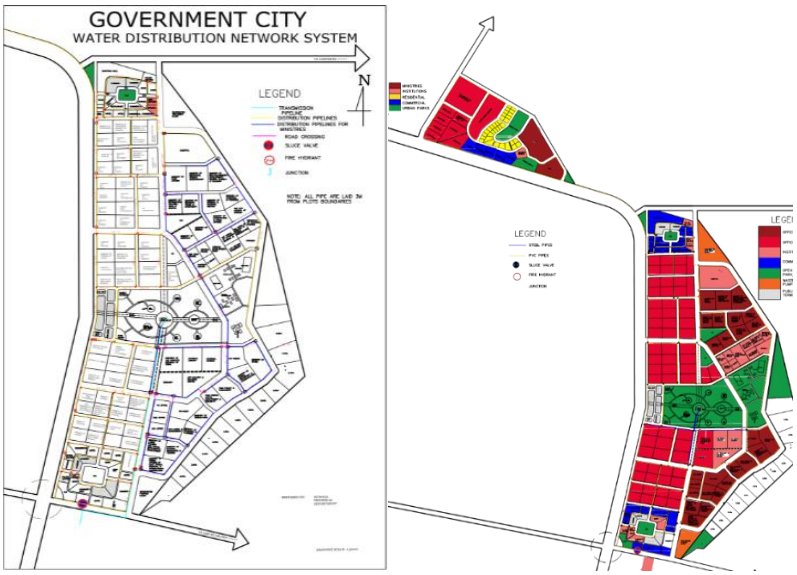
DODOMA URBAN WATER SUPPLY AND SANITATION AUTHORITY (DUWASA)

CONSTRUCTION OF DISTRIBUTION NETWORK SYSTEM AT NEW GOVERNMENT CITY (Phase 1 Ministries Office) - IHUMWA, DODOMA 15.05.2019



PROJECT COMPLETION REPORT

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1.0 INTRODUCTION

1.1 Project brief:

Although, the Government city constitutes the whole of Dodoma where Government functions will be located, Ihumwa area was selected to be the area/centre for Government functions.
The Mtumba site is located about 17 kilometres from Dodoma city centre. It covers a total area of 617.15 hectares, which includes 334.36 hectares of Mahoma Makulu and the whole area is already compensated for the Government city use. The site shares its borders with Ihumwa Army camp to the west, Mtumba settlement to the north and east and the Dar es Salaam highway to the south (Map 2.1). The site is easily accessible from Dodoma city centre through the Dar es Salaam-Dodoma Road. The site is also accessible through motor able tracks that traverse through the site northwards and eastward

Existing Situation

Water for the Government city rely on underground water source of Ihumwa basin. In this endeavour, 7 boreholes have been drilled in Ihumwa. These boreholes have discharge total of 175m3/hr, which meets the demand of the City. DUWASA also has already conducted Geophysical survey and acquired The Contractor (DDCA) for drilling additional three boreholes at Ihumwa in order increase water production. Fortunately, the Local Government of Ihumwa has handed over their borehole which make the total number of borehole to be 8.

Ihumwa Wellfields Source

Reference numbers of boreholes and their yield capacity is shown in Table 1.

Table 1

Borehole Ref. No.	Year of Drilling	Borehole Capacity (m^3/hr)
DO.45/17	2017	20.8
DO.295/17	2017	11.31
DO.75/18	2018	45
DO.76/18	2018	8.5
DO.77/18	2018	16.56
DO.78/18	2018	7.92
DO.79/18	2018	45
DO.60/82	1982	20
Total Capacity		**175.09**

Table 1: Yield Capacities of the Boreholes at Ihumwa

Table 2: Specifications of the pipes used

Diameter (mm)	Material	Pressure (PN)	Quantity (no.)	Total distance (m)
300	Steel	12	93	924
250	PVC	10	77	450.46
200	PVC	10	130	750.71
160	PVC	10	566	3283.17
75	PVC	10	928	5380.24
Total				**10788.58**

1.1.1 General

The Construction Contracts were three in number, detailed in table 3

Table 3: Contracts involved during project implementation

Contractor	Description	Contract Sum (Tshs.)	Contract Commencement date	Agreed completion date
M/s Mia Brothers	• Trench excavation and backfilling, 11,297m • Construction of 27 Chambers • Construction of 113 Mark posts	**72,323,380**	20/01/2019	17/02/2019
M/s Oriental Construction Company Ltd.	• Route Clearance- 2362m^2 • Excavation in normal soil, 341m^3 • Rocky Excavation- 793m^3 • Supply and Install steel pipes DN 300, 942m	**290,652,834**	25/01/2019	25/03/2019
Total		**362,976,214**		

1.1.2 Scope of works:

Works involved site clearance, trench excavation and back filling, pipe laying, installations of various pipe fitting (*Air valves, flanged adaptors, Tees, Bends, spigots and Sluice valves*), construction of valve chambers, reinforced concrete anchor blocks and installation of water pipe line Mark post.

1.1.3 Source of finance:

The project was financed jointly by the Ministry of Water (MoW) and Dodoma Urban Water Supply and Sanitation Authority (DUWASA). It is up to now known that MoW is financing the part of Steel pipeline from the 1000m^3 Tank at the Government City Hill to J1 and J2.

DUWASA using its in-house project funds, financed the rest of the project, including procurement of pipes and fittings, transportation costs, Supervision and labourer costs, as well as procurement of M/s Mia Brothers Company Ltd, who executed trench, chambers and Mark posts.

1.1.4 Administration:

The project was administered by the Technical Department represented by the Technical Manager and other junior staff of DUWASA.

1.1.5 The Contractors:

The Contract was initially signed between Dodoma Urban Water Supply and Sanitation Authority (DUWASA) and M/s Oriental Mia Brothers Company Limited. Fortunately, M/s Oriental Construction Company Limited was implementing the Project of Construction of Collector pipes, Transmission main, Water sump and Water storage tank for the New Government City at Ihumwa, and DUWASA took the advantage of the situation and offered them additional work. The scope of additional work was more similar to their original contract, thus made it easier and also speeded up the project. *See table 1.2*

1.1.6 Technical Department team:

The Technical Department team carried out day to day supervision of works on behalf of the Client - The Dodoma Urban Water Supply and Sanitation Authority (DUWASA) P.O. Box 431, Dodoma, Tanzania.

1.1.7 Technical Staff and Activities:

Table 4 Composition team involved in the project execution:

Name	Title	Participation
Eng. David Pallangyo	Managing Director	The Employer
Eng. Kashilimu Mayunga	Technical Manager	The Project Manager
Eng. Norbert Mwombeki	Civil Engineer	Project Engineer
Eng. Oscar Bakari	Operations Engineer	Supervisor
Eng. Orest John	Environmental Engineer	Supervisor
Evance Willhelm	SEAP Trainee	Site Engineer
Muksin Mbaraka	Plumber	Plumbing
Pascal Innocent	Plumber	Plumbing
Musa Said	Plumber	Plumbing
Yohana Madinda	Plumber-Trainee	Plumbing
Isaya Semundi	Plumber-Trainee	Plumbing
Deus Emiran	Plumber-Trainee	Plumbing

Major activities during the implementation of the project included: -

- Monitoring and general supervision of Works with respect to quality and adherence to specifications.

- Planning and preparation of daily working schedule including acquiring, handling, and transportation of PVC pipes and fitting to site.
- Installation of PVC Pipes and fittings
- Preparation of weekly progress reports.
- Measurement, evaluation and certification of the Contractors' works for Payment.
- Reviewing the design in order to suit the physical site situation.
- Preparation of Substantial Completion Certificates.
- Preparation of the Project Completion Report.

2.0 PROJECT DATA:

Table 5 : Project data

(a)	**Project: CONSTRUCTION OF DISTRIBUTION NETWORK SYSTEM AT NEW GOVERNMENT CITY (Phase 1 Ministries Office)**		
(b)	Project Costs in Tshs.	**Earthworks:**	
		Excavation & backfilling	56,331,360.00/=
		Materials:	
		• Pipes	492,347,767.00/=
		• Pipe fittings	84,228,130.96/=
		• Valve chambers and Anchors	18,360,000.00/=
		• Mark posts	8,480,000.00/=
		• Pipe Culvert (Sleeves)	7,375,000.00/=
		Other charges	
		• Labourer Costs	3,139,400.00/=
		• Food	3,650,000.00/=
		• Tools and Equipment	1,477,460.00/=
		• Stationary	70,000.00/=
		• Fuel	6,857,071.20/=
		Project Sum:	**682,316,188.00/=**
(c)	Financier	MoW and DUWASA	
(d)	Client	DUWASA	
(e)	Contractors	• M/s Mia Brothers Tanzania Ltd, P.O. Box 3305, DODOMA TANZANIA. • M/s Oriental Construction Company Ltd, P.O Box 48364 NAIROBI KENYA	
(g)	Commencement of works	20th January 2019 for Mia Brothers Tanzania Ltd. 25th January 2019 for Oriental Construction Company Ltd.	
(h)	Agreed Completion Date	17th February 2019 for Mia Brothers Tanzania Ltd. 25th March 2019 for Oriental Construction Company Ltd.	

3.0 PROJECT IMPLEMENTATION:

3.1 General:

The Government City Water Distribution Network is of Grid Iron type; thus its implementation was done starting from The Tank to different linked Nodes/Joints. The reticulated system contains **10788.58**m length supplying water to all 22 Ministries and 2 Institutions (E-Government and TARURA). Through the Contractors' hard working, works were substantially completed and handed over to the Client on 25th March 2019. All works were accomplished under the supervision of DUWASA Technical staff, stating from planning, designing, procurements, handling, transportation and installation of PVC pipes and fittings, using mostly in-house funds and some MoW.

3.2 Trench excavation and backfilling starting at the Tank to different Joints of the Grid.

3.2.1 Earth works:

3.2.1.1 Site Clearance:

The site clearance was done on several parts along the pipe line route/stretch. Since most of the rout was covered with dense shrubs, the use Backhoe Excavator was inevitable. The plant cleared 7,000m length with average of 5m width. The minimum width cleared along the route was 2m, and 35,000m^2 were cleared by Excavator, and 13,422.84m^2 was cleared by labourers before excavation of the trench.

3.2.1.2 Trench Excavation:

The trench excavations were done to the whole pipe line route/stretch as specified on contract agreement/ drawings, i.e. average of 1.2 m for depth and 1m for width. The total length of trench excavated was 10,230m, and among of that 284m was found to be of rocky, thus 341 m^3 was excavated.

3.2.1.3 Excavation of foundation bases for Chambers, Mark Posts and Anchor blocks:

The foundation bases for Chambers, Mark Posts and Anchor blocks executed on the specified parts of the system. All joints/Nodes have chamber and Anchors, while all bends have Anchors to prevent the effects of water hammering. Verification of necessary dimensions was carried out to ensure that the works performed conform to specifications.

3.2.1.4 Backfilling of the Trench:

The trench was back filled by using the excavated materials throughout the pipe line route. For rocky area, imported selected fill was used.

3.3 Pipe lying:

The pipe laying was done mostly by the in-house plumbers, and steel pipes was done through M/s Oriental Construction Company Ltd. Table 6 shows the break-down of the laid pipes;

Table 6: Details of the pipe laid

No.	Chainage/Joint	Pipe size and Material (mm)	Length (m)	Remarks
1	Tank-J1	300 (Steel)	279.8	As per the design criteria
2	J1-J2	300 (Steel)	643.9	As per the design criteria
3	J1-J11	250 (PVC)	450.5	As per the design criteria
4	J2-J17-J30	200 (PVC)	774.7	As per the design criteria
5	J10-J12-J16	160 (PVC)	768.1	As per the design criteria
6	J11-J10-J9	160 (PVC)	224.2	As per the design criteria
7	J9-J15-J8	160 (PVC)	265.3	As per the design criteria
8	J8-J7-J6	160 (PVC)	355.0	As per the design criteria
9	J6-J2	160 (PVC)	277.8	As per the design criteria
10	J2-J3	160 (PVC)	271.8	As per the design criteria
11	J19-J20	160 (PVC)	259.0	As per the design criteria
12	J19-J30	160 (PVC)	293.4	As per the design criteria
13	J21-J22-J20	160 (PVC)	634.1	As per the design criteria
14	J16-J14-J5	75 (PVC)	1353.4	As per the design criteria
15	J5-J4	75 (PVC)	332.7	As per the design criteria
16	J4-J3	75 (PVC)	335.6	As per the design criteria
17	J5-J6	75 (PVC)	240.1	As per the design criteria
18	J9-J13	75 (PVC)	414.6	As per the design criteria
19	J27-J28	75 (PVC)	639.9	As per the design criteria
20	J21-J23	75 (PVC)	333.1	As per the design criteria
21	J23-J24	75 (PVC)	175.7	As per the design criteria
22	J24-J25-J26	75 (PVC)	345.7	As per the design criteria
23	J19-J25	75 (PVC)	341.4	As per the design criteria
24	J26-J27	75 (PVC)	411.4	As per the design criteria
25	J28-J29	75 (PVC)	367.4	As per the design criteria
	TOTAL		**10788.6**	**App. 10.8 Km**

3.3.1 Installation of pipe fittings:

Installation of pipe fittings was done by the in house plumbers. To make future operation and maintenance easy, each joint was provided with at least one sluice valve for better control of the grid flow. Quantities of fittings were installed as shown in Table 3.2:

Table 7: Details of the installed fittings

Chainage (km)	Type of fitting and size	Quantity (Pcs)	Remarks
J1	• Push Fit /Flanged Tee (12" x 12" x 12") • Sluice valve (12"), • Flanged Reducer (12"- 10'') • Sluice Valve (10") • Flanged Adaptor 12" • Flanged Adaptor 10"	2 2 1 1 1 1	Four Direction Joint with both Steel and PVC pipes
J2	• Flanged Tee (12" x 12" x 12") • Sluice Valve (8") • Sluice Valve (6") • Flanged Reducer (12"- 8'') • Flanged Reducer (12"- 6'') • Flanged Tee (6" x 6" x 6") • Loose Flange 12" • Flanged Adaptor 8" • Flanged Adaptor 6	1 1 2 1 1 1 1 1 2	Four Direction Joint with both Steel and PVC pipes
J3	• Flanged Tee (3" x 3"x 3") • Flanged Reducer (6" - 3") • Sluice Valve (3") • Flanged Adapter (3") • Flanged Adapter (6") • Loose Flange Threaded (3") • Galvanised Plug (3")	1 1 1 2 1 1 1	Three Direction Joint, with only PVC pipes.
J4	• 45º flanged bend (3") • Flanged adaptor (3")	1 2	Change of pipe direction
J5	• Flanged Tee (3" x 3"x 3") • Sluice Valve (3") • Flanged Adapter (3")	1 1 3	Change of pipe line direction
J6	• Flanged adaptors (6") • Flanged Bend 45^0 (6") • Flanged Tee (6" x 6"x 6") • Flanged Reducer (6" - 3") • Sluice valve (3") • Flanged Adapter (6") • Flanged Adapter (3")	1 1 1 1 1 2 1	Valve chamber with bend.
J7 & J8	• Flanged adaptor (6") • Flanged Bend 90^0 (6")	4 1	Change of pipe line direction
J15	• Flanged adaptor (6") • Flanged Bend 450 (6")	2 1	Change of pipe line direction
J9	• Flanged Tee (6" x 3"x 6") • Flanged adaptor (6") • Flanged adaptor (3") • Sluice valve (6") • Sluice valve (3")	1 2 1 1 1	Three Direction Joint, with PVC pipes of different sizes.

J10	• Flanged Tee (6” x 6”x 6”) • Flanged adaptor (6”) • Sluice valve (6”)	1 3 2	Three Direction Joint, with PVC pipes of different sizes
J11	• Flanged Tee (10” x 6”x 10”) • Sluice Valve (6”) • Flanged Adapter (10”) • Flanged Adapter (6”) • Flanged Plug (10”)	1 1 1 1 1	Three Direction Joint, with PVC pipes of different sizes
J12	• Flanged Tee (6” x 3”x 6”) • Flanged adaptor (6”) • Flanged adaptor (3”) • Sluice valve (6”) • Sluice valve (3”)	1 2 1 1 1	Three Direction Joint, with PVC pipes of different sizes
J13	• Flanged Tee (3” x 3”x 3”) • Sluice Valve (3”) • Flanged Adapter (3”)	1 1 3	Three Direction Joint, with PVC pipes of same size
J14	• Flanged Tee (3” x 3”x 3”) • Sluice Valve (3”) • Flanged Adapter (3”)	1 2 3	Three Direction Joint, with PVC pipes of same size
J16	• Flanged Tee (3” x 3”x 3”) • Flanged Reducer (6” - 3”) • Sluice Valve (3”) • Flanged Adapter (3”) • Flanged Adapter (6”) • Loose Flange Threaded (3”) • Galvanised Plug (3”)	1 1 2 2 1 1 1	Three Direction Joint, with only PVC pipes.
J17	• Flanged adaptor (8”) • Flanged Bend 45^0 (8”)	2 1	Change of the pipe line direction
J30	• Flanged adaptor (8”) • Flanged adaptor (6”) • Flanged Reducer (8” – 6”) • Flanged Tee (6” x 3”x 6”) • Sluice Valve (3”)	1 1 1 2 2	Change of the pipe line size
J19	• Flanged Tee (6” x 3”x 6”) • Flanged adaptor (6”) • Flanged adaptor (3”) • Sluice valve (6”) • Sluice valve (3”)	1 2 1 1 1	Three Direction Joint, with PVC pipes of different sizes
J21	• Flanged Tee (6” x 3”x 6”) • Flanged adaptor (6”) • Flanged adaptor (3”) • Sluice valve (6”) • Sluice valve (3”)	1 2 1 1 1	Three Direction Joint, with PVC pipes of different sizes
J22	• Flanged adaptor (6”) • Loose Flange Threaded (6”) • Galvanised Plug (6”)	1 1 1	End of the line
J29	• Flanged adaptor (6”) • Loose Flange Threaded (6”) • Galvanised Plug (6”)	1 1 1	End of the line

J28	• Flanged Tee (3" x 3"x 3") • Sluice Valve (3") • Flanged Adapter (3") • Loose Flange Threaded (3") • Galvanised Plug (3")	1 1 3 1 1	Three Direction Joint, with only PVC pipes.
J27	• Flanged Tee (3" x 3"x 3") • Sluice Valve (3") • Flanged Adapter (3") • Loose Flange Threaded (3") • Galvanised Plug (3")	1 2 3 1 1	Three Direction Joint, with only PVC pipes.
J26	• Flanged adaptor (3") • Flanged Bend 90^0 (3")	4 1	Change of pipe line direction
J25	• Flanged Tee (3" x 3"x 3") • Sluice Valve (3") • Flanged Adapter (3")	1 2 3	Three Direction Joint, with PVC pipes of same size.
Air Valves	• Flanged Tee (8" x 4"x 8") • Flanged Tee (6" x 4"x 6") • Flanged Tee (3" x 3"x 3") • Flanged Adapter (8") • Flanged Adapter (6") • Flanged Adapter (3") • Sluice Valve (4") • Sluice Valve (3") • Air Valves (4") • Air Valves (3")	1 2 3 2 4 6 3 3 3 3	6 Air Valves. 1 on DN200 pipeline, 2 on DN150 pipelines, and 3 on DN75mm pipelines

3.4 Concrete and Masonry works:

3.4.1. Valve chambers:

The construction of valve chambers was done by The Contractor Mia Brothers Tanzania Ltd, under the close supervision of DUWASA's Technical Staff. The Construction followed the specifications and guidelines from the contract drawing provided by Engineers from DUWASA. All chambers with Tee were anchored, and sizes of Chambers differed from one another due to how many fittings the joint has. The more the number of fittings the larger the size of chamber. Sizes for different chambers are detailed in table 8 below.

Table 8: Details of the valve chambers.

Number of Chambers	Dimension of Valve Chamber			
	Leng (m)	Width (m)	Depth (m)	
15	1.5	1.5	1.5	Size for most chambers, as per the BOQ
1	2.5	5.22	1.9	Chamber for J2
2	2.4	1.9	1.8	Chambers with many fittings
3	1.5	1.5	1.8	Chambers with many fittings
1	4.7	2.7	1.9	Chamber for J1

3.4.2. Mark Post:

The construction of valve chambers was also done by the hired masonry for the whole project. Six valve chambers with minimum dimension of 2metre length, 2metres width and 2metres depth was constructed (see table 3.4).

4. 0 EQUIPMENT USED:

Table 9: List of equipment involved

Item	Type of Equipment	Qty
1	Toyota LandCruizer PRADO	1
2	Toyota Hilux Double Cabin	3
3	Tipper truck - ISUZU	1
4	Arc welding machine	1
5	Excavator – KOMATSU	1
6	Back hole Excavator - CATAPILLAR	1
7	Dynamic crane - IVECO	1
8	Compressor with Jack Hammer	1
9	Wire ropes	1
10	Spanners 19mm, 20mm, 24mm, and 32mm	8

5.0 CHALLENGES

- Delay in delivery of pipe fittings from suppliers. Some of the fittings such as sluice valves, flanged tapers and the air valves ordered took much time to be obtained for use. In some cases, a fabrication of some fittings was carried out in order to meet the dead line for project completion date.
- Excavation of trench in some areas particular was very difficult due to the hardness of the soil under Neath which lead us to spent more time contrary to the planned work schedule.
- Lack of Dedicated Transport for supervisors and materials. This caused daily delays in starting execution of daily activities, which caused delay in project completion.