

SUPPLEMENTARY MATERIAL

TABLE S1. Hazardous events, control measures and compliance of the control measures in 2016 for each system

System No. 1

Process	Hazard event	Control measures	Compliance percentage in 2016
Subsurface catchment	Floods	Defence works to optimise drainage systems. Studies for system improvements.	0%
	Meteorological and climatic phenomena	Defence works to optimise drainage systems. Studies for system improvements.	0%
	Erosive phenomena	Defence works to optimise drainage systems. Studies for system improvements.	0%
	Poor security	Optimisation of the existing security system, e.g. replacement of padlocks, metal covers, plates.	100%
	Droughts	Use of alternative water sources.	100%
Surface catchment	Agriculture	Negotiate with the watershed manager for the regulation of agriculture and livestock in the area.	50%
		Control to avoid the use of chemical products.	0%
		Construction of a new water treatment plant.	0%
	Domestic animals and livestock	Negotiate with the watershed manager for the regulation of agriculture and livestock in the area.	50%
		Establishing a specific area for pig, bovine, sheep and goat livestock.	0%
		Construction of a new water treatment plant.	0%
		Fencing of the water catchment area.	100%
	Poor maintenance	Optimisation of installations in general.	100%
		Continuous monitoring of intakes and rivers. Continuous inspections of facilities.	100%
	Floods	Use of alternative water sources.	100%
		River protection works.	0%
		Ability to close the water intakes.	100%
		Construction of a new water treatment plant.	0%
	Insufficient security staff	Introduce a rotating guard service to control the various treatment units.	0%

	Cesspools and latrines	Investigation of cesspools and studies on treatment systems that minimise the risk of contamination.	0%
	Meteorological and climatic phenomena	Use of alternative water sources.	100%
		River protection works.	0%
		Ability to close the water intakes.	100%
		Construction of a new water treatment plant.	0%
	Poor security	Fencing of the water catchment area.	100%
		Continuous monitoring of intakes and rivers. Continuous inspections of facilities.	100%
		Sealing and waterproofing of the chambers.	0%
		Water piping.	0%
		Optimisation of the existing security system, e.g. replacement of padlocks, metal covers, plates.	100%
	Droughts	Use of alternative water sources.	100%
	Improper recreational use	Fencing of the water catchment area.	100%
		Work with the relevant provincial authority to establish exclusion zones in catchment areas.	70%
	Passage of vehicles through water channels	Water piping in road crossings.	100%
Transport	Infrastructure in poor condition	Plan for maintenance and improvement of obsolete facilities.	100%
		Water piping.	0%
	Pipe breakage	Plan for the maintenance and upkeep of the water supply.	0%
	Poor security	Optimisation of the existing security system, e.g. replacement of padlocks, metal covers, plates.	100%
	Earthquakes	Have prevention and contingency plans in place. Train all staff and conduct drills.	50%
Potabilization	Agriculture	Negotiate with the watershed manager for the regulation of agriculture and livestock in the area.	50%
		Control to avoid the use of chemical products.	0%
		Construction of a new water treatment plant.	0%
	Domestic animals and livestock	Negotiate with the watershed manager for the regulation of agriculture and livestock in the area.	70%
		Establishing a specific area for pig, bovine, sheep and goat livestock.	0%
		Construction of a new water treatment plant.	0%

		Fencing of the water catchment area.	100%
	Insufficient treatment capacity	Optimisation of drinking water systems. Change of support and filter mantle.	0%
		Expansion of the existing facilities.	0%
		Construction of a new water treatment plant.	0%
	Poor maintenance	Optimisation of drinking water systems. Change of support and filter mantle.	0%
	Pollution sources	Investigation of cesspools and studies on treatment systems that minimise the risk of contamination.	0%
		Chromatographic analysis of organophosphate parameters.	0%
		Expansion of the existing facilities.	0%
		Construction of a new water treatment plant.	0%
	Insufficient security staff	Permanent staff for the operation of the water treatment plants.	100%
		Dosing protocol for chemical products.	0%
	Meteorological and climatic phenomena	Expansion of the existing facilities.	0%
		Construction of a new water treatment plant.	0%
	Poor security	Introduce a rotating guard service to control the various treatment units.	0%

System No. 2

Process	Hazard event	Control measures	Compliance percentage in 2016
Subsurface catchment	Agriculture	Application of restrictive measures. Cooperation with the Protected Areas Agency of the Ministry of Environment and Sustainable Production.	100%
		Establishment of minimum distances for agriculture and livestock.	0%
		Application of legislation on prohibitions in the protection zone.	100%
	Conflict with the easement	Negotiate to be able to exercise the rights of the easement already managed without restrictions.	0%
	Arids extraction	Regulation of the arids extraction system - Permanent controls.	100%
	Technical defects of the construction	Sealing and waterproofing of the chambers.	0%
	Floods	Construction of defences in drainage systems.	0%

		Ability to close the water intakes in case of increased turbidity.	100%
	Meteorological and climatic phenomena	Construction of defences in drainage systems.	0%
		Ability to close the water intakes in case of increased turbidity.	100%
	Erosive phenomena	Construction of defences in drainage systems.	0%
	Poor security	Optimisation of the existing security system, e.g. replacement of padlocks, metal covers, plates.	50%
	Droughts	Keep emergency well systems in operation.	100%
		Optimisation of the plant.	0%
		Management with Water Resources for the opening of the dam gate.	100%
		Construction of a new water treatment plant.	0%
Surface catchment	Agriculture	Application of restrictive measures. Cooperation with the Protected Areas Agency of the Ministry of Environment and Sustainable Production.	100%
		Establishment of minimum distances for agriculture and livestock.	0%
		Application of legislation on prohibitions in the protection zone.	100%
		Strict controls on water quality.	100%
		Construction of a new water treatment plant.	0%
	Domestic animals and livestock	Application of restrictive measures. Cooperation with the Protected Areas Agency of the Ministry of Environment and Sustainable Production.	100%
		Establishment of minimum distances for agriculture and livestock.	0%
		Application of legislation on prohibitions in the protection zone.	100%
		Strict controls on water quality.	100%
		Construction of a new water treatment plant.	0%
		Fencing of the water catchment area.	0%
	Poor maintenance	Continuous monitoring of intakes and rivers. Continuous inspections of facilities.	100%
	Floods	Construction of defences in surface catchment.	0%
	Meteorological and climatic phenomena	Optimisation of the plant.	0%
	Poor security	Optimisation of the existing security system, e.g. replacement of padlocks, metal covers, plates.	50%
		Fencing of the water catchment area.	0%

	Droughts	Keep emergency well systems in operation.	100%
		Optimisation of the plant.	0%
		Management with Water Resources for the opening of the dam gate.	100%
		Construction of a new water treatment plant.	0%
Transport	Failure of a material or component	Repair of existing water losses.	50%
	Technical defects of the construction	Optimisation of drainage chambers and air valves.	50%
	Poor maintenance	Maintenance plan for air valves, drainage chambers, etc. and improvement of obsolete facilities.	50%
	Infrastructure in poor condition	Repair of existing water losses.	50%
		Maintenance plan for air valves, drainage chambers, etc. and improvement of obsolete facilities.	50%
	Pipe breakage	Repair of existing water losses.	50%
	Erosive phenomena	Defence works in the sections of the aqueduct most likely to be affected.	0%
	Poor security	Optimisation of the existing security system, e.g. replacement of padlocks, metal covers, plates.	50%
	Earthquakes	Have prevention and contingency plans in place. Train all staff and conduct drills.	50%
Potabilization	Agriculture	Application of restrictive measures. Cooperation with the Protected Areas Agency of the Ministry of Environment and Sustainable Production.	100%
		Establishment of minimum distances for agriculture and livestock.	0%
		Application of legislation on prohibitions in the protection zone.	100%
		Strict controls on water quality.	100%
		Construction of a new water treatment plant.	0%
	Domestic animals and livestock	Application of restrictive measures. Cooperation with the Protected Areas Agency of the Ministry of Environment and Sustainable Production.	100%
		Establishment of minimum distances for agriculture and livestock.	0%
		Application of legislation on prohibitions in the protection zone.	100%
		Strict controls on water quality.	100%
		Construction of a new water treatment plant.	0%
		Fencing of the water catchment area.	0%
	Insufficient treatment capacity	Optimisation of the plant.	0%

		Construction of a new water treatment plant.	0%
	Power outage	Install emergency generators.	0%
	Pollution sources	Monitoring and control of the disposal of waste water.	0%
	Meteorological and climatic phenomena	Optimisation of the plant.	0%
		Construction of a new water treatment plant.	0%
	Poor security	Permanent surveillance, control of the relevant water quality parameters.	100%

System No. 3

Process	Hazard event	Control measures	Compliance percentage in 2016
Subsurface catchment	Conflict with the easement	Regularisation of property.	100%
	Technical defects of the construction	Waterproofing / Optimization of drainage chambers and valves.	100%
	Floods	Channelisation of storm water drains.	33%
		Defence works for the cameras. Canalisation of the river.	33%
		Waterproofing / Optimization of drainage chambers and valves.	33%
	Meteorological and climatic phenomena	Channelisation of storm water drains.	33%
		Defence works for the cameras. Canalisation of the river.	33%
		Waterproofing / Optimization of drainage chambers and valves.	33%
	Erosive phenomena	Defence works for the cameras. Canalisation of the river.	100%
	Poor security	Cover chambers - Installation of padlocks - Security systems.	100%
	Droughts	Well optimisation - Search for alternative sources.	100%
Transport	Technical defects of the construction	Verification of the sections most susceptible to the action of pressure.	100%
	Poor maintenance	Maintenance work on the valves. Coordinated operational work to avoid unfavourable manoeuvres. Pressure monitoring and recording.	100%
	Pressure fluctuations	Maintenance work on the valves. Coordinated operational work to avoid unfavourable manoeuvres. Pressure monitoring and recording.	100%
	Pipe breakage	Repair of existing water losses. Assessment of sections of the aqueduct affected due to defective installation and planning of replacement measures.	100%

Potabilization	Earthquakes	Have prevention and contingency plans in place. Train all staff and conduct drills.	100%
	Poor security	Cover chambers - Installation of padlocks - Security systems.	100%
	Inadequate disinfection	Commissioning of the disinfection system with chlorine gas in compliance with all safety regulations.	100%
	Meteorological and climatic phenomena	Channelisation of storm water drains.	50%
		Defence works for the cameras. Canalisation of the river.	50%

System No. 4

Process	Hazard event	Control measures	Compliance percentage in 2016
Groundwater catchment	Inadequacies in operating conditions	Control plan for old wells (in operation for approx. 15 years).	33%
		Work plan to verify that the depth of installation in relation to the position of the filters is consistent with the static level.	33%
		Work plan to control static and dynamic levels.	33%
	Power outage	Install generators in all wells or in wells in high supply areas. Adapt facilities for connecting generators.	40%
		The pre-feasibilities must make do with installations suitable for power generators.	20%
		Plan for interconnection of systems.	40%
	Unsafe dynamics of the aquifer	Watershed study requirements.	100%
	Technical defects of the construction	Remedial measures in case of construction defects.	50%
		Permanent inspection during construction works according to the requirements of the applicable regulations.	50%
	Poor maintenance	Control plan for old wells (in operation for approx. 15 years).	25%
		Work plan to verify that the depth of installation in relation to the position of the filters is consistent with the static level.	25%
		Include new wells in a predictive maintenance plan.	25%
		Improve obsolete facilities that are in use: Infrastructures, fences, chlorination plants, control panel, etc.	25%
	Pollution sources	Plan for interconnection of systems.	25%
		Take measures against polluting elements.	25%
		Search for alternative sources.	25%

		Permanent water monitoring.	25%
	Infrastructure in poor condition	Improve obsolete facilities that are in use: Infrastructures, fences, chlorination plants, control panel, etc.	100%
	Poor security	Improve the security system of each well to prevent vandalism.	100%
	Earthquakes	Have prevention and contingency plans in place. Train all staff and conduct drills.	100%
Potabilization	Power outage	Install generators in all wells or in wells in high supply areas. Adapt facilities for connecting generators.	50%
		The pre-feasibilities must make do with installations suitable for power generators.	50%
	Inadequate disinfection	Monitoring and control of the disinfection systems.	100%
	Poor maintenance	Improve obsolete facilities that are in use: Infrastructures, fences, chlorination plants, control panel, etc.	100%
	Pollution sources	Establishment of environmental base line in each of the deep well sources.	100%
	Infrastructure in poor condition	Improve obsolete facilities that are in use: Infrastructures, fences, chlorination plants, control panel, etc.	100%

System No. 5

Process	Hazard event	Control measures	Compliance percentage in 2016
	Pressure fluctuations	For new replacements, use pipes of suitable materials and pressure to prevent water or pressure surges from affecting the network.	50%
		Permanent monitoring and recording of pressures.	50%
	Technical defects of the construction	Replacement plan for networks and valves with repeated breaks.	50%
		Inspect new connections and the quality of the material.	50%
	Poor maintenance	Permanent monitoring and recording of pressures.	9%
		Replacement plan for networks and valves with repeated breaks.	9%
		Maintenance plan for valves and valve chambers.	9%
		Network cleaning plan for different systems (wells, cisterns, pumps, tanks, etc.).	9%
		Optimisation of the reserve tanks.	9%
		Drain maintenance and installation.	9%
		Sealing of cisterns.	9%

		Cleaning of cisterns.	9%
		Renovation of facilities, maintenance of lighting.	9%
		Keep distribution network maps up to date.	9%
		Weed control in the installations.	9%
	Infrastructure in poor condition	Maintenance plan for valves and valve chambers.	14%
		Replacement plan for networks and valves with repeated breaks.	14%
		Optimisation of the reserve tanks.	14%
		Drain maintenance and installation.	14%
		Sealing of cisterns.	14%
		Renovation of facilities, maintenance of lighting.	14%
		Weed control in the installations.	14%
	Pipe breakage	Replacement plan for networks and valves with repeated breaks.	25%
		When repairing pipes, check for contamination and check the pressure.	25%
		Plan for interconnection of systems.	25%
		Keep distribution network maps up to date.	25%
	Construction sites	Coordinate with companies or organisations carrying out works on public roads that affect our infrastructure. Inspection of works carried out on public roads.	100%
	Pressure fluctuations	Permanent monitoring and recording of pressures.	100%
	Earthquakes	Have prevention and contingency plans in place. Train all staff and conduct drills.	100%
	Unauthorized water connections	Permanent monitoring of the water connection, imposition of fines.	100%
	Disruption of supply	Water distribution plan with tankers in affected areas.	33%
		Permanent control of chlorination in the affected areas and of tankers.	33%
		Plan for interconnection of systems.	33%