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# NATIONAL REMOTE SENSING CENTRE
# NEPAL

## REPORT ON
## CONSULTANCY IN CARTOGRAPHY

by
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1. <u>Acknowledgements:</u>

I record my appreciation to the following people who were involved and associated with my 6 month consultancy at the National Remote Sensing Centre (NRSC).

First and foremost, thanks are due to Mr. K.B. Malla, Project Manager for initiating this consultancy in the interest of upgrading NRSC's cartographic and photographic units to standards comparable to many developed countries - - with the eventual aim of having the Centre equipped with facilities that are satisfactory for its own needs and those of other HMG user agencies. To this end he gave strong support and co-operation, as well as valuable suggestions.

Also, thanks to: Mr. Tom Wagner, ERIM Advisor and Team Leader for his very willing support and co-operation and efforts to help ensure that the objectives are met;

The professional staff of the NRSC Interpretation Unit for its co-operation, and valuable and constructive discussions in the preparation of various maps;

The entire cartographic and photographic staffs for their excellent support, willingness and constant co-operation. They all worked with great enthusiasm and keen interest in learning new techniques and all deserve great credit; and finally;

The administrative staff and other members of the Centre, who assisted in some way or other.

2. Introduction:

This consultant examined and undertook these "terms of reference "with the support and co-operation of the entire Remote Sensing Centre staff. A brief three month report covering the period 17th Feburary to 16th May 1983 was previously submitted.

3. Evaluation:

The cartographic and photographic staffs proved to be very capable in learning new techniques for faster and more accurate map preparation. A need for supervision and guidance still exists and will be achieved as a countinuing day-to-day process of learning and doing. The cartographer-in-charge is able to advise the Project Manager and the Centre's interpretation staff on the overall technical aspects related to modern cartographic procedures, presentations, and programmes. Editing of maps, prior to publication, must be carefully undertaken and the information accurately extracted. This consultant was able to discuss many such aspects with the interpretation staff and feels that the preliminary preparation of the Marsyangdi Watershed maps demonstrated the need for careful co-ordination of interpretation and cartographic tasks.

4. Training:

While on-the-job training was emphasised, this was accompanied by detailed explanations related to map preparation and reproduction processes that were involved. Training in scribing was conducted with satisfactory results. Step-by-step procedures in compilation, format design and accurate presentation were taught.

5. Progress:

Forms were prepared for recording cartographic and photographic work. A filing system for Landsat photographic prints and negatives has been introduced and is now in use. However due to the large backlog of Landsat images this will take time to complete. A separate filing system for maps has also been introduced. A flight line and aerial photo index covering Nepal, plotted on the 1:250,000 AM map series, has been obtained from the Topographic Survey Branch. (This will facilitate the correct identification and ordering of air photographs.)

The production in multi-colour maps of the Marsyangdi Watershed has been conducted by modern techniques and these have been submitted to the printers. However, delays are being experienced in having the printing completed before the end of this consultancy. A temporary photolaboratory room was prepared for the map reproduction work. The stages involved included: compilation, accurate presentation, diazo-guide images on scribe and peel coats (by both positive and negative methods) contact positive and negatives, composite screening, and colour proofing.

A photographic process of preparing maps on transparency materials was introduced by using a polaroid copy camera and enlarger. Such results can be useful for compilation from different scales of maps to a common base map.

6. Equipment and Materials:

Detailed lists of recommended equipment and supply items for cartography and photography were prepared and submitted at different times. When received, these items will enable the Centre to be independent of unreliable and costly local sources and will allow the Centre to serve the needs of HMG user agencies. As activities proceed there will be a need to introduce newer reproduction techniques, involving the purchase of additional equipment and related materials. The acquisition of a letterpress machine and a waxing machine will add new capabilities and thus improve the presentation results.

7. Recommendations:

7.1 Future Training Cartography:

My counterpart, Miss Sally Shahi, currently is pursuing a diploma course in geography, and I recommend that on successful completion of this course, she be nominated for a diploma course in cartography in the U.S.A. (The possibility for such technical programs exists in several universities in the United States and this possibility or further advanced training should be explored.)

It is so also recommended that Miss Rachana Gauchan be nominated for the three-month course in cartography at the HMG Topographic Survey Training Centre. This course is conducted in Nepali and could be followed by a more advanced course in the U.S.A. or other countries associated with USAID programmes. Similar nomination for the Topo Survey Training Centre course should be made for Miss Anu Rajbhandari. It is understood that Mr. Arjun Gurung will be attending a four week course in Doppler Reciever operation and maintance this fall in the U.S.A.

7.2. Future Training: Photolaboratory:

At the present Mr. Bhim Bahadur Thapa and Mr. Laxman Shrestha, who have followed courses in the U.S.A. and at the Training Centre respectively, ~~and~~ are capable of undertaking the new colour and reproduction work of the Centre. It is my opinion that Mr. Thapa possesses a high degree of technical ability and that Mr. Shrestha is keen to advance. Co-ordination has to made with cartography and methods undertaken by similiar if not alternate methods.

In the course of time Mr. Surendra Bhattarai, who recently joined the Centre, and gains experience, should be offered an overseas practical course, in lithography, which includes platemaking . It would facilitate if the centre can provide the printers with final printing plates undertaken at the centre. Plates should be ordered presensitised negative including necessary developers etc.

8. Editing: It is suggested that an editorial committee be appointed and that all publication work should be thoroughly edited prior to final publication as the onus of information emanating from the various disciplines be carefully studied. This should be at the compilation stages before drafting procedures have started.

9. Work Programmes: All work should be well co-ordinated in the interpretation section with a common base map. This will enable the cartographic section to commence work without delay. Legends and presentation should be discussed with the cartographers, and it is advisable for the authors to examine their work periodically. Publication work must conform to international usage, symbols and colours. All work programmes must be co-ordinated between the cartographer in charge and author. This will then be recorded and work handed by the cartographer in charge to the respective personnel in the section.

10. New Building: Visits were made to the new site. Until all equipment have been received, the layout has to be delayed, but a partitioned room must be prepared for the cartographer in charge. Suggestions were however given, and a definite portion alloted only to the cartographic section must be submitted, at present this is only preliminary, and could be prepared with a minimum of delay.

# GENERAL PROCEDURES PREPARATION OF MAPS

## COMPILATION:-

Use base information from existing, revised or new maps from the best available source ie. Topo Survey Branch. Check the scale of the map required to be published. Maps on various scales can be reduced or enlarged on stable base projection film on the polaroid camera and enlarger. Ensure geographical co-ordinates, this enables map facing north.

Compilation should be done on a stable base drafting material i.e. velvetex or cronaflex. Base should correspond to the theme of the map. Inking should be in thin line weight for accurate scribing, and sheet prepunched, this is the important aspect from fair drawing to reproduction process to colour proofing and to final printing. In addition to punch holes, process marks in the form of 1cm crosses cust be made on opposite sides of the compilation with 004" weight about 2cms from the four sides of the border the map. These must be erased by the printers prior to final printing.

The following information should be included and map designed accordingly.

a) Location map of Nepal with project area indicated.
b) Administrative map, Showing if any, in order of grade, international, zonal and district. Indicate name.
c) If a series state adjoining sheets, if work is derived from 1:50,000 series, indicate sheet numbers.
d) Air photo flight diagram. Draw flight lines and put first and last photograph number, with line number.
e) Acknowledgement sources.

When completed make an ammonia copy and colour according to standard colours. For large areas the colours should be light, to dark for small areas. Prepare a Hand coloured copy to author and discuss its presentation. Prior to scribing ensure the compilation sheet is prepunched. A flow chart should then be prepared to determine the stages.

LETTER PRESS:

As soon as the letterpress machine has been procured it will be necessary to make a letterpress style sheet and type styles and sized to correspond to features i.e drainage in italics. Invariably the size of the lettering will reflect the scale of the map.

Until such time this becomes operational, the leroy can be used, alternately, a list should be drawn up of the various features and have it printed at commercial printers on white art paper, which should then be photographed and transferred onto photographic stripping film which is then waxed. Two sets of copies should be made in the event of damage. Lettering should be on a positive transparency which is then converted to a negative to combine with the respective scribe sheets which are negatives.

DIAZO TRANSFER GUIDE IMAGE:

All scribed sheets should be prepunched. The compilation, a positive should then be transferred reverse reading to the scribed sheets by the diazo solution. Determine the number of sheets in relation to the colours. The flow chart will determine this. Final reproduction material must be in negative from, a positive reverse reading can also be sent to the printers, this is becaus the negative form for printing plates known as the albumen proces is for shorter runs or

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or lesser number of copies, while the positive material known as deep etch is for longer runs or a large number of copies.

SCRIBING:

All scribing should be undertaken according to specifications. If a river which is to be scribed in blue acts as a boundary for 2 colours, this should be scribed on the black sheet and latter duffed out after the preparation of the peel coats. This is for good registration . For pecks, this should be done after the transfer of the peel coats, and then pecked by touch up fluid. Ensure curves are retained, this is to keep the shape of the boundary.

CHOICE OF COLOURS:

Large areas must be kept light, grading to medium for medium areas and darker shades for small areas. They should be chosen according to the theme of the map, with geologic colours to international standards. Overprint patterns can be used to bring up or distinguish between similar units. A colour guide chart should be prepared, this will indicate the number of peel coats. In some instances the same area of one colour for one unit could be used for another which shows the combination. For straight forward colour maps, the preparation of colour models could be avoided. These models are for checking the the peeling off the required areas are correctly opened. Each colour model for each colour and percentage must be prepared, this is by hand colouring, a code of colours can be instituted

PEEL COATS PREPARATION:

Two common methods exist. First by using an ejactor knife (swivel), the second and more critical is the etching method, the latter could only be used if consistency can be maintained. This is a better method and for accurate registration. The scribed sheet should be exposed with the shiny side over the peel coat which is presensitized and thus reverse reading, and processed by a one step developer and etching fluid. Unwanted areas which appear white should be opaqued by a transparent red dye or black opaque solution.

The first method that of peeling by the ejactor knife is, if a complicated map, more laborious. Other two procedures exist for transfer of images on the peel coats. First the scribed sheet must be converted into a positive. By applying a diazo guide solution on the peel coat, this positive (prepunched) is exposed reverse reading and developed in an ammonia box. The use of the ammonia machine should be avoided as there could be a stretch because of use on the glass cylinder which could be heated or by the rolling process.

Second method is by using the scribed sheet and coating the peel coat with kwik proof colours ie blue or black. The shiny side of the scribed sheet should be placed over the coated side of the peel coat. This is to obtain a reverse reading. After exposure this is washed. The areas are then carefully cut by swivel ejactor knife.

In all instances the use of ultra violet lighting source must be used.

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After completion all sheets must be carefully checked. The preparation of colour models assists immensely in this direction. If preangled screans are not used, a base line below the border should be drawn. This is for proper alignment of screens for respective colours designated at the appropriate degrees.

SCREENING:

The three primary colours of yellow magenta and cyan made of screen tint percentages have to be orientated at specific angles. This is to avoid a moire, or dots getting filled up, hence they are angled at certain degrees. Various charts exist but the one in use at this centre is the U.S.G.S. Screen angles in negative form for the 3 primary colours are yellow 90°, Magenta 75°, and cyan 105°, for black or any other colour besides the primaries, i. are at 45°. Normally the distance is 30° apart, but since yellow is a light colour, this is at 15°. Screens are made up of so many lines to the inch, the ones are at 133 lines to the inch from this ruling the various percentage tints are derived, which have then to be orientated to the required angles. Preangled screens tint percentages have the greatest advantage of avoiding a moire, because the respective percentage screens for say yellow can be used without difficulty in orientating to the restective angles as against one that is to be used for orientating. It is very important to ensure that the emulsion side of the screens are in direct contact with the film.

Two common methods exist in screening for submission to the printers. For example if we have 15%, 30%, 50% and 70% on yellow. The following is undertaken with all peel coats prepunched.

Yellow screens are at 90°. Lay the film with emulsion facing up. The screen say 15% is in contact, emulsion side to the film and then the peel coat right reading. Exposure is made through the normal tungsten lighting. After exposure, no developing is to be made, until all screens of 30%, 50%, etc. are exposed in succession. This is then processed, the result being a right reading positive. After completion of all colours, these positives are then converted by direct contact for a negative reverse reading, which is then used firstly, for colour proofing and then submission to the printers. The other method is to have the same process undertaken, but this is then directly exposed on the printing plate, assuming a thorough edit has been made. Positive colour proofing methods do exist.

If a screen and a pattern have to go on the same plate or colour, and the preference lies in the pattern standing out, the pattern (negative) is placed emulsion side to the film then the screen, and on top the screen the peel coat. If the pattern is needed but requires lesser degree of portrayal, then the screen is first placed in contact with the film, then the pattern and over this the peel coat. If the pattern and screen have to go on the same peel coat, this shown by a box $\frac{3}{222}$ where 3 is 30% and 222 is the pattern number.

CODING:

Percentage screen tints which are used to print flat tones are identified as:

1=10% or 15%  2=20%  3=30%  4=40%  5=50%  6=60%
7=70%  8=80%  9=90%  x=solid or 100%

The colours are Yellow Magenta and Cyan, if the choice of the colour as shown or the chart is 752 then this coding represents.

70% yellow, 50% magenta and 20% cyan

COLOUR PROOFING:

Various systems exist, but the best manual method is the kwik proof. This is the negative method. Exposure is done through an ultra violet source. A kwik matte sheet is prepunched and is applied by the first colour dye say cyan which is rubbed manually with a pad or flannel cloth by even criss cross strokes, dried, and exposed. Timings should be tested. After exposure the sheet is washed in water containing a little ammonia, then in a tray containing soap and water, and finally rinsed in water and dried. The next colour say magenta is applied and processed in a similar manner till all the colours are completed. This proof is carefully edited for colours and especially for registration. Colours will be near the final one. The proof is then overlain with a transparent sheet, all corrections noted minutely first by the cartographer, then author and finally Project Manager. After corrections this proof should accompany all reproduction material. The correct number of negatives and instructions should be indicated on the transmittal form.