PCRWR

آب پاک

CLEAN WATER FOR SCHOOLS
CWS
Unique Welfare Project in Pakistan

School Education Department

Drinking Water Quality Assessment and Remedial Actions Taken in the Piloted 20 Selected Schools of 10 Districts of Punjab

Pakistan Council of Research in Water Resources (PCRWR)

2022

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Acknowledgements

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Executive Summary

Poor sanitation, water scarcity, inferior water quality and inappropriate hygiene behavior are disastrous for health and well-being of school going children and are major cause of mortality and low school enrolment. The unequal facilities in schools have been observed in terms of access to safe water, hand washing and sanitation facilities. The impact of unsafe drinking water has also been observed among the school going children. Attributing the issues of water-borne diseases among school students, the 24 offices of Pakistan Council of Research in Water Resources (PCRWR) across the country have adopted selected schools of girls and boys in the country to improve the water, sanitation, and hygiene situation.

Punjab is the largest province of Pakistan by population. It has approx. 53,000 government-owned schools and more than 10 million students are studying in these schools. PCRWR and Punjab Aab-e- Pak Authority (PAPA) have taken an initiative for the assessment of the existing schools water quality with the aim to rectify the identified water quality issues for provision of safe drinking water to students/staff of these 20 adopted schools of Punjab (as a pilot) with financial support of Clean Water for Schools-USA (CWS)[1]. The water quality survey of these 20 schools conducted by the PCRWR indicated that 100% of the schools were using microbiologically unsafe water whereas 21% schools were using brackish water. Similarly, 15% of these schools were unknowingly consuming Arsenic contaminated water. This alarming situation was planned to be addressed through a tripart Agreement of Assignment (AOA) among PAPA, CWS, and PCRWR. Under this agreement PCRWR has installed/upgraded the treatment systems in these schools. The consumables of the treatment system have been provided to schools' managements for one year along with log books for the records of operation and maintenance. Moreover, WASH committees of Schools have been constituted and necessary training to maintain the safe water systems was also imparted to WASH Committee of school teachers and staff. Together with this awareness, behavior change sessions to school students

[1] "Clean Water for Schools." - a welfare project has been launched in Pakistan by Dr. Qadeer Soharwardi, a USA-based Pakistani.

were also arranged by the PCRWR team. The quality of water was again checked after all the installations and all samples were found to be safe meeting the WHO Standards for drinking water. Therefore, all the 20 adopted schools are now providing safe drinking water to the students/staff. This pilot program will help in talking similar initiatives at all other schools across Punjab to ensure safe quality of water for our young students, and to achieve Sustainable Development Goal (SDG)-6, target 6.3.1 (as agreed with the UN) by 2030.

1. Introduction

Water is essential not only for human health but also for poverty reduction, food security, peace and human rights, ecosystem and environmental sustainability. Nonetheless, several countries are facing growing challenges linked to water scarcity, water pollution, degradation in water-related ecosystems and international cooperation over trans-boundary water basins. Pakistan is among 37 countries of the world with extremely high levels of water stress, a condition when water demand exceeds the water availability or when poor quality restricts its use.

The World Resources Institute has placed Pakistan in extremely high-water stress category by 2040 (Reig *et al.,* 2013) if this situation prevails as such and no actions are taken to improve availability of water and effective water conservation strategies. Similarly, Pakistan Council of Research in Water Resources (PCRWR) reported that if this situation continues i.e., population keeps on increasing and water resources remain constant, Pakistan will be touching the absolute water scarcity line (500 m^3/person/day) by 2025 (Qureshi and Ashraf, 2019). Since water quantity and water quality are directly linked, the level of access to safe drinking water also varies from region to region in Pakistan. The Economic Survey of Pakistan, 2019-2020 indicated that supply of drinkable Water and Sanitation Services (WSS) requires special attention as presently a large number of households do not have access to enough potable water.

Though Pakistan has made some improvements in safe water access over the years (15% safe in 2001 to 39% in 2021, as reported by PCRWR), (Rasheed *et al.,* 2020), Pakistan is still one of the top 10 countries with the lowest access to clean water (World Asia, 2018). Disposal and mixing of untreated wastewater in surface and groundwater as well as insufficient wastewater recycling has further exacerbated the health and environmental risks linked with unsafe water. The impact of unsafe drinking water quality area also reflected in schools of Pakistan. Considering this, 24 offices of PCRWR across the country have adopted some schools as a pilot to improve water, sanitation, hygiene and environment in the school.

2. Study Area

Punjab has an area of 205,344 km^2 and is the 2nd largest province (area-wise) after Balochistan. It has 36 districts and 53,000 Government schools, where approx. 10 million students are studying. PCRWR adopted 20 schools of 10 districts of Punjab as illustrated in Table 1:

Table 1: List of Schools Adopted by the PCRWR in Punjab

S No.	Water Quality Lab	District	Approx. number of Students	Name of School
1	Lahore	Lahore	1,246	Govt. Girls High School Sher Shah Colony
			450	Govt. Boys Middle school Sher shah colony Raiwind Road
2	Sahiwal	Sahiwal	3,200	Govt. Shuhda-E-APS Memorial High School
			450	Govt. Girls High School Bilal Colony
3	Sialkot	Sialkot	611	Govt. Girls Elementary School Daburji Arrian
			520	Govt. Muslim Boys schools kareem Pura
4	Gujranwala	Gujranwala	325	Govt. High School Boys No. 12 Peoples Colony
			180	Govt. Deaf and Defective Hearing High School Peoples Colony
5	Mianwali	Mianwali	250	Special Education Complex (Govt. Special Education Complex, Near Muslim Colony
6	Sargodha	Sargodha	500	Govt. Girls High School New Satellite Town

			475	Govt. Qasim Ul Aloom Boys High School Satellite Town
7	Faisalabad	Faisalabad	2,800	Government Technical High School, Peoples Colony
			1,400	Govt. High School 215 RB Jarranwala Road
8	Dera Ghazi Khan	Dera Ghazi Khan	1,450	Govt. Comprehensive High School
			2,600	Govt. Girls High School, Mulla Quaid Shah
9	Bahawalpur	Bahawalpur	2,035	Govt. Girls Higher Secondary School Satellite Town
			2,200	Govt. College of Technology, Satellite Town
10	Multan	Multan	1,200	Workers Welfare Higher Secondary School
			3,000	Govt. Girls Higher Sec. School Chah Borh Wala
	Total Students		**2,4890**	

Each of the PCRWR office has adopted two schools (each of girls and boys schools) to introduce the concept of safe drinking water, improved sanitation, hygiene and clean & green environment. Accordingly, following specific initiatives have been taken:

1. Reconnaissance survey of schools to investigate the drinking water quality, conditions of water storage tanks and WASH facilities. Based on the data, the most problematic school were adopted for: installation of water treatment/filtration plants, storage tank cleaning, hand washing facility and training of school staff and students for maintenance of school WASH facilities.

2. Installation of hand washing stations near school canteen/tuck-shops to reduce the risk of infections and diseases including Covid-19.

3. Constituting the school WASH committee with defined responsibilities and imparting training on different aspects of WASH and to streamline the WASH infrastructure and behavioral change activities in the schools.

3. Water Quality Assessment

Major sources of water in the adopted schools of Punjab are ground water either pumped directly or supplied from the government's piped system. Out of 20 schools 13 are using ground water, 3 are using government water supply, and 4 are using both sources.

3.1 Sampling Methodology

All water samples were collected, transported and tested for microbial and physico-chemical analysis following the protocols of standard methods for examination of water and wastewaters (American Public Health Association, 22nd Edition, 2017) (listed as Table 2). From each site four types of samples were collected. The detail about the types of samples and preservative used is as below:

1. **Type A** –All sites – Pre-sterilized sampling bottles for microbiological analysis
2. **Type B** –All sites –2 ml/liter nitric acid (HNO_3) as preservative for trace elements
3. **Type C** –All sites –1 ml/100 ml, 1 molar boric acid as preservative for nitrate
4. **Type D** –All sites –No preservative for other water quality parameters

All samples were collected in polystyrene bottles of 500 ml. Prior to sample collection, bottles were washed with distilled water and rinsed thoroughly several times with the same water which is to be collected. For microbial analysis, samples were collected in pre-sterilized bottles of 200 ml and tested in the respective PCRWR water quality laboratory. Water samples (types B, C and D) collected for chemical analysis were also analyzed in the respective Laboratory of the district while National Water Quality Laboratory, PCRWR, Islamabad and Regional Water Quality Laboratories also supported the analysis of parameters where facility was not available.

Table 2: Water quality parameters and methods used for analysis

Sr. No.	Water Quality Parameter	Reference Method
1.	Color	Sensory evaluation
2.	Electrical Conductivity	APHA, 22nd Edition Standard Method No. 2510 (B)
3.	pH	APHA, 22nd Edition Standard Method No. 4500 (B)
4.	Turbidity	APHA, 22nd Edition Standard Method No 2130(B)
5.	Alkalinity as $CaCO_3$	APHA, 22nd Edition Standard Method No. 2320 (B)
6.	Bicarbonate	APHA, 22nd Edition Standard Method No. 2320 (B)
7.	Calcium	APHA, 22nd Edition Standard Method No. 3500 (B)]
8.	Carbonate	APHA, 22nd Edition Standard Method No. 2320 (B)
9.	Chloride	APHA, 22nd Edition Standard Method No. 4500-Cl (B)
10.	Hardness	APHA, 22nd Edition Standard Method No. 2340 (C)
11.	Magnesium	APHA, 22nd Edition Standard Method No. 2340 (B)
12.	Potassium	APHA, 22nd Edition Standard Method No. 3500 Na (B)
13.	Sodium	APHA, 22nd Edition Standard Method No. 3500 K (B)
14.	Sulfate	APHA, 22nd Edition Standard Method No. 4500 SO_4 (E)
15.	Nitrate (N)	APHA, 22nd Edition Standard Method No. 4500 (NO_3 B)
16.	TDS	APHA, 22nd Edition Standard Method No. 2540 (C)
17.	Arsenic	APHA, 22nd Edition Standard Method No. 3111 (B)
18.	Fluoride	APHA, 22nd Edition Standard Method No. 4500 (F D)
19.	Total Coliform	Colilert Quantitray-2000 (AOAC)
20.	E.coli	Colilert Quantitray-2000 (AOAC)

Figure 1: Water sample collection from Faisalabad school

Figure 2: Water sample collection from Sahiwal

4. Results and Discussion

Test results of each school were compared with the Pakistan's National Drinking Water Quality Standards and problem parameters were identified to plan the arrangement of safe water facilities. The test results revealed highly unsafe water quality in majority of the schools. Microbial contamination was prevalent in all of the 20 schools, while 21% water samples are unsafe due to chemicals contaminations. Similarly, 15% of the schools had problem of excessive arsenic than safe limits as shown in Annexure-1.

Table 3: School wise water quality status of adopted schools

S#_District	School	Contaminants	Microbial	Arsenic	TDS
			-ve	10 ppb	1000 ppm
1	Lahore	Govt. Girls High School Sher Shah Colony	+ve	BDL	253
2		Govt. Boys Middle	+ve	24.12	439

		school Sher shah colony Raiwind Road			
3	Sahiwal	Govt. Shuhda-E-APS Memorial High School	+ve	BDL	1668
4		Govt. Girls High School Bilal Colony	+ve	BDL	325
5	Sialkot	Govt. Girls Elementary School Daburji Arrian	+ve	BDL	318
6		Govt. Muslim Boys schools kareem Pura	+ve	BDL	268
7	Gujranwala	Govt. High School Boys No. 12 Peoples Colony	+ve	BDL	269
8		Govt. Deaf and Defective Hearing High School Peoples Colony	+ve	BDL	278
9	Mianwali	Special Education Complex (Govt. Special Education Complex for Boys, Near Muslim Colony	+ve	BDL	724
10		Special Education Complex (Govt. Special Education Complex for Girls, Near Muslim Colony	+ve	BDL	724
11	Sargodha	Govt. Girls High School New Satellite	+ve	BDL	232

		Town			
12		Govt. Qasim Ul Aloom Boys High School Satellite Town	+ve	BDL	287
13	Faisalabad	Government Technical High School, Peoples Colony	+ve	BDL	232
14		Govt. High School 215 RB Jarranwala Road	+ve	BDL	3149
15	DG Khan	Govt. Comprehensive High School	+ve	BDL	2297
16		Govt. Girls High School, Mulla Quaid Shah	+ve	BDL	290
17	Bahawalpur	Govt. Girls Higher Secondary School Satellite Town	+ve	BDL	608
18		Govt. College of Technology, Satellite Town	+ve	BDL	572
19	Multan	Workers Welfare Higher Secondary School	+ve	55	260
20		Govt. Girls Higher Sec. School Chah Borh Wala,	+ve	55	255

BDL: Below Detection Limit, **ppm**: parts per million, **ppb**: parts per billion

4.1 Parameter-wise water quality profile

The descriptive statistics of monitored water quality parameters are given in Table 4. It shows that quality of water from different sources was safe with respect to chemical contamination. However, TDS, Arsenic and microbial contaminations were of main concern

Table 4: Descriptive statistics of major water quality parameters in adopted schools

Test Parameter_Unit	Min.	Max.	Mean	Samples exceeding permissible limits	No.	%
TDS	ppm	56.00	3149	699.73	4	21
Bicarbonate	ppm	20.00	800	254.73	1	5
Chloride	ppm	10.00	384	79.21	1	5
Sulphate	ppm	0.24	1170	195.44	2	11
Arsenic	ppm	0.13	55.00	8.05	3	15

Parameter wise details summary of results is discussed as below.

4.1.1 Microbial Contamination

Microbial pollution in drinking water is one of the critical issues due to a potential contamination by pathogenic bacteria, protozoa or viruses. School wise comparison of microbial contamination showed that water sources in all schools were found contaminated with microbial contamination. The most prevalent microbial contamination reveals the probability of mixing of sewage in drinking water supply pipelines. Waterborne diseases like cholera, diarrhea, typhoid, hepatitis A & E caused by microbially contaminated water may affect the health of school students and lower their academic progress.

4.1.2. Total Dissolved Solids

Total dissolved solids (TDS) is an overall estimation of the inorganic salts and small amounts of organic matter present in water and reflect an overall measurement of basic chemical water quality. The major constituents are usually calcium, magnesium, sodium, and potassium cations and carbonate, hydrogen carbonate, chloride, sulfate, and nitrate anions. TDS of 4 out of 19 adopted schools was not within acceptable range of National Standards for Drinking Water Quality (MOE, 2010) and WHO drinking water guidelines (i.e. 1000 mg/L) and required treatment.

4.1.3 Arsenic Contamination

Arsenic from geogenic natural deposits release into the groundwater and ingestion of unsafe arsenic through groundwater may cause nausea, vomiting, diarrhea, muscle weakness, cramping, skin hyper pigmentation, keratosis and at later stages certain types of cancer such as skin, lung and bladder. The arsenic contamination in drinking water sources of adopted schools was found in Lahore and Multan i.e. higher than 10 ppb.

4.2 Arrangements of Safe Drinking Water Facilities

Water quality analysis data of adopted schools (Annexure 1) revealed that major contaminants such as Microbiology, TDS and Arsenic require rectification measures. Based on source specific levels of contaminants and daily requirements, PCRWR technical team proposed the upgradation of existing water treatment systems in schools or installation of new treatment system for each school. Upgradation/installation tasks were undertaken as per below plan:

Table 5: Adopted Water Treatment for Schools

S No	School	Water Quality Treatment
1	Govt. Girls High School, Sher Shah Colony, Lahore	Replacement of cartridges and installation of UV disinfection lamp in existing system
2	Govt. Boys Middle school Sher shah colony Raiwind Road, Lahore	Installation of filtration plant along with facility of Arsenic Removal and UV Lamp
3	Govt. Shuhda-E-APS Memorial High School, Sahiwal	Due to High TDS level Reverse Osmosis system with facility of UV lamps
4	Govt. Girls High School Bilal Colony, Sahiwal	Due to High TDS level Reverse Osmosis system with facility of UV lamps
5	Govt. Girls Elementary School Daburji Arrian, Sialkot	Replacement of cartridges and installation of UV lamp in existing system
6	Govt. Muslim Boys schools, Kareem Pura, Sialkot	Replacement of cartridges and installation of UV lamp in existing system
7	Govt. High School Boys No. 12 Peoples Colony, Gujranwala	Filtration system with facility of UV Lamp
8	Govt. Deaf and Defective Hearing High School Peoples Colony, Gujranwala	Filtration system with facility of UV Lamp
9	Special Education Complex for Boys, Near Muslim Colony, Mianwali	Replacement of cartridges and installation of UV lamp in existing system
10	Special Education Complex for Girls, Near Muslim Colony, Mianwali	Replacement of cartridges and installation of UV lamp in existing system
11	Govt. Girls High School New Satellite Town, Sargodha	Replacement of cartridges and installation of UV lamp in existing system
12	Govt. Qasim Ul Aloom Boys High School Satellite Town, Sargodha	Filtration system with facility of UV Lamp
13	Government Technical High School,	Drinking source was shifted from ground

	Peoples Colony, Faisalabad	water to water supply scheme of WASA. Filtration system with facility of UV Lamp
14	Govt. High School 215 RB Jarranwala Road, Faisalabad	Overhauling of RO system and installation of new RO Membrane
15	Govt. Comprehensive High School, DG Khan	Due to High TDS level Reverse Osmosis system with facility of UV lamps
16	Govt. Girls High School, Mulla Quaid Shah, DG Khan	Filtration system with facility of UV Lamp
17	Govt. Girls Higher Secondary School Satellite Town, Bahawalpur	Replacement of cartridges and installation of UV lamp in existing system
18	Govt. College of Technology, Satellite Town, Bahawalpur	Replacement of cartridges and installation of UV lamp in existing system
19	Workers Welfare Higher Secondary School, Multan	Filtration plant along with facility of Arsenic Removal and UV Lamp
20	Govt. Girls Higher Sec. School Chah Borh Wala, Multan	Filtration plant along with facility of Arsenic Removal and UV Lamp

The technical team of PCRWR visited each school for the installation/rehabilitation/ overhauling of filtration systems. After the discussion with school management, the suitable site for installation of treatment plant was identified. As per proposed design, each school was facilitated with safe drinking source/treatment system.

In each school WASH committee was also constituted comprising teaching and administration staff (Annexure-2). The members of WASH committee were trained for the proper functioning of treatment system.

Instructional charts (reflected below) as per need of operation and maintenance of each filtration system was also displayed for proper functioning of the system.

An awareness lecture on the importance of safe water, water conversation and WASH by the PCRWR team was also delivered to students of every school.

Figure 3: Site Identification in Govt. Girls High School Bilal Colony, Sahiwal

Figure 4: Installation of RO system in Govt. Shuhda-E-APS Memorial High School, Sahiwal

Figure 5: Students taking water in Govt. Girls High School, Mulla Quaid Shah, DG Khan

Figure 6: Installed RO system in Govt. Shuhda-E-APS Memorial High School, Sahiwal

Figure 7: Rehabilitation work in Govt. Girls Higher Secondary School Satellite Town, Bahawalpur

Figure 8: Students taking treated water in Govt. Girls Higher Secondary School Satellite Town, Bahawalpur

Figure 9: Lecture to students in Govt. Girls High School, Mulla Quaid Shah, DG Khan

Figure 10: Discussion with school principal in Govt. College of Technology, Satellite Town, Bahawalpur

5. Post installation Drinking Water Quality

To check the efficiency of each treatment system, testing of water quality was also undertaken after the installation/rehabilitation/over hauling of each system. School wise water quality status after operationalization of each system is given as below (Table 6):

Table 6: Post Treatment Drinking Water Quality Status

Sr #	School	Before Treatment			After Treatment			Remarks
	Contamination	Microbial	Arsenic	TDS	Microbial	Arsenic	TDS	
	Permissible limit	-ve	10 ppb	1000 ppm	undetected	10 ppb	1000 ppm	
1	Govt. Girls High School Sher Shah Colony, Lahore	15	BDL	253	undetected	BDL	250	Safe for Drinking
2	Govt. Boys Middle school Sher shah colony Raiwind Road, Lahore	18	24.12	439	undetected	BDL	430	Safe for Drinking
3	Govt. Shuhda-E-APS Memorial High School, Sahiwal	9	BDL	1668	undetected	BDL	466	Safe for Drinking
4	Govt. Girls High School Bilal Colony, Sahiwal	17	BDL	325	undetected	BDL	320	Safe for Drinking
5	Govt. Girls Elementary School Daburji Arrian, Sialkot	23	BDL	318	undetected	BDL	310	Safe for Drinking
6	Govt. Muslim Boys schools kareem Pura, Sialkot	7	BDL	268	undetected	BDL	261	Safe for Drinking
7	Govt. High School Boys No. 12 Peoples	15	BDL	269	undetected	BDL	265	Safe for Drinking

	Colony, Gujranwala							
8	Govt. Deaf and Defective Hearing High School Peoples Colony, Gujranwala	22	BDL	278	undetected	BDL	272	Safe for Drinking
9	Special Education Complex (Govt. Special Education Complex, Near Muslim Colony, Mianwali (Schools with two sections one for boys and one for girls and thus considered two schools)	6	BDL	724	undetected	BDL	721	Safe for Drinking
10	Govt. Girls High School New Satellite Town, Sargodha	15	BDL	232	undetected	BDL	230	Safe for Drinking
11	Govt. Qasim Ul Aloom Boys High School Satellite Town, Sargodha	24	BDL	287	undetected	BDL	284	Safe for Drinking
12	Government Technical High School, Peoples Colony, Faisalabad	7	BDL	232	undetected	BDL	229	Sponsored filtration plant was available.

								UV Lamp add, leakages remove, multimedia replaced
13	Govt. High School 215 RB Jaranwala Road, Faisalabad	18	BDL	3149	undetected	BDL	452	Upgradation work is completed as already installed system has overhauled.
14	Govt. Comprehensive High School, DG khan	14	BDL	2297	undetected	BDL	435	Safe for Drinking, however some construction work is in progress and afterwards another filter will be added in the system.
15	Govt. Girls High School, Mulla Quaid Shah, DG khan	10	BDL	290	undetected	BDL	286	Safe for Drinking
16	Govt. Girls Higher Secondary School Satellite Town, Bahawalpur	15	BDL	608	undetected	BDL	599	Safe for Drinking

17	Govt. College of Technology, Satellite Town, Bahawalpur	7	BDL	572	undetected	BDL	567	Safe for Drinking
18	Workers Welfare Higher Secondary School, Multan	9	55	260	undetected	BDL	264	Safe for Drinking
19	Govt. Girls Higher Sec. School Chah Borh Wala, Multan	11	55	255	undetected	BDL	253	Safe for Drinking

BDL: Below Detection Limit

6 Recommended Way Forward

6.1 Regular Monitoring of Treatment System

The installed/ rehabilitated/overhauled treatment systems in the adopted schools should be monitored regularly to ensure the sustained supply of safe water to students in these adopted schools. In particular, the school WASH committee should ensure timely maintenance as advised through training for their water treatment system. Record of all such maintenance with specific details as advised, must be maintained for transparency.

6.2 Regular Replacement of Expired Components

PCRWR team has also provided one-year consumables for system of each school. The consumables in the treatment require be changed on regular basis. This will help in maintaining the quality of water being supplied through the well-maintained treatment system. The regular changing of consumables will not only increase the life of treatment system but will also play its role in the efficiency of this system. Although consumable have been provided to schools' management for one year's School will have to manage the timely replacement of expired consumables with its own resources to the best interest of student and teacher's health. Local PCRWR office will also assist the school for any guidance while tracking the maintenance status regularly. Such reports will be shared electronically with PAPA and CWS regularly.

6.3 Annual WASH Campaign Campaigns

Awareness campaigns play very important role in the schools because every student takes the knowledge about usage of safe water. School administration should ensure to launch an annual WASH campaign for WASH improvement (water, sanitation, hygiene) in their school. In this regard, PCRWR ensures its continuous support to schools to demonstrate these schools as model schools.

Annexure-I

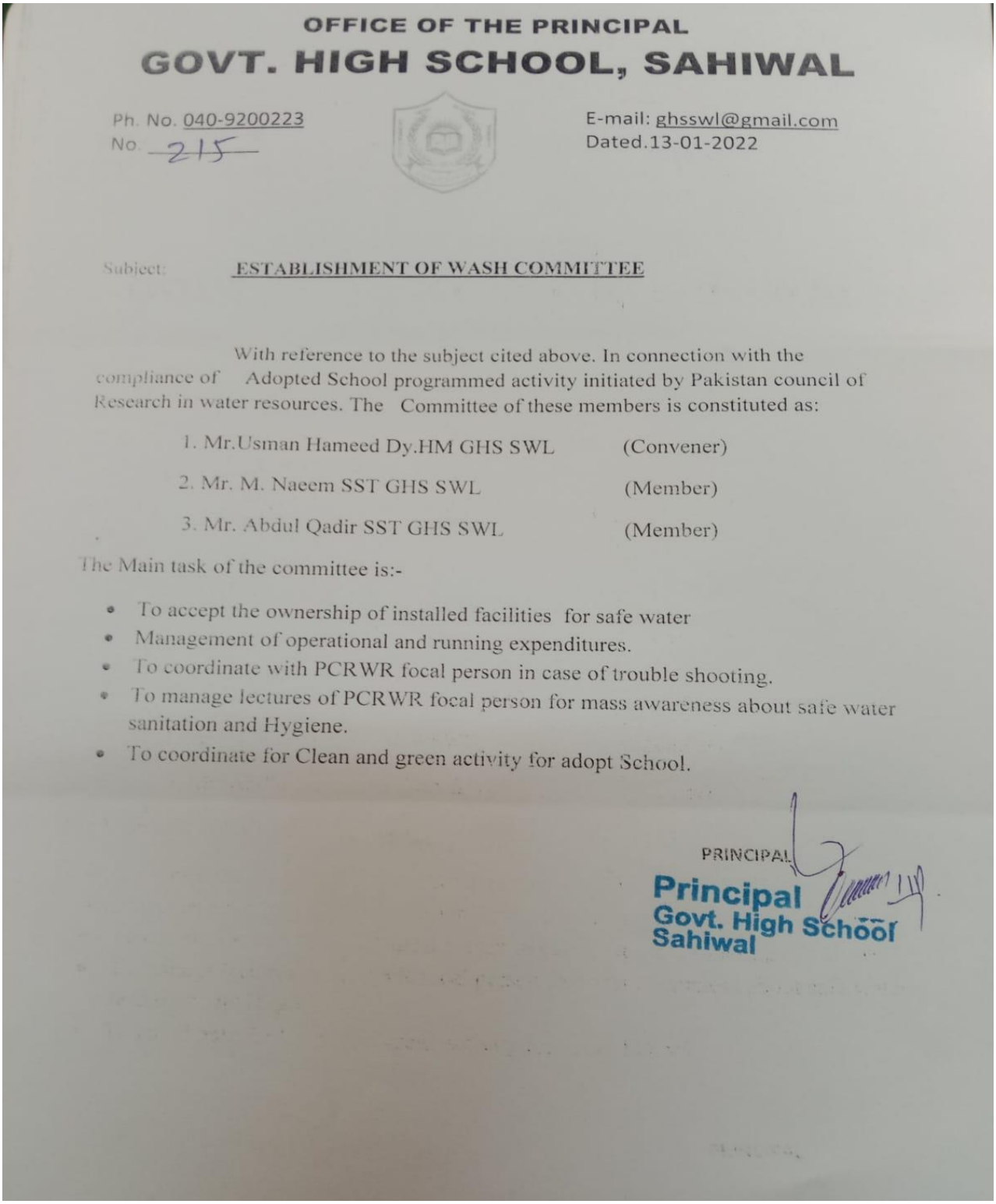
Sr No.	Water Quality Lab	Name of Schools	No. of Students	TDS	HCO_3	Cl	SO_4	As	Microbiological Contaminants	
	NDWQS			1000	500	250	NGVS	50 (PSQCA) 10 (WHO)	Total Coliforms 0/100ml	E-Coli 0/100ml
	Detection Limits			-	5	2	0.4	0.1	-	-
	Units			ppm	ppm	ppm	ppm	ppb	MPN /100ml	MPN /100ml
1.	Lahore	Government Girls high school Sher Shah Colony Lahore	1246	253	150	28	34	BDL	Positive	Positive
2.		Government Boys Middle school Sher shah colony Raiwind Road	450	439	290	38	71	24.12	Positive	Positive
3.	Sahiwal	Govt. Shuhda-E-APS Memorial High School Sahiwal	3200	1668	390	160	645	BDL	Positive	Positive
4.		Govt. Girls High School Bilal Colony Sahiwal	450	1072	310	186	265	BDL	Positive	Positive
5.	Sialkot	Government Girls Elementary School Daburji Arrian Sialkot	611	318	290	14	19	BDL	Positive	Positive
6.		Govt. Muslim Boys schools kareem Pura Sialkot	517	268	270	10	8	BDL	Positive	Positive
7.	Gujranwala	Govt. High School Boys No. 12 Peoples Colony, Gujranwala	325	269	210	11	BDL	BDL	Positive	Positive
8.		Govt. Deaf and Defective hearing High School Peoples colony, Gujranwala	180	278	220	15	BDL	BDL	Positive	Positive
9.	Mianwali	Special education complex (Govt. Special Education Complex, Near Muslim colony Mianwali (school for boys and girls)	247	724	280	92	162	BDL	Positive	Positive
10.	Sargodha	Govt. Girls High School New Satellite town Sargodha	500	232	110	23	60	BDL	Positive	Positive
11.		Govt. Qasim Ul Aloom Boys High School Satellite Town	475	287	140	64	34	BDL	Positive	Positive
12.	Faisalabad	Government Technical High School, Peoples Colony FSD	2800	56	20	15	BDL	BDL	Positive	Positive
13.		Govt.l High School 215 JarranwalaRB FSBD	1400	3149	800	384	1168	9.07	Positive	Positive

14.	Dera Ghazi khan	Govt. Comprehensive High School, D.G.Khan	1450	2297	270	244	1170	BDL	Positive	Positive
15.		Govt. Girls High School, Mulla Quaid Shah, Dera Ghazi Khan (2600 student) W.S. Scheme	2600	290	165	31	66	BDL	Positive	Positive
16.	Bahawalpur	Govt. Girls Higher Secondary School Satellite Town Bahawalpur	2033	608	280	78	10	BDL	Positive	Positive
		Govt. college of Technology, Satellite Town Bahawalpur	2200	572	270	60	BDL	BDL	Positive	Positive
	Multan	Workers Welfare Higher Secondary School Phulbarran, MultN	1200	260	175	31	BDL	55	Positive	Positive
		Govt Girls Higher Sec. School Chah Borh Wala, Multan	3000	255	200	21	BDL	55	Positive	Positive

BDL: Below detection limit, MPN: Most probable Number

Annexure II

Constitution of WASH Committee



OFFICE OF THE PRINCIPAL

GOVT. HIGH SCHOOL, SAHIWAL

Ph. No. 040-9200223
No. 215

E-mail: ghsswl@gmail.com
Dated.13-01-2022

Subject: **ESTABLISHMENT OF WASH COMMITTEE**

With reference to the subject cited above. In connection with the compliance of Adopted School programmed activity initiated by Pakistan council of Research in water resources. The Committee of these members is constituted as:

1. Mr.Usman Hameed Dy.HM GHS SWL (Convener)
2. Mr. M. Naeem SST GHS SWL (Member)
3. Mr. Abdul Qadir SST GHS SWL (Member)

The Main task of the committee is:-

- To accept the ownership of installed facilities for safe water
- Management of operational and running expenditures.
- To coordinate with PCRWR focal person in case of trouble shooting.
- To manage lectures of PCRWR focal person for mass awareness about safe water sanitation and Hygiene.
- To coordinate for Clean and green activity for adopt School.

PRINCIPAL

Principal
Govt. High School
Sahiwal

Govt. Comprehensive School, Dera Ghazi Khan

Ph No.03328496061
E-mail:gchskhan@gmail.com
No. 215
Dated: 01-02-2022

Subject: ESTABLISHMENT OF WASH COMMITTEE

With reference to the subject cited above. In connection with the accordance of Adopted School programmed activity initiated by Pakistan council of Research in water resources. The Committee of these members is constituted as:

1- Mr. Hamid Ali Principal GHS Comprehensive (Convener)
2- Mr. M.Idress khan S.S.S (bio) GHS Comprehensive (Member)
3- Mr. Abdul Aziz Baloch SS (Phy) GHS Comprehensive (Member)

The Main task of the committee is:-

- To accept the ownership of installed facilities for safe water
- Management of operational and running expenditures.
- To coordination with PCR WR focal person in case of trouble shooting.
- To manage lectures of PCR WR focal person for mass awareness about safe water sanitation and Hygiene.
- To coordination for Clean and green activity for adopt School.

Principal
Govt. Comprehensive School
Dera Ghazi Khan

GOVT .HIGH SCHOOL ,DERA GHAZI KHAN

Ph No. 03326224803 **E-mail: gghsmqshah@hotmailcom**

NO 181 **Dated:01-02-2022**

Subject: ESTABLISHMENT OF WASH COMMITTEE

With reference to the subject cited above.In connection with the compliance of Adopted School Programmed activity initiated by Pakistan council of Research in water resources.The Committee of these members is constituted as:

1 Mrs Tanveer Malik SST(G) Incharge Principal GGHS Mulla Quaid Shah Qadeem DERA GHAZI KHAN (Convener)

2.Mrs Shehla Rani SST(G) GGHS Mulla Quaid Shah Qadeem DERA GHAZI KHAN (Member)

3.Mrs Aljina Kareem SST(Sci) GGHS Mulla Quaid Shah Qadeem DERA GHAZI KHAN (Member)

The Main task of the Committee is:-

- To accept the ownership of installed facilities for safe water.
- Management of operational and running expenditures.
- To coordinate with PCR WR focal person in case of trouble shooting.
- To manage lectures of PCR WR focal person for mass awareness about safe water sanitation and Hygiene.
- To Coordinate for Clean and green activity for adopt School.

1/02/22

Principal
GGHS Mulla Quiad Shah Qadeem
Dear Gahzi Khan

PRINCIPAL
Govt High School
Mulla Quaid Shah (Qadeem)
Dera Ghazi Khan

Annexure III

Water Treatment Facilities Provided in Sialkot

Annexure III

Water Treatment Facilities Provided in Lahore

Annexure III

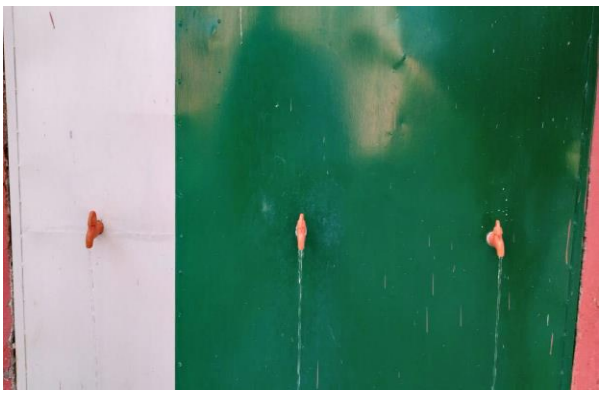
Water Treatment Facilities Provided in Multan

Annexure III

Water Treatment Facilities Provided in Bahawalpur

Annexure III

Water Treatment Facilities Provided in Sahiwal

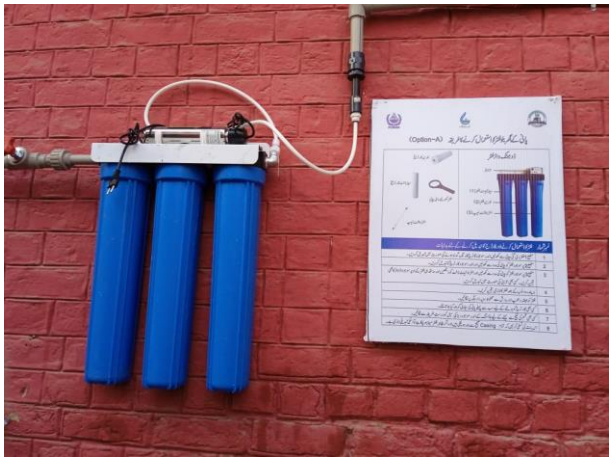


Annexure III

Water Treatment Facilities Provided in Sargodha

Annexure III

Water Treatment Facilities Provided in D.G. Khan

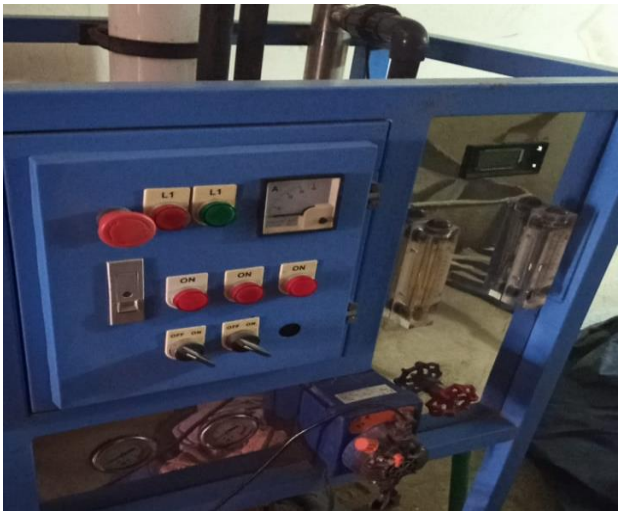


Annexure III

Water Treatment Facilities Provided in Mianwali

Annexure III

Water Treatment Facilities Provided in Faisalabad

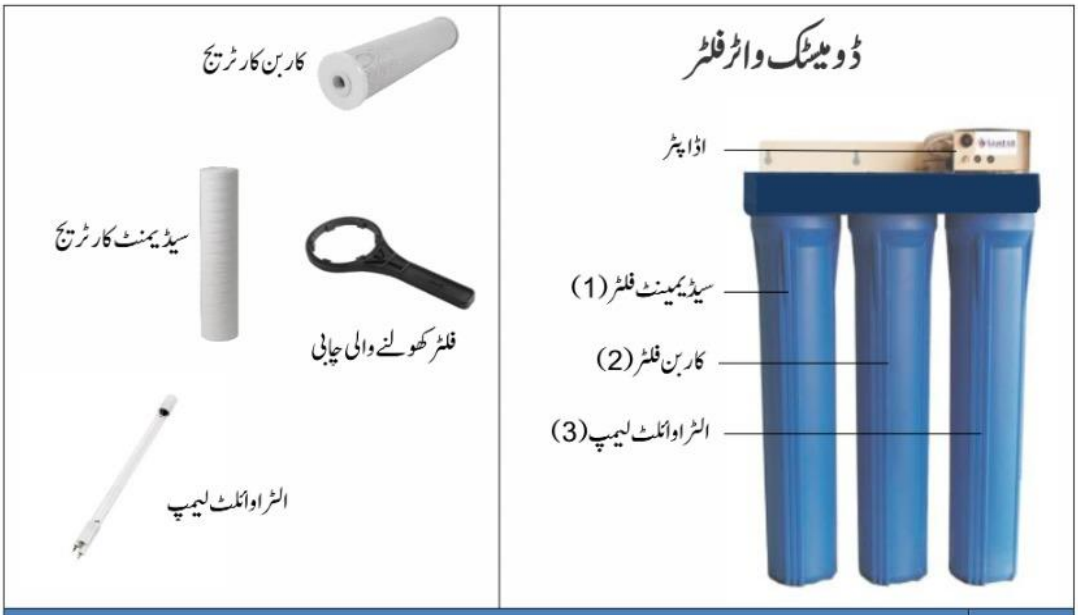


Annexure III

Water Treatment Facilities Provided in Gujranwala

Annexure IV

پانی کے گھریلو فلٹر کو استعمال کرنے کا طریقہ (Option-A)



نمبر شمار	فلٹر کو استعمال کرنے اور کارٹرج کو تبدیل کرنے کے لئے ہدایات
1	سٹیج 1 فلٹر دی گئی چابی سے کھولیں اندر موجود کارٹرج کا رنگ گدلا ہونے کی صورت میں تبدیل کر دیں۔
2	سٹیج 2 پر موجود فلٹر کو چابی کی مدد سے کھولیں اور اندر موجود کارٹرج کو تبدیل کر دیں۔
3	سٹیج 3 پر موجود فلٹر کو چابی کی مدد سے کھولیں اور الٹراوائیلٹ لائٹ کو دیکھیں اور ساتھ ہی فلٹر کے اوپر موجود اڈاپٹر کا بھی تجزیہ کریں۔ کسی بھی خرابی کی صورت میں تبدیل کر دیں
4	ہر پندرہ دنوں کے بعد فلٹر کا لازمی تجزیہ کریں۔
5	فلٹر کو ہمیشہ دھوپ اور بارش سے محفوظ سایہ دار جگہ پر لگائیں۔
6	کسی بھی کارٹرج کو بدلنے کے لیے سب سے پہلے پانی کی سپلائی کو بند کیا جاتا ھے۔
7	کسی بھی قسم کی لیکج سے بچنے کے لیے ہاؤسنگ کے اندر موجود ربڑ کی سیل کو درست طریقہ سے لگائیں۔
8	اس بات کی تسلی کر لیں کہ تمام Casing صحیح سے بند ہو چکی ہیں اور اگر بظاہر فلٹر میلا ہو چکا ہے تو اسکی تبدیلی لازمی ہے۔

پانی کے گھریلو آر او فلٹر کو استعمال کرنے کا طریقہ (Option-B)

نمبر شمار	پانی کے گھریلو آر او فلٹر کو استعمال کرنے کا طریقہ
1	آر او فلٹر پانی میں نمکیات کی زیادہ مقدار کی موجودگی کی صورت میں پانی کو پینے کے قابل بنانے کے لیے استعمال کیا جاتا ھے۔
2	2 پچھلے نمبر پر گدلاپن ختم کرنے کے لیے کارٹرج لگائی جاتی ھے جو کہ تین ماہ بعد تبدیل کی جاتی ھے۔
3	دوسرے نمبر پر پانی سے بدبو ختم کرنے کے لیے کارٹرج لگای جاتی ھے جو کہ تین ماہ بعد تبدیل کی جاتی ہے۔
4	تیسرے اور چوتھے نمبر پر موجود کارٹرجز کو چھ ماہ بعد بدلا جاتا ھے۔
5	پانچ نمبر موجود آر او میمبرین ہے جو کہ پانی میں سے زائد مقدار میں موجود نمکیات کو فلٹر کرتی ہے۔ میمبرین کو ایک سال کے استعمال کے بعد بدلا جاتا ہے۔
6	چھٹے نمبر پر موجود منرل کارٹرج جو کہ پانی میں پی ایچ کی مقدار کو پورا کرنے کے لیے لگای جاتی ھے۔
7	ساتوین نمبر پر الٹراویلٹ لایٹ جو کہ پانی میں موجود جراثیم کو ختم کرنے کے لیے استعمال کی جاتی ھے۔
8	آر او فلٹر کو ھمیشہ بارش اور دھوپ سے محفوظ کسی سایہ دار جگہ میں لگایا جاتا ھے۔
9	کسی بھی کارٹرج کو بدلنے کے لیے سب سے پہلے پانی کی سپلائی کو بند کیا جاتا ھے۔
10	کسی بھی قسم کی لیکج سے بچنے کے لیے ھاؤسنگ کے اندر موجود ربڑ کی سیل کو درست طریقہ سے لگائیں۔

آرسینک ریموول فلٹر کو استعمال کرنے کا طریقہ (Option-D)

آرسینک ریموول فلٹر

نمبر شمار	آرسینک ریموول فلٹر کو استعمال کرنے اور کارٹرج کو تبدیل کرنے کے لیے ہدایات
1	سٹیج 1 فلٹر دی گئی چابی سے کھولیں اندر موجود کارٹرج کا رنگ گدلا ہونے کی صورت میں تبدیل کر دیں۔
2	سٹیج 2 پر موجود فلٹر کو چابی کی مدد سے کھولیں اور اندر موجود کارٹرج کو تبدیل کر دیں۔
3	سٹیج 3 پر موجود فلٹر کو چابی کی مدد سے کھولیں اور الٹراوائیلٹ لائیٹ کو دیکھیں اور ساتھ ہی فلٹر کے اوپر موجود اڈاپٹر کا بھی تجزیہ کریں۔ کسی بھی خرابی کی صورت میں تبدیل کر دیں۔
4	آرسینک کی زیادہ مقدار کو ختم کرنے کے لیے مختلف قسم کے میڈیا استعمال کیے جاتے ہیں۔
5	آرسینک کو ختم کرنے والے میڈیا سے پہلے ہمیشہ پانی کو سیڈیمنٹ ریموول کارٹرج کا استعمال کیا جاتا ہے۔
6	آرسینک ریموول فلٹر کو بیک واش کرنا ضروری ہوتا ہے۔
7	بیک واش کرنے کے لیے فلٹر ویسل کے اوپر موجود والو کی پوزیشن کو متعلقہ جگہ (بیک واش) پر کیا جاتا ھے اور دس منٹ تک بیک واش کیا جاتا ہے۔
8	بیک واش مکمل ہونے پر والو کو دوبارہ متعلقہ جگہ (فلٹر) پر کیا جاتا ہے۔
9	ہر پندرہ دنوں کے بعد فلٹر کا لازمی تجزیہ کریں۔
10	فلٹر کو ہمیشہ دھوپ اور بارش سے محفوظ سایہ دار جگہ پر لگائیں۔
11	کسی بھی کارٹرج کو بدلنے کے لیے سب سے پہلے پانی کی سپلائی کو بند کیا جاتا ھے۔
12	کسی بھی قسم کی لیکج سے بچنے کے لیے ہاؤسنگ کے اندر موجود ربڑ کی سیل کو درست طریقہ سے لگائیں۔
13	اس بات کی تسلی کر لیں کہ تمام Casing صحیح سے Seal ہو چکی ہیں۔