WATER SAFETY PLAN

KOROR-AIRAI WATER SUPPLY

Step 1: Flow Chart

Catchment & Intake

Source: 1. Freshwater stream – Ngerikiil River
2. Freshwater Dam – Ngerimel Dam

Production (Max): Total of 4 million gallons per day (Ngerikiil River – 1m gallon; Ngerimel Dam – 3m gallons)

Ngerimel Dam

- The Ngerimel Dam has a storage capacity of 20 m gallons of water.
- The catchment consists of forest vegetation dominated by trees, shrubs and grass.
- The intake is located at a dam situated in a valley surrounded by high mountains.
- The catchment is fairly well protected and there is minimal human activity within the catchment area.
- Since the catchment is not fenced off, animals such as chickens, goats, pigs, cattle and/or horses could access the catchment and/or the intake.
- This could have a potential effect on the water quality.

Ngerimel Dam

Ngerikiil River

Ngerikiil River

- The Ngerikiil River is a freshwater stream running through a catchment that is widely used for residential and/or agricultural purposes.
- The catchment consists mostly of forest vegetation dominated by trees, shrubs and grass. The natural vegetation is disturbed in parts by extensive clearing for cultivation of crops.
- The catchment is not so well protected and there is considerable human activity within the catchment area.
- Since the catchment is not fenced off, animals such as chickens, goats, pigs, cattle and/or horses could access the catchment and/or the intake. This could have a potential effect on the water quality.
- The Ngerikiil River is known to supply water even during periods of prolonged drought, although the water level does tend to drop during drought.

Treatment

- A total of 4m gallons of water per day is fed into the Koror-Airai water treatment plant located in Airai State. One million gallon of water is pumped to the treatment plant from the Ngerikiil River while the remaining 3 m gallons is gravity fed into the treatment plant from the Ngerimel Dam.
- Water from both intakes is collected in chamber called the wet well.
- Alum, Lime and activated Carbon are added at the wet well.
- From the wet well, water is pumped into a series of clarifiers for removal of suspended solids. The sludge from the clarifiers is diverted to a series of drying beds.
- From the clarifiers, water is then diverted into a series of five (5) Automatic Gravity Valve-less (AVG) filters. Filtered water is collected in a separate chamber called the clear well. At the clear well, water is chlorinated before distribution.

Water from the two sources is collected at the Wet Well.

Automatic Gravity Valve-less filters

Clarifiers

Sludge drying bed

Distribution

- The Koror-Airai system supplies water to Koror and Airai states.
- Water is gravity fed into the distribution network.
- Some Households supplement the reticulated supply with Rainwater Catchment
- Some Households also have holding tanks to store reticulated water

Need more information….

Step 2: Worksheets

Catchment & Intake

List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)	Is this under control?	If not, judge whether this needs urgent attention. *Urgent attention is needed for something that happens a lot and/or could cause significant illness.*
Drying up of the Ngerimel Dam due to drought events	No	Yes
Contamination from Agricultural Chemicals	No	Yes
Increased turbidity due to deforestation e.g. for agriculture or wild fires	No	Yes
Contamination from road runoff e.g. from oil and petrol leaks/spills	No	Yes
High Sediment load from flooding during periods of heavy rainfall	No	Yes
Contamination from human and animal faeces due to open access to Intake for people and animals especially at Ngerikiil River	No	Yes
Contamination or damage to infrastructure due to Sabotage and/or vandalism	No	Yes
Feacal Coliform contamination from residential / recreational activities within the catchment and intake areas	No	Yes

Storage & Treatment

List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)	Is this under control?	If not, judge whether this needs urgent attention. *Urgent attention is needed for something that happens a lot and/or could cause significant illness.*
Chemical contamination	No	Yes
Increased turbidity and/or coliform levels due to in adequate dosing of chemicals such as Chlorine, Alum, Lime and activated Carbon	Yes	Routine tests to ensure correct dosing
Insufficient funds to buy relevant equipment, carry out repairs and maintenance etc	No	Yes
Not enough chemicals in stock (running out of chemicals such as Chlorine etc)	Yes	Proper stock control procedures in place to avoid the problem of running out of chemicals
Contamination or damage to infrastructure due to Sabotage and/or vandalism	Yes	The treatment area is well fenced and there are security personnel onsite at all times.
Damage to storage tanks due to aging Infrastructure	Yes	Regular monitoring of infrastructure conditions and maintenance when needed
Power Outage	Yes	A back-up generator on-site to continue operations during power outage.

Distribution

List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)	Is this under control?	If not, judge whether this needs urgent attention. *Urgent attention is needed for something that happens a lot and/or could cause significant illness.*
Increase in water loss from pipe breakages due to aging pipes	No	Yes
High water loss due to unattended and/or un-reported leakages in the distribution lines	No	Yes
Backflow contamination and/or cross contamination from household/rainwater storage tanks connected to water mains	No	Yes
Incorrect analysis data due to un calibrated laboratory equipment	Yes	Regular calibration of analytical equipment; cross-check /validation of data by EQPB
Point of use contamination due to improper hygiene practices	No	Yes

Step 3: Plan to Manage the Risks

Catchment & Intake

Risks that 'Needs Urgent Attention'	Improvement Schedule: How can you remove or reduce or remedy the cause and by when? Indicate where additional resources will be needed.	Until remedied, how will you know when this is actually causing deterioration towards unsafe drinking water?	What contingency management plan is in place until the cause is removed, reduced or remedied? Who needs to know and how quickly? Who can help?
Drying up of the Ngerimel Dam due to drought events	Establish / identify a back-up Intake and/or storage system for drought events	No water in the dam (or critically low levels)	Public Notices to collect water to be broadcasted over the media during drought;
Contamination from Agricultural Chemicals	Establish buffers (vegetation) between agricultural land and intake areas (river/stream)	Water appears, smells or tastes unusual; water quality monitoring indicates contamination	Shut off the system, flush the system out; place public messages over local media advising consumers to take precautionary measures
Increased turbidity due to deforestation e.g. for agriculture or wild fires	Improved land use management/ planning within the catchment	The turbidity levels rise significantly within short period of rainfall	Place public messages over local media advising consumers to take precautionary measure e.g. boiling
Contamination from road runoff e.g. from oil and petrol leaks/spills	Improve drainage around roads to divert runoff away from the intake areas	Water appears and/or smells of oil and/or petrol	Shut off the system, flush the system out
High Sediment load from flooding during periods of heavy rainfall	Better filtration system in place to remove suspended solids	The water appears muddy	Public Notices to collect water will be broadcasted over the media during heavy rainfall; Shut off the system during periods of heavy rain

Contamination from human and animal faeces due to open access to Intake for people and animals especially at Ngerikiil River	Fencing off the intake area; place warning signs for the public	Water appears, smells or tastes unusual; water quality monitoring indicates contamination	Place public messages over local media advising consumers to take precautionary measure e.g. boiling
Contamination or damage to infrastructure due to Sabotage and/or vandalism	Fence off the intake to prevent trespass. Hire security personnel.	Water appears, smells or tastes unusual; water quality monitoring indicates contamination; no water in system	Warning messages over local media discouraging trespass and sabotage; strict penalties for trespassers; warning signs
Feacal Coliform contamination from residential / recreational activities within the catchment and intake areas	Establish stringent catchment management plans to prevent human and/or animal sewage contamination	Water appears, smells or tastes unusual; water quality monitoring indicates contamination	Place public messages over local media advising consumers to take precautionary measure e.g. boiling

Storage & Treatment

Risks that 'Needs Urgent Attention'	Improvement Schedule: How can you remove or reduce or remedy the cause and by when? Indicate where additional resources will be needed.	Until remedied, how will you know when this is actually causing deterioration towards unsafe drinking water?	What contingency management plan is in place until the cause is removed, reduced or remedied? Who needs to know and how quickly? Who can help?
Chemical contamination		Water appears, smells or tastes unusual; water quality monitoring indicates contamination	Place public messages over local media
Insufficient funds to buy relevant equipment, carry out repairs and maintenance etc	Allocate extra funding in local budget; seek external funding sources; complete WSP to use as justification for more funds for capital improvements	Water appears, smells or tastes unusual; water quality monitoring indicates contamination	Place public messages over local media advising consumers to take precautionary measure e.g. boiling

Distribution

Risks that 'Needs Urgent Attention'	Improvement Schedule: How can you remove or reduce or remedy the cause and by when? Indicate where additional resources will be needed.	Until remedied, how will you know when this is actually causing deterioration towards unsafe drinking water?	What contingency management plan is in place until the cause is removed, reduced or remedied? Who needs to know and how quickly? Who can help?
Increase in water loss from pipe breakages due to aging pipes	Regular checks and maintenance/ replacement of pipes and/or fittings	Increased leakages and low pressure within the distribution network	Place public messages over local media advising consumers to take precautionary measure e.g. boiling
High water loss due to unattended and/or un-reported leakages in the distribution lines	Regular checks and maintenance/ replacement of pipes and/or fittings	Increased leakages and low pressure within the distribution network; more consumer complaints about leaking pipes etc	Place public messages over local media advising consumers to take precautionary measure e.g. boiling
Backflow contamination and/or cross contamination from household/rainwater storage tanks connected to water mains	Disconnect existing cross connections; discourage connection of private tanks to water mains	Low pressure	Warning messages over media; Public awareness
Point of use contamination due to improper hygiene practices	Public education/awareness about proper hygiene practices	Increased complaints from consumers	Place public messages over local media