Eskom	MATLA POWER STATION SCOPE OF WORK	Template Identifier	240-43921898	Rev	6
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PLANT AREA: Matla Power Station TITLE: Scope of Work for supply and delivery of raw water pre-treatment chemicals for Potable production at Matla Power Station on an as and when required basis. for a period of 5 years.			
REF: MEP-051315	Reference Rev No:1	MULTIDISCIPLINARY: No	Plant Level: All
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GENERAL

- Data books, reviews, reports and diagrams/drawings shall be submitted to Engineering after the completion of the work. Engineering to forward the data books to Quality Department (Document Control)
- All QCP's to be submitted to Engineering and Quality for approval prior to outage/project or maintenance work commencement.

	SCOPE OF WORK DESCRIPTION / ACTIVITY	PROCEDURE, SPECIFICATION, ENG. REQUIREMENTS / DOCUMENTATION	HOLD POINTS, WITNESS, REPORTS	RESPONSIBLE PARTY
1.	**SYSTEM DESCRIPTION**			
1.1	**EXECUTIVE SUMMARY** Raw water from dams or rivers contains organic as well as inorganic compounds which can be both dissolved and suspended Organic compounds if not removed from water can form algae in clarifiers, foul sand filters and form carcinogenic Tri-halo-methanes (THM) when water is chlorinated to remove microorganisms These organic and inorganic compounds can be minimised through the pre-treatment process which consists of coagulation, flocculation, clarification and sand filtration The main purpose for the pre-treatment process is to reduce suspended solids (turbidity) to <3.0 NTU as well as to reduce the total organic carbon (TOC) by at least 40% from raw water (clarifier outlet) In			

	Eskom water is treated using pre-treatment chemicals such as coagulants and flocculants Typical coagulant types mainly used in Eskom for raw water pre-treatment include aluminium based chemical compounds such as aluminium chloro-hydrate (ACH) as well as poly aluminium chloride (PACl) Typical flocculants used in Eskom which are normally referred to as polyelectrolytes or polymers in industry and are usually high molecular weight, synthetic organic polymers, produced by the polymerisation of one (homopolymer) or more (copolymer) types of monomer units. Since the type and number of monomer units can be varied during the manufacture of polyelectrolytes, a wide variety of polymers can be produced In addition to this the polymer chains can be linear, branched or cross-linked, adding to their complexity. They can contain both negatively and positively charged sites and this characteristic is used to classify them as, cationic, anionic, and non-ionic Cationic polyelectrolytes are mostly used in Eskom as primary flocculants.			

1.2	**FLOW DESCRIPTION (see Appendix A for basic flow diagram):** 1 Matla Power Station has two (2) clarifiers for pre-treatment of Potable water production 2. Potable water is produced via a clarifier and can treat water sources from the Usutu or the Vaal water or a blend of the two types. Matla P/S mainly uses the Vaal water currently and treat the water through the Potable water clarifier 3. The pre-treatment dosing system consist of 3 x 5000 L dosing tanks. Two tanks are utilised for polyelectrolyte, while one tank is utilised for coagulant storage 4. The tanks feed to the chemical dosing pumps. There are 2 pumps available for polyelectrolyte dosing and 2 pumps available for coagulant dosing. The chemicals are dosed separately directly into the raw water supply pipeline to the Raw water clarifier 5 The distance between the coagulant and polyelectrolyte dosing points in the raw water line to the Potable clarifier is 30 cm 6. The streaming current sample line is situated 20 m from the polyelectrolyte dosing point. 7. There is an option to move the existing polyelectrolyte dosing point to the current sample line for streaming current (20 m downstream) and move the sample line to an available point 10 m downstream (see drawing in Appendix A) from that point 8. The Potable clarifier is downstream from the SC analyser. 9. The potable sandfilters are downstream of the potable clarifier and are of horizontal pressure type, provided with a layer of sand for filtration.			

10 Chlorine is dosed after the filtration step on the line heading to the terrace potable head tank Chlorine dosing is between 0.3 – 0 9 ppm

11 From the potable head tank the water is distributed throughout the power station

1.3 SYSTEM INFORMATION:

Potable water clarifier (clarifier utilised currently)

Type. Sludge blanket recirculation type called an Accelerator type clarifier

Diameter	23 m
Depth	4 4 m
Volume	1800 m^3
Minimum Flow	100 m^3/h
Maximum Flow	· 660 m^3/h
Average Operating Flow	250 m^3/h
Retention Time	7 2 h (@ flow 250 m^3/h
Operating Temperatures	. 8 - 21 ° C (min/max)

Raw water clarifier (backup clarifier to be utilised)

Diameter	45m
Depth	. 6.0m
Volume	8300 m^3
Minimum Flow	· 500 m^3/h
Maximum Flow	3900 m^3/h
Average Operating Flow	500 m^3/h
Retention Time	· 16 6h @ flow 500 m^3/h)
Operating Temperatures	· 26–37 °C (min/max)

1.4	**OTHER DOSING CHEMICALS:**	Chemical Dosing equipment (automatically controlled based on proposed treatment regime) Piping · PVC class 16 Pressure B Tanks 3 x 5000 L (2 x poly & 1 x coag) Dosing Pumps . 4 x ProMinent Motor-Driven Metering Pump Sigma/ 1 (2 x pumps for poly and 2 x pumps for coagulant dosing) Dosing pump motor : 100 – 230 V; 50/60 Hz 130 W, 2 2-1.2 A 1500 rpm Dosing pump design 20 L/h, 20 bar Dosing pump type · SICAH12017PVT8010UA01000 Chemical Analyser · Ion charge analyser Chlorine gas as post treatment downstream of the potable clarifier and sandfilters.		

2.	**Detailed requirements**			
2.1	Supply and deliver the required coagulant and flocculent (polyelectrolyte) for optimal removal of suspended solids, colloidal material and NOM from raw water (quality provided in Appendix A) in the pre-treatment process.			
2.2	The proposed chemicals should deliver the following results Clarifier outlet TOC removal must be greater than 40% relative to the raw water and the clarifier outlet turbidity should be less than 3.0 NTU			
2.3	All chemicals selected must comply with the relevant SANS standards SANS 50881, SANS 50883, SANS 51407; SANS 51409, SANS 51410 & should be registered with the National Sanitation Foundation (NSF)			
2.4	The supplier service should include commissioning of the proposed system, monitoring of storage and dosing equipment, performing jar test on a monthly basis to optimise treatment and provide technical support and training as and when required.			
2.5	The supplier should provide technical support during the contract duration in order to assist with optimisation of plant performance. The impact of seasonal changes on the effectiveness of the pre-treatment chemicals quality should be considered			
2.6	The coagulant and flocculent shall be dosed as separate products and not as a single product (no blends – i.e Coagulant and flocculent in one product) and both chemicals should be in the liquid phase.			

2.7	The supplier should indicate the optimal dosing distance between the coagulant and flocculent chemicals for optimal mixing and working of the chemicals			
2.8	The process shall be optimised for each of the chemicals to ensure that no under/over dosing of the polyelectrolyte occurs (polyelectrolyte/flocculants dosing shall not exceed 1 mg kg^{-1})			
2.9	The proposed coagulant must be either Polyaluminium Chloride (PACl) or Aluminium Chlorohydrate (ACH) based			
2.10	The supplier should provide a detailed 16 points Material Safety Data Sheet (MSDS) with a South African contact number for each chemical. The MSDS must state the main active ingredient and the concentration thereof.			
2.11	The suppliers shall provide Certificate of Analysis (COA) including but not limited to Color, pH and specific gravity (SG) with every delivery of pre-treatment chemicals			
2.12	All chemical containers shall have an identifying label that includes as a minimum the substance name, shelf life or expiry date, appropriate hazard warnings and identification of manufacturer or distributor			
2.13	Chemicals to be delivered in Original Equipment Manufacturer (OEM) containers, no repackaging allowed.			
2.14	The suppliers should take raw water samples from the station and conduct tests to establish which pre-treatment chemicals would be			

	best suited for optimal treatment of the raw water (effectivity to reduce turbidity and TOC from raw water)			
2.15	The contractor should submit a proposal report stating the optimal treatment regime for raw water treatment to meet the specified limits. The proposed chemicals should not cause any damage or blockages in any parts of the potable treatment and distribution system If the test was successful as per the technical requirements, the supplier will be allowed to continue to the plant trail period	The tender documents must contain Jar Test results which will guide the station in deciding if the suppliers recommendation chemicals are capable of meeting the required performance. The jar test should be done in accordance with the ASTM Method D 2035· Standard Practice for Coagulant-Flocculation Jar Test of Water The result must indicate the performance of the chemicals, dosing rate and the treatment price as Rand per Mega Litre (R/ML) of raw water treated The recommended dosing rate must be within the limitation of NSF/ANSI 60 Certification and/or SANS Compliance for each chemical The RT&D test report will be used to support the rating given to each supplier during the test phase		
2.16	The plant trail period should allow the supplier to demonstrate the effectiveness of the suggested products. The time of the test period will be negotiated An order will be placed at the quoted rates for the test period to treat the specified volume The supplier should provide own dosing equipment during the test period	Suppliers who are granted access for pre-contracting trials should compile and submit a report of the outcome covering the timeline of the trial. The performance of each supplier will be based on the analytical results, technical support and state of the clarifier during the trial period The RT&D trials report will be used to support the rating given to each supplier after trials		
2.17	All drums and tanks of chemicals must be labelled with the name, use and safety information of the chemical. Contact names must be available in the event of a chemical spill			
2.18	The supplier must conduct periodic site visits to ensure that the specified chemicals are being dosed optimally and the desired treatment outcome is achieved			

2.19	The supplier should mention all previous work conducted with similar SOW requirements and plant equipment as per Matla Power Station.	Details to be included in each reference mentioned in the previous work report: (1) Name of plant and water source; (2) Raw water quality, (3) Clarifier outlet % Turbidity removal, (4) Clarifier outlet % TOC removal; (5) Dose rate and treatment cost R/ML; (6) Details for contact person which includes - name, telephone numbers and company name.		
2.20	The technician allocated to site will be responsible for assisting station chemist with troubleshooting and optimisation of the pre-treatment plant. It is expected that the supplier's technician to be of higher technical expertise tan station chemist to be able to advise when there are challenges on the plant Changes of the allocated technician during the life of the contract should be in consultation and approval of the Eskom Services manager	The potential suppliers will be required to attach the detailed CV of the allocated technician for station to evaluate if the technician has the necessary experience to support site staff The technician shall have a Matric plus 3 years technical qualification with at least 5 years related experience on pre-treatment plants of similar design		

BILL OF MATERIAL

	Full description Material/Spares/Equipment	Specifications of Material/Spares/Equipment	Stock No	Part Number	Required Quantity
1	1 x coagulant chemical	Polyaluminium Chloride/Aluminium Chlorohydrate based			As per supplier specifications
2	1 x flocculant/polyelectrolyte chemical				As per supplier specifications

APPENDIX A

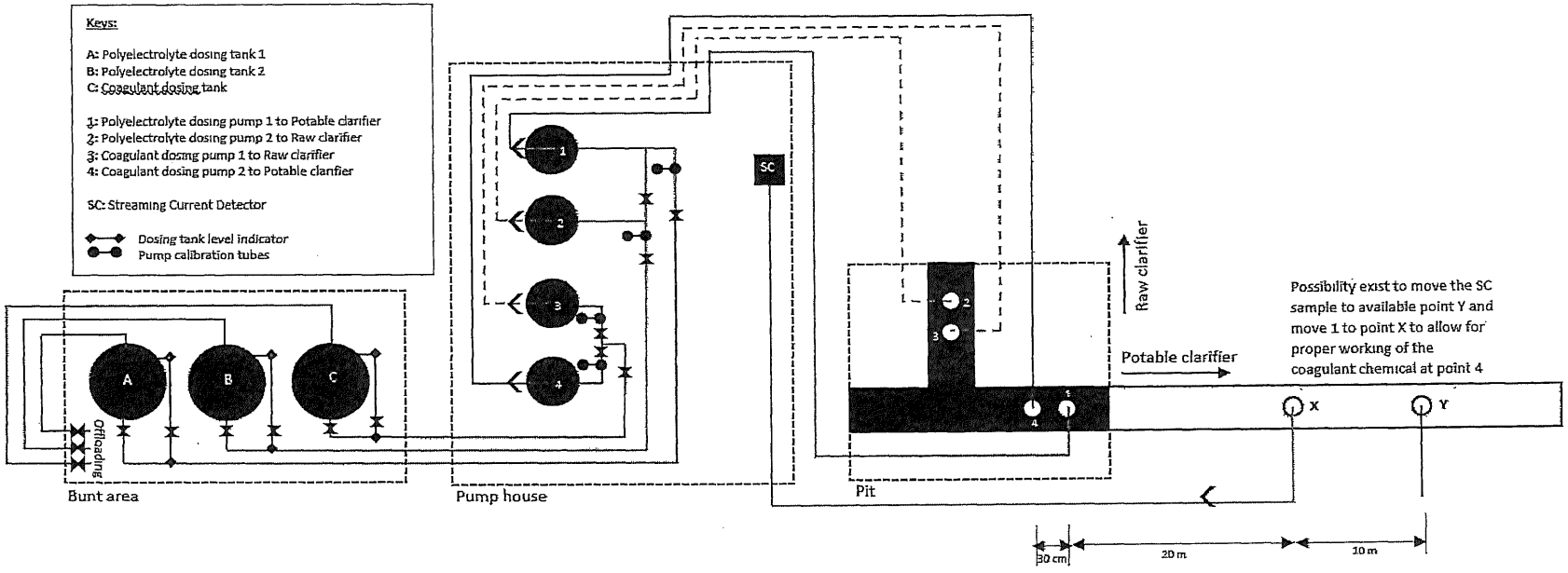
Raw water quality (95th percentile data from Jan 2018 – Feb 2021)

Parameter	Unit	Value
Turbidity	NTU	46
pH		8 6
Conductivity	uS/cm	326
M-alkalinity	mg/kg $CaCO_3$	98
Calcium hardness	mg/kg $CaCO_3$	54
Magnesium hardness	mg/kg $CaCO_3$	59
Total hardness	mg/kg $CaCO_3$	113
Sodium, Na	mg/kg	22
Potassium, K	mg/kg	8
Reactive Silica, SiO_2	mg/kg	15
Chloride, Cl	mg/kg	14
Sulphate, SO_4	mg/kg	47
EMA		60
Organic Acid, OA		13
Langelier Index, LI		0 4
Total Organic Carbon (TOC)	mg/kg	9

Potable water clarifier specifications

Parameter	Unit	Spec	Target
Sludge	%	5 - 10	6 - 8
Turbidity	NTU	3	<3
Pre-Chlorine	Mg/L	<0.1	Trace
TOC removal	%	40	>40
Aluminium residual	$\mu g/kg^{-1}$ as Al		<300

PROCESS FLOW DIAGRAM FOR THE SOUTH POTABLE AND RAW WATER CHEMICAL PRE-TREATMENT PLANT



SCOPE COMPILATION REFERENCES				
SOURCE & Ref No.	Yes	No	N/A	Comments
Previous outage service reports				
Return to service data packages				
Maintenance Strategy with Rev number				
SAP defects (attach list as appendix)				
GHRMS (STEP) reports (Generation Heat Rate Management System)				
Online Condition Monitoring				
Pre-outage performance test results				
Post outage performance test results				
GPSS/ Plant Performance data on UCLF incurred				
OMS / IIRMS recommendations (Audits Reports)				
Risk controls (IRM system)				
Previous audits and reviews (e.g. ERAP)				
Engineering Change Requests (Projects)				
LOPP strategy reports				
URS				
Philosophy (Outage)				
Condition Monitoring Report				

VA/PHD Viewer trends				
Corrective Actions				
CARAB reports				
Statutory Requirements				
Grid code requirements				
Waivers and Exemptions				
Calibration requirements				
Previous Outage SOW variations				
Post Mortems Actions from previous outages				
Pre–Outage plant walks				
Risk based inspection (RBI) report				
Simulation, TOIs, OON, SI				

COMMENTS

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