CHAPTER V
WATER QUALITY MONITORING AND SURVEILLANCE

The State Referral Institute (SRI), Nettoor, was equipped to conduct tests for 40 parameters in lieu of 73 number of water quality parameters to be tested at State level. Posts such as Chief Chemist, Microbiologist/Bacteriologist, Laboratory Assistant and Data Entry Operator were not sanctioned to SRI. A project initiated for strengthening the SRI infrastructure facilities was pending completion (June 2025) even after expending ₹5.65 crore.

Audit noticed that sub divisional laboratories did not conduct water quality testing covering all water sources under their jurisdiction. The results of samples which were tested positive were not shared with the community/GP for awareness and for remedial action. Water surveillance at GP/Village level by using FTKs was confined to the year 2021-22 only.

Audit observed that all the labs operating in the State had a turnaround time greater than seven days. The average turnaround time of district labs in test-checked districts of Kozhikode, Kollam and Palakkad was 45, 40 and 33 days respectively.

Drinking water quality monitoring and water quality surveillance are distinct, yet closely related activities. Water quality monitoring involved laboratory and field testing of water samples collected from water sources and FHTCs, whereas water quality surveillance was undertaken by local community using Field Test Kits[56] (FTKs) and H_2S vials.[57] JJM emphasised on the provision of potable water as prescribed by the Bureau of Indian Standards (BIS). The IS 10500:2012[58] was formulated with the objective of assessing the quality of water resources and to check the effectiveness of water treatment and supply by the authorities concerned.

5.1. Institutional framework of laboratories in the State

Under JJM, laboratories were to be set up at three levels - a nodal unit at the top-level, district laboratories at intermediate level and sub district labs at grassroots level. There was one State level Lab at Nettoor, Kochi and 14 district labs and 71 sub district labs in the State, of which 54 sub district labs were established and upgraded during the period of implementation of JJM, utilising an amount of ₹19.66 crore.

5.1.1. State level Laboratory

The State Referral Institute (SRI) established (February 2009) at Ernakulam, designated as the State lab and nodal unit for WQMS in Kerala operated under

[56] A portable multi-parameter kit used for examination of physio-chemical contamination as initial screening for water contamination to provide indicative test results that help in identifying potential water quality issues.

[57] Hydrogen Sulphide (H_2S) vials are used for ascertaining the presence/ absence of bacteria in water.

[58] IS 10500:2012 prescribed 13 basic water quality parameters such as pH, turbidity, total alkalinity, total hardness, etc.

the administrative control of KWA. The SRI was to oversee three Quality Control Divisions (QCD) with 14 District labs and 71 Sub Divisional Labs.

- The Water Quality Monitoring and Surveillance Framework (WQMSF) mandated establishment of an Independent Drinking Water Quality Commissionerate with the authority to oversee water quality testing. The roles and responsibility related to water supply and water quality monitoring were to be segregated along with personnel. The personnel working in SRI and District Laboratories were appointees of the Managing Director, KWA. The Director, SRI was a Superintending Engineer (SE) of KWA and the Executive Engineers (EE) from KWA headed its QCDs. The posts of the Director and the Heads of QCDs in SRI were interchangeable with those of SEs and EEs in the Public Health (PH) Circles and Divisions of KWA.

  Government stated (June 2025) that QCDs were working more or less independently, even though there was intra-swapping of staff and infrastructure. The Quality Control wing was started as a separate vertical to ensure that the system operated separately and independent of the other verticals.

  The above reply was not in consonance with the JJM Guidelines which envisaged de-coupling of water supply delivery function from water quality testing service to ensure transparency and accountability. The existing system carried the risk of conflict of interest as evidenced in non-communication of test results to stake holders and low priority given to water quality surveillance using FTKs.

- Government had not sanctioned the post of Chief Chemist[59] at the State level laboratory till date, so as to independently co-ordinate the activities of the laboratories in the State and to represent SRI in SWSM. The posts of Microbiologist/Bacteriologist, Laboratory Assistant and Data Entry Operator were also not sanctioned to SRI.

  Government replied (June 2025) that creation of posts was a matter of policy decision of the Government and that the functioning of SRI was properly managed by utilising the available manpower and by hiring required manpower as per rules. It was also stated that the duties of Chief Chemist were performed by the Seniormost Chemist.

  However, no records were produced to substantiate assigning of duties of Chief Chemist to the Seniormost Chemist. Further, SWSM had not nominated the Chief Chemist as the member of Executive Committee. It was also significant to note that Laboratory Gap Assessment and Improvement Plan 2025 of SRI had identified the need for appointing of permanent staff, which was required for maintaining National Accreditation Board for Testing and Calibration Laboratories (NABL) accreditation.

- The Institute faced deficiencies in physical infrastructure and manpower, which prevented it from conducting the full range of

[59] An individual with at least 15 years of experience in water quality analysis and a postgraduate degree in Sciences was to be appointed as the Chief Chemist at SRI, who was to oversee all drinking water quality testing laboratories in the State and report directly to the Secretary, WRD.

prescribed analyses. Of the mandated 73 number of water quality parameters to be tested at State level, SRI was equipped to conduct tests for 40 parameters only. The SRI was currently functioning in the building of Quality Control Division of KWA at Kochi. The available space in the two floors was being utilised for various utilities like laboratories, storage, office space, rest room, etc. of both the offices and a sub district laboratory.

- Audit noted the fact that though administrative sanction was accorded (August 2020) for construction of new building for SRI at Nettoor, Ernakulam and ₹5.65 crore was already spent for the purpose, only 72 *per cent* of the work was completed as shown in **Figure 5.1**. The project has been stalled from August 2024, with tendering for electrical works pending.

Figure 5.1: New SRI Building under construction at Nettoor. Photo taken by Audit party on 04 October 2024

Government assured (June 2025) that action was being taken to equip SRI laboratory to test the remaining parameters. In the case of infrastructure, it was stated that the issues associated with the new SRI building were being sorted out and that the construction would be completed quickly.

5.1.2. District Level Laboratories

There were 14 district laboratories in the State, which had NABL accreditation for 17 parameters. Only three out of 14 district laboratories got NABL accreditation for microbiology.

As per WQMSF, a district laboratory was to test 250 water sources/samples per month (3,000 water sources in a year[60]). All sources spread geographically were to be randomly covered, including the samples tested positive, referred by the sub divisional/block laboratory/mobile laboratory for atleast 13 basic water quality parameters. The district laboratory was to refer the samples which tested positive to the State laboratory immediately and communicate test results to District Panchayat (DP), GPs and/ or its sub-committees for corrective action.

Audit however observed that the district laboratories did not communicate the test results to DP or GP for remedial action. This led to the GPs being left unaware of the status of water quality in their jurisdictional area.

[60] As per the target of roster available on Department/National Mission IMIS

Government replied (June 2025) that the test results were uploaded in the Water Quality Monitoring and Information System (WQMIS) site and GP, DP and general public had access to view these details.

Audit noticed that in WQMIS (Format WQ1 to 6), vital information such as date of sampling, date of issue of test report, location of sampling and remedial action taken was not available. There were delays in uploading the test results in WQMIS and in test-checked districts, the turnaround time ranged between 33 and 45 days.

As test results were not shared with the GPs, there was no mechanism to generate awareness among communities to not consume water for cooking and drinking from contaminated sources.

5.1.3. Sub Divisional Laboratories

There were 71 sub divisional laboratories in the State, out of which 70 laboratories obtained NABL recognition for testing chemical parameters. Only two out of 71 laboratories got recognition for testing bacteriological parameters.

Sub divisional/block level laboratories were required to test 100 *per cent* of water sources under their jurisdiction; once for chemical parameters and twice[61] for bacteriological parameters in a year. The samples tested positive were to be referred to the district laboratory and the test results were to be shared with the community.

However, sub divisional laboratories in test-checked districts did not conduct water quality monitoring, covering all water sources under their jurisdiction. The test results were not shared with the community/GP for awareness and remedial action.

Government reply stated (June 2025) that only the sources of piped water supply were currently being tested and since the remedial actions were done by the implementing agency, the details were not officially communicated to GP.

The reply was not acceptable as the GPs had a legitimate right to know the test results of water samples in their jurisdictional areas.

The KWA stated in Exit conference (May 2025) that its quality control labs were monitoring the sources of KWA schemes in their jurisdictional areas alone. The aforementioned contentions of Government/KWA are to be viewed in the light of KWA's own statement in the Exit conference that there were 63 lakh wells in use in Kerala. Exclusion of these sources from the sphere of testing tantamounts to exposing them to the threat of biological and chemical contamination of water consumed. Further, the objective of JJM being supply of potable water to 100 *per cent* of households, exclusion of such significant number of sources from testing was against the provisions of WQMS Framework.

[61] Pre and post monsoon

5.2. Effectiveness of Water Quality Testing at Grama Panchayat/ Village Level

As per WQMS Framework, all drinking water sources were to be tested for water quality using FTKs at least once a month and the results of these tests systematically uploaded to the WQMIS portal.

Audit noticed that SRI procured 7,605 FTKs and 7,60,500 Bacteriological Vials (BV) during the financial year 2021-22. Ever since the commencement of JJM programme, procurement of instruments was undertaken only during 2021-22. Furthermore, the date of expiry of instruments costing ₹6.88 lakh had elapsed, as testing process was not carried out on time as shown in **Table 5.1**.

Table 5.1: Details of FTKs and BVs procured by SRI during 2021-22

Test Instrument	Details of Procurement		Details of expired instruments	
	Number	Value (₹ in lakh)	Number	Value (₹ in lakh)
Field Test Kits	7,605	72.78	401	3.83
Bacteriological Vials	7,60,500	54.26	42,800	3.05
Total		**127.04**		**6.88**

(Source: Reply furnished by SRI)

Further, during the course of audit, it was observed that five FTKs which could have been used for testing 500 samples, received by Munroethuruth GP for testing the water samples, were left unused with its sealed contents including bottles of reagents left unopened. The FTKs were found dumped inside the GP office and their dates of usage had already expired, as shown in **Figures 5.2** and **5.3**:

Figure 5.2: Unused bottles in the FTKs kept inside Munroethuruth GP office

Figure 5.3: Expired reagents supplied with FTKs kept at Munroethuruth GP office

Audit also undertook (March 2025) testing of water samples in Nenmeni ward of Munroethuruth GP in laboratories and found that the water samples collected from Nenmeni were chemically contaminated. Had the GP utilised the FTKs and regularly tested the quality of water supplied, remedial measures to mitigate the health hazards of chemical contamination of drinking water could have been initiated.

Government replied (June 2025) that Kudumbashree was engaged in testing using FTKs which was stopped due to dispute over payment. Government further stated that KWA was having a network of 84 labs and therefore the stoppage of testing using FTKs did not affect the quality monitoring of drinking water in the State.

The contention of Government was not tenable as KWA, with its established network of 84 labs had not ensured regular testing of water in the Nenmeni ward, which was exposed to contamination of sources. KWA laboratories undertook water quality testing in Nenmeni ward only once in a year.

5.3. Discrepancies among values in the results of Water Quality Tests

The WQMS Framework insisted upon the conduct of water quality surveillance by the local community every month. The activities of water quality monitoring and surveillance also included cross verification of water quality data and integration with other laboratories of State/ Central Government agencies.

Audit team, assisted by KWA, collected water samples from two different sources each from the test-checked districts and tested them at the Quality Control District Lab (QCDL) of KWA, and further at other labs on the same day and at QCDL after two months. The comparison of values among the test results conducted by QCDL and other laboratories is depicted in **Appendix 5.1**:

- While comparing the test results conducted by QCDL, Kollam with that of CEPCI[62], Audit observed that the values in test results of the water samples taken from the same location showed variations, when re-checked within a period of two months. Iron content in the sample checked increased by 0.57 mg/l and turbidity by 4.0 NTU[63]. Though the test results of CEPCI conducted on the very same day showed lower values of iron content and turbidity with that of QCDL, total coliform presence was positive for CEPCI, whereas it was negative in the test results of QCDL.
- In Palakkad district, the test results showed variations in the parameter value of Fluoride by QCDL, Palakkad (0.20 mg/l) and EMAL[64] (1.0 mg/l), indicating a difference of 0.80 mg/l. In the second sample collected, the test results of QCDL showed presence of coliform whereas it was absent in the results of EMAL.
- In Kozhikode district, the test results by CWRDM[65] showed presence of coliform in one of the samples, whereas it was absent in the report of QCDL, Kozhikode.

The above discrepancies point towards the urgent need to review the surveillance and quality testing mechanism and analyse the causes of variation in test results conducted in samples drawn from the same source on the same day.

Government replied (June 2025) that as KWA laboratories ensure accuracy and maintain ISO/IEC 17025:2017 accreditation, the chance for error in test results from QCD lab of KWA is very remote.

The reply is not tenable, as Audit noticed that results of water sample tests conducted at QCDL, Kollam within an interval of two months showed variation

[62] Cashew Export Promotion Council of India Laboratory and Research Institute, Kollam
[63] Nephelometric Turbidity Unit
[64] Environmental Monitoring and Analytical Laboratory, Palakkad
[65] Centre for Water Resources Development and Management, Kozhikode.

in iron content from 0.71 mg/l to 1.28 mg/l, as against the acceptable limit of 1.0 mg/l, which has been included in Paragraph 4.8.2 of this Report.

It was evident that cross verification of water quality data and integration with other laboratories of State/Central Government agencies as well as inter/intra laboratory comparison with the results of other laboratories have not been done, as prescribed in Guidelines of JJM/ISO.

5.4. Non-adherence to prescribed Turnaround Time

A turnaround time[66] of 24 hours was advised for testing chemical parameters and not beyond 48 hours for testing the biological parameters. Audit, on reviewing IMIS data, observed that all the labs operating in the State had a turnaround time greater than seven days.

The average turnaround time of district labs in test-checked districts of Kozhikode, Kollam and Palakkad was 45, 40 and 33 days respectively.

Government stated (June 2025) in reply that testing of all samples was completed within three to five days and that any delay in publishing the results would be examined. It was also stated that, the actual testing of water samples in the three test-checked districts was carried out within the prescribed turnaround time. However, no records to substantiate the claim was furnished to Audit by Government.

5.5. Other deficiencies noticed in implementation of Water Quality Monitoring and Surveillance Programme (WQMSP)

5.5.1. Sanitary survey

JJM guidelines prescribed formulation of a Water Safety Plan which included both water quality testing and sanitary inspection to determine appropriate control measures. A sanitary survey was to be carried out once in a year for all drinking water sources in the State. Annual sanitary survey, if conducted, was to be reported and remedial actions taken.

Audit noticed that sanitary survey as envisaged in the guidelines has not been conducted in the test-checked GPs and water security plan has not been prepared for the State.

Government replied (June 2025) that though annual sanitary survey has been conducted, the entire data was not being uploaded into the WQMIS portal due to lack of manpower. It was also stated that action was being taken to enter details of sanitary survey in WQMIS Portal.

However, no records pertaining to sanitary survey or any remedial action taken was provided to Audit to substantiate the claim of the Government.

[66] Turnaround time for laboratory services is done by taking the time of sample collection at the water quality laboratories as the starting point and the printing of reports/ receipt of electronic report as the end point.

5.5.2. Mobile Laboratory

Establishment of mobile laboratories to undertake regular water quality surveillance of sources of drinking water in far off/tribal/forested areas was to be prioritised. Mobile laboratory was deemed essential for conducting testing of water samples in remote locations and disaster-prone areas. However, Audit noticed that Mobile laboratories have not been made operational in the State.

Government replied (June 2025) that as KWA had a network of 84 labs undertaking quality monitoring and surveillance activities, establishment of mobile laboratories was not a necessity at present as it required additional expenditure. The reply was not acceptable in light of the observations relating to inferior quality of water provided to rural households, as revealed in tests mentioned in Paragraph 5.2 of this Report. Further, Government had made it clear during Exit conference that testing was restricted to sources of water supply of KWA alone. Kerala, being a State characterised by uneven terrains and frequent natural calamities, mobile laboratories would have supplemented and strengthened the coverage area of quality testing and surveillance.

Recommendation

- ***Government may ensure that KWA conducts water quality monitoring and surveillance programmes on a regular basis through Quality Control divisions and State/district/sub divisional laboratories and communicates test results to stakeholders in a timely manner.***