

Water Quality Policy Guideline



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Table of Content:

Acronym	5
1. Why this Policy Guideline?	6
2. WaterAid's Principles and Objectives	6
3. Audiences	6
4. Institutional Roles and Responsibilities	7
4.1. WaterAid Ethiopia (WAE)	7
4.2. Partner's Responsibilities	9
4.3. Government and Community	10
5. Determinants of Water Quality	11
5.1. Major Chemicals of Concern	11
5.1.1. Fluoride	11
5.1.2. Nitrate	12
5.1.3. Iron	12
5.1.4. Manganese	13
5.1.5. Total dissolved Solid (TDS)	14
5.1.6. Iodine	14
5.1.7. Arsenic	14
5.2. Turbidity, pH and chlorine residual	15
5.3. Microbiological Contaminants	15
6. WHO Physico-Chemical and Microbial Parameters	18
7. Water Quality Standard	19
7.1. List of National legislative standards for principal contaminants	20
7.2. List of chosen quantitative standards for principal contaminants	20
7.3. WaterAid Ethiopia Standard Limits of Principal Contaminants	21
10. Methodology	22
10.1. General Testing Frequency	23
10.2. Testing frequency for specific cases	25
10.2.1. Fluoride	25
10.2.2. Nitrates	25
10.2.3. Iron	26
10.3. Details of test methodologies selected	26
10.1. Field based testing	26
10.2. Sampling	27
10.3. Sample preservation and transportation	27
10.4. Field test for microbiological contaminants	28
10.5. Filed testing for chemicals	28
10.5.1. Fluoride	28
10.5.2. Nitrate	28
10.6. Point of use Water Treatment	29
10.7. Water Safety Plan	30
10.7.1. Sanitary survey	31
13. Financing Water Quality	32
13.1. Training for WaterAid Ethiopia, partners and government	32
13.2. Details of Equipment for Testing	33
14. Reporting, Documentation and Dissemination	34
15. Follow- up Arrangements	34
15.1. General	34

15.2. Organic Contamination.....	35
15.3 Inorganic Constituents.....	35
Reference	37
Annex I. Annual/Bi-annual Water quality of new and rehabilitated WaterAid funded water facilities reporting format.....	38
Annex II. Water quality of follow up tested WaterAid funded water facilities reporting format	39
Annex III. WaterAid Ethiopia Water Quality Monitoring Form-Bacteriological	40
Annex IV. WaterAid Ethiopia Water Quality monitoring form-Physicochemical.....	41
Annex V. Sanitary survey form for assessment of contamination.....	42

List of Tables

Table 1. WHO limits for physico-chemical parameters and their health risk	18
Table 2. Guideline values for verification of microbial quality (WHO guideline).....	19
Table 3. Guideline value for disease risk classification using microbial density	19
Table 4. Lists of the limits made by ESRDF and MoWE.....	21
Table 5. WaterAid Ethiopia limits for principal contaminants to be adopted for frequent monitoring purposes	22
Table 6. Minimum sample number for piped drinking water in the distribution system	25
Table 7. Comparison of steps in a water safety plan and steps that WaterAid promotes to assure water quality.....	31
Table 8. Minimum annual frequency for sanitary survey	32

Acronym

BGS	British Geological Survey
CCRDA	Consortium of Christian Rehabilitation Development Association
CLTSH	Community Led-Total Sanitation and Hygiene
EHNRI	Ethiopian Health and Nutrition Research institute
FMOH	Federal Ministry of Health
GI	Galvanized Iron
GPS	Geographical Positioning System
GV	Guideline value
HWTS	Household Water Treatment and Storage
JAICA	Japan International Cooperation Agency
MOARD	Ministry of Agriculture and Rural Development
MOH	Ministry of Health
MOWE	Ministry of Water and Energy
MWA	Millennium Water Alliance
NGO	Non Governmental Organizations
NTU	Nephelometric Turbidity Unit
PVC	Poly Vinyl Chloride
PSI	Population Service International
QSAE	Quality Standard Authority of Ethiopia
RADWQ	Rapid Assessment of Drinking Water Quality
SMT	Senior Management Team
SNV	Netherlands Development Organization
TCU	True Colour Unit
TTC	Thermo Tolerant Coliform
TVET	Technical and Vocational Education and Training
TWA	Town Wide Approach
UN	United Nations
UNICEF	United Nations Children's Fund
WAE	WaterAid Ethiopia
WaSH	Water Sanitation and Hygiene
WHO	World Health Organization
WSF	Water and Sanitation Forum
WSR	Whole System in the Room
WWA	Woreda Wide Approach

1. Why this Policy Guideline?

This policy guideline is developed:

- To clarify roles and responsibilities of carrying out water quality monitoring and assurance within WaterAid Ethiopia, partners - including local government, user community, and stakeholders.
- To set agreed minimum water quality parameters and ensure the water provided to the community by WaterAid fund is safe and adequate by monitoring the quality of water in line with the nationally adapted standards.
- To clarify the major health risk and non-health risk water quality parameters; major chemical concerns, microbiological contaminants, sampling and testing methods, and lay down major approaches to follow in water safety which includes risk assessments.
- To clarify WHO limits, national standards, and adopted WaterAid Ethiopia standards.

2. WaterAid's Principles and Objectives

WaterAid's aims are that the quality of drinking water delivered to consumers by the project that it supports:

- Be significantly better than the water quality of existing unimproved sources by risk reduction and management interventions
- Should be such that no health risk arises from its use by freeing from disease causing organisms, poisonous chemicals, and keeping optimum amount of minerals
- Should conform to the broadly accepted quality standards of the region or country where the installation is located
- Should be acceptable in appearance, taste, odor and other local aesthetic aspects

3. Audiences

This guideline is prepared for WaterAid Ethiopia (WAE) and its partner's organization as a framework to help them ensure water safety for all WaterAid funded projects. The document can be used as a reference by any other interested WaSH sector actor such

as local government, user community, donors, researches and private organizations. The policy guideline is subject to revision based on national water quality policy changes and WaterAid global directions.

Organizations in Ethiopia with responsibility for or interest in water quality assessment in which WaterAid Ethiopia could work are among others;

- The Federal Ministry of Water, Irrigation and Energy
- The Federal Ministry of Health
- Partner Organizations of WaterAid Ethiopia
- Quality and Standards Authority of Ethiopia
- Environmental Protection Authority of Ethiopia
- The Regional State Water Bureau
- The Regional State Health Bureau
- Regional and Zonal Laboratories
- The Ethiopian Health and Nutrition Research Institute
- Zonal/Woreda/ Water, Irrigation and Energy Offices
- Zonal/Woreda/Town Health Offices
- Private sectors (drilling companies, water treatment producers and distributors)
- Universities and Technical Vocational Education and Training Centres (TVETCs)
- Water quality logistics and chemicals importing companies
- Networks and forums (CCRDA WASH forum, WASH Ethiopia movement,)
- Urban Water and Sewerage Authorities/Utilities
- User Communities

4. Institutional Roles and Responsibilities

4.1. WaterAid Ethiopia (WAE)

The Programmes department of WaterAid Ethiopia (WAE) is responsible for drafting, reviewing and follow-up of the implementation of this policy guideline document. WaterAid Ethiopia's senior management team lead by the Country Representative shall oversee the process and provide the necessary support.

WaterAid Ethiopia's Woreda Wide Program Coordinator shall be responsible for the water quality guideline document drafting, providing technical support during water quality tasting and coordinating efforts for capacity building to stakeholders jointly with the capacity development coordinator.. In addition, the hygiene and sanitation technical manager is responsible to document the test results in a soft copy (data base) and hard copy.

The programmes department has specific responsibility of sharing the guideline document with WaterAid internally and with partner organizations; build the capacity of WaterAid and partner's (including government and partners) staff in collaboration with the capacity development coordinator of WaterAid Ethiopia. The programmes director shall oversee the proper implementation of the policy guideline.

WaterAid Ethiopia is committed to funding equipment and chemicals needed for water quality testing at field level during the project period or facilitate for the use of available testing kits or laboratories owned by government. WaterAid is also responsible for training partner and government staff who will be engaged in carrying out the risk assessment, risk management and water quality testing and treating using portable test kits. WaterAid Ethiopia technical staff shall take part in the implementation of water quality policy guideline.

Program managers in WaterAid Ethiopia shall make sure that their respective WASH projects include plans for water quality risk assessment, risk management, testing, treating and re-checking. The plan shall also include capacity building and plan required logistics for the implementation of water quality.

WaterAid Ethiopia will have responsibilities to water quality assurance of new, rehabilitated and follow-up water testing during the project period. However, follow-up tests done during the project period are not aiming to assure the quality of community water supplies for long term periods. However, it is the responsibility of local institutions and service providers to regularly test the water quality and assure that communities are getting clean and safe water. WAE will advocate and promote good

practice in relation to water quality assurance, monitoring and holding service providers to account for water quality issues.

4.2. Partner's Responsibilities

Partner organizations involved in water supply development need to include water quality baseline information in their project documents. For surface water the baseline has to be documented as part of the project document. For other technologies such as ground water and sand dam - if there is no water source in the nearby - the water quality information has to be included after the actual implementation of the water supply activity – e.g. at pump test level for drilled well.

Water quality monitoring should also be included in the activity and budget plan; the plan should include supply of testing kits and reagent for local government, testing and capacity building requirements.

Water quality testing for high risk contaminants is the responsibility of the partner organizations. Initial tests such as during inception and before handing over have to be verified by nearby government laboratories. To run a chemical and bacteriological test, partner organisations need to ensure that water samples are taken from the sources and use portable kits or mobile laboratory if they have access to one. Sample should be taken to a well establish laboratory where other facilities are not available for verification. If partners have no access to portable kits, partner organizations should ask WaterAid Ethiopia or respective woreda water and health offices to use their testing kits. In order to sustain the water quality monitoring and to maximize the use of the test kits WaterAid shall fund purchase of testing kit through the partners' project for woreda water or health offices.

The water quality monitoring has to be preceded by sanitary survey around the water sources. As sanitation coverage in the country is still in the lowest level and horticulture and mining industry, is proliferating in Ethiopia, water sources around the farm lands, greenhouses, cement, mining and tannery factories should get frequent sanitary survey and if there is any suggestion by the sanitary survey water quality should be tested. The test results of the water quality must be included in all the

project documents and reported to WaterAid Ethiopia and relevant stakeholders using reporting formats (Annex I, II III & IV) both in hard copy and electronics filing results in their offices by partners hygiene and sanitation officers.

Partners must take responsibility to take corrective measures for any test results that indicates poor water quality. Alternative sources will be identified with full involvement of the local government offices for water samples with high and continuous level of contamination. Partners must ensure existence of local government support to communities in relation to ongoing water safety. Partners should also include water quality requirements into their agreement with local government by including a statement that explains any water source that doesn't fulfill the guideline limits is subject to abandoned. Community awareness activities need to also include that water sources that doesn't meet the guideline value is subject to abandon.

4.3. Government and Community

Following capacity building of staff and provision of support with water quality monitoring logistics, the local government with full involvement of the community is expected to take over the responsibility of maintaining water safety. During the project's active phase, WaterAid Ethiopia and partners will focus on capacity building of woreda water and health offices in terms of training and logistic support so that the water quality risk assessment and risk management will be sustained. This policy guideline document gave Ministry of Health and its all structures a regulatory (quality assurance) responsibility while Ministry of Water, Irrigation and Energy and all its level structures are responsible for monitoring and ensuring water quality. Awareness creation and community involvement towards assuring water quality should be given due emphasis during project implementation periods so that hence community will take part in sustaining the water quality.

As indicated in the national drinking water quality monitoring and surveillance strategy of MoH, the role of the government also includes sharing the status of the water quality tests during the Whole System in the Room (WSR)-meeting for planning CLTSH triggering and targeting the household water treatment and storage (HWTS) using the private sector involvement by encouraging the market set up.

5. Determinants of Water Quality

There are different physico-chemical and bacteriological elements for water quality standards. The physico-chemical determinants can result naturally from rock types, human exercises like effluent releases/leakage from different sources, agricultural chemical practices with runoff, industrial pollutants and pathogenic contaminations. The level and concentration of these different elements would have a positive or negative health impact and economic effect. Water construction materials damage also ends up with indirect health impacts. Therefore, water quality is one of the service levels factor contributing to a positive public health benefit.

5.1. Major Chemicals of Concern

The following are high risk contaminants included in British Geological Survey (BGS) fact sheet for Ethiopia and this guideline would focus on the following parameters for monitoring purposes; otherwise all the parameters included in Ministry of Water, Irrigation and Energy (MOWIE) or Quality Standard Authority of Ethiopia (QSAE) guideline would be subject to be tested for all new or rehabilitated water supply schemes.

5.1.1. Fluoride

Fluoride minerals are abundant in certain rock types. High concentrations of fluoride can be released into ground water through dissolution of these fluoride minerals especially after prolonged contact periods within aquifers. Low concentrations of fluoride are beneficial to dental health (up to 1 mg/l) but elevated concentrations can result in dental fluorosis or debilitating skeletal fluorosis at higher concentrations. Fluoride intake can originate from dust inhalation and food sources but drinking water containing high concentrations can also be regarded as a primary source. Fluoride can be classified as a high priority chemical parameter requiring surveillance in areas where it is likely to occur in ground waters at high concentrations.

As in other parts of the East African Rift valleys, fluoride is also a major health problem for communities using ground water sources in the Ethiopian Rift valley area. Reports indicate that concentrations greater than 10 mg/l are found in waters from Rift valley. Moderately high concentrations have also been reported in ground water from volcanic

rocks in the highlands. Long-term use of high fluoride drinking water is known to cause both dental and skeletal fluorosis observed in populations residing in the Rift valley. Reports indicate that dental fluorosis is also recognized in some highland communities where the water is abstracted from volcanic rocks. Various studies have also indicated fluoride concentrations from deep geothermal wells and fluoride in excess of 200 mg/l in some of the alkaline, saline lakes such as Chitu, Shalla and Abayata mainly caused due to evaporation (previous water quality policy).

5.1.2. Nitrate

The UN 1989 report indicated that nitrate concentrations are high in ground water from several urban areas especially around Dire Dawa and Addis Ababa resulting from mainly leaking effluent from septic tanks. Concentrations are likely high in urban areas where the water tables are close to the ground surface.

High nitrate levels can develop in ground waters as a result of:

- Run-off from agricultural land using nitrate fertilizers
- Contamination with urine and feces
- Industrial pollution

Unprotected ground water sources are particularly susceptible to contamination. High nitrate concentrations pose a significant health risk to bottle-fed infants as nitrate inhibits the ability of the blood to convey oxygen around the body, leading to a potentially fatal condition called 'blue-baby syndrome' or methaemoglobinemia.

Reference to World Health Organisation (WHO) guideline limits for these contaminants are Nitrate – 50mg/l (short term exposure), Nitrite - 3mg/l- short term exposure, 0.2 long term exposure. WHO guideline value for combined nitrate plus nitrite; is the sum of the ratio of the concentration of each of its guideline value should not exceed 1. Typical range in ground water is 0-100mg/l.

5.1.3. Iron

The ground water in most of the country is not likely to contain high concentrations, since iron is expected in anaerobic or highly acidic groundwater, which has not been reported in the available literature. Hydro-geochemical data and reports confirm that

the groundwater of the country does not contain high concentration of iron. Iron is one of the most abundant metals in the Earth's crust. It is found in natural fresh water at levels ranging from 0.5 to 50 mg/liter. Iron may also be present in drinking - water as a result of the use of iron coagulants or the corrosion of steel and cast iron pipes during water distribution. Iron is an essential element in human nutrition. Estimates of the minimum daily requirement for iron depend on age, sex, physiological status and iron bioavailability and range from about 10 to 50mg/day.

Iron can be released from GI pipelines where the pH of the water is very low and water is acidic. After longer period of time the pipes will get rusted and the iron ion will be released from the pipe to the water and cause change in the color of the water-become reddish and the test also becomes metallic which in turn will result in abandoning the water supply. Based on the pH test of the water, water with low pH-acidic needs decision to whether cancel implementation of the water supply, use treatment option like addition of bicarbonate and use of uPVC pipes for the network and other needs in the system.

5.1.4. Manganese

Like as iron, the ground water in most of the country is not likely to contain high concentrations of manganese, since it is expected in anaerobic or highly acidic groundwater, which has not been reported in the available literature.

Manganese is one of the most abundant metals in the Earth's crust, usually occurring with iron. It is used principally in the manufacture of iron and steel alloys, as an oxidant for cleaning, bleaching and disinfection as potassium permanganate and as an ingredient in various products.

Manganese is an essential element for humans and other animals and occurs naturally in many food sources. Manganese is naturally occurring in many surface water and groundwater sources, particularly in anaerobic or low oxidation conditions, and this is the most important source for drinking-water. WHO limit for manganese is 0.4mg/l. Typical range in ground water is usually less than 1 µg/l (up to around 1 mg).

5.1.5. Total dissolved Solid (TDS)

In the Eastern part of Ethiopia sodium and chloride are likely to be dominant dissolved constituents, with total dissolved solids often in excess of 2000mg/l. In the southern part of the Rift valley, sodium and bicarbonate are the dominant dissolved constituents.

Ground water from Ogaden region are noted to be dominated by sodium and sulphate with total dissolved solids concentration in excess of 1500mg/l. In ground water from the Wabe-Shebelle catchments of southern Ethiopia, dominant dissolved constituents are reported to be sodium and chloride with total dissolved solids in excess of 300mg/l. Lowest concentrations of dissolved solids (<500mg/l) are reported for ground water from north central and southeast highlands and on south side of the Rift valley.

5.1.6. Iodine

Iodine deficiency disorders are widely prevalent in several parts of Ethiopia. The highest goiter prevalence is reported to be in Gammo Goffa and Benishangule. The iodine content of drinking water was not especially low, but that of local food crops were reported to be generally low.

Iodine - recommended limit- Typical range in potable ground water is less than 1 µg/l to 70 µg/l (extremes up to 400µg/l).

5.1.7. Arsenic

No data is available for arsenic in the ground water in Ethiopia. The geology of most of the country suggest that concentrations in ground water are not likely to be high. Possible exceptions occur where sulphide minerals occur in association with gold, platinum or copper ores. Arsenic occurs naturally in certain rock types, soils, the atmosphere and water bodies. It can be released into ground water sources at elevated concentrations following weathering reactions, biological activity, and volcanic emissions as well as through human activities such as mining and the application of fertilizers containing arsenic compounds. It is endemic in ground waters from certain areas and causes adverse human health effects after *prolonged exposure*.

There is overwhelming evidence from epidemiological studies that consumption of elevated levels of arsenic through drinking-water is causally related to the development of cancer through several sites, particularly skin, bladder and lung. Arsenic is thus a high priority chemical parameter that requires monitoring in water sources deemed to be at risk from contamination.

Although Arsenic is not considered to cause a problem in groundwater of Ethiopia, it is anticipated to occur in areas where sulphide minerals occur in association with gold, platinum or copper ores likely restricted to areas of ancient crystalline rocks. However for the sake of safety it is suggested that Arsenic tests to be done when sanitary survey indicates mining around the water source. For the time being WaterAid Ethiopia has no projects around the known gold mining areas.

The Ethiopian Standard Drinking water-Specifications recommended maximum permissible level for Arsenic is 0.01 mg/l. Arsenic is not high risk for the time being.

5.2. Turbidity, pH and chlorine residual

Chlorine residual is where supplies are chlorinated, as they can describe the microbial quality of drinking water. Therefore, these are recommended in water quality monitoring program as they either directly influence microbial quality (in the case of chlorine) or may influence disinfection efficiency and microbial survival (in the case of pH and turbidity). There is no health-based guideline or standard value for pH. Although pH usually has no direct impact on consumers, it is one of the most important operational water quality parameter. If water is acidic (low pH value) it causes corrosion of steel made pipe lines which intern causes change in color and test of the water and become objectionable to use.

5.3. Microbiological Contaminants

The potential health consequence of microbial contamination is such that its control must always be of paramount importance and must never be compromised From WHO guideline. Faecally derived pathogens are the principal concerns of setting health based targets for microbial safety.

Water bodies usually consists of a wide variety of microorganisms, which include pathogenic and non pathogenic. The non pathogenic microorganisms may lead to other problems like taste and odor, which may serve as indicator of safety and may influence the water selection for consumption.

The principal concern for microbiological water quality is to the contamination by pathogenic microorganism. Such pathogens include bacteria, helminthes, protozoa and viruses. The routine monitoring of pathogens is generally not undertaken for several reasons, such as due to lack of analytical tools and where it is available is expensive and difficult to perform. Individual pathogens cannot be guaranteed to be presenting in all untreated or unprotected water depending on whether pathogen contaminated faeces are present in the water or not. And thus failure to observe a particular pathogen in water sample could not imply the absence of other pathogens in water. But if resources permit assessing pathogens presence in source and drinking water are useful tools for determining the public health risk from drinking water and developing health based water quality targets.

Because of the above mentioned reasons and because most water-born pathogens are derived from faeces indicator organisms, usually bacteria are particularly used to analyze the microbiological quality of drinking water. The most commonly used are *E. coli* (type 1) or thermo tolerant *coli* form which are exclusively derived from human and animal faeces. The identification of these *E. coli* strain from contaminated water is simple but time taking as it requires a two step process presumptive and confirmatory testing methods. Thus many drinking water quality monitoring programs use thermo tolerant *coli* form as a surrogate, because results are quickly and cheaply obtained though it gives only a presumptive result.

Thermo tolerant *coli* form are *coli* form groups that can grow at 44 - 45 degree Celsius which contain mainly the type 1 *E. coli* at about 95% of the group and many others have an environmental sources. Thermo tolerant *coli* form analysis can be performed by different techniques of inexpensive methods and the result are obtained within 14-24 hours. In addition to this the broader group of *coli* forms known as total *coli* form is also used in the monitoring program of water quality. These are of no sanitary or public

health significance but their analysis is important in chlorinated water supplies as they are very sensitive to chlorine and their presence in such analyzed water implies that there is water contamination. However, since the total coli form can be present in any un-chlorinated water derived from bio films within the distribution system at about 10/100ml of sample their use in un-chlorinated water monitoring program is not as such recommended.

Faecal streptococci are also used as other kind of indicator of drinking water microbiological quality. These bacteria have strong relationship to diarrhea disease even than *E. coli* or thermo tolerant coli form and thus are more resistant to drying and chlorination their monitoring is recommended for ground water receiving contaminated recharge water and in chlorinated distribution systems. Variety of techniques are available for analysis of these bacteria but the limitation of their being time consuming as a result cannot be obtained before 48 hr, their usefulness for routine monitoring is limited but this still have a limited impact on their value in water quality assessment activities.

6. WHO Physico-Chemical and Microbial Parameters

Table 1. WHO limits for physico-chemical parameters and their health risk

No	Substance	WHO limits	Health risk
1.	Fluoride	1.5mg/l	Dental and skeletal Fluorosis
2.	Nitrate (NO ₃)	50mg/l	Blue baby syndrome
3.	Manganese (Mn)	0.4mg/l	
4.	Iron (Fe)	0.3mg/l	No health based risk
5.	Hardness	500mg/l	Not health based
6.	Ammonia (NH ₃)	1.5mg/l	Not health based
7.	Sodium (Na)	200mg/l	Not health based
8.	Sulphate	250mg/l	
9.	Hydrogen sulfide	0.05mg/l	Not health based
10.	Copper (Cu)	2.0mg/l	Health based
11.	Arsenic	0.01mg/l	Health based
12.	Lead (Pb)	0.01mg/l	Health based
13.	Chromium	0.05mg/l	
14.	Chloride (Cl)	200 – 300mg/l	Test and corrosion are the main problems
15.	Nitrite (NO ₂)	3mg/l	
16.	Alkalinity (CaCO ₃)	200mg/l	
17.	Potassium (K)	1.5mg/l	
18.	Colour (app)	15TCU	
19.	Turbidity	5 NTU	
20.	Conductivity	0.60 – 0.18µs/cm	
21.	pH	6.5 – 8.5	< 4 Acidic, 7 Neutral and > 7 Alkaline
22.	Calcium (Ca)	75mg/l	
23.	Chlorine (Cl ₂)	5mg/l	The residual free chlorine concentration after 30min should be ≥ 0.5mg/lit at pH < 8.0.

Table 2. Guideline values for verification of microbial quality (WHO guideline)

	Organisms Guideline value
All water directly intended for drinking	
<i>E. coli</i> or thermo tolerant coli form bacteria	Must not be detectable in any 100-ml sample
Treated water entering the distribution system	
<i>E. coli</i> or thermo tolerant coli form bacteria	Must not be detectable in any 100-ml sample
Treated water in the distribution system	
<i>E. coli</i> or thermo tolerant coli form bacteria	Must not be detectable in any 100-ml sample

Immediate investigative action must be taken if *E. coli* is detected. Although *E. coli* is the more precise indicator of faecal pollution, the count of thermo tolerant coli form bacteria is an acceptable alternative. If necessary, proper confirmatory tests must be carried out. Total coli form bacteria are not acceptable indicators of the sanitary quality of water supplies, particularly in tropical areas, where many bacteria of no sanitary significance occur in almost all untreated supplies.

It is recognized that in the great majority of rural water supplies, especially in developing countries, faecal contamination is widespread. Especially under these conditions, medium term targets for the progressive improvement of water supplies should be set.

Table 3. Guideline value for disease risk classification using microbial density

Thermo tolerant coli form density per 100ml	Disease Risk classification
<1	No risk
1-10	Low risk
11-100	High risk
>100	Very high risk

7. Water Quality Standard

Water quality standards of world health organization (WHO), British Geological Survey fact sheet for Ethiopia, Ministry of Water and Energy, Quality Standard Authority of Ethiopia and Ministry of Health guidelines are bases for setting minim water quality standards for WaterAid supported projects.

7.1. List of National legislative standards for principal contaminants

Quality and Standard Authority of Ethiopia has produced drinking water specifications Reference number ES261: 2001. The specification includes physical and chemical descriptors, bacteriological requirements and test methods for water for drinking and domestic purpose. The standard was prepared under the direction of Environmental and Health Protection Safety and Hygiene Practices Technical Committee and published by the Quality Standards Authority of Ethiopia. The standard is based on

- WHO guidelines for drinking water quality 1983 edition
- Kenyan Bureau of Standards publication KS 05-459, 1985 specification for drinking water
- Bureau of Indian Standards publication IS 10500, 1991, Drinking Water Specification

In October 1996 the Ethiopian Ministry of Health, Hygiene and Environmental Health Services Department has also issued a water quality standard and monitoring guideline. The standard is mainly based on WHO specification. The Federal Ministry of Water Resources and the Addis Ababa Water Supply and Sewerage Authority are also using WHO's standard. The Ethiopian Social Rehabilitation and Development Fund (ESRDF) financed by the World Bank has developed preliminary permissible limits on temporary basis for the projects it finances, which is similar to WHO limits except for Fluoride, for which MOWE has increased the limit to 3mg/lit.

* ESRDF was one of WASH implementer but currently it has phased out.

7.2. List of chosen quantitative standards for principal contaminants

The following are list of the national standards both for MoWE and other stakeholders; WaterAid Ethiopia would recommend adopting the national standard. The following limits are selected to be tested for all new and rehabilitated water sources before distribution for consumption. However some of the critical high risk parameters for which BGS has developed fact sheet are subject to frequent check up annually and as indicated by sanitary survey.

Table 4. Lists of the limits made by ESRDF and MoWE

No	Tested Chemicals	Standards/Permissible level	Remarks
1	Colour (app)	15TCU	TCU- true colour unit.
2	Turbidity	5 NTU	Median turbidity ≤ 1 NTU, single sample ≤ 5 NTU
3	Conductivity	0.60 – 0.18 μ s/cm	
4	pH	6.5 – 8.5	< 4 Acidic, 7 Neutral and >Alkaline
5	Ammonia (NH ₃)	1.5mg/l	Impact on Odour and test
6	Sodium (Na)	200mg/l	Taste problem
7	Potassium (K)	1.5mg/l	
8	Total Hardness (CaCO ₃)	300mg/l	
9	Calcium (Ca)	75mg/l	
10	Magnesium (Mg)	50mg/l	
11	Total Iron (Fe)	0.3mg/l	
12	Manganese (Mn)	0.50mg/l	
13	Fluoride (F)	3mg/l	
14	Chloride (Cl)	200 – 300mg/l	Test and corrosion are the main problems
15	Nitrite (NO ₂)	3mg/l	
16	Nitrate (NO ₃)	50mg/l	
17	Alkalinity (CaCO ₃)	200mg/l	
18	Sulphate (SO ₄)	250mg/l	Taste and corrosion
19	Hydrogen Sulphide (S)	0.05mg/l	
20	Chlorine (Cl ₂)	5mg/l	The residual free chlorine concentration after 30min should be ≥ 0.5 mg/l at pH < 8.0.

7.3. WaterAid Ethiopia Standard Limits of Principal Contaminants

With the priority of health risk and economic risk which impacts health indirectly the following parameters under table-5 are considered as the minimum WaterAid Ethiopia Water Quality Testing parameters for physico-chemical and bacteriological.

Table 5. WaterAid Ethiopia limits for principal contaminants to be adopted for frequent monitoring purposes

No	Tested Chemicals, physical & microbiological	Standards/Permissible level	Remarks
1	Fluoride	1.5mg/l	Tooth and bone fluorosis, rift valley common problem
2	pH	6.5 – 8.5	< 4 Acidic, 7 Neutral and >Alkaline
3	Turbidity	5 NTU	Median turbidity ≤1 NTU, single sample ≤ 5NTU
4	Total Iron (Fe)	0.3mg/l	
5	Manganese (Mn)	0.50mg/l	
6	Nitrate (NO ₃)	50mg/l	
7	Nitrite (NO ₂)	3mg/l	
8	Sodium (Na)	200mg/l	Taste problem
9	Chloride (Cl ⁻)	200 – 300mg/l	Taste and corrosion are the main problems
10	Sulphate (SO ₄ ²⁻)	250mg/l	Taste and corrosion
11	Conductivity	0.60 – 0.18µs/cm	
12	Term tolerant E. coli	0/100ml	High risk due to low sanitation and hygiene coverage

10. Methodology

WaterAid Ethiopia gives high value for the catchment wide approach which focuses on the preventive management than point/source based treatment approach. Water safety plan supported with sanitary surveillance could be used as one method. Sampling and testing the water for its quality at field level and laboratory, and taking appropriate measures based on the test results as well as re-confirmation of potable drinking water are methods to be used. Furthermore point of use water treatment promotion could be used as an alternative methodology to keep water safe. The

general and specific testing mechanisms and water safety plan and surveillance are discussed below.

10.1. General Testing Frequency

Water quality testing has to be done in the following cases;

During the project period, WaterAid Ethiopia and its partners should test all new or rehabilitated schemes for physico chemical and microbiological test for all the parameters stated in this guideline before providing the water for consumption. However, for regular or risk based monitoring testing high risk parameters would be sufficient. After the end of the project woreda water, health office and community would be able to sustain the testing provided that they are well capacitated during the project period.

The following are the situation where the water should be tested: -

1. During inception of the water supply project - for surface water possible water sources should be tested but for other ground water and technologies like sand dam if there is other source in the nearby sample within reasonable distance can be taken from those sources and documented as a baseline. In case where there are no other sources the testing can be in the middle of the actual implementation of the water supply work at pump test level for the case of drilling. In the case of urban water drilling, quality tests can be taken from test wells. If there are already test results, it is possible to use secondary water quality report.
2. Newly developed or rehabilitated water supply for community consumption has to be tested and corrective measures has to be taken before handing over the scheme.
3. As water supply development such as digging, drilling and building works introduce microbiological contamination, wells and spring development should be disinfected and routinely chlorinated before they are brought into services.
4. For rain water harvesting (roof water catchments) testing and disinfection of the reservoir before distribution is highly required.
5. Routine sanitary inspections (based on Table 5) should be carried out by partners and community members and used to identify the level of monitoring assigned to community supplies. Sanitary inspection involves- identification of potential

sources of contamination, assessment of the risk posed by these potential sources of contamination (sanitary inspection check list is Annexed-Annex-V).

6. Risk based testing -

- In case of an outbreak or an epidemic in project area, a test to verify the cause of the epidemic- microbiological testing is more significant here
- Whenever there is big farming using fertilizers and industrial activities like mining around the water sources water quality needs to be tested
- Whenever there is damage to the water structure water sample should be taken for testing
- When there is flood around the sources and when there is open dumping of waste around the water source water quality testing is mandatory

7. For follow-up test, water sources supplying more than 100,000 populations, or if a source serves more than 10% of the population it should be subject to more regular risk assessment, repeated test and treating (refer table-6).

8. Water source supplying schools and hospitals require more frequent testing.

9. Monitoring for follow-up test by WaterAid Ethiopia or partners is recommended to be annually for bacteriology and every three year for physico chemical parameters until the project is handed over to the community. During the project life the capacity of woreda water and health offices staff should be built to sustain the work.

10. For springs, sand dams and streams and small lakes microbiological testing should be done in dry and wet seasons.

11. When large number of sources are available for follow-up test, taking proportion of samples would be sufficient (testing 10% of the sources might be enough) for monitoring of high risk contaminants purpose. However, for initial testing all the sources should be tested.

12. Water quality testing of old schemes to see sustainability of the water quality and testing to household water storage or point of use to examine the real impact brought by sanitation and hygiene promotion.

Table 6. Minimum sample number for piped drinking water in the distribution system

Group	Population served	No of Annual samples
1	<5000	2
2	5,000-100,000	6 -120 samples
3	>100,000	Pop/100,000+120(120 and above)

10.2. Testing frequency for specific cases

10.2.1. Fluoride

Temporal variations in fluoride concentration are likely as a result of the seasonal variations in rainfall and base flow (ground water) inputs to the rivers. Consideration of the seasonal fluctuations in water quality should therefore be made if river water is to be used for potable supply. Therefore repeated testing during rainy and dry season is recommended if sanitary survey is suggestive of silt or flood interred the well or source. In rift valley areas where there are de-fluoridation schemes, initial test of water just after the completion of the treatment plant and a random check up of raw and treated water to verify efficacy of the treatment scheme is recommended (from experience).

10.2.2. Nitrates

Elevated nitrate levels can result from contamination with human/animal wastes, agricultural run-off or industrial pollution. Risk factors (particularly fertilized fields) are likely to be widespread. Given the *relatively* low health risks associated with nitrate, it may be practical to make sure that a small number of wells in risk areas are sampled regularly.

If nitrate appears to be rising, a wider investigation can be carried out. According to the rapid assessment carried out by WHO and UNICEF in 2010, nitrate (NO₃) concentration of 123mg/l was reported in Dire Dawa and Somali (RADWQ –WHO & UNICEF).

It is sensible to use the sanitary survey approach to assess the level of risk posed to a water source by nitrates. Sources close to latrines, graveyards, rubbish pits or fields

where nitrate fertilizers are applied should be regarded as high-risk and should be subject to more frequent monitoring. Ultimately it makes sense to reduce the risk of nitrate contamination by alerting a community to the danger posed by the close proximity of nitrate sources.

10.2.3. Iron

Iron is one of the most abundant metals in the earth's crust. Iron contamination is a particular problem for anaerobic groundwater supplies, but iron can get into drinking-water from the use of iron coagulants or from corrosion of galvanized iron, steel and cast-iron pipes in the distribution system. Iron also promotes the growth of iron bacteria, which oxidize ferrous iron to ferric iron and in the process, corrode which results on shortening of the design life of water systems.

Due to its aesthetic conditions people will be discouraged to use water with iron contents. 7% of the total sample size of 1,619 and 15% of SNNPR samples are with iron content above the standard as indicated in the report of (RADWQ report-WHO & UNICEF, 2010).

10.3. Details of test methodologies selected

10.1. Field based testing

Physico - chemical and microbiological water quality can be tested at field level by well-trained professional and portable test kits.

Field analysis have significant advantage of being carried out on fresh samples whose characteristics have not been affected by transportation (e.g. pH is highly affected by temperature and to get accurate result field test is recommended), for microbiological analysis field test is best as maintaining of sterility is best managed at field level if appropriate precaution is made. It is also advantageous where transportation of samples and refrigeration is not practicable in remote areas. However field analysis does have limitations like using calibration of the instruments using standard reagents/solutions.

In the case of test result unreliability in the field or local laboratories, partners should verify by referring five percent of the samples to a recognised reference (regional laboratories). In areas where regional laboratories are weak and not reliable; samples should be taken to national laboratories such as Ethiopian Health and Nutrition Research institute and MOWE.

In the future different technologies for water quality monitoring will be tested like the mobile technology for water quality monitoring.

10.2. Sampling

- Before taking sample for microbiological analysis from tap or pumps, it is important to sterilize the opening using lighter or alcohol flame.
- In the case of ground water, flush a well or water system before sampling. This is to clean out water that may have had extended contact with the well casing or pipe work. A flow cell can be set up using simple container. When pH and conductivity readings stabilize in the flow cell, a representative sample can be taken using a sterile, air tight container.
- All samples should be labeled with the site, date, and time, nature of water source and details of who collected the sample. A global positioning satellite (GPS) reference can be useful for data manipulation and future monitoring.

10.3. Sample preservation and transportation

If samples are taken for off- site testing at laboratories, it is essential that they are preserved during transportation to prevent change to their biological or hydro-chemical properties. They should be preserved, stored in a dark, covered cool box at a stable temperature between 4 and 10 degrees. They should be analyzed within 24 hours of collection. If there is no ice transportation time should not exceed two hrs. If transportation of samples to reference laboratory is not possible, results should be validated using a separate test kit by inviting local laboratories to carry out the test.

Filed testing is highly recommended provided that all the required trainings and logistics are fulfilled.

10.4. Field test for microbiological contaminants

The following testing equipments are recommended; potatest (potalab & potakit)– which is used to test coli form and inorganic parameters such as nitrate and fluoride, but it has to be able to read fluoride above 1.5 mg/l good to read fluoride up to 18 and 20 mg/l as fluoride in the rift valley are reaching to this level. Membrane filtration testing methods using field test kit would be recommended to be applied with strict maintenance of sterility techniques.

Rapid assessment using yes/no test strip - It is helpful to use a rapid strip test to detect the presence of hydrogen sulphide gas and thus the presence of bacteria in water. These strips can be used as a quick indicator of faecal contamination. Whenever strip test is positive further microbiological test should be done using other methods. Its limitation is that it detects presence of bacteria from around 3/100ml up words as a result subjective judgment can be used. This test is best to check pre-treated water supplies from piped network. It is highly recommended to be used for community level testing. It is recommended that the strip is used by the community or community hygiene promoters to report the water problem and to carry out system assessment.

10.5. Filed testing for chemicals

10.5.1. Fluoride

Field testing for fluoride analysis can be carried out by colorimetric or ion- selective electrode. Low –cost pocket colorimeter is available for field testing of fluoride and can be supplied as kit with reagent solutions. Colometric kit for fluoride measuring is also possible to be used but still we would like to have a kit that would measure high level of fluoride.

Trained sanitarian, health or medical assistance or persons with comparable educational attainments should become competent in the operation and maintenances of these kits after four to five days training.

10.5.2. Nitrate

Wagtech color comparator can be used to detect nitrate within the range 0 – 20mg/l.

A Palintest photometer is also suitable for monitoring nitrate levels within the range 0 - 20mg/l. Costs are the same as those listed for fluoride.

Again, trained sanitarians, health/medical assistants or persons with comparable educational attainments should become competent in the operation and maintenance of these kits after four to five days of instruction and practice.

Turbidity meter, pH meter and conductivity meter are also recommended to be included in the field monitoring kits. Community can also trained and conduct these tests with sanitary survey and yes or no test for detection of hydrogen sulfide.

All water sources found bacteriologically contaminated should be tested using the recommended treatment. (Water testing and treatment implementation manual will be prepared).

10.6. Point of use Water Treatment

A Rapid Assessment of Drinking Water Quality in the Federal Republic of Ethiopia found that 72% of samples from “improved water supplies” were in compliance with the WHO guideline values (GV) and Ethiopia drinking water standards for thermo tolerant coli forms (TTC). Compliance ranged from 88% for utility piped supplies to 43% for protected springs. The water microbiological quality of water is likely to be considerably worse for the 62.7% of the population that relies on unimproved sources. Moreover, at the household level, only 43.6% of samples were in compliance with the WHO Guideline Value and national standard for Thermo tolerant coli form, and more than half of household samples showed post-source contamination. The report provides strong evidence in support of Household Water Treatment, and concludes that “household water quality must be given serious attention”.

A systematic review of water quality interventions to prevent diarrhea suggests that interventions at the household level (chlorination, filtration, boiling, solar disinfection, flocculation/disinfection) are about twice as effective in preventing diarrhea as conventional improvements in water supplies (protected wells, boreholes and tap stands).

Therefore, household treatment options in the case where sanitation and hygiene level is very low and whenever water sources are liable to be abandoned due to contaminants above the guideline value, it is recommendable to treat any available water sources with point of use systems as alternative means. WaterAid Ethiopia first hand focus areas in water quality are risk prevention, securing the quality at the source (if funds are availed) and hygiene promotion for safe collection, transportation, storage and use. (Point of use methods will be included in implementation manual).

10.7. Water Safety Plan

Water safety planning is a preventative management approach aimed at minimising the risks posed to drinking water quality and health from catchment to point of use.

The purposes of Water Safety Plans (WSPs) are:

- Seek to prevent contamination of water from the source to the point of consumption; and
- Give consumers greater involvement and control over maintaining water quality.

Water Safety Plans can be used for new or existing water supply schemes, both for piped urban utility supplies and rural or peri-urban community supplies.

Table 7. Comparison of steps in a water safety plan and steps that WaterAid promotes to assure water quality.

Water safety plan steps	Steps WaterAid promotes
Establishment of health-based targets for microbial and chemical water quality	Country programme water quality policy identifying high-risk contaminants, usually based on national standards informed by health-based targets
A system assessment to determine whether the water supply chain from catchment to consumer can deliver safe water at the point of consumption	Sanitary inspection of conditions around water points and in households where water is stored before consumption
Effective operational monitoring of identified control measures within the water supply chain that provide assurance of safety	Sanitary survey of all points in the water supply chain. Risk-based follow up measures and water quality monitoring
Management and communication plans describing actions to be taken during normal operation or incident conditions which includes feedback and improvement	Communities trained on source protection, safe household storage of water, and hygiene. Country programme water quality policy outlines steps to take in event of contamination. Frequency of follow-up monitoring is also outlined
Independent public health surveillance of water safety	Should be carried out by national institutions

10.7.1. Sanitary survey

Sanitation inspection needs to be done for water supply schemes. Evaluation of all sanitary situation such as excreta disposal around water sources, lack of maintenance and poor workmanship, practices of collecting, transporting and handling water needs to be observed and corrective measures have to be taken from the community health point of view. A sanitary inspection format needs to be developed for each type of scheme and provided to locally employed staff, community hygiene promoters and health extension workers to be completed on regular basis (Annex of the check list is attached-Annex -V).

Table 8. Minimum annual frequency for sanitary survey

No	Source of water/ scheme	Community	Water supply agency	Surveillance agency
I	On spot supply			
I.1	Hand dug well	6	-	-
I.2	Dug well with hand pump	4	-	0.5
I.3	Shallow and deep borehole well with hand pump	4	-	0.5
I.4	Gravity spring	4	-	0.5
II	Piped supply			
II.1	Ground water	-	0.5	0.5
II.2	Treated surface water with chlorination			
	< 5,000 Population	-	0.5	0.5
	5,000 to 20,000	-	1	0.5
II.3.	Distribution system of piped supply	-	6	0.5

13. Financing Water Quality

13.1. Training for WaterAid Ethiopia, partners and government

WaterAid Ethiopia should provide adequate training to concerned staff of WaterAid, partners, local government focusing Woreda/Town Wide Approach (W/TWA) and the community.

The training should focus on how to conduct sanitary survey, microbiological and physico chemical analysis using portable test kits, interpretation of the results as well as taking remedial actions. Community Hygiene Promoters, government Health extension workers, TVETs graduates and community members should be trained on sanitary surveys and minor physico chemical testing using yes/no test for Hydrogen sulfide gas and pH or turbidity. Training on Sanitary survey is crucial for searching pollution of water sources due to practice of open defecation, new settlement, mining and farming with fertilizers around the water sources, drainage conditions around

public water points and cracks / damages around structures which may lead to pollution. In addition all staff involved in water quality testing should be trained in:

- Water sampling techniques and sample preservation for the various test parameters. Five days practical training will be organized for WaterAid and partner's staff who are directly working in water supply and sanitation as well as local government (water and health office staffs). The training has to be contentious based on regularly assessment of capacity gap. The main focus of capacity building in terms of training and logistic support should be for woreda water and health office as they are the ones who will sustain the project and continue water quality monitoring.
- Interpretation of results and taking remedial actions in consultation with local responsible agencies is also another area of training. These trainings can be given by the staff of any of the national laboratories or MOWE or MoH. Hygiene and sanitation promotion also need to include water quality with special emphasis of source protection from pollution.
- Reporting and dissemination of reports will be included in the training pack. Woreda water and health offices where there are WaterAid Ethiopia and its partners projects shall be trained and equipped with field testing kits and guidelines.

13.2. Details of Equipment for Testing

Wagtech potatest - That measure fluoride at high level of 18- 20mg/l

- Photometry / test kits for fluoride , Nitrate, manganese and others
- pH meter
- Turbidity meter
- Conductivity meter
- Consumables for both microbiology and chemicals
- Mobile technology for the future use

Priorities are given to use the existing mobile equipments and laboratory based materials owned by government at different levels. Shortages of reagents and chemicals would be covered by WaterAid Ethiopia. In areas where there is no access for mobile testing kits and laboratory based testing, WaterAid Ethiopia will provide

mobile kits for the local government (health or water and energy) offices as part of the projects included or planned by partners to fulfil the requirements addressed in this policy guideline.

14. Reporting, Documentation and Dissemination

Water quality test results should be reported using the attached Annexes. Baseline data of water quality shall be part of project documents. Partners are required to report water quality test results bi-annually and annually to WaterAid Ethiopia both in hard and electronic copy. WaterAid Ethiopia will document the reports in an excel database and share the learning for sector actors using different opportunities like the WSF and WaSH Ethiopia Movement.

15. Follow-up Arrangements

15.1. General

WaterAid finds it imperative that this guideline be adhered to by its own staff and its partners. However, the standard is subject to revision based on changes to country guideline and WaterAid global directions. WaterAid Ethiopia and partners' service delivery projects need to comply with the requirements stipulated in this guideline. The standard must be adhered during project study and implementation phase. Water quality test results must be attached to project proposals. Hence, any project that fails to meet this requirement will not be eligible for funding by WaterAid unless alternatives and treatment options are included with.

As part of the agreement WaterAid Ethiopia and partners need to develop a water quality monitoring system for projects that are implemented with WaterAid financial support.

Partners also need to include responsibility of sustaining water quality and the likelihood of abandoning the water source that doesn't meet the requirements stated in this guideline and all alternative treatment options are not feasible. Water sampling procedures and treatment options will be included in detail in the implementation manual which WaterAid Ethiopia will prepare.

15.2. Organic Contamination

Microbiological test results need to be included in the project proposal document so that all stakeholders including concerned government line bureau, communities and WaterAid shall have the necessary information to agree whether the project shall be implemented or terminated. However, in order to reach to a conclusion it is necessary to:

- Conduct a sanitary survey to find out the sources of contamination, or
- Explore other possible sources, or
- Simple/sustainable improvement works or raw water treatment

If alternative measures are not feasible and if upon consultation the other parties wish to proceed with the use of a source that WaterAid considers unfit because of potential health risk, the program manager is required to inform in writing to the other parties the final decision reached by WaterAid. In the event the other parties do not wish to proceed with a source on grounds of health risks, alternative solutions need to be sought but again the senior management team will record WaterAid's views on the health risk.

15.3 Inorganic Constituents

When water is tested for inorganic constituents, the properties that affect the safety of drinking water shall conform to the levels specified in table 1 of this document. If nitrates (expressed as N) are present in concentrations in excess of 10mg/l, the water may be unsuitable for use by infants under one year of age, and an alternative source of supply must be found for such infants' use or water from same source should be corrected in case of lack of other sources.

In areas where Nitrate is above 10mg/l, hygiene promotion should focus on the risk of the water for infants. According to the Quality and Standards Authority of Ethiopia test method ES B.W8.028 the recommended control limits of fluorides (as F) shall be between 1 and 1.5 mg/l. WaterAid Ethiopia has to follow the standard of fluoride as 1.5mg/l. However, for Rift Valley areas effort should be made to provide an alternative

supply where the fluoride level not exceeds 1.5 mg/l therefore, for fluoride level in excess of 1.5 mg/l other water sources with lower fluoride level should be sought or dilute the water with low level fluoride source or the water has to be treated with aluminum sulfate or other means based on the local government consultation.

Results that are beyond the absolute limits suggested in table 1 of this document need to be discussed with all concerned parties and the health risks adequately explained. Community views and the views of the concerned government departments should be taken into consideration while looking for alternative solutions. Other factors that need to be considered include the availability of alternative water resources, distance to source and the estimated development cost among others. In case an agreement is not reached regarding alternative solutions, the WaterAid senior management team will consider what action WaterAid needs to take to the best interest of the community.

Reference

1. An Introduction to Water Safety Plan-WEDC- Factsheet -8, UK, Loughborough, May 2012
2. British Geological Survey Information sheets for fluoride, nitrate, manganese arsenic, Industrialization and urban
3. Guideline for Drinking –Water Quality first addendum to Third edition Volume 1 WHO 2006
4. Guidelines for drinking-water quality [electronic resource]: incorporating 1st and 2nd addenda, Vol.1, Recommendations. – 3rd ed. WHO 2008, Geneva
5. MOWR water quality Guideline – 2001
6. National drinking water quality monitoring and surveillance strategy, Ministry of Health, May, 2011, Addis Ababa
7. Rapid Assessment of Drinking –Water Quality in the Federal Republic of Ethiopia Country Report, WHO, UNICE , FMOH, Ethiopian Health and Nutrition Research institute (EHNRI), 2010
8. The Ethiopian Drinking Water Quality Standard are referred to as ES261:2001.
9. The Ethiopian Social Rehabilitation and Development Fund (ESRDF) financed by the World Bank) preliminary water quality permissible limits.
10. WaterAid Ethiopia Water Quality Policy Guideline document 2009
11. WaterAid –UK- Organizational guidelines for water quality testing 2009
12. Water Security Framework-WaterAid, London -2012

Annex I. Annual/Bi-annual Water quality of new and rehabilitated WaterAid funded water facilities reporting format

	Project number		Water point coordinates
	Unique water point ref		
	Latitude of waterpoint		
	Longitude of waterpoint		
	Waterpoint type e.g. borehole,		
	New or rehabilitated?		
	Tested? (Y/N)		
	If not tested - reason not tested and date testing will be carried out		
	Tested by		if water point has been tested, please respond to the questions below
	Date tested		
	Date water source put into service		
	pH		
	Conductivity µS/cm		
	Turbidity NTU		
	TTC or Ecoli/100ml		
	TTC lab or field tested?		
	Nitrate (specify if [NO3] or [NO3-N]) mg/l		
	Arsenic (As) mg/l		
	Fluoride (F) mg/l		
	Iron (Fe) mg/l		
	Manganese (Mn) mg/l		
	Inorganic contaminants lab or field tested?		
	Copies of results held on file in CP office? Y/N		
	Potable/non-potable?		
	If non-potable, what follow up action was taken? Please also name the individual responsible for taking action		
	If non-potable, details of how users were informed		

Annex II. Water quality of follow up tested WaterAid funded water facilities reporting format

		Water point coordinates
	Project number	
	Unique water point ref	
	Latitude of waterpoint	
	Longitude of waterpoint	
	Waterpoint type	
	Tested by	
	Date tested	
	Date water source put into service	
	pH	
	Conductivity µS/cm	
	Turbidity NTU	
	TTC or Ecoli/100ml	
	TTC lab or field tested?	
	Nitrate (specify if [NO3] or [NO3-N]) mg/l	
	Arsenic (As) mg/l	
	Fluoride (F) mg/l	
	Iron (Fe) mg/l	
	Manganese (Mn) mg/l	
	Inorganic contaminants lab or field tested?	
	Copies of results held on file in CP office? Y/N	
	Potable/non-potable?	
	If non-potable, what follow up action was taken? Please also name the individual responsible for taking action	
	If non-potable, details of how users were informed	

Annex III. WaterAid Ethiopia Water Quality Monitoring Form-Bacteriological

Bacteriological Report for Result of Water Sample Analysis

BACKGROUND DATA:

Sample Serial No: _____ **GPS-Lat.** _____ **Log.** _____

Date of collection: DD ___ MM ___ Yr _____ **Time of collection:** _____ **Project No:** _____

1. Region: _____ Time of incubation started: _____
Time of reading: _____ New/rehabilitated/follow up _____
2. Name of the project: _____ Location: woreda _____ kebele _____
3. Partner Organization: _____ Unique water point name _____
4. Type of the scheme/water point type: _____ No. of users: _____
5. Date /Year of completion: _____
6. Site of collection: _____
7. Nature of the Sample: a, Chlorinated
 1. Yes, when (recent one) _____ by whom?

 2. No, _____ Why? Information _____
8. The Scheme Managed by: _____

RESULTS

- Thermo tolerant Coli form (TTC) count _____ E. coli /100ml
- Other organisms isolated (TC) count _____ Organisms/100ml

COMMENTS: Tick using (√)

- () Bacteriological Potable
- () Bacteriological non-potable
- () Chlorination Recommended
- () Disinfection recommended
- Sanitary condition of the scheme area? / Presence of potential contaminants in the area? (Yes/No) _____ Describe

LIST OF MONITORING TEAM

1 Name: _____ Organization: _____ Sign: _____

2 Name: _____ Organization: _____ Sign: _____

General Remark _____

Reported by: _____ Date: _____ Sign: _____

Annex IV. WaterAid Ethiopia Water Quality monitoring form-Physicochemical

Physicochemical Report Result of Water Sample Analysis

BACKGROUND DATA:

Sample Serial No: _____ GPS-Lat.(N) _____ Log.(E) _____

Date of collection: _____ Time of collection: _____ Project number: _____

1. Region: _____ Location: woreda _____ kebele _____

2. Name of the project: _____ New/rehabilitated/follow up

3. Partner Organization: _____ unique water point name _____

4. Type of the scheme/water point type: _____ No. of users: _____

5. Date /Year of completion: _____

6. Site of collection: _____

7. Nature of the Sample: a. Chlorinated

1. Yes, when (recent one) _____ by whom?

2. No, _____ No information _____

8. The Scheme Managed by: _____

No	Tested Chemicals	Standards/Permissible level	WAE limits of chemical to be tested – MUST	Result	Remark
1	Colour (app)	15TCU			
2	Turbidity (NTU)	5	Turbidity (NTU)		
3	Conductivity (µs/cm)	0.60 – 0.18	Conductivity (µs/cm)		
4	pH	6.5 – 8.5	pH		
5	Ammonia (NH ₃ mg/l)	1.5			
6	Sodium (mg/l Na)	200	Sodium (mg/l Na)		
7	Potassium (mg/l K)	1.5			
8	Total Hardness (mg/l CaCO ₃)	300			
9	Calcium, (mg/l Ca)	75			
10	Magnesium (mg/l Mg)	50			
11	Total Iron (mg/l Fe)	0.3	Total Iron (mg/l Fe)		
12	Manganese (mg/l Mn)	0.50	Manganese (mg/l Mn)		

13	Fluoride (mg/l F)	1.5	Fluoride (mg/l F)		
14	Chloride (mg/l Cl)	200 – 300	Chloride (mg/l Cl)		
15	Nitrite (mg/l NO ₂)	3	Nitrite (mg/l NO ₂)		
16	Nitrate (Mg/l NO ₃)	50	Nitrate (Mg/l NO ₃)		
17	Alkalinity (mg/l CaCO ₃)	200			
18	Sulphate (mg/l SO ₄)	250	Sulphate (mg/l SO ₄)		
19	Sulphide (S)				
20	Phenol (mg/l)				
21	Chlorine (mg/l Cl ₂)	5			
22	Sulphite (mg/l Na ₂ SO ₃)				
23	Organophosphate				

Reported by: _____ Date: _____ Sign: _____

Annex V. Sanitary survey form for assessment of contamination

Risk at a water point and source

A. General information – Location of water point

Region: _____ Woreda: _____ Kebele: _____ Gote: _____

GPS reading: Lat. (N) _____ Log. (E) _____

Year of construction: _____ Date of visit: DD __ MM __ Yr ____

Was a water sample taken? No ____ Yes ____ If yes, date: DD __ MM __ Yr ____

analysis made by _____ Field testing _____ Laboratory _____

Results of water sample:

- Bacteriology (Yes/No): _____
- Physico Chemical (Yes/No): _____
- Others (Yes/No): ____ If yes: Specify: _____

B. Identification of sanitary risk factors

- Is the water point / source located at the bottom of a slope or on lower ground/downhill? No ____ Yes ____
- Is there a latrine within 30 m of the source? No ____ Yes ____
- Is the ground around the water point swampy and wet? No ____ Yes ____
- Is the slab or apron around the water point damaged or cracked? No ____ Yes ____
- Is there inadequate or no drainage away from the water point? No ____ Yes ____
- Is the water point unfenced? No ____ Yes ____

- Do people drink directly from the spout/tap or place their fingers inside the spout/tap to help the water flow adequately? No ___ Yes ___
- Do taps attached to plastic tube to guide the flow? No ___ Yes___
- Are there any other possibilities for water contamination? (Industry, mining, mechanized farming etc) Specify:_____

Total score of sanitary risks

Note: One (1) point is given for each 'Yes' answer. Add up the total number of 'Yes' answers to get the sanitary risk score.

Note: Sanitary risk score: 6 – 7 = very high-risk of contamination

4 – 5 = high-risk of contamination

2 – 3 = some risk of contamination

0 – 1 = low risk of contamination

Name: Inspector: _____ Signature: _____ Org.: _____

Name: Community representative: _____ Signature: _____ Role: _____