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ENVIRONMENTAL MITIGATION AND MONITORING PLAN (EMMP)

PROJECT/ACTIVITY DATA

Project/Activity Name:	USAID Water and Sanitation Project – Water infrastructure construction and rehabilitation
Geographic Location(s) (Country/Region):	HAITI/LAC
Implementation Start/End:	12/04/2017 – 06/05/2022
Contract/Award Number:	AID-OAA-I-14-00049/720521
Implementing Partner(s):	DAI GLOBAL, LLC
Tracking ID/link:	
Tracking ID/link of Related IEE:	LAC-IEE-17-28 https://ecd.usaid.gov/repository/pdf/50023.pdf
Tracking ID/link of Other, Related Analyses:	

ORGANIZATIONAL/ADMINISTRATIVE DATA

Implementing Operating Unit(s): (e.g. Mission or Bureau or Office)	Office of Infrastructure, Energy and Engineering (OIEE)
Lead BEO Bureau:	Latin America and the Caribbean
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Date Submitted:	5 February 2020

ENVIRONMENTAL COMPLIANCE REVIEW DATA

Analysis Type:	EMMP
Additional Analyses/Reporting Required:	EMMR

PURPOSE

The USAID Water and Sanitation Project (the Project) is working to ensure sustainable, safely managed, and affordable water and sanitation services to stem the spread of cholera and other waterborne diseases in Haiti. The Project is laying the foundation for a long-term, sustained effort to increase access to safe drinking water and sanitation in Haiti, where many communities suffer from high incidences of cholera and diarrheal diseases.

Environmental Mitigation and Monitoring Plans (EMMPs) are required for USAID-funded projects, as specified in ADS 204, when the 22 CFR 216 documentation governing the project (e.g. the Initial Environmental Examination (IEE)) specifies mitigation measures are needed. EMMPs are in important tool for translating applicable IEE conditions and mitigation measures into specific, implementable, and verifiable actions. Since 2018 the Project has produced a Project level EMMP, two Umbrella level EMMPS and two site-specific EMMPs; this EMMP will be the third site specific EMMP.

The purpose of this EMMP is to ensure that the ADS 204.3 requirements for incorporating and monitoring appropriate mitigation measures into project or activity design are implemented. The mitigation measures in this EMMP respond to the LAC-IEE-1 7-28 "Negative determination, with Conditions." The Water infrastructure construction and rehabilitation Umbrella EMMP (U-EMMP), approved July 31, 2019 covers activities specified in the IEE amendment for water engineering and construction activities (Sub-IRs 1.1 and 1.2) that were part of the approved Scoping Statement (LAC-SS-19-0 1). This project level EMMP is directly derived from the U-EMMP but contains additional information relevant to the Canaan project. **This EMMP provides the mitigation and monitoring actions to be taken for all phases (1, 2, 3 and 4) of the Canaan activities.**

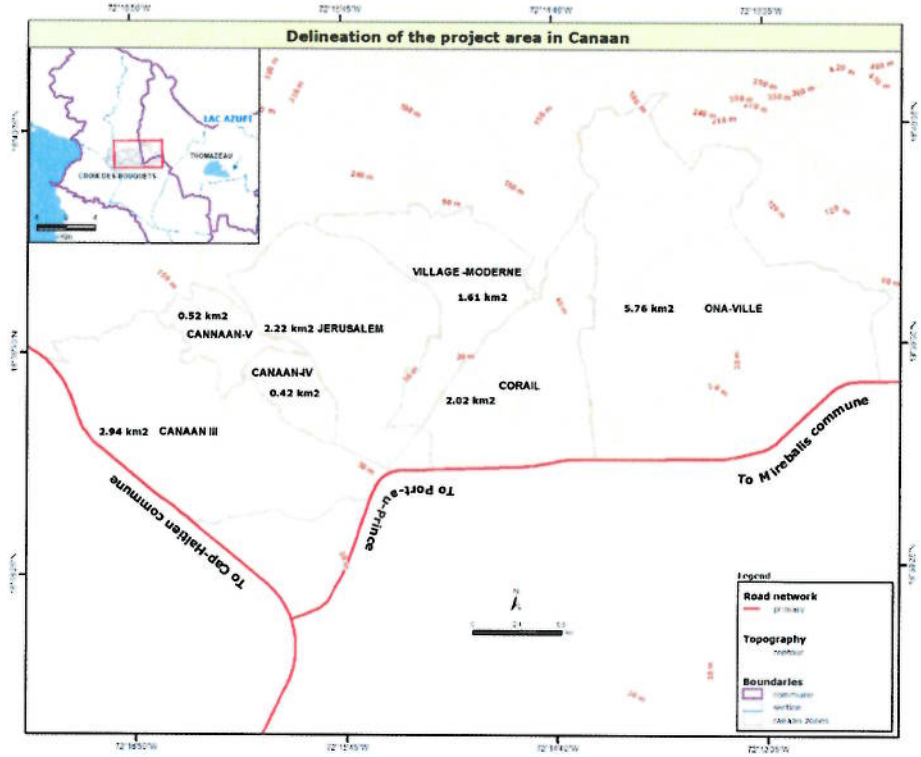

Figure 1 - Neighborhoods of Canaan Evaluated by the USAID Water and Sanitation Project

USAID APPROVAL OF EMMP

PROJECT/ACTIVITY NAME: USAID Water and Sanitation Project – Water infrastructure construction and rehabilitation

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Clearance:	Abdel Abellard, Mission Environmental Officer	2/28/2020 Date
Clearance:	cleared by e-mail Bethzaida Colon, Regional Environmental Advisor	2/28/2020 Date

Environmental Mitigation and Monitoring Plan (EMMP) Narrative

1 Background, Rationale and Results Expected:

The overarching objective of the USAID Water and Sanitation Project (the Project) is to increase access to safe drinking water and safely managed sewage services in Haiti. The Project serves to build the operational effectiveness and solvency of Haitian water utilities (Centres Technique d'Exploitation, or CTEs) and their regional administrators (Offices Régionales de l'Eau Potable et de l'Assainissement, OREPAs) to enable sustainable service delivery. Specifically, the Project will focus on increasing water supplies and sanitation services while simultaneously building an environment that facilitates their sustainable expansion. The Government of Haiti has identified the communes of Cap-Haïtien, Mirebalais, and Croix-des-Bouquets (Canaan) as priority cholera "hotspots." The communes of Les Cayes and Jérémie were also selected because their water and sanitation infrastructures sustained major damage from Hurricane Matthew. Working in these locations, the Project aims to enable 250,000 people to gain access to new or improved water services and 75,000 people to gain access to basic or safely managed sanitation services.

The Project is organized into three mutually reinforcing components to support its objectives:

Component 1. Increased access to sustainable water supply services;

Component 2. Increased access to sustainable sanitation services; and

Component 3. Strengthened enabling environments for sustainable delivery, operation, and maintenance of WASH services.

Additionally, the Project manages an enterprise acceleration fund that offers grants and sub-awards to help expand safe water and sanitation services to accelerate the impact and innovations by locally established entrepreneurs in the sector. Engaging local entrepreneurs has become increasingly integral to sustainable water and sanitation service delivery.

2 Activity Description:

2.1 Summary

The proposed project at Canaan has been developed to be implemented in four back-to-back phases that begin by quickly making the system operational and ends by having a wider area benefit from access to potable water. The phases are as follows:

Phase One: Phase 1 is ongoing. The OREPA West has taken responsibility for putting the system into operation. They are working with Global Communities to repair the existing leaks and will provide metered connections to around 20 private kiosks (small businesses that sell water by the bucket from a reservoir). The Croix-des-Bouquets CTE is managing the system. This provides a crucial test of the functionality of the system and the ability to generate the revenues required to operate the system.

Phase Two: The second phase will involve the additional works to make the C-1 well fully operational. This includes completing work on the reservoir and pump house and repairing pipes as needed.

Phase Three: The third phase involves building the distribution network for the C-1 well. This will provide water for approximately 40,000 people.

Phase Four: The final phase will involve expanding water distribution to the broader Canaan area. The USAID Water and Sanitation Project will prepare the conceptual design for this work and possibly the detailed design if a suitable donor can be identified.

The infrastructure corresponding to each phase of construction is presented in Figure 2.

2.2 Phase One

The first phase will be a rapid phase to make the system operational. The USAID Water and Sanitation Project will support the work that is being done by the OREPA Ouest but will not undertake any construction. The OREPA West is working with Global Communities to have its contractor repair any existing leaks since the system is still under the warranty period. Once the system is operational, the OREPA West will offer paid connections for around 20 private kiosks. These are existing small businesses that have a reservoir and currently buy water delivered by truck. The USAID Water and Sanitation Project will provide the pipes, meters, and other required supplies. This first phase is expected to be completed by the end of January.

By providing improved water through these 20 private kiosks, all of the households within 500m of each kiosk will have access to improved water. We estimate that each kiosk will be able to serve between 500 and 750 people per day or 10,000 to 15,000 per day in total.

2.3 Phase Two

The second phase will focus on completing the work on the pump house and the reservoir. This includes:

Reservoir: Completion of the construction of the reservoir site so that it is fully operational

- General civil improvements (site grading, graveling, etc.) to make it a workable site
- Construction of a guard house
- Installation of the overflow and drain piping from the reservoir to a suitable drain.
- Secure perimeter fence
- The primary chlorine dosage tank will be at the reservoir
- If it is deemed necessary and desired by l'OREPA Ouest, an auxiliary chlorine dosage tank can be installed for public kiosks in the vicinity of the pump station.
- A housing or chamber for the dosing pumps.
- A protective structure for the inlet and outlet valves at the reservoir.

Pumping station: Minor improvements to the site

- Masonry wall and security gate at the well
- A 2000-gallon diesel tank on a pad with a lip or spill prevention system, at the well site.
- Minor electrical repairs at pump – solar panel is disconnected, and there are potentially other minor issues. So, include budget and provisions for contractor to identify these repairs.

Since this phase will not involve expanding the number of connections, there will be no additional beneficiaries.

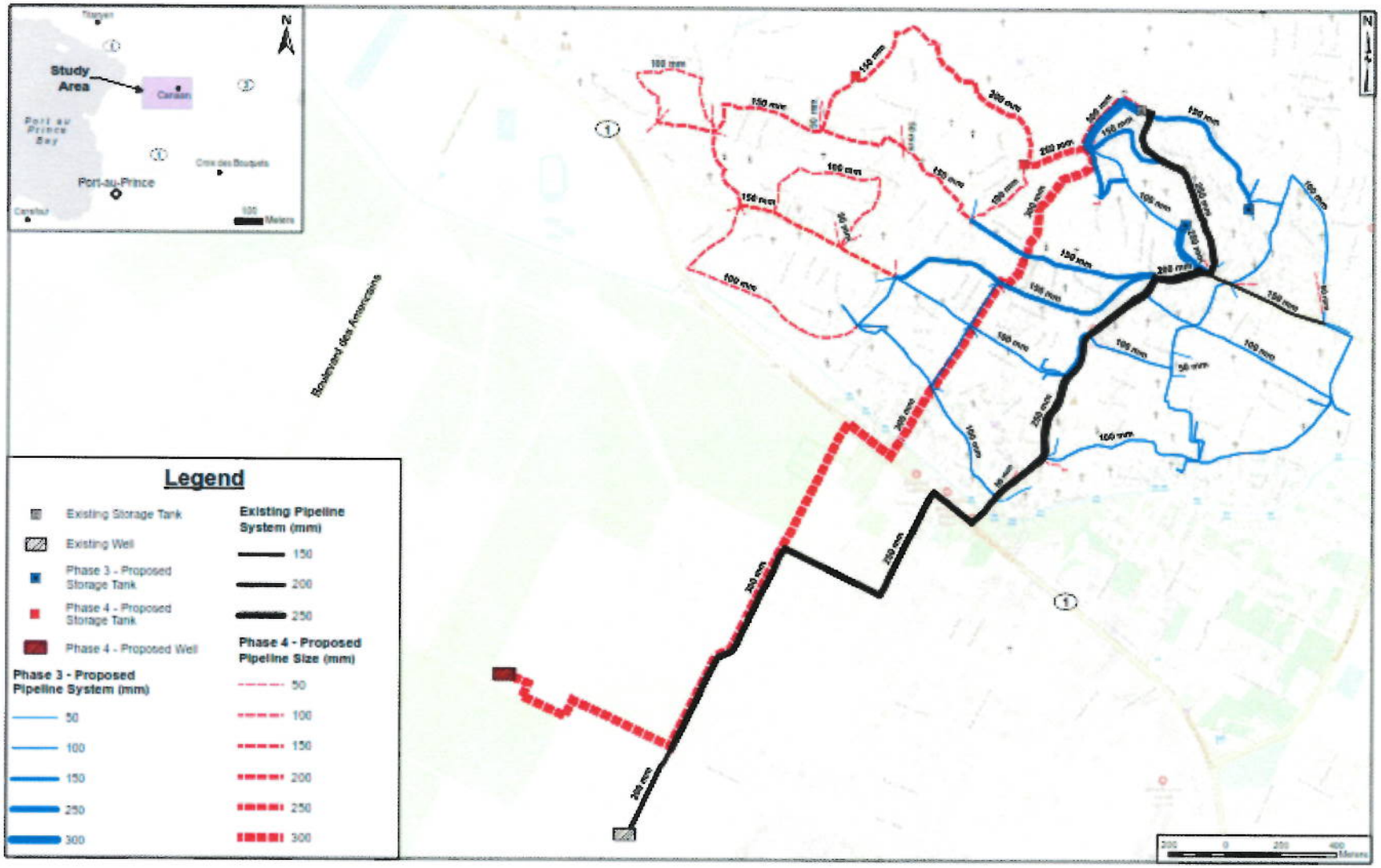

Figure 2 - Canaan Phase 3 and 4 Infrastructure Layout with Pressure Zones

2.4 Phase Three

The construction activities include:

- The installation of a HDPE pipe network consisting of pipe sizes ranging from DN 250 (12-inch) to DN 100 (2-inch)
- Up to 1500 private services with individual flow meters and accessories
- Two 70-m^3 elevated concrete storage tanks, approximately 4 meters above grade, that both augment available storage while serving the purpose of a break-pressure tank.
- Figure 2 shows estimated pressure zones. A break-pressure device is needed for elevations lower than 50 m.
- The addition of 10 public kiosks following DINEPA standard design, no above-ceiling storage tank, each with four supply faucets
- The installation of a transformer at the well house and a connection to the power grid

The distribution system for Phase Three will be capable of delivering the upper limit of production, but services will only be connected to the point where consumption and delivery are balanced. Values presented in this report refer to the upper limit of daily production.

The cumulative total number of beneficiaries for Phases One to Three is estimated to be 40,000. In addition, there is about 100 m^3/day allocated for connection to existing schools, health centers, and commercial establishments.

2.5 Phase Four

The Phase Four water system will be capable of providing the design consumption of approximately 5,000 m^3/day across Canaan zones III and IV. The actual volume delivered depends on additional studies that will be required as described in Section 3.2.

The construction activities include:

- The installation additional groundwater wells to supply the remaining water demand required for the design population of 152,400 projected in 2039, including power generation by diesel generators or solar power and the EdH power grid.
- Construction of additional DN 300 (12-in) pipelines to the existing tank R10.
- The extension of the Phase I water supply distribution network to the full geographical limits of zones III and IV
- Two additional 70 m^3 elevated concrete storage tanks, approximately 4 m above grade, that both augment available storage while serving the purpose of a break-pressure tank
- The addition of two to three thousand private service connections.
- The addition of additional kiosks following DINEPA standard design, no above-ceiling storage tank, each with four supply faucets as required.

Beneficiaries for Phase 4, in 2026, are estimated at 160,000. In addition, there is about 350 m^3/day allocated for connection to existing schools, health centers, and commercial establishments. Geographically, the coverage limits after Phase 3 and Phase 4 are completed are presented in Figure 3.

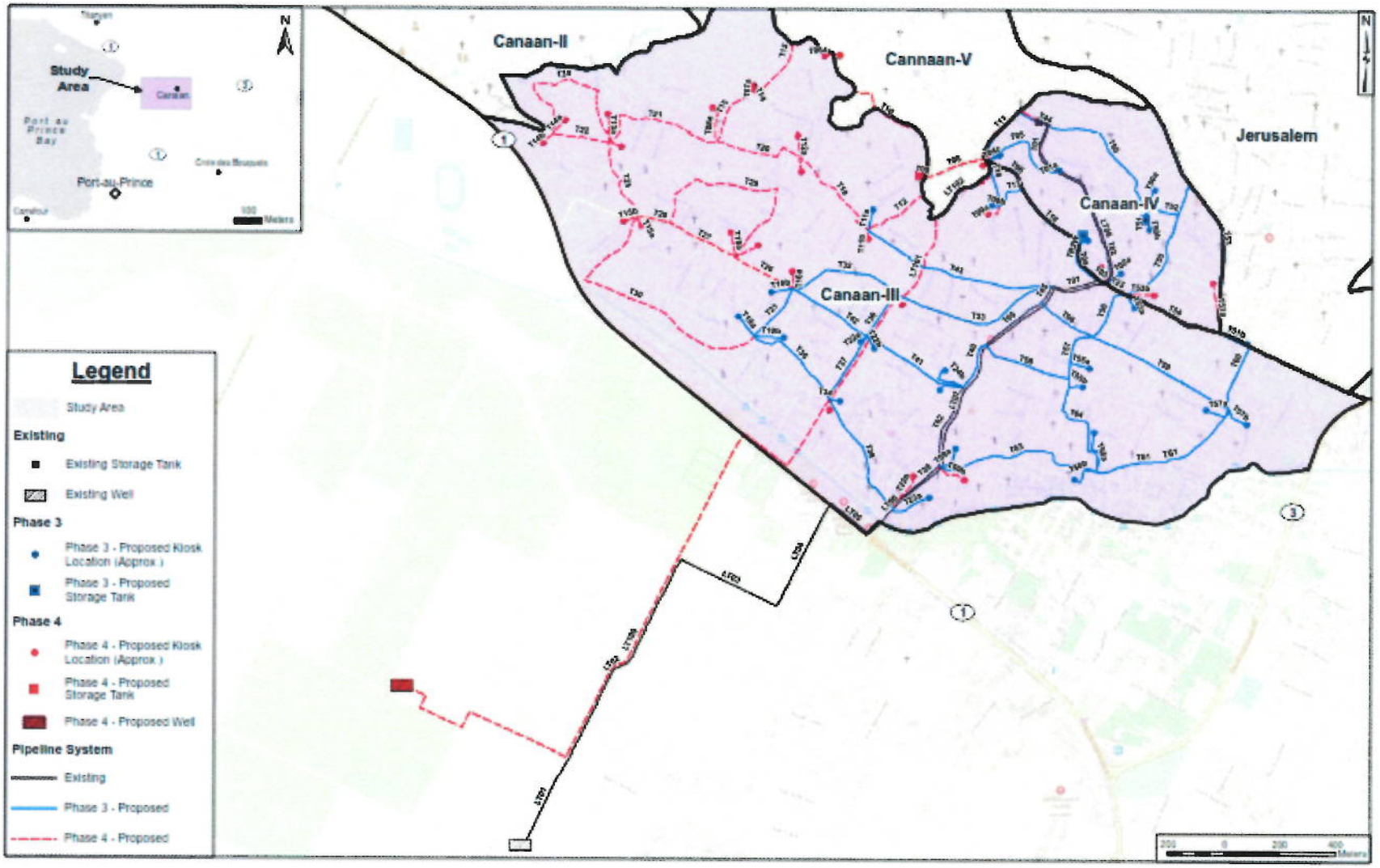

Figure 3 – Coverage limits for Phases 3 and 4 of the Project

3 Environmental Baselines:

3.1 Existing Infrastructure

The Canaan Area is located to the north of Port-au-Prince some 10 km from the Touissant de l'Ouverture Airport. It extends over a territory of approximately 50 km^2 that was declared public utility in reaction to the devastating 2010 earthquake. Access is by road RN1 coming from Port-au-Prince and heading to Cap-Haitian or RN3 from Port-au-Prince en route to Mirebalais. Canaan is comprised of approximately 15 neighborhoods and various reports place the current resident population at more than 200,000 people. The USAID Water and Sanitation project performed initial infrastructure assessment evaluations covering seven principal zones (or neighborhoods), which are presented in Figure 1.

The American Red Cross and USAID financed the installation of a well, reservoir, and connecting transmission lines for the Canaan area in 2018. The Project will complete the work on that first transmission line phase and build the water distribution system. The existing well, transmission line and reservoir (hereto referred to as a tank) are shown in Figures 2 and 3. **A preliminary concept for future distribution lines is also depicted in Figure 2, as conceived in a previous design report (Northwater International, 2018).** The well is known as C-1 and is located in the Sibert well field. The tank is located at an elevation of approximately 116 m, while the ground elevation at the well is approximately 14 m. The pump is driven by a 3-phase, 460 V, 8-inch Franklin motor with a 100 HP rating. The site of the well includes a well house, 135 KW generator, controls, valves and flow meters, and other appurtenances. A connection and the associated infrastructure to the EDH power grid is not present.

The tank is referred to as R10 and has 500 m^3 capacity and inner dimensions of approximately 10.5 m x 11.5 m x 4.2 m. Water treatment is not part of the current system.

3.2 Water Availability

3.2.1 The Aquifer in the Plaine du Cul de Sac

In 2017, USAID commissioned a study of the hydrogeological of the aquifer and its potential for water supply to Canaan (Northwater International and REZODLO, 2017). They found that there was less water being taken from the aquifer now than had previously been taken due to the decommissioning of a series of 20 high capacity irrigation wells. These wells had formerly been pumping 40 to 60 million m^3/year.

Based on their analysis of the aquifer, they estimated the recharge rate of the aquifer to be 203,000 m^3/day. The primary area of recharge is the upper Riviere Gris watershed (Figure 4).

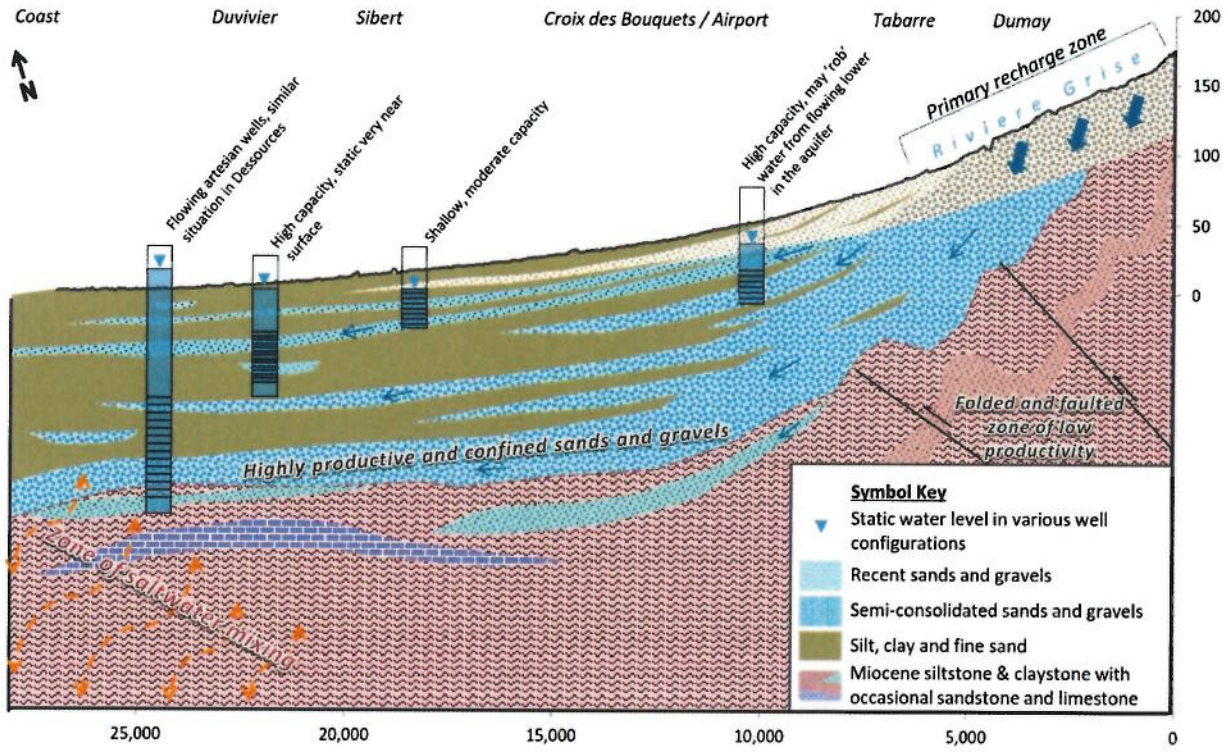

Figure 4. The recharge of the aquifer in the Plaine du Cul de Sac comes primarily from the upper watershed (Northwater, 2017).

They estimated the drawdown of the aquifer to be 172,000 m³/day (Figure 5)

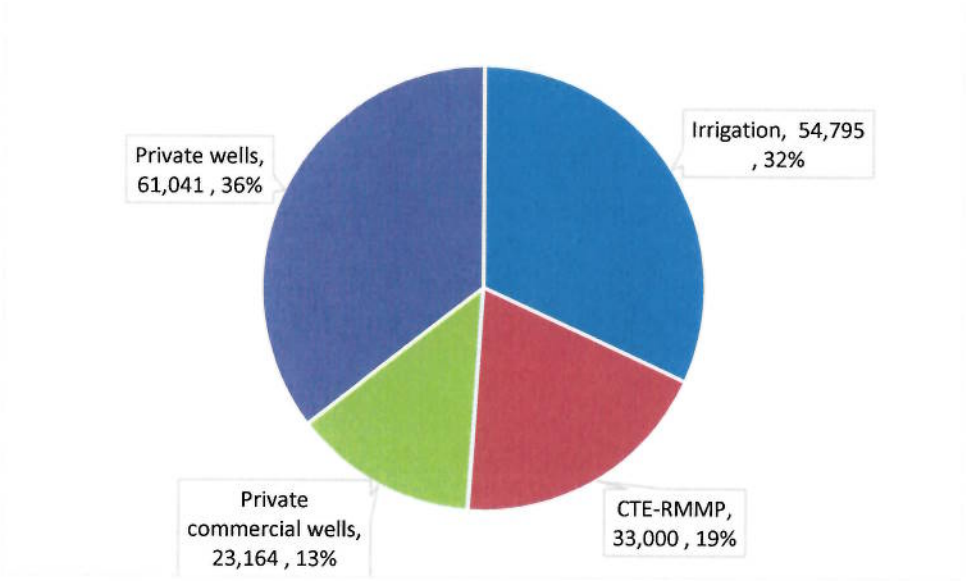

Figure 5. The estimated use of water extracted from the Plaine du Cul de Sac aquifer in cubic meters per day (data from Northwater, 2017).

Based on this analysis, they concluded

> Considering the limitations of this study, it is recommended to limit total abstraction from the Sibert area to 4,000 m³/day, and 2,500 m³/day from the Dessources area. This abstraction represents a fraction of historical pumping rates from the area and is based on a phase that would

include a few production wells with managed withdrawals based on drawdown. Achieving this abstraction may require two to four production wells in Sibert and two or three production wells in Dessources. These suggested limits are considered conservative to account for limited data and resources to guide sustainable withdrawals while minimizing impacts. Further studies and monitoring can better refine these suggestions and guide long-term sustainability for these areas of the aquifer, and the aquifer in its entirety.

Figure 6. Concrete reservoirs or basins such as this one are used to resell water.

3.2.2 Water Production from the C-1 Well

The current well, C-1, and pump installation, together with the DN 250 mm pipeline, is designed to deliver 32.5 l/s to the elevated reservoir. The designers intended that the pump is run for 14 hours per day (Northwater International, 2018), such that the design daily abstraction rate is estimated at 1640 m³/day. While 14 hours is the maximum time that the pumps could be run to allow the aquifer to recover, it would be impractical for the CTE to run the pumps for that long. Most CTEs only operate their pumps for a maximum of eight hours. Eight hours of pumping would yield a total of 920 m³/day.

This represents less than 25% of the 4,000 m³/day that is available on a sustainable basis. Note that these households are already receiving water from the aquifer. However, the per capita consumption of water is expected to rise as water becomes more accessible. Therefore, the impact of this increased pumping on the aquifer will be minimal.

3.2.3 Water Use from the C-1 Well

Of this total, some will be lost to leaks and clandestine connections. In a well-managed system, these losses can be as low as 25%. However, as the Project documented in its Baseline Report, the other water systems in this project have losses of upwards of 60%. As a newly constructed system, the Project is using a modest rate of 40% loss. As a result, the 920 m³/day being pumped should result in 550 m³/day that could be sold.

Currently, few houses in the Canaan area have piped water. Most household purchase water by the bucket from water resellers. These water resellers purchase the water from water trucks and store this water for resale in semi-buried water reservoirs referred to as *basins* (Figure 6). Eventually, private households and businesses in the area should switch to using water from the piped system. Table 1 lists the estimated number of connections that could be served by the C-1 well based on preliminary estimates.

Table 1. Estimated number of the connections by type for the C-1 well.

Demand Type	Connections	Design basis (liters/day)	Total Daily Demand, m^3
Private connection	1,500	300	450
Basins	50	800	40
School	3	1,000	3
Health Center	-	-	-
Businesses	30	1,000	30
Total:	**1,583**		**523**

Meeting the Water Demand for the Rest of Canaan

Canaan is one of the fastest growing communities in Haiti. Its population mushroomed after the 2010 earthquake as people moved into formerly unused land. Initially, the area grew entirely organically. In recent years, USAID and other donors have worked with the Haitian government to establish clear land tenure and to impose structure on the area.

The neighborhoods of Canaan II, III, and IV represent the central core of Canaan. In its baseline report, the Project estimated the population of this area to be 95,000 in 2016. Assuming a 5% annual growth rate, this area will swell to 154,000 people by 2026.

Without access to a piped water system, the per capita water consumption in Canaan is quite low. With the construction of the piped water network and the continual population growth, the water consumption is expected to increase significantly. To meet this higher demand, a second well with a significantly higher capacity is required. There is a potential well site approximately a half kilometer from the C-1 well. The Project has conducted preliminary calculations (Appendix 2) that indicate that this well could produce 64 l/s of water without adversely impacting C-1. If both wells were pumped for eight hours a day, this would yield just under 3,000 m^3/day, still under the Northwater estimate of 4,000 m^3/day. If future studies indicate that a higher drawdown was acceptable, both wells could be pumped for up to 14 hours a day yielding over 5,000 m^3/day.

Figure 6 indicates areas that are best suited for exploitation in the greater Canaan area. It is taken from the 2017 Northwater study, which has been used as the basis for the recommended water sources and existing system as well as the expansion of the production and distribution network that will aliment Canaan for Phase 3 and 4.

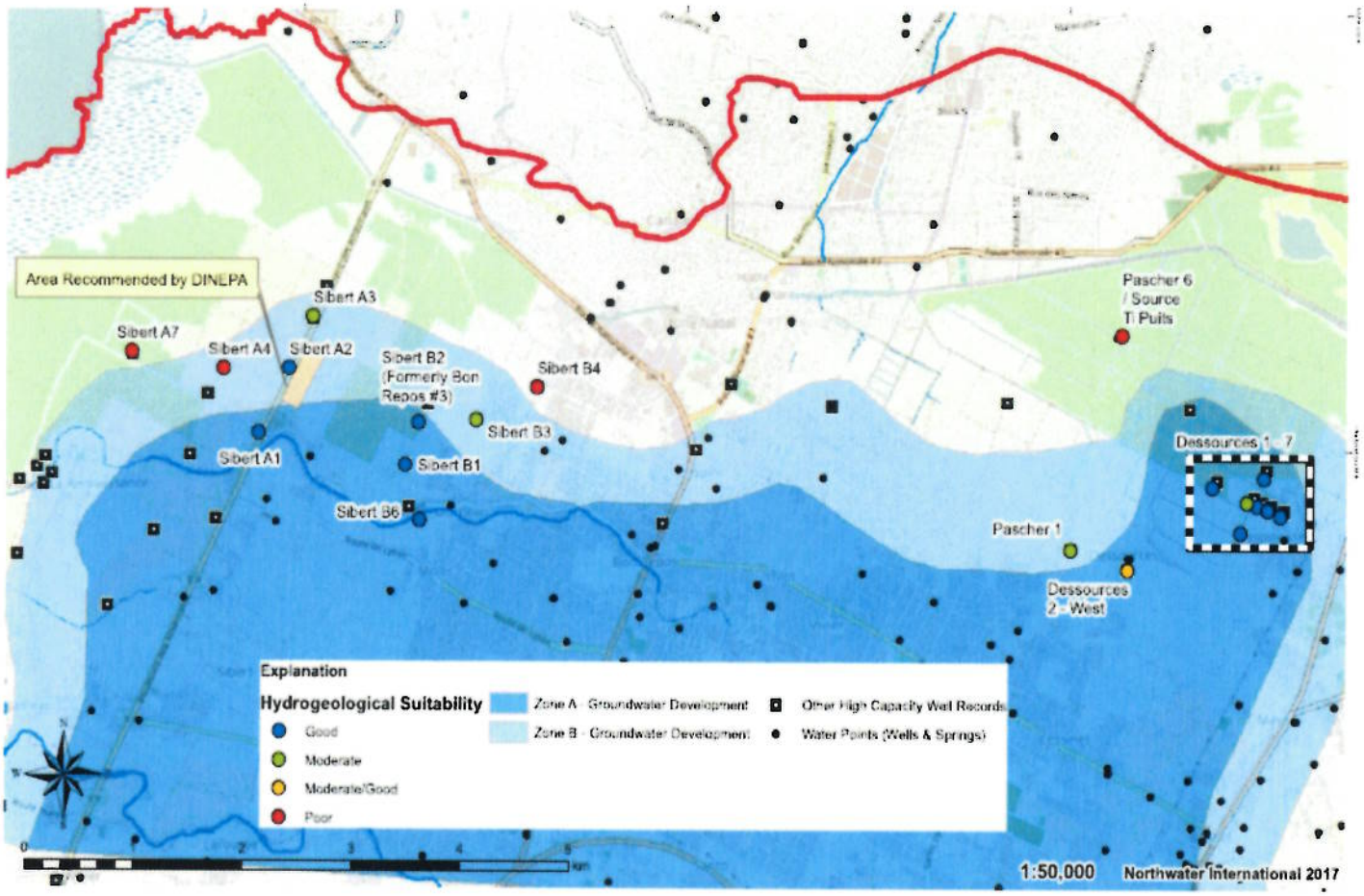

Figure 6. Recommended zones for groundwater development to serve Canaan. Both Zone A and B are considered good areas to develop groundwater resourses, however, Zone A is considered to have a lesser degree of long-term risk.

3.3 Noise

Vehicle traffic is the main human activity that influences the noise level in the targeted cities. The existing noise level is expected to increase while the construction and repair tasks are executed.

3.4 Air quality

There is no monitoring system for air quality in the intervention areas. However, the gas emissions generated by human activities, such as burning waste and the use of fossil fuels, contributes to deteriorating air quality. Air quality is expected to be affected while conducting construction and repairs.

4 Potential Environmental Impacts:

As shown in the summary table below, the activities mentioned in previous sections will have both positive and adverse environmental impacts.

Table 2. Summary of Potential Impacts

Activities	Potential impacts	Impact type	Nature of impacts	Environmental components affected	Likelihood
Water tank and pipe leak repairs; Connection of discharge line section to existing discharge line	Poorer air quality linked to dust produced during excavation	C	-	Air	Med
	Increased noise levels during excavation and/or welding	C	-	Workers, local population	High
	Poorer health of workers	D	-	Workers	Low
	Disturbance in vehicle circulation	I	-	Local communities	High
	Increased risk of accident	D	-	Pedestrians and motorists	Med
	Solid waste accumulation	D	-	Work site	Med
	Reduced water loss from the system and subsequently increased CTE revenue	D	+	Water supplies, CTEs	High
	Improvement of water supply to local communities	D	+	Local communities	High
Installation of protective borehole covers	Reduced risk of contamination of groundwater	D	+	Groundwater	High
Water treatment system repairs	Improvement of water quality supplied to local communities	D	+	Network or water system	High
	Chlorine intoxication/poisoning	D	-	Workers, Local communities	Low
Electrical repairs and power supply, including solar	Injury, shock or electrocution of unprotected workers	D	-	Workers	Med
	Improvement of water supply to local communities	D	+	Local communities	High
Installation and/or repairs/painting of perimeter fencing and gates	Security improvement	D	+	CTEs' facilities	High
	Poorer air quality due to liberation of vocs	D	-	Air	Med

Site clean-up	Reduced disease risk due to elimination of shelter and breeding areas for disease vectors	D	+	Site employees, local communities	High
	Solid waste accumulation and disposal	D	-	Work site	Med

Legend

D: Direct; I: Indirect; C: Cumulative

- Negative impacts + Positive impacts

1 Environmental Mitigation Measures

To mitigate the potential adverse impacts mentioned, we propose the following broad mitigation measures (for details on these measures, please refer to Tables 2 and 3):

- Monitor water quality;
- Submit specifications and design documents to USAID for approval;
- Mark and control access to work sites;
- Wet or dampen the intervention site's grounds before excavation if the soil humidity is too low;
- Cut off electricity to site during electrical repairs/installation using lockout tagout procedures;[1]
- Install signs to indicate changes in traffic patterns;
- Ensure and follow adequate worker health and safety procedures or protocols;
- Inform affected customers at least 48 hours before repairs begin;
- Shut down services in affected areas during repairs;
- Ensure work site debris is transport from the work site to the appropriate dump;
- Cover excavated soil to prevent erosion and dust creation;
- Conduct post-repair disinfection;
- Ensure the proper storage of chlorine and/or hypochlorite;
- Ensure workers wear proper personal protective equipment; and
- Limit the use of equipment and all activities to normal working hours;
- Follow environmental guidelines for well development

It should be noted that the subcontractor or CTE will be responsible for ensuring that their workers are aware of the EMMP and follow the listed mitigation measures; the Project will be responsible for monitoring the overall implementation of the EMMP. This will require some training by the Project's Environmental Compliance (EC) team and regular meetings (daily during the first 3 weeks of work and twice a week after that). The Project's EC team will also closely monitor the mitigation measures. The EMMP mitigation measures will be translated into French with public notices in Creole so that they can be understood and utilized by DENEPA staff, staff of the OREPAs and CTES and subcontractors.

2 Gender

As mentioned in previous sections, the envisioned activities will contribute to improving the water services in the intervention areas of the Project. This will benefit women and men equally. However, there is a possibility that men will be overrepresented (as workers) during the execution phase of the

[1] https://en.wikipedia.org/wiki/Lockout-tagout

activities. To increase women's participation in the relevant tasks, the Project will require that the hired subcontractor does not discriminate based on gender in hiring staff.

3 Climate Change Integration

Haiti is often in the path of tropical storms and hurricanes. These extreme weather events are becoming more frequent due to climate change. Therefore, the piped water networks and associated equipment that will be rehabilitated or installed by the Project will be exposed to the harmful effects of intense rainfall associated with storms and hurricanes. Pipes can be broken which can subsequently lead to contamination of the water network. To reduce this vulnerability, the Project will ensure that repair tasks are executed following the latest standards of DINEPA[2] which include mitigating climate change impacts. These extreme weather events can also damage the solar panels that will be installed by the Project. Based on lessons learn from damages caused by recent devastating hurricanes (Matthew, Harvey, Maria, Irma, etc.), mitigation measures including the following will be implemented to reduce the vulnerability of the solar panels:

- Through-bolting of supports (as opposed to top-down or T clamps) and frequent checking of bolted connections,
- Ensuring ample open space around solar panels (space cleared of large trees or palms),
- Frequent pruning of trees and palms within the site (removal of large branches and fronds),
- Securing all roofs of all buildings/structures on the site, and
- Using pre-fabricated solar panel racks.

However, some proposed activities will also contribute to climate change. A certain quantity of greenhouse gas emissions will be generated due to fossil fuel combustion during the transport of materials/solid waste and repair works. It is important to mention that these emissions will be limited, since the duration of repairs, installation or construction will be relatively short.

[2] « Referentiel Technique National Eau Potable et Assainissement » (https://dinepa.gouv.ht/lereferentieltechnique/)

Table 1. Environmental Screening Form

		Column A		Column B (answer if you checked "yes")	
		YES	NO	High Risk (difficult to mitigate impact)	Medium Risk (can be properly mitigated)
INFRASTRUCTURE (Buildings, roads, WASH, etc.)					
1	Will the intervention involve construction and/or reconstruction/rehabilitation of any type of building? For new construction, if less than 1,000 m^2 = medium risk, if greater than 1,000 m^2 = high risk.	X			X
2	Will the intervention involve building penetrating roads, road rehabilitation and maintenance, or other road related infrastructure (drainage, bridges, etc.)? If penetrating road construction/rerouting = high risk^2, if repair/rehabilitation (improving drainage, resurfacing of existing roads) = medium risk.		X		
3	Will the intervention involve construction or rehabilitation of water and sanitation infrastructure (irrigation systems, potable water, water harvesting, septic systems etc.)? Potable water systems require testing for bacteria, arsenic and other heavy metals.	X			X
4	Will the intervention involve construction or rehabilitation of any other infrastructure such as landfills, incinerators, energy infrastructure, etc.?	X			X
5	Will the intervention involve any kind of construction at all and/or engineering design? If YES, then a USAID Engineer must approve designs per USAID/Haiti Mission Order #36.	X			X
6	Does the intervention require adherence to the national building code or other regulatory standards? Mitigation measures in Table 2.	X			X
7	Does the intervention require local or national planning permissions (i.e. zoning, building permits, etc.)?			N.A.	N.A.
BIOPHYSICAL					
8	Will the intervention involve the use of pesticides of any kind?		X		
9	Will the intervention involve changes in water quality (pollution, sedimentation, stagnation, salinization, temperature change, etc.)?	X			X
10	Will the intervention affect surface or groundwater quantity?	X			X
11	Will the intervention involve training and/or implementation of agricultural practices/production including animal husbandry?		X		
12	Will the intervention involve aquaculture systems?		X		
13	Will the intervention involve the use or disposal of hazardous materials (used engine oil, paint, varnish, lead-based products, fluorescent light bulbs/mercury, batteries, asbestos, or other hazardous or special management waste)? Consider effects to both the biophysical environment and human health.	X			X
14	Will the intervention involve implementation of timber management, extraction of forest products, clearing of forest cover, and/or conversion of forest land by cutting of trees >20 cm diameter at base height (DBH)?		X		
15	Is the intervention in or near (within 50 m) any sensitive terrestrial or aquatic areas including protected areas, wetlands, critical wildlife habitat (including nesting areas), and threatened or endangered species?		X		
16	Will the interventions proposed generate airborne particulates (dust), liquids, or solids (i.e. discharge pollutants) or potentially violate local air standards?	X			X

		Column A		Column B (answer if you checked "yes")	
		YES	NO	High Risk (difficult to mitigate impact)	Medium Risk (can be properly mitigated)
17	Will the intervention create unpleasant odors?		X		
18	Will the intervention occur on steep slopes (greater than 15%)?		X		
19	Will the intervention contribute to erosion?	X			X
20	Will the intervention change existing land use in the vicinity?		X		
21	Is the proposed intervention incompatible with land type (i.e. annual crops on steep slopes, infrastructure on poorly drained soils)?		X		
22	Will the intervention affect unique geologic or physical features?		X		
23	Will the intervention have potential effects on inhabitants, natural landscapes, or flora/fauna downstream from the intervention site?	X			X
24	Will the intervention have a direct or indirect effect or include activities affecting mangroves, coral reefs, and other marine/coastal ecosystems?		X		
GLOBAL CLIMATE CHANGE					
25	Are interventions or outcomes vulnerable to changes in the weather or climate such as changes in precipitation patterns, increased temperatures, or sea level rise?	X			X
26	Does the intervention exacerbate climate change vulnerabilities (i.e. drought, flooding, decrease water supply)?	X			X
27	Will the intervention create greenhouse gas emissions from decomposing waste, burning of organic matter, use of fossil fuels, etc. (consider duration and scale)?	X			X
SOCIO ECONOMIC					
28	Will the intervention contribute to the displacement of people, housing or businesses?		X		
29	Will the intervention affect indigenous peoples and/or unique cultural or historical features?		X		
30	Will the intervention expose people or property to flooding?		X		
ENVIRONMENT & HEALTH					
31	Will the intervention create conditions enabling an increase in illness, diseases, or disease vectors (waterborne, STDs or other)?	X			X
32	Will the intervention generate hazards or barriers for pedestrians, motorists, or persons with disabilities?	X			X
33	Will the intervention involve the use, storage, handling, or disposal of syringes, gauzes, gloves, and other biohazard medical waste?		X		
34	Will the intervention expose workers to occupational hazards?	X			X
35	Will the intervention increase existing noise levels?	X			X
GENDER					
36	Does the intervention inhibit the equal involvement of men and women?		X		
37	Do the intervention results disproportionately benefit/impact men or women?		X		

		Column A		Column B (answer if you checked "yes")	
		YES	NO	High Risk (difficult to mitigate impact)	Medium Risk (can be properly mitigated)
38	Does the intervention/activity involve a sub-award component?	X			
39	Is an operations and maintenance plan required? (generally applies to infrastructure, equipment, road rehabilitation, or water and sanitation action = Yes)	X			

	RECOMMENDED ACTION *(Check Appropriate Action)*:	*(Check)*
(a)	The intervention has no potential for significant effects on the environment. No further environmental review is required.	
(b)	The intervention includes mitigation measures and design criteria that if, applied will prevent a significant effect on the environment. EMMP Required.	**X**
(c)	The intervention has potentially significant adverse environmental effects; therefore, an Environmental Assessment is required to gather additional analysis before implementation may begin. NOTE: This may apply if any potential effects listed above are marked as "High Risk."	
(d)	The intervention has significant adverse environmental effects that cannot be mitigated. Proposed mitigation is insufficient to eliminate these effects and alternatives are not feasible. The intervention is not recommended for implementation. *For sub-awards, do not fund.	

Table 2. Environmental Mitigation

# of the question from Table 2	Action or component with the different tasks required to implement the action.	Description of Impact	Environmental Mitigation Measures
1,5,9,13, 16,19, 23, 25, 31, 32, 34, 35	***Action/Task:*** Site clean-up ***Action/Task***: All tasks associated with water tank and pipe leak repairs ***Action/Task***: All tasks associated within construction of metallic structures ***Action/Task***: Connection of discharge line section to existing discharge line ***Action/Task***: Installation of back-flow prevention systems	a) Injury to local population if they enter work site during construction and repairs b) Worker health issues c) Injury of unprotected workers d) Increased noise level e) Generation of airborne particulates (dust) f) Increased turbidity of surface water near the construction and/or repair site due to erosion of excavated soil g) Intrusion of contaminant into the piped water network during construction and/or repair h) Use of wrong materials, creation of stagnant water leading to vector borne diseases due to poor specifications and design i) Solid waste accumulation	1. Cordon off/mark site before and during the implementation of the activities, and ensure that no unauthorized personnel access the site; 2. Ensure basic personnel protection equipment (PPE), are worn by all workers; 3. Ensure CTEs or hired subcontractor have adequate Health and Safety protocols and procedures and that workers are trained in these protocols/procedures; if not, collaborate with CTEs or subcontractor to develop procedures and associated training for workers; 4. Limit the implementation of the activities to normal working hours; 5. Submit specification and design document to USAID for approval 6. Wet or dampen the intervention site grounds before excavation if the soil humidity is too low; 7. Install signage to indicate vehicle circulation; use flagmen/women as needed; 8. Place dead palm fronds or other coverings on the top of excavated soil to prevent its displacement by wind or rain; 9. Inform affected customers at least 48 hours before the repair work begins; 10. Shut down services in affected area during repairs; 11. Conduct post-repair disinfection; 12. Ensure that solid waste from the work sites is transported to the nearest and best managed solid waste dump; 13. Establish and implement a waste management plan for the work sites.
16, 27, 35	***Action/task:*** All tasks associated with transport of equipment and materials to site as well as transport of solid waste from site to solid waste dump	a. Greenhouse gas emissions b. Increase noise level c. Generation of airborne particulates (dust)	14. Establish efficient transport schedule with construction sub-contractor to limit the number of trips to and from the site; 15. Ensure that all machinery and vehicles are regularly maintained and broken parts (such as mufflers) are replaced immediately;

# of the question from Table 2	Action or component with the different tasks required to implement the action.	Description of Impact	Environmental Mitigation Measures
3, 31	***Action/task:*** Water quality testing	Heavy metals poisoning and/or water-related diseases due to failure of water quality testing	16. Monitor water quality as part of the overall interventions on the systems;
4, 34	***Action/Task***: Electrical repairs and power supply, including solar	Shock or electrocution during electrical work;	17. Ensure electric power supply to all parts of the work site is turned off during solar panel installation and other electrical work using lock out tagout procedures;
10, 26,	***Action/Task:*** Well operation	a) Improper well siting; b) Draw down of water levels in borehole wells due to increasing of pumping duration once pumps are active; c) Lack of adequate water during drought events due to increasing of pumping duration once pumps are active.	18. Use best available information (referenced studies) to determine optimal well site selection; 19. Conduct frequent monitoring of the water levels in the borehole wells and adjust withdrawal regimes as necessary; 20. Include detailed guidelines on pumping duration and adjusted regimes in the Site Operations Manual and CTE training sessions
13, 34	***Action/Task***: installation and/or repairs/painting of building, perimeter fencing and gates	a) Pollution of site from unused paint or discarded paint cans; b) Poor air quality due to liberation of Volatile Organic Composites (VOCs); c) Workers health issues; d) Chlorine intoxication/poisoning.	21. Ensure adequate ventilation or periodic breaks when painting indoor surfaces of buildings; 22. Ensure additional PPE (gloves, coveralls, nose/mouth masks, and eye protection) is worn during handling of chlorine, painting, welding and electrical work; 23. Ensure proper storage of chlorine and/or hypochlorite.
3, 13, 34, 39	***Action/Task***: All tasks associated with equipment operation and maintenance; All tasks associated with water network maintenance	a) Solid waste accumulation; b) Water contamination; c) Workers health issues; d) Increased operation costs, etc.	24. Provide adequate and periodical training to staff operating the water networks; 25. Ensure additional PPE (gloves, coveralls, nose/mouth masks, and eye protection) is worn 26. Evaluate staff performance periodically.

Table 3. Environmental Monitoring

REPORTING NOTE: For this EMMP, implementing partners are required to submit updated versions of Table 5 and any corresponding narratives in all performance reports that are required in the relevant agreement. Generally, this includes quarterly and annual performance reports.

Program, Project, and/or Activity:	**USAID Water and Sanitation Project**
Award Number:	AID-OAA-1-14-00049/720521
Monitoring Period or Quarter:	**Date:**

#	Description of Mitigation Measure (same as in Table 2)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
1	Cordon off/mark site before and during the implementation of the activities, and ensure that no unauthorized personnel access the site	Subcontractor (implementation) - CTE and Project EC team (monitoring)	Work site marked; presence or absence of unauthorized personnel	Work site monitoring	Daily for CTE; Twice a week for EC team	cf. Project staff salaries & subcontractor budget or CT staff salaries	1			
							2			
							3			
							4			
2	Ensure basic personal protection equipment (PPE), e.g., hardhats, vests and boots are worn by all workers during work	Subcontractor (implementation) - CTE and Project EC team (monitoring)	Presence or absence of hardhats, vests and boots	Work site monitoring	Daily for CTE; Twice a week for EC team	cf. Project staff salaries & subcontractor budget, CTE staff salaries	1			
							2			
							3			
							4			
3	Ensure subcontractor has adequate Health and Safety (H&S) protocols and procedures and that	Subcontractor (implementation) - CTE and	Existence of H&S procedures;	Inspection of documents	Once (for procedure) CTE and EC team	cf. Project staff salaries & subcontractor	1			
							2			

#	Description of Mitigation Measure (same as in Table 2)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
	workers are trained in these protocols/procedures; if not, collaborate with CTE and subcontractor to develop procedures and associated training for workers	Project EC team (monitoring)	site H&S records	and records	twice a week (H&S records)	budget or CTE staff salaries				
							3			
							4			
4	Limit the implementation of the activities to normal working hours	Subcontractor (implementation) - CTE and Project EC team (monitoring)	Absence of work outside of normal working hours	Work site monitoring	CTE daily; EC team weekly	cf. Project staff salaries & subcontractor budget or CTE staff salaries	1			
							2			
							3			
							4			
5	Submit specifications and design documents to USAID for approval	Project engineering team	Existence of documents	Inspection of documents	Once (prior to starting subcontractor work)	cf. Project staff salaries	1			
							2			
							3			
							4			
6	Wet or dampen the intervention site grounds before excavation if the soil humidity is too low	Subcontractor (implementation) - CTE and Project EC team (monitoring)	Wet or damp grounds	Work site monitoring	CTE as needed; EC team twice a week	cf. Project staff salaries & subcontractor budget or CTE staff salaries	1			
							2			
							3			
							4			
7	Install signs to indicate changes in vehicle	Subcontractor (implementation) - CTE and	Signs installed	Work site monitoring	CTE as needed; EC team twice	cf. Project staff salaries & subcontractor	1			
							2			

#	Description of Mitigation Measure (same as in Table 2)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
	circulation	Project EC team (monitoring)			a week	budget or CTE staff salaries	3			
							4			
8	Place dead palm fronds or other coverings on the top of excavated soil to prevent its erosion by wind or rain	Subcontractor (implementation) - CTE and Project EC team (monitoring)	Excavated soil properly covered	Work site monitoring	CTE as needed; EC team twice a week	cf. Project staff salaries & subcontractor budget or CTE staff salaries	1			
							2			
							3			
							4			
9	Inform affected water customers at least 48 hours before the repair	CTE (implementation) - Project EC team (monitoring)	Announcements via local media	Record of letter addressed to media	CTE as needed; EC team (once during work)	cf. Project staff and CT staff salaries	1			
							2			
							3			
							4			
10	Shut down services in affected area during repair	CTE (implementation) - Project EC team (monitoring)	Affected area isolated	Work site monitoring	CTE as needed; EC team (once during repair)	cf. Project staff and CT staff salaries	1			
							2			
							3			
							4			
11	Conduct post-repair disinfection	Subcontractor (implementation) - Project EC team (monitoring)	Disinfection is done as needed	Record of consultation post-repair disinfect-tion	CTE as needed; EC team (once after repair)	cf. Project staff salaries & subcontractor budget or CTE staff salaries	1			
							2			
							3			
							4			

#	Description of Mitigation Measure (same as in Table 2)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
12	Ensure that solid waste from the work sites is transported to the nearest and best managed solid waste dump	Subcontractor (implementation) - CTE and Project EC team (monitoring)	Removal of waste to an appropriate end site	Monitoring of solid waste transport and disposal	CTE as needed EC team (Weekly)	cf. Project staff salaries & subcontractor budget or CTE staff salaries	1			
							2			
							3			
							4			
13	Establish and implement a waste management plan for the work sites	Subcontractor (implementation) - CTE and Project EC team (monitoring)	Existence of plan; implementation of measures in plan	Inspection of plan; work site monitoring	Once (for plan); CTE daily and EC team twice a week (implement ation of plan)	cf. Project staff salaries & subcontractor budget or CTE staff salaries	1			
							2			
							3			
							4			
14	Establish efficient transport schedule with construction subcontractor to limit the number of trips to and from the site	CTE and Sub-contractor (implementation) - Project EC team (monitoring)	Existence of schedule	Work site monitoring	Once (for sched.); CTE and EC Team twice a week (impl. of sched.)	cf. Project staff salaries & subcontractor budget or CTE staff salaries	1			
							2			
							3			
							4			

#	Description of Mitigation Measure (same as in Table 2)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
15	Ensure that all machinery and vehicles are regularly maintained and broken parts (such as mufflers) are replaced immediately	Sub-contractor (implementation) - CTE and Project EC team (monitoring)	machinery and vehicles are maintained	Inspection of maintenance records	CTE daily; EC team weekly	cf. Project staff salaries & subcontractor budget or CTE staff salaries	1			
							2			
							3			
							4			
16	Monitor water quality as part of the overall interventions on the systems	Project Engineering Team and CTE	Site operations records	Operations records	Broad tests: once, Bacteria: monthly, Chlorine: weekly	cf. Project staff salaries and CTE staff salaries	1			
							2			
							3			
							4			
17	Ensure electric power supply to all parts of the work site is turned off during electrical repairs and other electrical work using lockout tagout procedures	Sub-contractor (implementation) - CTE and Project EC team (monitoring)	Site health & safety records	Inspection of records	CTE as needed; EC team twice a week	cf. Project staff salaries & subcontractor budget	1			
							2			
							3			
							4			
18	Use best available information (referenced studies) to determine optimal well site selection;	Subcontractor, CTE and Project EC team	Latest studies on aquafer capacity used	Once – prior to final site selection	Project EC team	cf. Project staff salaries				
19	Conduct frequent monitoring of the water levels in the borehole	CTE and Sub-contractor (implementation)	Monitoring records	Inspection of records	CTE and Sub-contractor	cf. Project staff salaries & subcontractor	1			
							2			

#	Description of Mitigation Measure (same as in Table 2)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
	wells and adjust regimes as necessary	- Project EC team (monitoring)			as needed; EC team Twice a week	budget or CTE staff salaries	3			
							4			
20	Include detailed guidelines on pumping duration and adjusted regimes in the Site Operations Manual and CTE training sessions	Project engineering team	Existence of Site Operations Manual & content; training records	Inspection of Site Operations Manual and training records	Once for Site Operations Manual; Project Eng. Team weekly (once training begins)	cf. Project staff salaries	1			
							2			
							3			
							4			
21	Ensure adequate ventilation or periodic breaks when painting indoor surfaces of buildings	CTE and Subcontractor (implementation) - Project EC team (monitoring)	Existence of fans during painting	Work site monitoring	CTE and Subcontractor daily; EC team twice a week	cf. Project staff salaries & subcontractor budget or CTEs staff salaries	1			
							2			
							3			
							4			
22	Ensure additional PPE (gloves, coveralls, nose/mouth masks, eye protection) is worn during handling of chlorine, painting, welding and electrical work	Subcontractor (implementation) - CTE and Project EC team (monitoring)	Presence or absence of PPE	Work site monitoring	Daily for CTE; Twice a week for EC team	cf. Project staff salaries & subcontractor budget or CTEs staff salaries	1			
							2			
							3			
							4			
23		CTE	Presence of	Work site	CTE daily;		1			

#	Description of Mitigation Measure (same as in Table 2)	Responsible Party for implementing and monitoring mitigation measures	Monitoring Methods			Estimated Cost of implementing mitigation measures and monitoring	Results			Recommended Adjustments
			Indicators of implementation	Methods	Frequency		Dates Monitored	Problems Encountered	Mitigation Effectiveness	
	Ensure proper storage of chlorine and/or hypochlorite	(implementation) - Project EC team (monitoring)	sealed chemical containers in proper storage location	monitoring	EC team twice a week	cf. Project staff and CTEs staff salaries	2			
							3			
							4			
24	Provide adequate and periodic training to staff operating the water networks	Project engineering & capacity building teams	Training records and site operations records	Inspection of training and operations records	Twice a week during training; monthly after trainings	cf. Project staff salaries	1			
							2			
							3			
							4			
25	Ensure additional PPE (gloves, coveralls, nose/mouth masks, and eye protection) is worn	Subcontractor (implementation) - CTE and Project EC team (monitoring)	Presence or absence of PPE	Work site monitoring	Daily for CTE; Twice a week for EC team	cf. Project staff salaries & subcontractor budget or CTEs staff salaries				
26	Evaluate staff performance periodically	Project capacity building team	Site operations records	Operations records	Every 6 months after initial training	cf. Project staff salaries	1			
							2			
							3			
							4			

4 Annual Reporting

Annually, the Implementing Partner will prepare an Environmental Mitigation and Monitoring Report (EMMR) to be submitted to the Activity Manager/AOR/COR and the USAID Environmental Compliance Database. This report will summarize the effectiveness of mitigation measures, issues encountered, resolutions, and lessons learned. As appropriate, attachments such as site photos, verification of local inspections, product warranties, etc. should also be included.

External Reports Referenced:

Northwater International. (2018). *Memorandum - Canaan Center Water System.* Port au Prince: American Red Cross.

Northwater International and REZODLO. (2017). *An evaluation of the Plaine du Cul-de-Sac aquifer and its Poential to serve Canaan.* Port au Prince: USAID and American Red Cross

USAID
FROM THE AMERICAN PEOPLE

Marcia Urquhart Glenn <muglenn@usaid.gov>

Re: For REA review/clearance: The EMMP for the Canaan Water System

1 message

Bethzaida Colon <bcolon@usaid.gov> Fri, Feb 28, 2020 at 4:22 PM
To: Abdel Abellard <aabellard@usaid.gov>
Cc: Marcia Urquhart Glenn <muglenn@usaid.gov>, Brianne Sanford <brsanford@usaid.gov>

Hi Abdel and Marcia,

Apologies for the delay in getting back to you on this EMMP. I agree that the EMMP is excellent and very detailed. I just have two very minor edits to the EMMP. One is to delete the 'Recommended Actions" summary table at the end of the Environmental Screening Form since we are no longer using this section to capture the recommended threshold decision. I also included a reference to the Water Quality Assurance Plan in the water quality monitoring mitigation measure.

With these minor updates, I clear by way of this email.

Have a great weekend!

Betzy

On Wed, Feb 5, 2020 at 3:42 PM Abdel Abellard <aabellard@usaid.gov> wrote:

> Good afternoon Betzy,
>
> I am sending, for REA review/clearance, the draft EMMP for 4 components of Canaan water distribution system. I do believe it is a very good EMMp and therefore recommend REA approval. Let me know if you have any questions.
>
> Best,
>
> Abdel,
>
> ---
> From: **Dan O'Neil** <dan_oneil@watsan-haiti.com>
> Date: Wed, Feb 5, 2020 at 8:52 AM
> Subject: RE: The EMMP for the Canaan Water System
> To: Marcia Urquhart Glenn <muglenn@usaid.gov>, Abdel Abellard <aabellard@usaid.gov>

Please find attached the EMMP for the work the development of the water distribution network on the Canaan water system. Although the context of this work is very similar to the work covered by the Umbrella EMMP for "Water Infrastructure Construction and Rehabilitation," we discussed this question with Abdel and agreed that it made sense to have a separate EMMP for Canaan.

Please let us know if you have any questions or concerns with this EMMP.

Thank you,

Daniel O'Neil

Chief of Party

USAID Water and Sanitation Project

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