infrastructure projects to the main contractor (<math>\geq 3</math> m inside diameter and <math>\geq 5</math> km long) in medium-hard rock.</p> <p><b>*When referencing a completed project</b> – note this refers to the completion/taking over or performance certificate issued for the whole works to the main contractor for points allocation below.</p> <p><b>Note:</b> Micro-tunneling projects (i.e. non-accessible tunneling machines operated remotely) will not be accepted and will score nil.</p> <p>Five points for each project completed or construction tender/contract awarded in the past 15 years.</p>	20
1.2	<p>Design and construction supervision/monitoring of <b>welded steel pipeline</b> projects <b>completed*</b> (<math>\geq 1.5</math> m nominal diameter and <math>\geq 2.5</math> km long).</p> <p><b>*The construction contract for each project must be completed and the completion/taking over or performance certificate for the whole works issued to the main contractor for points allocation below.</b></p> <p>Two points for each project completed.</p>	10
	<b>Subtotal</b>	<b>30</b>
<b>2</b>	<b>Personnel Experience: CVs of Key Personnel (Refer to Annexure B)</b>	
2.1	<p><b>Project Manager:</b></p> <p>The incumbent must be a <b>Professional Engineer (Pr. Eng.)</b> (or internationally equivalent) and have at least ten years of professional project management experience in similar/comparable civil engineering infrastructure projects with capital cost (i.e. total project value and not just consultant's cost) of <math>\geq</math>R350 million (excluding VAT).</p> <ul style="list-style-type: none"> <li>• Nil points for the first nine years.</li> <li>• 1 point for every additional year of experience (maximum: 10 points).</li> <li>• Additional 2.5 points for using FIDIC contracts for a project (maximum: 2.5 points).</li> <li>• Additional 2.5 points for a tunnel project of <math>\geq 3</math>m inside diameter and <math>\geq 5</math>km long using a tunnel boring machine(s) (maximum: 2.5 points).</li> </ul>	15

No.	Functionality	Maximum score
2.2	<p><b>Tunnelling Specialist / Chief Design Engineer:</b></p> <p>The incumbent must be a <b>Professional Engineer (Pr. Eng)</b> (or internationally equivalent) and have at least ten years of professional design and construction experience in tunnels (<math>\geq 3\text{m}</math> inside diameter and <math>\geq 5\text{km}</math> long) in medium-hard rock and related infrastructure.</p> <p><b>Note:</b> Where the Chief Design Engineer is also the Tunneling Specialist, the bidder should confirm this and provide the relevant information.</p> <ul style="list-style-type: none"> <li>• Nil points for the first nine years.</li> <li>• 2 points for every additional year of experience.</li> </ul>	20
2.3	<p><b>Contracts Engineer</b></p> <p>The incumbent must be a <b>Professional Engineer (Pr. Eng)</b> or <b>Professional Quantity Surveyor (Pr. QS)</b> (or internationally equivalent) and have at least ten years of professional experience in similar/comparable civil engineering infrastructure projects with a capital cost (i.e. total project value and not just consultant's cost) of <math>\geq \text{R}350</math> million (excluding VAT).</p> <ul style="list-style-type: none"> <li>• Nil points for the first nine years.</li> <li>• 1 point for every additional year of experience (maximum: 8 points).</li> <li>• Additional 2 points for using FIDIC contract(s) for the construction component of a project (maximum: 2 points).</li> </ul>	10
2.4	<p><b>Chief Resident Engineer:</b></p> <p>The incumbent must be a <b>Professional Engineer (Pr. Eng)</b> (or internationally equivalent) and have at least ten years of experience in the construction supervision/monitoring of large diameter tunnels (<math>\geq 3\text{ m}</math> inside diameter and <math>\geq 5\text{ km}</math> long) in medium-hard rock.</p> <ul style="list-style-type: none"> <li>• Nil points for the first nine years.</li> <li>• 1 point for every additional year of experience (maximum: 10 points).</li> <li>• Additional 2.5 points for using FIDIC contract(s) for the construction component of a project (maximum: 2.5 points).</li> <li>• Additional 2.5 points for a tunnel project of <math>\geq 3\text{m}</math> inside diameter and <math>\geq 5\text{km}</math> long using a tunnel boring machine(s) (maximum: 2.5 points).</li> </ul>	15
2.5	<p><b>Senior Geological and Geotechnical Engineer:</b></p> <p>The incumbent must have <b>BSc (geology)</b>, be a <b>Professional Natural Scientist (Pr. Sci. Nat.)</b> OR be a <b>Professional Engineer (Pr. Eng)</b> (or internationally equivalent) and have at least ten years of experience in geological, geohydrological and geotechnical investigations, geophysical surveys, mapping, testing and assessments of large tunnels (<math>\geq 3\text{ m}</math> inside diameter and <math>\geq 5\text{ km}</math> long) and related infrastructure in medium-hard rock.</p> <ul style="list-style-type: none"> <li>• Nil points for the first nine years.</li> <li>• 2 points for every additional year of experience.</li> </ul>	20

No.	Functionality	Maximum score
2.6	<b>Environmental Assessment Practitioner:</b>  The incumbent must have environmental-related degree in biological, physical or earth sciences (NQF level 7) and have at least eight years of experience in managing and monitoring environmental and social management in similar/comparable civil engineering infrastructure projects, i.e. Environmental Impact Assessments and preparation of Environmental Management Programmes. <ul style="list-style-type: none"> <li>• Nil points for the first seven years.</li> <li>• 2 points for every additional year of experience (maximum: 8 points).</li> <li>• Additional 1 point for valid registration with the Environmental Assessment Practitioners Association of South Africa. (maximum: 1 point).</li> <li>• Additional 1 point for valid registration with the South African Council for Natural Scientific Professions (SACNASP) (maximum: 1 point).</li> </ul>	10
	<b>Subtotal</b>	<b>90</b>
	<b>TOTAL</b>	<b>120</b>
Note: 1. If the CV and table is not submitted in the prescribed template and format as outlined in Annexure B, then zero points will be awarded for the relevant human resource (personnel). This applies to each personnel listed above, i.e. no. 2.1 to 2.6.		

**Bidders who do not meet the threshold of 12 points out of the 30 points under Company Experience will be disqualified at the end of this stage and not evaluated further.**

**Furthermore, bidders who do not meet the threshold of 45 points out of the 90 points under Personnel Experience will be disqualified at the end of this stage and not evaluated further.**

## 8. STAGE 4: SPECIFIC GOALS

The specific goals for this bid are as follows:

### 8.1. B-BBEE

8.1.1. The following table will be used to calculate the points out of 10 for B-BBEE of the bidding entity:

B-BBEE Status Level of Contributor	Number of Points
1	10
2	9
3	6
4	5
5	4
6	3
7	2
8	1
Non-compliant contributor	0

- 8.1.2. A joint venture or consortium must submit a consolidated B-BBEE certificate based on the weighted members participation in order to earn B-BBEE points.
- 8.1.3. All B-BBEE certificates must be obtained from verification agencies accredited by SANAS unless the bidder is an EME or QSE in which case they must submit a validly commissioned affidavit.

## **9. STAGE 5: PRICE**

- 9.1. TCTA will treat the bids in terms of the Preferential Procurement Policy Framework Act, No.5 of 2000 (PPPFA).
- 9.2. If the price offered by the highest scoring bidder is not market related, TCTA may negotiate a market-related price.
- 9.3. Price must be reflected Excluding and Including VAT.
- 9.4. All prices must include disbursements.
- 9.5. Prices must be firm and in Rands.

### **9.6. Preferential Points Calculation**

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

$$P_s = 90 \left( 1 - \frac{P_t - P_{\min}}{P_{\min}} \right)$$

Where-

$P_s$  = Points scored for price of bid under consideration;

$P_t$  = Price of bid under consideration; and

$P_{\min}$  = Price of lowest acceptable bid.

- 9.6.2. The 90/10 preference point system will apply.
- 9.6.3. The weighting of the Preferential points calculation is as follows:

Specific Goals	= 10
Price	= 90

Bidder's Score

## **10. STAGE 6: SUPPLIER VETTING**

TCTA may disqualify a bidder who/whose:

- 10.1.1. Submits fraudulent information or information that they do not have to authority to submit;
- 10.1.2. Is listed on National Treasury's list of Blacklisted Suppliers or Defaulters or similar;
- 10.1.3. Poses a risk in terms of any vetting process conducted either by TCTA internally or the National Intelligence Agency;
- 10.1.4. Has a director and/or shareholder who is employed by any organ of state. This does not apply to any organ of state acting as a bidder. If a bidder has a director and/or shareholder who is employed by an organ of state, they must submit a letter from the relevant organ of state stating that they are allowed to do remunerative work outside of their employment contract and that they are not prohibited from doing business with other organs of state; and
- 10.1.5. Tax affairs are not in order at the time of award after being requested to resolve the non-compliance status with SARS within the prescribed period.

## **11. CONDITIONS OF BID**

Any bid submission that does not meet the conditions of bid may be rejected and not evaluated at all. Such a bid submission will not be acceptable.

### **11.1. Costs of Bidding**

- 11.1.1. Bidders shall bear their own costs, disbursements and expenses associated with the preparation and submission of the Bid Submissions, including submission of any additional information requested by TCTA or attending the compulsory briefing session.
- 11.1.2. TCTA shall not under any circumstances be liable nor assume liability to any Bidder for costs, disbursements and/or expenses incurred by Bidders regardless of the outcome of the Bid process or by virtue of cancellation and/or postponement of the Bid process. Where applicable a non-refundable fee for documents may be charged.

### **11.2. Clarifications**

- 11.2.1. All questions or queries regarding the Request for Bid must be directed to the person stated on the front page of this document, stating the relevant Bid number in the subject field, before the stipulated closing date and time of the Request for Bid. No e-mails, faxes and/or telephone calls should be directed to any other employees of TCTA.
- 11.2.2. TCTA shall not be liable nor assume liability for any failure to respond to any questions and/or queries raised by potential Bidders.
- 11.2.3. Should a Bidder fail to complete the annexures TCTA may call upon the Bidder to complete and submit such annexures except where such annexures are indicated as mandatory or are required for purposes of functional and preferential points evaluation. TCTA reserves the right to request clarity and to clarify any ambiguities in the documents that have already been submitted. If a Bidder fails to submit any of the requested documents and / or annexures duly

completed within 5 (five) working days of being called upon to do so, then the TCTA may disqualify the Bidder.

### 11.3. Amendments

- 11.3.1. TCTA reserves the right, in its sole and absolute discretion, to amend any terms and conditions of the Request for Bid and/or to stipulate additional requirements, provided that such amended terms and conditions and/or additional requirements are placed on TCTA's website at least 10 (ten) business days prior to the stipulated closing date and time.
- 11.3.2. Any amended terms and conditions and/or stipulation of additional requirements by TCTA shall be deemed to form part of this Request for Bid.
- 11.3.3. TCTA shall not be liable, nor assume liability of any nature whatsoever, for the failure of a Bidder to receive information if sent to the e-mail, fax or postal address supplied.
- 11.3.4. TCTA reserves the right to stipulate additional Bid requirements as it deems appropriate in its sole and absolute discretion.
- 11.3.5. TCTA shall not be liable nor assume liability to any potential Bidder/s for any failure by such Bidder/s to receive any request for additional information.
- 11.3.6. In the event that TCTA amends its Bid requirements or requests additional information, any Bidder shall be entitled to withdraw its Bid Submission submitted by it prior to the stipulated closing date and time and re-submit a replacement Bid Submission by not later than the stipulated closing date and time.

### 11.4. Modification, Alteration or Substitution and/or Withdrawal of a Bid Submission

- 11.4.1. Any Bidder shall be entitled to withdraw or modify its Bid Submission at any time prior to the stipulated closing date and time.
- 11.4.2. Any amendment or alteration to the Bid documents must be received before the closing date and time of the Bid as stipulated in the conditions of Bid. The words "Amendment to Bid" and the description of the Bid must be clearly reflected on the envelope containing the documents or courier packaging as referred to above.
- 11.4.3. No modification, alteration or substitution of Bid Submissions will be permitted after the stipulated closing date and time.
- 11.4.4. TCTA reserves the right to request Bids for clarification needed to evaluate their Bids, however, such request for clarification shall not allow or entitle Bidders to change the substance or price of their Bids after Bid opening. Any request for clarification and the Bidder's responses will be made in writing.

### 11.5. Validity Period

- 11.5.1. All Bid Submissions must remain valid from the stipulated closing date and time of the Request for Bid for the period stated in this Bid. Each Bid Submission will constitute an irrevocable offer which remains open for acceptance by TCTA during the validity period.

- 11.5.2. If TCTA issues a request to extend the validity period, failure to respond to such a request shall be deemed to be an approval to extend the bid validity period on the same terms and conditions as per your original bid submission.
- 11.5.3. If a bidder rejects the extension of validity period with no further comments. The bidder's rejection shall be accepted as a withdrawal from the bid process.
- 11.5.4. If a bidder rejects the extension of the validity period and requests an adjustment to their bid price. Such adjustment must be in line with the Consumer Price Index applicable at the time of request for extension and/or a recognised industry pricing guide. Adjustments outside of these parameters or for any other reason will not be acceptable and the bidders original bid price shall be deemed to be applicable for the extended validity period.

#### 11.6. Disclaimer - Protection of Personal Information Act

- 11.6.1. By participating in this bid process, you hereby acknowledge that you have read and accept the following Protection of Personal Information (POPI) disclaimer.
- 11.6.2. You (the Bidder, herein after referred to in the first person for purposes of this disclaimer) understand and agree that all information provided, whether personal or otherwise, may be used and processed by TCTA and such use may include placing such information in the public domain.
- 11.6.3. Further by partaking in this process you specifically agree that the TCTA will use such information provided by you, irrespective of the nature of such information.
- 11.6.4. TCTA shall take all reasonable measures to protect the personal information of users and for the purpose of this disclaimer "personal information" shall be defined as detailed in the Promotion of Access to Information Act, Act 2 of 2000 ("PAIA") and the Protection of Personal Information Act, Act 4 of 2013 ("POPI").
- 11.6.5. As per the POPI Act personal information refers to information that identifies or relates specifically to you as a person or data subject, for example, your name, age, gender, identity number and your email address.
- 11.6.6. We may collect the following information about you:
  - 11.6.6.1. Your name, address, contact details, date of birth, place of birth, identity number, passport number, bank details, details about your employment, tax number and financial information;
  - 11.6.6.2. Information about your beneficial owner if we are required to do so in terms of POPIA.
  - 11.6.6.3. Records of correspondence or enquiries from you or anyone acting on your behalf.
  - 11.6.6.4. Details of transactions you carry out with us.
  - 11.6.6.5. Details of contracts you carry out with us; and

- 11.6.6.6. Sensitive or special categories of personal information, including biometric information, such as images, fingerprints, and voiceprints.
- 11.6.7. If you are under 18 years old, please do not provide us with any personal information unless you have the permission of your parent or legal guardian to do so.
- 11.6.8. Why we collect Personal Information
- 11.6.9. Employee and Contractor Information
  - 11.6.9.1. To Remunerate the person.
  - 11.6.9.2. To comply with laws authorising or requiring such processing, including (but not limited to) the Basic Conditions of Employment Act 75 of 1997; the Labour Relations Act 66 of 1995 as amended; the Employment Equity Act 55 of 1998; the Occupational Health and Safety Act 85 of 1993, the Income Tax Act 58 of 1962 and the VAT Act 89 of 1991.
  - 11.6.9.3. To Admit the person to the Pension Fund and/or Medical Aid providers, if applicable.
  - 11.6.9.4. To conduct criminal, credit, employment reference and other related reference checks.
  - 11.6.9.5. To provide value added services such as human resource administration, training, performance reviews, talent management and other reasons related to the management of employees and/or contractors.
- 11.6.10. Client Information
  - 11.6.10.1. To render client related services and administration of client accounts.
  - 11.6.10.2. To conduct criminal, credit, reference, and other related reference checks.
  - 11.6.10.3. To authenticate the client.
  - 11.6.10.4. To provide the client with information which TCTA believes may be of interest to the client, such as information relating to public awareness campaigns and matters of public interest in which TCTA is involved or has decided to lend its support to.
- 11.6.11. Supplier and Third-Party Contractor/Service Provider Information
  - 11.6.11.1. To secure the products and services of the supplier/service provider or contractor as part of TCTA's product and service offering.
  - 11.6.11.2. To manage the TCTA supply chain and relationship with the supplier and/or contractor for any purposes required by law by virtue of the relationship between the supplier and TCTA.
  - 11.6.11.3. To render services relating to the administration of supplier supplier/service provider or contractor accounts.



- 11.6.11.4. To provide the supplier/service provider or contractor with information which TCTA believes may be of interest, such as information relating to public awareness campaigns and matters of public interest in which TCTA is involved or has decided to lend its support to.

#### 11.6.12. Sources of Personal Information

- 11.6.12.1. Personal information may be collected from the following sources:
- 11.6.12.2. Directly from the person when he/she applies for any TCTA related employment, provide services to TCTA, submit forms requests or transactions, use our websites, or make use of any of the TCTA services.
- 11.6.12.3. From public registers, credit bureaus and law enforcement agencies and any other organisation from which TCTA may acquire your information.
- 11.6.12.4. From people and entities employed by TCTA to provide services to TCTA which may be legally entitled to provide TCTA with personal information.

#### 11.6.13. The Storage of Personal Information

- 11.6.13.1. All personal information collected by TCTA will be stored as follows:
- 11.6.13.2. In a secure and safe manner according to strict information security principles with safeguards to ensure its privacy and confidentiality.
- 11.6.13.3. For no longer than is necessary to achieve the purpose for which it was collected unless further retention is:
- 11.6.13.4. Required by law or contractual obligation.
- 11.6.13.5. Otherwise reasonably required by TCTA for lawful purposes related to its functions and activities.
- 11.6.13.6. Retained further with the person's consent:
- 11.6.13.7. After which the information will be de-identified and disposed of as per the TCTA Records policy.

#### 11.6.14. Sharing of Personal Information

- 11.6.14.1. Any information supplied to TCTA will be treated as confidential and TCTA will not disclose information unless legally permitted thereto. No information will be transferred to a Third Party without the explicit consent of the data subject unless legally obliged thereto. By providing the personal information, the data subject agrees that TCTA may transfer the information to the following people and organisations in pursuit of the data processing purposes set out in our Policy on the Protection of Personal Information.

- 11.6.14.2. To the divisions and departments in TCTA, including directors, employees, contractors, agents, auditors, legal and other professional advisors who are authorised to process this information.
- 11.6.14.3. To financial and government organisations who may request information from TCTA, in which case the data subject will be notified in advance; the provision of such information, including banks, governmental, judicial, regulatory and law enforcement bodies including the South African Revenue services and the National Credit Regulator.
- 11.6.14.4. To persons employed by TCTA to provide services on our behalf and that adhere to principles like TCTA regarding the treatment of personal information.
- 11.6.14.5. To any person to whom TCTA cede, delegate, transfer or assign any of our rights or obligations pertaining to products and/or services provided to the person or contracts concluded with the person.
- 11.6.14.6. To any person who acts as legal guardian, executor of an estate, curator or in a similar capacity.
- 11.6.14.7. To any person or persons who may be permitted by applicable law or that you may consent to, including persons or entities who may request such information to evaluate the credit worthiness of the person.

#### 11.6.15. Your Rights regarding your Personal Information

- 11.6.15.1. A data subject (employee, contractor, supplier and/or customer) has the following rights to his/her personal information collected, processed, and stored by TCTA:
- 11.6.15.2. Right of access to and the right to rectify or update the personal information collected.
- 11.6.15.3. The right to object at any time to the processing of the personal information in which event the consequences of the objection will be explained to the data subject.
- 11.6.15.4. The right to request TCTA to no longer process the personal information of the data subject should the information not be required for further processing or by law.

#### 11.6.16. General Conditions pertaining to Personal Information

- 11.6.16.1. TCTA accepts no liability whatsoever for any loss, damage (whether direct, indirect, special, or consequential) and/or expenses of any nature whatsoever which may arise because of, or which may be attributable directly or indirectly from information made available on this document, or actions or transaction resulting there from.

- 11.6.17. This disclaimer shall be read together with the TCTA terms and conditions also available on the TCTA website <https://www.tcta.co.za> .

## 11.7. Conflicts of Interest

- 11.7.1. Bidders are required to provide professional, objective and impartial advice/services and at all times and to hold the client's interest's paramount, without any consideration for future work and strictly avoid conflicts with other assignments or their own corporate interests.
- 11.7.2. Bidders may not be appointed for any bid that would be in conflict with their prior or current obligations to other clients, or that may place them in a position of not being able to carry out the scope of work in the best interest of TCTA. The bidders appointment will be in the sole discretion of TCTA having considered the bidders connection to their earlier obligations to TCTA and shall be considered by Procurement on a case by case basis.
- 11.7.3. Without limitation on the generality of this rule, bidders should not be participating in the bid process and/or be appointed where the bidder:
  - 11.7.3.1. Has been engaged by the accounting officer/authority to provide goods or works for a project and any of its affiliates, should be disqualified from providing consulting services for the same project.
  - 11.7.3.2. Has been appointed to provide consulting services for the preparation or implementation of a project and any of its affiliates, should be disqualified from subsequently providing goods or works or services related to the initial assignment (other than a continuation of the firm's earlier consulting services as described below) for the same project, unless the various firms (consultants, contractors, or suppliers) are performing the contractor's obligations under a turnkey or design-and-build contract;
  - 11.7.3.3. Bidders or any of their affiliates should not be hired for any assignment which, by its nature, may be in conflict with another assignment of that entity. As an example, bidders may be appointed to prepare an engineering design for an infrastructure project should not be engaged to prepare an independent environmental assessment for the same project, and bidders assisting a client in the privatization of public assets should not purchase, nor advise purchasers of such assets.
- 11.7.4. The limitation of participation shall not apply to bidders who are organs of state.

## 11.8. Right Not to Award

TCTA reserves the right, at its sole discretion, not to award to any of the Bidders or to cancel a Bid:

- 11.8.1. Due to changed circumstances; there is no longer a need for the goods, or the services specified in the invitation;
- 11.8.2. Funds are no longer available to cover the total envisaged expenditure;
- 11.8.3. No acceptable Bid is received; or
- 11.8.4. There are material irregularities in the Bid process.

## 11.9. Subcontracting after award

The successful bidder:

- 11.9.1. May only subcontract this scope of work no less than 6 (six) months after award;
- 11.9.2. May only subcontract with the prior written approval from the Contract Manager appointed by TCTA.
- 11.9.3. May only sub-contract more than 25% of the contract to a third party that has a B-BBEE status level that is more or equal to that of the successful bidder unless the third party is an EME capable of executing the contract.

#### 11.10. Notification of Unsuccessful Bidders

If no correspondence or communication is received from TCTA within the validity period, the relevant Bid Submissions submitted will be deemed to be unsuccessful.

#### 11.11. Prohibition of Bribery, Fraudulent and Corrupt Practices

- 11.11.1. No Bidders shall directly or indirectly commit, or attempt to commit, for the benefit of the Bidder or any other person, any of the following:
  - 11.11.1.1. Influencing, or attempting to influence, any TCTA's employees or agents in respect of the award of a Bid or the outcome of the Bid process in relation to any contract for the provision of goods or services; and/or
  - 11.11.1.2. Offering, or giving gratification to, and/or inducing, or attempting to induce, as defined in the Prevention and Combating of Corrupt Activities Act No. 12 of 2004, as amended from time to time, any of TCTA's employees or agents, in favour of or for the benefit of the Bidder and/or any other party; and/or
  - 11.11.1.3. Bribing, or attempting to bribe, any TCTA's employees or agents in order to influence the outcome of a Bid process in favour of or for the benefit of the Bidder and/or any other party.
- 11.11.2. TCTA shall be entitled to disqualify any Bidder/s if it has reason to believe that any conduct relating to that set out in Condition 11.11.1 above has occurred.

#### 11.12. Fronting

- 11.12.1. The TCTA supports the spirit of Broad-Based Black Economic Empowerment and recognizes that real empowerment can only be achieved through individuals and businesses conducting themselves in accordance with the Constitution and in an honest, fair, equitable, transparent and legally compliant manner. Against this background TCTA condemns any form of fronting.
- 11.12.2. TCTA, in ensuring that Bidders conduct themselves in an honest manner will, as part of the bid evaluation process, conduct or initiate the necessary probity investigation to determine the accuracy of the representation made in the bid document. Should any of the fronting indicators as contained in the Guidelines on Complex Structures and Transactions and Fronting, issued by the Department of Trade and Industry be established during such enquiry / investigation, the onus will be on the Bidder to prove that fronting does not exist.

- 11.12.3. Failure to do so within a period of 14 days from the date of notification may invalidate the Bid/contract and may also result in the restriction of the Bidder, by National Treasury, to conduct business with the public sector for a period not exceeding ten years, in addition to any other remedies the National Treasury may have against the bidder concerned.

#### 11.13. Joint venture or consortium

##### 11.13.1. The joint venture or consortium agreement:

- 11.13.1.1. Must clearly and comprehensively set out the contributions to be made by each member towards the activities of the joint venture or consortium in securing and executing the contract and should allocate monetary values to such contributions.
- 11.13.1.2. Must record the percentage participation by each member.
- 11.13.1.3. Must provide for meaningful input by all members to the policy making and management activities of the joint venture or consortium;
- 11.13.1.4. Must provide for the establishment of a management body for the joint venture or consortium;
- 11.13.1.5. Must provide measures to limit, as far as possible, losses to the joint venture or consortium by the default of a member;
- 11.13.1.6. Must promote consensus between the members whilst ensuring that the activities of the joint venture or consortium will not be unduly hindered by failure to achieve it;
- 11.13.1.7. Must provide for rapid, affordable and easy interim dispute resolution and for effective final dispute resolution, if required; and
- 11.13.1.8. Must be sufficiently flexible to allow for joint venture or consortiums which differ in nature, objectives, inputs by members, management systems, etc;
- 11.13.1.9. Must submit on annual basis consolidated BBBEE scorecard for the Joint Venture failure which TCTA will implement contractual remedies.

##### 11.13.2. Right to review the joint venture or consortium agreement

TCTA reserves the right to review the joint venture or consortium agreement between the parties to ensure that the minimum conditions set out above are adhered to.

##### 11.13.3. Amendment of the joint venture or consortium agreement

The composition or the constitution of the joint venture or consortium shall not be altered without the prior consent of the Employer.



## **ANNEXURES**

The following returnables/schedules must be completed, and documents submitted by the bidder as part of the bid submission. **If the space is inadequate, the bidder must append additional/supplementary tables/sheets to comply with the bid requirements.** Each other/extra sheet must display "Contract No. TCTA 19-041" and be cross-referenced appropriately, firmly appended to the relevant returnable/schedule, or otherwise included. They will not inadvertently be detached from the bid submission. A complete contents list of all sheets, including those that may be attached to the returnables/schedules, must be provided by the bidder. References given are for guidance only and not necessarily exclusive of other pertinent information in this RFB. The bidder must sign each page of each schedule, including any supplementary tables.

Apart from providing data in the Agreement, the information and documents provided in the returnables/schedules are material to the bid evaluation and will assess how well the bidder has complied with this RFB.

ANNEXURE	DOCUMENT TYPE	DESCRIPTION
A	Functionality	COMPANY EXPERIENCE
B	Functionality	PERSONNEL EXPERIENCE: CVS OF KEY PERSONNEL
C	Compliance	SANAS VERIFIED B-BBEE CERTIFICATE(S) OR SWORN AFFIDAVIT(S)
D	Agreement	JOINT VENTURE AGREEMENT OR MEMORANDUM OF UNDERSTANDING AND DECLARATION OF JOINT AND SEVERAL LIABILITY
E	Agreement	POWER OF ATTORNEY AND AUTHORITY FOR SIGNATORY
F	Price	LETTER OF OFFER BY THE BIDDER
G	Price	SUMMARY OF COST ESTIMATE
H	Price	PERSONNEL COSTS
I	Price	PERSONNEL BILLING RATES
J	Price	PERSONNEL MARK-UP FACTORS
K	Price	DIRECT REIMBURSABLE COSTS
L	Price	CASH FLOW
M	Administrative	MANPOWER SCHEDULE
N	Administrative	PROGRAMME AND CHARTS
O	Compliance	REQUEST FOR BID (SBD 1)
P	Compliance	BIDDER'S DISCLOSURE (SBD 4)
Q	Compliance	IN TERMS OF PPR 2022 (SBD 6.1)
R	Compliance	PROOF OF REGISTRATION WITH NATIONAL TREASURY CENTRAL SUPPLIER DATABASE (CSD)
S	Agreement	AGREEMENT FORM AND APPENDICES AND THE CONDITIONS OF THE CLIENT/CONSULTANT MODEL SERVICES AGREEMENT **

\*\* The Agreement form will be signed with the preferred bidder after evaluation of bids, i.e. contract award.



## ANNEXURE A: COMPANY EXPERIENCE (1): DESIGN AND CONSTRUCTION SUPERVISION/MONITORING OF TUNNEL INFRASTRUCTURE PROJECTS

- i) The bidder should list the appropriate and relevant company experience per the form below. For each project listed, information must be provided: Design and construction supervision/monitoring (Employer's Representative or Engineer) of tunnel infrastructure projects completed in the past 15 years in medium-hard rock, i.e.  $\geq 3$  m inside diameter and  $\geq 5$  km long, OR design and the award of the construction tender of tunnel infrastructure projects to the main contractor in the past 15 years in medium-hard rock, i.e.  $\geq 3$  m inside diameter and  $\geq 5$  km long.
- ii) **In the case where the services listed above were performed as a sub-consultant(s) or within a consortium or joint venture, this should be clearly stated, with an indication of the proportions (company person-months versus total project person-months) and the nature of the services rendered by each participant.**

No.	Project name and brief description	Project details	Project location	Completion or construction tender/contract award dates	Details of services rendered and level of participation per ii) above	Name of client/employer and company, and contact person's name, number or email
1	Lesotho Highlands Water Project – Phase 2: Polihali Transfer Tunnel	Tunnel is 38 km long with 5m inside diameter connecting the new Polihali Dam reservoir with the existing Katse Dam reservoir. Works include intake and outlet works and gate shafts.	Lesotho	Construction tender awarded in Nov. '22, about 1-year ago.	Geotechnical investigations, tender design and compilation of the construction tender and prequalification documents as well as evaluation thereof.  AB and FG were JV members with 90% proportion.	Client: LHDA Mr X YZ +266 1234 5678 xyz@lhda.co.za  Company: [JV name] (members: AB, FG, etc.)
2						
3						
...						
<b>IMPORTANT NOTES:</b> <ol style="list-style-type: none"> <li>When completing the table above, completion refers to the completion/taking over or performance certificate issued for the whole of works to the main contractor for points allocation for each "completed" project listed.</li> <li>Micro-tunnelling projects (i.e. non-accessible tunnelling machines operated remotely) must not be included because they will not be accepted.</li> </ol>						

Number of sheets, appended by the bidder, comprising this table:.....(if nil, enter Nil)

SIGNATURE: .....  
(of the person authorised to sign on behalf of the bidder)

DATE: .....

## ANNEXURE A: COMPANY EXPERIENCE (2): DESIGN AND CONSTRUCTION SUPERVISION/MONITORING OF WELDED STEEL PIPELINE PROJECTS

- i) The bidder should list the appropriate and relevant company experience per the form below. For each project listed, information must be provided: Design and construction supervision/monitoring (Employer's Representative or Engineer) of welded steel pipeline projects completed, i.e.  $\geq 1.5$  m nominal diameter and  $\geq 2.5$  km long.
- ii) **In the case where the services listed above were performed as a sub-consultant(s) or within a consortium or joint venture, this should be clearly stated, with an indication of the proportions (company person-months versus total project person-months) and the nature of the services rendered by each participant.**

No.	Project name and brief description	Project details	Project location	Completion dates	Details of services rendered and level of participation per ii) above	Name of client/employer and company, and contact person's name, number or email
1						
2						
3						
4						
5						
...						
<b>IMPORTANT NOTE:</b> Only completed large, welded steel pipeline projects, where the completion/taking-over or performance certificate for the whole construction works for each project has been issued to the main contractor.						

Number of sheets, appended by the bidder, comprising this table:.....(if nil, enter Nil)

SIGNATURE: .....  
(of the person authorised to sign on behalf of the bidder)

DATE: .....

## ANNEXURE B: PERSONNEL EXPERIENCE

The bidder should determine and indicate the human resources as follows:

- i) All personnel categories and positions proposed per Manpower Schedule, including South African black professional people and key personnel below and their relationships per Organisational Structure.
  - Parent firm/company in abbreviation and brackets after each personnel.
  - Concise statement of the duties of each personnel, the suitability of their qualification(s) and concise experience record.
- ii) The bidder should submit CVs for key personnel in the format below - Curricula Vitae (CVs) of all key personnel identified by the TCTA for evaluation, i.e. bid. Each CV shall be strictly limited to a maximum of three (3) pages and shall give the following information:
  - Name, age, the parent firm, nationality and position in project organisation;
  - Demographic Status as defined in the Employment Equity Act No.55 of 1998;
  - Educational qualifications;
  - Professional qualifications (societies, honorary, publications, etc.);
  - Valid professional registrations and registration numbers;
  - Relevant experience (actual duties performed, degree of responsibility and management level must be indicated), including locations, dates and durations of assignments, starting with the latest;
  - Summary of other experiences;
  - Proficiency in speaking, reading and writing in English; and
  - Signature of the individual.
- iii) Much importance will be placed on the qualifications and experience of the personnel proposed. The bidder must ensure that, if selected, the nominated persons will be assigned as proposed. If the person is not available, then the bidder may replace the person with an equal or better alternative, subject to approval by the TCTA. Failure to do so may result in the annulment of any acceptance of the bidder's submission/proposal and Agreement/contract entered into by TCTA executing the Services. Attention is drawn to Sub-Clause 3.5.1 of the General Conditions of the FIDIC Client/Consultant Model Services Agreement.
- iv) TCTA may interview the key personnel of the preferred bidder during the negotiations stage.

The TCTA requires that the bidder complete the table below – list all personnel to render Services.

Position/Title	Title and Name (Nationality)	Black person (Y/N)	Youth (Y/N)	Duties, qualifications, and experience, OR refer to Key Personnel CV
Project Manager	<i>Mr Tom Harris (South African) (Parent Firm)</i>	<i>N</i>	<i>N</i>	<i>Key personnel CV</i>
Contracts Engineer				
Chief Design Engineer				
Senior Pipeline Design Engineer				
Chief Resident Engineer				
Senior Geological and Geotechnical Engineer				
Environmental Assessment Practitioner				
Senior Structural Engineer				
Construction Health and Safety Specialist or Manager				
Senior Hydraulic Design Engineer				
Environmental Manager (1)				
...				
...				
...				

Number of sheets, appended by the bidder, comprising this table:.....(if nil, enter Nil)

SIGNATURE: .....  
(of the person authorised to sign on behalf of the bidder)

DATE: .....

## CV OF KEY PERSONNEL (1): PROJECT MANAGER

CV is to be submitted in the following format:

**Name:**

**Profession:**

**Date of Birth:**

**Parent Firm:**

**Position in Firm:**

**Years with Firm:**

**Nationality:**

**BI & Male/Female Status:**

**Tertiary Education (and year obtained):**

**Professional Registrations (and year obtained):**

**Languages:**

*Please indicate your first language. If the first language is not English, please indicate proficiency in English. For other languages, please show speaking, reading and writing ability.*

**Countries of Work Experience:**

**PROPOSED POSITION ON TEAM:**

**KEY QUALIFICATIONS:**

*Please outline staff members' qualifications and training that are most pertinent to the assigned work on the team.*

**RELEVANT EXPERIENCE**

*Describe the degree of responsibility held by the staff member on relevant previous assignments and give dates and locations. For experience in the last ten years, provide types of activities performed and client references where appropriate.*

**SUMMARY OF OTHER EXPERIENCE**

*List all positions held by the staff member since graduation, giving dates, names of employing organisations and companies, the title of positions held and locations of assignments.*

**REFERENCES**

*Provide details of two contactable references or referees.*

**FUNCTIONALITY**

*Notwithstanding the above, complete the table below. The information is required for evaluation, i.e. functionality. Points will not be allocated if the table is not completed.*

1. Experience in project management, i.e. similar/comparable bulk water or civil engineering infrastructure projects with capital cost of ≥R350 million (excl VAT) (i.e. total project value and not just consultant's cost) and tunnels (≥ 3m inside Ø and ≥5 km long) using tunnel boring machine(s) only.
2. Pr. Eng (Yes or No): \_\_\_\_\_; Registration No.: \_\_\_\_\_  
Details of internationally equivalent to Pr. Eng (if relevant): \_\_\_\_\_
3. Attach valid registration certificates/documents.

No.	Role / Duties	Contract Type, e.g. FIDIC Yellow Book	Tunnel of ≥3 m Ø and ≥ 5 km long		Capital project cost of ≥R350 million (excl. VAT)	
			Project name and brief description, and details of the tunnel	Duration of work experience in years*	Project name and capital cost in Rands (excl. VAT)	Duration of work experience in years*
1						
2						
3						
4						
5						
...						

**IMPORTANT NOTES:**

1. \* The “duration of work experience in years” must be relevant to the project and indicate the start and finish dates in years of professional experience on each project listed. As such, the relevant professional experience must be listed from the first year (e.g. 1997) to the last year (e.g. 2022). Also, the projects must be listed in ascending order, considering the “duration of work experience in years”.
2. If the space is inadequate, the bidder must append additional/supplementary tables/sheets OR expand the cells/table. Where requested, and the bidder is unable to convert the table to Microsoft Word, TCTA will provide the annexure in Microsoft Word.
3. **The bidder must not make notes in the table above referencing information that is provided elsewhere in the bid submission. The table must be completed in full to ensure that points will be allocated correctly per the evaluation criteria, i.e. functionality. Bidders who use their own CV format/table will score zero points.**

**Declaration:**

I confirm that the above information contained in the CV is an accurate description of my experience and qualifications and that, at the time of signature, I am available and willing to serve in the position indicated for me in the bid for the uMkhomazi Water Project – Phase 1 (uMWP-1): Water Conveyance Infrastructure, for the duration and at the locations noted therein.

\_\_\_\_\_  
Signature of Staff Member

\_\_\_\_\_  
Date

## **CV OF KEY PERSONNEL (2): TUNNELLING SPECIALIST / CHIEF DESIGN ENGINEER**

**IMPORTANT NOTE:** The bidder must confirm, by amending the heading above, the use of a Chief Design Engineer (versus a Tunneling Specialist) who has experience in the design and construction experience in tunnelling.

CV is to be submitted in the following format:

**Name:**

**Profession:**

**Date of Birth:**

**Parent Firm:**

**Position in Firm:**

**Years with Firm:**

**Nationality:**

**BI & Male/Female Status:**

**Tertiary Education (and year obtained):**

**Professional Registrations (and year obtained):**

**Languages:**

*Please indicate your first language. If the first language is not English, please indicate proficiency in English. For other languages, please show speaking, reading and writing ability.*

**Countries of Work Experience:**

**PROPOSED POSITION ON TEAM:**

**KEY QUALIFICATIONS:**

*Please outline staff members' qualifications and training that are most pertinent to the assigned work on the team.*

**RELEVANT EXPERIENCE**

*Describe the degree of responsibility held by the staff member on relevant previous assignments and give dates and locations. For experience in the last ten years, provide types of activities performed and client references where appropriate.*

**SUMMARY OF OTHER EXPERIENCE**

*List all positions held by the staff member since graduation, giving dates, names of employing organisations and companies, the title of positions held and locations of assignments.*

**REFERENCES**

*Provide details of two contactable references or referees.*

**FUNCTIONALITY**

*Notwithstanding the above, complete the table below. The information is required for evaluation, i.e. functionality. Points will not be allocated if the table is not completed.*

1. Experience in the design and construction of large diameter tunnels ( $\geq 3$  m inside  $\varnothing$  and  $\geq 5$  km long) in medium-hard rock.
2. Pr. Eng (Yes or No): \_\_\_\_\_; Registration No.: \_\_\_\_\_  
Details of internationally equivalent to Pr.Eng (if relevant): \_\_\_\_\_
3. Attach valid registration certificates/documents.

No.	Role / Duties	Drill and Blast, TBM or both	Project name and brief description, and details of the tunnel (diameter, length, lining, etc.)	Duration of work experience on the project in years*
1				
2				
3				
4				
5				
...				

**IMPORTANT NOTES:**

1. \* The “duration of work experience on the project in years” must indicate the start and finish dates in years on each project listed. As such, the relevant professional experience must be listed from the first year (e.g. 1997) to the last year (e.g. 2022). Also, the projects must be listed in ascending order, considering the “duration of work experience on the project in years”.
1. If the space is inadequate, the bidder must append additional/supplementary tables/sheets OR expand the cells/table. Where requested, and the bidder is unable to convert the table to Microsoft Word, TCTA will provide the annexure in Microsoft Word.
2. TBM – Tunnel Boring Machine.
3. **The bidder must not make notes in the table above referencing information that is provided elsewhere in the bid submission. The table must be completed in full to ensure that points will be allocated correctly per the evaluation criteria, i.e. functionality. Bidders who use their own CV format/table will score zero points.**

**Declaration:**

I confirm that the above information contained in the CV is an accurate description of my experience and qualifications and that, at the time of signature, I am available and willing to serve in the position indicated for me in the bid for the uMkhomazi Water Project – Phase 1 (uMWP-1): Water Conveyance Infrastructure, for the duration and at the locations noted therein.

\_\_\_\_\_  
Signature of Staff Member

\_\_\_\_\_  
Date



**CV OF KEY PERSONNEL (3): CHIEF RESIDENT ENGINEER**

CV is to be submitted in the following format:

**Name:**

**Profession:**

**Date of Birth:**

**Parent Firm:**

**Position in Firm:**

**Years with Firm:**

**Nationality:**

**BI & Male/Female Status:**

**Tertiary Education (and year obtained):**

**Professional Registrations (and year obtained):**

**Languages:**

*Please indicate your first language. If the first language is not English, please indicate proficiency in English. For other languages, please show speaking, reading and writing ability.*

**Countries of Work Experience:**

**PROPOSED POSITION ON TEAM:**

**KEY QUALIFICATIONS:**

*Please outline staff members' qualifications and training that are most pertinent to the assigned work on the team.*

**RELEVANT EXPERIENCE**

*Describe the degree of responsibility held by the staff member on relevant previous assignments and give dates and locations. For experience in the last ten years, provide types of activities performed and client references where appropriate.*

**SUMMARY OF OTHER EXPERIENCE**

*List all positions held by the staff member since graduation, giving dates, names of employing organisations and companies, the title of positions held and locations of assignments.*

**REFERENCES**

*Provide details of two contactable references or referees.*

**FUNCTIONALITY**

*Notwithstanding the above, complete the table below. The information is required for evaluation, i.e. functionality. Points will not be allocated if the table is not completed.*

1. Experience in construction supervision/monitoring of large diameter tunnels ( $\geq 3$  m inside  $\varnothing$  and  $\geq 5$  km long) in medium-hard rock.
2. Pr. Eng (Yes or No): \_\_\_\_\_; Registration No.: \_\_\_\_\_  
Details of internationally equivalent to Pr. Eng (if relevant): \_\_\_\_\_
3. Attach valid registration certificates/documents.

No.	Role / Duties	Contract Type, e.g. FIDIC Red Book	Project name and brief description, and details of the tunnel (diameter, length, lining, tunnelling method, etc.)	Duration of work experience on the project in years*
1				
2				
3				
4				
5				
...				

**IMPORTANT NOTES:**

1. \* The “duration of work experience on the project in years” must be relevant to the project and indicate the start and finish dates in years of professional experience on each project listed. As such, the relevant professional experience must be listed from the first year (e.g. 1997) to the last year (e.g. 2022). Also, the projects must be listed in ascending order, considering the “duration of work experience in years”
2. If the space is inadequate, the bidder must append additional/supplementary tables/sheets OR expand the cells/table. Where requested, and the bidder is unable to convert the table to Microsoft Word, TCTA will provide the annexure in Microsoft Word.
3. **The bidder must not make notes in the table above referencing information that is provided elsewhere in the bid submission. The table must be completed in full to ensure that points will be allocated correctly per the evaluation criteria, i.e. functionality. Bidders who use their own CV format/table will score zero points.**

**Declaration:**

I confirm that the above information contained in the CV is an accurate description of my experience and qualifications and that, at the time of signature, I am available and willing to serve in the position indicated for me in the bid for the uMkhomazi Water Project – Phase 1 (uMWP-1): Water Conveyance Infrastructure, for the duration and at the locations noted therein.

\_\_\_\_\_  
Signature of Staff Member

\_\_\_\_\_  
Date

**CV OF KEY PERSONNEL (4): CONTRACTS ENGINEER**

CV is to be submitted in the following format:

**Name:**

**Profession:**

**Date of Birth:**

**Parent Firm:**

**Position in Firm:**

**Years with Firm:**

**Nationality:**

**BI & Male/Female Status:**

**Tertiary Education (and year obtained):**

**Professional Registrations (and year obtained):**

**Languages:**

*Please indicate your first language. If the first language is not English, please indicate proficiency in English. For other languages, please show speaking, reading and writing ability.*

**Countries of Work Experience:**

**PROPOSED POSITION ON TEAM:**

**KEY QUALIFICATIONS:**

*Please outline staff members' qualifications and training that are most pertinent to the assigned work on the team.*

**RELEVANT EXPERIENCE**

*Describe the degree of responsibility held by the staff member on relevant previous assignments and give dates and locations. For experience in the last ten years, provide types of activities performed and client references where appropriate.*

**SUMMARY OF OTHER EXPERIENCE**

*List all positions held by the staff member since graduation, giving dates, names of employing organisations and companies, the title of positions held and locations of assignments.*

**REFERENCES**

*Provide details of two contactable references or referees.*

**FUNCTIONALITY**

*Notwithstanding the above, complete the table below. The information is required for evaluation, i.e. functionality. Points will not be allocated if the table is not completed.*

1. Experience in similar/comparable bulk water or civil engineering infrastructure projects with capital cost of ≥R350 million (excluding VAT) (i.e. total project value and not just consultant's cost).
2. Pr. Eng (Yes or No): \_\_\_\_\_; Registration No.: \_\_\_\_\_  
OR  
Pr. QS (Yes or No): \_\_\_\_\_; Registration No.: \_\_\_\_\_  
Details of internationally equivalent to Pr. Eng / Pr. QS (if relevant): \_\_\_\_\_
3. Attach valid registration certificates/documents.

No.	Role / Duties	Project name and brief description	Capital cost in Rands (excl. VAT)	Duration of work experience on the project in years*
1				
2				
3				
4				
5				
...				

**IMPORTANT NOTES:**

1. \* The “duration of work experience on the project in years” must indicate the start and finish dates in years on each project listed. As such, the relevant professional experience must be listed from the first year (e.g. 1997) to the last year (e.g. 2022). Also, the projects must be listed in ascending order, considering the “duration of work experience on the project in years”.
2. If the space is inadequate, the bidder must append additional/supplementary tables/sheets OR expand the cells/table. Where requested, and the bidder is unable to convert the table to Microsoft Word, TCTA will provide the annexure in Microsoft Word.
3. **The bidder must not make notes in the table above referencing information that is provided elsewhere in the bid submission. The table must be completed in full to ensure that points will be allocated correctly per the evaluation criteria, i.e. functionality. Bidders who use their own CV format/table will score zero points.**

**Declaration:**

I confirm that the above information contained in the CV is an accurate description of my experience and qualifications and that, at the time of signature, I am available and willing to serve in the position indicated for me in the bid for the uMkhomazi Water Project – Phase 1 (uMWP-1): Water Conveyance Infrastructure, for the duration and at the locations noted therein.

\_\_\_\_\_  
Signature of Staff Member

\_\_\_\_\_  
Date

## **CV OF KEY PERSONNEL (5): SENIOR GEOLOGICAL AND GEOTECHNICAL ENGINEER**

CV is to be submitted in the following format:

**Name:**

**Profession:**

**Date of Birth:**

**Parent Firm:**

**Position in Firm:**

**Years with Firm:**

**Nationality:**

**BI & Male/Female Status:**

**Tertiary Education (and year obtained):**

**Professional Registrations (and year obtained, if any):**

**Languages:**

*Please indicate your first language. If the first language is not English, please indicate proficiency in English. For other languages, please show speaking, reading and writing ability.*

**Countries of Work Experience:**

**PROPOSED POSITION ON TEAM:**

**KEY QUALIFICATIONS:**

*Please outline staff members' qualifications and training that are most pertinent to the assigned work on the team.*

**RELEVANT EXPERIENCE**

*Describe the degree of responsibility held by the staff member on relevant previous assignments and give dates and locations. For experience in the last ten years, provide types of activities performed and client references where appropriate.*

**SUMMARY OF OTHER EXPERIENCE**

*List all positions held by the staff member since graduation, giving dates, names of employing organisations and companies, the title of positions held and locations of assignments.*

**REFERENCES**

*Provide details of two contactable references or referees.*

**FUNCTIONALITY**

*Notwithstanding the above, complete the table below. The information is required for evaluation, i.e. functionality. Points will not be allocated if the table is not completed.*

1. Experience in geological, geohydrological and geotechnical investigations, surveys, mapping, testing and assessments of large tunnels ( $\geq 3$  m inside  $\emptyset$  and  $\geq 5$  km long) and related infrastructure in medium-hard rock.
2. Pr. Eng / Pr. Sci. Nat. (specify): \_\_\_\_\_; Registration No.: \_\_\_\_\_  
OR  
BSc (geology) (Yes or No): \_\_\_\_\_  
Details of internationally equivalent to Pr. Eng / Pr. Sci. Nat. / BSc (geology) (if relevant): \_\_\_\_\_
3. Attach valid registration/qualification(s) certificates/documents.

No.	Role / Duties	Project name and brief description, and details of the tunnel (diameter and length.)	Details of the project, i.e. work/services rendered	Duration of work experience on the project in years*
1				
2				
3				
4				
5				
...				

**IMPORTANT NOTES:**

1. \* The “duration of work experience on the project in years” must indicate the start and finish dates in years on each project listed. As such, the relevant professional experience must be listed from the first year (e.g. 1997) to the last year (e.g. 2022). Also, the projects must be listed in ascending order, considering the “duration of work experience on the project in years”.
2. If the space is inadequate, the bidder must append additional/supplementary tables/sheets OR expand the cells/table. Where requested, and the bidder is unable to convert the table to Microsoft Word, TCTA will provide the annexure in Microsoft Word.
3. **The bidder must not make notes in the table above referencing information that is provided elsewhere in the bid submission. The table must be completed in full to ensure that points will be allocated correctly per the evaluation criteria, i.e. functionality. Bidders who use their own CV format/table will score zero points.**

**Declaration:**

I confirm that the above information contained in the CV is an accurate description of my experience and qualifications and that, at the time of signature, I am available and willing to serve in the position indicated for me in the bid for the uMkhomazi Water Project – Phase 1 (uMWP-1): Water Conveyance Infrastructure, for the duration and at the locations noted therein.

\_\_\_\_\_  
Signature of Staff Member

\_\_\_\_\_  
Date

**CV OF KEY PERSONNEL (6): ENVIRONMENTAL ASSESSMENT PRACTITIONER**

CV is to be submitted in the following format:

**Name:**

**Profession:**

**Date of Birth:**

**Parent Firm:**

**Position in Firm:**

**Years with Firm:**

**Nationality:**

**BI & Male/Female Status:**

**Tertiary Education (and year obtained):**

**Professional Registrations (and year obtained, if any):**

**Languages:**

*Please indicate your first language. If the first language is not English, please indicate proficiency in English. For other languages, please show speaking, reading and writing ability.*

**Countries of Work Experience:**

**PROPOSED POSITION ON TEAM:**

**KEY QUALIFICATIONS:**

*Please outline staff members' qualifications and training that are most pertinent to the assigned work on the team.*

**RELEVANT EXPERIENCE**

*Describe the degree of responsibility held by the staff member on relevant previous assignments and give dates and locations. For experience in the last ten years, provide types of activities performed and client references where appropriate.*

**SUMMARY OF OTHER EXPERIENCE**

*List all positions held by the staff member since graduation, giving dates, names of employing organisations and companies, the title of positions held and locations of assignments.*

**REFERENCES**

*Provide details of two contactable references or referees.*

**FUNCTIONALITY**

*Notwithstanding the above, complete the table below. The information is required for evaluation, i.e. functionality. Points will not be allocated if the table is not completed.*

1. Environmental (management and monitoring) and social management experience in similar/comparable civil engineering infrastructure projects, i.e. Environmental Impact Assessments (EIAs) and preparation of Environmental Management Programmes.
2. Environmental-related degree in biological, physical or earth sciences (NQF level 7) (specify): \_\_\_\_\_
3. Pr.Sci.Nat. (Yes or No): \_\_\_\_\_; Registration No.: \_\_\_\_\_  
Details of internationally equivalent to PrSciNat. (if relevant): \_\_\_\_\_
4. Environmental Assessment Practitioners Association of South Africa registration:  
Yes or No: \_\_\_\_\_; Registration No.: \_\_\_\_\_
5. Attach valid registration certificates/documents.

No.	Role / Duties	Project name and brief description	Details of the project, i.e. work/services rendered, e.g. EIA	Duration of work experience on the project in years*
1				
2				
3				
4				
5				
...				

**IMPORTANT NOTES:**

1. \* The “duration of work experience on the project in years” must indicate the start and finish dates in years on each project listed. As such, the relevant professional experience must be listed from the first year (e.g. 1997) to the last year (e.g. 2022). Also, the projects must be listed in ascending order, considering the “duration of work experience on the project in years”.
2. If the space is inadequate, the bidder must append additional/supplementary tables/sheets OR expand the cells/table. Where requested, and the bidder is unable to convert the table to Microsoft Word, TCTA will provide the annexure in Microsoft Word.
3. **The bidder must not make notes in the table above referencing information that is provided elsewhere in the bid submission. The table must be completed in full to ensure that points will be allocated correctly per the evaluation criteria, i.e. functionality. Bidders who use their own CV format/table will score zero points.**

**Declaration:**

I confirm that the above information contained in the CV is an accurate description of my experience and qualifications and that, at the time of signature, I am available and willing to serve in the position indicated for me in the bid for the uMkhomazi Water Project – Phase 1 (uMWP-1): Water Conveyance Infrastructure, for the duration and at the locations noted therein.

\_\_\_\_\_  
Signature of Staff Member

\_\_\_\_\_  
Date



**ANNEXURE C: SANAS VERIFIED B-BBEE CERTIFICATE(S) OR SWORN  
AFFIDAVIT(S)**

**IMPORTANT NOTE:** A joint venture or consortium must submit a consolidated SANAS verified B-BBEE certificate based on the weighted members participation in order to earn B-BBEE points.

## **ANNEXURE D: JOINT VENTURE AGREEMENT OR MEMORANDUM OF UNDERSTANDING AND DECLARATION OF JOINT AND SEVERAL LIABILITY**

It is not a requirement for the bidder to register the joint venture or consortium as a legal entity or to enter into a formal joint venture or consortium agreement between the members to submit a bid. A memorandum of understanding, signed by the duly authorised representatives of all the members, will suffice for the bidding stage showing the following:

- The composition, constitution and structure of the joint venture or consortium (in writing and diagrammatically).
- Percent or degree of participation of each member in the joint venture or consortium.
- Percent or degree participation of South African engineering consultancy companies or professional service providers in the joint venture or consortium (if applicable).
- Level of financial commitment of each member in the joint venture or consortium.
- Duties and responsibilities of each member in the joint venture or consortium.
- Declaration of Joint and Several Liability.
- Conditions of Bid: 11.13 Joint venture or consortium.

The signed joint venture or consortium agreement will be required soon after the award of the contract/Agreement for the Services.

## **ANNEXURE E: POWER OF ATTORNEY AND AUTHORITY FOR SIGNATORY**

## **ANNEXURE F: LETTER OF OFFER BY THE BIDDER**

The bidder must examine all the requirements stipulated in the RFB document for the execution of the Services, including any addenda relating to the addenda and provide a Letter of Offer as follows:

- Confirm in the letter that the bidder has examined the contents of the RFB document, including all the annexures and addenda (all addenda issued by TCTA to be listed).
- Confirm in the letter that the bidder has completed all the returnables/schedules and provided all the required documents.
- Acknowledge conformity with the conditions of the RFB in the letter.
- The letter must have the total price (including VAT and escalation in Rands) to execute and complete the Services.
- Acknowledge that the Summary of Cost Estimate (including Provisional Sum items entered by TCTA) forms part of the Letter of Offer (provide/attach the completed relevant annexure).
- Stipulate the validity date of the bid submission in the letter, considering the specified Bid Validity Period.
- Confirm in the letter that the bidder will provide the specified insurances, commence with the Services per the Commencement Date and complete the Services per the Time for Completion.
- The letter must acknowledge that until a formal Agreement is prepared, the executed Letter of Offer, together with TCTA written acceptance thereof, shall constitute a binding contract between the Parties.
- Confirm in the letter that the bidder has qualifications/conditions (if any). Such qualifications must be detailed separately and provided/attached with/to the bidder's Letter of Offer.
- The letter (with the abovementioned attachments) must be signed and dated by the person authorised to sign on behalf of the bidder.

**ANNEXURE G: SUMMARY OF COST ESTIMATE**

No	Cost Elements	Total (R)
<b>1</b>	<b>Personnel Costs:</b>	
	1. Tender Design and Documentation 2. Detailed Design 3. Construction Supervision 4. Post-Construction Monitoring 5. Project Management 6. Black South Africans, Enterprise and Supplier Development Requirements	
<b>2</b>	<b>Subtotal Personnel Costs</b>	
<b>3</b>	<b>Consultant's Fixed Fee on 2 at _____ %</b>	
<b>4</b>	<b>Direct Reimbursable Costs:</b>	
	1. Tender Design and Documentation 2. Detailed Design 3. Construction Supervision 4. Post-Construction Monitoring 5. Project Management 6. Black South Africans, Enterprise and Supplier Development Requirements	
<b>5</b>	<b>Subtotal Direct Reimbursable Costs 4</b>	
<b>6</b>	<b>Provisional Items entered by TCTA:</b>	
	1. TCTA Adjudication/Arbitration Costs 2. Assistance to TCTA 3. Hydropower plant complete scope of services 4. Project Vehicles and Accommodation for TCTA 5. Secondment of TCTA Graduates, Engineers and Scientists 6. Exceptional and Unforeseen Circumstances	5 000 000 113 000 000 25 000 000 8 500 000 1 000 000 85 000 000
<b>7</b>	<b>Subtotal of Provisional Items</b>	
<b>8</b>	<b>Consultant's Overall Mark-Up on 7 ESTIMATED at _____ %</b>	
<b>9</b>	<b>Total Costs:</b>	
<b>10</b>	<b>Subtotal Excluding Escalation (2+3+5+7+8)</b>	
<b>11</b>	<b>Escalation (Personnel and Direct Reimbursable Costs) (ESTIMATE)</b>	
<b>12</b>	<b>Subtotal Including Escalation (10+11)</b>	
<b>13</b>	<b>VAT @ 15% (of 12)</b>	
<b>14</b>	<b>TOTAL COST ESTIMATE (12+13)</b>	

Number of sheets, appended by the bidder, comprising this table:.....(if nil, enter Nil)

SIGNATURE: .....  
(of person authorised to sign on behalf of the bidder)

DATE: .....

## ANNEXURE H: PERSONNEL COSTS

- i) The bidder should provide schedules of personnel costs based on the Programme and Charts, Manpower Schedule (person-months carried from this schedule) and Personnel Billing Rates.
- ii) Support personnel such as secretaries, typists, messengers and clerks in home offices shall not be listed separately. Costs of such support shall be deemed to be office billing rates for professional personnel.
- iii) Full details and a breakdown of the composition of all billing rates must be provided.
- iv) Prepare a separate table for each task and subtask in the Services, i.e. "Detailed Personnel Costs".
- v) Carry total amounts for each task to a summary page of personnel costs listed by task, i.e. "Summary of Personnel Costs".
- vi) Extend this schedule to continue the sheets, as required.

### SUMMARY OF PERSONNEL COSTS

Summary of Personnel Costs				
Ref. No.	Task / Sub-Task No.	Description	Personnel Time and Cost	
			Person months	Amount (R)
1	Tender Design and Documentation			
	1.1	Engineering		
	1.2	Environmental, Social and Land Acquisition		
	1.3	Health and Safety		
	Subtotal 1. (carry to Summary of Cost Estimate):			
2	Detailed Design			
	2.1	Engineering		
	2.2	Environmental, Social and Land Acquisition		
	2.3	Health and Safety		
	Subtotal 2. (carry to Summary of Cost Estimate):			
3	Construction Supervision			
	3.1	Engineering		
	3.2	Environmental, Social and Land Acquisition		
	3.3	Health and Safety		
	Subtotal 3. (carry to Summary of Cost Estimate):			
4	Post-Construction Monitoring			
	4.1	Engineering		
	4.2	Environmental, Social and Land Acquisition		
	.3	Health and Safety		
	Subtotal 4. (carry to Summary of Cost Estimate):			
5	Project Management			
	Subtotal 5. (carry to Summary of Cost Estimate):			
6	Black South Africans, Enterprise and Supplier Development Requirements			
	Sub-Total 6. (carry to Summary of Cost Estimate):			
TOTAL PERSONNEL COST (Sub-Totals 1+2+3+4+5+6) :				

Number of sheets, appended by the bidder, comprising this table:.....(if nil, enter Nil)

SIGNATURE: .....

*(of person authorised to sign on behalf of the bidder)*

DATE: .....

**DETAILED PERSONNEL COSTS**

Task / Subtask No \_\_\_\_\_ Task / Sub-task Title \_\_\_\_\_

Ref. No.	Cost Element			Person-months	Billing Rate	Amount
	Personnel Category	Position or Title	Name			Consultant
e.g., H001	Level 11	Project Manager	Mr Tom Harris	0.675	Value	Value
1.						
2.						
3.						
4.						
5.						
Etc.						
	<b>Task / Subtask Total (carry to Summary of Personnel Costs)</b>					

Number of sheets, appended by the bidder, comprising this table:.....(if nil, enter Nil)

SIGNATURE: .....

DATE: .....

(of person authorised to sign on behalf of the bidder)



## ANNEXURE I: PERSONNEL BILLING RATES

- The bidder should provide the data below for each personnel.
- All positions should be indicated, and all personnel' names should be provided.
- Mark-up factors brought forward from "Personnel Mark-up Factors".
- Carry billing rates to "Personnel Costs".
- The period applicable to the billing rates is one calendar month.
- Salary = Cost-To-Company Remuneration.

Average Cost-To-Company		Personnel in Home Office			Personnel Resident on Site		
Annual	Monthly	Category	Mark-up	Rate	Category	Mark-up	Rate
		H1			R1		
		H2			R2		
		H3			R3		
		H4			R4		
		H5			R5		
		H6			R6		
		H7			R7		
		H8			R8		
		H9			R9		
		H10			R10		
		H11			R11		
		H12			R12		

Number of sheets, appended by the bidder, comprising this table:.....(if nil, enter Nil)

SIGNATURE: .....  
(of person authorised to sign on behalf of the bidder)

DATE: .....

## ANNEXURE J: PERSONNEL MARK-UP FACTORS

- The following mark-up factors (multipliers) are to be provided.
- Carry total mark-up factors must be carried to “Personnel Billing Rates”.

Ref No	Personnel Category	Mark-up Factor (Multiplier) %
<b>1</b>	<b>Personnel in Home Office</b>	
1.1	Cost-to-company remuneration	100
1.2	Overtime	
1.3	Company overhead	
1.4	Support Staff	
1.5	Other (to be detailed by the Consultant)	
	<b>TOTAL, as % of remuneration cost</b>	
<b>2</b>	<b>Personnel Resident on Site</b>	
2.1	Cost-to-company remuneration	100
2.2	Overtime	
2.3	Company overhead	
2.4	Support Staff	
2.5	Other (to be detailed by the Consultant)	
	<b>TOTAL, as % of remuneration cost</b>	

Number of sheets, appended by the bidder, comprising this table:.....(if nil, enter Nil)

SIGNATURE: .....

DATE: .....

(of person authorised to sign on behalf of the bidder)

## ANNEXURE K: DIRECT REIMBURSABLE COSTS

- The bidder should provide an estimate of all their direct reimbursable costs, supported by detailed worksheets on separate pages.
- Each worksheet shall correspond to one item on the “Summary of Direct Reimbursable Costs”.
- The bidder must amend and add other items as s/he deems necessary.
- Reimbursable costs must be estimated at actual costs, with no mark-up.
- Task 3: Construction Supervision: TCTA will provide certain facilities and equipment per Agreement: Appendix 2 – Personnel, Equipment, Facilities and Services of Others to be Provided by the Client. The bidders must not price for such items.

### SUMMARY OF DIRECT REIMBURSABLE COSTS

No.	ITEM DESCRIPTION	TASK						TOTAL
		1	2	3	4	5	6	
1	International travel							
2	Local travel							
3	Staff relocations (short-term)							
4	Per diem (nights away from home office) / Monthly allowances for resident staff							
5	Monthly allowance of on-site resident staff							
6	Cost of maintenance of equipment							
7	Consumable Materials / Supplies / Stationery / Paper, etc.							
8	Temporary office/staff accommodation							
9	Insurances							
10	Administrative handling charges							
11	Estimate of dues and charges							
12	Utility charges							
13	Vehicles for resident staff (supply, operation and maintenance)							
14	Office furniture for field office							
15	Office equipment (computers; hard & software & licensing, PABX, printers, copiers etc. for field inspections							
16	Test equipment and consumables							
17	Telecommunication costs							
18	Personal protective equipment							
19	Hand tools, torches and the like							
20	On-site resident staff accommodation							
21	...							
	<b>Total (carry to Summary Cost of Estimate)</b>							

Number of sheets, appended by the bidder, comprising this table:.....(if nil, enter Nil)

SIGNATURE: .....

DATE: .....

*(of person authorised to sign on behalf of the bidder)*

**ANNEXURE L: CASH FLOW**

- i) Using the programme, person-month schedule and estimate of costs, the bidder must provide here the cash flow by month for the duration of the Services, showing the following information:
- personnel costs
  - Consultant's fee
  - direct reimbursable costs
  - total amounts, by month
  - appropriate allowances for provisional sum items
- ii) The cash flow must, for budgetary and bidding purposes, include escalation of 5% per annum separately. Refer to the Agreement: Appendix 3 - Remuneration and Payment for requirements on escalation.

## ANNEXURE M: MANPOWER SCHEDULE

For planning, executing and managing the Services, the bidder should break down the Services into appropriate tasks and sub-tasks. The scope of Services (Agreement: Appendix 1) contains a description of the tasks and sub-tasks considered necessary by TCTA.

The bidder must consider the above and prepare a manpower or staffing schedule considering the Time Schedule for Services (Agreement: Appendix 4) as follows:

- i) The bidder must determine the human resources and level of effort (in person-month(s), based on normal working days) that will be required to fulfil the Services.
- ii) The number and level of effort of management, professional, technical, administration and support personnel required to execute the Services are at the bidder's discretion.
- iii) The proposed manpower must be balanced and adequately allow for inherent uncertainties and changes experienced in similar/comparable projects.
- iv) The proposed MANCO resources refer to the accountable director or manager of the members of the bidding entity to which the project manager reports.
- v) The bidder must provide a detailed table showing the breakdown of person-months based on:
  - Personnel category levels and position/title;
  - Task and sub-tasks;
  - Personnel active in each task and sub-task;
  - Location of activity for each task and sub-tasks; and
  - Totals and estimates must be carried into the bidder's financial proposal.

Name of Personnel	Category	Position / Title	Task 1 – Tender Design and Documentation			Task 2 – Detailed Design			Task 3: Construction Supervision			Task 4: Post-Construction Monitoring			Task 5: Project Management										Task 6: Black South Africans, Enterprise and Supplier Development Requirements				
			1.1 Engineering	1.2 Environment, Social and Land Acquisition	1.3 Health and Safety	2.1 Engineering	2.2 Environment, Social and Land Acquisition	3.3 Health and Safety	3.1 Engineering	3.2 Environment, Social and Land Acquisition	3.3 Health and Safety	4.1 Engineering	4.2 Environment, Social and Land Acquisition	4.3 Health and Safety	5.1 Integration Management	5.2 Scope Management	5.3 Time Management	5.4 Cost Management	5.5 Quality Management	5.6 Human Resource Management	5.7 Communications Management	5.8 Risk Management	5.9 Procurement Management	5.10 Stakeholder Management	6.1 Enterprise and Supplier Development	6.2 Training and Skills Development: South African Black People	6.3 Non-Conformance Penalties	6.4 Monitoring and Reporting	6.5 Measurement and Payment
<b>Manco</b>																													
	H8	Member 1																											
		...																											
<b>Internal Review Panel</b>																													
	H12	Member 1																											
		....																											
<b>Engineering/Construction/Specialists</b>																													
	R11	Contracts Engineer																											
		Tunnelling Specialist																											
		Senior Pipeline Design Engineer																											
		Senior Geological and Geotechnical Engineer																											
		Engineering Surveyor																											
		...																											
<b>Environment/Social/EAP/Specialists</b>																													
		Environmental Manager (1)																											

Name of Personnel	Category	Position / Title	Task 1 – Tender Design and Documentation			Task 2 – Detailed Design			Task 3: Construction Supervision			Task 4: Post-Construction Monitoring			Task 5: Project Management										Task 6: Black South Africans, Enterprise and Supplier Development Requirements				
			1.1 Engineering	1.2 Environment, Social and Land Acquisition	1.3 Health and Safety	2.1 Engineering	2.2 Environment, Social and Land Acquisition	3.3 Health and Safety	3.1 Engineering	3.2 Environment, Social and Land Acquisition	3.3 Health and Safety	4.1 Engineering	4.2 Environment, Social and Land Acquisition	4.3 Health and Safety	5.1 Integration Management	5.2 Scope Management	5.3 Time Management	5.4 Cost Management	5.5 Quality Management	5.6 Human Resource Management	5.7 Communications Management	5.8 Risk Management	5.9 Procurement Management	5.10 Stakeholder Management	6.1 Enterprise and Supplier Development	6.2 Training and Skills Development: South African Black People	6.3 Non-Conformance Penalties	6.4 Monitoring and Reporting	6.5 Measurement and Payment
		Ecologist																											
		EAP																											
		...																											
Project Management																													
		Project Manager																											
		Project Administer																											
		Programmer																											
		...																											
Health and Safety																													
		Construction H&S Manager																											
		...																											

Number of sheets, appended by the bidder, comprising this table :.....(if nil, enter Nil)

SIGNATURE: .....  
(of person authorised to sign on behalf of the bidder)

DATE: .....

**ANNEXURE N: PROGRAMME AND CHARTS**

For planning, executing and managing the Services, the bidder must break down the Services into appropriate tasks and sub-tasks. The Scope of Services (Agreement: Appendix 1) contains a description of the tasks and sub-tasks considered necessary by TCTA.

The bidder must consider the above and provide Gantt chart and graphs per Time Schedule for Services (Agreement: Appendix 4).

The bidder must use Microsoft Project or similar.





**ANNEXURE O****PART A: INVITATION TO BID****SBD 1**

<b>YOU ARE HEREBY INVITED TO BID FOR REQUIREMENTS OF THE (NAME OF DEPARTMENT/ PUBLIC ENTITY)</b>					
BID NUMBER:	013/2022/PMID/UMWP-1/RFB	CLOSING DATE:	15 December 2023	CLOSING TIME:	2:00 PM
DESCRIPTION	<b>CONSULTANCY SERVICES FOR uMWP-1: WATER CONVEYANCE INFRASTRUCTURE FOR 115 MONTHS</b>				
<b>BID RESPONSE DOCUMENTS MAY BE DEPOSITED IN THE BID BOX SITUATED AT (STREET ADDRESS)</b>					
Byls Bridge Office Park Cnr Olievenhoutsbosch Road and Jean Avenue Doringkloof Centurion, 0157					
<b>BIDDING PROCEDURE ENQUIRIES MAY BE DIRECTED TO</b>			<b>TECHNICAL ENQUIRIES MAY BE DIRECTED TO:</b>		
CONTACT PERSON	G Mnisi		CONTACT PERSON		
TELEPHONE NUMBER	012 683 1309		TELEPHONE NUMBER		
FACSIMILE NUMBER	-		FACSIMILE NUMBER		
E-MAIL ADDRESS	Tenders01@tcta.co.za		E-MAIL ADDRESS		
<b>SUPPLIER INFORMATION</b>					
NAME OF BIDDER					
POSTAL ADDRESS					
STREET ADDRESS					
TELEPHONE NUMBER	CODE		NUMBER		
CELLPHONE NUMBER					
FACSIMILE NUMBER	CODE		NUMBER		
E-MAIL ADDRESS					
VAT REGISTRATION NUMBER					
SUPPLIER COMPLIANCE STATUS	TAX COMPLIANCE SYSTEM PIN:		OR	CENTRAL SUPPLIER DATABASE No:	MAAA
B-BBEE STATUS LEVEL VERIFICATION CERTIFICATE	TICK APPLICABLE BOX]  <input type="checkbox"/> Yes <input type="checkbox"/> No		B-BBEE STATUS LEVEL SWORN AFFIDAVIT		[TICK APPLICABLE BOX]  <input type="checkbox"/> Yes <input type="checkbox"/> No
<b>[A B-BBEE STATUS LEVEL VERIFICATION CERTIFICATE/ SWORN AFFIDAVIT (FOR EMES &amp; QSEs) MUST BE SUBMITTED IN ORDER TO QUALIFY FOR PREFERENCE POINTS FOR B-BBEE]</b>					
ARE YOU THE ACCREDITED REPRESENTATIVE IN SOUTH AFRICA FOR THE GOODS /SERVICES /WORKS OFFERED?	<input type="checkbox"/> Yes <input type="checkbox"/> No [IF YES ENCLOSE PROOF]		ARE YOU A FOREIGN BASED SUPPLIER FOR THE GOODS /SERVICES /WORKS OFFERED?		<input type="checkbox"/> Yes <input type="checkbox"/> No [IF YES, ANSWER THE QUESTIONNAIRE BELOW ]
<b>QUESTIONNAIRE TO BIDDING FOREIGN SUPPLIERS</b>					
IS THE ENTITY A RESIDENT OF THE REPUBLIC OF SOUTH AFRICA (RSA)?			<input type="checkbox"/> YES <input type="checkbox"/> NO		
DOES THE ENTITY HAVE A BRANCH IN THE RSA?			<input type="checkbox"/> YES <input type="checkbox"/> NO		
DOES THE ENTITY HAVE A PERMANENT ESTABLISHMENT IN THE RSA?			<input type="checkbox"/> YES <input type="checkbox"/> NO		
DOES THE ENTITY HAVE ANY SOURCE OF INCOME IN THE RSA?			<input type="checkbox"/> YES <input type="checkbox"/> NO		
IS THE ENTITY LIABLE IN THE RSA FOR ANY FORM OF TAXATION?			<input type="checkbox"/> YES <input type="checkbox"/> 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 BELOW.					

## PART B: TERMS AND CONDITIONS FOR BIDDING

<b>1. BID SUBMISSION:</b>
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 IN THE MANNER PRESCRIBED IN THE BID DOCUMENT.
1.3. THIS BID IS SUBJECT TO THE PREFERENTIAL PROCUREMENT POLICY FRAMEWORK ACT, 2000 AND THE PREFERENTIAL PROCUREMENT REGULATIONS, 2022, THE GENERAL CONDITIONS OF CONTRACT (GCC) AND, IF APPLICABLE, ANY OTHER SPECIAL CONDITIONS OF CONTRACT.
1.4. THE SUCCESSFUL BIDDER WILL BE REQUIRED TO FILL IN AND SIGN A WRITTEN CONTRACT FORM (SBD7).
<b>2. TAX COMPLIANCE REQUIREMENTS</b>
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 VERIFY THE TAXPAYER'S PROFILE AND TAX STATUS.
2.3 APPLICATION FOR TAX COMPLIANCE STATUS (TCS) PIN MAY BE MADE VIA E-FILING THROUGH THE SARS WEBSITE WWW.SARS.GOV.ZA.
2.4 BIDDERS MAY ALSO SUBMIT A PRINTED TCS CERTIFICATE TOGETHER WITH THE BID.
2.5 IN BIDS WHERE CONSORTIA / JOINT VENTURES / SUB-CONTRACTORS ARE INVOLVED, EACH PARTY MUST SUBMIT A SEPARATE TCS CERTIFICATE / PIN / CSD NUMBER.
2.6 WHERE NO TCS PIN IS AVAILABLE BUT THE BIDDER IS REGISTERED ON THE CENTRAL SUPPLIER DATABASE (CSD), A CSD NUMBER MUST BE PROVIDED.
2.7 NO BIDS WILL BE CONSIDERED FROM PERSONS IN THE SERVICE OF THE STATE, COMPANIES WITH DIRECTORS WHO ARE PERSONS IN THE SERVICE OF THE STATE, OR CLOSE CORPORATIONS WITH MEMBERS PERSONS IN THE SERVICE OF THE STATE."

**NB: FAILURE TO PROVIDE / OR COMPLY WITH ANY OF THE ABOVE PARTICULARS MAY RENDER THE BID INVALID.**

SIGNATURE OF BIDDER: .....

CAPACITY UNDER WHICH THIS BID IS SIGNED: .....  
(Proof of authority must be submitted e.g. company resolution)

DATE: .....

**ANNEXURE P****SBD 4****BIDDER'S DISCLOSURE****1. PURPOSE OF THE FORM**

Any person (natural or juristic) may make an offer or offers in terms of this invitation to bid. In line with the principles of transparency, accountability, impartiality, and ethics as enshrined in the Constitution of the Republic of South Africa and further expressed in various pieces of legislation, it is required for the bidder to make this declaration in respect of the details required hereunder.

Where a person/s are listed in the Register for Tender Defaulters and / or the List of Restricted Suppliers, that person will automatically be disqualified from the bid process.

**2. Bidder's declaration**

2.1 Is the bidder, or any of its directors / trustees / shareholders / members / partners or any person having a controlling interest<sup>1</sup> in the enterprise, employed by the state? **YES/NO**

2.1.1 If so, furnish particulars of the names, individual identity numbers, and, if applicable, state employee numbers of sole proprietor/ directors / trustees / shareholders / members/ partners or any person having a controlling interest in the enterprise, in table below.

Full Name	Identity Number	Name of State institution

2.2 Do you, or any person connected with the bidder, have a relationship with any person who is employed by the procuring institution? **YES/NO**

2.2.1 If so, furnish particulars:

.....  
 .....

<sup>1</sup> the power, by one person or a group of persons holding the majority of the equity of an enterprise, alternatively, the person/s having the deciding vote or power to influence or to direct the course and decisions of the enterprise.

- 2.3 Does the bidder or any of its directors / trustees / shareholders / members / partners or any person having a controlling interest in the enterprise have any interest in any other related enterprise whether or not they are bidding for this contract?

**YES/NO**

- 2.3.1 If so, furnish particulars:

.....  
 .....

### 3 DECLARATION

I, \_\_\_\_\_ the \_\_\_\_\_ undersigned,  
 (name)..... in submitting the  
 accompanying bid, do hereby make the following statements that I certify to be true  
 and complete in every respect:

- 3.1 I have read and I understand the contents of this disclosure;
- 3.2 I understand that the accompanying bid will be disqualified if this disclosure is found not to be true and complete in every respect;
- 3.3 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<sup>2</sup> will not be construed as collusive bidding.
- 3.4 In addition, there have been no consultations, communications, agreements or arrangements with any competitor regarding the quality, quantity, specifications, prices, including methods, factors or formulas used to calculate prices, market allocation, the intention or decision to submit or not to submit the bid, bidding with the intention not to win the bid and conditions or delivery particulars of the products or services to which this bid invitation relates.
- 3.4 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.
- 3.5 There have been no consultations, communications, agreements or arrangements made by the bidder with any official of the procuring institution in relation to this procurement process prior to and during the bidding process except to provide clarification on the bid submitted where so required by the institution; and the bidder was not involved in the drafting of the specifications or terms of reference for this bid.
- 3.6 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.

<sup>2</sup> 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.

I CERTIFY THAT THE INFORMATION FURNISHED IN PARAGRAPHS 1, 2 and 3 ABOVE IS CORRECT.

I ACCEPT THAT THE STATE MAY REJECT THE BID OR ACT AGAINST ME IN TERMS OF PARAGRAPH 6 OF PFMA SCM INSTRUCTION 03 OF 2021/22 ON PREVENTING AND COMBATING ABUSE IN THE SUPPLY CHAIN MANAGEMENT SYSTEM SHOULD THIS DECLARATION PROVE TO BE FALSE.

.....  
Signature Date

.....  
Position Name of bidder

**ANNEXURE Q****SBD 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**

*(delete whichever is not applicable for this tender).*

- a) The applicable preference point system for this tender is the **90/10** preference point system.
- b) The applicable preference point system for this tender is the **80/20** preference point system.
- c) Either the **90/10 or 80/20 preference point system** will be applicable in this tender. The lowest/ highest acceptable tender will be used to determine the accurate system once tenders are received.

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

- (a) Price; and
- (b) Specific Goals.

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

The maximum points for this tender are allocated as follows:

	POINTS
PRICE	90
SPECIFIC GOALS	10
<b>Total points for Price and SPECIFIC GOALS</b>	<b>100</b>

- 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 80/20 OR 90/10 PREFERENCE POINT SYSTEMS

A maximum of 80 or 90 points is allocated for price on the following basis:

$$Ps = 80 \left( 1 - \frac{Pt - P_{min}}{P_{min}} \right) \quad \text{or} \quad Ps = 90 \left( 1 - \frac{Pt - P_{min}}{P_{min}} \right)$$

80/20                      or                      90/10

Where

- Ps = Points scored for price of tender under consideration
- Pt = Price of tender under consideration
- Pmin = Price of lowest acceptable tender



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

#### 3.2.1. POINTS AWARDED FOR PRICE

A maximum of 80 or 90 points is allocated for price on the following basis:

$$\begin{array}{ccc} 80/20 & \text{or} & 90/10 \\ Ps = 80 \left( 1 + \frac{Pt - P_{max}}{P_{max}} \right) & \text{or} & Ps = 90 \left( 1 + \frac{Pt - P_{max}}{P_{max}} \right) \end{array}$$

Where

- Ps = Points scored for price of tender under consideration  
 Pt = Price of tender under consideration  
 Pmax = Price of highest acceptable tender

### 4. POINTS AWARDED FOR SPECIFIC GOALS

- 4.1. 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:
- 4.2. 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 organs of state: Where either the 90/10 or 80/20 preference point system is applicable, corresponding points must also be indicated as such.**

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

The specific goals allocated points in terms of this tender	Number of points allocated (90/10 system) (To be completed by the organ of state)	Number of points claimed (90/10 system) (To be completed by the tenderer)
1	10	
2	9	
3	6	
4	5	
5	4	
6	3	
7	2	
8	1	
Non-compliant Contributor	0	

#### DECLARATION WITH REGARD TO COMPANY/FIRM

4.3. Name of company/firm.....

4.4. Company registration number: .....

4.5. 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]

- 4.6. 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:** .....

.....

.....

.....

**ANNEXURE R: PROOF OF REGISTRATION WITH NATIONAL TREASURY CENTRAL  
SUPPLIER DATABASE (CSD)**

**ANNEXURE S: AGREEMENT FORM AND APPENDICES AND THE CONDITIONS OF  
THE CLIENT/CONSULTANT MODEL SERVICES AGREEMENT**

## **AGREEMENT FORM**

## AGREEMENT

**This Agreement** dated this \_\_\_\_\_ day of \_\_\_\_\_ 2023

Between **Trans-Caledon Tunnel Authority (“TCTA”)**

established by Notice No. 2631 published in Government Gazette No. 10545 dated 12 December 1986, as amended by Notice No. 277 published in Government Gazette No. 21017 dated 24 March 2000, and its successors-in-title, a major public entity listed in Schedule 2 of the Public Finance Management Act, No. 1 of 1999, and a water management institution in terms of the National Water Act, No. 36 of 1998, operating in the water sector *inter alia*, in the funding and implementation of bulk raw water infrastructure projects as directed by the Minister from time to time;

(hereinafter called “the Client”) of the one part

and

\_\_\_\_\_ of registration number \_\_\_\_\_, a company (or joint venture or consortium) in terms of the laws of the Republic of South Africa.

(hereinafter called “the Consultant”) of the other part.

**Whereas** the Client desires that certain Services should be performed by the Consultant, namely

### **CONTRACT No. TCTA 019-041: CONSULTANCY SERVICES FOR uMKHOMAZI WATER PROJECT - PHASE ONE (uMWP-1) – WATER CONVEYANCE INFRASTRUCTURE**

and has accepted a proposal by the Consultant for the performance of such Services,

#### **The Client and the Consultant agree as follows:**

1. In this Agreement, words and expressions shall have the same meanings as are respectively assigned to them in Clause 1.1 of the General Conditions.
2. The following documents shall be deemed to form and be read and construed as part of the Agreement, namely:
  - (a) the letter of offer by the Consultant;
  - (b) the letter of acceptance by the Client;
  - (c) the Memorandum of Understanding (MOU), entered into between the Client and Consultant on insert date;

- (d) this Client/Consultant Model Services Agreement;
- (e) the Appendices, namely:
- Appendix 1: Scope of Services
  - Appendix 2: Personnel, Equipment, Facilities and Services of Others to be Provided by the Client
  - Appendix 3: Remuneration and Payment
  - Appendix 4: Time Schedule for Services
  - Appendix 5: Consultant's Health and Safety Specification
  - Appendix 6: Environmental Authorisation and Pre-construction Management Programme
  - Appendix 7: Record of Implementation Decisions
  - Appendix 8: Technical Guidelines for Development of Water and Sanitation Infrastructure.
3. In consideration of the payments to be made by the Client to the Consultant under this Agreement, the Consultant hereby agrees with the Client to perform the Services in conformity with the provisions of the Agreement.
4. The Client hereby agrees to pay the Consultant in consideration of the performance of the Services such amounts as may become payable under the provisions of the Agreement at times and in the manner prescribed by the Agreement.

**In witness whereof**, the parties hereto have caused this Agreement to be executed the day and year stated above in accordance with their respective laws.

**Authorised signature of the Client**

---

**NAME:**  
**POSITION:**  
**DATE:**

**Authorised signature of the Consultant**

---

**NAME:**  
**POSITION:**  
**DATE:**



## **THE CONDITIONS OF THE CLIENT/CONSULTANT MODEL SERVICES AGREEMENT**

## GENERAL CONDITIONS

The General Conditions shall be stipulated in the Fédération Internationale des Ingénieurs-Conseils (FIDIC) Clients / Consultant Model Services Agreement, Fourth Edition, 2006 (not bound into this document, but deemed integrally included).

The Consultant shall obtain their copy for reference (including the copies of the FIDIC Code of Ethics and FIDIC Integrity Management System). Consulting Engineers South Africa (CESA) is the distribution agent for selling FIDIC publications in South Africa. The contact details for CESA are as follows:

Tel: 011 463 2022  
e-mail: general@cesa.co.za

## PARTICULAR CONDITIONS

The following are to be read in conjunction with the General Conditions.

### A. REFERENCES FROM CLAUSES IN THE GENERAL CONDITIONS:

#### 1.1 DEFINITIONS

- 1.1.2 The Project is the uMkhomazi Water Project - Phase One (uMWP-1): Water Conveyance Infrastructure in the Republic of South Africa.
- 1.1.10 Commencement Date is seven days after the Consultant receives the letter of acceptance.
- 1.1.11 Time for Completion is 115 months.

#### 1.3 LANGUAGE FOR COMMUNICATIONS

The language for communications is English.

#### 1.4 LANGUAGE OF THE LANGUAGE

The ruling language of the Agreement is English.  
This Agreement shall be governed by and construed in accordance with the laws of the Republic of South Africa.

## 1.8 NOTICES

**Client:**

Postal address

The Chief Executive Officer

TCTA

PO Box 10335

CENTURION

0046

Telephone

012 683 1200

e-mail

info@tcta.co.za

Domicilium Executandi

Byls Bridge Office Park

Building 9, 1<sup>st</sup> Floor

Corner Olivenhoutbosch Road and Jean Avenue

CENTURION

0157

**Consultant:**

Postal address

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Telephone

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email

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Domicilium Executandi

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### 5.2.2 AGREED COMPENSATION FOR OVERDUE PAYMENT

Replace the words “compounded daily” with “compounded monthly”.

Agreed Compensation for overdue payment shall be the prime bank interest rate of the major South African banks.

## 6.2. DURATION OF LIABILITY

The duration of liability is ten years reckoned from the Time for Completion.

### 6.3.1 LIMIT OF COMPENSATION

The limit of compensation is R250 000 000.00 (two hundred and fifty million Rand).

### **8.3.2 RULES OF ARBITRATION**

Rules for arbitration is by the Association of Arbitrators (Southern Africa) in force at the effective date of the Agreement.

Each Party agrees to waive its rights to any form of appeal insofar as such waiver can validly be made.

The arbitration shall be conducted by a single arbitrator. In the absence of agreement between the Parties on the appointment of the arbitrator, the arbitrator shall be nominated by the chairperson of the Association of Arbitrators (Southern Africa).

## B. ADDITIONAL CLAUSES

### 1.1 DEFINITIONS

Add the following sub-clauses:

- 1.1.16 “person-month” means a period of 22 working days in a month.
- 1.1.17 “Engineer” means the Consultant, for the purpose of managing and administering the construction contract according to the duties and authority in the FIDIC Conditions of Contract for Construction for Building and Engineering Works Designed by the Employer (Red Book) (second Ed., 2017).
- 1.1.18 “Black People” means the definition in the Broad-Based Black Economic Empowerment (B-BBEE) Codes of Good Practice - i.e. it is a generic term that means Africans, Coloureds and Indians.
- Who are citizens of the Republic of South Africa by birth or descent; or
  - Who became citizens of the Republic of South Africa by naturalisation –
    - Before 27 April 1994;
    - On or before 27 April 1994 and who would have been entitled to acquire citizenship by naturalisation before that date.
- 1.1.19 “51% Black-owned” means the definition in the Broad-Based Black Economic Empowerment (B-BBEE) Codes of Good Practice. Means an entity in which:
- Black people hold at least 51% of the exercisable voting rights as determined under Code series 100;
  - Black people hold at least 51% of the economic interest as determined under Code series; and
  - Has earned all the points for Net Value understatement 100.
- 1.1.20 “Force Majeure Event” means an event or circumstance which is
- 1.1.20.1 beyond a Party's control;
  - 1.1.20.2 which such Party could not reasonably have provided against before entering into the Agreement;
  - 1.1.20.3 which having arisen, such Party could not reasonably have avoided or overcome; and
  - 1.1.20.4 which is not substantially attributable to the other Party.
- 1.1.20.5 A Force Majeure Event may include, but is not limited to, events or circumstances of the kind listed below, subject to clauses 1.1.20.1 to 1.1.20.4 above:
- 1.1.20.5.1 acts of God;
  - 1.1.20.5.2 war, hostilities (whether war be declared or not), invasion, act of foreign enemies;
  - 1.1.20.5.3 rebellion, terrorism, revolution, insurrection, military or usurped power or civil war;
  - 1.1.20.5.4 riot, commotion, disorder, strike or lockout by persons other than the Consultant's personnel and other

- employees of the Consultant and Consultant's sub-consultants;
- 1.1.20.5.5 munitions of war, explosive materials, ionising radiation or contamination by radio-activity except as may be attributable to the Consultant's actions;
- 1.1.20.5.6 natural catastrophes such as epidemics, earthquake, hurricane, typhoon or volcanic activity;
- 1.1.20.5.7 acts or omissions by governments (central, federal, regional, provincial, local, municipal) and state organs or public authorities or legislation promulgated by such governments (central, federal, regional, provincial, local, municipal) and state organs or public authorities resulting in an economic lockdown and/or restricts business operations and/or restricts movement between provinces and/or restricts import and/or export;
- 1.1.20.5.8 and anything else that may reasonably be outside the control of a Party.

## **1.9 PUBLICATION**

Delete sub-clause 1.9.1 and replace with:

"Publications shall be subject to approval by the Client if it is within five years of completion or termination of the Services."

### **1.10.1 CORRUPTION AND FRAUD**

Add the words "...and the Competition Commission of South Africa" at the end of the first sentence in sub-clause 1.10.1.

## **2.1 INFORMATION**

Delete and replace with:

"The Client shall, following the request from the Consultant, provide within a reasonable time the information as set out in Appendix 1, 2, 3, 4 or 5, or as otherwise requested by the Consultant."

## **2.4 CLIENT'S FINANCIAL ARRANGEMENTS**

Delete in its entirety.

## **3.3 DUTY OF CARE AND EXERCISE OF AUTHORITY**

Add sub-clause 3.3.3:

"The members to the joint venture or consortium accept joint and several liability for the work that forms the subject of this Agreement. The acceptance is certified by the

signatures of the duly authorised representatives of the members on the **Joint and Several Liability**.”

### 3.5 SUPPLY OF PERSONNEL

Delete sub-clause 3.5.1 and replace with:

“The obligations for the Consultant to supply personnel are set out in its bid and the Agreement to perform the Services.”

Any eventual agreement with the Consultant will contain the following conditions:

- (a) The duration of the Services and total person-months in the Agreement are reasonable estimates based on the Time Schedule for Services as set out in Appendix 4.
- (b) The Consultant agrees to retain qualified personnel for as long as it takes to complete all the Services.
- (c) The Consultant will not be entitled to assign and charge for additional personnel, nor charge person-months of more than those proposed for any position, without the prior approval of the Client.”

Add sub-clause 3.5.2:

“TCTA considers that the Consultant will require the personnel below. Furthermore, TCTA has set the minimum requirements for those personnel.

The list of personnel positions below is not exhaustive and doesn't represent the whole team to render all the Services. Only some of the key personnel positions are listed and the number of persons is not specified. As such, the Consultant must provide other technical, administrative and managerial personnel, e.g. draughtspersons, inspectors, cathodic protection specialists, hydro-mechanical engineers and technicians, heritage specialists, archaeologists, biodiversity specialist, manager (per **Task 6: Black South African, Enterprise and Supplier Development Requirements** under **Appendix 1: Scope of Services**), administrators, etc. In addition, the Consultant must determine the number of persons.”

Position	Minimum Qualifications	Minimum Experience	Specific Tasks
Project Manager*	Civil Engineering degree Pr. Eng.	At least ten years of professional experience managing similar or comparable civil engineering, or tunnelling infrastructure projects. Should have extensive experience working	A dedicated full-time team leader for the entire duration of the Project.

Position	Minimum Qualifications	Minimum Experience	Specific Tasks
		in Southern Africa and knowledge of the FIDIC contracts.	
Tunnelling Specialist (or Chief Design Engineer)*	Civil or mining engineering degree Pr. Eng.	At least ten years of professional experience designing and constructing large tunnels (≥3 m inside diameter and ≥5 km long) in medium-hard rock and related infrastructure, preferably water transfer tunnels using tunnel boring machines (TBMs).	Oversee and conduct the design and documentation of the Project. Provide technical support where required (and support the Chief Design Engineer).
TBM Specialist Sub-consultant/contractor	N/A	At least 20 years of experience designing and manufacturing TBMs for large tunnelling projects.	Provide input into the construction tender design and documentation.
Contracts Engineer*	Civil or quantity surveying degree Pr. Eng or Pr. QS	At least ten years of professional experience in similar or comparable civil engineering infrastructure projects, preferably using FIDIC contracts.	Develop conditions of contracts, tender documents, and Bill of Quantities, including estimates for construction. Measurement and payment certificates (monthly), assess contractor's claim and support the project manager and chief resident engineer.
Senior Geological and Geotechnical Engineer*	Civil, mining or geotechnical engineering degree, or geology degree BSc (geology), PR. Sci. Nat. OR Pr. Eng.	At least ten years of professional experience in geological, geohydrological, geotechnical investigations, geophysical surveys, mapping, testing and assessment of large engineering infrastructure	Oversee and conduct technical investigations and tests, designs and documentation of the Project. During construction, do geological mapping and evaluate and



Position	Minimum Qualifications	Minimum Experience	Specific Tasks
		projects, i.e. large tunnels ( $\geq 3$ m inside diameter and $\geq 5$ km long) in medium-hard rock and related infrastructure.	document actual rock conditions. Provide technical support where required.
Senior Structural Design Engineer	Civil engineering degree Pr. Eng.	At least ten years of professional experience designing and constructing large civil and hydraulic infrastructure.	Provide structural designs and documentation and technical support where required.
Senior Hydraulic Design Engineer	Civil engineering degree Pr. Eng.	At least eight years of professional experience in hydraulic analysis, design, and construction of bulk water transfer tunnels.	Oversee or conduct hydraulic analysis, design, documentation, and support the construction supervision team where required.
Senior Pipeline Design Engineer	Civil engineering degree Pr. Eng.	At least eight years of professional experience in the design and construction of bulk water transfer pipelines.	Oversee or conduct pipeline design and support the construction supervision team where required.
Senior Hydro-mechanical Engineer	National Diploma in mechanical engineering Pr. Tech.	At least eight years of professional experience designing, installing and commissioning hydro-mechanical plant items and equipment in similar bulk water infrastructure projects.	Oversee or conduct design and installation and develop the technical construction specifications. Support the construction supervision team where required.
Chief Resident Engineer*	Civil or mining engineering degree Pr. Eng.	At least ten years of professional experience as the engineer or employer's representative on large diameter tunnel ( $\geq 3$ m inside diameter and $\geq 5$ km long) infrastructure projects in medium-hard rock. Should have extensive	Lead construction supervision team. Employer's representative or engineer if the project manager is not nominated as such.

Position	Minimum Qualifications	Minimum Experience	Specific Tasks
		experience working in Southern Africa and knowledge of the FIDIC contracts.	
Resident Engineer for 1 <sup>st</sup> work-front	Civil engineering degree Pr. Eng.	At least eight years of professional experience as a resident engineer on similar or comparable bulk water infrastructure projects.	Construction supervision and support to the CRE.
Resident Engineer for 2 <sup>nd</sup> work-front	Civil engineering degree Pr. Eng.	At least eight years of professional experience as a resident engineer on similar or comparable bulk water infrastructure projects.	Construction supervision and support to the CRE.
Resident Engineer for ancillary works, i.e. roads, biodiversity offset initiatives.	Civil engineering degree	At least eight years of experience as a resident engineer on civil works.	Construction supervision and support to the CRE.
Materials Engineer	National Diploma in materials sciences Pr. Tech.	At least ten years of professional experience in similar bulk water infrastructure projects or large civil engineering projects.	Assess all material requirements. Manage the construction site materials testing laboratory.
Engineering Surveyor	Bachelor's Technology in surveying (geometrics) or land surveying degree (geometrics) S(GTg.ES) or PS (Gpr.ES)	At least five years' experience surveying during the construction of similar or comparable bulk water or civil engineering infrastructure projects.	Fulfil survey requirements.
Environmental Assessment Practitioner*	Environmental-related degree in biological, physical or earth sciences (NQF level 7) Preferably, Pr. Sci. Nat. and EAPASA registered	At least eight years of experience in managing and monitoring environmental and social management in similar or comparable civil engineering infrastructure projects i.e. Environmental	Develop Environmental Management Programme and additional plan(s) for the approval of DFFE, including submission of amendment applications where required.

Position	Minimum Qualifications	Minimum Experience	Specific Tasks
		Impact Assessments and preparation of Environmental Management Programmes.	
Environmental Manager for 1 <sup>st</sup> work-front	Environmental-related degree or equivalent	At least five years of experience in environmental and social management and mitigation measures associated with similar bulk water infrastructure projects.	Provide environmental input, ensure compliance, construction supervision and support to the CRE. The incumbent shall be based at the construction site fulltime to undertake construction supervision.
Environmental Manager for 2 <sup>nd</sup> work-front	Environmental-related degree or equivalent	At least five years of experience in environmental and social management and mitigation measures associated with similar bulk water infrastructure projects.	Provide environmental input, ensure compliance, construction supervision and support to the CRE. The incumbent shall be based at the construction site full-time to undertake Task 3: Construction Supervision.
Construction Health and Safety Specialist or Manager	Civil or mining engineering or health and safety national diploma SACPCMP – Construction Health and Safety Manager (CHSM)	At least ten years of experience complying with the Occupational Health and Safety Act and Mining Health and Safety Act relating to the design and construction of similar bulk water infrastructure projects.	Provide input into tender and construction documents and support construction supervision team, i.e. occupational and mine health and safety.  The Agent shall guide the above, i.e. latest Occupational Health and Safety Act and Construction Regulations.

Position	Minimum Qualifications	Minimum Experience	Specific Tasks
Quality Manager	National Diploma or any accredited quality management qualifications	At least five years' experience in quality management systems using ISO 9001 on similar bulk water infrastructure projects or large engineering projects.	Develop and manage a project-specific quality management system. Audit the established system regularly.
Programmer or Scheduler	National Diploma or any accredited programming qualifications	At least five years' experience using Primavera or MS Projects in civil engineering projects.	All programming requirements, including assessment of contractor's claims.
<b>Notes:</b> <ul style="list-style-type: none"> <li>For personnel from countries outside of Southern Africa, where qualifications and professional registration systems differ from Southern African practice, the Consultant shall provide evidence of equivalent qualifications and professional registration.</li> <li>* Consultant's (as the bidder) proposed personnel (staff resources) will be evaluated per the Functionality (functional evaluation criteria, i.e. bid document).</li> <li>Personnel who cannot speak, read and write English will not be accepted.</li> </ul>			

### 3.7.1 CHANGES IN PERSONNEL

Add the following words to the end of the paragraph:

"...and shall be for the approval of the Client, which approval shall not be unreasonably withheld."

### 4.1.1 AGREEMENT EFFECTIVE

Delete sub-clause 4.1.1 and replace with:

"The Agreement is effective from the date of receipt by the Consultant of the Client's letter of acceptance of the Consultant's proposal."

### 4.4 DELAYS

Add sub-clause 4.4.2:

"No extension to the Time for Completion or any additional payment relating to the increase in the ceiling amounts or Additional Services will be made unless the Consultant has submitted a fully motivated and detailed written application and the Client has approved such variations in writing."

## **4.5 CHANGED CIRCUMSTANCES**

Correct the typographical error in the first line: "Iff..." to "If..."

Add sub-clause 4.5.3:

"No variation to the Services or any additional payment relating to changed circumstances will be made unless the Consultant has submitted a written application explaining the impact on the Services and the Client has approved such variations in writing."

## **4.8 EXCEPTIONAL SERVICES**

Add sub-clause 4.8.3:

"No extension to the Time for Completion or any additional payment relating to the Exceptional Services will be made unless the Consultant has submitted a fully motivated and detailed written application and the Client has approved such amounts and Exceptional Services in writing."

## **5.2.3 TIME FOR PAYMENT**

Change "four days" to "14 days".

## **6.4 INDEMNITY**

Add sub-clause 6.4.2: Occupational and mine health and safety indemnity:

"The Consultant recognises the inherent risks and liabilities of construction, mining and other hazards that exist on the Client's construction sites and in terms of Section 37(2) of the Occupational Health and Safety Act 85 of 1993, and Mine Health and Safety Act 29 of 1996, as amended, the Consultant:

- (a) acknowledges that it, its employees, agents, sub-consultants and/or contractors enter the construction sites entirely at their own risk;
- (b) will take all steps necessary to ensure that it, its employees, agents, sub-consultants and/or contractors comply with the provisions of the Occupational Health and Safety Act and any site rules/regulations put in place by it to ensure the health, safety and well-being of any such party entering on site;
- (c) agrees to indemnify and hold harmless the Client against any and all claims in respect of any loss, damage, injury and/or death arising out of or sustained by it, its employees, agents, sub-consultants and/or contractors, arising out of or in connection with the Agreement."

### 7.1.1 INSURANCE FOR LIABILITY AND INDEMNITY

The insurance to be taken out and maintained by the Consultant shall comprise the following:

#### **Professional Indemnity Insurance**

The Consultant shall provide professional indemnity insurance against liability under Sub-Clause 6.1 (Liability and Compensation between the Parties) with a limit of indemnity of R100 000 000 (one hundred million Rand) for any one occurrence and R250 000 000 (two hundred and fifty million Rand) in aggregate for the period of insurance.

The period of insurance shall be from the Commencement Date of the Services to the end of the duration of liability stated in Clause 6.2 (duration of liability).

The Consultant shall be responsible for any policy deductible for every occurrence.

#### **Motor Vehicle Insurance**

In addition to any compulsory insurance required in terms of legislation, provide comprehensive motor insurance, including passenger liability and unauthorised passenger liability, with a minimum indemnity of R5 000 000 (five million Rand) for any one occurrence for any vehicle supplied through the Agreement.

#### **General Public Liability Insurance**

General public liability insurance with a limit of indemnity of R10 000 000 (ten million Rand) for any one occurrence.

#### **Other Insurances**

Insurance against loss or damage to:

- (a) equipment, facilities and materials purchased by the Consultant in whole or in part with funds provided under this Agreement while in possession of the Consultant, to their total replacement value;
- (b) the Consultant's property or facilities used in the performance of the Services; and
- (c) all documents prepared by the Consultant in the performance of the Services.

The Consultant shall be responsible for any policy deductible for every occurrence.

### 8.1 AMICABLE DISPUTE RESOLUTION

Replace "mediation" with "adjudication" at the end of the paragraph.

## 8.2 ADJUDICATION

Delete the Sub-Clause and replace it with:

“Unless settled amicably, any dispute or difference which arises between the Consultant and the Client out of or in connection with the Agreement, including any valuation or other decision of the Client, shall be referred by either Party to adjudication in accordance with the rules set out in sub-clauses 8.2.1 to 8.2.5 below (“the Rules”). The adjudicator shall be any person agreed by the Parties. In the event of disagreement, the adjudicator shall be appointed in accordance with the Rules.

### 8.2.1 Appointment of Adjudicator

- (a) The Parties shall jointly ensure the appointment of the adjudicator. The adjudicator shall be a suitably qualified person.
- (b) If, for any reason, the appointment of the adjudicator is not agreed upon at the latest within 14 days of the reference of a dispute in accordance with these rules, then either Party may apply, with a copy of the application to the other Party, to the chairperson for the time being of the Association of Arbitrators (Southern Africa), to appoint an adjudicator. Such appointment shall be final and conclusive.
- (c) The adjudicator’s appointment may be terminated by mutual agreement of the Parties. The adjudicator’s appointment shall expire when the Services have been completed or when any disputes referred to the adjudicator shall have been withdrawn or decided, whichever is the later.

### 8.2.2 Terms of Appointment

- (a) The adjudicator is to be and is to remain throughout her/his appointment, impartial and independent of the Parties and shall immediately disclose in writing to the Parties anything of which he becomes aware which could affect her/his impartiality or independence.
- (b) The adjudicator shall not give advice to the Parties or their representatives concerning the conduct of the Services other than in accordance with these rules.
- (c) The adjudicator shall not be called as a witness by the Parties to give evidence concerning any dispute in connection with, or arising out of, the Agreement.
- (d) The adjudicator shall treat the details of the Agreement and all activities and hearings of the adjudicator as confidential and shall not disclose the same without the prior written consent of the Parties. The adjudicator shall not, without the permission of the Parties, assign or delegate any of her/his work under these rules or engage legal or technical assistance.

- (e) The adjudicator may resign by giving 28 days' notice to the Parties. In the event of resignation, death or incapacity, termination or a failure or refusal to perform the duties of an adjudicator under these rules, the Parties shall agree upon a replacement adjudicator within 14 days, or paragraph 8.2.1 (b) shall apply.
- (f) The adjudicator shall in no circumstances be liable for any claims for anything done or omitted in the discharge of the adjudicator's duties unless the act or omission is shown to have been in bad faith.
- (g) If the adjudicator knowingly breaches any of the provisions of paragraph 8.2.2 (f) above or acts in bad faith, she/he shall not be entitled to any fees or expenses. She/He shall reimburse each of the Parties for any fees and expenses properly paid to her/him if, as a consequence of such breach, any proceedings or decisions of the adjudicator are rendered void or ineffective.

### **8.2.3 Payment**

- (a) The adjudicator shall be paid the fees and expenses set out in the Adjudicator's agreement.
- (b) The retainer fee, if applicable, shall be paid in full for:
  - (i) being available, on 28 days' notice, for all hearings and site visits;
  - (ii) all office overhead expenses such as secretarial services, photocopying and office supplies incurred in connection with her/his duties; and
  - (iii) all services performed hereunder except those performed during the days referred to in paragraph 8.2.3 (c) below.
- (c) The daily fee shall be payable for each working day preparing for or attending site visits or hearings or preparing decisions, including any associated travelling time.
- (d) The retainer and daily fees shall remain fixed for the period of tenure of the adjudicator.
- (e) All payments to the adjudicator shall be made by the Consultant, who will be entitled to be reimbursed half by the Client. The Consultant shall pay invoices addressed to her/him within 28 days of receipt. The adjudicator's invoices for any monthly retainer shall be submitted quarterly in advance, and invoices for daily fees and expenses shall be submitted following the conclusion of a site visit or hearing. All invoices shall contain a brief description of the activities performed during the relevant period. The adjudicator may suspend work if any invoice remains unpaid at the expiry of the period for payment, provided that seven days prior notice has been given to both Parties.
- (f) If the Consultant fails to pay an invoice addressed to it, the Client shall be entitled to pay the sum due to the adjudicator and recover the sum paid from the Consultant.



#### **8.2.4 Procedure for Obtaining Adjudicator's Decision**

- (a) A dispute between the Parties may be referred in writing by either Party to the adjudicator for her/his decision, with a copy to the other Party. If the adjudicator has not been agreed to or appointed, the dispute shall be referred in writing to the other Party, together with a proposal for the appointment of an adjudicator. A reference shall identify the dispute and refer to these rules.
- (b) The adjudicator may decide to visit the site. The adjudicator may choose to conduct a hearing in which event she/he shall decide on the date, location and time of the hearing. The adjudicator may request that written statements from the Parties be presented to her/him prior to, at or after the hearing. The Parties shall promptly provide the adjudicator with sufficient copies of any documentation and information relevant to the Agreement that she/he may request.
- (c) The adjudicator shall act as an impartial expert, not as an arbitrator, and shall have full authority to conduct any hearing as she/he thinks fit, not bound by any rules or procedures other than those set out herein. Without limiting the preceding, the adjudicator shall have the power to:
  - (i) decide upon the adjudicator's jurisdiction and as to the scope of any dispute referred to her/him;
  - (ii) make use of her/his specialist knowledge, if any;
  - (iii) adopt an inquisitorial procedure;
  - (iv) decide upon the payment of interest in accordance with the Agreement;
  - (v) open up, review and revise any opinion, instruction, determination, certificate or valuation related to the dispute; and
  - (vi) refuse admission to hearings to any persons other than the Client, the Consultant and their respective representatives, and to proceed in the absence of any Party to who the adjudicator is satisfied received notice of the hearing.
- (d) All communications between either of the Parties and the adjudicator and all hearings shall be in the language of the Agreement. All such communications shall be copied to the other Party.
- (e) No later than the fifty-sixth day after the day on which the adjudicator received a reference or, if later, the day on which the adjudicator's agreement came into effect, the adjudicator shall give written notice of her/his decision to the Parties. Such a decision shall include reasons and state that it is issued under the Rules.

#### **8.2.5 Notice of Dissatisfaction**

If a Party is dissatisfied with the decision of the adjudicator or if no decision is given within the time set out in the rules, the Party may give notice of dissatisfaction referring

to this Sub-Clause within 28 days of receipt of the decision or the expiry of the time for the decision. If no notice of dissatisfaction is given within the specified time, the decision shall be final and binding on the Parties. If notice of dissatisfaction is given within the specified time, the decision shall be binding on the Parties who shall give effect to it without delay unless and until the decision of the adjudicator is revised by an arbitrator.”

## **AGREEMENT**

### **APPENDIX 1: SCOPE OF SERVICES**

## 1. PROJECT CONTEXT

### 1.1 PROJECT DESCRIPTION

The Mgeni Water Supply System (MWSS) serves the municipalities of eThekweni, uMgungundlovu, Msunduzi and the surrounding areas in KwaZulu-Natal (KZN). It consists of four major dams (Nagle, Midmar, Albert Falls and Inanda) and phases 1 and 2 of the Mooi Mgeni Transfer Scheme (MMTS).

In 2015, the Department of Water and Sanitation (DWS) completed a technical feasibility study to determine long-term future water requirements in KZN. The study investigated the uMkhomazi Water Project – Phase One (uMWP-1), which will augment the MWSS with water from the uMkhomazi River – the third-largest mean annual runoff river in KZN. The system's yield is 398 million m<sup>3</sup>/a (2013), while the estimated water requirements are 480 million m<sup>3</sup>/a and 612 million m<sup>3</sup>/a in 2023 and 2040, respectively. The water requirements projection indicates that MWSS has been in deficit since 2016. Therefore, the system is under stress and will be augmented by uMWP-1.

The implementation of uMWP-1 involves the storage and transfer of about 220 million m<sup>3</sup>/a of raw water as follows:

- Smithfield Dam and Associated Infrastructure:
  - 81 m high Smithfield Dam with a spillway and outlet Works in the uMkhomazi River near the town of Bulwer.
  - 26 m high saddle dam with a spillway.
  - Smithfield Dam reservoir boat ramp.
  - Three flow gauging weirs in the uMkhomazi River – one upstream and two downstream of Smithfield Dam.
  - Temporary and permanent access roads and security fences.
  - Borrow pits, quarries and waste disposal sites.
  - River diversion works.
  - Operator facilities – permanent houses, offices/control room, guardhouse, storage and workshop.
  - Realignment or diversion of major and minor roads and Eskom transmission lines.
  - Acquisition of land and rights to land.
  - Potential hydropower plant.
  - Rehabilitation, biodiversity offsets and compensation.
  - Catchment Management and Ecological Infrastructure Plan.
  - Resettlement houses for the affected families/households.
- Water Conveyance Infrastructure (this Agreement):
  - 32km long at 3.5m diameter transfer tunnel from Smithfield Dam reservoir to the uMlaza River valley.

- 5km long at 2.6m diameter raw water steel pipeline from the outlet portal of the transfer tunnel above to the proposed Umgeni Water's Water Treatment Works (WTW) in the uMlaza River valley.
- Access roads, maintenance/service roads and security fences – permanent and temporary.
- Borrow pits, quarries and waste disposal sites.
- Acquisition of land and rights to land.
- Potential hydropower plant.
- Rehabilitation, biodiversity offsets and compensation.

The project consists of the bulk raw component above and a potable water component, i.e. Umgeni Water's WTW and pipeline. The potable water component will be implemented by Umgeni Water and therefore does not form part of the Services.

## **1.2 ENVIRONMENTAL AUTHORISATION AND AMENDMENTS**

An Environmental Impact Assessment (EIA) was undertaken for the Project, and the Environmental Authorisation (EA) was issued in November 2020 and amended in September 2021.

The EA requires that an Environmental Management Programme (EMPr) for the construction and operation of the scheme's components above be prepared and submitted by an Environmental Assessment Practitioner (EAP) to the Department of Forestry, Fisheries and Environment (DFFE) for approval. The EMPr shall incorporate conditions specified in the EA and comply with Appendix 4 of the National Environmental Management Act (Act 107 of 1998) Environmental Impact Assessment Regulations 2014 (as amended). The EA further requires that additional plans be prepared prior to the commencement of construction.

It should be noted that the proposed Langa Balancing Dam is not required as part of the uMWP-1 raw water component as it is not part of the authorised activities in the EA (as amended).

## **1.3 GENERAL OBJECTIVES**

The Consultant will provide engineering, project management, environmental, social and other specialist Services for the Water Conveyance Infrastructure component of the Project as follows:

- i) Undertake tender design and documentation, detailed design, construction supervision and post-construction monitoring, and develop the construction and operation EMPr.
- ii) Produce, amongst other things, up-to-date cost estimates and cash flow, a comprehensive work breakdown structure and programme, a risk register with

mitigation measures, and environmental and social plans for implementing the Project.

iii) Assessment and close-out of the Project.

TCTA would like to fast-track the implementation of the Project but still meet the required quality standards and improve risk management. The Project must be implemented according to TCTA's policies and Project Implementation Methodology (PIM). The policies and PIM were developed to ensure that TCTA's project implementation processes comply with best practices and are consistently applied to all TCTA's projects. This scope of Services is based on TCTA's policies and PIM, and the tasks have been defined accordingly.

## 1.4 PROJECT LOGISTICS

The Consultant will be required to communicate and work well with TCTA, including other service providers, organisations, and contractors on the Project, and perform all the Services using a comprehensive programme (**Appendix 4: Time Schedule for Services**) and cost (**Appendix 3: Remuneration and Payment**). TCTA will appoint independent Panels of Experts (PoEs) to conduct separate independent quality reviews on behalf of TCTA and will require the Consultant's participation. The Consultant must provide quality assurance measures in accordance with this Scope of Services.

TCTA will establish and manage a Project Committee, which will have Project Partners' (DWS, Umgeni Water, and Water Users) participating in developing and implementing the most cost-effective solutions to their water needs. This will be undertaken in a transparent and consultative manner.

## 1.5 STANDARDS AND SPECIFICATIONS

All dimensions and quantities shall be expressed in the SI system of units. The standards shall be those of the Department of Water and Sanitation (DWS), the International Standards Organisation (ISO), and the national standards.

## 1.6 REFERENCE MATERIAL FROM PREVIOUS STUDIES

Reports and documents relevant to the Project are listed below.

- Technical Feasibility reports:
  - Inception, Main and Summary reports
  - Hydrological assessment of the uMkhomazi River catchment
  - Groundwater resources
  - Water supply to local communities
  - Possible water supply from Smithfield Dam to surrounding communities
  - Community Supply from the Smithfield Dam-Comrie Dam

- Water requirements and return flow
- Water resources yield assessment
- Sediment yield report
- Sediment deposition and impact report
- Feasibility design report (Volumes 1 & 2)
- Optimisation of conveyance report
- Dam position report
- Optimisation Scheme configuration
- Cost model
- Dam Type Selection
- Climatology
- Water quality and limnology
- Water resources planning model
- Positioning of Gauging Weirs
- Route Investigation
- Traffic Impact Assessment
- Climate change Impact Assessment
- Hydropower assessment report
- Seismic hazard analysis and refraction investigation
- Geotechnical report
- Conveyance System – Materials and Geotechnical Investigation
- Baseline socio-economic report
- Institutional and Financial Aspects
- Economic Impact Assessment report
- Environmental Screening report
- DFFE: EIA reports
  - Scoping Report and appendices
  - EIA Report and appendices
  - Addendum No. 1 and 2 to the EIA Report
  - Environmental Authorisation and amendments to it for the Water Conveyance Infrastructure (**Appendix 6: of the Agreement**)
  - Pre-construction Environmental Management Programme for the Water Conveyance Infrastructure and approval (**Appendix 6 of the Agreement**)

The reports and documents are available on the websites: <https://www.dws.gov.za/iwrrp/uMkhomazi/documents.aspx>. Copies not available on these websites will be made available by TCTA per the Consultant's or bidder's request.

## **2. DESCRIPTION OF CONSULTANT'S SERVICES**

The required Services have been divided into the following tasks:

### **Task 1: Tender Design and Documentation**

Sub-Task 1.1: Engineering

Sub-Task 1.2: Environment, Social and Land Acquisition

Sub-Task 1.3: Health and Safety

### **Task 2: Detailed Design**

Sub-Task 2.1: Engineering

Sub-Task 2.2: Environment, Social and Land Acquisition

Sub-Task 2.3: Health and Safety

### **Task 3: Construction Supervision**

Sub-Task 3.1: Engineering

Sub-Task 3.2: Environment, Social and Land Acquisition

Sub-Task 3.3: Health and Safety

### **Task 4: Post-Construction Monitoring**

Sub-Task 4.1: Engineering

Sub-Task 4.2: Environment, Social and Land Acquisition

Sub-Task 4.3: Health and Safety

### **Task 5: Project Management**

Sub-Task 5.1: Integration Management

Sub-Task 5.2: Scope Management

Sub-Task 5.3: Time Management

Sub-Task 5.4: Cost Management

Sub-Task 5.5: Quality Management

Sub-Task 5.6: Human Resource Management

Sub-Task 5.7: Communications Management

Sub-Task 5.8: Risk Management

Sub-Task 5.9: Procurement Management

Sub-Task 5.10: Stakeholder Management

### **Task 6: Black South Africans, Enterprise and Supplier Development Requirements**

Sub-Task 6.1: Enterprise and Supplier Development

Sub-Task 6.2: Training and Skills Development: South African Black People

Sub-Task 6.3: Non-Conformance Penalties

Sub-Task 6.4: Monitoring and Reporting

Sub-Task 6.5: Measurement and Payment



The detailed requirements, obligations and responsibilities for each task (and sub-tasks) are specified below.

### 3. SCOPE OF SERVICES

The Consultant shall assemble a team(s) of engineers, environmentalists and other specialists experienced in the optimisation, design, tender documentation, construction supervision and monitoring and close-out as follows:

- Intake structure and access to it, i.e. layout, excavations, hydraulic, hydro-mechanical and operation/control and instrumentation designs, construction methods and related work.
- Water transfer tunnel, i.e. vertical and horizontal alignment, hydraulic and lining/structural designs, excavation using tunnel boring machines and drill and blast methods.
- Access adits and ventilation shafts, i.e. layout, excavations and lining/structural designs, construction methods and related work.
- Outlet portal structures and interface with the pipeline inlet, i.e. layout, excavations, hydraulic, hydro-mechanical, structural, operation/control and instrumentation designs, construction methods and related work.
- Pipeline, i.e. horizontal and vertical alignment, excavations, hydraulic, hydro-mechanical and structural designs, pipe material and related work.
- Pipeline outlet and interface with Umgeni Water's WTW, i.e. layout, excavation, hydro-mechanical, hydraulic, operation/control and instrumentation designs, and related work.
- Hydropower plant, i.e. layout, hydraulic, electro- and hydro-mechanical operation/control and instrumentation designs.
- Other infrastructure and facilities, i.e. access roads (temporary and permanent), opening and closing of quarries and borrow pits, spoil sites/areas, all construction site establishment requirements, and other temporary and permanent services (water, sanitation and telecommunications).
- Search, Rescue and Relocation Plan and Habitat Rehabilitation and Restoration Plan.

In addition to the above, the Consultant shall:

- i) Critically review the DWS Technical Feasibility reports and the EIA reports and addenda covering the planning and preliminary design of uMWP-1 to confirm the implementation decisions and identify gaps in the information presented.
- ii) Review EA issued by DFFE and approved EMP<sub>r</sub> for pre-construction and highlight specific areas where environmental and social requirements may impose conditions or create operational and implementation constraints on the Project. In that case, the Consultant shall study the issues and propose solutions recognising the environmental and social requirements, the Project development requirements and detailing the potential effect on Project time and cost. Alternatively, the Consultant could recommend amendments to the EA and approved Pre-construction EMP<sub>r</sub>.
- iii) Ensure all conditions of the EA and the approved pre-construction EMP<sub>r</sub> are adhered to.
- iv) Develop the construction and operation EMP<sub>r</sub> for approval by DFFE.

- v) Develop a detailed Biodiversity Offsets and Compensation Plan for approval by DFFE.
- vi) Undertake environmental and social baseline surveys, investigations and assessments and develop various plans and reports.
- vii) Carry out additional tests, studies, investigations and surveys, and document them.
- viii) Develop Design Criteria Memoranda (DCM) and project-specific Guidelines for Technical Implementation (GTI) and operation rules and philosophy.
- ix) Undertake a detailed hydropower feasibility study.
- x) Undertake tender design and documentation, detailed design, construction supervision, post-construction monitoring, and assessment and close-out. Ensure that the EIA recommendations, mitigation measures, and environmental conditions are considered.
- xi) Apply the latest ISO 14001 during the execution of the Services and respond to the TCTA Environmental and Social Management System (ESMS) requirements.
- xii) Collaborate with the consultant(s) for uMWP-1: Smithfield Dam and Associated Infrastructure.

The Consultant shall adopt an integrated approach while executing the Services, considering the other tasks and the interfaces with the uMWP-1: Smithfield Dam and Associated Infrastructure.

### 3.1 TASK 1: TENDER DESIGN AND DOCUMENTATION

The Consultant's personnel will be required to provide the Services below from the same location in South Africa, Gauteng (i.e. office building). In the instance of a consortium or joint venture, the Consultant's staff who are rendering Services uninterrupted for a period of more than two months shall not be permitted to work from home or different offices. The Consultant shall make suitable arrangements for all such technical staff to work in the same office building.

#### 3.1.1 Sub-Task 1.1: Engineering

##### 3.1.1.1 Record of Implementation Decisions (RID)

The approved RID from DWS has a reference, and the document is in **Appendix 7 of the Agreement**. This document summarises all decisions by DWS regarding the implementation of the Project by TCTA. The Consultant shall ensure that the Services comply with such decisions.

##### 3.1.1.2 Field Reconnaissance

The Consultant shall undertake field reconnaissance during the early stages of the Services to become familiar with the Project site (including biodiversity offset sites/areas) and investigate hydrological, geological, geophysical, topographical and geographical features and requirements, and environmental and social conditions that might affect the implementation of the Project.

The findings shall form part of the Inception Report below.

##### 3.1.1.3 Inception Report

Soon after the Commencement Date of the Agreement or contract, the Consultant shall immediately review the preliminary designs (Technical Feasibility reports) and assess all information under **Section 1.6: Reference Material from Previous Studies** and the scope of Services. The review and assessment shall, amongst other things, cover the following:

- Technical Feasibility reports for the Project.
- RID.
- EIA reports and related information for the Project.
- Available information on geological and geotechnical parameters, i.e. sub-surface conditions.
- Information on the availability of construction materials, i.e. sources, quality and quantity.
- The operation rule and philosophy.

The Consultant must take these primary and critical conditions and constraints into consideration and provide suitable solutions:

- Tunnelling and blasting activities that threaten Blue Swallows can only be performed during the migration period of the Blue Swallows (April to September) and must include noise and vibration monitoring systems. This is a condition in the EA.
- Treatment of water from the tunnel excavation activities before discharging or releasing it into the environment.
- Water quality affecting Umgeni Water's WTW.
- Tight timeframes for Project implementation due to the long EIA process.
- Future Phase 2 of the uMkhomazi Water Project should be considered.

The Inception Report shall provide the outcome of the reviews, assessments, data collection and field reconnaissance. The gaps, discrepancies, errors, omissions, problems and uncertainties in the information must be identified, and recommendations for additional information or remedial action should be included in the Inception Report. The Consultant must also describe the approach they intend to follow in fulfilling each task and sub-task associated with the Services. A comprehensive report shall be prepared and presented to TCTA no later than six weeks after the Commencement Date of the Agreement. The Consultant's final report shall incorporate all comments and recommendations and address all queries and questions by TCTA.

The additional information, studies and investigations required from the Consultant or other service providers to supplement and enhance the information on the Project as proposed by the Consultant and approved by TCTA shall be Additional Services. Procurement will be per **Section 3.5.9: Procurement Management** and cost management per **Section 3.5.4.2: Assistance to TCTA**.

#### 3.1.1.4 Existing Infrastructure and Services

The Consultant must identify all infrastructure and services affected by the Project and determine the relevant solutions.

SERVICES/INFRASTRUCTURE	PROPOSED SOLUTIONS
Buildings	Demolished and removed, or protected
Roads	Left as is, realigned, deviated, or upgraded
Fences	Demolished and removed
Electricity, fibre and telephone lines	Left as is, relocated or protected
Eskom overhead transmission lines	Consultant to submit applications to Eskom to determine the solutions.
Baynesfield Estate Lodge	To mitigate impacts to the Baynesfield Estate Lodge. A recommendation in the EIA is for this facility to be recreated at the Baynesfield Dam.
Notes: 1. The list above is not exhaustive. 2. The final solutions will not be implemented during the pre-construction phase (i.e. <b>Task 1: Tender Design and Documentation</b> ). Still, the existing infrastructure and services must be identified and documented during the pre-construction phase, and appropriate solutions determined with accurate cost estimates and programmed accordingly by the Consultant.	

### 3.1.1.5 Hydropower Feasibility Study

The Consultant shall conduct the study in two stages. The first stage will entail a critical review of the two options proposed by DWS in the Technical Feasibility reports. The second stage will entail a study that focuses on the following key deliverables:

- Feasibility of the hydropower plants.
- Capital costs for the hydropower plants.
- Life cycle costs for the hydropower plants.
- Assessment of critical parameters to determine the ideal location and efficient hydropower plant.
- Concept designs and drawings for the hydropower plant, i.e. proposed solution.

The Consultant must compile a concise report with the findings and proposed final solution.

### 3.1.1.6 Operation Rule and Philosophy

The Consultant shall, from the Technical Feasibility reports and in consultation with TCTA and DWS, develop operation rules and philosophy, considering:

- i) Life cycle costs.
- ii) Asset management.
- iii) Recommended operation and maintenance by manufacturers.
- iv) Spares availability, i.e. operation and maintenance.
- v) Skills of operators, i.e. repairs and facilities to that.
- vi) Procurement processes and challenges during operation and maintenance of the infrastructure.

### 3.1.1.7 Guideline for Technical Implementation (GTI)

The “Technical Guidelines for the Development of Water and Sanitation Infrastructure” (Second Edition, 2004) by the Department of Water and Sanitation (DWS) has reference, and it is in **Appendix 8 of the Agreement**. This document provides technical guidance to engineering for developing government waterworks, especially regarding planning and design.

The DWS undertook the planning of the Project per the Technical Feasibility reports. Therefore, the Consultant shall consider the guidelines above and develop a project-specific GTI. This GTI for the Project should, amongst others, provide technical guidelines relating to the design of the Water Conveyance Infrastructure, i.e. tunnel and related infrastructure, pipeline and related infrastructure, electrical plant and equipment, telemetry, etc.

The GTI must be submitted to TCTA and DWS for review and approval before the Design Criteria Memoranda (DCM) is prepared. TCTA will facilitate the engagements with the DWS where required.

### **3.1.1.8 Design Criteria**

The Consultant shall compile the DCM, setting out all the principles, parameters and assumptions based on best practices and international and national codes and standards for the tender design. It must include loading cases, factors of safety, allowable stresses, seismic, stability, deformation, minimum operational requirements, methods of application, flow diagrams and other factors. The Consultant shall submit the DCM to TCTA and DWS for review and acceptance before the design studies.

### **3.1.1.9 Investigations, Surveys and Studies**

#### **(1) Topographical Survey and Mapping**

The Consultant shall install survey control points, undertake LiDAR and bathymetry surveys and aerial photographs, and map the entire Project footprint/area at a suitable scale. The data must be used to develop a two- or three-dimensional digital terrain model that must include cadastral information and digital orthophotos.

The above by a specialist contractor(s), as well as the specifications and tender document(s) by the Consultant, will be Additional Services per **sections 3.5.4.2 (Assistance to TCTA) and 3.5.9 (Procurement Management)**.

#### **(2) Field Surveys and Investigations**

The Consultant shall plan and execute supplementary field surveys, sampling and investigations, and field and laboratory testing programme(s) for all the infrastructure components to support optimising the layout and arrangement of such infrastructure components and the design studies.

In addition to the above, the Consultant shall:

- i) Determine and mitigate against the subsurface construction risks.
- ii) Establish the topsoil profile and nutrients.
- iii) Define geology and provide geotechnical and geohydrological information, i.e. rock lithology, weathering, groundwater, etc.
- iv) Measure strength, deformation and permeability of foundations.
- v) Establish the availability, quantity, and quality of construction materials from the quarries and borrow pits on-site and foundation excavations, including spoil sites/areas.
- vi) Determine the gas potential and pressure, measure permeability, temperature and water chemical composition, i.e. subsurface strata.
- vii) Develop a 3-D geotechnical and geohydrological model.

The Consultant shall arrange the surveys and investigations, including geophysical surveys; drilling and logging of boreholes; test pits/trenches and mapping; various field and laboratory tests. The Consultant must optimise and prioritise these investigations into phases/stages to ensure cost-saving. The actual surveys, sampling, investigations and tests by a specialist contractor(s), as well as the specifications, tender documents, evaluation and contract administration and management by the Consultant, will be Additional Services per **sections 3.5.4.2 (Assistance to TCTA) and 3.5.9 (Procurement Management)**.

The field surveys, sampling, investigation and test results shall form part of the Geotechnical Baseline Report by the Consultant.

### **(3) Geotechnical Baseline Report**

Upon completing the supplementary **Section 3.1.1.9 (2) Field Surveys and Investigations** for all the components, the Consultant shall submit a comprehensive Geotechnical Baseline Report. This report shall include the results of the geotechnical investigations undertaken in other studies, i.e. Technical Feasibility reports.

The Geotechnical Baseline Report shall include plotted profiles, all the results (field and laboratory tests and geophysical studies) and a complete account of the technical analyses, interpretation and evaluation. The definitions, classifications, terminology, symbols and reporting shall be based on common terminology. The report shall be submitted to TCTA for review and acceptance. The final report shall incorporate all the queries and comments by TCTA.

It should be noted that the Geotechnical Baseline Report for the tunnel component must comply with the framework and requirements in the FIDIC Conditions of Contract for Underground Works (Emerald Book) (first edition, 2019) and the guidelines by the American Society for Civil Engineers Manuals and Reports on Engineering Practice No. 54: Geotechnical Baseline Reports: Suggested Guidelines.

The above shall be Additional Services per **Section 3.5.4.2 (Assistance to TCTA)** during the administration of this Agreement, i.e. drafting and compiling the Geotechnical Baseline Report.

### **(4) Flood Hydrology Studies**

The Consultant shall determine the flood risks and frequencies associated with designing and constructing all infrastructure components. The Consultant shall also determine the magnitudes, durations and water levels related to flood events.

### **(5) Hydraulic Design Studies**

The Consultant shall conduct hydraulic studies using suitable modelling techniques (including computational fluid dynamics modelling), calculations and analyses to determine the hydraulic conditions associated with all the infrastructure components. The studies shall, amongst other things, include the scour and sedimentation potential/impacts; water hammer; submergence of intakes; hydraulic stability; hydrodynamic vibration; energy dissipation; flow patterns; water levels; aeration; pressures; and flooding of existing upstream and downstream structures and properties.



The Consultant can propose to conduct a hydraulic physical model study to optimise or verify its hydraulic designs, subject to the Client's approval of the Additional Services per **sections 3.5.4.2 (Assistance to TCTA) and 3.5.9 (Procurement Management)**.

#### **3.1.1.10 Optimisation of Infrastructure Components**

The Consultant shall develop the final layouts and general arrangements of all the infrastructure components considering the following:

- Available information from previous studies and assessments.
- Corridors and conditions specified in the EAs.
- Outcome of the environmental and engineering investigations, studies, surveys and plans.
- Non-alienation of the affected properties.
- Design studies, including other studies and investigations recommended by the Consultant and approved by TCTA.

Upon completing the optimisation process, the Consultant shall prepare drawings showing the layouts and general arrangements of all the temporary and permanent infrastructure components. This will enable the Consultant to determine the construction footprint/area and calculate quantities and cost estimates. The information shall be revised as needed.

All the layouts and general arrangements shall be discussed with TCTA before they form the basis for more detailed studies

#### **3.1.1.11 Tender Design Studies**

The Consultant shall undertake various design studies using information from the tasks above and any additional information from other sources to successfully design all the required infrastructure components for effective and efficient construction. The objectives include, among other things, the following:

- i) Optimise and finalise the layouts and arrangements to reduce the overall costs and improve the technical performance of the infrastructure components. All the proposed arrangements shall be discussed with TCTA before they form the basis for more detailed studies
- ii) Provide complete designs for all the infrastructure components, including the hydro-mechanical and electrical plant and equipment, systems, instrumentation, reinforced concrete, stability, drainage, lighting, etc.
- iii) Provide the outline designs and performance specifications related to mechanical and electrical equipment and plant items such as gates and valves to enable detailed design and manufacturing by the contractor.
- iv) The designs, reports, specifications and drawings must be to a high level of standard to allow tenderers/bidders to quickly and fully understand the requirements of the proposed infrastructure to resource accurately, programme and price for the work.

- v) Identify and list any long lead items for construction plant and equipment (temporary and permanent) for inclusion under Risk Management and Tender Document.
- vi) Exclude poor plant, equipment and materials and only use new high-quality plant, equipment and materials that have a proven track record of being successfully operated and maintained in KZN, South Africa. Furthermore, all plant, equipment and materials must be suitable under all local climatic conditions and altitudes, providing the highest service life without refurbishment and using locally available materials if feasible.
- vii) Operation and maintenance must be safe, hygienic, secure, user-friendly, low-cost, accurate, efficient, durable, and accessible during all weather conditions, including remote and local operation (automatic and manual).
- viii) Do not adversely affect the environment and people's security, hygiene, health and safety.
- ix) Determine design requirements for the implementation of the biodiversity offsets initiatives.
- x) Level of detail on the above must be suitable for international tendering.
- xi) Identify interfaces required with others and items to be provided by others for the proper execution of the Services.

The design studies should include:

- i) Design calculations and analyses to determine the system's performance and failure probabilities, including reliability analysis.
- ii) Concrete mix and reinforcement designs for all grades of concrete, including pre-cast units or segmental lining.
- iii) Hazard and Operability Study (HAZOP).
- iv) Constructability or appropriate construction methods.
- v) Process Flow Diagrams.
- vi) Cathodic Protection and AC Mitigation Requirements.
- vii) Seismic analyses.
- viii) Operation Rule and Philosophy per **Section 3.1.1.6**, including telemetry and instrumentation requirements.
- ix) Provisions for the future tunnel, i.e. Phase 2 of uMkhomazi Water Project.

#### **(1) Pipeline Design Studies**

The Consultant shall undertake a design study and general arrangements for the pipeline. The study shall include, amongst other things, the following:

- i) Investigate and confirm the optimum pipeline route from the tunnel outlet portal in the uMlaza River Valley to Umgeni Water's WTW.

- ii) Determine the optimum diameter of the pipeline and associated friction losses to deliver the required yield and capacity, considering the Hydropower Feasibility Study above.
- iii) Determine the pipeline wall thickness following surge pressure and water hammer analyses.
- iv) Determine the structures, cathodic protection and hydromechanical requirements for safe operation and maintenance of the pipeline, i.e. scour valve; air valves; accesses; outlet/stilling basin; connection to the tunnel; management of bedding and waste material; instrumentation; chambers; etc.
- v) Prepare drawings of all arrangements to determine quantities and cost estimates.

## **(2) Tunnel Design Studies**

The Consultant shall undertake a design study and general arrangement of the tunnel. The study shall include, amongst other things, the following:

- i) Investigate and confirm the optimum route of the tunnel from the Smithfield Dam to the inlet of the pipeline in the uMlaza River valley, including spoil sites/areas for the tunnel muck.
- ii) Determine the optimum diameter of the tunnel and associated friction losses to deliver the required yield and capacity (Option 1).
- iii) Determine the optimum diameter of the tunnel and associated friction losses to deliver the required yield and capacity, considering the Hydropower Feasibility Study above (Option 2).
- iv) Determine the structures and hydromechanical requirements for safe operation and maintenance of the tunnel, i.e. intake; tunnel and lining of it; air shafts; access adits; portals; accesses; connection to the pipeline; constructability; management of groundwater and waste material; ventilation; monitoring systems; etc.
- v) Determine tunnel excavation production rates and suitable tunnel boring machines.
- vi) Determine the requirements of the mining health and safety regulations.
- vii) Drawings of all arrangements to determine quantities and cost estimates.

## **(3) Services Design Studies**

The Consultant shall determine site establishment and access roads (temporary for construction and permanent) design requirements. The construction roads shall include access roads to the quarries, borrow pits and waste disposal areas.

The Consultant shall determine the electricity supply points, demand and voltage requirements for the scheme's construction and operation and maintenance phases, including the timing and cost estimates (capital costs for the work and consumption). TCTA will facilitate engagements with Eskom and submit electricity supply applications where needed.

The Consultant shall determine all potable water supply and sanitation design requirements, i.e. temporary for construction and permanent for operation and maintenance.

#### **3.1.1.12 Tender Design Report**

The Consultant shall produce a self-contained report describing the tender design, consolidating the information covered in previous submissions, with any revisions made during discussion, review and refinement.

Notwithstanding the above, and as agreed with TCTA, the Consultant will be required to submit clear and concise technical memoranda during the design process, i.e. Design Studies. Each memorandum shall set out the concepts, methods, criteria and critical parameters used in the design, the design calculation results, discussion on the technical decisions or recommendations, an indication of outstanding matters, and implications on costs and programme. The memoranda must be submitted to TCTA for review and acceptance soon after the Services are performed on specific items. The final memoranda shall incorporate all the queries and comments by TCTA. The particular items shall be agreed upon with TCTA and form part of **Task 5: Project Management - Time Management**.

The contents of the tender design report shall include, amongst other things, the following:

- i) Methods used in the design.
- ii) Reasons for technical decisions.
- iii) Construction programme developed and presented in Primavera or MS Projects.
- iv) Details of further design work required during construction, with recommended methods and criteria.
- v) Details on approvals/authorisations required from authorities, if any.
- vi) Technical memoranda and other design reports in the appendices.
- vii) Design sketches and drawings and calculations in appendices.
- viii) Schedules for equipment and long lead items, including spares for operation and maintenance.
- ix) Resource-based cost estimates.

The tender design report shall be submitted to TCTA for review and acceptance. The final report shall incorporate all the queries and comments by TCTA.

#### **3.1.1.13 Tender Document**

The Consultant shall produce the tender document for the construction contract based on the Construction Industry Development Board (CIDB) Standard for Uniformity in Engineering and Construction Works Contracts, which are published in terms of the regulations of the CIDB Act 38 of 2000 (as amended).

The document shall describe the Works, including temporary works, as necessary, in sufficient detail to allow tenderers to determine their construction cost confidently and ensure the receipt of at least three tenders. Furthermore, the Consultant shall prepare suitable particular conditions of tender and contract.

The tender document shall include, amongst other things, the following:

- i) Tendering procedures and tender data, including the functional evaluation criteria. The Consultant shall develop such criteria in consultation with TCTA.
- ii) Returnable documents. Such documents must, amongst other things, be aligned with the functional evaluation criteria.
- iii) Agreement and contract data per the Conditions of Contract: FIDIC Conditions of Contract for Construction for Building and Engineering Works Designed by the Employer (Red Book) (second edition, 2017). The Consultant shall develop the particular conditions of contract in consultation with TCTA.
- iv) Pricing data and the Bill of Quantities (BoQ) per the recognised standard measurement method of civil engineering works. The BoQ must enable the evaluation of variations and determination of claims.
- v) Scope of work, including technical/construction specifications: engineering, environmental, social, black South Africans, enterprise and supplier development requirements, and health and safety.
- vi) Site information and other documents:
  - Drawings.
  - Site information such as the Geotechnical Baseline Report and environmental baseline records and plans.
  - Detailed design and construction programme developed and presented in Primavera or MS Projects.
  - Other relevant documents and reports such as the construction and operation EMPr and EA.

A separate pre-qualification document and the process will precede the tender document and process. The pre-qualification document shall include, amongst other things, procedures data and evaluation criteria, returnable documents and additional relevant information to shortlist contractors for the tender process. The Consultant shall develop the complete pre-qualification document in consultation with TCTA.

The pre-qualification and tender documents shall be submitted to TCTA for review and acceptance, and approval by its Bid Specification Committee (BSC) as detailed under **Sub-Task 5.9: Procurement Management**. The final pre-qualification and tender documents shall incorporate all the queries and comments by TCTA and its BSC.

### **3.1.2 Sub-Task 1.2: Environment, Social and Land Acquisition**

#### **3.1.2.1 Environmental Management Programme (DFFE)**

The Consultant will be required to comply with the EA conditions and obtain approval from DFFE for the construction and operation EMPr. As such, the Consultant shall be responsible for the preparation, public participation process and the submission of the final construction and operation EMPr to DFFE for approval, notification of the decision and management of the appeals process (if required). The Consultant must allow no less than two revisions of the EMPr, including public participation processes.

The format and structure of the construction and operation EMPr must be based on the Pre-construction EMPr, unless otherwise approved by TCTA.

#### **3.1.2.2 Environmental Plans**

##### **(1) Biodiversity Offsets and Compensation Plan (DFFE)**

A detailed Biodiversity Offset and Compensation Study was undertaken by the EAP during the preparation of the second Addendum to the EIA Report. This report (dated July 2020) addresses the significant ecological impacts that will occur during construction, and in line with the mitigation hierarchy, various options were considered. The main option being a recipient area identified using desktop method, comprising of nine properties/farms outside the Project footprint/area, willing to participate in the biodiversity offsets initiatives.

To achieve the targets in the table below on the properties above, the following summary of initiatives are detailed in the abovementioned report:

- Alien and invasive plant, waste, rubble, and litter removal
- Stormwater management – sediment traps, sloping/shaping areas with steep banks, etc.
- Planting/seeding, i.e. vegetation.
- Erosion control measures – installation of geofabrics, staking vertical strips, etc.
- Grazing and fire management plans.
- Short-term maintenance for approximately three years – monitoring and carrying out the above as required to achieve vegetation cover.
- Long-term management for over 30 years.

A budget estimate was also prepared for the above, totalling R170 million (including VAT) (2020), i.e. the Water Conveyance Infrastructure and Smithfield Dam and Associated Infrastructure. The estimate includes compensation payable for the impact of uMWP-1 on critical species.

The affected habitats, footprints, and targets described in Addendum 2 of the EIA report are summarised below:

AFFECTED HABITAT	AFFECTED HABITAT FOOTPRINT	TARGET
Wetland Habitat	4.35 ha	87 ha
Riparian Habitat	0.75 ha / 300 m (see note 3)	0.75 ha / 300 m
CBA Irreplaceable Habitat	4.66 ha	139.8 ha
CBA Optimal Habitat	0 ha	Not applicable
<p>Notes:</p> <ol style="list-style-type: none"> <li>1. TCTA foresees that the excavation for the tunnel will be from the Smithfield Dam site to the tunnel outlet portal at Baynesfield (i.e. the reverse of what is in the EIA report). Therefore, the Consultant will be required to assess and revise the footprints and targets above accordingly.</li> <li>2. CBA - Critical Biodiversity Area.</li> <li>3. The Consultant to determine the impacts and whether offsets are required due to edge effects as Normal Services.</li> <li>4. The targets are based on the national and provincial guidelines: Wetland Habitat (20:1); Riparian Habitat (1:1); CBA Irreplaceable Habitat (30:1); CBA Optimal Habitat (5:1). The Consultant shall revise these targets to comply with the official National Biodiversity Offset Guidelines or the latest relevant guidelines as Normal Services.</li> <li>5. The wetland offset tool requires a target of 11:1 for Wetland Habitat. This will reduce the target to 48 ha.</li> </ol>		

The Consultant shall use the report above as the basis to develop the Biodiversity Offsets and Compensation Plan. TCTA identified issues and gaps in the report above as follows:

- The budget and programme may be high-level and outdated and not appropriate for Tender Design and Documentation.
- Landowners may have changed or no longer be interested in the biodiversity offsets projects/initiatives.
- The solutions/designs don't have detailed drawings and quantities for accurate pricing by contractors.
- Compensation amounts lacked objective motivation and details on how it was calculated.
- There are no environmental authorisations or exemptions in place, required to implement biodiversity offsets.
- There are no Water Use Licence in place, required to implement biodiversity offsets.

The Consultant shall address all the issues and gaps and develop the Biodiversity Offsets and Compensation Plan after considering the National Biodiversity Offset Guideline (as gazetted) and Biodiversity Offsets and Compensation Study, with initiatives identified to compensate for the loss of identified species of conservation significance, which was undertaken during the EIA process.

The Biodiversity Offsets and Compensation Plan must include, amongst other things, the following:

- DFFE requirements per the EA as amended.
- Undertake Investigations, Surveys and Studies (per **Section 3.1.1.8** above) and provide details of the biodiversity offset areas/sites, including how to secure such sites/areas (approach and method only). This must be done in consultation with TCTA and will include revisiting the engagements with the landowners identified

during the EIA process to obtain formal approvals relating to the further studies and implementation of the above on their properties.

- Detailed scope of work for each biodiversity offset site/area – designs, specifications and requirements, drawings, cost estimates, escalated cash flow, implementation/construction programme (including short-term maintenance and long-term management), etc. per requirements under **Section 3.1.1.12: Tender Design Report**. The cost estimates must differentiate between Operating Expenditure (OpEx) and Capital Expenditure (CapEx).
- The conditions for long-term management for each biodiversity offset site/area. The conditions must be included in the agreements below.
- Negotiate and attached the signed agreements with six landowners and terms of reference for role players that will be involved with the implementation of the biodiversity offsets. The agreements must consider the approach and method to secure the biodiversity offset sites/areas. The proposed agreements and terms of reference must be submitted to TCTA for approval.
- Undertake a Basic Assessment for the biodiversity offset sites/areas and attach the Environmental Authorisation(s), or a formal exemption(s).
- Apply for Water Use Licence(s) and attach it, or a formal exemption(s).
- Where offsetting is impossible, the Consultant shall determine the compensation quantum. This shall be based on sound, objective, and scientifically defensible methods.

The Consultant will be required to work closely with the consultant for the Conveyance Infrastructure, upon the award of such a contract/agreement, to produce a consolidated and integrated Biodiversity Offsets and Compensation Plan.

The Biodiversity Offsets and Compensation Plan shall be submitted to TCTA for review and acceptance. The Consultant shall incorporate all the queries and comments by TCTA, before the public consultation process. The plan shall then undergo a formal public consultation process facilitated by the Consultant's EAP and the final plan signed by the EAP, considering the comments, shall be submitted to DFFE for approval. To this end, the Consultant will be required to address DFFE's queries for the plan to be approved.

**IMPORTANT NOTE:** If the properties or initiatives identified during the EIA process are no longer available as potential biodiversity offset sites/areas or unsuitable, the Consultant will be required to identify and propose new biodiversity offset sites/areas and initiatives. This will be considered as Additional Services, but subject to TCTA's approval.

## **(2) Search, Rescue and Relocation Plan (DFFE)**

The Consultant shall undertake an ecological walk-through survey to document the flora and fauna within the habitats that will be affected by the development including amongst other things the following:

- Details of red-data and conservation-worthy species and medicinal plants.
- Blue Swallow and other sensitive bird species (e.g. Grey-crowned crane) breeding sites.



- Where relocation cannot be undertaken, this will inform the Biodiversity Offsets and Compensation Plan above.

The Consultant shall develop the Search, Rescue and Relocation Plan. The plan shall include amongst other things the following:

- Flora that must be rescued and transplanted and the method of propagation, e.g. in whole or seeds collected.
- Identification of suitable relocation sites.
- Where relocation cannot be undertaken, this will inform the Biodiversity Offsets and Compensation Plan above.

The Search, Rescue and Relocation Plan shall be submitted to TCTA for review and acceptance. The Consultant shall incorporate all the queries and comments by TCTA, before the public consultation process. The plan shall then undergo a formal public consultation process facilitated by the Consultant's EAP and the final plan signed by the EAP, considering the comments, shall be submitted to DFFE for approval. To this end, the Consultant will be required to address DFFE's queries for the plan to be approved.

### **(3) Habitat Rehabilitation and Restoration Plan (DFFE)**

The Consultant shall undertake an ecological walk-through survey and investigations to document the habitats that will be affected by the development and develop the Habitat Rehabilitation and Restoration Plan. The plan shall include amongst other things the following:

- Laboratory results of soil samples tests, e.g. nutrients.
- Detailed and specific rehabilitation measures for each affected Project footprint/area where rehabilitation will be required.
- Requirements for controlling alien and invasive plants.
- Where rehabilitation cannot be undertaken, this will inform the Biodiversity Offsets and Compensation Plan above.

The Habitat Rehabilitation and Restoration Plan shall be submitted to TCTA for review and acceptance. The Consultant shall incorporate all the queries and comments by TCTA, before the public consultation process. The plan shall then undergo a formal public consultation process facilitated by the Consultant's EAP and the final plan signed by the EAP, considering the comments, shall be submitted to DFFE for approval. To this end, the Consultant will be required to address DFFE's queries for the plan to be approved.

#### **3.1.2.3 Environmental Baseline**

The Environmental Baseline (including, among other things: land use practices, vegetation status (in terms of plant species, alien invasive plants, noxious weeds, etc.), conditions of haul roads, river water quality, the state of river banks (where affected), ambient dust, noise and traffic volumes) and pre-construction survey (land uses and structures, e.g. fencing, boreholes, houses, etc.) situated approximately 100 metres adjacent from the site boundary(ies) must be undertaken by the Consultant. The

Consultant shall record all the variables and parameters, including photographic evidence, and prepare baseline reports for inclusion in **Section 3.1.1.13: Tender Document**.

### 3.1.2.4 Environmental Aspects

TCTA has developed and operates an Environmental and Social Management System (ESMS) per the requirements of King IV. The ESMS requires the Consultant to identify the aspects and determine their significance.

The table below provides a summary of the aspects. Note that this is not exhaustive, and the Consultant shall identify gaps and create a comprehensive list for the Project. To achieve responsible environmental management, direct and indirect impacts at an appropriate scale will be required from the Consultant.

COMPONENT	ASPECTS*
Site Layout	<ul style="list-style-type: none"> <li>• Demarcation of the infrastructure (temporary and permanent) required for site establishment and construction.</li> <li>• Indicate access roads, haul roads, and above and below-ground infrastructure, including fences and gates.</li> <li>• Site micro-climate features (aspect and slope) to specify site buildings' locations, dimensions, and orientation to enhance solar gain.</li> <li>• Identification of bulk fuelling stations.</li> <li>• Site traffic plan; topsoil stockpiling areas; staging area for firefighting; waste stations (general and hazardous).</li> <li>• Designate vehicle and plant cleaning and maintenance areas.</li> </ul>
Site establishment	<ul style="list-style-type: none"> <li>• Demarcation of the site; site drainage</li> <li>• Protection/removal of vegetation, natural features, fauna, and cultural-historical aspects</li> <li>• Topsoil conservation; de-bushing and de-stumping; erosion and sedimentation control; firefighting plant and procedures</li> </ul>
Site infrastructure/structure and accommodation	<ul style="list-style-type: none"> <li>• Energy efficient construction office building design (e.g. ventilation, solar orientation, windows, insulation, etc.)</li> <li>• Water conservation (e.g. installing low-flow appliances in the temporary construction facilities/buildings, greywater re-use in toilet flushing, directing roof runoff, etc.)</li> <li>• Contractor's offices, workshops and lay-down areas; batching plants; crusher plants; sand washing plants; nurseries; roads and access; gates and fences; waste stations</li> </ul>
Site management	<ul style="list-style-type: none"> <li>• Rubble and waste rock; solid waste (management, recycling, and re-use); recycled use of waste materials; liquid waste (management, recycling and re-use)</li> <li>• System for capturing site water run-off for dust control</li> <li>• Hazardous waste (handling, use, disposal, mitigation measures in case of spill and use of Material Safety Data</li> </ul>

COMPONENT	ASPECTS*
	<p>Sheets)</p> <ul style="list-style-type: none"> <li>• Pollution control; implements and equipment; blasting; air quality; noise control; fire control; health and safety; bioremediation</li> <li>• Construction waste recycling and re-use</li> <li>• Fuel/oil bundling of standing plant and storage areas</li> <li>• Oil and fuel spill absorption kits for fuel storage areas and provision in critical areas</li> <li>• Disposal techniques for waste materials from construction activities</li> <li>• Erosion control (site stormwater and drainage plan, mitigation measures, inspection schedule and correction of sediment control measures)</li> </ul>
Earthworks	Prospecting boreholes and test pits; excavations and trenches; cut and fill; shaping and trimming
Stockpiles, storage and handling of materials	Topsoil; waste materials; vehicles and equipment; fuel; hazardous substances
Water Management	<ul style="list-style-type: none"> <li>• Settlement ponds (design, management and rehabilitation); river crossings and diversions; working in or near rivers and wetlands; borrow pits; stormwater drainage; trench excavations;</li> <li>• Water quality and quantity monitoring</li> <li>• Ponding, especially near communities and homesteads</li> <li>• Water quality discharged from construction activities</li> <li>• Surface water management; erosion protection and control</li> </ul>
Rehabilitation, biodiversity offsetting and compensation	<ul style="list-style-type: none"> <li>• Removal of temporary structures and infrastructure; inert waste and rubble; hazardous waste and pollution control; final shaping; surface water management; topsoil replacement and soil amelioration; ripping and scarifying; planting; grassing; maintenance</li> <li>• Landowner consultation and property packs for every affected property – these packs to be signed off by the landowner pre-construction (confirming the accuracy of data) as well as post-construction (assuring the success of rehabilitation): <ul style="list-style-type: none"> <li>▪ Preconstruction baseline information of habitats and vegetation types within the servitudes and neighbouring properties along the proposed pipeline. Rehabilitation interventions are property specific, i.e. fertiliser application, kind of seed mix, special measures for slope stabilisation, etc.</li> <li>▪ A wetland assessment that maps all wetlands within 30 metres of the pipeline, identifies any potential geomorphic risks within the wetland and riparian habitats, assesses and documents the condition of the vegetation community within the wetland and riparian habitats and makes specific recommendations for</li> </ul> </li> </ul>

COMPONENT	ASPECTS*
	wetland crossings at the particular sites.
Incident Reporting	Design an incident reporting protocol
Environmental awareness (biophysical and social)	Training programmes; induction training; tool-box talks; signage; refresher training
Social Management	<ul style="list-style-type: none"> <li>• Social impact assessment and mitigation</li> <li>• Heritage resources and palaeontological impact assessment and mitigation</li> </ul>
Interactions with interested and affected parties	<ul style="list-style-type: none"> <li>• Access procedure to impacted properties</li> <li>• Response procedure to landowner concerns and claims</li> <li>• Provision of information to TCTA for sharing with affected landowners</li> </ul>
Notes: <ul style="list-style-type: none"> <li>• * Aspects are how Project activities and related processes interact with the receiving environment, resulting in positive or negative changes.</li> </ul>	

### 3.1.2.5 Social Impact Assessment and Mitigation

The Consultant shall determine the social impacts associated with the development (Project footprint/area) and document all the impacts along with the proposed mitigation measures where relevant. The Consultant shall submit a report to TCTA for review and acceptance. The final report shall incorporate all the queries and comments by TCTA.

### 3.1.2.6 Heritage Resources and Palaeontological Impact Assessment and Mitigation

A Phase 1 Heritage Impact Assessment and a palaeontological desktop study were undertaken during the EIA. The Project area is in Permian-Ecca age rocks, known to have inclusions of fossil plants associated with the coal flora.

The Consultant shall undertake a Phase 2 Heritage Impact Assessment and a detailed Palaeontological Impact Assessment, including field investigations, of the Project footprint/area and document all the impacts along with the proposed mitigation measures where relevant. The Consultant shall submit the reports to TCTA for review and acceptance. The final reports shall incorporate all the queries and comments by TCTA.

### 3.2.1.7 Water Use Licence Application

The Consultant shall prepare the necessary documentation per the National Water Act (Act 36 of 1998) (as amended). This includes engagement between the applicant (TCTA) and DWS to determine the type of authorisation, conduct site inspections and confirm the information requirements. The Consultant shall also be responsible for preparing the technical reports and any supporting documents that DWS may request. The Consultant must allow for no less than two revisions of the Water Use Licence Application, including any public participation processes that may be required.

### 3.2.2.8 Applications for permits and approvals

The Consultant shall identify all activities that require permits and approvals and prepare and submit the necessary documentation and applications to the relevant authorities.

- i) Amafa Institute (the Provincial Heritage Resources Authority (PHRA) for KwaZulu-Natal): archaeological and paleoanthropological field investigations as well as applications for permits required to undertake construction activities.
- ii) DFFE and Ezemvelo KwaZulu-Natal: permits for the removal, relocation, or destruction of any protected or endangered plant and animal species that cannot be accommodated within the construction footprint/area.

### 3.1.2.9 Land Acquisition

The Consultant shall identify the footprint of all the land and rights to land (permanent and temporary servitudes) required for the Project and compile a schedule of the affected properties, maps/drawings and technical information per affected cadastral portion. Also, the Consultant shall, in consultation with TCTA, determine the timing for acquisition of the required land and servitudes.

The Consultant shall obtain relevant title documentation at the Deeds Office (i.e. title deeds) and the Surveyor General's office (i.e. SG diagrams). The schedule must include the details of the registered landowners and the names and contact details of the contact person(s).

The Consultant shall ensure that all technical information and maps/drawings provided are accurate and readable. Technical information provided by the Consultant shall include, amongst other things, the location, dimensions and coordinates of the land and rights to land pertaining to the relevant infrastructure and construction footprint/area. The Consultant must make provision for five revisions of the information above during this task and **Task 2: Detailed Design** below, i.e. maps/drawings and supporting documentation. This shall not be Additional Services nor Exceptional Services during the administration of this Agreement.

The above will enable TCTA to compile the Land Acquisition Execution Plan for the Project and prepare various notices in terms of the Promotion of Administrative Justice Act (Act 3 of 2000) (as amended) and Expropriation Act (Act 63 of 1975) (as amended) and/or agreements per affected land portion.

### 3.1.3 Sub-Task 1.3: Health and Safety

The Consultant shall comply with the following:

- Occupational Health and Safety Act (Act 85 of 1993) (the OHS Act) and the Construction Regulations 2014 (as amended).
- Mine Health and Safety Act (Act 29 of 1996) and the regulations (as amended).
- Consultant's/designer's Health and Safety Specification in **Agreement: Appendix 5**, which TCTA has compiled.

The Construction Health and Safety Agent (the Agent), appointed by TCTA, will enforce compliance with the OHS Act and Construction Regulations 2014 (as amended) and Mine Health and Safety Act (Act 29 of 1996) and the regulations (as amended). The Agent will develop the baseline risk assessment and site-specific construction and mining (tunnelling) health and safety specification, conduct regular reviews of the Consultant's tender designs and other documentation and apply for the construction work permit.

Under the Agent's guidance, the Consultant will ensure that the sub-consultants and contractors comply with the same legislation, regulations and specifications.

## 3.2 TASK 2: DETAILED DESIGN

The Consultant will be required to provide the Services as follows:

- i) Carry out detailed design and timeously issue construction drawings.
- ii) Evaluate contractors' proposals, plans and method statements to ensure compliance with the design intent.
- iii) Respond promptly to any technical queries raised during the construction.
- iv) The design team to support the construction supervision team.
- v) Ensure that the contractors' documents, plans and other vital documents are approved before the construction and manufacture activities, e.g. Quality Plan and method statements.
- vi) Assist TCTA in managing or coordinating approvals and applications by the Construction and Health and Safety Agent, e.g. construction work permit, health and safety plan. This shall not be Additional Services nor Exceptional Services during the administration of this Agreement.
- vii) Collaborate with the Consultant(s) for uMWP-1: Smithfield Dam and Associated Infrastructure.

The Consultant shall adopt an integrated approach while executing the Services, considering the other tasks and the interfaces with the uMWP-1: Smithfield Dam and Associated Infrastructure.

### 3.2.1 Sub-Task 2.1: Engineering

#### 3.2.1.1 Detail Design and Construction Drawings

The Consultant shall prepare construction drawings for the proposed Works. The drawings shall have sufficient detail for the construction of the Works, including reinforcement and electrical drawings and reinforcement bending schedules. The contractor will design and detail the temporary works unless specified otherwise in the construction contract. The Consultant shall issue the construction drawings per the approved contract programme to enable the contractor sufficient time for planning, procurement, fabrication and construction.

The Consultant will be responsible for the adequacy of all designs and shall undertake detailed design for the proposed Works. The construction drawings shall impart the detailed design of the Works and shall be revised and supplemented to meet field conditions as the construction of the Works progresses. The Consultant shall engage with the contractor regarding construction methodologies and amend the tender designs and revise the drawings to address the following technical factors:

- i) Constructability, including transportability;
- ii) Operability; and
- iii) Maintainability.

### 3.2.1.2 Detail Design Report

The Consultant shall produce a detailed design report with the updated and revised tender design and other elements in the tender design report. The report shall include all the additional designs undertaken during construction and the as-built drawings.

The detailed design report shall be submitted to TCTA for review and acceptance. The final report shall incorporate all the queries and comments by TCTA.

## 3.2.2 Sub-Task 2.2: Environment, Social and Land Acquisition

### 3.2.2.1 Environmental and Social Compliance

The Consultant must ensure that the detailed designs do not result in significant changes to the nature and scope of the environmental and social impacts. As such, the Consultant will be required to comply with the EA (as amended) and approved pre-construction EMP, including the construction and operation EMP (approved by DFFE) for the development. However, should there be any significant changes, the Consultant shall prepare the necessary documentation per NEMA and the EIA Regulations for any changes to the project description or design refinements.

The Consultant must ensure and manage the implementation of the following, i.e. this task and Task 3: Construction Supervision:

- i) Biodiversity Offsets and Compensation Plan (CapEx-related activities and short-term maintenance only);
- ii) Search, Rescue and Relocation Plan;
- iii) Habitat Rehabilitation and Restoration Plan;
- iv) Social, heritage resources and palaeontological impact assessments and mitigation reports; and
- v) Stormwater Management Plan.

The biodiversity offset sites/areas must be formally secured before the implementation of the Biodiversity Offsets and Compensation Plan. This will be undertaken by a biodiversity specialist and conveyancing attorney, as well as the terms of reference and procurement process by the Consultant, will be Additional Services per **sections 3.5.4.2 (Assistance to TCTA) and 3.5.9 (Procurement Management)**.

The Consultant will not be required to develop the Stormwater Management Plan related to construction activities (i.e. **Task 3: Construction Supervision**), which requires DFFE's approval. This plan will be developed and implemented by the contractor; however, the Consultant and its EAP will be required to review the plan and submit to TCTA for comments. The final plan shall be signed by the Consultant's EAP, considering the comments, and submitted to DFFE for approval. To this end, the Consultant will be required to address DFFE's queries for the plan to be approved.



### 3.2.2.2 Land Acquisition

The Consultant shall inform TCTA of instances where the detailed designs and construction supervision/monitoring resulted in significant changes to **Task 1: Tender Design and Documentation - Land Acquisition**. Similar to Task 1, and where TCTA must undertake changes during detailed design and **Task 3: Construction Supervision**, the Consultant shall provide ongoing support to TCTA, i.e. provide new or revised technical information and maps/drawings.

The above information must be of sufficient detail to enable TCTA to issue the PAJA and Expropriation Notices or amendments to the original notices.

### 3.2.3 Sub-Task 2.3: Health and Safety

The Consultant shall comply with the following:

- Occupational Health and Safety Act (Act 85 of 1993) (the OHS Act) and the Construction Regulations 2014 (as amended).
- Mine Health and Safety Act (Act 29 of 1996) and the regulations (as amended).
- Consultant's/designer's Health and Safety Specification in **Agreement: Appendix 5**, which TCTA has compiled.

The Agent will conduct regular reviews of the Consultant's detailed designs.

Under the Agent's guidance, the Consultant will ensure that the sub-consultants and contractors comply with the same legislation, regulations and specifications.

### 3.3 TASK 3: CONSTRUCTION SUPERVISION

The Consultant shall act as the Engineer for administering the FIDIC construction contract. As such, the Consultant shall provide a suitably qualified person to act on its behalf as the Engineer, including other engineers, environmentalists, administrators, etc., necessary for the construction supervision on a full-time basis per the tasks below.

The Consultant shall adopt an integrated approach while executing the Services, considering the other tasks and the interfaces with the uMWP-1: Smithfield Dam and Associated Infrastructure.

#### 3.3.1 Sub-Task 3.1: Engineering

##### 3.3.1.1 Contract Administration and Construction Supervision

The Consultant shall undertake all the Engineer's duties associated with construction supervision and contract administration that includes, amongst other things, the following:

- i) Administer and manage all the works per the signed construction contract, including the site(s) handover.
- ii) Develop and implement a Quality Management System, and materials management plan and control procedure for all the works with the contractor, including establishing and managing on-site testing laboratory and witness tests during manufacturing, as required.
- iii) Establish specific contract management procedures, processes and protocols.
- iv) Perform additional studies or investigations and issue instructions and additional and revised construction drawings to ensure satisfactory completion of the Works.
- v) Undertake geological and geotechnical inspections and mapping and approve the final foundation levels and tunnel excavations for the Works.
- vi) Review, comment and approve the contractor's contract programme (including long lead items) and monitor construction progress monthly using the approved contract programme or as required.
- vii) Administer variations and evaluate all claims per the construction contract.
- viii) Review, comment, and accept or confirm "no objection" to the contractor's method statements and contractor's designs and detailing of the temporary works, including health and safety, environmental and social.
- ix) Provide an appropriate level of technical inspections, monitoring and supervision to ensure compliance with the design intent, field and laboratory testing programme, construction drawings and the construction contract, i.e. construction activities and manufacturing and installation of mechanical and electrical equipment and plant.
- x) Ensure that electrical and mechanical plant and equipment such as valves, gates, pipes, etc., meet the required design, performance and quality specifications.
- xi) Maintain all records and documents – daily site diary, reports, test results, payment certificates, determinations, agreements, instructions, letters, variations, claims and claim notices, monthly progress reports with photographic records, manuals, minutes

- of meetings, quality plan, health and safety plan, emergency plan and procedures, etc.
- xii) Update construction drawings to “as built” status continuously throughout construction, especially for completed parts of the Works.
  - xiii) Monitor and revise the cash flow continuously to completion of the contract.
  - xiv) Liaise with TCTA to establish specific commissioning requirements in addition to the construction contract. Supervise the commissioning of the completed Works, including training of the operators.
  - xv) Provide a draft operation and maintenance manual for the operators and the asset register. The format and structure are to be agreed upon with TCTA.
  - xvi) Resolve problems and conflicts promptly.
  - xvii) Collaborate with the Consultant(s) for uMkhomazi Water Project – Phase 1: Smithfield Dam and Associated Infrastructure.

#### **IMPORTANT NOTES:**

- (1) The FIDIC Conditions of Contract for Construction for Building and Engineering Works Designed by the Employer (Red Book) (second edition, 2017) has more onerous and stringent administration and management conditions and requirements for the Engineer compared to the first edition (1999). As such, the Consultant must make provisions to fulfil all the conditions and requirements of the second edition (2017). This shall not be Additional Services nor Exceptional Services during the administration of this Agreement.
- (2) This sub-task is also applicable to the construction of resettlement houses for affected families/households and biodiversity offset initiatives.

#### **3.3.1.2 Manufacture of Mechanical Plant and Pipes**

The Consultant shall establish an inspection programme in consultation with TCTA and the contractor and implement it through an independent inspectorate:

- i) Ensure that the contractor and manufacturers have sound quality management systems or programmes for the work.
- ii) Review and approve shop drawings, catalogues, materials, finishes, test reports, welding procedures, etc.
- iii) Undertake factory and site inspections during the manufacturing and testing to ensure the quality of materials and workmanship and produce the inspection reports.
- iv) Reject or ensure the contractor remedies the deficiencies and problems identified during the inspections above.

The independent inspectorate services will be under the construction contract, and it is not part of the Services. The Consultant will be required to review the reports by the independent inspectorate and ensure that the set specifications for quality materials and workmanship are met through the independent inspectorate services. To this end, the Consultant shall regularly engage with the independent inspectorate and contractor to monitor such services.

In addition to the above, the Consultant and TCTA will be required to witness factory acceptance tests carried out on the main hydro-mechanical plant and equipment critical for the continuous operation of the infrastructure.

### **3.3.2 Sub-Task 3.2: Environment, Social and Land Acquisition**

#### **3.3.2.1 Environmental and Social Monitoring**

The Consultant shall supervise all the construction activities and enforce compliance with the construction contract, i.e. environmental specifications, including the EA, and the approved EMPr and plans. This shall include, amongst other things, the following:

- i) Monitor the implementation of the contractor's environmental specifications and mitigation measures, including the following plans:
  - Biodiversity Offsets and Compensation Plan (CapEx-related activities and short-term maintenance only);
  - Search, Rescue and Relocation Plan;
  - Habitat Rehabilitation and Restoration Plan;
  - Heritage Resources and Palaeontological Management Plan;
  - Resettlement Action Plan; and
  - Stormwater Management Plan.
- ii) Issue instructions for corrective actions when there is non-compliance by the contractor.
- iii) Review, comment and accept or conform “no objection” to environmental matters in the construction method statements.
- iv) Establish and follow a formal protocol to access the construction footprint/areas. The protocol must provide details on interacting or liaising with the landowners.
- v) Establish and maintain a protocol to record, address and respond to queries, issues and complaints, and provide a single point of contact (suitably qualified person) through whom the interested and affected parties may register queries, issues or complaints.
- vi) Apply the latest ISO 14001 during construction.

#### **3.3.2.2 Incident Management**

Incidents are defined as events which are either natural (e.g. fires, floods, etc.) or human-induced (e.g. oil, diesel or hazardous liquid spill) or related to social issues (e.g. complaints, strike action, community unrest, etc.) that may cause a significant adverse environmental or social impact or that will result in public concern – project-related only. These incidents may be of an accidental nature or result from non-compliance with the construction contract or obligations of the EA and EMPr.

The Consultant will be required to report the details of the incidents listed below as part of **Task 5: Project Management - Communication Management**.

- Hydrocarbon and hazardous liquid spills.
- Construction vehicles in watercourses without authorisation.
- Accidental discharge of large quantities of sediment into watercourses.
- Explosions.
- Fire on site.
- Flooding.
- Workers' strike actions.
- Any other incident or emergency defined in Section 30 and 30A of National Environmental Management Act (Act 107 of 1998) (as amended).

### **3.3.2.3 Environmental Control Officer (ECO)**

TCTA will appoint the ECO on behalf of the DFFE. The Consultant shall provide the ECO with the contractors' environmental and social monitoring information. The Consultant shall accompany the ECO on the inspections and audits. The Consultant shall review and provide input into all ECO reports. The Consultant shall forward the ECO's reports to the contractor for written responses and implement corrective measures.

The Consultant shall make available the following staff members or personnel to prepare for, attend and participate in ECO audits (as required in the EA), namely the Chief Resident Engineer (or delegated Resident Engineer(s)) and the Environmental Manager(s).

### **3.3.2.4 Environmental Monitoring Committee (EMC)**

TCTA will facilitate the establishment of the EMC and appoint the EMC chairperson. The Consultant shall make available the Environmental Manager(s) to attend (as observers) EMC meetings that will be held monthly.

### **3.3.3 Sub-Task 3.3: Health and Safety**

The Consultant shall, amongst other things and under the guidance of the Agent, perform the following:

- Review, comment, and approve the contractor's health and safety plan. The plan's final approval shall be by the Agent per the Occupational Health and Safety Act (Act 85 of 1993) and Construction Regulations 2014 (as amended).
- Monitor and enforce the above, including the site-specific construction health and safety specifications per the construction contract.
- Compile safety statistics.
- Ensure no unsafe practices and conditions during construction and mining (tunnelling) activities.
- Ensure the contractor's qualifications, competency and resources are in place.
- Perform health and safety inspections and audits, and issue instructions for corrective actions when there is non-compliance by the contractor.

- Monitor and ensure compliance with the Occupational Health and Safety Act (Act 85 of 1993) and the Construction Regulations 2014 (as amended).
- Monitor and ensure compliance with the Mine Health and Safety Act (Act 29 of 1996) and the regulations (as amended).
- Report to the regional principal inspector, i.e. mine environmental engineering and occupational health.

The Agent will conduct regular independent site audits and inspections (with the Consultant, contractor and TCTA), and the Consultant and contractor will be required to comply with the Agent's requirements. The Consultant and contractor will, under the Agent's guidance, ensure that the sub-consultants and sub-contractors comply with the same legislation, regulations, specifications and requirements of the Agent.

### **3.4 TASK 4: POST-CONSTRUCTION MONITORING**

The objective of the task is to monitor the completed Works and any outstanding Works and claims/disputes after issuing the taking-over certificate for the whole of the Works, e.g. rehabilitation, and to conclude all contractual obligations and claims/disputes, i.e. 1-year defects notification period on the construction contract.

The Consultant shall adopt an integrated approach while executing the Services, considering the other tasks and the interfaces with the uMWP-1: Smithfield Dam and Associated Infrastructure.

#### **3.4.1 Sub-Task 4.1: Engineering**

During the Defects Notification Period (DNP), the Consultant shall conduct monthly inspections of the completed and outstanding Works and notify the contractor and TCTA of the following:

- i) Damages and defects which require rectification and remedying.
- ii) Operation and maintenance issues.
- iii) Environmental-related items that have failed or issues that have become apparent after construction requiring remedying.
- iv) Collaborate with the Consultant(s) for uMkhomazi Water Project – Phase 1: Smithfield Dam and Infrastructure.

Shortly before the end of the DNP, the Consultant shall inspect or test the completed Works (including rehabilitation) and, after ensuring that all the recorded issues, disputes, defects and damages have been remedied and rectified by the contractor to the Consultant's and TCTA's satisfaction, issue the performance certificate to the contractor, and comply with all other conditions and obligations of the construction contract.

#### **3.4.2 Sub-Task 4.2: Environment, Social and Land Acquisition**

##### **3.4.2.1 Environmental and Social Monitoring**

During the DNP, the Consultant shall conduct monthly inspections and submit reports to TCTA and contractors to monitor rehabilitation progress and any remedial measures, including outstanding Works. The Consultant shall be responsible for the overall compliance to the plans, specifications, and final acceptance of rehabilitation by the landowners, DFFE and TCTA.

##### **3.4.1.1 Environmental Control Officer (ECO)**

The Consultant shall accompany the ECO on the inspections (monthly) and audits (6-monthly). The Consultant shall review and provide input into all ECO reports. The Consultant shall forward the ECO's reports to the contractor for written responses and implement corrective measures.

The Consultant shall make available their Environmental Manager(s) to prepare for, attend and participate in ECO audits as required in the EA.

#### **3.4.2.2 Land Acquisition**

The Consultant will be required to support TCTA and the contractor as and when needed, particularly at the expiry of the temporary servitudes that require TCTA to extend or construction activities resulting in claims by the landowners.

#### **3.4.3 Sub-Task 4.3: Health and Safety**

The Consultant shall comply with the health and safety requirements of the Occupational Health and Safety Act (Act 85 of 1993) and access protocols of the DWS and its operators.



### 3.5 TASK 5: PROJECT MANAGEMENT

This section covers the tasks required to comply with the project management requirements and applies to all the other tasks, i.e. Services. The objectives of the task:

- i) Distribution of information, good communication, and coordination and integration of all activities related to the Services, including presentations to dignitaries, PoE and TCTA visitors.
- ii) Successful administration and management of the Agreement and all the contracts regarding the scope, programme, costs, quality and risks associated with the Project and Services.
- iii) Recruitment and participation of qualified and experienced personnel, e.g. engineers, environmental managers, programmers, scientists, administrators, etc.
- iv) Timely procurement of goods, equipment and services from consultants and contractors to achieve the above.
- v) Fulfilment of any instructions issued by TCTA from time to time.

It should be noted that the Consultant will be required to render comprehensive and full-time Services under project management to ensure successful administration and management of the Services, including other contracts.

The Consultant shall manage and administer all the Services in this Agreement per the FIDIC Conditions of the Client/Consultant Model Services Agreement (White Book) (fourth edition, 2006).

#### 3.5.1 Sub-Task 5.1: Integration Management

The Consultant's Project Manager shall be responsible for the proper performance and management of all Project activities per the Agreement, including processes and control methods to progress, monitor and control the Services, integrated change control, and completing the Services. The Consultant's Project Manager shall report directly to the TCTA's Project Manager.

The Consultant will be responsible for integrating all disciplines within their team throughout the Services per the Agreement while considering interfaces with the consultant(s) for uMWP-1: Smithfield Dam and Associated Infrastructure.

#### 3.5.2 Sub-Task 5.2: Scope Management

The Consultant shall define, develop a work breakdown structure, monitor, control and ensure that the scope of Services complies with all the requirements of the Project, and keep a detailed record of all the scope changes.

##### 3.5.2.1 Scope Variance Analysis

The Consultant shall continuously review the scope of the Services and bring to the attention of TCTA any discrepancies, errors, omissions or problems, and make

recommendations supported by relevant details for remedial action for the approval of TCTA.

### **3.5.3 Sub-Task 5.3: Time Management**

The Consultant shall use a programme to review, monitor and manage the progress of the Services.

#### **3.5.3.1 Programme**

The Consultant shall review TCTA's programme (**Appendix 4: Time Schedule for Services**) when bidding and planning for the Services and prepare and submit a comprehensive programme with activities, tasks and dates for approval by TCTA.

#### **3.5.3.2 Updating the Programme**

The Consultant shall monitor the programme and update it monthly. Variances must be highlighted, and corrective measures must be proposed in case of delays. If the redevelopment of the programme is required, a revised programme shall be prepared and submitted for approval.

#### **3.5.3.3 Programme Variance Report**

In the monthly progress reports, the Consultant shall provide variance reports explaining changes and revisions of the programme.

### **3.5.4 Sub-Task 5.4: Cost Management**

#### **3.5.4.1 Cost Control**

The Consultant shall be responsible for preparing, reviewing and monitoring all the costs and approved budgets related to the Services (i.e. Consultant's personnel by task, all the direct reimbursable costs, provisional sums, escalation, etc.). Forecasted cash flows must be prepared, considering the effect of escalation, additional scope and variances, claims and notices thereof, resources, programme etc., every month. All cost reports, statements and accruals are due to TCTA by the 1st day of every month.

The Consultant shall also prepare a comprehensive report on the financial status and the estimated cost of completing the Services and all other contracts. The cost estimate for the Services shall be resource-based and up to the end of the Services. The comprehensive report figures need to be kept live and updated monthly and be viewed by TCTA when requested at any given time. The report must be submitted in August of each year.

The Consultant shall ensure that there is no unauthorised expenditure as per National Treasury Instruction No. 4 of 2022/2023: PFMA Compliance and Reporting Framework, i.e. actual costs exceeding the approved budgets, at all times, and advise TCTA in advance of any additional funds required.

The format and structure are to be agreed upon with TCTA.

### 3.5.4.2 Assistance to TCTA

This task allows TCTA to instruct, or agree to, Additional or Exceptional Services that may be required due to unforeseen and other circumstances such as expanding available information and data. The extent cannot be reasonably defined on or before the bidding/tender process. A Provisional Sum for these Additional and Exceptional Services is provided in **Appendix 3 of the Agreement**.

The probable Additional and Exceptional Services that may be required include but are not limited to the following (subject to approval by TCTA):

- i) Geological, geohydrological and geotechnical investigations, surveys and tests by third parties, as identified by the Consultant or TCTA.
- ii) Further or additional surveys, studies, tests or investigations identified by the Consultant or TCTA.
- iii) Review of land acquisition valuation reports and landowner's financial loss claims by a specialist to be appointed by the Consultant through instructions by TCTA.
- iv) Hydraulic physical model study to optimise or verify the Consultant's hydraulic designs or a physical model by a third party.
- v) Implementation of mitigation measures related to heritage resources and social impacts during detailed design, construction supervision, post-construction monitoring and project management (assessment and close-out).
- vi) Lessons learnt workshop, i.e. venue hire and consumables.
- vii) Dispute or arbitration pursuant to the relevant clause of the construction contract (Clause 21 in FIDIC Conditions of Contract for Construction for Building and Engineering Works Designed by the Employer (Red Book) (second edition, 2017)) by the Consultant.
- viii) Secure biodiversity offset sites/areas by a biodiversity specialist and conveyancing attorney.

### 3.5.4.3 Cost Estimate and Cashflow

In consultation with TCTA, the Consultant shall prepare and submit a detailed cost estimate and cash flow for the Project considering the requirements below.

- i) Format to be suitable for presenting to financial institutions.
- ii) The cost of the Services per the Agreement.
- iii) Prepared using resource-based costing as far as possible. The Consultant may use rates and prices from similar projects where resource-based costing cannot be used. The use of such rates must be highlighted.
- iv) Construction programme and methodologies, as well as production rates and quantities, shall be used.
- v) Materials, plant, labour, services, lump sums, time and value-related costs, insurance, profits, etc. Where relevant quotations from manufacturers must be used.
- vi) Sale of materials and plant after construction, e.g. tunnel boring machines.

- vii) Cashflow prepared from cost estimates and includes escalation.

### **3.5.5 Sub-Task 5.5: Quality Management**

The Consultant shall prepare a Quality Plan for the Services. The plan should include, among other things, the following and be submitted to TCTA for approval before commencement of any Services:

- i) Management and supervision, administration, monitoring, document control, procurement, engineering, environmental, social and quality assurance per the latest recognised standards (ISO 9001).
- ii) Deal with aspects of contract management, including variation orders and claims to ensure compliance to national and local statutes with particular emphasis on the Public Finance Management Act (Act 1 of 1999) and contract documents.
- iii) The minimum sign-offs on all the reports and documents (all draft and final revisions) must be by the Consultant's project manager, senior engineer(s) of the relevant discipline(s), environmental manager/specialist(s) and health and safety manager/specialist(s). This requirement aims to ensure integration across all disciplines and superior quality management Services.
- iv) Signing or certifying of reports, documents and agreements shall be digital on softcopy files such as Portable Document Format (PDF). In general, signing, initialling or certifying hard copy reports, documents and agreements using wet signatures will not be permitted. To this end, Adobe Acrobat Pro (or similar software, but compatible with Adobe Acrobat) certificate-based electronic/digital signatures must be used. This type of signature shall have the actual signature including labels ("digitally signed by"), identity (name and surname), and date and time stamp.

The Quality Plan shall be audited every six months by an independent auditor, and the report submitted to TCTA. The Consultant must make provision for an independent auditor. TCTA, or its representative, may, on an ad-hoc basis, audit the Consultant's quality management system.

### **3.5.6 Sub-Task 5.6: Human Resource Management**

The Consultant shall provide adequately qualified and competent human resources or personnel such as engineers, environmental managers, a project manager, and other specialists experienced in the design and supervision/monitoring; administration and management, and construction of bulk water infrastructure (tunnelling, inlet/outlet structures, hydromechanical works, pipelines, etc.) and biodiversity offsetting to undertake all the Services.

The Consultant will be required to compose and manage the entire team to ensure the successful implementation of the Project and execution of all the Services. It should be noted that the Consultant will be required to provide a dedicated full-time project manager and construction supervision team.

The Consultant shall mobilise each member of the construction supervision team one calendar month before the commencement of the relevant construction activities that the member is required for.

The Consultant's human resources must be presented in an organogram and submitted to TCTA before or soon after the commencement of the Services. All the changes to the organogram must also be submitted to TCTA, i.e. revised organogram. The organisational structure (organogram) must conform to, amongst other things, the following:

- i) The representative details (refer to Clause 3.6 of the FIDIC Client/Consultant Model Services Agreement).
- ii) An organisational chart that indicates interfaces between the Consultant's team and:
  - its own home office;
  - survey and mapping team;
  - geotechnical investigations team;
  - environmental and social teams;
  - draftspersons;
  - ancillary works consultant and contractor(s);
  - sub-consultants and sub-contractors; and
  - the TCTA.
- iii) The organisational and functional relationships between all members of the joint venture or consortium (if relevant).
- iv) The exact manner in which any members of the joint venture or consortium would participate in the Services and contribute to the work, including their respective percent participation numerically stated. The mere fact of a joint venture or consortium will not be considered an adequate response in this respect.
- v) The following data should be submitted for each member of the joint venture or consortium and the entity:
  - Name and designation of person(s) who will be authorised to represent the Consultant.
  - Name of entity/company auditor(s).
  - A signed joint venture or consortium agreement.

### **3.5.7 Sub-Task 5.7: Communication Management**

The Consultant shall ensure that there is appropriate and timeous planning, collection, creation, distribution, storage, retrieval, management, control and monitoring of Project information:

- i) between the Consultant and TCTA.
- ii) between the Consultant and the Construction Health and Safety Agent.

- iii) between the Consultant, sub-consultants, contractors and others (e.g. consultant(s) for uMWP-1: Smithfield Dam and Associated Infrastructure).
- iv) within the Consultant's organisation(s).

All hardcopy records and documents must be scanned into suitable electronic format and be kept/filed in a fire-resistant facility.

### 3.5.7.1 Reporting

At pre-determined milestones, the Consultant shall submit two hard copies and one soft copy (original format and pdf) of all deliverables to TCTA. The Consultant shall identify the report milestones in its programme. The preparation of these reports shall be carried out as part of the tasks, and no separate remuneration shall be made to produce such information.

The Consultant shall prepare and present to TCTA, amongst other things, the following reports:

- i) Inception report, Geotechnical Baseline Report and various other reports and documents.
- ii) EMP, Biodiversity Offsets and Compensation Plans and various other plans, reports and documents.
- iii) Monthly progress reports.
- iv) Daily and weekly reports during construction.
- v) Financial review reports.
- vi) PoE briefing reports.
- vii) Responses to the PoE queries, comments and reports.
- viii) DAB progress/update reports.
- ix) Any other report that TCTA may need from time to time.

#### 3.5.7.1.1 *Monthly Progress Reports*

The Consultant shall provide monthly progress reports summarising the status, risks, and progress during the month on a quantitative and cost basis (including variation orders, issues/disputes, and claims) with appropriate graphical presentations. Progress shall be compared with the programmes and provide updates in the report. Reasons shall be given for any discrepancies, anomalies and delays. Furthermore, recommendations on the proposed remedial measures and action must be included.

In addition to the above, the Consultant shall monitor and report accurately on the **Task6: Black South Africans, Enterprise and Supplier Development Requirements** throughout the Project.

The Consultant shall submit monthly progress reports to TCTA on the 1st day of each month, followed by a monthly progress meeting with TCTA. Reports on unusual occurrences should be submitted promptly to appropriate higher levels of management/supervision personnel or TCTA.

### 3.5.7.1.2 Panel of Experts Reports

The TCTA may, as and when required, request its independent PoE to review the Consultant's Services, i.e. technical records and information (environmental, social and engineering).

The Consultant shall issue a briefing report at least 14 days before a site inspection or engagement with TCTA's Engineering, Environmental and Social PoE, highlighting the progress of the Project, a summary of technical/engineering records and information, social and environmental records and information, all significant difficulties and challenges, proposed solutions.

The Consultant will be required to respond to all the comments and queries by the PoE, including written responses to the PoE report(s).

### 3.5.7.2 Meetings

The Consultant shall arrange and attend regular and ad-hoc meetings as requested by TCTA or the Consultant (see table below) to ensure good communication. Per the table below, these meetings may be in-person (TCTA offices in Centurion and at construction sites in KZN) or virtual (audio-visual telecommunication).

Meeting	Frequency	Responsibility for Minutes/Notes	Chairperson
Project Committee	Monthly	TCTA	TCTA
Coordination and Integration Meetings *	Quarterly or as required	TCTA	TCTA
Management Meetings	Quarterly or as required	Consultant	TCTA
Technical Meetings	As required	Consultant	Consultant
Progress Meetings	Monthly	Consultant	TCTA
Panel of Experts	Quarterly or as required	Consultant	TCTA
Environmental Management Committee (EMC)	Monthly	Environmental Control Officer	EMC
Note * The meetings are for coordination and to ensure integration of requirements and the scope of work in this Agreement (i.e. Water Conveyance Infrastructure) and the Smithfield Dam and Associated Infrastructure by another consultant.			

The Consultant shall prepare minutes or notes of the relevant meetings and distribute them within seven (7) calendar days from the meeting date.

### 3.5.8 Sub-Task 5.8: Risk Management

In consultation with TCTA, the Consultant shall develop (i.e. identify/review, analyse and control), maintain and continuously update a risk register for the Services and implementation of the Project. The risk register must also include a list or log of

assumptions. The updated or revised register for the Services must be included in the monthly progress report.

The format and structure are to be agreed upon with TCTA.

### 3.5.9 Sub-Task 5.9: Procurement Management

The Consultant shall prepare bid or tender documents, advertise, manage the bidding process (i.e. advert, evaluation, award), and establish and manage the contracts. The TCTA shall approve the procurement strategy and procedures to procure sub-consultants, contractors, and third parties under Provisional Sums.

In principle, procurement of goods and services shall conform to the Broad-Based Black Economic Empowerment Act (Act 53 of 2003) (B-BBEEA) and its regulations and codes (as amended) and Preferential Procurement Policy Framework Act (Act No. 5 of 2000) (PPPFA) and regulations (as amended).

#### 3.5.9.1 Procurement of the Contractor

The Consultant shall determine the work breakdown structure and tendering programme and prepare the tender's procurement strategy and functional evaluation criteria. In particular, the Consultant will be required to undertake a market analysis relating to the development of South African black-owned construction enterprises and determine the transformation or socio-economic development criteria for the procurement strategy, construction tender and contract considering B-BBEEA and its regulations and codes (as amended) and PPPFA and regulations (as amended). The construction contract's procurement strategy and the tender document must conform to the Construction Industry Development Board Act (Act 38 of 2000) and its regulations and standards (as amended).

The procurement of the contractor will be based on the following process:

- Stage 1: Pre-qualification process:
  - i) Produce the pre-qualification document per **Task 1: Tender Design and Documentation** for approval by the TCTA Bid Specification Committee (BSC). The Consultant will be required to provide support throughout this process and respond to queries and questions from the BSC.
  - ii) Open public pre-qualification process and advertisement by TCTA following approval by the BSC. The Consultant will be required to provide the final pre-qualification document (a hardcopy and portable document format) and respond to questions and queries from tenderers/bidders by drafting clarification letters and addenda. The TCTA will formally issue all clarification letters and addenda. The pre-qualification document will be made available by TCTA, and tenderers/bidders will collect or download the document from TCTA offices and websites.
  - iii) The Consultant will be required to coordinate and conduct a compulsory briefing meeting for the tenderers/bidders, including keeping a record of attendance and issues raised by the tenderers.
  - iv) On or soon after closing, the Consultant shall be responsible for opening bids and checking bids for completeness and compliance.



- v) Evaluation of bids by the Consultant and TCTA: The Consultant and TCTA will produce the reports on the relevant sections of their evaluations. TCTA will present the consolidated tender evaluation report to the TCTA Bid Adjudication Committee (BAC) for approval. The Consultant will also be required to provide support throughout this process and respond to queries and questions from the BAC.
- vi) TCTA will notify tenderers/bidders of the outcome of the pre-qualification process.
- Stage 2: Tender process:
  - i) Produce the tender document per **Task 1: Tender Design and Documentation** for approval by the BSC. The Consultant will be required to provide support throughout this process and respond to queries and questions from the BSC.
  - ii) Open public tender process and advertisement or issue invitations to the prequalified tenderers by TCTA following approval by the BSC. The Consultant will be required to provide the final tender document (a hardcopy and portable document format) and respond to questions and queries from tenderers by drafting clarification letters and addenda. The TCTA will formally issue all clarification letters and addenda. The tender document will be made available by TCTA, and tenderers will collect or download the tender document from TCTA offices and websites.
  - iii) The Consultant will be required to coordinate and conduct a compulsory briefing meeting and facilitate a site inspection for the tenderers, including keeping a record of attendance and issues raised by the tenderers.
  - iv) On or soon after tender closing, the Consultant shall be responsible for opening tenders and checking tenders for completeness and compliance.
  - v) Evaluation of tenders by the Consultant and TCTA: The Consultant and TCTA will produce the reports on the relevant sections of their evaluations. TCTA will present the consolidated tender evaluation report to the BAC for approval. The Consultant will also be required to provide support throughout this process and respond to queries and questions from the BAC.
  - vi) Negotiations with the preferred tenderer: The Consultant shall conduct the negotiations and record and issue the minutes or notes of the negotiations. Upon successful negotiations, the Consultant will be required to draft the Memorandum of Understanding for review and acceptance by the preferred tenderer and TCTA. TCTA will then issue the letter of acceptance and the final Memorandum of Understanding for signing.
  - vii) The Consultant will be required to prepare the conformed contract document for signature by the contractor and TCTA. The Consultant shall provide two original signed hardcopies with leather binding and four paper-bound hard copies.

**IMPORTANT NOTE:** Bids/tenders will remain at TCTA offices until the procurement process is concluded. Therefore, the Consultant must make provision to evaluate all bids/tenders at TCTA offices/boardrooms.

### 3.5.9.2 Administration of the Construction Contract

In terms of the construction contract, the Consultant, as the Engineer, shall manage and administer the construction contract per the FIDIC Conditions of Contract for Construction for Building and Engineering Works Designed by the Employer (Red Book) (second edition, 2017). The Consultant must report any discrepancies, errors or omissions discovered during construction.

### 3.5.9.3 Project Vehicles and Accommodation for TCTA

The Consultant shall procure vehicles for use by TCTA and temporary accommodation during construction for TCTA, as instructed by TCTA. These vehicles shall be registered in the Consultant's name, which will be responsible for all administration, operation and maintenance expenses, including comprehensive insurance during the entire period of the Project. A Provisional Sum is provided in **Appendix 3 of the Agreement**.

Upon close-out of the Project, the Consultant shall dispose of the vehicles, and the residual value shall accrue to TCTA.

### 3.5.9.4 Assessment and Close-out

The Consultant shall close the construction contract per the relevant construction contract. As part of the close-out, the Consultant will be required to assess and document the performance of the Services as follows:

- i) Compile the construction completion report.
- ii) Compile the close-out report, i.e. Consultant's Services.
- iii) Provide input into the lessons learnt workshop, document the lessons learnt, and report on the recommendations for successful implementation of future projects. The contractor must be included in the lessons learnt workshop.
- iv) Archive and submit to TCTA all hardcopy records and documents using Metrofile's forms and labels (provided by TCTA), storage and information management system. The TCTA shall be responsible for the offsite storage, i.e. construction supervision and monitoring.
- v) Submit to TCTA a USB external hard drive(s) with electronic copies of all the records and documents relating to construction supervision and monitoring.

The construction completion report shall, amongst other things, include:

- i) Contractor's performance.
- ii) Details of the completed work, including construction methods and techniques, materials (type, quality, quantities, sources), essential studies, main problems encountered during construction, etc.
- iii) Details of the quality control results, e.g. concrete cube strengths.
- iv) Details of all agreements, claims, and disputes.
- v) Details of all variations.

- vi) Health and safety performance and statistics.
- vii) Summary information of the construction records and documents. However, the geological maps of the final excavations must be comprehensive and form part of the as-built drawings below.
- viii) The final payment certificate (copy).
- ix) Financial assessment with variance notes and reports.
- x) All as-built construction drawings (native files and portable document format).
- xi) All as-built records and documentation relating to rehabilitation and mitigation of heritage resources and social impacts not included in the closeout report below.
- xii) The final operation and maintenance manual and asset register.

The closeout report shall, amongst other things, include, i.e. Consultant's Services:

- i) Summary of the Services rendered by the Consultant, including challenges and issues experienced.
- ii) All as-built records and documentation relating to rehabilitation and mitigation of heritage resources and social impacts not included under the construction completion report.
- iii) Comments relating to compliance with the GTI and RID.
- iv) Comments relating to compliance with the EA and EMPs.
- v) Performance relating to **Task 6: Black South Africans, Enterprise and Supplier Development Requirements**.
- vi) Audit reports (by independent external auditors).
- vii) Details of all disputes and agreements between the Parties.
- viii) Details of all variations related to the Consultant's Services.
- ix) Summary information of the records and documents.
- x) As-built schedule of all land and rights to land (permanent only) with the details of the landowners.
- xi) Consultant's final invoice (copy).
- xii) Financial assessment with variance notes and reports.
- xiii) Lessons learnt report.

### 3.5.10 Sub-Task 5.10: Stakeholder Management

The Consultant will, amongst others, be required to manage or coordinate with the following entities:

- Authorities such as DFFE, Ezemvelo KwaZulu-Natal, Amafa KwaZulu-Natal and CoGTA.
- DWS and Umgeni Water (UW) operation and maintenance staff.
- DWS, i.e. Water Use Licence Application.
- Eskom and its contractors.

- Directly affected landowners and occupants.
- UW and its consultants and contractors for the design and construction of the potable component of the project.
- Construction Health and Safety Agent.
- Various other consultants and contractors, e.g. contractors for geological and geotechnical investigations, the consultant for the design and construction of Smithfield Dam and Associated Infrastructure.
- Various interested and affected parties, including local and provincial government authorities.

The Consultant must:

- i) Promote good project relations and, in so doing, monitor community relations.
- ii) Inform interested and affected parties about Project activities, particularly the directly affected communities and landowners.
- iii) Keep a detailed record of all interactions with the interested and affected parties, including details of each interested and affected party.
- iv) Identify and resolve potential problems and challenges promptly.
- v) Record and promptly address all complaints and issues submitted by interested and affected parties.
- vi) Report regularly to TCTA on the above and co-operate with TCTA in facilitating site visits.

### **3.6 TASK 6 – BLACK SOUTH AFRICANS, ENTERPRISE AND SUPPLIER DEVELOPMENT REQUIREMENTS**

TCTA must ensure that the Consultant contributes to sustainable socio-economic development by maximising the items below in this Agreement:

- i) Enterprise and supplier development through compulsory subcontracting/sub-consulting of South African companies.
- ii) Participation of previously disadvantaged individuals through preferential recruitment/employment, i.e. South African black persons and women, black professionals and persons with disabilities.
- iii) Training and skills development for previously disadvantaged South African individuals, i.e. black persons and women, black professionals and persons with disabilities.

The Consultant shall be subject to and comply with the requirements below and conditions related to the above in providing the Services.

#### **3.6.1 Sub-Task 6.1: Enterprise and Supplier Development**

The Consultant will be required to subcontract/sub-consult a minimum of 30% of the total amount (i.e. personnel costs) of this Agreement to advance and develop these designated groups:

- i) An EME or QSE, which is at least 51% owned by black people.
- ii) An EME or QSE, which is at least 51% owned by black people who are youth.
- iii) An EME or QSE, which is at least 51% owned by black people who are women.
- iv) An EME or QSE, which is at least 51% owned by black people with disabilities.
- v) An EME or QSE, which is 51% owned by black people living in rural or underdeveloped areas or townships.
- vi) A cooperative or company, which is at least 51% owned by black people.
- vii) An EME or QSE, which is at least 51% owned by black people who are military veterans.
- viii) More than one of the categories referred to in items i) to vii) above.

The Consultant shall submit the following documents per designated groups above:

- i) The subcontract/subconsultant agreement with each enterprise/supplier.
- ii) South African National Accreditation System (SANAS) verified B-BBEE scorecard and certificate or sworn affidavit for each enterprise/supplier.

The agreement with each enterprise/supplier shall, amongst other things, include:

- Needs analysis, i.e. enterprise/supplier.
- Details of the Services to be rendered by the enterprise/supplier and the cost thereof.

- Details of the development requirements i.e. skills, knowledge and capacity.
- Implementation programme/plan for the identified development requirements.
- Information of the persons (curriculum vitae) who will manage the development of the enterprise/supplier.
- The above shall be amended as required.

### 3.6.2 Sub-Task 6.2: Training and Skills Development: South African Black People

The Consultant must develop and submit to TCTA a detailed and comprehensive plan for its staff/personnel and subconsultant(s) (per Sub-Task 6.1 above) that must be implemented for the period of this Agreement. The plan must cover the entire duration of the Project and have measures to develop personnel capabilities to achieve significant career progression and shall be subject to acceptance by TCTA.

To this end, the Consultant shall ensure that a minimum of four South African black people are registered as professionals with the relevant institution such as Engineering Council of South Africa and/or The South African Council for Natural Scientific Professions.

### 3.6.3 Sub-Task 6.3: Non-Conformance Penalties

The Consultant will be penalised if he/she fails to achieve the specified and agreed targets for each category/sub-task above at the Services' completion date. The penalty amounts shall be calculated based on the individual category per sub-task spent and their respective targets.

The penalty for **Sub-Task 6.1 Enterprise and Supplier Development** will be calculated as follows:  $\text{Penalty amount} = (\text{Target \%} - \text{Actual \%}) \times \text{total contract Agreement amount/price}$  (i.e. personnel costs).

The penalty for **Sub-Task 6.2 Training and Skills Development: South African Black People** will be R450,000.00 for each person not registered as a professional.

### 3.6.4 Sub-Task 6.4: Monitoring and Reporting

The Consultant shall submit on an annual basis its South African National Accreditation System (SANAS) verified (consolidated, for the joint venture or consortium) B-BBEE scorecard and certificate.

For interim monitoring, the Consultant shall submit to TCTA, on the 1st day of each month, throughout the Agreement, a progress report on the implementation of programmes/plans and targets stipulated above. The format and structure of the progress report shall be agreed upon with TCTA. The Consultant shall sign the progress report and ensure that the information is accurate and correct. The progress report shall also include the participation of South African black people (including female, youth and persons with disabilities) – the number and percent of person-months thereof in the following categories: specialist; MANCO; internal review panel; environmental; engineering (natural and social) and project management.

Within 60 days after the completion of the Services, an audited statement verifying that agreed targets for each programme/plan and category have been met shall be submitted to TCTA, including the participation of South African black people. During the execution of the Agreement, the same shall also be audited annually and submitted to TCTA.

The auditing shall be carried out by an independent external auditor appointed and paid by the Consultant. However, TCTA reserves the right to appoint an independent external auditor at the Consultant's cost should the Consultant fail to appoint an independent external auditor in time or if TCTA is not satisfied with the independent external auditor's qualifications or independence. The terms of reference for the independent external auditor shall be agreed upon with TCTA before the appointment.

The derived data will be the figures by which final penalties, if any, will be calculated after the Services.

### **3.6.5 Sub-Task 6.5: Measurement and Payment**

The costs for complying with the Consultant's obligations regarding implementing and managing all the development requirements shall be allowed in the Consultant's bid submission, i.e. price returnables and **Appendix 3: Remuneration and Payment**. The Consultant shall also include the costs for a dedicated manager to manage this aspect and ensure compliance with and enforcement of the specified requirements.

## **AGREEMENT**

### **APPENDIX 2: PERSONNEL, EQUIPMENT, FACILITIES AND SERVICES OF OTHERS TO BE PROVIDED BY THE CLIENT**



## **1. PROVISIONS BY THE TCTA**

In general, TCTA will not provide or make available, free of cost, any personnel, equipment, facilities or services by others to the Consultant for the Services. The cost of any equipment, facilities or services by others is deemed to be covered in the Consultant's remuneration or elsewhere in the Agreement, unless specified otherwise below.

### **1.1 TASK 1 – TENDER DESIGN AND DOCUMENTATION**

TCTA will not provide personnel, equipment, facilities or services by others to the Consultant during this Task.

### **1.2 TASK 2 – DETAILED DESIGN**

TCTA will not provide personnel, equipment, facilities or services by others to the Consultant during this task.

### **1.3 TASK 3 – CONSTRUCTION SUPERVISION**

TCTA will not provide personnel, equipment, facilities or services by others to the Consultant during this task, except for the following items that will be provided by TCTA through the construction contract:

- i) Site offices with office furniture and desk telephones only, including ablution facilities and consumables, parking, fully equipped kitchen and eating area and consumables. The Consultant, in consultation with TCTA, shall determine detailed requirements for the Consultant's construction supervision team and TCTA staff for inclusion in the construction tender documentation. Cleaning and other services (electricity, water, refuse and sewage) will be provided by the contractor.
- ii) Laboratory and field-testing equipment, instruments and consumables. This will be the contractor's laboratory shared or utilised with the Consultant. As such, the facility and equipment will be managed and serviced by the contractor, including the provision of technicians, laboratory assistance and administration staff.
- iii) Digital telecommunications infrastructure and associated service costs at the construction site(s).
- iv) International travel and accommodation costs to witness factory acceptance test(s).

Only the above items will be provided by TCTA through the construction contract.

### **1.4 TASK 4 – POST-CONSTRUCTION MONITORING**

TCTA will not provide personnel, equipment, facilities or services by others to the Consultant during this task.

### **1.5 TASK 5 – PROJECT MANAGEMENT**

TCTA will not provide personnel, equipment, facilities or services by others to the Consultant during this task.

## **1.6 TASK 6 – BLACK SOUTH AFRICANS, ENTERPRISE AND SUPPLIER DEVELOPMENT REQUIREMENTS**

TCTA will not provide personnel, equipment, facilities or services by others to the Consultant during this task.

Graduate engineer(s), technologist(s), technician(s) and environmental scientist(s) may, however, be seconded to the Consultant for training and skills development to build capacity in TCTA and the built industry. A Provisional Sum is provided in Appendix 3 of the Agreement.

## **AGREEMENT**

### **APPENDIX 3: REMUNERATION AND PAYMENT**

## 1. TERMS OF PRICING FOR THE SERVICES

### 1.1 GENERAL

The Consultant shall, amongst other factors, consider the following items and conditions when preparing the financial proposal:

- The costs of equipment, facilities and services by others, considering the conditions and requirements in the Agreement (Appendix 2: Personnel, Equipment, Facilities and Services of Others to be provided by the Client). If not explicitly provided in this Appendix 3 of the Agreement, it will be deemed covered or incorporated into other elements of the Consultant's financial proposal.
- Scope of Services (Appendix 1) and Time Schedule for Services (Appendix 4) of the Agreement.
- The time and currency of payment to the Consultant shall be per the Agreement.
- No payment will be made for any Additional or Exceptional Services or other additional expenses which have not been authorised or approved by TCTA as "Variation Orders".
- The TCTA will not accept any mark-up or handling charges by the Consultant regarding other Services by the Consultant's sub-consultants and contractors.
- For any month, the total time charged for each personnel shall not exceed one person-month.
- Administration (i.e. secretaries, clerks, messengers, etc.) and direct reimbursable costs. If not explicitly provided in this appendix, it will be deemed covered or incorporated into other elements of the Consultant's bid submission.
- Contingencies and allowances for bonuses or other profit-sharing means are not permitted.
- Insurance for liability and indemnity, per Clause 7.1 of the Conditions of Agreement.

### 1.2 CONSULTANT'S PERSONNEL

The TCTA will not accept an invoice with personnel not named or assigned to a position in the Agreement.

The Consultant will not be entitled to supply additional personnel or change the personnel named in the Agreement, nor amend any person-months in the Agreement without the prior approval of TCTA. Such changes will be subject to Clause 3.7 and Clause 4.3 of the Conditions of Agreement.

#### 1.2.1 Personnel Categories and Levels

The categories for personnel have different levels, depending on the qualifications and years of experience, as shown in the table below.

Level	Engineers		Technologists		Technicians		Scientists	
	Qualification	Exp	Qualification	Exp	Qualification	Exp	Qualification	Exp
1					Technician	<4		
2			Technologist	<4	Technician	4-7	Env Scientist	<4
3	Engineer	<4	Technologist	4-7	Technician	8-12	Env Scientist	4-7
4	Engineer	4-7	Technologist	8-12	Technician	>12	Env Scientist	8-12
5	Engineer	8-12	Technologist	>12	Pr Eng Techni	4-7	Env Scientist	13-18
6	Engineer	>12	Pr Eng Techno	4-7	Pr Eng Techni	8-12	Env Scientist	>18
7	Pr Eng	4-7	Pr Eng Techno	8-12	Pr Eng Techni	>12	Pr Sci Nat	4-7
8	Pr Eng	8-12	Pr Eng Techno	13-18			Pr Sci Nat	8-12
9	Pr Eng	13-16	Pr Eng Techno	>18			Pr Sci Nat	13-18
10	Pr Eng	17-20					Pr Sci Nat	>18
11	Pr Eng	21-24						
12	Pr Eng	>25						

## Notes:

1. Minimum qualifications: Engineer (Bachelor's degree; NQF level 8); Technologist (Bachelor of Technology; NQF level 7); Technician (National diploma; NQF level 6); and Environmental Scientist ("Env Scientists") (Bachelor's degree; NQF level 7).
2. Professional Engineer (Pr Eng); Professional Engineering Technologist (Pr Eng Techno); and Professional Engineering Technician (Pr Eng Techni) by Engineering Council of South Africa. Professional Natural Scientist (Pr Sci Nat) by South African Council for Natural Scientific Professions.
3. "Exp" refers to the years of experience.
4. For personnel from countries outside of Southern Africa, where qualifications and professional registration systems differ from Southern African practice, the Consultant shall provide evidence of equivalent qualifications and professional registration.

An average cost-to-company billing rate applies to all personnel on the same level as **Personnel Billing Rates** (Returnable).

**A separate motivation will be required for billing levels greater than level 11.** These levels are generally reserved for industry specialists, review panel members and executive managers of the Consultant.

### 1.2.2 Personnel Billing Rates

The remuneration for personnel shall be made on a person-month(s) basis at the billing rates set out in **Personnel Billing Rates** (Returnable). The billing rates shall be deemed to cover, among other things, the following:

- i) Cost-to-company consisting of the following:
  - All actual salaries (no premium or bonus).
  - Other costs and charges (medical and retirement/pension benefits, annual leave, sick leave or other leave, public holidays, life insurances, etc.).
- ii) Cost of overtime worked by the personnel, as required to fulfil the Services and comply with the Time Schedule for Services.
- iii) Company overhead costs (administration, marketing, office rent and services, communications, computer charges, and other costs not directly reimbursable).
- iv) Secretaries, clerks, messengers, and any other support personnel.
- v) All other costs, except the directly reimbursable costs/expenses.

The Consultant shall specify billing rates for all positions and qualified personnel to render the Services. Qualified personnel shall fill such vacancies two calendar months before the required services or as agreed with TCTA. The categories for billing purposes shall be per **Personnel Billing Rates** (Returnable).

### 1.2.3 Consultant's Fee on Personnel

The Consultant's fee shall be a fixed percentage of the costs for personnel, as per **Summary of Cost Estimate** (Returnable). Only the billing rates for personnel shall be subject to price changes and not the Consultant's fee on personnel.

## 1.3 CONSULTANT'S DIRECT REIMBURSABLE COSTS

The TCTA shall pay or reimburse the Consultant for the reasonable costs or unit rates only, i.e. no mark-up on handling charges that are related to performing the Services, and to the extent that such costs are specified and allowed for in **Direct Reimbursable Costs** (Returnable), as follows:

- i) *Per diem* allowances to cover additional expenses for home office personnel working on site.
- ii) A site allowance or living subsistence to cover additional expenses for personnel residing at the site and accommodation.
- iii) Costs of other items, services and charges as listed and priced by the Consultant in Direct Reimbursable Costs (Returnable).

## 1.4 PROVISIONAL SUMS

Provisional Sum items listed under **Summary of Cost Estimate** (Returnable) shall be expended only on the instruction or with the prior written approval of TCTA, as Additional Services or Exceptional Services. The TCTA shall pay or reimburse the Consultant a fixed mark-up on handling/administration charges, which will not be subject to price changes where relevant.

The Provisional Sum items:

- i) "TCTA Adjudication/Arbitration Costs" is an allowance for the costs of adjudication and arbitration that may arise between the Parties. This allowance will only pay for TCTA's costs. The Consultant will be liable for its costs separately (i.e. adjudicator's/arbitrator's fees, venue hire, catering etc.).
- ii) "Assistance to TCTA" is an allowance for the Consultant to provide Additional Services as follows:
  - Geological, geohydrological and geotechnical investigations, surveys and tests by a third parties, and drafting and compiling the Geotechnical Baseline Report, as identified by the Consultant or TCTA.
  - Further or additional surveys, studies, or investigations identified by the Consultant or TCTA.
  - Review of land acquisition valuation reports and landowners' financial loss claims by a specialist to be appointed by the Consultant through instructions by TCTA.
  - Hydraulic physical model study to optimise or verify the Consultant's hydraulic designs or physical model by a third party.
  - Implementation of mitigation measures related to heritage resources and social impacts during detailed design, construction supervision or post-construction monitoring.
  - Lessons learnt workshop, i.e. venue hire and consumables.
  - Dispute or arbitration pursuant to the relevant clause of the construction contract (Clause 21 in FIDIC Conditions of Contract for Construction for Building and Engineering Works Designed by the Employer (Red Book) (second edition, 2017)) by the Consultant.
  - Secure biodiversity offset sites/areas by a biodiversity specialist and conveyancing attorney.
- iii) "Hydropower plant complete scope of services" is an allowance for the Consultant to undertake tender design and documentation, detail design, construction supervision and monitoring, and assessment and close-out per instructions by TCTA following the Hydropower Feasibility Study.
- iv) "Project Vehicles and Accommodation for TCTA" is an allowance per Appendix 1: Scope of Services.
- v) "Secondment of TCTA Graduates, Engineers and Scientists" under Appendix 2: Personnel, Equipment, Facilities and Services of others to be provided by the Client.

- vi) "Exceptional and Unforeseen Circumstances" e.g. extended construction supervision due to strike actions.

All the Provisional Sum items listed above are not part of and will not be used as the Normal Services and shall be subject to instructions and approvals by TCTA, as Additional Services or Exceptional Services.

## 2. PRICE CHANGES (ESCALATION)

Personnel or staff billing rates, consultancy fee (fee percentage to remain fixed) and direct reimbursable unit rates and costs will stay in effect (without escalation) for 12 calendar months after the Commencement Date and shall, after that, be adjusted annually for escalation on the anniversary of the date, to be billed or invoiced in arrears, as explained below.

The following conditions and procedures shall apply in the calculation of the escalation:

- i) The costs of personnel and Consultant's fee on personnel and direct reimbursable expenses shall be billed monthly at the rates stated in the returnables.
- ii) The base date for escalation shall be the Commencement Date.
- iii) Escalation to personnel billing rates, consultancy fee (fee percentage to remain fixed), and direct reimbursable unit rates and costs shall be calculated using the Consumer Price Index (CPI for all urban areas – STATS SA Statistical Release P0141, all items (i.e. CPI Headline)).
- iv) If any index relevant to any invoice is unknown when the Services are valued, the latest available index shall be used. Any adjustments necessary shall be made only when the actual index relevant to that invoice is published.
- v) Actual direct reimbursable costs will not be subject to any adjustment.

**IMPORTANT NOTE: For budget and bidding purposes, all the bidders (or the Consultant) must allow 5% per annum for escalation, i.e. Time Schedule for Services – Consultant's fee on personnel and direct reimbursable unit rates and costs.**

### 2.1 CASH FLOW

The Consultant shall provide an estimated monthly cash flow for the duration of the Services. The cash flow shall be based on the expected submission dates of monthly invoices.

The cash flow shall, amongst other things, show the following information by month and, where appropriate, amounts by sub-consultants and contractors:

- i) Personnel costs.
- ii) Consultant's fee.
- iii) Direct reimbursable costs.



- iv) Estimated escalation.
- v) Provisional sums and variation orders, as approved by TCTA.

The cash flow shall be updated each month to show a payment to date in each category, changes in the Services (i.e. variation orders), programme, progress, and escalation, affecting the cash flow and total forecast costs from that date to completion.

### **3. TERMS OF PAYMENT**

#### **3.1 GENERAL**

The Consultant shall maintain comprehensive records of accounts relating to the Services and make such records available for inspection by TCTA for audits.

The Consultant shall cooperate with TCTA to establish working arrangements and management practices, especially reporting, approval, cost control and billing procedures, which will expedite routine activities and minimise the costs of these activities for both Parties.

The TCTA, at its discretion and cost, shall have the right to obtain, through the Consultant's auditors, details of the Consultant's (and the respective joint venture or consortium members) records of time charges for personnel, management and cost-control procedures, salary rates, annual remuneration increases, books of accounts relating to the operation of offices, and any other factor relating to charges for the Services.

#### **3.2 CONSULTANT'S TAX INVOICES**

Regarding the Services performed, the Consultant shall submit a tax invoice as soon as practicable and not later than seven days after the end of each calendar month. Before submitting the first tax invoice, the Consultant shall agree with TCTA on the format and details of the invoices and the administrative procedures to be followed for submission.

No payment will be made by TCTA until the format and details of the invoice have been agreed upon and finalised by the Parties.

The invoices must show, amongst other things, the following information:

- i) A statement of account.
- ii) Purchase order number (provided by TCTA); TCTA and its address and VAT number (4360104923); Consultant's name, address and VAT number; date of invoice and its number, contract ward amount, the amount due, due date, etc.
- iii) Cost of personnel:
  - Net person-months expended for the month by each personnel and task.
  - Billing rates for each personnel.
  - Person-month budget, by task.
  - Cumulative person-months expended to date, by task.

- Costs of personnel for the month, by each personnel and by task.
  - Budget and updated forecasts by task, i.e. cash-flow and comprehensive financial reviews.
  - Balance forward and cumulative costs of personnel to date, by task.
- iv) Consultant's fee.
- v) Direct reimbursable costs, all by line item:
- Budget and updated forecasts, i.e. cash-flow and comprehensive financial reviews.
  - Costs for the month.
  - Costs to date.
  - Supporting documentation.
- vi) Escalation on the cost of personnel.
- vii) Escalation on direct reimbursable costs (where applicable).
- viii) Variation orders (including the items above, relevant to such variation orders).
- ix) Net payment due in the month.
- x) Balance forward and cumulative total payment.

The tax invoice must be based on the representations made by the Consultant. Should TCTA find such representations (through inspections, audits, or other means) materially incomplete or inaccurate, TCTA shall be entitled to introduce appropriate modifications in the affected rates and items. Any such change shall have a retroactive effect, and in case of payment made by TCTA before any such modification:

- i) The TCTA shall be entitled to offset any excess payment against the following payment to the Consultant, or
- ii) If TCTA makes no further payments to the Consultant, the Consultant shall reimburse TCTA for any excess payment within 28 days of receipt of a written demand from TCTA.

#### **4. METHOD OF PAYMENT**

Payments by TCTA will be made by direct transfer to the Consultant's bank account. Please note that TCTA will not pay any consortium or joint venture member directly nor a specific or nominated member on behalf of the consortium or joint venture.

The Consultant shall provide TCTA with the following information and documents:

- i) Formal written notice from the Consultant's authorised representative designating which Consultant's official(s) is authorised to issue bank instructions on behalf of the Consultant.
- ii) Certified original specimen signature(s) of the person(s) named above.
- iii) Bank destination instructions duly signed by an official(s) of the Consultant authorised above. Bank destination instructions must include:

- Bank name and address.
- Beneficiary name (i.e. account holder).
- Account type and number.
- Any special instructions.

iv) VAT registration certificate if the Consultant is a VAT vendor.

Please note that the information must be in its original form. E-mails, photocopies, or facsimile copies will not be accepted.

Regarding any future changes the Consultant may wish to make to the destination bank account(s), the authorities must provide such modifications to TCTA and deliver them to TCTA in their original form. Any such changes must be received at least 28 days before payment is required.

The TCTA must receive all payment instructions and bank destination documents before making payments.

## **AGREEMENT**

### **APPENDIX 4: TIME SCHEDULE FOR SERVICES**

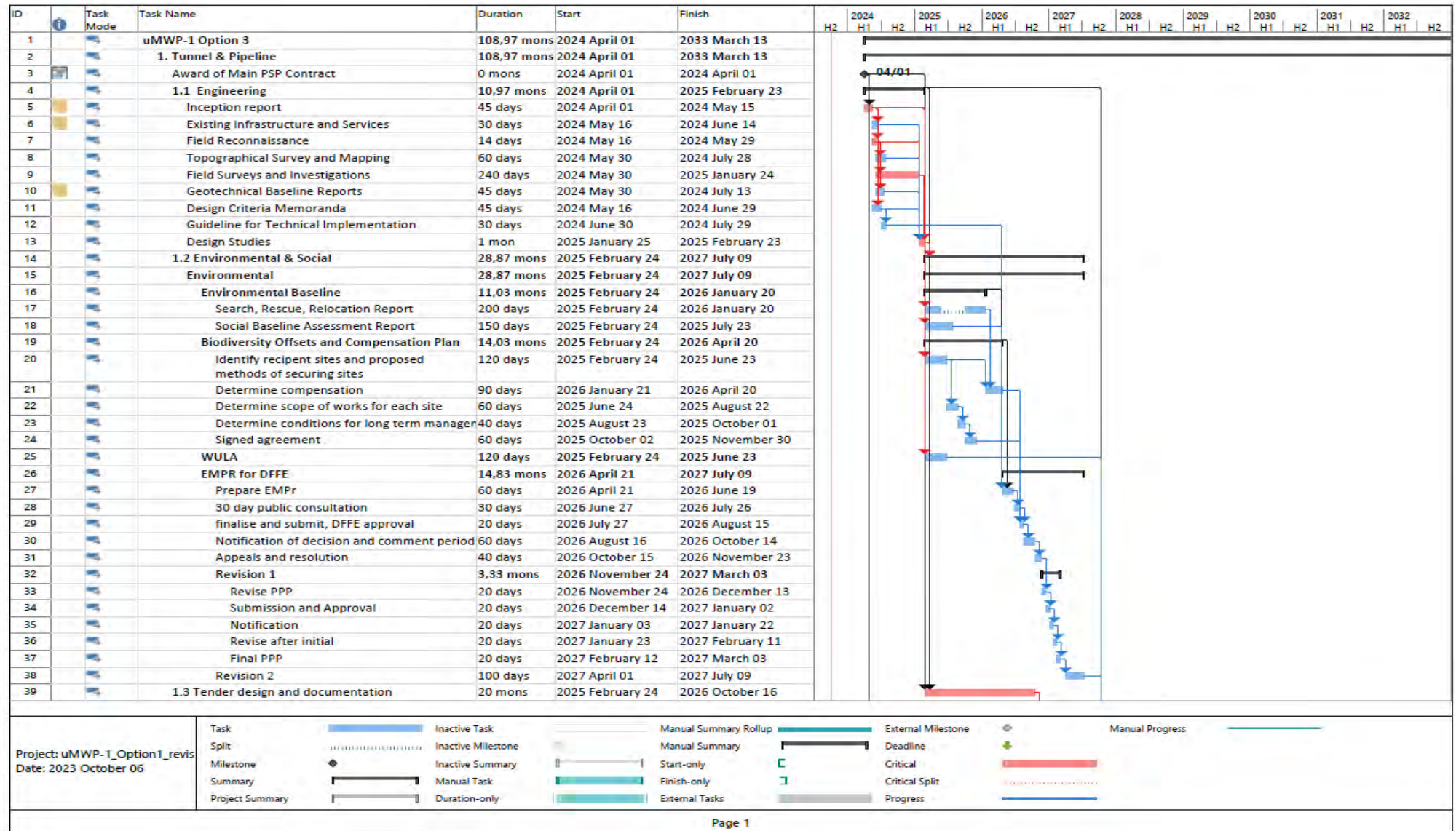
## **1. TIME SCHEDULE FOR SERVICES**

### **1.1 INDICATIVE PROGRAMME BY THE CLIENT**

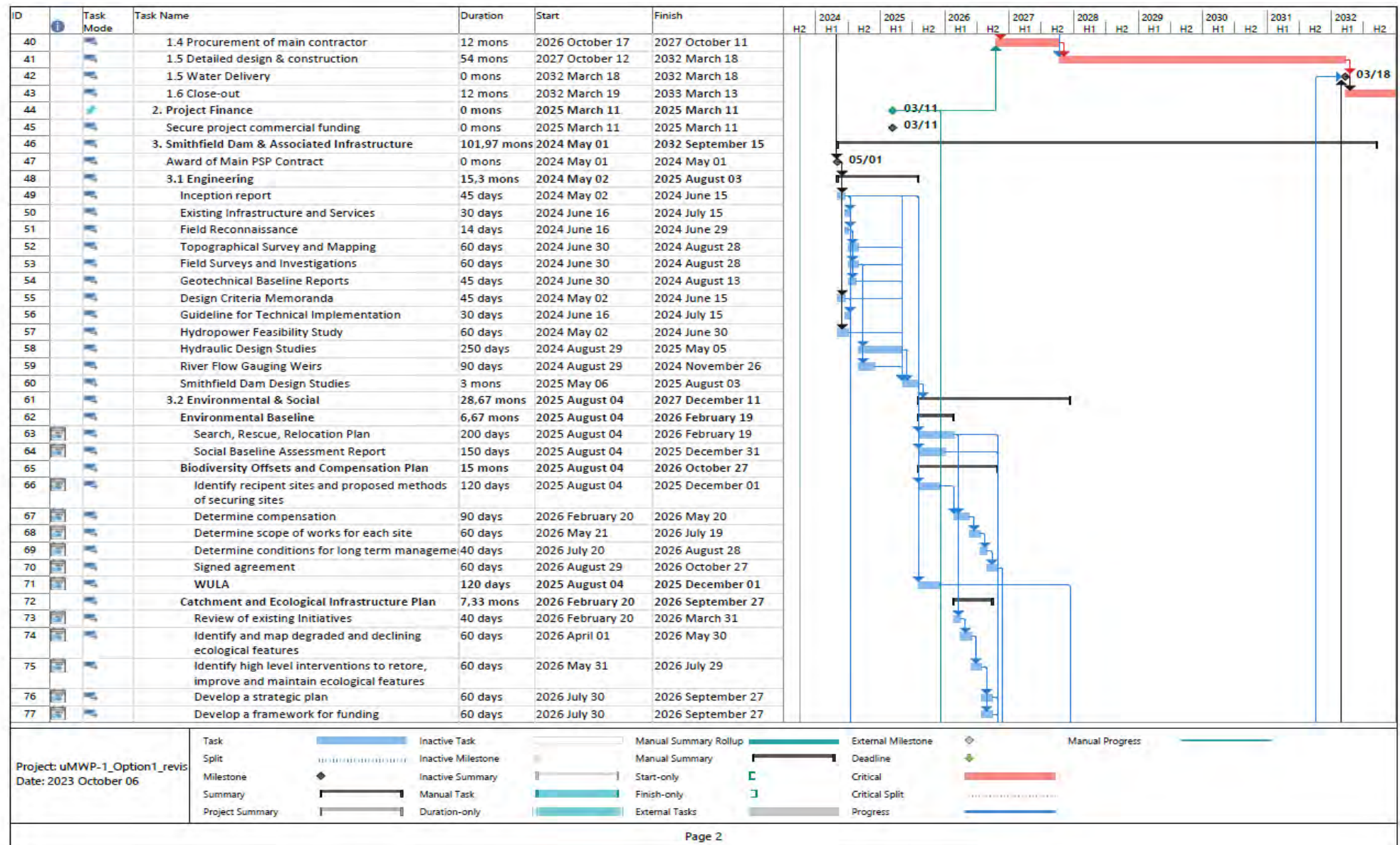
TCTA's indicative programme for the Services is provided below. The bidders shall refer to or consider the information in preparing its programme.

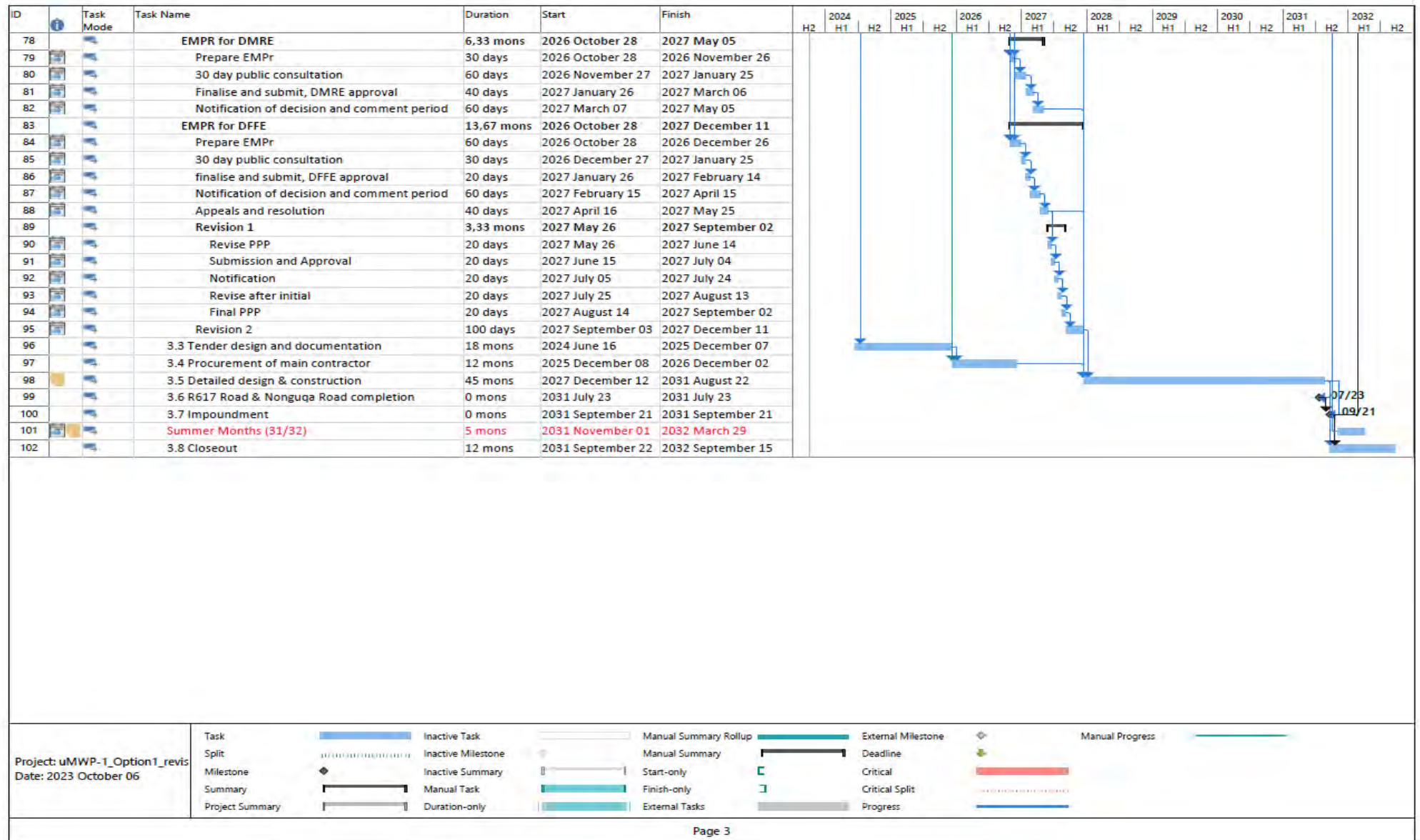
**IMPORTANT NOTE:** A separate pre-qualification process for the main construction contract (i.e. Water Conveyance Infrastructure – tunnel and pipeline) is not shown on the indicative programme as it is assumed to run in parallel with Tender Design and Documentation.

## TCTA'S INDICATIVE PROGRAMME :











## 1.2 PROGRAMME

The charts and schedules must be provided as described below:

- i) A detailed programme with critical path analysis and a comprehensive Gantt chart and graphs for all the Services. The programme is to have a calendar time in months and must be suitable for monitoring changes and fulfilling the reporting requirements under **Task 5 in Appendix 1: Scope of Services**.
- ii) The Gantt chart and graphs shall illustrate the start and finish dates, including the dependency relationship, of all the work breakdown structure elements and the task, sub-tasks, activities, deliverables, and milestones in the programme.
- iii) The personnel (human resources) allocation and durations must be linked to the programme. The personnel must be retained for as long as necessary to complete the Services to the required standards and quality per **Appendix 1: Scope of Services**. The TCTA will not be obliged to compensate the Consultant for personnel that exceed the durations in the Consultant's bid submission.
- iv) The personnel and determined person-months by the Consultant must be summarised and adjusted if so, required for uncertainties and the like, and carried forward into the price returnables and **Appendix 3: Remuneration and Payment**.

## **AGREEMENT**

### **APPENDIX 5: CONSULTANT'S HEALTH AND SAFETY SPECIFICATION**

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# Occupational health and safety specification

## 1. Definitions

In this document the following expressions shall bear the meanings assigned to them below:

- 1.1 **TCTA** means the client (as defined by Construction Regulation 1) for whom construction work is being performed and/or undertaken;
- 1.2 **Agent** means a competent person as per the Construction Regulation who acts as a representative for a client.
- 1.3 **Construction Regulations** means the Occupational Health and Safety Act's, No 85 of 1993, Construction Regulations that came into effect on 09 July 2014;
- 1.4 **Occupational health and safety plan** means a sufficiently documented plan to the standards of TCTA, which addresses hazards identified and includes safe working procedures to mitigate, reduce or control the hazards identified;
- 1.5 **Occupational health and safety specification** means a documented specification of all health and safety requirements pertaining to the associated works on a construction site, so as to ensure the health and safety of persons working, visiting, passing, staying and/or working close to the construction site and/or other applicable areas such as site camp;
- 1.6 **OHSA** means the Occupational Health and Safety Act, No 85 of 1993, as amended;
- 1.7 **Consultant** means TCTA's agent-who acts as a representative for a TCTA in providing professional services for the engineering and construction management (ECP) for the overall work, which shall also include the professional engineer or professional certified engineer as referred to in the Construction Regulations who shall also be obliged to carry out as part of the contract, with TCTA, geotechnical field investigations which includes work classified as construction work or excavation work in Construction Regulations 1 and ;
- 1.8 **Principal Contractor** means an employer, as defined by Section 1 of the OHSA who performs construction work, i.e. civil, building, electrical or mechanical work, and is appointed by TCTA to be in overall control and management of the construction site and works.

## 2. Introduction

In terms of Construction Regulation 5 (1) (b) of the OHSA, TCTA is required to compile an occupational health and safety specification for any intended project and provide such specification to prospective tenderers/bidders.

In terms of Construction Regulation 5(5) TCTA will appoint an independent incumbent as an Agent to act on its behalf in fulfilling its health and safety obligations during the engineering and construction stages of the project. The incumbent will be contracted to TCTA directly.

This specification has an objective to ensure that the Consultant entering into a contract with TCTA for the services ensures that construction work is undertaken in

accordance with the OHSa and Construction Regulations as further elaborated in these specifications.

This document defines roles, obligations and duties for the Consultant regarding health and safety on the entire project.

Compliance with this document does not absolve the Consultant from complying with any other minimum legal requirements and the Consultant remains responsible for the health and safety of his employees, those of his mandataries as well as any persons coming on site or on adjacent properties as far as it relates to the construction activities.

### **3. Scope**

The occupational health and safety obligation by the Consultant on this project entails:-

- 3.1 Develop a project specific occupational health and safety specification that addresses the reasonable and foreseeable risks, exposures and aspects of occupational health and safety as affected by the construction work to be undertaken by the Principal Contractors. The specification will include the requirements that the Principal Contractor will have to comply with in order to reduce the risks associated with work which is definable under Construction Regulation 1 which may lead to incidents causing injury and/or ill health, to a level as low as reasonably practicable and possible.
- 3.2 Prepare health and safety plan based on the specification herein included and the OHSa for field work or similar work which falls under the definition of such as included in Construction Regulation 1. TCTA will evaluate the health and safety plan as part of its formal tender adjudication processes to ensure compliance with Construction Regulation 5 that stipulates that TCTA may only appoint a Principal Contractor who has the necessary competencies and resources to carry of the work appointed for safely. The plan will be submitted by all consultants interested in being appointed by TCTA for the purposes of the RFP as a draft occupational health and safety plan.
- 3.3 Submit for review and approval by the Client the health and safety plans and the customized specification for the construction contract.

## **4. General occupational health and safety provisions**

### **4.1 Health and safety aspects of designs**

#### **4.1.1 Hazard analysis of scheme**

The Construction Regulations require the designer of the work among others to carry out inspections during construction, thereby ensuring compliance with the design. The designer also has other obligations. The client should ensure that the appointment of the designer includes these obligations.

The Consultant shall ensure that the project is designed to achieve a high health and safety standards, and in accordance with TCTA's requirements of international best practice. The designer shall, in the case of a structural work provide the Principal Contractor with a geotechnical report (where appropriate) and to inform the Principal Contractor of the dangers posed by the construction work, the loading which the structure is designed to resist and any requirements regarding method and sequence of construction.

For the selected general arrangement, preliminary designs, definition of design criteria, tender design and production of tender drawings the Consultant shall assemble a team of individuals with varying expertise and background to undertake a process of hazard identification through a collectively brainstorming of the entire operational processes.

The Consultant shall study the complete construction requirements for ensuring healthy and safe working environment with particular emphasis on tunneling methods if applicable. He shall address any climatic influences and external and internal influences affecting construction activities such as quarry operations and construction processes. The outcome of the hazard identification process shall be included in the risk assessment and identification of the project.

The process shall be undertaken at every incidence of design change taking into consideration the previous observation during the hazard identification process.

#### **4.1.2 Health and safety during construction**

By his appointment the Consultant shall liaise with the Agent who shall be obliged to act as TCTA's appointed agent regarding the health and safety management of the project, in terms of Construction Regulation

5(5), and therefore shall perform all the required deliverables as provided in the regulation to be undertaken by TCTA's agent.

The Consultant together with the Agent shall provide an appropriate level of inspection to ensure compliance of the Principal Contractor regarding the Construction Regulations and other obligations as required by the OHSA. Processes shall be placed to ensure that the design intent, specifications, drawings, and general contractual requirements are being met to ensure all Principal Contractor's general obligations with particular regard to health and safety including the provision of adequate personal protective clothing, the maintenance of a safe working environment and adequate means of evacuation and treatment in emergencies.

The Designer shall carry out inspections during construction to ensuring compliance with the design and to stop any construction work that is not in accordance with the design.

## **4.2 Hazard identification and risk assessment (Construction Regulation 9)**

This section shall apply to all cases where the Consultant undertakes, as a deliverable under the contract, work classified in Construction Regulation 1 as Construction Work which shall include but not limited to geotechnical field investigations.

### **4.2.1 Risk assessments**

Attachment 7 of this specification contains a list of risk assessment headings that have been identified by TCTA as possibly applicable to the abovementioned contract work. It is, by no means, exhaustive and is only offered as assistance to the Principal Contractor intending to tender for the applicable works. It therefore remains the overall responsibility of the Consultant to consider all applicable risks and pro-actively undertake risk assessments and implement appropriate risk mitigation measures.

### **4.2.2 Development of risk assessments**

Every Consultant performing construction work shall, before the commencement of any construction work or work associated with the aforesaid construction work and during such work, ensure that risk assessments are undertaken by a competent person, appointed in writing, and the risk assessments shall form part of the occupational health and safety plan and be implemented and maintained as contemplated in Construction Regulation 9 (1).



The risk assessments shall include, at least:

- The identification of the current as well as emerging risks and hazards to which persons may be exposed to;
- The analysis and evaluation of the risks and hazards identified;
- A documented plan of safe working procedures (SWP) and any method statements to mitigate, reduce or control the risks and hazards that have been identified;
- A plan to monitor the application of the SWPs; and
- A plan to review the risk assessments as the work progresses and changes are introduced or incidents occurred which requires the re-evaluation of the processes/risk mitigation.

Based on the risk assessments, the Consultant must develop a set of site-specific occupational health and safety rules that will be applied to regulate the occupational health and safety aspects of the construction.

The risk assessments, together with the site-specific occupational health and safety rules, must be submitted to TCTA before mobilization on site commences.

Despite the risk assessments listed in Attachment 7, the Consultant is required to conduct a baseline risk assessment and the aforesaid risk assessments must be incorporated into the baseline risk assessment. The baseline risk assessment must further include the SWPs and the applicable method statements based on the risk assessments.

Hazard identification and risk assessments must be undertaken whilst SWPs must be developed for all out-of-scope work.

#### **4.2.3 Review of risk assessments**

The Consultant is to review the hazards identified, the risk assessments and the SWPs at each production planning and progress report meeting as the contract work develops and progresses and each time changes are made to the designs, plans and construction methods and/or processes.

It is also proposed that should an incident occurs the SWPs and all other applicable processes be re-evaluated to ensure that the mitigation measures are still applicable and appropriate and if not a revision of the risk assessments must be undertaken.

The Consultant must provide TCTA, the Principal Contractor and all other concerned or affected parties with copies of any changes,

alterations or amendments as soon as possible but within 14 calendar days of such changes.

#### **4.3 Legal Requirements**

All Principal Contractors entering into a contract with TCTA shall, as a minimum, comply with the -

- OHSA and a current, up-to-date copy of the OHSA and its Regulations must be available on site at all times;
- Compensation for Occupational Injuries and Diseases Act, No 130 of 1993 (COIDA) as amended. The Consultant will be required to submit a letter of registration and “good-standing” from the Compensation Commissioner or compensation insurer before being awarded the contract. A current, up-to-date copy of the COIDA must be available on site at all times; and
- Where work is being carried out on mine premises, the Principal Contractor will comply with the Mine Health and Safety Act and Regulations (Act. 29 of 1996) as amended, the Minerals Act and Regulations (Act 50 of 1991) as amended and any other occupational health and safety requirements that the mine may specify. Current, up-to-date copies of the last two mentioned Acts must also be available on site at all times.

#### **4.4 Structure and responsibilities**

##### **4.4.1 Overall supervision and responsibility for occupational health and safety**

- a. The Consultant [appointed in terms of Construction Regulation 5 (1) (k)] is responsible to implement and maintain the occupational health and safety plan approved by TCTA and ensure implementation of plans submitted by Principal Contractors on the Project.
- b. The Chief Executive Officer (in terms of Section 16(1) of the OHSA) of the Consultant is to ensure that the Employer (as defined in the OHSA) complies with the OHSA. Attachment 2 “Legal Compliance Checklist” may be used for this purpose and assistance.
- c. The Consultant’s Chief Executive Officer may appoint any person reporting to him/her as Designated Person in terms of Section 16(2) of the OHSA. Such Designated Person is responsible to assist the Chief Executive Officer to ensure that the Employer complies with the requirements of the OHSA.
- d. The construction supervisor and assistant construction supervisor(s) appointed in terms of Construction Regulation 8 are responsible for supervising the construction work and in specific to ensure that all work undertaken comply with the

requirements of the OHSA, its Regulations and TCTA's specifications.

#### 4.4.2 Operational responsibilities for occupational health and safety

In carrying out his duties TCTA the Consultant shall appoint designated competent employees and/or other competent persons as required by the Act.

The Consultant shall ensure that the Principal Contractor make the necessary appointments during construction. This list below shows the minimum requirements and is therefore not exhaustive.

Appointment description	Appointment required in terms of
Assistant construction supervisor	Construction Regulation 8(2)
Blasting supervisor	Explosives Regulation 12 (1)
Construction vehicle, mobile plant and machinery supervisor	Construction Regulation 23
Construction supervisor	Construction Regulation 8(7)
Drivers of construction vehicles and operators of plant	Construction Regulation 23
Electrical installation and appliances inspector	Construction Regulation 24
Emergency, security and fire coordinator	Construction Regulation 29
Excavation supervisor (including piling)	Construction Regulation 13
Fall protection supervisor	Construction Regulation 10
First-aiders	General Safety Regulation 3
Fire fighting equipment inspector	Construction Regulation 29
Hazardous chemical substances supervisor	Hazardous Chemicals Substances Regulations 10
Incident investigator	General Administrative Regulation 9
Ladder inspector	General Safety Regulation 13(a)
Lifting machines and equipment inspector	Construction Regulation 22
Occupational health and safety committee	OHSA Section 19
Occupational health and safety officer	Construction Regulation 8(5)
Occupational health and safety representatives	OHSA Section 17
Person responsible for machinery	General Machinery Regulation 2
Risk assessor	Construction Regulation 9(1)
Scaffolding supervisor	Construction Regulation 16
Stacking and storage supervisor	Construction Regulation 28
Suspended platform supervisor	Construction Regulation 17(1)
Suspended platform inspector	Construction Regulation 17(8)(a)

<b>Appointment description</b>	<b>Appointment required in terms of</b>
Traffic management supervisor	OHSA Section 9(1)
Traffic safety officer	OHSA Section 9(1)
Vessels under pressure supervisor	Vessels under Pressure Regulations
Working on, over or next to water supervisor	Construction Regulation 26

These appointments must be in writing and the responsibilities clearly stated together with the period for which each appointment is made. This information must be communicated to and agreed with the appointees.

Copies of appointments must be submitted to TCTA together with concise CV's of the appointees as part of the Consultant's health and safety plan and if appointed copies of the appointments included in the occupational health and safety file. All appointments must be approved by TCTA and any changes of appointees or appointments must be communicated to TCTA and agreed upon before being implemented.

The Consultant must, furthermore, provide TCTA with an organogram of all sub-consultants that he/she has appointed or intends to appoint and keep this list updated on a weekly basis.

#### **4.4.3 Designation of occupational health and safety representatives (Section 18 of the OHSA)**

Where the Consultant employs more than 50 persons [including the employees of sub-consultant and its supervisors] the consultant shall appoint one occupational health and safety representative for every 50 employees or part thereof. General Administrative Regulation 6 requires that the election, appointment and subsequent designation of the occupational health and safety representatives be executed in consultation with employee representatives or employees. (Section 17 of the OHSA as well as General Administrative Regulation 6 and 7 refer).

Occupational health and safety representatives have to be designated in writing and the designation must include the area of responsibility of the person and term of the designation.

#### **4.4.4 Duties and functions of the occupational health and safety representatives (Section 19 of the OHSA)**

- a. The Consultant must ensure that the designated occupational health and safety representatives conduct a weekly inspection of their respective areas of responsibility, using a checklist, and report thereon to the Consultant.
- b. Occupational health and safety representatives must be included in accident and/or incident investigations.
- c. Occupational health and safety representatives must attend all occupational health and safety committee meetings.

#### **4.4.5 Appointment of occupational health and safety committee (Section 20 of the OHSA)**

The Consultant must establish an occupational health and safety committee consisting of all the designated occupational health and safety representatives, management and a representative of TCTA who shall act as the chairperson without voting rights. The members of the occupational health and safety committee must be appointed in writing and copies of the appointments included in the occupational health and safety file.

The occupational health and safety committee must meet as a minimum on a monthly basis and consider, at least, the following agenda items:

1. Opening and welcome.
2. Members present, apologies and absent.
3. Minutes of previous meeting.
4. Matters arising from the previous meeting.
5. Occupational health and safety representatives' reports.
6. Incident and/or accident reports and investigations.
7. Incident, accident and/or injury statistics.
8. Other matters.
9. Endorsement of registers and other statutory documents by a duly authorised representative of the Consultant.
10. Close and next meeting.

#### **4.5 Mandatory's**

The Consultant, comply with the relevant sections of the Construction Regulations when he appoints sub-consultants

#### **4.6 Administrative controls and the occupational health and safety file**

##### **4.6.1 The occupational health and safety file [Construction Regulation 7(1)]**

As required by Construction Regulation 7(1), the Consultant and other contractors will each keep an occupational health and safety file on site containing the following documents as a minimum:

1. Notification of construction work (Construction Regulation 4).
2. Updated copies of the OHS Act and its Regulations as well as the COIDA Act (General Administrative Regulation 4.).
3. Proof of registration and good standing with the Compensation Commissioner or a COIDA Insurer [Construction Regulation 5(1)(j)].
4. Occupational health and safety plan agreed with TCTA including the underpinning risk assessment(s) and method statements [Construction regulation 9(1)].
5. Copies of occupational health and safety committee meetings and other relevant minutes.
6. Designs and/or drawings [Construction Regulation 7(1)(e)].
7. A list of contractors (sub-contractors) including copies of the agreements between the parties, proof of good standing with the Compensation Commissioner or COIDA Insurer, and the type of work to be undertaken by each contractor (Construction Regulation 5).
8. Appointment and designation forms as per paragraphs 4.3.1 and 4.3.2 above.
9. The following registers:
  - Accident and/or incident register (Attachment 1 of the General Administrative Regulations);
  - Occupational health and safety representatives' inspection register;
  - Construction vehicles and mobile plant inspections by controller;
  - Daily inspections of vehicles, plant and other equipment by the operator, driver and/or user;
  - Designer's inspections and structures record;
  - Inspection and maintenance of explosive powered tools;
  - Inspection of electrical installations (including inspection of portable electrical tools, electrical equipment and other electrical appliances);
  - Fall protection inspections;
  - First-aid box content;
  - Record of first-aid treatment;
  - Fire equipment inspections and maintenance;

- Record of hazardous chemical substances kept and used on site;
  - Ladder inspections;
  - Machine safety inspections (including machine guards, lock-outs etcetera);
  - Inspection registers and logbooks for lifting machines and – tackle (including daily inspections by drivers/operators);
  - Inspections of scaffolding;
  - Inspections of stacking and storage;
  - Inspections of structures;
  - Vessels under pressure inspections; and
  - Inspections of welding equipment.
10. All other applicable records.

TCTA will conduct and evaluation of the Consultant's occupational health and safety file from time to time.

#### **4.7 Occupational health and safety goals and objectives and arrangements for monitoring and review of occupational health and safety performance**

TCTA upholds a principle of "Zero Injury" on projects it implements. The Consultant shall aim to achieve the maximum results from measures implemented on all work fronts of the Project. The Consultant is required to maintain a Recordable Case Rate statistics on the Project per contract included his own with TCTA (See Attachment 3 to this document: "Measuring Injury Experience") and report on to TCTA on a monthly basis.

#### **4.8 Notification of construction work (Construction Regulation 4)**

The Consultant shall, where the contract meets the requirements laid down in Construction Regulation 4, within 5 working days, ensure that the Department of Labour is notified of the intention to carry out construction work and use the form (Annexure A in the Construction Regulations) for this purpose. A copy of the notification must be held on the occupational health and safety file and a copy must also be forwarded to TCTA for record purposes.

#### **4.9 Training, awareness and competence**

The contents and syllabus of all training required by the OHSA and Regulations must be included in the Consultant's occupational health and safety plan.

#### **4.9.1 General induction training**

All members of the contractor's site management as well as all the persons appointed as responsible for occupational health and safety in terms of the Construction and other Regulations will be required to attend a general induction session.

All employees of the principal and other contractors must be in possession of proof of general induction training.

All subsequent and newly appointed employees must also be subjected to the induction training as soon as possible after the appointment but prior to starting to work on site.

#### **4.9.2 Site-specific induction training**

The Consultant will be required to develop a contract work project specific induction training course based on the risk assessments for the contract work and train all employees and other contractors and their employees in this.

All employees of the principal and other contractors must be in possession of proof that they have attended a site-specific occupational health and safety induction training at all times.

#### **4.9.3 Other training**

1. All operators, drivers and users of construction vehicles, mobile plant and other equipment must be in possession of valid proof of training and where applicable licenses or proof of competency.
2. All employees in jobs requiring training in terms of the OHSA and Regulations must be in possession of valid proof of training.
3. Occupational health and safety training requirements [as required by the Construction Regulations and as indicated by the occupational health and safety specification and the risk assessment(s)] i.e. -
  - a. General induction (Section 8 of the OHSA);
  - b. Site and job specific induction, including visitors (Sections 8 and 9 of the OHSA);
  - c. Site and project manager;
  - d. Construction supervisor;
  - e. Occupational health and safety representatives [Section 18 (3) of the OHSA];



- f. Training of the appointees indicated in paragraphs 4.3.1 and 4.3.2;
- g. Operators and drivers of construction vehicles and mobile plant (Construction Regulation 23);
- h. Basic fire prevention and protection (Environmental Regulations 9 and Construction Regulation 29);
- i. Basic first-aid (General Safety Regulations 3);
- j. Storekeeping methods and safe stacking (Construction Regulation 28); and
- k. Emergency, security and fire coordinator.

#### 4.9.4 Awareness and promotion

The Consultant is required to encourage promotion and awareness programme in place to create an occupational health and safety culture within project employees. The following are some of the methods that may be used:

- Toolbox talks
- Posters
- Videos
- Competitions
- Suggestion schemes
- Participative activities such as employee “occupational health and safety circles”.

#### 4.9.5 Notices and signs

The following notices and signs shall, where applicable, be compulsory on the construction site as well as the contractors’ yards:

Area and/or activity where notice or sign is required	Notice or sign required in terms of
Display of notices and signs	General Safety Regulation 2B and SABS Code 1186
Entry	General Safety Regulation 2C(2)
First-aid	General Safety Regulation 3(6)
Toilets and change rooms	Facilities Regulation 2 (5) 4(2)(f)
Storage of flammable materials	General Safety Regulation 4(8)(a)(i) and (ii) [10(e) only applicable to contractor’s yards]
Grinding wheels	Driven Machinery Regulation 8(1)(7)

Machinery	General Machinery Regulation 9 (Schedule D)
Explosive powered tools	Construction Regulation 21(2)(f)
Prohibition on smoking and eating or drinking at the workplaces where high risk substances [FR5 (1)] are stored or handled	Facilities Regulation 6(b)
Non-potable water	Facilities Regulation 7(B)

#### **4.9.6 Competence**

The Consultant shall ensure that his and other contractors' employees appointed are competent and that all training required to undertake the work safely and without risk to health of their or other persons, has been successfully completed before work commences.

The Consultant shall ensure that follow-up and refresher training is conducted on a regular basis as well as the contract work progresses and the work situation or requirements changes.

Records of all training must be kept on the occupational health and safety file for auditing purposes.

#### **4.10 Consultation, communication and liaison**

The following arrangements will apply-

- 4.10.1 Occupational health and safety liaison between TCTA, the Consultant, other contractors, the designer and other concerned parties will be through the occupational health and safety committee. In the absence of a health and safety committee, TCTA and Consultant will agree on an alternative communication forum to be implemented.
- 4.10.2 In addition to the above, communication may be directly to TCTA or his appointed Agent, verbally (followed up in writing within 14 calendar days) or in writing, as and when the need arises.
- 4.10.3 Consultation with the workforce on occupational health and safety matters will be through their supervisors, occupational health and safety representatives, the occupational health and safety committee and their elected trade union representatives, if any.

- 4.10.4 The Consultant will be responsible for the dissemination of all relevant occupational health and safety information to the other contractors, for example design changes agreed with TCTA and the designer, instructions by TCTA and/or his Agent, exchange of information between contractors, the reporting of hazardous and/or dangerous conditions and/or situations etcetera.
- 4.10.5 The Consultant will be required to do site safety inspections with TCTA Agent and/or his Health & Safety Auditor on a basis to be determined and agreed between the parties.
- 4.10.6 The principle and other contractors will be required to conduct toolbox talks with their employees on at least a weekly basis and records of these including the topics discussed must be kept on the occupational health and safety file. Employees must acknowledge the receipt of toolbox talks which record must, likewise be kept on the occupational health and safety file.
- 4.10.7 TCTA Health and Safety Auditor and the Consultant will agree on the dates, times and venues of the occupational health and safety meetings.

#### **4.11 Checking, reporting and corrective actions**

##### **4.11.1 Monthly compliance assessment by TCTA [Construction Regulation 5(1)(n)]**

TCTA will be conducting a monthly assessment to comply with Construction Regulation 5(1)(n) and to confirm that the Consultant has implemented and is maintaining the agreed and approved occupational health and safety plan.

##### **4.11.2 Other assessments and inspections by TCTA**

TCTA reserves the right to conduct other ad-hoc assessments and inspections as deemed necessary. This could include among others site safety walks.

##### **4.11.3 Conducting an assessment**

A representative of the Consultant must accompany TCTA on all assessments and inspections and may conduct his/her own inspection at the same time. Each party will, however, take responsibility for the results of his/her own assessment and/or inspection.

#### **4.11.4 Contractor's assessments and inspections**

The Consultant is to conduct his own internal assessments and inspections to verify compliance with his own occupational health and safety plan and management system as well as the requirements of this specification and the compliance of other contractors under his/her control.

#### **4.11.5 Inspections by occupational health and safety representatives and other appointees**

Occupational health and safety representatives must conduct weekly inspections of their areas of responsibility and report thereon to their foreman or supervisor whilst other appointees must conduct inspections and report thereon as specified in their appointments for example vehicle, plant and machinery drivers, operators and users must conduct daily inspections before start-up.

#### **4.11.6 Recording and review of inspection results**

All the results of the abovementioned inspections must be in writing, reviewed at occupational health and safety committee meetings, endorsed by the chairperson of the meeting and placed on the occupational health and safety file.

#### **4.11.7 Reporting of inspection results**

The Consultant is required to provide TCTA with a monthly report providing technical progress updates on issues in 4.11 hereof.

## 4.12 Incident reporting and investigation

### 4.12.1 Reporting of accidents and incidents (Section 24 and General Administrative Regulation 8 of the OHSA)

The Consultant in liaison with the Agent must report all incidents where an employee is injured on duty to the extent that he/she:

- dies
- becomes unconscious
- loses a limb or part of a limb
- is injured or becomes ill to such a degree that he/she is likely either to die or to suffer a permanent physical defect or likely to be unable for a period of at least 14 days either to work or continue with the activity for which he/she was usually employed

or where -

- a major incident occurred
- the health or safety of any person was endangered
- where a dangerous substance was spilled
- the uncontrolled release of any substance under pressure took place
- machinery or any part of machinery fractured or failed resulting in flying, falling or uncontrolled moving objects
- machinery ran out of control

to TCTA within two calendar days and to the Provincial Director of the Department of Labour within seven calendar days from date of incident (Section 24 of the OHSA and General Administrative Regulation 8), **except** that, where a person has died, has become unconscious for any reason or has lost a limb or part of a limb or may die or suffer a permanent physical defect, the incident must be reported to both TCTA and the Provincial Director of the Department of Labour forthwith by telephone, telefax or e-mail. All other reports should still be completed and provided as required.

The Consultant is required to provide TCTA with copies of all statutory reports required in terms of the OHSA within seven calendar days of the incident occurring.

The Consultant is required to provide TCTA with copies of all internal and external accident/incident investigation reports, including the reports contemplated in 4.12.2 (3) and (4) below, within seven calendar days of the incident occurring.

#### **4.12.2 Accident and incident investigation (General Administrative Regulation 9)**

1. The Consultant together with the Agent is responsible for the investigation of all accidents and/or incidents where employees and non-employees were injured to the extent that he, she and/or they had to be referred for medical treatment by a doctor, hospital or clinic.
2. The results of the investigation to be entered into the accident and/or incident register.
3. The Consultant is responsible for the investigation of all minor and non-injury incidents as described in Section 24 (1) (b) and (c) of the OHSA and keeping a record of the results of such investigations including the steps taken to prevent similar accidents/incidents in future.
4. The Consultant is responsible for the investigation of all road traffic accidents, related to the construction activities, and keeping a record of the results of such investigations including the steps taken to prevent similar accidents in future.
5. TCTA reserves the right to hold its own investigation into an incident or call for an independent external investigation.

### **5. Operational control**

#### **5.1 Emergency preparedness, contingency planning and response**

- 5.1.1 The Contractor must appoint a competent person to act as emergency controller and/or coordinator.
- 5.1.2 The Consultant must conduct an emergency identification exercise and establish what emergencies could possibly develop. He/she must then develop detailed contingency plans and emergency procedures, taking into account any emergency plan that TCTA may have in place.
- 5.1.3 The Consultant and the other contractors must hold regular practice drills of contingency plans and emergency procedures to test them and familiarize employees with them.

## **5.2 First-aid (General Safety Regulation 3)**

- 5.2.1 The Consultant must provide first-aid equipment (including a stretcher) and have qualified first-aiders on site as required by General Safety Regulation 3 of the OHSA.
- 5.2.2 The contingency plan of the Consultant must include arrangements for the speedy and timely transportation of injured and/or ill person(s) to a medical facility or getting emergency medical support to person(s) who may require it.
- 5.2.3 The Consultant must have firm arrangements with his contractors in place regarding the responsibility of these contractor's first-aid arrangements as well as treatment of injured and/or ill employees.

## **5.3 Rescue Procedures**

- 5.3.1 No later than 56 days after the commencement date and in any event no later than 7 days before the start of work in any area, the Consultant shall prepare and submit a method statement detailing evacuation procedures for the approval of TCTA.
- 5.3.2 The procedures shall detail the nature of the emergencies contemplated, the training of employees forming rescue teams, their numbers, availability (at least one team shall be available for each shift), any delegation of responsibility, liaison with the emergency services and TCTA, the equipment needed, actual methods of evacuation including transport methods, medical facilities to be used, communications systems to be used and any other matter that the Consultant considers relevant to the subject of emergency evacuation.
- 5.3.3 The emergencies contemplated shall include, among others, injury, fire, flood, falls of ground, accidental leaks, spillages and explosion.
- 5.3.4 The equipment requirements shall include for the need for items to be used exclusively by the rescue teams, and also the continuous operational readiness of plant and equipment, including standby facilities, during the construction of the works.
- 5.3.5 The procedures shall cover the level of medical competence of the rescue team, the use of support medical facilities and evacuation off site to a relevant hospital or otherwise, including the use of helicopter services or the access to air evacuation facilities.
- 5.3.6 The Consultant shall immediately implement and prominently advertise the procedures in each work area. The Consultant shall test the effectiveness of the rescue procedures under the inspection of TCTA at least every three months and shall make due allowance in his programs for the testing of the procedures.

## **5.4 Security**

- 5.4.1 The Consultant must establish site access rules and implement and maintain these throughout the construction period. Access control must, amongst other, include the rule that non-employees will not be allowed on site unaccompanied.
- 5.4.2 The Consultant must develop a set of project applicable security rules and procedures and maintain these throughout the construction period.

## **5.5 Accommodation of traffic**

- 5.5.1 Where construction work is undertaken in, next to or close to a public road, the use of appropriate as well as a sufficient number of road signs is of paramount importance to protect employees against traffic and to warn motorists of the presence of construction work as well as construction employees/risks/vehicles.
- 5.5.2 The Consultant shall ensure that appropriate as well as a sufficient number of road signs are posted to protect employees against traffic and to warn motorists of the presence of construction work as well as construction employees/vehicles. These signs shall be repeated and utilised, where appropriate, as actual construction work is approached.
- 5.5.3 The following signage is required as a minimum where construction work is undertaken in, next to or close to a public road:
  - a. "Construction work ahead" sign at least 45 meters before the start of the construction work;
  - b. "Lane narrows" sign 30 meters before the start of the construction work;
  - c. "Keep right/left" sign 15 meters before the start of the construction work and again where the tapering begins; and
  - d. Delineators and cones every 5 meters for the entire stretch of construction work.
- 5.5.4 Where construction work includes excavations in or next to a public road, warning lights or visible boundary indicators should be provided after dark or when visibility is poor.
- 5.5.5 The maintenance of all signage and especially those that is suitable after dark should be duly managed.
- 5.5.6 Where appropriate duly trained flag persons should be deployed a good distance ahead of areas where traffic is deviated or lanes closed off. These flag persons should be managed assertively to ensure that they add optimal value and should they not do so they should be retrained and if necessary replaced.



- 5.5.7 The community liaison officer (CLO) should also be sensitised on the optimal management of traffic and the risks involved and then be instructed to increase community awareness through talking to all stakeholders including the distribution of suitable information brochures.

**5.6. Fall protection [Working in elevated positions (Construction Regulation 10)]**

- 5.6.1 A pre-emptive risk assessment will be required for any work to be carried out above two metres from the ground or any floor level and will be classified as “work in elevated positions”.

- 5.6.2 As far as is practicable, any person working in an elevated position will work from a stable platform, ladder or other device that is at least as safe as if he or she is working at ground level and whilst working in this position be wearing a safety belt with lanyard to prevent the person falling from the platform, ladder or other device utilized. This safety belt will be, as far as is possible, secured to a point away from the edge over which the person might fall and the lanyard must be of such a length and strength that the person will not be able to move over the edge.

Alternatively any platform, slab, deck or surface forming an edge over which a person may fall may be fitted with suitable guard rails at two different heights as prescribed in SANS 10085 code of practice for the design, erection, use and inspection of access scaffolding.

- 5.6.3 Where the requirement in paragraph 5.4.2 is not practicable, the person will be provided with a full body harness that will be worn and attached above the wearer's head at all times and the lanyard must be fitted with a shock absorbing device or the person must be attached to a fall arrest system that is approved by TCTA.
- 5.6.4 Where the requirements in paragraph 5.4.3 are not practicable, a suitable catch net, which must be able to sustain the weight of at least the average person working in the elevated position, must be erected.
- 5.6.5 Employees working in elevated positions must be trained to do this safely and without risk to their or other person's health and safety.
- 5.6.6 Updated records confirming the physical and psychological fitness of employees working at elevated positions should be kept on the health and safety file at all times.

## **5.7 Access scaffolding (Construction Regulation 16)**

Access scaffolding must be erected, used and maintained safely in accordance with Construction Regulation 16 and SA Bureau of Standards Code of Practice, SANS 10085 entitled, "The Design, Erection, Use and Inspection of Access Scaffolding".

Detailed consideration must be given to all scaffolding to ensure that it is properly planned to meet the working requirements, designed to carry the necessary loadings and maintained in a sound condition. It must also be ensured that there is sufficient material available to erect the scaffolding properly and safely.

Scaffolding must be erected, altered or dismantled by person(s) who has/have adequate training and experience in this type of work or under the continuous supervision of such a person.

## 5.8 Lifting equipment (Construction Regulation 22)

Lifting equipment must be designed and constructed in accordance with the manufactures/designers specifications as well as generally accepted technical standards and operated, used, inspected and maintained in accordance with the manufactures requirements as well as that of the Driven Machinery Regulation 18 of the OHSA:

The Driven Machinery Regulation requires that:

- a. Lifting equipment to be clearly and conspicuously marked with the maximum mass load (MML) that it is designed to carry safely. When the MML varies with the conditions of use, the table of maximum loads should be used by the driver/operator;
- b. Each winch on a lifting machine must at all time have, at least, three full turns of rope on the drum when the winch has been run to its lowest limit;
- c. Lifting equipment be fitted with a brake or other applicable device capable of holding the MML. This brake or device must automatically prevent the downward movement of the load when the lifting power is interrupted;
- d. Lifting equipment fitted with a load limiting device that automatically arrest the lift when the load reaches its highest safe position or when the mass of the load is greater than the MML;
- e. Every chain or rope on a lifting machine that forms an integral part of the machine must have a factor of safety as prescribed by the manufacturer of the machine and where no standard is available the factor of safety must be:
  - chains – 4 (four)
  - steel wire ropes - 5 (five)
  - fibre ropes- 10 (ten)
- f. Every hook or load attaching device must be designed as such or fitted with a device that will prevent the load from slipping off or disconnecting;
- g. Every lifting machine must be inspected and load tested by a competent person every time it has been dismantled and re-erected and every 12 months after that. The load test must be in accordance with the manufacturers prescription or to 110% of the MML in addition all ropes, chains, hooks or other attaching devices, sheaves, brakes and safety devices forming an integral part of a lifting machine must be inspected every 6 months by a competent person;
- h. All maintenance, repairs, alterations and inspection results must be recorded in a log book and each lifting machine must have its own log book; and
- i. No person may be lifted by a lifting machine not designed for lifting persons unless in a cradle approved by an inspector of the Department of Labour.

## 5.9 Lifting tackle

- a. Manufactured of sound material, well constructed and free from latent defects;
- b. Clearly and conspicuously marked with an identity number;
- c. Maximum mass load factor of safety:
  - Natural fibre ropes - 10(ten)
  - Man-made fibre ropes and woven webbing - 06(six)

- Steel wire ropes – single rope - 06(six)
  - Steel wire ropes – combination slings - 08(eight)
  - Mild Steel chains - 05(five)
  - High tensile/alloy steel chains - 04(four)
- d. Steel wire ropes must be discarded (not used any further for lifting purposes) when wear and corrosion is evident and must be examined by a competent person every three months for this purpose and the results recorded in a designated log book.

#### **5.10 Construction vehicle and mobile plant operators**

The following requirements will apply to construction vehicle and mobile plant operators:

- a. Only certified and/or competent employees may be allowed to operate any construction vehicle and mobile plant.
- b. Every lifting machine operator must be trained specifically for the type of lifting machine that he or she is operating.
- c. Operators of jib cranes with a maximum mass load of 500 kg or more must be in possession of a certificate of training issued by an accredited (by the Department of Labour) training provider.
- d. Only employees duly authorized to do so may operate any construction vehicle and mobile plant.
- e. Only employees physically and psychologically fit, i.e. in possession of a medical certificate of fitness, may be allowed to operate any construction vehicle and mobile plant.

#### **5.11 Construction vehicles and mobile plant (Construction Regulation 23)**

Construction vehicles and mobile plant will initially during the competency evaluation process be inspected by TCTA prior to being allowed on a project site and suppliers of hired vehicles, plant and equipment will be required to comply with this specification as well as the OHSA and Regulations.

Construction vehicles and mobile plant must be:

- a. Of acceptable design and construction;
- b. Maintained in good working order;
- c. Used in accordance with their design and intention for which they were designed;
- d. Operated and/or driven by trained, competent and authorized operators/drivers. No unauthorized persons to be allowed to drive construction vehicles and mobile plant;
- e. Provided with safe and suitable means of access;
- f. Fitted with adequate signaling devices to make movement safe including reversing;
- g. Excavations and other openings must be provided with sufficient barriers to prevent construction vehicles and mobile plant from falling into same;
- h. Provided with roll-over protection;
- i. Inspected daily before start-up by the driver, operator and/or user and the findings recorded in a register/log book and any defects addressed as matter of urgency;

- j. Fitted with two head and two tail lights that is in good working condition whilst operating under poor visibility conditions; and
- k. Used for transporting persons must have seats firmly secured and sufficient for the number of persons being transported.

No loose tools, material etcetera is allowed in the driver and/or operators compartment/cabin nor in the compartment in which any other persons are transported.

No person may ride on construction vehicles and mobile plant except for in a safe place designed and provided for this purpose.

The construction site must be organized to facilitate the movement of construction vehicles and mobile plant in such a manner that pedestrians and other vehicles are not endangered. Traffic routes to be suitable, sufficient in number and adequately demarcated.

Construction vehicles and mobile plant left unattended after hours adjacent to roads and areas where there is traffic movement must be fitted with lights, reflectors or adequate barricades to prevent moving traffic from a sudden emergency, or to come into contact with the parked construction vehicles and mobile plant.

In addition construction vehicles and mobile plant left unattended after hours must be parked with all buckets, booms etc. full lowered, the emergency brakes engaged and, where necessary, the wheels chocked, the transmission in neutral and the motor switched off and the ignition key removed and stored safely.

All construction vehicles and mobile plant daily inspection records must be kept in the occupational health and safety file.

## **5.12 Electrical installations (Construction Regulation 24)**

The installation of temporary electricity for construction use shall be in accordance with Construction Regulation 24 and the Electrical Installation Regulations.

The Consultant must ensure that:

- a. Existing services are to be located and clearly marked before construction commences and during the progress thereof;
- b. Where the abovementioned is not possible, employees with jackhammers etc. will be protected against electric shock by the use of suitable protective equipment e.g. rubber mats, insulated handles etcetera;
- c. Electrical installations and -machinery are sufficiently robust to withstand normal working conditions on site;
- d. Temporary electrical installations must be inspected at least once per week by a competent person and a record of the inspections kept on the occupational health and safety file;
- e. Electrical machinery used on a construction site must be inspected daily before start-up by the competent driver/operator or any other competent person and a record of the inspections kept on the occupational health and safety file; and

- f. A competent person appointed in writing must control all temporary electrical installations.

### **5.13 Use and storage of flammables (Construction Regulation 25)**

The Consultant must ensure that:

- a. No person is required or permitted to work in a place where there is the danger of fire or an explosion due to flammable vapors being present unless adequate precautions is taken;
- b. No flammables is used or applied e.g. in spay painting, unless in a room or cabinet or other enclosure specially designed and constructed for the purpose unless there is no danger of fire or explosion due to the application of adequate ventilation;
- c. The workplace is effectively ventilated. Where this cannot be achieved:
  - Employees must wear suitable respiratory equipment
  - No smoking or other sources of ignition is allowed in the area
  - The area is conspicuously demarcated as “flammable”
- d. Flammables stored on a construction site are stored in a well-ventilated, reasonably fire-resistant container, cage or room that is kept locked with consistent access control measures in place and sufficient fire fighting equipment installed and fire prevention methods practiced for example proper housekeeping;
- e. Flammables stored in a permanent flammable store are stored so that no fire or explosion is caused i.e.:
  - Stored in a locked and well-ventilated reasonably fire resistant container, cage or room conspicuously demarcated as “Flammable Store – No Smoking or Naked Lights”
  - The flammables store to be constructed of two-hour fire retardant walls, door and roof and separated from adjoining rooms or workplaces by means of a two-hour fire retardant fire wall
  - Adequate and suitable fire fighting equipment installed in close vicinity of the flammables store and marked with the prescribed signs
  - All electrical switches and fittings to be of a flameproof design
  - Any work done with tools in a flammable store or work areas to be of a non-sparking nature
  - No Class A combustibles such as paper, cardboard, wood, plastic, straw etcetera to be stored together with flammables
  - The flammable store to be designed and constructed to, in the event of spillage of liquids in the store, to contain the full quantity + 10% of the liquids stored

- A sign indicating the capacity of the store to be displayed on the door
- f. Only one day's quantity of flammable is to be kept in the workplace;
- g. Containers (including empty containers) to be kept closed to prevent fumes/vapors from escaping and accumulating in low lying areas;
- h. Metal containers to be bonded to earth whilst decanting to prevent build-up of static forces; and
- i. Welding and other flammable gases to be stored segregated as to the type of gas and empty and full cylinders.

#### **5.14 Housekeeping (Construction Regulation 27)**

The Consultant must ensure that:

- a. Housekeeping is continuously implemented and maintained;
- b. Materials and equipment is properly stored;
- c. Scrap, waste and debris is removed off site regularly;
- d. Materials placed for use are placed safely and not allowed to accumulate or cause obstruction to the free-flow of pedestrians and vehicular traffic;
- e. Waste and debris not to be removed by throwing from heights but by chute or crane;
- f. Where practicable, construction sites are fenced off to prevent entry of unauthorized persons;
- g. Catch platforms or -nets are erected over entry and exit ways or over places where persons are working to prevent them being struck by falling objects;
- h. An unimpeded work space is maintained for every employee;
- i. Every workplace is kept clean, orderly and free of tools and the likes that are not required for the work being done;
- j. As far as is practicable, every floor, walkway, stair, passage and gangway is kept in good state of repair, skid-free and free of obstruction, waste and materials;
- k. The walls and roof of every indoor workplace be sound and leak-free; and
- l. Openings in floors, hatchways, stairways and open sides of floors or buildings are barricaded, fenced, boarded over or provided with protection to prevent persons from falling.

#### **5.15 Stacking and storage (Construction Regulation 28)**

The Consultant must ensure that:

- a. A competent person is appointed in writing to supervise all stacking and storage on a construction site;
- b. Adequate storage areas are provided and demarcated;
- c. The storage areas are kept neat and under control;
- d. The base of any stack is level and capable of sustaining the weight exerted on it by the stack;
- e. The items in the lower layers can support the weight exerted by the top layers;
- f. Cartons and other containers that may become unstable due to wet conditions are kept dry;
- g. Pallets and containers are in good condition and no material is allowed to spill out;
- h. The height of any stack does not exceed 3 times the base unless stepped back at least half the depth of a single container at least every fifth tier or the approval of an inspector of the Department of Labour has been

obtained to build the stacks higher with the aid of a machine. (The operator of the machine must be protected against items falling from overhead or off the stack and no items may overhang);

- i. The articles that make up a single tier are consistently of the same size, shape and mass;
- j. Structures for supporting stacks are structurally sound and able to support the mass of the stack;
- k. No articles are removed from the bottom of the stack first but from the top tier first;
- l. Anybody climbing onto a stack can and does do it safely and that the stack is sufficiently stable to support him or her;
- m. Stacks that are in danger of collapsing are broken down and restacked;
- n. Stability of stacks are not threatened by vehicles or other moving plant and machinery;
- o. Stacks are built in a header and stretcher fashion and that corners are securely bonded; and
- p. Persons climbing onto stacks do not approach unguarded moving machinery or electrical installations.

#### **5.16 Storage of flammable and hazardous chemicals (Hazardous Chemical Substances Regulations)**

See paragraphs 5.13 above and 5.22 below.

#### **5.17 Fire prevention and protection**

The Consultant must ensure that:

- a. The risk of fire is avoided;
- b. Sufficient and suitable storage of flammables is provided;
- c. Sources of ignition is obviated wherever flammable or highly combustible material is present in the workplace, for example:
  - Notices prohibiting smoking is displayed and enforced
  - Welding and flame cutting is only allowed under controlled conditions that includes written hot work permits and by duly competent persons
  - Only spark-free hand and power tools are used
  - No grinding, cutting and shaping of ferrous metals are allowed using electrically driven power tools that produces sparks
  - Flameproof switches and fittings are to be used in the flammable atmosphere
  - Good housekeeping is maintained to prevent the accumulation of unnecessary combustibles
  - Adequate ventilation is maintained
  - Adequate and suitable fixed and portable fire fighting equipment are provided and maintained in good working order with unrestricted access.
- d. Maintenance must include:
  - Regular inspections by a competent person appointed in writing and records of such inspections should be kept in the occupational health and safety file
  - Annual inspection and service by an accredited service provider
- e. All employees are instructed in the use of the fire fighting equipment and know how to attempt to extinguish a fire;



- f. A sufficient number of employees are appointed and trained to act as an emergency team to deal with fires and other emergencies;
- g. Employees are informed regarding emergency evacuation procedures and escape routes;
- h. Emergency escape routes are kept clear at all times and clearly marked;
- i. Evacuation assembly points are demarcated and made known to employees;
- j. Evacuation is regularly practiced to ensure that all persons are evacuated timeously and;
- k. Roll call is held after evacuation to account for all employees and to ensure that no-one including visitors and disabled persons have been left behind; and
- l. A clearly audible, to all persons on site, siren or alarm is fitted and regularly tested.

## **5.18 Eating, changing, washing and toilet facilities (Construction Regulation 30)**

### **5.18.1 Toilets**

- a. The provision of toilets for each sex is required in terms of the National Building Regulations and Construction Regulation 30.
- b. Chemical toilets are allowed instead of the water borne sewerage type. Toilets have to be provided at a ratio of at least 1 toilet per 30 employees.

### **5.18.2 Showers**

At least cold-water showers of some sort for each sex have to be provided at a ratio of at least 1 shower per 15 employees.

### **5.18.3 Change rooms**

Some form of screened off changing facility must be provided separately for each sex.

### **5.18.4 Eating facility**

Some form of eating facility sheltered from the sun, wind and rain must be provided.

#### 5.18.5 Living accommodation

Where the site is in a remote location and transport to home is not readily available, reasonable and suitable living accommodation must be provided after obtaining of the necessary permission from authorities and adhering to requirements such as Bylaws of the local municipality.

#### 5.19 Personal and other protective equipment (Sections 8, 15 and 23 of the OHSA)

The Consultant is required to proactively identify the hazards in the workplace and deal with them on an ongoing basis. He/she must either remove them or, where impracticable take steps to protect employees and make it possible for them to work safely and without risk to health under the hazardous conditions.

Personal protective equipment should, however, be the last resort and there should always first be an attempt to apply re-engineering and other solutions to mitigating hazardous situations before the issuing of personal protective equipment is considered.

Where it is not possible to create an absolutely safe and healthy workplace the Consultant is required to inform employees regarding this and issue, free of charge, suitable equipment to protect them from any hazards being present and that allows them to work safely and without risk to health in the hazardous environment.

It is a further requirement that the Consultant maintain the said equipment that he/she instructs and trains the employees in the use of the equipment and ensures that the prescribed equipment is used by the employee/s in a consistent and correct manner.

Employees do not have the right to refuse to use and/or wear the equipment prescribed by the employer and, if it is impossible for an employee to use or wear prescribed protective equipment through health or any other valid reason, the employee cannot be allowed to continue working under the hazardous condition(s) for which the equipment was prescribed but an alternative solution has to be found that may include relocating the employee.

The Consultant may **not charge any fee** for protective equipment prescribed by him or her **but may charge for equipment under the following conditions**, following a disciplinary hearing:

- Where the employee requests additional issue in excess of what is prescribed;
- Where the employee has blatantly abused or neglected the equipment leading to early failure; and
- Where the employee has lost the equipment.

## **5.20 Portable electrical tools and equipment (Electrical Machinery Regulation 9)**

Portable electrical tools and equipment includes every unit that takes electrical power from a 15 ampere plug point and is moved around for use in the workplace i.e. drills, saws, grindstones, portable lights, etcetera. In addition electrical appliances such as fridges, hotplates, heaters, and etcetera must be inspected regularly but at least on a weekly basis and maintained to the same standards as portable electrical tools and appliances.

The use, inspection and maintenance of portable electrical tools and equipment must be governed by the following:

- Regular inspections by a competent person appointed in writing;
- Inspection results must be recorded in a register;
- Only competent authorized persons are allowed to use portable electrical tools and equipment; and
- The correct protective equipment is worn/ used whilst operating portable electrical tools and equipment.

This equipment -

- Must be maintained in good condition at all times to prevent an electrical shock to the user;
- The main source should incorporate an earth leakage protection device or receive power through a double wound transformer or be double insulated and clearly marked as such; and
- All equipment must be fitted with a switch to allow for safe and easy starting and stopping.

## **5.21 Public health and safety (Section 9 of the OHSA)**

The Consultant is responsible for ensuring that non-employees affected by the construction work are made aware of the dangers likely to arise from said construction work as well as the precautionary measures to be observed to avoid or minimize those dangers. This includes among others:

- a. Non- employees entering the site for whatever reason;
- b. The surrounding community; and
- c. Passers by the site.

Appropriate signage must be posted to this effect and all employees on site must be instructed to ensure that non-employees are protected at all times.

All non-employees entering the site must receive site applicable induction into the hazards and risks and the control measures for these.

## **5.22 Hazardous chemical substances**

The Consultant must ensure that:

- a. Employees receive the necessary information and training to be able to use, handle and store hazardous chemical substances safely;
- b. Employees obey lawful instructions regarding:
  - The wearing and use of personal protective equipment
  - The use, handling and storage of hazardous chemical substances

- The prevention of the release of hazardous chemical substances
  - The wearing and using of exposure monitoring and measuring equipment
  - The cleaning up and disposal of materials containing hazardous chemical substances
  - Housekeeping, personal hygiene and the protection of the environment
- c. The risk assessments required in terms of Construction Regulation 9 include employee exposure to hazardous chemical substances and that the necessary measures be taken to protect persons from being detrimentally affected by hazardous chemical substances present or used in the workplace;
  - d. Suppliers provide the necessary information in the form of material safety data sheets regarding hazardous chemical substances required to ensure the safe use, handling and storage of these substances;
  - e. An up-to-date list is kept on site of hazardous chemical substances stored and used together with the material safety data sheet of the said hazardous chemical substances;
  - f. Hazardous chemical substances containers be clearly marked as to the contents and main hazardous category e.g. “Flammable” or “Corrosive” and the reference number of the hazardous chemical substances on the list indicated above;
  - g. Hazardous chemical substances for example asbestos dust is not cleared by using compressed air but should be vacuumed;
  - h. No person eats or drinks in a hazardous chemical substances workplace; and
  - i. Hazardous chemical substances waste is disposed of safely in terms of hazardous waste disposal requirements.

### **5.23 Excavations (including piling) (Construction Regulation 13)**

Where excavations or any part thereof will exceed 1,5 meters in depth the Consultant will be required to submit a method statement which includes a risk assessment to TCTA for approval before commencing with the excavation and TCTA will issue a permit to proceed once the risk assessment and method statement is approved.

Regardless of the above, all excavation work has to comply with the following:

- 5.23.1 Excavation work must be carried out under the supervision of a competent person with at least two years practical experience in excavation work who has been appointed in writing.
- 5.23.2 Before excavation work begins the stability of the ground must be evaluated.
- 5.23.3 Whilst excavation work is being performed, the Consultant must take suitable and sufficient steps to prevent any person from being buried or trapped by a fall or dislodgement of material.
- 5.23.4 No person may be required or permitted to work in an excavation that has not been adequately shored or braced.

- 2.23.5 Where the excavation is in stable material or where the sides of the excavation are sloped back to at least the maximum angle of repose measured relative to the horizontal plane, shoring or bracing may be left out **but only after** written permission has been obtained from the appointed competent person.
- 5.23.6 Shoring and bracing must be designed and constructed to safely support the sides of the excavation and prevent it from collapsing.
- 5.23.7 Where uncertainty exists regarding the stability of the soil the opinion of a competent professional engineer or professional technologist must be obtained, before excavation proceeds, whose opinion will be decisive. The opinion must be in writing and signed by TCTA or technologist as well as the appointed excavator.
- 5.23.8 No load or material may be placed near the edge of an excavation if it is likely to cause a collapse of the excavation, unless suitable shoring has been installed to be able to carry the additional load.
- 5.23.9 Neighbouring/adjoining buildings, structures or roads that may be affected or endangered by the excavation must be suitably protected.
- 5.23.10 Every excavation must be provided with means of access that must be within 6 metres of any employee within the excavation at any time.
- 5.23.11 The location and nature of any existing services such as water, electricity, gas, telecommunication etcetera must be established before any excavation is commenced with and any service that may be affected by the excavation must be protected and made safe for employees working in or near in the excavation.
- 5.23.12 Every excavation, including the shoring and bracing or any other method to prevent a possible collapse, must be inspected by the appointed competent person as follows:
- l. Daily before work commences
  - m. After every blasting operation
  - n. After an unexpected collapse of the excavation or part thereof
  - o. After substantial damage to any support
  - p. After rain
- 5.23.13 The results of any inspections must be recorded in a register kept on site in the health and safety file.
- 5.23.14 Every excavation accessible to the public or that is adjacent to a public road or thoroughfare or that threatens the safety of persons, must be adequately barricaded or fenced off, on all sides, to at least one meter high and as close to the excavation perimeter as practicable.
- 5.23.15 Provided with warning lights or visible boundary indicators after dark or when visibility is poor.

5.23.16 Upon entering an excavation the requirements of General Safety Regulation 5 must be observed:

- Any confined space may only be entered after the air quality has been tested to ensure that it is safe to breathe and does not contain any flammable or noxious air mixture.
- The confined space must be purged and ventilated of any hazardous or flammable gas, vapour, dust or fumes.
- The safe atmosphere must be maintained.
- Employees are to be provided with breathing apparatus and wearing a safety harness with a rope with the free end of the rope being continuously attended to by a competent person outside the confined space.
- Furthermore, an additional person, trained in resuscitation, to be in full-time attendance immediately outside the confined space.
- Additional serviceable breathing and rescue apparatus is kept immediately outside the confined space for rescue purposes.
- All pipes, ducts etcetera that may leak into the confined space to be blanked off sufficiently to prevent any leakage or seepage.
- The employer must ensure that all employees have left the confined space after the completion of work.
- Where flammable gas is present on or in a confined space no work may be performed in close proximity to the flammable atmosphere that may ignite the flammable gas or vapour.

## **5.24 Blasting**

The Consultant must ensure that:

- a. Blasting activities are carried out under the supervision of a competent person with at least five years practical experience in blasting who has been appointed in writing.
- b. A method statement is developed in accordance with all applicable explosives legislation, by an appointed person who is certified as a competent person in the use of explosives.
- c. The necessary permits are in place for the transportation of explosives to be used.
- d. Access to the blasting area is strictly restricted.
- e. No smoking or hot work is allowed close to explosives or the blasting areas.
- f. Reasonable steps are taken to prevent damage to structures in the vicinity of the blasting area.
- g. Any other industry required safety measures are considered and implemented specifically taking the construction site's specific requirements into account including the removal of any surplus explosives off the site.

## 5.25 Use of explosives

The Consultant shall comply with the requirements of the relevant Explosives Act for all requirements involving the use of explosives for the construction of the Works.

In addition to his compliance with the Explosives Act, the Consultant shall submit to TCTA, for his approval, a full and detailed Method Statement as to his proposals for the use of explosives in the construction of the Works. This shall be submitted at least 7 days before any blasting work is required, and shall include proposals for:

- a. The locations of blasting works;
- b. The location and size of storage magazines, explosives register, security fencing, earthing of building;
- c. Danger signs in English, Afrikaans and Xhosa that shall be prominently displayed at all areas where explosives are stored or used;
- d. Transportation of explosives to and from the magazine;
- e. Licenses required for the magazine(s);
- f. The storage at the place of use;
- g. The use of explosives and dealing with misfires;
- h. The types of explosive and detonators contemplated;
- i. Ensuring that all excavation spoil is free of undetonated caps;
- j. Fencing off excavation spoil dumps and preventing unauthorized entry; and
- k. The names, qualifications and experience of those people responsible for the handling and use of explosives. In addition to the blasting license referred to in the Explosives Act, the employees who shall be responsible for supervising the charging of drill holes with explosives and the blasting shall have documentary proof that they have at least five years experience in supervising the loading and firing of charges in surface works such as quarries or underground works such as tunnel excavation, depending on where it is proposed that they shall be employed.

Notwithstanding the provisions of the Explosives Act, any person who is licensed in the storage, handling and in the use of explosives must be literate, of good sight and hearing and well experienced in the work he is to carry out. TCTA shall have the right of access to storage areas and all registers.

Notwithstanding the provisions of the Explosives Act, the Consultant shall:

- a. Accept a decision of TCTA to suspend the holder of a blasting certificate for an act of negligence or a contravention of the Explosives Act, as if he, as the 'Employer' of the holder of the certificate had made that decision;
- b. Not permit the underground storage of explosives;
- c. Keep on site the originals of licenses for his own staff and acknowledged copies of licenses for any subcontracted works. All license holders will carry acknowledged copies on their person when at work. All blasting licenses or certificates should be valid for the period required on site; and
- d. Install and operate at each point where a blast is to take place a siren of sufficient volume to be easily heard above the general site noise from all points within a 1 km radius of any blast. Hand operated sirens may only be used in areas of restricted access such as a tunnel heading where access is fully controlled. Sirens will be sounded for at least 5 minutes before any blast takes place and will continue for one minute after the

blast has taken place. In addition to the above, the Consultant shall station men on roads and elsewhere with red flags to prevent persons, animals and traffic entering or remaining within the danger zone.

Care shall be taken to ensure that all possible approach routes to the danger zone are covered by these warning arrangements. Blasting shall not be carried out until occupants of any nearby buildings or working areas have been notified by the Consultant at least 24 hours in advance. After blasting, no person shall approach the area until it has been examined by the blasting supervisor or other responsible person and declared safe.

The Consultant shall provide for the approval of TCTA details of each and every blasting operation at least 24 hours before that operation is to be carried out. The details shall show the location of and the intended time of each blast, the number, size and length of each blast hole, the quantity and types of explosives and detonators to be used and the name of the licensed blaster and shift foreman responsible.

## **5.26 Working over or close to water**

Where construction or other support work is undertaken over or in close proximity to water or similar liquids such as wastewater and sludge, the Consultant shall –

- a. Appoint a competent person in writing to supervise, control and inspect any work on or over or in close proximity of the water as well as the construction, installation, and dismantling of caissons and/or cofferdams and/or other support or safety structures;
- b. Ensure that written proof of the competence of above appointee is available on site;
- c. Ensure that risk assessments are carried out by the competent person before any work is undertaken, mitigation measures documented as well as implemented and thereafter evaluated on a daily basis;
- d. Undertake the necessary induction and refresher training;
- e. Ensure that measures for the timeous warning of flooding are in place;
- f. Ensure that provision is made to prevent employees from falling into the water and the rescuing of employees in danger of drowning;
- g. Ensure that where an employee is exposed to the risk of drowning by falling into the water, a lifejacket is provided to and worn by the employee; and
- h. Provide applicable personal protective equipment such as safety harnesses etcetera and enforce the utilization thereof.

## **5.27 Suspended Platforms**

- 5.27.1 The Consultant shall ensure that all suspended platform work operations are carried out under the supervision of a competent person who has been appointed in writing, and that all suspended platform erectors, operators and inspectors are competent to carry out their work.
- 5.27.2 The Consultant shall not use or permit the use of a suspended platform, unless-
  - a. the design, stability and construction thereof comply with the applicable safety standards;



- b. he or she is in possession of a certificate of system design issued by a professional engineer, certificated engineer or a professional technologist for the use of the suspended platform system; and
  - c. he or she is, prior to the commencement of the work, in possession of an operational compliance plan developed by a competent person based on the certificate of system design and applicable to the environment in which the system is being used, this must include proof of the-
    - competent person who has been appointed for supervision;
    - competency of erectors, operators and inspectors;
    - operational design calculations which should comply with the requirements of the system design certificate;
    - performance test results;
    - sketches indicating the completed system with the operational loading capacity of the platform;
    - procedures for and records of inspections having been carried out; and
    - procedures for and records of maintenance work having been carried out.
- 5.27.3 The Consultant making use of a suspended platform system shall forward a copy of the certificate of system design issued by a professional engineer, certificated engineer or professional technologist including a copy of the design calculations, sketches and test results, to the provincial director of the Department of Labour before commencement of the use of the system and must further indicate the intended type of work the system would be used for.
- 5.27.4 The Consultant shall need not re-submit a copy of the certificate of system design for every new project, provided that the environment in which the system is being used does not change to such an extent that the system design certificate is no longer applicable and, should uncertainty exist of the applicability of the system design certificate, the decision of a professional engineer, certificated engineer or professional technologist will be decisive.
- 5.27.5 The Consultant shall ensure that the outriggers of each suspended platform-
- a. are constructed of steel or any other material of similar strength and have a safety factor of at least four in relation to the load it is to carry; and
  - b. have suspension points provided with stop devices or other effective devices at the outer ends to prevent the displacement of ropes.
- 5.27.6 The Consultant shall ensure that-
- a. the parts of the building or structure on which the outriggers are supported, are checked by means of calculations to ensure that the required safety factor is adhered to without risk of damage to the building or structure;
  - b. the suspension wire rope and the safety wire rope are separately connected to the outrigger;
  - c. each person on a suspended platform is provided with and wears a safety harness as a fall prevention device which must at all times, be attached to the suspended platform or to the

- anchorage points on the structure whilst on the suspended platform;
  - d. the hand or power driven machinery to be used for the lifting or lowering of the working platform of a suspended platform is constructed and maintained in such a manner that an uncontrolled movement of the working platform cannot occur;
  - e. the machinery referred to in paragraph (d) is so situated that it is easily accessible for inspection;
  - f. the rope connections to the outriggers are vertically above the connections to the working platform; and
  - g. where the working platform is suspended by two ropes only, the connections of the ropes to the working platform are of such height above the level of the working platform as to ensure the stability of the working platform.
- 5.27.7 The Consultant shall ensure that the suspended platform-
- a. is suspended as near as possible to the structure to which work is being done and, except when light work is being done, is secured at every working position to prevent horizontal movement between the suspended platform and the structure;
  - b. is fitted with anchorage points to which employees will attach the lanyards of the safety harnesses worn and used by the employees and such anchorage connections will have sufficient strength to withstand any potential load applied to it; and
  - c. is fitted with a conspicuous notice easily understandable by all employees working with the suspended platform, showing the maximum mass load which the suspended platform can carry.
- 5.27.8 The Consultant shall cause-
- a. the whole installation and all working parts of the suspended platform to be thoroughly examined in accordance with the manufacturer's specification;
  - b. the whole installation to be subjected to a performance test as determined by the standard to which the suspended platform was manufactured;
  - c. the performance test be undertaken by a competent person appointed in writing with the knowledge and experience of erection and maintenance of suspended platforms or similar machinery and who will determine the serviceability of the structures, ropes, machinery and safety devices before they are used, every time suspended platforms are erected; and
  - d. the performance test of the whole installation of the suspended platform to be subjected to a load equal to that prescribed by the manufacturer or, in the absence of such load, to a load of 110 per cent of the rated mass load, at intervals not exceeding 12 months and in such a manner that every part of the installation is stressed accordingly.
- 5.27.9 The Consultant shall cause every hoisting rope, hook or other load-attaching device which forms part of the suspended platform to be thoroughly examined in accordance with the manufacturer's specification by the competent person before they are used following every time they are assembled, and, in cases of continuous use, at intervals not exceeding three months.
- 5.27.10 The Consultant shall ensure that the suspended platform supervisor appointed, or the suspended platform inspector, carries out a daily inspection of all the equipment prior to use, including establishing whether-

- a. all connection bolts are secure;
  - b. all safety devices are functioning;
  - c. all safety devices are not tampered with or vandalized;
  - d. the maximum mass load of the platform is not exceeded;
  - e. the occupants in the suspended platform are using safety harnesses which have been properly attached;
  - f. there are no visible signs of damage to the equipment; and
  - g. all reported operating problems have been attended to.
- 5.27.11 The Consultant shall ensure that all inspection and performance test records are kept on the construction site at all times and made available to an inspector, TCTA, TCTA's agent or employee upon request.
- 5.27.12 The Consultant shall ensure that all employees required to work or to be supported on a suspended platform are-
- a. physically and psychologically fit to work safely in such an environment by being in possession of a valid medical certificate of fitness;
  - b. competent in conducting work related to suspended platforms safely;
  - c. trained or had received training which include at least-
    - how to access and egress the suspended platform safely;
    - how to correctly operate the controls and safety devices of the equipment;
    - information on the dangers related to the misuse of safety devices;
    - information on the procedures to be followed in the case of-
      - (i) an emergency;
      - (ii) the malfunctioning of equipment;
      - (iii) the discovery of a suspected defect in the equipment;
 and
    - instructions on the proper use of safety harnesses.
- 5.27.13 Where the outrigger is to be moved, the Consultant will ensure that only persons trained and competent to effect such move, perform this task and that an inspection be carried out and the results thereof be recorded by the competent person prior to re-use of the suspended platform.
- 5.27.14 The Consultant shall ensure that the suspended platform is properly isolated after use at the end of each working day such that no part of the suspended platform will present a danger to any person thereafter.

## **5.28 Transportation of employees**

- 5.28.1 Any vehicle used to transport employees must have seats firmly secured and adequate for the number of employees to be carried.
- 5.28.2 The Consultant shall not allow employees to be transported in a goods vehicle unless the portion of the vehicle in which the employees are being conveyed is enclosed to a height of –
- a. at least 350 mm above the surface on which employees are seated; or
  - b. at least 900 mm above the surface on which employees are standing,

in a manner and with a material of sufficient strength to prevent employees from falling from such vehicle when it is in motion.

#### **5.29 Epidemics**

In the event of any outbreak of illness of a highly contagious or epidemic nature the Consultant shall comply with and carry out such regulations, orders and requirements as may be made by the relevant authorities.

#### **5.30 Lightning**

The Consultant shall take precautions against lightning by the use of lightning protection equipment and earthing mats, all of which shall be properly designed and installed to the satisfaction of TCTA. Metalwork and conductors on the site shall be properly earthed. No charging or blasting shall take place if the imminent approach of lightning to the site is forecast. All charged areas shall be immediately evacuated.

#### **5.31 Health measures to address industrial hygiene**

The Consultant shall institute and operate a medical screening and examination system for prospective employees. The screening system shall be established and monitored in consultation with TCTA, the Department of Health and the Department of Labour. Medical screening shall take place before employment, annually, and on termination of employment, for whatever reason.

Subject to the approval of TCTA, the Consultant shall establish a procedure for detecting and treating work related disorders, such as hearing defects or breathing disability. The procedures shall be a best working practice, and shall include for the medical examination of all people whom he proposes to employ on the works. Records of the prospective employee's history of employment and the results of similar examinations shall be required to be produced at this pre-employment examination and shall be duly recorded. The procedure shall also include for annual re-examination and a final one on completion of employment. In addition, further examinations at shorter intervals may be necessary due to the work environment of the employee. Medical examination records of all employees shall be kept by the Consultant on the site in a standard format approved by TCTA. These records shall be sent to TCTA on completion of the works, or sooner as requested by TCTA.

Work related disorders shall include, but not be limited to:

- a. The effect on hearing due to noise exposure. The Consultant shall not expose people to a noise level in excess of 85 dB(A) unless adequate hearing protection in the form of ear muffs or plugs, of a type approved by TCTA for the noise levels emitted, is supplied and worn. The medical examinations referred to above shall include audiometric measurement for air and bone conduction.
- b. The effects on the respiratory system due to dust exposure. The Consultant shall not expose people to dust levels in excess of those specified, unless adequate protection is provided by the use of dust masks or respiratory systems as approved by TCTA for the working

conditions prevailing. The examinations referred to above shall include radiographic testing for pneumoconiosis and other similar disorders.

- c. Chest diseases due to exposure to such contaminable diseases as tuberculosis. The examinations referred to above shall include tests by the use of radiographs and spirometry.
- d. Allergic symptoms due to exposure to conditions to which the person is allergic. Examinations shall include such tests as are appropriate, and will be carried out on demand only.
- e. Local or temporary disorders which may be due to poor sanitary conditions, lack of nutritional food value and the like. Examinations and testing shall be as appropriate and on demand only.

Where referral or rehabilitation is required, the Consultant shall obtain and keep recorded information as to the treatments given and the results achieved.

The Consultant shall identify and negotiate with locally based and operational HIV/Aids and tuberculosis NGOs to provide applicable HIV/Aids awareness training and counseling to the workforce. Suitable HIV/Aids referral facilities should also be identified.

**6. Health and safety policy**

The Consultant has to provide TCTA, as an annexure to the health and safety plan, with a detailed health and safety policy outlining the Consultant's stance on and principles adopted for health and safety.

**7. Cost for health and safety measures during the construction process**

To enable TCTA to comply with Construction Regulation 5(1) (g), all potential Consultants submitting tenders/bids have to demonstrate to TCTA that sufficient provision has been for the cost to implement and maintain the health and safety plan proposed by the Consultant to meet the requirements of this health and safety specification as well as that of the OHSA and its Regulations.

A detailed schedule of costs has to be included in the health and safety plan submitted as part of the potential Consultant's tender document. Failure by the Consultant to adhere to this requirement will force TCTA to reject the tender/bid in terms of Construction Regulation 5(1) (h).

**8. Not Used**

**9. Overview of Attachments**

Attachment 1: Specified framework for the Consultant's occupational health and safety plan.

Attachment 2: Legal compliance assessment.

Attachment 3: Measuring injury experience.

Attachment 4: A Sample SHE Risk Management Report.

Attachment 5: Not Used.

Attachment 6: Not Used.

## **Attachment 1: Health and Safety Plan**

# **Specified framework for the principal contractor's occupational health and safety plan**

## **1. Definitions**

In this document the following expressions shall bear the meanings assigned to them below:

- 1.1 **Client** means any person for whom construction work is being performed and/or undertaken [i.e. Trans Caledon Tunnel Authority (TCTA) for purposes of this specification];
- 1.2 **Construction Regulations** means the Occupational Health and Safety Act's, No 85 of 1993, Construction Regulations that came into effect on 18 July 2003;
- 1.3 **Occupational health and safety plan** means a documented plan which addresses hazards identified and includes safe working procedures to mitigate, reduce or control the hazards identified;
- 1.4 **Occupational health and safety specification** means a documented specification of all health and safety requirements pertaining to the associated works on a construction site, so as to ensure the health and safety of persons working and/or visiting the site;
- 1.5 **OHSACT** means the Occupational Health and Safety Act, No 85 of 1993, as amended; and
- 1.6 **Principal Contractor** means an employer, as defined by section 1 of the OHSACT who performs construction work and is appointed by the Client to be in overall control and management of the construction works.

## **2. Introduction**

In terms of the Construction Regulations [Regulation 5 (1) (a)] of the OHSACT, the Client is required to compile an occupational health and safety specification for each of its projects and the principle contractor, appointed by the Client in terms of Regulation 5 (1) (k), is required to prepare an occupational health and safety plan.

This plan has to be prepared in terms of Regulation 5 (1) as well as the Client's occupational health and safety specification. In terms of Regulation 5 (1)(l), the Client and the principle contractor are required to agree on the occupational health and safety plan before any work may commence.

The principal contractor's health and safety plan has to follow the framework specified in this annexure a minimum guideline.

## **3. Specified framework for the Occupational Health and Safety Plan**

### **3.1 Introduction**

The principal contractor has to demonstrate to the Client that it has developed a suitable and sufficiently documented occupational health and safety plan for the specific project appointed as well as the necessary competencies, experience and resources to perform the construction work safely. The principle contractor should submit the following documentation for perusal and verification by the client:



- a. Management structure.
- b. Quality plan.
- c. Human resources plan.
- d. Registered workplace skills plan.
- e. "Letter of good standing" from the Compensation Commissioner or licensed compensation insurer.
- f. Proof of induction and other training of employees.
- g. Copy of minutes as an example of other project's occupational health and safety committee meetings and copies of incident investigation reports.

### **3.2 Contents of the occupational health and safety plan**

#### **3.2.1 Occupational health and safety management programme**

The occupational health and safety management programme should at least provide a detailed overview of the following matters:

- a. Management of occupational health and safety risks.
- b. Occupational health and safety structures and appointments.
- c. Programme of occupational health and safety inspections.
- d. Occupational health and safety representatives.
- e. Occupational health and safety committee.

#### **3.2.2 Communication principles and management of work**

The communication and management principles to be applied should be in the format as illustrated in Attachment 4 herein and of the content to cover the minimum of the following:

- a. Management structure and responsibilities.
- b. Occupational health and safety goals for the project and arrangements for monitoring and reviewing occupational health and safety performance.
- c. Arrangements for:
  - Regular liaison between parties on site; and
  - Consultation with the workforce.
- d. The exchange of design information between the client, designers, supervisors and contractors on site.
- e. Handling of design changes during the project.
- f. Selection and control of contractors.
- g. The exchange of occupational health and safety information between all contractors on matter such as:
  - Security;
  - Site induction and onsite training;
  - Facilities and first-aid;
  - The reporting and investigation of accidents and incidents;
  - The production and approval of risk assessments and method statements;
  - OHSACT site rules; and
  - Fire and emergency procedures.

- h. Reporting to the client i.e. results of occupational health and safety inspections, incidents, incident investigations and committee meetings.
- i. Reporting of incidents to the Department of Labour and compensation insurer where appropriate.

### **3.2.3 Arrangements for controlling significant site risks and exposures**

The following are some examples of the arrangements for controlling the most significant site risks/exposures:

#### **3.2.3.1 Safety risks**

- a. Services, including temporary electrical installations.
- b. Preventing employees from falling into excavations, from trucks etcetera.
- c. Work with, on or near fragile materials.
- d. Control of lifting operations.
- e. The maintenance of plant and equipment.
- f. Poor ground conditions.
- g. Traffic routes and segregation of vehicles and pedestrians.
- h. Storage of hazardous materials.
- i. Dealing with existing unstable structures and/or land.
- j. Accommodating adjacent land use.
- k. Other significant safety risks as and when identified.

#### **3.2.3.2 Health risks**

- a. Storage and use of hazardous chemical substances.
- b. Dealing with contaminated land or material.
- c. Manual handling.
- d. Reducing noise and vibration.
- e. Provision of adequate lighting.
- f. Ventilation considerations.
- g. Extreme heat and cold temperature considerations.
- h. Dealing with HIV/Aids and other illnesses.
- i. Provision of and maintaining ablution and eating facilities.
- j. Other significant health risks as and when identified.

### **3.3 Preparation of an occupational health and safety operational reference file and/or manual**

The following are some of the minimum requirements to be addressed:

- a. Layout, format and content requirements.
- b. Arrangement for the collection and gathering of information.
- c. Storage and archiving of all the information.
- d. Copy to the client at completion of project.

#### **3.3.1 Minimum contents of an occupational health and safety file and/or manual**

- a. Occupational health and safety policy.

- b. Notice of new projects.
- c. Relevant site start-up documentation.
- d. Security measures.
- e. Copies of written designations and appointments.
- f. Arrangements with contractors and/or mandataries.
- g. Occupational health and safety rules and procedures.
- h. Induction training details.
- i. Occupational health and safety training.
- j. Occupational health and safety promotion.
- k. Occupational health and safety representatives.
- l. Occupational health and safety committees.
- m. Workplace facilities, for example ablution, sheltered eating areas etcetera.
- n. Personal protective equipment.
- o. Workplace inspections and assessments.
- p. Investigation and reporting of incidents and/or accidents.
- q. Mechanical safeguarding.
- r. Electrical safeguarding.
- s. Safeguarding against hazardous substances.
- t. Lifting machinery and equipment.
- u. Construction vehicles and mobile plant.
- v. Welding, heating and flame cutting.
- w. Excavations.
- x. Protection of the environment affected by construction activities.
- y. Keeping of records in terms of the OHSACT.

### **3.4 Risk assessments**

Every principle contractor performing construction work shall, before the commencement of any construction work or work associated with the aforesaid construction work and during such work, ensure that a risk assessment is undertaken by a competent person, appointed in writing, and the risk assessment shall form part of the occupational health and safety plan and be implemented and maintained as contemplated in Construction Regulation 5 (1).

The risk assessment shall include, at least:

- a. The identification of the risks and hazards to which persons may be exposed to;
- b. The analysis and evaluation of the risks and hazards identified;
- c. A documented plan of safe working procedures (SWP) and any method statements to mitigate, reduce or control the risks and hazards that have been identified;
- d. A plan to monitor the application of the SWPs; and
- e. A plan to review the risk assessments as the work progresses and changes are introduced.

In order to ensure compliance with the Construction Regulations, the principal contractor will be required to carry out the following three forms of risk assessment:

#### **3.4.1 Baseline or datum risk assessments**

The principal contractor will be required carry out a risk assessment before the commencement of construction activities. This "baseline" or 'datum" risk assessment will form part of the principal contractor's health and safety plan. The risks and hazards to which persons, plant, vehicles and facilities may be exposed during the construction should be identified and evaluated. Measures to reduce or control these risks or hazards should be defined during this assessment. The effectiveness of the measures defined and the baseline risk assessment prepared shall be monitored and reviewed from time to time to ensure that it remains relevant and accurate

#### **3.4.2 Issue based risk assessments**

The Contractor will be required to carry out separate risk assessments during construction of the Works when methods and procedures are varied, for example when:

- a. Designs are amended,
- b. New machines are introduced,
- c. Plant is periodically cleaned and maintained,
- d. Plant is started-up or shut-down,
- e. Systems of work change or operations alter,
- f. Indents or near-misses occur, or
- g. Technological developments invalidate prior risk assessments

#### **3.4.3 Continuous risk assessments**

The OHSACT specifically requires that employers shall provide and maintain working environments that are safe and without risk to health. The general awareness of hazards needs to be raised as work ethic to maintain a safe and risk free environment on an ongoing basis. This is achieved by continuous risk assessments, the most important form of risk assessment that takes place as an integral part of day-to-day management. Examples of continuous risk assessments include:

- a. Regular audits,
- b. Maintaining general hazard awareness, and
- c. Pre-work risk assessment

The principal contractor's health and safety plan should include a comprehensive list (based on Annexure 7 of the client's occupational health and safety specification) to be carried out as well as the methodology to be followed. The plan should also include detailed site-specific occupational health and safety rules to be applied during the project.

### **3.5 Cost for health and safety measures during the construction process**

To enable the Client to comply with Construction Regulation 4 (1) (h), all potential contractors submitting tenders have to demonstrate to the Client that sufficient provision has been for the cost to implement the health and health

and safety plan proposed by the principal contractor to meet the requirements of this health and safety specification as well as that of the OHSACT and its Regulations.

A detailed schedule of costs has to be included in the health and safety plan submitted as part of the potential principal contractor's tender document. Failure by the principal contractor to adhere to this requirement will force the Client to reject the tender in terms of Construction Regulation 4 (4).

**Attachment 2:       Legal Compliance Assessment**

## Occupational health, -safety and environment: Risk assessment checklist

(Based on the Construction Regulations of the Occupational Health and Safety Act)

*\* Denotes items applicable to both construction sites, contractor plant and storage yards*

ELEMENT	REMARKS
1. Administrative and legal requirements	
2. Education, training and promotion	
3. Public safety, security measures and emergency preparedness	
4. Personal protective equipment	
5. Housekeeping	
6. Working at heights (including roof work)	
7. Scaffolding, formwork and support work	
8. Ladders	
9. Electrical safeguarding	
10. Emergency, fire prevention and protection	
11. Excavations and demolition	
12. Tools	
13. Cranes	
14. Builder's hoist hoists	
15. Transport and materials handling equipment	
16. Site plant and machinery	
17. Plant and storage yard or site workshop specifics	
18. Workplace environment, health and hygiene	

## 1. Administrative and Legal Requirements

OHSA Section or Regulation	Subject	Requirements	Yes/N
Construction Regulation 4	<b>Notice of carrying out Construction work</b>	Department of Labour notified. Copy of notice available on site.	
General Admin. Regulation 4	<b>*Copy of OHSA</b>	Updated copy of the OHSA and Regulations on site. Readily available for perusal by all employees.	
COID Act Section 80	<b>*Registration with Compensation Commissioner or other approved compensation insurer</b>	Written proof of registration/Letter of good standing available on site.	
Construction Regulation 5 & 7(1)	<b>OHSA specification, plans and programme</b>	OHSA spec received from TCTA. OHSA plan developed. OHSA programme implemented. Plans and programme updated regularly.	
Section 8(2)(d) Construction Regulation 9	<b>*Hazard identification and risk assessment</b>	Hazard identification carried out and recorded. Risk assessment and –plan drawn up and updated. Employees and sub-contractors informed and trained.	
Section 16(2)	<b>*Assigned duties (Managers)</b>	Responsibility of complying with the OHSA assigned to other person/s by CEO.	
Construction Regulation 8(1)	<b>Designation of person responsible on site</b>	Competent person appointed in writing as construction supervisor.	
Construction Regulation 8(2)	<b>Designation of assistant for responsible person</b>	Competent person appointed in writing as assistant construction supervisor.	
Section 17 & 18 and General Administrative Regulations 6 & 7	<b>*Election and designation of occupational health and safety representatives</b>	More than 20 employees - one representative and one additional representative for each 50 employees or part thereof. Designation in writing, period and area of responsibility specified. Meaningful reports. Reports actioned by management.	
Section 19 & 20 and General Administrative Regulations 5	<b>*Occupational health and safety committee/s</b>	Committee/s established. Members appointed in writing. Meetings held monthly. Minutes kept. Actioned by management.	
Section 37(1) & (2)	<b>*Agreement with mandataries, contractors and sub-contractors</b>	Written agreement with contractors and sub-contractors. List of contractors and sub-contractors displayed. Proof of Registration with Compensation Commissioner or Compensation Insurer as well as Letter of Good Standing. Construction Supervisor designated. Written arrangements regarding representatives and committee. Written arrangements regarding first-aid.	
Section 24 and General Administrative Regulation 8	<b>*Reporting of incidents (Department of Labour)</b>	Incident reporting procedure displayed. All incidents in terms of section 24 reported to the Provincial Director, Department of Labour, within 3 days (Annexure 1 and/or	



OHSA Section or Regulation	Subject	Requirements	Yes/N
COID Act Section 38, 39 and 41		WCL 1 or 2). Cases of occupational disease reported. Copies of reports available on site. Record of first-aid injuries kept.	
General Administrative Regulation 9	<b>*Investigation and recording of incidents</b>	All injuries which resulted in the person receiving medical treatment other than first aid, recorded and investigated by investigator designated in writing. Copies of reports (Annexure 1) available on site. Tabled at committee meeting. Actioned taken by site management.	
Construction Regulation 10	<b>Fall prevention and protection</b>	Competent person appointed to draw up and supervise the fall protection plan. Proof of appointees' competence available on site. Risk assessment carried out for work at heights. Fall protection plan drawn up and updated. Plan available on site.	
Construction Regulation 10(5)	<b>Roof work</b>	Competent person appointed to plan & supervise roof work. Proof of appointees' competence available on site. Risk assessment carried out. Roof work plan drawn up and updated. Roof work inspect before each shift and inspection register kept. Employees medically examined for physical and psychological fitness and written proof on site.	
Construction Regulation 11	<b>Structures</b>	Information regarding the structure being erected received from the designer including: <ul style="list-style-type: none"> <li>• geo-science technical report where relevant;</li> <li>• the design loading of the structure;</li> <li>• the methods and sequence of construction; and</li> <li>• anticipated dangers, hazards and/or special measures to construct safely.</li> </ul> Risk assessment carried out. Method statement drawn up. All above available on site. Structures inspected before each shift. Inspections register kept.	
Construction Regulation 12	<b>Temporary works</b>	Competent person appointed in writing to supervise erection, maintenance, use and dismantling of support and formwork. Design drawings available on site. Risk assessment carried out. Support and formwork inspected: <ul style="list-style-type: none"> <li>• before use and inspection;</li> <li>• before pouring of concrete;</li> <li>• weekly whilst in place; and</li> <li>• before stripping or dismantling and inspection register kept.</li> </ul>	

OHSA Section or Regulation	Subject	Requirements	Yes/N
Construction Regulation 16	<b>Scaffolding</b>	<p>Competent persons appointed in writing to:</p> <ul style="list-style-type: none"> <li>• erect scaffolding (scaffold erector/s);</li> <li>• act as scaffold team leaders; and</li> <li>• inspect scaffolding weekly and after inclement weather (scaffold inspector/s).</li> </ul> <p>Written proof of competence of above appointees.  Appointees available on site.  Copy of SABS 085 available on site.  Risk assessment carried out.  Inspected weekly and/or after bad weather.  Inspection register/s kept.</p>	
Construction Regulation 17	<b>Suspended platforms</b>	<p>Competent persons appointed in writing to:</p> <ul style="list-style-type: none"> <li>• control the erection of suspended platforms;</li> <li>• act as suspended platform team leaders; and</li> <li>• inspect suspended scaffolding weekly and after inclement weather.</li> </ul> <p>Risk assessment conducted.  Certificate of authorization issued by a registered professional engineer available on site and copy forwarded to the Department of Labour.  The following inspections of the whole installation carried out by a competent person</p> <ul style="list-style-type: none"> <li>• after erection and before use;</li> <li>• daily prior to use; and</li> <li>• inspection register kept.</li> </ul> <p>The following tests to be conducted by a competent person:</p> <ul style="list-style-type: none"> <li>• load test of whole installation and working parts every 12 months; and</li> <li>• hoisting ropes, hooks and load attaching devices quarterly; and</li> <li>• tests log book kept.</li> </ul> <p>Employees working on suspended platforms should be medically examined for physical and psychological fitness. Written proof available.</p>	
Construction Regulation 13	<b>Excavations</b>	<p>Competent person/s appointed in writing to supervise and inspect excavation work.  Written proof of competence of above appointee/s available on site.  Risk assessment carried out.  Excavations inspected:</p> <ul style="list-style-type: none"> <li>• before every shift;</li> <li>• after any blasting;</li> <li>• after an unexpected fall of ground;</li> <li>• after any substantial damage to the shoring; and</li> <li>• after rain.</li> </ul> <p>Inspections register kept.</p>	

OHS Section or Regulation	Subject	Requirements	Yes/N
		Method statement developed where explosives will be and/or are used.	
Construction Regulation 14	<b>Demolition work</b>	Competent person/s appointed in writing to supervise and control demolition work. Written proof of competence of above appointee/s available on site. Risk assessment carried out. Engineering survey and method statement available on site. Inspections to prevent premature collapse carried out by competent person before each shift. Inspection register kept.	
Construction Regulation 19	<b>Materials hoist</b>	Competent person appointed in writing to inspect the material hoist. Written proof of competence of above appointee available on site. Materials hoist to be inspected weekly by a competent person. Inspection register kept.	
Construction Regulation 26	<b>Water environments (including caissons and cofferdams)</b>	Competent person appointed in writing to supervise, control and inspect work on or over water and the construction, installation, and dismantling of caissons and/or cofferdams. Written proof of competence of above appointee available on site. Risk assessment carried by a competent person on a daily basis. Inspection register kept.	
Construction Regulation 21	<b>Explosive powered tools</b>	Competent person appointed to control the issue of the explosive powered tools and cartridges as well as the service, maintenance and cleaning. Register kept of above. Empty cartridge cases, nails and fixing bolts returns recorded. Cleaned daily after use.	
Construction Regulation 20	<b>Bulk Mixing plants</b>	Competent person appointed to control the operation of the batch plant as well as the service, maintenance and cleaning of this plant. Register kept of above. Risk assessment carried out. Batch plant to be inspected weekly by a competent person and inspections register kept.	
Construction Regulation 15 and Mine Health and Safety Act	<b>Tunneling</b>	Complying with Mines Health and Safety Act (29 of 1996). Risk Assessment carried out.	
Construction Regulation 22 Driven Machinery Regulations 18 and 19	<b>Cranes and lifting machines equipment</b>	Competent person appointed in writing to inspect cranes, lifting machines and equipment. Written proof of competence of above appointee available on site. Cranes and lifting tackle identified and	

OHS Section or Regulation	Subject	Requirements	Yes/N
		<p>numbered.  Register kept for lifting tackle.  Logbook kept for each individual crane.  Inspection:</p> <ul style="list-style-type: none"> <li>• <b>All cranes:</b> Daily by operator.</li> <li>• <b>Tower cranes:</b> After erection and thereafter 6 monthly.</li> <li>• <b>Other cranes:</b> Annually by competent person.</li> <li>• <b>Lifting tackle (slings, ropes, chain slings etcetera):</b> Three monthly.</li> </ul>	
<p>Construction  Regulation 24    Electrical    Machinery    Regulations 9 and 10    Electrical    Installation    Regulations</p>	<p><b>*Inspection and maintenance of electrical installation and equipment (including portable electrical tools)</b></p>	<p>Competent person appointed in writing to inspect/test the installation and equipment.  Written proof of competence of above appointee available on site.  Inspections:</p> <ul style="list-style-type: none"> <li>• Electrical installation and equipment inspected after installation, alterations and quarterly thereafter. Inspection registers kept.</li> <li>• Portable electric tools and -lights and extension leads identified/numbered.</li> <li>• Monthly visual inspection by user, issuer or storeman. Register kept.</li> </ul>	
<p>Diving Regulations</p>	<p><b>Diving operations</b></p>	<p>Competent person appointed in writing to supervise diving operations and ensure maintenance, statutory inspection and testing by an approved inspection authority of equipment used.  Written proof of competence of above appointee available on site.  Proof of registration of all divers present on site available.  Risk assessment carried out.  Diving manual produced and available on site.  Record of voice communications kept.  Diving operations record kept.  Each diver keeps a personal logbook and entries countersigned by the diving supervisor.  Decompression tables available on site.  Records of any decompression illness kept.  Certificate of manufacture of any compression chamber or diving bell in use available on site.</p>	
<p>Construction  Regulation 28  General Safety  Regulation 8(1)(a)</p>	<p><b>*Designation of stacking and storage supervisor</b></p>	<p>Competent persons with specific knowledge and experience designated to supervise all stacking and storage.  Written proof of competence of above</p>	

OHSA Section or Regulation	Subject	Requirements	Yes/N
		appointee available on site.	
Construction Regulation 29 Environmental Regulation 9	<b>*Designation of a person to coordinate emergency planning and fire protection</b>	<p>Person/s with specific knowledge and experience designated to coordinate emergency contingency planning and execution and fire prevention measures.</p> <p>Emergency evacuation plan:</p> <ul style="list-style-type: none"> <li>• Developed and available on site;</li> <li>• Drilled and practiced; and</li> <li>• Records of drills and practices available on site.</li> </ul> <p>Fire risk assessment carried out.</p> <p>All fire extinguishing equipment:</p> <ul style="list-style-type: none"> <li>• Identified and on register;</li> <li>• Inspected weekly and inspection registers kept;</li> <li>• Replaced after use; and</li> <li>• Serviced annually.</li> </ul>	
General Safety Regulation 3	<b>*First-aid</b>	<p>Every workplace provided with sufficient number of first-aid boxes (required where 5 persons or more are employed).</p> <p>First-aid boxes freely available.</p> <p>Content of boxes as per the minimum requirements of the OHSA.</p> <p>One qualified First-aider appointed for every 50 employees (required where more than 10 persons are employed).</p> <p>List of First-aiders and competency certificates available on site.</p> <p>Name and contact details of person in charge of first-aid box clearly displayed.</p> <p>Location of first-aid boxes clearly demarcated.</p> <p>Signs instructing employees to report all injuries and/or illness including first-aid injuries.</p>	
General Safety Regulation 2	<b>Personal protective equipment (PPE)</b>	<p>PPE risk assessment carried out.</p> <p>Items of PPE prescribed and use enforced.</p> <p>Records of issue kept.</p> <p>Undertaking by employee to use and/or wear PPE.</p>	
General Safety Regulation 9	<b>*Inspection and use of welding and/or flame cutting equipment</b>	<p>Competent person/s with specific knowledge and experience designated to inspect electric arc, gas welding and flame cutting equipment.</p> <p>Written proof of competence of above appointee available on site.</p> <p>Equipment identified/numbered and entered into a register.</p> <p>Equipment inspected monthly.</p> <p>Inspection register kept.</p>	
Hazardous Chemical Substances (HCS) Regulations Construction Regulation 25	<b>*Control of storage and usage of HCS and other flammables</b>	<p>Competent person/s with specific knowledge and experience designated to control the storage and usage of HCS (including flammables).</p> <p>Written proof of competence of above appointee available on site.</p> <p>Risk assessment carried out.</p>	

OHSA Section or Regulation	Subject	Requirements	Yes/N
		Register of HCS kept and/or used on site.	
Vessels under Pressure Regulations	<b>Vessels under pressure (VUP)</b>	Competent Person/s with specific knowledge and experience designated to supervise the use, storage, maintenance, statutory inspections and testing of VUPs. Written proof of competence of above appointee available on site. Risk assessment carried out. Certificates of manufacture available on site. Register of VUPs on site. Inspections and testing by approved inspection authority (AIA): <ul style="list-style-type: none"> <li>• after installation, re-erection or repairs;</li> <li>• every 36 months; and</li> <li>• register or log kept of inspections, tests, modifications and repair on site.</li> </ul>	
Construction Regulation 23	<b>Construction vehicles and earth moving equipment</b>	Operators or drivers appointed to: <ul style="list-style-type: none"> <li>• Carry out a daily inspection prior to use; and</li> <li>• Drive the vehicle or plant that he/she is competent to drive or operate.</li> </ul> Written proof of competence of above appointee available on site. Record of daily inspections kept on site.	
General Safety Regulation 13A	<b>*Inspection of Ladders</b>	Competent person appointed in writing to inspect ladders. Ladders inspected at arrival on site and monthly thereafter. Inspections register kept on site.	
General Safety regulation 13B	<b>Ramps</b>	Competent person appointed in writing to supervise the erection and inspection of ramps. Inspection register kept on site.	

## 2. Education, training and promotion

Subject	Requirement	Yes/No
*Occupational Health and Safety Policy as per OHSA Section 7(1)	Policy signed by CEO and published and communicated to employees. Policy displayed on employee notice boards. Management and employees committed.	
*Company and site health and safety rules as per OHSA Section 13(a)	Rules published. Rules displayed on employee notice boards. Rules issued and explained to employees with written proof hereof. Follow-up to ensure employees understand and adhere to the rules.	
*Induction and task safety training as per OHSA Section 13(a)	All new employees receive health and safety induction training. Training includes task safety instructions. Employees acknowledge receipt of training. Follow-up to ensure employees understand and adhere to instructions.	
*General health and safety training as per OHSA Section 13(a)	All employees receive basic health and safety training. Written proof kept. Operators of plant and equipment receive specialized training. Follow-up to ensure employees understand and adhere to instructions.	
*Occupational	Incident experience board indicating among others -	

Subject	Requirement	Yes/No
health and safety promotion	<ul style="list-style-type: none"> <li>Number of hours worked without an injury; and</li> <li>Number of days worked without an injury.</li> </ul> Safety grading - Board kept up to date. Relevant safety posters displayed and changed regularly. Employee notice board for health and safety notices. Site health and safety competitions. Company health and safety competition. Participation in regional health and safety competitions. Suggestion scheme.	

### 3. Public safety, security measures and emergency preparedness

Subject	Requirement	Yes/No
*Notices and signs          Site safeguarding *Security measures          *Emergency preparedness          *Emergency drill and evacuation	Notices and signs at entrances along perimeters indicating “ <b>No unauthorized entry</b> ” and “ <b>Entry at own risk</b> ”. Notices and signs at entrance instructing visitors and non-employees what to do, where to go and where to report on entering the site or yard with directional signs for example “ <b>Visitors to report to office</b> ”. Notices and signs posted to warn of overhead work and other hazardous activities for example <b>General Warning Signs</b> . Nets, canopies, stills, fans etcetera to protect members of the public passing and/or entering the site. Access control measures and register in operation. Security patrols after hours and weekends. Sufficient lighting after dark. Guard has access to telephone or other means of emergency communication. Emergency contact numbers displayed near telephone. Emergency evacuation instructions posted up on all notice boards (including employees' notice boards). Emergency contingency plan available on site or in yard. Doors open outwards and unobstructed. Emergency alarm audible all over (including in toilets). Adequate number of employees trained to use fire equipment. Emergency evacuation plan available, displayed and practiced. <b>(See Section 1 for designation and register).</b>	

### 4. Personal protective equipment (PPE)

Subject	Requirement	Yes/No
*PPE needs analysis	Need for PPE identified and prescribed in writing.	
*Head protection	It is compulsory for all persons on site to wear safety helmets including sub-contractors and visitors (where prescribed).	
*Foot protection	All persons on site have to wear safety footwear including gumboots for concrete or wet work and non-slip shoes for roof work.	
*Eye and face protection	Eye and face protection (such as goggles, face shields, welding helmets) to be used when operating the following: <ul style="list-style-type: none"> <li>Jack or kango hammers;</li> <li>Angle or bench grinders;</li> <li>Electric drills (overhead work into concrete, cement and bricks);</li> <li>Explosive powered tools;</li> <li>Concrete vibrators or pokers;</li> </ul>	

Subject	Requirement	Yes/No
	<ul style="list-style-type: none"> <li>Hammers and chisels;</li> <li>Cutting or welding torches;</li> <li>Arc welding equipment;</li> <li>Skill or bench saws; and</li> <li>Spray-painting equipment etcetera.</li> </ul>	
*Hearing protection	<p>Hearing Protectors (such as muffs, plugs) used when operating the following:</p> <ul style="list-style-type: none"> <li>Jack or kango hammers;</li> <li>Explosive powered tools; and</li> <li>Wood or aluminum working machines such as saws, planers, routers.</li> </ul>	
*Hand protection	<p>Protective gloves to be worn by employees handling or using:</p> <ul style="list-style-type: none"> <li>Cement, bricks, steel or chemicals;</li> <li>Welding equipment;</li> <li>Hammers and chisels; and</li> <li>Jack or kango hammers etcetera.</li> </ul>	
*Respiratory protection	<p>Suitable and efficient respirators to be worn correctly by employees handling or using:</p> <ul style="list-style-type: none"> <li>Dry cement;</li> <li>Dusty areas;</li> <li>Hazardous chemicals;</li> <li>Angle grinders; and</li> <li>Spray-painting etcetera.</li> </ul>	
*Fall Prevention Equipment	<p>Suitable safety belts or fall arrest equipment correctly used by persons working on or in unguarded, elevated positions such as:</p> <ul style="list-style-type: none"> <li>Scaffolding;</li> <li>Riggers;</li> <li>Lift shafts;</li> <li>Edge work; and</li> <li>Ring beam edges etcetera.</li> </ul> <p>Other applicable methods of fall prevention should al be applied such as catch nets.</p>	
*Protective clothing	<p>All jobs requiring protective clothing (such as overalls, rain wear, welding aprons etcetera) to be identified and clothing worn.</p>	
*PPE issue and control	<p>Identified equipment to be issued free of charge.</p> <p>All PPE should be maintained in good condition (i.e. regular checks).</p> <p>Workers instructed in the proper use and maintenance of PPE.</p> <p>Commitment obtained from wearer accepting conditions and to wear the PPE.</p> <p>Record of PPE issued kept on file.</p>	

## 5. Housekeeping

Subject	Requirement	Yes/No
*Scrap removal system	<p>All items of scrap, unusable off cuts, rubble and redundant material removed from working areas on a regular basis.</p> <p>Scrap and/or waste removal from heights by chute, hoist or crane (i.e. nothing thrown or swept over sides).</p> <p>Scrap disposed of in designated containers or areas.</p> <p>Removal from site or yard on a regular basis.</p>	
Stacking and storage (See Section 1 for designation and register)	<p>Stacking:</p> <ul style="list-style-type: none"> <li>Stable;</li> <li>On firm level surface or base;</li> <li>Not leaning and/or collapsing;</li> <li>Irregular shapes bonded;</li> </ul>	



Subject	Requirement	Yes/No
	<ul style="list-style-type: none"> <li>Not exceeding 3 times the base;</li> <li>Stacks accessible; and</li> <li>Removal from top only.</li> </ul> <p>Storage:</p> <ul style="list-style-type: none"> <li>Adequate storage areas provided;</li> <li>Functional for example demarcated storage areas, racks, bins etcetera;</li> <li>Special areas identified and demarcated for example flammable gas, cement etcetera:</li> <li>Neat, safe, stable and square:</li> <li>Store and storage areas clear of superfluous material;</li> <li>Storage behind sheds etcetera should be neat and under control; and</li> <li>Storage areas free from weeds, litter etcetera.</li> </ul>	
*Waste control or reclamation	<p>Re-usable off cuts and other re-useable material removed daily and kept to a minimum in the work areas.</p> <p>All re-useable materials neatly stacked or stored in designated areas (i.e. nails removed or bent over in re-useable timber).</p> <p>Issue of hardware, nails, screws and cartridges etcetera should be controlled and return of unused items monitored.</p>	
Sub-contractors	Sub-contractors required to comply with the site or yard's housekeeping requirements.	

## 6. Working at heights (including roof work)

Subject	Requirement	Yes/No
Openings	<p>Unprotected openings adequately guarded, fenced and barricaded with catch nets installed where necessary.</p> <p>Covers over openings in roof of robust construction and secured against displacement.</p>	
General requirements	<p>Roof work discontinued when bad or hazardous weather prevails.</p> <p>Fall protection measures (including warning notices) when working close to edges or on fragile roofing material.</p>	

## 7. Scaffolding, formwork and support work

Subject	Requirement	Yes/No
Access and system scaffolding (See Section 1 for designation and register)	<p>Foundation firm and stable.</p> <p>Sufficient bracing.</p> <p>Tied to structure and secured from side or cross movement.</p> <p>Platform boards in good condition and secured.</p> <p>Sufficient platform boards to be used.</p> <p>Handrails and toe boards provided.</p> <p>Access ladders or stairs provided.</p> <p>Area/s under scaffolding tidy.</p> <p>Safe and unsafe for use signs to be used.</p> <p>Complying with OHSA and SABS 085.</p>	
Free Standing Scaffolding	<p>Foundation firm and stable.</p> <p>Sufficient bracing.</p> <p>Platform boards in good condition and secured.</p> <p>Sufficient platform boards to be used.</p>	

Subject	Requirement	Yes/No
	Handrails and toe boards provided. Access ladders or stairs provided. Area/s under scaffolding tidy. Safe or unsafe for use signs to be used. Height and base ratio correct. Outriggers used and tied to structure where necessary. Complying with OHSA and SABS 085.	
*Mobile scaffolding	Foundation firm and stable. Sufficient bracing. Platform boards in good condition and secured. Sufficient platform boards to be used. Handrails and toe boards provided. Access ladders or stairs provided. Area/s under scaffolding tidy. Safe and unsafe for use signs to be used. Wheels and swivels in good condition Brakes working and applied. Height to base ratio correct. Outriggers used where necessary. Complying with OHSA and SABS 085.	
Suspended scaffolding	Outriggers securely supported and anchored. Correct number of steel wire ropes used. Platform as close as possible to the structure. Handrails on all sides. All winches, ropes, cables and brakes inspected regularly. Inspection registers kept on site. Scaffolding complies with OHSA. Winches maintained by competent person.	
Formwork and support work	All components in good condition. Foundation firm and stable. Adequate bracing and stability ensured. Good workmanship, uprights straight and plum. Good cantilever construction. Safe access provided. Areas under support work tidy. Same standards as for system scaffolding.	
Special scaffolding	Special scaffolding for example cantilever, jib and truss-out scaffolds erected to an acceptable standard and inspected by specialists. Inspection registers to be kept on site.	
Edges and openings	Edges barricaded to acceptable standards. Manhole openings covered and/or barricaded. Openings in floor and other openings covered, barricaded or fenced. Stairs provided with handrails. Lift shafts barricaded or fenced off.	

## 8. Ladders

Subject	Requirement	Yes/No
*Physical condition, use and storage (See Section 1 for designation and register)	Stepladders – hinges, stays, braces and stiles in order. Extension ladders – ropes, rungs, stiles, safety latch and hook in order. Extension or straight ladders secured or tied at the bottom or top. No joined ladders used. All ladders stored on hooks or racks and not on ground. Ladders protrude 900 mm above landings, platforms or roof. Fixed ladders higher than 5 m have cages or fall arrest system.	

## 9. Electrical safeguarding

Subject	Requirement	Yes/No
*Electrical distribution boards and earth leakage	<p>Colour coded, numbered and symbolic sign displayed.</p> <p>Area in front kept clear and unobstructed.</p> <p>Fitted with inside cover plate, openings blanked off and no exposed "live" conductors or terminals.</p> <p>Door kept close.</p> <p>Switches and/or circuit breakers identified.</p> <p>Earth leakage protection unit fitted and operating.</p> <p>Tested with instrument - test results within 15 – 30 milli-amps.</p> <p>Aperture openings provided for the plugging in and removal of extension leads without the need to open the door.</p>	
*Electrical installations and wiring	<p>Temporary wiring or extension leads in good condition with no bare or exposed wires.</p> <p>Earthing continuity and polarity correct:</p> <p><b>"Brown is live, Blue is neutral, Green and Yellow earth the lot"</b></p> <p>Cables protected from mechanical damage and moisture.</p> <p>Correct loading observed for example no heating appliance used from lighting circuit etcetera.</p> <p>Light fittings and lamps protected from mechanical damage/moisture.</p>	
*Physical condition of electrical appliances and tools	<p>Electrical Equipment and Tools (includes all items plugging in to a 15 Amp supply socket):</p> <ul style="list-style-type: none"> <li>• Insulation and casing in good condition.</li> <li>• Earth wire connected or intact where not of double insulated design.</li> <li>• Double insulation mark where no earth wire.</li> <li>• Cord in good condition/no bare wires/secured to machine &amp; plug.</li> <li>• Plug in good condition, connected correctly and correct polarity.</li> </ul>	

## 10. Emergency, fire prevention and protection

Subject	Requirement	Yes/No
*Fire extinguishing equipment (See Section 1 for designation and register)	<p>Fire Risks Identified and on record.</p> <p>Fire Extinguishing Equipment available for:</p> <ul style="list-style-type: none"> <li>• Offices;</li> <li>• General stores;</li> <li>• Flammable store;</li> <li>• Fuel storage tanks;</li> <li>• Gas welding or cutting operations; and</li> <li>• Where flammable substances are being used or applied.</li> </ul>	
*Maintenance	Fire equipment serviced minimum annually, but preferably 6 monthly.	
*Location & Signs	<p>Fire Extinguishing Equipment:</p> <ul style="list-style-type: none"> <li>• Clearly visible;</li> <li>• Unobstructed; and</li> <li>• Sign posted including "No Smoking" and "No Naked Lights" where required i.e. (flammable store, gas store, fuel tanks etc.).</li> </ul>	
* Storage issue and control of flammables (incl. gas cylinders)	<p>Storage area provided for flammables with suitable doors, ventilation, bund etcetera.</p> <p>Flammable store neat and tidy with no Class A combustibles.</p> <p>Decanting of flammable substances carried out in ignition free and</p>	

Subject	Requirement	Yes/No
	adequately ventilated area. Container bonding principles applied. Only sufficient quantities issued for one day's use. Special gas cylinder store or storage area. Gas cylinders stored, used and transported upright and secured in trolley, cradle or structure that is well ventilated. Types of gas cylinders identified and stored separately. Full cylinders stored separately from empty cylinders.	
*Storage, issue and control of Hazardous Chemical Substances (HCS) (See Section 1 for designation and register)	HCS storage principles applied i.e. products segregated. Provision made for leakage and spillage containment. Emergency (serviceable) showers and eye wash facilities provided. HCS under lock and key as well as controlled by designated person. Decanted or issued in containers with information and warning labels. Disposal of unwanted HCS by recognized disposal agent.	

## 11. Excavations and demolition

Subject	Requirement	Yes/No
Excavations deeper than 1.5 m. (See Section 1 for designation and register)	Shored or braced to prevent caving or falling in. Provided with an access ladder. Excavations guarded, barricaded or lighted after dark in public areas. Soil dumped at least 1 m away from edge of excavation. On sloping ground soil dumped on lower side of excavation.	

## 12. Tools

Subject	Requirement	Yes/No
*Hand tools	Shovels, Spades and Picks: <ul style="list-style-type: none"> <li>Handles free from cracks and splinters;</li> <li>Handles fit securely; and</li> <li>Working end sharp and true.</li> </ul> Hammers: <ul style="list-style-type: none"> <li>Good quality handles, no pipe or reinforcing steel handles;</li> <li>Handles free from cracks and splinters; and</li> <li>Handles fit securely.</li> </ul> Chisels: <ul style="list-style-type: none"> <li>No mushroomed heads or heads chamfered;</li> <li>Not hardened; and</li> <li>Cutting edge sharp and square.</li> </ul> Saws: <ul style="list-style-type: none"> <li>Teeth sharp and set correctly; and</li> <li>Correct saw used for the job.</li> </ul>	
*Explosive powered tools (See Section 1 for designation and register)	Only used by trained and authorised personnel. Prescribed warning signs placed or displayed where tool is in use. Inspected at least monthly by competent person and results recorded in on site register. Issue and return recorded including cartridges or nails and unused cartridges, nails, empty shells recorded. Cleaned daily after use in on site register.	

### 13. Cranes

Subject	Requirement	Yes/N
Tower crane (See Section 1 for designation and register)	<p>Only operated by trained authorized operator with valid certificate of training.</p> <p>Certificate available on site.</p> <p>Structure - no visible defects.</p> <p>Electrical installation good and safe.</p> <p>Crane hook - throat pop marked, safety latch fitted and functional.</p> <p>SWL/MML displayed.</p> <p>Limit switches fitted and operational.</p> <p>Access ladder fitted with backrests or fall arrest system installed.</p> <p>Lifting tackle in good condition and inspection colour coding current.</p>	
*Mobile crane (See Section 1 for designation and register)	<p>Only operated by trained authorized operator with valid certificate of training.</p> <p>Certificate available on site.</p> <p>Rear view mirrors and windscreen visibility good.</p> <p>Windscreen wipers operating effectively.</p> <p>Indicators operational.</p> <p>Hooter working.</p> <p>Tyres safe with sufficient tread and pressure visibly sufficient.</p> <p>No missing wheel nuts.</p> <p>Headlights, taillights operational.</p> <p>Grease nipples and grease on all joints.</p> <p>No visible oil leaks.</p> <p>Hydraulic pipes visibly sound with no leaks.</p> <p>No undue corrosion on battery terminals.</p> <p>Boom visibly in good condition with no apparent damage.</p> <p>Cable and sheaves greased with no visible damage, split wires or corrosion.</p> <p>Brakes working properly.</p> <p>Crane hook - throat pop marked, safety latch fitted and functional.</p> <p>SWL/MML displayed.</p> <p>By-pass valves operational.</p> <p>Deflection chart displayed and visible to operator or driver.</p> <p>Outriggers functional used.</p>	
*Gantry crane	<p>Only operated by trained authorized persons.</p> <p>Correct slinging techniques used.</p> <p>Recognized displayed on chart signals used.</p> <p>Log book kept up to date.</p> <p>Prescribed inspections conducted on crane and lifting tackle.</p> <p>"Crane overhead" signage, where applicable.</p> <p>Crane hook - throat pop marked, safety latch fitted and functional.</p> <p>SWL/MML displayed and load limiting switches fitted and operational.</p>	

### 14. Builder's hoist

Subject	Requirement	Yes/N
Builder's hoist (See Section 1 for designation and register)	<p><b>"Hoist in operation"</b> - sign displayed.</p> <p>General construction strong and free from latent defects.</p> <p>Tower:</p> <ul style="list-style-type: none"> <li>• Adequately secured and braced.</li> <li>• At least 900 mm available for over travel.</li> <li>• Barricaded at least 2 100 mm high at ground level and floors.</li> <li>• Landing place provided with gate at least 1 800 high.</li> </ul> <p>Platform:</p>	

Subject	Requirement	Yes/N
	<ul style="list-style-type: none"> <li>No persons conveyed on platform.</li> <li>Steel wire ropes with breaking strain of six times maximum weight.</li> <li>Signal systems used.</li> <li>Goods prevented from moving/falling off.</li> <li>Effective brake capable of holding maximum weight.</li> </ul>	

## 15. Transport and materials handling equipment

Subject	Requirement	Yes/N
*Site vehicles	<p>All site vehicles, dumpers, bobcats, loaders etcetera checked daily before used by driver or operator.</p> <p>Inventory of vehicles used/operated on site.</p> <p>Inspection by means of a checklist and results recorded.</p> <p>No persons will ride on equipment not designed for passengers.</p> <p>Site speed limit posted and not exceeded.</p> <p>Drivers and operators trained and licensed.</p> <p>Licenses available on site.</p> <p>No unauthorized persons allowed to drive or operate equipment.</p>	
Conveyors	<p>Conveyor belt nip points and drive guarded.</p> <p>Emergency stop and lever brake fitted, clearly marked and accessible.</p>	

## 16. Site plant and machinery

Subject	Requirement	Yes/N
Brick cutting machine	<p>Operator trained and only authorized persons use the machine.</p> <p>Emergency stop switch clearly marked and accessible.</p> <p>Area around the machine dry and slip or trip free as well as clear of off cuts.</p> <p>All moving drive parts guarded.</p> <p>Electrical supply cable protected.</p> <p>Operator using correct PPE i.e. eye, face, hearing, foot, hands and body.</p>	
*Electric arc welder	<p>Welder trained.</p> <p>Only authorized and trained persons use welder.</p> <p>Adequately earthed.</p> <p>Electrode holder in good condition and safe.</p> <p>Cables, clamps, lugs and connectors in good condition.</p> <p>Area in which welding machine is used is dry and protected from wet.</p> <p>Welder using correct PPE i.e. eye, face, foot, body and respiratory.</p> <p>Screens and warning signs placed.</p>	
*Woodworking machines	<p>Operator's trained and only authorized persons use machines.</p> <p>Provided with guards and guards used.</p> <p>Operators using correct PPE i.e. eye, face, foot and hearing.</p>	
*Compressors	<p>Relief valves set, locked and sealed.</p> <p>Maximum safe working pressure (MSWP) indicated on face of pressure gauge face and not on glass cover.</p> <p>All drives adequately guarded.</p> <p>Receiver and lines drained daily.</p> <p>Hoses good condition and clamped, not wired.</p>	
Concrete mixer and batch plant	<p>Top platform provided with guardrails.</p> <p>Dust abatement methods in use.</p> <p>Operators using correct PPE i.e. eye, hands and respiratory.</p>	

Subject	Requirement	Yes/N
	All moving drive parts guarded. Emergency stops identified, indicated and accessible. Area kept clean, dry and free from tripping and slipping hazards. Banksman identified and crane signals displayed and used.	
*Gas welding and flame cutting equipment	Only authorized and trained persons use the equipment. Torches and gauges in good condition. Flashback arrestors fitted at cylinders and gauges. Hoses in good condition, correct type and all connections with clamps. Cylinders stored, used and transported in upright position, secured in trolley or cradle. Fire prevention control methods applied. Hot work permits.	

## 17. Plant and storage yard or site workshop specifics

Subject	Requirement	Yes/N
OHSA, Section 8(2)(1) General Machinery Regulation 2(1) <b>Supervision of the use and maintenance of machinery</b>	Persons with specific knowledge and experience designated to supervise the use and maintenance of machinery. Critical items of machinery identified, numbered and placed on register or inventory. Inspection or maintenance schedules for abovementioned. Inspections or maintenance carried out to above schedules. Results recorded.	
General Machinery Regulation 9(2) <b>Notices regarding operation of machinery</b>	Schedule D notice posted in work areas.	
Vessels under Pressure Regulation 13(1)(b) <b>Supervision of the use and maintenance of vessels under pressure (VUP)</b>	Persons with specific knowledge and experience designated to Supervise the use and maintenance of VUPs. VUPs identified, numbered and placed on register. Manufacturers plate intact. Inspection or maintenance schedules for abovementioned. Inspections or maintenance carried out to above schedules. Results recorded and test certificates available.	
<b>Lock-out procedure</b>	Lock-out procedure in operation.	
<b>Ergonomics</b>	Ergonomics survey conducted. Results on record. Survey results applied.	
<b>Demarcation and colour coding</b>	Demarcation principles applied. All services, pipes, electrical installation, stop-start controls, emergency controls etcetera colour coded to own published or SABS standard. Employees trained to identify colour coding.	
<b>Portable and bench grinders</b>	Area around grinder clear and trip/slip free. Bench grinders mounted securely and grinder generally in good condition. No excessive vibration. On and off switch or button clearly demarcated and accessible. Adequate guards in place. Tool rest – secure, square and maximum 2 mm gap. Stone or disk - correct type and size, mounted correctly and dressed. Use of eye protection enforced.	
<b>Ancillary lifting equipment</b>	Chain blocks, tirsors, jacks and mobile gantries etcetera identified and numbered on register.	

Subject	Requirement	Yes/N
	Chains in good condition and links no excessive wear. Lifting hooks – throat pop marked and safety latch fitted. SWL/MML marked or displayed.	
<b>Presses, guillotines and shears</b>	Only operated by trained and authorized persons. PPE used by operators Interlocks or lockouts fitted.	

## 18. Workplace environment, health and hygiene

Subject	Requirement	Yes/No
*Lighting	Adequate lighting in places where work is being executed for example stairwells and basements or after sunset. Light fittings placed and installed causing no irritating or blinding glare.	
*Ventilation	Adequate ventilation, extraction and exhausting in hazardous areas for example where chemicals and adhesives are stored, welding takes place and where petrol or diesel motors are running in confined spaces or basements.	
*Noise	Tasks identified where noise exceeds 85 dBa. All reasonable steps taken to reduce noise levels at the source. Hearing protection used where noise levels could not be reduced to below 85 dBa.	
*Heat stress	Measures in place to prevent heat exhaustion in heat stress problem areas e.g. steel decks, when the WBGT index reaches 30 (see Environmental Regulation 4). Cold drinking water readily available when extreme temperatures are experienced.	
*Ablution facilities	Sufficient toilets provided for men and women separately i.e. 1 per 30 employees (National Building Regulations prescribe chemical toilets for Construction sites). Toilet paper available. Sufficient showers provided for men and women separately. Facilities for washing hands provided. Soap available for washing hands. Means of drying hands available. Changing facilities or area provided for men and women separately. Ablution facilities hygienic and clean.	
*Eating and cooking facilities	Adequate storage facilities provided. Weather protected eating area provided, separate from changing area. Refuse bins with lids provided. Facilities clean and hygienic.	
*Pollution of environment	Measures in place to minimize dust generation. Accumulation of empty cement pockets, plastic wrapping or bags, packing materials etcetera prevented. Spillage or discarding of oil, chemicals and diesel into storm water and other drains prevented.	



Subject	Requirement	Yes/No
*Hazardous chemical substances <b>(See Section 1 for designation and register)</b>	All substances identified and list available e.g. acids, flammables, poisons etc. Material Safety Data Sheets (MSDS) indicating hazardous properties and emergency procedures in case of incident on file and readily available. Substances stored safely.	

Name of person who have undertaken the assessment  
Signature

\_\_\_\_\_

Date

Received by

Designation

Date

Tabled at health and safety committee

\_\_\_\_\_

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**Attachment 3:      Measuring Injury Experience**

# Measuring injury experience

## 1. Background

Injury experience has moved from measuring injury by the use of a disabling injury frequency rate, the so-called “DIFR”. The DIFR was calculated by multiplying the number of disabling injuries by 1 million and dividing by the number of person-hours worked.

The DIFR has been replaced internationally with a Recordable Case Rate (RCR). The only difference between the two rates is that the 1 million in the calculation is replaced with 200 000 (200 000 purported to be the number of hours and average person works in a lifetime).

In using of the two rates with manipulation of disabling injuries to hide the facts by returning the injured employee to the workplace so as not to lose a shift and therefore having not to register a disabling injury will not be tolerated.

This Attachment provides guidance in the use of RCR rate based on the number of compensation injury claims, which are found not to be easy to manipulate because the reporting of compensational injuries is a legal requirement.

Measure of the RCR rate shall include professional staff on the project.

## 2. Recordable Case Rate (RCR)

### 2.1 Formula

$$\frac{\text{No of Recordable Cases X 200 000}}{\text{*220 person hours X No of employees}}$$

### 2.2 Definitions

**No of compensation claims:** The number of recordable cases for the period under review which, while being inclusive shall cover disabling and compensation claims. The Consultants shall keep his own register of cases regardless of their submission for compensation and use for reporting.

**200 000:** The fixed factor to align the rate with other rates used internationally.

**Person hours worked Include:** The denominator of the equation covers the total hours worked on the project to date of the report. The monthly data for the person hours shall be obtained from labour returns kept by the Consultant. Should an alternative calculation method be applicable to obtain hours for the daily paid employees the employee number is

multiplied by a common factor of 220 (No of employees X \*220 each) for construction workers and  
(No of employees X \*168 hours each) for professional staff

**220 and 168 person-hours:**

The \*average number of hours worked by one construction employee in one month in the construction industry and by one professional in construction industry.

**Note:** \* Overtime, absence on leave or sick leave, unrecorded after hours time worked by senior and middle management factored into this average. The total worked hours is always available from the contractor's labour data.

**No of employees:**

The actual or average number of employees employed for the period under review.

## Monthly Health and Safety Report

[illegible]

$$RCR = \frac{[ \textit{recordable cases} ] \times 200\,000}{[ \textit{total hours} ]}$$

**Attachment 4:        Sample SHE Management Report**

# **Sample Safety, Health and Environment (SHE): Risk management report**

Please note that this is an example only and all information is fictitious.

## **XYZ Construction**

### **SHE risk management report for the period January 2004 to March 2004**

#### **1. Introduction**

We trust that this quarterly SHE Risk Management report will provide a clear picture of the company's performance as far as occupational health, safety and environment is concerned.

The first quarter of 2004 generally reflected an improvement in injury experience and indicates a decline in the number of injuries. Although Building was the only division where there was an increase in compensation claims, figures are still well down from the average 2003 figures. A sub-contractor experienced one fatality.

All divisions are eagerly awaiting the final implementation during May 2004 of the new electronic SHE Management system that will provide the tools to implement the SHE programme and make it available to all management and supervisory staff.

#### **2. Incident statistics**

##### **2.1 Recordable Case Rate (RCR)**

See a sample report provided as Attachment 3:      Measuring      Injury  
Experience

##### **2.2. Other major incidents**

Three other major incidents were experienced in the period under review:

- 2.3.1. A major trench collapsed at Job. 00123: XYZ Head Office, Braamfontein: No personnel injured, extensive damage to foundations: 3 days delay.
- 2.3.2. A concrete dumper ran away when its brakes failed. It smashed into the glass façade of the building on Job 00332: McDonalds, Randburg. The driver jumped off and was not injured. Cost of damage to façade: R45 000.
- 2.3.3. A storage hut on Job 00567: BP Petrol Station, Swartruggens was demolished by fire when the night watchman made a fire inside the storage hut which contained concrete vibrators and leveling machines. Cost of replacing the hut and machines: R30 000.

#### **3. Risk areas**

The following items of concern need priority consideration by management:

- 3.1. New employees must undergo pre-employment medical examinations to:
- protect XYZ from possible claims at a later stage
  - ensure that only capable persons are employed
  - prevent injuries and illness in the workplace
  - enhance XYZ image
- 3.2. Vehicle drivers and plant operators must be instructed to inspect their vehicles daily before start-up using the prescribed checklists to ensure that these are safe to operate and in good condition.

#### 4. Risk assessments

Three SHE risk assessments were conducted in February and March:

Job 00432:	Gillooly's Mall	Compliance: 56%
Job 00786:	Cullinan Head Office	Compliance: 83%
Job 00589:	Cleveland Station	Compliance: 76%

#### 5. Training

One hundred and forty two employees, representing 7% of employees, attended nine training courses. \*Our objective is to train 5,5% of employees on a quarterly basis.

Month	No. of Employees Trained	Course	Source
January	26 15 3	Induction OH&S Reps Crane Drivers	Internal Consultant External
February	23 17	Induction OH&S Reps	Internal Consultant
March	43 9 3 3	Induction OH&S Reps Bomag Rollers First Aiders	Internal Consultant Supplier St. John's

#### 6. Legal matters

- 6.1. An inspector of the Department of Labour issued an improvement notice on Job 00987: Gillooley's Mall. The notice requires that all scaffolding comply with the SABS standards for the Erection and Maintenance of Access Scaffolding (SANS 085). This is currently being attended to and the inspector will return on 15 April 2004 to ascertain if the notice has been complied with.

#### 7. Occupational health matters

##### 7.1 HIV Aids

The proposed clinic will soon be operational and we will then be able to send our employees who have tested positive for HIV/Aids to the clinic for counseling and eventual treatment when necessary.

The mobile clinic attended to and tested fifty employees on a voluntary basis at 3 sites this month. Eighteen of them tested positive.



## **7.2 Tuberculosis (TB)**

The mobile clinic will be calling at Gillooly's Mall and Cleveland Station on 15 and 16 April 2004 respectively to screen employees for TB.

## **7.3 Noise**

All suspected noise pollution areas have been identified and tested and the results are awaited. Employees working in areas testing over 85dBa will be issued with suitable hearing protectors.

## **8. Environmental measures**

Inspectors from the Botswana Department of Environment visited Djwaneng and inspected the site and yard. They gave it a "clean bill of health" and advised that we should increase the dust control measures by spraying roads three times per day with water instead of the present twice per day.

## **9. Achievements and awards**

- 9.1 The client at Djwaneng (Job 00786) awarded the XYZ site first position in the housekeeping competition conducted bi-monthly by the client's SHE managers. The project manager and his team are to be congratulated for this sterling effort.
- 9.2 Job 0987: Refurbishment of Pretoria Main Railway Station has just completed 1 million compensation claim free days. This was no easy achievement if we consider the conditions being worked under after the extensive fire that caused major damage.

**Source:** SAFCEC Occupational Health and Safety Committee

**Attachment 5:** -

**Not Used**

**Attachment 6:** -

**Not Used**

## **AGREEMENT**

### **APPENDIX 6: ENVIRONMENTAL AUTHORISATION AND PRE-CONSTRUCTION MANAGEMENT PROGRAMME**



## environment, forestry & fisheries

Department:  
Environment, Forestry and Fisheries  
**REPUBLIC OF SOUTH AFRICA**

Private Bag X 447· PRETORIA · 0001· Environment House ·473 Steve Biko Road, Arcadia· PRETORIA

**DEA Reference:** 14/12/16/3/3/94/1

**Enquiries:** Ms Masina Litsoane

**Telephone:** (012) 399 9375 **E-mail:** [MLitsoane@environment.gov.za](mailto:MLitsoane@environment.gov.za)

Mr Kobus Bester  
Department of Water and Sanitation  
Private Bag X313  
**PRETORIA**  
0001

Telephone Number: (012) 336 8071  
Email Address: [besterk@dws.gov.za](mailto:besterk@dws.gov.za)

### PER EMAIL / MAIL

Dear Mr Bester

### **APPLICATION FOR ENVIRONMENTAL AUTHORISATION IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, ACT NO. 107 OF 1998, AS AMENDED: FOR THE UMKHOMAZI WATER PROJECT PHASE 1: RAW WATER COMPONENT – WATER CONVEYANCE INFRASTRUCTURE WITHIN RICHMOND, IMPENDLE AND MSUNDUZI LOCAL MUNICIPALITIES IN THE KWAZULU-NATAL PROVINCE**

With reference to the above application, please be advised that the Department has decided to grant authorisation. The Environmental Authorisation (EA) and reasons for the decision are attached herewith.

In terms of Regulation 4(2) of the Environmental Impact Assessment Regulations, 2014, as amended (the EIA Regulations), you are instructed to notify all registered interested and affected parties, in writing and within 14 (fourteen) days of the date of the decision as well as the provisions regarding the submission of appeals that are contained in the Regulations.

In terms of the Promotion of Administrative Justice Act, Act No. 3 of 2000, you are entitled to the right to fair, lawful and reasonable administrative action; and to written reasons for administrative action that affects you negatively. Further your attention is drawn to the provisions of the Protection of Personal Information Act, Act No. 4 of 2013 which stipulate that the Department should conduct itself in a responsible manner when collecting, processing, storing and sharing an individual or another entity's personal information by holding the Department accountable should the Department abuse or compromise your personal information in any way.

Your attention is drawn to Chapter 2 of National Environmental Management Act, Act No. 107 of 1998 National Appeal Regulations published under Government Notice R993 in Government Gazette No. 38303 dated 08 December 2014 (National Appeal Regulations, 2014), which prescribes the appeal procedure to be followed. Kindly include a copy of this document (National Appeal Regulations, 2014) with the letter of notification to interested and affected parties in this matter.

Should any person wish to lodge an appeal against this decision, he/she must submit the appeal to the appeal administrator, and a copy of the appeal to the applicant, any registered interested and affected party, and any organ of state with interest in the matter within 20 days from the date that the notification of the decision was

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sent to the registered interested and affected parties by the applicant; or the date that the notification of the decision was sent to the applicant by the Department, whichever is applicable.

**Appeals must be submitted in writing in the prescribed form to:**

The Director: Appeals and Legal Review of this Department at the below mentioned addresses.

By email: [appeals@environment.gov.za](mailto:appeals@environment.gov.za);

By hand: Environment House  
473 Steve Biko  
Arcadia  
Pretoria  
0083; or

By post: Private Bag X447  
Pretoria  
0001

Please note that in terms of Section 43(7) of the National Environmental Management Act, Act No. 107 of 1998, as amended, the lodging of an appeal will suspend the environmental authorisation or any provision or condition attached thereto. In the instance where an appeal is lodged, you may not commence with the activity until such time that the appeal is finalised.

To obtain the prescribed appeal form and for guidance on the submission of appeals, please visit the Department's website at [https://www.environment.gov.za/documents/forms#legal\\_authorisations](https://www.environment.gov.za/documents/forms#legal_authorisations) or request a copy of the documents at [appeals@environment.gov.za](mailto:appeals@environment.gov.za).

Yours faithfully



**Mr Sabelo Malaza**  
**Chief Director: Integrated Environmental Authorisations**  
**Department of Environment, Forestry and Fisheries**

Date: 19/11/2020

cc:	Donavan Henning	Nemai Consulting (Pty) Ltd	Email: <a href="mailto:donavanh@nemai.co.za">donavanh@nemai.co.za</a>
	Ian Felton	KZN Department of Economic Development, Tourism and Environmental Affairs (EDTEA)	Email: <a href="mailto:Ian.Felton@kznedtea.gov.za">Ian.Felton@kznedtea.gov.za</a>
	Ashantia Nerissa Pillay	Ezemvelo KZN Wildlife	Email: <a href="mailto:Nerissa.Pillay@kznwildlife.com">Nerissa.Pillay@kznwildlife.com</a>



**environment, forestry  
& fisheries**

Department:  
Environment, Forestry and Fisheries  
**REPUBLIC OF SOUTH AFRICA**

## Environmental Authorisation

In terms of Regulation 25 of the Environmental Impact Assessment Regulations, 2014

The uMkhomazi Water Project Phase 1: Raw Water Component – Water Conveyance Infrastructure

uMgungundlovu District Municipality

<b>Authorisation register number:</b>	14/12/16/3/3/94/1
<b>Last amended:</b>	First issue
<b>Holder of authorisation:</b>	Department of Water and Sanitation
<b>Location of activity:</b>	Portion 0 of the Farm Crowle 2260; Portion 0 of the Farm Smithfield 14796; Portion 0 of the Farm Nooitgedacht 1026; Portions 2,5,10,11 and 12 of the Farm Moor 1997; Portions 0,1,2,3 and 5 of the Farm Furth 1995; Portion 10 of the Farm Strathavon 1851; Portion 4 of the Farm Graighead 1859; Portions 1 and 4 of the Farm Long 2961; Portions 0 and 1 of the Farm Lot 107 1848; Portions 0 and 1 of the Farm Cottingham 1856; Portions 0 and 1 of the Farm Dunreath 2026; Portion 1 of the Farm Sevontein 1313; Portions 140,183,184, 529 and 550 of the Farm Dunbar Estate 1478; Portions 0,1 and 3 of the

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	<i>Farm Driefontein 854; Portions 0 and 1 of the Farm Meyers Hoek 847; Portion 0 of the Farm Onrust 848; Portion 0 of the Farm Baynesfield 17359; Portions 3,8,and 12 of the Farm Nooitgedacht 903 and Portion 0 of the The Mynde 15363, The Mzunduzi, Impendle and Richmond Local Municipalities; uMgungundlovu District Municipality; Kwa-Zulu Natal Province.</i>
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This authorisation does not negate the holder of the authorisation's responsibility to comply with any other statutory requirements that may be applicable to the undertaking of the activity.



## Decision

The Department is satisfied, on the basis of information available to it and subject to compliance with the conditions of this Environmental Authorisation, that the applicant should be authorised to undertake the activities specified below.

Non-compliance with a condition of this Environmental Authorisation may result in criminal prosecution or other actions provided for in the National Environmental Management Act, Act No. 107 of 1998, as amended and the EIA Regulations, 2014, as amended.

Details regarding the basis on which the Department reached this decision are set out in Annexure 1.

## Activities authorised

By virtue of the powers conferred on it by the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment Regulations, 2014, as amended, the Department hereby authorises –

### DEPARTMENT OF WATER AND SANITATION

(hereafter referred to as the **holder of the authorisation**)

with the following contact details –

Mr Kobus Bester  
Department of Water and Sanitation  
Private Bag X313  
**PRETORIA**  
0001  
Tel: (012) 336 8071  
Cell: (083) 419 1976  
E-mail: [besterk@dws.gov.za](mailto:besterk@dws.gov.za)

to undertake the following activities (hereafter referred to as "the activity") indicated in Listing Notice 1, Listing Notice 2 and Listing Notice 3 as amended (GN R. 983, 984 and 985 as amended):

Activity number	Activity description
<p><u>Listing Notice 1 Item 9:</u></p> <p><i>"The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water-</i></p> <p><i>(i) with an internal diameter of 0,36 metres or more;</i></p> <p><i>or</i></p> <p><i>(ii) with a peak throughput of 120 litres per second or more;</i></p> <p><i>excluding where-</i></p> <p><i>(a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve; or</i></p> <p><i>(b) where such development will occur within an urban area.</i></p>	<p>This activity is triggered by the bulk water infrastructure associated with the uMWP-1 Water Conveyance Infrastructure.</p> <p>The proposed tunnel is in the region of 34 km long (depending on the route selected within the proposed tunnel corridor), and the internal diameter of the tunnel is 3.5 m.</p> <p>A raw water pipeline will link the tunnel to the proposed Water Treatment Works (WTW). The WTW was applied for under uMWP-1 Potable Water.</p>
<p><u>Listing Notice 1 Item 12:</u></p> <p><i>"The development of -</i></p> <p><i>(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or</i></p> <p><i>(ii) infrastructure or structures with a physical footprint of 100 square metres or more;</i></p> <p><i>where such development occurs -</i></p> <p><i>(a) within a watercourse;</i></p> <p><i>(b) in front of a development setback; or</i></p> <p><i>(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; -</i></p>	<p>The components associated with the uMWP-1 Water Conveyance Infrastructure affect the uMkhomazi and uMlaza Rivers and their tributaries through construction work instream of these watercourses / within 32m from these watercourses (e.g. footprints of infrastructure, pipeline crossings, access road crossings, spoil sites, tunnel related infrastructure at entrance and exit points, etc.).</p>
<p><u>Listing Notice 1 Item 14</u></p> <p><i>(ii) "The development of facilities or infrastructure, for the storage, or for the</i></p>	<p>"Dangerous goods" that are likely to be associated with the greater project, are fuel stores used during the construction and operational phases.</p>

<p><i>storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.</i></p>	
<p><u>Listing Notice 1 Item 19:</u>  <i>"The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;  but excluding where such infilling, depositing, dredging, excavation, removal or moving -  (a) will occur behind a development setback;  (b) is for maintenance purposes undertaken in accordance with a maintenance management plan;  (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;  (d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or  (e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.</i></p>	<p>The components associated with the uMWP-1 Water Conveyance Infrastructure affect the uMkhomazi and uMlaza Rivers and their tributaries through construction work instream of these watercourses / within 32m from these watercourses (e.g. footprints of infrastructure, pipeline crossings, access road crossings, spoil sites, tunnel related infrastructure at entrance and exit points, etc.).</p>
<p><u>Listing Notice 1 Item 24:</u>  <i>"The development of a road -  (i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or  (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres</i></p>	<p>Access roads to the various sites (tunnel portals and adits, spoil sites, pipeline work fronts, etc.).</p>
<p><u>Listing Notice 1 Item 27:</u></p>	<p>Clearance of areas associated with the construction footprint, including tunnel portals, spoil sites, etc.</p>

<p><i>"The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for-</i></p> <ul style="list-style-type: none"> <li><i>(i) the undertaking of a linear activity; or</i></li> <li><i>(ii) maintenance purposes undertaken in accordance with a maintenance management plan.</i></li> </ul>	
<p><u>Listing Notice 1 Item 28:</u></p> <p><i>"Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development:</i></p> <ul style="list-style-type: none"> <li><i>(i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or</i></li> <li><i>(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare; excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.</i></li> </ul>	<p>Parts of project footprint were historically used for agricultural purposes. Operators' housing and offices to be built.</p>
<p><u>Listing Notice 1 Item 30:</u></p> <p><i>"Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)."</i></p>	<p>The proposed project impacts on biodiversity, as documented in the Final EIA Report, as well as in the First and Second Addenda.</p>
<p><u>Listing Notice 1 Item 31:</u></p> <p><i>"The decommissioning of existing facilities, structures or infrastructure for -</i></p> <ul style="list-style-type: none"> <li><i>(i) any development and related operation activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014;</i></li> <li><i>(ii) any expansion and related operation activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014;</i></li> </ul>	<p>Decommissioning of fuel storage areas after construction.</p>

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<p>(iv) any phased activity or activities for development and related operation activity or expansion or related operation activities listed in this Notice or Listing Notice 3 of 2014; or</p> <p>(v) any activity regardless the time the activity was commenced with, where such activity:</p> <p>(a) is similarly listed to an activity in (i) or (ii) above; and</p> <p>(b) is still in operation or development is still in progress;</p>	
<p><u>Listing Notice 1 Item 48:</u></p> <p>"The expansion of -</p> <p>(i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; or</p> <p>(ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square metres or more;</p> <p>where such expansion occurs -</p> <p>(a) within a watercourse;</p> <p>(b) in front of a development setback; or</p> <p>(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;</p>	<p>Expansion of infrastructure associated with the development with a physical footprint of 100 square metres or more within watercourse(s) / within 32 m from watercourse(s), including existing access roads.</p>
<p><u>Listing Notice 1 Item 56:</u></p> <p>"The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre-</p> <p>(i) where the existing reserve is wider than 13,5 meters; or</p> <p>(ii) where no reserve exists, where the existing road is wider than 8 metres;</p> <p>excluding where widening or lengthening occur inside urban areas.</p>	<p>Widening or lengthening of existing roads to create access roads, and for the relocation of roads that will be inundated.</p>

<p><u>Listing Notice 1 Item 67:</u></p> <p><i>"Phased activities for all activities—</i></p> <p><i>(i) listed in this Notice, which commenced on or after the effective date of this Notice or similarly listed in any of the previous NEMA notices, which commenced on or after the effective date of such previous NEMA Notices</i></p> <p><i>ii) listed as activities 5, 7, 8(ii), 11, 13, 16, 27(i) or 27(ii) in Listing Notice 2 of 2014 or similarly listed in any of the previous NEMA notices, which commenced on or after the effective date of such previous NEMA Notices; where any phase of the activity was below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold.</i></p>	<p>Possible phased activities that may collectively trigger this listed activity.</p>
<p><u>Listing Notice 2 Item 11:</u></p> <p><i>"The development of facilities or infrastructure for the transfer of 50 000 cubic metres or more water per day, from and to or between any combination of the following -</i></p> <p><i>(i) water catchments;</i></p> <p><i>(ii) water treatment works; or</i></p> <p><i>(iii) impoundments;</i></p> <p><i>excluding treatment works where water is to be treated for drinking purposes.</i></p>	<p>Water is transferred from the uMkhomazi River (from Smithfield Dam) to the Western Aqueduct at a rate of 8.65m<sup>3</sup>/s.</p>
<p><u>Listing Notice 2 Item 15:</u></p> <p><i>"The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for-</i></p> <p><i>(i) the undertaking of a linear activity; or</i></p> <p><i>(ii) maintenance purposes undertaken in accordance with a maintenance management plan.</i></p>	<p>Cumulative area to be cleared of indigenous vegetation (except linear components) exceeds 20 hectares. This includes tunnel portals, spoil sites, etc.</p>

<p><u>Listing Notice 3 Item 4(d)(viii), (xi) and (xii):</u></p> <p><i>"The development of a road wider than 4 metres with a reserve less than 13,5 metres.</i></p> <p><i>(d) In KwaZulu-Natal:</i></p> <p><i>(viii) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;</i></p> <p><i>(xi) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;</i></p> <p><i>(xii) Outside urban areas:</i></p> <p><i>(aa) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve; or</i></p> <p><i>(bb) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined;</i></p>	<p>Access roads to the various sites (tunnel portals, spoil sites, etc.), which are located in areas that are deemed to be important from a biodiversity perspective.</p>
<p><u>Listing Notice 3 Item 10(d)(ix), (xii) and (xiii):</u></p> <p><i>The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres.</i></p> <p><i>(d) In KwaZulu-Natal:</i></p> <p><i>(ix) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;</i></p> <p><i>(xii) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;</i></p>	<p>Temporary storage of dangerous goods (e.g. fuel) during the construction phase. Possible occurrence of sensitive biodiversity features in the project area.</p>

<p>(xiii) Outside urban areas:</p> <p>(aa) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve;</p> <p>(bb) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined; or</p> <p>(cc) Areas within 100 metres from the edge of a watercourse;</p>	
<p><u>Listing Notice 3 Item 12(b)(iv), (v) and (xii):</u></p> <p><i>"The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan:</i></p> <p><i>(b) In KwaZulu-Natal:</i></p> <p><i>(iv) Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;</i></p> <p><i>(v) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;</i></p> <p><i>(xii) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority."</i></p>	<p>Construction activities will involve clearance of indigenous vegetation in areas designated to be sensitive.</p>
<p><u>Listing Notice 3 Item 14(d)(vii), (viii) and (x)</u></p> <p><i>"The development of -</i></p>	<p>The components associated with the uMWP-1 Water Conveyance Infrastructure affect the uMkhomazi and uMlaza Rivers and their tributaries through</p>

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<p>(i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or</p> <p>(ii) infrastructure or structures with a physical footprint of 10 square metres or more;</p> <p>where such development occurs -</p> <p>(a) within a watercourse; -</p> <p>(b) in front of a development setback; or</p> <p>(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;</p> <p>(d) <u>In KwaZulu-Natal:</u></p> <p>(vii) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;</p> <p>(viii) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;</p> <p>(x) Outside urban areas:</p> <p>(aa) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve;</p>	<p>construction work instream of these watercourses / within 32m from these watercourses (e.g. footprints of infrastructure, pipeline crossings, access road crossings, spoil sites, tunnel related infrastructure at entrance and exit points, etc.). Certain parts of the aforementioned development footprints occur within areas designated to be sensitive.</p>
<p><u>Listing Notice 3 Item 18(d)(viii), (xi) and (xii):</u></p> <p>"The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre:</p> <p>(d) <u>In KwaZulu-Natal:</u></p> <p>(viii) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;</p> <p>(xi) Sensitive areas as identified in an environmental management framework as</p>	<p>Widening or lengthening access roads within areas designated to be sensitive.</p>

<p>contemplated in chapter 5 of the Act and as adopted by the competent authority;</p> <p>(xii) Outside urban areas:</p> <p>(aa) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve; or</p> <p>(bb) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is Determined."</p>	
<p><u>Listing Notice 3 Item 23(d)(viii) and (x)</u></p> <p>"The expansion of -</p> <p>(i) dams or weirs where the dam or weir is expanded by 10 square metres or more; or</p> <p>(ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more; where such expansion occurs -</p> <p>(a) within a watercourse;</p> <p>(b) in front of a development setback adopted in the prescribed manner; or</p> <p>(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse:</p> <p>(d) <u>In KwaZulu-Natal:</u></p> <p>(viii) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;</p> <p>(x) Outside urban areas:</p> <p>(aa) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve.</p>	<p>Expansion of infrastructure associated with the development by 10 square metres or more within watercourse(s) / within 32 m from watercourse(s), including existing access roads, within areas designated to be sensitive.</p>

<p><u>Listing Notice 3 Item 26</u></p> <p><i>"Phased activities for all activities -</i></p> <p><i>(i). listed in this Notice and as it applies to a specific geographical area, which commenced on or after the effective date of this Notice; or</i></p> <p><i>(ii) similarly listed in any of the previous NEMA notices, and as it applies to a specific geographical area, which commenced on or after the effective date of such previous NEMA Notices—</i></p> <p><i>where any phase of the activity was below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold;."</i></p>	<p>Possible phased activities that may collectively trigger this listed activity.</p>
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as described in the Environmental Impact Assessment Report (EIAR) dated November 2016, First and Second Addenda dated August 2018 and September 2020 respectively at:

#### SG 21 Code

LIST OF SGIDS SG Code	Farm	Portion
N0FS0000000022600000	Crowle 2260	0
N0FS00000000147960000	Smithfield 14796	0
N0FS00000000102600000	Nooitgedacht 1026	0
N0FT00000000199700010	Moor 1997	10
N0FT00000000199700012	Moor 1997	12
N0FT00000000199700005	Moor 1997	5
N0FT00000000199700002	Moor 1997	2
N0FT00000000199700011	Moor 1997	11
N0FT00000000199500003	Furth 1995	3
N0FT00000000199500005	Furth 1995	5
N0FT00000000199500000	Furth 1995	0
N0FT00000000199500002	Furth 1995	2
N0FT00000000199500001	Furth 1995	1

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NOFT00000000185100010	Strathavon 1851	10
NOFT00000000185900004	Graighead 1859	4
NOFT00000000296100001	Long 2961	1
NOFT00000000296100004	Long 2961	4
NOFT00000000184800001	Lot 107 1848	1
NOFT00000000184800000	Lot 107 1848	0
NOFT00000000185600001	Cottingham 1856	1
NOFT00000000185600000	Cottingham 1856	0
NOFT00000000202600000	Dunreath 2026	0
NOFT00000000202600001	Dunreath 2026	1
NOFT00000000131300001	Sevontein 1313	1
NOFT00000000147800184	Dunbar Estate 1478	184
NOFT00000000147800529	Dunbar Estate 1478	529
NOFT00000000147800550	Dunbar Estate 1478	550
NOFT00000000085400001	Driefontein 854	1
NOFT00000000147800183	Dunbar Estate 1478	183
NOFT00000000085400003	Driefontein 854	3
NOFT00000000147800140	Dunbar Estate 1478	140
NOFT00000000085400000	Driefontein 854	0
NOFT00000000084700000	Meyers Hoek 847	0
NOFT00000000084700001	Meyers Hoek 847	1
NOFT00000000084800000	Onrust 848	0
NOFT00000000173590000	Baynesfield 17359	0
NOFT00000000090300008	Nooitgedacht 903	8
NOFT00000000090300012	Nooitgedacht 903	12
NOFT00000000090300003	Nooitgedacht 903	3
NOFT000000001536300000	The Mynde 15363	0

- for the establishment of water conveyance infrastructure for the Smithfield Dam within the Msunduzi, Impendle and Richmond Local Municipalities in the Kwa-Zulu Natal Province, hereafter referred to as "the property"

UMWP-1 Raw Water Component: Water Conveyance Infrastructure:

Raw Water Component	Associated Infrastructure
Raw Water Conveyance Infrastructure	<ol style="list-style-type: none"><li>1. Tunnel</li><li>2. Tunnel intake tower</li><li>3. Raw water pipeline</li><li>4. Spoil sites (inlet, outlet and central portals)</li><li>5. Access road to Shaft 1</li><li>6. Access road to Shaft 2</li><li>7. Access road to Shaft 3</li><li>8. Access road to adit entry</li><li>9. Access road to tunnel outlet portal</li><li>10. Ventilation shaft</li><li>11. Adits</li><li>12. Hydropower plant</li></ol>

## Conditions of this Environmental Authorisation

### Scope of authorisation

1. Authorisation is granted for the establishment of water conveyance infrastructure for the Smithfield Dam within the Msunduzi, Impendle and Richmond Local Municipalities in the Kwa-Zulu Natal Province. The tunnel and pipeline corridors and Option B spoil sites 1, 3, 4, 5, 6, 7, and 8 are hereby approved
2. Authorisation of the activity is subject to the conditions contained in this Environmental Authorisation, which form part of the Environmental Authorisation and are binding on the holder of the authorisation.
3. The holder of the authorisation is responsible for ensuring compliance with the conditions contained in this Environmental Authorisation. This includes any person acting on the holder's behalf, including but not limited to, an agent, servant, contractor, sub-contractor, employee, consultant or person rendering a service to the holder of the authorisation.
4. The activities authorised may only be carried out at the property as described above.
5. Any changes to, or deviations from, the project description set out in this Environmental Authorisation must be approved, in writing, by the Department before such changes or deviations may be effected. In assessing whether to grant such approval or not, the Department may request such information as it deems necessary

to evaluate the significance and impacts of such changes or deviations and it may be necessary for the holder of the authorisation to apply for further Environmental Authorisation in terms of the regulations.

6. The holder of an Environmental Authorisation must apply for an amendment of the Environmental Authorisation with the Competent Authority for any alienation, transfer or change of ownership rights in the property on which the activity is to take place.
7. This activity must commence within a period of ten (10) years from the date of issue of this Environmental Authorisation. If commencement of the activity does not occur within that period, the authorisation lapses and a new application for Environmental Authorisation must be made in order for the activity to be undertaken.
8. Construction must be completed within five (05) years of the commencement of the activity on site.
9. Commencement with one activity listed in terms of this Environmental Authorisation constitutes commencement of all authorised activities.

#### **Notification of authorisation and right to appeal**

10. The holder of the authorisation must notify every registered interested and affected party, in writing and within 14 (fourteen) calendar days of the date of this Environmental Authorisation, of the decision to authorise the activity.
11. The notification referred to must –
  - 11.1. specify the date on which the authorisation was issued;
  - 11.2. inform the interested and affected party of the appeal procedure provided for in the National Appeal Regulations, 2014;
  - 11.3. advise the interested and affected party that a copy of the authorisation will be furnished on request; and
  - 11.4. give the reasons of the Competent Authority for the decision.

#### **Commencement of the activity**

12. The authorised activity shall not commence until the period for the submission of appeals has lapsed as per the National Appeal Regulations, 2014, and no appeal has been lodged against the decision. In terms of Section 43(7), an appeal under Section 43 of the National Environmental Management Act, Act No. 107 of 1998, as amended will suspend the Environmental Authorisation or any provision or condition attached thereto. In the instance where an appeal is lodged you may not commence with the activity until such time that the appeal has been finalised.

## Management of the activity

13. A copy of the final site layout map must be made available for comments by registered Interested and Affected Parties and the holder of this environmental authorisation must consider such comments. Once amended, the final development layout map must be submitted to the Department for written approval prior to commencement of the activity. All available biodiversity information must be used in the finalisation of the layout map. Existing infrastructure must be used as far as possible e.g. roads. The layout map must indicate the following:
  - 13.1.1. Final tunnel route and pipeline route within the approved corridors;
  - 13.1.2. Foundation footprint;
  - 13.1.3. Internal roads indicating width;
  - 13.1.4. Wetlands, drainage lines, rivers, stream and water crossing of the dam's associated infrastructure;
  - 13.1.5. All sensitive features e.g. heritage sites, wetlands, pans and drainage channels that will be affected by the water conveyance infrastructure;
  - 13.1.6. All existing infrastructure on the site, especially roads;
  - 13.1.7. Soil heaps (temporary for topsoil and subsoil and permanently for excess material);
  - 13.1.8. Temporary construction laydown areas;
  - 13.1.9. Heritage sites that will be affected by the water conveyance infrastructure;
  - 13.1.10. Borrow pits;
  - 13.1.11. Buildings, including accommodation; and,
  - 13.1.12. All "no-go" and buffer areas.; and
  - 13.1.13. A map combining the final layout plan superimposed (overlain) on the environmental sensitivity map with **the co-ordinates of all associated infrastructure.**
14. The Environmental Management Programme (EMPr) submitted as part of the EIAR is hereby NOT approved and it must be amended to incorporate all the details that are to be part of the finalised detailed Biodiversity Offset and Compensation Plan; and must also include measures as dictated by the final tunnel and pipeline routes, and the provisions of this environmental authorisation. The amended EMPr must be made available for comments by registered Interested and Affected Parties and the holder of this environmental authorisation must consider such comments. Once amended, the final EMPr must be submitted to the Department for written approval prior to commencement of the activity. Once approved the EMPr must be implemented and adhered to.
15. The amended EMPr must include the following:

- 15.1. The detailed final Biodiversity Offset and Compensation Plan developed in consultation with relevant stakeholders including *inter alia*, EDTEA and Ezemvelo KZN Wildlife. The plan must include the following:
    - 15.1.1. Finalised site selection.
    - 15.1.2. Landowner engagement and agreement regarding suitable legal, financial and stewardship mechanism for the offsets.
    - 15.1.3. Detailed design and planning of rehabilitation action and restoration plan.
    - 15.1.4. Necessary authorisation, licences and permits needed to implement rehabilitation structures where necessary.
    - 15.1.5. Defined budgets for offsets implementation based on the finalisation of the details of all of the above.
    - 15.1.6. Binding agreements and Terms of Reference between role-players for the implementation of the biodiversity offsets.
    - 15.1.7. Drawn programme of work for implementation of offsets on particular sites.
  - 15.2. The Catchment and Ecological Infrastructure Management Plan for the upper uMkhomazi catchment. The plan must:
    - 15.2.1. Identify and map degraded and declining ecological infrastructure in the upper uMkhomazi catchment.
    - 15.2.2. Identify appropriate interventions aimed in restoring, improving and maintaining identified areas.
    - 15.2.3. Include detailed design and plan for rehabilitation, restoration and maintenance actions.
  - 15.3. A rescue and relocation plan for the floral species of conservation significance that cannot be accommodated within the development footprint.
16. An environmental Monitoring Committee (EMC) must be established by the holder of the authorisation before commencement of construction activities.
- 16.1. The EMC must meet before the commencement of construction activities (to appoint a chairperson and to discuss terms of reference); from then on the EMC must sit once every two months and /or on a quarterly basis (depending on the circumstances and in agreement with this Department).
  - 16.2. The EMC shall consists of, *inter alia*, representatives from all Departments that have jurisdiction over the area, relevant organs of state and key stakeholders identified during the public participation process including the ECO.
  - 16.3. The EMC shall be responsible for:
    - 16.4. The on-going and continuous development of the EMPr applicable to the development.
    - 16.5. Monitoring adherence and compliance to the approved EMPr.
    - 16.6. Making necessary amendments to the operational EMPr as and when required.
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- 16.7. The recommendations and mitigation measures proposed by the EMC shall be submitted to the Department for approval. Once approved, the EMPr must be implemented and adhered to.

### **Frequency and process of updating the EMPr**

17. The EMPr must be updated where the findings of the environmental audit reports, contemplated in Condition 25 below, indicate insufficient mitigation of environmental impacts associated with the undertaking of the activity, or insufficient levels of compliance with the environmental authorisation or EMPr.
18. The updated EMPr must contain recommendations to rectify the shortcomings identified in the environmental audit report.
19. The updated EMPr must be submitted to the Department for approval together with the environmental audit report, as per Regulation 34 of the EIA Regulations, 2014 as amended. The updated EMPr must have been subjected to a public participation process, which process has been agreed to by the Department, prior to submission of the updated EMPr to the Department for approval.
20. In assessing whether to grant approval of an EMPr which has been updated as a result of an audit, the Department will consider the processes prescribed in Regulation 35 of the EIA Regulations, 2014 as amended. Prior to approving an amended EMPr, the Department may request such amendments to the EMPr as it deems appropriate to ensure that the EMPr sufficiently provides for avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity.
21. The holder of the authorisation must apply for an amendment of an EMPr, if such amendment is required before an audit is required. The amendment process is prescribed in Regulation 37 of the EIA Regulations, 2014, as amended. The holder of the authorisation must request comments on the proposed amendments to the impact management outcomes of the EMPr or amendments to the closure objectives of the closure plan from potentially interested and affected parties, including the competent authority, by using any of the methods provided for in the Act for a period of at least 30 days.

### **Monitoring**

22. The holder of the authorisation must appoint an experienced Environmental Control Officer (ECO) for the construction phase of the development that will have the responsibility to ensure that the mitigation/rehabilitation measures and recommendations referred to in this environmental authorisation are implemented and to ensure compliance with the provisions of the approved EMPr.
  - 22.1. The ECO must be appointed before commencement of any authorised activities.

- 22.2. Once appointed, the name and contact details of the ECO must be submitted to the *Director: Compliance Monitoring* of the Department.
- 22.3. The ECO must keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.
- 22.4. The ECO must remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site is ready for operation.

### **Recording and reporting to the Department**

- 23. All documentation e.g. audit/monitoring/compliance reports and notifications, required to be submitted to the Department in terms of this environmental authorisation, must be submitted to the *Director: Compliance Monitoring* of the Department.
- 24. The holder of the environmental authorisation must, for the period during which the environmental authorisation and EMPr remain valid, ensure that project compliance with the conditions of the environmental authorisation and the EMPr are audited, and that the audit reports are submitted to the *Director: Compliance Monitoring* of the Department.
- 25. The frequency of auditing and of submission of the environmental audit reports must be as per the frequency indicated in the EMPr, taking into account the processes for such auditing as prescribed in Regulation 34 of the EIA Regulations, 2014 as amended.
- 26. The holder of the authorisation must, in addition, submit environmental audit reports to the Department within 30 days of completion of the construction phase (i.e. within 30 days of site handover) and a final environmental audit report within 30 days of completion of rehabilitation activities.
- 27. The environmental audit reports must be compiled in accordance with Appendix 7 of the EIA Regulations, 2014 as amended and must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the environmental authorisation conditions as well as the requirements of the approved EMPr.
- 28. Records relating to monitoring and auditing must be kept on site and made available for inspection to any relevant and competent authority in respect of this development.

### **Notification to authorities**

- 29. A written notification of commencement must be given to the Department no later than fourteen (14) days prior to the commencement of the activity. Commencement for the purposes of this condition includes site

preparation. The notice must include a date on which it is anticipated that the activity will commence, as well as a reference number.

### **Operation of the activity**

30. A written notification of operation must be given to the Department no later than fourteen (14) days prior to the commencement of the activity operational phase.

### **Site closure and decommissioning**

31. Should the activity ever cease or become redundant, the holder of the authorisation must undertake the required actions as prescribed by legislation at the time and comply with all relevant legal requirements administered by any relevant and Competent Authority at that time.

### **Specific conditions**

#### Conditions for Non-operational aspects

32. The final tunnel and pipeline routes within the approved corridors must be concluded in collaboration with the avifaunal, ecological and acoustic specialists, and must be approved by Registered Professional Engineer and it must be submitted to the Department for record keeping prior to commencement of construction activities.
33. A Ground-Borne Vibration Monitoring Programme must be instituted during the tunnelling and blasting phase to ensure that vibration limits do not exceed Peak Particle Velocity (PPV) levels of 0,1 mm/s for continued steady state vibration and 0,57 mm/s for impulse transients.
34. The tunnelling and blasting activities must be undertaken during the migration period of the Blue Swallows, (April – September).
35. The detailed final Biodiversity Offset and Compensation Plan must be developed in consultation with relevant stakeholders including inter alia, EDTEA and Ezemvelo KZN Wildlife and must be approved by the competent authority prior to construction commencing on any part or aspect of the development.
- (i) The Biodiversity Offset and Compensation plan submitted for approval must be accompanied by a binding Memorandum of Agreement between the Applicant and Ezemvelo KZN Wildlife and the MoA must clearly define the roles and responsibilities of each party.
  - (ii) The EA holder is not allowed to deviate from any requirements of the Biodiversity Offset plan during the implementation stage of the plan.

- (iii) The implementation process of Biodiversity Offset must coincide and run concurrently with the commencement process for the construction of the dam and its associated infrastructure which, will draw its guidance from the EMPr.
  - (iv) A specialist must be appointed to evaluate progress in relation to the implementation and management of the Biodiversity Offset Plan requirements and they must submit reports every six months to be tabled for discussions at the EMC meetings.
36. The Catchment and Ecological Infrastructure Management Plan must be developed for the upper uMkhomazi catchment to address the issues of land degradation that will affect the dam functionality and must be submitted to the competent authority for approval prior to construction commencing on any part or aspect of the development.
37. A pre-construction survey of the final development footprint must be conducted to ascertain the identity and exact number of individual protected species affected by the proposed development prior to the commencement of construction.
38. The relevant permits must be obtained from EKZNW's Permits Office; for rescue and relocation of floral species of conservation significance; the removal or destruction of indigenous, protected or endangered plant or animal species that cannot be accommodated within the development footprint. Copies of the permit/s must also be included in the final EMPr to be submitted to this Department for approval before commencement of construction activities.
39. A comprehensive habitat rehabilitation and restoration plan must be developed for the site and must be submitted to the competent authority for approval prior to construction commencing on any part or aspect of the development. Restoration must be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.
40. No exotic plants may be used for rehabilitation purposes. Only indigenous plants of the area may be utilised.
41. Construction must include design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of storm water run-off.
42. Should any archaeological sites, artefacts, paleontological fossils or graves be exposed during construction, work in the immediate vicinity of the find must be stopped, SAHRA must be informed and the services of an accredited heritage professional obtained for an assessment of the heritage resources to be made.
43. An integrated waste management approach must be implemented that is based on waste minimisation and must incorporate reduction, recycling, re-use and disposal where appropriate. Any solid waste must be disposed of at a landfill licensed in terms of Section 20 (b) of the National Environment Management Waste Act, 2008 (Act No.59 of 2008).
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## General

44. A copy of this Environmental Authorisation, the audit and compliance monitoring reports, and the approved EMPr, must be made available for inspection and copying-
- 44.1. at the site of the authorised activity;
  - 44.2. to anyone on request; and
  - 44.3. where the holder of the Environmental Authorisation has a website, on such publicly accessible website.
45. National government, provincial government, local authorities or committees appointed in terms of the conditions of this authorisation or any other public authority shall not be held responsible for any damages or losses suffered by the holder of the authorisation or his/her successor in title in any instance where construction or operation subsequent to construction be temporarily or permanently stopped for reasons of non-compliance by the holder of the authorisation with the conditions of authorisation as set out in this document or any other subsequent document emanating from these conditions of authorisation.

Date of Environmental Authorisation: 19/11/2020

  
Mr Sabelo Malaza

Chief Director: Integrated Environmental Authorisations  
Department of Environment, Forestry and Fisheries

## Annexure 1: Reasons for Decision

### 1. Information considered in making the decision

In reaching its decision, the Department took, *inter alia*, the following into consideration -

- a) The listed activities as applied for in the application form received on 10 October 2018.
- b) The information contained in the EIAr dated November 2016, First and Second Addenda dated August 2018 and September 2020 respectively.
- c) The comments received from KZN: Department of Economic Development, Tourism and Environmental Affairs, the Ezemvelo KZN Wildlife and interested and affected parties as included in the EIAr dated November 2016, First and Second Addenda dated August 2018 and September 2020 respectively
- d) Mitigation measures as proposed in the EIAr and the EMPr.
- e) The information contained in the specialist studies contained within the appendices of the EIAr dated November 2016, First and Second Addenda dated August 2018 and September 2020 respectively and as appears below:

Title	Prepared by	Date
Terrestrial Fauna and Flora Assessment Report	Avhafarei Ronald Phamphe: Nemai Consulting Scientific Aquatic Services CC	October 2016 March 2020
Aquatic Impact Assessment	Dr Mathew Ross: EnviRoss CC Scientific Aquatic Services	January 2016 March 2020
Biodiversity Offset Study	Scientific Aquatic Services	July 2018 March 2020
Avifaunal Impact Assessment	WildSkies Ecological Services	September 2015
Vibration Impact Assessment	JH CONSULTING: Acoustics, Noise & Vibration Control	September 2016
Noise Impact Assessment	ENVIRO-ACOUSTIC RESEARCH	December 2019
Agricultural and Soils Impact Assessment	Dr A Gouws and Dr E Gouws: INDEX	May 2015
Socio-Economic impact assessment	Sameera Munshi: Nemai Consulting	February 2016
Sediment Impact Assessment	AK Theron and GR Basson	November 2015

Social Impact Assessment	Dr Neville Bews & Associates	February 2016
Visual Impact Assessment	AXIS LANDSCAPE ARCHITECTS (CC)	September 2015
Traffic Impact Assessment	AECOM SA (Pty) Ltd	June 2015
Heritage Impact Assessment	Jean Beater & Frans Prins	May 2015
EMPr	Aurecon SA	April 2019

## **2. Key factors considered in making the decision**

All information presented to the Department was taken into account in the Department's consideration of the application. A summary of the issues which, in the Department's view, were of the most significance is set out below.

- a) The findings of all the specialist studies conducted and their recommended mitigation measures.
- b) The need for the proposed project is to meet the long-term water requirements of the Mgeni Water Supply System.
- c) The EIAr dated November 2016; First and Second Addenda dated August 2018 and September 2020 respectively identified all legislation and guidelines that have been considered in the preparation of the EIAr.
- d) The methodology used in assessing the potential impacts identified in the EIAr dated November 2016, First and Second Addenda dated August 2018 and September 2020 respectively and the specialist studies have been adequately indicated.
- e) A sufficient public participation process was undertaken and the applicant has satisfied the minimum requirements as prescribed in the EIA Regulations, 2014 as amended for public involvement.

## **3. Findings**

After consideration of the information and factors listed above, the Department made the following findings -

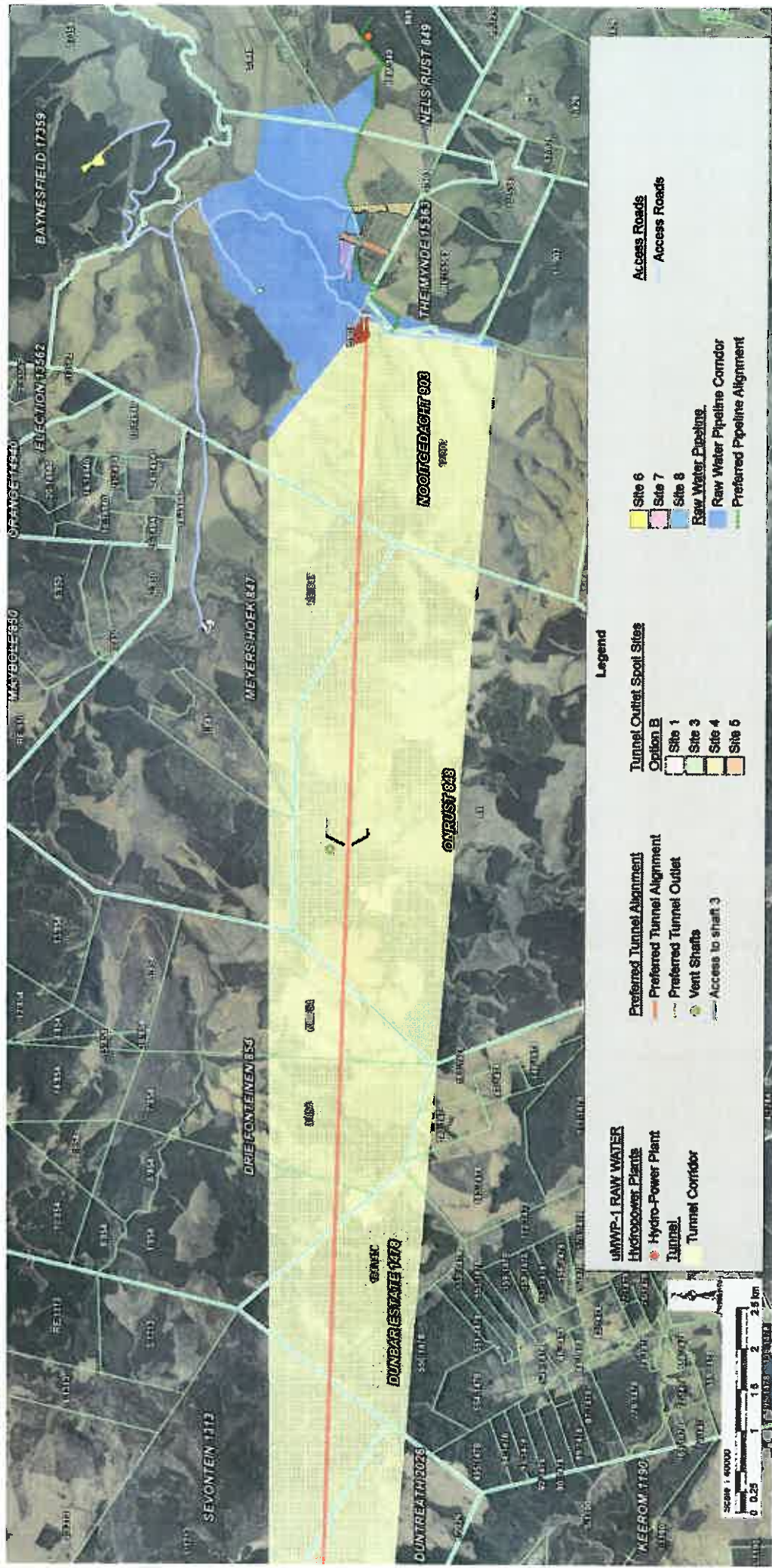
- a) The identification and assessment of impacts are detailed in the EIAr dated November 2016, First and Second Addenda dated August 2018 and September 2020 respectively and sufficient assessment of the key identified issues and impacts have been completed.
- b) The procedure followed for impact assessment is adequate for the decision-making process.
- c) The information contained in the EIAr dated November 2016, First and Second Addenda dated August 2018 and September 2020 respectively is deemed to be accurate and credible.
- d) The proposed mitigation of impacts identified and assessed adequately curtails the identified impacts.

- e) EMP measures for the pre-construction, construction and rehabilitation phases of the development were proposed and included in the EIAR and will be implemented to manage the identified environmental impacts during the construction phase.

In view of the above, the Department is satisfied that, subject to compliance with the conditions contained in the environmental authorisation, the authorised activities will not conflict with the general objectives of integrated environmental management laid down in Chapter 5 of the National Environmental Management Act, 1998 and that any potentially detrimental environmental impacts resulting from the authorised activities can be mitigated to acceptable levels. The environmental authorisation is accordingly granted.



## Annexure 2: Locality Plan



UMKHOMAZI WATER PROJECT PHASE 1: RAW WATER COMPONENT Water Conveyance Infrastructure

MS





## forestry, fisheries & the environment

Department:  
Forestry, Fisheries and the Environment  
REPUBLIC OF SOUTH AFRICA

Private Bag X 447· PRETORIA 0001· Environment House 473 Steve Biko Road, Arcadia· PRETORIA

DFFE Reference: 14/12/16/3/3/3/94/1/AM2

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Mr Kobus Bester  
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**PRETORIA**  
0001

Telephone Number: (012) 336 8071  
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### PER EMAIL / MAIL

Dear Mr Bester

### AMENDMENT OF THE ENVIRONMENTAL AUTHORISATION ISSUED ON 19 NOVEMBER 2020 FOR THE UMKHOMAZI WATER PROJECT PHASE 1: RAW WATER COMPONENT – WATER CONVEYANCE INFRASTRUCTURE WITHIN RICHMOND, IMPENDLE AND THE MSUNDUZI LOCAL MUNICIPALITIES IN THE KWAZULU-NATAL PROVINCE

The Environmental Authorisation (EA) issued for the abovementioned application by this Department on 19 November 2020 and your application for amendment of the EA received by the Department on 26 July 2021, and the acknowledgement letter dated 10 August 2021, refer.

Based on a review of the reason for requesting an amendment to the above EA, this Department, in terms of Chapter 5 of the Environmental Impact Assessment Regulations, 2014 as amended, has decided to amend the EA dated 19 November 2020, as follows:

#### **Amendment 1: Extension of project construction completion by 5 years:**

Condition 8 on page 16 of the EA:

*"Construction must be completed within five (05) years of the commencement of the activity on site."*

#### **Is amended to:**

*"Construction must be completed within **ten (10) years** of the commencement of the activity on site."*

#### **Reason for amendment:**

This condition is impractical, based on the project programme and the nature and scale of the construction activities. The main activities will take at least 5 years which exclude preparatory work and scheme commissioning.

*MS*

### **Amendment 2: Rewording of Condition 13 of the EA:**

*"A copy of the final site layout map must be made available for comments by registered Interested and Affected Parties and the holder of this environmental authorisation must consider such comments. Once amended, the final development layout map must be submitted to the Department for written approval prior to commencement of the activity. All available biodiversity information must be used in the finalisation of the layout map."*

#### **Is amended to:**

"A copy of the **detailed** site layout map must be made available for comments by registered Interested and Affected Parties **for a period of 30 days** and the holder of this environmental authorisation must consider such comments. Once amended, the development layout map must be submitted to the Department for written approval prior to commencement of **construction activities**. All available biodiversity information, **baseline studies, and pre-construction surveys** must be used in the finalisation of the layout map. **The Department will provide written response within a period of 30 days.**"

#### **Reason for amendment:**

It is proposed that this condition be amended to specify the abovementioned timeframes to avoid any ambiguity and to allow for project planning. It must be noted also that the final site layout map will be informed by the baseline studies to be undertaken and/or pre-construction surveys, therefore these activities will take place prior to the submission of the final site layout map for approval – usually progressive and throughout tender/construction period. It is therefore possible that certain information will not be available at a certain point in time during the project life-cycle.

### **Amendment 3: Rewording of Condition 14 of the EA:**

"The Environmental Management Programme (EMPr) submitted as part of the EIAR is hereby not approved and it must be amended to incorporate all the details that are to be part of the finalised detailed Biodiversity Offset and Compensation Plan; and must also include measures as dictated by the final dam designs, and the provisions of this environmental authorisation. The amended EMPr must be made available for comments by registered Interested and Affected Parties and the holder of this environmental authorisation must consider such comments. Once amended, the final EMPr must be submitted to the Department for written approval prior to commencement of the activity."

**The requested amendment is hereby not approved.**

### **Amendment 4: Rewording of Condition 15 of the EA:**

*"The amended EMPr must include the following....."*

#### **Is amended to:**

"The following plans must be submitted to this Department for approval....."

#### **Reason for amendment:**

The detailed Plans will be compiled separately from the EMPr, but will take cognisance of the requirements of the EMPr due to overlapping biodiversity and conservation targets.

#### **Amendment 5: Rewording of Condition 15.2 of the EA:**

*"The Catchment and Ecological Infrastructure Management Plan for the upper uMkhomazi catchment:*

- Identify and map degraded and declining ecological features.*
- Identify interventions to restore, improve and maintain the above,*
- Detailed design and plan for rehabilitation, restoration, and maintenance."*

**Is amended to:**

*"The Catchment and Ecological Infrastructure Management Plan for the upper uMkhomazi catchment must:*

- Identify and map degraded and declining ecological features in the uMkhomazi Catchment above the Smithfield Dam;*
- Identify interventions to restore, improve and maintain the ecological features in the uMkhomazi catchment above the Smithfield Dam; and;*
- Develop a strategic framework plan to guide, coordinate and direct interventions aimed at the rehabilitation, restoration, and maintenance of ecological infrastructure in the uMkhomazi catchment above the Smithfield Dam."*
- Provide a Framework for funding and implementation."*

#### **Reason for amendment:**

The uMkhomazi River has an enormous catchment (in excess of 200 000 ha) and substantial and lengthy work would be required as part of the Catchment and Ecological Infrastructure Management Plan. It is noted that Umgeni Water is already undertaking the work, however, due the size of upper catchment, the study is focussed on micro-catchments, i.e. key focal areas. Furthermore, the Institute of Natural Resources (INR) with input from Umgeni Water recently completed a Scoping study on behalf of the Nature Conservancy that investigated opportunities to establish a Water Fund to improve water security through Ecological Infrastructure (EI). The Upper uMkhomazi Catchment was identified as having high potential to benefit from these EI investments.

Firstly, and considering work by Umgeni Water and the INR, it is proposed that the amended EMPr provide a strategic Catchment and Ecological Infrastructure Management Plan. The strategic Plan will then be compiled separately from the EMPr. This will prevent delaying the baseline work required for the project, considering that the aforementioned catchment is above the dam basin.

Secondly, it should also be noted that this Condition may be ambiguous. The current interpretation is that the cost of the planning, design and implementation of the EI be borne by the Applicant as part of the dam project. It is assumed however, that the intention of this condition is that a framework be prepared whereby strategic interventions be directed or developed so that all parties undertaking EI restoration and rehabilitation can be directed in the Catchment to be more efficient and effective. As the INR and Umgeni Water is already involved in such initiatives and the feasibility study as indicated above is planned for this Catchment, it proposed that this condition be amended such that the requirement is to contribute to the existing initiatives such that a strategic plan is prepared for the Catchment.

#### **Amendment 6: Amendment to include Condition 16.8 to the EA:**

The inclusion of 16.8 is as follows:

*"The EMC must remain functional until all rehabilitation measures outlined in and habitat rehabilitation and plans are fully implemented. The EMC will not be functional during the long-term operation and maintenance of the ecosystems and biodiversity offsets."*

#### **Reason for amendment:**

This condition is silent on the period of establishment of the EMC.

DFFE REFERENCE: 14/12/16/3/3/94/1/AM2

AMENDMENT OF THE ENVIRONMENTAL AUTHORISATION ISSUED ON 19 NOVEMBER 2020 FOR THE UMKHOMAZI WATER PROJECT  
PHASE 1: RAW WATER COMPONENT – SMITHFIELD DAM AND ASSOCIATED INFRASTRUCTURE WITHIN DR NKOSAZANA DLAMINI  
ZUMA, IMPENDLE AND MSUNDUZI LOCAL MUNICIPALITIES IN THE KWAZULU-NATAL PROVINCE



**Amendment 7: Rewording of Condition 34 of the EA:**

*"The tunnelling and blasting activities must be undertaken during the migration period of the Blue Swallows (April - September).*

**Is amended to:**

"Project-related activities at the tunnel outlet site, including tunneling and blasting activities, that may cause impulsive vibrations (blasting) or steady state vibrations (construction and tunnelling), which exceed the vibration thresholds determined as part of the Vibration Impact Assessment that threaten Blue Swallows, must be undertaken during the migration period of the Blue Swallows (April - September).."

**Reason for amendment:**

The current wording of this condition may be misconstrued, as not all tunneling and blasting activities associated with the project will pose a risk to Blue Swallows. The Vibration Impact Assessment Report (2018) identified the following forms of vibration that will pose a potential threat to Blue Swallows in the project area, and the study also determined and mapped the associated vibration threshold radii.

**Amendment 8: Rewording of Condition 35 of the EA:**

*"The detailed final Biodiversity Offset and Compensation Plan must be developed in consultation with relevant stakeholders including inter alia, EDTEA and Ezemvelo KZN Wildlife and must be approved by this Department prior to construction commencing on any part or aspect of the development."*

**Is amended to:**

"The detailed Biodiversity Offset and Compensation Plan must be developed in consultation with relevant stakeholders including inter alia, EDTEA and Ezemvelo KZN Wildlife and must be approved by this Department prior to construction commencing on any part or aspect of the development. **The Department will provide written response within a period of 30 days.**"

**Reason for amendment:**

The EA condition is amended to specify the abovementioned timeframes to avoid any ambiguity and to allow for project planning.

**Amendment 9: Rewording of Condition 35 (iii) of the EA:**

*"The implementation process of Biodiversity Offset must coincide and run concurrently with the commencement process for the construction of the dam and its associated infrastructure which, will draw guidance from the EMPr."*

**Is amended to:**

"The preparation of the detailed Biodiversity Offset Plan must coincide and run concurrently with the preparation of the designs for the Smithfield Dam and its associated infrastructure. Implementation, excluding the long-term management of the Biodiversity Offsets Plan must coincide and run concurrently with the construction of the dam and its associated infrastructure."

**Reason for amendment:**

DFE REFERENCE: 14/12/16/3/3/94/1/AM2

AMENDMENT OF THE ENVIRONMENTAL AUTHORISATION ISSUED ON 19 NOVEMBER 2020 FOR THE UMKHOMAZI WATER PROJECT PHASE 1: RAW WATER COMPONENT – SMITHFIELD DAM AND ASSOCIATED INFRASTRUCTURE WITHIN DR NKOSAZANA DLAMINI ZUMA, IMPENDLE AND MSUNDUZI LOCAL MUNICIPALITIES IN THE KWAZULU-NATAL PROVINCE

The Biodiversity Offset and Compensation Plan, which needs to form part of the amended EMPr according to the EA, will take a considerable time to complete. This requirement will hold up the baseline work that needs to be undertaken, such as the detailed geotechnical investigations, fauna and flora assessments, ground truthing and other preparatory work that will inform the design work. It is proposed that the amended EMPr provide the requirements for the Biodiversity Offset and Compensation Plan, and other site-specific plans such as Search, Rescue and Relocation Plan, Storm water Management Plan etc. as some of these site-specific plans can only be compiled when the consultant and contractor are appointed. The detailed Plans will then be compiled separately from the EMPr, but will take cognisance of the requirements of the EMPr due to overlapping biodiversity and conservation targets.

#### **Amendment 10: Rewording of Condition 36 of the EA:**

*"A Catchment and Ecological Infrastructure Management Plan must be developed for the upper uMkhomazi catchment to address the issues of land degradation that will affect the dam functionality and must be submitted to this Department for approval prior to construction commencing on any part or aspect of the development."*

#### **Is amended to:**

"A **strategic** Catchment and Ecological Infrastructure Management Plan must be developed for the upper uMkhomazi catchment to address the issues of land degradation that will affect the dam functionality and must be submitted to this Department for approval."

#### **Reason for amendment:**

The uMkhomazi River has an enormous catchment (in excess of 200 000 ha) and substantial and lengthy work would be required as part of the Catchment and Ecological Infrastructure Management Plan. It is noted that Umgeni Water is already undertaking the work, however, due the size of upper catchment, the study is focussed on micro-catchments, i.e. key focal areas. Furthermore, the Institute of Natural Resources (INR) with input from Umgeni Water recently completed a Scoping study on behalf of the Nature Conservancy that investigated opportunities to establish a Water Fund to improve water security through Ecological Infrastructure (EI). The Upper uMkhomazi Catchment was identified as having high potential to benefit from these EI investments. Firstly, and considering work by Umgeni Water and the INR, it is proposed that the amended EMPr provide a strategic Catchment and Ecological Infrastructure Management Plan. The strategic Plan will then be compiled separately from the EMPr. This will prevent delaying the baseline work required for the project, considering that the aforementioned catchment is above the dam basin.

Secondly, it should also be noted that this Condition may be ambiguous. The current interpretation is that the cost of the planning, design and implementation of the EI be borne by the Applicant as part of the dam project. It is assumed however, that the intention of this condition is that a framework be prepared whereby strategic interventions be directed or developed so that all parties undertaking EI restoration and rehabilitation can be directed in the Catchment to be more efficient and effective. As the INR and Umgeni Water is already involved in such initiatives and the feasibility study as indicated above is planned for this Catchment, it proposed that this condition be amended such that the requirement is to contribute to the existing initiatives such that a strategic plan is prepared for the Catchment.

#### **Amendment 11: Rewording of Condition 37 of the EA:**

*"A pre-construction survey of the final development footprint must be concluded to ascertain the identity and exact number of individual protected species affected by the proposed development prior to the commencement of construction."*

**Is amended to:**

"A preconstruction survey of the final development footprint must be undertaken to ascertain the identity and the exact number of individual protected species affected by the proposed development prior to the commencement of construction. The pre-construction survey must be used to inform the plant search, rescue and relocation plan. The timing of the implementation of the plant rescue and relocation within the development footprints must be aligned with the construction programme and as far as it is practically possible incorporating a phased approach and allow for multiple season plant rescue and relocation."

**Reason for amendment:**

A pre-construction survey is required for the preparation of the Rescue and Relocation Plan. To produce this Plan the pre-construction survey of the final development footprint must be undertaken, however, due to the extent and nature of project, landowners are sometimes allowed to continue with activities on their land for as long as possible to allow for e.g. the completion of crop cycles, relocation of infrastructure, etc. The main construction area will be at the dam wall, whilst other areas to be inundated will not be required immediately. A pre-construction survey of the entire development footprint will therefore not be possible prior to the commencement of construction activities and may occur in a phased approach. Site-specific plans will then be prepared prior to the relevant construction activity.

**Amendment 12: Rewording of Condition 38 of the EA:**

*"All relevant permits must be obtained from EKZNW's Permits Office; for rescue and relocation of floral species of conservation significance; the removal or destruction of indigenous, protected or endangered plant, and animal species that cannot be accommodated within the development footprint. Copies of the permits must also be included in the final EMPr to be submitted to the Department for approval before commencement of construction activities."*

**Is amended to:**

"Prior to removal, relocation or destruction of any protected or endangered plant and animal species that cannot be accommodated within the development footprint, all relevant permits must be obtained from **the relevant competent authority**. Copies of the permits must also be submitted to the Department for record keeping."

**Reason for amendment:**

It is proposed that the EMPr provide the requirements for the other site-specific plans such as Search, Rescue and Relocation Plan, Storm water Management Plan etc. as some of these site-specific plans can only be compiled when the consultant and contractor are appointed. The detailed Plans will then be compiled separately from the EMPr, but will take cognisance of the requirements of the EMPr due to overlapping biodiversity and conservation targets.

**Amendment 13: Rewording of Condition 39 of the EA:**

"A comprehensive habitat rehabilitation and restoration plan must be developed for the site and must be submitted to the Department for approval prior to construction commencing on any part or aspect of the development."

*M.S.*



**Is amended to:**

"A comprehensive habitat rehabilitation and restoration plan must be developed for all construction and work sites and must be submitted to the Department for approval. This Plan must be informed by the available biodiversity information, baseline studies, and pre-construction surveys. The plan must be reviewed by EDTEA and EKZNW prior to submission to the Department. The Department will provide a written response within a period of 30 days."

**Reason for amendment:**

It is proposed that this condition be amended to specify the timeframe required by DEFF to review and decide on the Habitat Rehabilitation and Restoration Plan, in order to avoid any ambiguity and to allow for project planning.

**Amendment 15: Rewording of Condition 40 of the EA:**

"No exotic plants may be used for rehabilitation purposes. Only indigenous plants of the area may be utilised."

**Is amended to:**

"All areas affected by construction should be rehabilitated upon completion of the construction phase of the development to its pre-construction state where possible in line with good practice and the principle of duty of care."

**Reason for amendment:**

Rehabilitation needs to consider the status of the vegetation prior to construction, such as cultivated areas or kikuyu pastures. Thus, the pre-existing environment will be re-instated except for areas that had indigenous plants.

This proposed amendment letter must be read in conjunction with the EA dated 19 November 2020.

In terms of the Promotion of Administrative Justice Act, 2000 (Act No 3 of 2000), you are entitled to the right to fair, lawful and reasonable administrative action; and to written reasons for administrative action that affects you negatively. Further your attention is drawn to the provisions of the Protection of Personal Information Act, 2013 (Act no. 4 of 2013) which stipulate that the Department should conduct itself in a responsible manner when collecting, processing, storing and sharing an individual or another entity's personal information by holding the Department accountable should the Department abuse or compromise your personal information in any way.

In terms of Regulation 4(2) of the Environmental Impact Assessment Regulations, 2014, as amended (the EIA Regulations), you are instructed to notify all registered interested and affected parties, in writing and within 14 (fourteen) days of the date of the EA, of the Department's decision as well as the provisions regarding the submission of appeals that are contained in the Regulations.

Your attention is drawn to Chapter 2 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) National Appeal Regulations published under Government Notice R993 in Government Gazette No. 38303 dated 08 December 2014 (National Appeal Regulations, 2014), which prescribes the appeal procedure to be followed. Kindly include a copy of this document (National Appeal Regulations, 2014) with the letter of notification to interested and affected parties in this matter.

Should any person wish to lodge an appeal against this decision, he/she must submit the appeal to the appeal administrator, and a copy of the appeal to the applicant, any registered interested and affected party, and any

organ of state with interest in the matter within 20 days from the date that the notification of the decision was sent to the registered interested and affected parties by the applicant; or the date that the notification of the decision was sent to the applicant by the Department, whichever is applicable.

**Appeals must be submitted in writing in the prescribed form to:**

The Director: Appeals and Legal Review of this Department at the below mentioned addresses.

By email: [appeals@environment.gov.za](mailto:appeals@environment.gov.za)

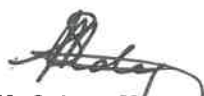
By hand: Environment House  
473 Steve Biko Road,  
Arcadia,  
Pretoria,  
0083; or

By post: Private Bag X447,  
Pretoria,  
0001;

Please note that in terms of Section 43(7) of the National Environmental Management Act, Act No. 107 of 1998, as amended, the lodging of an appeal will suspend the environmental authorisation or any provision or condition attached thereto. In the instance where an appeal is lodged, you may not commence with the activity until such time that the appeal is finalised.

To obtain the prescribed appeal form and for guidance on the submission of appeals, please visit the Department's website at [https://www.environment.gov.za/documents/forms#legal\\_authorisations](https://www.environment.gov.za/documents/forms#legal_authorisations) or request a copy of the documents at [appeals@environment.gov.za](mailto:appeals@environment.gov.za).

Yours faithfully



**Mr Sabelo Malaza**  
**Chief Director: Integrated Environmental Authorisations**  
**Department of Forestry, Fisheries and the Environment**  
Date: *09/09/2021*

cc:	Donavan Henning	Nemai Consulting (Pty) Ltd	Email: <a href="mailto:donavanh@nemai.co.za">donavanh@nemai.co.za</a>
	Ian Felton	KZN Department of Economic Development, Tourism and Environmental Affairs (EDTEA)	Email: <a href="mailto:ian.felton@kznedtea.gov.za">ian.felton@kznedtea.gov.za</a>
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**water & sanitation**

Department:  
Water and Sanitation  
**REPUBLIC OF SOUTH AFRICA**

# **uMKHOMAZI WATER PROJECT PHASE 1** **Construction of the Water Conveyance Infrastructure**

## **PRE-CONSTRUCTION ENVIRONMENTAL MANAGEMENT PROGRAMME**

**January 2022**

**[DFFE Ref. No.: 14/12/16/3/3/94/1]**

**TITLE AND APPROVAL PAGE**

**Project Name:** *The uMkhomazi Water Project Phase 1 – Construction of the Water Conveyance Infrastructure*

**Report Title:** *Pre-construction Environmental Management Programme*

**Authors:** *D. Henning, C. Chidley, N. Naidoo*


**Authority reference no.:** *14/12/16/3/3/3/94/1*

**Status of report:** *Final*

**Date of issue:** *January 2022*

**CONSULTANTS: NEMAI CONSULTING**

Approved for Consultants by:

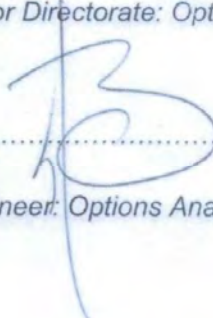


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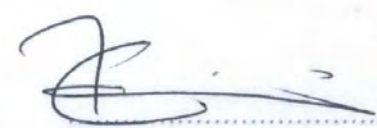
Study Leader

**DEPARTMENT OF WATER AND SANITATION**

Approved for Directorate: Options Analysis by:

  
JA Bester

Chief Engineer: Options Analysis (East)

  
C Fourie

Director: Options Analysis

Prepared by Nemai Consulting for the  
Department of Water and Sanitation



**AMENDMENTS PAGE**

Date	Nature of Amendment	Amendment No.	Signature
December 2021	Draft for Authorities and Public Review	0	
February 2022	Final for Submission to DFFE for Decision-Making	1	

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**LIST OF ACRONYMS & ABBREVIATIONS**

<b>DFFE</b>	Department of Forestry, Fisheries and Environment
<b>DWS</b>	Department of Water and Sanitation
<b>EAP</b>	Environmental Assessment Practitioner
<b>ECO</b>	Environmental Control Officer
<b>EIA</b>	Environmental Impact Assessment
<b>EKZNW</b>	Ezemvelo KZN Wildlife
<b>EMC</b>	Environmental Monitoring Committee
<b>EMPr</b>	Environmental Management Programme
<b>I&amp;AP</b>	Interested and Affected Party
<b>KZN</b>	KwaZulu-Natal
<b>NEMA</b>	National Environmental Management Act (Act No. 107 of 1998)
<b>OHS</b>	Occupational Health and Safety
<b>RAP</b>	Relocation Action Plan
<b>SCC</b>	Species of Conservation Concern
<b>TBM</b>	Tunnel Boring Machine
<b>uMWP-1</b>	uMkhomazi Water Project Phase 1
<b>WSS</b>	Water Supply System
<b>WTW</b>	Water Treatment Works



## DEFINITION OF KEY TERMS

<b>Auditing</b>	<i>A systematic and objective assessment of an organisation's activities and services conducted and documented on a periodic basis.</i>
<b>Competent</b>	<i>Combination of knowledge, qualifications and experience specific to the work or task being performed.</i>
<b>Construction Area</b>	<i>Immediate site influenced by specific construction activities, as approved by the Engineer.</i>
<b>Construction Domain</b>	<i>Entire footprint required for the construction of the overall project components.</i>
<b>Environment</b>	<i>The surroundings in which humans exist and which comprise:</i> <ul style="list-style-type: none"> <li><i>• The land, water and atmosphere of the earth.</i></li> <li><i>• Micro-organisms, plant and animal life.</i></li> <li><i>• Any part or combination of a) and b) and the interrelationships among and between them.</i></li> <li><i>• The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that can influence human health and well-being.</i></li> </ul>
<b>Environmental Aspect</b>	<i>Those components of the company's activities, products and services that are likely to interact with the environment.</i>
<b>Environmental Feature</b>	<i>Elements and attributes of the biophysical, economic and social environment.</i>
<b>Environmental Impact</b>	<i>The change to the environment resulting from an environmental aspect, whether desirable or undesirable. An impact may be the direct or indirect consequence of an activity.</i>
<b>Environmental Management Programme (EMPr)</b>	<i>A detailed plan of action prepared to ensure that recommendations for enhancing positive impacts and/or limiting or preventing negative environmental impacts are implemented during the life-cycle of a project.</i>
<b>Environmental Objective</b>	<i>Overall environmental goal pertaining to the management of environmental features.</i>
<b>Environmental Target</b>	<i>Performance requirement that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.</i>
<b>Monitoring</b>	<i>A systematic and objective observation of an organisation's activities and services conducted and reported on regularly.</i>
<b>Potable Water</b>	<i>Water that is fit or suitable for drinking.</i>
<b>Project Area</b>	<i>The greater area within which the project is executed. Extends beyond the construction domain.</i>
<b>Raw Water</b>	<i>Natural (untreated) water found in the environment, such as water from bodies like dams and rivers.</i>
<b>Sensitive environmental features</b>	<i>Environmental features protected by legislation (e.g. heritage resources), or identified during the EIA as sensitive through specialists' findings and input received from Interested and Affected Parties.</i>

**Watercourse**

*A geomorphological feature characterized by the presence of a streamflow channel, a floodplain and a transitional upland fringe seasonally or permanently conveying surface water. According to the National Water Act (Act 36 of 1998), a watercourse constitutes a river or spring, a natural channel in which water flows regularly or intermittently, a wetland, lake or dam into which, or from which, water flows, and any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.*

**Weeds and Invader Plants**

*Weeds and invader plants are defined as undesirable plant growth that shall include, but not be limited to all declared category 1, 2 and 3 listed invader species as set out in the Conservation of Agricultural Resources Act (No 43 of 1983) regulations. Other vegetation deemed to be invasive should be those plant species that show the potential to occupy in number, any area within the defined construction area*

## 1 PURPOSE OF THIS DOCUMENT

The proposed uMkhomazi Water Project Phase 1 (uMWP-1) consists of both raw water and potable water components which are being undertaken by the Department of Water and Sanitation (DWS) and Umgeni Water (UW), respectively. Nemai Consulting was appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the Environmental Impact Assessment (EIA) for both components of the uMWP-1.

The then Department of Environment, Forestry and Fisheries (now the Department of Forestry, Fisheries and the Environment – DFFE) issued two Environmental Authorizations (EAs) in November 2020. An Environmental Authorizations (EA) for the construction of the Smithfield Dam and its associated infrastructure was issued and another for the water conveyance infrastructure consisting of a tunnel and raw water pipeline.

DWS (Applicant) subsequently applied for amendments to the above EAs. DFFE approved most of the proposed amendments to the conditions in September 2021.

This document serves as the **Environmental Management Programme (EMPr)** for the **pre-construction phase only of the Water Conveyance Infrastructure**. It was developed in support of the EIA that was undertaken for the project, the EA (**Annexure A**) and the subsequent amendments to the EA (**Annexure B**). Furthermore, this EMPr was compiled in accordance with Appendix 4 of Government Notice (GN) No. R 982 of 4 December 2014 (as amended).

An approved **Construction and Operation EMPr** will be required prior to the commencement of the main construction activities.

The draft Pre-Construction EMPr was lodged for public review from 6 December 2021 until 26 January 2022. All comments received on the draft document are contained in **Annexure C**.

## 2 PROJECT BACKGROUND AND MOTIVATION

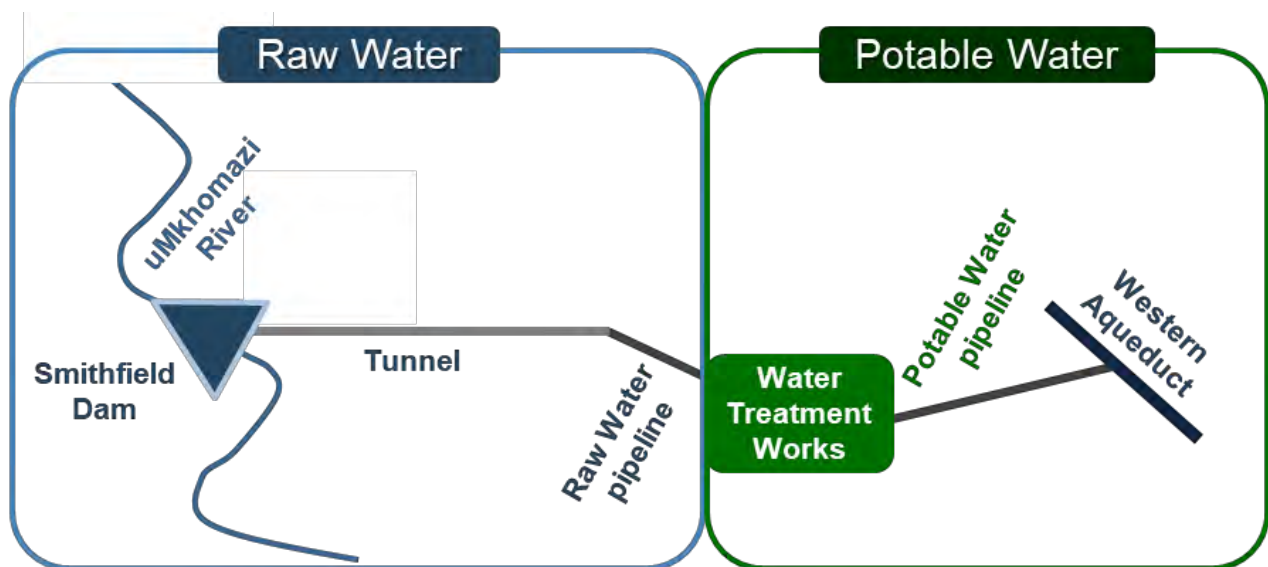
The current water resources of the Integrated Mgeni Water Supply System (WSS) are insufficient to meet the long-term water requirements of the system. The Integrated Mgeni WSS is the main water source that supplies about five million people and industries in the eThekweni Municipality, uMgungundlovu District Municipality (DM) and Msunduzi Local Municipality (LM), all of which comprise the economic powerhouse of the KwaZulu-Natal (KZN) Province.

The Integrated Mgeni WSS comprises the Midmar, Albert Falls, Nagle and Inanda Dams in KZN, a water transfer scheme from the Mooi River and the newly constructed Spring Grove Dam. The current system (Midmar, Albert Falls, Nagle and Inanda Dams and Phase 1 of the Mooi Mgeni

Transfer Scheme Phase 1 and 2) has a stochastic yield of 394 million m<sup>3</sup>/a (measured at Inanda Dam) at a 99% assurance of supply. However, this will not be sufficient to meet the long-term requirements of the system.

Pre-feasibility investigations indicated that the development of the undeveloped uMkhomazi River, to transfer water to the existing Mgeni system, most likely will fulfil this requirement. The uMkhomazi River is the third-largest river in KZN in terms of mean annual runoff.

The uMWP-1 consists of both Raw Water and Potable Water components, which are being undertaken by the DWS and Umgeni Water, respectively (refer to a simplified diagrammatic representation of the overall transfer scheme in **Figure 1** below).



**Figure 1:** Simplified Diagram of uMWP-1 Components

The proposed uMWP-1 Raw Water Component consists of the following, based on the outcomes of the Technical Feasibility Study (detailed project description provided in the uMWP-1 Raw Water EIA Report):

- Smithfield Dam (81 m high) on the uMkhomazi River, near Bulwer in KZN, with a Full Supply Level (FSL) of 930 masl, including associated infrastructure.
- Water Conveyance Infrastructure:
  - A transfer tunnel (known as the uMkhomazi-uMlaza Tunnel) with an approximate length of 32.5 km (depending on the final route along the tunnel corridor), an inside diameter of 3.5 m and a peak discharge of 8.65 m<sup>3</sup>/s, conveying water from the proposed Smithfield Dam to the uMlaza River Valley; and
  - A raw water pressure pipeline from the tunnel outlet to the Water Treatment Plant (WTP), with an approximate length of 5.2 km (depending on the final route along the pipeline corridor), an internal diameter of 2.6 m and peak discharge of 8.65 m<sup>3</sup>/s.

**This Document only focuses on the uMWP-1 Raw Water Component with specific reference to the pre-construction activities related to the Water Conveyance Infrastructure (DFFE Ref: 14/12/16/3/3/3/94/1).**

### 3 PROJECT LOCATION

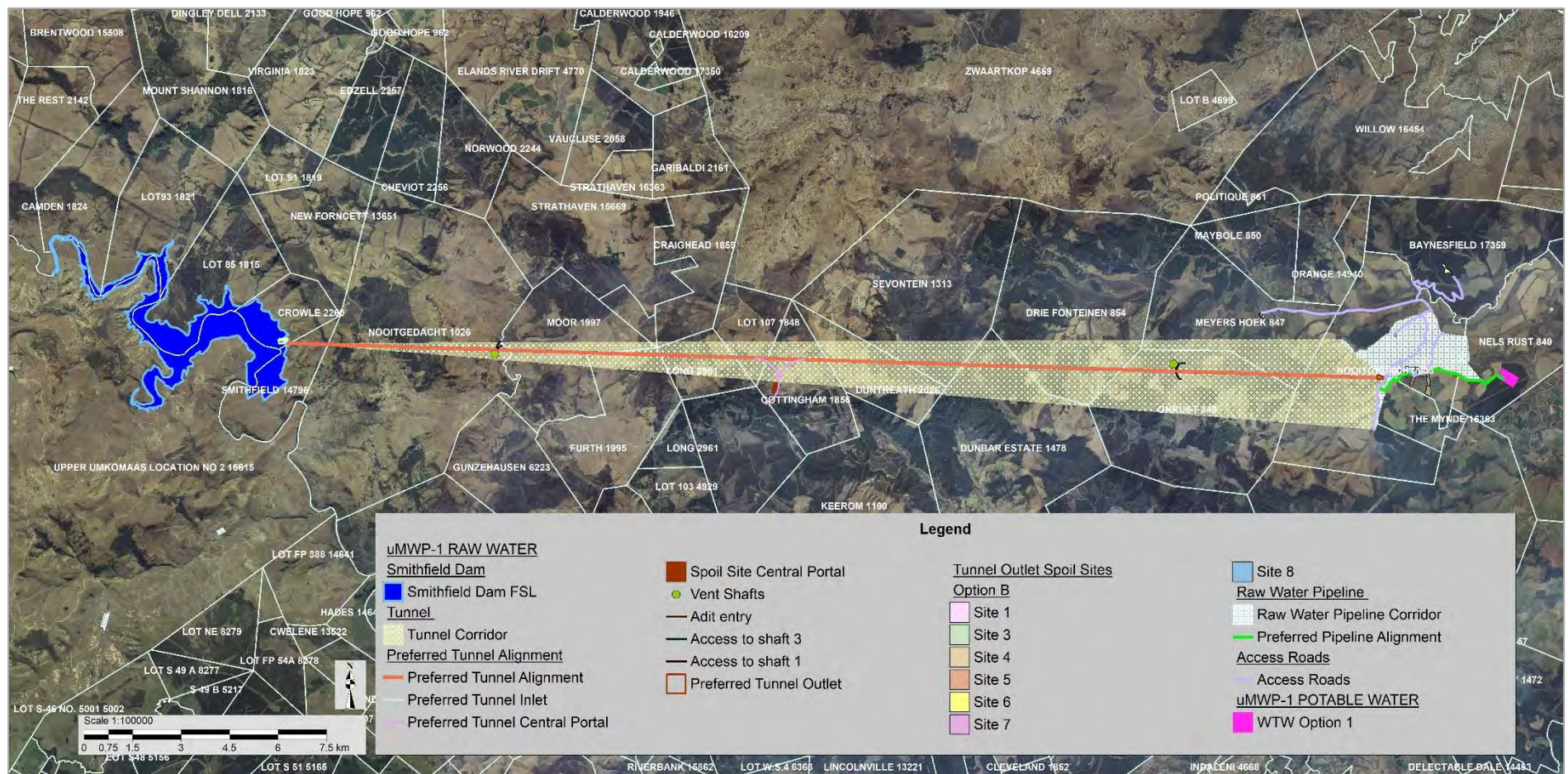
The preferred layout for the water conveyance infrastructure, as established through the EIA and additional assessments as part of the first and second Addenda, is shown in **Figure 2** below.

The project area is situated in the southern part of KZN. The majority of the project area falls within the uMgungundlovu DM (Impendle LM, The Msunduzi LM and Richmond LM), with a small portion in the west located in the Harry Gwala DM (Dr Nkosazana Dlamini Zuma LM) - Areas passed include Ncwadi, Songizini, Mhlongo and Ndondwane (amongst others). The area is characterised by diversified commercial farming operations.

The proposed transfer tunnel runs in a west to east direction approximately 32.5km with the inlet at Smithfield Dam reservoir and the outlet at Baynesfield Estate. There are access shafts and adits for maintenance purposes. The proposed tunnel will be connected with a pressure pipeline from the tunnel end to the proposed WTW.

The location of the infrastructure was influenced by various factors, such as topography and associated elevation, impacts to the receiving environment, existing servitudes, existing structures and infrastructure, access, site constraints and geotechnical conditions (amongst others). From a technical perspective, a primary determinant in siting the infrastructure was ensuring the correct elevation to maintain a gravity fed system.

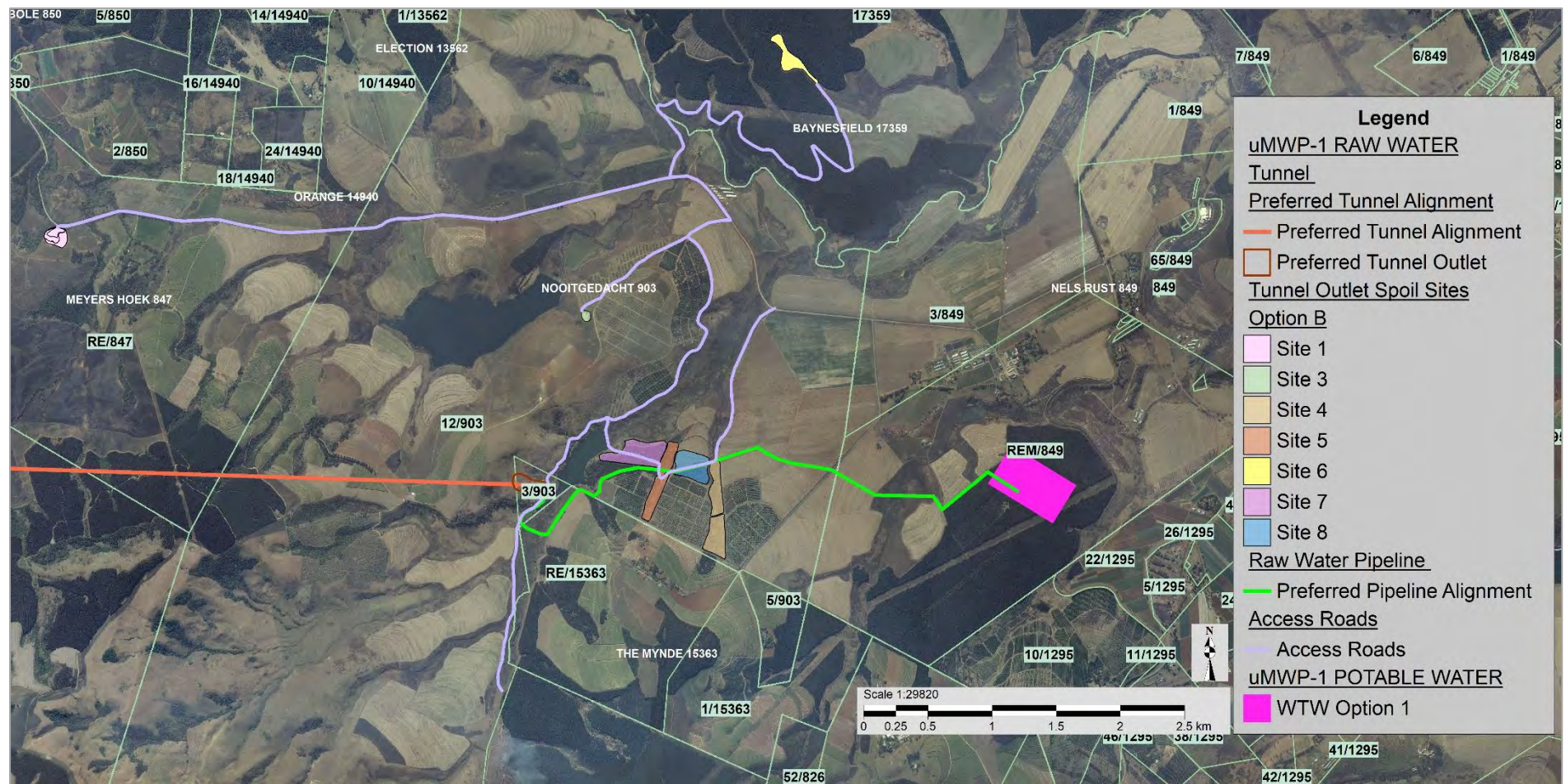




**Figure 2: Locality Map of Preferred Layout – uMWP-1 Raw Water Conveyance Infrastructure**

(Note: **Layout** – Smithfield Dam and WTW not part of Water Conveyance Infrastructure; **Cadastal** – farm portions not shown)





**Figure 3: Locality Map of Preferred Layout – uMWP-1 Raw Water Conveyance Infrastructure Spoil Sites**

(Note: **Layout** – WTW not part of Water Conveyance Infrastructure; Corridors for tunnel and raw water pipeline not shown)

## 4 OVERVIEW OF THE WATER CONVEYANCE INFRASTRUCTURE

The various components of the water conveyance infrastructure are listed in **Table 1** below (refer to **Figure 2 and 3** above).

**Table 1: uMWP-1 Raw Water Conveyance Infrastructure components (preferred layout)**

Raw Water Component	Associated Infrastructure
<b>Raw Water Conveyance Infrastructure</b>	<ol style="list-style-type: none"> <li>1. Tunnel and its associated infrastructure – intake tower/inlet, shafts, adits, portals and roads</li> <li>2. Raw water pipeline</li> <li>3. Spoil sites: inlet; tunnel central portal and tunnel outlet portal (Option B; Spoil Sites 1, 3, 4, 5, 6, 7 and 8)</li> <li>4. Access roads to the shafts; adits; tunnel outlet portal and spoil sites</li> <li>5. Hydropower plant</li> </ol>

## 5 PRE-CONSTRUCTION EMPr

This Pre-Construction EMPr provides performance criteria required to address potential environmental impacts during the pre-construction phase and must be read in conjunction with the EIA Report (November, 2016), as well as the First Addendum to the EIA Report (July, 2018) and Second Addendum to the EIA Report (February, 2020), Environmental Authorisation (November 2020), and first amendments to the Environmental Authorisation (September, 2021).

The Pre-Construction EMPr:

- Establishes management objectives during the pre-construction phase to enhance benefits and minimise adverse environmental impacts;
- Provides targets for management objectives, in terms of desired performance; and
- Describes actions required to achieve management objectives.

## 6 ROLES AND RESPONSIBILITIES

### 6.1 DFFE

The DFFE is the mandated authority in terms of NEMA that determines whether an authorisation can be issued for the project, following a decision-making process as conducted as part of the EIA. Conditions are included in the EA and EMPr, which need to be complied with by the project applicant. DFFE also fulfils a compliance and enforcement role with regards to the EA and EMPr. Any amendments that may be required to the EA and and/or EMPr, based on adaptive management



to site conditions and the technical requirements of the project must be submitted to DFFE following the required process. This Pre-Construction EMPr will require approval from DFFE prior to any of the activities as listed taking place.

## 6.2 DWS

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The Department of Water and Sanitation (DWS) is the applicant in terms of NEMA. DWS is also referred to as the project proponent. DWS has transferred the accountability of meeting the requirements of the EMPr and EA to TCTA, who is the implementing agent. This relationship was formalised in May 2018 when the Minister of Water and Sanitation issued a directive to TCTA fund and implement uMWP-1. TCTA is therefore responsible for the implementation of the EMPr and ensuring that the conditions in the EA are satisfied. DWS is accountable for the implementation of all environmental management requirements during the operation and maintenance of the infrastructure.

## 6.3 TCTA

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The Trans-Caledon Tunnel Authority (TCTA) is the state-owned entity, established by Government Notice No 2631 of 12 December 1986 for “the implementation, operation and maintenance of the project works within South Africa” according to the Treaty that governs the Lesotho Highlands Water Project (LHWP). Today TCTA has grown to become a specialised liability management body set up to finance and oversee the creation of bulk raw water infrastructure for the National Government on behalf of the people of South Africa.

TCTA is the implementing agent for the development, as directed by the Minister of Water and Sanitation. The responsibility for environmental compliance rests with the TCTA and includes *inter alia* the following:

- Implementation of the approved Pre-Construction EMPr.
- Submission of any substantial changes, updates or amendments to the Pre-Construction EMPr and/or EA to DFFE for approval.
- Ensuring that the provisions of the EA and Pre-Construction EMPr are binding on all contractors and service providers undertaking any of the pre-construction activities.
- Complying with all applicable environmental laws, regulations, standards and guidelines, and ensuring that the contractors and service providers accepts responsibility to do likewise.
- Being committed to the principles contained within NEMA, including sustainable development and the prevention of pollution and environmental degradation.

TCTA will comply with all applicable laws, regulations, standards and guidelines and will ensure that all professional service providers/contractors accept the responsibility to do likewise. This EMPr together with the EA and approved amendments will therefore form part of any contract between TCTA and its service providers appointed to undertake the pre-construction studies.

All monitoring will be conducted by TCTA in compliance with the requirements of the EA, and this Pre-Construction EMPr. Furthermore, TCTA has to comply with the stringent lender requirements in the loan covenants. These are not only audited internally, but also annually by the Auditor General of South Africa.

An Environmental Control Officer (ECO) will not be appointed to monitor the pre-construction phase as this is of a temporary duration.

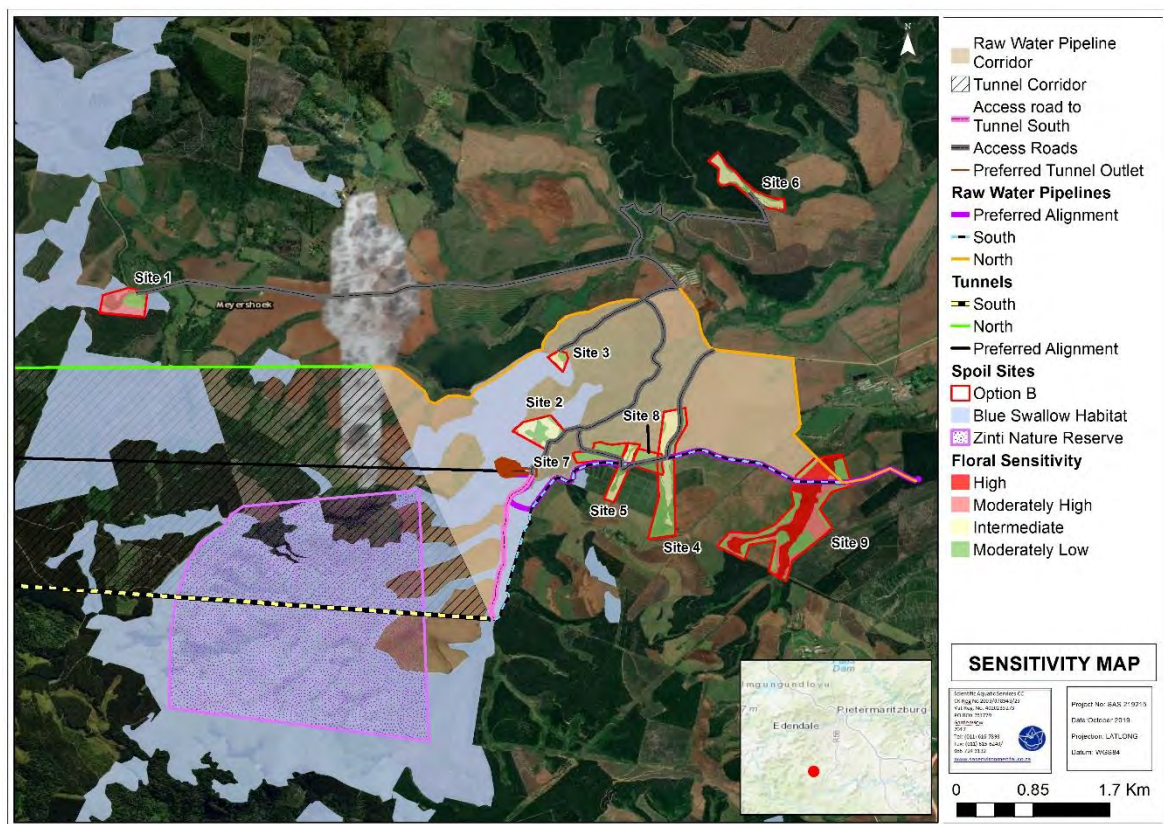
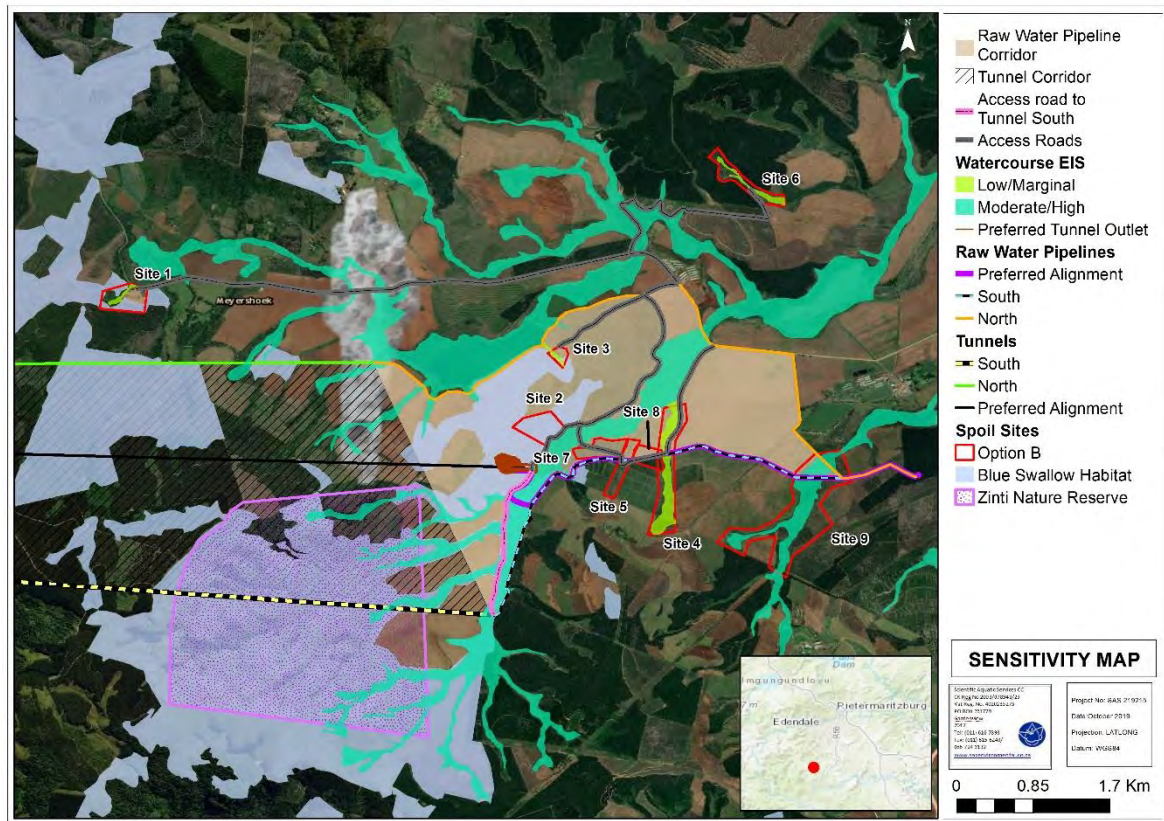
## 7 SENSITIVE ENVIRONMENTAL FEATURES

This Section highlights the key sensitive environmental features that were identified in the EIA. This is presented at a fairly high level as this will be verified through the 'Environmental Walk-Through Survey' described in **Section 10.6** below. Thereafter detailed maps will be prepared identifying highly sensitive environmental features and in instances where this cannot be avoided or mitigated, suitable replacement habitats and/or offset requirements will be provided. This detail will be included in the site-specific plans, i.e. Search Rescue and Relocation; Rehabilitation Management; and Biodiversity Offsets and Compensation.

The transfer tunnel and pipeline corridor intersects irreplaceable and optimal Critical Biodiversity Areas, the Endangered Midlands Mistbelt Grassland and Moist Coast Hinterland Grassland, the threatened Pietermaritzburg South terrestrial ecosystem as well as two private nature reserves (Zinti Valley and Minerva Nature Reserves).

One of the challenges posed by removing the balancing dam is the management of spoil material (tunnel muck). The total volume of spoil material to be generated during the proposed tunnel boring exercise (generated from the outlet portal excavations and the portion of the tunnel between the central adit and the outlet portal) is  $\pm 950\,000\text{ m}^3$  Loose Cubic Meters (LCM).

**Figure 4** and **Figure 5** below indicate the sensitivity analysis that was undertaken in the EIA.





## 8 ENVIRONMENTAL ASSESSMENT PRACTITIONER

Nemai Consulting was appointed by DWS as the independent EAP to undertake the EIA for the proposed uMWP-1 Raw Water. Nemai Consulting is an independent, specialist environmental, social development and Occupational Health and Safety (OHS) consultancy, which was founded in December 1999. The company is directed by a team of experienced and capable environmental engineers, scientists, ecologists, sociologists, economists and analysts. The company has offices in Randburg (Gauteng) and Durban (KZN).

The core members of Nemai Consulting that were involved with compiling the EMP for the project are captured in **Table 2** below, and their respective Curricula Vitae are contained in the body of the EIA Report.

**Table 2: EMP Core Team Members**

Name	Qualifications	Experience
Mr D. Henning	MSc (Aquatic Science)	20 years' experience. Prepared Environmental Management Plans (EMP's) and EMP's, as well as acted as the Environmental Control Officer (ECO) on various projects, including: <ul style="list-style-type: none"> <li>80 km bulk water pipeline from Randfontein to Rustenburg, North-West;</li> <li>Construction of the Spring Grove Dam, as part of the Mooi-Mgeni Transfer Scheme Phase 2, KZN;</li> <li>Ncwabeni Off-Channel Storage and associated infrastructure, KZN;</li> <li>Mokolo Crocodile West Water Augmentation Project (water transfer scheme), Limpopo Province; and</li> <li>Foxwood Dam and associated infrastructure, Eastern Cape.</li> </ul>
Mr C. Chidley	<ul style="list-style-type: none"> <li>BSc Eng (Civil)</li> <li>BA (Economics, Philosophy)</li> <li>MBA</li> </ul>	25 years' experience. Prepared EMP's and acted as the ECO on various projects, including: <ul style="list-style-type: none"> <li>Raising of Hazelmere Dam, KZN;</li> <li>Upgrade of the Sunderland Ridge Waste Water Treatment Works and bulk sewer line situated on the Hennops River, Gauteng; and</li> <li>Empangeni Bulk Outfall Sewer, 40 km pipeline, KZN.</li> </ul>

## 9 ENVIRONMENTAL GOVERNANCE FRAMEWORK

### 9.1 Legal Framework

Pre-construction activities will be undertaken according to recognised best industry practices and will include measures prescribed within this EMP. The EMP is a legally binding in terms of environmental legislation. As such, this EMP, and all environmental statutory requirements, shall form part of the contract documents for any service provider appointed to undertake the pre-construction activities (see **Section 10** below) and will inform the service provider of their duties in

the fulfilment of this Pre-Construction EMP, with particular reference to the mitigation of environmental impacts.

All pre-construction activities must comply with all relevant South African legislation and regulations. Specific legislation that must be complied with includes, but is not necessarily limited to:

- Constitution of the Republic of South Africa;
- National Environmental Management Act (Act No. 107 of 1998) (NEMA);
- National Water Act (Act No. 36 of 1998);
- Mineral and Petroleum Resources Development Act (Act No. 28 of 2002);
- Mine Health and Safety Act (Act No 29 of 1996);
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004);
- National Environmental Management: Waste Act (Act No. 59 of 2008);
- National Environmental Management: Protected Areas Act (Act No. 57 of 2003);
- National Environmental Management: Air Quality Act (Act No. 39 of 2004);
- National Heritage Resources Act (Act No. 25 of 1999);
- National Veld and Forest Fire Act (Act No. 101 of 1998);
- Environmental Conservation Act (Act No. 73 of 1989);
- Animal Protection Act (Act No. 71 of 1962);
- Conservation of Agricultural Resources Act (Act No. 43 of 1983);
- Hazardous Substances Act (Act No. 15 of 1973);
- Occupational Health and Safety Act (Act No. 85 of 1993);
- Construction Regulations (2014);
- Explosives Act (No. 15 of 2003); and
- Alien and Invasive Species Regulations (2014).

## 10 PRE-CONSTRUCTION ACTIVITIES

This Section describes the pre-construction activities and identifies any potential impacts, either positive or negative that may occur as a result of any activities associated with the proposed water conveyance infrastructure. All impacts identified must be then prevented, mitigated against or managed. This EMP strives to provide a comprehensive list of mitigation measures for the pre-construction activities.

The main activities as well as high-level environmental activities undertaken in the pre-construction phase are listed in **Table 3** below.

**Table 3: Activities associated with Pre-Construction Phase**

Project Phase: Pre-construction	
<b>Pre-construction Activities</b>	
Detailed geological and geotechnical investigations.	
Survey and map topography for determination of post-construction landscape, rehabilitation and shaping (where necessary).	
Baseline survey of existing infrastructure (e.g. existing roads, Eskom, Telkom, etc.).	
Conceptual Engineering design.	
<b>Environmental Activities</b>	
Undertake a walk-through survey of the project footprint by the relevant environmental specialists to identify sensitive environmental features (including <i>inter alia</i> red data, protected and endangered species and medicinal plants – detailed Search, Rescue and Relocation Plan; Rehabilitation Management Plan of the construction footprint.	
Develop a detailed Biodiversity Offsets and Compensation Plan including agreements to secure the offset sites.	
Permits if protected trees are to be cut, disturbed, damaged, destroyed or removed during construction.	
Access to the affected properties, including access control.	
On-going consultation with I&APs.	
Development of the Construction and Operation EMP.	

## 10.1 Geological and geotechnical investigations

### Management Objective:

- Arrange access to properties.
- Ensure that only areas that are specifically required for the geological and geotechnical surveys are cleared and rehabilitated.
- Ensure suitable management of labour and staff to prevent security-related issues.
- Provide a safe and healthy working environment to labour and staff, and the public by complying with the Occupational Health and Safety (OHS) Act.

### Indicators and Targets:

Indicators	Targets
Compliance notices or other forms of sanction by the authorities	None
Avoid sensitive areas	100%
General housekeeping as a function of visual inspections	Full compliance
General waste management, including	Full compliance



Indicators	Targets
contamination as a result of ablution facilities as a function of visual inspections	
Number of health and safety major incidents	None
Compliance with the OHS Act	100%

A description of the activities undertaken during the geological and geotechnical surveys, including survey method, equipment used, and impacts on properties is described in Table 4 below.



**Reporting and Monitoring Requirements:**

- Documentation i.e. OHS Act.
- Public complaints and issues, and responses.
- Specialist report – Geological and geotechnical report.
- Sign-off from landowners once the field investigations and restatement/rehabilitation are complete.

**Table 4: Description of typical activities for geophysical and geotechnical surveys**

TYPE OF SURVEY	BRIEF DESCRIPTION OF SURVEY METHOD	EQUIPMENT USED	IMPACTS ON PROPERTIES
Test pitting with a Tractor Loader Backhoe (TLB)	<p>A test pit is excavated using a TLB. The test pit is usually 3.5m deep by 1m wide and 3m to 5m long. A staff member enters the pit and describes and samples the soil therein (profiling). The test pit is then backfilled. As some settlement of the soil can be expected the pit is generally backfilled a little higher than the surrounding ground.</p> <p>Each test pit can take between, approximately, 20 minutes to 40 minutes depending on the skill of the operator and how dense or stiff the underlying material is.</p> <p>Care will be taken to avoid sensitive features.</p>	<p>TLB plus accompanying person in a Light Duty Vehicle (LDV) or car.</p>  <p><b>Tractor Loader Backhoe (TLB)</b></p>	<p>The excavation of test pits requires the excavation several cubic metres soil and replacing the same. An area of approximately 10m by 10m will be disturbed.</p> <p>Care will be taken that the topsoil is placed in a separate stockpile to the sub-soil, and is re-instated on top again.</p> <p>The process will be excavation, profiling and backfilling. No pit will remain open overnight nor left unattended.</p>
Test pitting with a tracked excavator	<p>A test pit is excavated using a tracked excavator which is a larger and more powerful machine than a TLB. The test pit is usually 5m to 6m deep by 1m wide and can be 10m long. A staff member enters the pit and describes and samples the soil therein (profiling). The test pit is then backfilled. As some settlement of the soil can be expected the pit is generally backfilled a little higher than the surrounding ground.</p> <p>Each test pit can take between, approximately, 10 minutes to 30 minutes depending on the skill of the operator and how dense or stiff the underlying material is.</p> <p>Test pits will, only, be excavated with the tracked excavator where suitable foundation conditions were not reached with the TLB. This would, typically, be at river crossings and at sites of potential borrow areas.</p>	<p>Tracked excavator plus accompanying persons in a LDV or car.</p>  <p><b>Excavator</b></p>	<p>The excavation of test pits requires the excavation several cubic metres soil and replacing the same. An area of approximately 20m by 20m will be disturbed as the depth of the pit is much greater than those excavated by a TLB. However, these deeper pits are usually only excavated at the positions of potential borrow areas or at major crossings where rock has to be proven.</p> <p>Care will be taken that the topsoil is placed in a separate stockpile to the sub-soil, and is re-instated on top again.</p> <p>The process will be excavation, profiling and backfilling. No pit will remain open overnight nor left unattended.</p>



TYPE OF SURVEY	BRIEF DESCRIPTION OF SURVEY METHOD	EQUIPMENT USED	IMPACTS ON PROPERTIES
Rotary Core Drilling	<p>A small diameter hole is drilled to depth using a rig which is driven or skidded into position. A full, cylindrical, sample of the profile drilled through is obtained and this can be logged and sampled for subsequent testing.</p> <p>Drilling can be to a predetermined depth or can be terminated when specific conditions are met such as once 3m of rock have been proven.</p> <p>It can take approximately half a day to establish the machine on site for each borehole. Thereafter the drill rig will need to be on site for the period required complete the drilling to the required depth. In exceptional circumstances the machine may be left on site over a weekend or public holiday(s).</p>	<p>Drilling rig plus accompanying LDV. A water cart will, occasionally visit the rig. Staff will be dropped off at the rig each morning and collected at the end of the working day.</p>  <p><b>Typical Drilling Rig</b></p>	<p>The drill hole itself is very small. However, a working area is required for drilling and it is necessary to dig a small sump, approximately 1m by 1m and 0.5m deep to allow water and drilling fluids to be recycled and there are drilling rods and core boxes that need to be stored adjacent to the drilling rig.</p>
Soil resistivity survey	<p>This is a non destructive testing method and require small pegs to be hammered into the ground and “wired” up. A small electrical pulse is put through the ground and a receiver picks up the signal along the line of connected pegs.</p> <p>Each survey line will take a few hours to set up and get readings from.</p>	<p>The equipment is, generally, confined to pegs and cables, which are removed after testing. Also, some instrument boxes which are, also, removed after testing. A Light Duty Vehicle (LDV) will be used to deliver the equipment to site.</p>  <p><b>Typical resistivity survey activities</b></p>	<p>Negligible as only small pegs are driven into the ground and removed once the survey is complete. The only impact will be the survey personnel walking across a property and the LDV which will deliver the equipment to site, using only the farm access roads where these are available.</p>

TYPE OF SURVEY	BRIEF DESCRIPTION OF SURVEY METHOD	EQUIPMENT USED	IMPACTS ON PROPERTIES
Soil Seismic survey	<p>This is a non destructive testing method and require small geophones to be placed on the ground and “wired” up. A small impulse is generated (usually by hitting a steel plate on the ground) causing a shock wave to travel through the ground. The arrival times of the shock wave at the various geophones is recorded.</p> <p>Each survey line will take a few hours to set up and get readings from.</p>	<p>The equipment is, generally, confined to geophones and cables which are removed after testing. Also, some instrument boxes (i.e. recorders) which are, also, removed after testing. A LDV will be used to deliver the equipment to site.</p> <p>Typical seismic survey activities are similar to those for the resistivity survey (see above).</p>	<p>Negligible as only small geophones are placed on the ground and removed once the survey is complete. The only impact will be the survey personnel walking across a property and the LDV which will deliver the equipment to site, using only the farm access roads where these are available.</p>

## 10.2 Topographical Surveys

A topographical survey locates all surface features showing all natural and man-made features. Specifically, it shows their location, size and levels/elevation. The topographical survey for the project will generally include:

- A two- or three-dimensional digital terrain model (DTM) of the surface (including bathymetry, where required);
- Contour digital orthophotos;
- 2D line mapping of the survey;
- Installation of survey benchmarks and/or control points; and
- Obtaining cadastral information, title deeds and/or SG diagrams.

Airplanes, helicopters and drones are the most commonly used platforms for acquiring LIDAR data over broad areas. Topographic LIDAR typically uses near infrared laser to map the land, while bathymetric LIDAR uses water-penetrating green light to measure riverbed elevations.

During these surveys, access to properties will be required for the installation of benchmarks and/or control points only.

### Management Objective:

- Arrange access to properties.
- Ensure suitable management of labour and staff to prevent security-related issues.
- Provide a safe and healthy working environment to labour and staff, by complying with the OHS Act.

### Indicators and Targets:

Indicators	Targets
Compliance notices or other forms of sanction by the authorities	None
Avoid sensitive areas	100%
Number of health and safety major incidents	None
Compliance with the OHS Act	100%

As much of these surveys are aerial, the impacts if any will be minimal.

### Reporting and Monitoring Requirements:

- Public complaints and issues, and responses.
- Topographical Survey information and/or model – this information will be used in Concept Engineering Design.

### 10.3 Baseline Surveys of Existing Infrastructure and Services

Infrastructure and services within the tunnel (portals, adits and shafts) and pipeline route and servitudes (within the approved corridor) may require decommissioning and/or removal or realignment if affected by construction activities, e.g. excavation of trenches and tunnelling. These include fences, roads, powerlines, buildings, pipelines and septic tanks.

The table below provides a summary of infrastructure and services may require decommissioning or realigned prior to the construction. It should be noted that some of the services/infrastructure will not be affected during the construction of the proposed tunnel as this will be well below the ground surface. Key areas of concern are limited to the surface level points such as the inlet, central and outlet portals; spoil sites; adits; and ventilation shafts.

**Table 5: Example of Service/Infrastructure and Requirements**

Services/Infrastructure	Construction Activities
Buildings	Demolished and removed, or protected
Roads	Left as is, realigned, deviated, or upgraded
Fences	Demolished and removed
Electricity and telephone lines	Left as is, relocated or protected
Abstraction works, pump stations and/or pipelines	Disconnected but left <i>in situ</i> . Realignment or relocated
Other services	Including <i>inter alia</i> fibre optic cables, etc.

Whilst the above construction activities will not be undertaken during the pre-construction phase, it is essential that the existing infrastructure and services are identified and mapped during pre-construction phase.

#### Management Objective:

- Arrange access to properties
- Ensure suitable management of labour and staff to prevent security-related issues.

#### Indicators and Targets:

Indicators	Targets
Compliance notices or other forms of sanction by the authorities	None
Avoid sensitive areas	100%

#### Monitoring Requirements:

- Public complaints and issues, and responses.
- Existing Infrastructure and Services information - this information will be used in Concept Engineering Design.

## 10.4 Access and Access Control

The right of access on or around the landowners/farmers private land that are required for the pre-construction activities will be sought from landowners/farmers through negotiation. Generally, permissions/consent for access will be required for small teams/specialists and will be temporary and for a limited period. The access control/protocol will be negotiated and agreed with each landowner/farmer/occupant.

### Management Objective:

- The access and access control will be in accordance with the EA and this EMP.

### Indicators and Targets:

Indicators	Targets
Access control measures/protocol, i.e. agreement with landowner(s)	Full compliance

### Monitoring Requirements:

- Public complaints and issues, and responses.

## 10.5 Conceptual Engineering design

All of the above pre-construction project activities as well as the environmental activities will inform the conceptual engineering design. This will meet the requirements of Condition 13 of the EA (as amended):

*“A copy of the detailed site layout map must be made available for comments by registered Interested and Affected Parties for a period of 30 days and the holder of this Environmental Authorisation must consider such comments. Once amended, the development layout map must be submitted to the Department for written approval prior to the commencement of construction activities. All available biodiversity information, baseline studies and preconstruction surveys must be used in the finalization of the layout map. The Department will provide written response within a period of 30 days”.*

The layout map will include *inter alia* the following:

- Final tunnel route and pipeline route within the approved corridors;
- Internal roads;
- Wetlands, drainage lines, rivers, streams and water crossings
- Sensitive environmental features;
- Temporary construction laydown areas;
- Spoil sites; and

- Buildings, etc.

## 10.6 Environmental Walk-Through Survey

The purpose of the survey is to document the habitats, flora and fauna that will be affected by the development, including *inter alia*:

- The terrestrial Critical Biodiversity Areas (CBAs) including Irreplaceable CBAs and Optimal CBAs.
- The wetlands, riparian areas and instream habitat, which are ecologically sensitive and often identified as CBAs.
- Blue Swallow and other sensitive bird species (e.g. Grey-crowned crane) breeding sites.

### Management Objectives:

- To identify and document flora and fauna.

### Indicators and Targets:

Indicator	Target
Percentage area of search and rescue on the construction area, including licences/permits where required	100%
Alien invasive vegetation control measures documented for the construction area	100%

An ecologist and/or group of specialists (with wetland and rehabilitation experience) will produce an ecological report, which will provide a description of the habitats and vegetation types including the siting of faunal species with particular attention to those listed above.

With regards to floral species and habitats, the report must include maps and photographic records per directly affected property and describe the vegetation types as well as:

- Mitigation for threatened/protected species of conservation importance.
- Any protected plants or trees must be documented to ensure that all the necessary permits under the National Forests Act (Act 84 of 1998) can be acquired timeously.
- The alien invasive plant species and weeds that will need to be controlled and the methods of control.
- Detailed and specific rehabilitation (i.e. fertilisers, seed mixes, timing, maintenance, type of applications, etc.) for those areas where rehabilitation will be required.

### Monitoring Requirements:

- Public complaints and issues, and responses.
- Information from the survey will be used to prepare the following plans:

- Search, Rescue, Relocation Management Plan; and
- Rehabilitation Management Plan.

## 10.7 The Biodiversity Offsets and Compensation Plan

The EA (as amended) requires that the detailed Biodiversity Offset and Compensation Plan must be approved by the Department **prior to the commencement** of construction commencing on any part or aspect of the development. The footprint lost as described in the EIA Report is summarised in **Table 6** below.

**Table 6: Biodiversity features and footprint lost**

Project Component	Biodiversity Feature Affected	Footprint Lost		Status
Central portal and spoil sites	CBA Optimal	4.6 ha	0 ha (excluding riparian vegetation)	Natural grasslands are associated with the central portal and spoil site.
	CBA Optimal	30 ha	4.6 ha (excluding riparian vegetation)	Portions which fall within CBA optimal have been transformed through forestry plantations.
	Riparian Vegetation	Central portal: 0 ha Access roads: 0.5 ha		Central Portal spoil site falls outside of riparian zone and associated buffer zones. Riparian zones within this area are dominated by escape exotic species originating from encroaching/invasive forestry species. Access roads do cross riparian zones of minor tributaries and some riparian zones will be lost to accommodate vehicle crossing points for haul and construction vehicles.

The detailed biodiversity offsets and compensation planning process will include *inter alia* the following:

- Review of the footprint lost or residual impacts (refer to **Table 6** above) and determining the offset targets.
- Develop a detailed plan:
  - Select recipient sites or biodiversity offset areas.
  - Develop detailed scope of work for each site/area - designs, specifications, drawings, budget estimates, cash-flows, etc.
  - Undertake EIAs or apply for exemption, where required.
  - Apply for Water Use Licences where required.
  - Determine the conditions for long-term management.
  - Sign agreement with landowner(s) and/or organisations.

## 11 ENVIRONMENTAL MANAGEMENT REQUIREMENTS

A separate Environmental Awareness Plan has not been prepared for pre-construction activities as there will be a low number of specialists/teams required to access the footprint of the proposed development to undertake the field surveys, studies and investigations. However, strict adherence to this Pre-Construction EMP will be required at all times and will be contractually binding.

### Management Objective:

- To mitigate impacts to environmental features, landowners and existing infrastructure.

### Management Actions:

- **Air Quality Management**
  - To minimise dust, the speed limit must be adhered to at all times
- **Noise Management**
  - To minimise disturbance to surrounding residents and landowners:
    - No amplified music is to be allowed from the use of radios and other devices.
    - Sufficient notice must be provided to the surrounding residents and landowners on any activity that may be a nuisance.
- **Water Management**
  - Working in close proximity to, or in, surface and underground water can pose a risk to the ecological integrity of these resources, potentially to the detriment of the users of water in the resources. It is therefore necessary to ensure that activities that could negatively impact on water resources and water users are effectively managed and controlled to minimise or prevent the same.
  - No hinderance to flow in natural drainage lines as well as the water table.
  - Pre-construction activities not to affect or interfere with downstream water users and ecology.
- **Fire Management**
  - Uncontrollable fires pose risks to health, safety and the environment. No fires will be allowed.
- **Fauna and Flora Management**
  - There are some critically endangered grasslands and functioning wetlands, and other sensitive environmental features. There is also the presence of red data and endangered fauna, flora and/or medicinal plants.
  - Ensure the protection of all animals including livestock and crops
  - Adhere to agreements made with landowners regarding animals, fences, gates, use of private roads, etc.
  - Have an emergency response procedure for dealing with snake bites, as venomous species may occur in the area.
- **Heritage Management**



- Care must be taken to avoid damage to, or destruction of, any heritage and cultural sites, graves and archaeological artefacts.
- **Social Management**
  - The project will affect landowners and other interested and affected in the area. All interested and affected parties will need to be (i) kept updated on status of pre-construction activities (ii) given the opportunity to complain, raise issues or request information.
  - Establish and maintain communication and sharing of information with interested and affected parties.
  - Continued liaison with authorities with regards to compliance with the EA and this EMPr.
  - Establish and maintain protocol to record and address complaints and issues and provide a single point of contact (suitably qualified person) through whom the interested and affected parties may register queries, issues or complaints.
- **Rehabilitation Management**
  - All areas disturbed by pre-construction activities must be rehabilitated as soon as is practically possible. Backfilling of excavations must ensure placement of soil in the order it was removed, i.e. subsoil is deposited first, followed by the topsoil and vegetation. Compact in suitable layer thickness to avoid subsistence or depressions, especially in existing roads.
- **General**

Some of the general requirements that must be adhered to include *inter alia*:

  - **Ablution facilities:**
    - Provide and maintain sufficient and suitable ablution facilities, where required e.g. portable toilets and ensure that these are removed once the pre-construction activities are complete.
    - Toilets may not be situated within 100 m of any water body or within the 1:100 year flood line, exceptions should, however, be allowed when the works are in the water body or in close proximity of the water body – in this instance mobile toilets may be situated at least 50 m away from the water body.
    - All temporary / portable / mobile toilets shall be secured to the ground to prevent them from toppling over due to wind or any other cause and doors are to be kept closed at all times.
    - All windows and other ventilation openings of the toilets should be fitted with suitable screens to prevent flies and other unwanted flying insects from entering the neighbouring properties.
    - The entrances to the toilets will be adequately screened from public view.
    - Sanitary hygiene bins will be provided for female labour and staff.
    - Toilet paper shall be provided.
    - All ablutions facilities are to be cleaned/emptied on a regular basis, before they are full and contaminate the environment, and the disposal of waste is only at a licensed waste disposal facility.

- **Management of equipment:**
  - Maintenance and cleaning/washing of equipment (which includes apparatus, machinery, and off-road vehicles) will be performed in such a manner so as to avoid any environmental contamination.
  - Use of drip trays, oil traps or other suitable measures.
  - Refuelling (using dripless methods/equipment) or servicing within or close proximity of the natural water resources will not be permitted.
- **Waste management:**
  - Littering is prohibited.
  - Oils spills must be prevented. For accidents/incidents relating to spills, cleaning must be immediate by bagging the contaminated soil and safe disposal thereof.

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**forestry, fisheries  
& the environment**

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**PER EMAIL / MAIL**

Dear Mr Bester

**APPROVAL OF THE PRE-CONSTRUCTION ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPR),  
FOR THE UMKHOMAZI WATER PROJECT PHASE 1: RAW WATER COMPONENT – WATER  
CONVEYANCE INFRASTRUCTURE WITHIN RICHMOND, IMPENDLE AND THE MSUNDUZI LOCAL  
MUNICIPALITIES IN THE KWAZULU-NATAL PROVINCE**

The Environmental Authorisation (EA) issued for the above application by this Department on 19 November 2020, the pre-construction EMPr dated January 2022, for the abovementioned development, received by the Department on 03 February 2022 refer.

This Department has evaluated the pre-construction EMPr and is hereby **approved**. The approved EMPr must be implemented and adhered to. This EMPr approval must be read in conjunction with the conditions contained within the abovementioned EA dated 19 November 2020, as amended.

It is noted that this is the approval for the pre-construction phase of the water conveyance infrastructure only. The Construction and Operation EMPr must be approved prior to the commencement of the main construction activities.

This EMPr must be regarded as a 'living document', which may be amended from time to time as and when the need arises. For future amendments to this EMPr, your attention is drawn to the processes as outlined in the EIA Regulations, 2014, as amended.

Yours faithfully

**Mr Sabelo Malaza**  
**Chief Director: Integrated Environmental Authorisations**  
**Department of Forestry, Fisheries and the Environment**  
**Date:** 04/03/2022

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## **AGREEMENT**

### **APPENDIX 7: RECORD OF IMPLEMENTATION DECISIONS**



**water & sanitation**

Department:  
Water and Sanitation  
REPUBLIC OF SOUTH AFRICA



REPORT NO: P WMA 11/U10/00/3312/1/4

# The uMkhomazi Water Project Phase 1: Module 1: Technical Feasibility Study: Raw Water

**RECORD OF IMPLEMENTATION DECISIONS**

FINAL

MARCH 2018



W112\_2013/J01763





**water & sanitation**

Department:  
Water and Sanitation  
**REPUBLIC OF SOUTH AFRICA**

# **The uMkhomazi Water Project Phase 1:**

## **Module 1: Technical Feasibility Study**

### **Raw Water**

## **RECORD OF IMPLEMENTATION DECISIONS**

*Project name:* **The uMkhomazi Water Project Phase 1**

*Report title:* **Record of Implementation Decisions**

*Authors:* **Directorate: Options Analysis**

*DWA Report no.:* **P WMA 11/U10/00/3312/4**

*Status of report:* **Final**

*First issue:* **June 2017**

*Final issue:* **March 2018**

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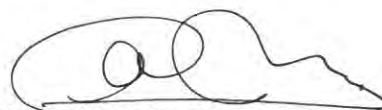
**DEPARTMENT OF WATER AND SANITATION (DWS):**

*Approved for Chief Directorate: Integrated Water Resources Planning by:*



**K Bester**

*Chief Engineer: Options Analysis*



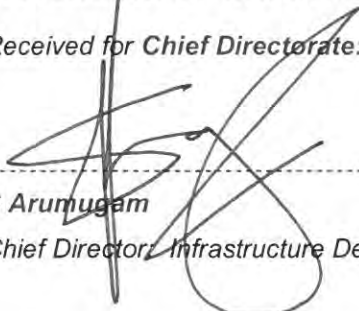
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17 March 2018



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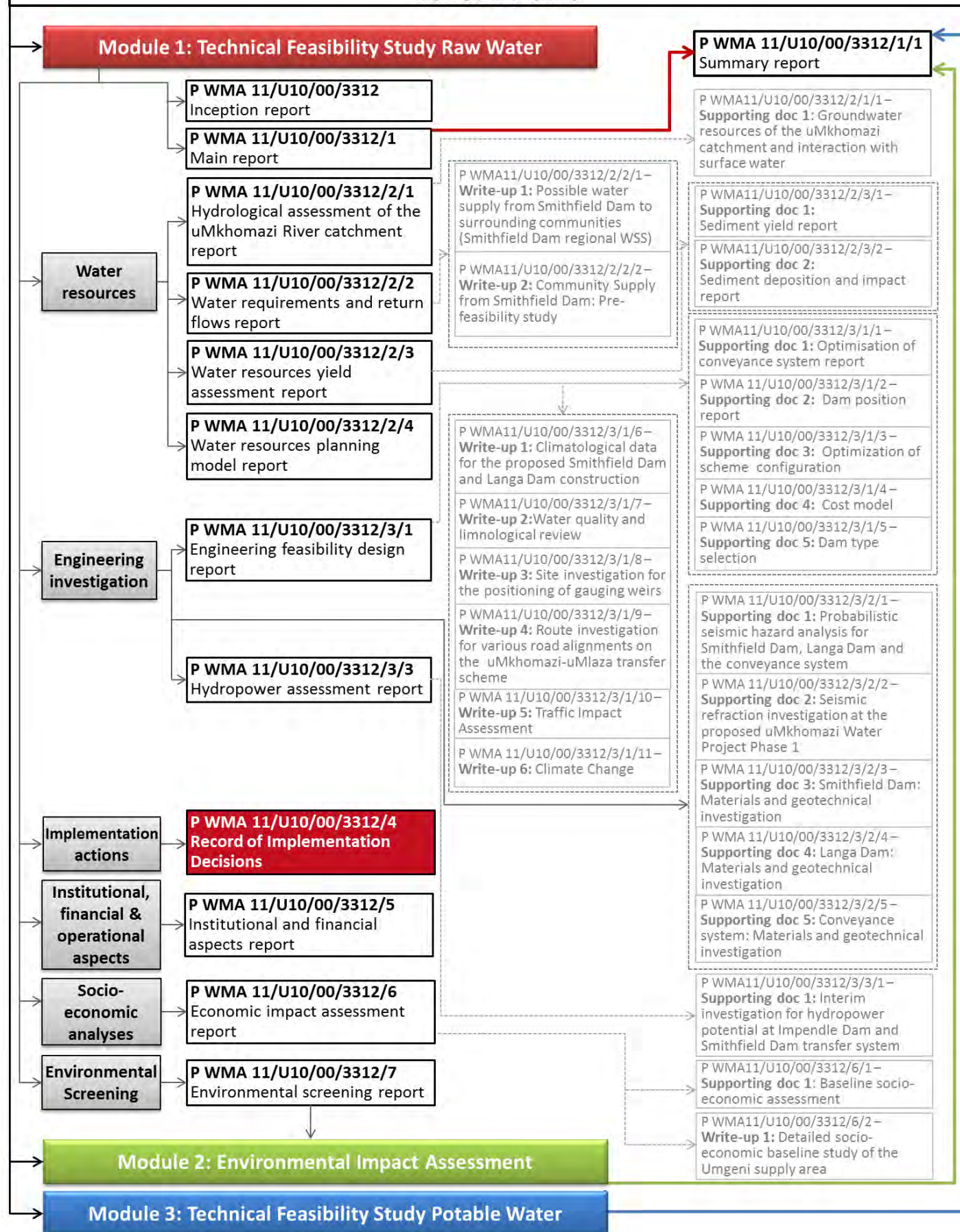
## PREAMBLE

In June 2014, two years after the commencement of the Technical Feasibility Study for the proposed uMkhomazi Water Project Phase 1 (uMWP-1), a new Department of Water and Sanitation (DWS) was formed by Cabinet, which included the formerly known Department of Water Affairs (DWA).

In order to maintain consistent reporting, all reports emanating from the uMWP-1: Module 1: Technical Feasibility Study: Raw Water will be published under the DWA name.

# The uMkhomazi Water Project Phase 1

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# LIST OF ABBREVIATIONS

APP	Approved Professional Person
BBBEE	Broad-Based Black Economic Empowerment
CD	Chief Directorate / Chief Director
DBT	Drill and Blast Technique
DEA	Department of Environmental Affairs
DM	District Municipality
DMR	Department of Mineral Resources
DWA	Department of Water Affairs (previously Department of Water Affairs and Forestry)
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation (previously Department of Water Affairs)
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECRD	Earth Core Rockfill Dam
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EKZNW	Ezemvelo KZN Wildlife
EMC	Environmental Monitoring Committee
EMP	Environmental Management Plan
EMPr	Environmental Management Programme
EWR	Environmental Water Requirements
FSL	Full Supply Level
HPP	Hydropower Plant
I&APs	Interested and Affected Parties
ID	Infrastructure Development
IWRP	Integrated Water Resources Planning
KZN	KwaZulu-Natal Province
KZN EDTEA	KZN Economic Development, Tourism and Environmental Affairs
LM	Local Municipality
MAR	Mean Annual Runoff
MM	Metropolitan Municipality
MMTS-1	Mooi Mgeni Transfer Scheme Phase 1
MMTS-2	Mooi Mgeni Transfer Scheme Phase 2
MoA	Memorandum of Agreement
MOL	Minimum Operating Level
ND	Nominal Diameter
NOC	Non Overspill Crest
NWA	National Water Act (Act No. 36 of 1998)
NWRI	National Water Resources Infrastructure
O&M	Operation and Maintenance



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PCC	Project Coordination Committee
PMC	Project Management Committee
PMF	Probable Maximum Flood
PPP	Public Participation Process
PR	Public Relations
Project	uMkhomazi Water Project Phase 1 (uMWP-1)
RAP	Relocation Action Plan
RCC	Roller Compacted Concrete
RDF	Recommended Design Flood
RI	Recurrence Interval
RID	Record of Implementation Decisions
RL	Reduced Level
RMF	Regional Maximum Flood
RPF	Relocation Policy Framework
SABS	South African Bureau of Standards
SANS	South African National Standards
SEF	Safety Evaluation Flood
TBM	Tunnel Boring Machine
TC	Technical Committee
TCTA	Trans-Caledon Tunnelling Authority
TEC	Target Ecological Class
uMWP	uMkhomazi Water Project
uMWP-1	uMkhomazi Water Project Phase 1
uMWP-2	uMkhomazi Water Project Phase 2
UW	Umgeni Water
VAT	Value Added Tax
WSA	Water Services Authority
WSS	Water Supply System
WTP	Water Treatment Plant
WULA	Water User Licence Application
WWTP	Waste Water Treatment Plant

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## LIST OF UNITS

Ha	Hectare
km	Kilometre
km <sup>2</sup>	Square kilometre
kVA	Kilovolt-ampere
m	Metre
m <sup>3</sup>	Cubic metre
m <sup>3</sup> /a	Cubic metre per annum
m <sup>3</sup> /s	Cubic meter per second
masl	Metres above sea level
MW	Megawatt
t/km <sup>2</sup> /a	Ton per square kilometre per annum

# 1 INTRODUCTION

---

The Department of Water and Sanitation (DWS) explored options to meet the long-term water requirements of the more than five million domestic and industrial water users in the eThekweni and Pietermaritzburg regions of the KwaZulu-Natal Province (KZN), also known as the economic hub of the KZN. The fully developed Mgeni Water Supply System (WSS), the main water source of this area, can be augmented by the uMkhomazi River, with dams at Smithfield and Impendle, transferring the water via a tunnel and pipelines to the Umgeni Water (UW) bulk distribution system at Umlaas Road.

The feasibility planning layout and sizing of the proposed uMkhomazi Water Project Phase 1 (uMWP-1) were undertaken as part of the **uMkhomazi Water Project Phase 1: Module 1: Technical Feasibility Study: Raw Water**.

The Department of Environmental Affairs' (DEA's) approval of the Environmental Impact Assessment (EIA) Report and Environmental Authorisation (EA) are still pending for the Project (the uMWP-1). Furthermore, the EA Process for the quarries and borrow areas for the Project, which is administered by the Department of Mineral Resources (DMR) is not completed. The Final EIA Reports for the uMWP-1's Raw Water and Potable Water Components were submitted to the DEA during November 2016. The DEA, however, requested additional information to conclude the decision-making process. The DEA's decision is expected by October 2018 and the DMR's decision is expected by July 2018.

The initial proposed realignment options for Provincial Road R617 by the Technical Feasibility Study are not acceptable to the KZN Department of Transport mainly due to substandard geometrics, specifically the steep slopes. During the EIA Process Ezemvelo KZN Wildlife (EKZNW) indicated that it will not be problematic if the re-aligned Provincial Road R617 traverse the southern parts of Impendle Nature Reserve. After the EIA Report has been submitted EKZNW indicated that they have a problem in principle with allowing development in any nature reserve. For these reasons the investigation of alternative alignment options for the Provincial Road R617 are currently underway. The Implementing Agent should also consider and evaluate the proposed alignment option/s for the Provincial Road R617 in more detail.

The tunnel alignment might have to be changed in order to avoid tunnel construction beneath the critically endangered Blue Swallows nesting sites, and alternative tunnel alignment investigations are currently underway. The balancing dam option (the proposed Langa Dam), and/or the position of this dam, might also change. Furthermore, there might also be other possible technical changes, and changes to the scheme layout.

## 2 THE RECORD OF IMPLEMENTATION DECISIONS

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A Memorandum of Agreement (MoA) between the Chief Directorates Integrated Water Resources Planning (IWRP) and Infrastructure Development (ID) dated March 2005, clarifies that *“the division and/or sharing of roles, responsibilities and accountability of the Chief Directorates through the various project phases from planning to the commissioning of a project”*.

This memorandum states that once the detailed planning of a project has been concluded, and the scheme configuration and other related requirements for implementation have been approved by the Minister, the project shall be formally handed over from the Chief Directorate (CD): IWRP to the CD: ID for implementation. This formal handing-over of the project is concluded through an official document namely, the Record of Implementation Decisions (RID), and is signed off by responsible officials from both the CD: IWRP and the CD: ID. The RID summarises all decisions as approved; describes the scope of the project; the specific configuration of the scheme to be implemented; the required implementation timelines; the financing arrangements; the finalisation of required institutional arrangements and the required environmental mitigation measures as described in the Environmental Impact Report (EIR) as well as any further requirements that may be prescribed by the EA from the DEA. Any work performed outside the scope of the RID will be considered unauthorised work unless official approval for such work has been obtained from the CD: IWRP prior to such work being performed.

This document is the Record of Implementation Decisions (RID) for initiating preparatory work of the **uMWP-1** by the Implementing Agent.

The formal RID for implementation of the **uMWP-1** will be finalised by the DWS when the EA has been obtained and when the Project has been gazetted.

## 3 BACKGROUND TO THE PROJECT

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### 3.1 THE MGENI SYSTEM

The Mgeni WSS supplies the eThekweni Metropolitan Municipality (MM), the Msunduzi Local Municipality (LM) as well as the iLembe; Ugu and uMgungundlovu District Municipalities (DMs). The current water resources of the Mgeni WSS are insufficient to meet the long-term water demands of the system.

The plan layout of both Phases 1 and 2 of the uMkhomazi Water Project (uMWP) is shown on **Figure 3.1** below.

The sources of the Mgeni WSS comprise the Midmar; Albert Falls; Nagle and Inanda dams in the KZN and a Water Transfer Scheme from the Mooi River, which includes the newly constructed Spring Grove Dam, as part of the Mooi Mgeni Transfer Scheme - Phase 2 (MMTS-2). Prior to the implementation of the MMTS-2 the Mgeni WSS, comprised the Midmar; Albert Falls; Nagle and Inanda dams, as well as the Mooi-Mgeni Transfer Scheme Phase 1 (MMTS-1), and had a stochastic yield of 334 million m<sup>3</sup>/a (measured at Inanda Dam) at a 99% assurance of supply. The short-term augmentation measure, which is the MMTS-2, will increase water supply from the Mgeni WSS by 60 million m<sup>3</sup>/a. This will however, not be sufficient to meet the long-term requirements of the Mgeni WSS from 2016 onwards.

Investigations indicated that the uMWP-1, which entails the transfer of water from the undeveloped uMkhomazi River to the existing Mgeni WSS, could fulfil this requirement.

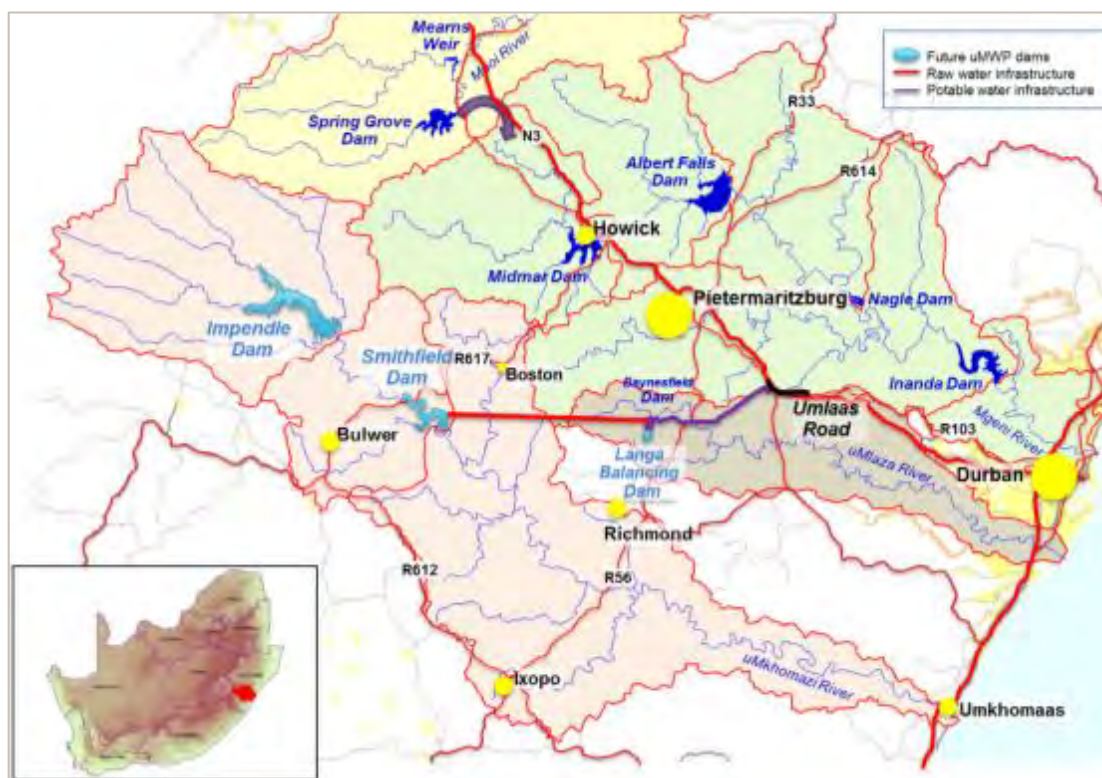


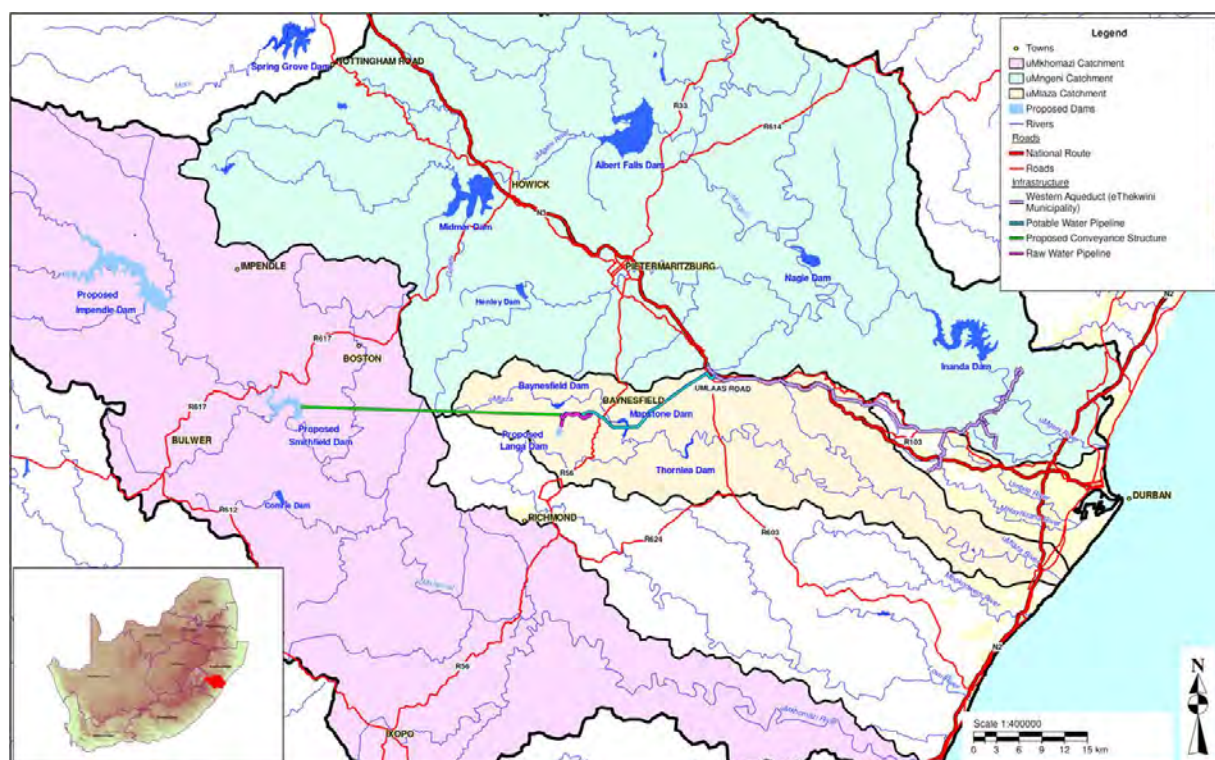
Figure 3.1: Locality of the uMkhomazi and uMgeni Catchments and the Proposed uMWP

### 3.2 GENERAL DESCRIPTION OF THE uMKHOMAZI WATER PROJECT PHASE 1

The main components of the uMWP-1 are the following:

- ◆ A new dam at Smithfield on the uMkhomazi River (proposed Smithfield Dam) near Bulwer (refer **Section 4** below);
- ◆ Raw water conveyance infrastructure (proposed tunnel and pipelines) (refer **Section 5** below) to the proposed Water Treatment Plant (WTP) in the uMlaza River Valley at Baynesfield (the Baynesfield WTP);
- ◆ A balancing dam (refer **Section 6** below) on the Mbangweni River (proposed Langa Dam);
- ◆ Other proposed infrastructure such as gauging weirs, hydropower plants, access routes and road deviations (refer **Section 7** below);
- ◆ A potable water gravity pipeline from the Baynesfield WTP to the Umgeni Bulk Distribution System, below the reservoir at Umlaas Road. It is recommended that water be distributed under gravity from the reservoir at Umlaas Road to eThekweni, as well as
- ◆ A proposed take-off bi-directional raw water pipeline to and from Langa Dam (refer **Section 5** below).





**Figure 3.2: Locality Map of the uMWP within the uMkhomazi and uMgeni Catchments**

The uMWP Phase 2 (uMWP-2) may be implemented when needed, and could comprise the construction of a large dam at Impendle further upstream on the uMkhomazi River (the proposed Impendle Dam) to release water to the downstream Smithfield Dam to be conveyed to the Mgeni WSS.

**Only the uMWP-1 is described further in this report for possible implementation.**

### 3.3 WATER REQUIREMENTS AND BALANCE OF THE MGENI WATER SUPPLY SYSTEM

Through a detailed assessment of the demographics and economic growth factors, the projected long-term Mgeni WSS's water requirements were estimated (*Water requirements and return flows report, P WMA 11/U10/00/3312/2/2*), as shown in **Figure 3.3** below. Significant projected economic growth and development in the eThekweni and Msunduzi Municipalities necessitates the implementation of the next Mgeni WSS augmentation scheme after 2016. The projected annual growth in water requirements in the eThekweni and Msunduzi municipal areas is approximated at 1.5% per annum.



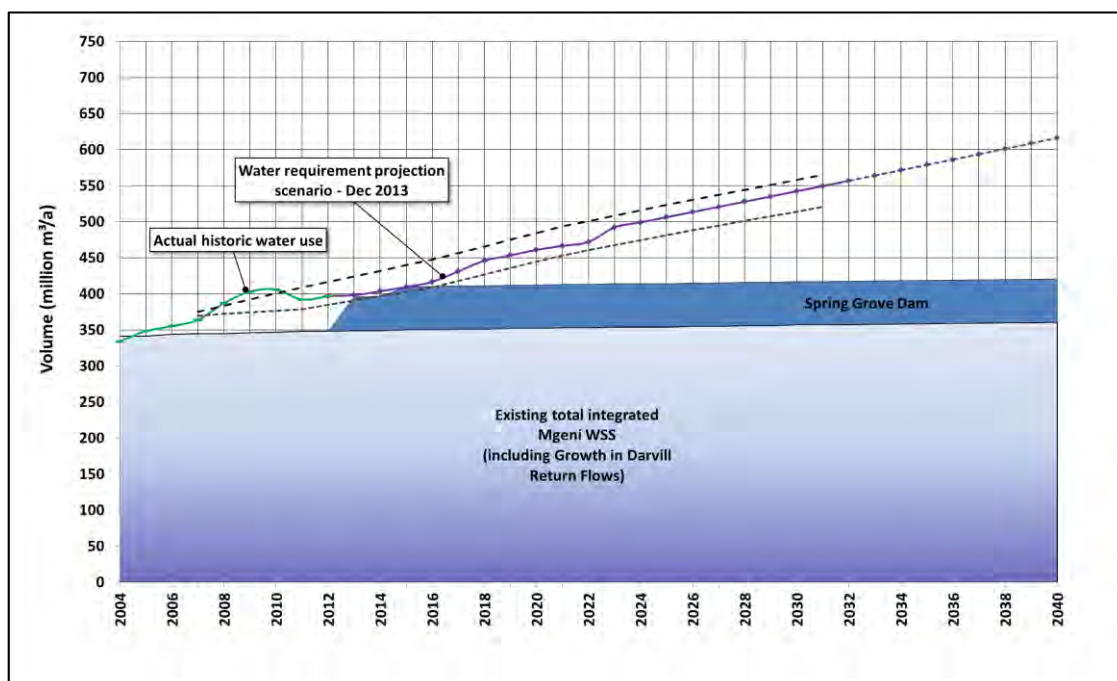


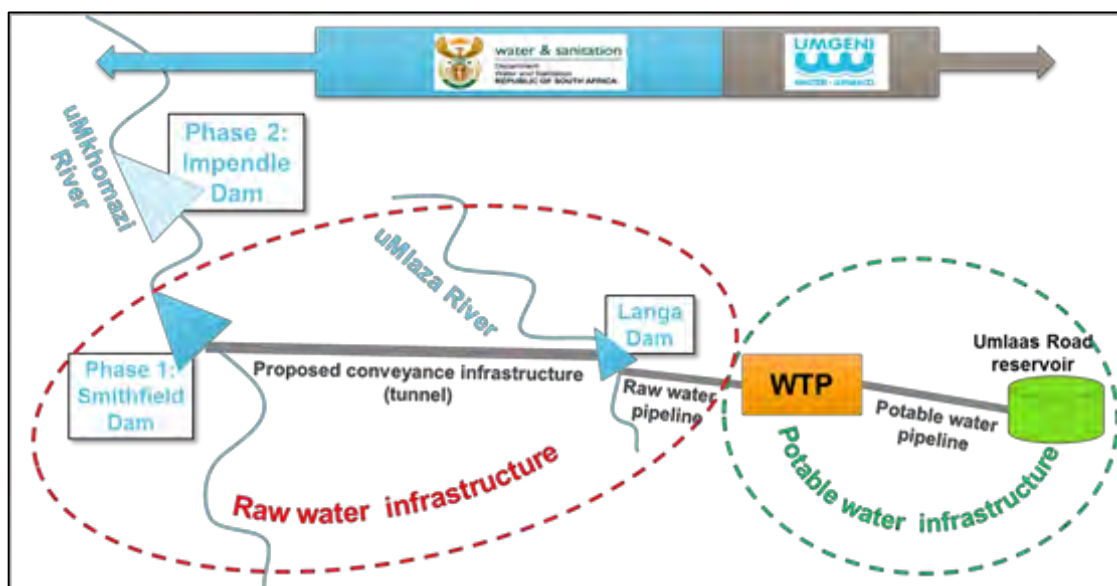
Figure 3.3: Mgeni Water Supply System Water Balance (2013)

### 3.4 PURPOSE OF THE PROJECT

The purpose of the uMWP (both phases) is thus to augment the yield of the Mgeni WSS for long-term water supply and related economic growth in the eThekweni MM; Msunduzi LM; southern areas of the ILembe DM and northern areas of the Ugu DM.

**All uMWP-1 infrastructure components mentioned in the report are only proposed infrastructure.**

Although reference is made to UW's Potable Water Infrastructure, this infrastructure is not further described in this document. This document should, however, be read in conjunction with the reports on the *uMWP-1 Module 1: Technical Feasibility Study: Raw Water*, *Module 2: Environmental Impact Assessment*, and *Module 3: Technical Feasibility Study: Potable Water*. The detail Feasibility Study Reports for the uMWP-1 are listed in **Section 14** below.



**Figure 3.4: Schematic Layout of uMWP-1 Raw and Potable Water Components**

Current DWS Guidelines and best practices (refer **Section 9** below) must be applied for the Scope of Work as described hereafter, as well as to develop and manage the implementation of the Project in the most effective and efficient manner and in accordance with all the applicable legislation; guidelines; protocols and current best practices.

## 4 SCOPE OF WORK FOR THE PROPOSED SMITHFIELD DAM

### 4.1 LOCATION OF SMITHFIELD DAM

The Smithfield Dam is to be constructed on the uMkhomazi River at the farm **Smithfield**, is situated about 18 km east of Bulwer and about 6 km south-east of where Provincial Road R617 crosses the uMkhomazi River, as shown in **Figure 4.1** below. The coordinates of the point where the centreline of the dam intersects the river are: **Latitude: 29° 46' 30.31"S, Longitude: 29° 56' 39.43"E**.

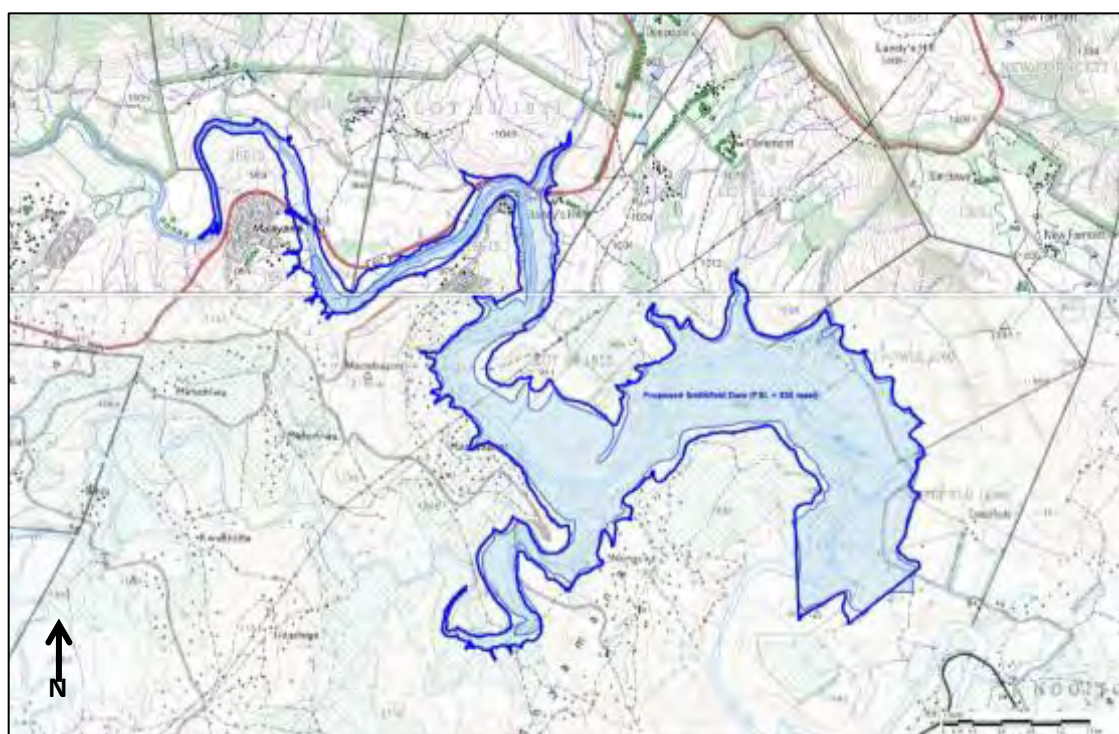
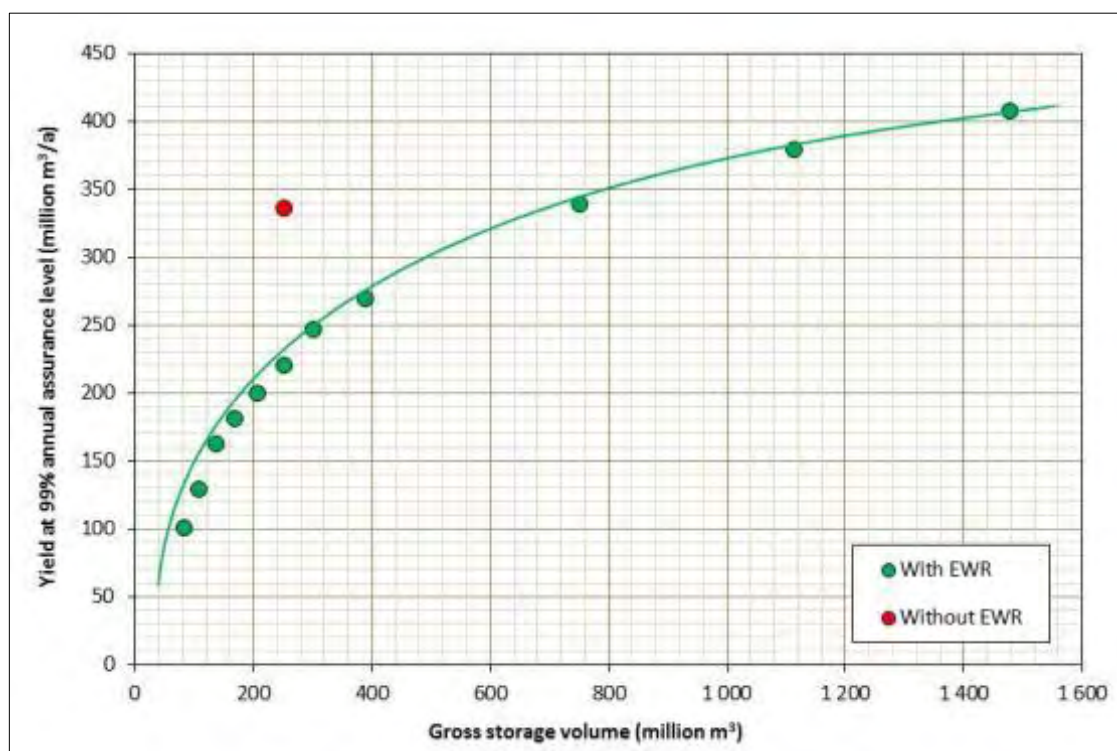


Figure 4.1: Location of Smithfield Dam

### 4.2 WATER RESOURCE DETAIL

#### 4.2.1 Dam Yield and System Demands

It is estimated that the natural Mean Annual Runoff (MAR) at the proposed Smithfield Dam Site is 725.9 million m<sup>3</sup>/a (for the period 1925 to 2008, hydrological years).



**Figure 4.2: Yield for Smithfield Dam at the 99% Annual Assurance Level**

It is anticipated that Smithfield Dam, will be developed to a Full Supply Level (FSL) of Reduced Level (RL) 930 masl with a gross storage volume of 251.43 million m<sup>3</sup>, will have a **yield at 99% annual assurance level of 215 million m<sup>3</sup>/a**, after full provision has been made for releases to support the Environmental Water Requirements (EWR) at EWR Site 1b (*Water resources yield assessment report, P WMA 11/U10/00/3312/2/3*). All yields, shown in **Figure 4.2** above, and given in **Table 4.1** below, are based on analyses undertaken at the 2050 development level, as this roughly coincides with the anticipated implementation date of the uMWP-2 (proposed Impendle Dam and second tunnel).

**Table 4.1: Results from the Yield Analyses for a RL 930 masl FSL Smithfield Dam with EWR Releases**

FSL (masl)	% MAR (%)	Gross Storage Volume <sup>(1)</sup> (million m³)	Stochastic yield at selected assurance level <sup>(2)</sup> (million m³/a)				Historic firm yield (million m³/a)
			95%	98%	99%	99,5%	
With EWR							
930	35	251.43	260	237	215	210	172

Notes: (1) At date of commissioning.

(2) At 2050-development levels

#### 4.2.2 Sedimentation

A sediment yield of 317 t/km<sup>2</sup>/a has been estimated for Smithfield Dam in the sedimentation study (*Sediment Yield Report - Supporting Document 1: Water Resources Yield Assessment, P WMA 11/U10/00/3312/2/3/1*). The volume of sediment that will be accumulated in the dam basin after 50 years is estimated to be 22.1 million m<sup>3</sup>, which is approximately 8.8% of the dam's gross storage volume.

#### 4.2.3 Flood Hydrology

##### a) Spillway Design Floods

Smithfield Dam will be a large dam (wall height >30 m) with a high hazard potential (due to extensive downstream developments) and will be classified as a **Category III** dam in terms of the standing Dam Safety Regulations.

Flood hydrographs, obtained from the *Engineering Feasibility Design Report (P WMA 11/U10/00/3312/3/1)*, with the following flood peaks were selected to size the spillway and freeboard in terms of the Recommended Design Flood (RDF); Safety Evaluation Flood (SEF); Regional Maximum Flood (RMF) and Probable Maximum Flood (PMF).

♦ RDF - 1:200 year Recurrence Interval (RI)	2 620 m <sup>3</sup> /s
♦ RMF	4 540 m <sup>3</sup> /s
♦ SEF = RMF+Δ	5 650 m <sup>3</sup> /s
♦ PMF	6 185 m <sup>3</sup> /s

##### b) River Diversion Design Floods

The appropriateness of the proposed selected flood diversion criteria should be reviewed during the detailed design phase, and must be approved by the DWS as well as by the Approved Professional Person (APP) for the dams (Smithfield and Langa dams).

#### 4.2.4 uMkhomazi-Mgeni System Water Resources Operating Rules

During the implementation phase of the uMWP-1 detailed operating rules for the system must be defined and established by the Operating Entity.



#### 4.2.5 Ecological Reserve

Water needs to be released to supply the EWR Site 1b, located directly downstream of the dam site, and equates to an average requirement of 228 million m<sup>3</sup>/a (or 31.4% of the natural MAR). EWR Mvoti to UMzimkhulu Water Management Area in detail in the *Water resources yield assessment report (P WMA11/U10/00/3312/2/3)*.

***The operating rules for the EWR releases will be informed by the outcomes of the Classification of Water Resources and Determination of the Comprehensive Reserve and Resources Quality Objectives in the Mvoti to UMzimkhulu Water Management Area (DWA, 2015/16) and must be established by the Operating Entity in accordance with the statutory requirements, and according to the developed EWR Rule Table.*** The Target Ecological Classes (TECs) and EWR in the Mvoti to UMzimkhulu Water Management Area were also Gazetted in Government Gazette No. 40075 dated 17 June 2016.

#### 4.2.6 Mgeni WSS Augmentation Requirements

Smithfield Dam will supply the water required to augment the Mgeni WSS, based on the Mgeni WSS water requirements growth curve as shown in **Figure 4.2** above. The Operating Entity within the integrated Mgeni WSS will manage these requirements.

#### 4.2.7 Permanent Water Supply Infrastructure at Smithfield Dam

A reasonable amount of water of about 1 million m<sup>3</sup>/a should be allocated for supply to the communities surrounding Smithfield Dam. This is, however, the responsibility of the Water Services Authority (WSA) and not part of the Implementing Agent's Directive.

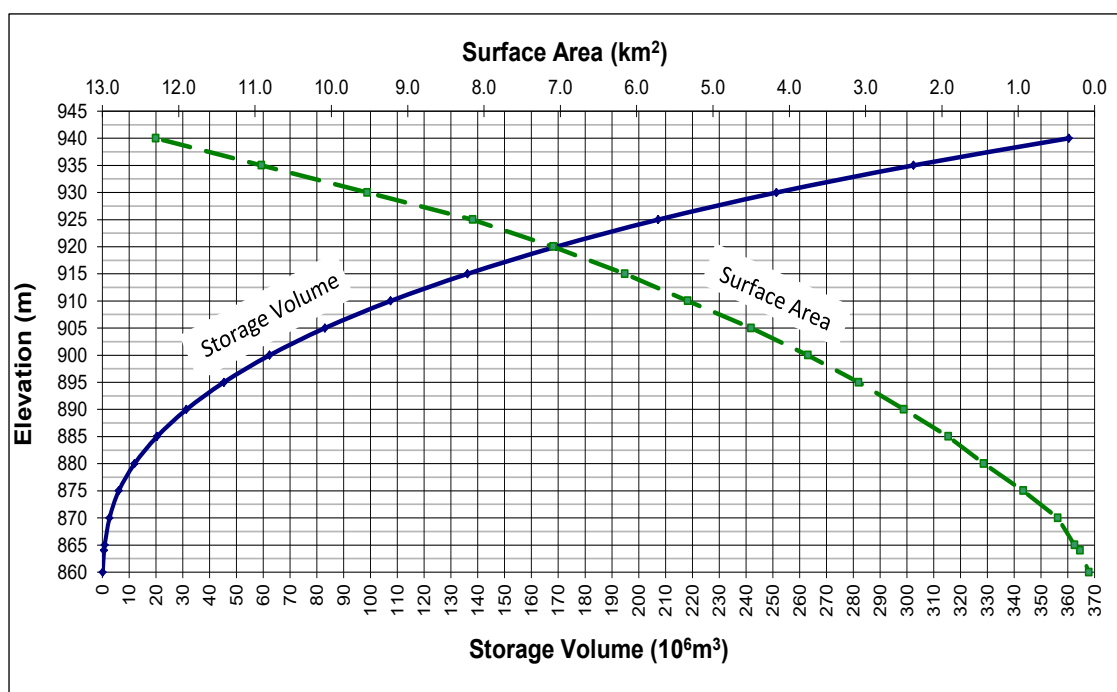
#### 4.2.8 Existing Water Entitlements in the Dam Basin

All the existing water users from the uMkhomazi River Catchment were taken into account, and an operating rule should be developed by the Operating Entity for the support of downstream users, which must also cater for future development up to 2050.

### 4.3 DAM CHARACTERISTICS

This section gives a brief description of Smithfield Dam, which is described in more detail in **Section 3** of the *Engineering Feasibility Design Report (P WMA 11/U10/00/3312/3/1)*.

The stage-storage volumes and surface area relationships from the available contour map for Smithfield Dam are shown in **Figure 4.3** below.



**Figure 4.3: Storage Volume and Surface Area Curves for Smithfield Dam**

The layout of, and principal data for Smithfield Dam is shown and summarised in **Figure 4.4** and in **Table 4.2** below.

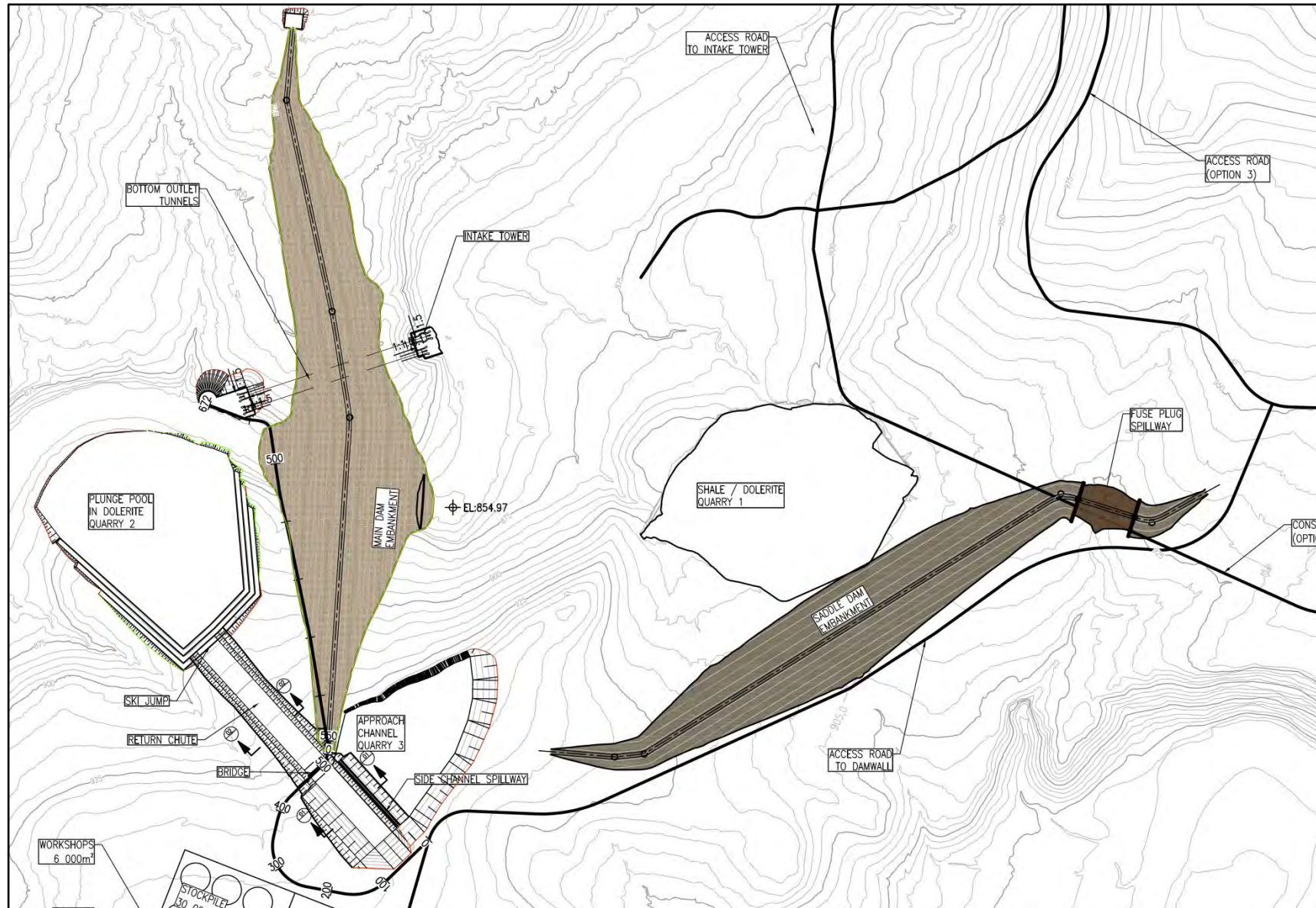


Figure 4.4: Smithfield Dam, Main Embankment, Saddle Dam and Spillway Layout



**Table 4.2: Smithfield Dam Principal Data**

Parameter		Description	
General			
Estimated year of completion		2025	
River		uMkhomazi River	
Nearest town		Bulwer	
Province		KwaZulu-Natal	
Dam site co-ordinates		29° 46' 30.31"S; 29° 56' 39.43"E	
Classification: Category		III	
Size class		Large	
Hazard potential		High	
Non-overspill Crest (NOC) level		RL 936 masl	
Saddle dam fuse plug spillway embankment crest level		RL 933.70 masl	
Full Supply Level (FSL)		RL 930 masl	
Minimum Operating Level (MOL)		RL 887.2 masl	
Mean Annual Runoff (MAR)		725.9 million m³/a	
Gross storage capacity at FSL		251 million m³	
Water surface area at FSL		9.53 km²	
		Main dam	Saddle dam
Wall height above lowest ground level (maximum height)		81 m (RL 855 masl to RL 936 masl)	26 m (RL 910 masl to RL 936 masl)
Dam type		Earth Core Rockfill Dam (ECD)	Zoned earthfill dam
Embankment crest length		1 200 m	1 090 m
Spillway type		Side-channel	Fuse plug*
Spillway shape		Ogee	Broad crested weir
Spillway length		150 m	100 m
Freeboard for embankments		6 m	-
Freeboard for fuse plug spillway embankment		-	3.7 m
Hydrology and Floods			
Catchment area		2 058 km²	
Safety Evaluation Flood (SEF)		5 650 m³/s	
Regional Maximum Flood (RMF)		4 540 m³/s	
Q <sub>1:100</sub>		2 389 m³/s	
Q <sub>1:200</sub> (RDF)		2 620 m³/s	
Outlet Works			
Dam outlet	Dual pipe system of Nominal Diameter (ND) 1.8 m; 6 intakes; butterfly and gate valves.		
Tunnel inlet	Tri pipe system of ND 2 m; 6 intakes; butterfly and gate valves.		

\* A fuse plug spillway is proposed for the saddle dam, and the DWS Dam Safety Office will consider this fuse plug spillway as part of the licence process.

## 4.4 CONSTRUCTION MATERIALS AND GEOTECHNICAL INVESTIGATIONS

The geotechnical investigations for the dam are included in the Geotechnical Report for Smithfield Dam (*P WMA 11/U10/00/3312/3/2/3 – Supporting document 3: Smithfield Dam: Materials and Geotechnical Investigation*).

### 4.4.1 Foundations

#### a) **Main Embankment**

The site has a low seismic risk and comprises shales (mud rocks) with subordinate sandstones and intrusions of dolerite. Three (3) near-horizontal dolerite sills have intruded mainly concordantly into the sedimentary strata and are responsible for the narrow river valley at the dam site and the presence of good quality rock for concrete aggregate and rockfill. The estimated founding levels for the shells of the rockfill embankment are as follows:

- ♦ At the upper left and right flanks a 6 to 10 m layer of colluvium and residual soil/completely weathered shale has to be removed;
- ♦ In the central river section 1.5 to 5 m of residual soil/completely weathered shale/dolerite and medium dense river alluvium has to be removed, and
- ♦ A large part of the right flank has 11.2 to 14.4 m of transported sandy clay with boulders that has to be removed.

These excavations will yield a large volume of material, which could be suitable as impervious and semi-pervious earthfill for the saddle embankment. Laboratory testing of this material will, however, need to be undertaken by the Implementing Agent to confirm the suitability thereof.

The estimated excavation depths for the clay core, which ranges between 2 m and 15 m, were based on the results at borehole positions of the geotechnical investigation that was carried out along the dam centre line and are summarised in the Engineering Feasibility Design Report (*P WMA 11/U10/00/3312/3/1 – Engineering feasibility design report: Volume 1*). It will, however, be necessary to make provision for a grout curtain to a depth of about 66% of the water head along the centre line of the main embankment at the position of the clay core.

#### b) **Saddle Embankment**

A 0.1 to 0.5 m thick layer of organic topsoil has to be removed for the foundations of the shells to be on highly weathered shale. The clay core can be founded on moderately weathered shale at depths of between 2 and 4 m. It will be necessary

to make provision for a grout curtain to a depth of at least 20 m below Quarry I, which will be located just upstream of the saddle embankment. The estimated excavation depths for the shells and clay core are also summarised in the Engineering Feasibility Design Report (*P WMA 11/U10/00/3312/3/1 – Engineering feasibility design report: Volume 1*). More detailed foundations investigations for the saddle embankment will, however, need to be undertaken by the Implementing Agent.

**c) Spillway**

From the geotechnical investigations it was derived that the control structure for the proposed side-channel spillway for the main dam will most probably be founded on slightly weathered shale at estimated depths ranging between 15 and 20 m below ground surface. The concrete lined chute will be founded on moderately weathered shale at estimated depths of between 10 and 12 m.

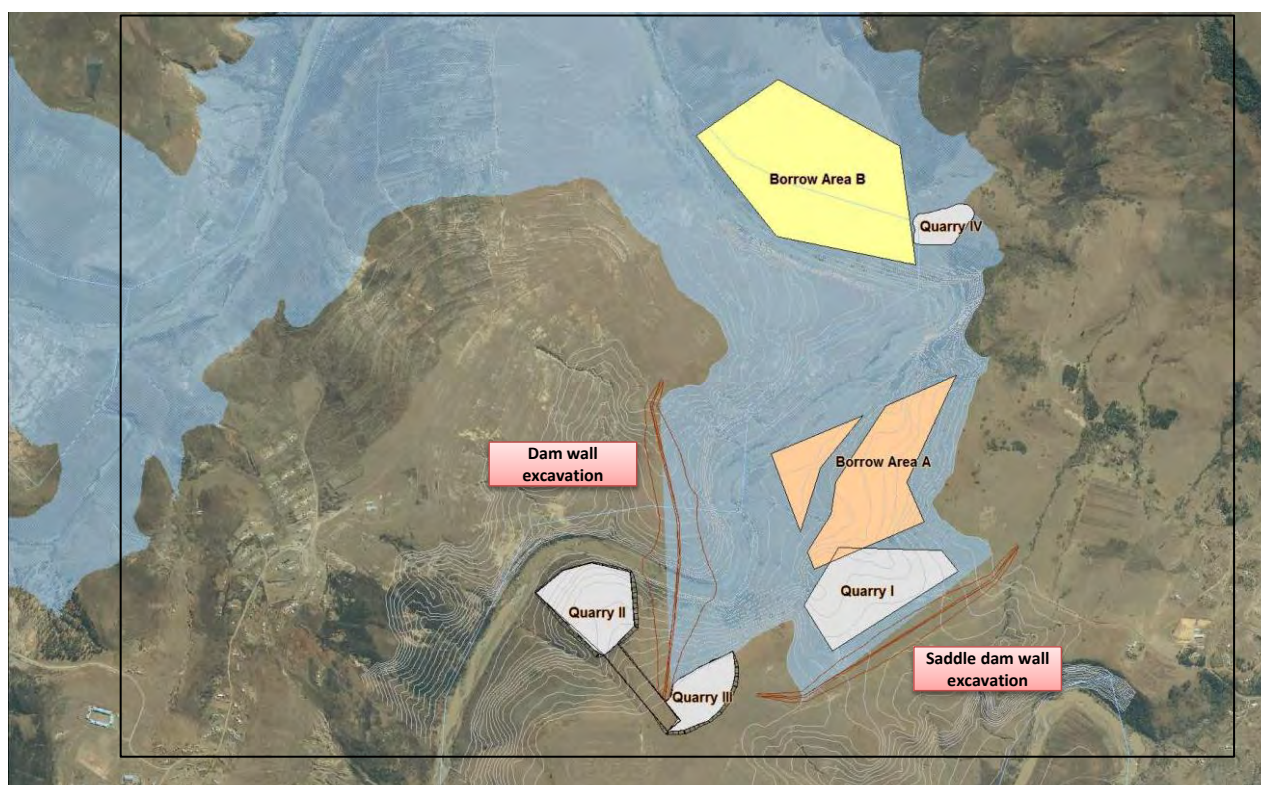
The proposed position of the side-channel spillway structure for the main dam was not adequately drilled to determine foundation levels and therefore additional geotechnical investigations will need to be undertaken by the Implementing Agent to determine foundation conditions at the position of the main spillway. The erosion potential at the fuse plug spillway must be investigated during the detailed design phase. Based on the outcomes of the additional geotechnical investigations a total cost optimisation of the dam's freeboard and spillway widths will be required.

It is also proposed that the possible damage to the fuse plug's spill channel during an extreme flood event be investigated in more detail during the detailed design phase to ensure that the minimum potential loss of materials along the valley section.

The excavations for the clay core of the saddle embankment will be adequate for the foundation of the concrete structure for the fuse plug spillway.

#### **4.4.2 Quarries and Borrow Areas**

From the materials investigations it was deduced that sufficient materials are available for the selected dam types for Smithfield Dam's main dam and saddle dam from the recommended quarries and borrow areas, which are shown in **Figure 4.5** below.



**Figure 4.5: Proposed Quarry and Earthfill Borrow Areas for Smithfield Dam's Embankment Materials**

The rockfill material for Smithfield Dam's main embankment needs to be obtained from the identified quarries. Earthfill material for the saddle embankment needs to be obtained from excavation for the main dam's embankment and the borrow areas. No suitable sand is available from the dam basin and it is anticipated that the sand for the filters will need to be imported from suitable commercial sources. Clayey sand from the borrow areas will be used in the core zone and highly and completely weathered material in the shell zone of the dam and will be obtained from the excavation at Quarry I. The removal of this material will be necessary to expose the dolerite to be used at other locations. It is recommended that the sand for the filters should be imported from suitable commercial sources, as for the main embankment.

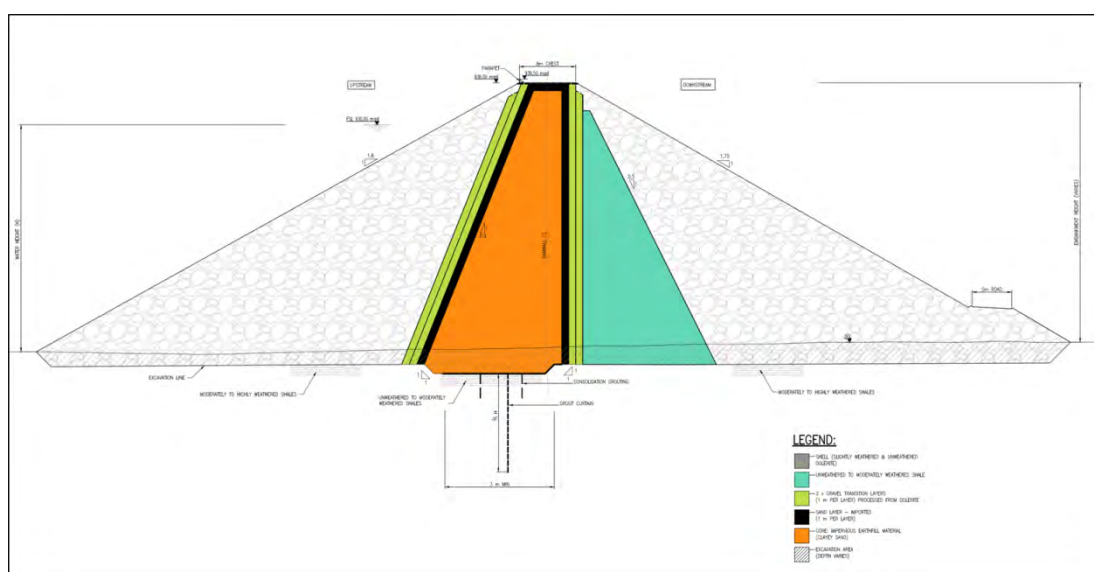
The development of Quarry I could impact on the saddle dam's stability, therefore the stability of the saddle dam needs to be verified pending the size and position of Quarry I.

## 4.5 DESCRIPTION OF SMITHFIELD DAM

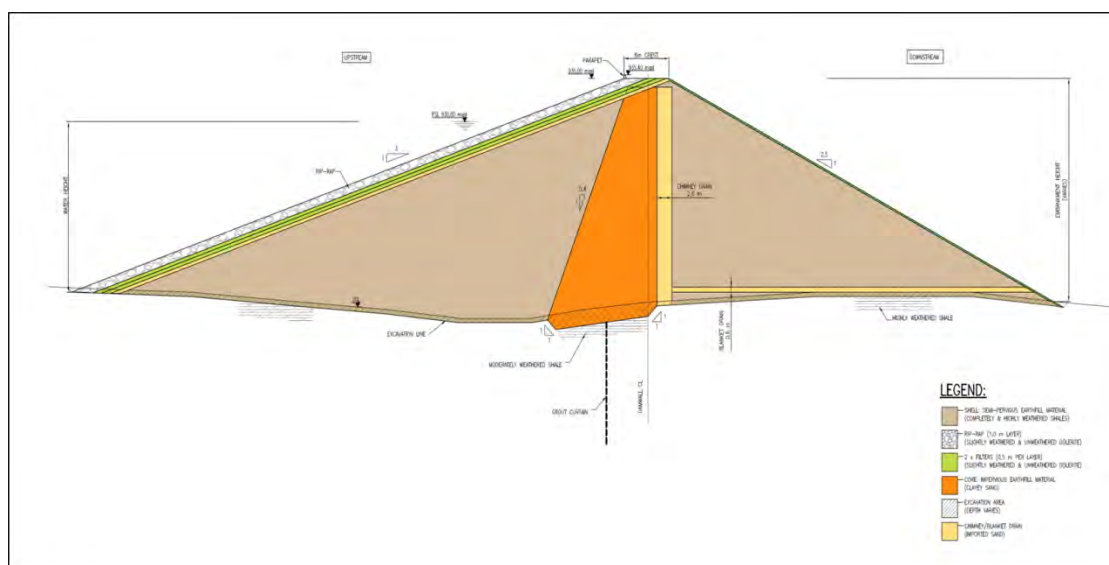
### 4.5.1 Embankments

Based on the site geology and the availability of construction materials the feasibility investigations recommended a zoned Earth Core Rockfill Dam (ECRD)

for the main dam, and a zoned earthfill embankment dam for the saddle dam as the most feasible dam types for the site. More detailed geotechnical investigations for the site may, however, reveal conditions that may favour other dam types for both the main dam and the saddle dam. This aspect needs to be investigated during the detailed design phase, and the onus is on the Implementing Agent to undertake a due diligence assessment to confirm the dam types for both the main dam and the saddle dam after further geotechnical investigations has been undertaken. **Figures 4.6 and 4.7** below show the various material zones for the main embankment and the saddle embankment.



**Figure 4.6: Cross Section of Smithfield Dam's Main Embankment (ECRD)**



**Figure 4.7: Cross Section of the Saddle Embankment at Smithfield Dam**





**Figure 4.8: Artistic Impression of Smithfield Dam**

#### **4.5.2 River Diversion**

The river diversion must be planned to be implemented in phases related to the different seasons (high/low flow). The lower risk of flooding during the winter months (low flow season) must be considered when the construction programme is compiled. If another dam type, instead of an ECRD, is selected for the main dam then a similar approach for the river diversion will be required. In addition to this the proposed diversion tunnels will be used or form part of the outlet works (refer **Section 4.5.4** below). Details of the seven (7) proposed phases of river diversion; description of the construction of each phase and the risk of possible damages are included in the *Engineering Feasibility Design Report (P WMA 11/U10/00/3312/3/1)*.

#### **4.5.3 Spillway Configuration**

A side-channel spillway with a crest length of 150 m on the left flank of the main embankment dam and a fuse plug spillway with a crest length of 100 m on the left flank of the saddle embankment dam (refer **Figure 4.4** above), are recommended to safely discharge the SEF (refer **Table 4.2** above). The side channel spillway for the main dam will consist of:

- ◆ An approach channel to be excavated to RL 926 masl;
- ◆ An ogee shaped spillway;
- ◆ A concrete lined spillway chute of 40 m wide, and

- A ski-jump discharging into a plunge pool.

The fuse plug spillway for the saddle dam will consist of:

- A concrete sill structure at the FSL of RL 930 masl, and
- Pilot channels in the fuse plug at the 1:200-year flood water level in the dam that will activate the fuse plug.

#### 4.5.4 Outlet Works

The proposed outlet works needs to release water into the uMkhomazi River from the dam for the EWR; downstream users and for emergency drawdown conditions.

The outlet works has a circular intake tower and will be positioned on top of the intake section of the right flank river diversion tunnel. It is recommended that this diversion tunnel also serve as the permanent outlet through which water will be discharged into the uMkhomazi River.

The pipe work inside the proposed intake tower will consist of a twin, or dual system, that will consist of multi-level intakes at different levels with butterfly valves for selecting the level at which water will be drawn off, and sleeve valves for controlling the releases (refer **Table 4.2** above).

## 4.6 RECOMMENDATIONS AND DIRECTIVES ARISING FROM THE FEASIBILITY DESIGN

Recommendations/directives arising from the feasibility design for the implementation of Smithfield Dam are the following:

- A due diligence study should be undertaken by the Implementing Agent to confirm the selected dam types for the main dam and the saddle dam after further geotechnical investigations have been undertaken. If substantial new geotechnical information gives motivation for another dam type, for both the main dam and the saddle dam, then other dam types need to be well motivated and approved by the Client. This new information should be presented to the DWS CD: IWRP for discussion.
- Additional geotechnical investigations are required in the tender design phase to determine the following:

- ◆ Main Dam: The excavation for the founding level of the main embankment will yield a large volume of material, which might be suitable as impervious and semi-pervious earthfill for the saddle dam's embankment. Laboratory testing of this material should be undertaken by the Implementing Agent to confirm the suitability thereof;
- ◆ Spillway: Determine foundation conditions for the position of the main spillway and chute as well as the erosion potential at the fuse plug spillway. Subsequently a total cost optimisation of the dam in terms of freeboard and spillway lengths, for both the main dam and saddle dam, should be carried out;
- ◆ Saddle Dam: A grout curtain at the saddle embankment is recommended, which must be confirmed with additional geotechnical investigations during implementation, to a level at least 20 m below the bottom (floor) of Quarry I, due to the development of this quarry just upstream of the saddle dam's embankment;
- ◆ Quarry I: Due to the fault line and the position of the saddle dam, further geotechnical investigations should confirm the volume and quality of the available materials;
- ◆ New routes for road deviations, including Provincial Road R617: The suitability of the material for road construction to be obtained from the borrow areas and quarries for the dam must be investigated, and
- ◆ Proposed Flow Gauging Weirs: No geotechnical and/or materials investigations were undertaken for the three (3) proposed flow gauging weirs and must be undertaken by the Implementing Agent.
- ◆ The importation of sand from suitable commercial sources for the filters;
- ◆ The anchors and drainage system for the spillway chute for the main dam should be determined during the detailed design phase;
- ◆ Optimising of the chute, ski jump and plunge pool (including a hydraulic model study) during the detailed design phase;
- ◆ Four (4) intake levels for the river releases should be designed to ensure that the dam and its management has a minimal impact on the downstream aquatic life;



- Despite the small probability of a gravel failure and large rock slide from one of the identified slopes on the rim of the reservoir a potential slide of this slope might result in large volumetric displacement and overtopping of the dam due to a high wave run-up. This slope must be investigated further during detailed design phase to ensure that overtopping of the Non Overspill Crest (NOC) will be prevented in case of such a failure event;
- The outlet works, including the intake tower, can be accessed via a bridge from the main dam embankment. This structure should be designed during the detailed design phase as such as to limit the influence of seismic activity on the integrity of the structure;
- Smithfield Dam's outlet works should be designed as such to allow for the addition of a Hydropower Plant (HPP) that can be connected to the outlet pipe system in future, and
- The detailed design for the access road should allow for an extreme flooding event downstream of the saddle dam's fuse plug spillway, when the fuse plug breach.

## 5 SCOPE OF WORK FOR THE PROPOSED BULK RAW WATER CONVEYANCE INFRASTRUCTURE

The proposed raw water conveyance infrastructure from Smithfield Dam on the uMkhomazi River to the Baynesfield WTP, including the proposed take-off bi-directional raw water pipeline to and from Langa Dam are shown in **Figure 5.1** below.

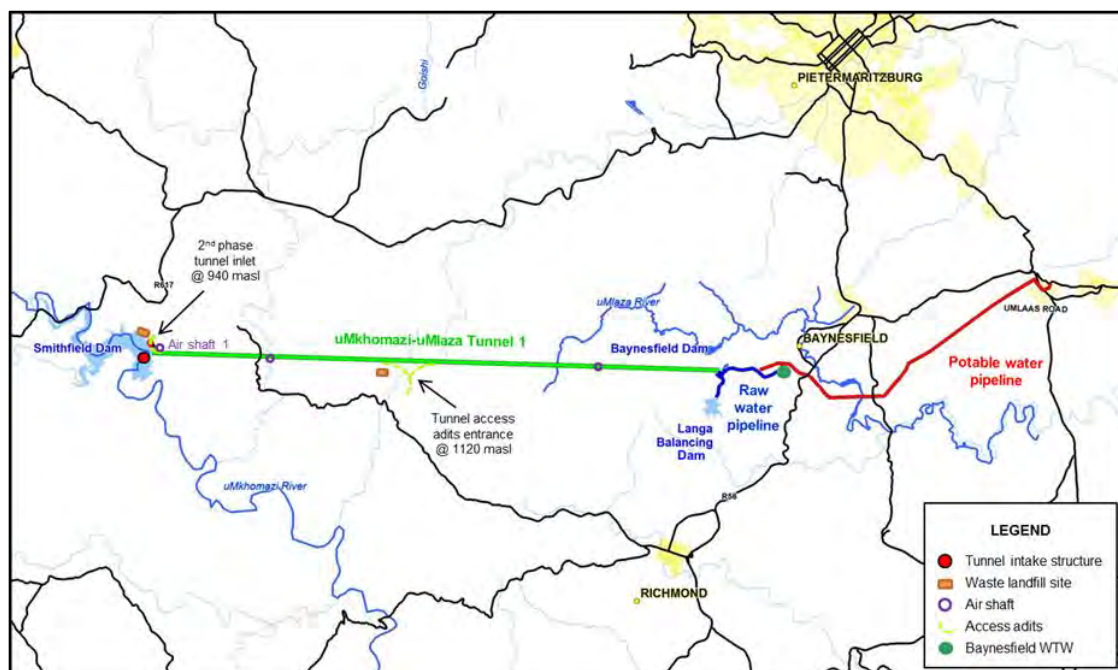


Figure 5.1: Layout of the Proposed Bulk Water Conveyance System

### 5.1 DESCRIPTION OF THE BULK RAW WATER CONVEYANCE INFRASTRUCTURE

#### a) Tunnel Intake Structure

The current position of the tunnel intake structure is located at **Latitude 29° 45' 50.56"S, Longitude 29° 57' 05.05"E** on the left flank of Smithfield Dam's main dam. The structure will house the hydro-mechanical equipment required to operate and control the releases from Smithfield Dam through the tunnel. The tunnel intake structure must also accommodate the implementation of the uMWP-2 tunnel in future.

#### b) Tunnel Outlet Structure and Portal

The current position of the tunnel outlet structure and portal is located at **29°46'16.42"S; 30°18'15.97"E** in an area on the Baynesfield Estate, which has

been designated as a wetland by the DEA. It will consist of a mass concrete structure with two units. The structure will accommodate the transition between the 3.5 m diameter concrete tunnel and the 2.6 m diameter steel pipeline, and the vertical change in the level of the steel pipeline. Access into the tunnel will also form part of this structure. A valve chamber will also be housed in this structure to accommodate a valve at the start of the pipeline to allow for inspection of the pipeline without having to drain the tunnel. A concrete slab assembling of the TBM during construction will also be required at this structure. After construction this slab should be decommissioned, but a short section of this slab of approximately 6 m by 30 m should, however, be retained for access to the outlet structure. The tunnel outlet portal in relation to the existing Mbangweni Dam is shown of **Figure 5.6** below. The connection between the 3.5 m diameter tunnel and the 2.6 m inside diameter raw water pipeline is described in more detail in *Section 4.6 of the Engineering Feasibility Design Report (P WMA 11/U10/00/3312/3/1)*.

**c) uMkhomazi-Baynesfield Tunnel 1 – Phase 1**

The 32.5 km long, and 3.5 m inside diameter, transfer tunnel will be a gravity conveyance system and extends from the east side of Smithfield Dam's reservoir to the upper reaches of the existing Mbangweni Dam in the uMlaza River Valley. Ventilation shafts are provided to accommodate air flow in the tunnel. Vehicle access must be provided at mid-length of the tunnel and at its outlet in the uMlaza River Valley.

During the EIA Process the current proposed tunnel alignment was opposed by some of the Interested and Affected Parties (I&APs). Further investigations are currently underway to assess the impacts of the tunnel construction in terms of noise and vibration on the active nests of the critically endangered Blue Swallow during their breeding season. Alternative tunnel alignment investigations are also currently underway, and if the tunnel alignment is changed then the alignment of the proposed 5.12 km long raw water pressure pipeline (refer **(d)** below) will also need to be revised.

**d) Proposed Bulk Raw Water Pipelines**

The proposed bulk raw water pipelines will consist of the following two (2) pipelines:

- An approximately 5.12 km long 2.6 m inside diameter raw water pressure pipeline needs to be connected from the tunnel outlet to the Baynesfield WTP, and
- An approximately 1.25 km long 1.6 m inside diameter take-off bi-directional pipeline along the 2.6 m diameter pipeline to convey water to and from Langa Dam).

During the maintenance periods of the tunnel, raw water will be conveyed via the afore-mentioned 1.6 m diameter pipeline to the 2.6 m diameter pipeline to the supply raw water to the Baynesfield WTP during these maintenance periods of the tunnel.

## 5.2 DESIGN PHILOSOPHY

The transfer capacities of the tunnels are as follows:

- uMWP-1 – Tunnel 1: The maximum transfer capacity of 8.65 m<sup>3</sup>/s will be conveyed through the uMkhomazi – uMlaza (Tunnel 1), and
- uMWP-2 – Tunnels 1 and 2: The total maximum transfer capacity of 14.86 m<sup>3</sup>/s that could be conveyed in future (beyond 2040), when the upstream Impendle Dam and second transfer tunnel (Tunnel 2) is implemented.

The hydraulic design for the bulk raw water conveyance system includes the following, which are, however, subject to optimisation during the detailed design phase:

- The 32.5 km long 3.5 m inside diameter lined uMkhomazi – uMlaza Tunnel 1;
- The Minimum Operating Level (MOL) of Smithfield Dam of RL 887.2 masl, which is the minimum water level upstream of the tunnel intake structure (intake tower). If water is abstracted from one of the bottom intakes, the friction and secondary losses incurred upstream of the tunnel intake structure were calculated as 15.2 m. The intake centre level of the lowest pipe at the tunnel intake structure will be at RL 881.5 masl. If the final design configuration of the intake tower is changed significantly during the detailed design phase, then this system should be optimised accordingly;
- Three (3) ventilations shafts are provided to accommodate air flow into the tunnel;

- The 5.12 km, 2.6 m inside diameter, long raw water pipeline from the tunnel outlet to the Baynesfield WTP;
- A stilling basin at the end of the 2.6 m inside diameter raw water pipeline at the Baynesfield WTP with a minimum water head at RL 872 masl. The Baynesfield WTP will be at this level to ensure that water will be provided under gravitation to the proposed Umlaas Road Pipeline (potable water pipeline), and
- The 1.6 m inside diameter and 1.25 km long bi-directional take-off pipeline to and from Langa Dam.

### 5.3 LAYOUT OF THE BULK RAW WATER CONVEYANCE INFRASTRUCTURE

#### 5.3.1 Tunnel Intake Structure

The tunnel intake structure houses the hydro-mechanical equipment required to operate and control the releases from Smithfield Dam through the tunnel. From the tunnel intake structure the raw water will be conveyed through a 1.8 m diameter pipe into the tunnel. The tunnel intake structure will also provide for the releases associated with the implementation of the uMWP-2 (upstream Impendle Dam and Tunnel 2). Therefore the tunnel intake structure will consist of three (3) intake systems. Systems 1 and 2 will be operational with the implementation of the uMWP-1 (a dual system will be required for maintenance purposes).

Although System 3 will, however, only be required for the uMWP-2, this intake must be constructed during the construction of the uMWP-1 and flanged off until the operation of this system will be necessary. The following components of System 3 must, however, be constructed during the construction of the uMWP-1:

- The bell mouth intakes at the various levels;
- The section of pipe leading from the tunnel intake structure to the second tunnel (Tunnel 2);
- The bell mouth outlet at the pipe-tunnel connection, and
- The ventilation shaft leading from the tunnel intake structure.

Each intake system will consist of multi-level bell mouth pipes with butterfly valves for selecting the level at which water will be drawn off. Control valves are situated downstream of each intake system conduit before connecting to the tunnel collector manifold for controlling the releases to the tunnel/s. Service valves (butterfly valves) are positioned in the tunnel collector manifold on both sides of each intake system's connection to allow for maintenance and

inspection, as well as to close off the intake system/s when not operational. The sectional and plan views of the tunnel intake structure are shown in **Figure 5.2** below.

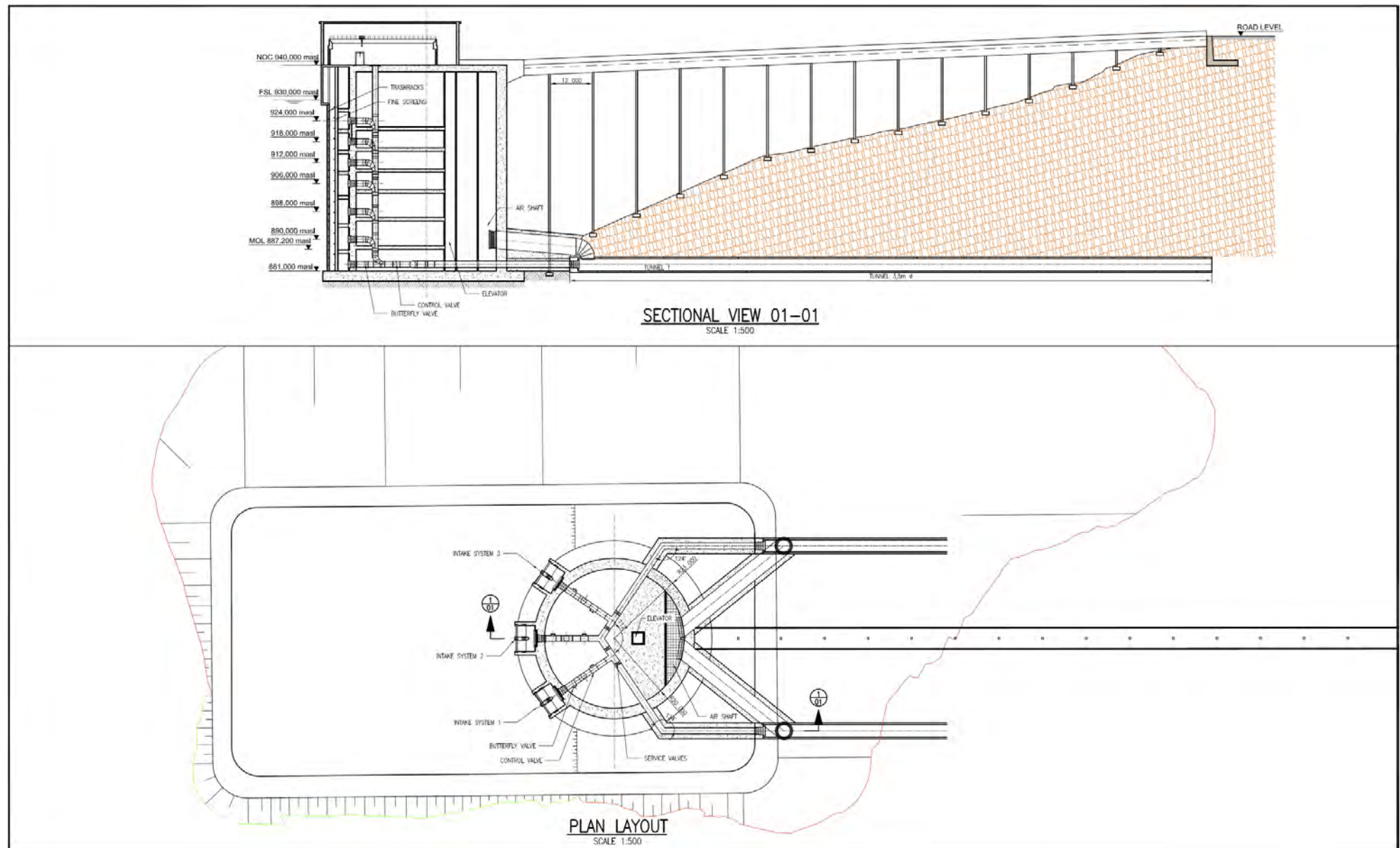


Figure 5.2: Section and Layout of the Proposed Tunnel Intake Structure at the Proposed Smithfield Dam



Six (6) abstraction levels were designed to ensure the best possible water quality will be abstracted from the dam, as described in the *Engineering Feasibility Design Report (P WMA 11/U10/00/3312/3/1)*.

A detail sediment deposition study considered the impact of sedimentation around the reservoir intake area of the tunnel inlet structure over a period of more than 100 years. This was undertaken in order to confirm the vertical alignment of the tunnel for the detailed design. The long-term reservoir sedimentation simulations indicated possible sediment deposition at the diversion tunnel intake in if the upstream Impendle Dam is not implemented (uMWP-2). After 50 years of operation the current and possible high future sediment yield indicated that the depths of the deposited sediment at the tunnel intake structure could be 0.4 m and 12.8 m respectively. If the high future sediment yield is considered over a 100 year period the depths of the deposited sediment could be 28.5 m at the tunnel intake structure and 58.5 m at the dam wall. This study therefore recommended engineering measures in the dam at the tunnel intake structure, such as a concrete wall to prevent delta sediment sliding/slumping into the tunnel intake structure and a sediment flushing tunnel for pressure flushing of the intake zone. The recommended engineering measures, and sediment flushing requirement that need to be provided must, however, be investigated and implemented by the Implementing Agent. The results of the sedimentation deposition study are concluded in the *Sediment Deposition and Impact Report (P WMA 11/U10/00/3312/2/3/2)*.

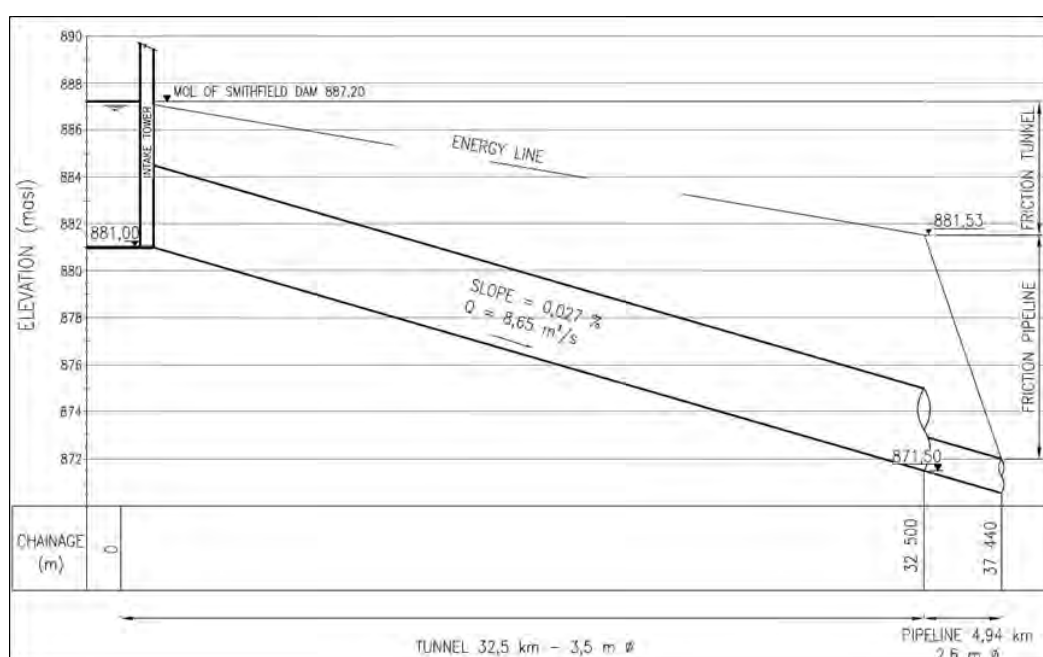
### 5.3.2 Tunnel 1

The layout of Tunnel 1, shown in **Figure 5.3** below, is based on the following:

- ◆ A constant downward slope of 0.027%;
- ◆ Drill and Blast Technique (DBT) excavations at both the inlet and outlet portals of the tunnel, however, care must be taken to avoid any tunnelling during the breeding season of the critically endangered Blue Swallow in the area;
- ◆ A DBT access adit at the central part of the tunnel from chainage 14 750 m to 16 250 m;
- ◆ Two (2) Tunnel Boring Machine (TBM) drives, both drilling up-slope in a westerly direction from the outlet portal to the central access adit, and also in a westerly direction from the central access adit towards the inlet portal, respectively;



- Two ventilation shafts with a shotcrete lining and an access adit in the centre of the tunnel (refer **Figure 5.4** below);
- One ventilation shaft with a concrete lining near the entrance to the tunnel for the uMWP-1;
- Two tunnel waste disposal landfill sites (refer to **Section 7.1.6** below) and the use of tunnel spoil material in the embankment of Langa Dam;
- An access adit at the entrance to facilitate access to the tunnel for the uMWP-2 (Tunnel 2), and
- Construction of the first 100 m of the Tunnel 2 to ensure access when the Smithfield Dam will be at, or above, its FSL of RL 930 masl.



**Figure 5.3: Schematic Layout of the Raw Water Conveyance System showing the Energy Line**

The inlet portal; ventilation shafts; access adits and tunnel outlet should be excavated using DBT. The ventilation shafts need to be positioned between the tunnel inlet and the access adits, as well as between the access adits and the tunnel outlet, respectively. The selected recommended layout of the tunnel is shown in **Figure 5.4** below.

Optimisation of the tunnel construction process may be required in order to fast-track the Project and must be undertaken by the Implementing Agent. Furthermore, the Implementing Agent must also take cognisance of the fact that the tunnel alignment might need to be changed in order to prevent, or minimise, the impacts of tunnel construction on the Blue Swallows, for which investigations are currently underway.

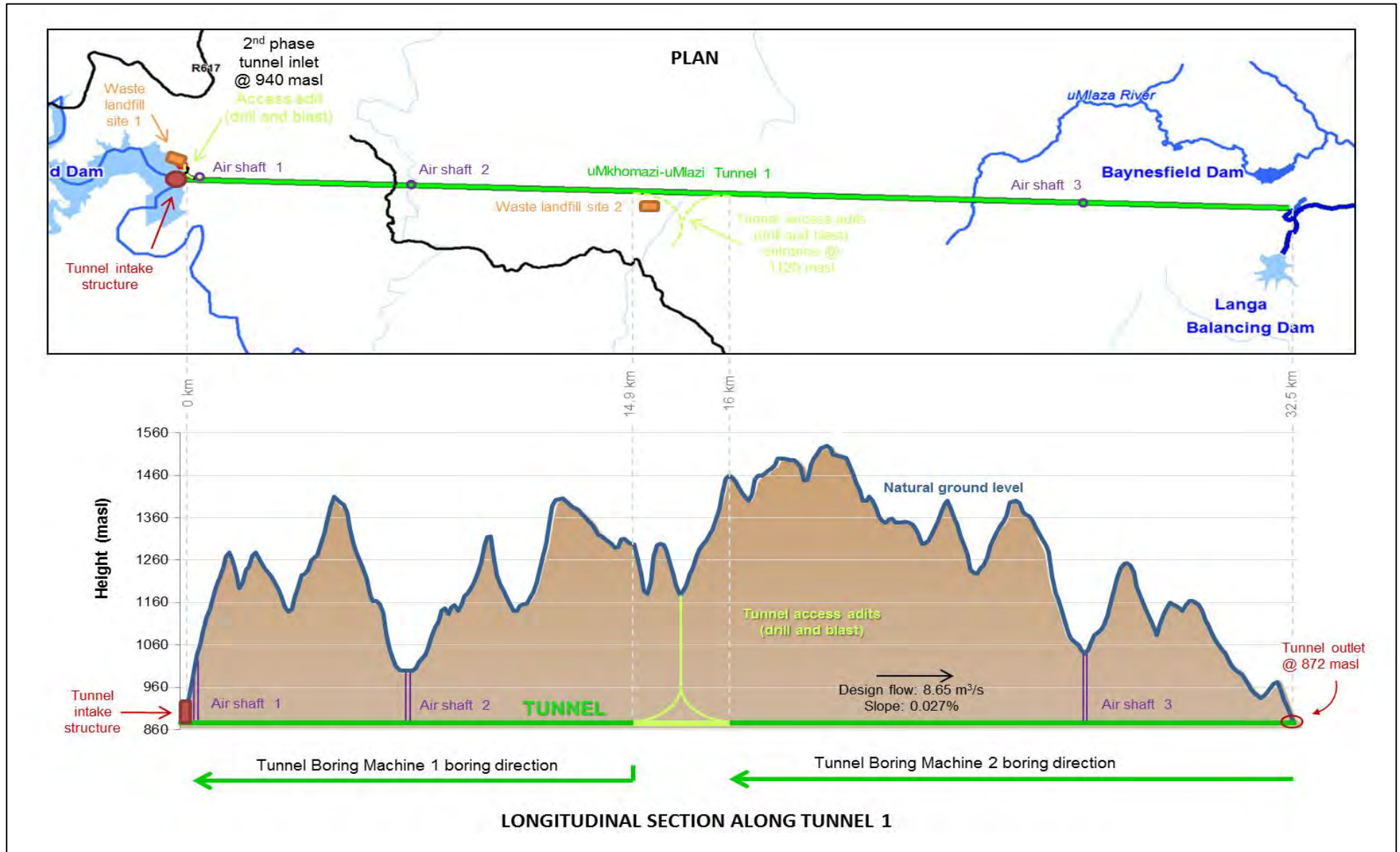
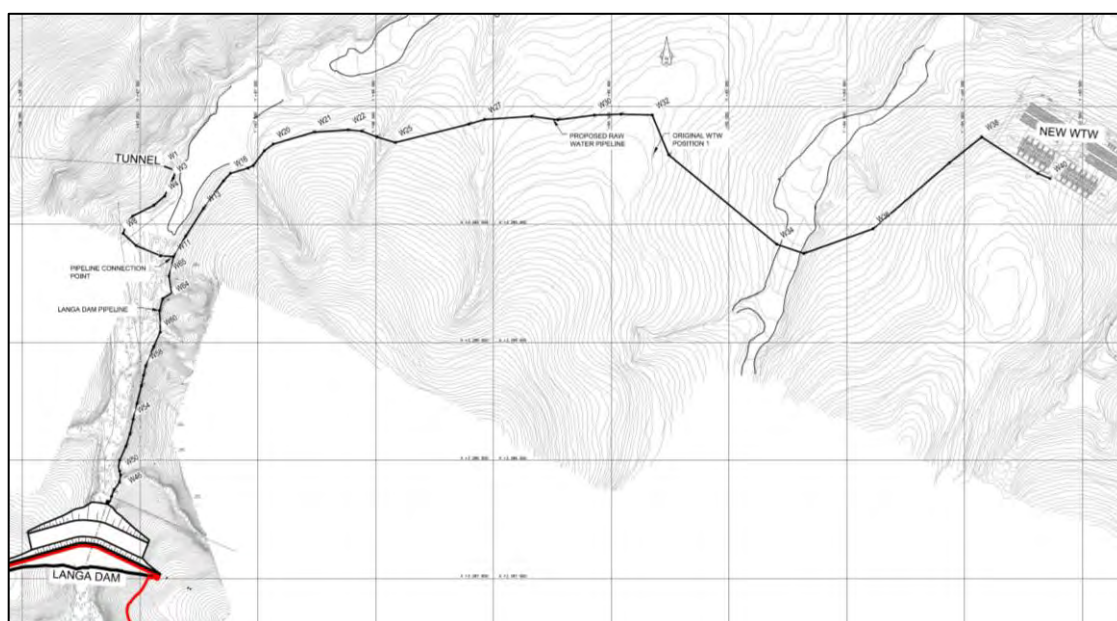


Figure 5.4: Tunnel Route and Longitudinal Tunnel Section along Tunnel 1

### 5.3.3 Raw Water Pipelines

The 5.12 km 2.6 m inside diameter long raw water pressure pipeline will connect the tunnel outlet to the Baynesfield WTP. A 1.25 km long 1.6 m inside diameter bi-directional take-off pipeline will convey raw water to Langa Dam from Smithfield Dam and from Langa Dam to the Baynesfield WTP during the maintenance periods of the tunnel (refer to the *Engineering Feasibility Design Report (P WMA 11/U10/00/3312/3/1)*).

The **Baynesfield WTP, which is shown in Figure 5.5 below has been selected for the layout of the pipeline**. An alternative to the Baynesfield WTP Site (refer to UW's *uMkhomazi Water Project Module 3 – Potable Water Module: Detailed Feasibility Study*) will, however, change the alignment of the raw water pipeline from the tunnel outlet to the WTP. The Implementing Agent will be informed of the final location of the WTP by Umgeni Water. The Implementing Agent must also take cognisance of the fact the alignment of the raw water pipeline will also need to be revised, if the tunnel alignment is changed.



**Figure 5.5: Routes of the Proposed Raw Water Pipelines**

## 5.4 GEOTECHNICAL INVESTIGATIONS AND CONSTRUCTION MATERIALS

The geotechnical conditions for the tunnel and related infrastructure are described in detail in *Conveyance system: Material and geotechnical investigation Report (P WMA 11/U10/00/3312/3/2/5)*.

#### 5.4.1 Tunnel Intake Structure, Inlet and Outlet Portals

The weathered rock in the area around the tunnel intake structure (intake tower) and the tunnel inlet portal was found at a depth of approximately 5 m below the ground level with less weathered and fractured rock at 15 to 20 m depth below ground level. However, in some areas slightly fractured to moderately weathered shale rock is encountered at approximately 6 m below ground level.

The water table in the area is close to the ground surface with seepage evident in some places. Therefore, all excavations will need to be adequately supported, or excavation slopes will need to be flattened, and dewatering measures will need to be put in place to facilitate both earth and concrete works.

Seepage might take place within the perimeter of the tunnel outlet portal position. If the position of the tunnel outlet portal stays the same then any earthworks, or concrete works, will be subjected to strict environmental guidelines. Appropriate measures will therefore be required, and will have to be implemented, to prevent the offset of any environmental triggers during construction. All excavations will need to be adequately supported, or flattened, and dewatering measures will be required to facilitate both the earth and concrete works.

Further geotechnical tests will have to be undertaken by the Implementing Agent to confirm whether excavated material from the tunnel inlet portal is suitable for use in either Smithfield Dam's main dam and/or the saddle dam. The Implementing Agent must undertake these tests.

#### 5.4.2 Tunnel

Primarily fractured hard to extremely hard rock shale was encountered with some hard to extremely hard dolerite. Joints in the shale rock are mostly smooth, whilst joints in the dolerite rock are mostly rough. It is anticipated that extensive lengths of the tunnel will be excavated in either shale or dolerite and therefore it would be reasonably easy to stockpile these two types of spoil materials separately.

Significant groundwater inflows should be expected, since inter-granular and fractured aquifers may be encountered. The groundwater inflow into the tunnel during construction may require treatment because of its fluoride concentrations and to adhere to the EIA requirements, furthermore mitigation measures must also be addressed in the method statement for construction. A Water User Licence Application (WULA) will need to be submitted by the Implementing Agent



to the DWS to treat groundwater and to mitigate the impacts of groundwater during the construction of the tunnel.

It is recommended that rock material be excavated by means of a TBM. The excavated un-weathered dolerite from the tunnel excavations may be utilised in a rockfill. Alternatively, the un-weathered dolerite may be crushed and utilised as aggregate.

The un-weathered shale may be utilised as general fill, but care will have to be taken with regards to the flaky nature of the aggregate should this material be utilised as aggregate. This material, especially the carbonaceous shale, is also likely to weather in time, especially if it is subjected to wetting and drying cycles.



**Figure 5.6: Artistic Impression of the Tunnel Outlet Structure and Portal**

#### **5.4.3 Raw Water Pipeline to the Baynesfield WTP**

The areas to be traversed by the 2.6 m diameter raw water pipeline are mainly underlain by firm to stiff silty clay, or clayey silt containing sand; gravel; cobbles and/or boulders if current configuration is accepted. The excavated in-situ material will be suitable for use as selected layers for pavement construction and as general backfill. This in-situ material will also be marginally suitable as bedding material for the pipeline. If the excavated in-situ material is unsuitable, or insufficient, then appropriate bedding material will have to be imported from commercial sources. The western section of the pipeline traverses a stream and

a recognisable wetland, therefore unstable sidewall conditions are envisaged during the trench excavations in this area.

#### 5.4.4 Take-off Bi-directional Raw Water Pipeline to and from the Langa Dam

No geotechnical investigations were undertaken along the route for the 1.6 m diameter take-off bi-directional raw water pipeline to and from Langa Dam.

### 5.5 RECOMMENDATIONS AND DIRECTIVES ARISING FROM THE FEASIBILITY STUDY

Recommendations/directives arising from the feasibility design for the implementation of the bulk raw water conveyance infrastructure are the following:

- Engineering measures in Smithfield Dam to prevent delta sediment sliding/slumping into the tunnel intake structure must be investigated and implemented by the Implementing Agent;
- The tunnel intake structure shall be designed as such to accommodate both phases of the uMWP;
- Sprayed concrete (shotcrete) layers should be applied as protection to portions of the exposed excavated rock faces at the inlet and outlet portals of the tunnel, as well as at the intermediate access portal and in the ventilation shafts. This should, however, be confirmed with more detailed geotechnical investigations during the detailed design phase;
- Both the tunnel inlet and outlet portals should be excavated in a step formation at a slope of 1V:1.5H;
- Further geotechnical investigations must be undertaken by the Implementing Agent for the tunnel to assess the tunnel conditions and the need for lining as well as estimates of the expected sources of groundwater.
- The groundwater conditions and groundwater quality aspects must also be identified and assessed by the Implementing Agent;
- The disposal of the groundwater should be mitigated according to the conditions that will be set by the EA and the required Water Use Licence to be obtained by the Implementing Agent;
- The basic assessment of surge in all the raw water conveyance infrastructure that was undertaken during the feasibility design should be taken forward during the detailed design phase;
- Detail analysis of the 2.6 m and 1.6 m diameter raw water pipelines should be done during the detailed design phase in order to assess the surge

pressures, pipe wall thicknesses, the positioning of valves and scours, as well as river and stream crossings;

- A hydraulic jump type stilling basin is proposed at the end of the 2.6 m diameter raw water pipeline at the Baynesfield WTP, but USBR Type II and USBR Type III stilling basins should also be investigated during the detailed design phase;
- At the end of the 2.6 m diameter raw water pipeline provision must be made to allow for the addition of a HPP that can be connected to the pipe at the Baynesfield WTP in future, and
- Any unpermitted waste must be transported to, and disposed of, at legal/registered commercial landfills.

## 6 SCOPE OF WORK FOR LANGA DAM

### 6.1 LOCATION OF LANGA DAM

Langa Dam will be situated on the Mbangweni River, which is a small tributary of the uMlaza River, about 1.7 km south of the proposed site for the tunnel outlet portal and about 9.8 km slightly north-east of Richmond on the farm Nooitgedacht 903, also known as the Baynesfield Estate. The Baynesfield Estate is a diversified commercial farming operation which is operated by the company, Joseph Baynes Estate (Pty) Ltd. The Implementing Agent must, however, also take cognisance of the fact that the Langa Dam option, and/or the position of this dam, might also change.

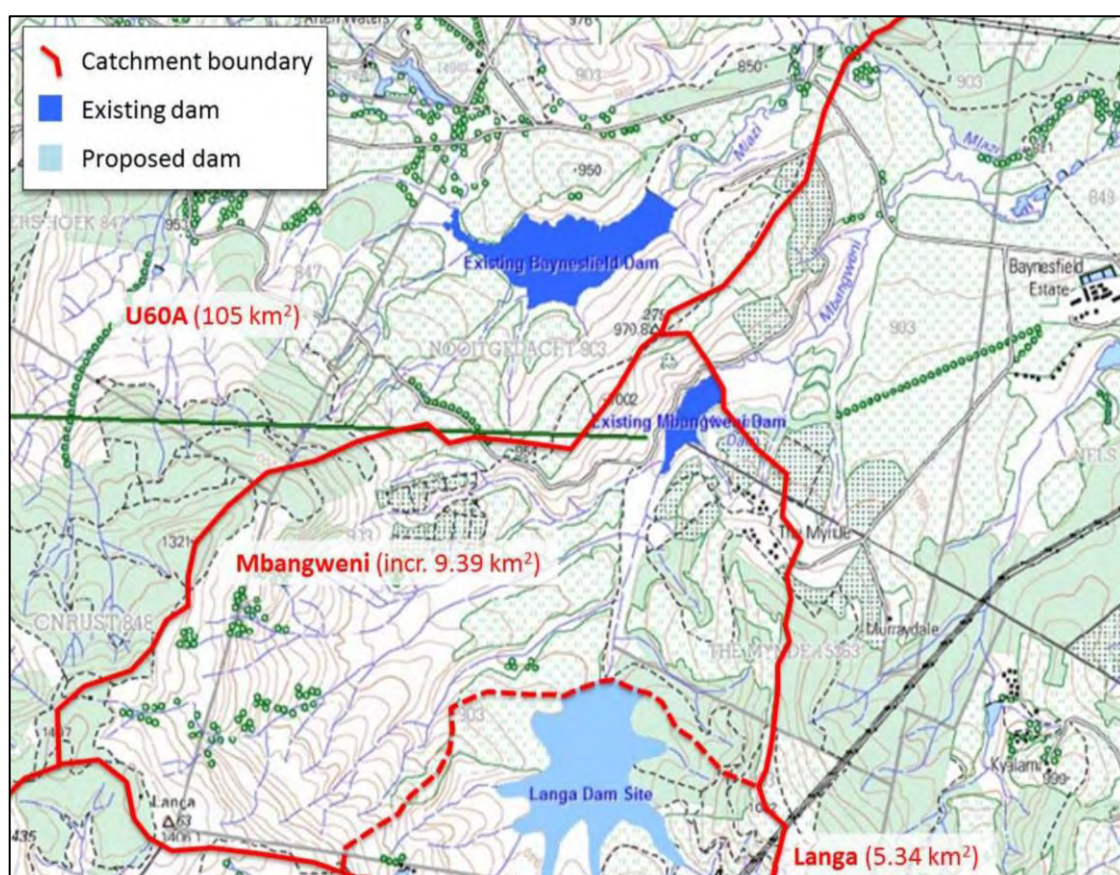


Figure 6.1: Location of Langa Dam

The coordinates of the point where the centreline of the dam intersects the river are: **Latitude: 29° 47' 17.75"S, Longitude: 30° 18' 01.80"E.**

#### 6.1.1 Water Resource Detail

Langa Dam will be required to store water for the supply of raw water to the Baynesfield WTP during maintenance periods of the tunnel and during



emergencies, when raw water cannot be supplied directly from Smithfield Dam via the tunnel to the Baynesfield WTP. The dam was sized for the maximum possible storage to provide two months of supply together with the resources of the integrated Mgeni WSS. The yield at 99% annual assurance level of Smithfield Dam is 215 million m<sup>3</sup>/a (2040 development level), after full provision has been made for releases to support the EWR. The live storage of Langa Dam is 14.82 million m<sup>3</sup>, and therefore the dam can supply the Baynesfield WTP for a period of only 25 days at 99% assurance of supply. The FSL of Langa Dam cannot be higher than RL 923.00 masl, since it will then not be possible to provide water to the dam under gravity from Smithfield Dam.

### 6.1.2 Sedimentation

Based on the Sedimentation Study (*Sediment Yield Report (Supporting Document 1: Water Resources Yield Assessment)*), a sediment yield of 1 165 t/km<sup>2</sup>/a has been estimated for Langa Dam. The volume of sediment that will be accumulated in the dam basin after 50 years is estimated to be approximately 0.21 million m<sup>3</sup>. No sediment deposition study was undertaken for Langa Dam to assess the impact of sedimentation around the reservoir intake area of the proposed outlet works (refer **Section 6.4.3** below). It was also not assessed whether any engineering measures would be required in the dam to prevent any delta sediment sliding/slumping into the outlet works, and whether sediment flushing of the intake zone will be required. An assessment of the sediment deposition in the dam must therefore be undertaken by the Implementing Agent to confirm the dam's MOL (RL 898.24 masl).

### 6.1.3 Flood Hydrology

#### a) Spillway Design Floods

Langa Dam will be a large dam (wall height >30 m) with a high hazard potential (due to extensive downstream developments) and will be classified as a **Category III** dam in terms of the standing Dam Safety Regulations.

The following inflow flood peaks were selected to size the spillway, also considering possible operational flows with regard to the RDF:

- |   |                          |
|---|--------------------------|
| ◆ RDF - 1:200 year RI                                     | 204 m <sup>3</sup> /s    |
| ○ plus 8.65 m <sup>3</sup> /s from the take-off pipeline: | 212.65 m <sup>3</sup> /s |
| ◆ SEF = RMF+Δ   | 313 m <sup>3</sup> /s    |
| ○ plus 8.65 m <sup>3</sup> /s from the take-off pipeline: | 321.65 m <sup>3</sup> /s |

Initially it was found that Langa Dam would not require a spillway, and that any excess water above the FSL could be drawn from the dam via the proposed combined inlet and outlet system if needed (refer **Section 6.4.3** below). If the SEF inflow hydrograph, with an estimated total volume of 0.676 million m<sup>3</sup>, should flow into the dam when the dam is at its FSL of RL 923 masl then the maximum water level in the dam will be approximately RL 923.704 masl if the dam does not have a spillway. It was, however, recognised that there is the risk that operational flaws could occur and that the total release from Smithfield Dam of 8.65 m<sup>3</sup>/s could be conveyed to Langa Dam, via the 1.6 m diameter bi-directional take-off pipeline. As a precautionary measure provision was therefor made for a small 10 m wide spillway, for which the design discharge is 8.65 m<sup>3</sup>/s. The spillway design and the need for a spillway must, however, be investigated in more detail during the detailed design phase.

**b) River Diversion Design Floods**

The appropriateness of the proposed selected flood diversion criteria should be reviewed during the detailed design phase, and must be approved by the DWS as well as by the Approved Professional Person (APP) for the dams (Smithfield and Langa dams).

#### **6.1.4 Proposed Operating Rules for the Dam**

During the implementation phase of the uMWP-1 detailed operating rules will be defined; optimised and established for Langa Dam by the Operating Entity. Langa Dam must, however, be filled; topped up and kept full from Smithfield Dam, preferably when the latter dam will be spilling or during off-peak periods. The EWR and the current water requirements from the downstream existing Mbangweni Dam will, however, have to be released from Langa Dam.

### **6.2 WATER SUPPLY FROM LANGA DAM**

#### **6.2.1 Ecological Reserve**

***The operating rules for the EWR releases will be informed by the outcomes of the Classification of Water Resources and Determination of the Comprehensive Reserve and Resources Quality Objectives in the Mvoti to UMzimkhulu Water Management Area (DWA, 2015/16) and must be established by the Operating Entity in accordance with the statutory requirements, and according to the developed EWR Rule Table.*** The TECs and EWR in the Mvoti

to UMzimkhulu Water Management Area were also gazetted in Government Gazette No. 40075 dated 17 June 2016.

### 6.2.2 Permanent Water Supply Infrastructure at Langa Dam

There will be no direct water uses from Langa Dam, other than supply to the Baynesfield WTP. It is therefore not foreseen that any other permanent water supply infrastructure will be required at the dam, apart from the outlet structure to release the EWR and the current water requirements for the downstream uses from the existing Mbangweni Dam.

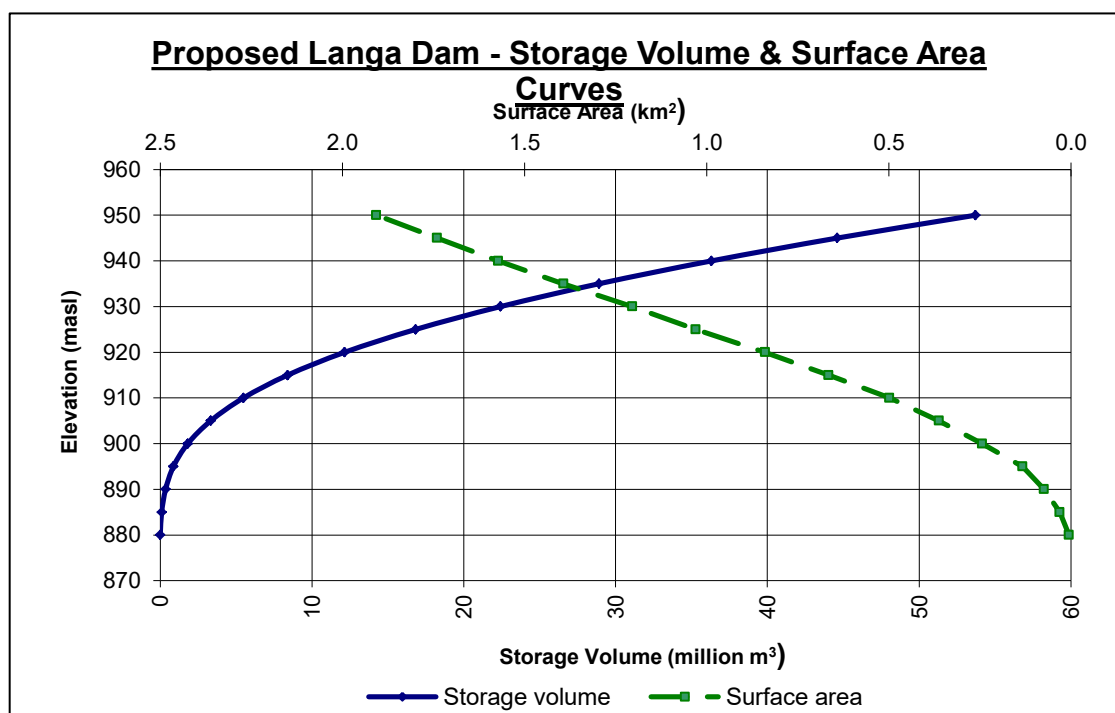
The Baynesfield Estate, however, requested whether Langa Dam can be used for recreational purposes. The viability of this should, however, be confirmed by the EIA.

### 6.2.3 Existing Water Entitlements in the Dam Basin and Downstream Water Use

There are no existing entitlements in the dam basin, other than what is required to sustain the current yield of the existing downstream Mbangweni Dam.

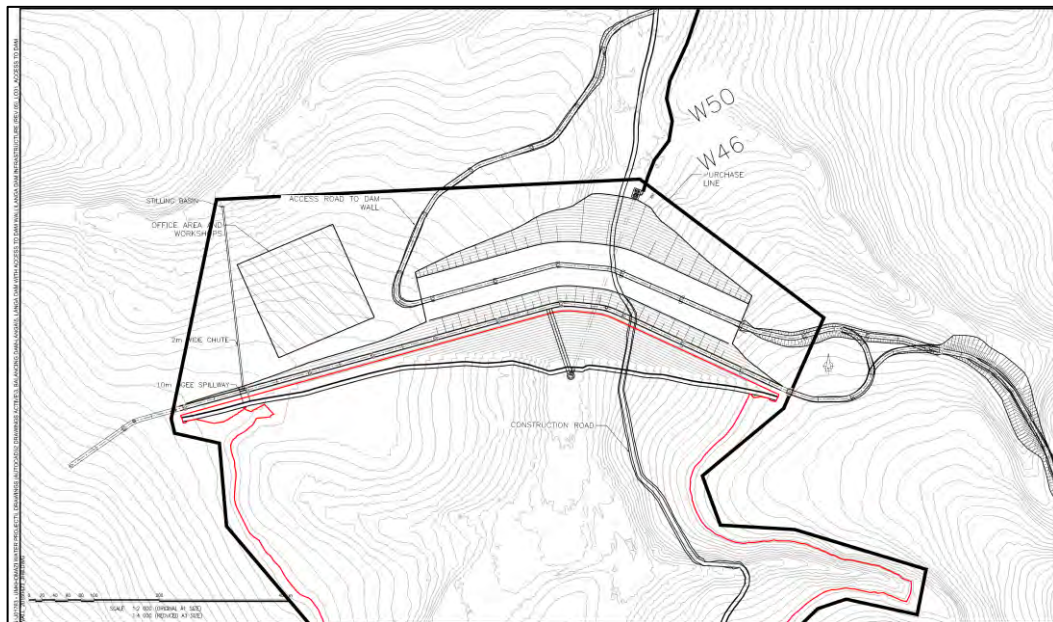
### 6.2.4 Dam Characteristics

The stage-storage volumes and surface area relationships from the available contour map for Langa Dam's basin are shown in **Figure 6.2** below.



**Figure 6.2: Storage Volume and Surface Area Curves for Langa Dam**

The layout of, and principal data for, Langa Dam is shown on **Figure 6.3** and summarised in **Table 6.1** below.



**Figure 6.3: Langa Dam, Main Embankment and Spillway Layout**

**Table 6.1: Langa Dam Principal Data**

Parameter	Description
Estimated year of completion	2025
River	Mbangweni River
Nearest towns	Pietermaritzburg & Richmond
Province	KwaZulu-Natal
Dam site co-ordinates	29° 47' 17.75"S, 30° 18' 01.80"E
Classification: Category	III
Size class	Large
Hazard potential	High
Dam type	Concrete Faced Rockfill Dam (CFRD)
Catchment area	5.34 km <sup>2</sup>
Recommended Design Flood (RDF)	1:200 year
<i>Design discharge for the spillway</i>	<i>*8.65 m<sup>3</sup>/s</i>
Peak inflow of the 1:200 year flood	212.65 m <sup>3</sup> /s
Regional Maximum Flood (RMF)	283 m <sup>3</sup> /s
Safety Evaluation Flood (SEF)	321.65 m <sup>3</sup> /s
Full Supply Level (FSL)	RL 923.00 masl
Approximate river bed level	RL 880.00 masl
Minimum Operating Level (MOL)	RL 898.24 masl
Non Overspill Crest (NOC) level	RL 926.60 masl
Gross storage volume (incl. storage created by the quarry)	15.67 million m <sup>3</sup>

Parameter	Description
Live storage volume (incl. storage created by the quarry)	14.82 million m <sup>3</sup>
Water surface area at FSL	95.48 ha
Spillway type	Side-channel
Spillway shape	Ogee
Spillway length	10 m
Freeboard	3.6 m
Estimated sediment volume after 50 years	0.21 million m <sup>3</sup>
Mean Annual Runoff (MAR)	2.03 million m <sup>3</sup> /a
Maximum wall height of the embankment	46.60 m
Maximum wall width of the embankment	202.72 m

\* Refer to **Section 6.1.3** above for discussion on why the design discharge is 8.65 m<sup>3</sup>/s for the spillway.

## 6.3 CONSTRUCTION MATERIALS AND GEOTECHNICAL INVESTIGATIONS

### 6.3.1 Foundation

The area around the proposed dam site is underlain by rocks of the Pietermaritzburg Formation of the Ecca Group, comprising shales and siltstones with subordinate sandstones. One near-horizontal dolerite sill had intruded concordantly into the sedimentary strata. For the shells of the proposed rockfill embankment, between 1.6 m and 5.3 m of colluvium and residual soil/completely weathered shale need to be removed along most parts of the centre line. However, in an area on the right flank, weak completely weathered shale and dolerite extends to a depth in excess of 17 m and will need to be removed. It is recommended that provision be made for a grout curtain to a depth of about 66% of the water head along the centre line.

### 6.3.2 Quarry Material

The estimated available volume of un-weathered shale and dolerite from the proposed quarry in the dam basin is 1.2 million m<sup>3</sup>. From this available volume of un-weathered shale and dolerite about 620 000 m<sup>3</sup> will be used in the rockfill embankment of the dam.

### 6.3.3 Embankment Material

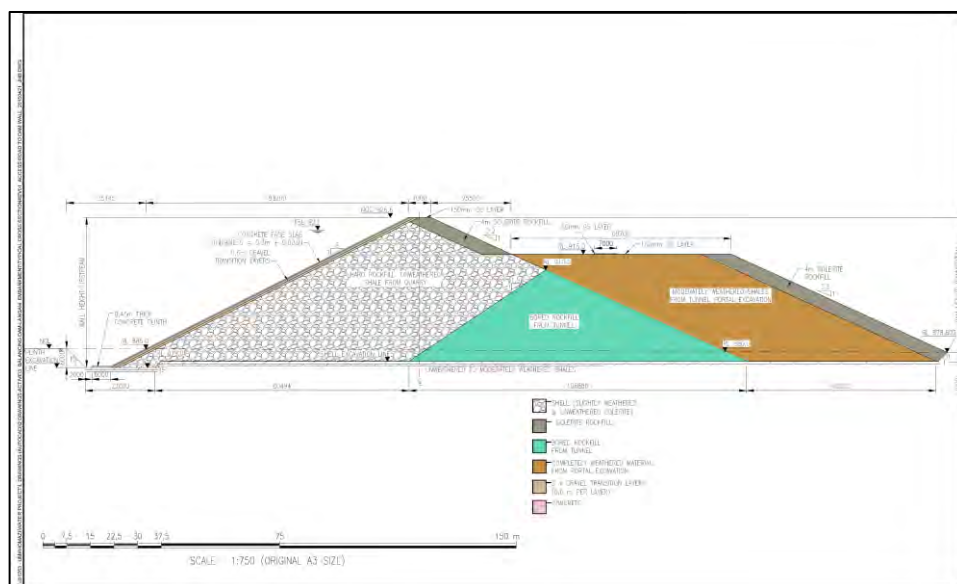
The rockfill embankment will consist of un-weathered shale and dolerite of which about 620 000 m<sup>3</sup> and 250 000 m<sup>3</sup> will be sourced from the quarry in the dam basin below the FSL and tunnel spoil respectively. A berm will also be created downstream that will form part of the embankment. The purpose of this berm will be to accommodate the estimated 563 000 m<sup>3</sup> spoil from the tunnel outlet portal and dam excavations.

## 6.4 DESCRIPTION OF LANGA DAM

### 6.4.1 Embankment

Based on the site geology and the availability of construction materials the feasibility investigations recommended a Concrete Face Rockfill Dam (CFRD) as the most feasible dam type for the site. More detailed geotechnical investigations for the site may, however, reveal conditions that may favour another dam type. This aspect needs to be investigated during the detailed design phase. The onus is, however, on the Implementing Agent to undertake a due diligence assessment to confirm the dam type after further geotechnical investigations have been undertaken.

The NOC will be at RL 926.60 masl with a crest width of 7 m and the estimated total length of the dam wall will be 573 m. The upstream and downstream slopes of the rockfill embankment will be 1V:2H and 1V:2.2H respectively. Dolerite is the preferred option for downstream protection, however, to comply with the EA alternatives (e.g. a vegetated downstream slope) may have to be considered. The various material zones for the proposed CFRD embankment with dolerite downstream protection layer are shown on **Figure 6.4** below. Artistic impressions of the proposed dam wall with dolerite and vegetated downstream protection layers are shown on **Figure 6.5** and **Figure 6.6** below. The final embankment cover should, however, be confirmed during the EIA Process and the Implementing Agent will be informed accordingly.



**Figure 6.4: Cross Section of the CFRD Embankment at Langa Dam with a Dolerite Downstream Protection Layer Dam**





**Figure 6.5: Artistic Impression of Langa Dam with a Dolerite Downstream Protection Layer**



**Figure 6.6: Artistic Impression of Langa Dam with a Vegetated Downstream Protection Layer**

#### **6.4.2 Proposed Spillway Configuration**

The proposed spillway will consist of:

- ◆ A 10 m long ogee spillway on the left flank of the dam;

- An approach channel with an ogee weir of 1.5 m depth;
- A 177 m long chute, and
- A conventional hydraulic jump stilling basin at the end of the chute.

#### 6.4.3 Proposed Outlet Works

The outlet works will consist of:

- An inlet structure with a dual pipe system for water supplied from Smithfield Dam to Langa Dam, and for water supply from Langa Dam to the Baynesfield WTP, and for emergency draw down, as well as
- An outlet structure to release the EWR and the existing water downstream water requirements from Langa Dam into the Mbangweni River.

A cylindrical tower with an inside diameter of 7.2 m is proposed for the outlet tower in order to accommodate two (2) 1.6 m diameter pipes at the bottom. These two 1.6 m diameter pipes will be for water that will be supplied to Langa Dam from Smithfield Dam, and for water that will be supplied from Langa Dam to the Baynesfield WTP. One of these 1.6 m diameter outlet pipes will suffice for water supply to the Baynesfield WTP, but the DWS requires a dual outlet pipe system. It is proposed that the EWR and downstream water requirements should also be released via one of these two 1.6 m diameter pipes.

The two (2) 1.6 m diameter outlet pipes will also be able to draw down Langa Dam from its FSL to 50% of its depth within 9.6 days, and the draw down to the lowest level will be achieved in less than 60 days.

#### 6.4.4 River Diversion

The river diversion must be planned to be implemented in phases related to the changes indifferent seasons (high/low flow). The lower risk of flooding during the winter months (low flow season) must be considered when the construction programme is compiled. If another dam type, instead of a CFRD, is selected then a similar approach for the river diversion will be required. In addition to this the diversion tunnels will be used or form part of the outlet works.

### 6.5 RECOMMENDATIONS AND DIRECTIVES ARISING FROM THE FEASIBILITY DESIGN

Recommendations/directives arising from the feasibility design for the implementation of Langa Dam are the following:



- ◆ Additional test pitting, core drilling, sampling and laboratory tests must be undertaken by the Implementing Agent to confirm the properties and volumes of construction materials actually required, as well as to confirm the founding conditions for the selected dam type and the spillway structure;
- ◆ Review of the proposed ogee spillway with a chute on the left flank for a design discharge of 8.65 m<sup>3</sup>/s during the detailed design phase;
- ◆ A seismic refraction survey should be undertaken by the Implementing Agent for the proposed dam site;
- ◆ The proposed configurations of the outlet tower that should be considered for detailed design are: (i) A cylindrical structure with an outside diameter of 11.2 m and an inside diameter of 7.2 m, or (ii) A square tower of 8.2 m x 8.2 m with a cylindrical shaft with a diameter of 7.2 m;
- ◆ It should be confirmed/decided whether the downstream projection layer for the selected dam type will be dolerite layer or vegetation, as well as
- ◆ A safety assessment for the existing Mbangweni Dam's spillway capacity must be undertaken during the detailed design phase for extreme flood events and/or failure of the transfer infrastructure.

## 7 ANCILLARY WORKS

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### 7.1 ANCILLARY WORKS FOR SMITHFIELD DAM

#### 7.1.1 Relocation of Water Treatment Plant

A package WTP in the dam basin must be relocated.

#### 7.1.2 Relocation of Eskom Infrastructure

The current 88 kVA Eskom transmission line from Bulwer to Elandskop that traverses Smithfield Dam's basin can be raised to accommodate the 700 m affected span of the line across the to-be-impounded reservoir. Sufficient freeboard will be required to ensure safe recreational use of the reservoir and for dam safety surveillance. The customer executive for Eskom will need to be contacted to request a transmission line deviation project.

#### 7.1.3 Roads

The following deviations of the existing public roads and permanent access roads to the dam are required:

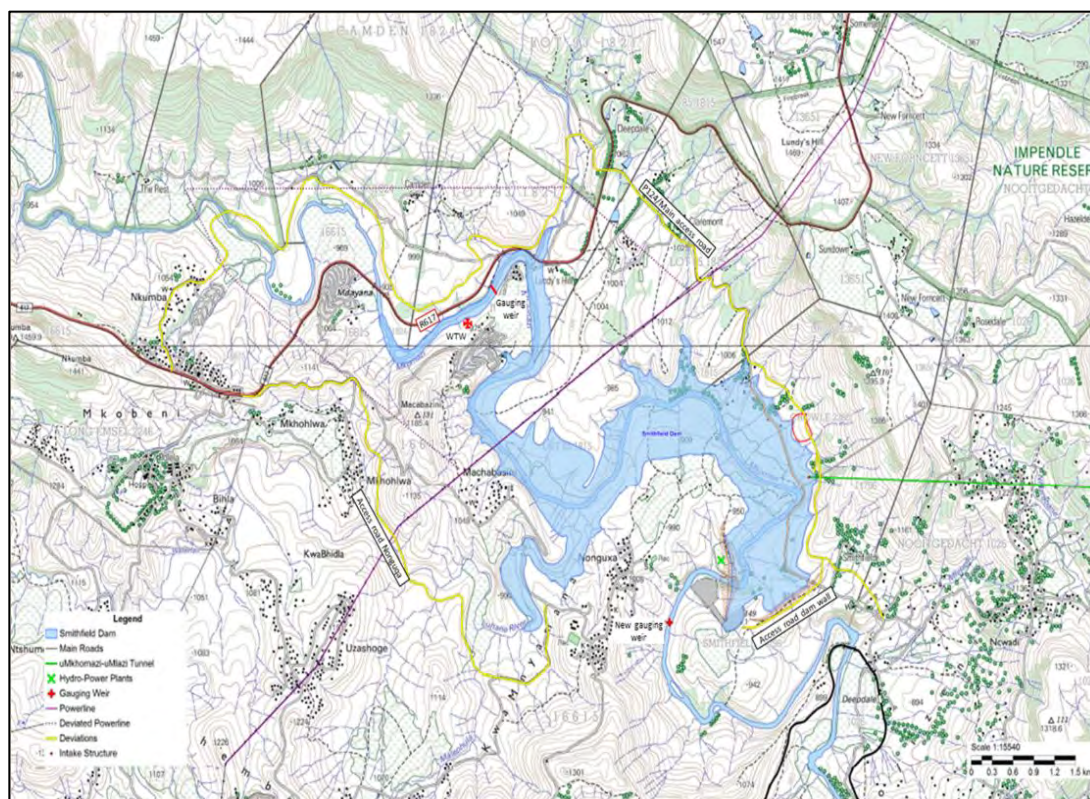
- ◆ Deviation of Provincial Road R617 (12 km of the existing road), during the EIA Process substantial resistance against the re-alignment was experienced. The option presented in the EIR will require the de-proclamation of a section of the Impendle Nature Reserve. This option was not accepted by the KZN Department of Transport mainly due to substandard geometrics, specifically the steep slopes. Furthermore, EKZNW indicated that they have a problem in principal with allowing development in any nature reserve. For these reasons the investigation of alternative alignment options for Provincial Road R617 are currently underway, and the Implementing Agent should consider, and evaluate ,the proposed alternative alignment option/s for Provincial Road R617 in more detail.
- ◆ The Implementing Agent must also investigate the option of an additional smaller bridge that will be required for pedestrians, including school children, and cattle to cross the stream near the old Deepdale Bridge that will be inundated.. This option may, however, trigger a listed activity in terms of the NEMA EIA Regulations (2014) and the Implementing Agent must obtain the necessary approvals will be required from DEA. Consultation must also take place with the KZN Department of

Transport to determine the design and finalise post construction management.

- Gravel access road to Nonguqa, (a village on the southern side of the dam), as well as
- Proposed main access and construction road are located on the north-eastern side of the dam basin, and are mostly on the alignment of an existing route P124. A section of about 3.4 km of the existing Route P124 needs to be deviated for the 7.5 km main access road to the dam. This section of road will also be used to provide access to the construction camp during the construction phase. This section will be inundated during impoundment. These roads must be paved during construction and a new seal layer to be provided after construction;

The following new access roads are required:

- New gravel access roads to the tunnel inlet portal (0.23 km) and to the dam wall (1.56 km), turning off the main access road;
- New gravel access road to the gauging weir upstream of the dam (0.17 km);
- New gravel access road to the gauging weir downstream of the dam (2.16 km);
- New gravel access road to the EWR/IFR2 Site (2.516 km), and
- Any other access roads (temporary or permanent) that may be identified during the due diligence and optimisation investigations.



**Figure 7.1: Existing Roads and other Infrastructure around Smithfield Dam**

Recommendations/directives/further investigations arising from the feasibility design of road deviations and access roads are the following:

- ◆ Detailed topographical surveys must be performed for all the proposed routes during the detailed design phase;
- ◆ No geotechnical investigations were undertaken for the roads and should be undertaken by the Implementing Agent. It was, however assumed that road building material will be readily available from the quarries for the dams, but the Implementing Agent must undertake further investigations to confirm the suitability of these materials for the construction of roads, and
- ◆ No heavy construction vehicles will be allowed to use the access road from Provincial Road R617 to Nwadi, as agreed during the EIA Public Participation Process (PPP), and consult the KZN Provincial Department of Transport for the design requirements for the different roads.

#### 7.1.4 Flow Gauging Requirements Upstream and Downstream of the Dam

The following three (3) proposed flow gauging crump weirs will be required on the uMkhomazi River:

- ◆ Weir 1: Upstream of Smithfield Dam, to measure inflow into the dam (coordinates: **29° 39' 8.92"S, 29° 46' 29.65"E**);

- Weir 2: Downstream of Smithfield Dam to measure the smaller discharges from the dam, as well as the EWR releases (coordinates: **29° 46' 53.09"S, 29° 55' 52.70"E** ), and
- Weir 3: Further downstream of Smithfield Dam, near the EWR Site 2, to determine the runoff from the incremental catchment downstream of Smithfield Dam, as well as to assist with the EWR and the monitoring thereof (coordinates: **29° 55' 12.31"S, 30° 5' 14.26"E**).

All three (3) weirs will be constructed as part of the uMWP-1. Weir 2 will replace the existing DWS Gauging Weir U1H005 on the uMkhomazi River, which will be inundated by Smithfield Dam. The DWS will provide the detailed designs (including telemetry requirements) to be implemented for the construction of the weirs. Weir 1 and Weir 3 are required, but were not part of the scope of work for the EIA Process. No geotechnical and materials investigations were undertaken for these flow gauging weirs as part of the feasibility investigations, and therefore the required geotechnical and materials investigations. The Implementing Agent must also undertake further additional work for Weir 1 and Weir 3, including an EIA, and all the necessary approvals as per the NEMA EIA Regulations (2014).

#### 7.1.5 Hydropower Plant

An assessment of the economic viability of a HPP as part of the outlet works (releases into the river) of Smithfield Dam, concluded that wheeling power into the grid is a feasible HPP option. More detailed investigations should be undertaken by the Implementing Agent during the detailed design phase to confirm the feasibility and economic viability of such a HPP. The dam's outlet works should, however, should be designed as such that a powerhouse can be connected to the outlet pipes in future.

#### 7.1.6 Waste Disposal Sites

A waste disposal site has been identified near the tunnel inlet portal for the disposal of about 600 000 m<sup>3</sup> of spoil materials, specifically unsuitable excavated material from the tunnel boring process. Following a meeting held with the DEA during December 2014 and the DEA confirmed that the spoiling of excess soil and rock would not require a Waste Management Licence in terms of the Waste Act (Act No. 59 of 2008). The Integrated Application Forms were amended in this regard to only relate to NEMA activities.

Solid (municipal) waste generated during the construction process must be disposed of at legal/registered municipal waste disposal sites.

### 7.1.7 Accommodation and Related Structures

The accommodation and related structures requirements at Smithfield Dam for the operational phase should be concluded during the detailed design phase, and may include, amongst others, an office complex; operator and workers houses; a workshop; a boat store, as well as a package WTP and a package Waste Water Treatment Plant (WWTP). The designs for construction accommodation should, however, be as such so that it could be used for recreation purposes in future, as requested by an I&AP (the Baynesfield Estate) during EIA Process. The Baynesfield Estate will be the owners of this accommodation once construction has been completed.

## 7.2 ANCILLARY WORKS FOR THE PROPOSED BULK RAW WATER CONVEYANCE INFRASTRUCTURE

### 7.2.1 Existing and New Roads

#### a) *Temporary Access Roads*

The permanent servitude roads along the tunnel; 2.6 m diameter raw water pipeline to the Baynesfield WTP and the take-off bi-directional 1.6 m diameter raw water pipeline to and from Langa Dam will also serve as the temporary access roads to the various infrastructure components during construction.

#### b) *Permanent Access Roads*

Where required, the afore-mentioned access roads along the tunnel and the raw water pipelines will be upgraded after construction to serve as the permanent servitude roads.

The other permanent access roads that will be accessed via the permanent servitude roads are the roads to the Ventilation Shaft 1 (70 m) and Ventilation Shaft 3 (68 m) of the tunnel as well as to the centre adit entry of the tunnel (about 2 km).

### 7.2.2 Hydropower Plant

Another possible HPP at the end of the of the 2.6 m diameter raw water pipeline, just before the outlet structure to the Baynesfield WTP has the potential to generate 3 MW (installed capacity).

More detail investigations should be undertaken by the Implementing Agent during the detailed design phase to confirm the feasibility and economic viability



of such a HPP. The dam's 2.6 m diameter raw water pipeline should, however, be designed as such that a powerhouse can be connected to the pipe in future just before the Baynesfield WTP.

### 7.2.3 Waste Disposal Sites

Two (2) waste disposal sites, one near the tunnel inlet portal and another one at mid-length along the tunnel length, near the tunnel access adits, have been identified for disposal of construction materials (spoil) that will mainly be excavated during construction of the tunnel as well as its inlet and outlet portals. These waste disposal sites will be part of the EIA Application for the Project. Alternative arrangements will be subject to optimisation. Following a meeting held with the DEA during December 2014 and the DEA confirmed that the spoiling of excess soil and rock would not require a Waste Management Licence in terms of the Waste Act (Act No. 59 of 2008). The Integrated Application Forms were amended in this regard to only relate to NEMA activities. It was agreed with the manager of Baynesfield Estate that excavated material from the tunnel outlet portal will be used for the construction of Langa Dam, and therefore the development of another waste disposal site near the tunnel outlet portal will therefore not be necessary.

Solid (municipal) waste generated during the construction process must be disposed of at legal/registered municipal waste disposal sites.

## 7.3 ANCILLARY WORKS FOR LANGA DAM

### 7.3.1 Relocation of Existing Infrastructure

No permanent infrastructure is located within the dam basin, and this was also confirmed during the EIA Process.

### 7.3.2 Existing and New Roads

#### a) *Temporary Access Roads*

Access to Langa Dam Site during construction will be along the existing P334 gravel road, turning off at about 3 km west of the Baynesfield Estate buildings (just before the piggery), past the Baynesfield Estate Lodge (adjacent to the existing Mbangweni Dam) and the tunnel outlet portal towards the proposed Langa Dam Site. The existing gravel road to Langa Dam (from the P334 turn-off) will have to be upgraded to accommodate the construction traffic. It is proposed that the existing long gravel road be upgraded to an 8 m wide layered and

compacted gravel road. The access road to the dam will be paved at the commencement of construction and re-sealed after the completion of construction. A final agreement, however, needs to be sought with Baynesfield Estate.

It is recommended that the Implementing Agent should undertake an investigation for the upgrading of a section of the existing P334 from the Baynesfield Estate buildings to the turn-off.

**b) *Permanent Access Roads***

The proposed temporary access road to Langa Dam will be upgraded after construction, since this road will be the permanent access road to the dam.

Recommendations arising from the feasibility design for the roads are:

- ◆ Detailed topographical surveys must be performed for all the proposed routes during the detailed design phase, and
- ◆ No geotechnical investigations were undertaken for the roads and should be undertaken by the Implementing Agent. It was, however, assumed that road building material will be readily available from the quarries for the dams, but the Implementing Agent must undertake further investigations to confirm the suitability of these materials for the construction of roads. The Feasibility Study did, however, make provision for the importation of G5 materials from the Midmar Quarry, which is a distance of 64 km away from the proposed Langa Dam Site.

**7.3.3 Flow Gauging Requirements Upstream and Downstream of the Dam**

Langa Dam will be a balancing dam and no flow gauging structures will be required upstream or downstream of the dam. The natural inflow into the dam is minimal if compared to the dam's storage volume. The EWR and the releases for the downstream requirements will be regulated by means of the outlet valves (refer **Section 6.2.1** above).

**7.3.4 Waste Disposal Site**

Waste, specifically tunnel spoil and excavated material from the tunnel, and the tunnel outlet portal, will be accommodated in the construction of the dam wall (refer **Section 4.5.2** above). Following a meeting held with the DEA during December 2014 and the DEA confirmed that the spoiling of excess soil and rock would not require a Waste Management Licence in terms of the Waste Act (Act



No. 59 of 2008). The Integrated Application Forms were amended in this regard to only relate to NEMA activities.

Solid (municipal) waste generated during the construction process must be disposed of at legal/registered municipal waste disposal sites.

#### **7.3.5 Accommodation and other Site infrastructure**

Construction related accommodation and site infrastructures will be located in and near the dam basin. Permanent infrastructure required, such as office space, will be accommodated at the Baynesfield WTP.

## 8 IMPLEMENTATION PROGRAMME

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A proposed construction programme for this comprehensive multidisciplinary project, including the principle work items, with the emphasis on the critical path activities is shown in **Appendix A**. The duration of the various activities are based on realistic construction production rates, and the proposed construction programme is based on the following milestone dates:

- Commencement of construction: 2020;
- Commencement of impoundment: December 2024, and
- Commencement of raw water supply to the Baynesfield WTP: December 2025.

When the construction programme was compiled it was assumed that appropriate time has been allocated to complete all the pre-construction activities, and preparations which include the following:

- Tendering process and contract award;
- Obtaining of relevant approvals, permits and licenses;
- Financing, and
- Land acquisition.

The important construction works for Smithfield Dam are the following:

- The excavation and lining of the dam's River Diversion Tunnel 2;
- The rock support of the dam's River Diversion Tunnel 1 has to be completed by the end of March 2021 to start diverting water through these tunnels;
- The proposed Roller Compacted Concrete (RCC) Cofferdam 5 must be completed before the summer rain season of 2021 to avoid possible flooding of the construction area and consequent damage and delay of construction;
- The proposed rockfill Cofferdam 6 must be completed before the summer rain season of 2022, and
- A large portion of the proposed saddle dam embankment should be completed prior to the commencement of the construction of the dam's main embankment since the shale to be used for the saddle dam's embankment

shell overlies the dolerite required for the shell of the main dam's embankment.

The important construction works for the raw water conveyance infrastructure are the following:

- The procurement, manufacturing, testing, shipping and assembling of the TBM for the construction of the tunnel;
- Provision of river crossing (for example pedestrian bridge);
- Erection of the crusher and batching plant;
- Drilling and blasting of the central access tunnel at mid length of the tunnel;
- Drilling and blasting of the tunnel's other access adits, and
- Boring and lining of the tunnel from chainage 33.1 km to chainage 15.2 km.

The construction of Langa Dam should be aligned with the construction of the tunnel as materials become available from the tunnel excavations. Langa Dam should therefore be completed at same time as the tunnel, and embankment rockfill material placement from the tunnel spoil should be planned carefully to avoid double handling of this material.

All the other construction activities (the construction of access roads; raw water pipelines; relocation of existing infrastructure; etc.) can be completed within the critical period, but these activities must be aligned and prioritised as such to ensure the efficient completion of the Project, as these activities could affect the critical path if not completed on time. The construction of the roads providing access to hard-to-reach construction sites have to be completed before the associated construction activity can commence, and this may require advance works to commence before September 2020. The proposed construction programme should be reviewed and adjusted accordingly after more accurate quantities and production rates have been established during the detailed design phase.

## 9 GENERAL CRITERIA

The uMWP-1 will be a government waterworks in terms of the National Water Act, (Act No. 36 of 1998) (NWA), Chapter 11. The implementation of the uMWP-1 must therefore adhere to the general criteria described in Chapter 11 of the NWA.

### 9.1 DESIGN GUIDELINES

The DWS design guidelines and specifications should be used together with other recognized standards; codes and acts such as those of the South African Bureau of Standards (SABS), South African National Standards (SANS) codes, the DWS standards, and the Occupational Health and Safety Act (Act No 85 of 1993) whilst applying professional expertise and sound engineering judgement.

**Table 9.1: DWS Specifications for the Design of Water Infrastructure\***

Number	Description
DWA 0510	Drilling and grouting
DWA 0750	Water retaining concrete
DWA 1110	Construction of pipelines (October 2010 revision)
DWA 1130	Design, manufacture and supply of steel pipes (October 2010 revision)
DWA 1131	Lining and coating of steel pipes and specials
DWA 1140	Design, manufacture and supply of asbestos-cement pressure pipes and joints
DWA 1150	Glass reinforced plastics (GRP) pipes and joints for use for water supply
DWA1160	Design, manufacture, supply, and installation of Polyvinyl Chloride (PVC) Pressure Pipes and fittings
DWA 1710	Bricklaying
DWA 1720	Plasterer, tiler, and floorer
DWA 1730	Glazing and painting
DWA 1740	Plumbing
DWA 1810	Specialist services
DWA 1910	Supply, delivery, installation and commissioning of mechanical and electrical equipment for a bio-filter plant
DWA 2010	Boundary fencing
DWA 2410	Landscaping
DWA 2510	Valves (set of specifications)
DWA 9900	Corrosion protection (set of specifications)
DWA GTE	General technical specifications (Electrical)

\* Latest specification to be used, also refer to the Design Criteria Memorandum

## 9.2 CURRENT BEST PRACTICES AND EFFICIENCY

Current best practices and efficiency shall be applied to the design; construction; supervision; commissioning and operation of the works. Where applicable the relevant international standards shall also be applied.

## 9.3 ELECTRICITY SUPPLY

All power requirements, for both the construction and operational phases of the Project, should be confirmed during the detailed design phase. Power requirements during construction may be provided by the contractor if permanent electricity infrastructure has not been installed. The installation of Eskom infrastructure (transformers, transmission lines etc.) may trigger a listed activity in terms of the NEMA EIA Regulations. The Implementing Agent must therefore engage with Eskom at an early stage to expedite this.

## 9.4 SECURITY MEASURES

The Project shall be implemented in compliance with the requirements for an Important Works as defined in the applicable legislation and the DWS Manual on Physical Security Measures at Departmental Works and Schemes.

The DWS agreed during a meeting of the Joseph Baynes Estate Trustees on 19 August 2014 that the construction sites will be fenced, and that construction workers may not move freely beyond the construction domain.

## 9.5 ADVANCE WORKS

### 9.5.1 Preparation to Construct

The Implementing Agent will be required to:

- Obtain relevant Section 21 Water Use licences from the DWS and the licence/s to construct the dams from the DWS's Dam Safety Office;
- Develop specifications for contractors work area;
- Develop a detailed construction plan;
- Undertake further studies and to finalise the detailed Environmental Management Programme (EMPr) for construction and the Environmental Management Plan (EMP) for the development of quarries and borrow areas;
- Submit applications for power supplies for construction, and

- Liaise with the local authorities and the Traditional Leader/s regarding access to the various construction sites.

### 9.5.2 Construction

Any construction work undertaken in the river channels (uMkhomazi and Mbangweni Rivers) shall as far as possible be scheduled to take place during the dry season (winter) to avoid possible flooding and associated damage to the works during the wet season.

Construction activities shall be undertaken in compliance with the Project Specifications; the EA as well as the related EMPs, which must have been approved by the relevant authorities. Method statements for all the construction activities must be consistent with these prescriptions so as to result in minimal and acceptable impact on the receiving environment.

The appointed contractor must also allow for sufficient time to restore/rehabilitate all the construction sites and disturbed areas to their original states upon completion of construction, strictly in accordance with the relevant specifications.

Construction housing for the permanent staff during construction from outside the Project Area must be identified. The contractor will be responsible for accommodation for the permanent staff during construction, in consultation with the Implementing Agent, municipalities and/or landowners.

## 9.6 QUALITY ASSURANCE AND CONTROL

Quality assurance in terms of ISO 9001-2000 or functionally equivalent standards will be a requirement. All consultants and contractors shall be required to compile Quality Assurance Plans for the works and these shall be rigorously applied; monitored and reported on.

The quality control aspects will follow logically from the afore-mentioned processes where it will culminate in the production of suitable reports; drawings; specifications and manuals that will meet the Operational and Maintenance (O&M) requirements of the Project.

## 9.7 OPERATION AND MAINTENANCE

### 9.7.1 Operating and Control Philosophy

Appropriate communication, monitoring and control systems shall be provided to allow for the effective and efficient control of all components of the system that will be directed by the DWS in the Final RID.

### 9.7.2 Operation and Maintenance Requirements

The O&M requirements for all the infrastructure shall be included in the O&M Manual that must be prepared by the Implementing Agent, and must address the following

- ◆ A planned preventative maintenance approach to ensure a high level of assurance of supply;
- ◆ Infrastructure at the dams and other structures that will allow for the removal and loading of equipment onto vehicles for transport;
- ◆ Suitable maintenance and inspection procedures, including maintenance of an asset register, which must form part of the O&M Manual, and
- ◆ A strategic spares philosophy for the major equipment.

Time periods required to perform maintenance activities during scheduled downtimes must be determined, also taking account of seasonal operation requirements. The bulk water users will need to be notified in advance of any shutdowns for planned maintenance, and in case of shutdowns for emergency repairs the bulk water users will need to be notified as soon as possible.

Prior to handover, the Implementing Agent must ensure that all the operators receive training on minor maintenance works by the design engineers and the relevant contractors.

## 10 COMPLIANCE WITH APPLICABLE LEGISLATION, REGULATIONS AND POLICY

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It will be the responsibility of the Implementing Agent and the Operating Entity to strictly adhere to all the relevant policies and legislation when implementing; operating and maintaining the scheme. This includes, inter alia, the NWA; Broad-Based Black Economic Empowerment (BBBEE) Amendment Act of 2013; Sustainable Utilisation Planning; the National Water Resources Strategy; the National Development Plan, and the Public Finance Management Act

Procurement procedures during implementation and operation of the scheme shall also comply with the relevant legislation, such as the Public Finance Management Act of 1999 and the BBBEE Amendment Act of 2013.

### 10.1 NATIONAL WATER ACT

A Notice of Intent to implement the uMWP-1 as a government waterworks in terms of Sections 109 & 110 of the NWA, and declaring the uMWP-1 as a government waterworks, will probably be published towards the end of 2018. Funding for the implementation of the Project will come from private funds and/or National Treasury. It is recommended that the Trans-Caledon Tunnelling Authority (TCTA) be appointed as the Implementing Agent for the uMWP-1. Since the uMWP-1 is earmarked to augment the Mgeni WSS it is recommended that UW will be the Operating Entity for the uMWP-1 on behalf of the DWS.

#### 10.1.1 Land Matters

Section 64 of the NWA enables the Minister of Water and Sanitation, or a Water Management Institution authorised by the Minister in writing, to expropriate any property for any purposes contemplated by the NWA if the purchase is for public purposes or in the public interest. Servitudes with specific purposes can also be registered. Therefore, land rights (including servitudes and unregistered rights) to implement and operate the required infrastructure must be acquired in accordance the appropriate legislation. A title deed, as well as tribal land needs to be secured for the Project. Preliminary expropriation lines, depicting the minimum land purchase requirements for the construction of Smithfield and Langa dams as well as for the three (3) flow gauging weirs (where servitudes will be required), were determined according to the *“Policy and Guidelines for the Acquisition of Land Rights at Departmental Dams”* (DWAF, 2001). The estimated



total area of land to be expropriated is 1 661 Ha, and the total estimated area of land for which servitudes will need to be registered is approximately 157 Ha. Servitudes for the tunnel and infrastructure associated with the tunnel must be obtained. Land matters are sensitive issues, and specifically during the EIA Process and Feasibility Study indications are that these matters should be handled with great care, therefore a good **Public Relations (PR) Team** should be involved as soon as the Project is approved to avoid miscommunication that may result in possible delays. It is recommended that the same PR Team that was used during the Feasibility Study be employed for the duration of the project implementation phase.

### 10.1.2 License Requirements

A license to construct must be obtained from the DWS before work on the dams and flow gauging weirs may commence. A licence to impound water must also be obtained from the DWS at least 120 days after the date on which the dams and flow gauging weirs are capable to storing or impound water.

### 10.1.3 Water Use Licence

The Project entails the following activities that constitute water uses in terms of Section 21 of the NWA:

- ♦ Taking water from a water resource;
- ♦ Storing of water; (impeding or diverting the flow of water in a watercourse; flow gauging weirs, road realignment, access roads, raw water pipelines, tunnel, etc.), and
- ♦ Altering the bed, banks, course or characteristics of a watercourse.

A draft Integrated WULA for the uMWP-1 was, compiled by the Environmental Assessment Practitioner (EAP) for the Project as part of the EIA Process. This WULA must, however, be finalised and submitted by the Implementing Agent to the DWS KZN Regional Office for both construction and operational requirements.

## 10.2 ENVIRONMENTAL IMPACT ASSESSMENT

### 10.2.1 General

The DEA rejected the EIA Report for the uMWP-1 Raw Water Component. After engagements with the DEA it became clear that additional technical and EIA work

will be required before the DEA will approve the applications for the Project. The following additional technical and EIA work are underway:

- ◆ A Noise & Vibration Impact Assessment pertaining to the tunnel construction;
- ◆ A Biodiversity Offset Assessment;
- ◆ An EIA for alternative tunnel routes, and
- ◆ Possible alternative realignment options of Provincial Road R617.

Upon completion of this additional technical and EIA, work and addendum to the EIR will be prepared, where after the EIR will be resubmitted to the DEA for approval, and the DEA's decision is expected by October 2018. The EIA also recommended that the EMP be further developed to include the following EMPs as further information becomes available:

- ◆ A Search, Rescue and Relocation Management Plan;
- ◆ Impoundment EMPs for Smithfield and Langa dams, as well as for the flow gauging weirs;
- ◆ A Rehabilitation Management Plan;
- ◆ An Operational EMP, which will complement the O&M Manual, and
- ◆ A Resource Management Plan.

A full Scoping and separate DMR EIA Process are also underway for the quarries and borrow areas, based on the listed activities to be triggered, and will be undertaken by the DWS's Project Team (refer **Section 10.2.7** below).

### 10.2.2 Relocation of People

During the EIA approximately thirty (30) dwellings were identified in Smithfield Dam's basin that will have to be relocated. A Relocation Policy Framework (RPF) that was prepared during the EIA comprises the social principles for the relocation. This should be the basis for a Relocation Action Plan (RAP), which needs to be prepared in consultation with the stakeholders (directly and indirectly affected) during the implementation phase. The RAP must consider as a minimum, the stakeholder engagement process; compensation framework (loss of assets, access to resources, income sources and/ or livelihoods, etc.); relocation sites; an independent review of the process, and grievance mechanism/procedure.

### **10.2.3 Relocation of Graves and Mitigation of Impacts on Cultural and Historic Sites**

A Phase 1 Heritage Impact Assessment (including an archaeological and paleontological assessment), in accordance with the National Heritage Resources Act (Act No. 25 of 1999) and the KZN Heritage Act (Act No. 04 of 2008), was undertaken as part of the EIA. Prior to construction a Phase 2 Heritage, Archaeological and Paleontological Impact Assessment must be undertaken by the Implementing Agent. The Implementing Agent must also develop a Grave Exhumation and Reburial Strategy in accordance with the relevant legislation that takes due cognisance of the cultural sensitivities; customs; beliefs and ceremonies with regard to the exhumation and relocation of graves.

### **10.2.4 Resource Management Plan**

The uMWP-1 (Smithfield and Langa dams) and surrounding landing land must be conserved and utilised in an environmentally sound and equitable manner. The Implementing Agent will be required to prepare and submit a Resource Management Plan (RMP) to the DWS for gazetting by the Minister of Water and Sanitation prior to the handover of the works for operation. This activity shall commence at the start of the implementation phase as it may be necessary to acquire land and/or land rights to implement the requirements of the RMP. The RMP must be prepared in accordance with the Department of Water Affairs and Forestry (DWAF) 2006 Recreational Water Use Manual and any subsequent amendments thereof.

### **10.2.5 Rehabilitation Management Plan**

Although provision is made in the EMPr for the construction phase of the Project, the EIA recommended that a dedicated Rehabilitation Management Plan be compiled. This plan must include additional site-specific measures identified during construction to supplement the reinstatement and rehabilitation provisions included in the EMPr. The EA may also require that the Rehabilitation Management Plan be approved by the DEA.

### **10.2.6 General Mitigation of Environmental Impacts**

Specific mitigation measures to safeguard sensitive environmental features and to prevent, minimise or rehabilitate impacts associated with the Project's life-cycle are included in the EIA Reports and the EMPrs.

Some of the key recommendations (not already discussed above) from the EIA are the following:

- Waste disposal sites (tunnel inlet and central portals) to avoid drainage lines;
- Specialist (avifaunal, terrestrial and aquatic ecological, heritage) walk-through to be performed on the site as part of the site specific EMPs prior to construction;
- Engage further with EKZNW regarding extension of the Impendle Nature Reserve as a biodiversity offset for the Project;
- Investigate the relocation of dwellings on the north-eastern side of Smithfield Dam prior to construction in order to avoid construction-related impacts to the occupants;
- Provide suitable cover for the road surface for the access road to the tunnel outlet portal and Langa Dam on the Baynesfield Estate;
- Support targeted investment in the maintenance and rehabilitation of ecological infrastructure (functioning ecosystem with associated services) in the uMkhomazi River Catchment;
- Establish an Environmental Monitoring Committee (EMC) during the pre-construction phase;
- The Baynesfield Estate Lodge is located adjacent to the existing Mbangweni Dam and currently offers tourist accommodation, recreational fishing on the dam and environmental education opportunities. To mitigate the impacts to the Baynesfield Estate Lodge during the construction phase it is recommended that this facility be recreated to the existing Baynesfield Dam. The existing Baynesfield Estate Lodge could be leased out to the construction team and then be reinstated (as necessary) after the construction period for continued future use.

#### 10.2.7 Scoping, EIA and EMP for the Quarries and Borrow Areas

In terms of the Minerals and Petroleum Resources Development Act (Act No. 28 of 2002), applications to the DMR for authorisation to extract naturally occurring construction materials are required. The EMP for the quarries and borrow areas was prepared and is attached to the EIA Report. A full Scoping and separate DMR EIA Process are currently underway for the quarries and borrow areas, based on the listed activities to be triggered. Upon completion of the Scoping and DMR EIA Process, the regulated timeframes in the EIA Regulations of 2014 will apply, and the DMR's decision is expected by July 2018.

## 11 FUNDING AND INSTITUTIONAL ARRANGEMENTS

### 11.1 COST ESTIMATE FOR SMITHFIELD DAM

A summary of the cost estimates for Smithfield Dam, including its associated infrastructure, for which the base date is March 2014, excluding VAT is provided in **Table 11.1** below. The detailed cost estimates for each component are contained in the *Engineering Feasibility Design Report (P WMA 11/U10/00/3312/3/1)*.

**Table 11.1: Summary of Cost Estimate for Smithfield Dam and its Associated Infrastructure (2014 Rands)**

Description	Cost (R million, excl. VAT)
River Diversion Works	178.5
Development of Quarries and Borrow Areas	9.9
Smithfield Dam Main Embankment (zoned ECRD)	813.5
Smithfield Dam Saddle Embankment (zoned earthfill dam)	252.1
Main Embankment Side-channel Spillway	189.7
Saddle Embankment Fuse Plug Spillway	66.0
Outlet Works and Intake Structure	146.4
Tunnel Intake Structure	288.4
<i>Access Roads and Deviation of Roads</i>	<i>179.8<sup>#</sup></i>
Flow Gauging Weirs	28.8
Waste Disposal Site 1	7.1
Transmission Lines	5.0
<i>Proposed Smithfield Dam HPP</i>	<i>36.6*</i>
Miscellaneous	85.8
<b>TOTAL</b>	<b>2 287.6</b>

\* Potential HPP cost is included although not part of the scope for the uMWP-1.

# Will change given the revised realignment of Provincial Road R617.

### 11.2 COST ESTIMATE FOR THE BULK RAW WATER CONVEYANCE INFRASTRUCTURE

A summary of the cost estimates for the bulk raw water conveyance infrastructure up to the Baynesfield WTP, for which the base date is March 2014, excluding VAT are provided in **Table 11.2** below. The detailed cost estimates for each component are contained in the *Engineering Feasibility Design Report (P WMA 11/U10/00/3312/3/1)*. This cost estimate includes the assumption that the tunnel

will be lined, until proven not required through detail geotechnical investigations either during the detailed design phase and/or construction.

**Table 11.2: Summary of Cost Estimate of all activities for the Raw Water Conveyance Infrastructure to the Baynesfield WTP**

Description	Cost (R million, excl. VAT)
<b>Tunnel</b>	
Transfer Tunnel (Tunnel 1)	3 362.2
Access and Deviation of Roads	11.9
Waste Disposal Site 2	7.1
<i>HPP before the Baynesfield WTP</i>	<i>42.8*</i>
Miscellaneous	542.2
<b>Total</b>	<b>3 966.2</b>
<b>Raw Water Pipelines</b>	
Raw Water Pipeline to the Baynesfield WTP- 2.6 m diameter section	277.3
Take-off Raw Water Pipeline to and from Langa Dam - 1.6 m diameter section	27.0
<b>Total</b>	<b>304.3</b>
<b>Total for the Raw Water Conveyance Infrastructure</b>	<b>4 270.5</b>

\* Potential HPP cost included, although not part of uMWP-1 Project cost

### 11.3 COST ESTIMATE FOR LANGA DAM

A summary of the cost estimate, base date of March 2014 and excluding VAT, for the construction of all the components of Langa Dam is given in **Table 11.3** below. The detailed cost estimates for each component are contained in the *Engineering Feasibility Design Report (P WMA 11/U10/00/3312/3/1)*. The Langa Dam option, and/or the position of Langa Dam, might also change.

**Table 11.3: Summary of Cost Estimate for the Components of Langa Dam**

Description	Cost (R million, excl. VAT)
River Diversion Works	1.4
Development of Quarry	0.5
Langa Dam Main Embankment (CFRD)	315.8
Spillway	3.6
Outlet Pipes	12.8
Outlet Works and Intake Structure	47.1
Access and Deviation of Roads	28.9
Miscellaneous	120.0
<b>TOTAL</b>	<b>530.1</b>

*Note: Additional R11.23 million (excl. VAT) to be added to total for vegetation downstream protection alternative.*

## 11.4 TOTAL PROJECT COST<sup>1</sup>

The total estimated capital costs of the uMWP-1's Raw Water Component, March 2014 prices excluding VAT, are given in **Table 11.4** below.

**Table 11.4: Estimated Total Capital Cost of the Proposed uMWP-1**

Raw Water Component	Cost (R million) <sup>\$</sup>
• Proposed Smithfield Dam	2 030
• uMkhomazi – uMlaza Tunnel	3 904
• Proposed Langa Dam	501
• Baynesfield 2.6 m diameter raw water pipeline	277
• Langa Dam 12.6 m diameter raw water take-off pipeline	27
• Transmission lines	5
• Proposed Smithfield Dam and Baynesfield HPPs	79
• Waste disposal sites	15
• Flow gauging weirs	29
• Roads and bridges	221 <sup>@</sup>
<b>Sub-total of activities</b>	<b>7 088</b>
Preliminary & General items (25% of activity cost)	1 772
Professional fees (12% of activity cost)	851
Environmental, landscaping and social costs (lump sum)*	450
Land acquisition (lump sum)	37
<b>Sub-total of activities and value-related costs</b>	<b>10 198</b>
Contingencies (25% of above sub-total)	2 550

<sup>1</sup> Project cost shown in 2014 Rands from the Feasibility Study. Refer to the latest Project Concept Note for updated capital projections.

Raw Water Component	Cost (R million) <sup>\$</sup>
Implementing Agent - TCTA (lump sum)	200
<b>Total: Raw Water System</b>	<b>12 948</b>
<b>Total: Potable Water System</b>	<b>3 591</b>
<b>Total Integrated uMWP-1 (excl. VAT) <sup>#</sup></b>	<b>16 539</b>
<b>Total Integrated uMWP-1 (incl. VAT) 2014 Rands</b>	<b>18 855</b>
<b>Total escalated @ 6%/a to 2020 – start of implementation</b>	<b>26 745</b>
<b>Total escalated @ 6%/a to 2025 – completion of the Project</b>	<b>35 791</b>

\* Provisional cost estimate, to be defined during the EIA Process.

# No financing cost included

\$ Cost based on current practices and additional cost due to new government policies, e.g. the Broad-Based Black Economic Act, 2013, has not been included.

@ Will change given the revised realignment of Provincial Road R617

## 11.5 FUNDING ARRANGEMENTS

The envisaged beneficiaries of the uMWP-1, i.e. users supplied by the Mgeni WSS, will be in a position to generate an income stream from water tariffs that can contribute towards the recovery of the capital cost of the works. It is, however, recognised that a significant portion of the beneficiaries (households) that use about 25% of the current supplies from the Mgeni WSS, are regarded as low income households below the poverty line that qualifies for free basic water. The Project, which is a large capital project, together with recently constructed MMTS-2, has a significant impact and may cause 'financial strain' on these users.

The Feasibility Study therefore recommended that the raw water component of the uMWP-1 to be partially funded (approximately 25%) on-budget by National Treasury. Funding from National Treasury for the 25% social component is, however, highly unlikely and therefore a 100% Off-budget Funding Model for the Project should be further developed. National Treasury did not entirely dismiss that they would be unable to fund the entire Project, as this will depend on the country's general economic performance.

The costs of the uMWP-1, including loan redemption should therefore be recovered through UW's potable water sales.



## 11.6 INSTITUTIONAL ARRANGEMENTS

### 11.6.1 National Water Resources Infrastructure

The water resources infrastructure constituting the uMWP-1 will be classified as **National Water Resources Infrastructure**<sup>2</sup>, as per Section 109 of the NWA, and the DWS was assigned the responsibility as promoter and owner of the Project, by the Minister of Water and Sanitation.

### 11.6.2 Water Services Infrastructure

Distinction should be drawn between the national water resources infrastructure as described above and water services infrastructure (mostly the bulk potable water and reticulation infrastructure). Water services infrastructure is, however, the responsibility of the relevant WSAs, which are either the DMs and/or LMs.

Without the uMWP-1 there would not be sufficient water in UW's area of supply for the provision of water services provision, whilst without water services infrastructure it would not be possible to distribute potable water to the end users.

Smithfield Dam is located within the Ingwe LM, which is part Harry Gwala DM (the WSA in the area), and as noted in **Section 4.2.7** above, water will be allocated for supply to the communities surrounding Smithfield Dam. The Harry Gwala DM will, in consultation with DWS, plan and develop the water services infrastructure for this area.

### 11.6.3 Responsibilities for Implementation, Preparation and Management

It is recommended that both TCTA and UW be appointed to jointly undertake the pre-implementation work required for the raw water component of the uMWP-1, comprising Smithfield Dam; the Raw Water Conveyance Infrastructure to the Baynesfield WTP; Langa Dam; the Bi-directional Take-off Pipeline to and from Langa Dam as well as other appurtenant infrastructure. The TCTA and UW will be required to jointly develop a funding and cost recovery plan.

As the owner of the raw water component of the uMWP-1, the DWS will have overall responsibility for the management, as well as the O&M of the Project. Although the DWS retains direct responsibility for the water resources systems, it is recommended that UW be directed to be the Operating Entity for the uMWP-1, as per current management of the Mgeni WSS.

## 12 CONSTRUCTION PROGRAMME

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The proposed construction programme for the uMWP-1's raw water component is based on commencement of construction in 2020 and is shown on the Proposed Implementation Schedule in **Appendix A**. The estimated completion date for the construction activities is end 2025.

## 13 REPORTING

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The Implementing Agent; DWS National Water Resources Infrastructure (NWRI) Branch, or its delegated agent, shall take the responsibility to manage and organise the implementation of the Project, including reporting to the following committees<sup>3</sup>:

- The DWS top management;
- The uMWP-1 TC, at a higher level than the Project Coordination Committee (PCC) (described below), might be required as well and it would then be necessary to streamline the composition of the PCC, and
- The PCC, chaired by DWS CD: ID, and attended by, among others, the following DWS directorates and offices: NWRI Branch, IWRP, Water Services, Hydrological Services, and the DWS KZN Regional Office. The PCC must also be attended by UW and the TCTA, if directed by the Minister to implement the scheme. UW shall represent the municipalities and other end users on the PCC, and may choose to involve the WSAs, namely the eThekweni MM, Msunduzi LM, Ingwe LM, iLembe DM, Ugu DM and the uMgungundlovu DM.

Reporting to the uMWP-1 TC and PCC shall be both written and verbal, bearing in mind the diversity of representation on the uMWP-1 TC, i.e. Departmental; National and Provincial Government; WSAs; etc.

### 13.1 MONTHLY PROGRESS REPORTS

For purposes of monitoring progress of implementation a Monthly Progress Report shall be prepared within the DWS: NWRI Branch. This report shall as a minimum cover the following:

- Actual progress against the approved construction programme;
- Cash flow against approved budget;
- Utilization of resources (plant and labour);
- Local employment versus set or agreed targets;
- BBBEE involvement against targets;

- Problems and mitigation measures in respect of meeting programme milestones/deliverables, and
- Any deviations regarding the configuration of the approved Project.

### 13.2 SIX-MONTHLY PROGRESS REPORTS

A concise Bi-annual Summary Report must be submitted to the Minister and the DWS top management, covering all issues discussed in the monthly progress reports of the preceding six (6) months. This report will also take cognisance of the requirements set out in the Ministerial Directive (if relevant) for the implementation of the Project.

### 13.3 FORMAT AND DISTRIBUTION OF REPORTS

- All reports shall be provided with the official name of the Project followed by the name; date and number of the report, e.g.:
  - ◆ Project name: uMkhomazi Water Project, Phase 1 (uMWP-1)
  - ◆ Report type: Monthly Progress Report and Bi-annual Summary Report.
  - ◆ Reporting period: (month & year) to (month & year)
  - ◆ Date: (month and year that report was issued)
- All reports shall be signed off by the responsible official within the DWS: NWRI Branch before distribution.
- All reports shall be distributed in both hardcopy and electronic (PDF) format.
- Copies of the progress reports shall be distributed to the responsible officials within the DWS: NWRI Branch; the Chief Director: IWRP; the Director: Options Analysis and the responsible Chief Engineer: Options Analysis. All reports shall also include the distribution list.

## 14 LIST OF FEASIBILITY STUDY REPORTS

This report forms part of the series of Feasibility Study Reports that were compiled for both the raw water and potable water components of the **uMWP-1**.

**Table 14.1: List of Feasibility Study Reports for the uMWP-1**

Report Number	Report Title	Supporting Document Title
<b>Technical Feasibility Study Raw Water - Module 1*</b>		
P WMA 11/U10/00/3312	Inception Report	-
P WMA 11/U10/00/3312/1	Main Report	-
P WMA 11/U10/00/3312/1/1	Summary Report	-
P WMA 11/U10/00/3312/2/1	Hydrological Assessment of the uMkhomazi River Catchment	-
P WMA 11/U10/00/3312/2/1/1	Hydrological Assessment of the uMkhomazi River Catchment	Supporting Document 1: Groundwater Resources of the uMkhomazi Catchment and Interaction with Surface Water
P WMA 11/U10/00/3312/2/2	Water Requirements and Return Flows	-
P WMA 11/U10/00/3312/2/2/1	Water Requirements and Return Flows	Write-up 1: Possible Water Supply from Smithfield Dam to Surrounding Communities (Smithfield Dam local WSS)
P WMA 11/U10/00/3312/2/2/2	Water Requirements and Return Flows	Write-up 2: Community Supply From Smithfield Dam: Pre-feasibility Study
P WMA 11/U10/00/3312/2/3	Water Resources Yield Assessment	-
P WMA1 1/U10/00/3312/2/3/1	Water Resources Yield Assessment	Supporting Document 1: Sediment Yield Report
P WMA 11/U10/00/3312/2/3/2	Water Resources Yield Assessment	Supporting Document 2: Sediment Deposition and Impact Report
P WMA 11/U10/00/3312/2/4	Water Resources Planning Model	-
P WMA 11/U10/00/3312/3/1	Engineering Feasibility Design Report	-
P WMA11/U10/00/3312/3/1/1	Engineering Feasibility Design Report	Supporting Document 1: Optimisation of Conveyance System Report
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P WMA 11/U10/00/3312/3/1/3	Engineering Feasibility Design Report	Supporting Document 3: Optimization of Scheme Configuration
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P WMA 11/U10/00/3312/3/1/5	Engineering Feasibility Design Report	Supporting Document 5: Dam Type Selection
P WMA 11/U10/00/3312/3/1/6	Engineering Feasibility Design Report	Write-up 1: Climatological Data for the Proposed Smithfield Dam and Langa Balancing Dam Construction
P WMA 11/U10/00/3312/3/1/7	Engineering Feasibility Design Report	Write-up 2: Water Quality and Limnological Review

Report Number	Report Title	Supporting Document Title
P WMA 11/U10/00/3312/3/1/8	Engineering Feasibility Design Report	Write-up 3: Site Investigation for the Positioning of Gauging Weirs
P WMA 11/U10/00/3312/3/1/9	Engineering Feasibility Design Report	Write-up 4: Route Investigation for Various Road Alignments on the uMkhomazi-uMlaza Transfer Scheme
P WMA 11/U10/00/3312/3/1/10	Engineering Feasibility Design Report	Write-up 5: Traffic Impact Assessment
P WMA 11/U10/00/3312/3/1/11	Engineering Feasibility Design Report	Write-up 6: Climate Change
P WMA 11/U10/00/3312/3/2/1	Geotechnical Report	Supporting Document 1: Probabilistic Seismic Hazard Analysis for Smithfield Dam, Langa Balancing Dam and the Conveyance System
P WMA 11/U10/00/3312/3/2/2	Geotechnical Report	Supporting Document 2: Seismic Refraction Investigation at the Proposed uMkhomazi Water Project Phase 1
P WMA 11/U10/00/3312/3/2/3	Geotechnical Report	Supporting Document 3: Smithfield Dam: Materials and Geotechnical Investigation
P WMA 11/U10/00/3312/3/2/4	Geotechnical Report	Supporting document 4: Langa Dam: Materials and Geotechnical Investigation
P WMA 11/U10/00/3312/3/2/5	Geotechnical Report	Supporting Document 5: Conveyance System: Materials and Geotechnical Investigation
P WMA 11/U10/00/3312/3/3	Hydropower Assessment Report	-
P WMA11/U10/00/3312/3/3/1	Hydropower Assessment Report	Supporting Document 1: Interim Investigation for Hydropower Potential at Impendle Dam and Transfer System
P WMA 11/U10/00/3312/4	Record of Implementation Decisions	-
P WMA 11/U10/00/3312/5	Institutional and Financial Aspects Report	-
P WMA 11/U10/00/3312/6	Economic Impact Assessment Report	-
P WMA11/U10/00/3312/6/1	Economic Impact Assessment Report	Supporting Document 1: Baseline Socio-economic Assessment
P WMA11/U10/00/3312/6/2	Economic Impact Assessment Report	Write-up 1: Detailed Socio-economic Baseline Study of the Umgeni Supply Area
P WMA 11/U10/00/3312/7	Environmental Screening Report	-
<b>Environmental Impact Assessment - Module 2<sup>s</sup></b>		
P WMA 11/U10/00/3413/1	Environmental Impact Assessment: Inception Report	-
P WMA 11/U10/00/3413/2	Environmental Impact Assessment: Scoping Report	-
P WMA 11/U10/00/3413/3	Environmental Impact Assessment: Environmental Impact Assessment Report	-
P WMA 11/U10/00/3413/4	Environmental Impact Assessment: Environmental Management Report	-

Report Number	Report Title	Supporting Document Title
<b>Module 3 - Potable Water<sup>#</sup></b>		
UW 108/114/12/R1-1	Main Report – Volume 1	-
UW 108/114/12/R1-2	Main Report - Volume 2 (Drawing Book)	
UW 108/114/12/R2	Preliminary Pricing of Potable Water Module Options	-
UW 108/114/12/R3	Water Demand Projections and Phasing of Infrastructure	-
UW 108/114/12/R4-1	Pipeline Design Report – Volume 1	-
UW 108/114/12/R4-2	Pipeline Design Report – Volume 2	-
UW 108/114/12/R4-3	Pipeline Design Report – Volume 3	-
UW 108/114/12/R4-4	Pipeline Design Report – Volume 4	-
UW 108/114/12/R5	Water Treatment Works Conceptual Design	-
UW 108/114/12/R6	Revised Mgeni System Operating Rules During uMkhomazi Raw Water Tunnel Shutdowns	-
UW 108/114/12/R8-1	Geotechnical Investigation Report - Volume 1 (Raw Water Pipeline)	-
UW 108/114/12/R7	Environmental Impact Assessment Report	-
UW 108/114/12/R8-2	Geotechnical Investigation Report - Volume 2 (Potable Water Pipeline)	-
UW 108/114/12/R8-3	Geotechnical Investigation Report – Volume 3 (Water Treatment Works)	-
UW 108/114/12/R8-4	Geotechnical Investigation Report – Volume 4 (Mapstone Dam Crossing)	-
UW 108/114/12/R9	Land Survey and Landowner Details	-

\* All reports titles for Module 1 include “**The uMkhomazi Water Project Phase 1: Module 1: Technical Feasibility Study Raw Water**”

\$ All reports titles for Module 2 include “**uMkhomazi Water Project Phase 1: Module 2: Environmental Impact Assessment**”

# All reports titles for Module 3 include “**uMkhomazi Water Project: Module 3: Potable Water Module**”

# Appendix A



## Engineer's Construction Programme

P WMA 11/U10/00/3312/4 – Record of Implementation Decisions

P WMA 11/U10/00/3312/4 – Record of Implementation Decisions

P WMA 11/U10/00/3312/4 – Record of Implementation Decisions

## **AGREEMENT**

### **APPENDIX 8: TECHNICAL GUIDELINES FOR DEVELOPMENT OF WATER AND SANITATION INFRASTRUCTURE**



*DEPARTMENT OF WATER AFFAIRS AND FORESTRY*

**TECHNICAL GUIDELINES FOR THE  
DEVELOPMENT OF WATER AND  
SANITATION INFRASTRUCTURE**

**SECOND EDITION: 2004**

## **PREFACE**

The first version of these Guidelines was issued in 1999. The original guidelines were specifically developed to give technical guidance to engineering and other experts who were responsible for developing RDP type water supply projects on behalf of the Department of Water Affairs and Forestry.

There have however been a number of fundamental changes since 1999, which prompted the Department to update the guidelines.

Firstly, a greater emphasis has been placed on the provision of basic sanitation services, necessitating the inclusion of guidelines on basic sanitation infrastructure.

Secondly, Government funding for water services is now channelled directly to Local Government through the Municipal Infrastructure Grant. With few exceptions, municipalities will in future be the main developers of basic services infrastructure.

Thirdly, much experience has in the interim been gained in the development of water services infrastructure and these lessons needed to be captured in the guidelines.

Finally, the adoption of the Strategic Framework for Water Services has impacted on the definition of basic services and on the approach to developing these services.

The purpose of this updated 2004 version of the guidelines is primarily to pass on the experience of national government in the development of water and sanitation services, and especially the planning and design of water and sanitation infrastructure, to local government. It is believed that this document will accelerate the learning process of those in local government who are taking full responsibility for water services development for the first time. It is also believed that these guidelines will be just as useful to those who wish to refine their existing knowledge.

While these guidelines are mainly technical in nature, the wider issues such as the social aspects and the operation and maintenance of water services infrastructure will be addressed in other documents.

A large number of experts from the Department of Water Affairs and Forestry and other organisations have selflessly contributed their experience towards the development of these guidelines. It is acknowledged that these guidelines would not have been possible without their contribution.

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## COMMONLY USED ABBREVIATIONS

CD	Compact disk
DBSA	Development Bank of Southern Africa
IDP	Integrated development plan
DPLG	Department of Provincial and Local Government
DWAF	Department of Water Affairs and Forestry
LG	Local government
MIU	Municipal Infrastructure Unit
SANS	South African National Standards
SABS	South African Bureau of Standards
SFWS	Strategic Framework for Water Services
WSA	Water services authority
WSDP	Water services development plan
WSP	Water services provider

# 1 INTRODUCTION

Municipalities have a Constitutional responsibility for providing sustainable and viable water services to the communities within their areas of jurisdiction.

The purpose of these guidelines is to assist municipalities undertake the development of water and sanitation infrastructure, with a focus on the design aspects of development.

Further guidelines are in the process of being developed for Water Services Development Plans, social aspects and operation and maintenance of water services projects.

## 1.1 Purpose of guidelines

It is important to note that these guidelines:

- ARE MERELY INTENDED TO GIVE GUIDANCE TO MUNICIPAL OFFICIALS, PLANNERS AND DESIGNERS.
- Are not intended to replace professional expertise and engineering judgement.
- Provide overarching guidance and cannot be used as a replacement for specifications.
- Must be used together with recognised standards, codes, and acts such as those of the South African Bureau of Standards (SANS Codes), the Water Services Act, the National Water Act, and the Occupational Health and Safety Act.

These guidelines are made available through two media:

- A CD has been distributed which contains this document as well as a number of useful folders. The contents of the folders are listed at the end of this document.
- A downloadable version of the document is also accessible from the web page of the Department of Water Affairs and Forestry. The DWAF web page also contains the same folders that are included on the CD.

## 1.2 Definitions of minimum norms and standards

The aim of Water Services projects funded out of government grants is primarily to provide a basic level of water services.

Section 6 of the “Strategic Framework for Water Services” provides the minimum technical norms and standards for water services. The Strategic Framework is included in the *Legislation and Policy Folder*.

The following definitions and minimum standards are given in the Strategic Framework:

**Basic water supply facility is:**

The infrastructure necessary to supply 25 litres of potable water per person per day supplied within 200 metres of a household and with a minimum flow of 10 litres per minute (in the case of communal water points) or 6 000 litres of potable water supplied per formal connection per month (in the case of yard or house connections).

**Basic water supply service is:**

The provision of a basic water supply facility, the sustainable operation of the facility (available for at least 350 days per year and not interrupted for more than 48 consecutive hours per incident) and the communication of good water-use, hygiene and related practices.

**Basic sanitation facility is:**

The infrastructure necessary to provide a sanitation facility which is safe, reliable, private, protected from the weather and ventilated, keeps smells to the minimum, is easy to keep clean, minimises the risk of the spread of sanitation-related diseases by facilitating the appropriate control of disease carrying flies and pests, and enables safe and appropriate treatment and/or removal of human waste and wastewater in an environmentally sound manner.

**Basic sanitation service is:**

The provision of a basic sanitation facility which is easily accessible to a household, the sustainable operation of the facility, including the safe removal of human waste and wastewater from the premises where this is appropriate and necessary, and the communication of good sanitation, hygiene and related practices.

**Potable water quality is:**

Water supplied by water services providers intended to be used for drinking or domestic purposes (potable water) must be of a quality consistent with SANS 241 (Specifications for Drinking Water), as may be amended from time to time.

**Metering and flow control:**

All unrestricted water connections must be metered or controlled to a basic level. Where appropriate, water services providers should consider the benefits of offering households controlled flow connections (for example, yard tanks) that can provide a basic supply of water cost-effectively. Where pre-payment meters are installed, these must take into account the free basic water services policy and allow for access to a basic amount of water at zero tariff.

**Eradication of bucket toilets:**

The bucket system is an unsuitable and inappropriate level of service. All water services authorities must identify and implement programmes for the eradication of all bucket systems by 2006.

### **1.3 Project development life cycle**

A typical project development life cycle consists of the following phases:

**Establishment of institutional arrangements**

The designated municipality is the water services authority and is responsible for water services provision. The water services authority either contracts with a water services provider or fulfils that function itself.

**Planning phase**

The municipality:

- prepares a Water Services Development Plan (WSDP) as part of its Integrated Development Plan (IDP) for the area of jurisdiction of the Water Services Authority (WSA);
- undertakes Feasibility Studies for each water or sanitation project identified in the WSDP.

DWAF integrates all WSDPs into a National Reference Framework.

**Design phase**

The municipality procures the design consultant who designs the works and prepares the tender documentation or the municipality does it in house.

**Tender stage**

Advertising, site inspection, adjudication of tenders received and award of contract.

## **Construction phase**

Execution of the works in accordance with the tender documentation under supervision

## **Operations and maintenance**

The Water Services Provider operates and maintains the works (with or without the assistance of contractors) and collects the revenue.

The Water Services Authority (WSA) monitors the Water Services Provider (WSP) and manages the contract that it has with the WSP.

The WSA undertakes an annual water services audit and reports to DWAF who performs the function of Regulator.



## 2 LEGISLATION AND POLICY

A number of important statutes and policy documents govern the development and operation of community water supply schemes. Legislation affects all phases of development, and for example stipulates requirements for taking water from the resource, for the planning of water services, how to determine institutional arrangements, and the requirements for financial and other reporting.

The most important legislation and policy documents governing the development and operation of water services are:

- Constitution of the Republic of South Africa, 1996 (Act 108 of 1996)
- Water Services Act, 1997 (Act 108 of 1997)
- National Water Act, 1998 (Act 36 of 1998)
- Municipal Systems Act, 2000 (Act 32 of 2000)
- Municipal Structures Act, 2000 (Act 33 of 2000)
- Public Finance Management Act, 1999 (Act 1 of 1999)
- Local Government Municipal Finance Management Act, 2003 (Act 56 of 2003)
- Division of Revenue Act-Enacted Annually
- Strategic Framework for Water Services, September 2003
- White Paper on Sanitation, September 2001
- Regulations under S9 of the Water Services Act, 1997
- Regulations under S10 of the Water Services Act, 1997
- Regulations under S 19 of the Water Services Act, 1997
- Model Water Services Bylaws. Section 21(1) of the Water Services Act, 1997
- Guidelines For Human Settlements Planning and Design (Red Book). Obtainable from the CSIR.

The full text of these documents, with the exception of the Red Book, are included in the ***Legislation and Policy folder*** of the guidelines CD. Most of these documents must be read with Acrobat Reader which is available on the Web

Specific sections of these documents will also be highlighted in the different sections of the Guidelines.

## 3 INSTITUTIONAL ARRANGEMENTS

### 3.1 Introduction

The following institutions are responsible for the supply of water and sanitation services:

- The Water Services Authority;
- The Water Services Provider (Sometimes a Water Board or bulk water provider); and
- The Department of Water Affairs and Forestry as regulator.

Other National Government Departments also fulfil important roles. For example DPLG manages the Municipal Infrastructure Grant and the Equitable Share and the Department of Health has an important function regarding health and hygiene and sanitation.

A Water Services Authority (WSA) is the municipality that has been designated responsibility for ensuring access to water services. The WSA is both the owner of the works and is the elected representative of the customers.

A water services provider (WSP) is the person or organization that actually provides water services to consumers or to another water services institution. The WSA can either appoint a WSP, for example another municipality, a water board or a private contractor, or can fulfil the function itself.

### 3.2 Deciding on and contracting with a water services provider

The WSA should follow the procedure set out in S78 of the Municipal Systems Act when deciding whether it should fulfil the WSP function itself or whether it should contract with a separate WSP. A model Terms of Reference for a S78 Assessment has been developed by the Municipal Infrastructure Unit (MIU) which is associated with DBSA. This model Terms of Reference is included in the Institutional Folder.

S19 of the Water Services Act sets out requirements that must be complied with when a WSA contracts with a WSP. The Minister has promulgated regulations under S19 of the Water Services Act which sets out the minimum requirements with which a contract between a WSA and a WSP must comply. These regulations are included in the *Legislation and Policy Folder*.

Even if the WSA fulfils the WSP function itself, it should account separately for water services, i.e. it should:

- keep separate financial accounts of how much was spent on or invested in water services during each financial year;
- the revenue it received from the sale of water services;
- funds received from National Government and other sources that were allocated to water services etc.

Water Services includes both water supply and sanitation services.

### **3.3 Bylaws and other requirements**

S21 of the Water Services Act requires that WSAs must make bylaws which contain conditions for water services. Model Bylaws that comply with the requirements of S21 of the Water Services Act are included in the *Legislative and Policy Folder*.

## 4 PLANNING

### 4.1 Introduction

Water and sanitation projects are essentially planned at three levels:

- At the national level the Department of Water Affairs and Forestry (DWAF) maintains a national reference framework;
- At a municipal level each Water Services Authority (WSA) compiles and regularly updates a Water Services Development Plan (WSDP); and
- At a project level each WSA undertakes a feasibility study for each project and compiles a technical report.

This hierarchy of plans are discussed below:

### 4.2 National reference plan

The Department of Water Affairs and Forestry is required to comment on the Water Services Development Plans (WSDP) of each WSA and to ensure that all current and projected activities are compatible with the national strategies. To enable a common framework for assessing WSDPs, a National Reference Plan is being developed which will capture the essence of each WSDP in one common structure that relates water services planning to the National Water Resource Strategy, Catchment Management Strategies (together with water allocations and licensing), Provincial Strategies and IDPs.

The reference framework will cover the following topics:

- General (Locality map and Demographics);
- Physical & Socio-Economic Development;
- Water resource availability, allocation and licensing;
- Service Level Development;
- Water Resource Development;
- Water Conservation & Demand Management;
- Water Services Infrastructure;
- Water Services Authority Institutional Arrangement;
- Customer Services;
- Financial Profile; and
- Project Development.

Municipalities will need to cross reference their plans to the National Reference Framework in order to integrate their own planning with other developments being undertaken in surrounding areas.

### 4.3 Water services development plan

Sections 12 to 18 of the Water Services Act, 1997 requires a Water Services Authority to prepare a Water Services Development Plan. These sections describe how to develop and adopt a WSDP and sets out the contents of the WSDP.

The Water Services Act, 1997 is included in the *Legislation and Policy Folder*.

Whilst the WSDP is a legal requirement, the real value of preparing a WSDP lies in the development of a plan whereby the key municipal water services targets are set for a five year period.

The WSDP forms a subset of, and must be aligned to, the municipality's Integrated Development Plan (IDP).

The Department of Water Affairs and Forestry has prepared a set of Guidelines for preparing a WSDP. These Guidelines provide basic information about the WSDP, as well as specific information on how to prepare the WSDP.

The DWAF WSDP guidelines are included in the *Planning Folder*.

### 4.4 Feasibility studies and technical reports

The aim of Water Services projects funded by municipalities out of government grants is primarily to provide a basic level of services to the poorer residents of the municipality.

Previously, project level business plans were compiled by municipalities for purposes of project approval and allocation of funds by national government. Under the Municipal Infrastructure Grant (MIG) it is no longer necessary for municipalities to submit business plans to National Government for approval. However municipalities are still required to plan for projects (feasibility studies) and to submit a Water Services Project Technical Report to the appropriate DWAF Office for recommendation before releasing funds for water services projects. It is recommended that the same approach be followed for all Water Services projects.

Essentially the Water Services Project Technical Report (Technical Report) comprises a description of the following elements of the project:

- Population
- Water consumption
- Existing works
- Water source
- Proposed works
- Supply pipelines and pump systems

- Service reservoirs
- Water purification works
- Distribution network
- Estimated cost of integral parts
- Unit cost of water
- Viability, acceptability and sustainability of proposed project
- Legal requirements

The format of the “Water Services Project Technical Report” is shown in the table below:

#### **FORMAT OF WATER SERVICES PROJECT TECHNICAL REPORT**

1.1	Introduction	<p>(a) Name the engineering reports from which the report was compiled. Relevant letters or notes should be enclosed.</p> <p>(b) General</p> <p>A good concise description of the location of the local community or supply area based on its geographical location and main routes serving the area. The socio-economic activities of the community with much emphasis on the development prospects that can be realistically expected of the area as well as the climatic factors and their influence on the water consumption.</p> <p>(c) General nature and extent of the problem with regard to the water supply.</p>
1.2	Existing works	<p>A concise description of the existing works in which the relevant storage capacities, yield capacities, distances and heights are reflected and preferably it should be further illustrated by means of a site map or a diagrammatic sketch plan. In respect of the particular component of the works that has to be improved, more detail should be included, whereas more general detail on the remaining elements will suffice although the extent, condition and effectiveness thereof should be indicated.</p> <p>Briefly, the extent of the works is as follows:</p>
1.2.1	Existing Water source	<p>(a) From own sources, e.g. boreholes, reservoirs and/or abstraction from public</p>

		<p>streams.</p> <p>General detail, relative location, method of abstraction or supply, existing yield capacity, water rights, etc.</p> <p>(b) From other sources, e.g. Government water works, common works, or supply by water boards.</p>
1.2.2	Existing Supply pipelines and pump systems	A general description, diameter, length and yield capacity of pipelines and pump units and, where applicable, number of pump units, pump heads, etc.
1.2.3	Existing Service reservoirs	Location, volume, condition and expected useful life and adequacy.
1.2.4	Existing Water purification works	General dimensions, type of treatment, yield capacity and adequacy.
1.2.5	Existing Distribution network	<ul style="list-style-type: none"> <li>• General dimensions, condition and adequacy.</li> <li>• Is total use being metered?</li> <li>• Is every point of supply equipped with a meter?</li> <li>• Is the bulk supply to the different communities being metered?</li> <li>• How is water supplied to the different communities?</li> <li>• Stand-up taps or indoors?</li> <li>• Is there a water-borne sewerage system in these communities?</li> <li>• Are such improvements being planned for the future and, if so, for when?</li> <li>• How much is the unaccounted water?</li> </ul>
1.3	Population	An estimate of the population growth over the next 25 years in stages of five years, showing the population to be provided out of the existing works and the population to be provided out of the proposed works. This estimate should be approached cautiously taking into account all pertinent factors, in comparison with the historical growth and accompanying socio-economic circumstances. Unless there are specific circumstances demanding elucidation, any estimate of the population growth is assumed to link up with the available census information.

		Where available the official information for the past 25 years for the supply area of the water scheme should be provided. If the supply area varies from the census area or if the census returns do not correspond with the area's own surveys, the latter figures should also be provided. If no figures are available a judicial estimate should be made of the present population, based on known items such as number of houses, etc.
1.4	Water consumption	<p>The conditions and particulars of the water consumption over at least the preceding five years should be provided. In some areas records covering longer periods are available and it is useful to provide this information in such instances. The projection of the expected water needs should be compiled from various parameters that have an effect on the water consumption, e.g.:</p> <ul style="list-style-type: none"> <li>(a) Historical water consumption;</li> <li>(b) the unit consumption;</li> <li>(c) population projection;</li> <li>(d) water consumption of the business centre;</li> <li>(e) water consumption of the industrial area;</li> <li>(f) schools, hostels, old age homes, army complex, etc.;</li> <li>(g) municipal consumption, e.g. irrigation of sports grounds, parks, etc.;</li> <li>(h) unmetered use;</li> <li>(i) losses. If the losses in a system are higher than say 10%, an accurate loss analysis ought to be done on the system; and</li> <li>(j) climatic factors.</li> </ul> <p>In item (b) attention should also be given to the expected increase in unit consumption taking place as a result of the improvement in living standards.</p> <p>The estimates of the future water needs should be calculated in stages of five years over the next 25 years, and where applicable the expected peak consumption should also be shown. An example of a table that can be used in calculating the projected future water consumptions is given below.</p>
1.5	Water source	A general description of the source, in addition to the description given in paragraph 1.2.1 above, indicating the adequacy of the source to meet the



		<p>expected future water consumption. If the source is a storage dam or if one is being developed, the basic data of the dam should be furnished, i.e. the assured yield, mean annual runoff, size of catchment area and storage capacity of the dam basin. If available, information on the silting up should be included. In respect of boreholes the dependable yield of the various sources should be provided and for existing boreholes their performance during dry periods should be mentioned.</p> <p>Where water sources are shared with other consumers, the apportionment, water rights, agreements, permits, water court orders, servitudes, tariffs, etc. should be fully set out.</p> <p>Where the water source is being further developed, proper hydrological and/or geohydrological reports should be compiled. For new schemes the necessary permits, water court orders, servitudes etc. should be obtained.</p> <p>The quality of the water should be given as well as any process that will be used to treat the water should be commented on.</p>
1.6	Proposed works	<p>In the introductory paragraph a concise explanation should be given of the reasons for deciding on the water scheme or works in question. Where applicable it should be done on the basis of information obtained from an economic study or evaluation of alternatives weighed up against each other. The reader should be convinced that the proposed works represent the most favourable alternative and that works must indeed now be constructed. Further phases (say for the next 10 to 20 years) should be stated briefly so that a complete view of the future planning may be formed.</p> <p>Further, the individual components of the scheme should be described to provide at least the following information:</p> <p>(i) Description and dimensions: Volume, yield capacity, diameter, length, pumping head, pump yield</p>

		<p>capacity, pump drive requirement.</p> <p>(ii) Serviceability of proposed components in respect of the required rendering of service, i.e. to what extent future demands will be met.</p> <p>(iii) In respect of water feeder systems the peak capacities of the feeder pipes and water purification works should be mentioned. As regards distribution systems the maximum and minimum pressures in the network during zero and peak consumption should be furnished.</p>
1.7	Integral parts and estimated cost	In this paragraph the engineer should give a capital cost estimate of the proposed scheme as accurately as possible. The term "integral parts" relates to those components of the scheme that can function independently, e.g. pipelines, pumping station, reservoirs, purification works, powerlines, dams, pressure towers, etc.
1.8	Operation and maintenance arrangement	It is important that arrangements for the operation and management of the works are dealt with before the project is completed. The designer of the project should provide the operating authority with an operating manual, in advance, in order for it to train or appoint qualified personnel to operate and maintain the project.
1.9	Viability	Calculations to show that the operations and maintenance are financially sustainable through a mix of tariff revenue and equitable share and other allocations.
1.10	Legal Requirements	Legal requirements that need to be complied with including water use licensing and Environmental Impact Assessments.

**Example of a table for cost estimation:**

ITEM	DESCRIPTION	COST (R)
1.	Concrete reservoir 1 000 m <sup>3</sup>	.....
2.	Pumping station	.....
2.1	Pumping gear 2 x 55 kW x 35 l/s @ 65 m	.....
2.2	Pump house (50 m <sup>2</sup> )	.....
2.3	Electricity supply KVA x L meter	.....
3.	Main supply pipeline (35 l/s)	.....
3.1	8 000 m x 250 mm dia	.....
3.2	4 000 m x 200 mm dia	.....
	Subtotal	.....
	10% contingencies	.....
	Professional fees and supervision	.....
	Subtotal	.....
	Total estimated cost	.....
	VAT	.....
	Total cost of scheme	.....

**2. UNIT COST OF WATER**

The total annual expenditure on completed scheme must be calculated in terms of the present cost.

An example on calculating the unit cost is given below.

**EXAMPLE OF A TABLE THAT CAN BE USED IN CALCULATING THE PROJECTED FUTURE WATER CONSUMPTION**

YEAR	HOUSEHOLD			INDUS- TRIAL	INSTITUTION SCHOOLS HOSP. ECT.	MUNICIPAL AND LOSSES	TOTAL CONSUMPTION		AVERAGE DAILY PEAK DEMAND	GROWTH RATE
	NUMBER	AVERAGE DAILY CONSUMPTION					DAY	YEAR		
		l/c	m <sup>3</sup> /d	m <sup>3</sup> /d	m <sup>3</sup> /d	m <sup>3</sup> /d	m <sup>3</sup> /d	m <sup>3</sup> /d	m <sup>3</sup> /d	%/a

A. **PRECEDING WATER CONSUMPTION** (A record of at least the preceding 5 years ought to be provided.)

The actual annual water consumption for the previous 5 years should be shown to provide an indication of the historical growth rate. Sometimes these particulars are simply not available. A grouping of available data of actual water consumption according to group consumption and the determination of actual unit consumption of the various population groups, present the possibility to do more accurate projections of future water consumption. If bulk water meters are not available, summation of sales can be integrated with the general monthly bookkeeping. With modern accounting equipment it can probably be readily integrated.

B. **PROJECTION OF FUTURE WATER CONSUMPTION**

The method of calculation and assumptions on expected consumption should be motivated and should be compatible with the WSDP. The Departmental standards indicate the minimum standard to which consumption for institutions, etc., should be added. Some estimates assume larger unit consumptions per capita, whether as a result of gardening, high living standards, climatic conditions or because a separate estimate is not included for schools, hospitals and businesses etc.

The format of this example allows for gradual adjustment of unit consumption which mainly applies where improved services and exalted living standards eg. as a result of future indoors water supply and sewerage. Rainfall and climate information, nature of population composition and the economic activities (e.g. wet industries) of the community therefore should be elucidated in the report.

**EXAMPLE OF A TABLE TO CALCULATE THE ANNUAL COST:**

ITEM	DESCRIPTION	COST (R)
1.	Interest and redemption	
1.1	Existing works	
1.2	Proposed works $R \times A\%$ p.a. for 25 years	
2.	Maintenance cost	
2.1	Existing works	
2.2	Proposed works	
2.2.1	4% on mechanical equipment to the value of	
2.2.2	1% on pipelines and powerlines to the value of	
2.2.3	0,5% on civil works to the value of	
3.	Electricity cost $E$ kWh @ $B$ c/kWh	
4.	Chemicals $Z$ m <sup>3</sup> @ $C$ c/m <sup>3</sup>	
5.	Salaries and wages of operating staff required i.t.o. section 12A of the Water Act	
6.	Administrative costs @ $RD$ per point of connection	
	<b>TOTAL ANNUAL COST</b>	
	Based on the estimated annual water consumption the unit of water is	$x$ c/m <sup>3</sup>

**NOTES:**

- (A) Interest rate at time of application for funds.
- (B) Cost of electricity per unit.
- (C) Cost of chemicals per m<sup>3</sup> (kl).
- (D) The actual estimated administrative cost.
- (E) Total units estimated to be used.
- (Z) Estimated water consumption plus losses.

## 5 DESIGN CRITERIA

### 5.1 Introduction

These planning/design criteria have been determined to provide a basic level of water supply with some provision has been made for the future upgrading of the supply to higher levels of service. For higher levels of service the Red Book should be used.

Notwithstanding the guidelines given in this document, the professional responsibility for selecting appropriate planning/design criteria for the specific circumstances remains with the planner or design engineer.

### 5.2 Summary of design and planning criteria

Recommended planning/design criteria are summarised in the following table:

#### GENERAL SUMMARY OF BASIC PLANNING AND DESIGN CRITERIA

1	Design Horizon:	10 Years from commissioning for pipelines and reticulation. 5 - 10 years for all above ground civil works and mechanical and electrical equipment.
2	Population:	For Design Horizon as above.
3	House occupancy:	6 persons (unless evidence exists to prove otherwise).
4	Growth Rate: (up to Design Horizon)	As projected in WSDP or otherwise proved. Could be as low as 0% in some areas.
5	Design Water Usage:	60 lcd for all infrastructure components  In cases of restricted groundwater sources, a minimum water usage of 25 lcd is acceptable for pumps, pumping mains and elevated tanks only. Even in cases of restricted groundwater sources reticulation is to be designed for 60 lcd.
6	Design Loss Factors (LF):	i) Water treatment works, $LF_w = 10\%$ ii) Total conveyance losses, $LF_r = 10\%$
7	Gross Average Annual Daily Demand (GAADD):	$GAADD = (1 + LF_r) * AADD$
8	Summer Peak Factor:	SPF = 1,2 minimum to 1,5 maximum
9	Summer Daily Demand, WATER TREATMENT WORKS AND	$SDD_{ww} = SPF * GAADD * (1 + LF_w)$ Design Pumping Period = 20 hrs/day

	RAW WATER AND CLEAN WATER PUMPS, ( $SDD_{ww}$ ):	
10	Summer Daily Demand, BULK SUPPLY PIPELINES, ( $SDD_{pl}$ ):	$SDD_{pl} = SPF * GAADD$
11	Summer Daily Demand, BOREHOLE PUMPS, ( $SDD_{pu}$ )	$SDD_{pu} = SPF * GAADD$ Design Pumping Period – See below
12	Storage Reservoirs: (Total Storage, i.e. Regional and Village Reservoirs combined, but excluding elevated tank volume)	<p>48 Hrs * AADD Pumped from One Source  36 Hrs * AADD Pumped from Multiple Sources  24 Hrs * AADD Gravity Source</p> <p>Recommended to split volumes roughly equal between Regional and Village storage's for new reservoirs.</p> <p>A maximum of 24 hours and a minimum of 16 hours is required at Village storage.</p> <p>Reinforced concrete structures only acceptable.</p> <p>Exceptions apply for a groundwater source supply where a ground level storage is inappropriate. In this case an elevated tank with 16hrs (for 2 or more powered borehole pumps) to 24hrs * AADD (one powered pump only) for 25 lcd is acceptable.</p>
13	Elevated Tank/Tower: (Only required to provide reticulation pressures)	<p>4 Hrs * AADD (only for area to be served by tank)</p> <p>Max. 6 x 10 kl for polyethylene tanks on stands.  From 75 kl and greater size use pressed sectional steel tanks on stand.</p>
14	Design for pipeline flow between Main Storage and Elevated Tank:	<p>2 * GAADD (Gravity)  2 * GAADD (Pumped: 20hrs/day)</p>
15	Design Peak Factor (for Reticulations):	DPF = 2 to 3
16	Design Peak Flow Rate (DPFR for Reticulation):	<p>DPFR = DPF * GAADD</p> <p>Primary reticulation designed to supply 60 lcd for all erven, but only standpipes and existing erf connections to be provided against project costs.  New erf connection piping to be paid for by the new consumer.</p>
17	Standpipe design: Flow Rate	<p>DPFR divided by No. of standpipes, subject to a minimum of 10 l/min (0,17l/s) per tap</p> <p>Note: Standpipe with two taps – flow rate 20 l/min</p>
18	Standpipe design: Spacing	<p>Each household must be within a 200m radius of a Standpipe</p> <p>Note: Additional standpipes should be provided if a</p>

		physical barrier, such as a river, main highway, railway or long housing block unduly lengthens the walking distance to standpipes.
19	Residual Pressures (above GL):	10 m minimum at point of delivery, where possible.  <i>Flow limiters must be installed on stand pipes when Residual Pressure are greater than 25 m above GL.</i>

### 5.3 Water availability

A common cause of scheme failure is the overestimation of the availability of water. Care must be taken that the underlying assumptions of water source availability are proven, especially in the case of ground water and where river abstraction is not controlled by significant upstream storage.

### 5.4 Power availability and alternative pump drives

It is also important that the availability of a power supply for the project is properly investigated. Installation of long power lines may prove to be very expensive. Dedicated transformer supply points are preferred.

In some instances an economic Eskom power supply may not be available, in which case alternative power sources for driving pumps must be considered. There are many factors to be considered in these instances and it will be up to the engineer to investigate these factors. Some of the factors to be considered are:

- Amount of power required.
- Can this be provided by solar means - usually for small power requirements.
- Can the pumps be directly driven by a diesel engine.
- Can a diesel generator be provided in anticipation of later conversion to Eskom power supply.
- Are facilities for operation and maintenance of diesel engines available,
- The comparable cost of each solution.

### 5.5 Guidelines for economic optimisation of pump - pipeline sizing

Two or three of the preferred layouts should be compared in terms of cost, technical feasibility, economic viability, social and environmental impacts.



### 5.5.1 *Economic analyses*

At the preliminary design stage, economic analyses will normally only be undertaken for surface water pumping mains. The purpose is to optimise the pump and pipeline sizes by comparing the net present value of alternative configurations.

These analyses are not usually relevant for small village pumping mains from localised boreholes.

Usually the analysis compares net present values over a planning horizon of 30 years.

The recommended criteria to be used for economic analysis of water supply infrastructure are as follows:

(i) Infrastructure Lifetime:

Small pumps and motors	15 years
Electric installation	15 years
Structures and buildings	30 years
Pipelines	30 years

(ii) Power Costs: Eskom Tariff A

(iii) Operation and Maintenance Costs:

Pump station:	0,5 % per annum (p.a.) of total pipeline costs 0,25 % p.a. of pump station civil costs 4 % p.a. of pump station mechanical and electrical costs
Pipeline:	0,5 % p.a. of total costs
Civil Works:	0.25 % p.a. of total costs

(iv) Discount Rates:

8% p.a. or the official Government discount rate as revised from time to time (but sensitivity analysis also done to test for 6 % and 10 %)

### 5.5.2 *Pump and pipe sizing for small borehole schemes*

In most cases the boreholes for small schemes have yields of less than 5l/sec and only require a pumping main of one to two kilometres to the village storage or reticulation.

Typically, pipe diameters are less than 100mm. Pumps for borehole schemes are also usually small, typically less than 10 kW.

Sizing of pipes, and therefore pumps, can normally be made using simple engineering calculations without the need for undertaking optimisation analyses.

Simple guidelines for this type of scheme are:

- (i) Pipeline velocities of between 0,8 and 1,0 m/s generally result in optimised pump and pipeline size.
- (ii) For diesel engine powered pumps the optimum pump and pipeline should be governed by the option with the lowest recurrent diesel fuel consumption.

## **6 DESIGN REPORT, DRAWINGS AND SPECIFICATIONS**

### **6.1 Introduction**

This section deals with the design report and the design drawings.

A typical water supply scheme comprises the following components:

- A source, which could be boreholes or a dam or a weir;
- A water treatment plans;
- A pumps station;
- Pipelines;
- Reservoirs; and
- Consumer connections.

The design of all of these components are discussed in following sections.

A section has also been included on VIP Pit Latrines.

### **6.2 Design report**

Design reports should generally contain the following information:

- Cover page (Region/Province's name, District Council/Water Services Authority, Consultant's name, Scheme name, CWSS No. Locality number, File No., Date, and report's status, i.e. draft 1, draft 2 etc.).
- Index/Contents page.
- Executive summary.
- Description of the project. Refer to locality and scheme layout plans, preferably in A3 size.
- Historical background – for existing supply.
- Statistical data.
- Design philosophy.
- Water source - to be correctly and thoroughly described as described below.
- Design assumptions.
- Sizing of components/infrastructure (litres per second or m<sup>3</sup>) - clearly indicate how sized. Peak factors should be motivated.
- Discussion of alternatives and choice of preferred solution.
- Design standards – SANS, BS, etc. standards used to design each component.

- Special problems and their solution.
- Methods of analysis.
- Geology.
- Foundation treatment.
- Diversion.
- Instrumentation/ Scheme's control system.
- Quantities.
- Costs including fees, contingencies and VAT and indicate schemes budgeted amount.
- Programme – bar chart in weeks/months.
- Recommendations.
- References - White papers, feasibility reports, previous and / or other phases design reports, etc.
- Annexures - not greater than A3 size containing a locality plan.

Usually 5 copies of each report will be required.

An expanded framework for the design report is included in the design folder.

### **6.3 Sustainability**

Sustainability must be designed into the development process. At least the following should be confirmed (preferably in the Design Report) before going out to tender:

- Name of the identified WSP;
- Budgeted Operation and Maintenance costs;
- Amount allocated for basic water supply;
- Cost recovery mechanisms and expected revenue;
- Other sources of operating funds (such as Equitable share).

### **6.4 Drawings**

Drawings should generally comply with the following standards:

- All drawing work shall be done on A1, or smaller size sheets with the client's standard title block. All electrical drawings to be A3.
- The drawings remain the property of the Client.
- The minimum letter size is 3mm.
- All drawings shall be signed by the employer or his representative.
- Alterations to drawings may only be authorised by the employer or his representative.
- Index drawing sheets of the complete scheme or part thereof as per type drawing, must be drawn up giving a list of all drawings with their description and must be subsidised in sections with appropriate section headings. Reference must be made on all drawings to these index drawing numbers.

- Every project shall have a compilation/ property diagram drawing(s), showing the required expropriation and/or servitude requirements for bulk water pipelines up to the revenue flow meter and associated dimensions.
- Cross sections on drawings shall be consecutively numbered for each part of the project. The number and section as well as the sheet number where the section is shown must be indicated on the drawing where the position of the section is shown, i.e. 49 section number 12 sheet number
- Pipeline drawings shall contain a summarised complete profile drawing(s) indicating the pipeline profile, design and field test pressure lines, pipeline and valves' major characteristics.
- Detailed profile drawings shall contain a plan view showing major topographical features, property boundaries and all other items as per DWS 1110 clause 4.1 (See Design Folder for Standard Specifications).
- Drawings prepared by the Consulting Engineer must bear a partners or directors signature.
- Drawings prepared by the Contractor must be thoroughly checked by the Consulting Engineer with particular regard to compatibility with proposed, adjoining or existing works.
- Manufacturers' drawings shall be supplied as specified in mechanical contracts and wiring and circuit diagrams shall be supplied as specified in electrical contracts.
- Where civil works are based on plant layout drawings prepared by the mechanical/electrical contractor, the drawings shall be formally approved by the mechanical/electrical representative of the employer, after which the layout may not be altered without repeating the procedure.
- On completion of the works the original drawings must be updated to the "AS BUILT" condition, clearly marked "AS BUILT" and all drawings returned to the employer or his representative for safekeeping in a format as specified. The original will be returned to the Consulting Engineer for his records. Submitted not later than 3 months after completion of the project.

Approval of the specification or drawing shall not absolve the Consulting Engineer of any responsibility.

## **6.5 Standard drawings**

A number of standard drawings are included in the *Drawings Folder*. CAD software is required to read these drawings.

## **6.6 Special drawing requirements and operating and maintenance manuals**

Special requirements for drawings for tendering, manufacturing, and construction of a mechanical/electrical nature and special requirements for mechanical and electrical operating and maintenance manuals are included in the *Design Folder*.

## 6.7 Design specifications

The following DWAF specifications are relevant to the design of Community Water Supply Schemes and are included in the *Specifications Folder*. DWAF gives its approval to any municipality or water board to use or adapt, for their own purposes, any of these specifications:

NUMBER	DESCRIPTION
DWS 0510	Drilling and grouting
DWS 0750	Water retaining concrete
DWS 1110	Construction of pipelines
DWS 1130	Design, manufacture and supply of steel pipes
DWS 1131	Lining and coating of steel pipes and specials
DWS 1140	Design, manufacture and supply of asbestos-cement pressure pipes and joints
DWS 1150	Glass reinforced plastics (GRP) pipes and joints for use for water supply
DWS1160	Design, manufacture, supply, and installation of Polyvinyl Chloride (PVC) Pressure Pipes and fittings
DWS 1710	Bricklaying
DWS 1720	Plasterer, tiler, and floorer
DWS 1730	Glazing and painting
DWS 1740	Plumbing
DWS 1810	Specialist services
DWS 1910	Supply, delivery, installation and commissioning of mechanical and electrical equipment for a bio-filter plant
DWS 1930	Supply, installation and commissioning of water treatment plant equipment
DWS 1940	Design, manufacture, supply, delivery, installation and commissioning of package water treatment plant
DWS 1950	Supply, installation and commissioning of a reverse osmosis unit for the desalination of mineralised water
DWS 2010	Boundary fencing
DWS 2410	Landscaping
DWS 2510	Valves (set of specifications)
DWS 9900	Corrosion protection (set of specifications)
DWS GTE	General Technical Specifications (Electrical)

## 7 BOREHOLES

### 7.1 Borehole development steps

The establishment of potable groundwater sources for community water supply entails hydrogeological related investigations and the drilling and test pumping of existing and new boreholes.

It is a requirement that the establishment of potable groundwater sources should be executed under the controlled supervision of qualified and suitably experienced hydrogeologists, (geologists, geophysicists and hydrogeological technicians).

The hydrogeological services required during project implementation are as follows:

- **Assessment of existing groundwater sources.** This may require the test pumping of existing boreholes, rehabilitation or re-drilling of boreholes, chemical analysis of water samples from existing boreholes and an examination of documentation relating to the reliability and sustained discharge rate of existing boreholes.
- **Groundwater quality assessment.** In areas with marginal water quality, testing of newly drilled boreholes or equipped existing boreholes should not commence prior to availability of chemical analysis results of TDS, NO<sub>3</sub> and F.
- **Borehole siting.** The hydrogeologist is responsible for ensuring that appropriate scientifically based methods are used to identify suitable drilling targets (sites) in accordance with hydrogeological conditions for exploration drilling. In order to ensure safe working conditions and to limit the risk of pollution entering the groundwater abstraction facility, borehole sites are also affected by the existence of manmade structures such as roads, pipelines, cemeteries, sewage plants, overhead powerlines, buildings, etc.
- **Supervision of borehole drilling and administration of drilling contracts.** The hydrogeologist is responsible to ensure that boreholes are drilled, designed and constructed to the required standards by controlled and on site supervision of drilling rigs. One supervisor is to supervise at least two drilling rigs up to a maximum of three drilling rigs.
- **Supervision of borehole test pumping and administration of testing contracts.** The hydrogeologist is responsible to ensure that the required and appropriate calibration, multi-rate draw-down, constant discharge, and related recovery tests are conducted to the required standards by on site and controlled supervision of testing contractors.

- **Borehole yield recommendations.** Motorized borehole pumps are generally warranted only in instances where a discharge rate in excess of 0,5l/s can be maintained for a continuous pumping period of eight hours or more per day. Borehole yields must always be determined on the basis of 24 hour per day pumping.
- **Reporting.** A technical report documenting all data and information is required on completion of investigations. The project hydrogeologist is required to ensure that data requirements from the hydrogeologist and contractors are documented on appropriate data recording forms and submitted to DWAF.
- **Borehole development.** This comprises the removal of drilling fines from the aquifer pores, removal of drilling foam/mud and establishing a reverse filter around the borehole aquifer interface. Duration of development can vary from a couple of hours (formation stabilizer, hard rock formations) to several days (unconsolidated fine sandy aquifers). Boreholes must also be disinfected or sterilized of any bacteria, and particularly coliform bacteria, intruded into the borehole during drilling operations.
- **Borehole Protection and Marking.** The borehole is protected from foreign material by means of a lockable cap fitted to the borehole collar. The borehole should be marked with a pole (5 meters to the north of the borehole) of approximately 2,0 m high with a number plate, showing the borehole identification number.
- **Borehole pump testing.** The pump testing contractor is required to test newly drilled boreholes which have not yet been equipped and existing boreholes which may or may not already be equipped with pumping installations. The type of borehole test methods required include:
  - Slug Test
  - Calibration Discharge Test
  - Stepped Discharge Test
  - Constant Discharge Test
  - Recovery Test
- **Monitoring the resource.** The geohydrologist must develop a monitoring system for at least one full hydrological year to evaluate the resource response to the safe yield abstraction rate. After this period the monitoring program should be re-assessed and planned according to prevailing climatic conditions.

## 7.2 Borehole pumps

The pump specified must not be capable of exceeding the safe yield of the borehole when utilized over a 24 hour period.



The rest and pumping water levels in a borehole may vary considerably during drought and above average rainfall sequences. Choice of type of borehole pumping plant must take this into account.

The selection of the particular pumping unit must also take into account the following factors:

- The static head between the lowest drawdown level anticipated in the borehole and the delivery point at the borehole top.
- The friction generated in this length of rising main given due attention to the presence of any operating rods within the rising main.
- The static and friction heads from the top of the borehole to the top water level of the delivery point.
- The ability of the pumping plant to commence operation under the full static head conditions of the pump unit.
- The ability of the pump to start operation with the riser pipe empty.
- The level at which the pumping unit has to be placed in the borehole must be as specified by the hydrogeologist or based on reliable information known to the engineer should a hydrogeologist not be available.

Borehole pumps can be powered by means of line supply electricity, solar power, or diesel power. It is generally not acceptable to provide motorised borehole pumps in boreholes yielding less than 0,5 litres per second.

### **7.3 Borehole monitoring and other equipment**

All boreholes and borehole pumping plant must be provided with equipment to monitor pump, borehole and aquifer performance. The main components required are:

- Water meters
- Hour meters
- Water level depth measuring devices –a conduit pipe (20-25mm diameter) next to the riser in the borehole through which a measuring cable can be lowered is preferred, however an electrical transducer or pressure pipe is an alternative.
- Operational equipment

The following operational equipment is required:

- Non return valve, to prevent backflow into borehole.
- Isolating valve, to prevent backflow into the borehole. Only allowed for positive displacement pumps if a pressure relief valve is installed upstream of the valve.
- Scour valve.
- Valves placed to enable removal/replacement of meter in exceptional circumstances.
- Pressure release valve upstream of all isolating valves.

- Pressure cut out switch with manual control and pressure cut out switch with 1 to 2 hour timed reset in auto control (if electrically operated).
- Delivery pressure gauge.
- Low water level in borehole cut out relay with manual control and low water level in borehole cut out relay with 1 to 2 hr. timed reset in auto control (if electrically operated).

## **8 DAMS AND WEIRS**

### **8.1 Dams**

In some cases dams will be required to store surface runoff and to provide the bulk water supply source.

The size of the dam is dependent on the water demand, the required assurance of delivery, the hydrological characteristics of the river, and the characteristics of the dam basin.

The type of dam to be constructed will, amongst others, depend on site configuration (topography), foundation conditions and the availability of suitable construction materials.

### **8.2 Weirs**

Where a dam is used for bulk water storage, and the water is released down the river, it may be necessary to construct a weir at the point of abstraction. The purpose of the weir is usually to provide limited balancing storage for the bulk releases from the dam.

Weirs can also be constructed to store limited amounts of runoff, or even, by allowing the basin to be filled with alluvial material, to create a reservoir within the alluvial sand from which water can be abstracted.

In the case of weirs, siltation is a far greater problem than in the case of large or medium sized dams. The outlet works and abstraction points of weirs need to be kept free of silt.

Weirs, generally being of a limited height and capacity, will also be overtopped by (large) floods. They will therefore need to be constructed of concrete or other non-erodable material.

A site for a weir, where both the riverbed and the abutments consist of good quality rock is an ideal situation. More usually the weir is founded on rock in the river section and one or both of the abutments will comprise of soft river-bank materials. In this case special measures are required to prevent outflanking of the structure by (large) floods.

### **8.3 Approved professional engineer**

Dams are site specific. The Dam Safety Regulations may require that an Approved Professional Engineer (APE) assume responsibility for the design depending on the site, capacity, and hazard potential of the dam. The classification of a proposed dam is done by the Dam Safety Office of DWAF upon submission of an application listing the pertinent data.

Dams can be categorized into the following categories:

- Category I,
- Category II, and
- Category III.

The design of weirs should also be undertaken, or supervised, by competent engineers who are conversant with the particular problems associated with these structures.

### **8.4 Outlet works of dams and weirs**

The outlet works of a typical dam comprises the following components:

- Outlet works;
- Outlet pipe systems
- Intake entrance
- Control valves for outlet works
- Isolating valves
- Control valves
- Intake isolating gates
- Under water wall mounted sluice gates
- Maintenance cranes
- Screening of intake works

The requirements for the outlet works of a typical Class I Dam is described below:

#### **8.4.1 *Depth of water draw off***

Water drawn from the dam directly to the water treatment works should come from the upper 1,2m layer of the dam.

### **8.4.2     *Outlet pipe systems***

Dual system outlets should be provided in order to ensure continuous outlet from the water sources during repair or maintenance of the main outlet.

At the most upstream point of the outlet pipe system, an emergency closure by means of an underwater wall type spindle driven sluice gates operated by manual actuators may be employed only if the size of the outlet is in excess of 600 mm diameter.

### **8.4.3     *Intake entrance***

The most upstream exit from the dam/reservoir should consist of a bellmouth. Maintenance of bellmouths is practically impossible due to leakage through the isolating gate seals (if gates are employed) and limited working space downstream of such gates. Intake bellmouths and adjacent pipework should thus be fabricated from stainless steel up to the downstream isolating valve.

Should the pipework downstream of the isolating valve be built into concrete or buried in earth, this pipework should also be fabricated from stainless steel.

Accessible pipework in any outlet system i.e. pipes which are exposed and are removable, may be fabricated from mild steel and corrosion protected.

HDPE pipework is acceptable for small dams. Reducers and pipework directly adjacent to valves should be of fabricated steel.

The coupling of built-in steel or HDPE pipework should be SABS or BSS 4504 flanges only and should be rated according to the hydrostatic pressure of the outlet works. Flanges should normally be used to join built-in pipes. HDPE pipe may not be joined with friction grip couplings. Friction grip couplings are unacceptable in other cases as well except where construction joints occur.

Air supply pipes should be fitted to the outlet bellmouth top and extended to above the high flood level of the dam. The air pipe should be at least 1/6 th of the diameter of the outlet pipe.

### **8.4.4     *Control valves for outlet works***

#### **8.4.4.1     Isolating valves**

Pipe outlets should be provided with a valve downstream of the pipe entrance to facilitate maintenance of the control valves and downstream pipework. Pipe outlets up to 300 mm in diameter should be provided with open port resilient seal valve (RSV) type gate valves.

Rising and non-rising spindles are acceptable. Pipe outlets exceeding 300 mm diameter should be fitted with butterfly valves double flanged or wafer type having horizontal spindles only so as not to be affected by silt build-up on the bottom of the pipe. For small dams and weirs, manual actuation can be specified for all isolating valves. Manual operation is to be provided as far as possible due to the low cost and lower maintenance. Larger valves may be fitted with manually operated gearboxes to limit operating forces on the hand wheels or levers to 100 kN.

Isolating valves should all be situated in fully accessible boxed-out chambers having suitable drainage facilities.

Valves situated in chambers less than 1,8 m deep should be provided with extension spindles, which are operable from the deck of the chamber.

Valves in chambers more than 1,8m deep should be accessible via vertically mounted access ladders.

All isolating valves should be removable by means of either approved flange adapters or in line pipe couplings situated directly downstream of such valves.

Supports should be provided under pipework at either side of dismantling couplings, excepting in cases where such couplings are converted to thrust absorbing couplings by means of studs and thrust collars.

#### 8.4.4.2 Control valves

Control valves are to be situated at the end of outlet works pipelines to facilitate controlled flow outlet from the dam.

resilient seal valve (RSV) type gate valves are acceptable control valves for small dams and shall as far as possible be manually operated.

In cases of free discharge into rivers, adequate protection must be given to the environment in the immediate vicinity of the valve to prevent erosion.

#### 8.4.4.3 Control valves - needle type

Only in extreme instances where low head loss is important should in-line needle valves be used for controlled water outlet from the dam or weir.

Since needle valves are mounted in the pipeline, their energy dissipating qualities are not as effective as sleeve valves. It is thus advisable to either provide the pipe exit downstream of the valve with a flared disperser, which is to be shaped to cause a hydraulic jump or alternatively the exit should disperse into a stilling chamber.

Needle valves should be operated manually in the case of low head dams (12 meters maximum). It is essential to have a mechanical position indication in 10% increments on the handwheel headstock in order to facilitate accurate water outlet control in accordance with the flow chart provided with the valve.

Acceptable needle valves are more fully described in Standard Specification DWS 2510 - 1996.

#### 8.4.4.4 Intake isolating gates

Dam outlet works having maintainable horizontally placed outlet pipework may be provided with emergency closure gates i.e., gates which are capable of closing under fully unbalanced condition and against high flood conditions (HFL).

Emergency closure is required for unforeseen simultaneous failure of the isolating valve and control valve or a failure in the pipework or pipe couplings downstream of the outlet entrance.

The construction and functioning of wall mounted sluice gates, which have positive spindle drives, are more fully described below.

Dam outlet works having vertically placed outlets may be isolated by means of a rubber lined steel sphere or tapered plug. These however only serve as service closure mechanisms i.e. to isolate pipe entrances under balanced hydrostatic conditions.

#### 8.4.4.5 Under water wall mounted sluice gates

These gates are generally spindle driven units which are secured in a sealing frame where sufficient movement is provided upwards for the gate to clear the inlet fully open and for the downward stroke to seal off the opening completely.

These gates are primarily proprietary items provided by private concerns and are provided with either metal to metal sealing qualities or alternatively with rubber to metal seals. Departmental designs for such gates for operation under low head conditions are also available i.e. for water heads in the order of maximum of 6 meters. Wall mounted sluice gates are spindle driven units where the spindle is supported against buckling by means of wall mounted brackets, spaced to suit the design criteria.

Since these gates are permanently submerged all materials used should be of stainless steel. Exposed sealing frame components built into concrete should be stainless steel grade 316 or 316 L. The gate body should be of at least stainless steel 304 and 304 L. All fasteners should be of stainless steel.

Drive spindles should consist of stainless steel 304 or 304 L as well as submerged wall mounted spindle guide brackets. Wall bracket spindle guide sleeves should be of vescolene PP, ultrablack, or vesconite and should be split to facilitate removal of the gate spindle without having to remove the wall bracket in the process.

All fasteners for under water fixing of components to concrete should be of stainless steel.

All fasteners used on the assembly of the gate and sealing frame should similarly be of stainless steel.

Operating gear for wall mounted sluice gates should as far as possible be manually operated. The screwed spindle shall be stainless steel and should be driven through a brass nut by means of a handwheel mounted on a headstock. The headstock, which is to be mounted on the concrete deck of the outlet works, may be of mild steel fabrication (galvanised).

Rising spindle designs are essential since experience has proven that submerged drive nuts used on non-rising spindle designs renders the gate inoperable due to algae and other debris suspended in the water which enters the drive nut thread.

Rising spindle drives should be provided with position indicator in 10% increments from the fully open to fully closed stroke of the gate.

The indicator arrow should be driven by the spindle either within a slot in the headstock or in a column mounted on top of the headstock over the rising spindle. The manual operating force on the handwheel or cranking lever should not exceed 100 kN. Gearboxes may be employed to reduce operating forces to within the given limit. Handwheel diameters should not exceed 600 mm and lever arm radii should not exceed 400 mm.

#### **8.4.5     *Maintenance cranes***

Affordable maintenance cranes in the form of slewing jib type, A-frame structures or monorail hoist structures should be provided for the handling i.e. installation and removal, of accessible mechanical components forming part of the outlet works of the dam such as valves and pipework. Removable manually operated hoist units should be employed as far as possible, which includes geared chain hoists, pneumatic chain hoists or winches. All hoist structures should be designed in accordance with BSS 2573, BSS 466 and should comply with the requirements of the Occupational Health and Safety Act.

Crane structures should provide sufficient approach to enable an operator to offload the equipment from a truck and to install such equipment with ease and visa versa. The structures should be of simple, affordable basic design and fabricated from galvanised mild steel.



Fasteners having key functions in the structural strength and stability of the structures should without exception, especially in respect of supporting carriage beams, monorails etc. be of stainless steel. Geared trolleys having manual drive chains to facilitate long or cross travel should be fitted to the carriage rails/beams. All crawl beams should have removable end stops to prevent over-travel of the trolleys and hoist units. To prevent deterioration of the hoist units due to outdoor exposure, they should be removed directly after each use and suitably stored for future use as may be required.

To prevent overloading of cranes, the safe working loads should be clearly displayed on the travel beams, hoist trolley as well as on the hoist or winch unit, example 1,5t SWL. Hoist units and winches as well as travelling trolleys are proprietary items.

Structures especially those of slewing jib cranes should be designed to ensure that minimum maintenance will be required and should incorporate self lubricating bronze or plastic bushing and sealed roller ball or thrust bearings. It is however essential to provide sufficient lubricating nipples at all strategic points of moving components.

#### **8.4.6     *Screening of intake works***

In order to prevent debris from entering the outlet pipes of the dam from the upstream side and thus forming blockage of the isolating and especially the control valves, removable fine screens having clear openings between slats of 20 mm (min) to 25 mm (max) are to be provided and placed at a distance of 1,5 X pipe outlet diameter (minimum) from the intake pipe entrance. These screens are to be placed upstream of the emergency gate or wall sluice gate in all instances and should either be individually lowered in guides, one on top of the other by use of either an automatic grapple or by inter-linking the screen elements in cases where more frequent removal is required.

The screen size should be such that the water velocity through the slats does not exceed 2m per second.

The total height of the stacked screen units should extend from the very bottom outlet pipe up to at least 500mm above the high flood level (HFL) of the dam or weir.

## **9 WATER TREATMENT WORKS**

### **9.1 General**

As with dams, the design of the water treatment process is a specialist field of expertise and should be done by a suitably trained professional engineer.

Certain broad guidelines can however be given for planning purposes.

### **9.2 Potable water quality**

Potable water should comply with SANS 241.

### **9.3 Selection of appropriate treatment process**

The selection of an appropriate treatment process is essentially determined by:

- The raw water quality (physical and chemical).
- The prescribed final water quality.

### **9.4 Recommended loading rates and design parameters for water treatment process units**

The following loading rates and design parameters can be given as guidelines only and should be tested against actual circumstances:

- Rapid mixing: at least 500mm head loss (mixing in G values,  $G = 2000^{-5}$ ).
- Flocculation: 10 min. Retention with a total head loss of about 150mm and  $G = 50s^{-5}$  (40 - 80)<sup>-5</sup>
- Horizontal flow settling tanks (in lieu of other flow types) are recommended for turbid raw waters > 200NTUs with manual sludge or hydraulic sludge withdrawal and a maximum loading rate of  $1m^3/m^2.h$ .
- Direct gravity filtration as secondary solid/liquid phase separation step: filtration rate 5m/h with upstream flow control.

- Upflow-downflow (series) filtration: only to be constructed when the raw water turbidity rarely exceeds 100NTU (say 5% of the time). Recommended filtration rates are:
  - Upflow: 5m/h
  - Downflow: 10m/h
- Flotation: recirculation rate of 10% and a loading rate of  $6\text{m}^3/\text{m}^2\cdot\text{h}$ .
- Sludge and wash handling facilities: for design purposes assume that the sludge will thicken to a 10% concentration. The sludge dam should be large enough for a planning horizon of 6 to 8 years and space should be available for a second dam.
- Production losses through water plant: allow 3% to 5%.
- Chlorine contact time: 6% of flow capacity.  $6\% \times 24 = 1,5$  hours.
- Clear water sump for high lift pumps: 2% of flow capacity.
- Sludge disposal to sludge dams.
- Design flow capacity of plant to be based on the average daily summer demand plus 5% for production losses.

The sludge from settling (sedimentation) tanks should at least flow to sludge lagoons from where only the supernatant flows to rivers. Reclamation can be considered where water is scarce and supernatant can be used.

## **9.5 Automation**

If a water treatment plant has more than 4 rapid gravity sand filters, the filter backwashing sequence may be automated. Other operations, for example chemical dosing and sludge withdrawal will only be automated in plants bigger than 50 000m<sup>3</sup>/d (579 litres per second).

Automation shall be motivated and not governed by hard and fast rules.

## **9.6 Structural considerations**

It is recommended that all reinforced concrete water retaining structures should be designed to a 0,2mm crack width using 30MPa concrete in accordance with BS8007.

## **9.7 Accessibility**

All units should be easily accessible, and easily removed for repairs. Walkways should be provided to give safe access to all points requiring inspection and to provide logical progression to operators doing inspections. Ease of handling chemicals should receive special attention.

## 9.8 Specifications

The following specifications are relevant for the design, manufacture, supply, construction, and commissioning of water treatment plants.

Departmental Specification	Description
DWS 1930	Supply, installation and commissioning of water treatment plant equipment.
DWS 1940	Design, manufacture, supply, delivery, installation, and commissioning of package water treatment plant.
DWS 1950	Supply, installation, and commissioning of a reverse osmosis unit for the desalination of mineralised water.

These specifications are included in the *Specifications Folder*.

# 10 PUMP STATIONS

## 10.1 Introduction

Community water supply schemes are likely to involve the pumping of relatively small quantities of water. Pump stations are often be sited at small purification works or as booster pump stations along pipelines.

Normally the electrical power supply will be provided by Eskom or the local authority.

## 10.2 Pump selection

The following steps should be followed to select the correct pump duty:

- The system curve, relating to the hydraulic head lost in the system for different flows, is calculated and plotted as a graph above the required static head. Pump Station losses, including those of all valves in the pumpline, should be included in the calculation of the system curve.
- The pump performance curves are then plotted on the same graph. If more than one pump is required then these are added either in series or in parallel, as required. The pump curves will intercept the system curve at the station duty point.
- An ideal pump selection will result in each Pump Duty Point falling at or very near to the pump Best Efficiency Point (BEP).
- When only one pump in a multi-pump arrangement is operating, the intercept with the system curve will be at a point of reduced head and increased flow with regard to the chosen Pump Duty Point. Care should be taken that the motor is not overloaded under the one pump condition, and that a margin of at least 15% in excess of what the pump will demand is ensured under the worst possible operating condition.

### **10.3 Pump standby capacity**

#### **For Surface Water Pump Stations:**

- 100% standby capacity for single pumps
- 33% minimum standby acceptable for larger pump sets.

#### **For Borehole Pump Stations:**

- No standby pump capacity is required, but a minimum of 2 boreholes must be equipped for a village.

### **10.4 Power requirements for pumps**

The power supplied to a pump must equal the total power required for the duty as calculated above with an allowance for pump and motor efficiency, and in addition the following factors must be added:

For Motors > 25 kW: Add 10% to power requirement

For Motors < 25 kW: Add 25% to power requirement

### **10.5 Pump control**

Centrifugal pumps should be started and stopped against a closed valve.

All controls should be designed to operate "fail safe".

All pumps should be provided with emergency stops adjacent to the pump.

Pumps may be controlled manually, by means of downstream pressure (reservoir pressure) or by means of telemetry. The following rules apply:

#### **MANUAL Pump Control:**

- Top Open Inlet to Storage or Combined Bottom Inlet/Outlet.
- Manual or Timer Control for starting and stopping of pumps.
- Manual override switch for starting and stopping of pumps.

#### **PRESSURE Pump Control:**

- Top or Bottom inlet to storage.
- Float Level Control.
- High Pressure Cut-Out switch for pumps – must always switch off pumps, even when on manual.
- Time delay restart for pumps (minimum 30 mins.)
- Manual override switch for starting and stopping of pumps.

#### TELEMETRY Pump Control:

- Top Open Inlet to Storage or Combined Bottom Inlet/Outlet
- Automatic Telemetry Cut-In and Cut-Out Level Control for pumps.
- Settings for Cut-In levels:
  - Reservoirs:** 4 hr x GAADD below TWL
  - Elev. Tanks:** 1 hr x GAADD below TWL
- Minimum distance of 150 mm, in all cases, between cut-in and cut-out levels.
- Manual override switch for starting and stopping of pumps.

### 10.6 Pump station building

The suggested requirements for a pump station building are as follows:

- Pump station floor level: determined in conjunction with the minimum N.P.S.H. (net positive suction height) of the pumps. The effect of surge in the suction pipeline and manifold should also be checked for pump start-up and trip conditions.
- Top of the pump well should not be below the 1:50 year flood level for pump stations built along a river. This can be raised to say 1:100 year flood level if the pump station is downstream of a dam wall. If the pump station is built upstream of a dam wall then the motor floor must at least be 2,0 m above the 1:100 year or the high flood level, whichever is the greater.
- The pump station should be accessible during all weather conditions.
- The protective fencing must be designed in accordance with the protection requirements of the area, usually barbed wire spaced at 100mm intervals with razor-cut flat coils fencing materials.
- Stormwater to be drained away from the pump station during the construction and operation phase.
- Corrosivity of the soils surrounding the pump station concrete structure should be investigated.
- Pump wells should be anchored to prevent flotation.
- Light fittings must be vandal proof. Light bulbs must be easily changed. Fluorescent lighting is acceptable. Security lighting to be provided with daylight switches. High masts to be furnished with lightning down conductors.
- Generally no external windows will be allowed. Fixed and sturdy ventilated louvers with insect screens must be provided instead.
- Facilities (crawl beam and loading bay) for the safe removal of the pumps and motors should be provided where the weight of the equipment is such that it cannot be manhandled.
- The loading bay entrance doors should preferably be of the roller shutter type (rugged design).
- Normally steel roofs should be used. Reinforced concrete roofs could be three times as expensive as steel roofs. Timber should not be used.
- The following stair dimensions are suggested:

Risers: 160 to 178 mm high

Treads: 265 to 300 mm long

- Off shutter concrete finished areas i.e. pump well walls, concrete columns, etc., should generally not be painted.
- Hot dip galvanised treatment  
All internal handrails, steel cat ladders, steel stairways and eggrate flooring.  
Steel windows, doors and door farms.  
Roller shutter doors.
- Structural steelwork to be protected and painted as per SANS 1200 HC.
- Generally vinyl tiles on floors except loading bay, workshops, store rooms and very low traffic areas around and in pump well which should be concrete wood screed.

**NOTE:** Many of the pump station guidelines are also applicable to the design of water treatment work structures and reservoirs.

## **10.7 Pumpline components**

### **10.7.1 Baseplates**

Pumpset baseplates should be machined and must be adequately anchored and grouted to robust concrete plinths. Pumpset and pipework out-of-balance thrust loads must be adequately restrained by concrete or steel supports and pipework must be supported to the floor or walls within the pump station.

Pumps and motors should be located by dowels, once aligned.

### **10.7.2 Pumps**

Suitable pumps are:

- single stage end-suction or horizontal split,
- multi stage, horizontal, for treated water (not recommended for raw water owing to excessive wear on balancing disc),
- single or multi stage vertical in raw water wet-well application (product-lubricated with thrust bearing outside the flow tube), or
- progressive cavity pumps.

### **10.7.3 Pump coupling**

Belt drives are unacceptable for electrically driven pumps.



#### **10.7.4 Pump components**

Impellers or rotors should be either a zinc-free bronze or stainless steel.

Cast iron impellers are not acceptable.

Impellers and pump casings should be fitted with renewable bronze or stainless steel wearing neck-rings.

Pump testing should be to BS 5316 part 2 class B undertaken at an acceptable test facility, e.g. SABS or at the pump manufacturer if test facilities meet with the standards.

#### **10.7.5 Motors**

Limited to motors of 185kW (400V).

Motors should be (TEFC.) Totally Enclosed Fan Cooled( 1C 0141) with cast iron body and should be 3 phase 400V induction type.

#### **10.7.6 Pumpset speed**

Pumpset speed should not be greater than 1 480 rpm (4 - pole).

2-pole motors  $\pm 2$  800 rpm are only acceptable under exceptional circumstances.

#### **10.7.7 Switchgear enclosures:**

All switchgear and control panel enclosures should be rated IP54.

#### **10.7.8 Valves**

See **DWS Standard 2510 in Specifications Folder.**

##### Isolating valves:

Double flange gate valves should be specified (resilient seal valves up to 1,6Mpa).

Isolating valves at both pump suction and pump delivery should be hand operated and double-flanged to permit stripping of the pump or control valve. A wafer type valve will not permit this and is therefore unacceptable.

The upstream (suction) isolating valve should have the same pressure rating as the delivery isolating valve.

### Control valves

Flow and pressure control valves are not acceptable. In order to reduce excessive surges, double flanged reflux valves are preferred. Alternatively surge tanks should be provided or an alternative form of surge control.

### Mounting of butterfly valves

(or valves with adjustable seals with specific reference to their use in or relating to pump stations)

The seal should always be accessible from the side of the valve “facing the pump”.

The direction in which the valve is to be placed, should be specified by the supplier.

Butterfly valves should be supported and not fixed.

## ***10.7.9 Instrumentation and protection***

All instrumentation must be mounted on vibration free surfaces.

Temperature sensors (pump thermal protection) should be fitted in the pump casing to protect the pump against closed valve conditions.

RTDs (Resistance Temperature Detectors) are preferred for motors greater than 50kW and should be embedded in the motor windings, two per phase providing one set spare.

In typical community water supply size of pump station, motor or pump bearings as well as pump glands need not be monitored.

### Pressure sensors

A low suction pressure sensor should be provided and located between the suction isolating valve and the pump suction flange. This device should monitor and ensure that the pump does not operate under conditions that will result in cavitation within the pump.

A pump delivery pressure sensor should be located between the pump delivery flange and the reflux or other control valve. This device should monitor two conditions:

- (1) on start-up, that the pump is generating full pressure and it is safe to open the delivery isolating valve, and
- (2) in operation, that when the level controlled valve at the receiving reservoir located at the upper end of the rising main is closed, the ensuing increase in pump delivery pressure should be employed to stop the pump. The delivery isolating valve should then be re-closed before restarting the pump.

### Pressure gauges

Each pumpline should be equipped with two pressure gauges. One should display the pressure at the pump suction flange, the other, the pressure at the pump delivery flange.

In addition, one pressure gauge should be installed to measure the pressure in the station delivery manifold itself.

Pressure gauges should be glycerine filled and be calibrated in metres head of water. The range of operation should be from zero to 50% in excess of the pump "closed valve" pressure.

All pressure gauges should be supplied with isolating and drain cocks, piping, and fitted with a pulsation damper.

### Flow meters

Usually ultrasonic flowmeters should be used where electronic type metering is required. Where this type of meter is not justified mechanical type meter are acceptable.

#### ***10.7.10 Control panel***

All panels should have a test button to test all lamps. For indication lamps use only cluster type LED with coloured lens caps (blue LED's are not available).

The pumpline control panel (whether combined with the motor starting switchgear, or separate) should contain the following displays:

- Green lamp - "pump running".
- Red lamp "pump stopped".
- White lamp "pump tripped".
- Blue lamp "pump available".

The blue "pump available" lamp should be illuminated only when all safety conditions being monitored are healthy, i.e.:

- motor winding temperature sensors, and
- suction pressure sensor healthy.

In addition electric power should be available.

Should any one of these safety sensors indicate an "unhealthy" or faulty condition the pump should be tripped and the white "pump tripped" lamp should be illuminated. In addition, the station panel alarm should sound.

Audible alarm devices should be time controlled (3 minutes) as these devices are sometimes sabotaged by nearby residents.

Also mounted on the control panel should be the following push buttons:

- pump start - green
- pump stop - red
- emergency stop - red mushroom (lockable)
- alarm accept (to silence station alarm) - black.
- trip cancel (to cancel white lamp after fault is rectified) - black.
- Auto/manual switch if remote auto controls are used, such as level devices or telemetry. When in manual mode warning devices must still be operative.

# 11 LOW VOLTAGE ELECTRICAL EQUIPMENT

## 11.1 General guidelines

The DWAF General Technical Specifications (Electrical) (GTSE) are included in the *Specifications Folder*.

SANS 0142 and other standard specifications as set out in the GTSE as well as regulations of Eskom and local authorities must be followed where applicable.

The Occupational Health and Safety Act (Act 85 of 1993) applies in all instances.

## 11.2 Design report

The design report must include the results of a quality investigation of the electrical supply. This could determine the starting methods to be used by the various electric motors. Direct on line starting is always preferred if possible.

## 11.3 Important aspects to consider

Cognisance should be taken of the following aspects:

- Environmental;
- Aesthetics;
- Safety to equipment and personnel;
- Spares cost & availability;
- Ease of operation;
- Future extensions;
- Maintainability;
- Availability;
- Serviceability;
- Technology improvements;
- Quality of equipment;
- Energy conservation;
- Quality of electrical supply; and
- Economics.

## **11.4 Maximum voltage**

No voltage higher than 400V should be used. Higher voltages must remain the responsibility of the electricity supply authority.

## **11.5 Metering points**

A dedicated transformer should be negotiated with the relevant supply authority for each metering point to avoid quality of supply problems originating from the supply authorities 400 volt system.

The total cost of the supply point is important and should be determined before final designs are submitted.

## **11.6 Motors**

Motors must meet the necessary pump requirements.

## **11.7 Power cables**

Power cables must be suitable for short circuit and environmental conditions.

## **11.8 LV switchboards and motor control**

### ***11.8.1 Construction***

The following requirements are recommended for switchboards:

- IP54 enclosure;
- Free standing;
- Extensible;
- Flush tiers front and rear;
- Accessible front and rear with hinged doors in front and removable panels at the rear;
- Door locking and safety lockout systems are required;
- Steel construction (2mm);
- Colour white internal and lighter electric orange external;
- Provide ventilation slots on face panels and doors with vermin screens behind slots;

- Ensure that all panels are totally vermin proof; and
- Use substantial gland plates at bottom of panels (3mm thickness).

## **11.9 Switchgear**

### **11.9.1 Circuit breakers**

The following requirements for circuit breakers are recommended:

- The incoming circuit breaker of the main LT switch board, which receives the supply from the supply authority or transformer, must be equipped with adjustable earth leakage protection as well as an adjustable time delay facility to create the necessary discriminating between this breaker and other earth leakage protectors further down the line.
- Selective tripping between incoming and outgoing circuits must be provided.
- Protection grading must be effective for all operating conditions.
- Where circuit breakers are used to protect contactors, motor protection circuit breakers equipped with shunt trips to trip the circuit breaker in the event of short circuit or earth faults should be used. The contactor should not be required to clear these types of faults.
- Fast acting circuit breakers should be used in all instances.
- Motor circuit breakers should allow for long duration (up to 10 second) start ups.
- HRC fuses should not be used as these tend to get tampered with and are not always readily available.
- All circuit breakers must be selected to handle the maximum possible fault current taking into consideration possible future extensions involving and increase in the available fault current.

### **11.9.2 Isolators**

Isolators should be load breaking \ fault making type.  
Isolator should be lockable in the OPEN position.

### **11.9.3 Contactors**

Contactor should comply with IEC 158-1 for Class AC3 unless the specific duty requires a higher rating.

De-rate contactors should be used in areas where ambient temperatures exceed 35°C.

#### **11.9.4 Switch gear general**

No bypass facilities on protection equipment, level relays, etc. are allowed.  
All power, signal and control cables must be numbered on site and on drawings.

#### **11.10 Motor protection**

The following requirements for motor protection are recommended:

- Comprehensive motor protection is required where the requirements are such that the normal thermal overload protection will not be adequate. A versatile, multifunction motor protection unit or relay is therefore to be used.
- For motors below 15kW thermal overload protection may be used provided single phase, phase reversal, and under load protection is provided. For under load protection, phase angle type relays may be used.
- Trip mechanisms should be settable with front panel mounted buttons and trip conditions should have indicator lamps on the front panel.
- Under and over voltage protection must be provided to disable the motor starter control circuits excluding the remainder of the pump station.
- Automatic re-start must be prevented when trips occurred due to over/under current conditions. In such instances make use of an alarm plus a manual restart.
- Provide adequate motor, pump, and pipe earthing.

#### **11.11 Indication and instrumentation**

The following instrumentation is required:

- Combined thermal demand and instantaneous ammeters on all incomers, and transformer feeders.
- One ammeter per phase.
- Motor starter panels one ammeter.
- Voltmeter with selector switch on each incoming panel.
- Maximum demand/kWh combination meters will normally be required on the incoming sections.
- Power factor indicating instrument where warranted.

Other indication will include:

- Run lamp;
- Emergency Stop lamp;
- Ready lamp (not applicable in the case of boreholes and small pumpstations);
- Overload lamp;
- Motor winding lamp (over-temperature) where motor winding temperature sensors are available in motors;



- Supply Voltage lamp; and
- Running hour meter.

Other requirements for indication are:

- Where necessary for safety reasons a control voltage should be 24v.
- All alarm indication must be latched and reset by a reset button.
- Only mercury bulbs or 3 wire level relays should be used for level controls in reservoirs. Ultra sonic level sensing is not acceptable.
- Borehole level sensing should be done with equipment using normal wires.
- To assist operators, three "cable live" neon indication lamps should be provided on incoming supplies.

## **11.12 Control**

### ***11.12.1 General***

Easily maintainable systems using relays, etc. must be used.

PLC's are only to be used where warranted.

If PLC's are used (see above) full lighting protection must be provided for all inputs, outputs, and power supplies.

### ***11.12.2 Local control***

Local control should consist of pushbuttons as follows:

- Start;
- Stop;
- Emergency Stop (At motor starting cubicle and at motor);
- Reset; and
- Lamp test.

## **11.13 Power factor correction**

Power factor correction must only be provided where it can be proved before-hand that it is economically justified.

Power factor correction equipment, if provided, should preferably be mounted directly on the motor.

Automatic power factor equipment should be avoided.

## **11.14 Earthing**

The following requirements for earthing are recommended:

- Earthing may consist of an earth mat, trench earth, electrode earth, or a trench and electrode combination scheme.
- An earthing survey must be carried out by a specialist where necessary.
- All earthing must be connected to a common earth bar at the lowest possible point where separate systems are provided for instrumentation, LV and MV.
- All exposed earthing must be PVC insulated copper conductors. All other must be bare copper conductors.
- Maximum resistance to earth is  $1\Omega$  for LV systems and  $2\Omega$  for MV systems.
- The supply authority's requirements regarding earthing must be taken into consideration.
- One drawing showing the overall arrangements must be provided.

## **11.15 Lightning protection**

The requirements for lightning protection are:

- Lightning protection must be provided for safety purposes as well as for the protection of equipment and instrumentation.
- Surge arrestors must be of the metal oxide type in accordance with SANS 172.
- Guard against the use of long control cables between eg. reservoirs and pump stations to minimise damage due to lightning.
- Use MOV (5 - 10kA) surge arrestors on both ends of control cables between eg. level sensing equipment and motor controls.
- Provide lightning protection for instrument supply cables.
- Provide lightning protection for panel incomers.

## **11.16 Conduit wire ways and conduit**

### ***11.16.1 Conduit***

All conduits must be galvanised steel conduit in accordance with SANS 1665 and should be surface mounted.

### ***11.16.2 Wire ways (conduit and trunking)***

Separate wire ways must be used for normal power and lighting, emergency power and lighting, standby power and lighting, control wiring, and extra low voltage wiring.

### **11.16.3 Cable ways**

The requirements for cable ways are:

- Cable routes should be specified. This should be in trenches, in floors, or cable ladders against walls.
- Floor trenches should be filled with sand and screeded over after completion of the installation. Provision should be made for draining of cable trenches. Gland drip water should be piped into a no-fines opening into the trench, next to the pump set in this case, to keep the sand wet.
- Heavy duty galvanised beehive type racks supported at least every 750mm on galvanised angle iron brackets should be used to support aerial and vertical cables.
- Stainless steel straps should be used to attach cables to cable racks, masts, etc.
- Pipes must not be used for cable ways for motor cables. Channel iron or other protection and support that allows sufficient ventilation should be used.

### **11.16.4 Switches and socket outlets**

Light switches should be placed in galvanised steel box in accordance with SANS 1065, 1,2m above finished floor level.

16A Switched socket outlets should be placed in 100mm x 100mm boxes.

Three phase welding sockets with built in earth leakage should be provided.

### **11.16.5 Wiring**

One circuit per conduit wire way is allowed. All un-armoured conductors should be installed in conduit or wire ways. All cables and conductors must be protected by suitably rated switch or fuse gear.

Conductors originating from different switchboards may not be installed in the same wire way.

Minimum conductor sizes are:

- Lighting circuits 1,5mm<sup>2</sup> power and 2,5mm<sup>2</sup> earth conductors
- Socket outlets 2,5mm<sup>2</sup> power and 2,5mm<sup>2</sup> earth conductors
- Stove circuits 10mm<sup>2</sup> power and 6mm<sup>2</sup> earth conductors
- Bell circuits 1,5mm<sup>2</sup>
- Clock circuits 1,5mm<sup>2</sup>

## **11.17 Lighting, luminaires and masts**

### ***11.17.1 Lighting***

Task lighting of 160 lux is required for each pump.

Walkways, footpaths, staircases, general movement areas etc. must be lighted according to SANS 10098.

Maintained emergency lighting must be provided where applicable.

### ***11.17.2 Luminaires***

For ease of maintenance, light fittings should be mounted against walls at a maximum height of 3,5m.

Depending on the application and the required lighting levels fluorescent, incandescent or HPS luminaires may be used.

Exterior luminaires are to be rated to IP65.

Luminaires manufactured from sheet steel or aluminium may not be used.

Highmast luminaires must be 250W HPS.

ES Screw in lamps incandescent fittings should be used.

### ***11.17.3 High masts***

Streetlights should be mounted on 8m standard poles with a 2m outreach.

High masts should be of the 12m hinged type with removable hand winch.

## **11.18 Standby generators**

Where standby generators are provided, the change-over switches between standby and normal electricity must be both mechanically and electrically interlocked and conform to the supply authorities requirements.

Batteries for standby generators should be charged from the mains supply.

Fuel tank level and battery voltage sensors should be provided (for possible use with telemetry systems).

## **12 TELEMETRY**

### **12.1 Maintenance**

It is normally recommended that telemetry be maintained by maintenance contractors.

### **12.2 General guidelines**

Telemetry will normally be required where there is a need to exchange data and information between two or more distant or remote installations or sites, e.g. between a remote reservoir and a pump station or control room.

The design engineer should take consideration of the following:

- Environmental impact;
- Safety to equipment and personnel;
- Affordability;
- Ease of operation;
- Maintainability;
- Serviceability;
- Compatibility with existing systems;
- Quality;
- Aesthetics;
- Best practice;
- Spares costs and availability;
- Future extensions;
- Availability; and
- Technology improvements.

### **12.3 Typical system configuration**

A typical system may consist of a master station and a number of outstations. Depending on the distance and terrain, repeater stations may be required. Typical data or information that may be transmitted is for example:

- valve position;
- reservoir level;
- pump status, e.g. running, stopped, tripped etc;
- start/stop commands; and

- camera images.

The telemetry installation consists of the following elements:

- transducers and field instrumentation;
- cabling;
- communication system; and
- control systems.

To protect and enable the above to operate two ancillary systems are required, namely:

- power supplies; and
- lightning protection and earthing.

## **12.4 Transducers and field instrumentation**

### ***12.4.1 General***

In most cases the instrumentation, transducers and sensors will be supplied and installed by the various other Contractors, e.g. electrical or pump contractor. However situations may arise where no other Contractors are employed and in these cases the supply and installation of the instrumentation equipment must form part of the telemetry installation.

### ***12.4.2 Technical requirements***

In general all transducers/sensors must comply with the following -

- analogue outputs 4 - 20 mA
- supply voltage 24 V DC (nominal)
- accuracy  $\pm 0,3 \%$
- reliability + 5 000 hours
- housing suitable for environment.

### ***12.4.3 Back up requirements***

Where valves are controlled, limit and back up switches must be provided. Level transducers must be backed up by float switches.

### ***12.4.4 Compatibility***

Cognisance must be taken of compatibility with existing equipment.

## 12.5 Cabling

### 12.5.1 Power cables

The installation of these cables are covered in the Department's Specifications on Electrical Installations included in the *Specifications Folder*.

### 12.5.2 Data cables

For correct performance of cables for data transmission, the correct type and size cable must be selected for the application e.g. data transmission speed, noise, distance, type of data (analogue or discrete) etc.

As a general rule, the following should apply:

- Low data transfer rates: Low frequency type cables e.g. twisted pair;
- High data transfer rates: High frequency type cables e.g. co-axial cables, optic fibre or special type of twisted pair;
- High noise and lightning environment: Shielded cable or optic fibre cable.

The number of cables or pairs must make allowance for future extensions. Cables must be suitably protected against damage.

## 12.6 Communication system

The communication system consists of the following sub-systems:

- Radio equipment – Transmitters and receivers;
- Antennas and Masts;
- RF cabling;
- Power supply system; and
- Lightning protection and earthing.

### 12.6.1 Transmitter and receivers

The Transmitters and Receivers should comply with the requirements of SANS 300086.

The specification should address the following :

- RF output power                      Normally 2 - 30 W
- Modulation                              Phase or frequency
- Frequency stability                      3 - 5 ppm

- Allowable audio distortion less than 5%
- Maximum spurious radiation and harmonics < 70 dB
- Channel spacing 12,5 kHz.
- Number of channels 4 minimum
- Frequency bands VHF (68 - 88 MHz),
- VHF (146 - 174 MHz) and UHF (450 - 470 MHz)
- Microwave (2,4GHz; 10GHz)
- GSM (HSC0; GPRS; SMS)
- Input impedance 50 ohm.

### **12.6.2 Masts and antennas**

#### **a) Masts**

Construction of masts should be metallic self supporting lattice or sectional pole.

Steel is preferred above 4m.

12m and above must have stay wires.

The finish should be galvanised steel.

The design load, including antenna, is a wind load of 160 km/h (and snow load where applicable).

#### **b) Antennas**

Gain: 6 dB depending on signal

Type: Omni-directional or directional where applicable

Nominal impedance: 50 ohm

Material: Aluminium.

#### **c) RF cabling**

All RF cabling must be low loss coaxial cable suitable for outdoor use.

Suitable protection must be provided to the cable where exposed to damage.

Minimum bending radius must be specified.

## **12.7 Control systems**

### **12.7.1 Control modes**

Local and remote control modes are required, i.e.. it must be possible to switch between local and remote control.

Both control modes can be either automatic or manual.

Distributed control should be employed with override and monitoring by the telemetry system.



Failure of the telemetry system should not affect the local control.  
Telemetry must not be able to start or stop in local control.

### **12.7.2 *Man machine interface***

Computers must be specified as follows:

- 17 inch monitor;
- Pentium IV 2GHZ or higher
- 40G Hard Drive
- At least 512 MB memory.

A display unit must be provided or the existing display upgraded or reprogrammed at the master control panel to display all the data and control parameters from the out stations, including all alarms, equipment status, valve positions, levels, etc.

All controls should be effected from this interface, either automatically or by the operator when selected.

Sufficient data storage capability must be provided for backup and data storage.

## **12.8 Power supplies**

Suitable power supplies with adequate battery back up facilities must be provided.

The batteries may be charged from one of the following sources:

- AC main supply with rectifier and protective equipment
- Solar cells
- WIVA chargers.

Solar cells will be used where no mains power is available.

Alarm signals should include the following:

- Low battery voltage;
- Mains failure (if applicable);
- Solar panel (if applicable);
- Intruder alarm;
- Communication failure.

In general the power supplies must conform to the following:

- Output voltage: 12 Volt for normal use or 24 Volt for transducers;
- Protection: Overcharging, under voltage, cut out, power surges, reverse polarity.

Rating:

- Data transmission only: 30% Transmit/Receiver 70% standby for 48 hours;
- Data and Voice transmission: 50% Transmit/Receiver 50% standby for 48 hours.

## **12.9 Lightning protection and earthing**

Suitable protection must be provided to protect equipment, including:

a) Earth Electrode System

- Maximum resistance 5 ohms. 1 ohm if possible;
- Test points are to be provided;
- SANS 10199 is applicable;
- Concealed joints and interconnections brazed or welded.

b) Bonding all exposed steelwork and other steelwork that may become "live" due to equipment faults, static build up or lightning strikes are to be bonded.

c) Lightning Protection

All equipment should be considered exposed to lightning strikes and suitable protection must be provided.

All instrument boxes should be earthed by a 70 mm copper earth wire.

## **12.10 Documentation and training**

Complete maintenance and operating manuals must form part of the scope of supply.

As-built documentation must be provided and must include:

- Control logic;
- Cabling; and
- Physical layout.

Operating and Maintenance manual must also be provided.

## **12.11 Spares**

A full set of spares must be included with the manuals.

## 13 PIPELINES

### 13.1 General

Water supply is delivered under pressure either by gravity or by pumping.

Water supply pipelines are generally designed to convey water free of suspended matter and generally of potable quality.

Laying and jointing are important operations that contribute to the life of a pipeline and to the level of service provided. These can constitute a significant factor in pipe selection, especially where labour based construction methods are utilized.

The prime function of any pipe and pipe material is that, for the expected life of the pipeline, there is adequate resistance and strength to withstand all forces that can be expected to be imposed on the pipe. These forces and requirements include:

- Internal forces including internal pressure and pressure surges;
- External forces including earth pressure and superimposed loads;
- Water tightness; and
- Corrosion.

Generally refer to **DWS 1110 Clause 4** (included in the *Specifications Folder*) for the design and setting out of pipelines.

### 13.2 Design capacity

See Planning and Design Parameters in the Preliminary Design Section.

### 13.3 Pipeline materials

The pipeline material that provides the lowest life cycle cost should be selected. The selection procedure as proposed in **Section 3 of Darling and Hodgson's "Pipe Selection Manual, 1996"** is recommended.

Suitable pipeline materials are tabulated below:

Pipe Materials, Classes and Acceptable Sizes:	DWAF DWS Specification	Class (bar)	Sizes (mm)
Minimum pipe size for reticulation: 50mm nominal diameter			
HDPE (SANS 533)	None	Min. Class 6	15 - 75
uPVC (SANS 966 or ISO 4422)	DWS 1160	Min. Class 6	50 - 250
Note: 125 and 140 mm sizes are not recommended for uPVC pipes, due to the lack of standard fittings.			
21GRP	DWS 1150	Min. Class 6, Max. 25 bar	Min. 150
Galvanised Mild Steel (SANS 62)	None	Medium Duty	15 – 150
Steel (> 150mm)	DWS 1130	Min. API 5L Grade A Min. wall thick. t = 4,5 mm Slenderness, D/t < 120	Min. 200
	Max. Press. incl. surge (m) = $120 \cdot t/D$ , where S = Yield Point Stress (MPa) and D = Outside Dia (mm).  Formula assumes max. of 60% of yield stress mobilised.		
Protection to steel pipes (> 150 mm):	Generally bitumen fibre wrap coating with cement mortar lining or epoxy lining and cathodic protection – see DWS 1131.		

### 13.4 Pipeline velocities

The following maximum and minimum pipeline velocities are recommended:

- Minimum Raw water: 0,6 m/s,
- Minimum Treated water: 0,3 m/s,
- Maximum DPFR for Reticulations: 1,5 m/s,
- Maximum Pump suction inside station: 2,0 m/s,
- Maximum Design flow in Bulk Supply: 3,0 m/s,
- Maximum Scour flow in Pipelines: 5,0 m/s,

### 13.5 Pipe friction factors

Only Colebrook-White or Darcy-Weisbach formulae (with friction factor,  $\lambda$ , determined using Moody diagram or equivalent formula); or Hazen-Williams formula, with C factor equivalent to  $k_s$  for pipe diameter and velocity, are acceptable for design.

Pipe friction factors are provided in the table below:

**Pipe Friction Factors (Absolute Roughness,  $k_s$ , mm)**

	<b>Pipelines; (excl. fittings losses)</b>	<b>Reticulation (incl. fittings losses);</b>
uPVC or GRP	0,06 mm	0,10 mm
Steel (cement mortar lined)	0,20 mm	0,26 mm

### 13.6 Depth of pipe cover

The minimum depth of cover to main pipelines are:

- Generally: 600mm
- Under cultivated land: 900mm
- Road/Railway crossings: 1000mm

Additional protection should be provided to pipes under roads or railways where required.

### 13.7 Vacuum pressures

Vacuum pressures in Bulk Supply Pipelines during shutdown and scouring of pipes are generally unacceptable, but 3 m maximum is acceptable to economise on Double Orifice Air Valve installations.

### 13.8 Cover

750mm minimum cover with 1000mm cover required under road crossings.

### **13.9 Trench width**

Allow for at least the pipe diameter plus 150mm on both sides for small diameter pipelines to ensure that backfilling is effectively rammed. The minimum trench width should be 500mm.

### **13.10 Bedding and backfill (including material)**

According to SANS 1200 and DWS 1110 (see *Specification Folder*) where applicable.

### **13.11 Slope**

A slope of steeper than 0,3% is required to avoid air pockets.

### **13.12 Meters**

Schemes should be provided with bulk metering from the water source.

The supply to each local authority should be separately metered.

All stand pipes should be measured.

Where house or yard connections are provided, the consumption of each individual household should be measured.

### **13.13 Delivery point**

For a basic level of service in rural communities the delivery point should be the stand pipe or a yard tank.

### **13.14 Pipe markers**

Refer to DWS 1110 in *Specifications Folder*.

Pipe markers are required at a minimum spacing of 500m unless the pipeline follows a road.

All bends should be marked.

### 13.15 Air release and air intake valves

Air valves should be provided on summits of main lines.

Air intake valves are required upstream and downstream of isolation valves on ascending and descending pipeline slopes respectively.

The minimum distance between air valves should be 500m.

Separate isolating valves are required on each air valve branch for maintenance purposes.

Refer to **Messrs Mulric Hydro Projects' catalogue No. RBX 0001** for the selection and positioning of air valves.

Diameter of branch below air valve should be as follows:

- Pipeline  $\leq$  200 mm NB: Install an equal T piece below air valve.
- Pipeline  $>$  200mm NB: The branch pipe must be as large as practically possible with a maximum diameter of 600mm NB for all pipelines  $>$  600mm NB.

### 13.16 Scour valves

Should be provided at all low points.

Scour valves should be so sized that the pipe can be drained between the isolating valves within 2 hours.

The diameter of the drainpipe should be 0,4 times the diameter of the main pipe but should be an equal T for pipelines  $\leq$  200mm NB.

### 13.17 Isolating valves

Should be placed:

- At all pipeline intersections in the branch and main line.
- At an approximate distance of 1,5km, preferably at the lowest points.
- Start of every rising main with arrow pointing towards the pumping station.
- At the end of every gravity main with arrow on valve pointing in flow direction.

Isolating valves should be mounted with flange adapters to aid in removal.

### 13.18 Valve chambers

Valve chambers of robust construction should be provided for all valves.

Valve chambers must be properly ventilated with vermin proof fixed GMS or 3CR12 louvered ventilators.

Sufficient access should be provided in valve chambers for the removal of bolts.

The cover should be 700mm above ground level and should be of a hinged and non-removable type.

A sump should be provided for dewatering.

The chamber should be secure against vandalism.

### **13.19 Pressure control valves**

Pressure control valves are not favoured and their use should be minimised.

Break pressure tanks should be used for pressure reduction where possible, but the correct placing of reservoirs is preferred.

### **13.20 Thrust blocks and anchors**

Coupled pipelines must be anchored at:

- All changes of direction greater than 10 degrees.
- At changes in pipe size.
- At slopes greater than 1:6.
- At blank ends.

The anchor blocks must be large enough to:

- Provide sufficient friction and bearing forces between the anchor block and soil to balance the thrust force in any direction; and
- Balance upward forces through the mass of the block.

The pipe should be imbedded at least up to the centre line at bends.

A flexible membrane should be inserted between the pipe and anchor block to prevent damage to pipes subject to chafing.

### **13.21 Structural design**

Pipelines should be designed for internal and external pressure including surge pressure.

The structural load bearing capacity of the pipe is specified by the manufacturer and care should be taken not to expose the pipe to loading conditions other than that intended by the manufacturer.



## 13.22 Corrosion protection

Refer to DWS 1131 in *Specifications Folder*.

## 13.23 Couplings

Two major categories are generally used, namely rigid and flexible joints.

Flexible joints are defined as those joints that allow some telescopic movement or angular flexure of the adjoining pipes.

### 13.23.1 Rigid couplings/joints

#### 13.23.1.1 Flanges

Flanges should be attached to pipes by metal-arc welding, the weld preparation being in accordance with the requirements of **BS806 Type 6** unless otherwise specified.

A slip-on welded flange is suitable for all design pressure conditions covered by BS flange tables up to and including **Table J** and design temperatures not exceeding 425°C, with pipes 80 mm and over.

Flanges should be in accordance with **BS 4504**.

#### 13.23.1.2 Welded butt joints

Butt joints welded by the metal-arc process should be in accordance with the requirements of **DWS 1130 and DWS 1110**.

#### 13.23.1.3 Screwed couplings

Pipes should be screwed taper and sockets parallel thread according to SANS 1109 or ISO 7/1.

Galvanized pipes may be threaded after galvanizing.

The use of parallel threads on light pipes are not recommended.

### **13.23.2 Flexible couplings**

All flexible coupling should be able to withstand an internal pressure equal to or greater than the design working pressure of the pipe.

The couplings should be able to withstand any external pressure due to installation conditions without the presence of an internal pressure.

Spigot and socket joints utilizing a rubber ring as a seal should be watertight under working pressure with a shear force equal to the expected external load applied to the coupling.

Rubber O-rings used for sealing should not elongate more than 25% of the original length when stretched over the spigot end of a pipe. See BS 2494.

Rubber o-rings should not be exposed to ultra-violet radiation or ozone for periods longer than the time required for installation.

Where a pipeline is likely to be subjected to any abnormally corrosive condition, the pipe manufacturer should be contacted in advance so that they may advise on the suitability of their joints for the purpose, or alternatively in collaboration with their rubber supplier, provide rings that will meet the requirements of the situation.

Sleeve type joints using a flexible plastic sleeve must conform to the misalignment test according to the relevant SANS standard for that specific type of pipe utilizing the coupling.

The draw and slew movement of the coupling will be in accordance with the requirements of the relevant SANS standard for that specific type of pipe utilizing the coupling.

## **13.24 Fittings**

### **13.24.1 Reducers / diffusers and inlets**

The range of angle of deflection for concentric or eccentric diffusers (enlarging diameter) should be between 2,5 – 30 degrees.

Where available NPSH is a problem, rounded inlets should provide better flow characteristics and less friction losses.

### ***13.24.2 Bends***

Refer to **DWS 1130**.

Elbows should not have a bending radius smaller than the outside diameter of the pipe.

Medium and long radius bends should not have a radius larger than seven times the outside diameter of the pipe. Long radius bends normally have a radius of approximately three times the outside diameter of the pipe.

Standard angles of elbows are: 90, 45 and 22,5 degrees.

### ***13.24.3 Dividers***

All flow dividers will cause change in flow direction and should therefore be properly anchored.

Standard angles of deviation from the main pipe are: 90, 60, 45, 22.5 and 11 degrees.

### ***13.24.4 Puddle or thrust flanges***

Puddle or thrust flanges should be provided where a pipe passes through a water retaining structure or chamber.

A thrust flange will assist in the transfer of axial pipe forces due to water hammer or surges.

The flange should be designed structurally to withstand the shear forces it will experience.

Steel pipelines should be insulated with paint where they pass through concrete.

### ***13.24.5 Reinforced specials***

The procedures developed H.S. Swanson et al have been incorporated **into AWWA M11 - Steel pipe - A guide for design and installation**, and are generally used in the design of reinforced specials.

### 13.25 Pipeline specifications

The following DWAF specifications are applicable to pipelines and are included in the *Specifications Folder*.

NUMBER	DESCRIPTION
DWS 1110	Construction of pipelines
DWS 1130	Design, manufacture and supply of steel pipes
DWS 1131	Lining and coating of steel pipes and specials
DWS 1140	Design, manufacture and supply of asbestos-cement pressure pipes and joints
DWS 1150	Glass reinforced plastics (GRP) pipes and joints for use for water supply
DWS1160	Design, manufacture, supply, and installation of Polyvinyl Chloride (PVC) Pressure Pipes and fittings
DWS 2510	Supply of valves

# 14 RESERVOIRS

## 14.1 Storage

Reservoirs should be designed for the following storage capacities:

- Elevated storage capacity should be designed for 2 hours of peak daily demand for the area served by the elevated storage.
- Ground level reservoirs that are gravity fed: 24 hours of annual average daily demand.
- Ground level reservoirs that are pump fed from one source without a standby power supply or pump: 48 hours of annual average daily demand (all storage inclusive).
- Storage based on 60 litres per capita per day demand.

## 14.2 Storage for small ground water schemes

If ground level storage can be located close to the village and provide the required residual head for the reticulation, then 36 hours or 48 hours storage at 60 lcd should be provided according to the number of boreholes utilised.

However, if achieving the minimum residual pressure requires an elevated tank, then it is recommended to omit the ground level storage.

The elevated tank should only be sized for 16 to 24 hours of 25 lcd (10 years design horizon), and the borehole pumps should pump directly into the tank.

An elevated tank so sized will be adequate in the short term and will be a suitable investment for use as an elevated tank in conjunction with ground level storage at a future date.

## 14.3 Design

It is recommended that all reinforced concrete water-retaining structures be designed to a 0,2mm crack width using 30MPa concrete in accordance with **BS8007**.

Potable water tanks must have roofs.

Storage must be provided for sludge accumulation and a scour valve must be provided. The scour pipe should be separate from the inlet or the outlet pipe.

Submerged valves and fittings must be avoided if possible.

Pipework below the reservoir floor should be minimized.

A screen should be provided at the outlet.

#### **14.4 Materials**

The selection of materials is dictated by durability and life cycle costs.

#### **14.5 Metering**

Bulk metering is essential.

Whether the meter should be placed at the inlet or the outlet depends on the institutional or contractual arrangements.

#### **14.6 Level control and indication**

The reservoir must not be capable of spilling under normal operating conditions.

A water level indicator should be provided.

#### **14.7 Position**

The reservoir should be provided close to consumers to avoid long pipelines having to cater for the instantaneous peak demand.

#### **14.8 Break pressure tanks**

Correctly placed reservoirs are preferred in place Break Pressure Tanks, but when this is not practical, the following guidelines are applicable to break pressure tanks:

Tanks to have a partition with duplicate pipework and control valves etc.

The minimum volume per partition:

- Gravity inflow and outflow – 5 minutes
- Pumped inflow and/or outflow – 30 minutes

Inlet control:

- Gravity – Float Level Control

- Pumped – as per pump control

Control Valves are not preferred, but if required, then provision must be made for adequate maintenance.

## **15 STAND PIPES, YARD TANKS AND OTHER CONSUMER CONNECTIONS**

### **15.1 Stand pipes**

A concrete plinth should be provided which allows the water to drain into a soak-away (sump with crushed stone).

The tap should be high enough for a container to fit underneath. Preferably a stand should be provided for the container to stand on, with a higher tap.

The tap should preferably be of the push button or self-closing type.

Consumer off-takes directly on pumping mains are not acceptable.

### **15.2 Yard tanks**

The yard tanks should be approximately 200 litres in size to provide adequate storage for daily supply. The flow into the yard tank must be regulated by means of a flow constraint mechanism to maintain supply at approximately 200 litres.

The level of the outlet must be high enough to ensure a 25-litre container can fit easily for filling.

As in standpipes, a concrete plinth should be provided below the outlet to allow waste to drain into a soak-away (Sump with crushed stones).

Sunlight entry into the tank should be prevented to prevent algae growth.

### **15.3 Valves**

An isolating valve should be provided at each standpipe.

### **15.4 Pressure**

The minimum pressure at the hydraulically highest tap under a dynamic loading of 80% of the stand pipes being open should not be less than 6m.



The maximum static pressure should be 90m.

### **15.5 Minimum flow**

The flow rate from the outlet of a standpipe should not be less than 10 litres per minute. For yard tanks it should be a maximum of 6000 litres per household per month.

### **15.6 Coverage**

A maximum of 25 households or 100 people per stand pipe.

### **15.7 Walking distance**

A maximum of 200m where feasible.

# 16 VENTILATED IMPROVED TOILETS

## 16.1 Introduction

Providing adequate sanitation facilities for residents is a major challenge in all developing countries. Those who have inadequate sanitation may be using a bucket system, unimproved pit toilets or the veld or any toilet which is not properly operated and maintained.

When a sanitation system fails, or is inadequate, the impact on the health of the community and the negative impact on the environment can be extremely serious. Outbreaks of diarrhoea and of cholera could occur.

The VIP toilet has a number of advantages over other toilet systems. The capital and operation and maintenance costs of a VIP are low, standard designs are available, only semi-skilled labour is required for their construction and the availability of a constant supply of water is not a factor.

The purpose of this standard is primarily to assist authorities and funding agencies in setting acceptable minimum standards for the design and construction of VIP toilets.

Individual households often copy the VIP toilets constructed by nearby formal programmes. It is hoped that this standard will create an expanded sphere of influence in that the VIP toilets constructed in accordance with this standard should stand as examples for surrounding communities who wish to build their own.

## 16.2 Definitions

**Ventilated Improved Pit Toilet (VIP toilet)** is a toilet which comprises:

- a pit into which the excreta falls and from which the liquid fraction seeps into the surrounding soil;
- a slab which covers the pit and which has two holes, one for the excreta to fall through and one for the vent pipe;
- a superstructure which provides privacy and which prevents light from entering the pit;
- a vent pipe which removes odour from the pit;
- a fly screen at the top of the vent pipe which prevents flies from entering the pit and which also prevents flies that have entered the pit from leaving through the vent pipe.

The Strategic Framework provides various definitions relating to a basic sanitation facility, a basic sanitation service and the eradication of the bucket system, as follows:

**Basic sanitation facility is:**

The infrastructure necessary to provide a sanitation facility which is safe, reliable, private, protected from the weather and ventilated, keeps smells to the minimum, is easy to keep clean, minimises the risk of the spread of sanitation-related diseases by facilitating the appropriate control of disease carrying flies and pests, and enables safe and appropriate treatment and/or removal of human waste and wastewater in an environmentally sound manner.

**Basic sanitation service is:**

The provision of a basic sanitation facility which is easily accessible to a household, the sustainable operation of the facility, including the safe removal of human waste and wastewater from the premises where this is appropriate and necessary, and the communication of good sanitation, hygiene and related practices.

[A Ventilated Improved Pit toilet (VIP) complies with both the old and revised definitions of a basic sanitation facility.]

**Eradication of bucket toilets:**

The bucket system is an unsuitable and inappropriate level of service. All water services authorities must identify and implement programmes for the eradication of all bucket systems by 2006.

The social, economic and cultural circumstances in the community, the geographical location and the technical characteristics of the different sanitation facilities all play major roles in the choice of the most appropriate sanitation system. In most situations, however, the ventilated improved pit (VIP) toilet together with good domestic health and hygiene practices will meet the requirements of a basic minimum level of service.

### **16.3 Operating principles**

No water is needed to operate a VIP toilet (i.e. there is no flushing).

The pit should retain sufficient moisture for biological decomposition to occur, as the faecal matter will not break down if the pit is too dry and as a result the pit will fill up rapidly.

The egress of water from the pit should be adequate to prevent the pit being filled up rapidly with faeces and urine.

Provision should be made to access the pit of a VIP toilet through the slab in order to empty it manually or per vacuum action when required. Alternatively it should be possible for the VIP toilet to be moved when the pit is full.

Odour is removed from the pit through the action of wind blowing across the vent pipe and to a lesser extent by the air heating up on the inside of the vent pipe.

Flies, which are attracted into the pit by the smell, are trapped by the fly screen at the top of the vent pipe as they try to escape to the light.

## 16.4 Material

### 16.4.1 Concrete

The concrete should be capable of coping with the exposure conditions expected. Where necessary this will dictate cement and aggregate selection.

Recommended volumetric mix proportions are given in table 1.

**Table 1 — Volumetric mix proportions for concrete and mortar**

1	2	3	4
<b>Purpose for use</b>	<b>Cement Wheelbarrow<sup>a)</sup></b>	<b>Sand Wheelbarrow<sup>b)</sup></b>	<b>Stone Wheelbarrow</b>
Mortar for plastering	1	6	-
Mortar for bricklaying	1	6	-
Concrete for foundations and floors	1	3	4
Cover slab	1	2	2
<sup>a)</sup> The volume of 2 packets of cement is equal to the volume of 1 wheelbarrow of cement			
<sup>b)</sup> The type of sand should comply with the purpose, i.e. plaster sand for plastering, building sand for bricklaying and river or crusher sand for concrete			

### 16.4.2 Cover slab

The cover slab should generally be made of concrete or cement-mortar

### 16.4.3 Pedestal

The pedestal can be commercially fabricated with ceramic, polyethylene, glass reinforced plastic (GRP) and PVC or can be fabricated on site with wood, concrete, mortar or bricks.

#### **16.4.4 Superstructure**

The walls and roof can be constructed from a variety of local or prefabricated materials that are durable and weatherproof.

All hinges, locks and handles should be of robust construction and resistant to corrosion.

#### **16.4.5 Vent pipe**

The vent pipe should be manufactured from uPVC pipe, brick, fibre cement pipe or cast iron.

#### **16.4.6 Fly screen**

The flyscreen should be resistant to damage from UV light, rain water and the gases emanating from the pit.

### **16.5 Design and construction of a VIP toilet**

#### **16.5.1 Pit**

The recommended pit storage volume for a typical household (excluding the freeboard) is as given in Table 2.

**NOTE** A method for determining the pit storage volume as a function of the number of people using the pit, the solid accumulation rate and the desired life span of the pit is described in the publication *Building VIPs: Guidelines for the design and construction of domestic ventilated improved pit toilets*.

Freeboard height above the storage volume should be as given in Table 2 and Figure 1.

A pit can be round or rectangular. A round pit is more stable and is recommended in less cohesive soils.

For maximum efficiency, a pit should be large and deep. Round pits with diameter 1 m to 1,5 m and square pits with a width of 1 m to 1,5 m are the norm. Longer and shallower pits are acceptable in the case of rocky areas or areas with a high water table.

If the pit depth cannot be achieved due to rock or groundwater, an alternative such as a urine diversion toilet should be considered.

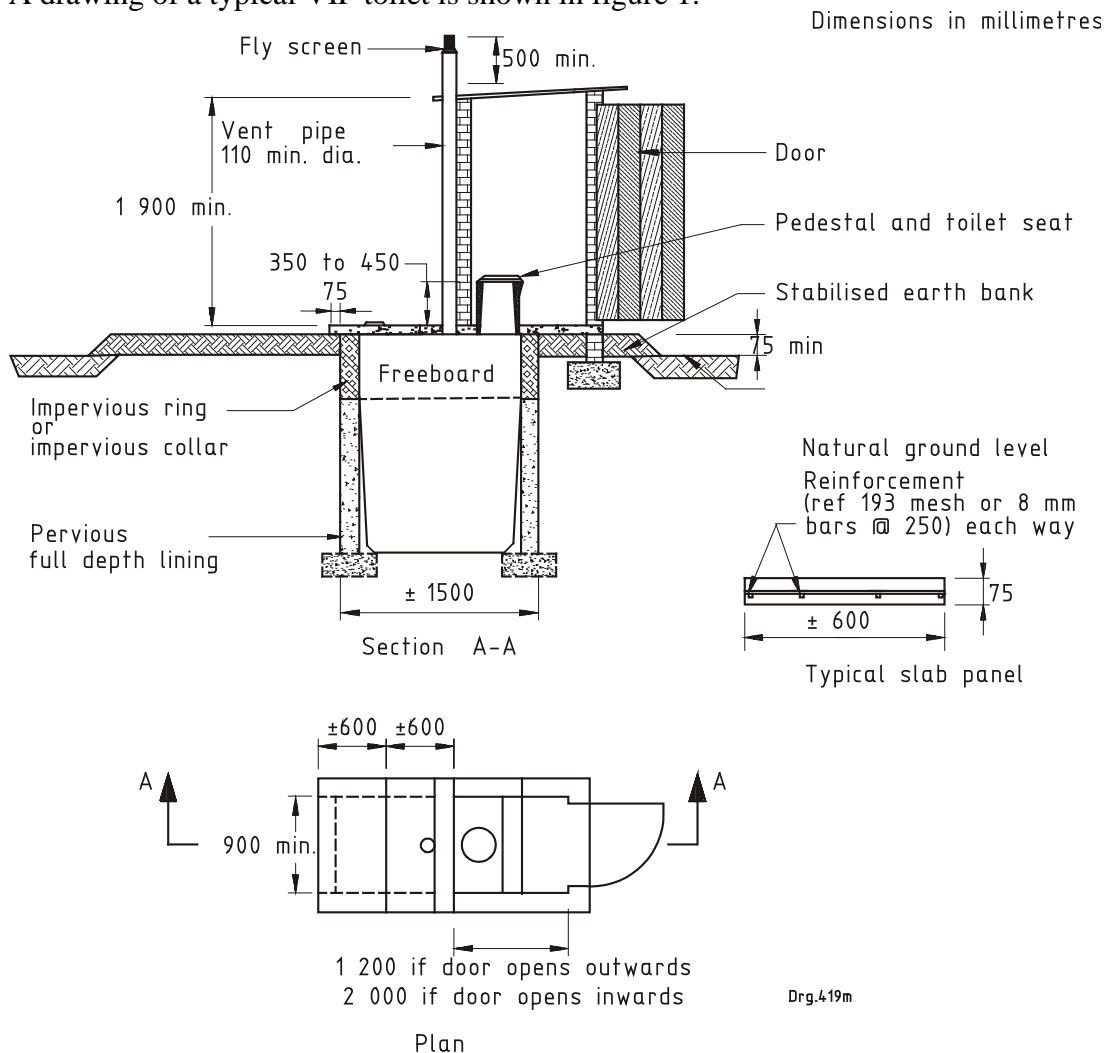
The size of the pit and the porosity of the soil surrounding it should be such that water will percolate faster out of the pit than liquids entering the pit.

A pit should not penetrate the water table

Only faecal matter, urine and cleansing water should be allowed to enter the pit.

Separate provision should be made for the disposal of grey-water and other household waste.

A drawing of a typical VIP toilet is shown in figure 1.



**Figure 1 — Drawing of a typical VIP toilet**

### **16.5.2 Location**

The toilet should be situated downhill and at least 30 m from a borehole or a well (see SANS 10252-2).

The toilet should be near the house but so sited as not to endanger the structure of any building or any services on the site or on the border of the site.

The toilet should afford privacy of use by facing towards the house

If practical, more than one potential suitable location should be identified per stand where there is no pit emptying service.

Where the pit will be emptied by a vacuum tanker the toilet should be situated such that a vacuum tanker can approach to within 30 m of the toilet and not more than 2 m above the pit.

The toilet should not be built under or near trees.

### **16.5.3 Lining**

Pits in stable soil which will be emptied by hand or pits moved when full need not be lined.

Pits in unstable soils and those that will be emptied by vacuum tanker should be lined.

The lining and soil should be sufficiently porous to allow water to seep out.

The lining can be constructed from concrete blocks, bricks, cement-stabilised soil blocks, stones or mesh-reinforced soil-cement.

### **16.5.4 Collar**

A collar should be installed in all pits to:

- a) prevent surface water or soil fines running into the pit;
- b) support the cover slab and the mass of the users; and
- c) support the mass of the superstructure if it rests on the slab.

A collar should be impervious and extend to at least 500 mm below the top of the pit and at least 75 mm above ground level.

A collar should be surrounded by a cement-stabilised earth bank or a shaped earth drain.

The same material that would be used for a lining is suitable for a collar.

#### **16.5.5    *Cover slab***

The cover slab should generally be made of concrete.

The minimum thickness of the slab panel should be as given in Table 2. The mass of the slab should not exceed 150kg (to allow it to be moved by hand).

The reinforcing should be as given in Table 2.

Reinforcing have to be designed for a flat slab exceeding 1,5 m in span.

A cover slab should have two holes to accommodate the pedestal and the vent pipe. The shapes and sizes of the holes should correspond with the shapes and sizes of the pedestal and the vent pipe.

It can be circular or rectangular.

A cover slab should be properly supported by the pit lining or pit collar by allowing an overlap of at least 75 mm on each side.

Separate panels should be sealed against each other with a weak mortar mixture or window putty to obtain a fly-proof joint.

#### **16.5.6    *Pedestal and toilet seat***

Some groups may require a squatting plate and not a pedestal.

The pedestal should have a smooth inside surface and be impervious to the penetration of water.

Pedestals can be commercially fabricated with ceramic, polyethylene, glass reinforced plastics (GRP) and uPVC or can be fabricated on site with concrete, mortar or bricks.

Concrete or mortar pedestals should be painted with a waterproof paint.

The inside walls should be vertical or splayed slightly outwards from top to bottom (to minimize fouling).

The inside walls should be located directly over the pit. A side chute is not recommended.



The pedestal height should be between 350 mm and 450 mm.

A toilet seat should be installed. The minimum internal dimensions of an oval seat are 310 mm and 250 mm and for a round seat the diameter is 250 mm.

The opening in the seat should be smaller than the opening in the pedestal with an overlap of at least 10 mm at the front end side and at least 70 mm at the back.

The surfaces of the toilet seat and lid should be smooth and free of obstructions.

The hinges of the seat and lid should be corrosion-resistant.

A gap should be provided between the seat and lid for ventilation purposes.

### ***16.5.7 Superstructure***

The superstructure can be rectangular shaped, circular or spiral with or without a privacy wall (a screen wall makes a door unnecessary).

The design of the superstructure should ensure privacy, comfort and protection against the weather.

The design of the superstructure should allow for emptying the pit, if required. (manually or by vacuum).

To reduce load on the cover slab, pit collar or lining, the superstructure can be offset. Any part of a wall that extends beyond the edge of the cover slab should be supported by a foundation.

The vent pipe may be situated inside or outside of the superstructure.

While the superstructure should allow indirect light to enter, the pit should be kept dark.

The superstructure should be adequately fastened to the cover slab or the foundation.

The roof should be waterproof and adequately fastened to the walls.

The vent pipe should be adequately fastened to the superstructure.

If the door opens outwards it is more prone to wind damage but the interior floor area can be decreased, thus reducing building costs.

The minimum dimensions of a superstructure should be as given in table 2.

The walls and roof can be constructed from a variety of local or prefabricated materials that are durable and weatherproof.

## **16.6 Ventilation**

### **16.6.1 General**

Moving air should be allowed to enter the superstructure through the vent holes through the walls and above the door, through the gap between the lid and seat, through the pedestal into the pit and out through the vent pipe.

Ventilation openings should be provided and positioned high up in the walls or above the door (see Figure 2).

The total ventilation opening areas for incoming air should be at least three times the cross-sectional area of the vent pipe.

### **16.6.2 Vent pipe**

Wind shear across the vent pipe is the main cause of ventilation in the system.

The vent pipe should have a diameter of at least 110 mm.

The vent pipe should extend at least 500 mm above the highest point of the roof.

### **16.6.3 Fly screen**

The vent pipe should be covered with a mesh to prevent flies entering or leaving the pit.

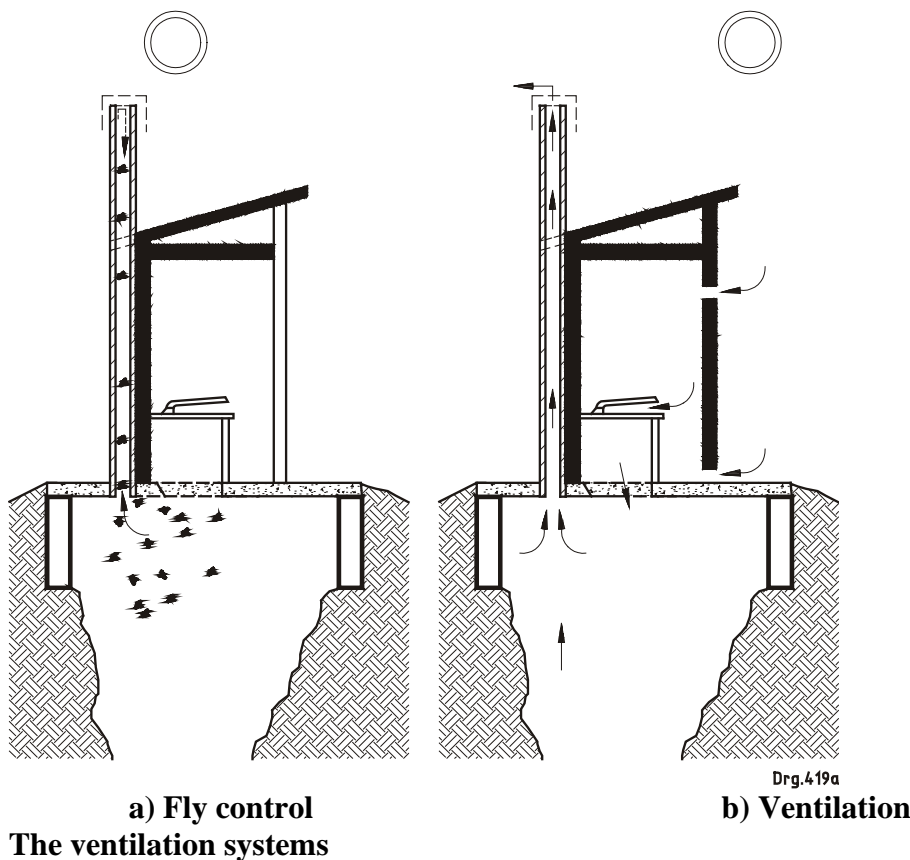
The mesh should be secured horizontally over the top of the vent pipe.

The openings in the mesh should have a maximum size of 1 mm x 1 mm. Smaller openings will cause resistance to free air flow and larger openings allow insects to pass through to the pit.

The mesh should be located in such a position that leaves will not accumulate on it.

The mesh should be made of aluminium, stainless steel, glass fibre or other material resistant to corrosion from uv light, rust and the gases emanating from the pit.

Cowls should not be used over the vent pipe as they obstruct the light and induce turbulence, thereby reducing wind shear at the top of the vent pipe.



#### 16.6.4 Hand-wash facility

Where a water stand pipe is not available nearby a small water tank should be provided.

### 16.7 Ground water contamination risk associated with a VIP toilet

Unless lined with an impervious lining, on-site sanitation systems, such as the VIP Toilet, dispose of human waste directly into the ground.

In order to minimise the risk of contaminating ground water sources the guidelines provided in the DWAF Ground Water Protocol must be followed.

The DWAF Ground Water Protocol is included in the *Ground Water Folder*.

**TABLE 2: SUMMARY OF RECOMMENDED MINIMUM DIMENSIONS**

<b>Component</b>	<b>Recommended minimum dimensions</b>	
Pit	Storage volume: Pit to be emptied Toilet to be moved Freeboard:	2,0 m <sup>3</sup> 3,0 m <sup>3</sup> 0,5 m
Collar	Depth: Projection above ground level: Slab support width:	500 mm 75 mm 75 mm
Slab	Thickness: Overlap on collar: Reinforcement if span is < 1,5 m: In underside of slab Concrete cover over reinforcement Type: 8 mm bars, 250 c/c each way, or Ref 193 steel mesh, or 4 mm roofing wire, 150 c/c	75 mm 75 mm   25 mm
Pedestal	Height from floor:	350 mm to 450 mm
Seat opening <sup>b)</sup>	Round Oval	250 mm diameter 310 mm X 250 mm
Superstructure <sup>c)</sup> (on site constructed)	Internal height: Internal width:  Internal length, door opening outwards: Internal length, door opening inwards: Dimension between pedestal and door opening outwards	1,9 m 0,9 m  1,2 m 2,0 m 0,6 m
Door	Height: Width:	1,5 m 0,7 m
Vent pipe	Diameter: Extending above roof:	110 mm 500 mm
Fly screen	Openings:	1 mm x 1 mm

# 17 STAFF, HOUSING, LABORATORIES, AND OTHER FACILITIES

## 17.1 Staff requirements for water supply schemes

Once a scheme has been planned and the basic designs of the various components are known, a staffing structure must be developed. This will depend on the nature of the works (i.e. water or sewage) and on the components which are to be operated and maintained. Staff within the operating organisation who have spare capacity must be kept in mind so as not to burden the organisation unnecessarily.

The components for which staff must be considered are:

- The raw water source, i.e. borehole(s), dam, river pump station, and pipelines.
- The treatment works.
- The main distribution system and reservoirs.
- Reticulation.
- Laboratory.
- Stores.
- Administration.
- Meter reading, billing and collecting revenue.

Where a borehole, fitted with a hand pump or a windmill, is provided and user ownership resides in the community, individual members of the community will have to operate the pump as they require water. In the case of the windmill a few people can be responsible for monitoring tank levels and releasing or applying the brake when necessary. Someone within the community needs to be trained to service the pumps/windmill at regular intervals or these services should be provided from outside.

Where one or more boreholes equipped with an engine are involved a permanent "operator" is required to monitor reservoir levels, start and stop the engine, check fuel, oil and water levels, generally ensure the well-being of the engine, procure the fuel and call for specialised maintenance when needed.

In a case similar to the above where chlorination is applied the operator should receive additional training in controlling the chlorination system.

Where water is abstracted from a river, chlorinated and pumped to a reservoir from where it is reticulated to the community an operator will be necessary with appropriate training in pumps diesel/petrol engines or electric motors. Depending on the length of pipelines

and extent of the reticulation, number of standpipes etc. an additional person may be needed to help with maintenance.

Any water supply scheme/or sewage disposal system where a treatment works as defined in the Water Act forms part of the system will fall under Regulation R2834 of 1985 and such works will have to be registered with DWAF and will have to employ operators of the requisite grading. These regulations are included in the ***Legislation and Policy Folder***. These regulations only stipulate the minimum number of operators needed to meet the law. In every case this minimum must be compared with the number of operators physically required to man the works at all times during its operation. Where any works is to operate continuously, for example, at least 4 operators will be required to allow for days off and sick and vocational leave. Besides the operating staff for the treatment process, additional operating staff for dams and pump stations etc., as well as maintenance staff may be required. Depending on the overall length and diameters of the pipelines involved the number and size of maintenance teams will need to be decided. It is recommended that there be at least 1 team per 10 km of pipeline with the size of teams as follows:

<b>DIAMETER OF PIPE</b>	<b>SIZE OF TEAM</b>
<75mm	2
75 - 100mm	3
100 - 300mm	4
300 - 800mm	5
>800mm	6

The amount and type of equipment installed will dictate whether full time mechanical and electrical artisans need to be employed or whether such services can be contracted out.

The extent of the buildings and structured will determine the number of civil maintenance staff needed and the number of cleaners needed.

The size of the treatment plant and complexity of the process employed will determine whether full time laboratory staff are required. Usually they would only be necessary on a Class "B" or higher works.

As the size of a treatment plant and/or the major pipelines and reticulation increases, so does the number of supporting staff. Stores are of major importance and a Class "C" or higher works should be provided with a storeman.

Where billing and tariff collection is to be the responsibility of the scheme itself, provision must be made for meter readers (when meters are installed) and for clerks and a cashier.

Financial arrangements need to be made with the WSA to facilitate payments for fuel or electricity and chemicals.

## **17.2 Housing requirement for water supply schemes**

The necessity of providing housing for a scheme will depend on the following:

- Location of works and distance from town.
- Type of storage, water care and pumping facilities and whether they require constant attention.
- Existing staff of service provider and where they are housed.

At the smaller water supply schemes, i.e. those involving boreholes, pumps and chlorination only, and where the level of skill required for the operation and maintenance can be found within the community, housing associated with the scheme should not be necessary.

At larger schemes, where skills required cannot be found within the community to be served and where skills must therefore be procured from elsewhere, consideration must be given to providing housing for the staff required to perform certain duties such as process control, skilled electrical and mechanical maintenance and computerized billing systems.

The houses will need to be similar in size and finish to the standards expected by persons of the relevant post grading. Generally, however, it is preferable to minimize the different types of housing. This reduces housing related problems when personnel are transferred or promoted.

Where housing is provided, problems may arise in cases where it is necessary to terminate the services of employees.

Geographical aspects can be a reason to provide housing for all staff members, such cases arise where a scheme may be located in an isolated area in order to be near a large dam and where transport infrastructure is minimal.

In all cases where housing is provided, the economies of providing the houses against providing a transport allowance should be considered in conjunction with the inconvenience factors which arise. While providing on site housing is convenient for staff, problems arise in providing schooling for children etc.

A charge is normally levied where housing is provided and should this be regarded as too high it is likely that staff may choose lower standards of housing at cheaper rates, privately.

There may be tax implications (perks tax) for employers who receive free housing.

Providing a subsidy for workers to own their own housing should be seen as preferable as this builds stability in communities.

Consideration should be given to the following:

- The installation of security fencing around the housing.
- The provision of security lighting like street lighting or high-mast lighting.
- The provision of an electricity meter for each house.
- The provision of one or more communal telephones.

### 17.3 Laboratories, offices and other facilities

Laboratory or on-site analysis of water may be performed as a means of plant and system control or adjustment and as a periodic check on water quality. Routine testing of water is designed to establish that the water is aesthetically acceptable and hygienic. These tests may be carried out with relatively simple equipment, titrations, colour comparison or simple robust instrumentation such as pH measurement.

Any water supply scheme such as a borehole or a river pump station where chlorine is added to the water should be provided with a chlorine test kit and the necessary reagents. The recommended equipment is a Lovibond comparator with a chlorine disc B/40A and DPD tablets.

On a small scheme where lime is added a test kit such as that for chlorine, but with a pH disc and reagents should be provided. Alternatively a simple robust PH meter may be used.

Suitable testing equipment and testing frequency for a small water treatment plant that produces <1Ml/d are indicated in the table below:

PARAMETERS	EQUIPMENT	FREQUENCY	REMARKS
PH	PH meter	Daily	If lime is added
Turbidity	Turbidity meter	Daily	If flocculants are added
Colour	Colour comparator	Daily	
Chlorine:		Once a day	When gas chlorine is used.
Total residual	Chlorine comparator	At least twice a day	When chlorine tablets or solutions are used.
Free residual			
Flocculation	Laboratory jar stirrer	When necessary	When replacing flocculant with a new one or when the nature of the raw water changes



Conductivity TDS E-coli Total hardness Calcium hardness Magnesium hardness Total alkalinity Sulphates Chlorides Fluorides Nitrates Iron Manganese	These tests can be contracted out or performed by a nearby larger facility.	In accordance with the water quality monitoring schedule.	Alternatively when there is pollution or suspicion of pollution in the area.
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*Note: Potable water should comply with SANS 241. See Chapter 9 for Water Treatment plants.*

Suitable testing equipment and testing frequency for a water treatment plant which produces between 1Ml/d and 5Ml/d s are listed in the table below:

PARAMETER	EQUIPMENT	FREQUENCY	REMARKS
PH	PH meter	Daily	
Turbidity	Turbidity meter	Daily	
Colour	Colour comparator	Daily	
Chlorine:		Once a day	When gas chlorine is used.
Total residual	Chlorine comparator	At least twice a day	When chlorine tablets or solutions are used.
Free residual			
E-coli	Incubator	Weekly	
Conductivity	Conductivity meter	Daily	
TDS	Weighing Balance/Calculations	Weekly	
Total hardness			
Calcium hardness	Titration:Burettes	Daily	
Magnesium hardness			
Total alkalinity			
Stability test	Calculations	Daily	
Flocculation test	Laboratory jar stirrer	When necessary	When replacing flocculant with a new one or when the nature of the raw water changes.

Sulphate Chlorides Fluorides Nitrates Iron Manganese	These tests can be contracted out or performed by a nearby facility.	Once a month or every two months.	Iron and Manganese may be analysed for on a frequent basis, where these are known to occur. Other specific metals may need to be determined when there are industrial or mining activities in the vicinity.
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A complete laboratory as per list below should be provided for a water treatment plant which produces >5Ml/d. Support laboratory equipment such as weighing balance, hot plates, filters, vacuum pumps, stirrers and burners will also be required.

PARAMETERS	METHOD/ EQUIPMENT	FREQUENCY	REMARKS
PH	PH meter	Daily	
Turbidity	Turbidity meter	Daily	
Colour	Colour comparator	Daily	
Chlorine		Once a day	When gas chlorine is used.
Total residual: Free residual	Chlorine comparator	At least twice a day	When chlorine tablets or solutions are used.
E-coli	Incubator	Daily	
Conductivity	Conductivity meter	Daily	
TDS	Weighing balance/ Calculations	Weekly	
Total hardness Calcium hardness Magnesium hardness Total alkalinity	Titration	Daily	
Flocculation test	Laboratory jar stirrer	When necessary	When replacing flocculant with a new one or when the nature of the raw water changes.
Stability test	Calculations	Daily	

Sulphates Chlorides Fluorides Nitrates Iron Manganese	Turbidity/ Gravimetric Titration Spectrometry Spectrometry Spectrometry Spectrometry	Weekly	Iron and Manganese may be analysed for on a frequent basis, where these are known to occur. Other specific metals may need to be determined when there are industrial or mining activities in the vicinity..
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Laboratories, workshops and other facilities should be available at the time of scheme commissioning. Sufficient funds should be allowed in the project budget for the start up costs of these facilities.

#### **17.4 Non-fixed assets**

Non-fixed assets such as loose tools, laboratory fittings, and workshop equipment should be provided as part of the implementation cost.

The number of vehicles needs to be determined carefully according to the requirement and sharing possibilities.

# 18 TENDER PROCEDURES

Each Municipality must have their own Tender Procedures. However DWAF Tender Procedures are provided here as a guideline.

## 18.1 Limitations

This section applies mainly to Civil Contracts, and is only applicable to tenders for new schemes being controlled by the Department of Water Affairs and Forestry.

For Mechanical/Electrical Contracts the Mechanical/Electrical Engineering Directorate must be consulted.

Where State Funds are involved, the Departmental Tender Procedures as prescribed in the Accounting Officer's Procurement Procedures must be used.

## 18.2 Steps in the tendering process

The tendering process comprise the following steps:

- Approval of Business Plan.
- Detailed survey work starts.
- Detailed design work starts.
- Conceptual Design Report submitted to DWAF Pretoria.
- Design Meeting: consultants meet with DWAF Pretoria design team.
- Update on Conceptual Design Report.
- Draft Tender documents with drawings (3 copies prepared and forwarded to DWAF Pretoria).
- Update Tender Documents: 13 copies plus marked up draft sent to DWAF Pretoria.
- Approval: Original Tender Documents sent around to relevant officials of DWAF Pretoria for signature.
- Original copy plus 12 other copies sent to Departmental Control Committee for approval.
- Call for tender advertised in Government Tender Bulletin (Friday). Advertisement period should be 28 days.
- Tenderers obtain Tender Documents from Tender Office situated at the entrance of zwaMadaka Building.
- Compulsory site visit.
- Contractors calculate prices, fees and total cost of their bid for constructing the project.

- Sealed tenders submitted before due date. Tenders up to an unlimited amount close at the Department.
- Tender box closed at specific time (Wednesday at 11h00).
- Tender box opened in public and details of tenders received recorded.

Adjudication of tenders by consultant.

Submission of Adjudication Report to RDP coordinator.

Adjudication Report accepted and contractor assigned to project.

Contractor starts work.

### **18.3 Pre- tender stage**

The pre-tender stage includes all work up to the submission of the tender documents for approval by the Regional Tender Committee or the Departmental Control Committee, as appropriate.

This stage includes:

- Preliminary proposals (dealt with under Section C: Civil Design).
- Design Reports (dealt with under Section C: Civil Design).
- Draft Tender Documents.
- Final Tender Document.
- Drawings (dealt with under Section C: Civil Design).
- Tender Procedures.
- All reviewed and approved by Directorates: Civil Design and Mechanical/Electrical Engineering as appropriate.

### **18.4 Draft tender documents**

#### ***18.4.1 Compilation of draft tender document***

All tender documents must be prepared in English.

It is recommended that Consultants familiarize themselves with the general requirements of the General Conditions of Tender, Contract and Order.

On completion of the designs, unless otherwise specified, two draft copies of the tender document, based on the standard DWAF format for either:

- supply/ or installation only, or
- supply, installation and commissioning of mechanical/electrical/civil plants,
- are to be submitted to the Director: Civil Design or M/E Engineering for his comments and approval.

The General Conditions of Contract as amended from time to time are applicable. Civil Design and Mechanical/Electrical Engineering must be consulted to determine which general conditions are applicable.

Various standard forms and specifications as indicated in the standard DWAF format, are to be included in the tender documents, i.e.:

- Special conditions of contract which should not be altered or modified by the Consulting Engineer without the approval of the Department.
- Preference should be given to the use of South African National Standards (SANS) as drawn up by the South African Bureau of Standards.
- Penalties or damages must be determined as described in the General Conditions of Contract and or Clause 32.5.2 of the General Conditions of Tender, Contract and Order. For smaller contracts the formula gives an insignificant amount and the penalty must be determined in collaboration with the Director: Civil Design or M/E Engineering and Sub-directorate: Contract Administration. When valves for example are supplied under a separate contract for a pipeline, reservoir, etc., late deliveries can have a significant influence on the construction and completion of the contract. If the late completion of the contract may result in claims from other Contractors against the Department, this must be taken into consideration when determining the penalty.

#### ***18.4.2 Standard format of a DWAF tender document***

The standard format of a Departmental tender document is provided below. The consultant may rearrange the format:

- DWAF Tender Front page (DW 106)
- Invitation to Tender (C2)
- Tax Clearance Certificate (C3)
- Locality Plan
- Notice of Site Inspection
- Site Inspection Certificate
- Instructions to Tenderers
- Form of Tender
- Appendix
- Important Conditions: Miscellaneous Requirements (C 6)
- Tender Commitment form (C4)
- Form Preference Points Claim: General Conditions and Definitions (C9)  
**Compulsory**
- Form Preference Points System: (C9.1, C9.2)
- Form Preference Points System: Equity Ownership by HDI's (C9.6)  
**Compulsory**
- Form Preference Points System: Procuring Locally Manufactured Products (C9.7)

- Form Preference Points System: The Promotion of Small Businesses (C9.8)
- Declaration of Interest (C10)
- Questionnaire (C8)
- Credit Order Instruction (C11)
- Agreement
- Deed of Suretyship
- Schedule of Similar Work Undertaken by Tenderer
- Schedule of Proposed Sub-Contractors
- Special Conditions of Contract
- Alterations by Tenderer
- Project Specification (Including Project Manufacture and Installation Schedule)
- Particular Specifications
- Schedule of Quantities
- Daywork Schedule
- List of provisional amounts, for example allowances for escalation.
- The National Industrial Participation Programme (NIPP) [where appropriate for large import content contracts]

#### **18.4.3 Departmental tender and contract forms (C-forms)**

The following Departmental Tender and Contract Forms should be included in the tender document:

- Form C2: Invitation to Tender.
- Form C3: Tax Clearance Certificate.
- Form C6: Important Conditions: Miscellaneous requirements.
- Form C4: Tender Commitment Form.
- Form C8: Questionnaire.
- Form Preference Points Claim: General Conditions and Definitions (C9)
- **Compulsory**
- Form Preference Points System: (C9.1, C9.2)
- Form Preference Points System: Equity Ownership by HDI's (C9.6)
- **Compulsory**
- Form Preference Points System: Procuring Locally Manufactured Products (C9.7)
- Form Preference Points System: The Promotion of Small Businesses (C9.8)
- Form C10: Declaration of Interest.

Credit Order Instruction (C11)

Original copies of the C forms can be obtained from the Tender Office situated at the entrance of zwaMadaka Building and may not be retyped.

#### ***18.4.4 Departmental formats***

The following Departmental Formats are available and should be included in the Tender Document:

- Instructions to Tenderers (The Consultant may add additional instructions).
- Special Conditions of Contract and its Appendix.

#### ***18.4.5 Standard proformas***

The following proformas should be the standard pro forma forms of the “General Conditions of Contract 1990”.

- Alterations by tenderer.
- Tender.
- Agreement.
- Deed of Suretyship.

#### ***18.4.6 Other proformas***

The following should be included in the contract document:

- Preamble to the Schedule of Quantities.
- Daywork Schedule.
- Schedule of Proposed Sub-Contractors.
- Schedule of Similar Work.

The Consultant may use his own forms or the Standard forms of the Department.

No allowance for price variation or contingencies may be included in the tender.

#### **Amount of Suretyship (Civil Contracts)**

The following is recommended:

For contracts with a value in excess of R5 million the amount of suretyship shall be 10%.

For contracts with a value equal to R3 million, but less than R5 million the amount of suretyship shall be as follows:

The greater value of:

Value of fixed charge and value related items in Schedule of Quantities

Or

If value of contract is R150 000 or less: 0%

If value of contract is more than R150 000 but less than R1 million: 2,5%

If value of contract is more than R1 million but less or equal to R3 million: 5%

If the value of the contract is more than R3 million but less than R5 million: 6% - 10%



#### **18.4.7 Final tender document**

After incorporation of the comments of the Department into the final document, thirteen copies shall be forwarded to the Tender Office, under cover of a letter which must also give the total estimated cost of the contract, together with expected expenditures for each financial year.

An advertisement, completed on the standard Departmental form, giving the date of advertisement, details of the site inspection, deposit to be paid by the Tenderers for a set of documents, closing date of the tender, etc. must also accompany this letter.

The following deposit structure is recommended:

the invitation of tenders above R150 000, 00 and up to R500 000, 00 a non-refundable deposit will be R50, 00;

between R500 000, 00 and up to R1 million a non-refundable deposit of R100, 00; and for the invitation of tenders in excess of R1 million a R200, 00 non-refundable deposit.

Please note that no tender deposits are allowed on the invitation of price quotations up to R150 000, 00 per case as well as on the invitation of proposals for professional services.

The date of the site meeting for major civil and building contracts shall be arranged in consultation with the office of the South African Federation of Civil Engineering Contractors or the Master Builders Association in the case of building contracts.

#### **18.5 Tender procedure**

Approximately two weeks after the tender document has been approved for publication by the Departmental Control Committee, the tender will be advertised in the Government Tender Bulletin. If required, advertisements can also be placed in the press. Tenders must close at the appropriate DWAF office.

Tender documents will only be issued by the tender section of the Department on payment of the prescribed non-refundable deposit.

## **18.6 Tender stage**

The tender stage includes all work from the advertisement of the tender until the issue of the order.

### ***18.6.1 Site inspection***

All information, clarification of clauses in the documents given by the Consultant and questions lodged by any tenderer at the site inspection, together with the answers, shall be recorded and sent to all tenderers as an addendum. It is to be stated clearly that the above will form an integral part of the tender documentation and tenderers must sign acceptance thereof and submit the said addendum together with their tenders. The addendum must be approved and counter signed by the Regional Director before it is distributed to the tenderers. Any other addendums shall be distributed in the same manner and must also be included in the tender. All addendums will be regarded as an integral part of the tender document.

### ***18.6.2 Extension of tender period***

Before granting and extension to the tender period it shall be discussed with and approved by the Tender Section, who will then inform the Government Tender Bulletin in writing of the new closing date of the tender. Consulting Engineers shall then advise the tenderers in writing by means of a telex or fax of the new closing date. Clause 12.4 of the General Conditions of Tender, Contract and Order must be adhered to.

### ***18.6.3 Adjudication of tenders***

After the closing of the tenders, the Tender Office will forward the tenders to the Regional Director. A duplicate copy of the tenders plus all correspondence shall be collected by hand from the Regional Director by the Consulting Engineer.

Consulting Engineers may not obtain any additional prices or rates from any tenderer during the adjudication period. Communication, except for technical clarification, with the tenderers should be avoided, and then only with the approval of the Regional Director.

The Consulting Engineer must submit a detailed report recommending, with full motivation, the acceptance of a tender as soon as possible, but not later than three weeks after receipt of the tenders from the Department. This recommendation plus all copies of the tenders including the correspondence shall be returned to the Regional Director, by hand.

The report shall include a Schedule of Tenders with comparative prices and a technical summary of the offers received.

#### ***18.6.4 Acceptance of a tender***

Based on the Consultant's report the Department will check for any discrepancies between the "ORIGINAL" and "DUPLICATE COPY" of the tenders and draw up and submit a recommendation to the appropriate committee for approval. The Departmental Control Committee meets once per week, on a Monday at 12h00. Recommendations and/or specifications which must serve before the DCC must reach the Tender Office not later than a Wednesday at 12h00. When the tender recommendation has been approved, the Tender Office will send a Letter of Acceptance (C17) to the successful Tenderer. The Consulting Engineer will be advised and the official tender order will subsequently be issued by the Regional Director.

The "Tender" becomes a "Contract" with the letter of acceptance.

Rejection of all tenders or cancellation, but before approval by the DCC/RTC

A recommendation to reject all tenders or to cancel the tender must be referred to the relevant Director for approval of the cancellation.

#### ***18.6.5 Sureties and insurances***

The sureties or guarantees and insurance policies that must be provided by the Contractor in accordance with the General Conditions of Contract and Clause 45 of the General Conditions of Tender, Contract and Order shall on receipt thereof from the Contractor, firstly be checked for correctness, and then sent to the Regional Director.

#### ***18.6.6 Signing of the contract***

For all major contracts the "Form of Agreement" must be signed in duplicate by the Contractor and relevant Managing Engineer of the Department on behalf of the Employer.

Two documents must be book bound for signature. Only the agreement must be signed. It is not necessary to initial each page.

### ***18.6.7 Award meeting***

Immediately after the award of a contract the Consulting Engineer must arrange a meeting between responsible representatives of the Employer, the Consulting Engineer and the Contractor to clarify the scope of the contract and matters of procedure and to hand over the site to the Contractor.

## **18.7 Mechanical tender preparation guidelines**

### ***18.7.1 Document preparation - broad outline***

Mechanical tender documents shall comprise the following in broad outline:

General specification relating to components, items and services which generally occur in pump stations, including the crane or hoist.

Project specification describing the specific project first in general terms and then in specific detail.

Technical schedule similar to the Bill of Quantities, but limited to specifying and/or inquiring of the tenderer only the technicalities of the equipment offered.

Form of Guarantee relating to pump, motor and pumpset performance.

Price schedule comprising tender price broken down into just a few major groupings and detailed items as deemed necessary for financial control of the contract.

#### Note:

The Mechanical engineering component of a pump station contract, unlike its Electrical and Civil engineering counterparts, does not employ a Bill of Quantities because very little of the equipment offered is of a repetitive or "measured" nature. It is not necessary to cost out each little pipe piece or nut, bolt and gasket.

Furthermore, a "payment by progressive measurement" of works completed by month end is not a meaningful control device. A method of payment against measurable goals achieved and relating to specific items of equipment as highlighted in the original document price schedule is employed. Progress payments per item are limited to up to 80% of tender value when delivered to site, with a further 10% making up 90% of both item cost and installation when equipment is ready for commissioning. Successful commissioning initiates the Guarantee Period (either 12 or 24 months). The final 10% of

Contract Value is withheld as retention money and may be released only after the satisfactory completion of the Guarantee Period, signaled by the Final Certificate.

A "Performance Bond" for 10% of the order value, is held until the Final Certificate is issued.

#### **18.7.2 *Specific points to be noted***

The pump and motor (the pumpset mounted on a single baseplate) are costed in the same schedule and are considered to be a single entity.

The pump duty and station duty are specified as a primary factor in the compilation of the Project Specification - not hidden somewhere in a bill of quantities.

No specific pump manufacturer, pump size or model may be assumed. The specification must therefore clearly define how the motor is to be sized with at least 15% over-capacity safety margin. Pump and motor performance efficiency and power demand shall be guaranteed by the contractor.

Brand names may not be referred to under any circumstances when describing items in the specification. Performance requirements shall be fully specified.

Pump motor, flow meters and any other sensing instrumentation shall be part of the Mechanical Specification.

### **18.8 Electrical tender**

The following must be included in all electrical tender documents issued for CWSS projects.

- No brand names and/or type numbers are allowed.
- The electrical scope and limits of contract must be clearly defined.
- The tenderers must be informed as to how and where the electricity is supplied and metered.
- An electrical and control function analysis must be provided.
- A line diagram of the system must be provided. This must indicate the existing layout as well as that required by the contract.
- One drawing showing the overall electrical earthing system is required.
- The Department's Mechanical and Electrical Engineering Directorate's General Technical Specifications (Electrical) (GTSE) must form part of the document. These are available in printed form as well as on electronic media.
- Transformer and cable sizes must be clearly indicated.
- There must be an electrical project specification that describes the requirements of the tender. This must cover the MV (if any) and LT panels, the motor control center, an earthing system, lighting protection and building power and lights etc. These must be clearly set out to enable the tenderer to select the relevant parts of the GTSE that apply to the contract.
- Only include those sections of the GTSE that applies to the specific project.

## **18.9 Procurement of a professional team**

The latest version of DWAF's Policy for the appointment of Professional Service Providers (PSP's) should be followed. Special attention should be given to the respective fee limitations for competitive bid and tender.

## 19 CONTRACT ADMINISTRATION

Each Municipality must have their own contract administration systems. DWAF's system is given here as a guide.

### 19.1 Payment certificates

Payment certificates, certified for payment by the Consultant must be forwarded timeously to the Regional Director who must be consulted beforehand on the payment procedure.

The payment certificate must be structured as set out below and must contain the following information for each item of the schedule of quantities:

- The item number with a short description.
- The unit of measurement.
- The billed quantities.
- The previously measured quantity.
- The quantity for the month.
- The total quantity measured to date.
- The rate of payment.
- The total amount claimed.

All variation orders, day-works claims and extras must be listed and referenced at the end of the certificate.

The certificate must also be accompanied by a summary sheet containing the aggregates of all the individual sections, day-works and variation orders, as well as materials on site, price variation and other miscellaneous items.

An original VAT invoice must accompany all payment certificates.

Actual disbursements should be captured on the Department's Financial Management System. Operating and Capital costs should be recorded separately and not confused with one another.

## **19.2 Correspondence**

Where Consulting Engineers are employed to supervise the construction of works of a civil engineering and building nature or a mechanical/electrical contract executed by a private contractor the following shall apply:

Copies of all correspondence must be forwarded to the Regional Director.

All matters relating to design aspects of the works shall be referred to the Regional Director and copies of correspondence, reports, etc. must be sent to the Regional Director.

## **19.3 Estimated costs**

The following procedure must be followed:

- The estimated cost of the contract together with expected expenditures for each financial year must be submitted to the Department under covering letter with the Final Tender Document.
- After the award of a tender, the Consulting Engineer must submit an estimate of the total value of the contract including all additional costs that can be foreseen at that time, subdivided into annual expenditures if the duration of the contract extends over more than one financial year.
- On larger works where more than one contract is involved, a table setting out the anticipated expenditure for the whole project or works controlled by the Consulting Engineer, must be submitted initially and updated during April of each year. During January of each year an estimate must, after consultation with the Contractors, be made and submitted to the Regional Director, giving the value of the payment certificates for which payment will be required before 31 March of that year.

## **19.4 Variation orders**

For alterations, additions and omissions to the contract the Consulting Engineer shall follow the procedures as set out in the General Conditions of Contract. The following procedures must also be adopted:

The nature and up to what value a variation order may be issued by the Consulting Engineer without prior reference to the Regional Director will be specified in the special conditions of contract. All variation orders must however be referred to the Regional Director for his final approval.

All variation orders involving substantial changes in design or specifications must be referred to the Regional Director. In these instances the Consulting Engineer must obtain



a written quotation from the Contractor and determine whether the price is reasonable before reference to the Regional Director. The quotation and recommendation can be dealt with per facsimile if urgent, but must be followed by the Contractor's original signed quotation. The Consulting Engineer shall not instruct the Contractor to proceed until he has obtained approval from the Regional Director.

All variation orders must be submitted on an approved standardised form and consecutively numbered.

Variation orders must be kept up to date and submitted for approval within one month after occurrence of the event.

## **19.5 Co-ordination**

Since most Departmental projects involve more than one contract as well as works executed Departmentally, regular co-ordinating meetings shall be held between the parties involved with the Consulting Engineers responsible represented. The Consulting Engineers will normally be required to minute all meetings with Contractors and must forward copies to all parties involved including the Regional Director.

## **19.6 Construction reports**

The Consulting Engineer will be required to submit a Monthly Construction Report or Progress Report.

Where dams requiring dam safety regulations are involved or for the larger schemes, proposed pro-forma of the construction report is available from the Chief Engineer: Contract Administration. The reports must be in such a format that at the end of the contract the monthly reports must be in bound together with the final covering report to constitute the Final Construction Report. Under certain circumstances (dam safety requirements) the Engineer will be required to submit a separate consolidated Final Construction Report.

## **19.7 Inspections**

### ***19.7.1 Civil works***

#### General

On completion of a contract, but prior to the issuing of the Certificate of Practical Completion, a joint site inspection shall be held. On completion of the list of outstanding items compiled at this inspection the Consultant may issue the Certificate of Practical

Completion in terms of Clause 54 of the General Conditions of Contract to the Contractor.

At the end of the maintenance period the works shall once again be inspected to establish whether any defects have to be corrected by the Contractor.

These inspections shall be attended by the Contractor and the Consulting Engineer and representatives of the following Directorates of this Department:

- Construction
- Civil Design
- Mechanical/Electrical Engineering
- Water Utilisation
- Regional Office

When it has been established that the Contractor has fulfilled all his obligations in terms of the contract, the “FINAL APPROVAL CERTIFICATE” may be issued in terms of Clause 55 of the General Conditions of Contract and the last retention monies released.

### Dams

The behaviour of the dam structure and ancillary works shall be monitored during the construction and during the first filling as required by the Director: Civil Design.

### Mechanical and electrical works

The following procedure shall be adopted:

While commissioning is in progress, the Contractor in conjunction with the Consulting Engineer will be expected to train the Water Services Provider's (Water Board or Local Government) staff in the normal operation of the plant installed. The training shall be done with the aid of operation and maintenance manuals which shall be compiled and provided by the Consulting Engineer and/or the Contractor as required by the Director: M/E Engineering.

When commissioning has been satisfactorily achieved, acceptance tests on site will be carried out by the Contractor, in the presence of the Consulting Engineer and representatives of the Water Services Provider (Water Board or Local Government), the Regional Director and of the Mechanical/Electrical Engineering, Civil Design and Water Utilisation Directorates.

The Engineer will subsequently recommend that the plant be taken over from the Contractor, by way of a commissioning certificate whereby the Water Service Provider (Water Board or Local Government) also agrees to be responsible for the operation of the plant. At this time the guarantee period (normally twelve months) commences during which period the Contractor must meet any outstanding obligations.

Prior to the expiry of the guarantee period, an on-site inspection will be held where the Consulting Engineer, the Contractor, the Water Services Provider (Water Board or Local Government) and the Directorates: Mechanical/Electrical Engineering, Civil Design and Water Utilisation and the Regional Office will be represented. When it has been shown that the Contractor has fulfilled all his obligations, the Final Certificate must be issued together with the release of the last retention monies.

## **20 REPORTING ON OPERATIONS**

### **20.1 Annual scheme audit and water balance**

The Regulations prepared in terms of S9 of the Water Services Act require a Water Services Authority to include a water services audit in its annual report on the implementation of its water services development plan. The annual report on the WSDP is required in terms of section 18(1) of the Act.

The Regulations also require a Water Services Authority to undertake an annual water balance every month.

The S9 Regulations are included in the Legislation and Policy Folder.

## **21 CONTENTS OF FOLDERS**

### **21.1 Legal and policy folder**

- Constitution of the Republic of South Africa, 1996(Act 108 of 1996)
- Water Services Act, 1997(Act 108 of 1997)
- National Water Act, 1998(Act 36 of 1998)
- Municipal Systems Act, 2000(Act 32 of 2000)
- Municipal Structures Act, 2000(Act 33 of 2000)
- Public Finance Management Act, 1999(Act 1 of 1999)
- Local Government Municipal Finance Management Act, 2003 (Act 56 of 2003)
- Division of Revenue Act-Enacted Annually
- Strategic Framework for Water Services, September 2003
- White Paper on Sanitation, September 2001
- Regulations under S9 of the Water Services Act, 1997
- Regulations under S10 of the Water Services Act, 1997
- Regulations under S 19 of the Water Services Act, 1997
- Model Water Services Bylaws. Section 21(1) of the Water Services Act, 1997

### **21.2 Institutional folder**

- Terms of reference (TOR) for assessing Water Services Provider options under S78 of the Municipal Systems Act
- Model Water Services Contract between DM and LM

### **21.3 Planning folder**

- WSDP preparation guide

### **21.4 Design specifications folder**

- See Design Specifications Section for full list

### **21.5 SANS folder**

- SANS specification numbering list

## **21.6 Drawing folder**

- BOT Drawings
- Standard Drawings

CAD software is required to read these drawings.

## **21.7 Procurement folder**

- DWAF Policy for the Appointment of Professional Service Providers
- DWAF Accounting Officer's procurement procedures
- Government Procurement: General Conditions of Tender, Contract and Order

## **21.8 Sanitation folder**

- Farm Dweller Sanitation: Guidelines for implementation

## **21.9 Ground water folder**

- Ground water protocol