Catbalogan Water District

Water Safety Plan (WSP)

Revision No 1.0 Dated 03 JAN 2017

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Document History

This page records the changes made to the document since its inception. Every time a revision is made to the document,

Revision Number and Date	**Which sections of the document were revised**
Rev 0.0 Date 01 Sep, 2016	Issue of first revision – all sections new
Rev 1.0 Date 03 Jan. 2017	Inclusion of:
	- Office Memorandum of WSP Team meetings
	- Board Resolution adopting the CWD WSP
	- Activity on monitoring of customer satisfaction

1. Introduction

1.1 Background

Guided by its vision which is "to be an excellent water utility providing potable and sustainable water with efficient and economically viable services and ensuring the preservation of our natural resources", Catbalogan Water District (CWD) develop this Water Safety Plan (WSP) to ensure that the quality of drinking water supplied by CWD can meet the health based standards even in emergency situations.

Water Safety Plan is a comprehensive approach that encompasses all steps from source to consumers by identifying the hazards that may cause hazardous events. The conceptual framework of the plan describes in details the water sources, the treatment process down to the distribution networks and up to the consumer's tap. This is a proactive approach in addressing issues that affects water quantity and quality. The WSP will act as a guide in the continuous improvement projects to ensure health and safety of the consumer of the water district.

The plan was modelled after the World Health Organization (WHO) which recommends identifying residual risks to water safety, determining the existing and proposed control measures, and develop improvement plan based on the significant risks identified. Correct details in operational monitoring of the WSP are also indicated to ensure that the water supply system components and control measures continue to work effectively. Verification process will also confirm that the drinking water quality standards are being met, and consumers are satisfied. The said process will also validate that the WSP is complete and is working effectively.

1.2 Mission, Vision and Core Values

1.2.1 Mission: We are committed to be a customer service-oriented utility that is concerned with the preservation of our natural resources

1.2.2 Vision: To be an excellent water utility providing potable and sustainable water with efficient and economically viable service and ensuring the preservation of our natural resources

1.2.3 Core Values: Commitment, Teamwork, & Environmental Stewardship

2. WSP Team

2.1 WSP Team Composition

CWD board of directors and top management showed their support for the development of WSP and its implementation activities through a signed Board Resolution no. 70 dated July 18, 2016 (See attached Annex A).

The WSP team was formed to lead the development and implementation of the identified approach that is connected to the safety of the water supply.

The core team that was assembled have knowledge and experience in all aspects of the water supply system and sufficient decision-making authority to develop and implement the WSP.

Table 2-1. Skills needed to complete a WSP team

1	Technical expertise on operation and maintenance of	
	a	Source
	b	Storage
	c	Treatment
	d	Distribution
2	Provide operational support for the WSP in terms of	
	a	Administrative
	b	Financing
	c	Technical
3	Capable of communicating the WSP objectives and outcomes	
	a	Inside the WD
	b	Outside the WD
4	Understand water quality targets to be met	
5	Understand the impact of proposed water quality controls on the environment	
6	Knows the regulation	
7	Familiar with training and awareness programmes	
8	With authority	
9	Other team members	
	a	Resource persons
	b	Coordinator
	c	Secretariat
	d	Documentation committee/staff

2.2 WSP Team Members

Using table 2-1, the team members' expertise were identified and was plotted in table 2-2. As much as the required skills needed to complete a WSP team, table 2-2 shows that the district has people that could met the needed skills.

Table 2-2 shows the list of members, its job title, contact information, role in the water safety plan team, and its expertise.

Table 2-2. WSP Team Members

Name	Role in the WSP Team	Expertise																	
		1				2			3		4	5	6	7	8	9			
		a	b	c	d	a	b	c	a	b						a	b	c	d
Engr. Miguel P. Macaspag OIC – Engineering Division Cell #: 09177072643	1. Team Leader 2. Chairman: Source Unit	■	■	■	■			■	■	■	■	■	■		■				
Exequiel C. Cabrigas III Sr. Mgt. System Analyst Cell #: 09091480830	1. Assistant Team Leader 2. Coordinator				■	■			■	■		■	■	■			■		
Isabelo R. Labangco Jr. WSM Man B Cell #:	1. Member Source Unit	■	■					■	■		■	■	■						
Bernabe S. Dacles WSM Man B Cell #:	1. Member Source Unit	■	■					■	■		■	■	■						
Herbert R. Maga WRF Operator A Cell #: 09075486563	1. Member Source Unit	■	■					■	■		■	■	■						
Engr. Herminia S. Tuazon Engineer B Cell #: 09173086315	1. Chairman Treatment & Quality Unit 2. Documentor			■	■			■	■		■	■	■						
Zaldy A. Mahinay Sr. Mgt. System Analyst Cell #: 09774410054	1. Member Treatment & Quality Unit	■	■	■	■			■	■		■	■	■						
Macario M. Gabunar Sr. Mgt. System Analyst Cell #:	1. Chairman Treatment & Quality Unit	■	■		■			■	■		■	■	■						
Gerardo L. Romano Sr. Mgt. System Analyst Cell #: 09495727209	1. Member Treatment & Quality Unit	■			■			■	■			■	■	■					
Eusebia Christina G. Yboa Sr. Mgt. System Analyst Cell #: 09196081957	1. Chairman Support Unit					■	■		■	■	■	■	■	■	■				
Maria Patria C. Dacallos Sr. Mgt. System Analyst Cell #: 09208034524	1. Member Support Unit – Human Resource 2. Documentor					■			■				■	■			■	■	■
Julia P. Lobriño Sr. Mgt. System Analyst Cell #: 09177074035	1. Member Support Unit – Financial				■		■		■		■	■	■		■				
Jessamine Q. Costo Sr. Mgt. System Analyst Cell #: 09285596338	1. Member Support Unit – Financial						■		■		■	■	■						
Arlene R. Jabinal Sr. Mgt. System Analyst Cell #: 09228045815	1. Member Support Unit – Financial						■		■		■	■	■						
Constancia V. Panela Sr. Mgt. System Analyst Cell #:	1. Documentor					■			■		■	■	■					■	■
Odette L. Tesoro Sr. Mgt. System Analyst Cell #: 09106551908	1. Secretariat								■		■	■	■				■	■	■
Marilyn A. Serida Sr. Mgt. System Analyst Cell #: 09485989127	1. Secretariat								■		■	■	■					■	■

1. Technical expertise on the operation and maintenance of
    a. Source
    b. Storage
    c. Treatment
    d. Distribution
2. Provide operational support for the WSP in terms of
    a. Administrative
    b. Financing
    c. Technical
3. Capable of communicating the WSP objectives and outcomes
    a. Inside the WD
    b. Outside the WD
4. Understand Water Quality Targets to be met (Specific knowledge on product water)
5. Understand the impact of proposed quality controls on the environment
6. Knows the regulation
7. Familiar with training and awareness programmes
8. With Authority
9. Other Members
    a. Consultants
    b. Coordinator
    c. Secretariat
    d. Documentation Committee

2.3 Duties and Responsibilities

2.3.1 The team leader should drive the project and ensure focus.

2.3.2 The team leader must use his interpersonal skills to ensure project implementation and must explore for external support, that includes benchmarking or partnering with other organizations and sources of aid and information.

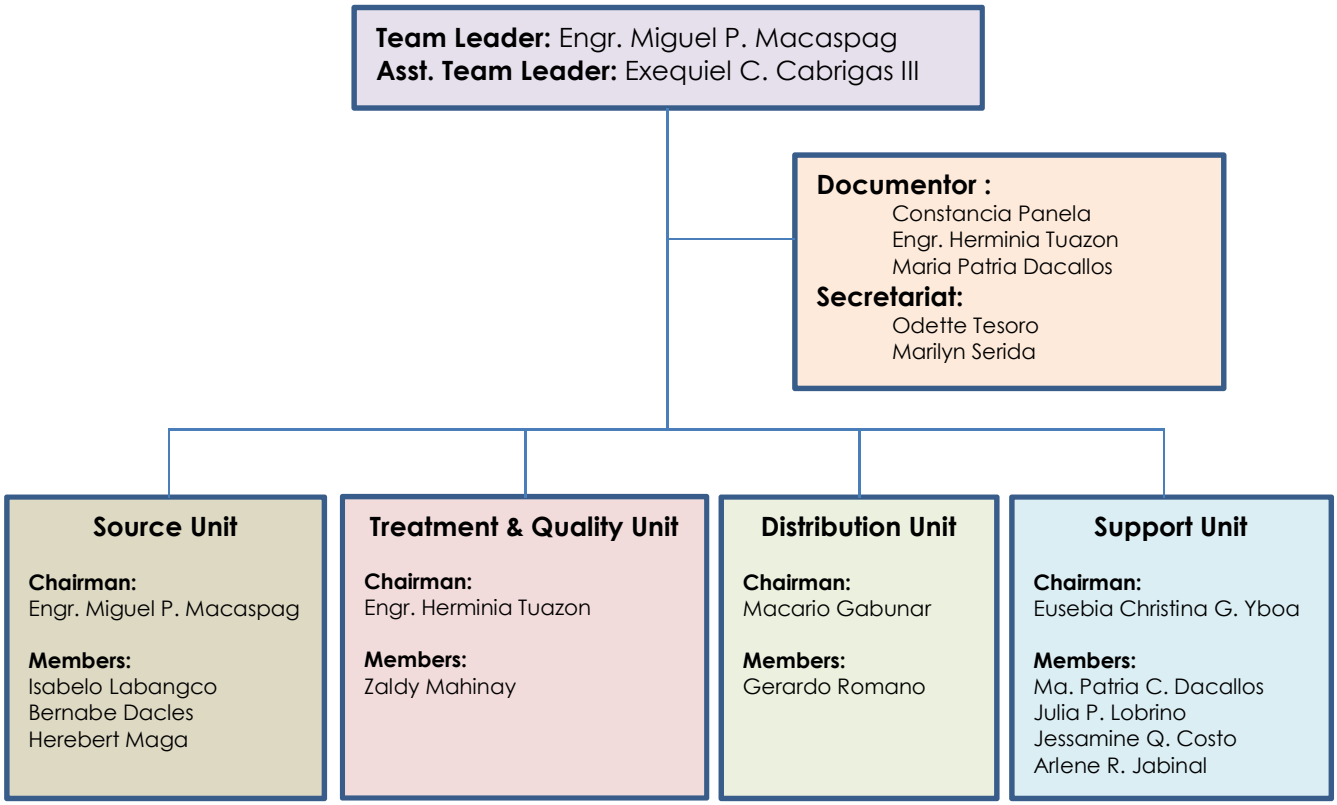
2.3.3 The team will discuss, determine, and define the water supply system, its stakeholders, the hazards of each part of water supply system, the control measures both existing and proposed, the improvement plan to minimize if not eliminate hazardous events.

2.3.4 The team is responsible in the monitoring of the effectiveness of the WSP and ensure that corrective actions are fully implemented.

2.3.5 The team is responsible of the verification process by conducting several verification activities to ensure that the WSP is effectively implemented to deal with water quality issues.

2.3.6 Ensure an open communication with the management and its stakeholders on activities that will affect quality of water.

Figure 1.0 WSP Organogram



2.4 Stakeholders

Stakeholders play a vital role in bringing quality water to our customers. This part will describe the stakeholders' roles and responsibilities, what component of the water supply the stakeholder is engaged, and the interaction mechanism with the water district.

Table 2-3 WSP Stakeholder identification and Interaction

Stakeholders				Interaction Mechanism	Record of Interaction
Name	Relationship to Drinking Water Supply Issues	Point of Contact with WD/WSP Team	Issues with Drinking Water Supply		
SOURCE					
Department of Environment and Natural Resources (DENR)	B F	P: WD - Team Leader(Source), DENR - PENRO/CENRO	1. Strict implementation of forest protection; 2. Enforcement of police power (Timber poaching, kaingin, charcoal making activities)	P: Semestral Meeting	Minutes of the meeting, attendance

Stakeholders				Interaction Mechanism	Record of Interaction
Name	Relationship to Drinking Water Supply Issues	Point of Contact with WD/WSP Team	Issues with Drinking Water Supply		
Catbalogan City - LGU	B E	P: WD - Team Leader(Source), LGU -Mayor	Strict Implementation of existing ordinance on environment protection	P1: Semestral Meeting	1: Minutes of the meeting, attendance
				P2: Periodic follow up of implementation of ordinances	2: Letter Request or logbook
Department of Agriculture (DA)	B	P: WD - Team Leader(Source), DA: Head of office	Strict Implementation of existing regulation on the use of pesticide	P: Annual Meeting	Minutes of the meeting, attendance
Barangay	A	P: WD - Team Leader(Source), UB - Brgay Captain	Waste runoff during rainy days	P: Quarterly meeting	Minutes of the meeting, attendance
Farmers	A	P: WD - Team Leader(Source), Farmers - Brgy Captain	Pesticide and human waste runoff to river during onset of rainy season;	P: Quarterly meeting	Minutes of the meeting, attendance
AFP	F	P: WD - Team Leader(Source), AFP: Commanding General	Close coordination with DENR for the apprehension of timber poachers, kaingeros and charcoal makers	P: Semestral Meeting	Minutes of the meeting, attendance
PNP	F	P: WD - Team Leader(Source), PNP: Chief of Police	Close coordination with DENR for the apprehension of timber poachers, kaingeros and charcoal makers	P: Semestral Meeting	Minutes of the meeting, attendance
Samelco	D	P: WD - Team Leader(Source), Samelco: GM	Proper coordination of preventive maintenance; advance notification of power interruption for continuity of water treatment process	E: Communication thru Text and social media P: Monthly meeting	E: Screenshots of Notices P: Minutes of Meetings and Attendance
BFP	G	P: WD - Team Leader(Source), BFP: Fire Chief	Immediate response during grass fire to prevent possible water contamination	P: Semestral Meeting	Minutes of the meeting, attendance

Stakeholders				Interaction Mechanism	Record of Interaction
Name	**Relationship to Drinking Water Supply Issues**	**Point of Contact with WD/WSP Team**	**Issues with Drinking Water Supply**		
CHO	B	P: WD - Team Leader(Source), CHO: City Heath Officer	Strict monitoring of proper design of septic tanks; implementation of sanitary code	P: Monthly Meeting	Minutes of the meeting, attendance
Suppliers/Contractors	D	P: WD - Team Leader(Source), S/C: Proprietor	Supply materials that adhere to the standard specifications	E: PhilGeps Posting, Bidding	PR, RFQ/Invitation to bid
NGO (PBSP)	G	P: WD - Team Leader(Source), NGO: Chairman/President	Organic fertilizer; livelihood trainings; training on proper planting of trees	P: Quarterly Meeting	Training proposal; attendance
DISTRIBUTION					
City Health Unit (CHU)	B, C	P: WD - Lab. Tech./CHU - Sanitary	Compliance with PNSDW	P: Assist in gathering & conduct the laboratory test of water samples, if necessary	Laboratory Test Results
			Compliance with Sanitary Code of the Phils.	P: Strict implementation of the law, particularly in the Design/Const. of Septic Tanks	Copy of Permits and/or Certification
City Engineering Office (CEO)	B, C, A	P: WD - Eng'g. Division/CEO - Bldg. Officials & City Engineer	Compliance with Sanitary and Building Code of the Phils.	P: Strict implementation of sanitary and building code/laws	Copy of Permits and/or Certification
			Provide necessary permits to CWD for speedy repair/restoration/rehabiltation works of leakages	P: Coordination before projects/repair / rehabilitation works	Letter Request/Permits
			Provide advance information regarding implementation of projects that may caused damage to water pipelines	Confer with authorized personnel, if necessary	Copy of Plans

Stakeholders				Interaction Mechanism	Record of Interaction
Name	Relationship to Drinking Water Supply Issues	Point of Contact with WD/WSP Team	Issues with Drinking Water Supply		
DPWH-2SED	B, A	P: WD - Eng'g. Division/DPWH-SED District Engineer	Provide advance information regarding implementation of projects that may caused damage to water pipelines	Confer with authorized personnel, if necessary	Copy of Plans
			Provide necessary permits to CWD for speedy repair/restoration/rehabiltation works of leakages	P: Coordination before projects/repair/rehabilitation works	Letter Request/Permits
Provincial Engineering Office (PEO)	B, A	P: WD - Eng'g. Division/PEO - Prov'l. Engineer	Provide advance information regarding implementation of projects that may caused damage to water pipelines	Confer with authorized personnel, if necessary	Copy of Plans
			Provide necessary permits to CWD for speedy repair/restoration/rehabiltation works of leakages	P: Coordination before projects/repair/rehabilitation works	Letter Request/Permits
Barangay LGU	B, A	P: WD - Eng'g. Division/LGU-Brgy. Chairman	Provide advance information regarding implementation of projects that may caused damage to water pipelines	Confer with authorized personnel, if necessary	Copy of Plans
			Provide necessary permits to CWD for speedy repair/restoration/rehabiltation works of leakages	P: Coordination before projects/repair/rehabilitation works	Letter Request/Permits

Stakeholders				Interaction Mechanism	Record of Interaction
Name	**Relationship to Drinking Water Supply Issues**	**Point of Contact with WD/WSP Team**	**Issues with Drinking Water Supply**		
Accredited Laboratory Testing Centers	D	E: WD: Lab. Tech./Lab. Center - Lab. Technician; RMT	Compliance with PNSDW - Provide speedy laboratory test results of water samples submitted for various parameters (Physical-Chemical) & absence or presence of E.Coli (Bacteriological) for sound & efficient management decision	E: Proper handling of water samples for accurate & truthful laboratory results	Laboratory Test Results
TREATMENT					
City Health Unit (CHU)	B, C	P: WD - Lab. Tech./CHU - Sanitary Inspector	Compliance with PNSDW	P: Assist in gathering & conduct the laboratory tests of water samples, especially during emergencies	Laboratory Test Results
Accredited Laboratory Testing Centers	D	E: WD: Lab. Tech./Lab. Center - Lab. Technician; RMT	Compliance with PNSDW - Provide speedy laboratory test results of water samples submitted for various parameters (Physical-Chemical) & absence or presence of E.Coli (Bacteriological) for sound & efficient management decision	E: Proper handling of water samples for accurate & truthful laboratory results	Laboratory Test Results
Barangay LGU	B, A	P: WD - Eng'g. Division/LGU-Brgy. Chairman	Proper coordination with CWD prior to issuance of permits/certification, especially structures built near CWD treatment facilities	P: Letter Request (Approval/Disapproval)	Copy of the Letter with CWD concurrence

Stakeholders				Interaction Mechanism	Record of Interaction
Name	**Relationship to Drinking Water Supply Issues**	**Point of Contact with WD/WSP Team**	**Issues with Drinking Water Supply**		
Technically, Financially Capable Suppliers & PhilGEPS Registered	D	E: WD: BAC Chairman/Supplier Sales Manager	Provide materials/supplies that met the standard specifications & delivered within the specified period to avoid interruption in the operation of treatment plant, especailly during rainy season and calamities	E: Invitation to Bid and/or Request for Quotation; and Bid Notice Abstract (PhilGEPS)	Copy of Purchase Request/RFQ,/Bid Notice Abstract/ITB

3. System Description

3.1 General information on the supplier

The water supply of the City of Catbalogan is handled and managed by the Catbalogan Water District (CWD), which was initially constructed in 1925 under the management of the local government. It was transferred to the National Waterworks and Sewerage Authority (NAWASA) upon its creation in 1995. In 1969, NAWASA was abolished and the Catbalogan municipal government took over the CWD management.

A Sanguniang Bayan resolution No. 66 was approved in July 5, 1978 creating the Catbalogan Water District (CWD) based on the national policy, the P.D. 198 known as Provincial Water Utilities Act of 1973 favoring local operation and control of water systems; authorizing the formation of local water districts and providing for the government and administration of such districts; chartering a national administration for facilitate improvement of local water utilities; granting said administration such powers as are necessary to optimize public service from water utility operations, and for other purposes. On December 7, 1979 the Local Water Utilities Administration awarded Conditional Certificate of Conformance No. 107 to the CWD.

Currently, Catbalogan Water District is the only water service provider in the city of Catbalogan. Catbalogan Water District is a none-profit oriented and receives no subsidy from the national and local government. The revenue raised is solely from the concessionaires' monthly payment s of water bills and other installation costs. Local Water District was declared a Government Owned Controlled Corporation by Supreme Court as of 1992.

The district is currently managed by its General Manager, Engr. Ralph S. Uy. It has three divisions namely: Administrative Division headed by Eusebia Christina Yboa, Commercial Division headed by Julia P. Lobriño, and Engineering Division headed by Engr. Miguel P. Macaspag.

The policy making body is composed of five directors each representing different sectors. The Chairman is Mr. Victoriano C. Navarrete, CPA (Education Sector), Vice Chairman is Mr. Don A. Mabulay Jr. (Civic Sector), Secretary/Treasurer is Mrs. Myra Gay M. Tambor (Women Sector), Rolando T. Ko (Business Sector), representative for the Professional Sector is currently vacant.

3.1.1 Area of Coverage

Catbalogan is composed of 57 barangays with 22 barangays classified as upland or island barangays, the remaining 35 barangays are along the carline.

The current service area of CWD is only 62% of the total number of the carline and poblacion barangays or 22 out of 35 barangays, mostly within the town proper. These barangays are Poblacion 1 to 13, San Andres, Barangay Canlapwas, Barangay San Pablo, Barangay Muñoz, Barangay Mercedes, Barangay Maulong, Barangay Guindapunan, Barangay Guinsorongan, Barangay Bunu-anan. Installation of Distribution line to the two Island barangays, Darahuway Guti and Darahuway Dako is on-going.

Possible expansions of the service coverage are the carline barangays along the highway, namely, San Vicente, Mahayag, Iguid, Pupua, Payao, upper portion of Maulong, Lagundi, and Socorro.

3.1.2 Household Coverage

For the last five years, there was a 31.7% increase in the number of active service connection from 6,853 of Dec 2010 to 9,028 of Dec 2015.

CWD is currently serving 57% of the total Number of households in the service area and is projected to increase by 13% by the end of year 2020.

3.1.3 Transmission and Distribution Pipelines

There are four transmission pipelines originating from the three water sources namely, one from Kulador, two from Masacpasac Spring and another one from Caramayon Spring. However, only two 200mm transmission pipelines that is in place from San Andres to the poblacion proper.

The existing transmission lines have a carrying capacity of about 90-120 lps. This was based on the hydraulic analysis of the two 200mm transmission pipelines and actual recorded production.

Length of the following Transmission and Distribution Lines.

300 mm	PVC	0.289 Km
250 mm	PVC	5.584 Km
200 mm	PVC, GI, CI	9.322 Km
150 mm	CI, PVC	4.470 Km
100 mm	PVC	4.713 Km
75 mm	PVC	6.205 Km
63 mm	PVC	0.170 Km
50 mm	PVC, PE	2.908 Km
38 mm	PE, PVC	1.680 Km
25 mm	PE	0.140 Km
TOTAL LENGTH		**33.961 KM**

3.1.4 Transmission and Distribution Pipelines

Customers of CWD are classified into five types, namely, residential, government commercial, commercial a, commercial b, and commercial c.

Below is the current water rate of Catbalogan Water District.

Type	Min. Charge	11-20 cu.m	21-30 cu.m	31-40 cu.m	over4 cu.m
Residential/Govt	175	19.45	21.35	24.80	28.50
Commercial	350	38.90	42.70	49.60	57.00
Commercial A	306.25	34.00	37.35	43.40	49.85
Commercial B	262.50	29.15	32.00	37.20	42.75
Commercial C	218.75	24.30	26.65	31.00	35.60

3.2 Source of water: Catchment and extraction from source

The District currently has three main water sources, namely Kulador, Caramayon, and Masacpasac spring. It has also two supplemental sources namely: Piczonville Pumping Station and Tumalistis Pumping Station. Incoming water source Is Caramayon 2 spring.

3.2.1 Kulador Treatment Facility

The plant is located 2.7 kilometers from Barangay San Andres of Catbalogan, Samar, or 110 48' 44.4" N and 240 54' 10.3" E.

The treatment plant receives water from the Antiao River through an Intake Box 3m x 3m wide and 2.5m depth. The water was conveyed through a telescopic Transmission Line of 250mm and 200mm diameter PVC pipes and goes into a 4,000cum/day clarifier system for water treatment. Later this year the clarifier is to expand its capacity to 6,000cum/day.

3.2.2 The Caramayon Pumping Station

The project started on February 22, 2002. Fund by 32M ADB – Loan under LWUA's Small Towns Water Supply System Project (STWSSP). Component of the project are the ff:

- Construction of impounding Dam and Sump Tank
- Pumping facilities 1-100hp, 2-500hp, 440v, 3 diameter
- Generator, 300hp
- Laying of 5.1km 10"diameter Transmission Lines, 500lm riser pipe, 200mm diameter
- Installation of 3-phase Electric Power Line, 13.2 KV primary lines

The Project site is not accessible to any mode of transportation. The spring is located in a highland Barangay of Lobo, Sitio Caramayon, it is approximately 9.1 kms. from the nearest lowland Barangay San Andres

and about 11 kms. from the center of the Poblacion. Caramayon spring could be reached only by foot passing through mountains, the highest elevation of which is 197 meters above mean sea level and traversing the same river about twenty (20) times. The said spring source is below and between mountain ranges with an elevation of 84.7 meters.

Except for the pumps which were airlifted (courtesy of the 8ID, Camp Lucban & PAF) all of the materials and equipment were handled/ carried manually.

Caramayon spring source capacity is 140 lps. A Mini impounding Dam was built from where water flows to the sump Tank by gravity. Three high head submersible pumps, 1-100hp, 2-50 hp was installed to pump the water to the break pressure chamber and from there water flows by gravity to the Kulador Treatment Plant via a 10-inch pipeline through a 4.65-km distance.

A 3-phase power line 13.2 KV Primary Line with a distance of 11.9 kms was constructed as a primary prime mover of the pumping equipment. A generator was installed as standby power.

5.1 kms pipelines 10 inch and 8 inch diameter were installed. On February 22, 2005, test run was conducted on the pumping equipment and three days after it was put to operation

With the three (3) pumps capable of delivering a combined capacity of 91 lps, it can supply 9000 households.

3.2.3 Masacpasac Spring

The Masacpasac spring is located at 11 4j8' 58.8000" N, 124 55' 10.8000" E and approximately 5 kms from Brgy San Andres.

The water source contributes an averagje of 64% of the total water production with two transmission lines, CI 6" and CI 10" with a total rated capacity of 55 lps.

The source is not passable by any vehicle and can only be reached by hiking.

3.2.4 Piczonville Pumping Station

Its operation is from 5:00 in the morning to 1:00 o'clock in the afternoon, then from 4:00 in the afternoon to 6:00 in the evening daily.

As observed, this pumping schedule is operational during rainy season but during dry season/summertime, it is on a standby due to high salinity level recorded in the underground source.

Source: Deep Well, Rated Capacity: 6.5 lps, 10hp submersible pump

3.2.5 Tumalistis Pumping Station

This is a deep well water source providing water in the southside part of Catbalogan. This has a total rated capacity of 4.5 lps utilizing a 10hp submersible pump.

Two hours operation is intended for the Executive heights subdivision. The remaining hours supplements the supply for the poblacion.

3.2.6 V&G Booster Pump

V & G, 5hp booster pump - was donated by the developer to CWD, to cater the needs of V & G subdivision.

3.2.7 Canlapwas in-line Booster Pump

This station is equipped with 25hp, 220v, 3 phase, Floor mounted high pressure pump. It boosts water pressure to increase the water supply in Canlapwas, San Andres, Salug, Casantolan, Brgy. Mercedes, Brgy. Mabini.

3.2.8 Mabini in-line Booster Pump

Mabini in-line Booster pump – 40 hp, 220v, 3 phase, high head, submersible pump, boosting of water pressure to increase the area coverage supplied due to existing limited size of Distribution Line, serving Canlapwas, San Andres, Salug, Casantolan, Brgy. Mercedes, Brgy. Mabini.

3.2.9 440 Cu.m. Concrete Reservoir

This Reservoir was constructed by the Americans way back 1935. It was rehabilitated and re commissioned last 2005. It is located in an elevated part of Brgy. 13, with an elevation of 35m above sea level. It is used to augment the high demand during morning (peak hour) of the poblacion. The remaining 100cu.m. of water was reserved for fire fighting purposes.

3.2.10 Cogao Booster Pump

This Station was constructed last 2015 to provide water supply to two (2) island Barangays namely Darahuway Dako and Darahuway Guti. Transmission line is a 2" diameter x 1.7km underwater, it is equipped with a floor mounted high pressure, 75m TDH, 5lps, 200v, 3 diameter pump.

3.3 Flow diagram

To accurately define the hazards in the water supply system, it is best to describe first the components of the system in detail. The diagram shows the flow of water from the source, to the treatment, and to distribution. In between are operational and inspection processes to ensure the quality of water

Figure 1.0: System Schematic Diagram

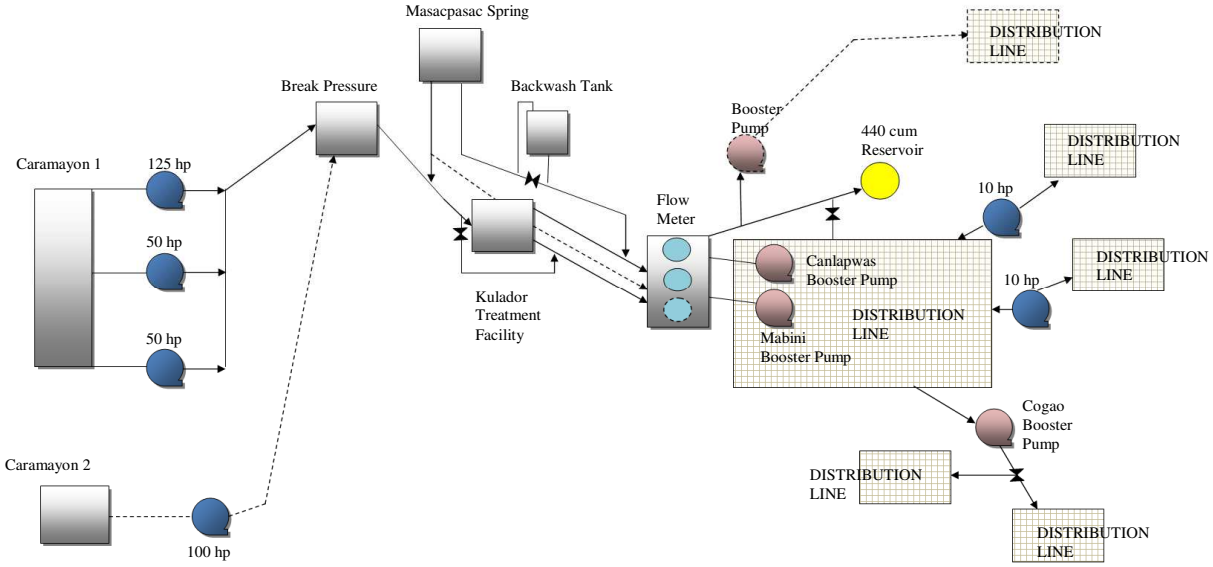
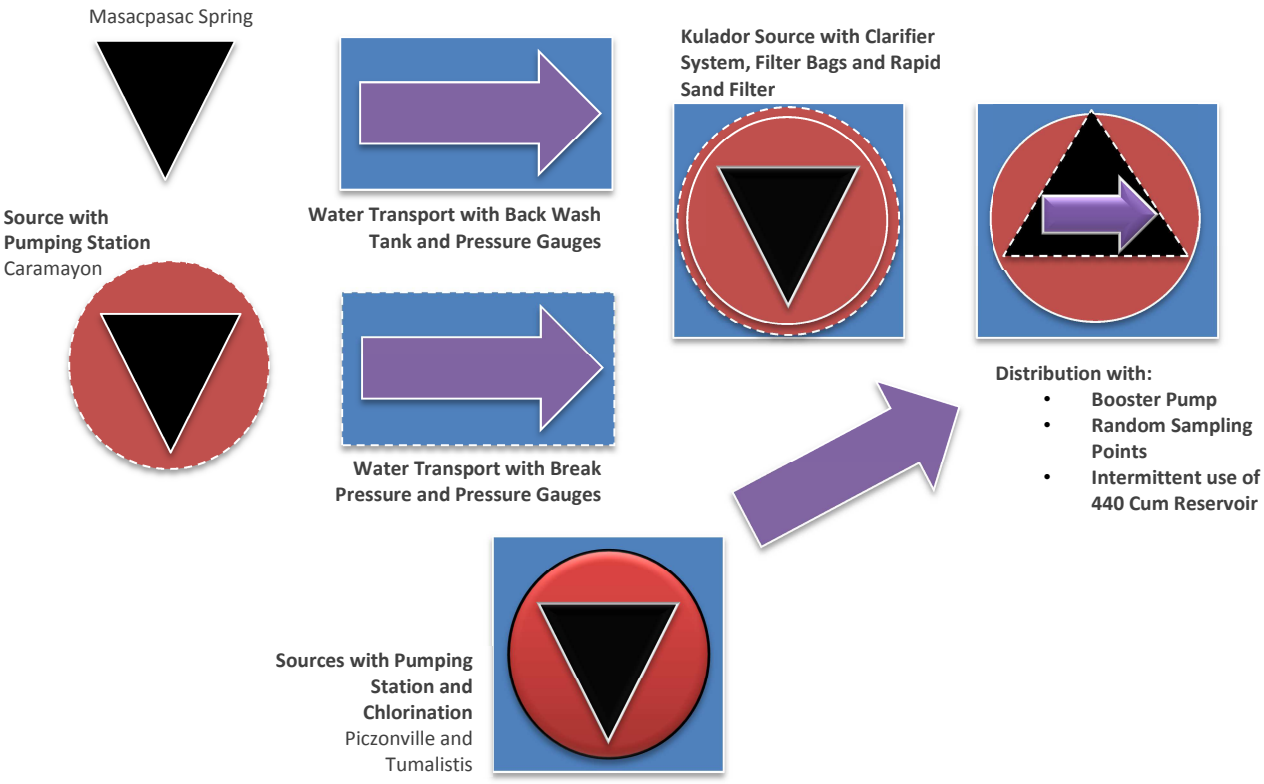
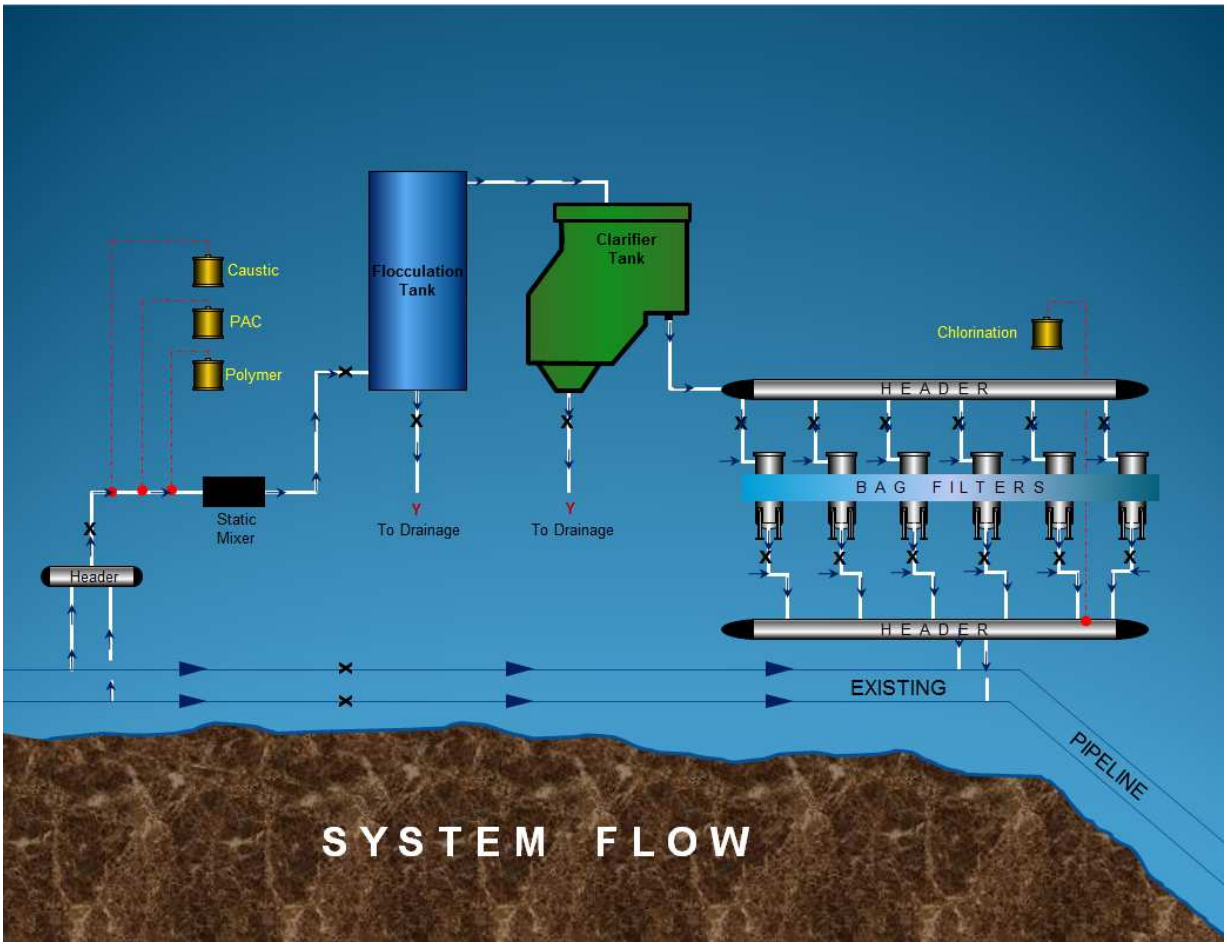


Figure 2.0: Process Flow Diagram



3.4 Treatment processes

Figure 4.0 Clarifier system flow



The treatment facility is located in Kulador, approximately 2.7 kms from the poblacion as discussed in item 3.2.1.

The facility is equipped with a clarifier system which can process 4,000 CMD of turbid water. Turbid water that enters the system is injected with PAC and Polymer to capture sediments, it will then go to a fluctuation tank and clarifier to let the sediments settle down. Finish product will pass through bag filters for final process of filtration before chlorine is injected for disinfection.

3.5 Distribution system

Figure 3.0 Distribution Line

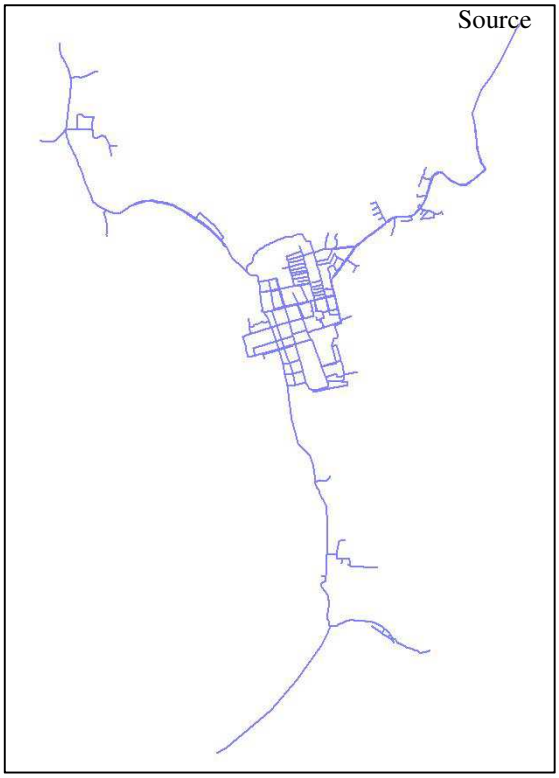
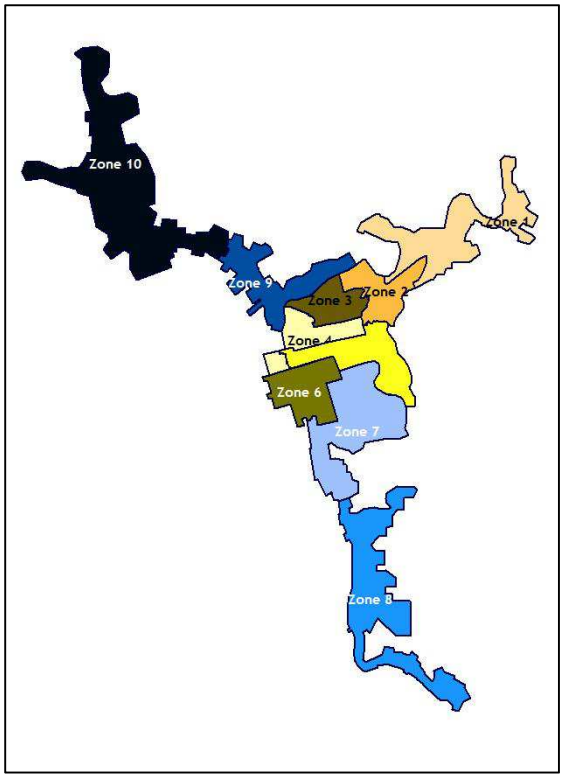


Figure 4.0 Zoning



The current distribution line is serving 22 barangays subdivided into 10 zones. Two (2) booster pumps are in placed within the poblacion to boost water pressure to far distant barangays. Another booster pump was place in Cogao to boost water pressure to the two island barangays of Darahuway Dako and Darahuway Guti which is not yet operational due to the El Niño phenomenon.

As shown in figures 3 and 4, northern tip of zone 10 and southern tip of zone 8 covers the barangays that are farthest from the source. These are also the barangays that experience low to negative water pressure every day.

The district distribution lines and facilities information are databased in the exsiting Geographic Information System of the office.

In the later part of this plan, control measures and improvement plans will be discussed to answer the different hazards that the current distribution lines is having.

3.6 Water quality required

The district follows the standards set by the Administrative Order No 2007- Philippine National Standards for Drinking Water of 2007.

To ensure safe drinking water, the laboratory technician conducts the following:

1. **Bacteriological Test**
    a. PHC Bottle

    Tests are conducted every Monday and Wednesday using PHC bootle. Daily results are saved in a database where reports are generated and submitted to the City Health Office.

b. Microbiological Test

The test is conducted by a DOH accredited testing center in the region. In our Region we have two testing center, EVRMC andLMWD. Water sample is brought to the testing center every 3rd week of the month.

Test Results are submitted to LWUA every month.

2. Laboratory Test

Water sampling is conducted daily in random household points within the service area. The office is equipped with laboratory equipment to measure the following standards:

a. Chlorine Residual - 1.0 ppm
b. Salinity - 500 ppm s
c. Conductivity - No Limit
d. Ph - 6.5 - 8.5 mg/l
e. Total Dissolved Solid - 500 mg/l
f. Turbidity - 5.0 NTU

Laboratory test results are encoded to a database where reports are generated for submission to the City Health office.

3. Physico-Chemical Test

This test is conducted once a year by a DOH accredited testing center. The test measures, Aesthetic, Physical, and Chemical components of the water supplied. The table below shows the parameters being measured by the test.

PARAMETER	METOD OF ANALYSIS	PERMISSIBLE LIMITS
AESTHETIC		
Color	Colometric	≤ 5 TCU
Turbidity	Nephelometric	≤ 5 NTU
PHYSICAL		
pH	Direct Measurement	≤ 6.5 – 8.5
Conductivity	Direct Measurement	
Resistivity	Direct Measurement	
Salinity	Direct Measurement	
Total Dissolved Solids	Direct Measurement	≤ 500 mg/L
Water Temperature	Direct Measurement	24.9 ° C
CHEMICAL		
Inorganic		
Alkalinity	Titration	≤ 150 mg/L @ pH=4.8
Ammonia	Distillation	Not greater than 250 mg/L
Boron	Carmine	≤ 0.30 mg/L
Chloride	Argentometric	≤ 250 mg/L
Iron	Phenanthroline	≤ 1 mg/L
Manganese	Persulfate	≤ 0.50 mg/L
Nitrate	Distillation	≤ 50 mg/L
Nitrite	Spectrophotometric	≤ 3 mg/L

3.7 Delivery Point, Intended users of water and intended uses of the water

Catbalogan Water District is currently serving 9,500 customers within the City of Catbalogan. The farthest delivery point to the North is barangay Maulong, this is about 3 kms from the Poblacion. Farthest southern delivery point is barangay Bunuanan, this is about 2 kms away from the Poblacion.

Intended users of water are the population of the City of Catbalogan. Currently 22 barangays were only served, but is planned to expand to other carline barangays.

3.8 Current delivered-water quality

The current delivered water generally passed the National Standards for Drinking water, in fact all regular laboratory test results are within the permissible limits in all parameters of the tests.

3.9 Persistent Problems

The water produced from the sources has different quality issues that were addressed during the treatment process. Here are some of the major problems with some of the sources:

- High Turbidity issues are common in our two sources, Caramayon and Kulador sources during heavy rains,
- High Salinity issue is a problem in Piczonville Pumping Station.
- High iron Content is a problem in Tumalistis Pumping Station.
- The major problem is not on the quality but on the quantity of water delivered. Although lack of supply doesn't directly affects quality of water, its after effects caused hazard to the supply system, like:
    - contaminants tends to enter in leak pipes in areas with low/negative pressure
    - Back flow from customer tanks in areas with low/negative pressure
    - Areas with no water supply tend to use alternative water sources which are untreated causing water born deceases.

The current issues/problems will be discussed in the later part of this plan. These were identified as hazards and were addressed through control measures.

4. Risk Assessments, Hazard Table and Existing Control Measures

4.1 Risk assessment methodology

The team uses the hazard / risk table methodology. With this method, the team identified the different hazards from water sources, to treatment plants, to pumping stations, distribution lines and other facilities where the quality of water may be affected.

In this Methodology, the hazard table was clustered into groups for easy categorization. These grouping are Source, Treatment, Distribution, and Customer premises.

The table allocates a column for Raw Risk, Existing Control Measure being applied to minimize the event, and the residual risks which determine if there are still risks that remains after the existing control measure.

4.2 Hazard / Risk table and existing controls

The Hazard / Risk table is subdivided into different areas of focus like, Water Source, Treatment, Distribution, and customer taps.

Risk Ref	Priority	Hazard	Hazardous event (source of hazard)	Raw Risk			Existing Control Measure	Effectiveness of existing control measure	Residual Risk	
				Likelihood	Severity	Score			Likelihood	Score
WATER SOURCES										
S1 - CARAMAYON SPRING										
S1.1	L	M	Seepage of animal and human wastes in existing sink holes near the source	5	5	25	Uncontrollable in the catchment but Measures are in the treatment facility	Bacteriological Test Results shows that the water produced passed the parameters	1	5
S1.2	H	C	Entry of wildlife and unauthorized persons inside the pumping stations which could lead to contamination, sabotage (poisoning) and vandalism of pumping station equipments	5	4	20	24/7 Watchman is on Duty in the Pumping Station	Watchman cannot fully monitor the entry of wildlife and cannot prevent unauthorized entry of persons	5	20
S1.3	M	P	Soil erosion due to kaingin, charcoal making, and timber poaching activities leading to change in the physical quality (High Turbidity) of water	4	3	12	- Tree planting activities is conducted every Environment Day and Anniversary - Coordination with City LGU on the implementation of Ordinances regarding Watershed protections	Problem on turbidity still existent	4	12

Risk Ref	Priority	Hazard	Hazardous event (source of hazard)	Raw Risk			Existing Control Measure	Effectiveness of existing control measure	Residual Risk	
				Likelihood	Severity	Score			Likelihood	Score
S1.4	H	C	Fish poisoning activities near the source resulting to water contamination	4	4	16			4	16
S1.5	L	P	Presence of algae formation in sump tank leading to change in the quality of water	5	3	15	Monthly Cleaning of Sump Tank	Reduce of Algae formation	1	5
S1.6	L	P	Well casing damage due to wear and tear	5	3	15	Regular Monitoring by the Watchman	Well casing properly maintained	1	5
S2 - MASACPASAC SOURCE / SPRING										
S2.1	L	M	Seepage of animal and human wastes in existing sink holes near the source	5	5	25	Uncontrollable in the catchment but Measures are in the treatment facility	Bacteriological Test Results shows that the water produced passed the parameters	1	5
S2.2	H	C	Entry of wildlife and unauthorized persons inside the pumping stations which could lead to contamination, sabotage (poisoning) and vandalism of catchment	5	4	20			5	20
S2.3	M	P	Soil erosion due to kaingin, charcoal making, and timber poaching activities leading to change in the physical quality (High Turbidity) of water	4	3	12	- Tree planting activities is conducted every Environment Day and Anniversary - Coordination with City LGU on the implementation of Ordinances regarding Watershed protections	Problem on turbidity still existent	4	12
S2.4	L	P	Presence of algae formation in the intake box leading to change in the quality of water	5	3	15	Monthly Cleaning of Sump Tank	Reduce of Algae formation	1	5
S2.5	L	M	Entry of small animals and insects in the uncovered intake box	5	5	25	Installation of Aluminum insect Screen	Installed screen is small enough for debris, birds, carwling animals and insects to enter the intake box	1	5
S3 - KULADOR SOURCE / SURFACE WATER										
S3.1	L	M	Seepage of animal and human wastes in existing sink holes near the source	5	5	25	Uncontrollable in the catchment but Measures are in the treatment facility	Bacteriological Test Results shows that the water produced passed the parameters	1	5

Risk Ref	Priority	Hazard	Hazardous event (source of hazard)	Raw Risk			Existing Control Measure	Effectiveness of existing control measure	Residual Risk	
				Likelihood	Severity	Score			Likelihood	Score
S3.2	H	C	Entry of wildlife and unauthorized persons inside the pumping stations which could lead to contamination, sabotage (poisoning) and vandalism of catchment	5	4	20	24/7 Watchman is on Duty in the Pumping Station	Watchman cannot fully monitor the entry of wildlife and cannot prevent unauthorized entry of persons	5	20
S3.3	M	P	Soil erosion due to kaingin, charcoal making, and timber poaching activities leading to change in the physical quality (High Turbidity) of water	4	3	12	- Tree planting activities is conducted every Environment Day and Anniversary - Coordination with City LGU on the implementation of Ordinances regarding Watershed protections - Installation of Clarifier System in treatment	Problem on turbidity still existent Clarifier system can only process 6000 cmd	2	6
S4 - PICZONVILLE SOURCE / DEEP WELL										
S4.1	H	C	Entry of wildlife and unauthorized persons inside the pumping stations which could lead to contamination, sabotage (poisoning) and vandalism of catchment	5	4	20	24/7 Watchman is on Duty in the Pumping Station	Watchman cannot fully monitor the entry of wildlife and cannot prevent unauthorized entry of persons	5	20
S4.2	H	M	Existence of septic tanks within the 25 meter radius from the well leading to water contamination	5	5	25			5	25
S4.3	H	M	Presence of household garbage and human waste 10 to 15 meters away from the well	5	5	25			5	25
S4.4	H	P	Sea water intrusion leading to high water salinity	5	3	15	Reduce pumping hours from 6 hrs to 3 hrs	There are still complaints in salty water	5	15
S4.5	H	M	Flood water intrusion in the well casing affecting the quality of water	5	5	25			5	25

Risk Ref	Priority	Hazard	Hazardous event (source of hazard)	Raw Risk			Existing Control Measure	Effectiveness of existing control measure	Residual Risk	
				Likelihood	Severity	Score			Likelihood	Score
S5 - TUMALISTIS SOURCE / DEEP WELL										
S5.1	H	C	Entry of animals and unauthorized persons inside the pumping stations which could lead to contamination, sabotage (poisoning) and vandalism of pumping station equipments	5	4	20	24/7 Watchman is on Duty in the Pumping Station	Watchman cannot fully monitor the entry of wildlife and cannot prevent unauthorized entry of persons	5	20
S5.2	H	M	Existence of septic tanks within the 25 meter radius from the well leading to water contamination	5	5	25			5	25
S5.3	L	P	Presence of naturally occurring iron bacteria affecting water quality	5	3	15	- Periodic maintenance of riser pipe - Post chlorination	No complaints received regarding the quality of water	1	3
T1 - WATER TREATMENT										
T1.1 Maintenance of Clarifier System										
T1.1.1	L	P	High turbidity due to inssufficient filtration capacity, processing only 50% of the total production	4	3	12	Installation of additional filter bags	Processing capacity from 4000 cmd to 6000 cmd	4	3
T1.1.2	L	P	Damage of clarifier system due to wear and tear	2	3	6	Preventive Maintenance of parts	Increase life span of clarifier system	2	3
T1.2 Application of Poly-Aluminun Chloride (PAC)										
T1.2.1	L	P	Slow settling process due to under dosing of Poly-Aluminun Chloride (PAC)	2	3	6	Training of employee in-charge		1	3
T1.2.2	L	C	Concentration of PAC above acceptable level due to over dosing	2	4	8	Training of employee in-charge		1	4
T1.3 Disinfection of the finished product										
T1.3.1	M	M	Survival of pathogens caused by under dosing of chlorine due to clogged / defective chlorinator	3	5	15	Training of employee in-charge Daily Monitoring	Daily Chlorine Residual within permissible limit	2	10
T1.3.2	L	C	Residual chlorine > 1.5ppm due to over dosing	2	4	8	Training of employee in-charge Daily Monitoring	Daily Chlorine Residual within permissible limit	1	4
T1.3.3	L	M	Failure of chlorination due to power interruption	3	5	15	Existing Stand by drip type chlorinator	Daily Chlorine Residual within permissible limit	1	5

Risk Ref	Priority	Hazard	Hazardous event (source of hazard)	Raw Risk			Existing Control Measure	Effectiveness of existing control measure	Residual Risk	
				Likelihood	Severity	Score			Likelihood	Score
T1.3.4	L	M	Failure of chlorination due to unavailability of chlorine products due to fortuitous event	2	5	10	Proper monitoring of stock reorder level	Chlorine stock always above the reorder level	1	5
T1.3.5	L	M	Failure of final filtration due to clogged filter bags	3	5	15	Regular schedule of cleaning and monitoring	There are filter bags as spare	1	5
T1.4 Quality control of treatment chemicals										
T1.4.1	L	M	Poor quality of treatment chemicals due to lack of quality check during delivery	2	5	10	Follow Standard Operational Procedure in accepting delivered inventories	All delivered inventories undergoes quality checks	1	5
T1.4.2	H	M	poor quality of treatment chemicals due to lack of proper storage leading to exposure (rain, humidity, etc)	5	5	25			5	25
D1 - DISTRIBUTION										
D1.1 Burst and Leaks										
	H	M	Ingress of contamination during leak repair near drainage canals	5	5	25	Relocation of existing pipelines along drainage canal	40% of pipelines along drainage canals transferred	5	25
	H	M	Poor workmanship and unhygienic practices in leak repairs	5	5	25	Skills Training	Employees not in proper attire during conduct of work	4	20
	H	M	Entry of contaminants due to leaks caused by vandalism or construction works of other government agencies (DPWH, LGU) and other private entities	3	5	15			3	15
	H	M	Entry of contaminants due to leaks caused by old dilapidated pipes	5	5	25	Rehabilitation or replacement of dilapidated pipes	Only identified dilapidated pipes were replaced, ageing of pipes not yet determined as basis for evaluation	5	15
D1.2 Water Distribution Pressure										
	H	M	Back siphonage of contaminants in the distribution lines caused by intermittent , low, negative pressure	5	5	25			5	25
	H	M	- In Maulong (zero to negative pressure - 5am to 11pm)	5	5	25			5	25

Risk Ref	Priority	Hazard	Hazardous event (source of hazard)	Raw Risk			Existing Control Measure	Effectiveness of existing control measure	Residual Risk	
				Likelihood	Severity	Score			Likelihood	Score
	H	M	- Parts of Mercedes (zero to negative pressure - 5am to 11pm)	5	5	25			5	25
	H	M	- Rotation of distribution by phase in Executive Heights	5	5	25			5	25
	H	M	- Scheduled Pumping in Piczonville Subdivision	5	5	25			5	25
	H	M	- Elevated Area in Brgy 13	5	5	25			5	25
	H	M	- In Bunuanan (zero to negative pressure 20hrs/day)	5	5	25			5	25
	H	M	- In Calapog (zero to negative pressure 20hrs/day)	5	5	25			5	25
	L	M	Back flow from customer uncleaned elevated tanks during negative pressure	3	5	15	Installation of non-return valve in	__% of water service connections to be installed	3	5
	H	M	Back flow from customer 's alternative untreated water source	5	5	25	Installation of non-return valve in	__% of water service connections to be installed	5	25
	H	M	Use of alternative untreated water source due to low water supply	5	5	15			5	25
D1.3 Quality Control of materials for leak repair and installation										
	H	M	Entry of small animals and insects in pipes stored at the stockyard	5	3	15			5	15
	H	C	Use of non-food grade materials during installation, repair and rehabilitation	4	4	16			4	16
	L	M	Poor quality of material used due to insufficient inspection during delivery	4	5	20	Follow Standard Operational Procedure in accepting delivered inventories	All delivered inventories undergoes quality checks	1	5
D1..4 Maintenance of Distribution and appurtenances										
	L	M	Accumulation of suspendend sediments in dead-ends	5	5	25	Periodic Flushing		1	5
	H	M	Entry of garbage / contaminants in open hydrants	5	5	25			5	25
	H	M	Cross connection with dilapidated and abandoned water pipes	5	5	25			5	25

Risk Ref	Priority	Hazard	Hazardous event (source of hazard)	Raw Risk			Existing Control Measure	Effectiveness of existing control measure	Residual Risk	
				Likelihood	Severity	Score			Likelihood	Score
	H	M	Pipes and meter stands submerged or traverse drainage canals	5	5	25	Relocation of pipes	Not yet completed	5	25
D1.5 Disinfection of service line										
	L	M	Drop of Clorine residual less than 0.3 to 1.0 ppm not detected	5	5	25	Daily monitoring of Chlorine Residual	Daily results shows Chlroine residual within distribution lines are within permissible limits	1	5

4.3 Proposed Control Measures

Risk Ref	Priority	Hazard	Hazardous event (source of hazard)	Residual Risk		Proposed Control Measure	Validation
				Likelihood	Score		
WATER SOURCES							
S1 - CARAMAYON SOURCE / DEEP WELL							
S1.1	**L**	M	Seepage of animal and human wastes in existing sink holes near the source	1	5	Soil Erosion Management	Instituting soil erosion management will lessen entry of contaminants in sink holes
S1.2	**H**	C	Entry of wildlife and unauthorized persons inside the pumping stations which could lead to contamination, sabotage (poisoning) and vandalism of pumping station equipments	5	20	Fencing	Fencing of the pumping station will limit the entry of wildlife animals and unauthorized persons passing by the area
S1.3	**M**	P	Soil erosion due to kaingin, charcoal making, and timber poaching activities leading to change in the physical quality (High Turbidity) of water	4	12	Strict implementation of Ordinances regarding watershed preservation	The strict implementation of ordinances will reduce the illegal activities in the watershed area that causes degradation of forest cover
S1.4	**H**	C	Fish poisoning activities near the source resulting to water contamination	4	16		
S1.6	**L**	P	Well casing damage due to wear and tear	1	5	Spare Unit	Providing a spare unit of well casing will reduce the occurrence of interruption in water supply
S2 - MASACPASAC SOURCE / SPRING							
S2.1	**L**	M	Seepage of animal and human wastes in existing sink holes near the source	1	5	Soil Erosion Management	Instituting soil erosion management will lessen entry of contaminants in sink holes
S2.2	**H**	C	Entry of wildlife and unauthorized persons inside the pumping stations which could lead to contamination, sabotage (poisoning) and vandalism of catchment	5	20	Fencing	Fencing of the pumping station will limit the entry of wildlife animals and unauthorized persons passing by the area

Risk Ref	Priority	Hazard	Hazardous event (source of hazard)	Residual Risk		Proposed Control Measure	Validation
				Likelihood	Score		
S2 .3	**M**	P	Soil erosion due to kaingin, charcoal making, and timber poaching activities leading to change in the physical quality (High Turbidity) of water	4	12	Strict implementation of Ordinances regarding watershed preservation	The strict implementation of ordinances will reduce the illegal activities in the watershed area that causes degradation of forest cover
S3 - KULADOR SOURCE / SURFACE WATER							
S3 .1	**L**	M	Seepage of animal and human wastes in existing sink holes near the source	1	5	Soil Erosion Management	Instituting soil erosion management will lessen entry of contaminants in sink holes
S3 .2	**H**	C	Entry of wildlife and unauthorized persons inside the pumping stations which could lead to contamination, sabotage (poisoning) and vandalism of catchment	5	20	Fencing	Fencing of the pumping station will limit the entry of wildlife animals and unauthorized persons passing by the area
S3 .3	**M**	P	Soil erosion due to kaingin, charcoal making, and timber poaching activities leading to change in the physical quality (High Turbidity) of water	2	6	Strict implementation of Ordinances regarding watershed preservation	The strict implementation of ordinances will reduce the illegal activities in the watershed area that causes degradation of forest cover
S4 - PICZONVILLE SOURCE / DEEP WELL							
S4 .1	**H**	C	Entry of wildlife and unauthorized persons inside the pumping stations which could lead to contamination, sabotage (poisoning) and vandalism of catchment	5	20	Fencing	Fencing of the pumping station will limit the entry of wildlife animals and unauthorized persons passing by the area
S4 .2	**H**	M	Existence of septic tanks within the 25 meter radius from the well leading to water contamination	5	25	Strict implementation of the ordinance regarding use of standard septic tanks	Septic tanks specifically those near the water sources must follow standards to prevent possible contamination of water source
S4 .3	**H**	M	Presence of household garbage and human waste 10 to 15 meters away from the well	5	25	Strict implementation of ordinance on proper disposal of garbage and use of toilets	Prohibition the disposal of Garbage and human waste will prevent possible contamination of water source
S4 .4	**H**	P	Sea water intrusion leading to high water salinity	5	15	Reduce pumping hours	Reduction of pumping hours will allow fresh water to replenish
S4 .5	**H**	M	Flood water intrusion in the well casing affecting the quality of water	5	25	Elevate well casing/pump base	
S5 - TUMALISTIS SOURCE / DEEP WELL							
S5 .1	**H**	C	Entry of animals and unauthorized persons inside the pumping stations which could lead to contamination, sabotage (poisoning) and vandalism of pumping station equipments	5	20	Fencing	Fencing of the pumping station will limit the entry of wildlife animals and unauthorized persons passing by the area
S5 .2	**H**	M	Existence of septic tanks within the 25 meter radius from the well leading to water contamination	5	25	Strict implementation of the ordinance regarding use of standard septic tanks	Septic tanks specifically those near the water sources must follow standards to prevent possible contamination of water source

Risk Ref	Priority	Hazard	Hazardous event (source of hazard)	Residual Risk		Proposed Control Measure	Validation
				Likelihood	Score		
S5 .3	**L**	P	Presence of naturally occurring iron bacteria affecting water quality	1	3		
T1 - WATER TREATMENT							
T1.1 Maintenance of Clarifier System							
T1 .1. 1	**L**	P	High turbidity due to insufficient filtration capacity, processing only 50% of the total production	4	3	Provide New Treatment Facility	The new facility will process the remaining 50% of production during high turbidity
T1.4 Quality control of treatment chemicals							
T1 .4. 2	**H**	M	Poor quality of treatment chemicals due to lack of proper storage leading to exposure (rain, humidity, etc)	5	25	Construction of Storage Facility	The storage facility of chemicals will maintain the quality of treatment chemicals for long span of time
D1 - DISTRIBUTION							
D1.1 Burst and Leaks							
	H	M	Ingress of contamination during leak repair near drainage canals	5	25	Relocation of all existing pipelines along drainage canals	No pipelines along the drainage canals will minimize possible contamination during leak repair
	H	M	Poor workmanship and unhygienic practices in leak repairs	4	20	Skills training	Continuous training and refresher course is needed to improve workmanship and hygienic practices
	H	M	Entry of contaminants due to leaks caused by vandalism or construction works of other government agencies (DPWH, LGU) and other private entities	3	15	Enter into an agreement between government agencies that can be considered as effluent to the water system	Government agencies must coordinate with the office to minimize the possibilities of damage in the water supply system during their road repairs
	H	M	Entry of contaminants due to leaks caused by old dilapidated pipes	5	15	Pipe age and status must be determined Continuous rehabilitation or replacement of dilapidated pipes	Determining the Pipe age and its status will give an ease in the decision making of pipe rehabilitation Continuous rehabilitation will minimize leaks that causes entry of contaminants
D1.2 Water Distribution Pressure							
	H	M	Back siphonage of contaminants in the distribution lines caused by intermittent , low, negative pressure	5	25	Development of new source and transmission line	
	H	M	Use of alternative untreated water source due to low water supply	5	25		
	H	M	- In Maulong (zero to negative pressure - 5am to 11pm)	5	25	Improvement of water supply system for Mercedes – Maulong	
	H	M	- Parts of Mercedes (zero to negative pressure - 5am to 11pm)	5	25		
	H	M	- Rotation of distribution by phase in Executive Heights	5	25	24/7 supply for executive heights subdivision	
	H	M	- Scheduled Pumping in Piczonville Subdivision	5	25	24/7 supply for executive heights subdivision	

Risk Ref	Priority	Hazard	Hazardous event (source of hazard)	Residual Risk		Proposed Control Measure	Validation
				Likelihood	Score		
	H	M	- Elevated Areas like in Brgy 13, Brgy Guindapunan, etc.	5	25	Improvement of water supply system for elevated areas	
	H	M	- In Bunuanan (zero to negative pressure 20hrs/day)	5	25	Improvement of water supply system for Bunuanan – Calapog	
	H	M	- In Calapog (zero to negative pressure 20hrs/day)	5	25		
	L	M	Back flow from customer uncleaned elevated tanks during negative pressure	3	5	Installation of non-return valve	100% of all water meters installed with non-return valve
	H	M	Back flow from customer 's alternative untreated water source	5	25	Installation of non-return valve	100% of all water meters installed with non-return valve
D1.3 Quality Control of materials for leak repair and installation							
	H	M	Entry of small animals and insects in pipes stored at the stockyard	5	15	Proper storage of pipes	Maintain the quality of materials
	H	C	Use of non-food grade materials during installation, repair and rehabilitation	4	16	Non-use of lead materials in installation, repair and rehabilitation	Use of food grade materials will prevent contamination
D1..4 Maintenance of Distribution and appurtenances							
	H	M	Entry of garbage / contaminants in open hydrants	5	25	Installation of hydrant covers	Hydrant cover will limit entry of contaminants
	H	M	Cross connection with dilapidated and abandoned water pipes	5	25	Abandoned water pipes must be determined Continuous rehabilitation or replacement of dilapidated pipes	Determining the Pipe age and its status will give an ease in the decision making of pipe rehabilitation Continuous rehabilitation will minimize leaks that causes entry of contaminants
	H	M	Pipes and meter stands submerged or traverse drainage canals	5	25	Continuous transfer or replacement of meter stands submerged or traverse drainage canals	Continuous transfer of meter stands will lessen the risk of entry of contaminants

5. Improvement Plans

Risk Ref	Priority	Hazard	Hazardous event (source of hazard)	Action to be Taken (Name of Project)	Funding Source - Cost	Responsible Party - Target Due/Completion Date
WATER SOURCES						
S1 - CARAMAYON SOURCE / DEEP WELL						
S1 .1	**L**	M	Seepage of animal and human wastes in existing sink holes near the source	Site identification and classification of sink holes	ICGF - 40,000.00	Eng'g Division Oscar, Raphaelito - 1. December 2016
S1 .2	**H**	C	Entry of wildlife and unauthorized persons inside the pumping stations which could lead to contamination, sabotage (poisoning) and vandalism of pumping station equipments	Installation of Fence along the Perimeter of Caramayon source	ICGF - 500,000.00	Eng'g Division - 1. July 2017
S1 .3	**M**	P	Soil erosion due to kaingin, charcoal making, and timber poaching activities leading to change in the physical quality (High Turbidity) of water	Periodic consultative meeting with DENR and LGU on the implementation of ordinances	ICGF - 50,000.00	WSP Team - Semi-annual
S1 .4	**H**	C	Fish poisoning activities near the source resulting to water contamination			
S2 - MASACPASAC SOURCE / SPRING						
S2 .1	**L**	M	Seepage of animal and human wastes in existing sink holes near the source	Site identification and classification of sink holes	ICGF - 40,000.00	Eng'g Division - 1. December 2016
S2 .2	**H**	C	Entry of wildlife and unauthorized persons inside the pumping stations which could lead to contamination, sabotage (poisoning) and vandalism of catchment	Installation of Fence along the Perimeter of Mascapasac source	ICGF - 50,000.00	Eng'g Division - July 2017
S2 .3	**M**	P	Soil erosion due to kaingin, charcoal making, and timber poaching activities leading to change in the physical quality (High Turbidity) of water	Periodic consultative meeting with DENR and LGU on the implementation of ordinances	ICGF - 50,000.00	WSP Team - Semi-annual
S3 - KULADOR SOURCE / SURFACE WATER						
S3 .2	**H**	C	Entry of wildlife and unauthorized persons inside the pumping stations which could lead to contamination, sabotage (poisoning) and vandalism of catchment	Installation of Fence along the Perimeter of Kulador source	ICGF - 200,000.00	Eng'g Division - July 2017
S3 .3	**M**	P	Soil erosion due to kaingin, charcoal making, and timber poaching activities leading to change in the physical quality (High Turbidity) of water	Periodic consultative meeting with DENR and LGU on the implementation of ordinances	ICGF - 50,000.00	WSP Team - Semi-annual

Risk Ref	Priority	Hazard	Hazardous event (source of hazard)	Action to be Taken (Name of Project)	Funding Source - Cost	Responsible Party - Target Due/Completion Date
S4 - PICZONVILLE SOURCE / DEEP WELL						
S4 .1	**H**	C	Entry of wildlife and unauthorized persons inside the pumping stations which could lead to contamination, sabotage (poisoning) and vandalism of catchment	Installation of Fence along the Perimeter of Piczonville Substation	ICGF - 100,000.00	Eng'g Division - July 2017
S4 .2	**H**	M	Existence of septic tanks within the 25 meter radius from the well leading to water contamination	Periodic consultative meeting with DENR and LGU on the implementation of ordinances	ICGF - 50,000.00	WSP Team - Semi-annual
S4 .3	**H**	M	Presence of household garbage and human waste 10 to 15 meters away from the well	Periodic consultative meeting with DENR and LGU on the implementation of ordinances	ICGF - 50,000.00	WSP Team - Semi-annual
S4 .4	**H**	P	Sea water intrusion leading to high water salinity	Sealing using clay 6 meters depth	ICGF - 30,000.00	Eng'g Division - March 2017
S4 .5	**H**	M	Flood water intrusion in the well casing affecting the quality of water	Elevate well casing/pump base	ICGF - 100,000.00	Eng'g Division - January 2017
S5 - TUMALISTIS SOURCE / DEEP WELL						
S5 .1	**H**	C	Entry of animals and unauthorized persons inside the pumping stations which could lead to contamination, sabotage (poisoning) and vandalism of pumping station equipments	Installation of Fence along the Perimeter of Tumalistis pumping station	ICGF - 100,000.00	Eng'g Division - July 2017
S5 .2	**H**	M	Existence of septic tanks within the 25 meter radius from the well leading to water contamination	Periodic consultative meeting with DENR and LGU on the implementation of ordinances	ICGF - 50,000.00	WSP Team - Semi-annual
T1 - WATER TREATMENT						
T1.1 Maintenance of Clarifier System						
T1 .1. 1	**L**	P	High turbidity due to insufficient filtration capacity, processing only 50% of the total production	Provide Additional Treatment Facility Purchase of dosing pump for PAC and polymer	ICGF - 10,000,000.00 200,000.00	Eng'g Division - 2019

Risk Ref	Priority	Hazard	Hazardous event (source of hazard)	Action to be Taken (Name of Project)	Funding Source - Cost	Responsible Party - Target Due/Completion Date
T1.3 Disinfection of the finished product						
T1.3.1	**M**	M	Proliferation of pathogens caused by under dosing of chlorine due to clogged / defective chlorinator	Purchase of spare five (5) units chlorinator	ICGF - 250,000.00	Eng'g Division - March 2017
T1.4 Quality control of treatment chemicals						
T1.4.2	**H**	M	Poor quality of treatment chemicals due to lack of proper storage leading to exposure (rain, humidity, etc)	Construction of Storage facility in Kulador Treatment plant	ICGF - 150,000.00	Eng'g Division - May 2017
D1 - DISTRIBUTION						
D1.1 Burst and Leaks						
	H	M	Ingress of contamination during leak repair near drainage canals	Continuous relocation of pipes near drainage canal Installation of control valves along the distribution lines	ICGF - 1,000,000.00 500,000.00	Eng'g Division - December 2017 December 2017
	H	M	Poor workmanship and unhygienic practices in leak repairs	Competency trainings	ICGF - 100,000.00	Eng'g Division - 2017
	H	M	Entry of contaminants due to leaks caused by vandalism or construction works of other government agencies (DPWH, LGU) and other private entities	Information Campaign	ICGF - 50,000.00	Commercial Division - 2017
	H	M	Entry of contaminants due to leaks caused by old dilapidated pipes	Replacement of old Dilapidated pipes and fittings	ICGF -1,000,000.00	Eng'g Division - 2017
	H	M	Cross connection with dilapidated and abandoned water pipes			
D1.2 Water Distribution Pressure						
	H	M	Back siphonage of contaminants in the distribution lines caused by intermittent , low, negative pressure	Installation of non-return valve/check valves in service connections	ICGF - 100,000.00	Eng'g Division - 2017
	H	M	Back flow from customer 's alternative untreated water source			
	H	M	Use of alternative untreated water source due to low water supply	See annex B for Project Details	See annex E for Project Details	See annex E for Project Details
	H	M	- In Maulong (zero to negative pressure - 5am to 11pm)			
	H	M	- Parts of Mercedes (zero to negative pressure - 5am to 11pm)			
	H	M	- Rotation of distribution by phase in Executive Heights			
	H	M	- Scheduled Pumping in Piczonville Subdivision			
	H	M	- Elevated Areas like in Brgy 13, Brgy Guindapunan, etc.			

Risk Ref	Priority	Hazard	Hazardous event (source of hazard)	Action to be Taken (Name of Project)	Funding Source - Cost	Responsible Party - Target Due/Completion Date
	H	M	- In Bunuanan (zero to negative pressure 20hrs/day)	See annex B for Project Details	See annex B for Project Details	See annex B for Project Details
	H	M	- In Calapog (zero to negative pressure 20hrs/day)			
D1..4 Maintenance of Distribution and appurtenances						
	H	M	Entry of garbage / contaminants in open hydrants	Installation hydrant cap	ICGF - 0.00	Eng'g Division - January 2017
	H	M	Pipes and meter stands submerged or traverse drainage canals	See annex B for Project Details	See annex E for Project Details	See annex E for Project Details

6. Operational Monitoring and Corrective Actions of Control Measures

	Parameters and Critical Limits	Monitoring Locations - Monitoring Frequency	Responsible Party - Monitoring Procedures	Corrective action
Water Source / Catchment	High turbidity level (Permissible limit: 5 ntu)	Caramayon - Daily Monitoring	Source Operator - 1. Water sampling using portable turbidimeter with fast tracker	Greater than 5 ntu – Shut off operation
	Power Interruption	Caramayon - Daily Monitoring	Source Operator - 1. Record date and time of Power outage	Inform production head for proper coordination with electric cooperative to restore power Use the standby Generator Set
	Preventive Maintenance of pumping station Equipment and other electrical appurtenances	Caramayon - Daily Monitoring	Source Operator - Recording of operating hour	Ensure enough fuel Ensure GenSet in good running condition Ensure availability of spare pumps and motors
	High salinity level (Permissible limit: 500ppm)	Piczonville - Daily Monitoring	Laboratory Technician - 1. Water sampling using HACH Tester 2. include in daily laboratory report	Above permissible limit: reduce pumping hours
	Physical Chemical Tests (13 +1 parameters)	All water sources - Twice in a year	Laboratory Technician - 1. Water Sampling 2. Send samples to DOH accredited laboratory centers 3. forward results to LWUA	Per recommendation from LWUA
Water Treatment	High turbidity level (Permissible limit: 5 ntu)	Kulador - Daily Monitoring	Source Operator - 1. Water sampling using portable turbidimeter with fast tracker	Dosing of PAC and Polymer depending on the level of turbidity Conduct pre and post chlorination procedure Replacement anf cleaning of filter bags using pressure washer
	Clogging of chlorinator nozzle	Kulador - Daily Monitoring	Source Operator - 1. conduct regular check-up and cleaning	Pull out chlorinator for cleaning and use stand by chlorinator for continuous water disinfection
Water Distribution	Chlorine Residual (Permissible limit: 0.3 to 1.5 PPM)	17 Sampling points - Daily Monitoring	Laboratory Technician - 1. Water sampling using HACH Tester 2. include in daily laboratory report	Below permissible limit: Inform pump operator to increase chlorine dosage Above permissible limit: Inform pump operator to decrease chlorine dosage

	Parameters and Critical Limits	Monitoring Locations - Monitoring Frequency	Responsible Party - Monitoring Procedures	Corrective action
	Microbiological Test	12 sampling points - Daily Monitoring	Laboratory Technician - 1. Water Sampling 2. Send samples to DOH accredited laboratory centers 3. forward results to LWUA	For positive result: 1. Conduct investigation 2. Conduct resampling
Consumer	1. abang 2. inside plumbing 3. alternative source, tanks,	**NWSC** **-** **Application of NWSC**	Plumber - 1. Conduct resurvey before installation of New SC	Advise applicant to proper pipe laying after the meter

7. Verification Procedures

7.1 Compliance monitoring plan consistent with water quality targets

Activity	Description	Frequency of Monitoring	Responsible Party	Records
Physical Chemical Test	Check water (13) parameters if still within permissible limits (PNSDW 2007)	Twice a year in all water sources	DOH accredited testing centers	Test Results submitted to LWUA
Bacteriological Test using PHC bottle	*E. coli* is monitored in product water samples	Twice a week in 8 sampling points	In house testing	Test Results submitted to CHO
Bacteriological Test - Laboratory	*E. coli* is monitored in product water samples	Once a month one sample for every one thousand connections	DOH accredited testing centers	Test Results submitted to LWUA
Water quality monitoring	Check water (6) parameters if still within permissible limits (PNSDW 2007)	Daily in 17 sampling points	In house testing	For Management monitoring
Physical Chemical Test for new possible sources	Check viability of water parameters (PNSDW 2007)	As needed	DOH accredited testing centers	Basis for decision making

7.2 Verification Monitoring Program

Verification Activity	Location of Activity	Type of Activity	Frequency of activity	Analyst	Recipient of Analysis Result*	Action on unusual/ failing result	3rd-Party Recipient of Results
Water Quality							
Physical Chemical Test	All water sources	Sampling	Twice a year	DOH accredited lab	Engineering Division Chief	Protocol for water Parameter permissible limits	Production Manager, LWUA
Bacteriological Test using PHC bottle	Consumer's taps randomly selected per designed sampling plan	Sampling	Twice a week	Water Quality Technician	Engineering Division Chief	Protocol for positive results	CHO

Verification Activity	Location of Activity	Type of Activity	Frequency of activity	Analyst	Recipient of Analysis Result*	Action on unusual/ failing result	3rd-Party Recipient of Results
Bacteriological Test - Laboratory	Consumer's taps randomly selected per designed sampling plan	Sampling	Monthly	DOH accredited lab	Engineering Division Chief	Protocol for positive results	Production Manager, LWUA
Water quality monitoring	Consumer's taps randomly selected per designed sampling plan	Sampling	Daily	Water Quality Technician	Engineering Division Chief	Protocol for positive results	General Manager
Physical Chemical Test for new possible sources	Drilling site	Sampling	As needed	DOH accredited lab	Engineering Division Chief	Protocol for water Parameter permissible limits	General Manager
Monitoring of Consumer Satisfaction	Service Area	Commissioning a Customer Satisfaction Survey	Annual	Samar State University Research Dept.	Commercial Division Chief	Review processes and address specific area of dissatisfaction	General Manager, Division Heads, Planning Officer

7.3 External Audit Plans

Activity	Description	Frequency	Responsible party
Physical – Chemical test by external		Twice a year	City Health Office/LWUA

8. Management Procedures

Standard Operating Procedures	Description	Document Reference Operations Manual (OM)
Water Source Operation	Caramayon Spring Source (Pumping Station) 1. Operating Procedure 2. Electrical Failure 3. Equipment Preventive Maintenance 4. Production Monitoring 5. Water Supply Masacpasac Spring 1. Operating a valve (shutting down/recharging a main) 2. Maintenance of impounding structure 3. Maintenance of Intake box 4. Water Sampling Procedure Kulador Surface Water 1. Operating a valve (shutting down/recharging a main) 2. Maintenance of impounding structure 3. Production monitoring and recording 4. Maintenance of Intake box 5. Maintenance of facility 6. Water Sampling Procedure Piczonville 1. Pumping Operation 2. Valving 3. Monitoring and reporting of static water level and drawdown 4. Maintenance of facility 5. Water Sampling Procedure Tumalistis 6. Pumping Operation 7. Valving 8. Monitoring and reporting of static water level and drawdown 9. Maintenance of facility 10. Water Sampling Procedure	Operations Manual (OM) Annex F
Production House	1. Data logging and reporting 2. Maintenance of facility	

Standard Operating Procedures	Description	Document Reference
Treatment Operation	Kulador Treatment Facility 1. Clarifier System operation 2. Pre and post Chlorination Piczonville 1. Post Chlorination Tumalistis 2. Pre and Post Chlorination	
Transmission Main Line	1. Operating a valve (shutting down/recharging a main) 2. Water main repair procedure 3. Repair Burst/Leaking Water Mains 4. Notification of Burst Water Main	
Booster pump operation	**V&G** 1. Pump Operation 2. Maintenance of facility and equipment Canlapwas 3. Monitoring and Data logging 4. Maintenance of electro mechanical equipment Mabini 5. Monitoring and Data logging 6. Maintenance of electro mechanical equipment 7. Dewatering of pump housing structure Cogao 8. Monitoring and Data logging 9. Maintenance of electro mechanical equipment	
Distribution Line	1. Repair Burst/Leaking 2. Repair of a Damaged / Burst Hydrant 3. Notification of Burst distribution line repair 4. Tapping of Service connection	
Extension Line	1. Relocation of extension line 2. Repair Burst/Leaking 3. Water Sampling Procedure 4. Notification of Burst extension line repair 5. Tapping of Service connection	
Leak Detection	6. Leak Detection and Reporting 7. Flushing 8. Valving 9. Pressure Monitoring and Reporting	

Standard Operating Procedures	Description	Document Reference
Service Connection	1. New water service connection 2. Reconnection 3. Disconnection 4. Meter Stand Repair 5. Relocation of Service 6. Abrupt increase / decrease of consumption	
Water Meter Maintenance	1. Recalibration of New Water Meters 2. Replacement of Water Meter 5 yr old 3. Removal of reported faulty or defective water meters 4. Relocation of Water Meters 5. Clustering of Water Meters	

9. Supporting Programs

9.1 Plan for supporting programmes

Program	Activity	Purpose	Target Date
Hygiene, Sanitation and safety Gear	Strict Implementation of Proper uniform and wearing of safety gear	Proper Safety of field workers and hygiene purposes	On going
Research	Geographic Information System	Efficiency in the operations	On going
	Computerized Database		On going
Organizational Culture	Team Building	Enhancing team cooperation and camaraderie within employee and management	Once every 2 years
	Family Day		Yearly
Training & continuing education	Program on Employee's Skills Training	Enhancing Employee's skills	On going
	Program on Seminar-orientation of New Water Service Connection applicants	Proper Information for customers in the operations of the water district	MWF
	Skills Competition	Enhancing Employee's skills	Once every year during anniversary
	Competency requirements	Enhancing Employee's skills	On going
Equipment upgrade, calibration & Maintenance	Program on Change of 5 yr old meter	Lowering NRW	On going
	Recalibration	Lowering NRW	On going

	Night shift leak detection	Lowering NRW	On going
	Regular Flushing	Reduction of sediments	Once every month or as needed

10. WSP Review Procedures

Purpose of Review	Schedule	Responsible Unit
Changes in the Catchment, Treatment and Distribution	Any changes in the water system	WSP Team
Revised Procedures	Any changes made in the office procedures	WSP Team
Staff Changes	Any changes in the workforce	WSP Team, HR
Stakeholder Contact Changes	Any changes in the Contact Nos of WSP team Member	WSP Team Secretariat

11. Incident Response Plans

Purpose of Review	Schedule	Responsible Unit
Incident	After fortuitous event (e.g. Typhoon, Earthquake, Landslide)	WSP Team
Near Miss	After fortuitous event (e.g. Typhoon, Earthquake, Landslide)	WSP Team

Annex A
Board Resolution Supporting WSP Development

Annex B
Office Memorandum creating the WSP Team

Annex C
Office Memorandums of Scheduled WSP Team Meetings

Annex D
Board Resolution Adopting the CWD Water Safety Plan

Annex E
Improvement Plan

189-01 : Survey, Exploration, Drilling

Lagundi	**300,000.00 (ICGF)**

203-04 : Wells

Construction of Dugwell with 35 hp Submersible Pump & Pressure Filter Villa Paula (2016)	**1,390,000.00 (ICGF)**

203-08 : Source Exploration & Development

Caramayon II New Source	**2,829,926.40 (ICGF)**
Tumalistis II Well Development	**952,000.00 (ICGF)**

203-09 : Transmission and Distribution Main

1. Installation of 1,200 LM 10" Transmission Pipeline from Nasarang to Culador	**2,181,634.00 (ICGF)**
2. Installation of 630 LM 8" PVC Transmission Pipeline Mabini after Mabini Pumping Station to Del Rosario St.	**1,333,107.00 (ICGF)**
3.Installation of Transmission Pipeline to Diversion Road	**4,969,503.00 (ICGF)**
4. Installation Distribution Line to Darahuway Island Dako & Guti	**1,615,599.00 (ICGF)**
5. Procurement of Combination Air Release valve	**300,000.00 (ICGF)**
6. Procurement of Electromagnetic Flow Meter 8" - Location: Kulador	**200,000.00 (ICGF)**

Annex F
Operation's Manual