



WILDEVOELVLEI WASTEWATER TREATMENT PLANT

Upgrade of Dewatering plant Report



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Site details

Site Name : Wildevoelvlei WWTW
Address : Wildevoelvlei Rd (-34.135281, 18.366876)
Plant type : Wastewater Treatment Plant

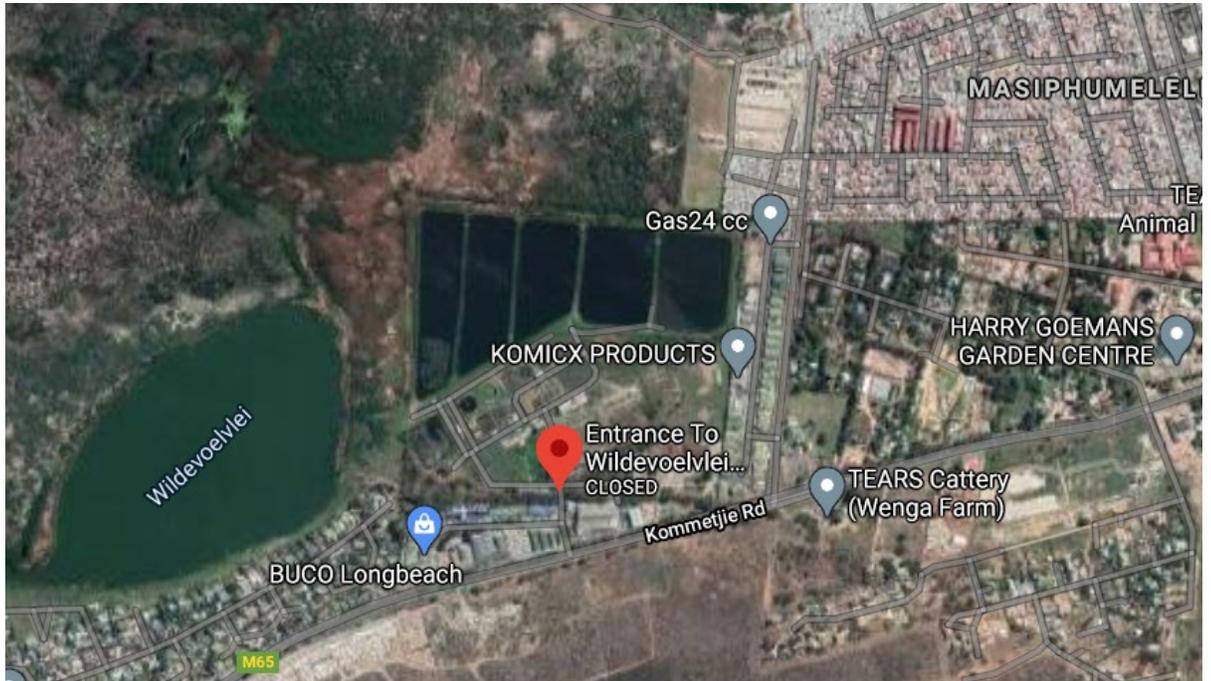


Figure 1: Site Location Map

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1 INTRODUCTION

The Wildevoelvlei WWTW was constructed in 1977 when the former oxidation ponds for Ocean View were closed down. The effluent from this works flows to the Wildevoelvlei, which is presently under environmental pressure due to the abundant seasonal growth of blue – green algae in the vlei.

The Wildevoelvlei WWTW employs two parallel process trains, one using a conventional biological reactor and the other a Carousel type oxidation ditch. Both processes have dedicated secondary sedimentation facilities, while Head of Works, final effluent disposal and sludge handling facilities are shared. Overflow from a common inlet sump upstream of the Head of Works is diverted to a side stream balancing tank, from which the wastewater is pumped to the inlet of the activated sludge process.

Waste sludge from both processes can be withdrawn from the biological reactor/oxidation ditch or from the underflow from the Secondary Settlement Tanks (SSTs) and is pumped to the sludge handling facility, which consists of a linear screen, a belt press and sludge drying beds.

The dewatering produces approximately 30 tons of sludge per day, the sludge is transported to a land fill site for disposal. Water removed from the sludge by linear screen and belt press is returned to the activated sludge process.

It is proposed to upgrade the existing Wildevoelvlei Wastewater Treatment Works (WWTW) by constructing a new dewatering facility and refurbishing parts of the existing plant. Wildevoelvlei Wastewater Treatment Works (WWTW) receives sewage from Kommetjie, Fish Hoek area and from the surrounding area. The existing WWTW consists of the following units of operations:

- Inlet works with:
 - ✓ Two screw pumps
 - ✓ Two fine screens
 - ✓ Two grit removals
- Biological reactor and oxidation ditch (Carousel)
- Four Secondary Settling Tanks (SSTs)
- Maturation ponds
- Sludge dewatering (one linear screen belt press)

2 DISCRIPTION OF WORKS

This project shall form part of the continuous improvement vision to ensure that the City of Cape Town's Wastewater plants function correctly and safely to comply with design and statutory requirements/standards. The upgrade should include a dewatering building, dewatering equipment (including belt press, polyelectrolyte equipment, sludge feed pumps, wash water system, cake conveyer and odour control system).



Figure 1: Areal view of Wildevoelvi WWTW

3 STRATEGIC CASE

The reuse of an acceptable quality of biosolids is encouraged and the waste (grit and screenings) disposal which must be done in a sustainable and an environmentally friendly manner. It is critical that the wastewater treatment capacities meet the demand for developmental growth bearing in mind the long lead times between concept and commissioning of these facilities. Capital upgrading to improve treatment process performance, meeting higher discharge quality requirements and to replace equipment as it becomes ineffective or has reached the end of its functional life.

It is therefore fundamental to undertake this project as part of improvements and innovations envisaged in Wastewater 10-year Master Plan. The regionalisation of sludge handling to optimally use the existing plants and create more sustainable resource recovery, reuse options for the recyclable products (biosolids) and environmentally friendly disposal. In addition, the upgrading of the existing dewatering system will see the implementation of appropriate automation, on-line monitoring and control (SCADA) and other technologies to ensure sustainable wastewater treatment operation and management, re-designing some of the WWTW in order to meet and adhere to the more stringent Department of Water Affairs Water Use Licence (WUL) conditions.

4 SOCIAL/ ECONOMICAL CASE

This project is part of the Wastewater Branch's several plans to improve its business processes and improve the products (effluent and sludge) reused or discharged to the environment. This project will also improve the quality of sludge and ensure that the sludge is disposed in an environmental acceptable manner as stipulated in the Wastewater Master Plan. The improvements can be seen from the improved effluent compliance over the years and recognition received by the Department of Water and Sanitation Green Drop Awards.

From table 1 below it can be seen that the Wildevoelwei plant is on a critical pathway as far as the process is concerned, the plant is overloaded and the current aeration system and design is not coping with the high COD load entering the plant. The plant is failing to comply with its license requirements. The service directorates and departments of the municipality need to ensure that the infrastructure and resources are available for the growth of the city.

Table 1: **Wildevoevllei WWTW average compliance for the past 24 months**

Parameter	Limit	Average over 24 months	% compliance over 24 months
TSS	25	30.04	50.48
COD	75	95.89	43.81
Ammonia	10	34.38	5.71
Ortho-Phosphate	10	4.92	96.19
E.coli	1000	770.15	89.52

The Plant only complied 5% with ammonia for the last 24 months, hence the urgency for the new Dewatering Facility.

5 PROCUREMENT CASE

The project has been registered in Demand Plan system and Supply Chain Management SCM has been engaged in the project. This project will make use of the following:

- 194C/2020/21 - Term tender for the provision of multidisciplinary professional services for the water and sanitation department.
- DP5282Q/2019/20 - Design- Build of mechanical and electrical works for the refurbishment of sludge dewatering equipment at Wildevoevllei WWTW.

Appointment of Contractor should follow the procurement plan shown in table 2 below.

Table 2 Procurement Plan

WWTW	Designation of Measure (Package/Lot/Contract)	Procurement Standards to be applied	Procurement Method [ICB, NCB, Quotation,...]/ Pre- or Post-Qualification/ One or two envelopes	Evaluation Method [QCBS, CBS]	Expected date of PQ/Tender Publication	Type of Bidding Document / Contract to be used [FIDIC Yellow Book, Engineering Council, CIDB]	Contract Type [lump-sum, time-based, performance-based]	Contract Execution Period	Commissioning Date	Completion Date
Wildevoevllei	Design-Build Mechanical and Electrical Works for the Refurbishment of Sludge Dewatering Equipment at Wildevoevllei Wastewater	CIDB, MFMA / City of Cape Town SCM Policy	National Competitive Bidding	Functionality and cost based selection	Pending	FIDIC Yellow	lump-sum with allowance for forex and escalation	810 days	Forsee August 2025	Forsee December 2026

6 COMMERCIAL & REGULATORY CASE

The following requirements are considered and adhered to when implementing treated effluent reuse infrastructure:

- All service provider appointments are in line with SCM policy.
- Performance Guarantees are a requirement for contractors.
- Wayleaves are requested & obtained by contractor after projects work allocation.
- OHS file/plan to be submitted and approved prior to site handover.
- Environmental impact assessment applicability check is submitted prior to commencement of detail design.
- Construction regulations to be adhered to for duration of construction works. All construction works will be carried out by CIDB registered contractors

7 FINANCIAL CASE

Table 3 below provides a summary of the cost estimate ($\pm 15\%$) associated with the proposed solutions dewatering plant. Furthermore, Table 4 provides the expenditure per financial year.

Table 3: Project cost estimate summary

COST ESTIMATE FOR DEWATERING UPGRADE - WILDEVOELVLEI WWTW					
Item	Description	Unit	Qty	Price	Amount
1	Mechanical Work				
	Dewatering equipment	sum	–		R 6 577 506.46
	Polyelectrolyte system	Sum	–		R 1 004 311.56
	Dewatering Odour Control	sum	–		R 5 312 021.00
	HVAC	sum			R 114 799.80
2	Electrical Work				
	Electrical equipment	sum			R 2 828 251.18
3	Civil Work				
	Site Clearance	sum	–		R 504 289.00
	Demolition and Alteration works	sum	–		R 3 557 495.00
	Dewatering Holding Silos	Sum			R 2 645 760.00
	Sub-Total				R 22 544 434.00
	15% Contingencies				R 3 381 665.10
	Total				R 25 926 099.10

Table 4 shows the predicted expenditure per financial year for the proposed budget.

WBS Element	Description	Approved Budget	Proposed Budget	Forecast spend			
				2021/22 FY	2022/23 FY	2023/24 FY	2024/25 FY
CPX.0010426	Wildevolvellei Upgrade dewatering	R26 000 000	R25 926 099.10	R -	R -	R 12 963 049.55	R 12 963 049.55
194C/2020/21	Professional Services fees	R0	R 6 000 000.00	R 1 000 000.00	R 1 000 000.00	R 2 000 000.00	R 2 000 000.00
Total		R26 000 000	R31 926 099.10	R 1 000 000.00	R 1 000 000.00	R 14 963 049.55	R 14 963 049.55

8 PROJECT MANAGEMENT CASE

Professional Service Providers will be responsible for the preliminary investigations, detailed designs, tender documentation, project management, contract administration and site supervision of this contract. The consulting team must produce the necessary designs, drawings, specifications, contract documents and reports associated with the implementation of this project.

This Scoping Report acts as a brief to the Consultant team, providing our understanding of the scope of works.

8.1 Terms of reference

With reference to the Professional Services tender document Part C3: Scope of Works, Section 5.2. Specific Requirements, the following:

Section 5.2.1: Report Stage refers:

“The Service Provider shall inspect the site(s) to familiarise him/herself with the nature of the site and the conditions under which work (both the provision of professional services and the construction work by others) is going to have to be executed. The report stage must include pertinent information relating to each specific project, the feasibility of the project, estimated cost and time frames and the benefits and drawbacks of implementing the various projects and any other information which the Wastewater Branch may need to make a decision on the way forward with respect to each project.”

Section 5.2.2: Preliminary Design Stage refers:

“It is anticipated that for a particular project there may or may not be a preliminary design stage per se, although consultation with the client, various services authorities, and other interested parties will be necessary prior to finalising designs and documentation. The service

provider must however allow for providing any of those preliminary design services as may be necessary to proceed with and finalise the detail design and tender documentation.”

8.2 Programme

A draft project programme (see appendix A: project programme) has been drawn up.

The Key dates are:

Project inception	: 04 May 2022 – 13 May 2022
Preliminary Design	: 16 May 2022 – 19 August 2022
Design Development	: 01 August 2022 – 04 November 2022
Documentation and Procurement	: 20 September 2022 – 25 October 2023
Issue tender	: 29 March 2023
Tender period	: 30 March 2023 – 10 May 2023
Issue of Letter of Acceptance	: 25 October 2023 – 25 October 2023
Project Execution	: 25 October 2023 – 02 December 2026
Project Close-Out (including DNP)	: 03 December 2026 – 13 January 2027

8.3 Risks

The risks assessment was previously updated in 2020, as shown on Appendix B of this report. The risk assessment will be reviewed and updated continuously to identify and manage new risks.

8.4 Stakeholders

The successful implementation of the programme requires continuous stakeholder interaction and adaptation to changes. Internal and external stakeholders play different and vital roles on the success of the project. Shown on the table below are the stakeholders, their role on the project and the impact they have on the project success.

Table 4: Stakeholders

Stakeholder	Role	Impact	Interest	Method of communication
Wastewater Operations	Client/User	H	Efficient and effective operation of the plant and compliance of the final effluent	Emails and meetings
Engineering & Asset Management	Support	M	Proactive maintenance and input on the proposed infrastructure.	Emails and meetings
Directorate	Funding	H	Financial Support	Emails and meetings
Capital & Contract Management	Advisor	L	To advise and assist with QS services	Emails and meetings
SCM	Advisor	H	Tenders (Professional service providers and Contractors)	Emails and meetings
Medium Voltage Team	Support	M	Approvals of wayleave for the proposed infrastructure.	Emails and meetings
Consultant	Engineers	H	Design and approval of the proposed infrastructure	Emails and meetings
Contractors	Suppliers	H	Design and construction of the proposed infrastructure	Emails and meetings
Public	–	L	To be informed of any disruptions that may occur	Letters, Notice boards

9 TECHNICAL / ENGINEERING CASE

A brief description of the project has been discussed in Section 2 above; this is a summary of technical aspect that need considerations.

- Installation of additional belt press and associated equipment in the dewatering building:
 - 1 belt press
 - Poly dosing, (Continuous or batching)
 - wash water system
 - Cake conveyer and pumping
 - Odour control
 - Sludge feed pumps

- Replacement of the existing (damaged) screw conveyer for the grit clarifier
- Civil
 - New dewatering facility
 - New reinforced concrete hoppers
 - RAS building window frames and doors needs replacement
 - Reactor A, expansion rubber lines in walls are corroded, needs new filling
 - Inlet works, roof is coming apart, windmill (odour extraction) is missing on roof. Window frames need to be changed, doors to be fixed
 - Reactor B, all walkways are falling apart, due to sand erosion, reinstate walkways, staircases and railings
 - Reinstates roads, walkways and concrete around the building structures
 - Existing dewatering Plant cracks in walls, need to be repaired
 - Fill up sand and compact around SSTs
- Electrical
 - New MCC panel
 - SCADA for the dewatering systems

10 CONCLUSIONS

This report outlines the mechanical work identified for implementation up to financial year 2026. The project is pending on submission of updated project cost by Professional Service Providers who will be responsible for the preliminary investigations, detailed designs, tender documentation, project management, contract administration and site supervision of this contract.

12 Appendix B – Risk Assessment and Management Measures

WWTW - RISK ASSESSMENT AND MANAGEMENT MEASURES

INTRODUCTION:

This register addresses the risks essential to the upgrade of dewatering plant at the **WildevoelMei** Wastewater Treatment Plant, which may impact on project costs, prevent completion within the fixed timeframe and compromise performance of the WWTP. These risks have varying impacts on the project and will require specific management and mitigation measures.

Risk assessment of the project has to be executed on a continuous basis throughout the course of the project.

BASIS FOR ASSESSMENT:

The risks are assessed according to the severity of the impact as well as the probability of the occurrence. A score is then calculated as the product of the impact and probability for each risk.

Rankings for impact and probability of occurrence are reflected in Table 1 and Table 2 below.

Table 1:

Impact								
Ranking	Description							
1	Insignificant – event is negligible							
3	Minor – financial loss or injuries							
5	Moderate to Significant – loss of business, significant financial loss, loss of jobs							
8	Severe – loss of business opportunities, major financial loss, many job losses and fatalities							
10	Catastrophic impact on the business entity							

Table 2:

Probability								
Ranking	Description							
1	Adverse event should not occur, or may incur in exceptional circumstances							
3	Highly unlikely that the event will occur							
5	Event can occur							
8	Highly likely that the event will occur							
10	Adverse event will definitely occur							

Table 3:

Risk Matrix										
Probability	Impact									
	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100
Risk rating reference		Low		Medium			Significant		High	

RISK AND IMPACT ASSESSMENT AND MANAGEMENT THEREOF:

The risk groupings identified for this project are reflected in Table 4. These risks and their relative ratings are further expanded in Table 5 below.

Table 4:

No.	Risk Grouping
1	Technical Risk
2	Management Risk
3	Commercial Risk
4	External Risk

Key action steps identified

Proposed measures that can be put in place by the Client or Project team to mitigate the risks are provided in Table 5. Risk management is allocated to the responsible party and the status of each mitigation measure is recorded throughout the project. Risk ratings will be reduced by a percentage as the risks are managed.

Table 5:

Date of latest update: 2021/02/17

Risk Assessment											
Ref	(Potential) Risk	Impact	Risk Rating			Mitigation	Responsible Party	Date	Status	Risk Reduction %	Residual Risk Rating
			Impact	Probability	Rating						
1 Technical Risk											
1.1	Scope change	Additional costs and design delay	5	3	15	Ensure that the scope is well-defined, finalised and approved during inception and preliminary design stages.	CCT		Technical aspects of the scoping report have been approved in principle.	50	7.5
1.2	A key staff member unable to participate further during the course of the project	Design delay	7	5	35	Ensure staff member is replaced with equal or better person. Ensure a sufficient project handing over period and team support for the new key staff member	Consultant	*note status	No challenges raised to date.	100	0
1.3	Transportation of large/heavy equipment between point of manufacturing and to site.	Delay project	5	3	15	Greater international support.	Contractor	*note status	To be addressed during the conceptual design phases.	50	7.5
1.4	Quality compliance (Quality of equipment, construction not to specification)	Delay project	7	5	35	Early procurement of materials.	Contractor	*note status	Detailed specification to be provided at tender stage which will ensure the quality of the equipment supplied under this Contract.	30	24.5
1.5	Unsuitable materials of construction can lead to premature failure of system.	Additional cost and delays	8	3	24	Product specifications verified by Planning, Design and Projects. Supplier/ Contractor agreements.	Contractor	*note status	To be mitigated during tendering phase	0	24
1.6	Performance compliance of equipment	Delays	7	3	21	Selection of reputable supplier. Extensive model testing. Detection of problems at early stage by close monitoring and frequent workshop inspections, discussion with Client.	Contractor	*note status	To be mitigated during the tendering phase of the project.	0	21
1.7	Contractor design items inadequate	Delays	8	2	16	Check contractor design package, reputable and experienced contractor/sub contractors.	Contractor	*note status	To be mitigated during the tendering /construction phase of the project.	0	16
1.8	Reactor basins lifting when emptied	Delays, cost	7	5	35	Underwater drainage pumps to be provided	Contractor	*note status	To be mitigated during the construction phase.	0	35
1.9	Catastrophic failure during commissioning	Delays, cost	9	2	18	Design to acceptable risk, in accordance with international best practice, appropriate safety factors.	Contractor	*note status	To be mitigated during the tendering/construction phase of the contract.	0	18
2 Management Risk											
2.1	Termination of the Professional Services Contract	Project delay	8	5	40	Ensure proper coordination between key role players in monthly meetings.	CCT	Monthly	Contract conditions to be clarified	0	40
2.2	Delays in internal wayleave approvals regarding electrical work	Project delay	7	4	28	Ensure proper coordination and tracking in monthly meetings.	CCT	Monthly	Ongoing process that has to be managed throughout project.	15	23.8
2.3	Delay in obtaining construction working permit in terms of the H&S Act	Project delay	8	5	40	Complete application form including a base line risk assessment and SSHS.	Consultant	*note status	This application has to be submitted 30 days prior to the start of construction.	0	40
2.4	Not all authorisations, licences and permits are applied for	Project delay	8	3	24	Do detailed regulatory review at project start-up, monitor and update with developments or project configuration changes.	Contractor	*note status	No additional risk identified at present.	0	24
2.5	Lack of coordination between civil, mechanical and electrical Contractors	Delay project	7	5	35	Conduct frequent coordination meetings with key staff of each discipline.	Contractor	*note status	To be mitigated during construction phase.	0	35
2.6	Contractor not complying to Occupational Health and Safety requirements	Delay project, injuries on site, possible legal action against the client	7	4	28	Compile detailed Health and Safety Specification and risk assessment for tendering purposes. Selection of Contractor partly based on Health and Safety records. Appoint suitable health and safety agent to audit and monitor the Contractor's health and safety processes.	Consultant	*note status	To be mitigated during construction phase.	20	22.4

2.7	Non-compliance to environmental management plans	Project delay and environmental harm	7	4	28	Identify non-compliance problems and adequate measures to deal with them. Monitor management and plant maintenance to prevent non-compliance occurring.	Contractor	*note status	To be mitigated during construction phase.	15	23.8
2.8	Non-compliance with authorisations and licences	Delay and cost	7	4	28	Daily monitoring of construction activities.	Contractor	*note status	Decision made to allow for full time construction monitoring.	0	28
2.9	Communication problems with contractor	Delay project	5	4	20	Ensure that contractor representatives are fully conversant in official language of contract.	Contractor	*note status	To be mitigated during tendering phase.	0	20
2.10	Lack of relevant experience by appointed Contractor	Delay in construction	7	4	28	During the documentation stage, the evaluation criteria must be well-defined and implemented during evaluation stage	Contractor	*note status	To be mitigated during tender evaluation phase.	0	28
3	Commercial Risks										
3.1	Imbalanced risk allocation.	Excessive cost contingencies, inadequate provision for risks, retendering and/or delay.	8	5	40	Develop a balanced risk management strategy. Ensure clear and balanced risk identification, description, quantification, assessment, mitigation and allocation.	Contractor	*note status	To be mitigated during tender phase	0	40
3.2	Longer than anticipated tender evaluation and negotiation.	Project delay.	6	7	42	Well balanced and thorough bidding documents and evaluation criteria. Close collaboration within evaluation team can reduce time to achieve selection.	CCT	*note status	To be mitigated during tender phase	0	42
3.3	No tenders are submitted to complete the specified work.	Project delay.	7	2	14	Project scope to be drafted in a method that ensures local tenders can complete the specified work.	Consultant	*note status	To be mitigated during conceptual design phase of the Project.	0	14
3.4	Contractor bankruptcy	Delays and additional costs	8	4	32	Identify financial problems early, assist contractor with financial management & cash-flow.	Contractor	*note status	To be managed during construction stage.	0	32
3.5	Construction Contractors not performing	Delay project	8	5	40	Careful adjudication and assessment of the Contractor's capabilities. Careful and realistic programming, with critical paths, key performance monitoring.	Contractor	*note status	To be mitigated during construction phase.	0	40
3.6	Possible manipulation of the prices by the suppliers	Cost	6	4	24	Negotiating with suppliers.	CCT/Consultant	*note status	Market related prices to be verified prior to appointment of contractors.	0	24
4	External Risks										
4.1	Extreme weather (Flooding of structures and fewer working days)	Cost and delay project	6	1	6	Advance investigation and route planning. Upgrading where necessary	Contractor	*note status	Construction program to allow for adverse weather conditions.	0	6
4.2	Power outages (planned and unplanned) may result in interrupted construction.	Additional cost and delays	5	5	25	Power outage plan and mobile generators	Contractor	*note status	To be mitigated during tendering phase.	0	25
4.3	Further weakening of the ZAR	Cost	5	4	20	Identify windows for ordering imported equipment and optimise timing in terms of upward or downward trends.	Contractor	*note status	To be mitigated during tendering phase	0	20
4.4	Theft	Additional cost and delays	7	5	35	Ensure and monitor security arrangements made by the contractor on site.	Contractor	*note status	To be mitigated during tendering phase	0	35
4.5	War/sabotage	Delays, cost	7	1	7	Robust security and control systems to be allowed for in construction contract.	Contractor/ CCT	*note status	Adverse event which cannot be mitigated	0	7

