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**PROGRESS REPORT TO THE SUB-COMMITTEE
ON GEOINFORMATION
JAN 1997 – MARCH 1999**

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**Progress Report
Jan 1997 - March 1999**

Department of Surveys & Mapping Republic of Botswana

1. Introduction

The Department of Surveys and Mapping is a specialist organisation which provides professional services and advice to Government, Parastatals and private companies on all matters related to land and geographic information, Surveying, Mapping and Remote Sensing.

The Department is divided into three technical Divisions namely Survey, Mapping and Geo-Informatics.

1.1 Survey

The Survey Division uses up-to-date modern equipment to perform cadastral, engineering, topographical and control surveys. Cadastral surveys from single plots to multi thousand plot layouts are performed using Leica total stations with data recording facilities. Diagrams, general plans and working plans are produced by computer using the Department's Microstation CAD software. Control surveys for reference marks and photo control are executed by the Division's GPS section using four Leica and nine Ashtech global positioning receivers. Height control levelling surveys for engineering purposes and topographical surveys for other Government Departments are performed upon request. The Division is also responsible for the maintenance and improvement whenever necessary of Botswana's national geodetic triangulation network and levelling networks.

1.2 Mapping

The Mapping Division is responsible for the National Mapping Programme using in house techniques and contract services. The Division provides digital mapping data and topographic map series at small, medium and large scales.

Map revision at all scales is a major responsibility of the Division and is on-going. The Division also provides Tourist maps, Town Street maps and thematic maps for other Government Departments, Remote Sensing data, including

Aerial Photography and Satellite Imagery and mapping for Government development projects. The Division produces a catalogue of maps and controls the Government copyright in maps of Botswana. The Mapping Division has over the past 6 years, been transformed from a conventional mapping agency into a fully computerised digital mapping unit.

1.3. Geo-Informatics

This Division is responsible for the management and maintenance of Land and Geographic Information Systems and the dissemination of this information to Government and the Private Sector. The division also manages and maintains the departmental computer network which at the present time comprises some 80 work stations linked to 3 central processing units and connected to the Regional Offices by modem.

It has also a statutory responsibility for the examination and approval of all cadastral surveys carried out in the country. The Division is also responsible for the storage and safe-keeping of all survey and mapping records.

1.4 Staff

The Department has a staff complement of 289 people. Over 100 are specialists in various fields. Of these, 28 are professional Land Surveyors, 42 Land Survey Technicians, 35 Cartographers, 9 Photographic Laboratory Technicians, 11 Photogrammetrists and 1 expatriate GIS expert.

2 PROGRESS REPORT 1997 - 1999

2.1. Equipment

Since my last report in 1996, progress has continued with the acquisition of further hi-tech equipment as follows:

Survey Division

- Global Positioning System Ashtec ZS 6 receivers
Laptop computer and high level computing software for above

The department now operates a total of 13 geodetic GPS receivers for a wide variety of survey work on a full-time basis.

Mapping Division

- 1 Heavy duty raster plotter.
- 1 light duty raster plotter.
- 1 full scale colour scanner for scanning of maps and photographs.
- 1 daylight contact printer.
- 1 vertical repromaster camera.
- 1 complete digital photogrammetric system (Digital photogrammetric work station plus a high precision scanner).
- 2 analytical photogrammetric stereo-plotters.
- 1 PC station for ortho-photo production.

2.2. Training

The training policy mentioned at the ninth Regional Cartographic Conference has been continued. During the reporting period, 5 officers successfully completed BSc. degrees and 2 officers are due to complete their courses in 2000. There are currently 4 officers studying for a BSc. at overseas establishments in the UK and Australia. In addition, 8 officers are undergoing diploma courses in various survey, mapping and computer disciplines.

The Department has continued to expand and professional and technical staff have increased to 162. The department is now fully localised except for 3 professional posts which will be localised by 1998. A variety of short-term specialist courses in modern automated map production and Geographic Information Systems offered overseas, have been attended by professional and senior technical staff.

2.3. Institutional Co-operation

The Institutional Co-operation with Swedesurvey, was successfully completed in June 1997, however, a new agreement was negotiated with SIDA to assist the department on a cost-sharing basis with the following projects under National Development Plan 8:

- Botswana National Atlas Project.
- Integrated National GIS Project.
- Digital Ortho-Photo Mapping within the department.

2.4. Progress in the Survey Division

During this review period, the Survey Division has been kept busy with a wide variety of survey tasks. These are broken down as follows:

- a Cadastral Lots - During this period, 7 342 cadastral surveys were performed for registration of title. A further 1 075 plots were rationalised to upgrade informal developments in the far south west of the country.

The division provided precise reference marks in 15 villages by GPS surveys.

- b General survey work undertaken
 - i 250 kilometres of District Boundaries were demarcated and opened along the nineteenth parallel.
 - ii 850 beacons were relocated on the international boundary Botswana/Zimbabwe as a start to the ratification process. This line is now being re-opened by joint teams.
 - iii Terms of reference were agreed between Botswana/Namibia, setting up a Joint Boundary Commission to finalise the location of the 350 Km. section of the riverine boundary between the two countries.
 - iv Innumerable minor subdivisions and relocation of lost boundaries were undertaken on a day to day basis.

2.5. Progress in the Mapping Division

Since my report of 1996, the following work has been undertaken by the Mapping Division:

2.5.1 Air-photography.

- a. Scale 1:20 000 - 4 949 sq. kms of major Rural and Urban Centres has already been flown. In all, this represents 3 374 line kilometres. This photography is used for 1:5 000 digital mapping.
- b. Scale 1:50 000 - no photography at this scale has been flown during the reporting period.

Since 1995, our flying specifications have called for cameras equipped with on-board GPS which fixes the perspective centre of each photograph thus drastically reducing the later ground control work.

2.5.2 Mapping.

Since digital mapping commenced in this department in February 1994, the following mapping has been completed:

- a. Scale 1:5 000 - 412 sheets covering 3 730 square kilometres of 28 major Rural and Urban settlements.
- b. Scale 1:50 000 - 14 Sheets covering 11 648 sq. Kms of strategically needed mapping.
- c. 3 Sheets of 1:250 000 small scale have been mapped as well as the 1:1 500 000 Botswana map.

2.6 The current status of mapping in the Botswana

Large Scale

Large scale digital mapping at various scales, mainly at 1:5000, exists for the urban areas and most of the major rural centres. This mapping can also be produced as multi-coloured sheets on design-jet plotters.

Orthophotomaps exist at various large scales for some other remote settlements, but these are fast becoming out of date and will gradually be replaced by new 1:5 000 digital ortho-photo maps.

Large-Scale revision

All 1:5 000 maps produced before 1996 are to be revised by scanning the latest photography using newly acquired technology in the form of a Digital Photogrammetric Work-Station.

Medium Scale

The standard 1:50 000 medium scale map series has been compiled from air photographs. The conventional line maps

are in 5 colours with contours at intervals of 50ft or 20m. This mapping covers the more developed eastern and southern areas of Botswana and makes up 27% of the country.

Out of the existing 270 sheets, 64 have been manually digitised and these can be printed as hard copies.

Multicoloured photomaps have been produced for other parts of the country in areas of low relief. This covers a further 17% of the country.

The provisional series of photo-mosaics is in monochrome and covers the remaining 56% of the country. These are not being revised. To cover the whole country at 1:50 000 quarter degree sheets would require 850 sheets. The present divisions have evolved from technical and financial constraints.

Photomaps at 1:100 000 scale cover the remote areas in the north and northwest parts of the country. The series comprises 37 half degree sheets. In conjunction with Swedsurvey 7 more sheets have been produced using SPOT imagery.

Small scale

The largest scale series which covers the whole country is 1:250 000 (41 sheets). Other national scales are 1:500 000 (11 sheets), 1:1 000 000 (2 sheets), 1:1 500 000 and 1:2 000 000. The Division is in the process of digitizing the small scale series.

Special purpose maps

Special thematic maps are produced for other Government Departments on request; usually at 1:1 500 000.

The department is currently in production of Digital Orthophotomaps with a view to using these as a base for the proposed Geographic Information System.

2.7 Computerisation

Since my last report in 1996, the departmental network has been augmented by the acquisition of further computer equipment as follows:

In 1997

Upgrade of departmental computer network cabling system
from 10Base-2 to 10Base-T

- 167 X Network Outlets UTP, Cat 5:
- 9 X Patch Panel with Fibre-Optic cable connection with
main cabinet Switch Unit
- 1 X Wan Router
- 1 X Pentium computer Server type, MS Windows NT Server 4.
system

Others:

- 5 X Pentium computers Notebooks, Win 95 system
- 4 X Bubble-Jet colour printer, A4 size, 720 dpi
- 2 X Pentium computer GIS type, Win NT 4.0 system
- 1 X CD ROM writer
- 2 X SW Arc/Info PC
- 3 X SW ArcView
- 3 X SW MS Office 97
- 3 X SW Infomate

In 1998

2 x GIS computers,	23.01.98
4 x OA computers,	30.01.98
1 x NT server,	02.02.98
2 x A3/A2 Color printer,	07.03.98
8 x CAD computers,	18.03.98
2 x GIS computers,	18.03.98
1 x Optical disk drive,	18.03.98
2 x OA computers,	20.03.98
1 x CAD computer,	20.03.98
2 x Color printer,	20.03.98
2 x Notebook computers,	15.04.98
1 x PC projector,	20.04.98
3 x DPS computers,	June 98
1 x Photo scanner,	June 98
4 x OA computers,	04.11.98
3 x CAD computers,	11.12.98

Virtually all of the production work of the department is

now computerised and all records are stored or in the process of being captured, in data-base format.

The network is constantly being rejuvenated as and when equipment reaches four years old or when new technological advances are made in the field.

All senior staff now have immediate access to a PC and most middle grade staff have received training relevant to their specific skills in addition to standard software such as Lotus, D.Base, Wordperfect, Excel and Norton Commander. Computer literacy has reached the stage where staff expect to be able to switch information around from one software to another in the system without having to re-enter data in another format.

2.8 Future Developments

2.8.1 Geographical Information Systems

A report by the Consulting Firm, Associates in Rural Development Inc. on the assessment of the need for a country-wide GIS in Botswana was presented to and adopted by the Government of Botswana in June 1993.

Following on this, and more specific consultancies by Swedesurvey, work has now commenced on the data capture and development of a base National GIS in this department.

This project comprises of the creation of a Topographic data-base, Cadastral data-base, Aerial photo image data-base, satellite imagery data-base and a Geodetic Control Network data-base.

2.8.2 Botswana National Atlas Project

In 1993/94, a wide-ranging feasibility study was undertaken by a Swedish expert in the field of Atlas production. This study indicated an urgent need for such a product and accordingly, in 1995, an agreement was signed Between the Government of Botswana and SIDA for the joint production of the Botswana National Atlas in both hard-copy and digital computerised format. Botswana is supplying the hardware and software and Sweden is supplying training and Swedish expertise.

The department has already purchased the following

specialist equipment for the implementation of this project:

- 1 X Sun Ultra System Work Station
- 1 X Option for Sun System 2.1 HD
- 2 X PC Clients Computers
- 2 X PC Clients Screens
- 2 X PC Clients LINUX Operating System
- Network Equipment

- 2 X ESRI ArcView for Windows
- 1 X ESRI Arc Info for UNIX
- 1 X ESRI Arc Info Extension GRID for UNIX
- 1 X ESRI Arc Press for UNIX
- 2 X Windows for Workgroups
- 2 X Corel Draw
- 2 X Pagemaker
- 2 X MS Office (Word, Excel and Access)
- 2 X Exceed 4
- 2 X PC-NFS Pro

Due to unforeseen difficulties at the editing stage, the project has now been extended until August 1999.

The Atlas consists of 29 chapters with all the associated graphics. To date, all chapters have been submitted by the authors and 15 have been finalised by the Editorial Committee. The remaining 14 chapters are in the final editing stage. The printing is scheduled for later in 1999.

2.9 Place Names Commission

This Commission has been dormant since 1994 due to changes in the membership of the Committee and the need to review its functions. A start is shortly to be made in the drafting of a Place Names Amendment Act to replace the existing outdated legislation as the first step in reconstituting the Commission.