

Chapter-IV
Execution of schemes

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Drinking water supply schemes are executed in the State through *Jal Shakti Vibhag* and Executive Engineers were responsible for ensuring the desired pace of work and completion of schemes within the stipulated time and cost. Deficiencies in execution of schemes such as delay in start/completion of schemes, schemes lying held up for want of encumbrance-free land and cost overruns etc. are discussed below.

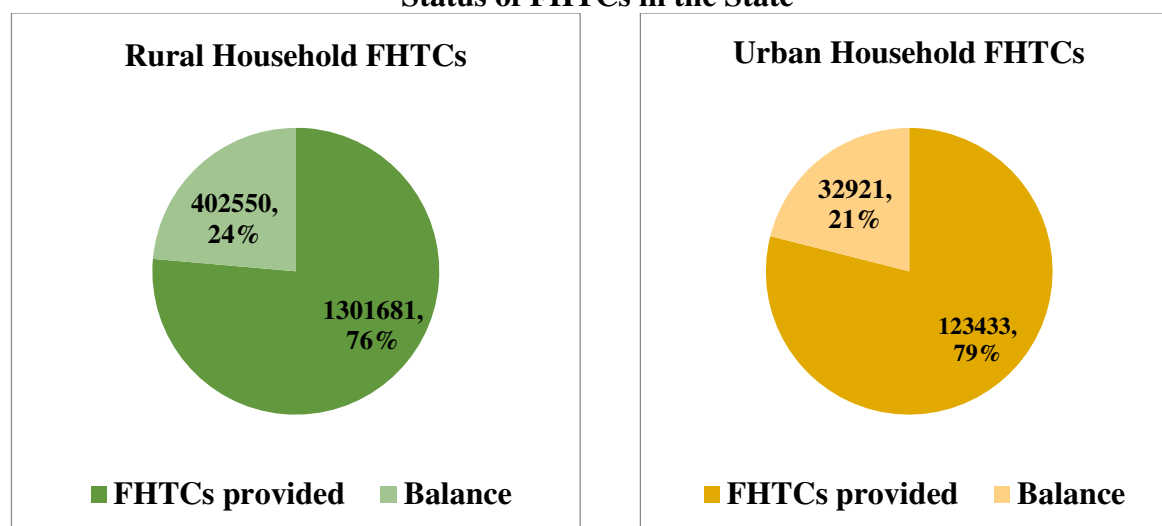
Out of total 18,60,585 households in the State, 14,25,114 households were provided with functional household tap connections (FHTCs) as of June 2021.

4.1 Execution of water supply schemes

The Government of Himachal Pradesh had fixed (July 2020) target to provide all rural households (17,04,231 nos.) with functional household tap connections (FHTC) by August 2022 under Jal Jeevan Mission. No targets were framed for connectivity for urban households (1,56,354 nos.).

As of June 2021, 13,01,681 (76 per cent) of 17,04,231 rural households and 1,23,433 (79 per cent) of 1,56,354 urban households, had been provided with FHTCs.

Chart-4.1
Status of FHTCs in the State



Source: Information supplied by the Department.

4.2 Supply in completed schemes

To gain assurance of the quantity and quality of water being supplied to the beneficiaries, Audit conducted a joint inspection with Departmental representatives (between July 2021 and March 2022) of 40 completed schemes (Lift water supply schemes: 23 and Gravity water supply schemes: 17). These schemes' areas covered an approximate population of 1.77 lakh

spread amongst 787 habitations (**Appendix-1**). The audit observations are detailed later in this chapter.

4.3 Variation in data of coverage of households online and actual water consumers

Jal Jeevan Mission guidelines provide that the details of FHTCs should be uploaded on Integrated Management Information System (IMIS)¹ after receipt of commissioning certificates from Gram Panchayat/ its sub-committee, i.e., VWSC/ Paani Samiti/ User Group, etc.

Audit noticed:

- In 15 (out of 20) test-checked divisions², as per IMIS data 4,18,714 rural households were having FHTCs as of February 2022. However, there were only 2,69,581 FHTCs as per consumer ledgers³. The difference of 1,49,133 FHTCs indicates that data was inflated and actual coverage of households was much below that shown in IMIS.
- In Lahaul & Spiti district, as per IMIS data, 100 *per cent* i.e. 7,284 households were provided FHTC whereas as per consumer ledgers, only 1,335 FHTCs (18 *per cent*) had been provided.

Commissioning certificates of FHTCs were also not obtained by divisions from Gram Panchayat/ its sub-committee, i.e., VWSC/ Paani Samiti/ User Group, etc. before uploading FHTCs data on IMIS. Thus, reliability of data uploaded on IMIS was doubtful.

During the exit conference (December 2022), it was brought out that variations were due to non-updating of consumers ledgers, which are now being updated and commissioning certificates are also being obtained. The reply is not acceptable as details of FHTCs should have been uploaded on IMIS only after receipt of commissioning certificates from Gram Panchayats/ its sub-committees, i.e., VWSC/ Paani Samiti/ User Groups, etc.

Out of 1,125 approved schemes, 88 schemes were not started and 457 schemes could be completed and 580 were lying incomplete. Of 457 completed schemes, 282 schemes were completed after a delay of one to 113 months. Out of 580 incomplete schemes, 245 schemes were lagging behind their scheduled period of completion by one to 138 months.

4.4 Status of execution of schemes

The Executive Engineers were responsible for ensuring the desired pace of work and completion of schemes within the stipulated time and cost. Deficiencies in execution of schemes such as delay in start of schemes, schemes lying held up, cost overrun due to delay, faulty completion of schemes, etc. are discussed below.

¹ Online report of Jal Jeevan Mission Portal, Department of Drinking Water & Sanitation, Ministry of Jal Shakti, Government of India.

² Baggi, Bilaspur, Chamba, Chountra, Dalhousie, Hamirpur, Jhandutta, Kaza, Keylong, Kullu-1, Mandi, Matiana, Rampur, Salooni and Thural.

³ New water connection sanctioned to consumer is entered in the ledger for record. The ledger shows the name of consumer, amount of bills raised, realized and balance also.

The work-wise consolidated records of the schemes taken up for execution, those completed and those remaining incomplete during 2016-21 had not been maintained/ updated at E-in-C level.

The details of execution of schemes in all test-checked divisions during 2016-21 are given in Table-4.1 and 4.2.

Table-4.1
Details of execution of schemes in all test-checked divisions during 2016-21

(₹ in crore)

Year	Schemes approved		Schemes not started		Schemes completed		Schemes incomplete/ ongoing as of Sep 2021	
	Nos.	Approved cost	Nos. (%)	Approved cost	Nos. (%)	Expenditure	Nos. (%)	Expenditure
Prior to 03/2016	331	756.24	2 (01)	3.30	247 (75)	387.32	82 (24)	208.80
2016-17	109	124.96	1 (01)	0.36	67 (61)	25.32	41 (38)	90.15
2017-18	76	55.69	4 (05)	0.12	32 (42)	6.15	40 (53)	27.19
2018-19	95	119.34	8 (08)	33.85	23 (24)	6.65	64 (68)	43.76
2019-20	249	760.03	9 (04)	12.05	64 (26)	19.91	176 (70)	242.46
2020-21	265	446.67	64 (24)	236.94	24 (09)	2.08	177 (67)	71.29
Total	1125	2262.93	88 (08)	286.62	457 (41)	447.43	580 (51)	683.65

Source: Information supplied by Department.

Table-4.2
Details of time and cost overruns noticed in all test-checked divisions during 2016-21

Schemes	No. of cases of time overrun	Time overrun in months	No. of cases of cost overrun	Cost overrun (₹ in crore)	No. of persons affected by delay
Schemes completed	282	one to 113 months	125	39.66	4,65,099
Schemes incomplete	245	one to 138 months	57	26.42	9,58,987
Schemes not started	27	one to 60 months	Liability yet to crystallise	Liability yet to crystallise	37,309
Total	554		182	66.08	14,61,395

4.4.1 Completed schemes

Of the 1,125 approved schemes from the beginning, only 457 schemes could be completed. Of these 457 schemes, 282 schemes were completed after a delay of one to 113 months owing to land disputes (57), non-availability of funds (37), delay in obtaining forest clearance (nine), delays attributable to contractors (64), snow bound area/ limited working season (10), delay in supply of power (five) and delay in change of scope of work (one). Reasons were not furnished by the Department in respect of balance 99 water supply schemes. Resultantly, 4,65,099 beneficiaries of these 282 schemes were deprived of adequate drinking water supply in time. Of these 282 schemes completed with delay, 86 schemes were completed with a cost overrun of ₹ 24.26 crore. Similarly, 39 schemes out of 175 schemes completed within stipulated time, there was a cost overrun of ₹ 15.40 crore.

4.4.2 Incomplete schemes and schemes not started

- Out of 1,125 approved water supply schemes as on 31 March 2021, overall 580 schemes were incomplete (including 335 ongoing works which were within the stipulated period of completion). It was in addition to 88 works which were never started. Out of 580 schemes, 82 schemes had been sanctioned prior to April 2016. Further, 78 (out of 82) schemes were lagging behind their scheduled period of completion (between January 2010 and January 2021) by 13 to 138 months. Resultantly, 4,49,016 beneficiaries of these 78 schemes were deprived of adequate drinking water supply in time. These schemes were lying incomplete due to land disputes (13), non - availability of necessary Forest Right Act clearances (1), work delayed by contractor (2), and insufficient funds (5). Reasons were not furnished by the Department in respect of the remaining 57 water supply schemes. Delay in completion of works had resulted in cost overrun of ₹ 6.98 crore in 23 schemes running with delays, for which Department was yet to obtain revised administrative approvals and financial sanctions.
- Of remaining 498 schemes approved between 2016-21, 167 schemes were lying incomplete beyond their stipulated completion period and time overruns ranging between one and 47 months from the stipulated date of completion (between February 2017 and September 2021) were noticed in these schemes. Out of these 498 schemes, 331 schemes were ongoing schemes still within their scheduled date of completion. Resultantly, 5,09,971 beneficiaries were deprived of adequate drinking water supply in time. These schemes were lying incomplete due to site/ land disputes (23), limited working season (10), non-availability of funds (12), delay by contractors (two), non-installation of supply of power equipment (one) and others (four). In 115 water supply schemes, no reasons were furnished by the EEs concerned. Delay in completion of works had resulted in cost overrun of ₹ 17.67 crore in 24 schemes for which Department was yet to obtain revised administrative approvals and financial sanctions. Similarly, for 10 schemes out of 498 schemes approved after March 2016 and still in progress, there was a cost overrun of ₹1.77 crore.
- It was noticed that execution of 88 (8 *per cent*) schemes had not even been started as of 31 March 2021. Of these 88 schemes, 27 schemes stipulated to be completed between June 2016 and August 2021, had overshoot their stipulated completion dates by one to 60 months. Audit observed that local disputes (one), dry source (one), non-obtaining of technical sanction (one), works not started by the contractors (three), tender under process (five) were the reasons cited as contributing to the delays. The Department did not furnish the reasons for delays in respect of the remaining 16 schemes. Resultantly, 37,309 beneficiaries of these 27 schemes were deprived of adequate drinking water supply. As these schemes were neither implemented nor cancelled, the additional liability on account of cost overrun of these projects cannot be ruled out.

As can be seen from the **Table 4.2**, that the percentage of affected persons, due to delays in completion of various projects, was 21.29 *per cent* of the state population (as per last

available population census of 2011). The number of projects with delays in completion resulting in time overrun constituted 49.24 *per cent* of total approved projects. Similarly, the number of projects with cost overrun constituted 16.18 *per cent* of total approved projects with a cost overrun of ₹ 66.08 crore. This figure of cost overrun does not take into account, the additional liability, on account of cost overrun of 88 projects which were yet to be started.

4.5 Expenditure in excess of estimates

As per CPWD Manual, revised estimate must be submitted when the sanctioned estimate is likely to be exceeded by more than 10 *per cent*.

Audit noticed that in 18 test-checked divisions⁴, expenditure of ₹ 59.66 crore was incurred in excess of sanctioned estimates for 95 schemes (68 completed water supply schemes and 27 water supply schemes in progress) but revised estimates of these works were not prepared as of July 2021-March 2022. The excess expenditure was between 11 and 97 *per cent* of the sanctioned estimates in 85 water supply schemes and 107 and 437 *per cent* in nine schemes; in one case it was 748⁵ *per cent* of the sanctioned estimates. The excess expenditure needed to be regularised.

The EEs stated (July 2021 and March 2022) that revised estimates would be prepared and necessary sanction to regularise the excess expenditure would be obtained from the competent authority.

In nine completed water supply schemes, against norms of 70 litres per capita per day (lpcd) in rural areas and 120 lpcd in semi urban area, water supply ranging between 22 and 67 lpcd for rural area and in semi urban area 73 lpcd was being provided to beneficiaries. In 40 test-checked completed schemes, there were deficiencies in source, water treatment unit, pumping machinery, rising/ gravity main, storage tank/ distribution network and automation/ chlorination system which adversely affected the quantity and quality of water supplied to the user population.

4.6 Detailed scrutiny of selected water supply schemes

Audit conducted detailed scrutiny of 40 completed drinking water supply schemes (lift water supply schemes: 23 and gravity water supply schemes: 17) approved between September 2006 and September 2019 for ₹ 116.47 crore and completed between April 2016 and October 2021 after incurring an expenditure of ₹ 132.49 crore (**Appendix-1**). Besides, detailed scrutiny of 15 incomplete water supply schemes (lift water supply schemes: 08 and gravity water supply schemes: 07) approved between September 2011 and November 2018 for ₹ 37.51 crore after incurring an expenditure of ₹ 22.04 crore was also conducted (**Appendix-2**).

⁴ Baggi: ₹ 2.55 crore, Bilaspur: ₹ 0.45 crore, Bhoranj: ₹ 0.55 crore, Chamba: ₹ 2.01 crore, Choutra: ₹ 0.35 crore, Dalhousie: ₹ 3.01 crore, Dharamshala: ₹ 10.15 crore, Hamirpur: ₹ 15.93 crore, Kaza: ₹ 3.47 crore, Keylong: ₹ 0.20 crore, Kullu-1: ₹ 1.30 crore, Mandi: ₹ 10.55 crore, Matiana: ₹ 0.89 crore, Rampur: ₹ 3.90 crore, Reckong Peo: ₹ 1.08 crore, Salooni: ₹ 0.42 crore, Shimla: ₹ 2.78 crore and Thural: ₹ 0.07 crore.

⁵ Providing water supply scheme to PC habitation Kurched in Keylong district- Estimated cost: ₹ 1.32 lakh and Expenditure: ₹ 11.20 lakh.

Shortfall in supply of water

It was noticed in nine lift water supply schemes in five test-checked divisions, against design of supply of 70 lpcd in rural areas and 120 lpcd in semi urban areas (scheme proposed partially for urban and rural area), water supply ranging between 22 and 67 lpcd in rural areas and 73 lpcd in semi urban areas (LWSS Mehli Pujarli) was being provided to beneficiaries as detailed in **Appendix-3**.



During the exit conference (December 2022), the Secretary accepted the position and assured for appropriate action to augment the supply of drinking water to the habitations.

Component-wise deficiencies of completed water supply schemes have been discussed below.


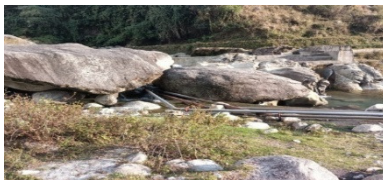

4.6.1 Deficiencies in the source of water supply schemes

Source of water refers to bodies of water that provide drinking water to public. Water sources include surface water (rivers, *khads*, *nallah*, canal, etc.) and ground water (percolation well, borewell etc.). Out of 40 schemes, 31 schemes were having surface water sources and nine were having ground water sources. Deficiencies related to source of the schemes observed in Audit are given in **Table 4.3** below.

Table-4.3
Source deficiencies in water supply schemes

Sr. No.	Scheme	Source deficiencies
1.	LWSS Jakhyal Phase II (Hamirpur district)	<ul style="list-style-type: none"> Original site of percolation well was changed wide off Seer <i>Khad</i> upward and constructed in the middle of Seer <i>Khad</i>. Spurs⁶ were not found constructed to divert the flow. The percolation well was not protected and could wash away during floods.
		 <p>Percolation well in flood prone area of Seer khad</p>
2.	Improvement of LWSS Kareri, Takroon, Gwal Pather and Hathol (Hamirpur district)	<ul style="list-style-type: none"> Percolation well was constructed on the banks of <i>Maan Khad</i> but with flow of water in the <i>Khad</i>, the wall constructed for its safety was partially damaged during rainy season. The possibility of damages of percolation well in near future could not be ruled out. Action for protection of the percolation well was not initiated.
		 <p>Damaged protection wall of percolation well on the bank of Maan khad.</p>
3.	Improvement of LWSS Lagwalti Jangle and LWSS Bhatlamber in Hamirpur district	<ul style="list-style-type: none"> The scheme was shown completed at a cost of ₹56.55 lakh during October 2020 but percolation well and pump house were yet to be constructed. The percolation well of another Lift Irrigation Scheme (LIS) Jakhu was used for making the Scheme functional by installation of 10 horsepower (HP) submersible pumping set whereas the LIS was made non-functional. In a survey conducted by Audit, seven (out of 30) beneficiaries were not satisfied with the quality of drinking water supplied through this scheme.




⁶ The spurs (or groynes) are structures placed transverse to the water flow and extend from the bank into the river/ *khad*.





4.	LWSS Mehli Pujarli (Shimla district)	<ul style="list-style-type: none"> One borewell with capacity of 5 LPS and its rising main from Borewell to WTP, electric panel board, electric pole, etc. were totally damaged and washed away in floods that occurred during August 2019. The borewell was constructed in the middle of source (Ashwani Khad). Against total water requirement of 6,64,080 litres per day (LPD), only 4,03,200 LPD (at the rate of 16 hours X 7 LPS pumping from Borewell) was lifted from 2nd borewell having capacity of 7 LPS, resulting in short supply of 2,60,880 LPD. Water was being distributed to habitations on alternate days only. A period of two years (as of July 2021) had elapsed from the date of damage of the Borewell, but the same was not repaired. Against 120 LPCD, only 73 LPCD water was being provided to the beneficiaries of this scheme. 	 <p>Damaged borewell constructed in the middle of the source at Ashwani Khad</p>
5.	PWSS to partially covered (PC) habitation Banuri, Banuri Khas (Kangra district)	<ul style="list-style-type: none"> No intake chamber was constructed. Water was directly tapped from the Awa Khad and the pipes laid open into the Khad, which were likely to be washed away with higher flow of water in rainy seasons. 	 <p>Water tapped directly (without intake chamber) from Awa khad</p>
6.	LWSS Suka Kun (Mandi district)	<ul style="list-style-type: none"> One Winch Room and Rail Trolley System was constructed for the scheme for lifting raw water from Beas River through submersible pump and the system had tilted/ derailed due to floods in August 2021. The Rail Trolley had not been adjusted in its place by the Department as of November 2021. Against requirement of 577360 litres (70 LPCD) water, only 463680 litres (56 LPCD) water was being lifted from <i>Khaliana Khad</i>. All surveyed beneficiaries (10) of <i>Bathar</i>, <i>Chalahar</i> and <i>Khajroun</i> village stated in beneficiary survey that water was supplied only once in 3 days. 	 <p>Tilted Rail Trolley system for lifting water from Beas river</p>

4.6.2 Deficiencies in water treatment unit.

Water treatment is a process that improves the quality of water to make it fit for a specific end-use. Water treatment process consists of several steps including collection; sedimentation; clarification; filtration and disinfection. Deficiencies related to water treatment units of water supply schemes noticed in Audit are given in **Table 4.4**.

Table-4.4
Water treatment unit deficiencies in water supply schemes

Sr. No.	Scheme	Deficiencies	
1.	Water supply scheme (WSS) Dobhi Shim (Kullu district)	<ul style="list-style-type: none"> The scheme was shown completed (December 2020) but sedimentation tank and filter beds were observed as not connected to the source (August 2021). Resultantly, unfiltered water was being supplied to households. In the survey conducted by Audit, six beneficiaries (out of 30) of the scheme stated that water was not of good quality and turned turbid during rainy season. 	 <p align="center">Incomplete sedimentation tank and filter bed</p>
2.	WSS Dawara (Kullu district)	<ul style="list-style-type: none"> Sedimentation tank and filter beds damaged during 2018 were not repaired as of August 2021. Therefore, unfiltered water was being supplied to households directly from the source. Ten out of 33 beneficiaries of the scheme expressed that water quality was not good during rainy season and turned turbid. 	 <p align="center">Damaged sedimentation tank and filter beds</p>
3.	LWSS to Village Shirgulli Kadraim and Balghar Ghassigoan Madhog (Shimla district)	<ul style="list-style-type: none"> There was leakage on the walls of sedimentation tank and the water was muddy. Sedimentation tank and filter beds were unclean. Logs of cleaning of the sedimentation tank and filter beds were not available. Four (out of 31) beneficiaries were not satisfied with the quality of drinking water. 	 <p align="center">Leakage in sedimentation tank</p>
4.	WSS Dul Panjajan and Dagon group of Villages (Mandi district)	<ul style="list-style-type: none"> Sedimentation tank and filter beds constructed during 2012-13 were lying unused (December 2021) of Phase I of the scheme. In phase II, filter beds were constructed and Scheme was reported as completed (March 2018) but the same was not used. As per Measurement Book (No.1769), the measurement of the filter beds was done during April 2018 showing all the layers (Top layer: fine sand; 2nd layer: coarse sand 3mm to 6 mm; 3rd layer: Bajri 20 mm to 25 mm, and Bottom layer: broken stone 50 mm to 75 mm) having been laid. However, only the broken stones of almost 75 mm were found at the bottom layer and no other layers were seen as certified. This indicated the dubious measurement of the filter beds. Thus, filter beds were not constructed as per specification and the water tapped from source (<i>nallah</i>) was directly taken into the storage tank. 17 beneficiaries (out of 30) expressed dissatisfaction with the quality of drinking water. 	

<p>5.</p>	<p>Three water supply schemes Bhoranj: WSS Kathialwin, Matiana: LWSS Swari Khad and Shimla: LWSS Mehli Pujarli</p>	<ul style="list-style-type: none"> • Joint inspections (between July 2021 and March 2022) of schemes showed that in three schemes (out of 40), sedimentation tanks and filter beds were not cleaned since December 2018 and February 2021. Resultantly, layers of algae had formed in sedimentation tank and filter beds. • 15 (out of 63) beneficiaries of two (out of three) schemes stated that dirty and smelly water was being supplied. 	 <p>Unclean sedimentation tank of WSS Kathialwin</p>
			 <p>Unclean filter bed of LWSS Swari Khad</p>
			 <p>Unclean filter bed of LWSS Mehli Pujarli</p>
<p>6.</p>	<p>Improvement of WSS Bachuni Pukhri Phase-II and WSS Danoon (Chamba district)</p>	<ul style="list-style-type: none"> • Water tapped from <i>Ghal Nallah (source)</i> was being provided to the beneficiaries without filtration. Chamber of filter media was damaged and dirty. Foreign material, bushes and stones were visible in the chamber. Unfiltered water was being supplied to the beneficiaries. • 16 beneficiaries (out of 30) expressed (October 2021) dissatisfaction with the quality of drinking water. 	 <p>Unclean chamber of filter bed</p>
<p>7.</p>	<p>Augmentation of WSS to Village Jassure, Dukhar, Bharari and Tikri (Chamba district)</p>	<ul style="list-style-type: none"> • After tapping water from proposed <i>Mahadev Nallah</i>, water was required to be taken into the existing sedimentation tank for supply after filtration. During joint inspection it was noticed that the line was laid directly from <i>Mahadev Nallah</i> to storage tank at <i>Kut</i> instead of first to old sedimentation tank and filter media as planned. Resultantly, unfiltered water was being supplied to the beneficiaries. • 16, out of 30 beneficiaries were not satisfied with the quality of drinking water. 	

4.6.3 Deficiencies in pump house & pumping machinery

Pump house is place where pumping machinery is installed to lift water from one place to another through rising main.

Audit noticed:

- The augmentation of LWSS Tandi in Lahaul & Spiti district completed in October 2020 at a cost of ₹ 34.85 lakh was not made functional due to non-installation of separate electricity meter for running pumping machinery. Non-commissioning of the Scheme resulted in expenditure of ₹34.85 lakh remaining unfruitful.
- In LWSS Mehli Pujarli (Shimla district), auto transformer starter for second pump was not installed right from the time of commissioning in December 2018 rendering the pump non-functional.
- As per Central Public Health and Environmental Engineering Organization (CPHEEO) Manual and instructions of the Department (May 2003), provision for stand by pumps should be made in all water supply schemes. However, in four test-checked divisions, seven pump sets of six water supply schemes⁷ were found to be out of order since December 2018 and August 2021. The Department had not initiated action to repair these standby pumps as of date of audit. It is felt that if second pump of these water supply schemes goes out of order, water supply to the households would be affected.
- Two test checked schemes i.e. LWSS from Kashapat *khad* to Dansa and LWSS Kharahan *khad* to Jahu Kofradhar under Rampur division were completed in August 2017 and May 2017 respectively. However, the pumping machinery installed for lifting of water was not operated for optimum capacity. Against the scheduled running of 16 hours per day, the pumping machinery of LWSS Kashapat *khad* was operated for 12.1 hours per day. Similarly, against 8 hours, the pumping machinery of LWSS Kharahan *khad* was operated for 4.33 hours per day. As a result, inadequate water was being lifted and supplied to the beneficiaries (**Appendix-3**).

4.6.4 Deficiencies in rising/ gravity main

Rising main is the delivery line carrying water from pump to storage tank. Gravity main is to transport water from the source to the user through a piped network without pumping.

- In providing WSS to partially covered (PC) habitation Sosaring (Kinnaur district), all the components of scheme i.e. intake chamber: one, storage tank of 10000 litres capacity: one, distribution network, etc. were constructed but the gravity main 350 Rmt. (dia 25 mm from intake to storage tank) was not laid. Beside the constructed tank, water of nallah was flowing which was utilized by the villagers for irrigation purpose. Instead of connecting the constructed tank with the proposed source by laying the 350 Rmt. gravity main, the water flowing beside the tank was tapped into the constructed tank and water supply scheme was made functional. When the water was required for irrigation, the water of nallah was diverted for irrigation purpose and otherwise water was diverted to tank for drinking purposes.
- In improvement & augmentation of source level LWSS Jharet Rajhoon & LWSS Kiarwan (Kangra district), the gravity main of the scheme laid during 2011-12 was seen lying without anchor block during joint inspection. The Scheme was shown as

⁷ Bhoranj: one; Mandi: two; Matiana: three and Shimla: one.

completed in March 2020. However, construction of thrust block/ anchor block for the gravity main awarded to a contractor at a cost of ₹ 8.47 lakh during 2011-12 was not constructed and the Division had not initiated any action against the contractor. The gravity main without anchor block could be damaged in case of flood. Thus, the Department had not ensured the safety of the gravity main.

4.6.5 Deficiencies in storage tank and distribution network

(i) Non-construction of storage tank and non-laying of distribution network

In Replacement of distribution system for water supply scheme Jia Gopalpur Phase-1st (Kangra district), against construction of seven underground reservoirs awarded to a contractor (July 2013), six underground reservoirs having capacity between 10000 and 115000 litres were constructed and one underground reservoir of 10000 litres was not constructed. The work of laying and jointing of galvanized iron (GI) pipes of 25 mm dia (480 Rmt.) and 32 mm dia GI pipes (1435 Rmt.) had not been started as of January 2022. The Department had, however, reported (February 2020) the Scheme as completed. Eight (out of 32) beneficiaries expressed (January 2022) that inadequate quantity of water was being provided.

(ii) Leakage in storage tank

In LWSS Dhararsani and its adjoining villages (Bilaspur district), there were leakages in distribution network since July 2021, but had not been attended as of December 2021. This resulted in wastage of water. However, the exact quantity of water wastage could not be calculated in the absence of details of discharge rate of leakage.

(iii) Distribution network-wrong reporting of facts

- In LWSS Mehli Pujarli (Shimla district), against distribution line of 30,650 Rmt, only 24891 Rmt. line had been laid as of July 2021. The Scheme though incomplete had been shown as completed. Six (out of 30) beneficiaries stated (July 2021) that distribution line had not been laid and inadequate water was being supplied.
- In Reckong Peo division, the scheme 'Providing WSS from Chhamble to Pangri' (Kinnaur district), was shown as completed in April 2016. The approved scope of the scheme included construction of intake chamber, two storage tanks (5000 litres and 10000 litres), chlorination chamber and distribution network. Construction of one intake chamber, RCC underground storage tank (5000 litres), chlorination chamber, barbed wire fencing, development of site and laying and jointing of galvanised mild steel (GMS) tube of various dia, awarded in September 2008 for ₹ 9.81 lakh was completed in February 2010. The remaining work i.e. construction of RCC underground tank (10000 litres), stand posts, development of site for storage tank and laying and jointing of GMS tube of various dia and providing and fixing galvanised mild peet valve was awarded in September 2008 for ₹ 6.46 lakh stipulated to be completed within six months. However, scrutiny of records and joint inspection showed that only one tank of 10,000 litres was constructed by the contractor and remaining components were not constructed. The contractor was issued (March 2009)

material⁸ of ₹ 2.85 lakh but the contractor did not execute any work thereof. Further, it was observed that all executed components i.e., intake chamber, storage tanks, chlorination chamber and laid mild steel (GMS) tubes were not found usable. Total expenditure of ₹ 26.18 lakh had been incurred and the scheme was shown as completed in April 2016, but actually the scheme was incomplete even on the date of audit. Thus, the executed work of the scheme was not put to use resulting in expenditure of ₹ 26.18 lakh remaining unfruitful. Besides, material worth ₹ 2.85 lakh was lying with the contractor since 2009. The purpose of the scheme of providing clean drinking water thus could not be achieved.

- The scheme 'WSS Dul Panjajan and Dagon group of Villages in Mandi district' scheduled to be completed by January 2015 was not actually completed as three sub works of laying jointing of GI pipes (part of distribution network) awarded to three contractors for ₹ 2.57 lakh had not started. The Division had neither rescinded the contracts nor taken action for execution of the works as of January 2022. The incomplete scheme was shown as completed in March 2018.

4.6.6 Deficiencies in miscellaneous components- Automation and Chlorination

- In LWSS from Kashapat *Khad* to Dansa (Shimla district):
 - (i) The work was awarded (January 2016) for ₹ 5.37 crore and stipulated to be completed within 12 months. The Scheme was commissioned in August 2017. However, the automation system including pumping machinery upto delivery tank at Node 10 (Sartu) was not functional ever since the commissioning of the scheme. The cost of automation system was ₹ 45.65 lakh. As per agreement, there was provision of automation of the scheme with normal sluice valve⁹ which was not applicable at site. There was no provision for self-actuated sluice valve and SCADA system¹⁰ for full automation of the scheme actually required at site. The provision of self-actuated sluice valve and SCADA system for complete automation of the scheme was made as extra items for ₹ 43.59 lakh in September 2019. These extra items were arranged by the contractor for which payment of ₹ 35.17 lakh was made to contractor in June 2020. In spite of this, the automation system was not made functional for the last 54 months and the scheme was being operated manually. Reasons for the same were not on record and operation and maintenance contract *ibid* of the scheme for two years had also expired. Thus, the Department had initially failed to assess the actual requirement of automation system at site and the expenditure of ₹ 80.82 lakh (normal automation system: ₹ 45.65 lakh and self-actuated automation system: ₹ 35.17 lakh) incurred on this component was rendered wasteful.

⁸ Galvanised iron pipes: 15 mm dia (500 rmt.); 20 mm dia (1654 rmt.); 25 mm dia (175 rmt.); 40 mm dia (30 rmt.) and cement (50 bags).

⁹ Regulator consisting of a valve or gate that controls the rate of water flow through a sluice head gate.

¹⁰ SCADA: Supervisory Control and Data Acquisition (SCADA) system provides control functionality and alarms at rural/ urban water supply scheme sites which, in many cases are very remote and to satisfy a variety of increasing pressures such as consumer demands, regulatory requirements, and to also satisfy the need to reduce operational costs. It is a type of software application program for process control.

(ii) Bleaching powder type chlorinator at WTP of the scheme was also not made functional as of February 2022. Bleaching powder was stated to be added on daily basis in the sectoral storage tanks but no records were maintained by the Department. It was also noticed that against required 0.2 mg/litre of chlorine, as per JJM guidelines, 0.1 mg/litre residual chlorine was found in water test of chlorinated water, got conducted by Audit. This was indicative of the fact that proper chlorination was not being done by the Department.

(iii) The work of WTP was awarded in December 2014 for ₹ 6.99 crore to be completed within 12 months. The Scheme was completed and commissioned only in August 2017. The provisions of laboratory and equipment were made at WTP and were provided by the contractor. As per condition of the award letter, this laboratory was to be run by the contractor for six months upto January 2018. After that the laboratory was to be handed over to the Department for operation. However, it was seen during joint inspection that the laboratory was not being run by the Department and equipment was lying idle since January 2018. Thus, in the absence of on-site testing, supply of quality water could not be ensured.

- In WSS Uteep, Bat, Luddu, etc. (Chamba district):

(i) Gaseous chlorination system was installed in WTP of scheme. However, it was noticed that out of four installed cylinders having capacity of 100 kg each (duration of one cylinder is four to five months), not a single cylinder had run out yet whereas 56 months had lapsed from the date of commissioning of scheme (April 2017), indicating improper operation. The residual chlorine that should be 0.2 mg/l, was below detection limit in water sample collected from the outlet of the schemes on 09.12.2021 as confirmed in water test conducted in District Laboratory, Chamba. It was observed that staff had no proper knowledge regarding operation of this gaseous system. No logbook of the gaseous chlorination system was found maintained by the Department during joint inspection.

(ii) Laboratory installed (April 2017) at WTP as per provisions of DPR, was in dilapidated condition since 2019. Joint inspection showed building of the laboratory had been damaged in rainy season and the work of operation and maintenance of the Scheme, done by the contractor since April 2017 whose contract was going to expire in April 2022.

- In Lift water supply scheme Mehli Pujarli (Shimla district), Gaseous chlorination plant installed at the top of sump well-cum-main storage tank of scheme, was out of order since June 2019 due to which automated chlorination was not being done.



Gaseous chlorination plant

- In three¹¹ (out of 40) test-checked water supply schemes (completed during July 2016 to November 2018) in three test-checked divisions, against the requirement of 1900, 1400 and 1700 gms of bleaching powder daily, only 1200, 1000 and 1000 gms of bleaching powder were added in the main storage tanks respectively, manually. Thus, lesser quantity of 700, 400 and 700 gms of bleaching powder was added in the storage tanks. To test the quality of water, one water sample was drawn from the scheme LWSS Juni *Khad* by Audit and got tested. The sample showed no residual chlorine due to which bacterial contamination (Total Coliform 23/100 MPN) was also found in water sample.

Further, provision of chemical solution dosing pump with complete accessories (automation system) was kept in the DPRs of two (out of three above) test-checked water supply schemes¹² but the same was not constructed/ installed at the time of completion of schemes. Due to non-construction of chemical solution dosing pump at WTP, bleaching powder for chlorination was added manually in main storage tanks as mentioned above.

- In two water supply schemes¹³, provision of laboratory was kept in the DPRs of the schemes. These schemes were completed during 2016-17, but the provision of laboratory was not ensured at the time of execution of these schemes. Thus, no testing of water is done at the site of WTP.

During the exit conference (December 2022) discussions, the Secretary assured to issue directions to respective divisions to take corrective measures.

4.6.7 Impact of audit findings of completed water supply schemes

Audit noticed that there were deficiencies in completed water supply schemes, indicated in the foregoing paragraphs, which had adverse impact on supply of drinking water to the beneficiaries:

- The State had aimed to provide 135 litres per capita per day (lpcd) to all urban and 70 lpcd to rural population by the year 2030. However, only 10.39 *per cent* of urban population and 61.43 *per cent* of rural population was being supplied water of at least 135 lpcd and 70 lpcd respectively.
- Due to deficiencies in source and pumping machinery, against design of supply of 70 lpcd in rural areas and 120 lpcd in semi urban areas, water supply ranging between 22 and 67 lpcd for rural areas and 73 lpcd in semi urban areas (LWSS Mehli Pujarli), was being provided to beneficiaries in nine lift water supply schemes of the selected sample indicated in **Paragraph 4.2**.
- Due to deficiencies in water treatment unit, unsafe water was being supplied to the beneficiaries of nine water supply schemes. In these schemes, the water supplied was

¹¹ Jhandutta: LWSS Barad Manan (November 2018); Mandi: LWSS Juni *Khad* to Upper Pandoh (July 2016); and Mandi: LWSS Suka Kun (2017).

¹² Jhandutta: LWSS Barad Manan and Mandi: LWSS Suka Kun.

¹³ Mandi: LWSS Juni *Khad* and LWSS Suka Kun.

turbid, smelly and unfiltered. Deficiencies in chlorination level resulted in supply of unsafe drinking water to the beneficiaries in six water supply schemes and the residual chlorine that should be 0.2 mg/l, was below detection limit in water sample collected from the outlet of three water supply schemes. Audit got a sample tested and total Coliform of 23/100 MPN count was found in the water sample. In effect, the water supplied posed a health hazard to the beneficiaries.

- Due to deficiencies in storage and distribution network, supply of inadequate drinking water was being provided in two water supply schemes as confirmed in the beneficiaries' survey.

4.7 Beneficiary Survey of test-checked completed schemes

Beneficiaries' survey in respect of 40 completed schemes was conducted (July 2021-March 2022) by Audit Team. The survey covered 1109 beneficiaries from head to tail end of each scheme (Head beneficiaries: 279, Middle beneficiaries: 256 and Tail end beneficiaries: 574). The details of beneficiaries surveyed and their satisfaction level are given in **Table-4.5** below:

Table-4.5
Details of beneficiary survey and satisfaction level in respect of 40 test-checked completed schemes

Parameter	Beneficiaries surveyed	Satisfaction level response	
		Number of beneficiaries	Percentage
Awareness of safe/ potable drinking water	1,109	987	89
Supply of sufficient water for drinking, cooking and other domestic needs	1,109	885	80
Availability of supply of drinking water all around the year	1,109	824	74
Supply of drinking water supply at regular intervals	1,109	903	81
Water complaints filed with the department relating to non-supplying of drinking water	1,109	440	40
Access to drinking water from multiple/ alternative sources	1,109	558	50
Supply of adequate water (70 lpcd) to habitants at the tail end	574	427	74
Water quality satisfaction of beneficiary	1,109	876	79
Collection of samples from water supply points for testing	1,109	237	21
Collection and testing of water samples of private sources (wells/ bowris)	1,109	95	09
Awareness of locations of the water testing laboratories	1,109	138	12
Training and awareness generating IEC activities on drinking water provided to the beneficiaries	1,109	184	17
Non-functional water supply schemes due to operation and maintenance	1,109	383	35
Awareness about Field Test Kits (FTK) for water quality test	1,109	118	11
Collection of user charges and their use for operation and maintenance of the schemes	1,109	643	58
Installation of water meters for households for billing/ adequate water purpose	1,109	25	2
Flat charges paid to the Department irrespective of quantity of water being supplied	1,109	851	77

It can be seen from **Table 4.5** that:

- Overall satisfaction level of supply of sufficient water was 80 *per cent* but the satisfactory level of tail end beneficiaries was at 74 *per cent*.
- Though 79 *per cent* of total beneficiaries surveyed were satisfied with water quality being supplied to them, only 21 *per cent* were aware about the collection of samples from water supply points for testing, 12 *per cent* were aware of locations of the water testing laboratories, 17 *per cent* responded positively about training and awareness generation activities on drinking water and only 11 *per cent* were aware of FTKs for water quality test.

4.8 Shortcomings in selected incomplete water supply schemes

Fifteen incomplete drinking water supply schemes from 15 selected divisions were taken up for detailed scrutiny. Details of these schemes are given in **Appendix-2** and the deficiencies noticed in nine schemes during audit have been mentioned in **Table-4.6**.

Table-4.6
Deficiencies in incomplete schemes in test-checked divisions

(₹ in crore)

Name of Scheme	Month of A/A and E/S / Stipulated completion period	Approved cost/ Expenditure	Status of scheme	Audit issues and reply
1. Providing LWSS to PC habitation of Dhaban and Tanda in Mandi district (Baggi division)	January 2017 & September 2019/ 4 years	1.00 & 3.14/1.19	<i>Incomplete as of September 2021</i> (running delay: 8 months)- drilling of tube well completed (July 2017)	Awarding of works (August 2019 to March 2021) of distribution system, pump house, sump well and storage tanks, lack of funds, etc.; and consequent failure to complete the scheme. The EE stated (October 2021) that the scheme was delayed due to non-availability of land for development of source/ Borewell. However, the Borewell was drilled by the division in July 2017 itself.
2. LWSS to PC habitation of Shira from Ali Khad in Bilaspur district (Bilaspur division)	August 2009 and September 2012/ 4 years	1.06/0.71	<i>Incomplete as of October 2021</i> (running delay: 61 months)-distribution system of 15382 Rmt. (out of 18470 Rmt.) laid (upto 02/2017) by the contractor	Non-availability of encumbrance free land for execution of water treatment plant (WTP), pump house, clear water tank and laying of rising main; Pumping machinery arranged by the contractor in September 2015 was lying idle due to non-construction of pump house. The EE stated (October 2021), that the scheme could not be completed due to land dispute at site of WTP, pump house, etc. The Department did not follow proper sequence i.e. ensuring a

Name of Scheme	Month of A/A and E/S / Stipulated completion period	Approved cost/ Expenditure	Status of scheme	Audit issues and reply
				dependable source of water, WTP and pump house.
3. Construction of LWSS Bagwar in Hamirpur district (Bhoranj division)	September 2018/ 4 years	0.80/0.11	<i>Incomplete as of October 2021</i>	Non-execution of scheme by the contractors for more than three years. No action was initiated by the department. The EE stated (November 2021), that matter for non-execution of works by the contractors will be enquired and necessary action taken.
4. Providing Lift Water Supply Scheme to cantonment Area Dalhousie in Chamba district (Dalhousie division)	Not yet approved.	--/0.19	<i>Not taken up as of August 2021</i>	Non-approval of scheme due to non-availability of forest land.
5. State of Art Water Treatment for Potable Tapped Water for improvement of WSS Ramnagar Shamnagar in Kangra district (Dharamshala division)	November 2018/ 5 years	5.46/1.50	<i>Incomplete as of February 2022</i> (The scheme was held up for more than two years)	Non-availability of land. ₹ 1.49 crore was paid to contractor (October 2019) but not yet adjusted; and Excess secured advance of ₹ 32.71 lakh was paid to contractor but indenture not signed. The EE stated (March 2022) that the inhabitants had initially agreed to donate the land but later refused. The site was being changed.
6. Augmentation of water supply scheme Raison Mali Pather in Kullu district (Kullu-I division)	December 2014/ 4 years	2.56/2.30	<i>Incomplete as of July 2021</i> (The scheme commissioned in March 2021 without construction of WTPs)	Non-awarding the work of sedimentation tank and slow sand filter beds of Phase-I as of July 2021; Non-execution of the work of sedimentation tank and slow sand filter beds (Phase-II) awarded (August 2016) to the contractors. The EE stated (August 2021) that the <i>nallah</i> source was initially proposed but during execution the water for scheme was tapped from the spring source for which there was no need for sedimentation tanks and filter beds. The reply is not acceptable as construction of WTP in all new water supply schemes was mandatory as per instructions of the department (March 2016).

Name of Scheme	Month of A/A and E/S / Stipulated completion period	Approved cost/ Expenditure	Status of scheme	Audit issues and reply
7. Augmentation of 8 Nos. LWSS in Shimla district (Matiana division)	March 2012/ 5 years	12.79/9.42	<i>Incomplete as of February 2022</i> (Work of pump house (2nd stage) and laying of distribution system in progress.)	Non-availability of suitable site for construction of water treatment plant and pump house of first stage; Pumping machinery (₹ 2.18 crore) arranged by the contractor in August 2016 for first and second stages lying idle as of February 2022; The EE stated (March 2022) that the scheme had been delayed due to non-clearance of FCA and site disputes. The fact, however, remains that the Department did not follow the sequence of first ensure a dependable source of water, WTP and pump house for running the scheme.
8. Providing Water Supply Scheme to not covered (NC) / partially covered (PC) habitations under WSS Kusmal Bagora in Kangra district (Palampur division)	February 2012/ 3 years	0.62/0.59	<i>Incomplete as of December 2021</i> (running delay: 82 months)-work of laying of distribution system completed (07/2014)	Non-execution of work due to non-availability of forest clearance. The EE stated (January 2022) that case for diversion of forest land for the intended purpose initiated but approval awaited.
9. Water Supply Scheme to left out Hadala Banetu in Chamba district (Salooni division)	March 2014/ 3 years	0.48/0.29	<i>Incomplete as of September 2021</i> (running delay: 54 months)-distribution system of 6,810 Rmt. (out of 20615 Rmt.) laid upto October 2015 by the contractor	The work of intake chamber, RCC storage tank and laying of distribution system awarded October 2014 was not completed by the contractor as of September 2021. The EE concerned stated (October 2021) that action against the contractor was under consideration.

During the exit conference, the Secretary admitted the facts and stated (December 2022) that the status of incomplete schemes might have now changed. It was further stated that matter would be taken up with respective divisions to initiate action against defaulting contractors.

Conclusion

The State's aim of providing functional household tap connections to 100 *per cent* of rural households had been partially fulfilled (76 *per cent*) by June 2021. The beneficiary population in the test checked divisions could not be provided the targeted quantity and quality of drinking water. There were deficiencies in source, water treatment unit, pumping

machinery, rising/ gravity main, storage tank/ distribution network and automation/ chlorination system which adversely affected the quantity and quality of water supplied to the user population.

Recommendations

The Department may like to take immediate remedial steps to ensure both quality and minimum quantity of promised drinking water to citizens by repairing/ augmenting the water supply installations. It may also like to take feedback of beneficiary population at regular intervals to gauge the efficiency of the schemes.

