



**Monitoring report form for CDM programme of activities  
(version 01.0)**

*Complete this form in accordance with the Attachment "Instructions for filling out the monitoring report form for CDM programme of activities" at the end of this form.*

**MONITORING REPORT**

<b>Title of the programme of activities (PoA)</b>	International Water Purification Programme	
<b>UNFCCC reference number of the PoA</b>	5962	
<b>Version number(s) of the PoA-DD(s) applicable to this monitoring report</b>	07	
<b>Coordinating/managing entity (CME)</b>	Pure Water Ltd.	
<b>Version number of this monitoring report</b>	02	
<b>Completion date of this monitoring report</b>	04/07/2016	
<b>Monitoring period number and dates covered by this monitoring report</b>	2 <sup>nd</sup> monitoring period 01/02/2015 – 30/09/2015	
<b>Monitoring report number for this monitoring period</b>	01	
<b>Host Party(ies)</b>	<b>Host Party(ies) of the PoA</b>	<b>Is this a host Party to a specific-case CPA covered in this monitoring report?(yes/no)</b>
	Uganda	Yes
	Ethiopia	No
	Gambia	No
	Kenya	No
	Madagascar	No
	South Africa	No
	Egypt	No
	El Salvador	No
	Mexico	No
	Nicaragua	No
	Chile	No
Iran	No	

	Vietnam	No
	Cambodia	No
	Malawi	No
<b>Sectoral scope(s)</b>	Sectoral scope 3 : Energy demand	
<b>Selected methodology(ies)</b>	AMS-III.AV. “Low greenhouse gas emitting safe drinking water production systems (EB69, version 03)”	
<b>Selected standardized baseline(s)</b>	N/A	
<b>Total amount of GHG emission reductions or net GHG removals by sinks for all specific-case-case CPAs in the PoA covered in this monitoring report</b>	GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards
	0 tCO <sub>2</sub> e	79,558 tCO <sub>2</sub> e

## PART I - Programme of activities

### SECTION A. Description of PoA

#### A.1. Brief description of the PoA

This PoA seeks to further the access of households and communities to clean and safe drinking water, by promoting low greenhouse gas emitting water purification technologies. This PoA is thus primarily designed for the long-term improvement of the living conditions of local people. The targeted users of such technologies will be households and/or communities. Examples of technologies include, but are not limited to, water filters (e.g. membrane, activated carbon, ceramic filters), solar technologies (Ultra violet disinfection devices, solar water disinfection SODIS), photocatalytic disinfection equipment, pasteurization appliances, chemical disinfection methods (eg. chlorination), combined treatment approaches (eg. Flocculation plus disinfection), etc.

The PoA reduces the use and demand for fossil fuels and non-renewable biomass that would have been used to boil water as a mean of water purification in the absence of the Programme of Activities. This directly leads to reduced greenhouse gas emissions.

#### A.1.1. Generic CPA(s)

Title, identification/reference number and/or version number of the generic CPA(s) of the PoA	Sectoral scope(s)	Applied methodology(ies) or combination of methodologies and/or standardized baseline(s)
<p><b>International water purification programme</b> The approved PoA-DD (version 07, 13/04/2015): PART II. Generic component project activity (CPA)</p>	Sectoral scope 3 : Energy demand	<p>AMS-III.AV. Low greenhouse gas emitting safe drinking water production systems (version 03)</p> <p>This methodology refers to the following methodology and tools:</p> <ul style="list-style-type: none"> <li>AMS-I.E. Switch from Non-Renewable biomass for thermal applications by the user (version 05)<sup>1</sup></li> <li>Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion (version 02)<sup>2</sup></li> <li>Tool to calculate baseline, project and/or leakage emissions from electricity consumption (version 01)<sup>3</sup></li> </ul>

#### A.1.2. Specific-case CPA(s) covered in this monitoring report

Reference number of the specific-case CPA included in the	Title, identification/reference number and version number	Crediting period dates of the specific-case CPA	Is this specific-case CPA covered in this monitoring report?

1

[http://cdm.unfccc.int/filestorage/5/e/HSVPWKBG6X7Q8YEFMOT214IA3R0ZDL.pdf/EB%2068\\_repan22\\_Re\\_v\\_AMS-I.E\\_ver05.0.pdf?t=Ykh8b2NnY2I4fDCp1ObgpFSWKlJWx5ggydnj](http://cdm.unfccc.int/filestorage/5/e/HSVPWKBG6X7Q8YEFMOT214IA3R0ZDL.pdf/EB%2068_repan22_Re_v_AMS-I.E_ver05.0.pdf?t=Ykh8b2NnY2I4fDCp1ObgpFSWKlJWx5ggydnj)

<sup>2</sup> <https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-03-v2.pdf>

<sup>3</sup> [https://cdm.unfccc.int/Reference/tools/ls/meth\\_tool05\\_v01.pdf](https://cdm.unfccc.int/Reference/tools/ls/meth_tool05_v01.pdf)

PoA as of the end of this monitoring period	of the generic CPA to which the specific-case CPA applies		(yes/no)
5962-0001	<b>International water purification programme</b> The approved PoA-DD (version 07, 13/04/2015): PART II. Generic component project activity (CPA)	01/11/2013 – 30/10/2020	Yes
5962-0002	<b>International water purification programme</b> The approved PoA-DD (version 07, 13/04/2015): PART II. Generic component project activity (CPA)	17/07/2014 – 16/07/2021	Yes
5962-0003	<b>International water purification programme</b> The approved PoA-DD (version 07, 13/04/2015): PART II. Generic component project activity (CPA)	15/04/2015 – 14/04/2022	Yes

## A.2. Contact information of the coordinating/managing entity (CME) and/or responsible persons(s)/entity(ies)

Lars Osterwalder, Pure Water Ltd. (CME), [l.osterwalder@thesouthpolegroup.com](mailto:l.osterwalder@thesouthpolegroup.com)

The detailed contact information of CME are provided in Appendix 1.

## SECTION B. Implementation of PoA

### B.1. Implementation of the management system of the PoA

The management system has been implemented as described in the validated PoA-DD ('Operational and management plan') and in accordance with applicable provisions on the implementation of the management system in the Project Standard. The PoA is managed by the CME (Pure Water Ltd.) with CPA Managers responsible for the coordination with the CPA Implementers (CPA 1: Water School Uganda; CPA 2 and CPA 3: Evidence Action). Detailed roles and responsibilities of CME and CPA Implementers are described in the PoA-DD.

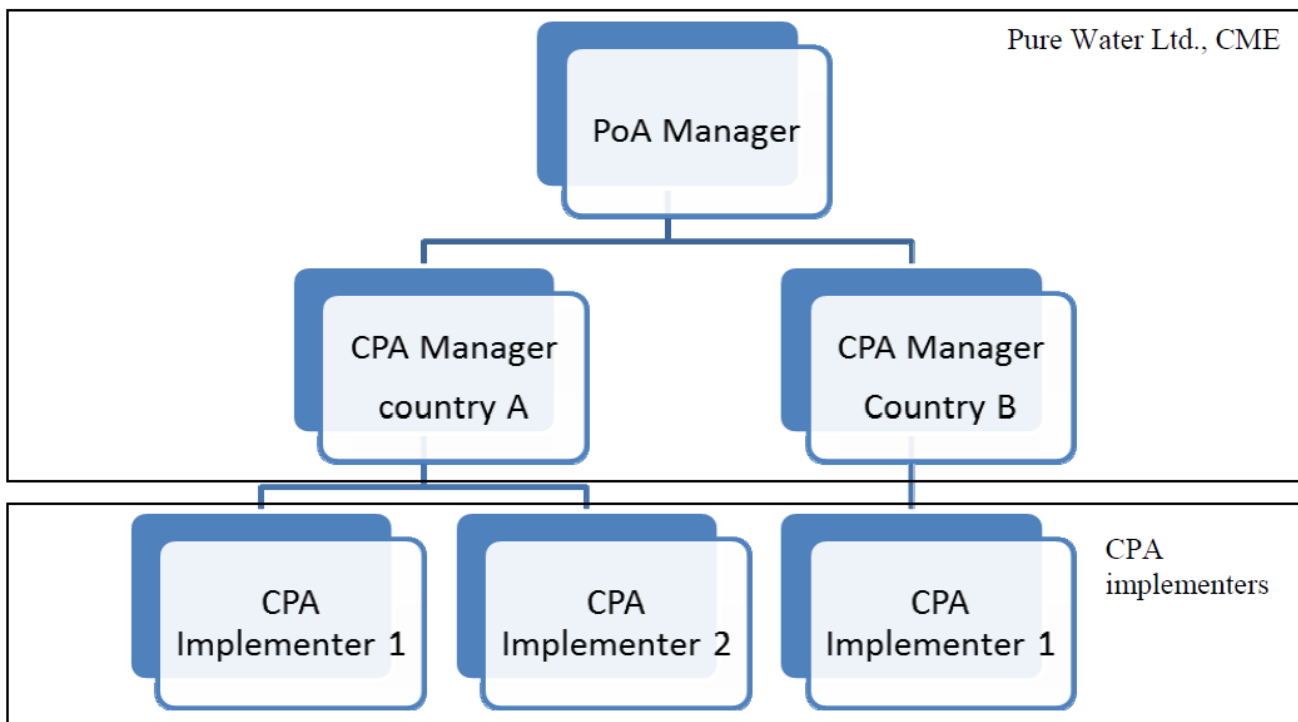


Figure: Overview of organizational structure

In order to ensure that CPAs comply with the double counting avoidance requirement stated in the PoA-DD, the CPA Manager checked every new CPA against the CPAs in the existing PoA database and the list of project activities that are under validation or registered at the UNFCCC.

All CPA-related data are stored electronically and/or in hard copy formats. The dispenser databases of CPA 2 and CPA 3 contain details about the unique waterpoint IDs, installation dates and administrative units in which the dispensers were installed.

## B.2. Implementation of single sampling plan(s)

In this monitoring period the single sampling plan was implemented combined for the involved CPAs as the same technology has been used in the same host-country (see section G.3 of Part II).

## SECTION C. Post-registration changes to the PoA (including the generic CPA(s))

### C.1. Corrections

No corrections were made to the registered PoA-DD (including the generic CPAs).

### C.2. Inclusion of a monitoring plan to the registered PoA-DD (including its generic CPA-DD(s)), if a monitoring plan was not included at the time of registration

No monitoring plan was included to the registered PoA-DD.

### C.3. Permanent changes to the monitoring plan as described in the registered PoA-DD, applied methodology, or applied standardized baseline

No permanent changes were made to the monitoring plan as described in the registered PoA-DD, applied methodology, or applied standardized baseline.

**C.4. Changes to the programme design of the registered PoA-DD (including corresponding changes to project design of the generic CPA-DD(s)) and updates to the eligibility criteria for inclusion of specific-case CPAs in the PoA**

No changes were made to the programme design of the registered PoA-DD during the current monitoring period.

**C.5. Types of changes specific to afforestation and reforestation activities**

N/A

## PART II - Specific-case component project activity(ies)

### SECTION D. Description of specific-case CPA(s)

#### D.1. Brief description of implemented specific-case CPA(s)

The start date of CPA 1 [Gravity Driven Membrane Filters in Uganda](#) (CDM# 5962-0001) is still pending (no Gravity-Driven ultrafiltration Membranes filter has been distributed as of the end of the second monitoring period) and no CERs will be claimed for CPA 1 for the indicated monitoring period. No further information or monitoring data are provided in this monitoring report regarding CPA 1.

The implementation of the project activities of CPA 2 [Chlorine Dispensers in Uganda](#) (CDM# 5962-0002) and CPA 3 [Chlorine Dispensers in Uganda](#) (CDM# 5962-0003) were carried out in accordance with the registered CPA-DD. On 30/09/2015 a total of 1,150 chlorine dispensers were installed within the defined project boundary of CPA 2 (152 dispensers less than indicated in the registered CPA-DD, however, the same as in the first monitoring period) and 1,013 chlorine dispensers within the defined project boundary of CPA 3 (13 more than in the registered CPA-DD). In order to avoid double-counting each water source is given a unique ID. In addition, each dispenser casing is marked with a unique identification number on a scannable asset tag (barcode ID). The allocation of this barcode ID to the unique water point ID is recorded in a central database.

The CPA implementer is aware that the CPA will be subscribed to this present PoA and cedes its rights to claim and own emission reductions under the Clean Development Mechanism to the managing entity of this present PoA. The CPA implementer has warranted that the proposed CPA is neither registered as an individual CDM project, nor is it part of another registered PoA, nor is it a CPA that has been excluded from a registered CDM PoA as a result of erroneous inclusion of CPAs.

#### Purpose of the project activity CPA 2 & 3

The CPAs seek to further the access of households and communities to safe drinking water, using a low greenhouse gas emitting water purification technology, chlorine dispensers. The CPA reduces the use and demand of non-renewable biomass that would have been used to boil the water as a mean of water purification in the absence of the CPA. This directly leads to reduced greenhouse gas emissions.

#### Applicability of methodology

No events or situations occurred during the monitoring period that may have impacted the applicability of the applied methodology AMS-III.AV version 03.

#### Brief description of the installed technology and equipment

Chlorine dispensers have been installed in the project activity (CPA 2 & 3).

Hardware specification	
Dispenser casing	Injection-molded HDPE tank produced in Kenya
Dispenser tank	Blow-molded HDPE tank produced in Kenya; capacity 3 liters
Dispenser tank valve	Imported from USA; delivers a precise 3ml dose of chlorine
Marine padlock	Imported from China
Asset tag	Imported from USA
Chlorine	Sodium hypochlorite solution, 11.90 minimum pH, 1.2% ± 0.1 available chlorine; imported from Kenya in 5 liter container with tamper-resistant cap
Hardware lifetime	5 years

Load factor	28,800 L per day <sup>4</sup>
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<sup>4</sup> Assuming 30 seconds per dispensing over 12 hours per day

## Relevant dates for the project activity

Timeline CPA	
29/07/2011	Validation start date of IWPP (PoA)
16/11/2012	Registration of the PoA under the CDM of the UNFCCC.
08/04/2013	Start date of CPA 2: installation of the first 12 dispenser in the roll-out phase (in Kibuku district, Kasasira sub-county). The unique barcode IDs of these 12 dispensers are 1002193, 1002199, 1002206, 1002211, 1002215, 1002218, 1002228, 1002596, 1002626, 1002655, 1002681 and 1002686. In total 1,150 dispensers were installed between 08/04/2013 and 10/04/2014 (see dispenser database for CPA 2).
09/10/2013	Emission Reduction Purchase Agreement signed between Pure Water Ltd. (the CME) and Evidence Action (implementer).
22/01/2014	Start date of CPA 3: installation of the first 2 dispenser (in Manafwa district, Bukiabi sub-county). The unique barcode IDs of these 2 dispensers are 1009810 and 1009888. In total 1,013 dispensers were installed between 22/01/2014 and 25/10/2014 (see dispenser database for CPA 3).
17/07/2014	CDM inclusion date of CPA2.
31/01/2015	Cut-off date monitoring period#1: 1,150 chlorine dispensers installed
15/04/2015	CDM inclusion date of CPA3.
30/09/2015	Cut-off date monitoring period#2: 1,150 chlorine dispensers installed (CPA 2) and 1,013 dispensers installed (CPA 3)

## Achieved emission reductions

Total GHG emission reductions achieved during this monitoring period are **79,558 tCO<sub>2e</sub>**.

CPA	Monitoring Period #2	Monitoring Period #1
CPA 1	0	0
CPA 2	47,809	26,816 <sup>5</sup>
CPA 3	31,749	-
<b>Total</b>	<b>79,558</b>	<b>26,816</b>

## D.2. Geographical references or other means of identification of the location of the specific-case CPA(s)

The physical boundary of CPA 2 and CPA 3 are the communities who use the water points where chlorine dispensers are installed. A database containing the GPS coordinates and unique IDs for all included chlorine dispensers is available at the Evidence Action Uganda country office.

### CPA 2

- Budaka district (all sub-counties), N 01° 00' 44.32", E 33° 48' 35.99"
- Kibuku district (all sub-counties), N 01° 04' 12.48", E 33° 59' 50.30"
- Manafwa district (Tsekukulu, Mukoto, Buwabala, Bukhabusi, Bukhaweka, Bupoto, Namabaya, Bumbu and Bukhoko sub-counties), N 00° 52' 40.72", E 34° 18' 51.38"

### CPA 3

- Manafwa district (Bubutu, Bukiabi, Bumwoni, Lwakhakha TC, Magale, Namboko, Bugobero, Bukhofu, Bukhusu, Bunabwana, Busukuya, Butiru, Butta, Buwagogo, Kaato, Khabutoola, Manafwa TC, Nalondo, Sibanga, Sisuni and Wesswa sub-counties) N 00° 52' 40.72", E 34° 18' 51.38"

<sup>5</sup> Of which 22,639 CERs 2014 vintage, and 4,177 CERs 2015 vintage

- Mbale district (Bubyangu, Bufumbo, Bukhiende, Lukhonge, Busiu, Bumasikeye, Busoba, Nyondo and Busanosub-counties), N 01° 00' 05.18", E 34° 10' 27.76"

**SECTION E. Post-registration changes to specific-case CPA(s)****E.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline**

No temporary deviations from registered monitoring plan or applied methodology were necessary for the involved CPAs since the start date of the project activities.

**E.2. Corrections**

No corrections were made to the registered CPA DDs.

**E.3. Changes to the start date of the crediting period of the specific-case CPA(s)**

N/A

**E.4. Inclusion of a monitoring plan into the specific-case CPA(s) that was not included at registration**

No monitoring plan was included into the specific-case CPAs that was not included at registration.

**E.5. Permanent changes to the monitoring plan as described in the registered specific-case CPA-DD(s), applied methodology or standardized baseline**

There is only one permanent change occurred: in the revised DD (version 04, 30/05/2016) of CPA 2, the monitoring frequency of the parameter "Existence of public distribution network supplying safe drinking water" was changed from "Biennial" to "Annual" following the FAR raised during the first verification.

**E.6. Changes to project design of the specific-case CPA(s)**

No changes to project design of the specific-case CPAs were made.

**E.7. Types of changes specific to afforestation and reforestation specific-case CPA(s)**

N/A

**SECTION F. Description of the monitoring system of specific-case CPA(s)**

Evidence Action had the responsibility to monitor and record all relevant parameters for CPA 2 and 3. The procedure is in line with the monitoring plan described in the CPA-DD section D.7.2. Details about the sampling design are given in section G.3.

**Parameters to be monitored**

- Existence of public distribution network supplying safe drinking water  
(see 'interviews' below)
- Number of functional chlorine dispensers (N<sub>y</sub>)  
(see 'chlorine delivery records' below)
- Average number of refills per functional dispenser (Refill#)  
(see 'chlorine delivery records' below)
- Fraction of delivered chlorine available for use in dispenser (Refill%)  
(see 'surveys' below)
- Fraction of water treated with the dispenser that is actually drunk (Drink%)  
(see 'surveys' below)
- Water quality  
(see 'surveys' below)

The data were collected through three main monitoring activities:

a) Chlorine delivery records (N<sub>y</sub> and Refill#)

**Refill#:** All chlorine dispensers were visited in rotation during chlorine deliveries by Evidence Action field staff. At each visit a chlorine delivery record was collected using a mobile phone-based recording format (Open Data Kit or short ODK). The collected information included the number of chlorine refills on stock and the number of new chlorine refills delivered (refill = 5 L jerrican with chlorine solution). The ODK records were uploaded to a master database on a central server and analysed by Evidence Action's MLIS team (Monitoring, Learning and Information System) using a statistics software package (Stata).

The collected records were used to determine the number of chlorine refills used within the CPA project boundary and within the monitoring period. The summary data for each dispenser is presented in the '160513\_Chlorine Usage Data CPA 2 & 3' spreadsheet. An example of the calculation for determining Refill# is shown in a separately submitted Excel spreadsheet 'Example of Refill# Calculation'. The CME made a consistency check for the results.

It was assumed that the average chlorine consumption was constant between the last chlorine delivery before the start date and the first record during the monitoring period, and between the cut-off date and the first chlorine delivery after the cut-off date. In case of missing data, it is assumed that no chlorine was used (e.g. in case no chlorine delivery record was collected for a certain dispenser before the start date of the monitoring period but chlorine delivery records are available for during and after the monitoring period, no chlorine usage is assumed before the date of the chlorine delivery record collected during the monitoring period). In total 8,202 jerricans of 5 L chlorine were used for CPA 2 dispensers during the monitoring period, and 5,853 jerricans for CPA 3 dispensers.

**N<sub>y</sub>:** Whenever chlorine solution was delivered and additional random spot-checks the functionality of the chlorine dispenser was checked by Evidence Action field staff using a mobile phone-based recording format (dispenser spot-check). The ODK records were uploaded to a master database on a central server and analysed by Evidence Action's MLIS team using a statistics software package. The CME made a consistency check for the results.

In case a dispenser was found to be non-functional, the status of the respective dispenser was recorded as "non-functional". Functionality is defined as: the dispenser releases 3 ml of chlorine when the valve is turned. In case the dispenser is empty, chlorine is added and the dispenser is checked again. Dispensers for which no functionality records were collected after monitoring start date (01/02/2015) are assumed to be non-functional.

b) Interviews (Existence of public distribution network supplying safe drinking water)

In early 2016 the district bureaus in Kibuku, Budaka, Manafwa and Mbale districts were visited by Evidence Action field staff to determine if a public distribution network supplying safe drinking water was constructed within the project area. The interviews were conducted with the technical personnel such as district health inspectors and district water engineers and confirmed by the Resident District Commissioners. Details are provided in a separate document ('150430\_Interview Existence of Public Distribution Network').

c) Surveys (Refill%, Drink% and Water Quality)

Three parameters were quantified through surveys. Details about the surveys are given in section G.3.

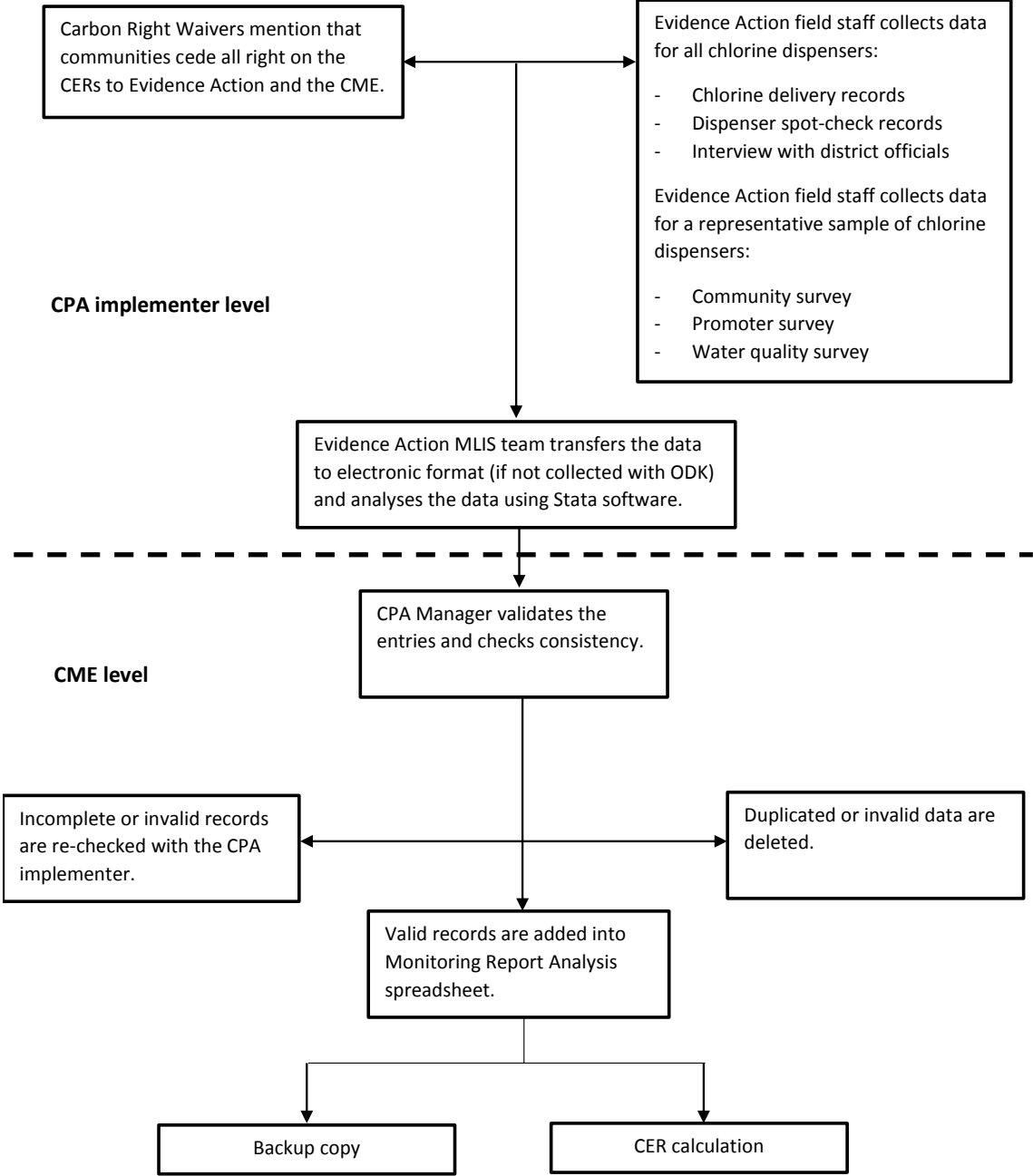


Figure: Records and documentation control process for CPA 2 and 3

**SECTION G. Data and parameters****G.1. Data and parameters fixed ex ante, at registration, inclusion or renewal of crediting period**

<b>Data / Parameter</b>	<b>EF<sub>projected_fossilfuel</sub></b>
Data unit	tCO <sub>2</sub> /TJ
Description	Emission factor as per AMS-I.E procedures when NRB is displaced or the emission factor of the fossil fuel substituted
Source of data	AMS-I.E for NRB displacement, IPCC for other fossil fuel displaced
Value(s) applied	81.6
Choice of data or measurement methods and procedures	As per AMS-I.E, this value represents the emission factor of the substitution fuels likely to be used by similar users, on a weighted average basis.
Purpose of data	Calculation of baseline emissions
Additional comment	

<b>Data / Parameter</b>	<b>WH</b>
Data unit	kJ/L °C
Description	Specific heat of water
Source of data	AMS-III.AV version 03
Value(s) applied	4.186
Choice of data or measurement methods and procedures	Default value
Purpose of data	Calculation of baseline emissions
Additional comment	

<b>Data / Parameter</b>	<b>T<sub>f</sub></b>
Data unit	°C
Description	Final temperature
Source of data	AMS-III.AV version 03
Value(s) applied	100
Choice of data or measurement methods and procedures	Default value. Boiling point of water at standard conditions.
Purpose of data	Calculation of baseline emissions
Additional comment	

<b>Data / Parameter</b>	<b>T<sub>i</sub></b>
Data unit	°C
Description	Initial temperature
Source of data	AMS-III.AV version 03
Value(s) applied	20
Choice of data or measurement methods and procedures	Default value
Purpose of data	Calculation of baseline emissions
Additional comment	

<b>Data / Parameter</b>	<b>WHE</b>
Data unit	kJ/L
Description	Latent heat of water evaporation
Source of data	AMS-III.AV version 03
Value(s) applied	2,260
Choice of data or measurement methods and procedures	Default value. The latent heat required to boil one liter of water for five minutes is assumed to be equivalent to latent heat for the evaporation of 1% of the water volume (WHO recommends a minimum duration of five minutes of water boiling) <sup>6</sup>
Purpose of data	Calculation of baseline emissions
Additional comment	

<b>Data / Parameter</b>	<b><math>\eta_{wb}</math></b>
Data unit	-
Description	Efficiency of the water boiling system being replaced
Source of data	Baseline survey
Value(s) applied	10.83% (CPA 2) and 10.92% (CPA 3)
Choice of data or measurement methods and procedures	0.10 default value is used if the replaced system or the system that would have been used is a three stone fire or a conventional system for woody biomass lacking improved combustion air supply mechanism and flue gas ventilation system i.e. without a grate as well as a chimney; for the rest of the systems using woody biomass 0.20 default value will optionally be used. 0.50 default value will be used if the replaced system or the system that would have been used is a fossil fuel combusting system. Use weighted average values if more than one type of system is encountered.
Purpose of data	Calculation of baseline emissions
Additional comment	The water boiling systems and the fuel used in the baseline have been established ex-ante via a baseline survey.

<b>Data / Parameter</b>	<b><math>f_{NRB}</math></b>
Data unit	-
Description	Non Renewable Biomass factor
Source of data	EB 67 Report Annex 22
Value(s) applied	82%
Choice of data or measurement methods and procedures	Fraction of woody biomass used in the absence of the project activity in year y for Uganda as per "Information note: Default values of fraction of non-renewable biomass for least developed countries and small island developing states (version 01.0)"
Purpose of data	Calculation of baseline emissions
Additional comment	

<b>Data / Parameter</b>	<b><math>L_p</math></b>
Data unit	Liters/refill (chemical disinfection)
Description	Capacity of the water purification equipment
Source of data	Manufacturer's specifications / Water Point Verification
Value(s) applied	32,971 (CPA 2) and 32,680 (CPA 3)
Choice of data or measurement methods and procedures	Manufacturer specifications of maximal amount of water treated based on one refill (5 liter chlorine solution) and dosage (3 ml dose treats 20 liters of water if turbidity is below 10 NTU and 6 ml if turbidity is above 10 NTU)

<sup>6</sup> WHO guidelines for Emergency Treatment of drinking water at point of the use

Purpose of data	Calculation of baseline emissions
Additional comment	For the sake of conservativeness the specifications are adjusted for chlorine losses during refills (Refill%) and chlorinated water used for other purposes than drinking (Drink%).

<b>Data / Parameter</b>	<b>POP<sub>p</sub></b>
Data unit	-
Description	Number of persons supplied with purified water from each of the functional project appliances
Source of data	Water Point Verification
Value(s) applied	301 (CPA 2) and 287 (CPA 3)
Choice of data or measurement methods and procedures	As part of the Water Point Site Inspection Survey conducted by Evidence Action prior to the dispenser installation, the number of households using each water points for CPA 2 and CPA 3 was established at 53.8 and 51.2 households per dispenser.  For CPA 2: $POP_p = 53.8 \text{ households} * 5.6 \text{ people/household}^7 = 301.3$ ; For CPA 3: $POP_p = 51.2 \text{ households} * 5.6 \text{ people/household}^8 = 286.7$
Purpose of data	Calculation of baseline emissions
Additional comment	The project activity falls under Case 1 per paragraph 3(a) in AMS-III.AV version 03, therefore this parameter is determined ex-ante. The applied value is rounded to the closest integer.

<b>Data / Parameter</b>	<b>DW<sub>POP</sub></b>
Data unit	Liters/person/day
Description	Average volume of drinking water per person per day
Source of data	Official data, WHO, minimum water quantity needed
Value(s) applied	3.5
Choice of data or measurement methods and procedures	Official data used on average volumes of drinking water per person per day in emergency situation published by World Health Organization <sup>9</sup> . Conservative value as according to AMS-III.AV Version 03 a value of 5.5 liters per person per day shall not be exceeded.
Purpose of data	Calculation of baseline emissions
Additional comment	

<b>Data / Parameter</b>	<b>POP<sub>Boiling</sub></b>
Data unit	-
Description	Proportion of total population attended by the project that is serviced at households/buildings where water boiling would have been the purification practice.
Source of data	-
Value(s) applied	Only relevant for Case 2
Choice of data or measurement methods and procedures	-

<sup>7</sup> Uganda Household Survey 2009/2010, average household size for Eastern Uganda

<sup>8</sup> Uganda Household Survey 2009/2010, average household size for Eastern Uganda

<sup>9</sup> WHO SEARO, Minimum water quantity needed for domestic uses, 3 – 4 liters per person per day

[http://ec.europa.eu/echo/files/evaluation/watsan2005/annex\\_files/WHO/WHO5%20-%20Minimum%20water%20quantity%20needed%20for%20domestic%20use.pdf](http://ec.europa.eu/echo/files/evaluation/watsan2005/annex_files/WHO/WHO5%20-%20Minimum%20water%20quantity%20needed%20for%20domestic%20use.pdf)

Purpose of data	Calculation of baseline emissions
Additional comment	The project activity falls under Case 1 per paragraph 3(a) in AMS-III.AV version 03 and thus POP <sub>Boiling</sub> does not need to be considered.

<b>Data / Parameter</b>	<b>Ex-ante determined parameters for the project emissions from fossil fuel combustion</b>
Data unit	-
Description	Parameters to be determined ex ante for the calculation of project emissions from fossil fuel combustion as per the tool.
Source of data	-
Value(s) applied	No consumption of fossil fuel by chlorine dispenser
Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of project emissions
Additional comment	-

<b>Data / Parameter</b>	<b>Ex-ante determined parameters for the project emissions from electricity consumption</b>
Data unit	-
Description	Parameters to be determined ex ante for the calculation of project emissions from electricity consumption as per the tool
Source of data	-
Value(s) applied	No consumption of electricity by chlorine dispenser
Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of project emissions
Additional comment	-

<b>Data / Parameter</b>	<b>Leakage</b>
Data unit	-
Description	Fractional increase in NRB usage by households outside the project boundary
Source of data	AMS-I.E Version 5
Value(s) applied	0.95
Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of leakage
Additional comment	

**G.2. Data and parameters monitored**

<b>Data / Parameter:</b>	<b>QPW<sub>y</sub></b>
Unit:	Liters
Description:	Quantity of purified water in year y
Measured/ Calculated / Default:	Calculated

Source of data:	Derived from the capacity of the equipment established by the manufacturers' specifications ( $L_P = 32,971$ [CPA 2], $L_P = 32,680$ [CPA 3] ), the number of functional project appliances ( $N_y = 1,053$ [CPA 2], $N_y = 970$ [CPA 3]), average number of refills per dispenser (Refill# = 7.79 [CPA 2], Refill# = 6.03 [CPA 3]) and two adjustment factors (Refill% = 98.6%, Drink% = 92.2%):  $QPW_y = L_P * N_y * Refill\# * Refill\% * Drink\%$ $= 32,971 \text{ L} * 1,053 \text{ dispensers} * 7.79 * 98.6\% * 92.2\% \text{ [CPA 2]}$ $= 32,680 \text{ L} * 970 \text{ dispensers} * 6.03 * 98.6\% * 92.2\% \text{ [CPA 3]}$
Value(s) of monitored parameter:	246,054,247 L [CPA 2] and 173,840,224 [CPA 3]
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	N/A
Calculation method (if applicable):	N/A
QA/QC procedures:	N/A
Purpose of data:	Calculation of baseline emissions
Additional comment:	QPW <sub>y</sub> is subject to a cap based on the number of persons supplied with purified water from each of the functional project appliances (POP <sub>P</sub> ) multiplied by the average volume of drinking water per person per day (DW <sub>POP</sub> .) Cap CPA 2 = 1,053 * 301 person * 3.5 L/person/day * 242 days = 268,561,170 L (bigger than monitored value)  Cap CPA 3 = 970 * 287 person * 3.5 L/person/day * 169 days = <b>164,744,756 L</b> (smaller than monitored value – cap applies)

<b>Data / Parameter:</b>	<b>N<sub>y</sub></b>
Unit:	-
Description:	Number of functional chlorine dispensers in monitoring period
Measured/ Calculated / Default:	Measured
Source of data:	Periodical physical inspection of each device (spot-checks).  N <sub>y</sub> is derived from regular functionality checks. In case a dispenser was found to be non-functional, the status of the respective dispenser was recorded as “non-functional” in the central database.  N <sub>y</sub> was determined by multiplying the total number of installed dispensers (1,150 for CPA 2, and 1,013 for CPA 3) by the fraction of functional dispensers (91.6% for CPA 2 and 95.8% for CPA 3 from Chlorine Delivery Records) at the cut-off date (30/09/2015).
Value(s) of monitored parameter:	1,053 (CPA 2) and 970 (CPA 3)
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Physical inspection of all dispensers in rotation.
Calculation method (if applicable):	N/A

QA/QC procedures:	In case a dispenser was not operating and has not been replaced at the cut-off date (30/09/2015), it was excluded from the emission reduction calculation for the whole monitoring period.  Monitoring data will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.
Purpose of data:	Calculation of baseline emissions
Additional comment:	

<b>Data / Parameter:</b>	<b>Refill#</b>
Unit:	-
Description:	Average number of refills per functional dispenser per year
Measured/ Calculated / Default:	Measured
Source of data:	Number of chlorine containers delivered to promoters (chlorine delivery records)  When new chlorine is delivered to a promoter, the number of containers delivered and the number of containers in stock are recorded.  Refill# was determined by adding up all chlorine used during the monitoring period. For calculating Refill# only dispensers recorded as 'functional' at the cut-off date were considered.
Value(s) of monitored parameter:	7.79 (CPA 2) and 6.03 (CPA 3) during this monitoring period.
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Chlorine is delivered to all dispensers in rotation.
Calculation method (if applicable):	Stata code (based on chlorine delivery records)
QA/QC procedures:	Monitoring data will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.
Purpose of data:	Calculation of baseline emissions
Additional comment:	

<b>Data / Parameter:</b>	<b>Refill%</b>
Unit:	%
Description:	Fraction of delivered chlorine available for use in dispenser
Measured/ Calculated / Default:	Measured
Source of data:	Promoter survey. A total of 220 randomly selected promoters were interviewed.  Survey question: "From the time that you receive the jerrican of chlorine to the time that the chlorine is put into the dispenser, is any chlorine lost?"
Value(s) of monitored parameter:	98.6%
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	The validated CPA-DD states a monitoring frequency of at least every four months. As part of the second monitoring period promoters surveys were collected every month and the results were consolidated into one single value over the full monitoring period.
Calculation method (if applicable):	N/A

QA/QC procedures:	Monitoring data will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.
Purpose of data:	Calculation of baseline emissions
Additional comment:	

<b>Data / Parameter:</b>	<b>Drink%</b>
Unit:	%
Description:	Fraction of water treated with the dispenser that is actually drunk
Measured/ Calculated / Default:	Measured
Source of data:	Interviews with 8 randomly selected households as part of the adoption survey.  Survey question: "What is your primary use for chlorinated water?" and "How much of your chlorinated water is used for [primary use]?"  Responses from 741 households that had total chlorine residual in their stored drinking water were used for calculating Drink%.
Value(s) of monitored parameter:	92.2%
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	The validated CPA-DD states a monitoring frequency frequency of at least every four months. As part of the second monitoring period community adoption surveys were collected every month and the results were consolidated into one single value over the full monitoring period.
Calculation method (if applicable):	N/A
QA/QC procedures:	Monitoring data will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.
Purpose of data:	Calculation of baseline emissions
Additional comment:	

<b>Data / Parameter:</b>	<b>Existence of public distribution network supplying safe drinking water</b>
Unit:	-
Description:	Existence of public distribution network supplying safe drinking water to the project boundary in year y
Measured/ Calculated / Default:	Interviews
Source of data:	Interviews with the technical personnel at the district bureau in Kibuku, Budaka, Manafwa and Mbale to determine if a piped water supply exists for the sub-counties included in the CPA. The information given by the technical personnel was confirmed by the Resident District Commissioners.
Value(s) of monitored parameter:	0 (no households need to be discounted)
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Annual
Calculation method (if applicable):	N/A
QA/QC procedures:	Emission reductions related to those households will be discounted accordingly considering the number of households linked to the network and the date the network became operational.
Purpose of data:	Calculation of baseline emissions

Additional comment:	
<b>Data / Parameter:</b>	<b>Water quality</b>
Unit:	-
Description:	Water quality
Measured/ Calculated/ Default:	Measured
Source of data:	Sampling surveys
Value(s) of monitored parameter:	92.6%
Monitoring equipment:	Hach Color Wheel for Total Chlorine Residual (TCR) and IDEXX machine for E.coli
Measuring/ Reading/ Recording frequency:	Water quality is monitored at least biennial as per registered CPA DD. As part of the second monitoring period water quality samples were collected monthly and the results were consolidated into one single value over the full monitoring period.
Calculation method (if applicable):	The fraction of households with sufficient water quality was established as the number of water samples with E.coli below 10 CFU/100 ml divided by the number of water samples that tested positive for the presence of TCR ('users').
QA/QC procedures:	The fraction of water quality measurements providing water of insufficient quality shall be excluded from the calculation of emission reductions.
Purpose of data:	Calculation of baseline emissions
Additional comment:	

<b>Data / Parameter:</b>	<b>POP<sub>y</sub></b>
Unit:	-
Description:	Number of persons supplied with purified water from each of the functional project appliances
Measured/ Calculated / Default:	Only relevant for Case 2
Source of data:	-
Value(s) of monitored parameter:	-
Monitoring equipment:	-
Measuring/ Reading/ Recording frequency:	-
Calculation method (if applicable):	-
QA/QC procedures:	-
Purpose of data:	Calculation of baseline emissions
Additional comment:	Only relevant for Case 2. The project activity falls under Case 1 per paragraph 3(a) in AMS-III.AV version 03 and thus POP <sub>y</sub> does not need to be considered.

<b>Data / Parameter:</b>	<b>Monitoring parameters for the project emissions from fossil fuel combustion</b>
Unit:	-
Description:	Parameters to be monitored for the calculation of project emissions from fossil fuel combustion as per the tool
Measured/ Calculated/ Default:	-

Source of data:	-
Value(s) of monitored parameter:	No consumption of fossil fuel by chlorine dispensers.
Monitoring equipment:	-
Measuring/ Reading/ Recording frequency:	-
Calculation method (if applicable):	-
QA/QC procedures:	-
Purpose of data:	Used to quantify project emissions
Additional comment:	To be considered only in the case the water purification devices consumes fossil fuels.

<b>Data / Parameter:</b>	<b>Monitoring parameters for the project emissions from electricity consumption</b>
Unit:	-
Description:	Parameters to be monitored for the calculation of project emissions from electricity consumption as per the tool
Measured/ Calculated/ Default:	-
Source of data:	-
Value(s) of monitored parameter:	No consumption of electricity by chlorine dispensers.
Monitoring equipment:	-
Measuring/ Reading/ Recording frequency:	-
Calculation method (if applicable):	-
QA/QC procedures:	-
Purpose of data:	Used to quantify project emissions
Additional comment:	To be considered only in the case the water purification devices consumes electricity.

### G.3. Implementation of specific-case CPA level sampling plan

As indicated in Section F of this monitoring report, three parameters were quantified through surveys: Water quality, Drink% and Refill%. The single sampling design was implemented in line with the validated CPA DD Section D.7.2:

(i) *Objectives and Reliability Requirements*

The objective was to obtain a reliable and conservative estimates of the parameters listed in Section F obtained through surveys over the course of the monitoring period and meeting the indicated confidence/precision levels. The results were consolidated in one single value over the full monitoring period.

(ii) *Target Population*

The target population is the people with access to chlorine dispensers installed as a result of CPA 2 and CPA 3 under the IWPP PoA. Each dispenser casing is marked with a unique identification number on a scannable tag, which is part of the CPA dispenser database and linked to a unique water point ID. A list of the number of users of a water point was compiled during the community education meeting. Each end user is linked to a cluster (water point with a dispenser) and each chlorine dispenser is assigned to a specific CPA. Surveys were conducted by Evidence Action field staff using mobile-based surveys (Open Data Kit)

(iii) *Sampling Method*

Grouping of CPAs was applied for this monitoring period (CPA 2 and CPA 3). Clustered sampling was undertaken for the water quality monitoring, multi-stage sampling approach for Drink%, and simple random sampling for Refill%. The sampling was done using Stata software to randomly select numbers corresponding to unique ID numbers of the clusters. More chlorine dispensers were selected for sampling than is required by the sample size, to ensure that if there are any chlorine dispensers unable to be reached and/or households not willing to provide responses, the required accuracy was still achieved.

(iv) *Sample Size*

A 95/10 confidence/precision requirement has to be fulfilled. 36 instead of the minimal 12 dispensers were visited during the monitoring period for the water quality monitoring; 222 instead of the minimal 14 dispensers were visited during the monitoring period for Drink%; and 220 instead of the minimal 21 promoters were interviewed during the monitoring period for Refill%.

(v) *Sampling Frame*

The sampling frame for CPA 2 and CPA 3 consisted of all installed chlorine dispensers allocated to CPA 2 and CPA 3, represented by their unique identification numbers stored in the chlorine dispenser database.

The following section describes the details of the implemented sampling design:

**Water Quality:** the CPA 2 and CPA 3 dispenser databases with all dispensers were imported to Stata from the Excel spreadsheet and random numbers were assigned to each dispenser using the `runiform()` command. The list was then sorted using the generated random numbers in ascending order. A total number of 36 dispensers were visited in the indicated monitoring period following the random order. Assigned field officers (FO) compile a list with all households that use the selected water point/dispenser with the support of the local promoter. The FO then visits all the households listed and tests their drinking water for total chlorine residual (to determine 'users'). Where a household's water is found to have total chlorine residual, the FO collects a water sample to conduct a water quality test. When a household did not have an adult member capable of answering the survey questions at home, the household was skipped.

During the second monitoring period a total of 686 households were visited and 95 water samples collected from different households for water quality testing.

**Drink%:** a list with all dispensers in CPA 2 and CPA 3 was imported to Stata from an Excel spreadsheet and random number assigned to them using the `runiform()` command. A total of 222 dispensers were visited during the monitoring period. An in-office randomization was used for the random selection of households. The names of households that use the selected dispenser were collected in a first site visit with the support of the local promoter or the persons living next to the water point. The name list was typed into Excel, imported to Stata and merged using waterpoint IDs with the list of randomly selected dispensers. Each household was assigned a compound ID based on the waterpoint and then randomized by waterpoint using the `runiform()` command. The list of all compounds in a waterpoint was then sorted by the assigned random number. The first 8 households were visited in the field, however the list included the first 30 households to allow for replacement in case no adult member capable of answering the survey questions was at home or because the household refused to provide a water sample.

During the second monitoring period a total of 1,697 household interviews were conducted. A water test for total chlorine residual was used to determine 'users'. The answers of the 741 households showing total chlorine residual in their stored water were used to determine Drink%.

**Refill%:** At each dispenser selected for the community survey (Drink%) also the promoter was interviewed. Refill% is calculated based on 220 promoter interviews.

The collected data are summarized and analysed in a separate 'ER Spreadsheet MP02' Excel spreadsheet. Water quality reaches a precision of 4.6%, Drink% a precision of 2.3% and Refill% a precision of 1.5% (with a 95% confidence). Thus, the 95/10 confidence/precision level was met.

## SECTION H. Calculation of GHG emission reductions or net GHG removals by sinks

### H.1. Calculation of baseline emissions or baseline net GHG removals by sinks

$$\begin{aligned}
 BE_y &= QPW_y * SEC * f_{NRB,y} * EF_{projected\_fossilfuel} * 10^{-9} & (1) \\
 &= 54,348 \text{ tCO}_2\text{e [CPA 2]} \\
 &= 36,091 \text{ tCO}_2\text{e [CPA 3]}
 \end{aligned}$$

Where:

$BE_y$	Baseline emissions during the year $y$ (tCO <sub>2</sub> e)
$QPW_y$	Quantity of purified water in year $y$ = 246,054,247 (monitoring results) [CPA 2] = 164,744,756 (cap) [CPA 3]
$SEC$	Specific energy consumption required to boil one liter of water = 3,301 kJ/L [CPA 2] and 3,274 [CPA 3] (SEC calculation below)
$f_{NRB,y}$	Fraction of non-renewable biomass = 82% (default value for Uganda)
$EF_{projected\_fossilfuel}$	Emission factor = 81.6 tCO <sub>2</sub> /TJ (default value)

The specific energy consumption required to boil one liter of water was calculated as follows:

$$SEC = \left[ WH * (T_f - T_i) + 0.01 * WHE \right] / \eta_{wb} \quad (2)$$

Where:

$WH$	Specific heat of water = 4.186 kJ/L °C (default value)
$T_f$	Final temperature = 100 °C (default value)
$T_i$	Initial temperature of water = 20 °C (default value)
$WHE$	Latent heat of water evaporation = 2,260 kJ/L (default value)
$\eta_{wb}$	Efficiency of the water boiling systems being replaced = 10.83% [CPA 2] and 10.92% [CPA 3] (baseline survey)

The water quality was monitored on sample basis for contamination with Escherichia coli (E. coli). A presence of up to 10 E. coli CFU/100 ml shall be acceptable. The fraction of water quality measurements providing water of insufficient quality (92.6%) needs be excluded from the calculation of emission reductions and BE<sub>y</sub> was adjusted accordingly.

$$54,348 \text{ tCO}_2\text{e} * 92.6\% = 50,326 \text{ tCO}_2\text{e} \text{ [CPA 2]}$$

$$36,091 \text{ tCO}_2\text{e} * 92.6\% = 33,420 \text{ tCO}_2\text{e} \text{ [CPA 3]} \tag{3}$$

(Adjustment for water with insufficient quality, rounded down)

### H.2. Calculation of project emissions or actual net GHG removals by sinks

The operation of the chlorine dispensers does not involve the consumption of fossil fuels or electricity. Therefore, the project emissions are zero.

### H.3. Calculation of leakage

Leakage relating to the non-renewable woody biomass is assessed as per the relevant procedures of AMS-I.E version 5 explained below: BE<sub>y</sub> is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required.

$$50,326 \text{ tCO}_2\text{e} * 0.95 = 47,809 \text{ tCO}_2\text{e} \text{ [CPA 2]} \tag{4}$$

$$33,420 \text{ tCO}_2\text{e} * 0.95 = 31,749 \text{ tCO}_2\text{e} \text{ [CPA 3]}$$

Adjustment for leakage (2,517 tCO<sub>2</sub>e (CPA-2) and 1,671 tCO<sub>2</sub>e (CPA-3), rounded)

### H.4. Summary of calculation of GHG emission reductions or net GHG removals by sinks

Specific-case CPA reference number	Baseline emissions or baseline net GHG removals by sinks (tCO <sub>2</sub> e)	Project emissions or actual net GHG removals by sinks (tCO <sub>2</sub> e)	Leakage (tCO <sub>2</sub> e)	GHG emission reductions or net GHG removals by sinks (tCO <sub>2</sub> e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
5962-0001	0	0	0	0	0	0
5962-0002	50,326	0	2,517	0	47,809	47,809
5962-0003	33,420	0	1,671	0	31,749	31,749
<b>Total</b>	<b>83,746</b>	<b>0</b>	<b>4,188</b>	<b>0</b>	<b>79,558</b>	<b>79,558</b>

### H.5. Comparison of GHG emission reductions or net GHG removals by sinks with estimates in the included CPA-DD(s)

Specific-case CPA reference number	Value estimated in ex ante calculation in the included CPA-DD(s)	Actual values achieved by the specific-case CPA(s) during this monitoring period
5962-0001	1,864 <sup>10</sup>	0
5962-0002	34,764 <sup>12</sup>	47,809

<sup>10</sup> Estimated emission reductions in CPA-DD 2<sup>nd</sup> year (2,824 CERs) adjusted to 242 days (242/365 = 0.66)

<sup>12</sup> Estimated annual emission reductions in CPA-DD (52,434 CERs) adjusted to 242 days (242/365 = 0.66)

5962-0003	20,716 <sup>13</sup>	31,749
<b>Total</b>	<b>55,480</b>	<b>79,558</b>

#### H.6. Remarks on difference from the estimated value in the included CPA-DD(s)

As the start date of CPA 1 is still pending no CERs are claimed for this monitoring period.

For CPA 2 and CPA 3, the measured emission reductions during the 242 day and 169 day monitoring period, respectively, are higher than the estimated emission reductions in the CPA-DDs. This is mainly due to a higher chlorine consumption: in the CPA-DD an annual use of 9 chlorine jerricans (5 L) per dispenser was assumed while the actual annual consumption (projected to one full year) was 11.7 (CPA 2) and 13.0 (CPA 3). High adoption rates by local communities are the reason for the increased emission reductions achieved.

In order to be deemed additional it needs to be shown that each of the chlorine dispensers achieves an annual emission reduction equal to or less than 3,000 (i.e. 5% of the small-scale CDM threshold).

In addition, according to the Methodological tool: Assessment of debundling for small-scale project activities (Version 04.0) for determining the occurrence of debundling under a Programme of Activities (PoA)", if each of the independent subsystem/measures included in the CPA of a PoA is not larger than 1% of the small scale threshold defined by the methodology applied, than that CPA of PoA is exempted from performing de-bundling check, i.e. considered as being not a de-bundled component of a large scale activity. Hence, the annual emission reductions per dispenser shall be below 600 tCO<sub>2</sub>. Both eligibility criteria are still fulfilled with an annual emission reduction of 62.7 CERs per dispenser (CPA 2) and 67.7 CERs per dispenser (CPA 3) respectively.

In order to meet the small-scale threshold, the average annual emission reductions for the Type III components need to be below 60k tCO<sub>2</sub> per annum. If the threshold is exceeded the emission reductions shall be capped at 60k tCO<sub>2</sub> per annum. So far in 2015, a total of 51,986 CERs were claimed for CPA 2 (4,177 in first monitoring period and 47,809 in the second monitoring period) and 31,749 CERs for CPA 3. No more than 8,014 CERs (for CPA 2) and 28,251 CERs (for CPA 3) shall be claimed for the remaining three months of 2015 (01/10/2015 – 31/12/2015) which will be included in the third monitoring period.

<sup>13</sup> Estimated annual emission reductions in CPA-DD (44,742 CERs) adjusted to 169 days (169/365 = 0.46)

**Appendix 1. Contact information of coordinating/managing entity and/or responsible persons/entities**

<b>Coordinating/managing entity and/or responsible person/entity</b>	<input checked="" type="checkbox"/> Coordinating/managing entity <input checked="" type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
<b>Organization name</b>	Pure Water Ltd.
<b>Street/P.O. Box</b>	Technoparkstrasse 1
<b>Building</b>	
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<b>Salutation</b>	
<b>Last name</b>	Osterwalder
<b>Middle name</b>	
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