

THUNE DAM WATER TREATMENT WORKS – MECHANICAL WORKS

Ministry of Land Management, Water and Sanitation Services
Programme Management Office

SUMMARY OF WORKS	
Type of Works	Water Treatment Works
Location of Works	Botswana
Size of Works	12 ML/D
Date of Award	8 July 2015
Date Completed	August 2018
Completion Value (No VAT Applicable – Botswana Contract)	R 44 276 420.97
Client	Excavator Hire
Conditions of Contract	FIDIC

The 90'000'000 cubic meters capacity Thune dam is located on the Thune river upstream from its confluence with the Motloutse. The dam is situated in relatively flat country, and has an average depth of about 15 meters. The dam construction was completed in April 2013.

The Water Treatment Works constructed at the dam supplies drinking water to several villages in the Bobirwa area, and irrigation water to an agricultural project near Mathathane. Water is delivered to the villages of Bobonong, Motlhabaneng, Mathathane, Tsetsebjwe, Mabolwe, Semolale, Gobojango, Lepokole and Molalatau.

The raw water supply to the Water Treatment Works flows from the dam intake tower via one or more electrically actuated valve, positioned at different levels, through to a series of sleeve valves, to discharge water in the river downstream of the dam, or via a feed line to either the Raw Water Pump station or directly to the head of works under gravity conditions (dependent on the level of the dam).

From the head of works, the water undergoes clarification, followed by sand filtration and finally disinfection. The treated water is pumped from the sand filters to a treated water storage reservoir from where pumps supply potable water to Mathathane and Molalatau villages respectively. From The Molalatau village, water is further transported via ductile iron rising mains to Bobonong and Gobojango villages respectively.

Water discarded from the processes of clarifier sludge discharge and filter backwashing, which accumulates at a central sludge water storage dam system, is partially recovered by means of pumping the supernatant water at the sludge dams back to the head of works.

The project is a greenfields project and the capacity of the works is approximately 12 Mℓ/day raw water intake volumetric flow rate with an estimated potable water supply capacity of roughly 11 Mℓ/day. The extent of the project includes construction works of civil, structural, mechanical, electrical and control and instrumentation related components but PCI AFRICA only did the mechanical works.

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The Project scope included mechanical aspects of design, selection, manufacture, factory testing, delivery to site, installation, testing and commissioning of the following:

MECHANICAL

- Raw Water Pump Station and Flow Control to Head of Works
 - Supply and installation of 2 number of WTP Feed Pumpsets (RW)
 - Supply and installation of 2 number of Irrigation Pumpsets (RW)
 - Supply and installation of 1 number of Surge Vessel for Irrigation rising main pipeline.
 - Supply and installation of one suction and one discharge isolation butterfly type manually operated valve per each pumpset.
 - Supply and installation of one discharge reflux type (non-return) valve per each pumpset.
 - Supply and installation of one suction and one discharge pressure gauge per each pumpset.
 - Supply and installation of one 6-ton overhead crane, with Crane bridge and Monorail hoist, comes with electric motors with external electromagnetic fail safe brakes, variable speed drives on all motions, in-line helical gearboxes, ropes and rope drums, rigging equipment and controls.
 - Supply and installation of several access platforms and bridges.
 - Supply and installation of 2 number of gland leakage pumps.
 - Supply and installation of 1 number of flow control valve with modulating actuation for raw water plant feed control.
 - Supply and installation of 2 number of isolation valves with digital actuation for switching between gravity and pressurised raw water plant feed.

- Sedimentation Tanks and other Raw Water Inlet components
 - Supply and installation of 28 number of effluent collection launders to convey the sedimentation tank overflow to the filtration modules.
 - Supply and installation of 40 number of digitally controlled electrically actuated resilient seated gate valves to maintain sludge blanket thickness at the bottom of the sedimentation tanks.
 - Supply and installation of 4 number of raw water inlet sluice gates to isolate the four trains of sedimentation lanes.

- Chemical Dosing at Head of Works
 - Supply and installation of 2 number of coagulant (poly) plinth mounted dosing stations (benches) with pipework, valves, calibration columns, pressure holding valves, pressure transmitters, 500 litre day tanks, magnetic flow meters, ultrasonic level transmitters, vertical shaft day tank mixers, with electrical control panels in stainless steel cabinet.
 - Supply and installation of 2 number of bulk coagulant (poly) 10'000 litre storage tanks with ultrasonic level transmitters and transfer pumps (to pump to day tanks).
 - Supply and installation of 2 number of powder activated carbon wall mounted dosing stations (benches) with water supply lines, pipework, valves, calibration columns, pressure holding valves, pressure transmitters, 5'000 litre concrete make-up tanks, bag loaders, magnetic flow meters, ultrasonic level transmitters, vertical shaft day tank mixers, one dust extraction system with dust extraction ducts, with electrical control panels in stainless steel cabinet.
 - Supply and installation of 2 number of powdered lime wall mounted dosing feeders with water supply lines and vortex type mixing bowls, pipework, valves, bag loaders, one dust extraction system with dust extraction ducts, with electrical control panels in stainless steel cabinet. This is supplied with one mobile access platform and pallet jack.
 - Supply and installation of 2 number of 1.5-ton overhead cranes, with Monorail hoists, comes with electric motors with external electromagnetic fail safe brakes, variable speed drives on all motions, in-line helical gearboxes, ropes and rope drums, rigging equipment and controls.

- Sand Filtration
 - Supply and installation of 2 number of Sand Filter Backwash Pumpsets.
 - Supply and installation of 2 number of Clear Water Pumpsets.
 - Supply and installation of one suction and one discharge isolation butterfly type manually operated valve per each pumpset.
 - Supply and installation of one discharge reflux type (non-return) valve per each pumpset.
 - Supply and installation of one suction and one discharge pressure gauge per each pumpset.
 - Supply and installation of one 2.5-ton overhead crane, with Monorail hoist, comes with electric motors with external electromagnetic fail safe brakes, variable speed drives on all motions, in-line helical gearboxes, ropes and rope drums, rigging equipment and controls.
 - Supply and installation of 1 number of gland leakage pump.
 - Supply and installation of 40 number of 1200 x 1200 PCI Monolithic false floor panels, 28 number of 1200 x 600 PCI Monolithic false floor panels, 4 number of 600 x 600 PCI Monolithic false floor panels.
 - Supply and installation of 660 number of PCI Filter nozzles with associated stems, domes and nuts.
 - Supply and installation of 4 number of electrically actuated settled water inlet sluice gates to isolate the four trains of filter basins.
 - Supply and installation of 4 number of electrically actuated backwashed water outlet sluice gates.
 - Supply and installation of 4 number of electrically actuated modulating filtered water outlet sluice gates to maintain filtered water outlet volumetric flow.
 - Supply and installation of 4 number of electrically actuated settled backwash water inlet sluice gates to isolate the four trains of filter basins when a backwash is initiated on a specific filter.
 - Supply and installation of 4 number of electrically actuated settled air inlet sluice gates to isolate the four trains of filter basins when a backwash is initiated on a specific filter.
 - Supply and installation of one flow switch per each pumpset.
 - Supply and installation of one suction and one discharge pressure switch per each pumpset.

- Filtered Water Disinfection
 - Supply and installation of 1 number of Chlorine Dioxide make-up skid unit for Chlorine Dioxide preparation with 4'600 litre chlorine dioxide storage tank. The make-up system comes with residual chlorite and residual chlorine dioxide membrane sensors and transmitters as well as GMS fume detector with battery back-up. The installation further comprises of a sample pump including pipes and valves and a back-up booster pump (supplied loose) as well as a handheld residual tester for chlorine dioxide and chlorites.
 - Supply and installation of 1 number of Chlorine Dioxide dosing bench (plinth mounted) with pipework and valves, pulsation damper, calibration column, pressure holding valve, magnetic flow meter and electric control panel.
 - Supply and installation of safety equipment including a safety shower with eye wash, safety suits and gear and a safety box (wall mounted).
 - Supply and installation of extraction fan with gravity louver for chlorination building.
 - Supply and installation of 2 number of 1'000 litre flow bins for storage of sodium chlorite (24.5 % NaClO₂) and hydrochloric acid (30 – 38 % HCl) serving as supply chemical tanks, piped up to feed to make-up station. These two tanks comes with manual chemical transfer pumps to be used to transfer chemicals from supplier containers to flow bin tanks.
 - Supply and installation of Dosing point and piping linking the dosed product to the point of dose.

- Treated Water Storage (Clear Water Reservoir area)
 - Supply and installation of several piping to supply treated water into the reservoir
 - Supply and installation of several piping to abstract treated water away from the reservoir
 - Supply and installation of overflow and scour piping and valves
 - Supply and installation of a three-way valve chamber to allow for future extension for a second clear water reservoir if needed.

- Treated Water Distribution (Clear Water Pump Station and related)
 - Supply and installation of 2 number of Pumpsets to transfer treated water to Mathathane village.
 - Supply and installation of 2 number of Pumpsets to transfer treated water to Molalatau village and Molalatau Pump Station reservoir.
 - Supply and installation of 2 number of Pumpsets to transfer treated water to the Elevated Storage tank on the WTW for plant potable water storage and use.
 - Supply and installation of 1 number of Surge Vessel for Molalatau supply rising main pipeline.
 - Supply and installation of one suction and one discharge isolation butterfly type manually operated valve per each pumpset.
 - Supply and installation of one discharge reflux type (non-return) valve per each pumpset.
 - Supply and installation of one suction and one discharge pressure gauge per each pumpset.
 - Supply and installation of one 2.5-ton overhead crane, with Crane bridge and Monorail hoist, comes with electric motors with external electromagnetic fail safe brakes, variable speed drives on all motions, in-line helical gearboxes, ropes and rope drums, rigging equipment and controls.
 - Supply and installation of several access platforms.
 - Supply and installation of 1 number of gland leakage pump.

- Further (secondary) Treated Water Distribution (Molalatau Pump Station and related)
 - Supply and installation of 2 number of Pumpsets to transfer treated water to Bobonong.
 - Supply and installation of 2 number of Pumpsets to transfer treated water to Gobojango village.
 - Supply and installation of 1 number of Surge Vessel for Bononong supply rising main pipeline.

- Supply and installation of one suction and one discharge isolation butterfly type manually operated valve per each pumpset.
- Supply and installation of one discharge reflux type (non-return) valve per each pumpset.
- Supply and installation of one suction and one discharge pressure gauge per each pumpset.
- Supply and installation of one 2.0-ton overhead crane, with Crane bridge and Monorail hoist, comes with electric motors with external electromagnetic fail safe brakes, variable speed drives on all motions, in-line helical gearboxes, ropes and rope drums, rigging equipment and controls.
- Supply and installation of several access platforms.
- Spent backwash water and handling of general effluent
 - Supply and installation of 2 number of submersible pumps to transfer recovered supernatant water back to the head of works.
 - Supply and installation of one discharge isolation butterfly type manually operated valve per each pumpset.
 - Supply and installation of one discharge reflux type (non-return) valve per each pumpset.
 - Supply and installation of one suction and one discharge pressure gauge per each pumpset.
 - Supply and installation of 4 number of sluice gates to divert spent backwash water and sedimentation tank sludge discharge water to the sludge pond of choice.

The Contract was awarded to PCI in July 2015 and completion envisaged August 2019.

The contract sum was approximately 30 Million BWP (Pula)

Rapid Gravity Sand Filter prior to media loading:



Bulk polymer transfer



Polymer dosing make-up



Clear Water Pump Station



Surge Vessel installation



Molalatau Pump Station



Raw Water Pump Station



Sedimentation Tanks

