

Umalwad Rural Water Supply Scheme
Village: Umalwad, Taluka: Shirol,
District: Kolhapur



Third Party Assessment Report

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1 Introduction

1.1 Project background

Kolhapur Zilla Parishad empaneled KIT's College of Engineering, Kolhapur as a third-party evaluator for technical inspection of the selected Rural Water Supply Schemes (RWSS) in the district. The overall aim of this assignment is to improve sustainability, efficiency and equitability of these schemes. As per the **Government Resolution No: Gra. Pa. Dho.- 1114 / Case No.61 / Pa.Pu.-07, Dt. 15 June 2015**, the technical inspection of the RWSS is to be undertaken. Kolhapur Zilla Parishad has shortlisted ongoing schemes under MUKHYAMANTRI RURAL DRINKING WATER SUPPLY PROGRAMME (YEAR 2017-18) for third-party inspection in different taluka in Kolhapur district. KIT is evaluating these schemes through design verification, physical asset verification, and performance and adherence of scheme to design as per the approved Detailed Project Report (DPR). This sub-module discusses the findings of the technical inspection undertaken for the Umalwad (Shirol) Rural Water Supply Scheme which is ongoing scheme.

1.2 Objectives of Technical audit

The objectives of the technical audit are as follows:

- Assessment of the scheme Detailed Project Report (DPR) to know design details of assets proposed in the scheme and to check whether supporting documents are prepared.
- To check if design verification of key assets of the scheme given in DPR is appropriate.
- Physical verification of assets to know whether the scheme has been implemented according to design mentioned in the DPR.
- Checking the scheme performance to assess its sustainability
- Summarize findings and propose recommendations.

1.3 Inspection methodology

The scheme was evaluated by following a detailed methodology comprising data collection, necessary field visits and data analysis. The activities include:

- Assessment of supporting documents and study of design of assets
- Verification of Distribution network design
- Excavation for assets verification at specification level
- Ensuring source sustainability and quality of material by checking the yield test report and material test report respectively
- Tracing of rising main and distribution network for getting actual paths and lengths
- Measurement of pump flow rate in order to know the duration for filling of ESR
- Collection of household connections data and zone wise distribution of habitation by interviewing the Gram panchayat officials and operator
- Measuring actual flow rates across the distribution network
- Ensuring whether the scheme has covered all households and checking amount of water received by household having individual connection.
- Providing success indicator score for scheme depending upon progress of scheme, developed by Auditors. Interpretation of scheme numbered from 0-100 is provided in following chapter.

2 Scheme overview

Umalwad is a village located in Shirol Tehsil of Kolhapur District. It is situated at a distance of 40 km from the district headquarter. Maximum annual rainfall in this area is about 690 mm. The selected scheme is commissioned in year 2016-2017. The scheme is designed for 15 years to serve an estimated population of 6428 people.

Figure 1: Google map image showing Umalwad village

Details of the scheme from the detailed project report (DPR) are mentioned in table 1.

Table 1: Scheme details

Scheme Name		Umalwad rural water supply scheme	
Taluka, District		Shirol, Kolhapur	
Sanction Year		2016 – 2017	
Source		Varana River	
Villages and Habitations covered		Umalwad	
Scheme capacity		0.296 MLD	
Technical approval date	15/2/2019	Administrative approval date	18/2/2019
Work Order date		Time limit	18 months
Total Budget estimate	Rs. 1,22,86,581	Budget spent	
Implementation agency (GP/ Zilla Parishad/ MJP/ VWSC)			ZP

2.1 Scheme description

Umalwad Village Water Supply Scheme is commissioned in year 2003-04 by MJP. The source taken for this scheme is a Jack well in right bank of river. But this scheme is commissioned for villages and storage for Kotali village & the water supply for Umalwad is less and Umalwad GB demided separate scheme due to shortage of water hence new scheme is proposed. And now it is necessary prepared new water supply scheme on the perennial river Warana with full flanged water supply scheme.

In new scheme a following component were proposed such as, works 1. Raw Water Pumping Machinery 2. Raw Water Rising Main 3. Pressure Sand Filter 4. Room for Pressure Sand Filter 5. Pure water Rising Main 6. R.C.C. ESR 7. Distribution System 8. Misc. works 9. Trail run etc.

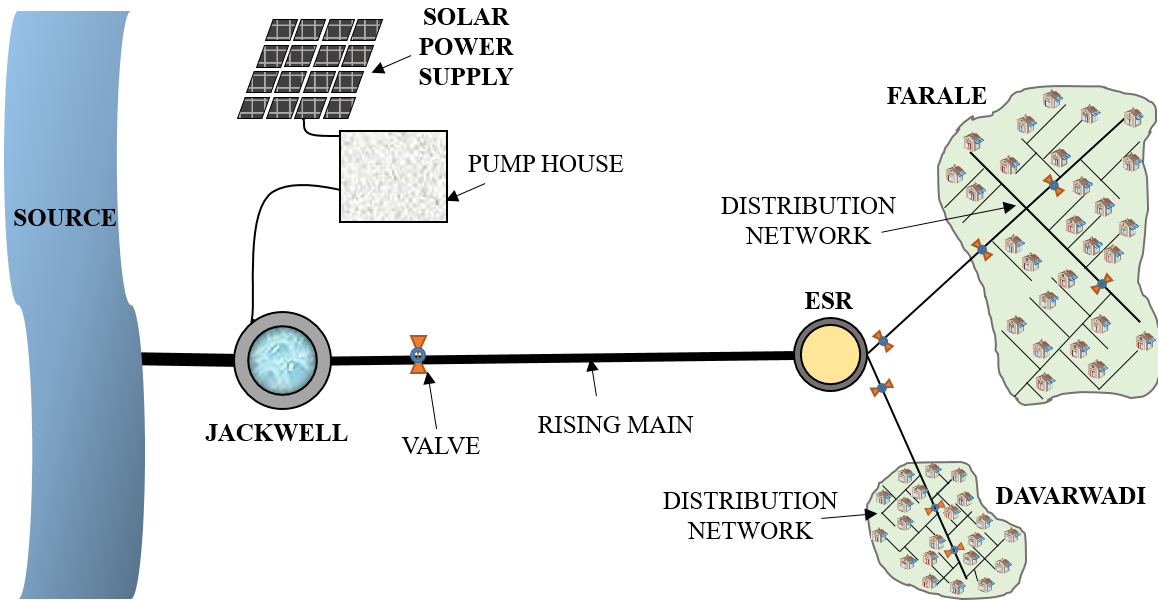


Figure 2: Schematic layout of the scheme

2.2 Site visit details

Physical verification of all the assets of the scheme is done by site visit. Activities carried out and purpose of site visits are mentioned in table 2.

Table 2: Site visit details

Sr. No.	Visit Dates	Purpose	Activities
1	17/03/2023	Assessment visit	Assets verification, discussion with VWSC, Sarpanch and villagers

3 Planning and Design Audit

Completion of a new scheme passes through various phases which include: planning, design, implementation and its operation. The mistakes and inconsistencies in following norms during any of these phases may lead to scheme failure. Thus, each phase is important and needs to be verified. This module covers all the verifications and checks for various phases of the scheme as mentioned in the DPR.

3.1 List of documents in DPR

In order to check official procedure for demanding the scheme, utility of material and source sustainability, the documents verified are listed in Table 3.

Table 3: Documents assessed

Document	Present in DPR (YES/ NO)	Remarks
Demand letter	Yes	OK
GSDA permission/ authorization letter/ report	Not Required	--
Yield Test	Not Required	--
Material test report	Yes	--
Water quality test	Yes	--
Land acquisition document		--
VWSC/ SAC	Yes	--
Budget Estimate	Yes	Detailed estimates of all assets present
Distribution system Summary	Yes	--
Key plan	Yes	Provided
Survey map	Yes	Provided

3.2 Planning verification

In order to have proper coverage, sustainability and operation, the first step in scheme implementation is the planning. The necessary planning documents are checked during the assessment of the DPR. Although some of these documents are procedural documents (e.g., Gram Sabha resolution, VWSC, etc.), they have a great impact on monitoring and sustainability of the scheme. Following are the findings from the planning document assessment.

- In planning stage, the entire habitation of Umalwad was covered.
- In Umalwad village, the storage capacity and distribution network of MJP scheme was insufficient to cater the demand of water supply of the village. While planning the new scheme, this issue is covered by proposing additional ESR and extension of distribution network for new area in the village.
- Similarly, the issue of maintenance of rising main was thought of during the design and planning stage of the scheme. The previous scheme faced the rusting problem of rising mains, since the GI material was used for the same. However, for the new scheme HDPE material is proposed for laying of rising main to minimize the maintenance of the pipes.

3.3 Design verification

The first step of technical audit is to undertake a design verification of different assets of the scheme. Hydraulic designs of various assets as mentioned in the DPR were verified to ascertain whether the given design details of various assets are correct or not.

Table 4: Assets design details

Design component	Dimensions	From DPR	From design verification	Remarks
Population forecasting	Year 2035	10280(Graphical) 6011 6428		Geometrical progressive method, Incremental increase method, Arithmetic projection method
Demand	MLD	0.296		
	LPCD	40		
Raw water Pumping machinery	BHP	15 HP (2 No.s)		
	Total Head	82 m		
	Pump flow rate	6.27 lps		
Raw Rising main	Diameter	140 mm		
Distribution pipe	Diameter Range and respective length	75 mm – 360 m 90 mm – 3000 m		

Design verification was done by using actual data, on the length of rising main provided in DPR.

4 Implementation Audit

Physical asset verification is done as per the following steps:

4.1 Physical assets verification

Physical verification of assets includes checking performance and adherence of scheme to the design as per the DPR. Physical assets to be verified include: pump house, rising main, and distribution network. The physical assets were verified through on-site inspections, details are provided in Table 5.

Table 5: Physical assets detail

Asset name	Dimensions	From DPR/ Structural design	From Field visit	Remarks
Distribution network	Diameter (mm) – Length (m)	75 mm – 360 m 90 mm – 3000 m		Length measured using digital device.
	Material	PVC		
Pumping Mechanism	Pump capacity	15 HP (2 No.s)		
Rising Main	Diameter (mm) – Length (m)	Raw water 140mm (6kg/cm ²) – 7250 m Pure water 110 mm (6kg/cm ²) – 850 m 90 mm (6kg/cm ²) – 850 m		
	Material	PVC		

5 Asset's summary

In the proposed PWS scheme of Umalwad village pumping machinery, rising main, sand pressure filter, ESR and distribution network are newly constructed. At the time of audit, all construction activities are completed and the scheme is running for trial period.

Construction of Pumping machinery –

As per DPR, the provision of pumping machinery was made on the field. The 2 Pumping machinery are installed having pump capacity is of 15 HP , hence it is satisfactory.



Figure 3: Float and Pumping machinery



Figure 4: Four Pole Structure

Rising Main –

The laying of rising main is completed. The implemented raw water rising main is 140mm @ (6 kg/cm²) of length 7250m & pure water rising main @ (6 kg/cm²) of length 850m . Also there are 02, 32mm dia Air Valve and 01 Non-Return Valve was verified during field visit.



Figure 5: Rising Main

Distribution network –

There is detailed design of distribution network is given in the DPR. As per the estimation of distribution network the required pipe details are 75 mm with length of 360 m, 90 mm with length of 3000 m,

In field, it is observed that the network is divided provided with 40 number of valves to supply the water to 535 households. The village is situated in plane terrain. In order to maintain equal pressure and sufficient quantity of water supply. In all places, distribution pipes are laid underground.

6 Operation Audit

Data collected on operation status of the scheme is presented in the following sub- sections:

6.1 Operations of the scheme

- The scheme serves the village Umalwad habitation. The overall water demand from the village is 0.296 MLD.
- Total 1287 number of household connections are provided in Umalwad village (Figure 6). According to the operator, time required to fill the ESR is about 12 hours and it is filled once in a day.

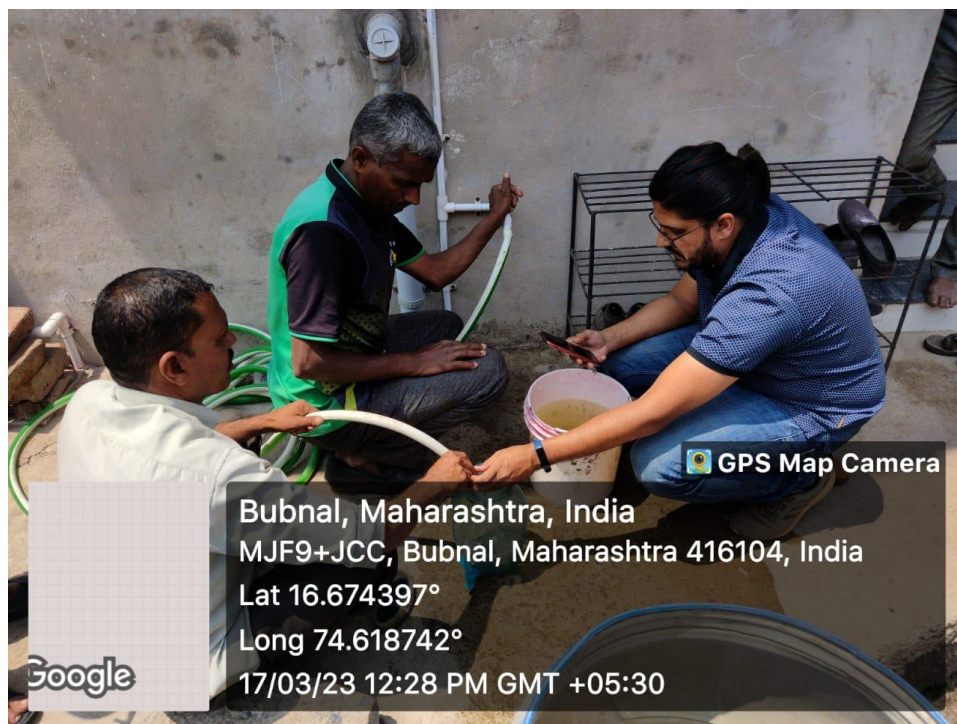


Figure 6: Tap water Supply in the village

- Water is supplied to the village in 8 zones by operating 40 valves providing 45 minutes of water supply for each valve. Each zone gets the water at different time interval throughout the day. In order to supply the water to 8 zones, the pumps are run for 12 hours a day.
- According to the operator, TCL is added into the ESR tank. Other than disinfection no other treatment of raw water is undertaken in the village.
- Pressure sand filter is installed in the village but it is not in operation since a proper training is yet to be provided to the operator.

6.2 Serviceability of scheme

- **Coverage** – Distribution network is laid in all zones of the village covering all sections of the Umalwad village. All villagers are receiving ample amount of water which is actually causing wastage of large amount of water in the village. This point is discussed further in the next section.
- **Quality** – Overall quality of water is good; however, it is observed that location of collection point of drinking water is situated near to the downstream where liquid waste discharge point in the source.
- **Quantity** - Presently, the scheme is running on existing jack well and rising main and new distribution lines. Each household receive about **1304** liters of water per day, which is about **261** LPCD of water.
- **Equity** – In Umalwad, villagers get abundant quantity of water roughly in equal quantity.



Figure 8: Verification of tap water supply in the village

As the scheme is fully completed, flow measurement activity is carried out in various locations of the village. The flow rate was measured at the tap in three households in three zones that they receive the water from ESR.

Table 6: Flow measurement

Sr. No.	Zone Name	Location	Size of utensil	Time (seconds)	Avg. time	Avg Flow	Avg Flow	Avg. Water available in liters for following minutes	LPCD
			(liters)			(lps)	(lpm)	45	
1	Zone 1	(at higher elevation)	3	7.8	7.40	0.48	28.98	1304	261
2			3	7.4					
3			3	7					
4	Zone 2	(at mid elevation)	3	5	5.03				
5			3	5.1					
6			3	5					
7	Zone 3	(at lower elevation)	3	6	6.20				
8			3	6.4					
9			3	6.2					

From table 6, equity with respect to water distribution can be inferred as the flow is measured at the household tap connection.

However, at the time of field verification it was observed that each household connection is left without tap. In addition to this, each household receives the water for 45 mins of time. Generally, every household requires 20-25 mins of water supply to fill all the storage units in the household. Consequently, large amount treated drinking water is found to be wasted in the village.

The village gram panchayat is already facing problem related to the electricity charges resulted due to excessive pumping hours. Hence, It is recommended to curtail the water supply time from 45 mins to 25 mins to safeguard both water and energy resources.

63 Maintenance of the Scheme**Table 7: Annual charges**

Sr. No.	Heads	From DPR (Rs.)	Actual (Rs.)
i	Annual M&R charges	93359	
ii.	Labor charges		
iii.	Chemical charges	19448	
iv.	MSEB charges	1070244	
	Total annual expenditure		
i	Taxable houses (projected)	1158	
iii	Revenue from each household connections	1300	
	Total revenue	7,46,000	

The actual expenditure data on the scheme is collected from the gram panchayat for last two years. It is been observed that the actual annual expenditures are much higher than the DPR considerations. As well as, the actual expenditure and revenue generation is not matching, with Rs. 2,11,900/- of annual deficit in the maintenance.

7 Scheme Findings

7.1 Assessment of the documents

All the necessary documents required for the sanction as well as planning of water supply scheme were present in the DPR. The design documents of proposed components are also provided in DPR, except detailed design of distribution network is absent. The necessary planning and design documents are available in the sub-division office of rural water supply department at Shirol tahsil.

7.2 Assets

Since the scheme is fully functional, all the proposed components of the scheme are monitored during the field verification of the audit.

- **Pumping machinery**

As per DPR, the provision of float and pumping machinery was made on the bank of Warana river. The 2 Pumping machinery are installed having pump capacity is of 15 HP , hence it is satisfactory.

- **Rising main**

The continuous maintenance problem of rising main is resolved in the new scheme by replacing GI material with HDPE material of pipes. The same is verified and found satisfactory in the village.

- **ESR and Pressure Sand Filter**

The existing ESR was constructed under MJP scheme with capacity of 75,000 Liters, in addition to it now in the new scheme ESR with capacity of 30,000 is constructed newly. The additional capacity is sufficient enough to cater the demand of village.

- **Distribution network**

The length of distribution network was matching with the length proposed in the DPR. There were 40 number of valves provided for operating the network and supply the water to 8 zones in the village. The entire distribution network is laid underground.

7.3 Operation

The village gets water at different time intervals for 45 minutes to each valve in 8 zones. At the time of field verification, it was observed that each household connection is left without tap. In addition to this, each household receives the water for 45 mins of time. Generally, every household requires 20-25 mins of water supply to fill all the storage units in the household. Consequently, large amount treated drinking water is found to be wasted in the village.

The village gram panchayat is already facing problem related to the electricity charges resulted due to excessive pumping hours. Hence, It is recommended to curtail the water supply time from 45 mins to 25 mins to safeguard both water and energy resources.

7.4 Service level

Household connections are provided by the Gram Panchayat. The scheme is yet to be handed over to Gram Panchayat and a tap needs to be provided to each household connection. It is recommended that, for better performance of the scheme taps should be provided during the trial period itself.

A tariff structure is decided by VWSC and there is no issue with the recovery from household connections. However, the current expenditures of the scheme are found to be high than actual revenue collection. Hence it is recommended to minimize the use of electricity by curtailing the water supply time from 45 mins to 25 mins. This will reduce the financial burden as well as it will save the wastage of water.

7.5 Success Indicator

The success indicator score is categorized as follows:

- 1) **Excellent (above 85)** - Status of scheme is very good, very likely to succeed with minor improvements
- 2) **Good (71 – 85)** - Satisfactory status of scheme is expected, likely to succeed with few improvements
- 3) **Satisfactory (55 – 70)** – Scheme likely to succeed only with non-trivial improvement
- 4) **Poor (below 55)** - Likely to fail without major improvement in all phases

Sr No	Phases	Final Marks	Out of
1	Planning & Design	86.0	100
2	Implementation	78.83	100
3	Operation and Maintenance	61.7	100
4	Exit and Handover	0	0
Total		226.5	300
Final score		75.5	

Table 8: Final Success Indicator score

Sr No	Phases	Final Marks	Out of
1	Planning & Design	83.8	100
2	Implementation	86.56	100
3	Operation and Maintenance	86.0	100
4	Exit and Handover	0	NA
Total		256.3	300
Final score		85.4	

Success indicator score for this scheme is 85.4 (Table 8), and it falls under the ‘Excellent’ category. This should be treated as a dynamic score and is expected to change with the further progress on the scheme. The score of implementation and Operation and Maintenance phases are good indicating smooth running of the work. However, score of planning and design is slightly affected due to the partial coverage of the habitations within the village. This success indicator score reflects that the scheme is doing well, although if coverage of the scheme is improved the remaining issues can also be resolved.

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