

**BASIC DESIGN STUDY REPORT  
ON  
THE PROJECT FOR IMPROVEMENT OF  
NUWARA ELIYA WATER SUPPLY  
IN  
THE DEMOCRATIC SOCIALIST REPUBLIC OF  
SRI LANKA**

**July 2001**

**JAPAN INTERNATIONAL COOPERATION AGENCY  
Nihon Suido Consultants Co., Ltd., Tokyo JAPAN**

## PREFACE

In response to a request from the Government of the Democratic Socialist Republic of Sri Lanka, the Government of Japan decided to conduct a basic design study on the Project for Improvement of Nuwara Eliya Water Supply and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Sri Lanka a study team from August 28 to October 4, 2000 and February 15 to April 11, 2001.

The team held discussions with the officials concerned of the Government of Sri Lanka, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Sri Lanka in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Democratic Socialist Republic of Sri Lanka for their close cooperation extended to the teams.

July 2001



Kunihiko Saito

President

Japan International Cooperation Agency

July 2001

**Letter of Transmittal**

We are pleased to submit to you the basic design study report on the Project for Improvement of Nuwara Eliya Water Supply in the Democratic Socialist Republic of Sri Lanka.

This study was conducted by Nihon Suido Consultants Co., Ltd., under a contract to JICA, during the period from August 2000 to July 2001. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Sri Lanka and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

A handwritten signature in black ink, appearing to read 'Takemasa Mamiya', with a stylized, sweeping flourish at the end.

**Takemasa Mamiya**

**Project manager,  
Basic design study team on  
The Project for Improvement of  
Nuwara Eliya Water Supply  
Nihon Suido Consultants Co., Ltd.**

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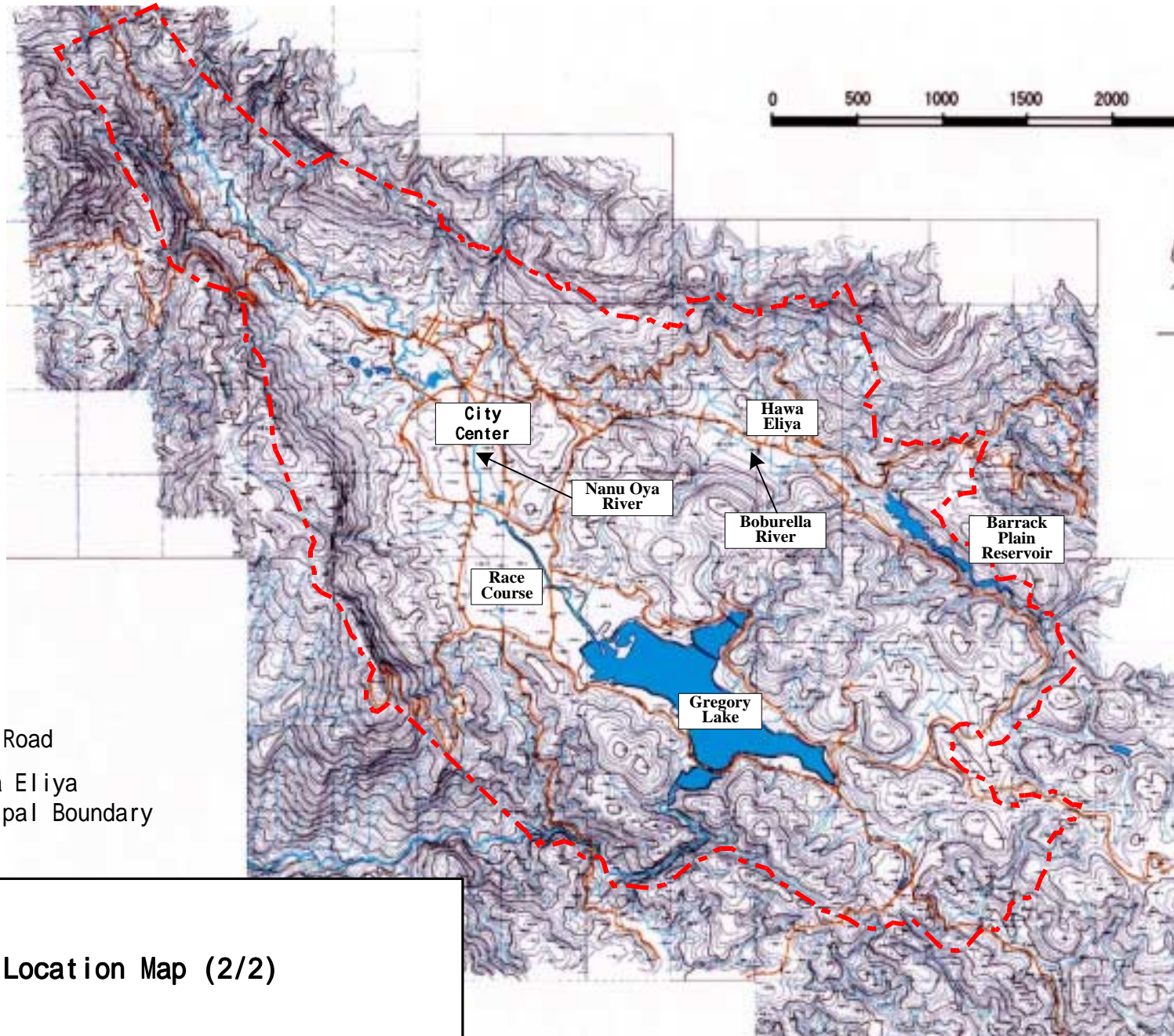
## Abbreviations




ADB	Asian Development Bank
ADDIGM	Additional General Manager
AGM	Assistant General Manager
BOD	Bio-chemical Oxygen Demand
CEA	Central Environmental Authority
CIP	Cast Iron Pipe
DAC	Development Assistance Committee, OECD
DGM	Deputy General Manager
DIP	Ductile Cast Iron Pipe
GDP	Gross Domestic Products
IMF	International Monetary Fund
JICA	Japan International Cooperation Agency
JIS	Japanese Industrial Standard
MUCPU	Ministry of Urban Development, Construction, and Public Utilities
NWSDB	National Water Supply & Drainage Board
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
PVC	Polyvinyl Chloride Pipe
RDA	Road Development Authority
SLRs.	Sri Lanka Rupee
UDA	Urban Development Authority



Location Map (1/2)





-  : River
-  : Major Road
-  : Nuwara Eliya Municipal Boundary

Location Map (2/2)



## Construction Site of Old Water Field Reservoir



Existing intake weir



View from upstream of intake weir



Abandoned guards house  
New reservoir will be constructed here



Backyard of abandoned guard house



Access to the construction site

## Construction site of Pedro Elevated Tank



Existing intake



Construction site of elevated tank  
(left side)



View of construction site from intake weir



View of construction site from intake weir

## Construction of Unique View Reservoir



Construction site of new reservoir,  
concrete structure is existing reservoir



Existing reservoir



Access road to the construction site



## Construction Site of Vijithapura Reservoir



Existing reservoir  
Construction site is in front



Construction site of reservoir  
Left concrete structure is existing reservoir



View from the top of existing reservoir

## Construction Site of Low Area 2 Reservoir



Construction site of reservoir, left of the road



View from the construction site

## Construction Site of Gemunupura Reservoir



Concrete structure is abandoned reservoir  
backyard is construction site



Access road to the construction site

## Other Existing Water Supply Facilities



Banbarakere Intake



Brewery Intake



Gemunu Intake





Lover's Leap Intake



New Water Field Intake



Haddon Hill Reservoir



Bona Vista Reservoir



Naseby Reservoir



New Water Field Reservoir



Piyatisapura Reservoir

### Construction Site of Wells



Electric sounding in Golf Course



Proposed well site in Hawa Eliya



Gregory Lake



Road bridge in the city



Bus terminal



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## **Summary**

Average population growth rate of Sri Lanka is rather lower than rates of other countries in Southeast Asia although urban population is increasing rapidly. Ratio of urban and rural population was 21 % and 79 %, respectively in 1994. Although overall population growth rate is not high, Sri Lanka is suffering from deterioration urban environment and poor infrastructure such as water supply, garbage collection and disposal, and transportation because of rapid industrialization and changing life style.

In aspect of water supply, only 25 % of population can access to the piped water supply and more than 90 % of them is served by public stand pipes. More than two third of piped water supply in the country, or the majority outside the Colombo, is intermittent supply, not continuous. It scarcely rains in dry season though it rains a lot in rain season and the amount of annual rainfall is relatively big in Sri Lanka. Water supply sector in Sri Lanka is suffering from very low water service ratio and shortage, or a large seasonal variation, of water source.

The government of Sri Lanka, Department of Planning, defined that the development or improvement of water supply sector is very important among their environmental administration. The improvement of water supply will contribute BHN and indispensable for upgrading human life style. Adequate water supply system will secure safe potable water and convenience and will contribute improvement of sanitary environment, public health condition, and relief people from heavy water fetching work. The Government puts its target “Safe water for everybody” and the Government announced that this target should be achieved by year 2010.

Under such circumstances, regulation of National Water Supply and Drainage were enacted in 1974 and National Water Supply and Drainage Board (NWSDB) has responsibility on planning and management of water supply and drainage works under this regulation. Since the NWSDB should have responsibility on sound management of every waterworks in Sri Lanka, the NWSDB has a right of taking over waterworks from local government with their willingness or by order. Under this regulation, the NWSDB operates water supply system and provides water supply to consumers and other institutions. The NWSDB should also consult the local government in aspect of planning, designing, and construction of water supply system to assist the local water supply system.

Water supply system in Nuwara Eliya consists of several small components for which water sources are surface water and/or groundwater. Typical weather feature of Nuwara Eliya is that dry season, January to May, and rainy season are clearly distinguished and this condition brings serious shortage

of surface water in the dry season, about 30% of water source of rain season. The quantity of water supply, therefore, is significantly decreased during the dry season. People are obliged to depend on other unhygienic water sources such as small river and/or pond as a result of absence of quantity control, inadequate disinfection and limited water supply,.

Under such circumstances, the GOSL requested to Government of Japan (GOJ) for execution of a study concerning development of water supply system and sewerage in Greater Kandy and Nuwara Eliya in February 1997. The GOJ entrusted the study to the Japan International Cooperation Agency (JICA), the official agency implementing Japanese Government's technical assistance and the JICA conducted the study from 1998 to January 1999. Under the Study, "Greater Kandy and Nuwara Eliya Water Supply and Environmental Improvement Plan" (hereinafter referred to as "the previous JICA Study"), Master Plan was prepared and Feasibility Study for the priority project was conducted.

In June 1999, the GOSL made a request for grant aid for Nuwara Eliya Water Supply and Sanitation Improvement Project to the GOJ based on the results of the previous JICA Study. GOJ entrusted the study to examine the viability of the Project to the JICA, and expediting proper execution of the Japan's grant aid. Hence, JICA decided to conduct a Basic Design Study and dispatched the Study Team. It should be noted that the GOJ decided to conduct the Basic Design Study on water supply sector only while sanitation sector is excluded from the scope of the Study.

Under the Basic Design Study, the Study Team was dispatched to Sri Lanka for discussions with agencies concerned and for site investigation from August 28 to October 4 in 2000 and February 15 to April 11 in 2001. After home work in Japan, Draft Final Report was presented and discussed in Sri Lanka from June 12 to June 26 in 2001.

Project objectives of the Basic Design Study are to attain achievement of stable water supply throughout the year by developing new groundwater sources and establishment of the water supply block through improvement of water transmission and distribution pipe network, which will enable adequate operation and maintenance and contribute to reduction of unaccounted-for water.

The basic planning figures such as population and water demand, projected in the previous JICA Study, was revised considering the site survey results and judged to be adequate to employ in the Basic Design Study as shown in the following table. The day maximum demand in 2005 is estimated as 10,200 m<sup>3</sup>/day and quantity of water source in dry season is 4,245 m<sup>3</sup>/day. Though 5,955 m<sup>3</sup>/day, the balance of water demand and source, is water shortage, the actual capacity

required to develop should be calculated from water balance in the respective supply blocks and is estimated as about 6,500 m<sup>3</sup>/day.

**Balance of Water Demand and Water Source (m<sup>3</sup>/day)**

	Quantity of Water Source		Year 2000		Year 2005		Year 2015	
	Rainy Season	Dry Season						
Surface Water Source	18,000	3,345	Demand	Shortage in Dry Season	Demand	Shortage in Dry Season	Demand	Shortage in Dry Season
Groundwater Source	-	900						
<b>Total</b>	18,000	4,245	9,800	5,555	10,200	5,955	10,700	6,455

Major project scopes planned under the Basic Design are as follows.

1. Groundwater development by constructing wells to substitute water shortage in dry season. Although there was an another option to utilize surface water by constructing dam, dam construction would cause serious environmental impacts, relocation of habitat, and would required huge construction costs, therefore, option of groundwater development was selected. Quantity of groundwater abstraction will be 4,000m<sup>3</sup>/day ( @800m<sup>3</sup>/day × 5 wells ) in Hawa Eliya and 3,200m<sup>3</sup>/day ( @800m<sup>3</sup>/day × 4 wells ) in Golf Course. Location of wells were decided based on the results of geophysical survey (electric sounding and electromagnetic survey) and test borings which were executed during the Basic Design.
2. Establishment of water supply block to enable water quantity control and pressure control. Boundary valves, 25 locations with diameter 50 to 250 mm, will be installed on boundary of the water supply block. Purpose of the water supply block is to simplify water supply system and for easy operation. Relation of each water supply block and respective service reservoir will not change even though water source is changed by dry and rainy seasons, and this will enable to evaluate magnitude of unaccounted-for water in each supply block and the Nuwara Eliya Waterworks will be able to plan and implement effective unaccounted-for water reduction measures. Boundary of supply block was carefully set to secure adequate water pressure.
3. Improvement of water transmission and distribution system to distinguish transmission and distribution system and to contribute establishment of the water supply block. New transmission pipeline, length 11.3 km with diameter 75 to 300 mm, will be installed and new distribution pipeline, length 7.1 km with diameter 75 to 250 mm, will be installed.
4. Construction of six distribution reservoirs to achieve stable water supply. All reservoirs will be equipped with chlorination and metering devises. Capacity of each reservoir is equivalent to six-hour daily maximum water demand.

Reservoir	Capacity (m <sup>3</sup> )	Remarks
Old Water Field	110	New
Pedro	130	New
Unique View	190	Expansion
Vijithapura	110	Expansion
Low Area 2	460	New
Gemunupura	40	New

5. Provision of 800 water meters for defective water meters to reduce unaccounted-for water and provision of a meter test bench for calibration of water meters.

It should be noted that transmission and distribution pipelines included into this project are required pipelines for new wells, reservoirs, and for water supply block establishment and not for reduction of current high unaccounted-for water.

Implementation of this project, in the case of Japan's Grant Aid Scheme, will require 30 months including five months for detailed design.

Effects of this project will be as follows.

- 24 hour continuous stable water supply through the year by groundwater development even though in five month dry season
- Stable water supply meeting demand fluctuation by construction of distribution reservoirs.
- Potable water supply by installing disinfection facilities for every distribution reservoirs.
- Water balance in each water supply block can be analyzed by improvement of measuring system. Waterworks can set prioritization of reduction of unaccounted-for water based on the results of water balance analysis in each water supply block.
- Reduction of water-related and water-borne disease.
- Improvement of water supply condition as basic infrastructure will contribute to economic activities and industries in Nuwara Eliya.

Adequacy of project implementation will be justified from the following aspects.

- This project will contribute national target and be conformed with national development plan.
- Improvement of water supply will contribute to BHN.
- Beneficially will be total population of Nuwara Eliya Municipal, 41,500 people, including low income labors working in tea plantation.
- Future system operation and maintenance can be done by local staff and own fund and will not require sophisticated technology.
- Costs of operation and maintenance can be covered by current water tariff level and waterworks

can maintain sound financial status.

- Although minor negative environmental impacts are foreseen, it can be mitigate or offset by efforts of Sri Lanka side.

Following actions or measures should be dully considered by Sri Lanka side for sustainable and sound waterworks operation and management.

1. Disinfection using chlorination devices should be conducted.
2. Implement effective plan of unaccounted-for water reduction using measuring system.
3. Maintenance of adequate water tariff level.
4. Maintenance of suitable water quality at water source.
5. Improvement of Nuwara Eliya Waterworks organization structure.
6. Implementation of countermeasures to reduce pollutants.

## **Chapter 1 BACKGROUND OF THE PROJECT**

Water supply system in Nuwara Eliya consists of several small components for which water sources are surface water and/or groundwater. The most serious problem for the city water supply system is surface water shortage occurring in dry season while the system has sufficient water during rainy season. Typical weather feature of Nuwara Eliya is that dry season, January to May, and rainy season is clearly distinguished and this condition brings serious shortage of surface water the dry season. In terms of water quality of drinking water, adequate disinfection are not provided continuously and people are also obliged to depend on other unhygienic water sources such as small river and/or pond during dry season.

Under such circumstances, the GOSL requested to Government of Japan (GOJ) for execution of a study concerning development of water supply system and sewerage in Greater Kandy and Nuwara Eliya in February 1997. The GOJ entrusted the study to the Japan International Cooperation Agency (JICA), the official agency implementing Japanese Government's technical assistance and the JICA conducted the study from 1998 to January 1999. Under the Study, "Greater Kandy and Nuwara Eliya Water Supply and Environmental Improvement Plan" (hereinafter referred to as "the previous JICA Study"), Master Plan was prepared and Feasibility Study for the priority project was conducted.

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