ANNEX 8 – REVISED WATER PLAN

Government of Nauru

Plan for Long Term Water Supply for Nauru

A coordinated plan to achieve a safe and reliable potable water supply in Nauru

Draft plan prepared through the cooperation of:

- Ministry of Health
- Ministry for Industry and Economic Development
- Nauru Phosphate Corporation
- Nauru Rehabilitation Corporation
- World Health Organization

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Objectives of Nauru Water Plan

The objectives of the Nauru Water Plan are:

1. To provide safe potable water to the residents of Nauru;
2. To ensure that the water supply is sustainable in perpetuity;
3. To provide an adequate amount of water for the needs of all residents;
4. To ensure a reliable water supply even during prolonged droughts;
5. To safeguard the environment and the ecology of Nauru;
6. To ensure potable water is affordable by all residents;
7. To have efficient distribution of water;
8. To make best use of existing resources, facilities and skills;
9. To conserve resources and energy; and
10. To provide a culturally acceptable water system.

Safe Water Supply

1. Potable water for households, schools, commercial buildings, hotels, restaurants and similar uses must be safe, clean, clear and potable.
2. Potable water must come from collection of rainwater, desalination of seawater or extraction of freshwater from the groundwater. Potable water also may be produced by private desalination units operated using seawater or brackish water.
3. Household gutters and storage tanks must be cleaned periodically to ensure they do not harbour rodents, mosquitoes or pathogenic bacteria.
4. Water transport trucks, tanks and pipelines must be kept clean and should be disinfected periodically to ensure they do not contaminate the water.

Amount of Potable Water Supply

1. The amount of potable water required by each resident in Nauru is 100 litres per day. This corresponds to 1230 t/d for the estimated future population of 12,300 persons (residents and visitors). [Note: 100 litres = 22 gallons]
2. The daily potable water allowance of 100 litres per day represents an essential base supply of 30 litres/day for drinking, cooking, washing and cleaning, and an additional allowance of 70 litres/day for showers, washing clothes and other household purposes.
3. Because of the shortage of water in Nauru, it is planned that brackish well water (or seawater where piped to houses for sewerage) will be used by all residents in the coastal strip for toilet flushing and other non-potable purposes.
4. Brackish water cannot be used by residents and visitors at topside, as the discharge of brackish water to the ground would add salt and other contaminants to the groundwater resource. Hence an additional 70 litres per day of fresh water must be supplied for each person living on topside (making a total of 170 litres per person per day for persons on topside).
5. The following additional allowances for potable water are made for commercial and government establishments:

- Hospitals and related buildings 40 t/d
- Hotels and guesthouses 100 t/d
- Restaurants and cafes 40 t/d
- Laundry and workshops 30 t/d
- Schools and preschools nil (included in household use)
- Commercial/offices 60 t/d

6. Adding household and other uses for potable water, the total amount required in the future is 1500 t/d.

Existing Situation

1. Many residents are concerned about restrictions in the supply and delivery of water.

2. The existing desalinator at the power station supplies 950 t/d of high quality potable water and the remainder must come from rainwater and brackish well water.

3. There are no definitive records of the distribution of water from the desalinator. The current best estimate of the distribution of desalinated water, based on available NPC records for the dry period of 1998/2001, is as follows:

* Truck supply to households	350 t/d
* Hospitals and related buildings	140 t/d
* NPC houses and foreign workers	130 t/d
* NPC location housing by tender	45 t/d
* Menen hotel	40 t/d
* Other hotel and restaurants	20 t/d
* Laundry, workshops and settlement	95 t/d
* Losses and unaccounted water	130 t/d.

4. When the desalinator is not operating the island faces a severe water shortage.

5. The desalinator requires periodic maintenance which could take 1 to 2 weeks twice each year. A backup or alternative supply is required for these times.

6. The island has periodic droughts (about every nine years) and rainwater collection is not sufficient except in wet years to provide an adequate water supply.

7. The brackish groundwater from wells used as an alternative supply has high coliforms and high dissolved solids and the brackish groundwater s not suitable as a potable supply.

8. Extraction of too much groundwater from wells around the perimeter of the island may be causing seawater intrusion and threatening the supply of freshwater to the roots of coastal plants.

9. Until a comprehensive hydrogeological study is completed, it is not known whether the groundwater lens beneath topside can supply water reliably or not, particularly during prolonged droughts.

10. About half the houses have roof gutters and water storage tanks and half do not. Many of the gutters need repair and maintenance.

11. It is recognized that the only practical option is to build from the existing arrangements for producing, distributing and storing potable water. These arrangements involve the existing desalinator (future capacity of 950 t/d), existing storage tanks (needing repair), existing household rainwater collection systems and trucks to distribute water. A new desalinator is under construction at the Menen Hotel and the supplier advises the long term capacity is 120 t/d.

Desalination Options

1. Present production of the existing desalination unit averages 950 t/d. A new RO unit of about 120 t/d, will be installed at Menen Hotel, taking total the desalination capacity to 1070 t/d. There is an inexhaustible supply of seawater for desalination;
2. Desalination provides a safe water supply: the desalinated water has very low levels of salt and metals and no pathogens. There is little risk of adverse environmental effects.
3. The cost for producing water with the existing desalinator at $2.90/t is lower than for all other options.
4. The existing desalination plant is deteriorating due to exposure to sea air, power station (acid gas) fumes and lack of maintenance. Without regular maintenance, the existing plant has a remaining service life of 4 to 5 years.
5. A new desalination plant could be purchased. Various types of desalination processes may be suitable, including the RO process or vapour distillation. The cost for producing water at a new desalinator would be $4.00/t.

Option A: New arrangements for existing desalinator as in Option B plus purchase another desalinator with capacity of about 500 t/d. Would ensure **reliable and satisfactory** water supply and desalinators should last another 20 years. This option has higher operating costs, as there are two desalinators to be operated and maintained.

Option B: Provide funds (about $200,000/year) to maintain existing desalinator, and storage (up to 30,000 t) to allow desalinator to be closed for 2 weeks for annual maintenance. Would ensure **reliable but limited** water supply and desalinator could last another 15 to 20 years.

Option C: Continue present arrangements, with minimum maintenance of existing desalinator. Would expect periodic failures and water emergencies, and desalinator could last for only about 4 to 5 years

Rainwater Options

1. Nauru has wet years (2600 mm/yr to 4600 mm/yr rainfall) one-third of the time and dry years (400 mm/yr to 2000 mm/yr) two-thirds of the time. The 83 year rainfall record shows droughts every nine years on average, with many droughts lasting two or three years. In the most recent 1998-2000 drought, the annual rainfall averaged 463 mm/year.
2. Even in a year with average rainfall, the rainwater collected on household roofs will not meet the household demand for potable water. The situation is worse in dry or drought years. It is more economical (and more feasible) to supply water from a desalinator or a national rainwater collection system than to provide very large roofs and tanks at each house.
3. To maximise the collection of rainwater on the island, each household should have well-maintained guttering and a large water storage tank. Rainwater also should be collected on commercial buildings.
4. The flat land beside the airport runway within the airport boundary could be developed as a rainwater catchment. The rainfall that could be collected from the airport catchment would supply over 1 t/d to each household in an average year and 0.3 to 0.4 t/d in a dry year.
5. A 30,000 t water storage is required. This can be constructed by rehabilitating existing tanks. The available storage capacity on the island in existing tanks is 40,080 t.
6. A backup water supply would be required for extreme drought years.

Option A: Encourage householders to collect and store rainwater, as in Option B, plus construct national rainwater collection system beside the airport runway. This option would ensure **reliable and satisfactory** rainwater water supply and avoid need to purchase another desalinator. Existing desalinator would keep operating.

Option B: Encourage householders and building owners, through community education and government supply of guttering and plumbing advice, to progressively upgrade their rainwater systems. Existing desalinator would keep operating.

Option C: Continue present arrangements, with householders making their own decisions about tanks and rainwater collection.

Groundwater Options

1. The potential secure supply of groundwater in average or low rainfall years could be up to 850 t/d. However, in a prolonged drought the safe yield could be less than 500 t/d. Hence groundwater is not yet confirmed as a reliable long term potable water source.
2. Extraction wells must be limited to very low pumping rates (<0.1 L/s) or seawater will intrude into the freshwater lens. A long horizontal infiltration gallery may be required to safely extract groundwater, which would have a high capital cost.
3. There is a high risk that overpumping could occur and destroy the groundwater with resultant ecological effects.
4. There also is a significant risk of contamination of groundwater from human activities (rubbish dump, slime storage, new houses above).
5. The cost of groundwater would be about $2.35/t. which is less than the cost of water from the new desalinator and airport rainwater other options.
6. Removal of too much groundwater from the centre of the island could increase the intrusion of seawater around the perimeter of the island, which would have adverse effects on coastal trees and other vegetation using the groundwater.
7. In summary, groundwater is not yet a proven supply and its sustainable extraction may prove a difficult task.

Option A: Carry out comprehensive groundwater study and prepare 10-year plan for safe extraction of fresh water from the groundwater, possibly as a supply in droughts. Continue to use brackish water around the perimeter in households, with discharge of all wastewater through septic tanks and soil infiltration beds. Existing desalinator would keep operating and rainwater tanks required.

Option B: Make limited study of groundwater and commence pumping from a few trial bores at very low rates. Carry out detailed monitoring program to establish effects on groundwater. This is the economy option, with higher risk.

Option C: Continue present arrangements, with no study of groundwater, and each landowner making his/her own decisions about bores and pumping. Take the risk of groundwater contamination, pollution and over-pumping.

Actions to Implement the Nauru Water Plan

1. *Task Force to **Complete Development and Documentation** of Nauru Water Plan (this task force should consult with government and the community in the development of the Nauru Water Plan).*
2. *Review and Adoption of Nauru Water Plan **by Government**.*
3. *Task Force for **Community Awareness and Responsibilities** for new Nauru Water Plan (perhaps in conjunction with Nauru Water Week), including advice on water conservation, safe water storage and related matters including mosquito control and safe wastewater discharge (for example, through septic tanks and infiltration trenches).*
4. *Action Plan for **Rainwater Gutters and Tanks** on Each House and Commercial Building*
5. *Action Plan to establish a **30,000 t storage of desalinated water/rainwater** as a 20-day backup for periods of maintenance of the desalinator.*
6. *Action plan to introduce **charges for desalinated water** (and later airport rainwater) to provide funds for maintenance of the equipment and storages, including stewardship of the money collected. This plan would include recording the quantity of water supplied via truck and pipeline to all consumers;*
7. *Task force to complete inlet piping and commissioning of 120 t/d **desalination** unit at Menen Hotel, including deciding on disinfection of storage, sale/distribution of surplus water, charges for this water and stewardship of funds for operations and maintenance.*
8. *Task force to obtain funds for purchase/supply of **new 500 t/d desalination** unit, including deciding location and management.*
9. *Task force to obtain funds for supply/construction of **new rainwater collection surface and tanks at the airport,** including deciding on treatment and disinfection, storage, sale/distribution of collected water, charges for this water and stewardship of funds for operations and maintenance.*
10. *Task force to oversee and obtain **hydrogeological advice on the groundwater lens** including the safe yield (particularly during droughts), water quality and the limit of extraction of brackish groundwater around the perimeter of the island. This study is envisaged to involve up to 30 test bores, some of which may later be used as production bores.*
11. *Task force for **actions to prevent the contamination** of the groundwater lens, including management of landfill sites and wastewater generated on topside, and upgrading wastewater disposal on the island.*

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Documentation of Recommended Nauru Water Plan

*The recommended Nauru Water Plan will be completed by the **Task Force for Development and Documentation** of the Nauru Water Plan (after the task force has consulted with government and the community about the components, charges and other aspects of possible water supply options. It is expected that the document summarising the Nauru Water Plan may have the following contents:*

1. *Introduction setting out context of Nauru Water Plan as Government Policy*
2. *Objectives (some or all of draft objectives set out on first page).*
3. *Statement about estimates of population and water use that underlie the plan, including demand for potable water and non-potable water*
4. *Statement and Action Plan for Water Conservation.*
5. *Summary of Options Considered (desalination, rainwater, groundwater)*
6. *Statement and Action Plan for water charges and funding.*
7. *Statement and Action Plan for Existing Desalination Plant.*
8. *Statement and Action Plan for New Desalination Plant.*
9. *Statement and Action Plan for Rainwater Collection at Households.*
10. *Statement and Action Plan for Rainwater Collection at the Airport.*
11. *Statement and Action Plan for water storage.*
12. *Statement and Action Plan for groundwater study, followed by possible future groundwater development, depending on findings of groundwater study.*
13. *Statement and Action Plan for monitoring and record keeping.*
14. *Statement and Action Plan to prevent contamination of the groundwater lens, including management of landfill sites and wastewater generated on topside, and upgrading wastewater disposal on the island.*