JAPAN INTERNATIONAL COOPERATION AGENCY

DEPARTMENT OF WATAR AFFAIRS
MINISTRY OF AGRICULTURE, WATER AND RURAL DEVELOPMENT
THE REPUBLIC OF NAMIBIA

THE STUDY
ON
THE GROUNDWATER POTENTIAL EVALUATION
AND MANAGEMENT PLAN
IN
THE SOUTHEAST KALAHARI (STAMPRIET)
ARTESIAN BASIN
IN
THE REPUBLIC OF NAMIBIA

DRAFRT FINAL REPORT

SUPPORTING REPORT

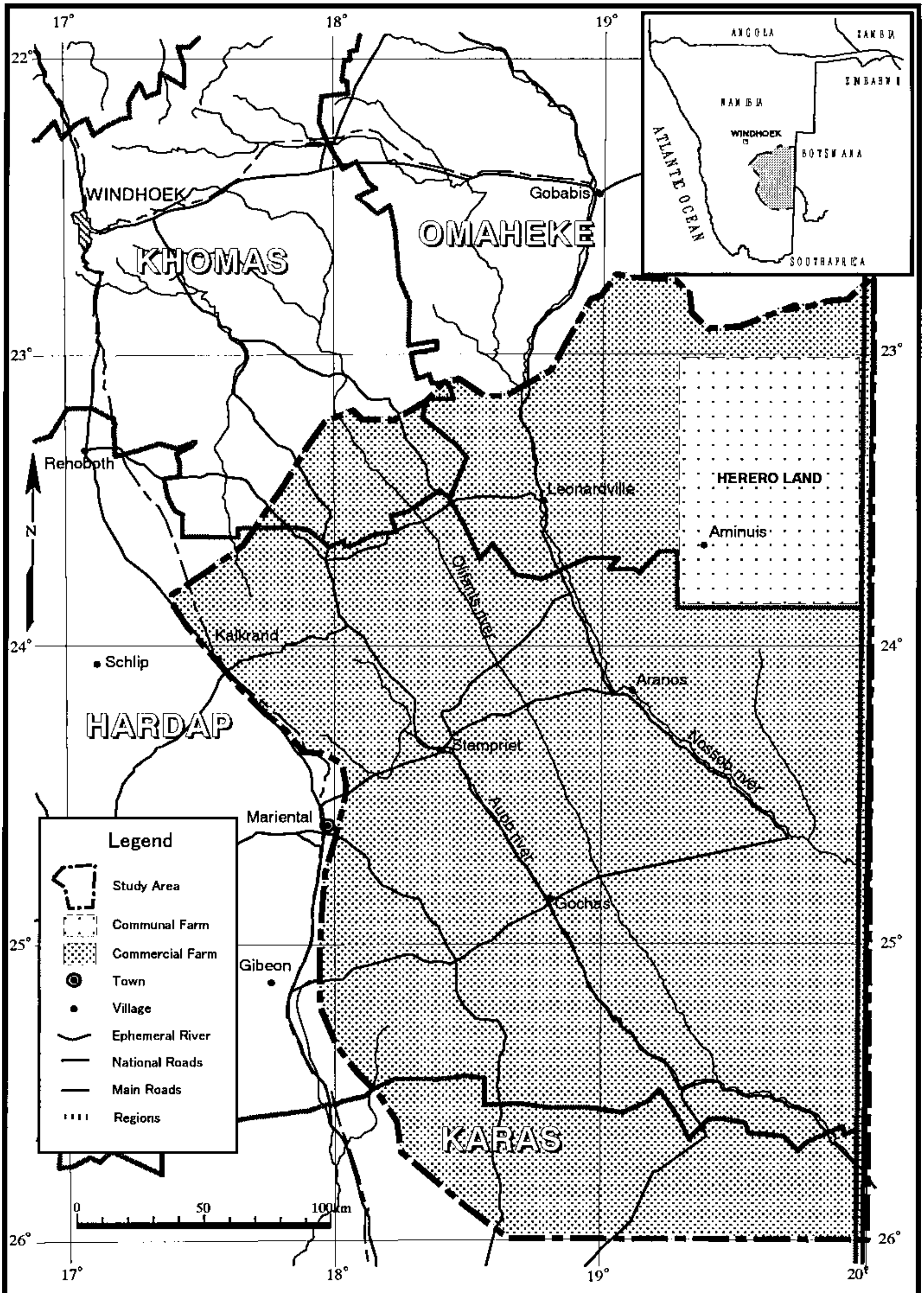
JANUARY 2002

PACIFIC CONSULTANTS INTERNATIONAL, TOKYO

IN ASSOCIATION WITH

SANYU CONSULTANTS INC., TOKYO

Exchange rate on Feb.2002 is Namibian Dollar ($N) =South African Rand (Zar)= Japanese Yen ¥11.70= US$0.0877



17°
18°
19°
20°
22°
23°
24°
25°
26°
WINDHOEK
KHOMAS
OMAHEKE
Gobabis
Rehoboth
N
Leonardville
HERERO LAND
Aminuis
Kalkrand
Schlip
HARDAP
Aranos
Stampriet
Olifants river
Nossob river
Auob river
Mariental
Gochas
Gibeon
KARAS
Legend
Study Area
Communal Farm
Commercial Farm
Town
Village
Ephemeral River
National Roads
Main Roads
Regions
0
50
100km
ANGOLA
WINDHOEK

Study Area

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ABBREVIATIONS

ASL	: Above Sea Level
AGL	: Above Ground Level
BGL	: Below Ground Level
CMBM	; Chloride Mass Balance Method
CSAMT	: Controlled Source Audio Magnet Telluric
DO	: Dissolved Oxygen
DRWS	: Directorate of Rural Water Supply
DVS	: Directorate of Veterinary Services
DWA	: Department of Water Affairs
EC	: Electric Conductivity
GDP	: Gross Domestic Product
GPS	: Global Positioning System
GVA	: Gross Value Added
IAEA	; International Atomic Energy Agency
IEE	; Initial Environment Evaluation
IMF	: International Monetary Fund
JICA	: Japan International Cooperation Agency
MAWRD	: Ministry of Agriculture, Water and Rural development
NamWater	: Namibia Water Corporation
SABS	: South African Bureau of Standard
T	: Temperature
TDEM	; Time Domain Electric-Magnetic
TDS	: Total Dissolved Solids
TEM	: Transient Electro Magnetic
USAID	: United States Agency for International Development
USGS	: United States Geological Survey

CHAPTER 1 INTRODUCTION

1.1 Background of the Study

The Southeast Kalahari (Stampriet) Artesian Basin (hereinafter referred to as "the Southeast Kalahari Artesian Basin" is situated in the southeastern part of Namibia. The Southeast Kalahari Artesian Basin is the largest groundwater basin in the country, which extends eastwards to Botswana and South Africa. Its area is approximately 71,000km^2. The basin is almost entirely overlain by the Kalahari Beds.

Groundwater from the basin is supplied to both commercial and communal farmers for their domestic, livestock and irrigation purposes. It is also supplied to the towns of Stampriet, Gochas, Aranos and Leonardville by the bulk water supply system of NamWater.

Groundwater abstraction within the Southeast Kalahari Artesian Basin has been controlled by regulations promulgated in terms of the Water Act. Extensive groundwater abstraction by commercial farmers occurs in the northern and central parts of the basin. Groundwater levels have been declining continuously since 1980 according to some monitoring wells that were installed during 1978.

Consequently, a Hydrocensus was carried out by the Department of Water Affairs (DWA) during 1986 to 1988 in order to define the impact due to abstraction of the groundwater. Since then, no further work has been done, although, groundwater use has steadily increased to nearly double that of 1988.

In order to manage the excessive abstraction, DWA needs to understand the nature of entire aquifer system. Accordingly, the Government of Namibia requested the Government of Japan to carry out an investigation of the groundwater flow and recharge mechanism of the Southeast Kalahari Artesian Basin and to formulate a groundwater management plan for sustainable groundwater usage.

1.2 Objectives of the Study

The objectives of the study are:

(1) To investigate the groundwater flow regime and recharge mechanism within the Southeast Kalahari Artesian Basin;

(2) To evaluate the groundwater potential to support sustainable development within the Southeast Kalahari Artesian Basin;

(3) To formulate a groundwater management plan within the Southeast Kalahari

Artesian Basin;

(4) To achieve technology transfer to counterpart personnel during the course of the study.

1.3 Study Area

The study area covers the Southeast Kalahari Artesian Basin (approximately 71,000km^2) as shown in the figure at the beginning of the report.

1.4 Implementation of Study

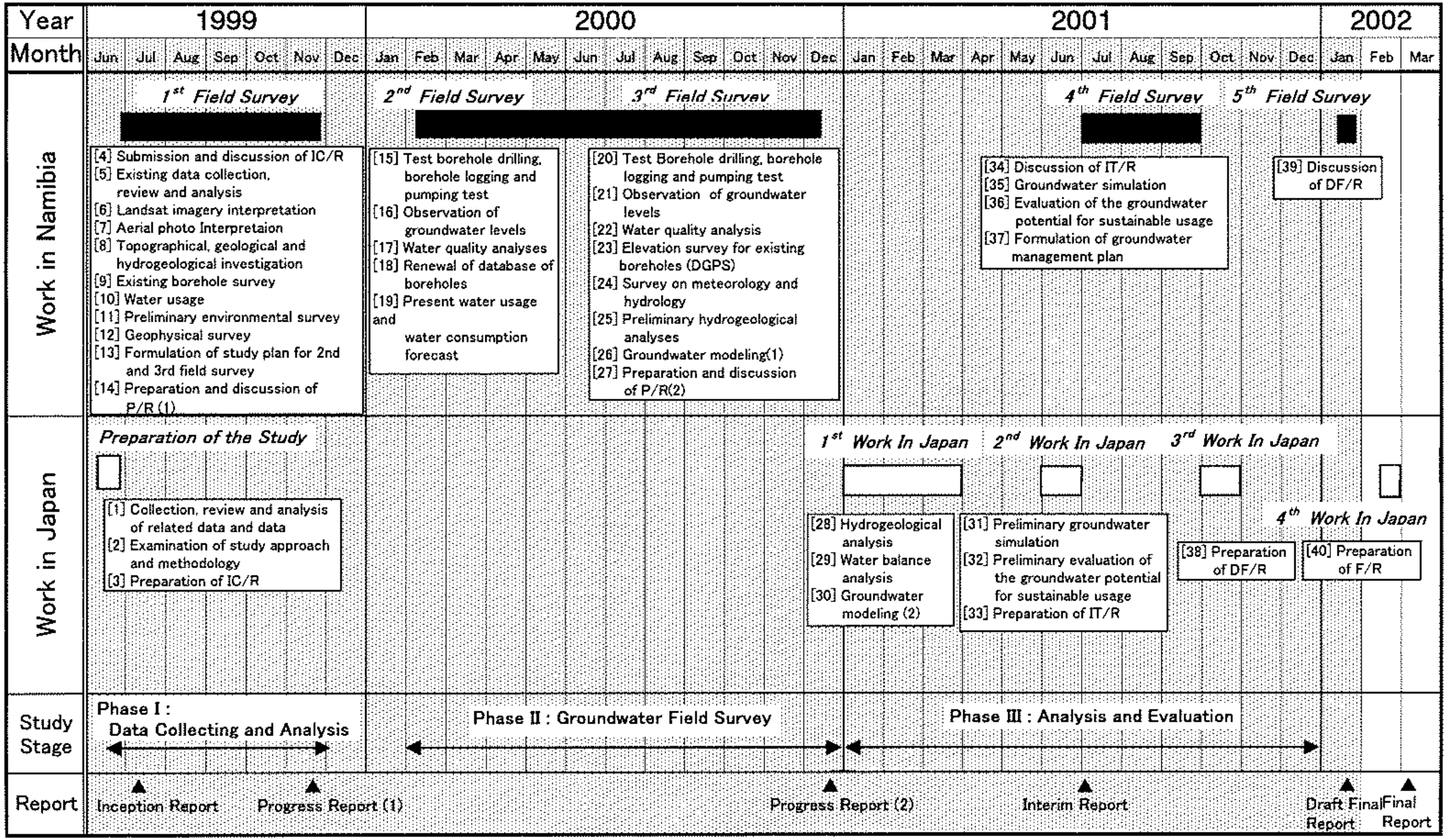
The Department of Water Affairs (DWA) of the Ministry of Agriculture, Water and Rural Development (MAWRD) was assigned as the counterpart organization by the Government of Namibia, while the Japan International Cooperation Agency (JICA) was assigned as the official agency responsible for the implementation of the technical cooperation program of the Government of Japan.

The study was conducted by the Japanese study team, comprised members of Pacific Consultants International and Sanyu Consultants Inc., officially retained by JICA for the study, and the counterpart staff provided by the DWA.

The total schedule of the study is shown in Table 1.4-1.

The members involved in the study are shown in Table 1.4-2.

Table 1.4-1 Total Schedule of the Study



<Notes> [shaded box] : Completed. IC/R: Inception Report P/R: Progress Report IT/R: Interim Report DF/R: Draft Final Report F/R: Final Report

Table 1.4-2 Member List

Name	Assignment
< Study Team of JICA >	
Mr. Yasumasa YAMASAKI	Team Leader/Groundwater Management Planner
Mr. Norifumi YAMAMOTO	Hydrogeologist (A)
Dr. Mahbub A. K. REZA	Hydrologist/Water Balance Expert
Dr. Gideon TREDOUX	Water Quality/Environmental Specialist
Mr. Yuichi HATA	Hydrogeologist (B)/Drilling Expert
Mr. Katsuhiro FUJISAKI	Groundwater Simulation Expert
Mr. Kensuke IRIYA	Socio-Economist
Mr. Hiroyoshi YAMADA	Coordinator
<DWA Staff>	<Title>
Mr. Piet HEYNS	Director: Resource Management
Mr. Greg CHRISTELIS	Deputy Director: Geohydrology
Mr. Guido Van LANGENHOVE	Deputy Director: Hydrology
Mr. Dudley BIGGS	Deputy Director: Planning
Mr. Don LOUW	Principal Hydrogeologist
Mr. Harmut STRUB	Senior Hydrologist
Mr. Piet LIEBENBERG	(Irrigation Division, Department of Agriculture)
Mr. Alex KATJUONGUA	Chief Technical Assistant
Ms. Theopauline NGULA	Technical Assistant