Water Quality Safety Plan

Zaatari Refugee Camp - Jordan

Final

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IGIP GITEC CONSULT GMBH Consulting & Engineering Services Worldwide

CONSULAQUA Hamburg
A Company of HAMBURG WASSER

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Abbreviations

BH	Borehole
E.C	Electrical Conductivity
E.Coli	Escherichia coli
FRC	Free Residual Chlorine
GOJ	Government of Jordan
JS	Jordanian Standard
MoH	Ministry of Health
NTU	Nephelometric Turbidity Unit
O&M	Operation and Maintenance
T.Coli	Total Coliforms
TDS	Total Dissolved Solids
WHO	World Health Organization
PPM	Parts per Million

1 Objective

This **Water Quality Security Plan** is an addendum to the O&M Manual Drinking Water System. Its purpose is to **define the activities for drinking water quality monitoring** in the **Zaatari Water Supply System**.

The **Zaatari Water System Operator** (Operator) is responsible for compliance of the Water Quality Security Plan and **Water Quality Reporting to UNICEF**.

The plan is in accordance with **JS 286:2015** (Annex 1) and the **WHO Guidelines for Drinking-water Quality, Fourth Edition** (Annex 2). It takes into consideration the findings of the Analysis of water quality monitoring (Zaatari Camp Water Supply, Phase I), prepared by GITEC-IGIP GmbH in Association with CONSULAQUA Hamburg Beratungsgesellschaft mbH, February 2018 (Annex 3).

2 Sampling requirements according to Jordanian and WHO Standards

The Jordanian Standard on Drinking Water Quality (JS 286:2015, Annex 1), was published by the Jordan Standards and Metrology Organization. It defines the standard requirements of microbiological, chemical and physical characteristics and the procedures for monitoring and evaluating the quality of drinking water, both from the public and private sources.

Please refer to JS 286:2015 for the maximum values for microbiological, chemical and physical parameters. As JS 286:2015 is currently only available in Arabic language, sample test results indicating maximum levels for all tested parameters can be found in Annex 4.

JS 286:2015 also defines the frequencies for sampling at source and network level. Table 1 shows the frequencies for required sampling at source level, specifically defined for protected ground sources.

Frequency of sampling – Protected Ground Source, JS 286:2015	
Parameter group[1]	**Frequency**
Total coliforms	1 / month
Turbidity	1 / day
Physical Properties (JS 286:2015, Tables 2 & 3) & Nitrites and Nitrates (Table 4)	1 / year
Non-organic substances except nitrites and nitrates (Table 4)	Once a year, if it stabilizes for two successive years, it is examined once every 3 years
Pesticides & organic pollutants (Tables 5 & 6)	Once a year, if it stabilizes for two successive years, it is examined once every 3 years
Chlorine excess in water source and Chlorite (Table 7)	1 / day
Total halogenated methane (Table7)	Once a year, if it stabilizes for two successive years, it is examined once every 3 years

Table 1: Frequency of sampling – Protected Ground Source, JS 286:2015

The WHO Guidelines do provide explicit recommendations on sampling frequencies at source level. Therefore, sampling frequencies according JS 286:2015 are considered at **source level** in this Water Quality Safety Plan.

In addition to the samples at source level, Table 2 shows the minimum requirements for sampling for a water network that serves a population of 100.000. For further information, the table also includes the sampling frequencies defined in the WHO Guidelines for Drinking-water Quality, Fourth Edition (Annex 2); they match the requirements defined by JS 286:2015.

[1] Please refer to **Error! Reference source not found.** for details on the specific parameters included in each parameter group.

Frequency of sampling – Water Network (100.000 p), WHO and JS 286:2015		
Parameter	**Frequency (JS 286:2015)**	**Frequency (WHO)**
Total coliforms and e-coli	240 / year[2] (20 / month)	240 / year (20 / month)
Excess free chlorine	Daily / source	Parameters such as chlorine, turbidity and pH should be tested more frequently
Result-products of disinfection process (Free chlorine, chlorine dioxide, chlorite and total halogenated methane) [3]	Yearly / source	

Table 2: Frequency of sampling – Water Network (100.000 p), WHO and JS 286:2015

The sampling frequencies in JS 286:2015 are more explicit than the frequencies recommended by the WHO. Therefore, sampling frequencies within the **water network** are applied in this Water Quality Safety Plan are applied according to JS 286:2015.

[2] 1 sample /month/10,000 p + 10 samples monthly
[3] Included in sampling list at source level (JS 286:2015, Table 6)

3 System Description

During standard operation of the network-based Zaatari Water Supply System, the raw water is provided via three internal boreholes (BH1, BH2, BH3), where chlorination of the water takes place. The water is pumped through pipelines to storage reservoirs and distributed to the district level tanks. From there water is provided according to a supply schedule to household storage tanks (for further details please refer to O&M Manual Drinking Water System). The average filling frequency for household tanks is 5 days. [4]

Table 3 shows the components of the network-based Zaatari Water Supply System and back-up alternatives.

Zaatari Water Supply System, components Phase II		
Component	**Standard**	**Alternative**
Source	Internal borehole	External borehole
Treatment	Chlorination	n/a
Transmission	Pipeline	Water truck
Storage	Reservoir	n/a
Distribution	Pipeline	Water truck
Storage at HH level	Household tank	n/a
Access	Household water point	n/a

Table 3: Zaatari Water Supply System components

Back-up alternatives are required for the following scenarios:

1) Water volume provided through internal boreholes (BH 1 to 3) is not sufficient. Additional water quantities are sourced from external water sources to Zaatari Camp storage reservoirs:
    a. Through pipeline from Zaatari Village, or
    b. From external boreholes via water trucks.
2) Water volumes received at household level are not sufficient, due to network failure. Water quantities are distributed to household tanks through water trucks.[5]

[4] For further details on Water System and Operation, please refer to O&M Plan/Manual - Water System for Zaatari Refugee Camp, Jordan.
[5] Please refer to Water Quantity Contingency Plan for Zaatari Refugee Camp, Jordan.

4 Water Quality Monitoring

In this chapter water quality monitoring measures are defined for the standard operation of the Zaatari Camp Water System, consisting of (1) production at internal boreholes and (2) distribution through the network.

In the case that one of the components of the standard system fails to deliver quantities or qualities required, water quality monitoring measures for (3) alternative source, transmission or distribution means, are to be applied.

4.1 Water quality monitoring at production level (internal boreholes)

This section is divided into monitoring of (1) groundwater quality and (2) water production quality. Groundwater quality monitoring entails detailed microbiological, physical and chemical analyses. As groundwater quality undergoes slow changes, monitoring frequencies are low. During water production (pumping and treatment), groundwater can undergo physical changes (e.g. increased turbidity at pump start). The disinfection process changes water characteristics, as chlorine is added. Therefore, monitoring at production level requires higher frequencies.

Please note, that this section only applies to sources, boreholes and treatment facilities within Zaatari Camp. For external boreholes please refer to section 4.3.1 External borehole.

4.1.1 Groundwater quality

For each borehole operated within the Zaatari Water Supply System, the borehole licenses are to be renewed yearly. Around each borehole a sanitary survey is to be conducted on quarterly basis (Annex 5: Sanitary Survey Form, Deep Borehole with Mechanised Pumping). Also, sanitary conditions throughout the camp shall be monitored on a regular basis. Unsanitary conditions shall be addressed immediately.

In order to verify that groundwater fulfils the required quality standards, microbiological, physical and chemical parameters are to be monitored for raw water at each groundwater source (BH 1-3) operated within Zaatari Camp. The analyses are to be performed by a certified water laboratory.

A basic microbiological, physical and chemical analysis is to be performed on a monthly basis. A full microbiological, physical and chemical, covering all raw water parameters according to JS 286:2015, is to be performed on a six-monthly basis. Please refer to Table 4 for parameters to be analysed during monthly and six-monthly analyses.

The Ministry of Health (MoH) as supervising authority, will perform additional monthly raw water quality analyses. MoH will inform test results to the operator only in case that a sample

fail. The operator will give MoH full access, as required for sample taking. The operator will pursuit to take monthly samples intermittently to MoH analyses, thus ensuring raw water sampling on a bi-weekly basis (e.g. MoH monitoring at beginning of month, operator monitoring at mid-month).

Parameter	Test frequency	
	Monthly	6 Monthly
FRC	x	
E.C.	x	
PO4	x	
S	x	
Physical characteristics of drinking water (JS 286:2015, Table 2)		
Turbidity	x	x
Odor	x	x
Color		x
Taste		x
Materials and properties that have a spongy effect on drinking water (JS 286:2015, Table 3)		
pH	x	x
TDS	x	x
NH4	x	x
Fe	x	x
Al	x	x
TH (as CaCO3)		x
Cl		x
MBAS		x
SO4		x
Zn		x
Cu		x
Mn		x
Inorganic chemical elements and compounds (JS 286:2015, Table 4)		
NO3	x	x
F	x	x
CN		x
NO2		x
B		x
As		x
Pb		x
Cd		x
Cr		x
Ba		x
Se		x
Hg		x
Ag		x
Ni		x
Sb		x
Mo		x

Parameter	Test frequency	
	Monthly	6 Monthly
Organic pesticides (JS 286:2015, Table 5)		
Endrin		x
Lindan		x
Aldrin		x
Dieldrin		x
DDT		x
2,4-D		x
2,4,5-T		x
Organic pollutants in drinking water		
Benzene		x
Tetrachloroethylene		x
Trichloroethylene (TCE)		x
Ethylbenzene		x
Total Xylene		x
Toluene		x
Disinfection products in drinking water (JS 286:2015, Table 7)		
ClO2		x
TTHM		x
Radioactive materials in drinking water (JS 286:2015, Table 8)		
Gross Alpha		x
Gross Beta		x
Microbiological contaminants		
T.Coli	x	
E.Coli	x	x
TCC		x
Free Living Larvae		x

Table 4: Parameters, monthly and 6-monthly raw water samples

Water quality monitoring for protected groundwater sources			
Parameters	**Frequency**	**Samples per year**	**Response if values are outside acceptance range**
Microbiological and basic physical, chemical[6]	1/ month / borehole	36	Stop water production, use alternative sources to provide required quantities to the camp; Investigate and eliminate source of contamination; Clean and disinfect contaminated parts of the system; Take samples according to JS 286:2015 in order to prove reestablishment of water quality.
Full microbiological, physical and chemical (according to JS 286:2015) [7]	2 / year / borehole	6	

Table 5: Water quality monitoring for protected groundwater sources

This monitoring schedule is in compliance with JS 286:2015 and WHO Guideline.

4.1.2 Water production quality

At water production level, a set of parameters is to be monitored at the borehole, an additional set of parameters is to be monitored at the reservoir outlet.

Figure 1: Sample point borehole level (BH 2)

Figure 2: Sample taking BH 2

The samples are to be taken at the borehole outlet, immediately after the pump. Figure 1 and Figure 2 show the sample point at BH 2.

Table 6 shows the required water production monitoring at borehole level. It states the frequency in which the different parameters are to be analysed. In case the parameters measured

[6] Refer to **Error! Reference source not found.** for a detailed list of parameters to be tested.
[7] Refer to **Error! Reference source not found.** for a detailed list of parameters to be tested.

are outside the acceptance range, the operator shall react according to the response stated in the table.

Water quality monitoring at borehole level			
Parameter	**Frequency**	**Acceptance range**	**Response if values are outside acceptance range**
Turbidity	Hourly and with each pump-restart	< 1 NTU[8]	Use water filter to reduce turbidity to acceptable value; Discharge water until turbidity normalizes
TDS	Hourly	< 1.000 PPM	Use water filter to reduce TDS to acceptable value; Discharge water until TDS normalizes
E.C	Weekly	< 1.200	Stop water production, investigate
pH	Weekly	6.5 - 8.5	Stop water production, investigate
Ammonium	Weekly	<0.2 mg/l	Stop water production, investigate

Table 6: Water quality monitoring at borehole level

Table 7 shows the required water production monitoring after water treatment. At the reservoir outlet, FRC and turbidity are to be analysed hourly. In case the parameters measured are outside the acceptance range, the operator shall react according to the response stated in the table.

Water treatment samples are taken at reservoir outlet. Figure 4 shows the sample point for treated water quality at BH 2.

Figure 3: Sample point water treatment (BH 2)

Water quality monitoring at treatment level			
Parameter	**Frequency**	**Acceptance range**	**Response if values are outside acceptance range**
FRC	Hourly	1.0 – 1.8 mg/l	Adapt chlorine level from chlorinator until back to acceptable range
Turbidity	Hourly	< 5 NTU[9]	Stop distribution and address high turbidity levels

Table 7: Water quality monitoring at treatment level

These monitoring schedules are in compliance with the JS 286:2015 and WHO Guideline.

[8] According to WHO turbidity should not exceed 1 NTU before chlorination.
[9] According to WHO turbidity should not exceed 5 NTU for water distributed to households.

4.2 Water quality monitoring at distribution level (network)

The water network is a closed system. However, due to storage at district and household level, or contamination through eventual fissures in the pipeline, water quality can change. Therefore, within the water supply system, basic microbiological, physical and chemical parameters are to be monitored regularly.

The sample point for water quality monitoring at district level reservoir is at the outlet of the district level reservoir (see Figure 5).

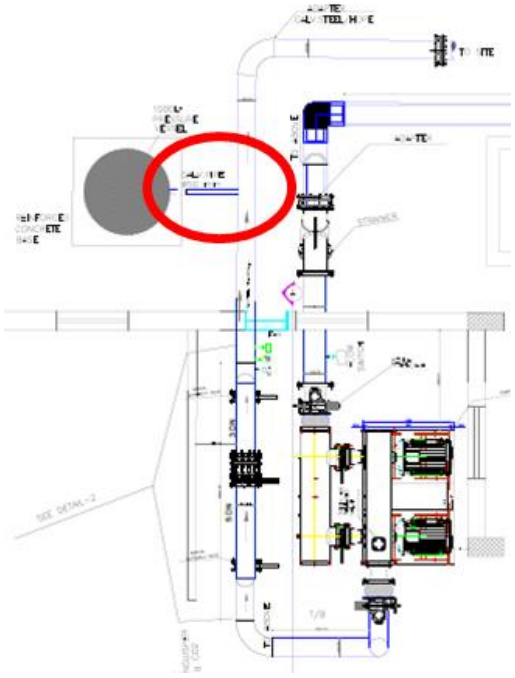


Figure 4: Sampling point district level reservoir

Week	Zone							
	1	2	3	4	5	6	7	8
2	x							
4		x						
6			x					
8				x				
10					x			
12						x		
14							x	
16								x
18	x							
20		x						
22			x					
24				x				
26					x			
28						x		
30							x	
32								x
34	x							
36		x						
38			x					
40				x				
42					x			
44						x		
46							x	
48								x
50	x							
52		x						

Table 8: Household sampling scheme

According to Table 9, coliforms, turbidity, TDS, pH and FRC are to be monitored at district reservoir and household level. In a bi-weekly rhythm, in each district one sample shall be taken at district reservoir level and one sample at household level. In order to ensure, that all zones within the districts are tested regularly, the household level samples shall be taken according to the rotatory scheme displayed in Table 8.

Please not, that the scheme displayed in Table 8 is based on a district with eight (8) zones. In case the respective district has more or less zones, the scheme is to be adapted accordingly.

Water quality monitoring in the network – Parameters and frequencies			
Component	**Parameters**	**Frequency**	**Total number of samples per year**
Network / district reservoirs	Microbiological (T.Coli/E.Coli), turbidity, TDS, pH, FRC	2 / month / district reservoir	192
Household level[10]	Microbiological (T.Coli/E.Coli), turbidity, TDS, pH, FRC	2 / month / district	288
Total	**Microbiological (T.Coli/E.Coli), turbidity, TDS, pH, FRC**		**480**

Table 9: Water quality monitoring in the network – Parameters and frequencies

The total number of microbiological samples in the network per year is 480 and fulfils the requirements established in JS 286:2015 and by WHO Guideline.

Table 10 indicates the acceptance ranges per parameter to be tested within the network and response measures in the case that a parameter analysed lies outside the acceptance range.

Water quality monitoring in the network – Acceptance ranges and responses			
Parameter	**Frequency**	**Acceptance range**	**Response if values are outside acceptance range**
E.Coli	See Table 9	<1 MPN/100 ml	Inform population downstream of contamination to disinfect water before consumption; investigate; eliminate source of contamination; clean and disinfect contaminated parts of the system; take samples according to JS 286:2015, in order to prove reestablishment of water quality; inform population that issue was resolved.
Turbidity	See Table 9	< 5 NTU[11]	Investigate; eliminate source of contamination; clean and disinfect contaminated parts of the system.
TDS	See Table 9	< 1.000 PPM	Investigate; eliminate source of contamination; clean and disinfect contaminated parts of the system.
pH	See Table 9	6.5 - 8.5	Investigate
FRC	See Table 9	1.0 – 1.8 mg/l	Investigate; eliminate source of contamination; clean and disinfect contaminated parts of the system; adapt chlorine level from chlorinator until back to acceptable range

Table 10: Water quality monitoring in the network – Acceptance range and responses

[10] Depending use of household tank (e.g. tap at the tank, pipeline installed into the house), sample shall be taken within the household or at the household tank (Annex 7: Sample point at household level).
[11] According to WHO turbidity should not exceed 5 NTU for water distributed to households.

In order to prevent accumulation of sediments and contaminants, the household level tanks are to be cleaned and disinfected once per year, according to Annex 6: SOP Household Tank Cleaning and Disinfection).

4.3 Water quality monitoring for alternative source, transmission or distribution

4.3.1 External borehole

External boreholes refer to those privately owned and operated wells that are outside the camp. The operators of these external boreholes are responsible to comply with Jordanian Drinking Water Standards; therefore, no additional monitoring is required by Zaatari Water System Operator. However, it is to be verified, that the boreholes are fully licensed and routine tests are done in accordance with the GOJ approved procedures.

Operators of external boreholes shall provide borehole registration document every year. In case renewed borehole registration documents are not provided within 3 months of expiration, water from respective boreholes cannot be supplied into the camp.

4.3.2 Water trucks (transmission from external borehole)

Transmission refers to the transportation of water from external boreholes into the water distribution system. Transmission is done through water trucking.

As new trucks are added, operators of water trucks shall provide complete truck registration, including authorization to transport drinkable water, issued by the Ministry of Health. Renewed documents shall be provided every year. In case renewed documents are not provided within 3 months of expiration, water trucks cannot supply water to the camp. An up-to-date database of water trucks (incl. drivers name, vehicle registration, vehicle license, etc.) is to be kept.

The truck driver is requested to provide voucher, indicating the source from which water is delivered. Water will only be accepted from licensed boreholes (see 4.3.1). In addition, the following water quality monitoring is performed at the entrance gate to verify water quality.

Operational monitoring water trucks (transmission)			
Parameter	**Frequency**	**Acceptance range**	**Response**
Colour, odour, taste	Each trip	Zero colour, odour or taste	Reject truck if outside quality acceptance range, category I rejection (refer to Annex 8)
Turbidity	Each trip	< 5 NTU	
TDS	Each trip	< 1.000 PPM	
pH	Each trip	6.5 – 8.5	
FRC	Each trip	1.0 – 1.8 mg/l	If chlorine is too high, the water will be mixed with less chlorinated water and will remain at the gate/borehole until the level of FRC is acceptable. If chlorine is too low, category II rejection (refer to Annex 8)
Ammonium	Each truck	< 0.2 mg/l	Reject truck if outside quality acceptance range, category II rejection (refer to Annex 8)[12]

Table 11: Operational monitoring water trucks (transmission)

JS 286:2015 and WHO Guidelines do not establish specific frequencies for water trucking. The acceptance ranges are according to JS 286:2015 and WHO Guidelines.

4.3.3 Water trucks (distribution)

Distribution refers to the transportation of water within the Zaatari Camp, e.g. between reservoirs or from reservoirs to communal or household level tanks. The following requirements refer to distribution through water trucking.

As new trucks are added, operators of water trucks shall provide complete truck registration, including authorization to transport drinkable water, issued by the Ministry of Health. Renewed documents shall be provided every year. In case renewed documents are not provided within 3 months of expiration, water trucks cannot supply water to the camp.

An up-to-date database of water trucks (incl. drivers name, vehicle registration, vehicle license, etc.) is to be kept.

As water trucks do not leave premises between trips and receive water from monitored supply, the monitoring requirements are less strict than for transmission water trucks.[13] The following water quality monitoring is to be conducted.

[12] Ammonium is tested as indicator to verify that water comes from safe source.
[13] Each truck is to be tested on all parameters at first trip, afterwards every 10th trip is to be tested. Testing of ammonium is not required.

Operational monitoring water trucks (distribution)			
Parameter	**Frequency**	**Acceptance range**	**Response**
Colour, odour, taste	Each truck at first trip per day, then 1 out of 10 trips	Zero colour, odour or taste	Reject truck if outside quality acceptance range, category I rejection (refer to Annex 8)
Turbidity	Each truck at first trip per day, then 1 out of 10 trips	< 5 NTU	
TDS	Each truck at first trip per day, then 1 out of 10 trips	< 1.000 PPM	
pH	Each truck at first trip per day, then 1 out of 10 trips	6.5 – 8.5	
FRC	Each truck at first trip per day, then 1 out of 10 trips	1.0 – 1.8 mg/l	If chlorine is too high, mix with less chlorinated water until the level of FRC is acceptable. Investigate chlorine levels at reservoir. If chlorine is too low, category II rejection (refer to Annex 8)

Table 12: Operational monitoring water trucks (distribution)

4.4 Overview

Compo-nent	Sup-Com-ponent	Activity	Frequency	Acceptance range	Responsible party	Reaction/Response
Source	**Raw water**	Renew borehole license	Yearly	As per GOJ guide-lines	Operator	Stop operation of borehole until license is available
		Full physical, chemical and microbiological water quality monitoring	6-monthly	As per GOJ guide-lines	Operator	Stop water production and address contamination
		Sanitary Survey around bore-hole	Quarterly	Zero unsanitary conditions exist	Operator	Address all unsanitary concerns
		Basic physical, chemical and microbiological water quality monitoring	Monthly	As per Annex 4	Operator	Stop water production and address contamination
	Pump	Turbidity	Hourly and with each pump-restart	< 1 NTU[14]	Operator	Use water filter to reduce turbidity to acceptable value; Discharge water to waste pipe until turbidity normalizes
		TDS	Hourly	< 1.000 PPM	Operator	Use water filter to reduce TDS to acceptable value; Dis-charge water to waste pipe until TDS normalizes
		E.C	Weekly	< 1.200	Operator	Stop water production, investigate
		pH	Weekly	6.5 - 8.5	Operator	Stop water production, investigate
		Ammonium	Weekly	<0.2 mg/l	Operator	Stop water production, investigate
	Treatment	Free Residual Chlorine (FRC)	Hourly	Between 1.0mg/l to 1.8 mg/l	Operator	Increase or decrease chlorine level from chlorinator un-til back to acceptable range
		Turbidity	Hourly	≤ 5NTU	Operator	Stop distribution and address high turbidity levels

[14] According to WHO turbidity should not exceed 1 NTU before chlorination.

Component	Sup-Component	Activity	Frequency	Acceptance range	Responsible party	Reaction/Response
Source	**External Borehole**	Check borehole license	Yearly	As per GOJ guidelines	Operator	Stop purchasing water from borehole until license is available
Transmission	**Water trucks**	Submission of trucks registration and certification for safe water trucking documentation	Yearly and as and when a new truck is added	As per GOJ /MOH guidelines	Operator	Stop using trucks that do not submit the required documents
		Colour, odour, taste	Each trip	Zero colour, odour or taste	Operator	Reject truck if outside quality acceptance range, category I rejection (refer to Annex 8)
		Turbidity	Each trip	< 5 NTU	Operator	
		TDS	Each trip	< 1.000 PPM	Operator	
		pH	Each trip	6.5 – 8.5	Operator	
		FRC	Each trip	1.0 – 1.8 mg/l	Operator	If chlorine is too high, the water will be mixed with less chlorinated water and will remain at the gate/borehole until the level of FRC is acceptable. If chlorine is too low, category II rejection (refer to Annex 8)
		Ammonium	Each truck	< 0.2 mg/l	Operator	Reject truck if outside quality acceptance range, category II rejection (refer to Annex 8)[15]

[15] Ammonium is tested as indicator to verify that water comes from safe source.

Component	Sub-Component	Activity	Frequency	Acceptance range	Responsible party	Reaction/Response
Distribution	**Water trucks**	Submission of trucks registration and certification for safe water trucking documentation	Yearly and as and when a new truck is added	As per GOJ /MOH guidelines	Operator	Stop using trucks that do not submit the required documents
		Colour, odour, taste	Each truck at first trip per day, then 1 out of 10 trips	Zero colour, odour or taste	Operator	Reject truck if outside quality acceptance range, category I rejection (refer to Annex 8)
		Turbidity	Each truck at first trip per day, then 1 out of 10 trips	< 5 NTU	Operator	
		TDS	Each truck at first trip per day, then 1 out of 10 trips	< 1.000 PPM	Operator	
		pH	Each truck at first trip per day, then 1 out of 10 trips	6.5 – 8.5	Operator	
		FRC	Each truck at first trip per day, then 1 out of 10 trips	1.0 – 1.8 mg/l	Operator	If chlorine is too high, mix with less chlorinated water until the level of FRC is acceptable. Investigate chlorine levels at reservoir. If chlorine is too low, category II rejection (refer to Annex 8)

Component	Sub-Compo-nent	Activity	Frequency	Acceptance range	Responsi-ble party	Reaction/Response
Distribution	**Network**	Microbiological (T.Coli/E.Coli)	2 / month / district reservoir	Zero T.Coli, zero E.Coli	Operator	Stop water distribution, investigate
		FRC	2 / month / district reservoir	1.0 – 1.8 mg/l	Operator	
		Turbidity	2 / month / district reservoir	< 5 NTU	Operator	
	Household level[16]	Microbiological (T.Coli/E.Coli)	2 / month / district[17]	Zero T.Coli, zero E.Coli	Operator	Investigate, clean and disinfect household level tank
		FRC	2 / month / district	0.2 – 1.8 mg/l	Operator	Investigate, clean and disinfect household level tank
		Turbidity	2 / month / district	< 5 NTU	Operator	Investigate, clean and disinfect household level tank

[16] Depending use of household tank (e.g. tap at the tank, pipeline installed into the house), sample shall be taken within the household or at the household tank (Annex 7: Sample point at household level).
[17] In order to ensure, that all zones will be tested regularly, please consider district level sample scheme (Table 8: Household sampling scheme, page 14).

4.5 Water quality monitoring for privately trucked water

While UNICEF is responsible for providing potable water for all refugees in Zaatari Camp, its capacity and accountability is limited to 35 litres per capita per day. While this allocation is considered adequate in refugee settings, it is understood that some refugees, for commercial and other socioeconomic purposes require more than the allocated 35 litres per person per day. Under such circumstances, UNICEF cannot prevent refugees from bringing in additional water into the camp if they are able to do so and obtain the necessary permission from camp management.

However, to ensure that water consumed in the camp is within acceptable standards. It was agreed that water entering the camp, regardless of source or ownership, shall undergo the same water quality monitoring process. To ensure effective monitoring of water quality in a simplified manner, the procedure for monitoring water quality of privately trucked water is as follows:

- Private owner will request for entry permit from SRAD/Camp management;
- SRAD sends request to operator to conduct water quality test as per agreed procedure via a 'Request for quality test voucher' at least 24 hours before the expected entry of the water truck;
- It is understood by SRAD and Camp management that Zaatari Water System Operator will conduct water quality tests only between 8 AM and 4 PM;
- Operator will check that the driver has a permit and a 'Request for quality check voucher;
- Operator conducts the tests at its control area located at the Eastern Gate and shares the results (showing acceptable ranges for easy comparison) with SRAD/Camp management in the quickest possible time.

NOTE: The quality test of the normal water trucking remains the priority and will not be delayed because of the need to test privately trucked water.

- SRAD makes the decision as to whether or not to allow the water truck in the camp. Operator will not decide which private truck enters or not. This function is strictly the responsibility of SRAD, and Operator is only supporting in conducting the tests.

Monitoring applies according to 4.3.2 Water trucks (transmission from external borehole).

5 Water Quality Complaint Mechanism

Three institutions are involved in the Water Quality Complaint Mechanism:

- UNOPS,
- UNICEF and
- Operator.

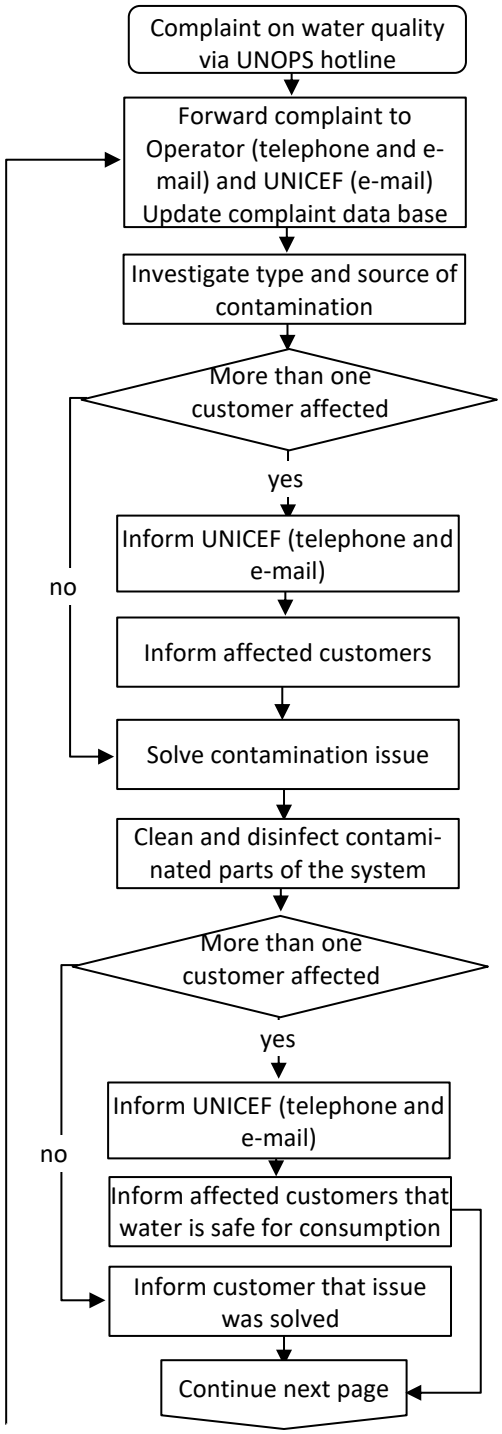
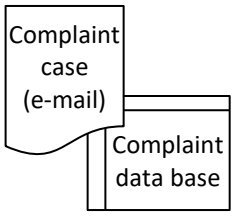
UNOPS Water Complaint Hotline
0797555979
Sun-Fri, 7 am – 10 pm

Their responsibilities are summarized in Table 13.

Institution	Responsibilities
UNOPS	– Run complaint hotline (7 am – 10 pm, every day) – Open complaint case – Forward complaint case to operator (via telephone and e-mail) – CC UNICEF in any quality-related complaints (via e-mail) – Follow-up on complaints with operator – Confirm settling of issue with customer – Close complaint case – Provide monthly overview of complaints to UNICEF
Operator	– Immediate follow-up on complaints – Immediately contact UNICEF in case that parts of system are contaminated in order to warn affected customers – Identify source for complaint and implement corrective measures – If complaint case cannot be resolved within 24 hrs, inform deadline of resolution to UNOPS and UNICEF – Contact UNICEF when system is rehabilitated, in order to inform affected customers (only if customers have been warned previously) – Elaborate incident report for any water quality related complaint – Send incident report to UNICEF – Inform UNOPS on closure of complaint case (CC UNICEF on any quality related com-plaint)
UNICEF	– Analyse monthly complaints overview – Analyse water quality incident reports – Inform customers in case that water is contaminated – Inform customers once contamination of water is resolved

Table 13: Water Quality Complaint Mechanism, Responsibilities

Table 14 depicts the process to be followed if a water qu ality related complaint is received by the UNOPS hotline.

Responsible R A C I	**Process**	**Documentation**
UNOPS Operator Operator UNI-CEF Operator Operator Operator Operator Operator Operator UNI-CEF UNOPS		

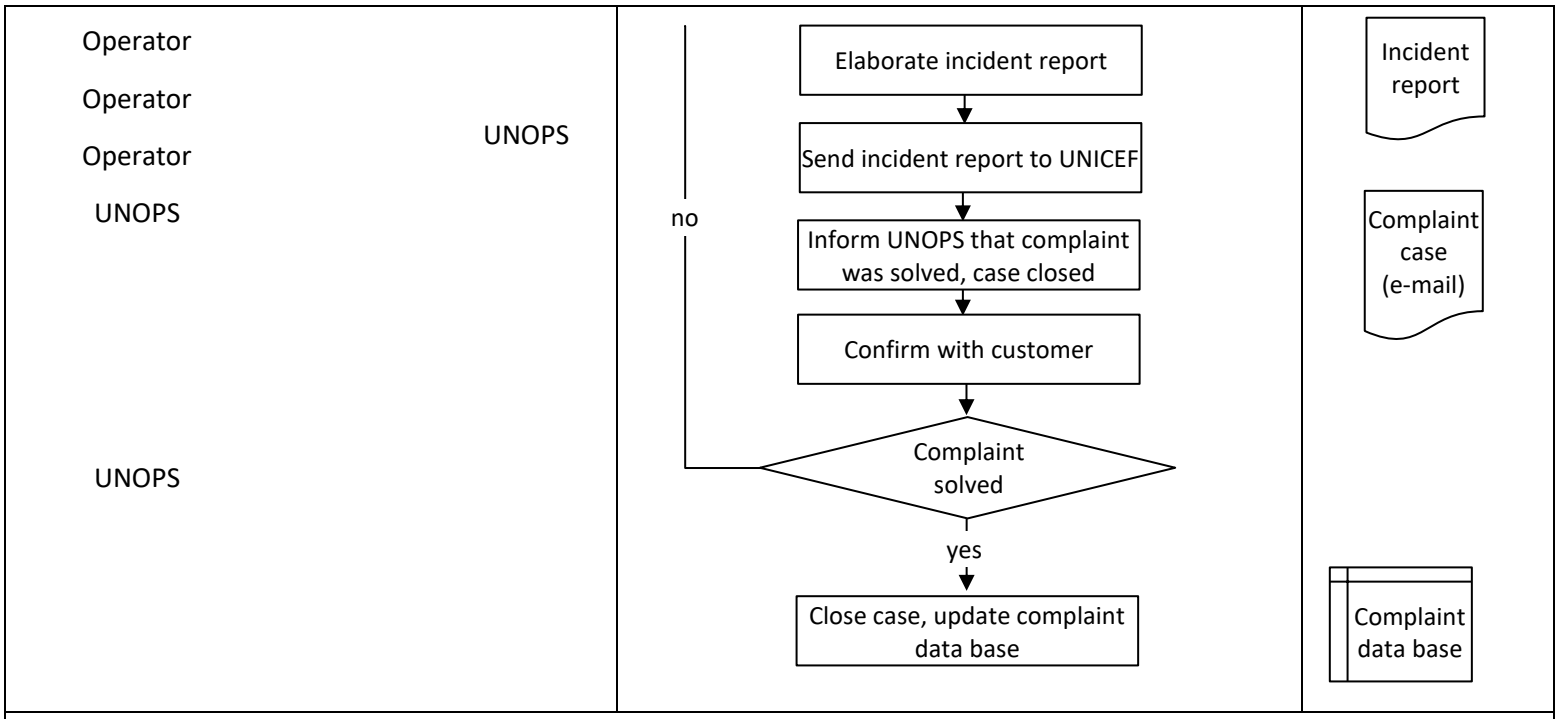


Table 14: Water Quality Complaint Process

6 Water Quality Reporting

If any of the samples taken during regular water quality monitoring fails, immediate action is to be taken. UNOPS and UNICEF are to be informed respectively. The Water Quality Complaint Process shall apply accordingly.

For each month, the operator will provide a Monthly Water Quality Report to UNICEF no later than the 10th of the following month.

The reports should be precise and include at minimum the following information.

1 Evaluation of standard monitoring results

1.1 Water quality monitoring at borehole level

- Graph on weekly pH results, development during 52 weeks
- Graph on weekly E.C results, development during 52 weeks
- Graph on weekly Ammonium results, development during 52 weeks

For each graph shortly discuss development and measures to be taken in case that development is inconvenient.

1.2 Water quality monitoring in the network

- Table including: Type and number of analysis performed per district, type and number of tests failed per district
- Short description of reasons or sources of contamination
- Corrective and preventative measures taken and pending

2 Water Quality Complaints

2.1 Overview on number and content of Water Quality Complaints

2.2 Corrective and preventive measures taken

2.3 Proposal to improve complaint process (if applicable)

3 External Water Trucks

3.1 Transmission from external water source

- Table including: Number of trucks received, type and number of tests performed, type and number of tests failed

- Specific information on trucks that failed tests (license number, test results, water source…)
- Corrective and preventative measures taken in case that tests failed

3.2 Distribution within camp

- Table including: Number of trucks filled, type and number of tests performed, type and number of tests failed
- Specific information on trucks that failed tests (license number, test results, water source…)
- Corrective and preventative measures taken in case that tests failed

4 Annexes

4.1 Results monthly raw water analysis (monthly, per borehole)

4.2 Results bi-yearly raw water analysis (6-monthly, per borehole)

4.3 Sanitary survey (quarterly, per borehole)

4.4 Borehole licenses (yearly, per internal and external borehole)

4.5 Results of quality monitoring in the network (table indicating results per district and location)

4.6 Water Quality Incident Reports

Annexes

Annex 1: JS 286:2015
Annex 2: WHO Guidelines for Drinking-water Quality, Fourth Edition
Annex 3: Analysis of water quality monitoring (Zaatari Camp Water Supply, Phase I)
Annex 4: Sample results raw water (monthly and 6-monthly)
Annex 5: Sanitary Survey Form, Deep Borehole with Mechanised Pumping
Annex 6: SOP Household Tank Cleaning and Disinfection
Annex 7: Sample point at household level
Annex 8: Water truck rejection

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Annex 5: Sanitary Survey Form, Deep Borehole with Mechanised Pumping

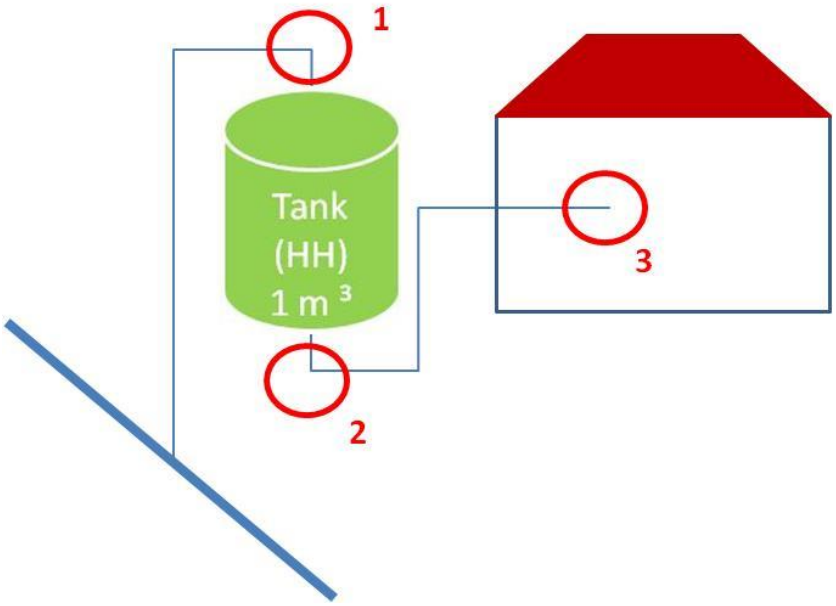
Annex 6: SOP Household Tank Cleaning and Disinfection

Annex 7: Sample point at household level

If the household tank is connected to a spigot within the household, the water sample is to be taken within the household (3).

In case the household members collect water at the outlet tab of the household level tank, the sample is to be taken at the outlet of the household tank (2).

In case that a sample has failed, for further investigation, samples also shall be taken at household tank inlet (1).



1 tank inlet
2 tank outlet
3 inside caravan

Annex 8: Water truck rejection

Water trucks with water that do not conform to the agreed water quality standards and rejected shall be categorized into two groups and managed accordingly to the categories, as follows:

- **Category 1 rejection**: Trucks rejected because water quality does not comply with FRC, turbidity, colour, taste or odour parameters shall be managed as follows:

i. FRC; if above limit, mix with less chlorinated water. If below limit, test for micro bacteriological contamination.
ii. Turbidity, colour, taste and odour: discharge contaminated water; properly clean tanks, fill will clean water and re-test to ensure that is within acceptable range.

- **Category 2 rejection**: This refers to biological infection of water trucks, and identified when there are worms, algae, increased level or ammonium substances and any other biological growth in the water. A truck rejected under this category shall be managed as follows:

- The truck is issued with three copies of rejection voucher; a copy each for the attention of Mafraq Directorate of Environment and Food Health (DEFH), operator, contractor.
- The truck is requested to undergo disinfection at one external borehole in accordance with the WHO specification for disinfection of water trucks as described below. To ensure conformity, operator may support the truck owner (through training, provision of chlorine, conduct or supervision) of the disinfection process.

Note: The disinfection must be carried out in the presence of a representative from operator; according to the procedure described in *Cleaning and disinfecting water storage tanks and tankers. Technical Note 3 (*WHO 2005); http://www.who.int/water_sanitation_health/hygiene/envsan/tn03/en/

- Once the disinfection process is complete, the affected the truck is then taken to the Mafraq Directorate of Environment and Food Health (DEFH), to undergo specific microbiological tests, to ensure that the truck is properly disinfected and is fit for use for transporting drinking water. Once the tests are completed and the truck is considered fit, the voucher issued by the operator will be filled as approved for re use by the DEFH and presented by the driver to the operator.
- Once the truck is back into operation, daily samples are collected and tested for Ammonia, TDS and micro-bacteriological agents for the subsequent two weeks.