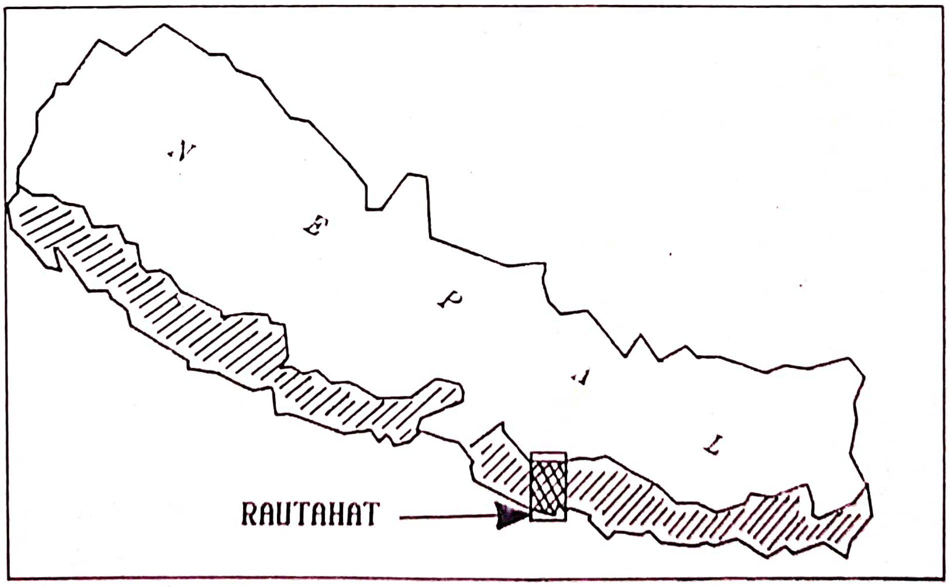
UNITED NATIONS DEVELOPMENT PROGRAMME
AND
HIS MAJESTY's GOVERNMENT OF NEPAL
NEP/86/025

SHALLOW GROUND WATER INVESTIGATIONS IN TERAI

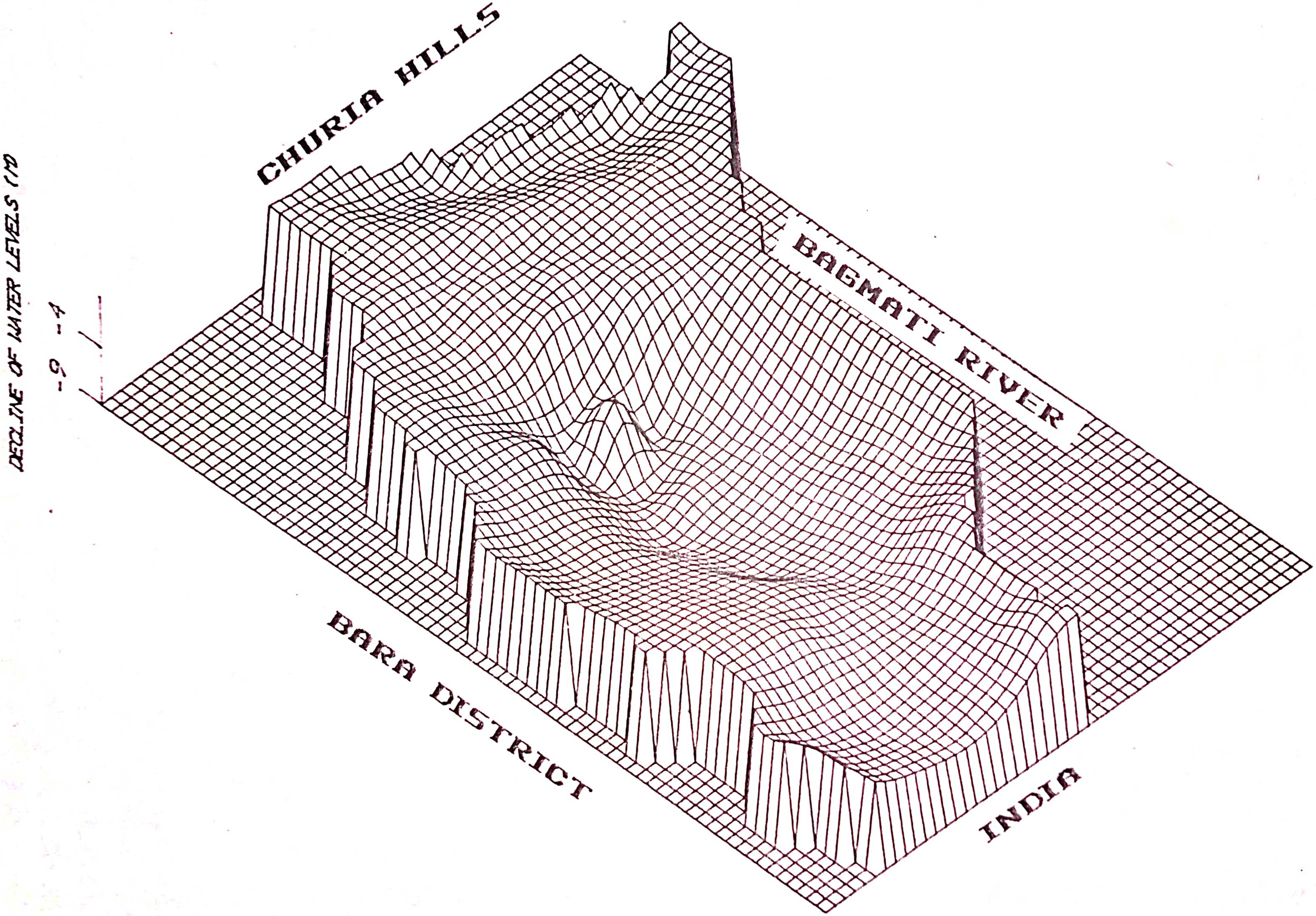
RAUTAHAT DISTRICT

MATHEMATICAL MODEL
OF SHALLOW GROUND WATER SYSTEM

TECHNICAL REPORT NO.4



KATHMANDU, DECEMBER 1988



RAUTAHAT MODEL - DECLINE OF WATER LEVELS AFTER 4-YEAR OF PUMPING

GWRDB-UNDP NEP/86/025
SHALLOW GROUND WATER INVESTIGATIONS IN TERAI

RAUTAHAT DISTRICT
MATHEMATICAL MODEL
OF SHALLOW GROUND WATER SYSTEM

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Executing Agency: United Nations Department of Technical Co-operation for Development, New York

KATHMANDU, NEPAL
DECEMBER 1988

EXECUTIVE SUMMARY

The model of the shallow ground water system of the Rautahat District was primarily made to arrive at a global water balance of the whole district and to indicate a maximum development potential for future intensive ground water exploitation. In the process, all components of the system have been verified. The model also checked and verified the conclusions of a companion report recently released by the project NEP/86/025: "Shallow Wells Drilling, Testing and Monitoring in 1987/88. Basic Documentation and Preliminary Interpretation".

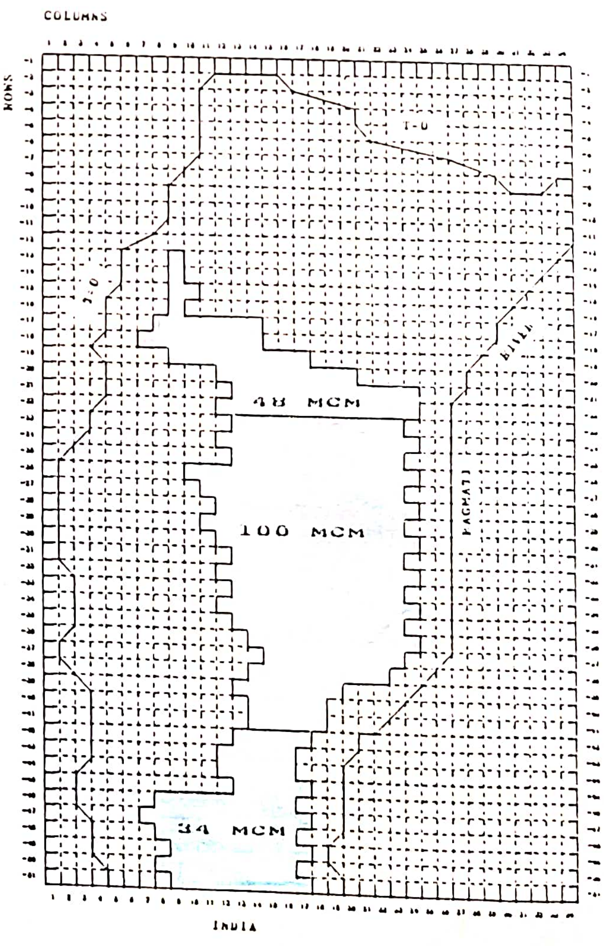
The modelling work reported herein confirmed the following typical one-year water balance. The recharge from rainfall, mostly in the near-the-hills area, including some subsurface inflow from streams cutting through the Churia Range, amounts to about 208 MCM (million cubic meters) per year. Considering the size of the model of about 1008 km^2, the average percentage of infiltrated rainfall in a typical year, in which about 1500 mm of rain falls, is about 14. Out of this, in "virgin" conditions, 71 MCM is lost through the evaporation process (from the shallow water table), about 3 MCM flow out into India, and the remaining 134 MCM flows into the Bagmati River contributing to the river base flow.

From this distribution of water one may easily conclude where are the sources of additional shallow ground water development in the future. The evaporation loss can be reduced, although not eliminated, by lowering the water levels to a depth that will prevent or diminish the losses. The outflow into the Bagmati River can be reduced by pumping from shallow wells located along a stretch parallel to the river bank. It is a favourable coincidence that along the right bank of the Bagmati River the shallow aquifer is the most promising, having good thickness and almost the best transmissivity in the whole district.

After successful calibration and verification of the model on the basis of the past ground water record (water levels in many observation wells in one year period), one hypothetical future development scheme was tested. The scheme included an area of 346 km^2, as shown in the sketch below, from which about 182 MCM of ground water were pumped on a six-month per year basis. Twenty percent of this volume was returned into the subsurface in the form of return irrigation. The simulation continued for four years and the results are the following. The volume tested is probably slightly above the maximum development potential of the district. The drawdown was in most of the area less than 6 m, and was approaching a steady or balanced state. In some cells, near the King Mahendra highway, the drawdown is excessive, unbalanced and depletes the aquifer. A comparative sketch of the evolution of the cone of depression (drawdown) after the second, third and fourth year of pumping, is shown below. With minor modifications of the pumping distribution, with a shift toward south and south-center, the shallow ground water system of the Rautahat district can sustain the total withdrawal of about 160 MCM in a year. In the tested scheme of development, the excessive pumping was offset by the contribution of the Bagmati River water in a form of a induced recharge. The balance in the fourth year was the following. The recharge from all sources, including the return irrigation flow, is 215 MCM/year. The withdrawal from the shallow aquifer is 182 MCM/year. The evaporation loss is about 61 MCM/year. It is reduced compared to the "virgin" conditions, but not appreciably. The "deficit" of withdrawal compared to the recharge of some 31 MCM/year comes from the Bagmati River. (This is less than 1 m^3/sec, or less than 5% of the river base flow in the dry season.)

The model of the Rautahat District is an example of modelling of shallow ground water system in the Terai. It offers a sound base for ADBN development plans. The conclusions formulated herein are believed to be on the safe side. The model did not count with any recharge from other rivers, such as the Lal Bakeya. The withdrawal volume of some 160 MCM/season indicates that the number of shallow wells to be constructed over the pumping area of some 346 km^2 could be about 5300. The volume of water could be sufficient to satisfy the agricultural demand of rice crops on an area of some 13,000 ha.

RAUTAHAT MODEL - FUTURE DEVELOPMENT SCHEME

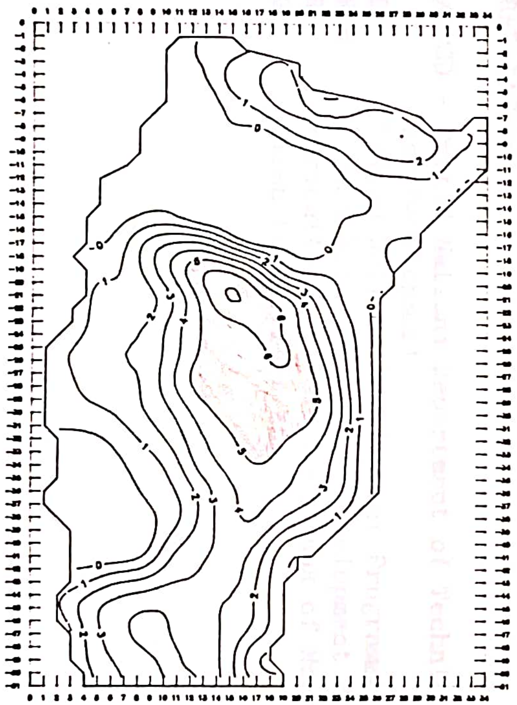


SHALLOW GROUND WATER DEVELOPMENT

FORECAST OF DECLINE OF LEVELS

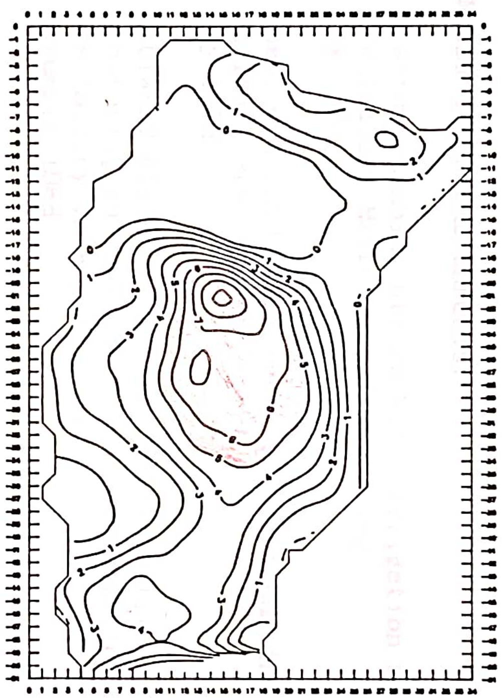
2 Years

RAUTAHAT MODEL – DECLINE OF LEVELS AFTER 2 YEARS PUMPING



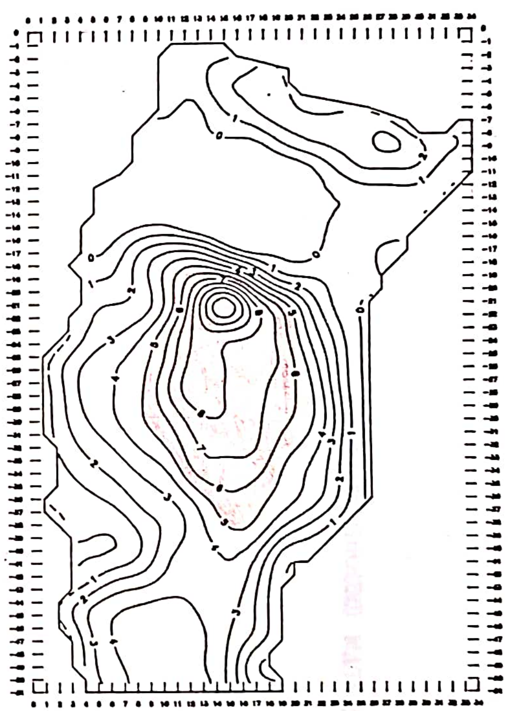
3 Years

RAUTAHAT MODEL – WATER LEVELS AFTER 3-YEAR PUMPING



4 Years

RAUTAHAT MODEL – DECLINE OF LEVELS 4-YEAR PUMPING



EARLIER TECHNICAL REPORTS:

1. Bhairawa-Lumbini Ground Water Irrigation System
   Preliminary Mathematical Modelling
   May 1988

2. Shallow Ground Water Level Fluctuations in the Terai
   in 1987. Preliminary Report.
   May 1988

3. RAUTAHAT DISTRICT. Shallow Wells Drilling, Testing and
   Monitoring in 1987/88. Basic Documentation and
   Preliminary Interpretation.
   November 1988

ABBREVIATIONS:

UN/DTCD - United Nations Department of Technical Co-operation for Development
UNDP - United Nations Development Programme
GWRDB - Ground Water Resources Development Board
ADBN - Agricultural Development Bank of Nepal
ADB - Asian Development Bank

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MATHEMATICAL MODEL
OF SHALLOW GROUND WATER SYSTEM IN RAUTAHAT DISTRICT

1. INTRODUCTION

1.1. NEP/86/025 Project Document Details

The project NEP/86/025 - Shallow Ground Water Investigations in the Terai - is executed by the United Nations Department of Technical Co-operation for Development. It is designed as a three-year project primarily oriented to field-data collection, establishment of ground water data base, and to assessment of development potentials of shallow aquifers all over the Terai. The government counterpart agency is the Ground Water Resources Development Board (GWRDB) of the Department of Irrigation of the Ministry of Water Resources. The project's activities started in June 1987.

Among project outputs, reports on mathematical modelling of various parts of the Terai are expected to provide the means for evaluation and assessment of shallow ground water development potentials.

In the first year of the project, the drilling and pump testing activities have been carried out in the following districts of the Terai: Rautahat, Nawalparasi, Kapilvastu, and Dang. Technical Report No. 3 has been recently prepared on shallow wells drilling, testing of shallow aquifers, and monitoring water levels in 1987/88. The present report is its companion report.

1.2. Basis for This Report

This report is based on the following:

(a) NEP/86/025 project wells (for ease of reference called "project" wells) - 25 newly drilled shallow wells between January and June 1988.

(b) Shallow drilled wells for the Nepal Drinking Water Supply Scheme

Phase III in the Narayani Zone by the Japanese Red Cross Society and its contractor Nissaku Co., Ltd., between March and May 1987 - 49 wells.

(c) Pumping tests conducted in project wells in 1988, in ADBN shallow tube wells and in Mahotari project wells in mid eighties.

(d) Water level observations since May 1987, notably maps of water levels in May and September 1988.

Most, if not all, of previous information is compiled and reported in Technical Report No.3, titled "RAUTAHAT DISTRICT, SHALLOW WELLS DRILLING, TESTING AND MONITORING IN 1987/88, BASIC DOCUMENTATION AND PRELIMINARY INTERPRETATION".

1.3. Location, Size, Climate, Rivers in Rautahat District

Rautahat district belongs to the Central Region. The district's total area is 1020 km^2 out of which 1008 km^2 are included into the model. The location of Rautahat district within Nepal is shown in Figure 1. The model area is completely within a plain commonly known as the Terai of Nepal. The Terai plain is composed of interlocked alluvial deposits of the wider Ganges Plain and that of fans, channels, flood plains of numerous rivers flowing from the Siwalik (Churia) Range. For the sake of economy of drilling and well construction, the whole sequence of unconsolidated materials is divided into shallow and deep ground water systems. In the context of this model, the shallow ground water system includes the first significant permeable layer of at least 6 meter thickness, directly or indirectly recharged from local rainfall. As will be clear from appendices, this is normally down to a depth of 20 to 35 meters. The contour line of 150 m is considered to be the physical end of the Terai's Quaternary sediments.

The main characteristic of the climate in Rautahat district, as well as in the whole Terai, is monsoon rainfall which occurs between June and September and which delivers an average of 85% of the total annual rainfall. Locations of two rainfall stations (Gaur in the south and Ramauli in the center-east) are shown in Figure 2, along with monthly sums of rainfall in 1987 and 1988. The mean annual rainfall is close to 1500 mm, and pan evaporation is also about 1500 mm. Average monthly rainfall exceeds average evaporation during only 4 months, June to September.

For this modelling study, the rainfall record from the above two stations was used, but evaporation data were "imported" from another Terai district, that of Rupandehi (Bhairawa). The potential evaporation in Bhairawa is also shown in Figure 2.

The major potential surface water source for supplementing natural rainfall is the Bagmati River which has a highly variable flow averaging annually 161 m^3/sec at the exit from the Churia (Siwalik) hills (1965-1979). The flow recorded at Karmaiya-Manglapur, some 2 km south of the gorge inside the

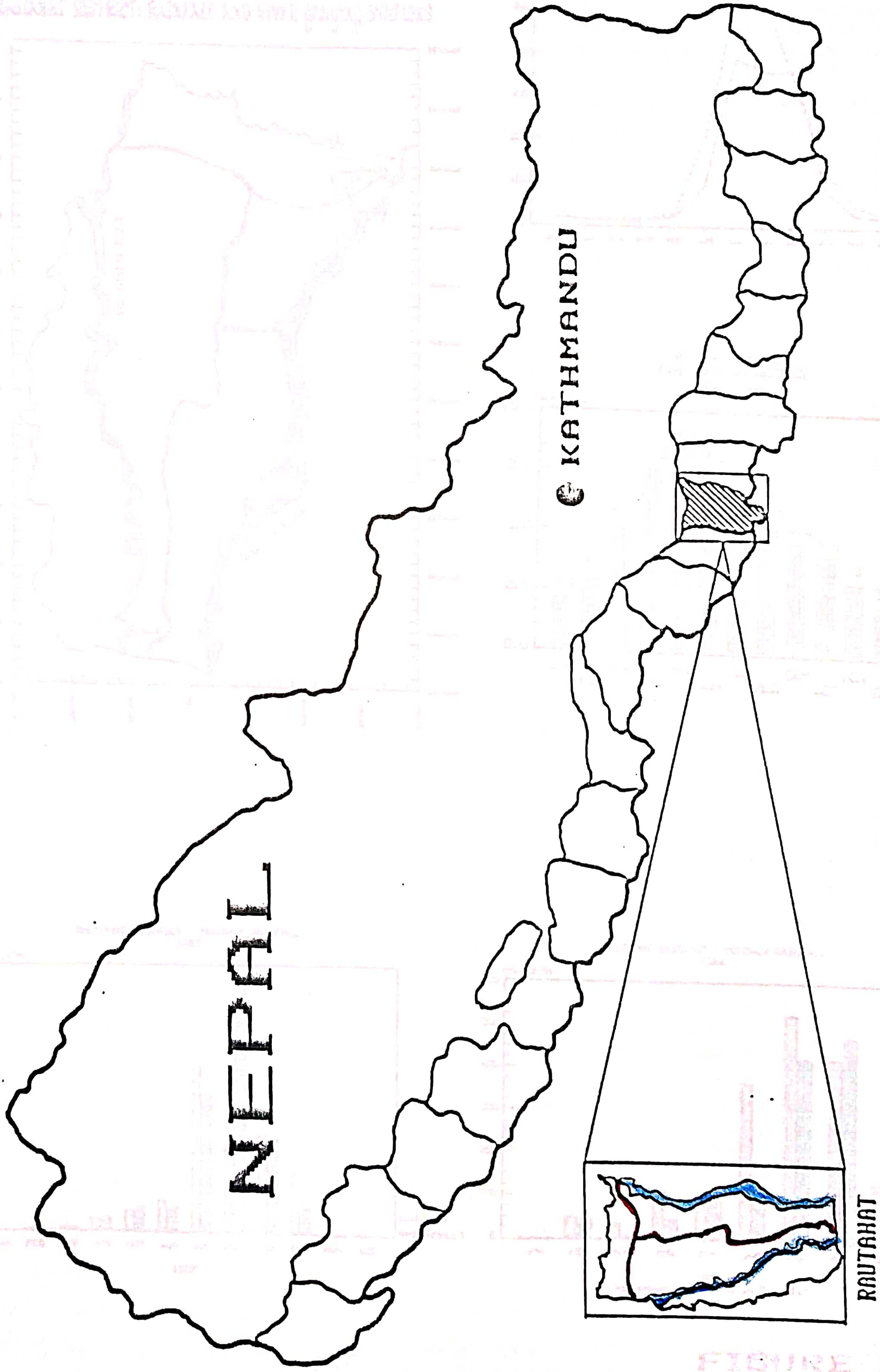
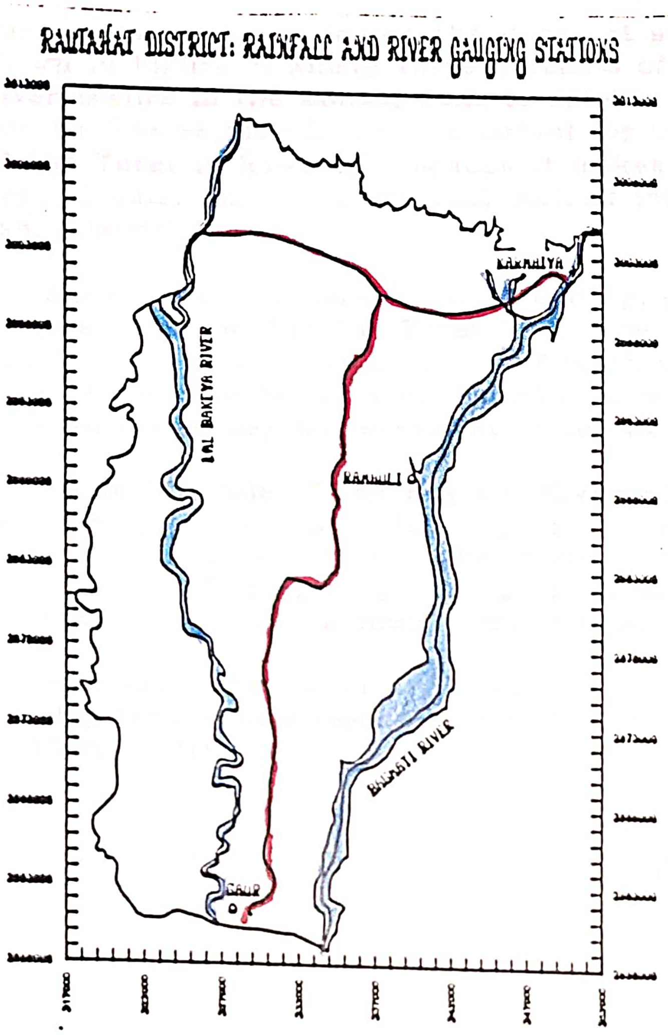
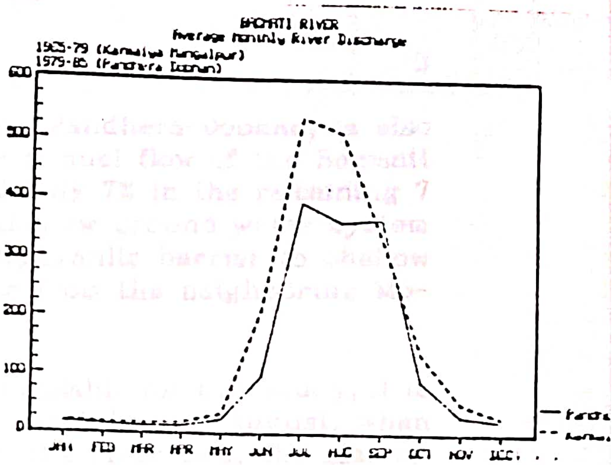
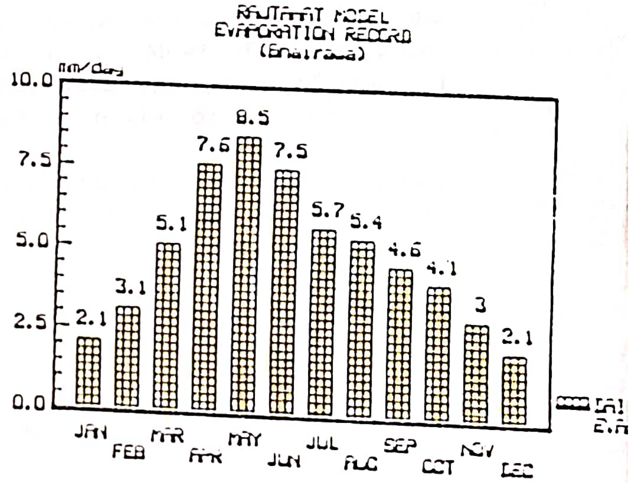
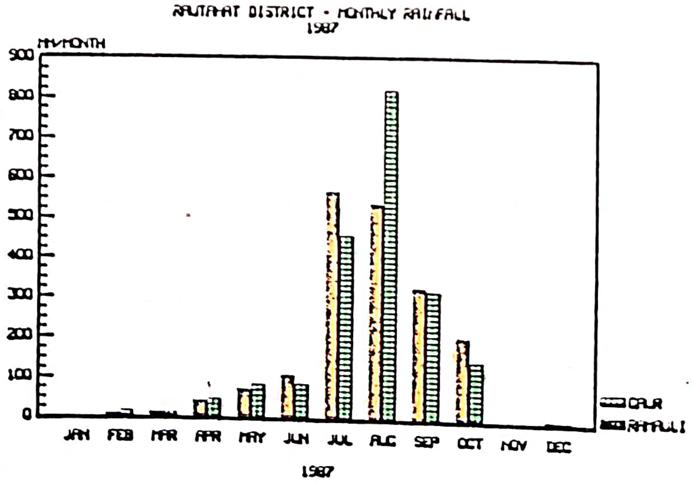


FIGURE 1


RAUTAHAT DISTRICT: RAINFALL AND RIVER GAUGING STATIONS
KARKHIYA
LAL BAKEYA RIVER
RAMAULI
BAGMATI RIVER
GAUR


BAGMATI RIVER
Average Monthly River Discharge
1965-79 (Karmaiya Mangalpur)
1979-85 (Pandhera Dobhan)
600
500
400
300
200
100
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC


RAUTAHAT MODEL
EVAPORATION RECORD
(Bhairawa)
mm/day
10.0
7.5
5.0
2.5
0.0
2.1
3.1
5.1
7.6
8.5
7.5
5.7
5.4
4.6
4.1
3
2.1
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC


RAUTAHAT DISTRICT - MONTHLY RAINFALL
1987
MM/MONTH
900
800
700
600
500
400
300
200
100
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1987
GAUR
RAMAULI

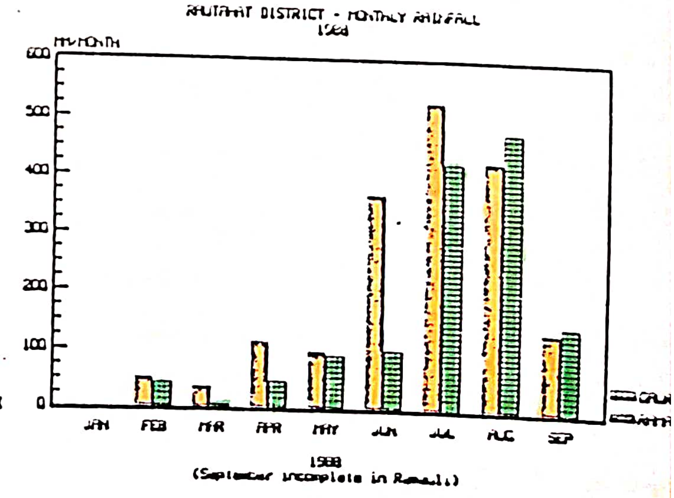

RAUTAHAT DISTRICT - MONTHLY RAINFALL
1988
MM/MONTH
600
500
400
300
200
100
0
JAN FEB MAR APR MAY JUN JUL AUG SEP
1988
(September incomplete in Ramauli)
GAUR

FIGURE 2

Terai, and upstream inside the gorge at station Pandhera-Dobhan, is also shown in Figure 2. Ninety three percents of the annual flow of the Bagmati River occurs in the months June to October and only 7% in the remaining 7 months. The Bagmati River is important for the shallow ground water system of the Terai in Rautahat because it makes a hydraulic barrier to shallow ground water flow from Rautahat district into or from the neighboring Morang district.

Since there is no Bagmati River hydrograph available for this study, it is assumed that, within the Terai, in the months of July and August, when about 550 m^3/sec of water has to flow through the river bed, the rise of river stage may be between 1.0 and 1.5 m considering that the river bed between banks may be several hundreds meters wide.

While the role of the Bagmati River may be that of a constant-head boundary preventing any shallow ground water exchange across its banks, the role of other rivers in Rautahat district is not clear. Most of streams are intermittent, flowing only during the monsoon, with exception of the Lal Bakeya River, which in some years is flowing even in the dry season.

Although the Terai of Nepal is in the subtropical zone, the mean monthly temperature reaches a low of 16.1°C in January compared to a high of 30.5°C in May.

2. MODEL SETUP

2.1. Model Size and Network

The shallow ground water system of Rautahat district, which is the subject of this modelling work, has two natural and two artificial boundaries. The natural boundaries are the Bagmati River on the east, and the Churia (Siwalik) hills on the north. The artificial boundaries are the state boundary with India in the south and the western boundary with the neighboring district Bara in the west. The modelled area, and its boundaries, are shown schematically in Figure 3. The size of each cell is 1000 m by 1000 m, i.e. the area occupied by one cell is 1,000,000 m^2 big. The model's coordinates are expressed in columns (I), which may be taken as an equivalent to "X" coordinate axis, and in rows (J), which may be taken as an equivalent to "Y" coordinate axis. The orientation of the model is west-east (columns) and north-south (rows). The labelling starts in the north-western corner. (The minus sign for rows should not confuse the reader. It is only for the convenience of a graphical computer program.)

The total area occupied by the model is 1734 km^2, which is discretized into 1734 equal-size cells. The number of columns is 34, and that of rows is 51. It is a middle-size model. Considering the spacing of 1000 m in either direction, the model is of a preliminary nature, sufficiently accurate for global balance and assessment of overall recharge and discharge components of the system. It is not to be used for detailed location of water-supply and/or irrigation wells. The model is two-dimensional, meaning that all lithological layers along the vertical to the depth of representation are averaged into one layer.

The whole area east of the Bagmati River is eliminated from the modelling. This is on the grounds that shallow ground water in Rautahat District is not hydraulically (and physically) connected with the water in Morang district in the east. In other words, the Bagmati River is taken as a constant-head boundary which is the physical termination of the Rautahat shallow ground water system.

The area to the north declared with T=0 (transmissivity equal zero) coincides with the Churia hills above the absolute elevation 150 m. There is no Quaternary (alluvium) aquifer in the hills, and the boundary is the natural one. All cells declared with T=0 are also eliminated from the modelling.

However, the area to the west, which is also eliminated and which is in Bara district, does contain a shallow ground water system, very similar to the one in Rautahat district. That area was eliminated from the modelling on the following grounds: (a) one of targets of the modelling is to produce the water balance for Rautahat district, (b) the ground water flow is from the north to south, i.e. from the hills towards India, and, in natural state, there is very little flow from east to west or vice versa. This is not to say that this is a natural condition, since, in nature, any large-scale shallow water

MODEL NETWORK & BOUNDARY CONDITIONS

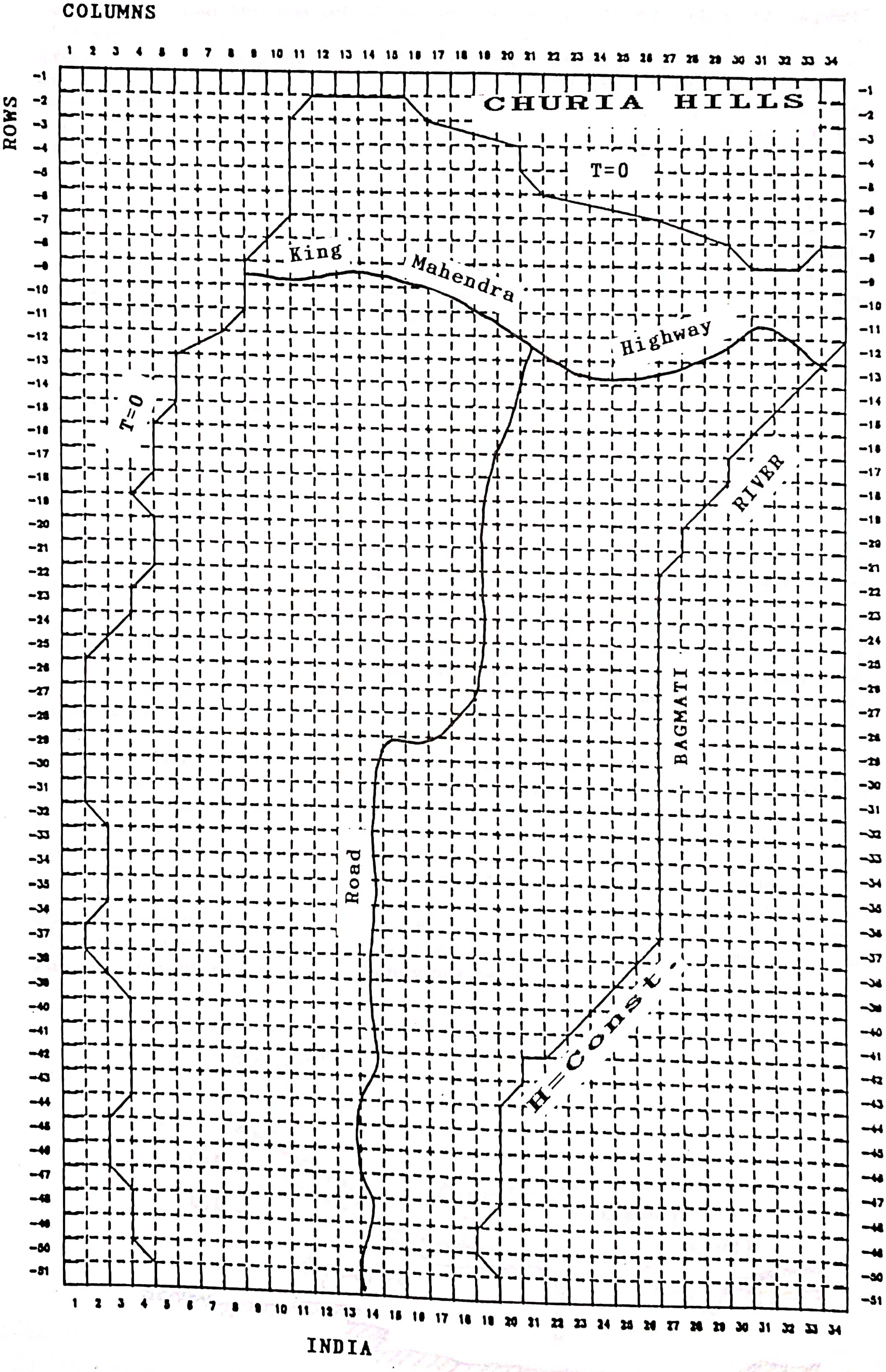


FIGURE 3

development near the district border would have produced additional "import" of shallow ground water from Bara district. However, the planning of shallow ground water development calls equally for increased pumping in Bara as well as in Rautahat district. It is on the safe side to assume that any development in Rautahat should count only with the water recharged in that district. To conclude, there is an error introduced when the Bara portion of the system is eliminated, but that error is on the safe side.

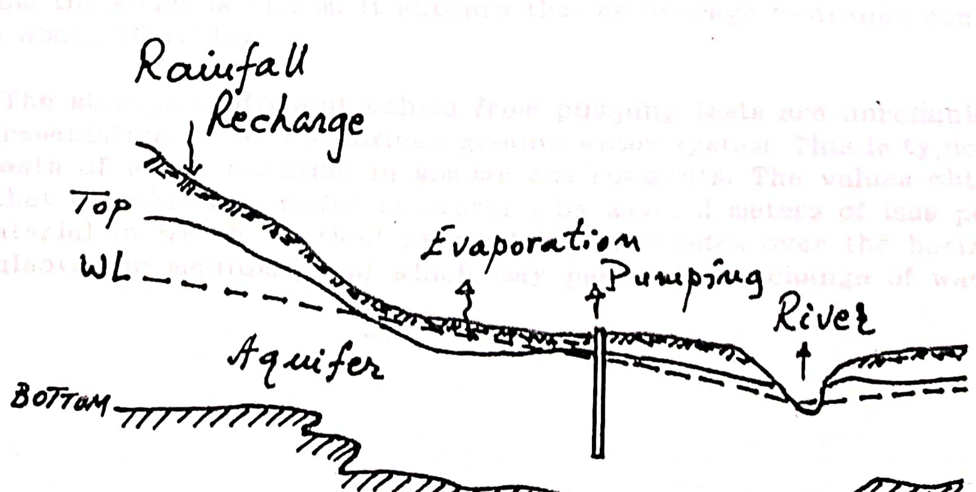
The southern boundary of the model, towards India, is also an artificial one. The model assumes a physical end of shallow aquifer in the southern direction, which implies that there is no outflow of ground water into India. This is not true, but the shallow ground water flow rate is almost negligible in comparison with other components of the system. Yet, the flow is simulated with discharging wells, reducing thus the error.

2.2. Modelled Processes and Aquifer Parameters

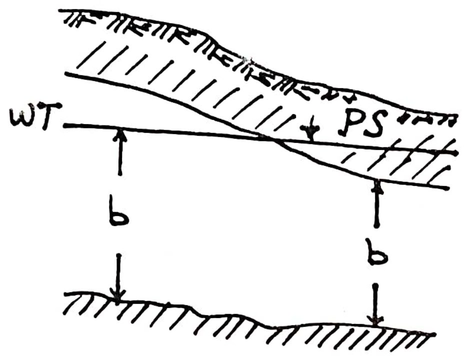
The shallow ground water system of the Terai is recharged directly from the surface in places in which a more or less permeable layer occurs near the land surface. It receives the water which infiltrates after rainfall, or which originates from rivers and other surface streams. Although the water from surface sources (rainfall, surface streams) may infiltrate almost everywhere, the major source of shallow aquifer recharge comes from a zone along the hills, known as the Bhabar zone. It is a very permeable zone composed of gravel with pebbles, some coarse sand and minor amount of finer clastics. Although generally permeable, it is characterized by extremely poor sorting. Because it was formed as a result of river fan and colluvial deposition, the Bhabar zone is not continuous.

The shallow ground water, which infiltrates after rains and recharges the aquifer, flows down the gradient mostly in the southern direction. On its way it is being consumed by evapotranspiration processes which may be active in places in which the water table comes close to the surface.

The Bagmati River, as well as any other perennial or intermittent surface stream, may either recharge the shallow ground water system or discharge from it. The direction of water exchange depends on the difference of water levels between the river and the shallow aquifer. The sketch of shallow ground water system behaviour is shown here below.



Although the ground water system modelled in this study is two-dimensional, with only one value of hydraulic conductivity (permeability) and storage coefficient representing one cell, the modelling code permits the distinction between fully saturated aquifer, and its semi- or totally confining layer above. The model also takes care to calculate the real transmissivity of the permeable layer on the basis of saturated thickness and hydraulic conductivity. This is shown in the sketch here below.



T=Kb

WT - Water table
PS - Piezometric surface
T - Transmissivity
K - Hydraulic conductivity
b - Thickness of saturated layer

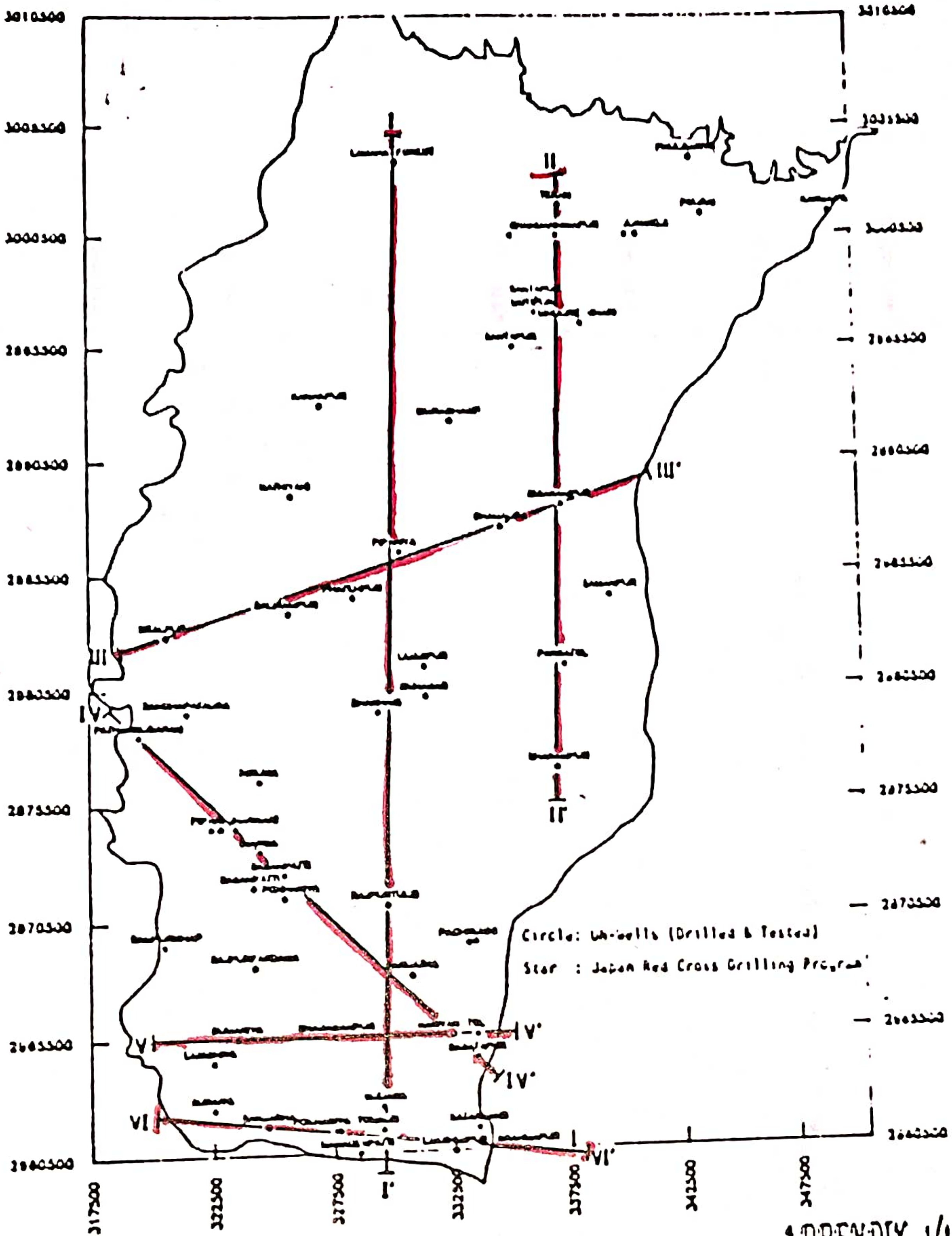
Likewise, the model also takes care to distinguish between water table conditions (when the water table is inside the permeable formation) and confining conditions (when the water table rises above the top of permeable formation).

Although the shallow system is not homogeneous and unique water-bearing layer, but composed of a sequence of permeable and impermeable layers, the model treats such a sequence as only one layer and characterizes it with an averaged value of conductivity. The nonhomogeneity of the system is clearly evidenced in lithological cross-sections in Figure 4. The Figure contains six typical lithological cross-sections, with permeable layers coloured blue and impermeable layers red.

Many pumping tests have been conducted recently to define the transmissivity of the shallow ground water system. The location of pump-tested wells is shown in Figure 5 and the transmissivity-distribution map in Figure 6. The highest transmissivities are found in the northeastern part and in the southern part. The range of values is from several hundred square meters per day to over 2,000 m^2/day. The hydraulic conductivities of shallow aquifer materials are on average between 50 m/day and 100 m/day. The average transmissivity of all tested layers is about 700 m^2/day, and the average permeable thickness is 11.4 m. It appears that an average hydraulic conductivity is about 60 m/day.

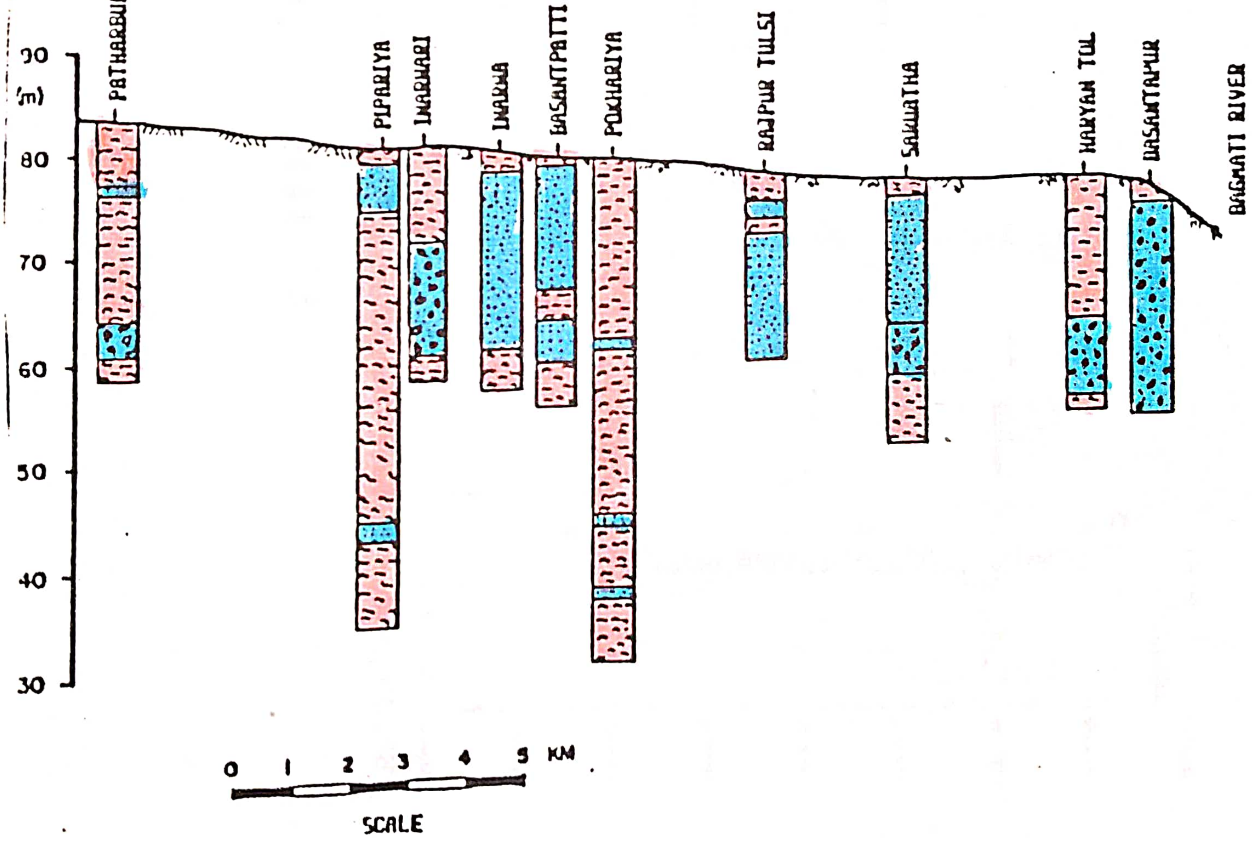
The storage coefficient values from pumping tests are unreliable and not representative for an unconfined ground water system. This is typical for many tests of short duration in similar environments. The values obtained prove that the shallow aquifer is overlain by several meters of less permeable material in which vertical permeability dominates over the horizontal one (anisotropic medium), and which may permit the exchange of water in

RAUTAHAT – LOCATION OF WELLS
LITHOLOGICAL CROSS SECTION (I – VI)

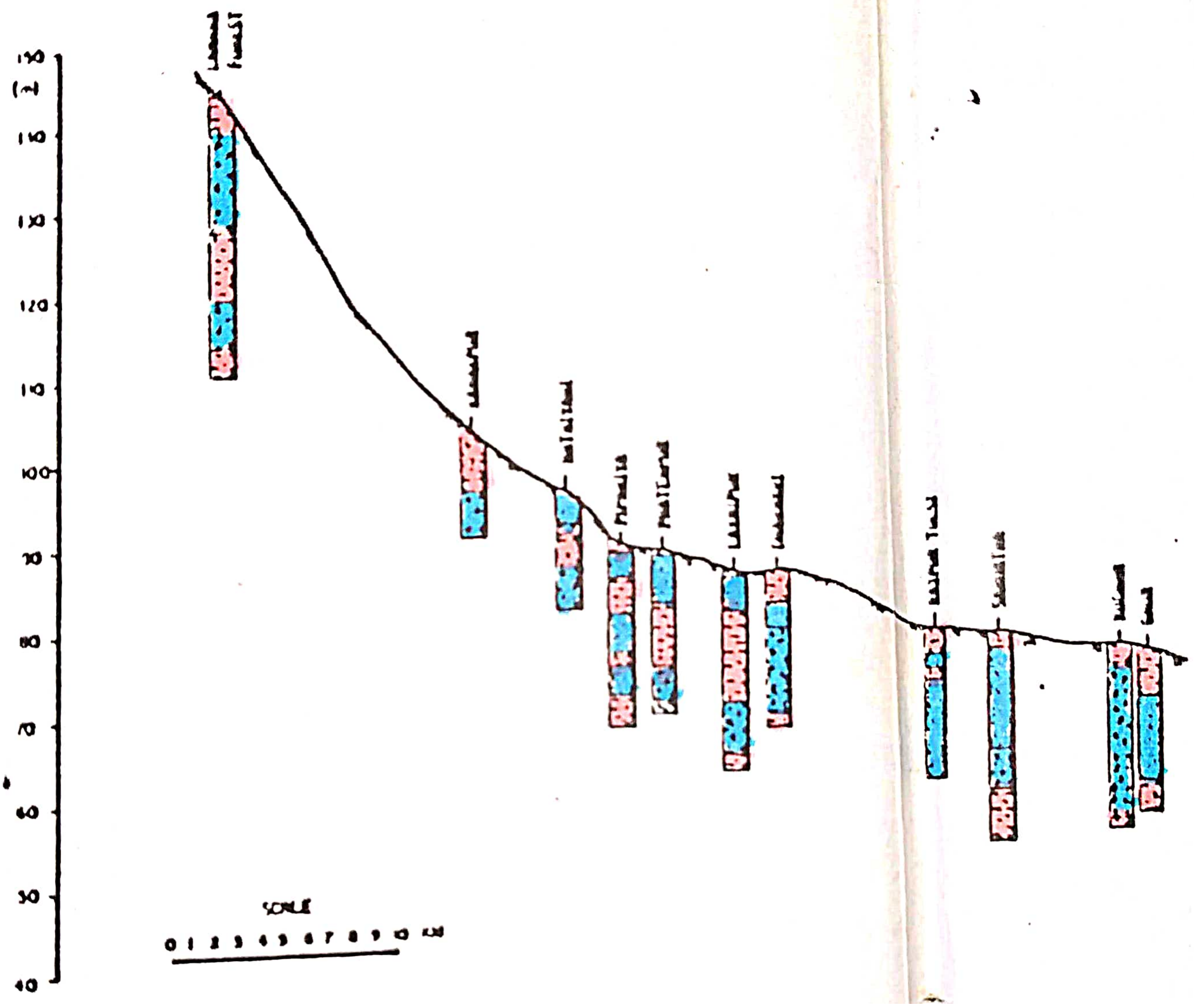


APPENDIX 4/1

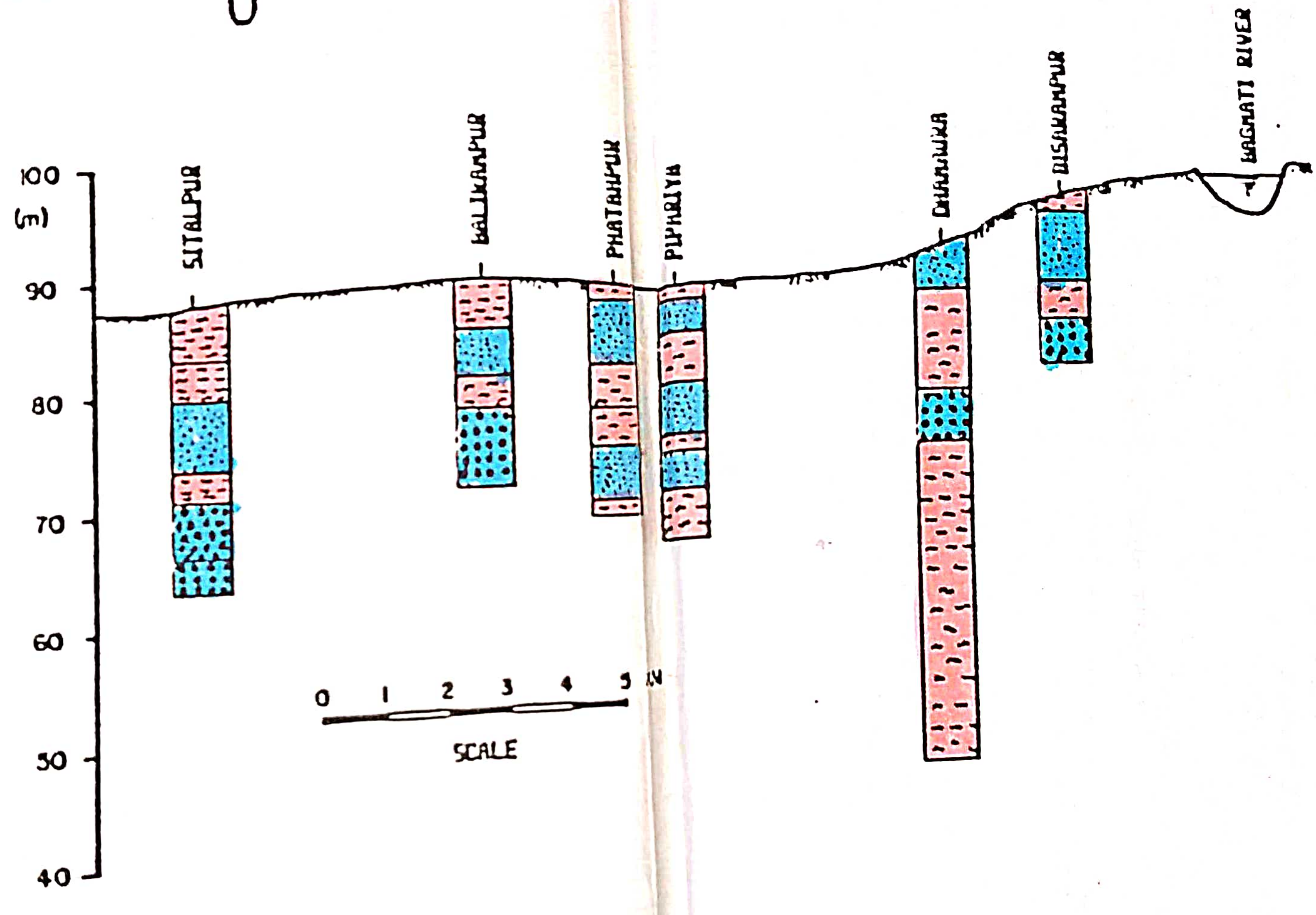
LITHOLOGICAL CROSS SECTION IV – IV'



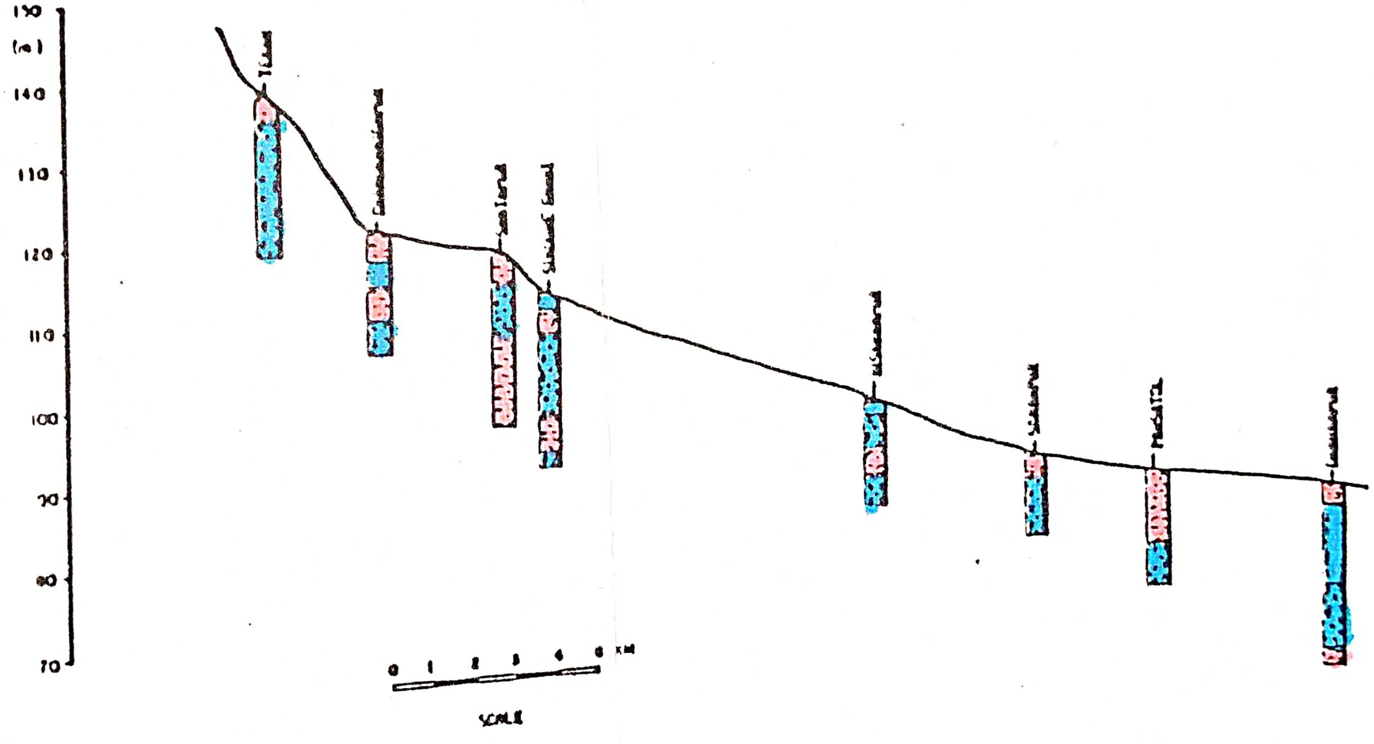
LITHOLOGICAL CROSS SECTION I – I'



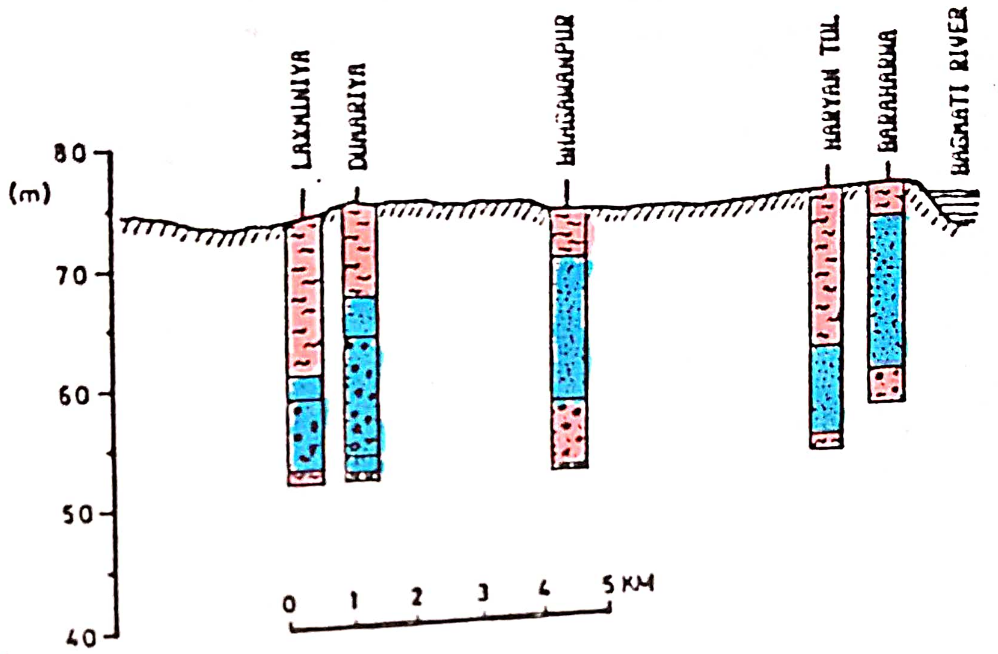
LITHOLOGICAL CROSS SECTION III – III'



LITHOLOGICAL CROSS SECTION II – II'



LITHOLOGICAL CROSS SECTION V – V'



LITHOLOGICAL CROSS SECTION VI – VI'

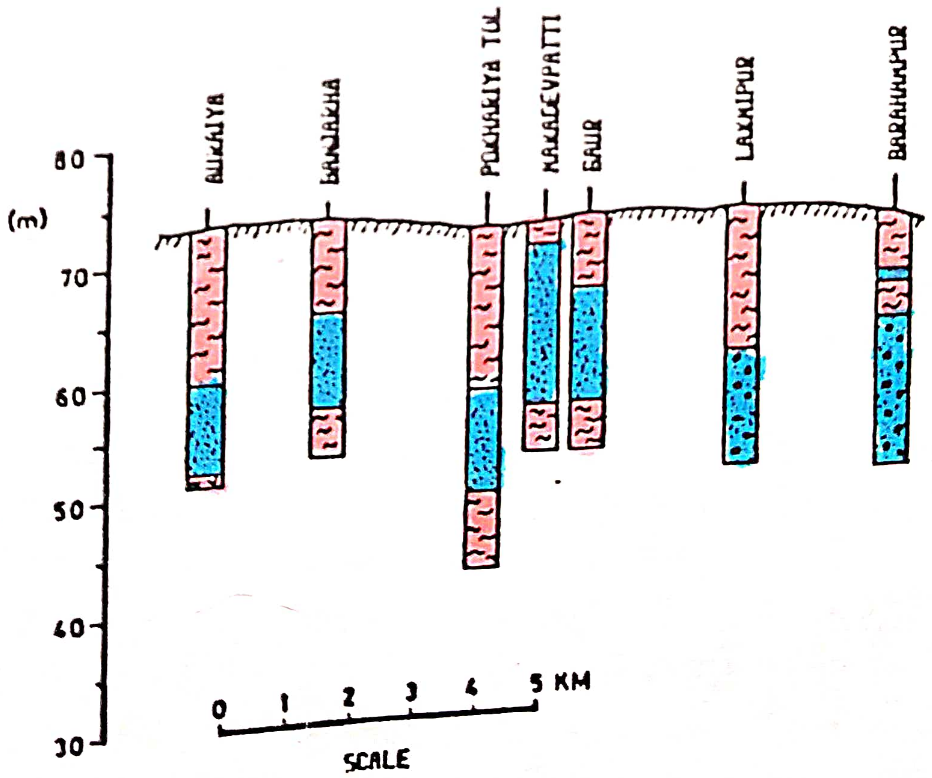
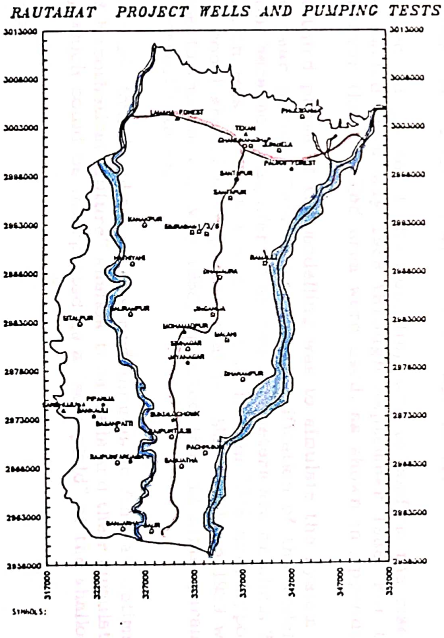


FIGURE 4

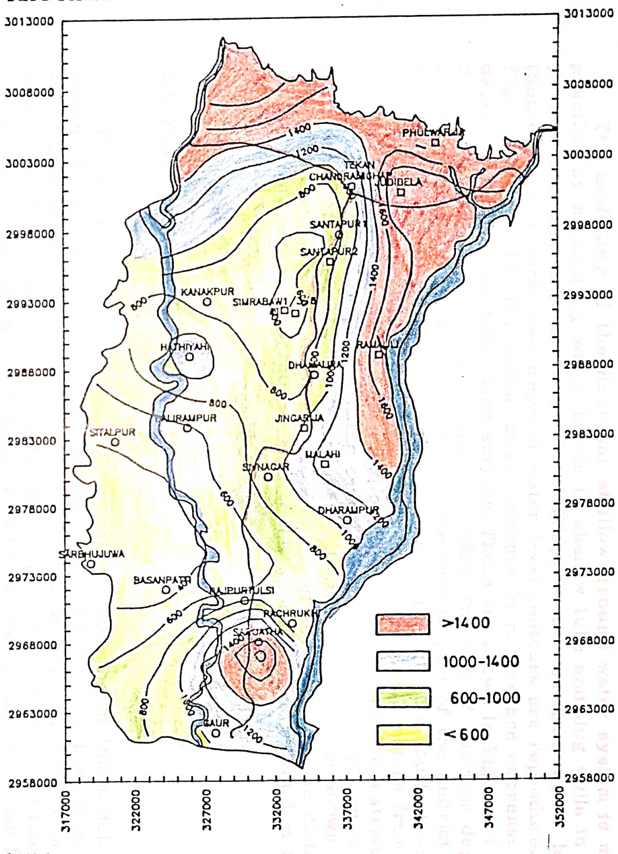
FIGURE 5

RAUTAHAT PROJECT WELLS AND PUMPING TESTS



SYMBOLS:

RAUTAHAT MAP OF TRANSMISSIVITIES (M2/DAY)



SYMBOLS:
Circle: Pumping Test Project Wells
Square: Pumping Test other STW

FIGURE 6

vertical direction (recharge from infiltrated water and evapotranspiration loss), but which offers very little storage of water.

The modelling of the Rautahat shallow ground water system is made possible by monitoring water levels in shallow tube and dug wells in the period from the minimum water level (May) to the maximum water level (September) of 1988. Two maps of water level contours are reproduced in Figures 10 and 11. The actual measurements in nature are expressed in depths to water table below land surface. These are shown in Figures 7 and 8 for the months of May and September 1988. The map of maximum depths to water table, Figure 7, shows that in the central part of the district the water table is still within 2 m from the land surface. To the south, towards Indian border, the depth is slightly higher, within 2 to 3 meters from the land surface. Only in the northern and north-western part of the district the depth to the water table is greater than 3 m. The maximum depth is in the northwest, at 11 m. The map of minimum depth to water table shows that water table is close to the land surface in the greatest part of the district. In the whole central and southern part, the water table is within 1 m from the land surface.

2.3. Phases of Modelling

The modelling started with steady-state calibration of the model. The month of May 1988 was selected for the initial phase of the modelling. The water-level contour map (Figure 10) is taken as an end of a long-term dry period. Although there is no "steady-state" in nature, it is assumed that the minimum levels would have prevailed should there be almost no rainfall for a long period of time. In a steady-state modelling, the dominant parameters in the simulation are: (a) recharge, (b) hydraulic conductivity, (c) evaporation control, plus the connection with the Bagmati River.

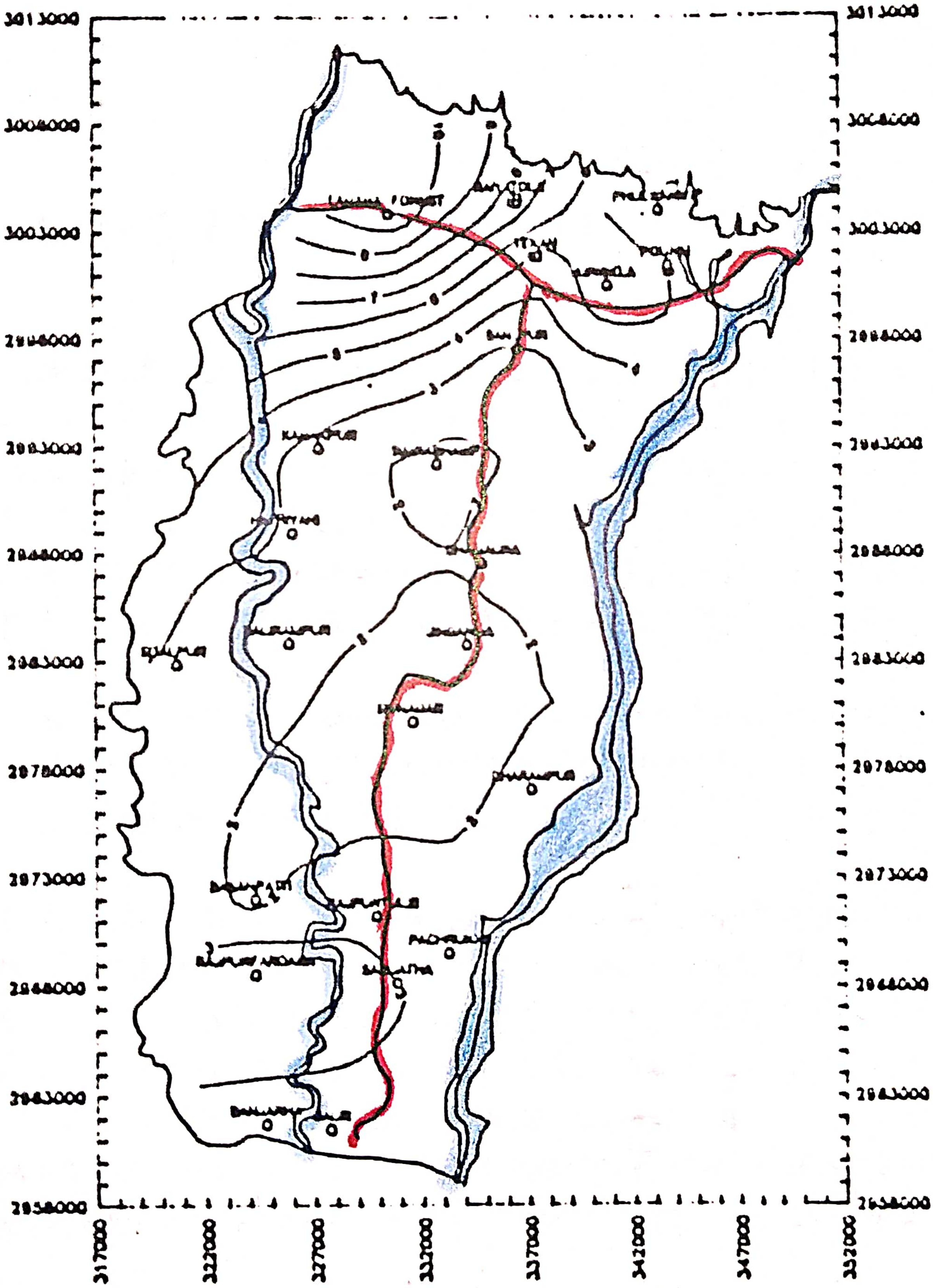
The second phase of the modelling was to confirm the rise of levels over the period from May 1988 through September 1988. For this many points all over the modelled area were used, as shown in Appendix 33.

The third phase of the modelling was to simulate the system behaviour over one year period. This is more the verification of the model than the calibration, because no aquifer or system parameters are matched. The period of simulation was between the months of May in 1988 and, hypothetically, 1989. The model should have proved that the May levels in 1989 would have come close to the ones in May 1988, provided that all input parameters are globally correctly taken.

The final, fourth, phase of the modelling is to find an optimum distribution of hypothetical "future" shallow tube wells and their cumulative pumping rate, which could be interpreted as a "safe yield" of the shallow aquifer.

FIGURE 7

RAUTAHAT DEPTH TO WATER TABLE MAY 1988



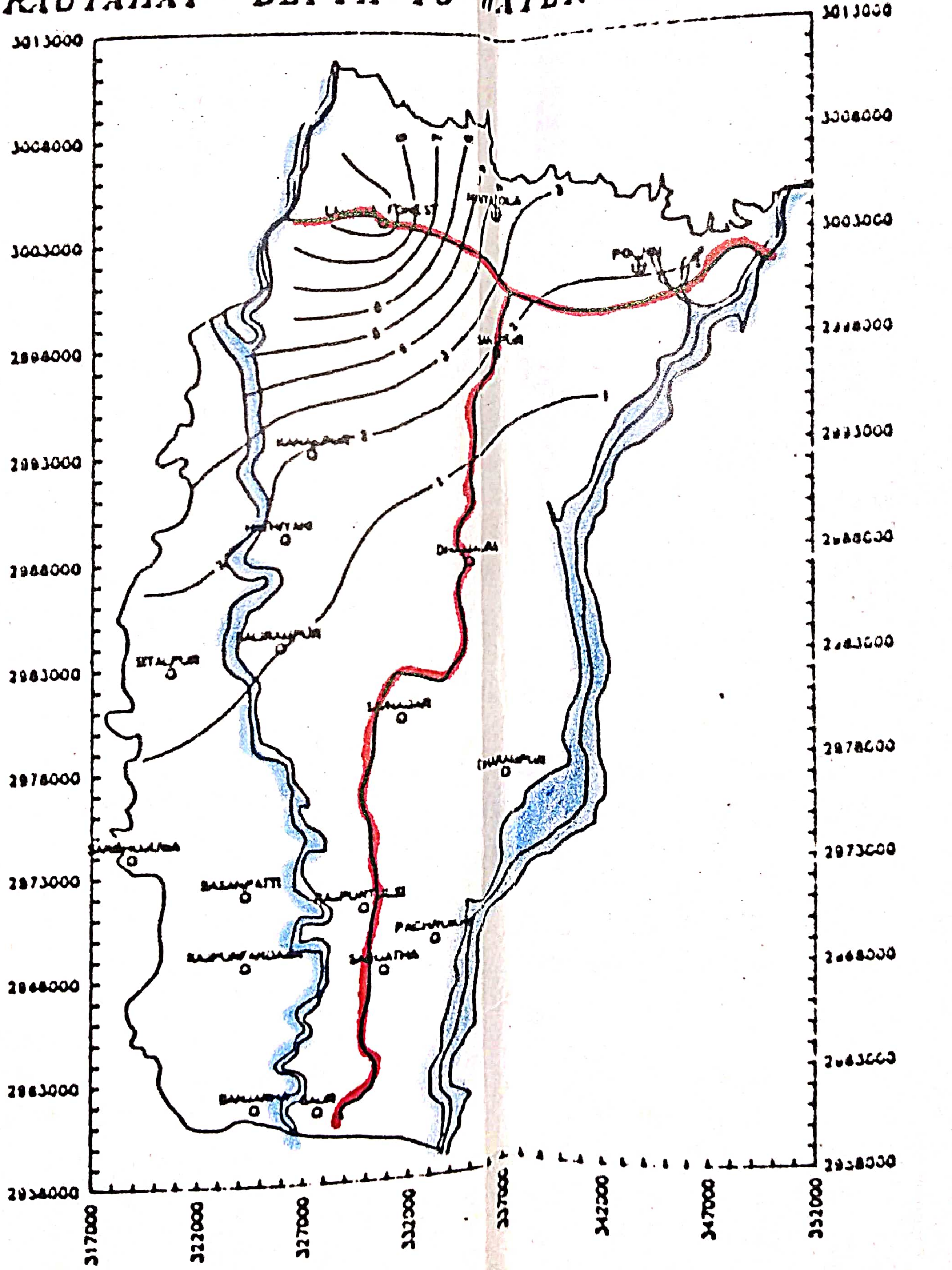
Symbols:

Circle with Cross: Dugwells

Circle: Shallow Tube wells

FIGURE 8

RAUTAHAT DEPTH TO WATER TABLE SEP 1988



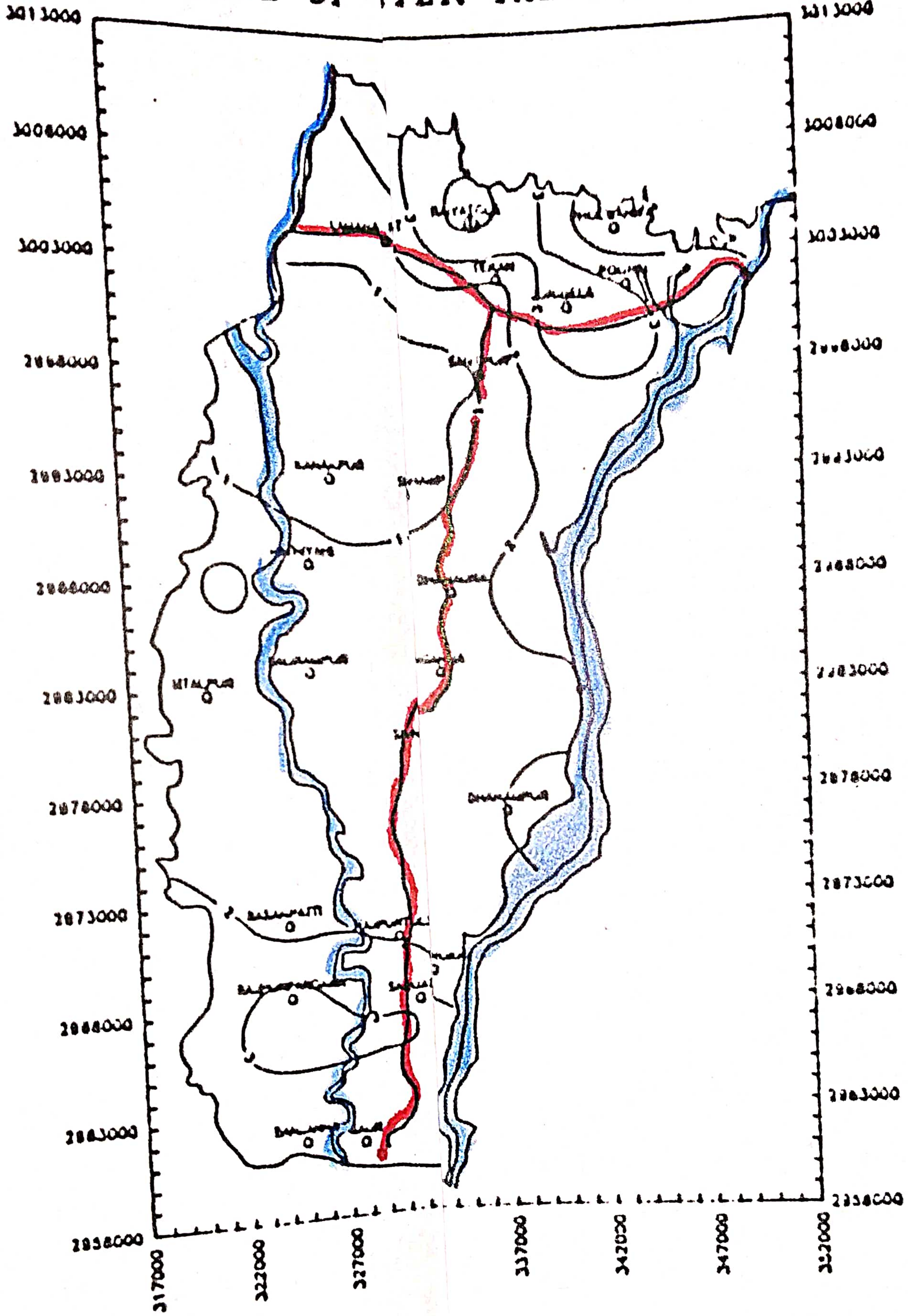
Symbols:

Circle with Cross: Dugwells

Circle: Shallow Tube wells

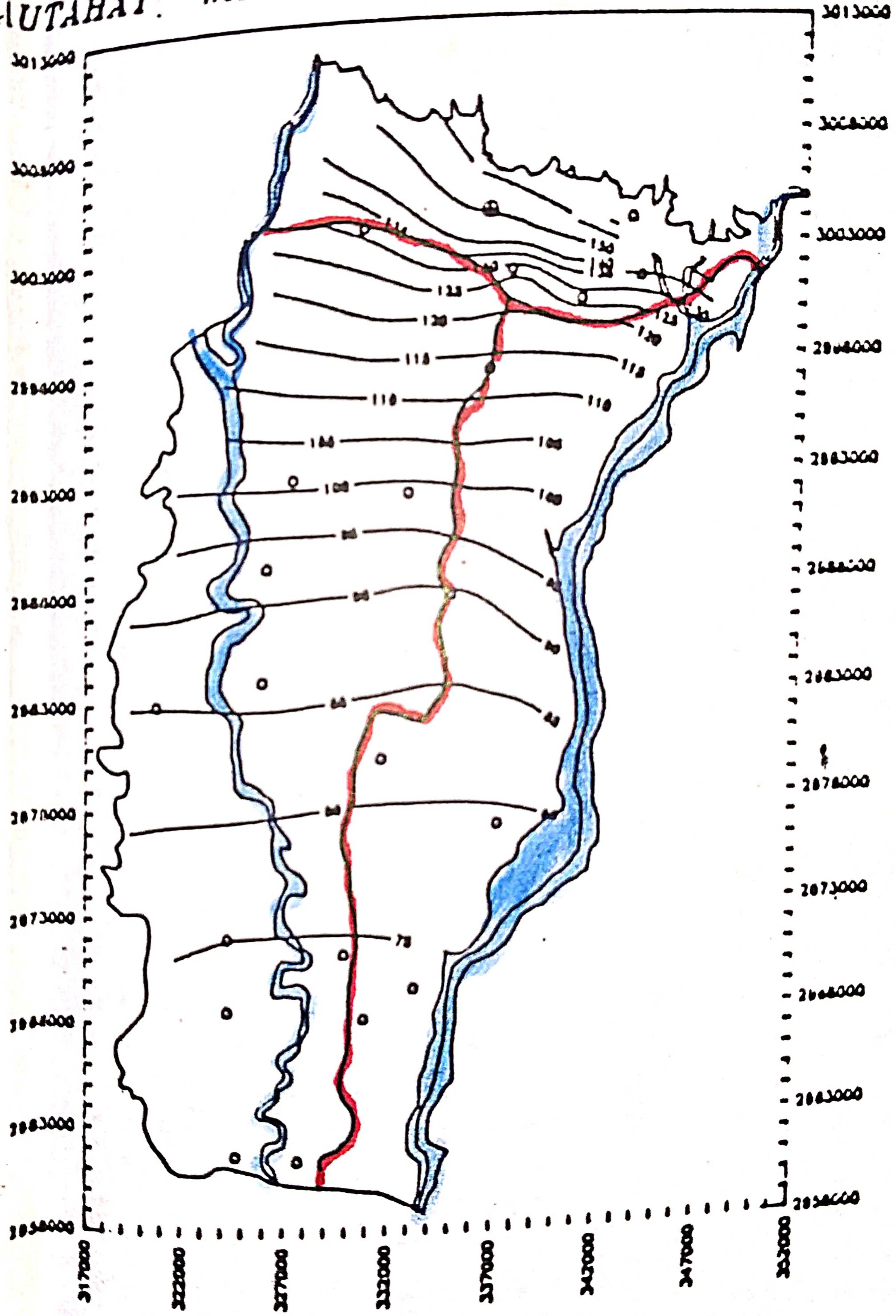
FIGURE 9

RAUTAHAT RISE OF WATER TABLE MAY - SEP 1988



Symbols:
Circle with Cross: Dugwells
Circle: Shallow Tube wells

RAUTAHAT WATER LEVEL CONTOUR MAP MAY 1988



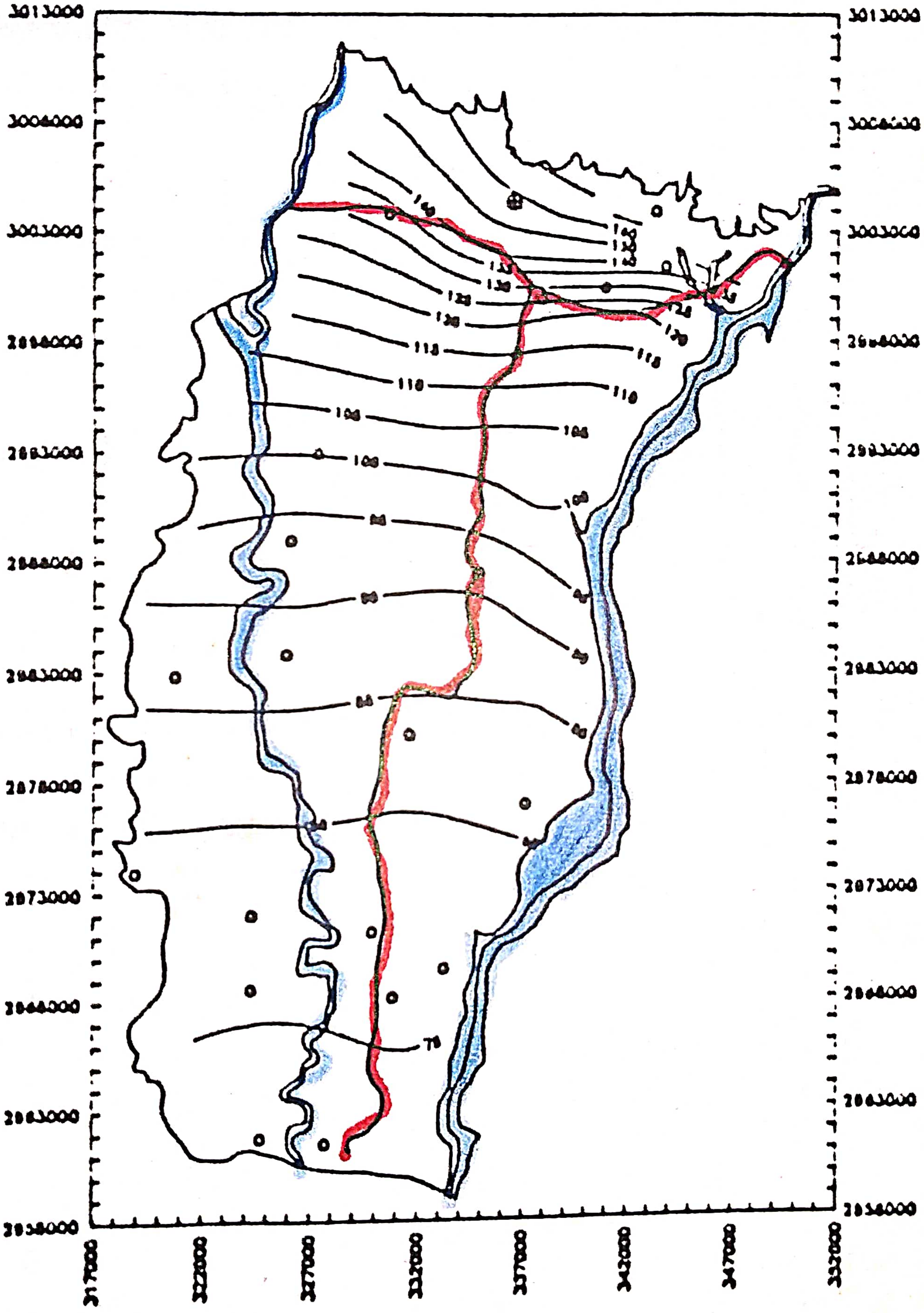
Symbols:

Circle with Cross: Dugwells

Circle: Shallow Tube wells

FIGURE 10

RAUTAHAT WATER LEVEL CONTOUR MAP SEP 1988



Symbols:

Circle with Cross: Dugwells

Circle: Shallow Tube wells

FIGURE 11

2.4. Background and Introduction on Mathematical Modelling in General

The use of microcomputers in ground water resources has grown rapidly within the past few years. A model is a system of finite-difference equations that replace partial differential equations that govern the ground water flow. One such finite-difference equation is written for each cell of the model. The user does not necessarily need to be involved in mathematics behind the modelling or programmer's code and mode of solution.

The software used for the modelling of the Rautahat shallow ground water system is proprietary United Nations ground water software, being, incidentally, prepared by the author of this report.

The finite difference grid is superposed over a map of aquifer, such as shown in Figure 3. The aquifer is thus divided into volumes having dimensions $m \Delta x \Delta y$ where m is the saturated thickness of the aquifer. The system of finite-difference equations is solved for the principal unknown h (head). The method of solution used is an iterative alternating direction implicit method. Between two iterations a residual error remains which is either reduced in successive iteration or accepted as suitable solution.

Essentially the modelling process can be thought of a black box such as the following sketch demonstrates.

INPUT DATA + PROGRAM FOR SOLUTION = OUTPUT

INPUT DATA	OUTPUT
Boundary data	Water Balance
Land Surface	Map of Levels
Top of Aquifer	Hydrographs
Bottom of Aquifer	Depth to Water
Permeability	Evaporation Distribution
Storage Coefficient	Permeability Distribution
Recharge	Storage Coeff. Distribution
Evaporation	
Bagmati River	
Initial Levels	

The role of input data cannot be overemphasized. A model is only as good as the data used to make it. As far as the Rautahat model is concerned, it is believed that the data are sufficiently good to warrant its construction.

2.5. Aquifer Geometry

The geometry of an aquifer includes the elevation of land surface, the top of permeable sequence, and the bottom of permeable sequence.

The land surface is important for having a means of controlling the evaporation process. It is a known fact that the shallow ground water shall be lost through the process of evaporation when the water table comes within several meters from the land surface. There is an empirical formula by Schoeller according to which there is a critical depth of the water table below which there shall be no water loss on account of evaporation. This depth is found from a mean monthly or annual air temperature:

$$d_{cr} = 8 \times t_o +/- 15$$

where d_{cr} is the critical depth expressed in cm, t_o is the mean annual temperature. In the Terai of Nepal, the mean annual temperature is about 23°C. Thus the maximum depth below which there should be no evaporation loss from the water table could just be about 2 meters. (The evaporation control in the model shall be discussed in Section 2.6.)

The land surface elevation is also important for limiting the rise of water table above the land surface. Only in parts of the model in which the aquifer is covered with completely impermeable clays, the modelling permits the piezometric surface to rise above the land surface.

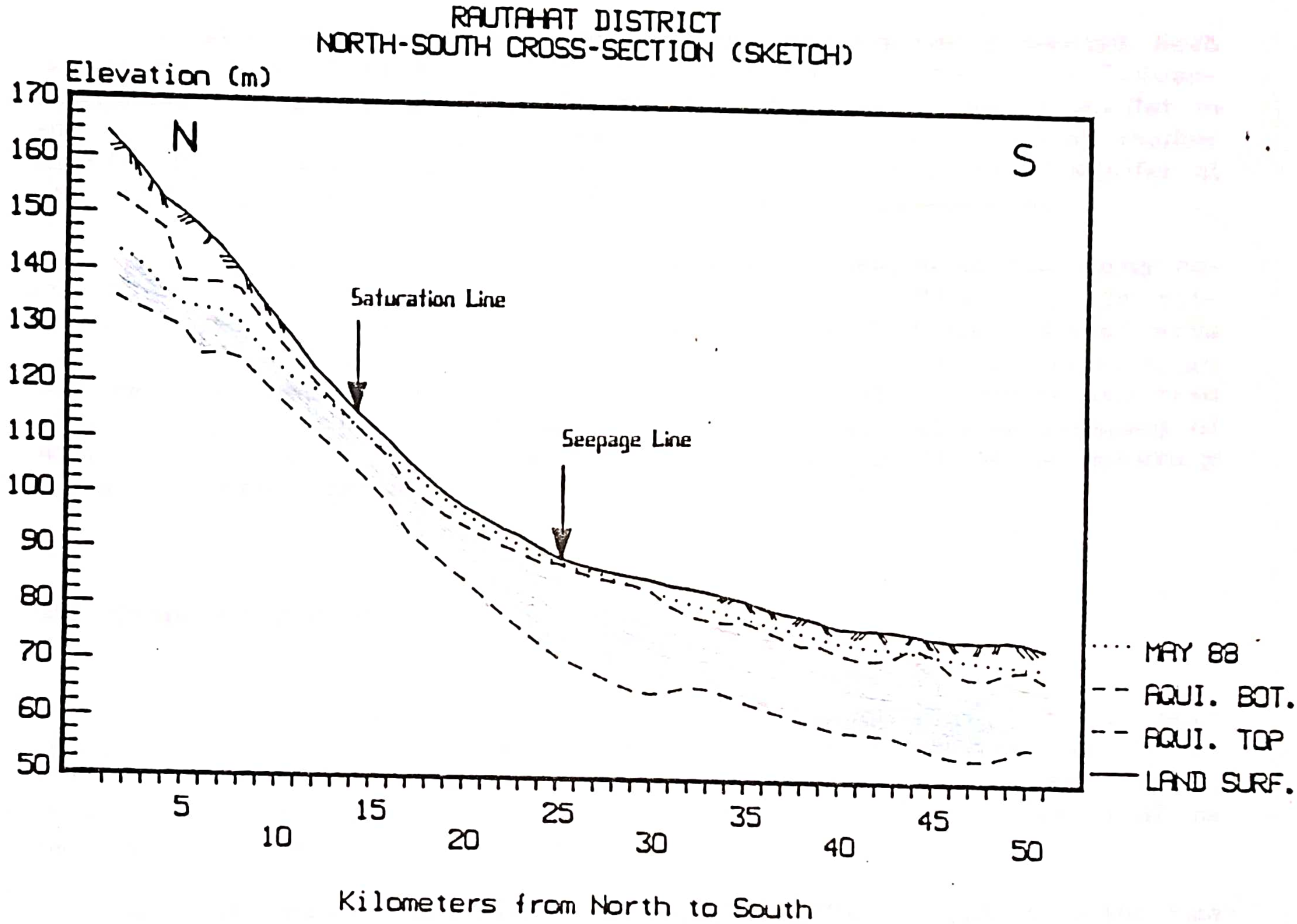
The top of aquifer elevation is important for two reasons: (1) it is used to check whether the cell is under water table or confined conditions, (2) to recalculate the transmissivity if and when the water table drops to below the top of aquifer.

The bottom of aquifer elevation is used to calculate the saturated thickness of the aquifer which is then used to obtain the transmissivity by multiplying it by the hydraulic conductivity. It is also used to assign a minimum thickness to the saturated aquifer of 0.01 m should the level ever fall below the aquifer bottom. Thus the aquifer transmissivity always has some positive value, and this allows refilling of the aquifer if the opportunity ever occurs.

The geometry of the shallow ground water system in the Rautahat model is amply illustrated in Appendices 2,3 (Land surface data), 4,5 (Top of aquifer), 6,7 (Bottom of aquifer).

The cross-sections through various parts of the model are shown in Appendices 25 through 32. The blue-coloured layer is the shallow aquifer which is the subject of this modelling study. Although shown as uninterrupted unit, this is in essence a sequence of several permeable and impermeable layers, which are all hydraulically connected and have the same source of recharge and discharge.

The geometry of the shallow aquifer, in its north-south direction, is also sketched here below.



The change of land surface slope is evident some 20 or so kilometers from the hills. Although the sketch shows the "bottom" of the shallow aquifer, it is in no way an indication of the absence of permeable layers underneath. Rather than that, it is a subjective indication of what one may call "shallow aquifer", that is the uppermost sequence of permeable layers directly recharged from rainfall and surface streams.

The break of the land surface slope is mostly responsible for the introduction of two terms: "phreatic seepage line" and "saturation line". The seepage line is defined as the line where shallow water table emerges at the land surface. If it is assumed that the near-the-surface layer is permeable, than along this line there will be a loss of shallow ground water in the form of dispersed seepage. In the sketch above, the seepage line might be (in May

1988) somewhere about the 25th kilometer or at an elevation of about 90 m. The saturation line is an artificial projection onto the land surface of the line where the first permeable layer becomes fully saturated. In the sketch, the saturation line may be somewhere near the 12th kilometer from the northern edge of the plain. Evidently both lines are constantly shifting, depending on the season and the vertical position of the water table.

In Appendices, some other geometric features are also presented. Each is the outcome of an automatic modelling opportunity which "cross-interprets" the geometry of the system. The depth to the top of aquifer in each model cell is shown in Appendix 8, the depth to the bottom of shallow aquifer is shown in Appendix 9, and the saturated thickness of aquifer at the beginning of simulation (May 1988) is shown in Appendix 10.

The geometry of the shallow aquifer was interpreted from many recently drilled shallow wells. Their schematic locations within the model network are shown in Appendix 1 (56 locations). Some of recently drilled wells (UN project) have their land surface elevations taken from air photos to an accuracy of some 25 cm. For others, the land surface elevation was read from a 1:125,000 topographic map (English version), with an accuracy of some 0.5 m in most cases, except in the very north where the accuracy could be several meters.

2.6. Evaporation Control

The process of evaporation of shallow ground water is one of the most dominant and decisive processes in the Rautahat ground water system. Therefore, the model pays an adequate attention to its role. It is assumed that in every cell in which the evaporation process is possible, the loss shall be calculated according to the following:

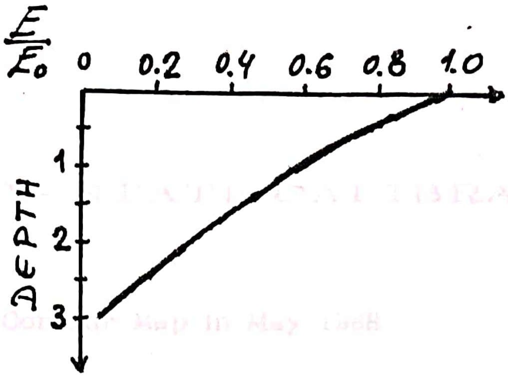
(a) When water table comes to the land surface or above it, the loss shall be equal to the potential evaporation (maximum evaporation, or free-water surface evaporation - that is the one reported in meteorological manuals).

(b) When water table drops to below the critical depth of evaporation, which is in this model set at 3.0 m below the land surface, there will be zero evaporation loss.

(c) Between 3 m depth and the land surface, the loss is calculated according to the exponential formula:

$$E = E_0 \exp(-0.6d)$$

where E is the current loss (function of space, depth, and, indirectly, time), E_0 is the free-water surface evaporation rate, d is the current depth of water table below the land surface. Graphically, the loss is shown in the sketch below.

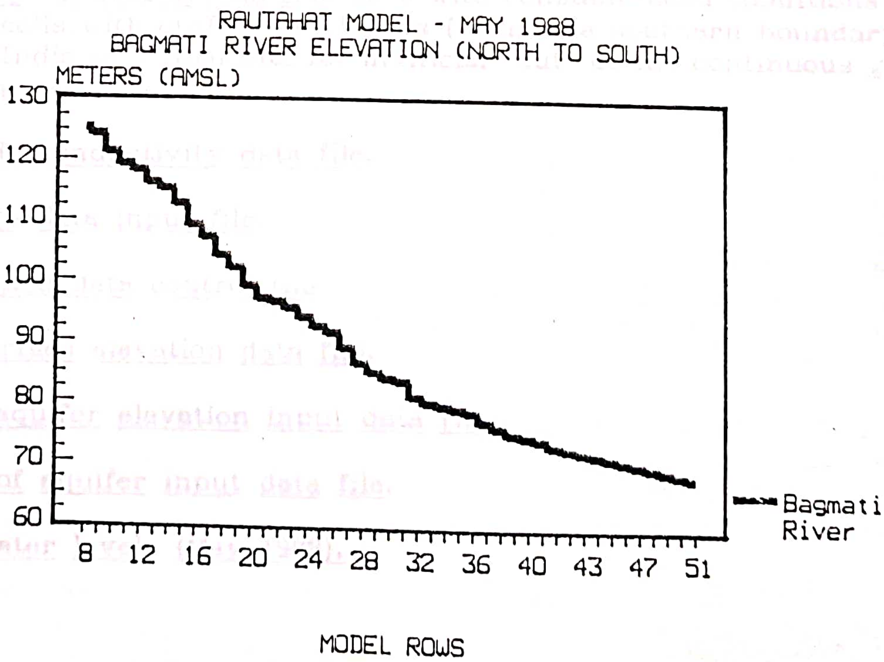


If the shallow aquifer is covered by a semiconfining layer (silty, sandy clay) and "water table" is within this semiconfining zone, the evaporation loss shall be equal to 10% of the equivalent loss which would have occurred had the water table been inside the saturated permeable medium.

The model keeps an account of cumulative evaporation losses which are then compared to cumulative recharge.

2.7. Bagmati River

The Bagmati River makes the eastern boundary of the shallow ground water flow system. The elevation of the water table in the river cells is taken from the topographic map, scale 1:125,000. The slope of the river, as it is entered into the model in the month of May 1988 is shown in the sketch here below.



3. STEADY-STATE CALIBRATION (MAY 1988)

3.1. Water Level Contour Map in May 1988

The basis for the steady-state calibration is the contour map of water levels in May 1988. The map is produced by subtracting the depth to water table in selected wells from absolute land surface elevation. The map of depths to water table from the land surface is shown in Figure 7, along with the map of the depth to water table in September 1988, and the rise of levels between May and September 1988. In absolute elevations, the water table contour map is produced in Figure 10 (small scale), and in Appendix 12 (larger scale). The model is expected, in the steady-state calibration to duplicate this map. The map (Appendix 12) was produced from some 20 measured values in the observation network, covering all parts of the model.

3.2. Input Data Files

The model demands the following input data files:

(a) General Data: number of columns, number of rows, size of one time step (DELTA) (in the steady-state calibration the size of the time step is very large; normally $1x10^{10}$ days is sufficient), maximum permitted number of iterations, error convergence criterion (ERROR).

(b) Boundary conditions data file: cells with constant-head conditions (Bagmati River), cells with outflow conditions (along the southern boundary, the outflow into India to compensate for artificial "cut" of the continuous ground water system.

(c) Hydraulic conductivity data file.

(d) Recharge data input file.

(e) Evaporation data control file.

(f) Land surface elevation data file.

(g) Top of aquifer elevation input data file.

(h) Bottom of aquifer input data file.

(i) Initial water levels (May 1988).

The boundary date file contains 51 lines, one for each row, prepared in the format 5x,34I1. This means that in the first five columns anything could be typed (ignored by the computer), after which each row has one field (from the field 6 through 39). The number 9 is reserved for a constant-head cell (the river), and the number 1 for the inflow/outflow conditions (e.g. the outflow of shallow ground water out of the model into the neighboring India). The Bagmati River is located along the eastern boundary of the model, and the outflow is limited to the last row of the model (51).

The hydraulic conductivity input data file is reproduced in Appendix 22. The first line contains the values of different categories of permeabilities (hydraulic conductivities) and the remaining 51 lines contain the categories for each cell, one row by row. The format of input is 5x,34I1, which means that in the first columns anything can be typed since it shall be ignored by the computer. (This "free" space is used for typing numbers of rows.) There is also a legend, which explains the relationship between the values and categories. For example, the code 4 means the permeability of 50 m/day, etc. As mentioned before, these are a kind of artificial values of permeabilities, because they are averaged over the whole saturated thickness, irrespective of the proportion of permeable versus impermeable material. (The real value of the hydraulic conductivity must be higher than the one used herein.)

The distribution of hydraulic conductivities as shown in Appendix 22 is the final outcome of the modelling (calibration) process.

The recharge data input file is shown in Appendix 21. It is also an outcome of the modelling calibration process. Similar to the hydraulic conductivities, the first line in the file contains the values, expressed in percentages of rainfall, and the remaining 51 lines the codes (categories) which are translated by the model into the values of recharge. There is also one line at the end of the file, which shows the rainfall (daily rate) for a particular time interval. Thus, the value of 0.001 is 1 mm/day, or 30 mm/month, because the basic units in this model are meter for length (distance), day for time. (There are two more basic units: m^2/day for transmissivity, m^3/day for pumping rates.)

The evaporation input data file is shown in Appendix 23. There are only two categories of data, zero (or blank) and 1. The first implies that there will be no evaporation process, either because the cell is outside of the model, or the aquifer is covered by completely impermeable formation. The last line (the 52nd in this case) contains the daily maximum (free-surface) evaporation rates for each time interval. (In the steady-state calibration only the first value is used, since, by definition, the steady-state is achieved in only one time step.)

The land surface elevation file is shown in Appendix 2. The values are input in the so-called free format, i.e. each value is separated from the next one by either space or comma. Each line represents one model row, with 34 values in it. The "number" data in Appendix 2 are the ones that are read by the model (computer), while the contour map shown in Appendix 3 is only for reporting.

<u>The top of aquifer input data file</u> is shown in Appendix 4, and its graphical equivalent (used only for reporting) in Appendix 5.

<u>The bottom of aquifer input data file</u> is shown in Appendix 6, and its graphical equivalent in Appendix 7.

<u>The initial water levels input data file</u> is shown in Appendix 11, and its graphical equivalent in Appendix 12. It is very important that the input file contains as close initial levels as possible to what is believed to be the real water level configuration. The importance comes from the fact that these levels are used to calculate initial transmissivities of the shallow aquifer, and initial evaporation rates. Both of these will prevail throughout the steady-state calibration without any modification.

3.3. Results of Steady-State Calibration

The steady-state calibration is necessary to produce a good initial map of water levels. The levels must be in equilibrium (recharge-flow-discharge) so that any subsequent non-steady state deviation from the balanced state produces changes in wanted direction. E.g., the levels should decline in dry season or rise in wet. They will not do so unless the map of initial levels is perfectly balanced in the antecedent period.

After many computer runs, in which the hydraulic conductivities, recharge rates and evaporation distribution were changed (sometimes also geometry of aquifer, including double check of land surface elevations, lithology, etc.) the final outcome was the map of levels in May 1988, as produced by the model. This is presented in Appendix 16 in graphical form, and in Appendix 15 in the "number" form. The success of the steady-state calibration becomes evident when two maps are compared: Appendix 12 (initial levels, subjectively input by the modeler) and Appendix 15 (model final outcome). The match is also evidenced by the differences at each cell as shown in Appendix 17. (This is also an output feature of the computer software used for the modelling.) The match between "nature" and model is excellent in the lower half of the model, being mostly in the range from -0.5 to +0.5 m. In the hilly parts of the model, in some isolated cells the difference could be as high as 2.4 m, although on average the difference is only between -0.5 and +1.0 m in most cells. It is believed that the map as shown in Appendix 16 is a good starting point for the unsteady-state calibration of the rise of levels in the monsoon season of 1988.

The map of levels in Appendices 15 and 16 are obtained with the following input data distributions: (a) transmissivities as shown in Appendix 14, (b) evaporation as shown in Appendix 20, (c) hydraulic conductivities as shown in Appendix 22, (d) recharge rates and distributions as shown in Appendix 21, (e) evaporation codes as shown in Appendix 23.

Although the modeler has a certain freedom to modify some parameters, the modifications may not exceed some tolerances. The values of conductivities and recharge rates, in particular, must be based on the conclusions of previous hydrogeological studies. The final distribution of transmissivities (Appendix 14) is not materially too much different from the map of transmissivities produced in Report No. 3 (Rautahat District, Basic Documentation and Preliminary Interpretation from shallow wells drilling, pumping tests and water levels monitoring) (see Figure 6).

The quality of match in selected 24 observation wells is demonstrated in the table here below.

Cell	Location	Nature (m)	Model (m)	Difference (m)
21,11	Chandranigapur	122.9	123.3	+0.4
19,7	Rayatola	137.0	136.5	-0.5
27,10	Pourai	126.0	125.3	-0.7
13,36	Karuniya	77.8	77.6	-0.2
18,24	Dhamaura	88.8	89.2	+0.4
20,35	Dharampur	78.8	78.8	0.0
13,50	Gaur	69.9	70.0	+0.1
14,43	Saruatha	72.4	72.1	-0.3
16,42	Pachrukhi	73.1	72.8	-0.3
7,43	Rajpur Fardawa	72.5	72.2	-0.3
12,41	Rajpur Tulsi	73.9	73.2	-0.7
19,13	Santapur	114.4	114.5	+0.1
13,8	Lamaha Forest	130.6	130.8	+0.2
8,27	Balirampur	86.1	85.4	-0.7
8,22	Hathiyahi	90.6	89.6	-1.0
10,18	Kanakpur	99.0	98.7	-0.3
27,8	Phulwariya	132.0	132.3	+0.3
25,10	Juribela	125.7	125.8	+0.1
16,19	Simrah Bhawani Pur	96.4	96.4	0.0
7,39	Basanpatti	75.0	75.2	+0.2
14,31	Sivnagar	82.9	82.6	-0.3
4,28	Sitalpur	85.0	85.0	0.0
22,9	Tekan Tole	130.6	130.4	-0.2
8,46	Banjarha	71.5	71.0	-0.5

The average difference is about 0.3 m. The location of observation wells used in the steady-state calibration is shown in Appendix 33.

The model also keeps an account of the water balance and shows the total convergence "error", plus indicates the cell (I,J coordinates) in which the error is the largest in each particular iteration. As shown in Appendix 24, in the final steady-state calibration computer run, the convergence was achieved in 48 iterations (on an IBM AT equipped with numerical co-processor, the total processing time was slightly over 3 minutes).

The total recharge, as shown by the model, in the dry season was about 410450 m^3/day, which makes an equivalent of 12.3 MCM/month (million cubic meters). The evaporation loss is equal to 230585 m^3/day, or 6.9 MCM per month. The outflow into India across 13 km section is 8600 m^3/day, or 258,000 m^3/month. Thus, what remains as a surplus of recharge flows into the Bagmati River. The ground water outflow into the Bagmati River amounts to about 171,000 m^3/day, or 5.1 MCM per month. This is also an equivalent of about 2 m^3/sec, which is of correct order of magnitude when compared to the minimum flow rate of the Bagmati River recorded at Karmaiya gauging station (about 18 m^3/sec, see Figure 2).

4. UNSTEADY-STATE CALIBRATION MAY 1988 – SEPTEMBER 1988

4.1. Basis for Calibration

Sixteen observation wells were under once-a-month monitoring in the period from May through September 1988. On the basis of observations, a contour map of water levels (in absolute elevations) was drawn as shown in Appendix 40. Individual hydrographs, as observed in the nature, are presented in Appendices 34,35,36,37.

The rainfall record was available through the end of September in Gaur, and through the middle of September in Ramauli. On the basis of this, the daily rainfall was input into the model.

4.2. Calibration Process

The five-month period (May through September) was divided into 10 equal time intervals, each of 15 days. At the beginning of each time interval, a new value of rainfall and potential evaporation was read into the model (in m/day). Likewise, the Bagmati River cells were assigned different values in each time interval.

In the process of calibration major changes were made in the distribution of different storage coefficients, both under water table conditions (effective porosity) and under confined conditions (storativity). The final outcome is presented in Appendices 41 (effective porosity) and 42 (storativity).

Also, the Bagmati River cells were assigned different elevations. Two selected hydrographs that were assigned as a boundary condition, are shown in Appendix 38 (cells 25,25 and 18,46). In the absence of a realistic river stage measurement, it was accepted that the Bagmati River rises in the monsoon period 1.5 m from the pre-monsoon level, and that by the end of September it recedes one meter remaining in September still 0.5 m above the May levels. Even if this is not quite accurate the error should not be decisive. Yet, for future modelling, it is important to have more information on the Bagmati River.

The initial river stage - distance cross-section is shown in Appendix 38, as well. This is the graph of absolute river elevation starting from the northern row 8 and ending at the southmost row 51. Clearly, the river slope is greater in the upper half of the district, being about 0.2%, or 0.002 m/m. In the lower part of the district, the slope is 0.06%, or 0.0006 m/m.

Minor changes have been made also in the distribution of recharge and hydraulic conductivity. The outcome is discussed next.

4.3. Results of Unsteady-State Calibration

The model produced several outputs in this phase of simulation:

(a) Map of Water Levels in September 1988 (Appendix 39), which matches a similar map constructed from field observations (Appendix 40).

(b) Hydrographs at selected points, shown in Appendices 34,35,36,37, and compared to the hydrographs constructed from field observations.

(c) Depth to water in September 1988, shown in Appendix 43, which should be compared with a similar map (Figure 8) constructed from field observations.

(d) Rise of levels from May to September 1988, shown in Appendix 45, which should be compared with a similar map in Figure 9.

(e) Distribution of Storage Coefficients, under water table and confined conditions, as shown in Appendices 41 and 42, respectively.

(f) Water Balance, which is reproduced here below.

WATER BALANCE IN MAY THROUGH SEPTEMBER 1988

MONTH	RECHARGE		INFLOW		OUTFLOW		EVAPORATION	
	M^3/D	MCM	M^3/D	MCM	M^3/D	MCM	M^3/D	MCM
MAY	119,650	3.59	262,000	7.86	8,200	0.25	351,936	10.56
JUNE	478,600	14.36	262,000	7.86	8,200	0.25	360,751	10.82
JULY	1196,500	35.90	262,000	7.86	8,200	0.25	289,654	8.69
AUGUST	1196,500	35.90	262,000	7.86	8,200	0.25	255,672	7.67
SEPT.	358,950	10.77	262,000	7.86	8,200	0.25	201,462	6.04
		100.52		39.3		1.25		43.78

In the above table, the recharge is shown under two headings: recharge and inflow. Inflow is the entrance of either surface, spring, or river water directly recharging the shallow aquifer in near-the-hills area (Bhabar zone), or contributing the recharge in a form of subsurface flow through the beds of river which enter the Terai plain from Siwalik hills. The "Inflow" is taken as a constant, i.e. not being so much influenced by seasonal rain.

Outflow, as shown above, is artificial discharge through wells in 13 cells in the row 51. This is a compensation for cutting off the aquifer which normally extends into India. Clearly, this outflow is a minor component of the water balance.

The balance shown above may be interpreted in the following way. The total input of water into the shallow ground water system in the monsoon period between May and September is equal to about 140 MCM (million cubic meters). Out of this volume, about 44 MCM are lost through evaporation, and 1 MCM outflows into India. The remaining 95 MCM are split in the following way: (a) one portion is used to fill up the storage, with the consequence of water levels rising (see Appendix 45); (b) another portion flows into the Bagmati River. The model does not distinguish between the two.

5. VERIFICATION OF THE MODEL IN ONE YEAR PERIOD

5.1. Assumptions

The modelling process continued with one-year simulation. One part of this period is real (May through September), but the second part (dry season) is hypothetical. It is assumed that the rainfall that may contribute recharge to the shallow aquifer is as follows:

MAY	1-15	15 mm	NOV	1-15	15 mm
MAY	16-30	15 mm	NOV	16-30	15 mm
JUN	1-15	30 mm	DEC	1-15	15 mm
JUN	16-30	90 mm	DEC	16-30	15 mm
JUL	1-15	150 mm	JAN	1-15	0 mm
JUL	16-30	150 mm	JAN	16-30	0 mm
AUG	1-15	150 mm	FEB	1-15	7.5 mm
AUG	16-30	150 mm	FEB	16-30	7.5 mm
SEP	1-15	60 mm	MAR	1-15	7.5 mm
SEP	16-30	30 mm	MAR	16-30	7.5 mm
OCT	1-15	30 mm	APR	1-15	7.5 mm
OCT	16-30	30 mm	APR	16-30	7.5 mm

The total rainfall that may contribute the recharge is 1005 mm, which is less than an average annual rainfall. The following interpretation of heavy rainfall explains why the actually important rainfall is less than recorded. Some of rain during heavy monsoon spells exceeds the soil infiltration capacity and flows as surface or overland flow without contributing to infiltration into the soil. Thus the rainfall input into the model in the months of July and August are reduced.

All other parameters remained the same as in the previous calibration run. The time interval was kept constant, 15 days, and the one-year period was simulated in 24 time intervals.

5.2. Results

The results are shown in two forms: (a) one-year hydrographs at selected points (Appendices 46 and 47), (b) water balance for each 15-day interval (Table here below).

STEP	RECHARGE M3/DAY	RECHARGE L/SEC	INFLOW M3/DAY	INFLOW L/SEC	EVAPORATION M3/DAY	EVAPORATION L/SEC	OUTFLOW M3/DAY	OUTFLOW L/SEC
1	-119650.	-1385.	-262000.	-3032.	326483.	3778.7	8200.	94.9
2	-119650.	-1385.	-262000.	-3032.	380422.	4403.0	8200.	94.9
3	-239300.	-2770.	-262000.	-3032.	358893.	4153.8	8200.	94.9
4	-717900.	-8309.	-262000.	-3032.	366350.	4240.2	8200.	94.9
5	-1196500.	-13848.	-262000.	-3032.	283738.	3284.0	8200.	94.9
6	-1196500.	-13848.	-262000.	-3032.	297575.	3444.2	8200.	94.9
7	-1196500.	-13848.	-262000.	-3032.	274253.	3174.2	8200.	94.9
8	-1196500.	-13848.	-262000.	-3032.	234756.	2717.1	8200.	94.9
9	-478600.	-5539.	-262000.	-3032.	191328.	2214.4	8200.	94.9
10	-239300.	-2770.	-194000.	-2245.	195102.	2258.1	8200.	94.9
11	-239300.	-2770.	-194000.	-2245.	166854.	1931.2	8200.	94.9
12	-239300.	-2770.	-160000.	-1852.	163058.	1887.2	8200.	94.9
13	-119650.	-1385.	-160000.	-1852.	119402.	1382.0	8200.	94.9
14	-119650.	-1385.	-160000.	-1852.	112897.	1306.7	8200.	94.9
15	-119650.	-1385.	-126000.	-1458.	77265.	894.3	8200.	94.9
16	-119650.	-1385.	-126000.	-1458.	72274.	836.5	8200.	94.9
17	0.	0.	-126000.	-1458.	68969.	798.2	8200.	94.9
18	0.	0.	-126000.	-1458.	67317.	779.1	8200.	94.9
19	-59825.	-692.	-126000.	-1458.	100271.	1160.5	8200.	94.9
20	-59825.	-692.	-126000.	-1458.	99689.	1153.8	8200.	94.9
21	-59825.	-692.	-126000.	-1458.	159460.	1845.6	8200.	94.9
22	-59825.	-692.	-126000.	-1458.	156320.	1809.3	8200.	94.9
23	-119650.	-1385.	-126000.	-1458.	229472.	2655.9	8200.	94.9
24	-119650.	-1385.	-126000.	-1458.	229587.	2657.3	8200.	94.9

The water balance for each time interval (15 days) is shown in Figures 12, 13, 14. The total recharge from infiltrated rainfall in one-year period amounts to about 208 MCM (million cubic meters). This volume includes the

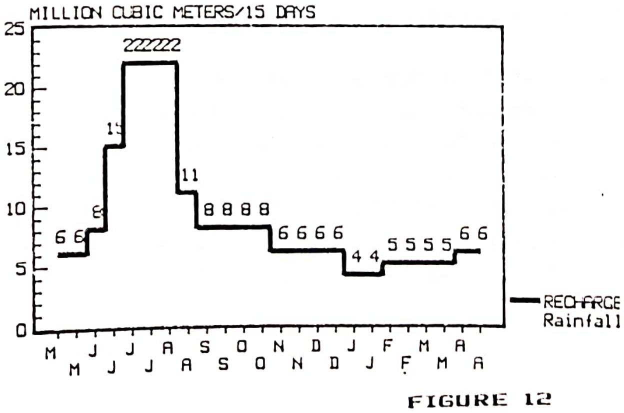


FIGURE 12

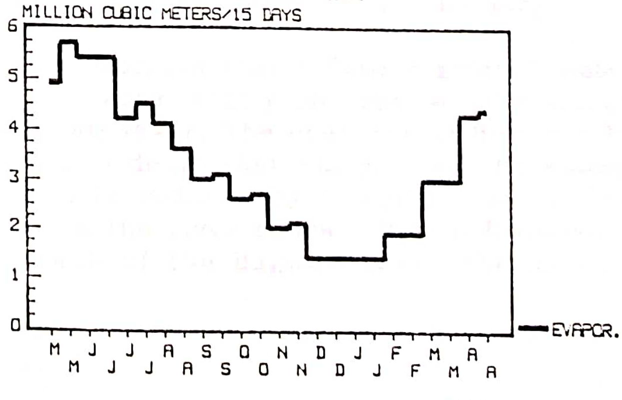


FIGURE 13

inflow across the northern boundary of the model (Siwalik hills, surface streams bringing water from distant areas and recharging shallow aquifer nearby the hills), and the infiltration from rainfall all over the model.

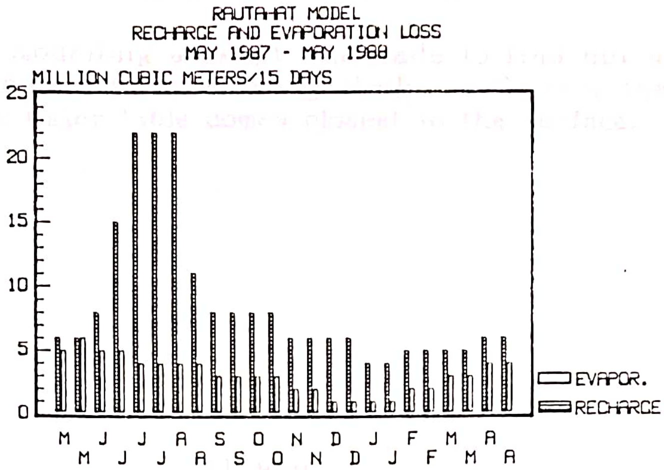


FIGURE 14

The total evaporation amounts to about 71 MCM. The outflow into India across the row 51 amounts to about 3 MCM. The total water balance in one-year period may have the following form:

RECHARGE = EVAPORATION + OUTFLOW + RIVER + CHANGE OF STORAGE

As shown in hydrographs in Appendices 46 and 47, there is very little change of storage over a typical one-year period, meaning that the May levels at the end of the year are close to the May levels one year before. Thus, with the change of storage being negligible, the water balance may have the following form:

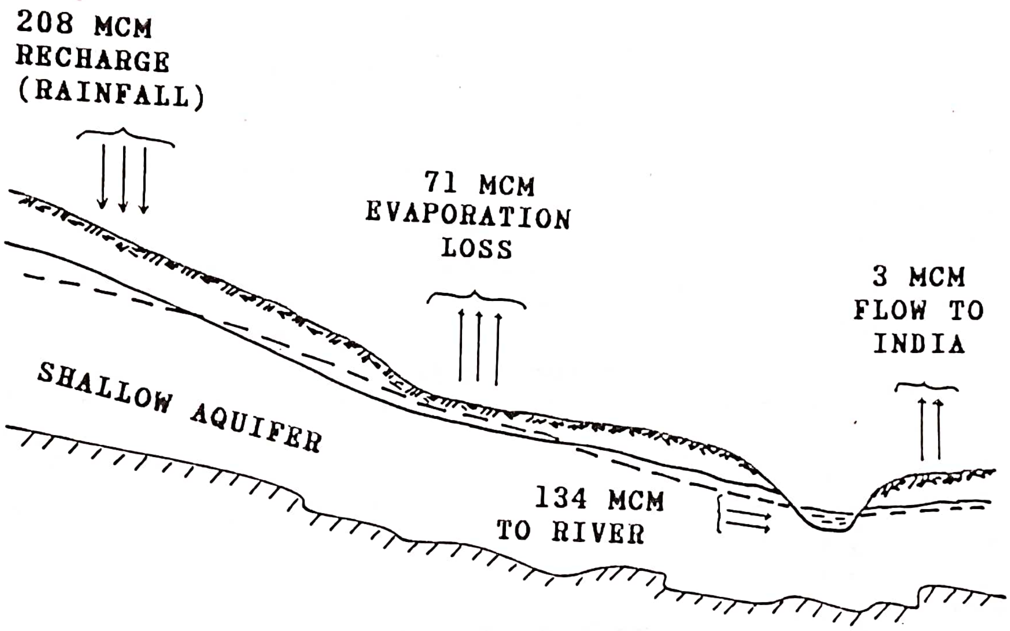
208	=	71	+	3	+	134	MCM/YEA
Recharge		Evaporation		Outflow		Contribution to river flow	

All values are in million cubic meters per year. The contribution to the Bagmati River flow is not excessive; it amounts to about 4.2 m^3/sec, which is about 2.3% of an average Bagmati River flow at Karmaiya (177 m^3/sec).

From this water balance one may conclude that a future ground water development from shallow aquifers may come mostly on expense of reduced evaporation and outflow into the Bagmati River. The evaporation loss can be reduced by lowering the water levels to a depth that will prevent the losses. The outflow into the Bagmati River can be reduced by pumping from shallow wells located along a stretch parallel to the river course. It is a favourable coincidence that along the right bank of the Bagmati River the shallow aquifer in Rautahat district is the most promising, having good thickness and almost the best tansmissivity in the whole district.

The water balance is sketched here below.

The final modelling attempt was made to find out a future potential development potential by locating shallow wells near the river and in the areas in which water table comes closest to the surface.



RAUTAHAT MODEL - FUTURE DEVELOPMENT SCHEME

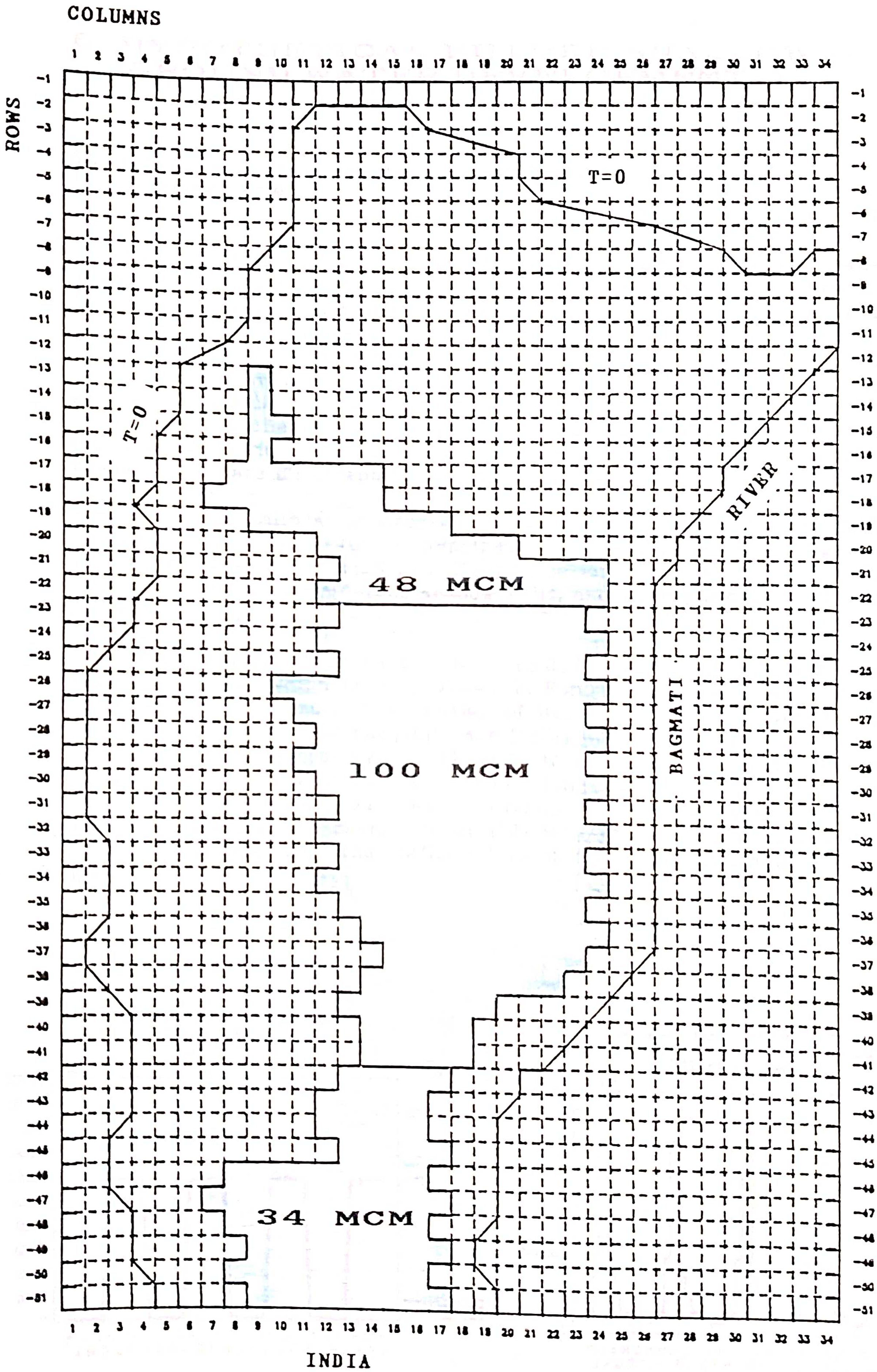


FIGURE 15

6. HYPOTHETICAL FUTURE SHALLOW GROUND WATER DEVELOPMENT

6.1. Scheme of Development, Location and Number of Wells, Pumping Rates

Once the model is sufficiently successful in calibrating the past record of evolution of water levels, it could be used for future predictive purposes. The Rautahat model was shown to correctly duplicate the behaviour of shallow water table in the period from May through September 1988. Likewise, it was also successful in confirming the decline of levels in the post-monsoon period (September-May). None of input parameters was questionable. The map of transmissivities produced by the model at the end of the calibration process is very similar to the conclusions of the Report No.3 which preceded the modelling study. The recharge, evaporation loss, and outflow into the Bagmati River are all acceptable volumes.

Once the calibration process was successfully terminated the model was used to predict the future, hypothetic, behaviour of the shallow ground system, which was subjected to a stress. The term "stress" in this context means the drilling of numerous shallow wells, and their pumping in the dry portion of the year.

After several check runs, it was decided to fully test only one development scheme, which is fully shown in Figures 15 (Location of Pumping Cells) and 16 (Schematic Distribution of Pumping in Time Sequence). The criterion for locating the pumping wells (cells) was the following: (a) acceptable transmissivity, (b) water table close to the surface, (c) site near the Bagmati River. It was learnt, from the modelling study before coming to this stage, that the shallow ground water development should come on expense of water outflow into the Bagmati River (134 MCM/year), and losses to evaporation (71 MCM/year). (The outflow of about 3 MCM/year to India is negligible.)

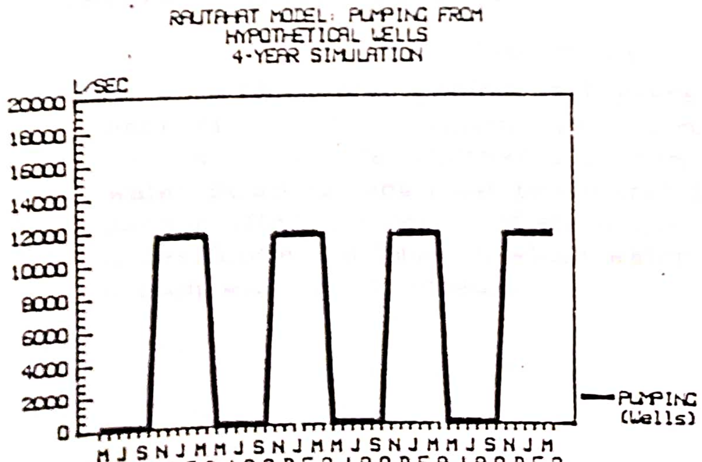


FIGURE 16

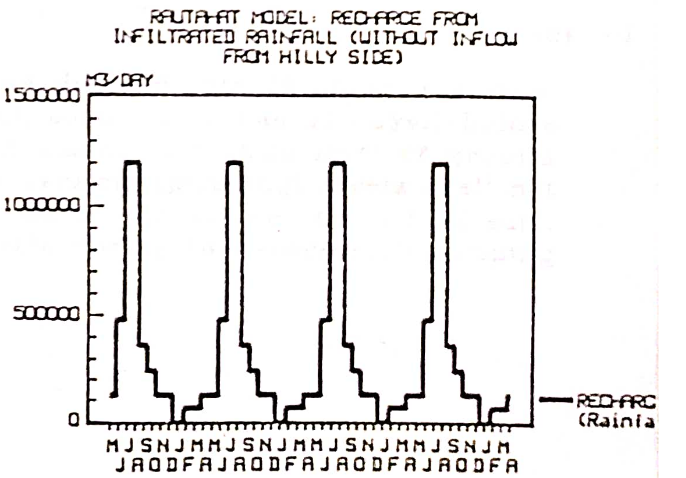


FIGURE 17

The number of pumping cells is 213. Since one cell is 1000 m by 1000 m large, the number of wells that may actually be located in one cell could be on average 25, if the wells are located at 200 m distance one from the other. Thus the total number of wells could be about 5300. The cells are located almost all over the model, except in steeper near-the-hill region, which is either covered by a forest or the water table is too deep for economical pumping. Likewise, the western central part is also excluded on the grounds that there the transmissivity is inferior to the rest of the area.

The 213 development cells are distributed inside an area of some 346 km² (see Figure 15). The more development is in the northern rows (17 through 22) where each cell is a "development" cell. From the row 22 southward, the development is in each second cell in a checkered manner.

For the purpose of the forecast, it was assumed that each cell is producing between 4000 and 5000 m³/day water throughout the period of 6 months each year. This is an equivalent of about 5 or 6 l/sec of continuous pumping. If 25 wells are in each cell, this would be equivalent to pumping 32,400 m³/season, which is enough to irrigate about 60% of the command area of one well covered with rice (agricultural demand for rice field is about 13,000 m³/ha, or 52,000 m³/4 ha).

It was further assumed that the recharge in the future shall be distributed in the same as in the past, as shown in Figure 17. The inflow from hilly sides (2-3 km from the end of the Terai) is shown in Figure 18. This is also obtained from the calibration of the model. The Bagmati River was modelled as shown in Figure 19. (This is only for one cell, 25,25, but the same hydrograph was superposed on all other "Bagmati" cells.)

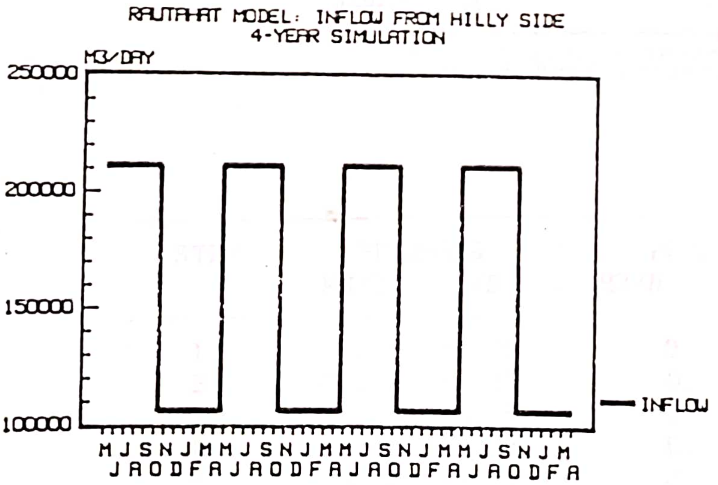


FIGURE 18

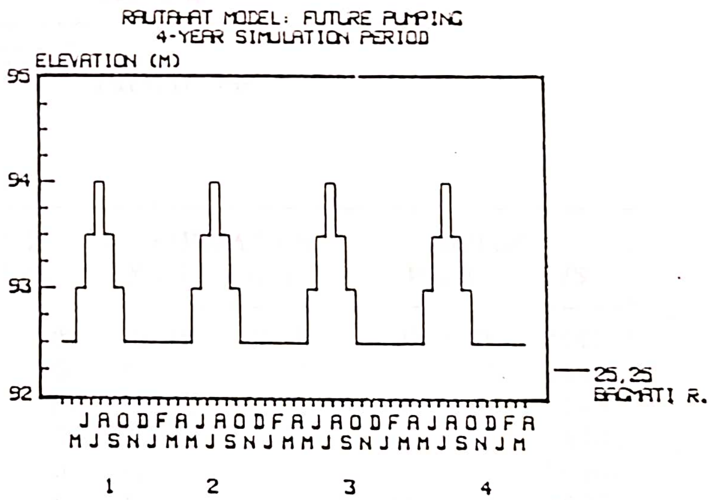


FIGURE 19

The whole period of 4 years was divided into 48 equal intervals, each of 30 days duration. (In this model, each month has 30 days.) Before one can conclude whether a system can sustain a certain level of ground water pumping, one must prove that the dynamic (pumping) levels shall not decline after the period of simulation. In other words, one has to find such a development scheme in which water levels during two successive pumping season will become steady.

-1,665,000

With 213 cells involved in ground water development, at variable rates from 4000 to 5000 m³/day, the total ground water withdrawal is equal to 11,748 l/sec, or 1,015,000 m³/day, or 182 MCM/season. This is about equal to the total recharge into the model area. Evidently, this is a very high development rate, which may have chances to succeed provided wells are properly located to lower water table beyond the reach of evaporation.

6.2. Results

The results are shown in Figures 20 and 21, in Appendices 48 through 64, and in the balance table here below.

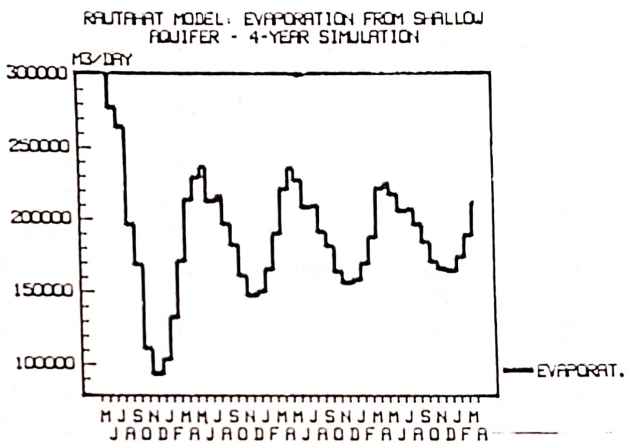


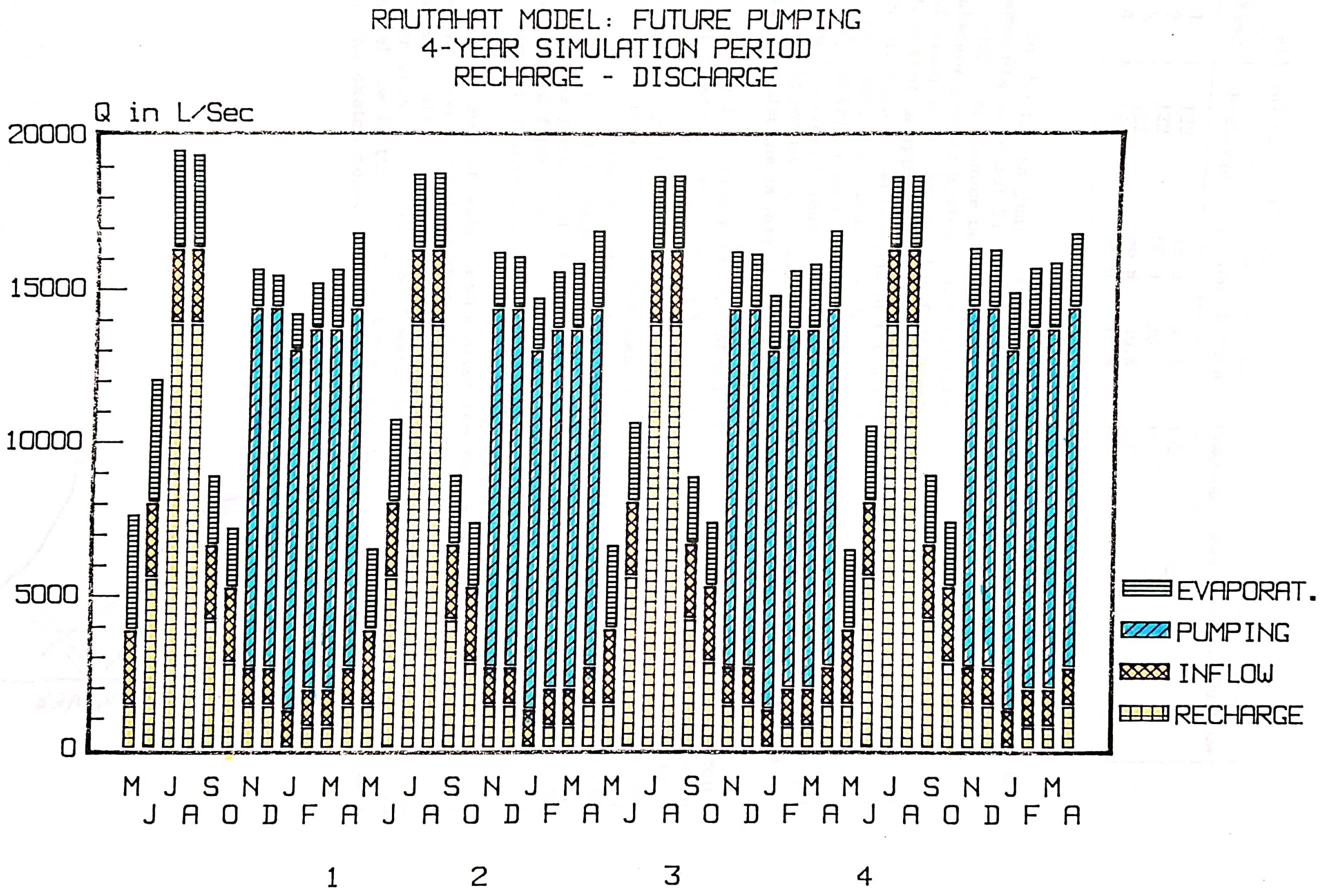
FIGURE 20

STEP	RECHARGE M3/D	RECHARGE L/S	PUMPING M3/D	PUMPING L/S	EVAPORATION M3/D	EVAPORATION L/S	INFLOW M3/D	INFLOW L/S
1	-119650.	-1385.	0.	0.	326483.	3778.7	-210800.	-2440.
2	-478600.	-5539.	0.	0.	349449.	4044.5	-210800.	-2440.
3	-1196500.	-13848.	0.	0.	277439.	3211.1	-210800.	-2440.
4	-1196500.	-13848.	0.	0.	264026.	3055.9	-210800.	-2440.
5	-358950.	-4154.	0.	0.	196256.	2271.5	-210800.	-2440.
6	-239300.	-2770.	0.	0.	168666.	1952.2	-210800.	-2440.
7	-119650.	-1385.	1015000.	11748.	111259.	1287.7	-105400.	-1220.
8	-119650.	-1385.	1015000.	11748.	93254.	1079.3	-105400.	-1220.
9	0.	0.	1015000.	11748.	103523.	1198.2	-105400.	-1220.
10	-59825.	-692.	1015000.	11748.	132700.	1535.9	-105400.	-1220.
11	-59825.	-692.	1015000.	11748.	171328.	1983.0	-105400.	-1220.
12	-119650.	-1385.	1015000.	11748.	213839.	2475.0	-105400.	-1220.
13	-119650.	-1385.	0.	0.	229270.	2653.6	-210800.	-2440.
14	-478600.	-5539.	0.	0.	236819.	2741.0	-210800.	-2440.

STEP	RECHARGE M3/D	RECHARGE L/S	PUMPING M3/D	PUMPING L/S	EVAPORATION M3/D	EVAPORATION L/S	INFLOW M3/D	INFLOW L/S
15	-1196500.	-13848.	0.	0.	212743.	2462.3	-210800.	-2440.
16	-1196500.	-13848.	0.	0.	216448.	2505.2	-210800.	-2440.
17	-358950.	-4154.	0.	0.	196822.	2278.0	-210800.	-2440.
18	-239300.	-2770.	0.	0.	182249.	2109.4	-210800.	-2440.
19	-119650.	-1385.	1015000.	11748.	161098.	1864.6	-105400.	-1220.
20	-119650.	-1385.	1015000.	11748.	147594.	1708.3	-105400.	-1220.
21	0.	0.	1015000.	11748.	150320.	1739.8	-105400.	-1220.
22	-59825.	-692.	1015000.	11748.	165560.	1916.2	-105400.	-1220.
23	-59825.	-692.	1015000.	11748.	190287.	2202.4	-105400.	-1220.
24	-119650.	-1385.	1015000.	11748.	221427.	2562.8	-105400.	-1220.
25	-119650.	-1385.	0.	0.	235933.	2730.7	-210800.	-2440.
26	-478600.	-5539.	0.	0.	227301.	2630.8	-210800.	-2440.
27	-1196500.	-13848.	0.	0.	208480.	2413.0	-210800.	-2440.
28	-1196500.	-13848.	0.	0.	209823.	2428.5	-210800.	-2440.
29	-358950.	-4154.	0.	0.	191395.	2215.2	-210800.	-2440.
30	-239300.	-2770.	0.	0.	181529.	2101.0	-210800.	-2440.
31	-119650.	-1385.	1015000.	11748.	163832.	1896.2	-105400.	-1220.
32	-119650.	-1385.	1015000.	11748.	156183.	1807.7	-105400.	-1220.
33	0.	0.	1015000.	11748.	158363.	1832.9	-105400.	-1220.
34	-59825.	-692.	1015000.	11748.	169618.	1963.2	-105400.	-1220.
35	-59825.	-692.	1015000.	11748.	187799.	2173.6	-105400.	-1220.
36	-119650.	-1385.	1015000.	11748.	221595.	2564.8	-105400.	-1220.
37	-119650.	-1385.	0.	0.	224944.	2603.5	-210800.	-2440.
38	-478600.	-5539.	0.	0.	217472.	2517.0	-210800.	-2440.
39	-1196500.	-13848.	0.	0.	205757.	2381.4	-210800.	-2440.
40	-1196500.	-13848.	0.	0.	206911.	2394.8	-210800.	-2440.
41	-358950.	-4154.	0.	0.	196370.	2272.8	-210800.	-2440.
42	-239300.	-2770.	0.	0.	184183.	2131.8	-210800.	-2440.
43	-119650.	-1385.	1015000.	11748.	170583.	1974.3	-105400.	-1220.
44	-119650.	-1385.	1015000.	11748.	165649.	1917.2	-105400.	-1220.
45	0.	0.	1015000.	11748.	164368.	1902.4	-105400.	-1220.
46	-59825.	-692.	1015000.	11748.	173985.	2013.7	-105400.	-1220.
47	-59825.	-692.	1015000.	11748.	188984.	2187.3	-105400.	-1220.
48	-119650.	-1385.	1015000.	11748.	211160.	2444.0	-105400.	-1220.

Out of the total pumping volume, 20% is assumed to have returned into the subsurface, recharging the shallow aquifer, in the form of "return" irrigation. This is to say that any irrigation over a permeable surface is equivalent to artificial recharge by surface spreading. The percentage of 20 is assumed considering the form of irrigation, that practiced with rice crop.

Thus the water balance in each of four years of simulation may look as follows.



RAUTAHAT MODEL: FUTURE PUMPING
4-YEAR SIMULATION PERIOD
RECHARGE - DISCHARGE
Q in L/Sec
20000
15000
10000
5000
0
M J S N J M M J S N J M M J S N J M M J S N J M
J A O D F A J A O D F A J A O D F A J A O D F A
1
2
3
4
EVAPORAT.
PUMPING
INFLOW
RECHARGE

APPENDIX 21

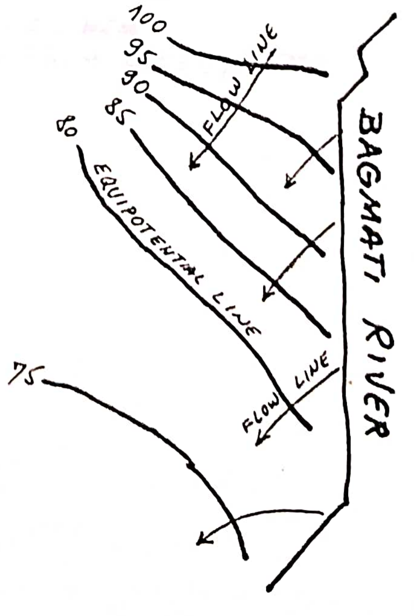
All values in MCM/year

Year	Recharge	Inflow	Return	Pumping	Evaporation	Outflow
1	122	56.9	36.5	182.7	72.2	3
2	122	56.9	36.5	182.7	69.3	3
3	122	56.9	36.5	182.7	63.8	3
4	122	56.9	36.5	182.7	61.3	3

In the fourth year of the simulation, the total recharge into the system amounts to about 215.4 MCM. The discharge is equal to 244.0 MCM. There is still a de-balance between recharge and discharge. This is to say that the shallow ground system is not yet fully in equilibrium and additional decline of water levels beyond the fourth year could be foreseen. The documentation that is appended to this report (Appendices 48 through 61) prove this point. While in some parts of the system there is no appreciable decline of water levels between the third and fourth year (cells 24,36; 20,35; 13,50; 15,47; 18,42), in some parts there is more or less substantial drop of levels. This is evident near the cell 13,36 (Appendix 58, village Karuniya), cell 14,31 (Appendix 54, village Sivnagar), while in some other parts of the system the decline is less than 50 cm per year.

The best demonstration of the evolution of water levels in the four-year pumping scheme is given in Appendices 63 through 65. After the second year of pumping the maximum decline of water levels is about 7.0 m; after the third year the maximum is about 9 m; and after the fourth year the maximum is about 11 m. The maximum drawdown occurs in 15,21 in which the whole saturated thickness becomes depleted (see Appendix 66). Evidently the scheme of development that was tested will have to be modified, to exclude the portion of the model near cells 15,20; 16,20; 14,21; 15,21; 16,21; and 16,22 from pumping. All the rest of the model still has a sufficient saturated thickness to sustain the development.

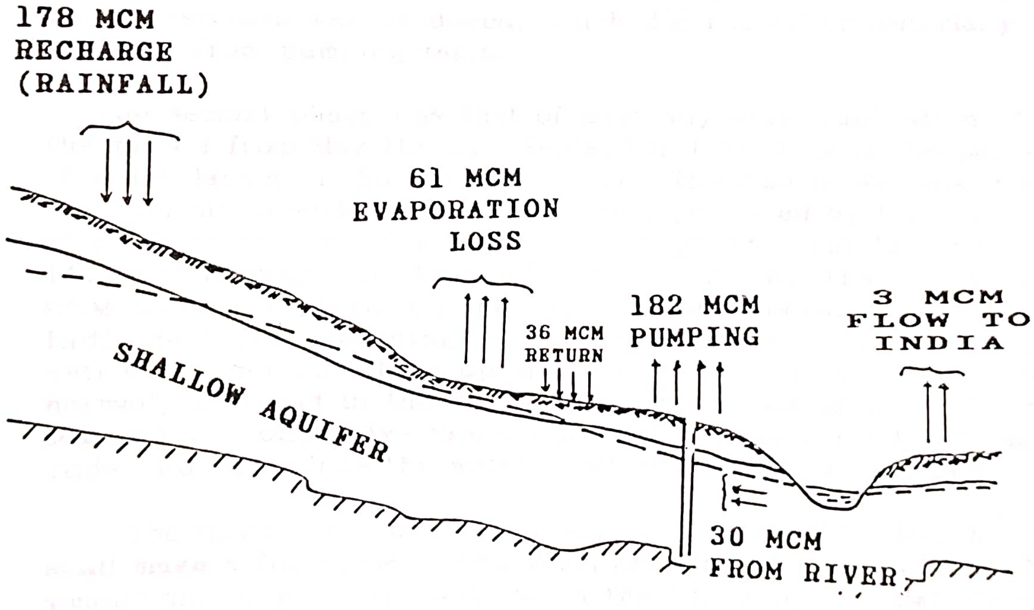
The map of water levels after the fourth year of extensive ground water development as shown in Appendix 62, indicates that the Bagmati River contributes water to the zone of ground water development. This is clear from the curvature of water level contour lines starting from the model row 20 through the last row. A portion of the flow net is reproduced in the sketch below.



The scheme of development as tested herein was not quite successful in utilizing the evaporation loss. The loss was diminished from 71 MCM/year to some 61 MCM/year, but this was insufficient. Still plenty of water is being lost through the evaporation process. Instead, the "unbalanced" development (pumping) was offset by the contribution from the Bagmati River.

It may be concluded that the scheme of shallow ground water development as tested in this phase of the modelling is near the absolute limit of the development potential of the shallow ground water of the Rautahat district. It is not be discarded, however, but should be given some modifications with respect to areal distribution of pumping. The core of the development should be within the geometric shape in Figure 15, but with some readjustments. The total pumping of about 180 MCM should be reduced to probably 160 MCM, which could be considered as the maximum development potential for a long-term development.

The model is ready to test some additional schemes of development, with different areal distribution, different individual pumping rates, and diverse time schedules. The testing of additional schemes of development can be done in cooperation with other concerned agencies, such as the Agricultural Development Bank of Nepal.



7. CONCLUSIONS AND RECOMMENDATIONS

The model of the shallow ground water system of the Rautahat district was primarily made to arrive at a global water balance of the whole district, and to indicate a maximum development potential for future ground water exploitation. In the process, all components of the system have been verified.

The modelling study is a companion work to the UNDP-GWRDB project field activities. It could be considered as the state-of-the-art in quantitative evaluation of the natural system and its future development potential.

The whole simulation was divided into four phases. The phase I was to confirm an initial map of water levels which was constructed on the basis of field monitoring in May 1988. This is called the "steady-state calibration", and is equivalent to confirming the minimum water levels (maximum depths to water table) at the end of a long dry season. The primary result of the steady-state calibration was the distribution of permeability coefficients (hydraulic conductivity), setting up the geometry of the shallow aquifer, and arriving at correct recharge and evaporation values. The conclusion of the steady-state calibration was that the recharge in the dry portion of a year is equivalent to about 12.3 MCM/month (million cubic meters), out of which some 6.9 MCM are consumed by the evaporation process, 0.2 MCM outflows into India, and some 5.1 MCM flow into the Bagmati River. The recharge mostly comes from the hills on the north, in a form of subsurface flow through dry river beds that cut the Siwalik hills. In the process, the map of transmissivities was produced, which did not differ materially from the one obtained from pumping tests.

The second phase was that of unsteady-state calibration of the model in the period from May through September 1988. This is the period of the rise of water levels in the monsoon season. The rise is well documented in some 16 observation wells. The water balance produced by the model in this phase of calibration showed a sum of recharge from rainfall in amount of about 140 MCM throughout the whole period of 5 months, out of which some 44 MCM were lost through the evaporation process, 1 MCM outflowed into India, and the remaining 96 MCM are split between the flow into the Bagmati River and the filling up of the storage. (The shallow aquifer storage is normally depleted in the dry season, and replenished or refilled in the wet season.) The unsteady-state calibration was considered successful since the model did reproduce the water level rise that was recorded in the nature.

The third phase of the modelling was to confirm that the "model" levels shall make a full cycle in one year, arriving at May levels at the end of the simulation. Only in that way, when the filling up and depletion of the storage are balanced, one may conclude about the recharge-discharge relationship. This phase was called the "verification" of the model. The model indicated that, in one-year cycle, most of the water recharged from infiltrated rainfall is released into the Bagmati River, and that the evaporation is a minor component of the total balance. The simulation indicated the source of water that may be utilized more beneficially than letting the water to flow into the river, or be consumed by the evaporation. The balance in one year cycle was the following. The recharge from rainfall amounts to about 208 MCM (per year). Out of this, about 71 MCM is lost through evaporation from the shallow water table, 3 MCM flow into India, and 134 MCM into the Bagmati River. Of course, all this calculation is based on the assumption that the year was a typical year, with the levels at the end of the year at about the same level as a year before. From this water balance one may conclude that any future ground water development from shallow aquifer may come mostly on expense of reduced evaporation and outflow into the Bagmati River. The evaporation loss can be reduced by lowering the water levels to a depth that will prevent or diminish the losses. The outflow into the Bagmati River can be reduced by pumping from shallow wells located along a stretch parallel to the river course. It is a favourable coincidence that along the right bank of the Bagmati River the shallow aquifer is the most promising, having good thickness and almost the best transmissivity in the whole district. In the process, an average recharge into the shallow ground water system was calculated. The volume of 208 MCM in a year is equivalent to about 14% of the total annual rainfall falling over an area of 1008 km^2. This percentage may be accepted as an average recharge percentage for the whole district.

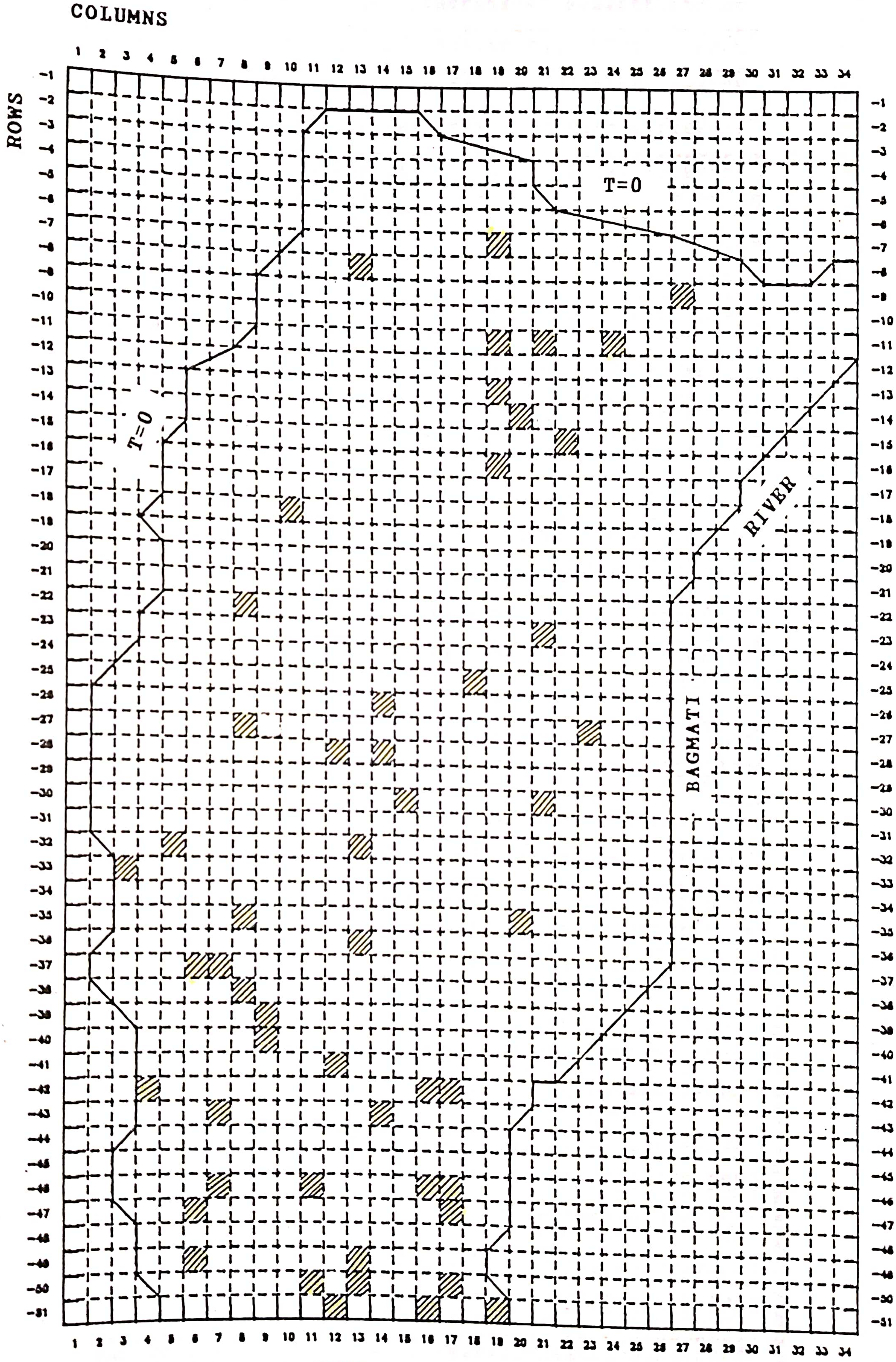
All the previous phases were a kind of establishing the model as a credible tool for forecasting an extensive future development of shallow ground water. The philosophy behind the last phase is the following. If the model is successful in reproducing the past, it could be used in predicting the future. The Rautahat model was shown to correctly duplicate the behaviour of shallow water table in the period from May through September 1988.

After several check runs, it was decided to fully test only one development scheme. The scheme included 213 cells, each of 1 km^2. In each cell, between 4,000 and 5000 m^3/day were pumped in the 6-month period. Thus the total development amounted to about 182 MCM/season. Out of this 20% were returned back to the system in the form of return irrigation. The total volume of pumped water is sufficient to irrigate about 13,000 ha with rice. The criteria for locating the wells were the following: (a) acceptable transmissivity, (b) water table close to the surface, (c) site near the Bagmati River. With the total area involved in testing equal to 213 km^2, assuming the spacing between wells of 200 m, the total number of wells could be as high as 5300.

The development scheme was tested over a period of four years, on a cyclic basis: pumping in 6 dry months, idling in the remaining six wet months. The results are encouraging, although a minor modification of the wells should be done to correct excessive drawdowns in some parts of the system. The dynamic levels after four seasons of pumping are not yet steady, although the total drawdown in most of the modelled area is less than 6 meters. In the fourth year of pumping, the recharge into the system is about 215 MCM/year. The discharge is equal to 244 MCM. There is still a de-balance between recharge and discharge. Additional decline of water levels beyond the fourth year could be foreseen. The "deficit" of pumped water comes from the Bagmati River. The induced recharge from the river amounts to about 30 MCM/year, which is less than 1 m^3/sec, or less than 5% of the river base flow in the dry season.

The model of the Rautahat district is an example of modelling of shallow ground water system in the Terai. It offers a sound base for ADBN development plans. The conclusions formulated herein are believed to be on the safe side. The model did not count with any recharge from other rivers, such as the Lal Bakeya which carry plenty of water in the monsoon season. It, also, did not take into account an eventual inflow of water from neighboring districts. Although previous reports have speculated about the maximum permissible number of shallow wells in various districts of the Terai, mentioning the number of 4500 for Rautahat district, this modelling study formulated not only the number of wells, but suggested the area which may be favourable for the overall development of the shallow ground water resource. In the simulation process, the model evaluated quantitatively all components of the shallow ground water system: recharge from infiltrated rain, evaporation loss from very shallow water table, filling up and depleting the storage, connection with the Bagmati River. This last may be the weak point of the study. It is recommended to establish either two river stage (and flow) gauging stations on the Bagmati (one near the border with India), or to drill two shallow observation wells at the river bank to monitor the river stage.

MODEL NETWORK - WELLS WITH KNOWN LITHOLOGY



APPENDIX 1

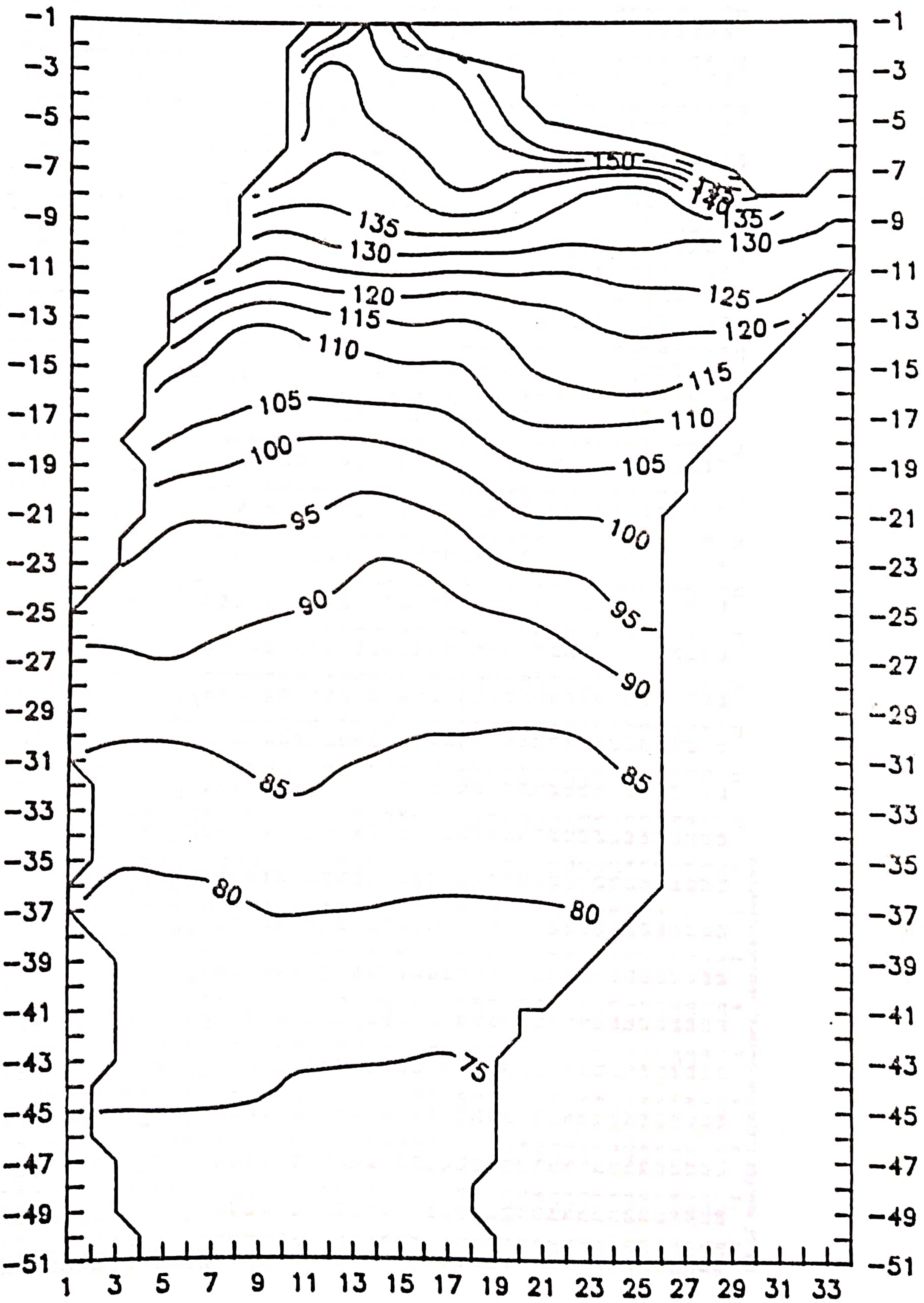
HAUTAHAT MODEL -- LAND SURFACE ELEVATION

161.2	164.3	168.0	171.9	175.9	179.5	181.5	180.1	177.1	174.0	171.0	148.4	147.3	150.0	163.4	162.9	162.7	172.9	171.5	175.3	177.9	180.3	179.3	180.6	181.4	180.1	178.9	175.6	171.0	169.9	166.5	163.2	159.9	156.9	1
157.9	161.8	165.7	169.8	174.1	178.4	182.9	178.7	174.8	171.2	143.4	146.1	148.0	150.0	150.3	160.3	160.5	167.3	169.6	173.9	176.6	179.3	179.2	180.8	181.8	180.7	179.5	176.0	172.9	169.2	165.3	161.4	157.9	154.6	2
156.5	159.5	163.0	166.8	170.6	174.1	175.8	174.0	170.7	167.2	142.0	145.5	148.0	149.9	147.9	150.6	150.4	155.8	159.6	172.1	175.0	177.9	178.7	180.8	183.0	181.5	180.2	176.5	172.6	168.2	163.6	159.2	155.3	151.8	3
154.9	157.3	160.2	163.0	166.0	168.3	169.1	167.8	165.2	162.3	142.0	143.7	145.0	146.4	146.6	148.9	149.3	152.2	155.7	169.9	172.8	175.8	177.6	180.3	183.1	182.4	181.2	177.0	172.1	166.6	161.2	156.3	152.0	148.4	4
152.6	154.5	156.7	159.0	161.1	162.6	162.8	161.4	159.0	156.7	143.5	143.4	144.0	146.1	146.8	146.3	147.7	150.9	152.1	153.9	170.0	172.8	175.5	179.5	182.7	183.5	182.5	177.5	171.0	164.2	157.8	152.4	148.0	144.4	5
149.2	151.3	152.9	154.5	155.8	156.7	157.0	154.8	152.4	141.7	142.1	141.0	144.0	144.3	142.0	143.7	146.5	146.8	148.0	147.0	142.1	140.0	143.0	146.4	142.0	184.5	183.8	177.5	168.6	160.1	153.1	146.5	142.2	138.9	6
146.0	147.1	148.8	149.7	150.4	150.5	149.8	147.9	145.9	139.7	138.9	139.5	138.6	141.2	141.2	144.5	148.7	146.0	145.0	146.0	143.1	138.0	138.0	138.0	139.0	142.0	144.0	144.0	168.7	147.1	140.1	143.0	134.0	134.0	7
142.6	143.2	143.9	145.0	145.0	144.5	143.4	138.5	135.0	135.8	135.8	138.9	142.0	140.2	139.4	140.6	141.3	141.6	141.0	142.0	142.4	136.0	137.0	137.0	137.7	139.0	138.0	137.3	138.4	146.1	140.6	140.0	133.5	133.0	8
139.1	139.4	139.6	133.6	139.9	139.1	137.8	136.2	131.8	132.0	133.0	134.2	135.2	135.7	137.6	138.2	138.7	139.6	137.8	134.0	134.5	135.0	133.0	132.0	132.0	135.4	132.0	133.2	132.6	132.5	132.4	132.6	131.0	132.5	9
135.6	135.6	135.4	135.1	134.5	133.6	132.9	131.5	127.3	126.4	126.2	128.8	129.7	132.7	134.4	135.5	132.6	130.9	129.7	130.5	130.5	128.5	127.0	127.0	132.0	131.4	131.3	131.9	130.0	131.0	129.0	128.0	127.0	122.4	10
132.2	131.9	131.4	130.8	130.0	129.0	127.9	121.0	123.1	123.5	123.9	124.1	125.6	125.7	126.0	123.0	124.0	125.4	125.9	124.6	124.5	124.0	125.5	128.0	128.3	126.3	125.5	127.0	130.0	131.0	128.0	127.0	125.1	120.6	11
127.0	126.7	127.7	126.9	125.9	113.0	115.0	116.0	116.0	117.0	117.5	114.4	115.0	117.0	120.2	120.1	118.9	118.8	117.9	118.5	120.0	121.9	123.5	124.6	124.2	125.2	124.2	122.9	125.0	128.5	126.0	122.0	119.8	118.7	12
123.7	123.2	122.6	121.9	122.1	112.9	112.9	111.9	109.0	112.4	112.6	113.2	112.7	114.8	115.8	115.6	114.2	114.0	116.0	117.1	118.0	117.5	119.9	124.1	120.4	122.9	120.9	121.0	122.6	125.9	120.2	118.8	117.7	116.8	13
120.5	119.9	119.2	118.4	119.8	111.3	110.4	109.5	108.4	110.1	110.3	110.8	112.8	113.3	112.6	111.9	111.0	111.8	112.8	114.0	116.0	116.0	119.4	121.8	122.3	122.8	118.8	119.3	118.5	118.0	117.4	116.4	115.2	114.4	14
117.7	117.0	116.0	117.9	110.5	107.6	108.8	109.7	107.7	108.2	108.8	109.2	109.6	110.0	109.8	107.8	108.8	111.0	113.4	116.3	116.2	113.8	117.7	119.2	120.6	119.1	117.0	116.9	114.3	114.5	114.4	113.7	113.0	112.4	15
117.3	116.4	115.1	114.2	109.5	108.6	107.6	106.6	106.2	105.6	105.6	105.9	106.2	106.0	106.2	105.9	108.0	109.6	114.3	117.6	115.6	113.4	112.9	113.9	114.5	113.8	111.7	113.9	111.8	113.7	113.4	112.9	112.5	109.7	16
113.9	113.0	112.3	111.3	107.3	106.4	105.5	103.5	103.0	102.8	101.8	102.8	102.0	102.4	102.9	103.0	104.2	106.6	109.5	111.4	111.0	112.0	110.3	109.6	110.6	108.6	108.0	110.9	110.3	110.9	110.8	110.5	110.3	110.0	17
111.2	111.0	110.1	102.4	102.9	102.4	101.8	101.0	99.0	99.0	99.3	99.7	100.0	100.0	102.2	102.1	103.1	104.1	106.0	106.3	108.6	107.7	106.7	107.1	106.6	106.7	108.0	108.2	108.3	108.3	108.4	108.1	108.0	107.9	18
104.7	104.9	104.5	104.2	101.7	101.2	100.6	101.0	98.2	97.6	98.2	96.8	97.5	98.6	98.6	98.0	99.8	100.9	102.9	103.2	105.4	105.9	105.7	104.8	104.6	104.9	105.2	105.4	105.7	106.0	106.0	106.3	105.8	105.9	19
100.7	100.7	100.8	100.8	97.7	97.5	97.3	96.5	97.5	97.0	96.5	94.3	94.2	94.2	94.3	95.4	97.1	99.4	100.3	101.1	101.4	101.9	102.9	102.9	101.9	103.7	102.6	102.7	101.1	103.7	104.3	104.1	104.5	104.9	20
99.2	99.2	99.1	99.1	95.9	95.7	95.4	95.3	96.6	96.2	95.6	93.3	92.1	92.4	93.2	93.4	94.8	96.9	98.8	99.6	100.4	99.9	99.3	100.4	102.0	100.7	100.5	100.0	100.7	101.4	102.1	102.8	103.0	103.2	21
97.7	97.6	97.5	93.6	93.4	93.2	93.9	93.6	92.8	92.7	92.2	91.4	90.7	90.6	90.4	91.6	93.0	95.5	96.3	97.2	97.3	97.4	96.8	98.5	101.0	98.9	98.8	98.6	98.8	99.4	100.4	101.2	101.9	102.7	22
96.2	96.1	96.0	92.1	92.8	92.6	92.3	92.3	92.2	92.1	91.9	90.7	90.4	90.3	89.6	90.8	91.9	93.2	95.0	96.0	96.3	95.5	94.5	97.5	100.0	97.1	97.5	96.6	96.9	97.5	98.3	99.0	100.1	101.0	23
92.6	92.8	91.0	91.5	91.3	91.3	91.3	91.3	91.1	91.2	91.1	88.9	88.6	88.2	89.2	89.3	90.1	90.9	91.0	92.0	92.7	93.3	94.2	95.1	98.6	94.9	94.9	94.2	95.1	95.9	96.8	97.3	98.8	99.6	24
91.7	90.9	91.1	91.3	91.3	91.3	91.1	90.1	90.7	90.0	90.2	89.8	88.2	87.3	87.5	88.6	88.6	89.1	89.4	90.5	91.3	92.2	92.8	93.8	98.5	92.8	92.9	92.9	91.6	94.4	95.1	95.9	96.6	97.3	25
90.6	89.8	90.1	90.4	90.3	90.2	90.2	90.2	89.2	88.0	87.4	86.8	86.4	86.2	87.3	87.3	88.4	88.1	87.7	88.9	89.7	90.4	91.8	92.8	95.0	91.1	91.4	91.6	91.8	92.1	92.3	94.5	95.2	95.9	26
89.3	89.6	89.9	90.1	90.2	90.1	89.1	89.1	88.0	88.2	87.4	86.5	86.4	86.3	86.3	87.5	87.6	86.8	86.6	88.3	88.3	88.6	89.0	89.8	93.0	89.5	90.0	90.4	90.7	90.9	91.2	91.4	93.9	94.6	27
88.3	88.5	88.7	88.0	88.9	88.9	89.0	88.3	87.7	87.3	86.6	86.0	85.8	85.6	85.5	86.5	86.5	86.0	86.2	85.9	86.4	86.6	88.6	88.8	92.0	88.2	88.7	89.2	88.6	89.9	90.2	90.4	90.6	90.7	28
87.3	87.4	87.0	87.6	87.7	87.8	86.9	87.1	86.7	86.4	86.0	86.6	87.0	86.4	85.9	85.3	85.7	85.7	85.8	85.7	86.2	85.9	85.8	87.2	90.0	87.2	87.7	88.2	88.6	88.9	89.2	89.5	89.7	89.9	29
86.2	85.0	84.5	83.5	83.5	85.7	85.9	86.0	86.0	85.7	86.4	86.1	85.8	85.4	85.4	84.7	85.6	85.5	84.6	84.6	84.8	84.8	84.0	84.2	88.0	86.2	86.8	87.2	87.7	88.0	88.3	88.6	88.8	89.1	30
85.1	83.9	83.9	83.0	83.3	84.6	84.9	85.1	86.4	86.2	86.1	85.9	85.5	84.0	84.3	84.4	84.5	84.4	83.6	83.7	83.9	84.1	83.3	83.7	87.0	85.4	85.9	86.4	86.8	87.2	87.5	87.8	88.1	88.3	31
84.1	84.0	83.0	83.0	82.1	82.5	82.9	83.3	83.5	85.6	85.6	83.4	83.3	83.0	82.4	82.9	83.0	83.0	83.1	83.0	83.2	83.4	83.6	84.0	86.0	84.7	85.2	85.8	86.1	86.4	86.7	87.0	87.2	87.5	32
83.2	83.1	80.9	81.1	81.3	81.7	82.2	82.5	83.8	84.8	84.7	81.6	82.1	81.4	81.4	83.0	83.0	81.9	82.1	82.4	82.5	82.8	83.1	83.4	83.7	84.1	84.5	85.0	85.3	85.5	85.8	86.1	86.4	86.7	33
82.3	82.2	81.2	81.3	81.5	81.9	82.3	82.7	82.8	83.8	83.7	81.4	81.0	81.0	81.1	81.8	81.7	81.5	81.5	81.3	81.8	82.0	82.2	82.7	82.9	83.1	83.5	83.9	84.3	84.5	85.0	85.3	85.6	85.9	34
81.5	81.4	80.4	80.5	80.6	80.9	81.5	82.2	83.0	82.9	82.7	81.4	81.2	80.8	81.4	81.2	81.0	81.0	81.1	81.1	81.2	81.4	81.6	81.8	82.0	82.2	82.5	82.9	83.3	83.6	83.9	84.2	84.5	85.1	35
80.8	79.9	79.8	79.9	79.9	79.8	80.0	80.5	81.7	81.6	81.6	81.4	81.2	80.6	80.6	80.4	80.3	80.2	80.3	80.3	80.4	80.6	80.8	80.9	81.1	81.3	81.5	81.9	82.3	82.8	83.1	83.5	83.8	84.1	36
80.2	79.1	78.9	78.9	78.9	78.9	78.2	79.0	80.2	80.4	80.4	80.3	80.2	79.7	79.6	79.5	79.6	79.6	79.7	79.7	79.8	80.0	80.2	80.1	80.2	80.3	80.5	81.0	81.5	82.0	82.3	82.7	83.1	83.4	37
79.3	79.4	79.2	79.2	77.7	77.5	78.5	79.2	79.0	79.2	78.9	79.3	79.2	79.1	78.8	78.8	79.1	79.1	78.0	77.9	78.0	78.4	79.4	79.3	79.5	79.6	79.8	80.1	81.6	80.9	81.5	81.9	82.2	82.8	38
78.7	78.6	78.4	78.3	78.2	77.7	76.7	77.0	77.8	77.5	77.8	78.0	77.8	78.1	77.7	77.9	78.2	77.1	77.3	77.4	77.5	77.5	78.6	78.5	78.7	78.9	79.1	79.4	79.8	80.2	80.6	80.9	81.5	81.9	39
78.3	78.0	77.7	77.4	77.3	77.1	77.8	77.0	77.0	77.0	77.0	76.3	77.0	77.0	76.8	76.8	76.4	76.5	76.6	77.7	77.8	77.9	77.9	77.8	78.0	78.2	78.4	78.7	79.0	79.3	79.9	80.2	80.6	81.3	40
77.6	76.9	77.0	77.0	76.9	76.8	76.7	76.9	77.1	77.1	77.0	77.0	75.9	75.8	75.6	75.6	75.4	75.5	76.4	76.8	76.9	76.9	77.0	77.0	77.2	77.5	77.8	78.2	78.5	78.7	79.0	79.2	80.0	80.3	41
76.5	76.5	76.5	76.5	76.5	76.5	76.6	76.7	76.6	75.6	75.6	75.6	75.7	75.7	75.4	75.9	74.9	75.0	76.0	76.2	76.2	76.2	76.2	76.2	76.6	76.9	77.3	77.6	77.9	78.2	78.5	78.5	78.8	79.7	42
75.9	76.0	76.0	76.0	76.0	76.1	76.5	76.4	75.2	75.1	75.1	75.2	75.3	75.5	75.2	74.8	74.8	75.7	75.6	75.7	75.7	75.6	75.7	75.8	76.0	76.4	76.8	77.1	77.4	77.5	77.8	78.0	78.3	78.5	43
75.5	75.5	74.7	74.8	74.6	74.7	75.7	75.7	75.6	74.4	74.4	74.5	74.7	75.0	74.8	74.5	74.3	75.1	75.1	75.1	75.2	75.2	75.3	75.4	75.7	75.9	76.3	76.6	77.0	77.1	77.4	77.6	77.9	78.1	44
75.1	75.2	75.0	75.0	75.0	75.1	75.1	75.0	74.9	74.6	74.6	73.9	74.1	74.3	74.1	73.9	73.7	74.6	74.5	74.5	74.7	74.8	74.9	75.0	75.3	75.5	75.8	76.2	76.5	76.8	77.1	77.2	77.4	77.7	45
74.8	74.7	74.6	74.5	74.5	74.4	73.6	73.0	75.0	74.0	73.8	74.4	74.9	74.9	74.5	74.1	74.1	73.8	73.8	73.9	74.0	74.2	74.4	74.5	74.6	75.2	75.4	75.7	75.9	76.5	76.8	77.0	77.3	77.5	46
74.3	74.2	74.1	74.0	73.9	72.9	72.8	73.8	72.7	73.7	73.9	74.5	74.9	74.8	74.2	73.4	74.0	72.8	73.1	73.2	73.5	73.7	73.9	74.1	74.2	74.8	75.1	75.3	75.5	75.8	76.4	76.7	76.9	77.2	47
74.0	73.9	73.7	73.5	73.3	72.6	72.2	72.3	72.4	72.5	73.8	74.6	75.2	74.9	74.0	72.8	72.2	72.1	72.4	72.7	73.0	73.3	73.5	73.7	73.9	74.0	74.7	75.0	75.2	75.4	75.6	76.3	76.6	76.8	48
73.7	73.6	73.4	73.1	72.0	71.5	71.9	72.1	72.1	72.1	73.0	73.6	73.0	74.1	73.0	72.0	71.7	71.7	71.9	72.2	72.5	72.9	73.1	73.4	73.5	73.7	74.4	74.7	74.9	75.1	75.3	75.5	76.3	75.5	49
73.5	73.3	73.1	72.9	72.0	71.5	71.6	71.9	71.8	71.6	72.5	73.0	72.5	73.7	72.2	71.9	71.5	71.3	71.7	71.9	72.2	72.5	72.8	73.1	73.3	73.4	73.6	74.4	74.6	74.9	75.1	75.3	75.4	75.2	50
73.3	73.2	73.0	72.8	72.0	71.4	71.5	71.6	71.5	71.4	71.4	72.0	72.0	71.6	70.6	71.3	71.1	71.2	71.6	71.7	71.9	72.2	72.6	72.8	72.9	73.2	73.3	74.1	74.4	74.6	74.8	75.0	75.2	75.4	51
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	

LAND SURFACE ELEVATION DATA FILE (meters, absolute elevation)

APPENDIX 2

RAUTAHAT MODEL – LAND SURFACE ELEVATION MAP



APPENDIX 3

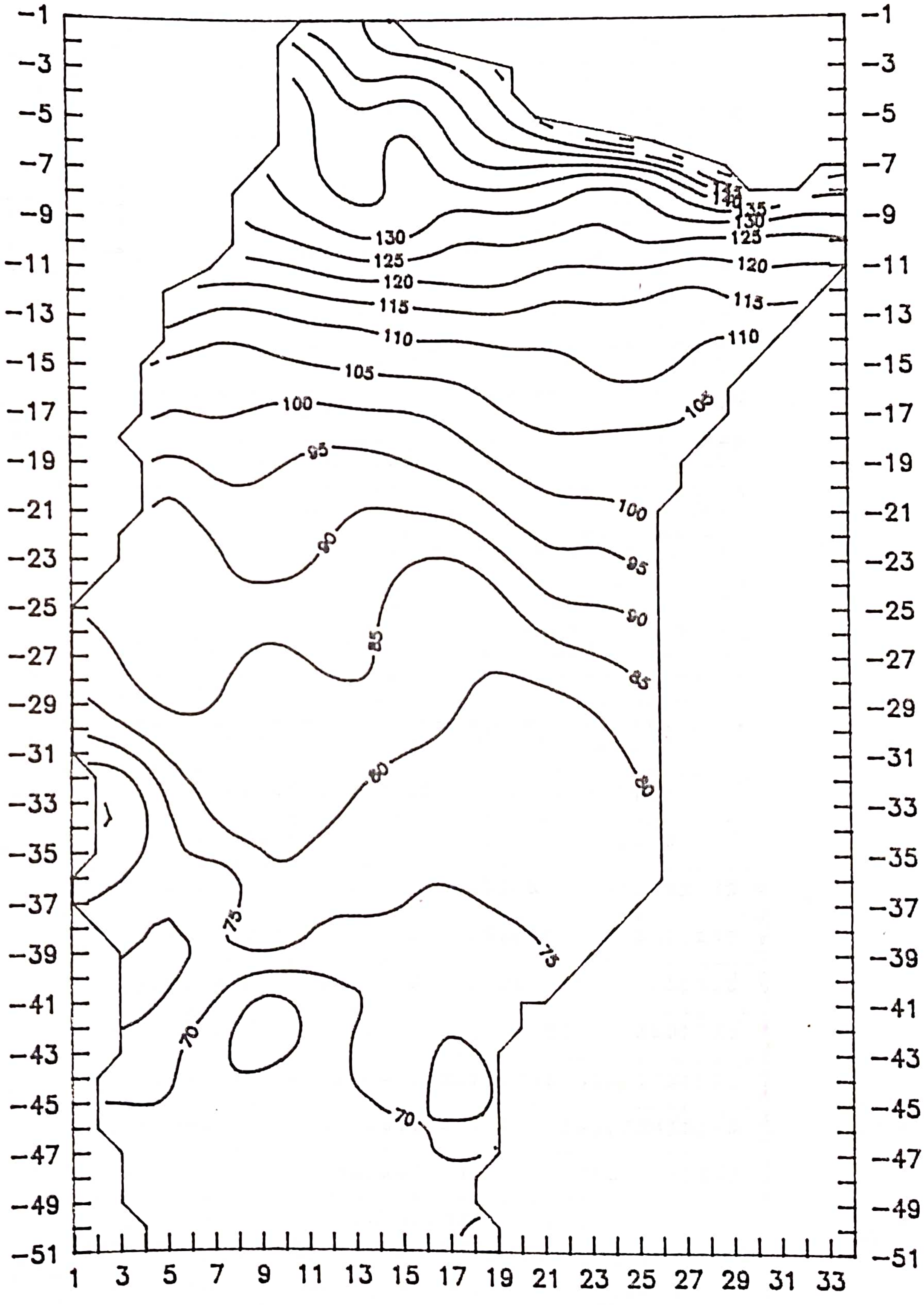
RAUTAHAT MODEL -- TOP OF AQUIFER ELEVATION

128.0	128.7	129.5	130.3	131.1	132.0	132.9	133.8	134.6	135.5	148.6	147.1	147.1	145.2	158.2	159.8	161.7	163.8	166.1	168.6	171.3	174.1	176.9	177.1	178.8	179.8	180.0	178.6	177.2	175.1	172.7	170.0	167.3	164.7	1
127.2	127.9	128.7	129.5	130.4	131.3	132.3	133.3	134.2	135.2	142.4	144.7	147.1	147.9	148.3	157.3	159.2	161.2	163.6	166.3	169.2	172.4	175.7	176.8	179.0	180.4	180.4	179.2	177.4	174.8	171.8	168.7	165.6	162.7	2
126.4	127.1	127.8	128.7	129.6	130.5	131.7	132.6	133.7	134.8	135.8	140.6	146.6	149.6	145.8	147.1	148.3	150.3	152.7	163.4	166.6	170.2	174.0	176.2	179.2	180.7	180.9	179.9	177.4	174.1	170.4	166.7	163.3	160.1	3
125.4	126.1	126.9	127.8	128.6	129.6	130.8	131.9	133.0	134.2	135.4	136.4	138.5	144.2	141.2	143.3	147.0	149.9	152.2	159.9	163.3	167.2	171.6	176.2	178.8	181.6	182.1	180.5	177.2	172.9	168.4	164.1	160.2	156.9	4
124.3	125.0	125.8	126.6	127.6	128.6	129.6	130.9	132.2	133.5	133.8	136.1	138.4	140.1	135.4	139.2	141.5	145.9	148.0	151.7	156.0	163.2	168.2	173.2	178.3	182.2	183.5	181.1	176.2	170.6	165.2	160.4	156.3	153.0	5
123.1	123.7	124.5	125.3	126.3	127.3	128.4	129.7	131.0	132.5	134.0	136.5	138.2	139.0	134.3	135.2	138.6	138.7	140.2	143.5	139.7	136.9	141.2	144.2	141.5	182.9	135.3	130.9	173.7	166.6	160.5	155.4	151.4	148.2	6
119.7	122.4	123.1	123.9	124.8	125.8	126.9	128.1	129.5	132.0	133.7	136.5	138.3	137.9	132.8	132.3	136.9	137.3	140.2	140.5	139.1	135.0	134.8	136.5	138.2	141.2	142.4	140.8	167.8	160.0	153.9	149.0	145.3	142.6	7
118.2	119.0	121.6	122.3	123.1	124.1	125.1	126.3	127.7	130.1	131.8	136.6	137.8	126.8	134.5	131.3	131.4	134.0	140.0	135.5	136.4	132.3	134.8	134.6	135.7	134.0	137.0	136.1	137.6	150.3	145.3	141.3	129.2	130.3	8
116.6	117.3	120.5	121.2	121.3	122.1	123.1	124.2	126.4	127.8	129.3	130.9	133.3	134.2	135.2	131.7	128.3	128.9	127.9	128.2	129.8	130.0	124.6	127.2	129.2	132.5	130.3	131.4	131.2	131.6	128.7	128.8	129.5	129.7	9
116.3	115.6	118.8	119.3	119.9	120.0	120.8	121.8	123.9	124.1	125.3	126.6	128.7	131.3	132.5	132.2	127.7	126.3	128.7	127.9	129.0	127.2	123.8	125.2	130.0	128.1	124.6	125.7	127.5	127.3	125.5	123.8	122.5	123.6	10
114.6	115.1	115.6	117.3	117.8	118.3	118.4	116.2	118.0	119.0	120.1	121.1	122.9	122.4	122.5	122.4	122.9	123.3	123.9	122.2	120.5	119.6	119.8	120.0	121.0	116.5	116.8	117.5	119.6	121.5	121.1	122.7	118.4	119.0	11
112.8	113.2	113.7	114.1	115.1	108.9	111.4	112.4	113.0	114.8	114.6	113.4	114.2	115.6	116.8	119.6	118.2	118.1	117.4	117.8	118.3	115.3	114.4	115.7	118.0	120.3	119.9	117.2	115.9	117.6	118.6	114.2	114.7	115.5	12
111.1	111.3	111.6	111.9	112.7	107.1	107.7	109.0	108.3	109.5	110.1	110.8	110.5	112.0	113.2	113.4	113.2	113.1	114.5	112.6	113.0	112.2	112.7	116.2	112.9	116.7	112.1	111.3	111.3	111.6	114.7	113.6	111.5	112.5	13
109.0	109.4	109.6	109.7	109.9	105.5	105.6	107.1	107.1	107.4	107.5	108.2	109.8	110.4	109.9	110.0	109.0	110.3	110.7	107.5	109.3	109.7	111.4	112.2	112.8	111.9	111.1	110.2	110.9	109.8	106.8	107.8	108.9	110.0	14
104.1	107.3	107.6	107.6	102.6	102.6	103.9	103.8	104.0	105.1	105.4	105.9	106.4	107.1	106.8	106.2	106.4	103.0	107.7	108.0	108.1	108.8	110.8	111.7	112.4	111.5	110.6	107.6	108.1	103.8	104.7	105.7	106.7	107.8	15
102.3	102.7	105.4	105.4	102.4	102.2	101.9	101.9	101.6	102.0	101.9	102.3	103.1	102.9	103.1	102.3	104.5	106.2	107.3	106.4	107.2	107.6	107.6	109.8	110.5	105.9	103.3	105.3	101.6	102.3	103.1	104.0	105.0	106.0	16
100.5	100.9	101.2	104.4	101.1	100.9	100.3	99.6	99.1	97.9	97.1	97.6	98.3	97.6	98.6	99.7	100.7	103.0	104.9	106.5	105.9	106.3	106.2	105.4	105.6	103.8	105.5	109.2	99.1	99.6	100.3	101.1	102.1	103.1	17
98.8	99.2	99.5	95.7	99.1	98.6	98.1	97.2	98.1	95.2	96.6	97.5	98.2	98.1	98.9	97.9	98.9	100.8	102.5	102.9	105.0	105.1	104.4	104.7	104.6	101.2	103.2	107.8	108.6	97.6	96.6	97.2	98.0	98.9	18
96.5	97.4	99.4	99.4	92.3	97.8	97.2	97.4	95.6	95.3	95.1	93.6	94.1	94.6	95.1	95.9	96.6	97.5	99.3	100.4	102.8	103.5	103.8	103.1	102.3	104.0	104.2	104.2	104.8	105.4	95.2	95.7	96.5	97.3	19
88.7	89.6	90.8	92.1	89.9	90.6	92.2	93.3	94.1	93.9	92.7	90.7	90.8	90.8	90.3	92.1	93.6	95.7	96.4	97.7	98.6	99.7	101.1	101.4	100.7	102.3	102.5	102.7	103.0	103.6	104.2	94.4	95.0	95.8	20
88.1	89.1	90.1	91.3	89.1	90.3	91.6	91.9	94.0	93.7	93.3	90.8	89.4	89.0	89.6	89.2	90.2	92.1	94.5	96.5	97.9	97.7	97.5	99.2	100.4	100.7	100.9	101.1	101.4	104.2	104.9	103.2	93.8	94.5	21
87.5	88.5	89.5	86.5	87.6	88.5	90.5	90.5	92.8	91.5	90.1	89.0	88.2	87.4	86.5	88.5	86.8	89.0	91.0	93.7	95.2	96.0	95.6	95.7	98.5	98.8	99.1	99.3	99.7	102.1	102.7	103.3	104.5	105.0	22
86.6	87.8	88.9	85.9	88.0	88.8	89.0	91.5	91.9	91.6	90.6	88.2	87.5	87.0	85.5	84.9	84.2	84.3	87.3	91.4	95.0	94.0	92.9	92.9	95.9	96.8	97.2	97.5	97.9	100.4	101.0	101.7	102.3	102.8	23
85.7	86.9	86.2	87.2	88.1	88.9	89.5	89.9	90.2	89.3	89.3	87.1	86.7	85.5	84.7	82.6	81.6	78.9	83.0	87.6	91.2	91.7	92.3	90.6	92.9	93.1	93.3	96.1	96.6	97.1	99.4	100.1	100.7	101.3	24
84.7	85.0	86.4	87.5	88.3	88.9	89.3	88.4	88.2	88.1	87.8	87.3	86.8	86.3	84.1	82.8	80.5	80.2	81.9	84.8	87.5	89.4	89.5	89.3	90.8	91.0	91.3	91.8	95.0	95.6	98.3	99.1	100.8	101.5	25
83.6	84.0	85.4	86.3	87.6	88.0	88.1	87.8	86.4	86.2	86.1	85.9	85.6	84.8	84.3	82.6	81.8	80.9	81.2	82.7	84.4	85.6	87.0	86.9	88.7	89.3	89.8	90.2	90.9	90.9	97.1	97.7	98.5	100.2	26
82.2	83.8	85.5	87.1	87.9	88.1	86.9	86.3	83.2	86.5	85.6	85.5	85.5	84.8	83.6	83.3	81.8	80.7	80.5	82.1	83.2	84.5	83.7	84.8	86.7	87.4	88.1	88.7	89.2	89.7	90.4	95.6	97.1	98.0	27
80.2	82.1	84.4	86.5	87.3	87.2	86.9	85.2	84.0	84.1	84.3	84.5	84.6	84.1	83.2	83.0	81.3	80.1	79.5	79.5	80.0	81.1	82.4	83.4	84.2	86.0	86.6	87.3	87.9	88.5	88.9	94.3	95.2	95.8	28
77.9	79.8	82.3	85.1	86.0	86.2	85.1	84.4	83.2	83.2	83.3	84.4	84.7	84.6	84.3	82.7	80.6	79.3	78.3	77.8	77.8	78.9	80.4	80.6	82.7	83.5	85.5	86.4	87.2	87.3	87.9	88.3	94.0	94.9	29
75.1	76.6	79.0	80.9	83.0	83.9	84.1	84.4	83.8	82.4	83.4	83.4	83.7	83.4	84.0	81.3	80.5	79.3	77.3	76.4	75.5	77.4	78.0	79.3	81.5	82.4	83.1	85.3	86.1	86.8	87.4	87.4	87.9	93.8	30
71.4	72.5	74.8	77.6	81.1	82.7	83.2	83.2	84.6	83.5	83.3	82.9	82.2	77.9	79.7	79.6	79.3	78.4	76.8	76.2	76.1	77.0	77.3	78.5	80.6	81.0	81.7	82.2	82.6	83.0	83.3	87.2	87.7	88.2	31
68.7	68.3	69.8	74.8	80.1	81.3	82.0	82.4	82.4	82.6	82.4	82.0	81.3	80.1	78.1	78.3	78.3	78.0	77.7	76.6	76.7	77.3	78.0	78.8	79.9	80.6	81.3	81.8	82.3	82.7	83.0	83.3	83.6	87.3	32
66.6	65.1	62.4	69.9	75.7	79.0	80.6	81.5	81.9	81.9	81.8	80.2	79.8	78.3	77.1	77.7	77.5	76.7	76.9	77.3	77.4	77.8	78.3	78.8	79.5	80.1	80.6	81.2	81.6	82.0	82.4	82.7	83.0	83.2	33
66.1	65.4	65.1	69.0	73.7	77.2	79.5	80.8	81.0	81.0	80.5	80.0	79.4	77.9	76.8	76.4	76.5	76.5	77.0	78.3	78.0	78.0	78.3	78.6	79.1	79.6	80.1	80.6	81.0	81.4	81.7	82.1	83.1	83.3	34
66.9	67.0	67.3	70.0	73.2	75.8	77.9	80.2	81.0	80.0	79.7	79.1	78.2	78.1	76.3	76.1	75.9	76.0	76.6	77.4	77.9	77.8	78.0	77.7	77.8	79.2	79.6	80.0	81.0	81.4	81.8	82.2	82.5	82.8	35
68.0	67.7	70.0	72.2	74.5	75.4	74.8	76.8	79.0	79.1	78.5	77.8	77.2	76.7	76.5	75.0	75.2	75.7	76.0	76.7	77.2	77.4	77.5	77.6	77.8	78.0	78.4	78.7	80.5	80.9	81.3	81.7	82.0	82.3	36
69.8	69.9	71.4	73.3	75.3	77.1	69.2	75.0	78.1	77.9	77.2	76.3	76.2	75.3	74.8	74.8	74.4	74.9	75.4	75.8	76.0	76.6	76.8	77.0	77.1	77.3	77.9	79.9	80.2	80.5	79.1	82.2	82.6	82.9	37
71.0	72.1	73.4	74.9	75.4	75.4	75.5	78.7	78.0	76.3	74.8	74.3	74.0	73.9	74.2	74.3	74.3	74.9	74.4	74.8	75.3	75.5	76.6	77.5	77.1	78.2	78.5	78.8	79.0	79.2	79.4	79.9	79.0	79.7	38
71.4	73.6	74.6	75.5	75.9	76.0	75.2	76.3	77.7	73.2	72.6	73.1	72.4	72.5	73.4	73.8	73.2	73.1	73.8	74.3	74.8	75.1	76.3	76.4	78.1	78.4	78.7	79.0	76.3	76.4	76.4	76.5	76.5	76.6	39
74.2	74.1	75.0	77.0	75.9	74.6	72.4	69.0	69.7	64.7	67.1	69.7	70.9	71.6	71.9	72.4	72.0	72.8	73.6	74.8	75.3	75.6	75.3	74.8	74.6	74.5	75.6	75.7	75.7	75.8	75.9	79.2	79.3	79.4	40
73.6	76.4	76.6	76.2	74.8	72.7	69.6	65.8	62.2	63.7	66.9	68.8	69.4	70.4	70.3	69.8	70.7	72.1	73.5	74.0	74.3	74.5	74.6	74.7	74.1	74.0	73.7	73.6	73.4	78.4	78.5	78.7	78.8	78.9	41
75.1	75.3	75.4	75.5	73.2	70.6	67.5	64.3	63.2	63.5	65.7	67.8	70.2	71.2	70.4	68.1	70.9	71.5	73.0	73.5	73.8	74.0	74.1	74.1	74.1	74.1	73.2	73.1	73.0	72.8	72.7	78.1	78.2	78.4	42
73.8	73.7	73.6	72.8	71.2	68.5	65.9	63.8	63.0	64.5	66.4	68.7	70.8	73.8	71.3	70.0	69.1	71.1	71.1	73.1	73.3	73.4	73.5	73.5	73.5	73.2	73.2	73.1	73.1	72.4	72.3	72.2	72.1	77.8	43
72.2	71.4	70.0	69.1	67.6	66.3	65.9	65.0	65.3	65.6	67.1	69.4	70.7	73.0	72.0	70.0	68.7	70.6	71.9	71.9	71.8	71.6	72.7	72.7	72.6	72.6	72.6	72.5	72.5	72.5	72.5	72.4	74.7	74.7	44
70.0	69.1	70.0	70.0	70.0	66.2	66.3	66.3	67.4	68.3	69.8	69.9	69.5	71.0	71.0	70.0	68.2	70.7	70.9	70.6	70.2	71.1	72.0	71.9	71.9	71.9	71.9	71.9	71.9	71.9	71.9	71.9	71.9	71.9	45
70.0	70.0	70.0	68.0	68.0	67.0	66.7	64.9	68.3	68.3	69.8	70.0	69.6	71.3	71.7	70.6	71.1	71.2	70.6	70.0	69.5	69.1	68.8	68.6	71.1	71.2	71.2	71.2	71.3	71.3	71.3	71.4	71.4	71.4	46
68.0	68.0	68.0	68.0	68.0	68.0	66.8	66.4	67.3	67.4	68.9	69.8	69.8	70.0	69.0	69.0	71.5	70.3	69.6	69.0	68.6	68.3	68.1	67.9	67.7	67.6	70.5	70.6	70.6	70.7	70.8	70.8	70.9	70.9	47
68.0	68.0	68.0	68.0	68.0	68.0	67.0	66.0	66.0	68.0	68.0	69.0	69.0	69.6	68.7	68.0	67.2	67.8	68.1	68.1	67.4	67.3	67.2	67.1	67.1	67.0	66.9	66.9	70.0	70.1	70.2	70.3	70.3	70.4	48
68.0	68.0	68.0	68.0	68.0	68.0	67.5	67.5	67.9	68.0	68.0	69.0	61.0	69.0	69.5	68.5	65.3	64.9	65.7	66.4	66.7	67.0	67.1	67.2	67.3	66.4	66.4	66.4	66.4	66.4	69.6	69.7	69.8	69.9	49
68.0	68.0	68.0	68.0	68.0	68.0	68.0	67.3	67.8	67.3	67.8	67.9	68.0	68.0	65.9	66.8	66.0	64.5	63.7	64.7	65.4	65.9	66.2	66.4	66.6	66.8	66.9	67.0	67.1	67.1	66.6	66.7	69.3	69.4	50
68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	66.0	66.0	66.3	66.3	62.9	64.9	64.2	63.6	63.4	64.2	64.7	65.3	65.7	65.9	66.2	66.3	66.5	66.6	66.7	66.8	66.9	66.9	67.0	51
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	

TOP OF AQUIFER ELEVATION (meters, absolute elevation)

APPENDIX 4

RAUTAHAT MODEL – TOP–OF–AQUIFER ELEVATION MAP



APPENDIX 5

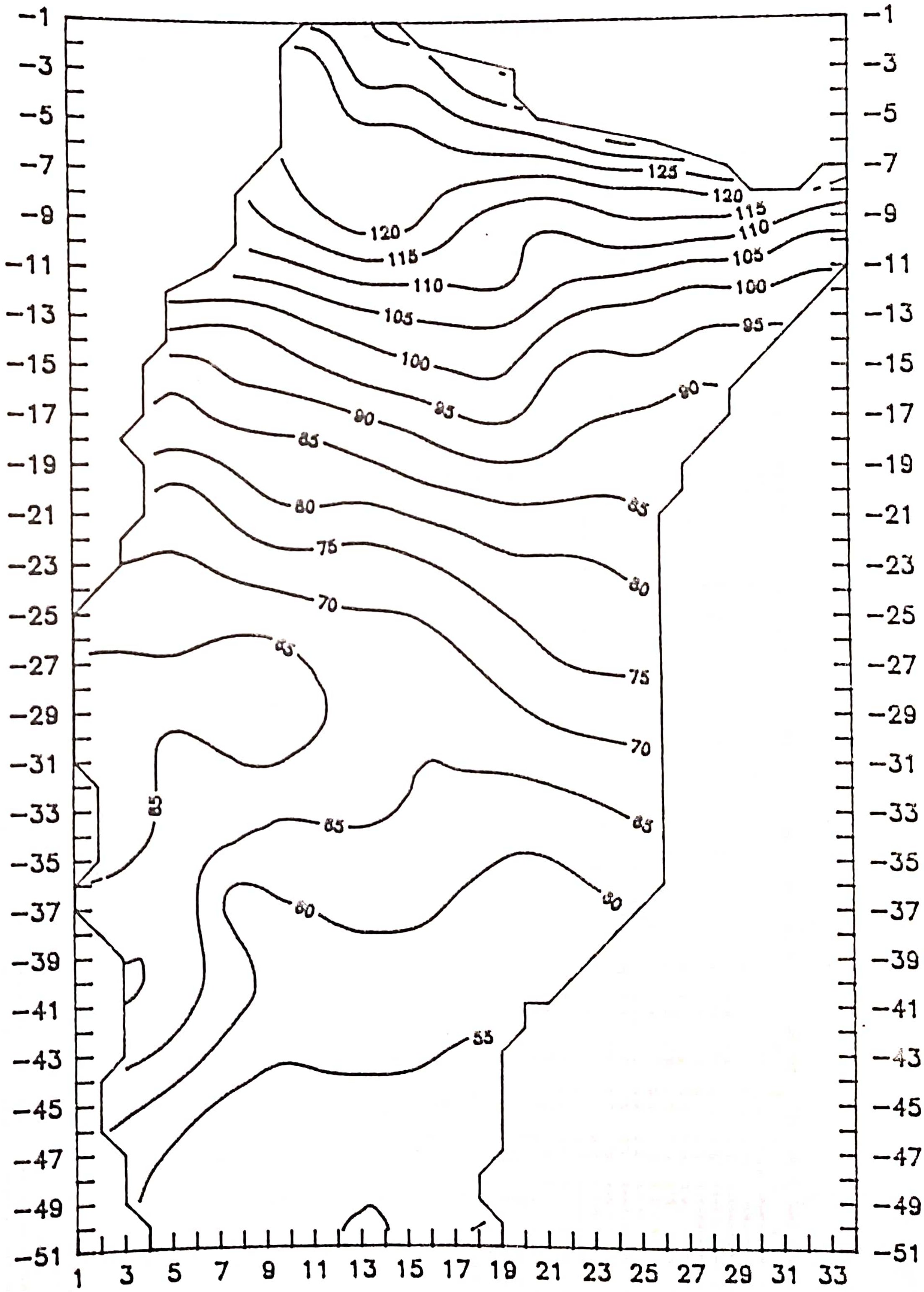
RAUTAHAT MODEL .. BOTTOM OF AQUIFER ELEVATION

114.0	114.8	115.6	115.7	116.6	117.6	120.3	121.1	128.4	129.6	130.8	130.3	133.5	133.3	136.8	138.4	139.2	140.1	141.3	142.6	144.2	145.8	143.8	145.0	145.9	146.4	146.2	145.3	144.1	142.3	140.3	138.0	135.8	133.6	1
113.3	114.1	115.0	115.9	116.8	117.1	119.9	120.8	121.6	122.4	126.9	128.7	132.2	133.3	135.3	136.7	137.4	138.3	139.4	140.8	142.4	144.3	143.2	144.8	146.1	146.8	146.6	145.9	144.3	142.2	139.7	137.1	134.5	132.1	2
112.5	113.4	114.2	115.2	116.1	117.2	118.2	120.3	121.3	122.2	120.0	127.5	131.5	132.8	131.1	134.0	135.3	138.1	141.1	138.5	140.3	142.4	144.9	144.5	146.3	147.3	147.5	146.5	144.5	141.8	138.8	135.8	132.9	130.2	3
111.6	112.5	113.4	114.3	115.4	116.4	117.6	119.7	120.8	121.8	119.8	121.7	124.3	133.3	129.4	130.5	132.1	133.6	136.4	135.7	137.5	139.9	142.8	143.7	146.2	148.1	148.5	147.2	144.6	141.2	137.5	133.9	130.7	127.9	4
110.6	111.5	112.4	113.4	114.4	115.6	116.8	118.0	120.1	121.3	121.6	123.7	124.5	131.8	124.7	127.5	128.4	130.7	131.3	133.4	134.1	136.6	139.9	143.9	146.0	149.0	149.8	148.0	144.3	139.8	135.4	131.4	127.9	124.9	5
109.5	110.3	111.2	112.2	113.3	114.5	115.7	117.1	118.5	120.6	122.0	123.4	124.6	126.2	127.9	127.4	126.9	125.9	125.7	127.3	128.8	130.4	135.0	135.0	130.0	135.0	135.0	135.0	135.0	135.0	132.0	127.9	124.3	121.4	6
104.3	109.1	109.9	110.9	112.0	113.2	114.4	115.8	117.4	120.4	122.0	122.7	124.4	125.6	122.7	122.2	122.2	121.3	122.6	121.6	120.6	120.0	123.7	123.0	124.0	124.0	125.0	127.0	130.0	130.0	127.9	123.4	119.8	117.1	7
102.8	103.9	108.5	109.4	110.5	111.6	112.9	114.3	115.8	118.5	120.5	121.2	123.1	124.6	123.5	120.8	118.5	118.2	117.8	117.5	117.5	115.5	118.2	118.0	118.0	120.0	120.0	121.0	123.0	127.1	122.1	117.8	113.5	112.3	8
101.2	102.2	107.0	107.9	108.7	109.8	111.0	112.4	114.9	116.5	118.2	119.9	122.4	123.2	122.8	119.5	117.0	115.3	112.3	111.0	110.6	110.4	112.8	114.4	116.8	116.1	115.3	115.9	116.1	115.4	110.4	109.5	107.5	107.2	9
100.9	100.4	105.2	106.0	106.9	107.8	108.9	110.2	112.6	113.1	114.6	116.1	118.2	120.9	123.8	123.1	115.9	114.6	112.3	110.6	111.0	110.3	110.7	112.8	114.7	114.0	110.0	112.3	111.5	110.8	108.0	104.7	102.0	102.6	10
99.5	99.9	101.0	104.0	104.8	105.7	106.6	104.7	107.0	108.3	109.7	111.1	112.9	112.6	112.8	111.6	111.9	113.4	113.4	110.6	108.5	106.4	106.8	106.6	107.0	102.9	101.8	102.5	105.1	104.4	102.7	101.5	99.8	99.5	11
97.3	98.0	99.1	100.1	102.6	97.3	99.1	101.0	102.1	104.3	104.5	103.8	104.9	106.4	107.9	109.0	109.7	109.0	107.9	106.2	104.3	102.4	100.7	100.8	101.1	100.7	100.4	98.6	98.8	99.5	99.6	98.4	97.6	97.4	12
95.3	95.9	96.6	97.7	98.4	94.6	95.4	97.2	97.0	99.0	100.2	101.4	102.6	103.6	104.9	105.4	105.6	105.2	106.5	105.6	102.8	98.9	97.7	97.9	98.6	100.7	96.7	96.8	95.9	95.8	95.4	95.9	95.5	95.4	13
93.2	93.8	94.4	95.0	95.8	91.6	92.3	95.0	95.8	96.5	97.7	98.9	101.1	102.4	102.0	101.9	101.4	102.5	102.7	102.9	98.9	94.8	95.0	95.7	96.9	98.4	95.0	94.2	94.4	94.4	94.3	94.2	94.1	94.2	14
90.9	91.3	92.1	92.6	86.1	87.8	90.5	91.0	92.4	94.5	95.3	96.3	97.6	98.1	99.4	99.4	100.2	99.8	102.1	100.8	96.1	90.8	93.2	94.6	96.2	97.8	91.8	91.0	92.2	92.4	92.4	92.5	92.6	92.8	15
87.9	89.1	89.4	90.2	87.6	88.0	88.5	89.0	89.4	90.4	91.5	92.5	93.9	94.3	95.7	97.1	99.3	100.0	102.3	99.6	94.5	91.6	90.9	92.9	94.3	94.8	88.2	90.4	90.6	90.8	90.9	91.1	91.3	91.6	16
85.7	86.1	86.5	87.4	84.7	85.7	85.9	86.3	86.5	86.8	86.1	87.1	89.0	89.4	91.1	92.7	94.1	96.2	97.0	96.5	93.0	91.3	90.2	89.3	89.9	92.4	86.1	89.2	89.4	89.6	89.8	90.0	90.3	87.4	17
83.5	83.9	84.2	80.6	82.2	83.1	83.3	83.4	85.5	86.4	86.2	87.5	89.1	89.5	90.9	90.2	92.3	92.8	93.5	92.0	91.8	89.9	88.1	88.0	87.3	87.4	89.7	83.9	83.9	84.0	84.1	84.3	84.6	84.9	18
81.4	81.6	81.9	77.1	76.1	78.2	79.0	82.9	82.8	83.6	84.3	83.2	84.6	85.5	86.6	87.7	88.3	88.7	89.5	88.6	89.6	88.1	87.3	86.5	85.8	87.8	87.6	88.1	82.5	82.6	82.7	83.0	83.2	83.6	19
73.7	74.3	74.8	76.1	72.8	73.8	76.3	88.4	80.1	80.8	80.4	79.1	79.9	81.0	81.3	83.1	84.8	85.8	85.8	85.4	85.1	84.6	84.9	84.8	84.9	86.4	86.9	86.6	87.1	87.6	81.2	81.8	82.0	82.4	20
72.5	73.1	73.7	74.2	72.5	73.2	74.6	75.6	78.4	78.9	79.3	77.8	77.4	78.0	79.7	80.1	81.2	82.6	83.9	84.0	83.5	83.9	84.0	84.1	84.5	85.0	85.5	85.3	85.7	86.2	86.5	86.9	80.9	80.1	21
71.2	71.7	72.2	68.7	69.4	70.6	72.7	73.6	75.6	74.7	75.1	74.3	74.6	75.0	75.6	78.8	78.1	80.3	80.7	81.3	80.6	80.7	80.3	80.6	83.0	83.6	84.2	84.0	84.4	84.9	85.3	85.6	86.0	86.3	22
69.9	70.3	70.7	67.2	68.6	69.2	70.3	72.0	72.8	73.2	73.4	72.8	73.1	73.3	73.6	74.9	76.1	77.2	78.7	79.6	79.3	78.9	78.3	79.4	81.9	81.8	83.5	82.8	83.2	83.6	84.0	84.4	84.8	85.1	23
68.6	68.8	67.1	67.5	67.7	68.1	68.6	69.3	69.9	70.6	71.1	70.4	70.6	70.7	71.3	72.1	73.2	74.0	76.0	77.3	78.4	78.3	79.0	77.2	79.3	79.3	80.8	81.0	81.8	81.2	81.6	81.9	82.1	82.4	24
67.2	66.4	66.6	66.8	67.0	67.0	67.2	66.5	67.0	68.0	68.8	69.4	69.5	69.3	69.5	70.8	71.1	72.3	74.6	75.8	77.1	78.1	77.8	77.2	78.2	78.2	78.1	77.9	80.0	79.9	30.3	80.6	80.8	81.1	25
65.5	65.0	65.2	65.3	65.3	65.1	64.9	64.7	64.1	65.2	66.8	67.9	68.1	67.9	68.9	69.2	71.0	71.7	72.2	73.6	74.8	76.1	77.0	76.3	77.2	77.1	77.0	76.9	76.8	79.0	78.9	79.3	79.6	79.9	26
64.6	64.6	64.7	64.8	64.9	64.7	63.2	62.5	62.3	63.8	65.9	68.0	67.7	67.4	67.6	68.9	69.5	70.4	70.8	73.2	74.6	75.9	75.2	75.1	76.0	75.9	75.8	75.7	75.7	75.6	75.6	78.7	79.5	78.6	27
63.7	63.7	63.7	64.0	64.1	64.0	63.3	60.9	59.0	61.9	64.3	65.8	66.1	65.8	65.9	67.2	68.0	69.0	70.1	70.8	72.1	73.3	74.2	74.5	74.5	74.5	74.5	74.5	74.3	74.5	74.6	77.9	78.3	78.7	28
63.0	63.0	63.0	62.7	64.1	64.1	62.7	61.6	60.7	61.9	63.6	65.7	65.8	65.5	65.0	65.5	66.5	67.5	68.7	69.9	70.8	71.7	72.5	71.7	72.9	73.0	73.1	73.2	73.3	73.2	73.3	76.7	77.2	77.5	29
62.6	61.9	62.8	63.2	64.5	64.7	64.1	63.6	63.0	63.5	65.4	65.6	66.0	64.9	63.0	64.3	66.4	67.3	67.3	68.4	69.5	70.0	69.4	70.2	71.8	71.7	72.0	72.3	71.6	71.7	71.7	71.8	76.6	77.0	30
61.2	61.7	63.1	64.6	66.8	66.8	65.7	64.7	65.7	65.4	66.1	66.8	66.8	65.5	65.2	65.0	65.5	66.0	65.7	66.5	67.2	67.9	67.4	67.8	69.1	69.3	69.4	70.9	71.3	71.6	70.6	70.8	70.9	76.7	31
61.0	61.0	62.3	66.1	70.1	68.4	66.9	65.7	64.3	65.6	66.0	67.2	68.3	67.3	65.8	65.0	64.7	64.8	64.9	64.4	65.0	65.7	66.4	66.9	67.4	67.8	68.1	68.3	68.4	68.5	70.8	71.1	69.9	70.1	32
61.1	60.6	58.9	64.1	67.6	67.9	66.8	65.6	64.8	65.1	65.5	65.2	66.8	65.9	64.6	64.7	63.7	62.4	62.3	62.4	62.8	63.6	64.5	65.2	65.8	66.4	66.8	67.1	67.4	67.6	67.7	66.7	70.5	70.8	33
62.3	62.2	61.9	64.6	66.9	67.3	66.1	64.7	63.5	64.1	64.5	64.8	65.6	64.9	63.6	62.8	61.9	61.3	60.9	60.5	60.7	61.8	62.8	63.7	64.4	65.0	65.6	66.0	66.3	66.6	65.5	65.7	65.8	65.9	34
63.8	64.3	64.5	66.1	67.6	67.2	65.0	63.2	63.4	62.7	62.9	63.0	63.1	63.6	62.7	62.1	61.3	60.4	59.8	59.3	59.4	60.3	61.3	62.1	62.8	63.4	63.9	63.8	64.1	64.4	64.6	64.8	64.9	65.0	35
65.3	65.3	66.6	68.1	69.4	68.1	63.1	60.5	60.8	60.8	61.1	61.4	61.6	62.5	61.8	61.1	60.5	59.9	59.3	58.8	58.9	59.4	60.0	60.7	61.3	61.9	62.3	62.7	63.6	63.9	64.2	64.4	64.6	64.8	36
66.6	66.6	67.8	69.3	71.0	72.6	58.2	58.0	58.8	59.4	59.9	60.2	61.4	61.5	60.9	60.4	59.7	59.3	58.8	58.4	58.4	58.7	59.2	59.8	60.3	60.8	61.3	61.7	62.1	63.0	63.3	63.6	63.5	63.7	37
67.6	68.4	69.3	70.3	70.0	67.7	62.7	59.2	58.0	58.4	58.3	59.3	60.4	60.4	59.8	59.7	59.1	58.7	56.3	56.9	56.9	57.1	58.5	59.0	59.4	59.9	60.4	61.1	61.5	61.8	62.1	62.4	62.6	62.8	38
68.4	69.4	69.9	70.0	69.2	66.9	63.4	60.4	58.7	58.9	59.1	59.9	59.0	59.5	59.2	59.0	58.6	56.9	56.7	56.4	56.1	56.5	57.8	58.4	58.9	58.6	59.0	59.4	59.7	60.1	60.4	60.6	60.9	61.1	39
68.9	69.4	69.6	70.6	68.8	66.2	66.5	64.0	62.7	61.4	61.1	58.4	58.6	58.5	58.1	58.0	56.9	56.5	56.1	56.7	56.1	55.9	55.9	57.1	57.4	57.8	58.2	58.6	58.9	59.3	59.6	59.9	60.1	60.4	40
68.2	70.7	70.4	69.5	67.5	65.0	62.4	60.4	59.0	58.1	58.2	58.2	57.4	57.3	56.9	56.5	56.1	55.7	56.3	56.0	55.8	55.8	55.8	55.9	56.1	56.2	57.4	57.8	58.2	58.5	58.8	59.1	59.4	59.9	41
69.4	69.2	68.9	68.5	65.9	63.3	60.8	58.8	57.9	56.8	56.6	56.7	56.9	57.0	56.6	57.0	55.4	54.9	55.5	55.5	54.9	54.7	55.2	55.3	55.4	55.6	55.8	55.9	56.1	58.0	58.3	58.6	58.9	59.2	42
67.6	67.2	66.6	65.5	63.5	61.0	58.8	57.0	55.4	55.6	55.6	55.8	56.2	56.6	56.2	55.3	54.6	55.0	54.5	54.4	54.2	54.0	53.9	53.9	53.8	55.0	55.2	55.3	55.5	55.7	55.9	58.0	58.3	58.6	43
65.8	64.6	62.7	61.4	59.7	57.6	56.7	55.4	54.9	54.1	54.2	54.7	54.9	55.4	55.2	54.4	53.6	54.1	53.6	53.4	53.4	53.3	53.3	53.3	53.3	53.3	53.3	54.8	55.0	55.2	55.4	55.5	57.7	57.9	44
63.5	62.5	61.2	59.9	58.1	56.2	54.6	53.9	54.0	53.7	53.9	53.2	53.8	54.1	53.8	53.2	52.5	53.0	52.3	52.1	51.9	51.8	52.7	52.7	52.7	52.8	52.8	52.8	52.9	52.9	54.9	55.0	55.2	57.4	45
61.8	60.7	59.2	57.7	56.0	54.1	52.4	52.6	53.9	52.7	52.3	53.2	53.9	54.2	53.8	53.1	52.1	51.7	51.7	51.3	51.3	51.2	51.2	51.9	52.0	52.1	52.1	52.2	52.3	52.3	52.4	54.1	54.3	54.5	46
59.8	58.8	57.5	56.0	54.4	52.8	52.3	53.8	53.7	52.4	52.4	52.9	53.6	53.8	53.2	51.9	51.5	50.8	50.9	50.8	50.8	50.8	50.8	50.7	51.6	51.7	51.8	51.8	51.9	52.0	52.1	52.1	52.2	52.2	47
58.7	57.6	56.5	54.9	53.3	52.2	52.8	53.3	53.1	52.5	52.5	53.4	53.8	53.8	53.0	51.8	50.8	50.4	50.4	50.4	50.4	50.4	50.4	50.5	50.5	50.5	51.4	51.5	51.6	51.7	51.8	51.9	51.9	52.0	48
58.1	57.0	55.8	54.4	53.0	51.5	53.5	54.8	53.9	52.3	52.6	54.6	54.9	54.8	53.3	51.9	51.1	50.4	50.1	50.0	50.0	50.1	50.1	50.2	50.2	50.3	50.3	50.4	51.4	51.5	51.6	51.6	51.7	51.8	49
57.6	56.6	55.6	54.5	52.5	52.9	54.4	56.1	54.6	52.[illegible]	49.6	56.7	59.9	56.[illegible]	53.1	51.1	51.0	50.3	49.9	49.8	49.8	49.3	49.9	49.9	50.0	50.1	50.1	50.2	50.2	50.3	51.3	51.4	51.5	51.6	50
57.3	56.5	55.6	54.5	53.1	53.7	54.7	55.3	54.7	53.6	54.1	57.0	57.6	55.5	52.3	48.9	49.6	49.7	49.6	49.6	49.8	49.6	49.7	49.8	49.3	49.9	50.0	50.0	50.1	50.1	50.[illegible]	51.2	51.3	51.4	51
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	

BOTTOM OF AQUIFER ELEVATION (meters, absolute elevation)

APPENDIX 6

RAUTAHAT MODEL – BOTTOM-OF-AQUIFER ELEVATION MAP



APPENDIX 7

RAUTAHAT MODEL .. DEPTH TO TOP OF SHALLOW AQUIFER

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1												1.3	0.2	4.8																				
2											1.0	1.4	0.9	2.1	2.0																			
3											6.2	4.9	1.4	0.3	2.1	3.5	2.1	5.5	6.9															
4											6.6	7.3	6.5	2.2	5.4	5.6	2.3	2.3	3.5															
5											9.7	7.3	5.6	6.0	11.4	7.1	6.2	5.0	4.1	2.2														
6										9.2	8.1	4.5	5.8	5.3	7.7	8.5	7.9	8.1	7.8	3.5	2.4	3.1	1.8	2.2	0.5									
7										7.7	5.2	3.0	0.3	3.3	8.4	12.2	11.8	8.7	4.8	5.5	4.0	3.0	3.2	1.5	0.8	0.8	1.6	3.2						
8									7.3	5.7	4.0	2.3	4.2	3.4	4.9	8.7	9.9	7.6	1.0	6.5	6.0	3.7	2.2	2.4	2.0	5.0	1.0	1.2	1.8				4.3	2.7
9									5.4	4.2	3.7	3.3	1.9	1.5	2.4	6.5	10.4	10.7	9.9	5.8	4.7	5.0	8.4	4.8	2.8	2.9	1.7	1.8	1.4	0.9	3.7	3.8	1.5	2.8
10									3.4	2.3	0.9	2.2	1.0	1.4	1.9	3.3	4.3	4.6	1.0	2.6	1.5	1.3	3.2	1.8	2.0	3.3	6.7	6.2	2.5	3.7	3.5	4.2	4.5	
11								4.8	5.1	4.5	3.8	3.0	2.7	3.3	3.5	0.6	1.1	2.1	2.0	2.4	4.0	4.4	5.7	8.0	7.3	9.8	8.7	9.5	10.4	9.5	6.9	4.3	6.7	
12						4.1	3.6	3.6	3.0	2.2	2.9	1.0	0.8	1.4	3.4	0.5	0.7	0.7	0.5	0.7	1.7	6.6	9.1	8.9	6.2	4.9	4.3	5.7	9.1	10.9	7.4	7.8		
13						5.8	5.2	2.9	0.7	2.9	2.5	2.4	2.2	2.8	2.6	2.2	1.0	0.9	1.5	4.5	5.0	5.3	7.2	7.9	7.5	6.2	8.8	9.7	11.3	14.3	5.5			
14						5.8	4.8	2.4	1.3	2.7	2.8	2.6	3.0	2.9	2.7	1.9	2.0	1.5	2.1	6.5	6.7	6.3	8.0	9.6	9.5	10.9	7.7	9.1	8.6	8.2				
15					7.9	5.0	4.9	5.9	3.7	3.1	3.4	3.3	3.2	2.9	3.0	1.6	2.4	8.0	5.7	8.3	8.1	5.0	6.9	7.5	8.2	7.6	6.4	9.3	6.2					
16					7.1	6.4	5.7	4.7	4.6	3.6	3.7	3.6	3.1	3.1	3.1	3.6	3.5	3.4	7.0	11.2	8.4	5.8	5.3	4.1	4.0	7.9	8.4	8.6						
17					6.2	5.5	5.2	3.9	3.9	4.9	4.7	5.2	3.7	4.8	4.3	3.3	3.5	3.6	4.6	4.9	5.1	5.7	4.1	4.2	5.0	4.8	2.5	1.7						
18				6.7	3.8	3.8	3.7	3.8	0.9	3.8	2.7	2.2	1.8	1.9	3.3	4.2	4.2	3.3	3.5	3.4	3.6	2.6	2.3	2.4	2.0	5.5	4.3							
19					9.4	3.4	3.4	3.6	2.6	2.3	3.1	3.2	3.4	4.0	3.5	2.1	3.2	3.4	3.6	2.8	2.6	2.4	1.9	1.7	2.3	0.9								
20					7.8	6.9	5.1	3.2	3.4	3.1	3.8	3.6	3.4	3.4	3.5	3.3	3.5	3.7	3.9	3.4	2.8	2.2	1.8	1.5	1.2	1.4								
21					6.8	5.4	3.8	3.4	2.6	2.5	2.3	2.5	2.7	3.4	3.6	4.2	4.6	4.8	4.3	3.1	2.5	2.2	1.8	1.2	1.6									
22				7.1	5.8	4.7	3.4	3.1	0.0	1.2	2.1	2.4	2.5	3.2	3.9	3.1	6.2	6.5	5.3	3.5	2.1	1.4	1.2	2.8	2.5									
23				6.2	4.8	3.8	3.3	0.8	0.3	0.5	1.3	2.5	2.9	3.3	4.1	5.9	7.7	8.9	7.7	4.6	1.3	1.5	1.3	4.6	4.1									
24			4.8	4.3	3.2	2.4	1.8	1.4	0.9	1.3	1.8	1.8	1.9	2.7	4.5	6.7	8.5	12.0	7.7	4.1	1.5	1.6	1.9	4.5	5.7									
25		5.9	4.7	3.8	3.0	2.4	1.8	1.7	2.5	1.9	2.4	2.5	1.4	1.0	3.4	5.8	8.1	8.9	7.5	5.7	3.5	2.8	3.3	4.5	7.7									
26		5.8	4.7	3.6	2.7	2.2	2.1	2.4	2.8	1.8	1.3	0.9	0.8	1.4	3.0	4.7	6.6	7.2	6.0	5.7	4.4	4.1	4.8	5.9	6.3									
27		5.8	4.4	3.0	2.3	2.0	2.2	2.8	4.8	1.7	1.8	1.0	0.9	1.5	2.7	4.2	5.8	6.1	6.1	6.2	5.1	4.1	4.7	5.0	6.3									
28		6.4	4.3	1.5	1.6	1.7	2.1	3.1	3.7	3.2	2.3	1.5	1.2	1.5	2.3	3.5	5.2	5.9	6.7	6.4	5.9	5.5	6.2	5.4	7.8									
29		7.6	4.7	2.5	1.7	1.6	1.8	2.7	3.5	3.2	2.7	2.2	2.3	1.8	1.6	3.1	5.1	6.4	7.5	7.9	8.4	7.0	5.4	6.6	7.3									
30		8.4	5.5	2.6	0.5	1.8	1.8	1.6	2.2	3.3	3.0	2.7	2.1	2.0	1.4	3.4	5.1	6.2	7.3	8.2	9.3	7.4	6.0	4.9	6.5									
31		11.4	9.1	5.4	2.2	1.9	1.7	1.9	1.8	2.7	2.8	3.0	3.3	6.1	4.6	4.8	5.2	6.0	6.8	7.5	7.8	7.1	6.0	5.2	6.4									
32			13.2	8.2	2.0	1.2	0.9	0.9	1.1	3.0	3.2	1.4	2.0	2.9	4.3	4.6	4.7	5.0	5.4	6.4	6.5	6.1	5.6	5.2	6.1									
33			18.5	11.2	5.6	2.7	1.6	1.0	1.9	2.9	2.9	1.4	2.3	3.1	4.3	5.3	5.5	5.2	5.2	5.1	5.1	5.0	4.8	4.6	4.2									
34			16.1	12.3	7.8	4.7	2.8	1.9	1.8	2.8	3.2	1.4	1.6	3.1	4.3	5.4	5.2	5.0	4.5	3.0	3.8	4.0	3.9	4.1	3.8									
35			13.1	10.5	7.4	5.1	3.6	2.0	2.0	2.9	3.0	2.3	3.0	2.7	5.1	5.1	5.1	5.0	4.5	3.7	3.3	3.6	3.6	4.1	4.2									
36		12.2	9.8	7.7	5.4	4.4	5.2	3.7	2.7	2.5	3.1	3.6	4.0	3.9	4.1	5.4	5.1	4.5	4.3	3.6	3.2	3.2	3.3	3.3	3.3									
37		9.2	7.5	5.6	3.6	1.8	9.0	4.0	2.1	2.5	3.2	4.0	4.0	4.4	4.8	4.7	5.2	4.7	4.3	3.9	3.8	3.4	3.4	3.1										
38			5.8	4.3	2.3	2.1	3.0	0.5	1.0	2.9	4.1	5.0	5.2	5.2	4.6	4.5	4.8	4.2	3.6	3.1	2.7	2.9	2.8											
39				2.8	2.3	1.7	1.5	0.7	0.1	4.3	5.2	4.9	5.4	5.6	4.3	4.1	5.0	4.0	3.5	3.1	2.7	2.4												
40				0.4	1.4	2.5	5.4	8.0	7.3	12.3	9.9	6.6	6.1	5.4	4.9	4.4	4.4	3.7	3.0	2.9	2.5													
41				0.8	2.1	4.1	7.1	11.1	14.9	13.4	10.1	8.2	6.5	5.4	5.3	5.8	4.7	3.4	2.9															
42				1.0	3.3	5.9	9.1	12.4	13.4	12.1	9.9	7.8	5.5	4.5	5.0	7.8	4.0	3.5	3.0															
43				3.2	4.8	7.6	10.6	12.6	12.2	10.6	8.7	6.5	4.5	1.7	3.9	4.8	5.7	4.6																
44			4.7	5.7	7.0	8.4	9.8	10.7	10.3	8.8	7.3	5.1	4.0	2.0	2.8	4.5	5.6	4.5																
45			5.0	5.0	5.0	8.9	8.8	8.7	7.5	6.3	4.8	4.0	4.6	3.3	3.1	3.9	5.5	3.9																
46			4.6	6.5	6.5	7.4	6.9	8.1	6.7	5.7	4.0	4.4	5.3	3.6	2.8	3.5	3.0	2.6																
47				6.0	5.9	4.9	6.0	7.4	5.4	6.3	5.0	4.7	5.1	4.8	5.2	4.4	2.5	2.5																
48				5.5	5.3	4.6	5.2	6.3	6.4	4.5	5.8	5.6	6.2	5.3	5.3	4.8	5.0																	
49				5.1	4.0	3.5	4.4	4.6	4.2	4.1	5.0	4.6	4.0	5.1	3.5	3.5	5.4																	
50					4.0	3.5	3.6	4.1	4.0	3.8	4.7	5.1	4.5	5.7	5.3	5.1	5.5	6.8																
51					4.0	3.3	3.5	3.6	3.5	3.4	3.4	6.0	6.0	5.3	3.7	8.4	6.2	7.0																

DEPTH TO TOP OF SHALLOW AQUIFER ... STEADY-STATE CALIBRATION ... NOVEMBER 19 1988 .... (LAND SURFACE - ELEVATION OF TOP OF AQUIFER)

APPENDIX 8

RAUTAHAT MODEL .. DEPTH TO BOTTOM OF SHALLOW AQUIFER

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1												18.1	13.8	16.7																				
2											16.5	17.4	15.8	16.7	15.0																			
3											22.0	18.0	16.5	17.1	16.8	16.6	15.1	17.7	18.5															
4											22.2	22.0	20.7	13.1	17.2	18.4	17.2	18.6	19.3															
5											21.9	19.7	19.5	14.3	22.1	18.8	19.3	20.2	20.8	20.5														
6										21.1	20.1	17.6	19.4	18.1	14.1	16.3	19.6	20.9	22.3	19.7	13.3	9.6	8.0	11.4	12.0									
7										19.3	16.9	16.8	14.2	15.6	18.5	22.3	26.5	24.7	22.4	24.4	22.5	18.0	14.3	15.0	15.0	18.0	19.0	17.0						
8									19.2	17.3	15.3	17.7	18.9	15.6	15.9	19.8	22.8	23.4	23.2	24.5	24.9	20.5	18.8	19.0	19.7	19.0	18.0	16.3	16.4				20.0	20.7
9									16.9	15.5	14.8	14.3	12.8	12.5	14.8	18.7	21.7	24.3	25.5	23.0	23.9	24.6	20.2	17.6	15.2	19.3	16.7	17.3	16.5	17.1	22.0	23.1	23.5	25.3
10									14.7	13.3	11.6	12.7	11.5	11.8	10.6	12.4	16.7	16.3	17.4	19.9	19.5	18.2	16.3	14.2	17.3	17.4	21.3	19.6	18.5	20.2	21.0	23.3	25.0	
11								16.3	16.1	15.2	14.2	13.0	12.7	13.1	13.2	11.4	12.1	12.0	12.5	14.0	16.0	17.6	18.7	21.4	21.3	23.4	23.7	24.5	24.9	26.6	25.3	25.5	25.3	
12						15.7	15.9	15.0	13.9	12.7	13.0	10.6	10.1	10.6	12.3	11.1	9.2	9.8	10.0	12.3	15.7	19.5	22.8	23.8	23.1	24.5	23.8	24.3	26.2	29.0	26.4	23.6		
13						18.3	17.5	14.7	12.0	13.4	12.4	11.8	10.1	11.2	10.9	10.2	8.6	8.8	9.5	11.5	15.2	18.6	22.2	26.2	21.8	22.2	24.2	24.2	26.7	30.1	24.8			
14						19.7	18.1	14.5	12.6	13.6	12.6	11.9	11.7	10.9	10.6	10.0	9.6	9.3	10.1	11.1	17.1	21.2	24.4	26.1	25.4	24.4	23.8	25.1	25.1	23.6				
15					24.4	19.8	18.3	18.7	15.3	13.7	13.5	12.9	12.0	11.9	10.4	8.4	8.6	11.2	11.3	15.5	20.1	23.0	24.5	24.6	24.4	21.3	25.2	25.9	22.1					
16					21.9	20.6	19.1	17.6	16.8	15.2	14.1	13.4	12.3	11.7	10.5	8.8	8.7	9.6	12.0	18.0	21.1	21.8	22.0	21.0	20.2	19.0	23.5	23.5						
17					22.6	20.7	19.6	17.2	16.5	16.0	15.7	15.7	13.0	13.0	11.8	10.3	10.1	10.4	12.5	14.9	18.0	20.7	20.1	20.3	20.7	16.2	21.9	21.7						
18				21.8	20.7	19.3	18.5	17.6	13.5	12.6	13.1	12.2	10.9	10.5	11.3	11.9	10.8	11.3	12.5	14.3	16.8	17.8	18.6	19.1	19.3	19.3	18.3							
19					25.6	23.0	21.6	18.1	15.4	14.0	13.9	13.6	12.9	13.1	12.0	10.3	11.5	12.2	13.4	14.6	15.8	17.8	18.4	18.3	18.8	17.1								
20					24.9	23.7	21.0	8.1	17.4	16.2	16.1	15.2	14.3	13.2	13.0	12.3	12.3	13.6	14.5	15.7	16.3	17.3	18.0	18.1	17.0	17.3								
21					23.4	22.5	20.8	19.7	18.2	17.3	16.3	15.5	14.7	14.4	13.5	13.3	13.6	14.3	14.9	15.6	16.9	16.0	15.3	16.3	17.5									
22				24.9	24.0	22.6	21.2	20.0	17.2	18.0	17.1	17.1	16.1	15.6	14.8	12.8	14.9	15.2	15.6	15.9	16.7	16.7	16.5	17.9	18.0									
23				24.9	24.2	23.4	22.0	20.3	19.4	18.9	18.5	17.9	17.3	17.0	16.0	15.9	15.8	16.0	16.3	16.4	17.0	16.6	15.9	18.1	18.1									
24			23.9	24.0	23.6	23.2	22.7	22.0	21.2	20.6	20.0	18.5	18.0	17.5	17.9	17.2	16.9	16.9	14.7	14.4	14.3	15.0	15.2	17.9	19.3									
25		24.5	24.5	24.5	24.3	24.3	23.9	23.6	23.7	22.0	21.4	20.4	18.7	18.0	18.0	17.8	17.5	16.8	14.8	14.7	13.9	14.1	15.0	16.6	20.3									
26		24.8	24.9	25.1	25.0	25.1	25.3	25.5	25.1	22.8	20.6	18.9	18.3	18.3	18.4	18.1	17.4	16.4	15.0	14.8	14.0	13.6	14.8	16.5	17.8									
27		25.0	25.2	25.3	25.3	25.4	25.9	26.6	25.7	24.4	21.5	18.5	18.7	18.9	18.7	18.6	18.1	16.4	15.8	15.1	13.7	12.7	13.2	14.7	17.0									
28		24.8	25.0	24.0	24.8	24.9	25.7	27.4	28.7	25.4	22.3	20.2	19.7	19.8	19.6	19.3	18.5	17.0	16.1	15.1	13.8	13.3	14.4	14.3	17.5									
29		24.4	24.0	24.9	23.6	23.7	24.2	25.5	26.0	24.5	22.4	20.9	21.2	20.9	20.9	20.3	19.2	18.2	17.1	15.8	15.4	14.2	13.3	15.5	17.1									
30		23.1	21.7	20.3	19.0	21.0	21.8	22.4	23.0	22.2	21.0	20.5	19.8	20.5	22.4	20.4	19.2	18.2	17.3	16.2	15.3	14.8	14.6	14.0	16.2									
31		22.2	20.8	18.4	16.5	17.8	19.2	20.4	20.7	20.8	20.0	19.1	18.7	18.5	19.1	19.4	19.0	18.4	17.9	17.2	16.7	16.2	15.9	15.9	17.9									
32			20.7	16.9	12.0	14.1	16.0	17.6	19.2	20.0	19.6	16.2	15.0	15.7	16.6	17.9	18.3	18.2	18.2	18.6	18.2	17.7	17.2	17.1	18.6									
33			22.0	17.0	13.7	13.8	15.4	16.9	19.0	19.7	19.2	16.4	15.3	15.5	16.8	18.3	19.3	19.5	19.8	20.0	19.7	19.2	18.6	18.2	17.9									
34			19.3	16.7	14.6	14.6	16.2	18.0	19.3	19.7	19.2	16.6	15.4	16.1	17.5	19.0	19.8	20.2	20.6	20.8	21.1	20.2	19.4	19.0	18.5									
35			15.9	14.4	13.0	13.7	16.5	19.0	19.6	20.2	19.8	18.4	18.1	17.2	18.7	19.1	19.7	20.6	21.3	21.8	21.8	21.1	20.3	19.7	19.2									
36		14.6	13.2	11.8	10.5	11.7	16.9	20.0	20.9	20.8	20.5	20.0	19.6	18.1	18.8	19.3	19.8	20.3	21.0	21.5	21.5	21.2	20.8	20.2	19.8									
37		12.5	11.1	9.6	7.9	6.3	20.0	21.0	21.4	21.0	20.5	20.1	18.8	18.2	18.7	19.1	19.9	20.3	20.9	21.3	21.4	21.3	21.0	20.3										
38			9.9	8.9	7.7	9.8	15.8	20.0	21.0	20.8	20.6	20.0	18.8	18.7	19.0	19.1	20.0	20.4	21.7	21.0	21.1	21.3	20.9											
39				8.3	9.0	10.8	13.3	16.6	19.1	18.6	18.7	18.1	18.8	18.6	18.5	18.9	19.6	20.2	20.6	21.0	21.4	21.0												
40				6.8	8.5	10.9	11.3	13.0	14.3	15.6	15.9	17.9	18.4	18.5	18.7	18.8	19.5	20.0	20.5	21.0	21.7													
41				7.5	9.4	11.8	14.3	16.5	18.1	19.0	18.8	18.8	18.5	18.7	18.7	19.1	19.3	19.8	20.1															
42				8.0	10.6	13.2	15.8	17.9	18.7	18.8	19.0	18.9	18.8	18.7	18.8	18.9	19.5	20.1	20.5															
43				10.5	12.5	15.1	17.7	19.4	19.8	19.5	19.5	19.4	19.1	18.9	19.0	19.5	20.2	20.7																
44			12.0	13.4	14.9	17.1	19.0	20.3	20.7	20.3	20.2	19.8	19.8	19.6	19.6	20.1	20.7	21.0																
45			13.8	15.1	16.9	18.9	20.5	21.1	20.9	20.9	20.7	20.7	20.3	20.2	20.3	20.7	21.2	21.6																
46			15.4	16.8	18.5	20.3	21.2	20.4	21.1	21.3	21.5	21.2	21.0	20.7	20.7	21.0	22.0	22.1																
47				18.0	19.5	20.1	20.5	20.0	19.0	21.3	21.5	21.6	21.3	21.0	21.0	21.5	22.5	22.0																
48				18.6	20.0	20.4	19.4	19.0	19.3	20.0	21.3	21.2	21.4	21.1	21.0	21.0	21.4	20.6																
49				18.7	19.0	20.0	18.4	17.3	18.2	19.8	20.4	19.0	18.[illegible]	19.3	19.7	20.1	20.6																	
50					19.5	18.6	17.[illegible]	15.8	17.2	19.5	22.9	16.3	12.[illegible]	17.6	13.1	20.8	20.5	21.0																
51					15.[illegible]	17.7	15.[illegible]	16.3	16.[illegible]	17.[illegible]	17.3	15.[illegible]	14.4	16.1	18.3	22.4	21.5	21.5																

STEADY-STATE RUN ... DEPTH TO BOTTOM OF SHALLOW AQUIFER ... 19 NOVEMBER 1988

RAUTAHAT MODEL -- SATURATED THICKNESS OF SHALLOW AQUIFER

Row	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1												8.9	6.7	7.3																				
2											11.2	9.8	7.6	8.5	9.1																			
3											15.8	9.5	6.4	7.4	10.6	10.5	10.1	9.6	8.9															
4											15.6	13.5	11.8	5.0	10.4	11.2	10.7	10.3	10.6															
5											12.2	11.5	10.4	4.2	10.7	11.0	11.5	10.7	11.7	9.6														
6										11.0	10.7	10.6	8.9	8.2	6.4	7.8	10.5	12.6	13.3	11.7	8.2	5.6	3.0	3.0	8.0									
7										9.5	8.8	9.3	7.6	7.4	10.1	10.1	13.2	14.7	14.4	14.4	14.4	13.5	9.8	10.0	10.0	10.0	10.0	10.0						
8									9.6	8.6	7.4	8.3	7.5	7.0	8.5	11.1	12.9	15.7	16.2	16.5	15.3	16.0	13.8	14.0	14.0	12.0	12.0	12.0	10.0				12.5	12.7
9									8.5	7.6	6.8	6.6	5.1	6.2	7.7	11.1	11.3	13.6	15.6	17.2	13.2	19.6	11.8	12.8	12.2	12.9	14.7	13.1	12.9	11.9	14.6	15.0	17.0	16.8
10									8.5	7.4	6.5	5.7	4.5	3.8	3.2	5.3	11.8	11.7	16.3	17.2	17.0	16.7	13.1	12.4	11.0	11.8	14.6	13.2	12.5	12.2	14.0	16.3	19.0	
11								8.8	8.0	7.7	6.8	5.9	4.8	5.0	6.7	9.2	10.9	9.9	10.5	11.6	12.0	13.2	13.0	13.4	14.0	13.6	15.0	15.0	14.5	16.1	16.9	18.5	18.6	
12						9.3	9.4	9.7	8.9	8.0	8.0	7.9	7.6	7.9	8.2	8.0	7.3	8.0	9.4	11.5	13.9	12.9	13.7	14.9	16.9	19.3	19.5	18.6	17.1	18.1	19.0	15.9		
13						11.1	10.9	10.5	10.5	10.0	9.4	9.0	7.5	8.0	7.9	7.9	7.1	7.3	7.9	7.0	10.2	13.3	15.0	18.0	14.3	16.0	15.4	14.5	15.4	15.8	19.3			
14						13.1	12.8	10.6	10.3	10.9	9.8	9.3	8.7	7.9	7.7	7.3	7.4	7.7	8.0	4.6	10.4	14.9	16.4	16.5	15.9	13.5	16.1	16.0	16.5	15.4				
15					16.2	14.8	13.4	12.8	11.6	10.6	10.1	9.6	8.8	9.0	7.2	6.4	6.2	3.2	5.6	7.2	12.0	19.0	17.6	17.1	16.2	13.7	18.8	16.6	15.3					
16					14.7	14.2	13.4	12.9	12.2	11.6	10.4	9.8	9.2	8.6	7.4	5.2	5.2	5.2	4.1	6.8	12.7	16.0	16.7	16.3	15.4	11.1	15.1	14.9						
17					15.4	14.9	14.4	13.3	12.6	11.1	11.0	10.5	9.3	8.2	7.5	7.0	6.6	6.1	6.7	8.4	12.1	15.0	16.0	16.1	15.7	11.4	19.4	17.8						
18				15.1	16.0	15.5	14.8	13.8	12.6	8.8	10.4	10.0	9.1	8.6	7.6	7.7	6.6	7.7	8.5	10.6	11.7	14.1	15.4	16.1	16.6	13.8	13.5							
19					16.2	13.3	18.2	14.1	12.8	11.7	10.8	10.4	9.5	9.1	8.5	8.2	8.3	8.8	9.8	11.5	11.6	13.6	14.9	15.4	16.3	14.2								
20					17.1	16.8	15.9	4.9	14.0	13.1	12.3	11.6	10.9	9.8	9.5	9.0	8.8	9.9	10.6	12.2	13.3	14.6	14.5	15.0	14.7	12.6								
21					16.6	17.1	17.0	16.3	13.8	13.2	12.8	13.0	12.0	11.0	9.9	9.1	9.0	9.5	10.6	12.4	13.7	13.2	13.0	13.0	12.5									
22				17.8	18.2	17.9	17.8	16.9	14.2	14.9	15.0	14.7	13.6	12.4	10.9	9.7	9.7	8.7	10.3	12.4	14.1	15.3	15.3	15.1	13.5									
23				18.7	19.4	19.6	18.7	17.3	16.4	15.6	15.4	15.4	14.4	13.7	11.9	10.0	8.1	7.1	8.6	11.8	14.3	14.8	14.6	13.5	13.6									
24			19.1	19.7	20.4	20.2	19.7	18.9	18.2	17.5	17.0	16.7	16.1	14.8	13.4	10.5	8.4	4.9	7.0	10.3	12.8	13.4	13.3	13.4	13.6									
25		19.6	19.8	20.7	20.9	21.0	20.9	20.6	20.0	19.0	18.2	17.4	17.3	17.0	14.6	12.0	9.4	7.9	7.3	9.0	10.4	11.3	11.7	12.1	12.6									
26		19.0	20.2	21.5	21.5	21.8	22.1	22.4	22.1	21.0	19.3	18.0	17.5	16.9	15.4	13.4	10.8	9.2	9.0	9.1	9.6	9.5	10.0	10.6	11.5									
27		19.2	20.8	21.9	21.9	22.2	22.8	23.6	20.9	22.0	19.7	17.5	17.8	17.4	16.0	14.4	12.3	10.3	9.7	8.9	8.6	8.6	8.5	9.7	10.7									
28		18.4	20.7	21.0	21.6	21.8	22.6	24.2	25.0	22.2	20.0	18.7	18.5	18.3	17.3	15.8	13.3	11.1	9.4	8.7	7.9	7.8	8.2	8.9	9.7									
29		16.8	19.3	22.0	20.6	20.7	21.2	22.4	22.5	21.3	19.7	18.7	18.8	19.0	19.3	17.2	14.1	11.8	9.6	7.9	7.0	7.2	7.9	8.9	9.8									
30		14.7	16.2	17.7	18.3	18.1	18.8	19.3	19.9	18.9	18.0	17.8	17.5	18.5	20.3	17.0	14.1	12.0	10.0	8.0	6.0	7.4	8.6	9.1	9.7									
31		10.8	11.7	13.0	14.3	15.1	16.2	17.2	17.1	17.4	16.8	15.8	15.4	12.4	14.5	14.6	13.8	12.4	11.1	9.7	8.9	9.1	9.9	10.7	11.5									
32			7.5	8.7	10.0	12.5	14.1	15.3	16.7	16.3	15.8	14.4	13.0	12.8	12.3	13.3	13.6	13.2	12.8	12.2	11.7	11.6	11.6	11.9	12.5									
33			3.5	5.8	8.1	11.1	13.3	14.5	15.2	15.8	15.3	14.5	13.0	12.4	12.5	13.0	13.8	14.3	14.6	14.9	14.6	14.2	13.8	13.6	13.7									
34			3.2	4.4	6.8	9.9	13.1	14.4	15.5	15.8	15.3	14.9	13.8	13.0	13.2	13.6	14.6	15.2	16.1	17.8	17.3	16.2	15.5	14.9	14.7									
35			2.8	3.9	5.6	8.6	12.9	14.9	15.6	16.2	15.9	15.8	15.1	14.5	13.6	14.0	14.6	15.6	16.8	18.1	18.5	17.5	16.7	15.6	15.0									
36		2.4	3.4	4.1	5.1	7.3	11.7	16.3	17.3	17.2	16.8	16.4	15.6	14.2	14.7	13.9	14.7	15.8	16.7	17.9	18.3	18.0	17.5	16.9	16.5									
37		3.3	3.6	4.0	4.3	4.1	11.0	17.0	18.6	17.9	17.3	16.1	14.8	13.8	13.9	14.4	14.7	15.6	16.6	17.4	17.6	17.9	17.6	17.2										
38			4.1	4.6	5.4	7.7	12.8	17.3	18.4	17.9	16.5	15.0	13.6	13.5	14.4	14.6	15.2	16.2	18.1	17.9	18.4	18.4	18.1											
39				5.5	6.7	9.0	11.6	14.8	17.5	14.3	13.5	13.2	13.4	13.0	14.2	14.8	14.6	16.2	17.1	17.9	18.7	17.5												
40				5.0	6.6	8.4	5.9	5.0	7.0	3.3	6.0	11.3	12.3	13.1	13.8	14.4	15.1	16.3	17.5	17.3	18.4													
41				5.4	7.1	7.7	7.2	5.4	3.2	5.6	8.7	10.6	12.0	13.1	13.4	13.3	14.6	16.4	16.7															
42				5.8	7.3	7.3	6.7	5.5	5.3	6.7	9.1	11.1	13.3	14.2	13.8	11.1	15.5	16.6	17.0															
43				7.3	7.7	7.5	7.1	6.8	7.6	8.9	10.8	12.9	14.6	15.8	15.1	14.7	14.5	16.1																
44			7.3	7.7	7.9	8.7	9.2	9.6	10.4	11.5	12.9	14.7	15.8	16.6	16.8	15.6	15.1	16.5																
45			8.8	10.1	11.9	10.0	11.7	12.4	13.4	14.6	15.9	16.7	15.7	16.9	17.2	16.8	15.7	17.7																
46			10.8	10.3	12.0	12.9	14.3	12.3	14.4	15.6	17.5	16.8	15.7	16.9	17.3	17.5	18.7	18.8																
47				12.0	13.6	15.2	14.5	12.6	13.6	15.0	16.5	16.9	16.2	16.2	15.8	17.1	19.3	19.5																
48				13.1	14.7	15.8	14.2	12.7	12.9	15.5	15.5	15.6	15.2	15.8	15.7	16.2	16.4																	
49				13.6	15.0	16.5	14.0	12.7	14.0	15.7	15.4	14.4	14.1	14.2	16.2	16.6	15.2																	
50					15.5	15.1	13.6	11.7	13.2	15.7	18.2	11.2	8.1	11.9	13.8	15.7	15.0	14.2																
51					14.9	14.3	13.3	12.7	13.3	14.4	13.9	9.0	3.4	10.3	14.6	14.0	15.3	14.5																

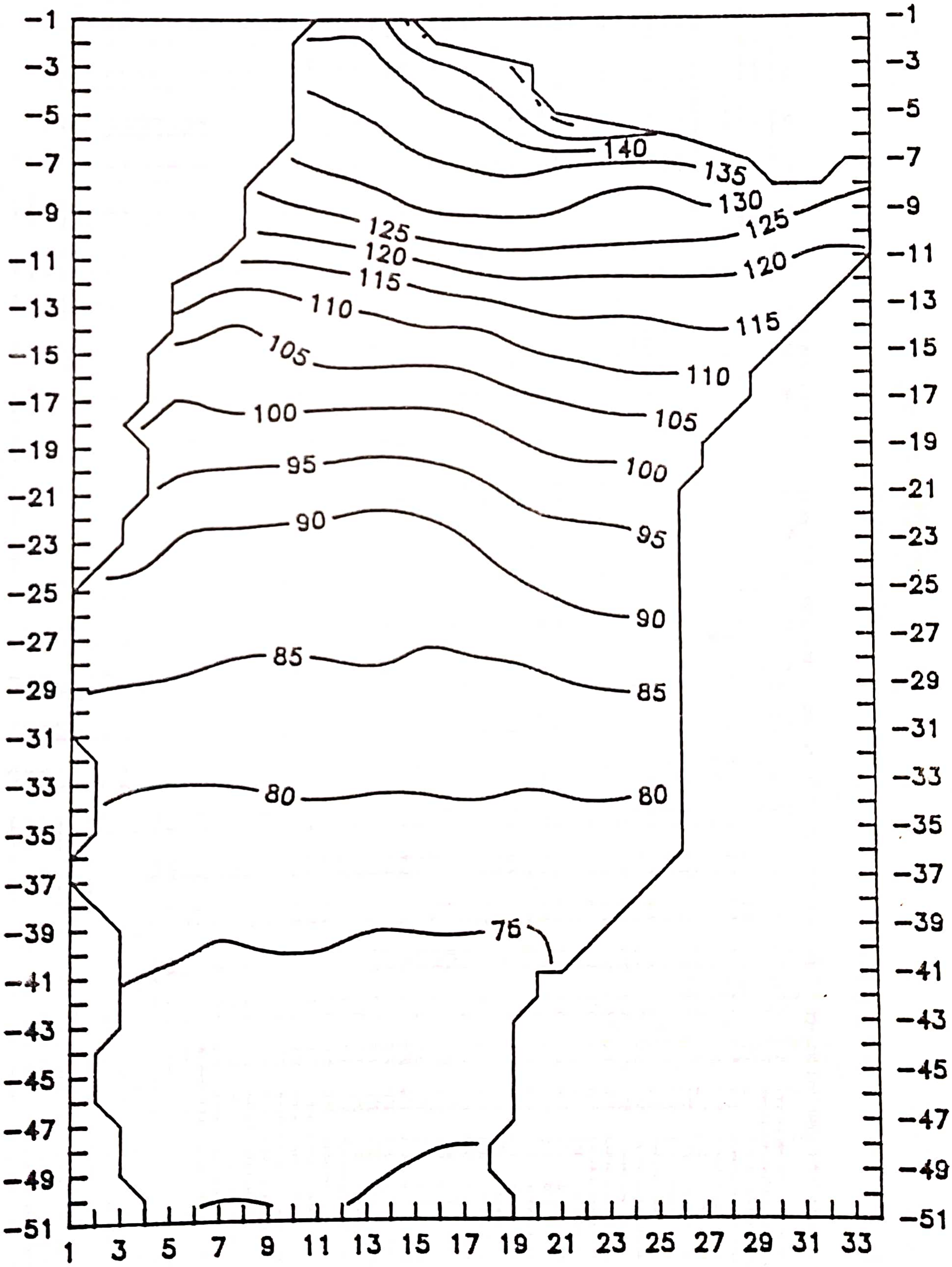
STEADY-STATE CALIBRATION ... SATURATED THICKNESS OF SHALLOW AQUIFER ... BEGINNING OF CALIBRATION RUN ... 19 NOVEMBER 1988

RAUTAHAT MODEL .. INITIAL STEADY-STATE LEVELS
MAY 1988

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	143.9	139.2	140.2	141.1	155.0	155.0	155.0	155.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	144.0	138.1	138.5	139.8	141.8	144.4	155.0	155.0	155.0	155.0	156.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	142.0	136.2	137.0	137.9	140.2	141.7	144.5	145.4	147.7	150.0	155.0	155.0	155.0	155.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	139.0	135.5	135.2	136.1	138.3	139.8	141.7	142.8	143.9	147.0	155.0	155.0	155.0	155.0	155.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	136.0	134.7	135.2	134.9	136.0	138.6	138.5	139.9	141.4	143.0	143.0	155.0	155.0	155.0	155.0	155.0	155.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	132.0	131.6	132.7	134.0	133.5	134.4	135.9	137.0	137.4	138.5	139.0	139.0	137.0	136.0	138.0	138.0	138.0	146.0	142.0	142.0	0.0	0.0	0.0	0.0	0.0	0.0	6
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	129.0	129.9	130.8	132.0	132.0	133.0	133.9	134.0	135.4	136.0	137.0	136.0	135.0	133.5	133.5	133.0	134.0	134.0	135.0	137.0	142.0	0.0	0.0	0.0	128.0	127.0	7
0.0	0.0	0.0	0.0	0.0	0.0	0.0	126.0	125.4	127.1	127.9	129.5	130.6	131.6	132.0	132.8	132.8	133.9	134.0	134.0	132.8	131.5	132.0	132.0	132.0	132.0	132.0	133.0	133.0	132.0	131.5	131.0	126.0	125.0	8
0.0	0.0	0.0	0.0	0.0	0.0	0.0	123.0	123.4	124.1	125.0	126.5	127.5	129.4	130.5	130.6	130.7	132.0	131.2	130.5	131.0	130.6	130.0	129.0	129.0	129.0	130.0	129.0	129.0	127.3	125.0	124.5	124.5	124.0	9
0.0	0.0	0.0	0.0	0.0	0.0	0.0	121.0	121.1	120.5	121.1	121.8	122.7	124.7	127.0	128.4	127.8	128.7	128.6	127.9	128.0	127.0	126.0	126.0	125.7	125.8	126.0	125.5	124.0	123.0	122.0	121.0	121.0	122.0	10
0.0	0.0	0.0	0.0	0.0	115.0	116.0	113.5	115.0	116.0	116.5	117.0	117.7	117.6	119.5	120.8	122.8	123.6	124.2	123.9	122.9	122.8	123.0	122.5	123.0	122.0	122.0	121.5	122.0	120.5	119.6	120.0	119.0	125.0	11
0.0	0.0	0.0	0.0	114.0	106.6	108.5	110.7	111.0	112.3	112.5	111.7	112.5	114.3	116.1	117.0	117.0	117.0	117.3	117.7	118.2	118.4	118.1	118.8	119.1	120.0	120.2	119.9	119.0	119.0	119.0	118.0	122.0	0.0	12
0.0	0.0	0.0	0.0	112.0	105.7	106.2	107.7	107.5	109.0	109.6	110.4	110.1	111.6	112.8	113.3	112.7	112.5	114.4	116.3	116.8	115.6	115.7	115.9	116.2	117.5	117.3	118.0	117.5	117.0	116.0	119.0	0.0	0.0	13
0.0	0.0	0.0	0.0	110.0	104.7	105.1	105.6	106.1	107.7	108.1	108.5	109.9	110.3	109.7	109.2	108.8	110.2	111.0	112.6	113.4	113.0	113.8	114.0	114.3	114.9	115.9	116.4	116.0	115.0	116.0	0.0	0.0	0.0	14
0.0	0.0	0.0	108.0	102.3	103.6	104.0	104.4	104.8	106.2	106.6	106.9	107.1	107.4	106.6	105.8	107.0	108.5	109.5	109.8	110.6	111.3	112.3	112.4	112.9	113.6	113.7	113.2	112.5	113.0	0.0	0.0	0.0	0.0	15
0.0	0.0	0.0	106.0	102.3	102.6	102.9	103.2	103.5	103.9	104.1	104.3	104.4	103.5	103.6	103.8	104.9	105.2	106.4	107.7	107.8	108.8	108.9	109.2	109.7	109.5	108.7	103.0	111.0	0.0	0.0	0.0	0.0	0.0	16
0.0	0.0	0.0	104.0	100.1	100.6	100.8	101.0	101.3	101.6	100.8	100.8	100.7	100.7	100.7	100.8	101.0	102.3	103.7	104.9	105.1	106.3	106.6	106.1	106.7	105.6	105.8	107.0	109.0	0.0	0.0	0.0	0.0	0.0	17
0.0	0.0	102.0	98.1	98.2	98.9	99.0	99.1	99.0	99.0	99.0	98.8	98.7	98.5	98.5	98.9	100.1	100.5	102.0	102.6	103.5	104.0	103.5	104.1	103.9	103.9	104.0	107.0	0.0	0.0	0.0	0.0	0.0	0.0	18
0.0	0.0	100.0	100.0	97.8	97.5	97.2	97.0	97.0	97.0	97.0	96.4	96.4	96.4	96.4	96.4	97.4	97.9	99.4	100.1	101.2	101.7	102.2	101.9	102.1	102.0	105.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19
0.0	0.0	99.0	99.0	94.9	94.8	94.7	94.6	94.5	94.5	93.5	93.4	93.3	93.1	92.8	93.7	94.9	96.3	96.9	97.6	98.4	99.2	99.4	99.8	99.6	99.0	104.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20
0.0	0.0	0.0	97.0	93.1	92.9	92.6	92.4	92.2	92.1	92.1	91.1	91.0	90.9	91.7	91.6	92.6	94.0	95.6	96.4	97.2	97.1	97.0	97.1	97.0	102.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21
0.0	0.0	95.0	90.6	90.4	90.1	90.8	90.6	89.8	89.6	90.1	89.1	89.1	89.2	89.0	90.9	90.9	93.2	93.8	94.7	94.7	96.0	96.1	96.1	96.5	101.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22
0.0	0.0	94.0	89.0	89.7	89.5	89.1	89.3	89.2	88.8	88.8	88.3	88.3	88.4	88.2	89.0	89.9	90.9	92.5	93.5	93.6	93.7	94.1	95.1	95.5	99.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23
0.0	90.0	87.8	88.3	88.3	88.3	88.3	88.2	88.1	88.1	88.1	87.2	87.2	86.8	87.6	87.4	88.1	88.8	90.5	91.6	92.7	92.8	93.8	93.3	94.0	98.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24
89.0	87.8	87.8	87.8	87.9	88.0	88.1	87.1	87.0	87.0	87.0	86.8	86.8	86.6	86.4	87.1	86.9	87.8	89.3	90.1	90.9	92.1	92.1	92.7	92.5	96.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25
89.0	86.7	86.7	86.8	86.8	86.9	87.0	87.1	86.2	86.2	86.2	86.2	85.6	85.4	86.2	86.0	86.8	86.8	87.1	88.1	88.5	89.7	90.6	91.1	91.5	95.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26
87.0	86.7	86.7	86.7	86.8	86.9	86.0	86.1	85.6	85.8	85.9	86.0	85.9	85.8	85.1	85.9	85.8	85.9	86.1	87.5	88.0	88.5	88.4	89.3	89.0	93.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27
86.0	85.7	85.7	85.0	85.7	85.8	85.9	85.1	85.2	85.1	85.0	84.9	84.8	84.6	84.4	85.3	85.1	85.0	85.1	85.5	85.9	86.4	86.9	87.4	86.5	91.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28
85.0	84.8	84.7	84.7	84.7	84.8	83.9	84.0	84.0	84.0	83.9	84.7	84.6	84.5	84.3	84.2	84.1	84.0	83.9	84.4	84.8	85.3	85.7	85.3	85.0	90.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29
84.0	83.9	83.8	82.8	82.8	82.8	82.9	82.9	82.9	82.8	83.7	83.6	83.5	83.4	83.3	83.2	84.1	84.0	83.0	83.0	83.0	83.1	83.8	83.9	84.0	88.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30
84.0	83.1	83.0	81.9	81.9	81.9	81.9	81.9	82.8	82.8	82.9	82.6	82.5	82.9	83.0	83.2	83.1	83.1	82.2	82.2	82.3	82.4	82.8	83.3	83.5	86.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31
0.0	83.0	82.1	82.0	80.9	80.9	81.0	81.0	81.0	81.9	81.8	81.6	81.5	82.4	82.2	82.2	82.2	82.2	82.2	81.3	81.4	81.5	81.7	81.8	81.0	85.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32
0.0	82.0	80.2	80.1	80.0	80.2	80.1	80.1	80.0	80.9	80.8	79.7	80.5	80.4	80.3	81.3	81.3	80.3	80.3	80.4	80.5	80.7	80.9	81.0	80.0	83.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33
0.0	81.0	79.4	79.4	79.3	79.2	79.2	79.1	79.0	79.9	79.8	79.7	79.7	79.6	79.5	79.5	79.5	79.5	79.6	79.2	79.7	79.9	80.1	80.3	79.5	82.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34
0.0	80.0	78.6	78.5	78.4	78.3	78.2	78.1	79.0	78.9	78.8	78.8	78.7	78.7	78.6	78.6	78.7	78.7	78.7	78.8	79.0	79.2	79.4	79.6	79.0	81.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35
79.0	77.9	77.8	77.6	77.5	77.4	77.3	77.2	78.1	78.0	77.9	77.9	77.8	77.8	77.8	77.8	77.8	77.9	78.0	78.1	78.2	78.5	78.7	78.0	78.5	80.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36
79.0	77.3	77.2	77.0	76.9	76.7	76.6	76.5	77.4	77.3	77.2	77.2	77.1	77.1	77.0	77.0	77.1	77.2	77.3	77.4	77.6	77.7	77.9	77.0	79.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37
0.0	78.0	77.4	77.2	76.0	75.8	76.6	76.5	76.4	76.3	76.3	76.2	76.2	76.2	76.3	76.4	76.3	76.5	75.6	75.8	75.9	76.1	77.0	76.0	78.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38
0.0	0.0	77.0	76.4	76.1	75.9	75.0	75.2	76.2	76.2	76.2	76.0	75.3	75.3	75.4	75.6	75.7	74.8	74.9	75.1	75.3	74.0	77.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39
0.0	0.0	76.0	75.6	75.4	75.1	75.8	75.7	75.6	75.6	75.6	74.5	74.1	74.2	74.5	74.8	74.0	74.2	74.3	74.0	74.5	77.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40
0.0	0.0	75.0	74.9	74.6	74.3	74.1	73.9	73.8	73.9	73.9	73.9	72.9	73.0	73.1	73.2	73.3	73.5	73.0	74.0	76.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	41
0.0	0.0	75.0	74.3	74.0	73.6	73.3	73.2	73.2	72.2	72.3	72.4	72.5	72.6	72.7	73.1	72.7	73.0	72.5	74.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	42
0.0	0.0	74.0	73.7	73.4	73.1	72.5	72.5	71.6	71.7	71.8	71.9	72.1	72.4	72.4	72.3	72.4	72.0	74.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	43
0.0	74.0	72.5	72.2	71.9	71.6	72.3	72.1	72.1	71.2	71.3	71.5	71.7	72.0	72.0	72.0	72.1	71.5	74.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44
0.0	74.0	72.1	72.0	72.0	72.0	71.8	71.5	71.8	71.8	71.9	71.1	71.3	71.4	71.5	71.6	71.7	71.0	73.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45
0.0	73.0	71.9	71.8	71.5	71.5	71.4	71.5	71.4	70.8	71.1	71.3	71.2	71.1	71.1	71.0	70.8	70.5	73.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46
0.0	0.0	73.0	71.7	71.5	71.4	70.6	71.4	71.4	70.7	70.9	71.0	71.0	70.8	70.7	70.5	70.8	72.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	47
0.0	0.0	72.0	71.6	71.3	71.2	70.6	70.4	70.4	70.6	70.7	70.7	70.6	70.4	70.2	70.0	69.5	72.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48
0.0	0.0	72.0	71.4	71.0	70.6	70.2	70.3	70.4	70.4	70.5	70.5	70.2	70.2	69.8	69.5	69.0	72.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49
0.0	0.0	0.0	72.0	70.4	70.2	70.0	70.1	70.1	70.1	70.1	70.0	69.9	69.8	69.4	69.0	68.3	68.5	68.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50
0.0	0.0	0.0	72.0	69.8	69.3	69.8	69.8	69.8	69.8	69.9	69.8	69.7	69.3	69.0	68.8	68.5	68.0	68.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	51
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	

INITIAL WATER LEVELS (MAY 1988, meters, absolute elevation)

RAUTAHAT MODEL – INITIAL WATER LEVEL MAP MAY 1988



APPENDIX 12

RAUTAHAT MODEL -- DEPTH TO WATER TABLE
BEGINNING OF STEADY-STATE CALIBRATION RUN

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1												9.2	7.1	8.9																				
2											5.3	7.6	8.2	8.2	5.9																			
3											5.8	8.5	10.1	9.7	6.2	6.1	5.0	8.1	9.6															
4											6.5	8.5	8.9	8.1	6.8	7.2	6.5	8.3	8.7															
5											8.8	8.2	9.1	10.1	8.2	7.8	7.8	9.5	9.1	10.9														
6										10.1	9.4	7.0	10.5	9.9	6.1	6.7	9.1	8.3	9.0	8.0	5.1	4.0	5.0	8.4	4.0									
7										9.8	8.1	7.5	6.6	8.2	7.3	10.5	13.3	10.0	8.0	10.0	8.1	4.5	4.5	5.0	5.0	8.0	9.0	7.0						
8									9.6	8.7	7.9	9.4	11.4	8.6	7.4	7.8	8.5	7.7	7.0	8.0	9.6	4.5	5.0	5.0	5.7	7.0	6.0	4.3	6.4				7.5	8.0
9									8.4	7.9	8.0	7.7	7.7	6.3	7.1	7.6	8.0	7.6	6.6	3.5	3.5	4.4	3.0	3.0	3.0	6.4	2.0	4.2	3.6	5.2	7.4	8.1	6.5	8.5
10									6.2	5.9	5.1	7.0	7.0	8.0	7.4	7.1	4.8	2.2	1.1	2.7	2.5	1.5	1.0	1.0	6.3	5.6	5.3	6.4	6.0	8.0	7.0	7.0	6.0	
11								7.5	8.1	7.5	7.4	7.1	7.9	8.1	6.5	2.2	1.2	1.8	1.7	0.7	1.6	1.2	2.5	5.5	5.3	4.3	3.5	5.5	8.0	10.5	8.4	7.0	6.1	
12						6.4	6.5	5.3	5.0	4.7	5.0	2.7	2.5	2.7	4.1	3.1	1.9	1.8	0.6	0.8	1.8	3.5	5.4	5.8	5.1	5.2	4.0	3.0	6.0	9.5	7.0	4.0		
13						7.2	6.7	4.2	1.5	3.4	3.0	2.8	2.6	3.2	3.0	2.3	1.5	1.5	1.6	0.8	1.2	1.9	4.2	8.2	4.2	5.4	3.6	3.0	5.1	8.9	4.2			
14						6.6	5.3	3.9	2.3	2.4	2.2	2.3	2.9	3.0	2.9	2.7	2.2	1.6	1.8	1.4	2.6	3.0	5.6	7.8	8.0	7.9	2.9	2.9	3.5	3.0				
15					8.2	4.0	4.8	5.3	2.9	2.0	2.2	2.3	2.5	2.6	3.2	2.0	1.8	2.5	3.9	6.5	5.6	2.5	5.4	6.8	7.7	5.5	3.3	3.7	1.8					
16					7.2	6.0	4.7	3.4	2.7	1.7	1.5	1.6	1.8	2.5	2.6	2.1	3.1	4.4	7.9	9.9	7.8	4.6	4.0	4.7	4.8	4.3	3.0	4.9						
17					7.2	5.8	4.7	2.5	1.7	1.2	1.0	2.0	1.3	1.7	2.2	2.2	3.2	4.3	5.8	6.5	5.9	5.7	3.7	3.5	3.9	3.0	2.2	3.9						
18				4.3	4.7	3.5	2.8	1.9	0.0	0.0	0.3	0.9	1.3	1.5	3.7	3.2	3.0	3.6	4.0	3.7	5.1	3.7	3.2	3.0	2.7	2.8	4.0							
19					3.9	3.7	3.4	4.0	1.2	0.6	1.2	0.4	1.1	2.2	2.2	1.6	2.4	3.0	3.5	3.1	4.2	4.2	3.5	2.9	2.5	2.9								
20					2.8	2.7	2.6	1.9	3.0	2.5	3.0	0.9	0.9	1.1	1.5	1.7	2.2	3.1	3.4	3.5	3.0	2.7	3.5	3.1	2.3	4.7								
21					2.8	2.8	2.8	2.9	4.4	4.1	3.5	2.2	1.1	1.5	1.5	1.8	2.2	2.9	3.2	3.2	3.2	2.8	2.3	3.3	5.0									
22				3.0	3.0	3.1	3.1	3.0	3.0	3.1	2.1	2.3	1.6	1.4	1.4	0.7	2.1	2.3	2.5	2.5	2.6	1.4	0.7	2.4	4.5									
23				3.1	3.1	3.1	3.2	3.0	3.0	3.3	3.1	2.4	2.1	1.9	1.4	1.8	2.0	2.3	2.5	2.5	2.7	1.8	0.1	2.4	4.5									
24			3.2	3.2	3.0	3.0	3.0	3.1	3.0	3.1	3.0	1.7	1.4	1.4	1.6	1.9	2.0	2.1	0.2	0.1	0.0	0.5	0.4	1.8	4.6									
25		3.1	3.3	3.5	3.4	3.3	3.0	3.0	3.7	3.0	3.2	3.0	1.4	0.7	1.1	1.5	1.7	1.3	0.1	0.4	0.1	0.1	0.7	1.1	6.0									
26		3.1	3.4	3.6	3.5	3.3	3.2	3.1	3.0	1.8	1.2	0.6	0.8	0.8	1.1	1.3	1.6	1.3	0.1	0.3	0.3	0.0	1.2	1.7	3.5									
27		2.9	3.2	3.4	3.4	3.2	3.1	3.0	2.4	2.4	1.5	0.5	0.5	0.5	1.2	1.6	1.8	0.9	0.5	0.8	0.3	0.1	0.0	0.5	4.0									
28		2.8	3.0	3.0	3.2	3.1	3.1	3.2	2.5	2.2	1.6	1.1	1.0	1.0	1.1	1.2	1.4	1.0	1.1	0.4	0.0	0.2	1.7	1.4	5.5									
29		2.6	2.3	2.9	3.0	3.0	3.0	3.1	2.7	2.4	2.1	1.9	2.4	1.9	1.6	1.6	1.6	1.7	1.9	1.3	1.4	0.6	0.1	1.9	5.0									
30		1.1	0.7	0.7	0.7	2.9	3.0	3.1	3.1	2.9	2.7	2.5	2.3	2.0	2.1	1.5	1.5	1.5	1.6	1.6	1.8	1.7	0.2	0.3	4.0									
31		0.8	0.9	1.1	1.4	2.7	3.0	3.2	3.6	3.4	3.2	3.3	3.0	1.1	1.3	1.2	1.4	1.3	1.4	1.5	1.6	1.7	0.5	0.4	3.5									
32			0.9	1.0	1.2	1.6	1.9	2.3	2.5	3.7	3.8	1.8	1.8	0.6	0.2	0.7	0.8	0.8	0.9	1.7	1.8	1.9	1.9	2.2	5.0									
33			0.7	1.0	1.3	1.5	2.1	2.4	3.8	3.9	3.9	1.9	1.6	1.0	1.1	1.7	1.7	1.6	1.8	2.0	2.0	2.1	2.2	2.4	3.7									
34			1.8	1.9	2.2	2.7	3.1	3.6	3.8	3.9	3.9	1.7	1.3	1.4	1.6	2.3	2.2	2.0	1.9	2.1	2.1	2.1	2.1	2.4	3.4									
35			1.8	2.0	2.2	2.6	3.3	4.1	4.0	4.0	3.9	2.6	2.5	2.1	2.8	2.6	2.3	2.3	2.4	2.3	2.2	2.2	2.2	2.2	3.0									
36		2.0	2.0	2.3	2.4	2.4	2.7	3.3	3.6	3.6	3.7	3.5	3.4	2.8	2.8	2.6	2.5	2.3	2.3	2.2	2.2	2.1	2.1	2.9	2.6									
37		1.8	1.7	1.9	2.0	2.2	1.6	2.5	2.8	3.1	3.2	3.1	3.1	2.6	2.6	2.5	2.5	2.4	2.4	2.3	2.2	2.3	2.3	3.1										
38			1.8	2.0	1.7	1.7	1.9	2.7	2.6	2.9	2.6	3.1	3.0	2.9	2.5	2.4	2.8	2.6	2.4	2.1	2.1	2.3	2.4											
39				1.9	2.1	1.8	1.7	1.8	1.6	1.3	1.6	2.0	2.5	2.8	2.3	2.3	2.5	2.3	2.4	2.3	2.2	3.5												
40				1.8	1.9	2.0	2.0	1.3	1.4	1.4	1.4	1.8	2.9	2.8	2.3	2.0	2.4	2.3	2.3	3.7	3.3													
41				2.1	2.3	2.5	2.6	3.0	3.3	3.2	3.1	3.1	3.0	2.8	2.5	2.4	2.1	2.0	3.4															
42				2.2	2.5	2.9	3.3	3.5	3.4	3.4	3.3	3.2	3.2	3.1	2.7	2.8	2.2	2.0	3.5															
43				2.3	2.6	3.0	4.0	3.9	3.6	3.4	3.3	3.3	3.2	3.1	2.8	2.5	2.4	3.7																
44			2.2	2.6	2.7	3.1	3.4	3.6	3.5	3.2	3.1	3.0	3.0	3.0	2.8	2.5	2.2	3.6																
45			2.9	3.0	3.0	3.1	3.3	3.5	3.1	2.8	2.7	2.8	2.8	2.9	2.6	2.3	2.0	3.6																
46			2.7	2.7	3.0	2.9	2.2	1.5	3.6	3.2	2.7	3.1	3.7	3.8	3.4	3.1	3.3	3.3																
47				2.3	2.4	1.5	2.2	2.4	1.3	3.0	3.0	3.5	3.9	4.0	3.5	2.9	3.2	0.8																
48				1.9	2.0	1.4	1.6	1.9	2.0	1.9	3.1	3.9	4.6	4.5	3.8	2.8	2.7																	
49				1.7	1.0	0.9	1.7	1.8	1.7	1.7	2.5	3.1	2.8	3.9	3.2	2.5	2.7																	
50					1.9	1.3	1.6	1.8	1.7	1.5	2.4	3.0	2.6	3.9	2.8	2.9	2.7	2.8																
51					2.2	1.6	1.7	1.8	1.7	1.6	1.5	2.2	2.3	2.3	1.5	2.5	2.6	3.3																

DEPTH TO WATER TABLE FROM LAND SURFACE ... MAY 1988 (STEADY-STATE SIMULATION) ... BEGINNING OF CALIBRATION RUN ... 19 NOVEMBER 1988

APPENDIX 13

RAUTAHAT MODEL .. TRANSMISSIVITY
BEGINNING OF STEADY-STATE CALIBRATION

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1												445.	335.	390.																				
2											560.	490.	380.	425.	455.																			
3											1106.	665.	448.	518.	742.	525.	505.	480.	445.															
4											1950.	1687.	1180.	500.	728.	560.	535.	515.	530.															
5											1220.	1150.	1040.	525.	1337.	1375.	1437.	535.	585.	480.														
6										1100.	1070.	1060.	623.	1025.	640.	780.	1050.	630.	665.	585.	410.	560.	300.	300.	800.									
7										950.	880.	930.	532.	925.	1263.	1263.	1320.	735.	720.	720.	720.	1350.	980.	1000.	1000.	1000.	500.	500.						
8									960.	860.	740.	581.	525.	875.	1062.	1387.	1612.	785.	810.	495.	459.	1600.	1380.	1400.	1400.	1200.	600.	600.	500.				375.	381.
9									595.	532.	476.	462.	357.	620.	770.	1110.	1130.	408.	468.	516.	576.	588.	354.	896.	854.	1290.	735.	655.	645.	357.	438.	450.	510.	504.
10									595.	518.	455.	399.	315.	380.	320.	265.	590.	234.	489.	516.	510.	501.	393.	868.	770.	826.	1022.	660.	625.	610.	700.	815.	950.	
11								616.	560.	539.	476.	413.	336.	500.	670.	460.	545.	198.	210.	232.	360.	396.	390.	402.	700.	680.	750.	750.	725.	805.	845.	925.	930.	
12						465.	470.	485.	445.	400.	400.	395.	380.	553.	574.	240.	219.	240.	282.	1150.	1390.	1290.	685.	1043.	1183.	965.	975.	930.	855.	905.	950.	790.		
13						555.	540.	1050.	1050.	1000.	940.	630.	525.	560.	237.	158.	213.	219.	237.	210.	510.	665.	750.	1800.	1430.	1600.	770.	725.	770.	474.	579.			
14						655.	640.	1060.	1030.	1090.	980.	651.	609.	395.	154.	146.	148.	385.	400.	230.	520.	745.	1148.	1650.	1590.	1350.	483.	320.	330.	308.				
15					810.	740.	670.	640.	580.	530.	303.	288.	264.	270.	216.	192.	124.	160.	280.	360.	600.	900.	880.	855.	810.	685.	376.	332.	318.					
16					441.	426.	402.	387.	366.	348.	312.	294.	276.	258.	222.	104.	104.	104.	205.	340.	635.	800.	835.	815.	770.	555.	453.	447.						
17					462.	447.	432.	399.	378.	333.	330.	525.	465.	410.	375.	350.	330.	305.	335.	420.	847.	1050.	1120.	1127.	1099.	798.	1358.	1246.						
18				453.	480.	465.	444.	414.	378.	264.	312.	300.	273.	258.	228.	231.	198.	231.	255.	318.	585.	987.	1078.	1127.	1162.	966.	945.							
19					324.	386.	364.	282.	256.	234.	216.	208.	190.	182.	170.	164.	166.	264.	294.	345.	580.	952.	1043.	1078.	1141.	994.								
20					342.	336.	318.	98.	280.	262.	246.	232.	218.	294.	285.	270.	264.	297.	318.	366.	931.	1022.	1015.	1050.	1029.	832.								
21					332.	342.	340.	326.	276.	264.	256.	260.	360.	330.	297.	273.	450.	475.	530.	868.	959.	924.	910.	910.	875.									
22				534.	546.	537.	534.	507.	426.	447.	450.	441.	408.	372.	545.	485.	435.	609.	721.	868.	987.	1071.	1071.	1057.	945.									
23				561.	582.	588.	561.	519.	492.	468.	462.	770.	720.	685.	595.	700.	567.	710.	860.	1180.	1430.	1480.	1460.	1350.	1360.									
24			573.	591.	612.	606.	591.	567.	546.	525.	850.	835.	805.	740.	670.	1050.	840.	490.	700.	1030.	1280.	1340.	1330.	1340.	1360.									
25		372.	396.	414.	418.	630.	627.	618.	600.	570.	546.	522.	519.	850.	1460.	1200.	940.	790.	730.	900.	1040.	1130.	1170.	1210.	1260.									
26		380.	404.	430.	430.	436.	663.	672.	663.	1050.	965.	900.	1225.	1183.	1540.	1340.	1080.	920.	900.	910.	960.	950.	1000.	1060.	1150.									
27		384.	416.	438.	438.	444.	456.	472.	418.	660.	591.	875.	1246.	1218.	1120.	1440.	1230.	1030.	970.	890.	860.	860.	1062.	1213.	1337.									
28		184.	207.	210.	216.	218.	226.	242.	500.	444.	600.	561.	925.	915.	865.	1106.	931.	1110.	940.	870.	988.	975.	1025.	1113.	1212.									
29		168.	193.	220.	206.	207.	212.	448.	450.	426.	591.	935.	940.	950.	1351.	1204.	987.	1180.	960.	790.	700.	900.	988.	1113.	1225.									
30		294.	324.	354.	366.	543.	564.	579.	597.	945.	900.	890.	875.	925.	1015.	1190.	987.	840.	1000.	800.	600.	925.	1075.	1138.	1212.									
31		324.	351.	390.	429.	453.	486.	516.	513.	522.	504.	474.	462.	620.	725.	730.	690.	868.	1110.	970.	890.	1137.	1238.	1337.	1437.									
32			225.	261.	300.	375.	423.	459.	501.	489.	474.	432.	390.	384.	369.	399.	408.	396.	384.	610.	585.	1160.	1160.	1190.	1250.									
33			105.	174.	243.	333.	399.	435.	456.	474.	459.	435.	390.	372.	375.	390.	414.	429.	438.	745.	730.	994.	966.	1360.	1370.									
34			96.	132.	204.	297.	393.	432.	465.	474.	459.	447.	414.	390.	396.	408.	438.	456.	483.	534.	519.	810.	775.	745.	735.									
35			84.	117.	168.	258.	387.	447.	468.	486.	477.	474.	453.	435.	408.	420.	438.	468.	504.	543.	555.	525.	501.	468.	450.									
36		120.	170.	205.	255.	365.	585.	489.	519.	516.	504.	492.	468.	426.	441.	417.	441.	474.	501.	537.	549.	540.	525.	507.	495.									
37		165.	180.	200.	215.	205.	550.	850.	930.	537.	519.	483.	444.	414.	417.	432.	441.	468.	498.	522.	528.	537.	528.	516.										
38			205.	230.	270.	385.	384.	519.	552.	537.	495.	450.	408.	405.	432.	438.	456.	486.	543.	537.	552.	552.	543.											
39				165.	201.	270.	348.	444.	525.	429.	405.	396.	402.	390.	426.	444.	438.	486.	513.	537.	561.	525.												
40				100.	132.	168.	118.	100.	140.	66.	120.	226.	246.	262.	276.	432.	453.	489.	525.	519.	552.													
41				108.	142.	154.	144.	108.	64.	168.	261.	318.	600.	655.	938.	931.	438.	492.	501.															
42				116.	146.	146.	134.	110.	106.	201.	455.	555.	665.	994.	690.	333.	310.	332.	340.															
43				146.	154.	150.	213.	204.	228.	445.	756.	903.	1022.	790.	755.	735.	435.	483.																
44			146.	154.	237.	261.	276.	480.	520.	805.	903.	1029.	1106.	1162.	1176.	1092.	1057.	825.																
45			264.	303.	595.	500.	585.	620.	938.	1022.	1113.	1169.	1099.	1183.	1204.	1176.	1099.	1239.																
46			324.	309.	360.	645.	715.	861.	1008.	1092.	1225.	1680.	1099.	1183.	1211.	1225.	935.	940.																
47				360.	408.	760.	725.	882.	952.	1050.	1155.	1183.	1134.	1134.	1106.	1197.	965.	975.																
48				393.	441.	790.	710.	889.	903.	1085.	1085.	1092.	1064.	1106.	1099.	810.	820.																	
49				408.	450.	825.	700.	889.	980.	1099.	1078.	1008.	987.	994.	1134.	1162.	1064.																	
50					465.	453.	680.	819.	924.	1099.	1274.	784.	567.	833.	985.	1039.	1050.	994.																
51					745.	715.	931.	889.	931.	1008.	973.	630.	538.	756.	730.	700.	765.	725.																

TRANSMISSIVITY AT BEGINNING OF FINAL STEADY-STATE CALIBRATION RUN ... 19 NOVEMBER 1988

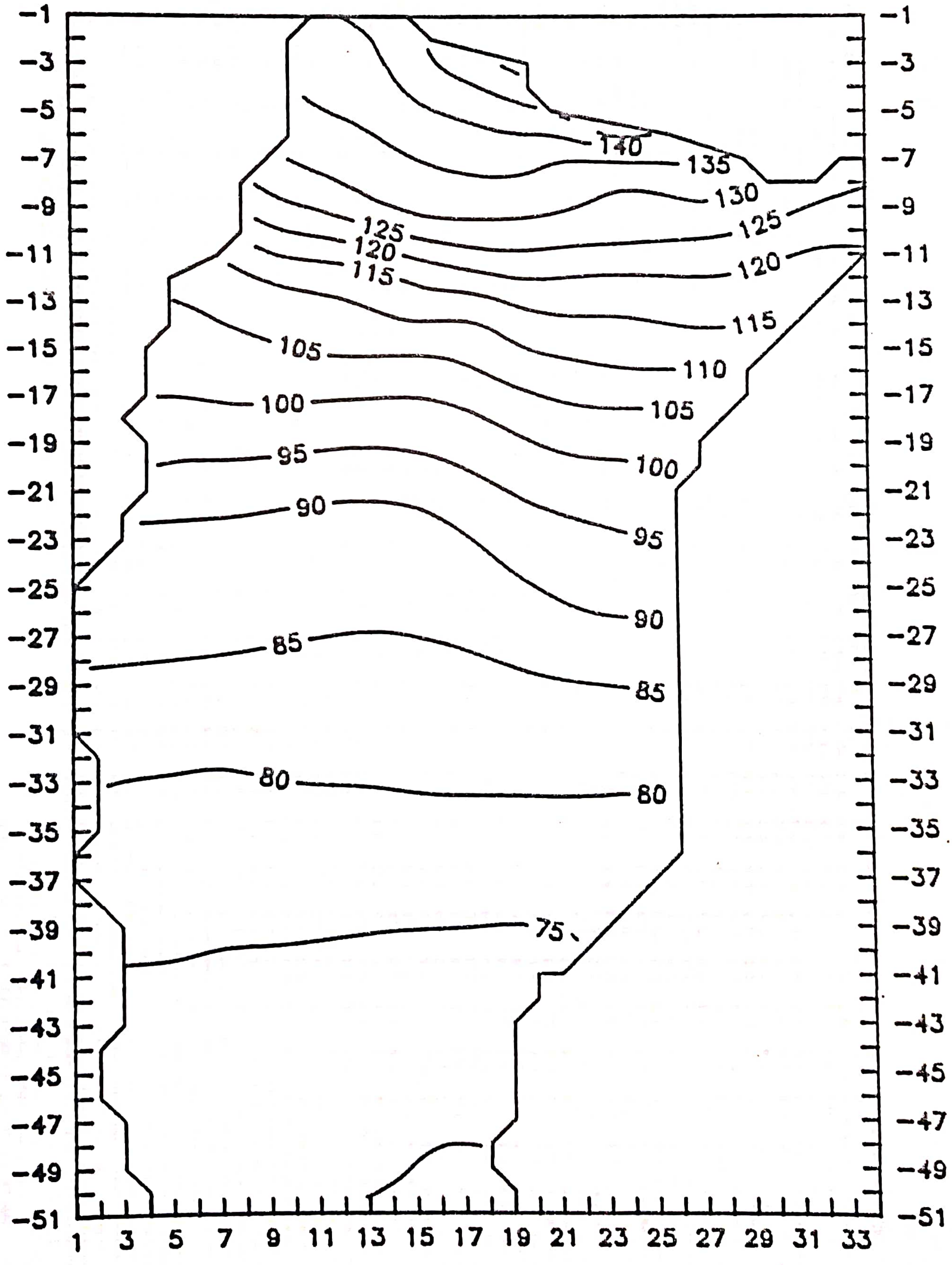
APPENDIX 14

RAUTAHAT MODEL .. WATER LEVELS AT END OF STEADY-STATE CALIBRATION RUN .. MAY 1988

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	143.9	138.8	139.8	140.7	140.7	155.0	155.0	155.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	144.0	136.7	137.7	139.3	141.4	144.1	144.1	155.0	155.0	155.0	156.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	142.0	135.8	136.2	137.4	140.0	141.7	143.6	145.5	147.5	149.6	149.6	155.0	155.0	155.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	139.0	135.1	135.3	135.9	137.9	140.0	141.2	142.6	144.3	146.4	146.4	155.0	155.0	155.0	155.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	136.0	134.3	134.5	135.0	136.3	138.0	138.7	139.6	140.8	142.3	143.0	143.0	155.0	155.0	155.0	155.0	155.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	132.0	131.1	132.5	133.2	134.0	134.8	136.1	137.0	137.5	138.2	139.3	138.7	136.7	136.0	137.5	137.9	137.7	137.7	142.0	142.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	129.0	129.6	130.6	131.5	132.5	133.5	134.1	134.7	135.3	135.8	136.5	135.9	134.1	133.1	132.7	132.7	133.4	133.9	134.8	136.0	136.0	0.0	0.0	0.0	128.0	127.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	126.0	124.7	126.6	128.1	129.5	130.8	131.9	132.7	133.1	133.4	133.7	133.9	133.5	132.2	131.6	131.2	131.0	131.2	131.7	132.3	132.6	132.9	132.9	131.5	131.0	125.9	125.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	123.0	122.8	123.8	124.9	126.2	128.1	129.9	131.2	131.6	131.6	131.8	131.3	130.8	130.6	130.4	129.7	129.2	129.1	129.0	129.2	129.2	128.4	126.7	125.0	124.1	124.0	124.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	121.0	118.7	119.4	120.3	121.4	122.9	124.7	126.7	128.4	128.6	128.5	128.1	127.8	127.5	127.1	126.3	125.9	125.8	125.6	125.3	125.0	124.1	122.7	121.8	121.2	121.0	122.0
0.0	0.0	0.0	0.0	0.0	115.0	116.0	111.1	113.7	114.9	115.6	116.2	117.1	118.4	119.8	121.4	123.0	123.9	124.6	124.0	123.3	123.1	123.0	122.8	122.3	122.3	122.2	121.8	121.2	120.4	119.8	119.5	119.0	119.0
0.0	0.0	0.0	0.0	114.0	106.9	107.5	109.0	110.3	111.3	112.0	112.4	113.4	114.9	116.5	117.7	117.7	116.9	117.0	117.8	117.9	118.0	118.1	118.3	119.0	119.4	119.7	119.7	119.3	118.7	118.1	118.0	118.5	0.0
0.0	0.0	0.0	0.0	112.0	105.9	106.2	106.7	107.1	107.8	108.5	109.2	110.3	112.0	113.1	112.6	111.9	112.5	114.5	116.6	116.5	116.0	115.7	116.0	116.4	117.1	117.6	117.8	117.7	117.2	116.0	117.2	0.0	0.0
0.0	0.0	0.0	0.0	110.0	104.8	105.1	105.6	106.0	106.6	107.1	107.6	108.2	108.9	108.8	108.5	108.6	109.6	111.1	112.5	113.3	113.3	113.7	114.3	114.6	115.2	115.6	116.0	115.8	115.0	115.7	0.0	0.0	0.0
0.0	0.0	0.0	108.0	102.8	103.5	104.1	104.6	105.0	105.6	106.0	106.2	106.3	106.0	105.5	104.9	106.5	107.8	109.5	110.0	110.8	111.3	112.0	112.6	112.9	113.1	112.9	112.7	112.5	113.7	0.0	0.0	0.0	0.0
0.0	0.0	0.0	106.0	102.0	102.4	102.8	103.2	103.4	103.5	103.2	103.2	103.2	103.2	103.0	103.0	104.3	104.9	106.4	107.5	108.3	108.9	109.2	109.4	109.5	109.4	109.0	109.0	110.5	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	104.0	100.3	100.5	100.7	100.9	101.1	101.1	100.6	100.4	100.2	100.1	100.0	100.1	100.8	102.0	103.3	104.6	105.5	106.0	106.2	106.2	106.1	106.0	106.2	107.0	107.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	102.0	98.6	98.6	98.6	98.7	99.0	98.9	98.8	98.7	98.7	98.5	98.4	98.5	98.7	99.4	100.4	101.5	102.6	103.4	103.8	104.0	104.0	103.9	103.9	104.0	105.7	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	100.0	98.7	96.9	96.9	97.1	97.5	96.9	96.3	96.2	96.0	95.9	95.9	96.0	96.4	97.1	98.1	99.2	100.2	100.9	101.4	101.7	101.8	101.8	102.0	103.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	99.0	99.0	94.4	94.5	94.5	94.2	94.0	93.7	93.4	93.0	92.6	92.6	92.9	93.6	94.7	96.0	97.0	97.9	98.5	99.1	99.6	99.7	99.5	99.0	99.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	97.0	92.0	92.0	91.8	91.2	91.5	91.3	91.0	90.6	90.4	90.6	91.0	91.7	92.7	93.9	95.0	95.9	96.6	97.0	97.4	97.6	97.0	98.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	95.0	89.0	89.6	89.8	89.8	89.6	89.5	89.3	89.0	88.9	88.9	88.9	89.2	89.9	91.1	92.5	93.7	94.4	94.9	95.4	95.8	96.1	96.5	96.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	94.0	88.4	88.6	88.7	88.6	88.5	88.3	88.1	87.8	87.6	87.6	87.7	87.9	88.5	89.5	91.0	92.3	93.0	93.5	93.9	94.3	94.8	95.5	95.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	90.0	87.2	87.6	87.7	87.8	87.7	87.5	87.3	87.1	87.0	86.9	86.8	86.8	86.9	87.3	87.9	89.2	90.8	91.8	92.4	92.9	93.3	93.6	94.0	94.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
89.0	86.5	86.8	87.0	87.1	87.0	86.9	86.7	86.5	86.4	86.4	86.3	86.1	86.0	86.2	86.4	86.9	87.7	89.0	90.2	91.1	91.7	92.1	92.4	92.5	92.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
89.0	86.1	86.2	86.3	86.4	86.4	86.2	86.0	85.8	85.6	85.5	85.4	85.4	85.5	85.6	85.7	86.0	86.6	87.5	88.6	89.5	90.1	90.6	90.9	91.5	91.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
87.0	85.6	85.7	85.7	85.7	85.7	85.7	85.5	85.2	85.1	84.9	84.9	84.9	84.9	85.0	85.1	85.3	85.7	86.4	87.1	87.9	88.3	88.7	88.8	89.0	89.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
86.0	85.1	85.1	85.0	85.0	85.0	84.9	84.7	84.5	84.4	84.4	84.3	84.3	84.4	84.5	84.6	84.7	84.9	85.3	85.8	86.3	86.6	86.9	86.9	86.5	86.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
85.0	83.9	83.8	83.5	83.5	83.6	83.5	83.5	83.6	83.6	83.6	83.6	83.6	83.7	83.8	83.9	84.0	84.1	84.3	84.6	84.9	85.1	85.2	85.2	85.0	85.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
84.0	82.6	82.5	82.2	81.7	81.8	82.1	82.4	82.6	82.7	82.8	83.0	83.0	83.2	83.3	83.4	83.4	83.4	83.3	83.3	83.3	83.5	83.7	83.9	84.0	84.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
81.0	82.1	81.8	81.5	81.2	81.1	81.3	81.5	81.8	82.1	82.2	82.3	82.5	82.6	82.8	82.8	82.7	82.6	82.4	82.2	82.1	82.2	82.4	82.7	83.5	83.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	82.1	81.0	80.7	80.4	80.0	80.1	80.4	80.7	81.0	81.1	81.0	81.4	81.7	81.9	82.0	82.0	81.9	81.7	81.5	81.3	81.3	81.4	81.4	81.0	81.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	82.0	79.6	79.7	79.6	79.4	79.2	79.4	79.8	79.9	79.9	79.7	80.1	80.3	80.5	80.7	80.7	80.6	80.6	80.5	80.5	80.6	80.5	80.4	80.0	80.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	81.0	78.2	78.5	78.7	78.7	78.7	78.8	78.9	79.0	79.0	78.7	79.0	79.2	79.4	79.5	79.6	79.6	79.7	79.8	79.8	79.9	79.9	79.8	79.5	79.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	80.0	77.3	77.6	77.9	78.0	78.0	78.0	78.1	78.2	78.1	78.0	78.2	78.3	78.4	78.5	78.6	78.7	78.7	78.8	79.0	79.1	79.2	79.1	79.0	79.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
79.0	76.9	77.0	77.0	77.0	77.0	77.2	77.2	77.3	77.4	77.5	77.5	77.6	77.6	77.6	77.6	77.7	77.7	77.8	77.9	78.0	78.1	78.2	78.2	78.5	78.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
79.0	76.7	76.6	76.5	76.2	75.7	76.4	76.6	76.7	76.8	76.9	76.9	76.9	76.9	76.8	76.8	76.8	76.8	76.8	76.9	76.9	77.1	77.3	77.0	77.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	76.7	76.4	76.1	75.8	75.7	75.9	76.1	76.1	76.3	76.4	76.3	76.2	76.1	76.0	75.9	75.9	75.9	75.9	75.9	75.9	76.0	77.0	77.0	78.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	76.4	75.8	75.6	75.4	75.2	75.4	75.6	75.9	75.8	75.6	75.4	75.3	75.2	75.1	75.0	75.0	75.0	74.9	74.8	74.0	75.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	76.0	75.4	75.2	75.1	75.0	75.2	75.3	75.1	74.9	74.7	74.5	74.4	74.3	74.2	74.2	74.1	74.0	74.0	74.5	74.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	75.0	74.5	74.4	74.4	74.2	74.1	73.8	73.3	73.2	73.2	73.1	73.1	73.2	73.3	73.4	73.3	73.0	73.7	74.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	75.0	73.6	73.6	73.5	73.3	72.9	72.5	72.4	72.4	72.4	72.5	72.6	72.7	72.8	72.8	72.7	72.5	72.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	74.0	72.7	72.7	72.5	72.2	72.0	71.8	71.8	71.9	71.9	72.0	72.1	72.0	72.0	72.0	72.0	72.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	74.0	71.6	71.9	71.8	71.8	71.6	71.5	71.5	71.5	71.5	71.6	71.6	71.6	71.6	71.5	71.4	71.5	71.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	74.0	71.4	71.4	71.3	71.3	71.3	71.2	71.2	71.3	71.3	71.3	71.3	71.3	71.3	71.2	71.1	71.0	71.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	73.0	71.3	71.2	71.1	71.1	71.0	71.0	71.1	71.1	71.1	71.1	71.1	71.0	71.0	70.9	70.8	70.5	70.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	71.3	70.9	70.9	70.9	70.9	70.9	70.9	70.9	70.9	70.9	70.8	70.7	70.7	70.6	70.8	72.0	72.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	72.0	70.8	70.7	70.7	70.7	70.7	70.7	70.7	70.7	70.6	70.6	70.4	70.3	70.0	69.5	70.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	72.0	70.6	70.5	70.5	70.5	70.5	70.5	70.5	70.4	70.4	70.3	70.1	69.8	69.5	69.0	69.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	70.6	70.3	70.3	70.3	70.3	70.3	70.3	70.2	70.2	70.0	69.8	69.6	69.3	68.5	68.5	68.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	72.0	70.1	70.1	70.1	70.1	70.1	70.1	70.0	69.9	69.6	69.5	69.4	69.1	68.7	68.0	68.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34

COMMENTS:
Water Levels are in [m]
Time Step = 1
Time elapsed = 0.1000E+11 [day]
STEADY-STATE CALIBRATION ... MAP OF LEVELS AT THE END OF CALIBRATION RUN ... 19 NOVEMBER 1988

RAUTAHAT MODEL – FINAL WATER LEVEL MAP: MAY 1988



DIFFERENCES BETWEEN NATURE AND MODEL

RAUTAHAT MODEL .. WATER LEVELS
STEADY-STATE CALIBRATION .. MAY 1988

MAP OF DIFFERENCES OF WATER LEVELS (INITIAL - FINAL)
(- Sign: final levels higher than initial)
(+ Sign: final levels lower than initial)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1												0.4	0.4	0.4																				
2											1.4	0.8	0.5	0.4	0.3																			
3											0.4	0.8	0.5	0.2	0.0	0.9	-0.1	0.2	0.4															
4											0.4	-0.1	0.2	0.4	-0.2	0.5	0.2	-0.4	0.6															
5											0.4	0.7	-0.1	-0.3	0.6	-0.2	0.3	0.6	0.7	0.0														
6										0.5	0.2	0.8	-0.5	-0.4	-0.2	0.0	-0.1	0.3	-0.3	0.3	0.3	0.0	0.5	0.1	0.3									
7										0.3	0.2	0.5	-0.5	-0.5	-0.2	-0.7	0.1	0.2	0.5	0.1	0.9	0.4	0.8	0.3	0.6	0.1	0.2	1.0						
8									0.7	0.5	-0.2	0.0	-0.2	-0.3	-0.7	-0.3	-0.6	0.2	0.1	0.5	0.6	-0.1	0.8	1.0	0.8	0.3	-0.3	0.4	0.1				0.1	0.0
9									0.6	0.3	0.1	0.3	-0.6	-0.5	-0.7	-1.0	-0.9	0.2	-0.1	-0.3	0.4	0.2	0.3	-0.2	-0.1	0.0	0.8	-0.2	0.6	0.6	0.0	0.4	0.5	0.0
10									2.4	1.1	0.8	0.4	-0.2	0.0	0.3	0.0	-0.8	0.2	0.5	0.0	0.5	-0.1	-0.3	0.1	-0.1	0.2	0.7	0.5	-0.1	0.3	0.2	-0.2	0.0	
11								2.4	1.3	1.1	0.9	0.8	0.6	-0.8	-0.3	-0.6	-0.2	-0.3	-0.4	-0.1	-0.4	-0.3	0.0	-0.3	0.7	-0.3	-0.2	-0.3	0.8	0.1	-0.2	0.5	0.0	
12						-0.3	1.0	1.7	0.7	1.0	0.5	-0.7	-0.9	-0.6	-0.4	-0.7	-0.7	0.1	0.3	-0.1	0.3	0.4	0.0	0.5	0.1	0.6	0.5	0.2	-0.3	0.3	0.9	0.0		
13						-0.2	0.0	1.0	0.4	1.2	1.1	1.2	-0.2	-0.4	-0.3	0.7	0.8	0.0	-0.1	-0.3	0.3	-0.4	0.0	-0.1	-0.2	0.4	-0.3	0.2	-0.2	-0.2	0.0			
14						-0.1	0.0	0.0	0.1	1.1	1.0	0.9	1.7	1.4	0.9	0.7	0.2	0.6	-0.1	0.1	0.1	-0.3	0.1	-0.3	-0.3	-0.3	0.3	0.4	0.2	0.0				
15					-0.5	0.1	-0.1	-0.2	-0.2	0.6	0.6	0.7	0.8	1.4	1.1	0.9	0.5	0.7	0.0	-0.2	-0.2	0.0	0.3	-0.2	0.0	0.5	0.8	0.5	0.0					
16					0.3	0.2	0.1	0.0	0.1	0.4	0.9	1.1	1.2	0.3	0.6	0.8	0.6	0.3	0.0	0.2	-0.5	-0.1	-0.3	-0.2	0.2	0.1	-0.3	0.0						
17					-0.2	0.1	0.1	0.1	0.2	0.5	0.2	0.4	0.5	0.6	0.7	0.7	0.2	0.3	0.4	0.3	-0.4	0.3	0.4	-0.1	0.6	-0.4	-0.4	0.0						
18				-0.5	-0.4	0.3	0.3	0.1	0.1	0.2	0.3	0.1	0.2	0.1	0.0	0.2	0.7	0.1	0.5	0.0	0.1	0.2	-0.5	0.1	0.0	0.0	0.0							
19					0.9	0.6	0.1	-0.5	0.1	0.7	0.8	0.4	0.5	0.5	0.4	0.0	0.3	-0.2	0.2	-0.1	0.3	0.3	0.5	0.1	0.3	0.0								
20					0.5	0.3	0.2	0.4	0.5	0.8	0.1	0.4	0.7	0.5	-0.1	0.1	0.2	0.3	-0.1	-0.3	-0.1	0.1	-0.2	0.1	0.1	0.0								
21					1.1	0.9	0.8	1.2	0.7	0.8	1.1	0.5	0.6	0.3	0.7	-0.1	-0.1	0.1	0.6	0.5	0.6	0.1	-0.4	-0.5	0.0									
22				1.6	0.8	0.3	1.0	1.0	0.3	0.3	1.1	0.2	0.2	0.3	-0.2	1.0	-0.2	0.7	0.1	0.3	-0.2	0.6	0.3	0.0	0.0									
23				0.6	1.1	0.8	0.5	0.8	0.9	0.7	1.0	0.7	0.7	0.7	0.3	0.5	0.4	-0.1	0.2	0.5	0.1	-0.2	-0.2	0.3	0.0									
24			0.6	0.7	0.6	0.5	0.6	0.7	0.8	1.0	1.1	0.3	0.4	0.0	0.7	0.1	0.2	-0.4	-0.3	-0.2	0.3	-0.1	0.5	-0.3	0.0									
25		1.3	1.0	0.8	0.8	1.0	1.2	0.4	0.5	0.6	0.6	0.5	0.7	0.6	0.2	0.7	0.0	0.1	0.3	-0.1	-0.2	0.4	0.0	0.3	0.0									
26		0.6	0.5	0.5	0.4	0.5	0.8	1.1	0.4	0.6	0.7	0.8	0.2	-0.1	0.6	0.3	0.8	0.2	-0.4	-0.5	-1.0	-0.4	0.0	0.2	0.0									
27		1.1	1.0	1.0	1.1	1.2	0.3	0.6	0.4	0.7	1.0	1.1	1.0	0.9	0.1	0.8	0.5	0.2	-0.3	0.4	0.1	0.2	-0.3	0.5	0.0									
28		0.6	0.6	0.0	0.7	0.8	1.0	0.4	0.7	0.7	0.6	0.6	0.5	0.2	-0.1	0.7	0.4	0.1	-0.2	-0.3	-0.4	-0.2	0.0	0.5	0.0									
29		0.9	0.9	1.2	1.2	1.2	0.4	0.5	0.4	0.4	0.3	1.1	1.0	0.8	0.5	0.3	0.1	-0.1	-0.4	-0.2	-0.1	0.2	0.5	0.1	0.0									
30		1.3	1.3	0.6	1.1	1.0	0.8	0.5	0.3	0.1	0.9	0.6	0.5	0.2	0.0	-0.2	0.7	0.6	-0.3	-0.3	-0.3	-0.4	0.1	0.0	0.0									
31		1.0	1.2	0.4	0.7	0.8	0.6	0.4	1.0	0.7	0.7	0.3	0.0	0.3	0.2	0.4	0.4	0.5	-0.2	0.0	0.2	0.2	0.4	0.6	0.0									
32			1.1	1.3	0.5	0.9	0.9	0.6	0.3	0.9	0.7	0.6	0.1	0.7	0.3	0.2	0.2	0.3	0.5	-0.2	0.1	0.2	0.3	0.4	0.0									
33			0.6	0.4	0.4	0.8	0.9	0.7	0.2	1.0	0.9	0.0	0.4	0.1	-0.2	0.6	0.6	-0.3	-0.3	-0.1	0.0	0.1	0.4	0.6	0.0									
34			1.2	0.9	0.6	0.5	0.5	0.3	0.1	0.9	0.8	1.0	0.7	0.4	0.1	0.0	-0.1	-0.1	-0.1	-0.6	-0.1	0.0	0.2	0.5	0.0									
35			1.3	0.9	0.5	0.3	0.2	0.1	0.9	0.7	0.7	0.8	0.5	0.4	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.5	0.0									
36		1.0	0.8	0.6	0.5	0.4	0.1	0.0	0.8	0.6	0.4	0.4	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.4	0.5	-0.2	0.0									
37		0.6	0.6	0.5	0.7	1.0	0.2	-0.1	0.7	0.5	0.3	0.3	0.2	0.2	0.2	0.2	0.3	0.4	0.5	0.5	0.7	0.6	0.6	0.0										
38			1.0	1.1	0.2	0.1	0.7	0.4	0.3	0.0	-0.1	-0.1	0.0	0.1	0.3	0.5	0.4	0.6	-0.3	-0.1	0.0	0.1	0.0											
39				0.6	0.5	0.5	-0.2	-0.2	0.6	0.3	0.4	0.4	-0.1	0.0	0.2	0.5	0.7	-0.2	-0.1	0.2	0.5	0.0												
40				0.2	0.2	0.0	0.8	0.5	0.3	0.5	0.7	-0.2	-0.4	-0.2	0.2	0.6	-0.2	0.1	0.3	0.0	0.0													
41				0.4	0.2	-0.1	-0.1	-0.2	0.0	0.6	0.7	0.7	-0.2	-0.1	-0.1	-0.1	-0.1	0.2	0.0															
42				0.7	0.4	0.1	0.0	0.3	0.7	-0.2	-0.1	0.0	0.0	0.0	0.0	0.3	-0.1	0.3	0.0															
43				1.0	0.7	0.6	0.3	0.5	-0.2	-0.1	-0.1	0.0	0.1	0.3	0.4	0.3	0.4	0.0																
44			0.9	0.3	0.1	-0.2	0.7	0.6	0.6	-0.3	-0.2	-0.1	0.1	0.4	0.4	0.5	0.7	0.0																
45			0.7	0.6	0.7	0.7	0.5	0.3	0.6	0.5	0.6	-0.2	0.0	0.1	0.2	0.4	0.6	0.0																
46			0.6	0.6	0.4	0.4	0.4	0.5	0.3	-0.3	0.0	0.2	0.1	0.1	0.1	0.1	0.0	0.0																
47				0.8	0.6	0.5	-0.3	0.5	0.5	-0.2	0.0	0.1	0.2	0.1	0.0	-0.1	0.0	0.0																
48				0.8	0.6	0.5	-0.1	-0.3	-0.3	-0.1	0.0	0.1	0.0	0.0	-0.1	0.0	0.0																	
49				0.8	0.5	0.1	-0.3	-0.2	-0.1	-0.1	0.1	0.1	-0.1	0.1	0.0	0.0	0.0																	
50					0.1	-0.1	-0.3	-0.2	-0.2	-0.2	-0.1	-0.2	-0.1	0.0	-0.2	-0.3	-0.1	0.0																
51					-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.1	-0.[illegible]	0.1	-0.2	-0.4	-0.3	-0.2	0.0																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34

FINAL STEADY-STATE CALIBRATION RUN ... MAY 1988 LEVELS MATCHING ... DIFFERENCES BETWEEN NATURE AND MODEL ... 19 NOVEMBER 1988

RAUTAHAT MODEL -- DEPTH TO WATER TABLE
END OF STEADY-STATE CALIBRATION RUN

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1												9.6	7.5	9.3			
2											6.7	3.4	8.7	8.6	6.2		
3											6.2	9.3	10.6	9.9	6.2	7.0	4.9
4											6.9	8.4	9.1	9.5	6.6	7.7	6.7
5											9.2	8.9	9.0	9.8	8.8	7.6	3.1
6										10.6	9.6	7.8	10.0	9.5	5.9	6.7	9.0
7										10.1	9.3	8.0	6.1	7.7	7.1	9.3	13.4
8									10.3	9.2	7.7	9.4	11.2	8.3	6.7	7.5	7.9
9									9.0	8.2	8.1	8.0	7.1	5.8	6.4	6.6	7.1
10									8.6	7.0	5.9	7.4	6.8	8.0	7.7	7.1	4.0
11								9.9	9.4	8.6	9.3	7.9	8.5	7.3	6.2	1.6	1.0
12						6.1	7.5	7.0	5.7	5.7	5.5	2.0	1.6	2.1	3.7	2.4	1.2
13						7.0	6.7	5.2	1.9	4.6	4.1	4.0	2.4	2.8	2.7	3.0	2.3
14						6.5	5.3	3.9	2.4	3.5	3.2	3.2	4.6	4.4	3.8	3.4	2.4
15					7.7	4.1	4.7	5.1	2.7	2.6	2.8	3.0	3.3	4.0	4.3	2.9	2.3
16					7.5	6.2	4.8	3.4	2.8	2.1	2.4	2.7	3.0	2.8	3.2	2.9	3.7
17					7.0	5.9	4.8	2.6	1.9	1.7	1.2	2.4	1.8	2.3	2.9	2.9	3.4
18				3.9	4.3	3.8	3.1	2.0	0.1	0.2	0.6	1.0	1.5	1.6	3.7	3.4	3.7
19					4.8	4.3	3.5	3.5	1.3	1.3	2.0	0.8	1.6	2.7	2.6	1.6	2.7
20					3.3	3.0	2.8	2.3	3.5	3.3	3.1	1.3	1.6	1.6	1.4	1.8	2.4
21					3.9	3.7	3.6	4.1	5.1	4.9	4.6	2.7	1.7	1.8	2.2	1.7	2.1
22				4.6	3.8	3.4	4.1	4.0	3.3	3.4	3.2	2.5	1.8	1.7	1.2	1.7	1.9
23				3.7	4.2	3.9	3.7	3.8	3.9	4.0	4.1	3.1	2.8	2.6	1.7	2.3	2.4
24			3.8	3.9	3.6	3.5	3.6	3.8	3.8	4.1	4.1	2.0	1.8	1.4	2.3	2.0	2.2
25		4.4	4.3	4.3	4.2	4.3	4.2	3.4	4.2	3.6	3.8	3.5	2.1	1.3	1.3	2.2	1.7
26		3.7	3.9	4.1	3.9	3.8	4.0	4.2	3.4	2.4	1.9	1.4	1.0	0.7	1.7	1.6	2.4
27		4.0	4.2	4.4	4.5	4.4	3.4	3.6	2.8	3.1	2.5	1.6	1.5	1.4	1.3	2.4	2.3
28		3.4	3.6	3.0	3.9	3.9	4.1	3.6	3.2	2.9	2.2	1.7	1.5	1.2	1.0	1.9	1.8
29		3.5	3.2	4.1	4.2	4.2	3.4	3.6	3.1	2.8	2.4	3.0	3.4	2.7	2.1	1.9	1.7
30		2.4	2.0	1.3	1.8	3.9	3.8	3.6	3.4	3.0	3.6	3.1	2.8	2.2	2.1	1.3	2.2
31		1.8	2.1	1.5	2.1	3.5	3.6	3.6	4.6	4.1	3.9	3.6	3.0	1.4	1.5	1.6	1.8
32			2.0	2.3	1.7	2.5	2.8	2.9	2.8	4.6	4.5	2.4	1.9	1.3	0.5	0.9	1.0
33			1.3	1.4	1.7	2.3	3.0	3.1	4.0	4.9	4.8	1.9	2.0	1.1	0.9	2.3	2.3
34			3.0	2.9	2.8	3.2	3.6	3.9	3.9	4.8	4.7	2.7	2.0	1.8	1.7	2.3	2.1
35			3.1	2.9	2.7	2.9	3.5	4.2	4.9	4.7	4.6	3.4	3.0	2.5	3.0	2.7	2.4
36		3.0	2.8	2.9	2.9	2.8	2.8	3.3	4.4	4.2	4.1	3.9	3.6	3.0	3.0	2.8	2.6
37		2.4	2.3	2.4	2.7	3.2	1.8	2.4	3.5	3.6	3.5	3.4	3.3	2.8	2.8	2.7	2.8
38			2.8	3.1	1.9	1.8	2.6	3.1	2.9	2.9	2.5	3.0	3.0	3.0	2.8	2.9	3.2
39				2.5	2.6	2.3	1.5	1.6	2.2	1.6	2.0	2.4	2.4	2.8	2.5	2.8	3.2
40				2.0	2.1	2.0	2.8	1.8	1.7	1.9	2.1	1.6	2.5	2.6	2.5	2.6	2.2
41				2.5	2.5	2.4	2.5	2.8	3.3	3.8	3.8	3.8	2.8	2.7	2.4	2.3	2.0
42				2.9	2.9	3.0	3.3	3.8	4.1	3.2	3.2	3.2	3.2	3.1	2.7	3.1	2.1
43				3.3	3.3	3.6	4.3	4.4	3.4	3.3	3.2	3.3	3.3	3.4	3.2	2.8	2.8
44			3.1	2.9	2.8	2.9	4.1	4.2	4.1	2.9	2.9	2.9	3.1	3.4	3.2	3.0	2.9
45			3.6	3.6	3.7	3.8	3.8	3.8	3.7	3.3	3.3	2.6	2.8	3.0	2.8	2.7	2.6
46			3.3	3.3	3.4	3.3	2.6	2.0	3.9	2.9	2.7	3.3	3.8	3.9	3.5	3.2	3.3
47				3.1	3.0	2.0	1.9	2.9	1.8	2.8	3.0	3.6	4.1	4.1	3.5	2.8	3.2
48				2.7	2.6	1.9	1.5	1.6	1.7	1.8	3.1	4.0	4.6	4.5	3.7	2.8	2.7
49				2.5	1.5	1.0	1.4	1.6	1.6	1.6	2.6	3.2	2.7	4.0	3.2	2.5	2.7
50					1.7	1.2	1.3	1.5	1.5	1.3	2.3	2.8	2.5	3.9	2.6	2.3	2.6
51					1.3	1.3	1.4	1.5	1.4	1.3	1.4	2.1	[illegible]	2.1	1.2	2.2	2.4

	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1																	
2																	
3	8.3	10.0															
4	7.9	9.3															
5	10.1	9.8	10.3														
6	8.6	8.7	8.3	5.4	4.0	5.5	9.5	4.3									
7	10.2	8.5	10.1	9.0	4.9	5.3	5.3	5.6	8.1	9.2	8.0						
8	7.9	7.1	8.5	10.2	4.4	5.8	6.0	6.5	7.3	5.7	4.7	6.5				7.6	8.0
9	7.8	6.5	3.2	3.9	4.6	3.3	2.8	2.9	6.4	2.8	4.0	4.2	5.8	7.4	8.5	7.0	8.5
10	2.4	1.6	2.7	3.0	1.4	0.7	1.1	6.2	5.8	6.0	6.9	5.9	8.3	7.2	6.3	6.0	
11	1.5	1.3	0.6	1.2	0.9	2.5	5.2	6.0	4.0	3.3	5.2	8.8	10.6	8.2	7.5	6.1	
12	1.9	0.9	0.7	2.1	3.9	5.4	6.3	5.2	5.8	4.5	3.2	5.7	9.8	7.9	4.0		
13	1.5	1.5	0.5	1.5	1.5	4.2	8.1	4.0	5.8	3.3	3.2	4.9	8.7	4.2			
14	2.2	1.7	1.5	2.7	2.7	5.7	7.5	7.7	7.6	3.2	3.3	3.7	3.0				
15	3.2	3.9	6.3	5.4	2.5	5.7	6.6	7.7	6.0	4.1	4.2	1.9					
16	4.7	7.9	10.1	7.3	4.5	3.7	4.5	5.0	4.4	2.7	4.3						
17	4.6	6.2	6.8	5.5	6.0	4.1	3.4	4.5	2.6	1.8	3.9						
18	3.7	4.5	3.7	5.2	3.9	2.7	3.1	2.7	2.8	4.0							
19	2.8	3.7	3.0	4.5	4.5	4.0	3.0	2.8	2.9								
20	3.4	3.3	3.2	2.9	2.8	3.3	3.2	2.4	4.7								
21	3.0	3.8	3.7	3.8	2.9	1.9	2.8	5.0									
22	3.0	2.6	2.8	2.4	2.0	1.0	2.4	4.5									
23	2.2	2.7	3.0	2.8	1.6	0.2	2.7	4.5									
24	1.7	0.2	0.2	0.3	0.4	0.9	1.5	4.6									
25	1.4	0.4	0.3	0.2	0.5	0.7	1.4	6.0									
26	1.5	0.2	0.3	0.2	0.3	1.2	1.9	3.5									
27	1.1	0.2	1.2	0.4	0.3	0.3	1.0	4.0									
28	1.1	0.9	0.1	0.1	0.0	1.7	1.9	5.5									
29	1.6	1.5	1.1	1.3	0.8	0.6	2.0	5.0									
30	2.1	1.3	1.3	1.5	1.3	0.3	0.3	4.0									
31	1.8	1.2	1.5	1.8	1.9	0.9	1.0	3.5									
32	1.1	1.4	1.5	1.9	2.1	2.2	2.6	5.0									
33	1.3	1.5	1.9	2.0	2.2	2.6	3.0	3.7									
34	1.9	1.8	1.5	2.0	2.1	2.3	2.9	3.4									
35	2.3	2.4	2.3	2.2	2.3	2.4	2.7	3.0									
36	2.5	2.5	2.4	2.4	2.5	2.6	2.7	2.6									
37	2.9	2.9	2.8	2.9	2.9	2.9	3.1										
38	3.2	2.1	2.0	2.1	2.4	2.4											
39	2.1	2.3	2.5	2.7	3.5												
40	2.4	2.6	3.7	3.3													
41	2.2	3.4															
42	2.3	3.5															
43	3.7																
44	3.6																
45	3.6																
46	3.3																
47	0.8																
48																	
49																	
50	2.3																
51	[illegible]																

DEPTH TO WATER TABLE AT THE END OF THE FINAL STEADY-STATE CALIBRATION RUN ... 19 NOVEMBER 1988

RAUTAHAT MODEL .. TRANSMISSIVITY
END OF STEADY-STATE CALIBRATION

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1												427.	316.	368.																				
2											439.	451.	354.	406.	442.																			
3											1106.	611.	416.	505.	741.	480.	512.	470.	424.															
4											1909.	1700.	1158.	461.	739.	536.	526.	537.	500.															
5											1220.	1084.	1055.	561.	1337.	1403.	1394.	505.	550.	482.														
6										1054.	1045.	982.	660.	1074.	640.	780.	1065.	614.	678.	569.	395.	555.	253.	290.	766.									
7										923.	863.	830.	567.	982.	1263.	1263.	1306.	725.	693.	713.	673.	1310.	905.	974.	942.	987.	492.	452.						
8									894.	815.	764.	579.	537.	911.	1154.	1387.	1612.	777.	806.	481.	442.	1607.	1302.	1300.	1320.	1175.	615.	579.	494.				372.	381.
9									552.	514.	469.	444.	401.	670.	835.	1212.	1130.	408.	468.	516.	576.	538.	354.	896.	858.	1287.	694.	665.	613.	339.	438.	439.	495.	504.
10									426.	438.	397.	374.	326.	383.	287.	267.	590.	234.	474.	517.	496.	503.	393.	868.	776.	812.	1022.	637.	628.	594.	689.	827.	950.	
11								451.	468.	462.	413.	358.	296.	584.	703.	491.	550.	198.	210.	232.	360.	396.	390.	402.	700.	680.	750.	750.	725.	800.	856.	901.	930.	
12						479.	418.	401.	412.	352.	375.	430.	425.	595.	601.	262.	239.	237.	272.	1158.	1364.	1290.	685.	1043.	1183.	934.	964.	930.	855.	905.	924.	790.		
13						567.	540.	951.	1014.	885.	835.	545.	538.	586.	247.	144.	189.	218.	240.	210.	510.	665.	750.	1806.	1430.	1600.	770.	725.	770.	474.	579.			
14						660.	642.	1058.	1020.	1011.	941.	609.	498.	324.	137.	133.	144.	356.	400.	230.	520.	745.	1148.	1650.	1590.	1350.	483.	320.	330.	308.				
15					825.	740.	670.	640.	580.	530.	303.	288.	262.	238.	184.	165.	124.	160.	280.	360.	600.	900.	880.	855.	810.	685.	376.	332.	318.					
16					432.	426.	402.	387.	366.	348.	312.	294.	276.	258.	219.	104.	99.	98.	203.	340.	635.	800.	835.	825.	760.	555.	453.	447.						
17					469.	443.	432.	399.	378.	333.	330.	525.	465.	410.	375.	350.	330.	289.	316.	405.	873.	1027.	1117.	1127.	1099.	798.	1358.	1246.						
18				453.	492.	464.	444.	414.	378.	264.	312.	300.	273.	258.	227.	231.	198.	228.	241.	318.	581.	972.	1110.	1119.	1161.	966.	945.							
19					324.	375.	361.	290.	256.	234.	216.	208.	190.	182.	170.	164.	166.	264.	290.	347.	564.	931.	1010.	1072.	1121.	994.								
20					342.	336.	318.	98.	278.	258.	246.	232.	218.	294.	285.	270.	264.	297.	318.	369.	940.	1015.	1026.	1043.	1022.	882.								
21					332.	342.	340.	313.	262.	248.	234.	256.	360.	330.	297.	273.	450.	475.	530.	834.	916.	919.	938.	944.	875.									
22				534.	546.	537.	512.	480.	416.	437.	418.	438.	408.	372.	545.	485.	435.	609.	721.	868.	1002.	1026.	1071.	1057.	945.									
23				561.	582.	584.	550.	495.	465.	447.	433.	742.	720.	685.	595.	700.	567.	710.	860.	1130.	1416.	1498.	1460.	1350.	1360.									
24			573.	591.	601.	590.	573.	547.	523.	495.	794.	826.	805.	740.	670.	1050.	840.	490.	700.	1030.	1280.	1340.	1330.	1340.	1360.									
25		372.	396.	404.	402.	601.	591.	607.	586.	553.	527.	507.	499.	837.	1460.	1200.	940.	790.	730.	900.	1040.	1130.	1170.	1210.	1260.									
26		380.	404.	421.	422.	426.	640.	640.	651.	1018.	933.	873.	1208.	1183.	1540.	1340.	1080.	920.	900.	910.	960.	950.	1000.	1060.	1150.									
27		384.	416.	418.	417.	421.	449.	459.	418.	638.	571.	843.	1201.	1218.	1120.	1440.	1230.	1030.	970.	890.	860.	860.	1062.	1213.	1337.									
28		184.	207.	210.	209.	210.	216.	238.	500.	444.	600.	556.	912.	915.	865.	1106.	931.	1110.	940.	870.	983.	975.	1025.	1113.	1212.									
29		168.	193.	208.	194.	195.	208.	439.	450.	426.	591.	894.	891.	909.	1315.	1204.	987.	1180.	960.	790.	700.	900.	988.	1113.	1225.									
30		294.	324.	354.	344.	514.	541.	564.	587.	945.	872.	869.	852.	917.	1015.	1190.	987.	840.	1000.	800.	600.	925.	1075.	1138.	1212.									
31		324.	351.	390.	429.	428.	468.	505.	484.	500.	484.	466.	462.	620.	725.	730.	690.	868.	1110.	970.	890.	1137.	1238.	1337.	1437.									
32			225.	261.	300.	349.	396.	440.	491.	461.	452.	413.	390.	384.	369.	399.	408.	396.	384.	610.	585.	1160.	1160.	1190.	1250.									
33			105.	174.	243.	333.	373.	415.	449.	445.	433.	436.	390.	372.	375.	390.	414.	429.	438.	745.	730.	994.	966.	1360.	1370.									
34			96.	132.	204.	297.	378.	422.	462.	447.	434.	418.	402.	390.	396.	408.	438.	456.	483.	534.	519.	810.	775.	745.	735.									
35			84.	117.	168.	258.	387.	444.	441.	464.	457.	451.	453.	435.	408.	420.	438.	468.	504.	543.	555.	525.	501.	468.	450.									
36		120.	170.	205.	255.	365.	585.	489.	496.	499.	492.	483.	468.	426.	441.	417.	441.	474.	501.	537.	549.	540.	525.	507.	495.									
37		165.	180.	200.	215.	157.	550.	850.	893.	522.	510.	483.	444.	414.	417.	432.	441.	468.	498.	522.	528.	537.	528.	516.										
38			205.	230.	270.	385.	384.	508.	544.	537.	495.	450.	408.	405.	432.	438.	456.	486.	543.	537.	552.	552.	543.											
39				165.	192.	255.	354.	451.	507.	429.	405.	396.	402.	390.	426.	444.	438.	486.	513.	537.	561.	525.												
40				95.	128.	168.	118.	100.	140.	66.	120.	226.	246.	262.	276.	432.	453.	489.	525.	519.	552.													
41				101.	139.	154.	144.	108.	64.	168.	261.	318.	600.	655.	938.	931.	438.	492.	501.															
42				102.	146.	146.	134.	110.	106.	201.	455.	555.	665.	994.	690.	333.	310.	332.	340.															
43				144.	154.	150.	213.	204.	228.	445.	756.	903.	1022.	773.	755.	735.	435.	483.																
44			146.	154.	237.	261.	276.	480.	520.	805.	903.	1029.	1106.	1135.	1145.	1092.	1057.	825.																
45			264.	303.	595.	500.	585.	620.	938.	1022.	1113.	1169.	1099.	1183.	1204.	1176.	1099.	1239.																
46			324.	309.	360.	645.	715.	861.	1008.	1092.	1225.	1680.	1099.	1178.	1202.	1225.	937.	940.																
47				360.	408.	760.	725.	882.	952.	1050.	1155.	1183.	1134.	1134.	1106.	1197.	964.	975.																
48				393.	441.	790.	710.	889.	903.	1085.	1085.	1092.	1064.	1106.	1099.	810.	820.																	
49				408.	450.	825.	700.	889.	980.	1099.	1078.	1008.	987.	994.	1134.	1162.	1054.																	
50					435.	453.	680.	819.	924.	1099.	1274.	784.	567.	833.	966.	1099.	1050.	994.																
51					7-5.	715.	931.	389.	931.	1008.	973.	630.	598.	756.	730.	700.	765.	725.																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34

TRANSMISSIVITY AT THE END OF FINAL STEADY-STATE CALIBRATION RUN ... 19 NOVEMBER 1988

RAUTAHAT MODEL -- EVAPORATION LOSS

r	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1	***	***	***	***	***	***	***	***	***	***	***	0.	0.	0.	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
2	***	***	***	***	***	***	***	***	***	***	0.	0.	0.	0.	0.	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
3	***	***	***	***	***	***	***	***	***	***	0.	0.	0.	0.	0.	0.	0.	0.	0.	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
4	***	***	***	***	***	***	***	***	***	***	0.	0.	0.	0.	0.	0.	0.	0.	0.	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
5	***	***	***	***	***	***	***	***	***	***	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	***	***	***	***	***	***	***	***	***	***	***	***	***	***
6	***	***	***	***	***	***	***	***	***	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	***	***	***	***	***	***	***	***	***
7	***	***	***	***	***	***	***	***	***	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	***	***	***	***	***	***
8	***	***	***	***	***	***	***	***	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	***	***	***	0.	0.
9	***	***	***	***	***	***	***	***	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	***	***	***	***	***	***	***	***	0.	0.	0.	0.	0.	0.	0.	0.	0.	200.	3462.	1555.	1719.	2834.	364.	364.	0.	0.	0.	0.	0.	0.	0.	0.	0.	***
11	***	***	***	***	***	***	***	0.	0.	0.	0.	0.	0.	0.	0.	1997.	3293.	244.	256.	423.	270.	329.	172.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	***
12	***	***	***	***	***	0.	0.	0.	0.	0.	0.	1555.	1719.	1555.	0.	0.	2320.	2439.	4445.	4022.	2439.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	***	***
13	***	***	***	***	***	0.	0.	0.	2834.	0.	0.	1480.	1635.	0.	0.	1900.	2834.	2834.	2696.	402.	329.	232.	0.	0.	0.	0.	0.	0.	0.	0.	0.	***	***	***
14	***	***	***	***	***	0.	0.	0.	1900.	181.	200.	190.	141.	0.	1407.	1555.	1997.	2696.	244.	298.	164.	0.	0.	0.	0.	0.	141.	141.	0.	0.	***	***	***	***
15	***	***	***	***	0.	0.	0.	0.	141.	221.	200.	190.	172.	164.	0.	2207.	244.	172.	0.	0.	0.	172.	0.	0.	0.	0.	0.	0.	0.	***	***	***	***	***
16	***	***	***	***	0.	0.	0.	0.	156.	256.	283.	270.	244.	172.	164.	210.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	***	***	***	***	***	***
17	***	***	***	***	0.	0.	0.	172.	256.	329.	364.	221.	313.	256.	200.	200.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	200.	0.	***	***	***	***	***	***
18	***	***	***	0.	0.	0.	148.	232.	0.	0.	516.	383.	313.	283.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1555.	148.	0.	***	***	***	***	***	***	***
19	***	***	***	***	0.	0.	0.	0.	329.	444.	329.	491.	346.	200.	200.	270.	181.	0.	0.	0.	0.	0.	0.	1407.	1719.	0.	***	***	***	***	***	***	***	***
20	***	***	***	***	148.	156.	164.	232.	0.	172.	0.	383.	383.	346.	283.	256.	200.	0.	0.	0.	0.	1555.	0.	0.	1900.	0.	***	***	***	***	***	***	***	***
21	***	***	***	***	148.	149.	148.	141.	0.	0.	0.	200.	346.	283.	283.	244.	200.	141.	0.	0.	0.	1480.	1900.	0.	0.	***	***	***	***	***	***	***	***	***
22	***	***	***	0.	0.	0.	0.	0.	0.	0.	210.	190.	270.	298.	298.	423.	210.	190.	172.	172.	1635.	298.	423.	181.	0.	***	***	***	***	***	***	***	***	***
23	***	***	***	0.	0.	0.	0.	0.	0.	0.	0.	181.	210.	232.	298.	244.	221.	190.	172.	172.	1555.	2439.	571.	181.	0.	***	***	***	***	***	***	***	***	***
24	***	***	0.	0.	0.	0.	0.	0.	0.	0.	0.	256.	298.	298.	270.	232.	221.	210.	543.	571.	0.	467.	491.	244.	0.	***	***	***	***	***	***	***	***	***
25	***	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	298.	423.	346.	283.	256.	313.	571.	491.	571.	571.	423.	346.	0.	***	***	***	***	***	***	***	***	***
26	***	0.	0.	0.	0.	0.	0.	0.	0.	244.	329.	444.	402.	402.	346.	313.	270.	313.	571.	516.	516.	0.	329.	256.	0.	***	***	***	***	***	***	***	***	***
27	***	141.	0.	0.	0.	0.	0.	0.	181.	1807.	283.	467.	467.	467.	329.	270.	244.	383.	467.	402.	516.	571.	0.	467.	0.	***	***	***	***	***	***	***	***	***
28	***	148.	0.	0.	0.	0.	0.	0.	172.	200.	270.	346.	364.	364.	346.	329.	298.	364.	346.	491.	0.	543.	256.	298.	0.	***	***	***	***	***	***	***	***	***
29	***	164.	190.	1407.	0.	0.	0.	0.	156.	181.	210.	232.	1807.	2320.	270.	270.	270.	256.	232.	313.	298.	444.	571.	0.	0.	***	***	***	***	***	***	***	***	***
30	***	346.	423.	423.	4228.	1407.	0.	0.	0.	141.	156.	172.	1900.	221.	2100.	283.	283.	283.	270.	270.	244.	256.	0.	0.	0.	***	***	***	***	***	***	***	***	***
31	***	402.	383.	346.	298.	1555.	0.	0.	0.	0.	0.	0.	0.	346.	313.	329.	298.	313.	298.	283.	270.	256.	0.	0.	0.	***	***	***	***	***	***	***	***	***
32	***	***	383.	364.	329.	2696.	2320.	1900.	1719.	0.	0.	2439.	244.	444.	543.	423.	402.	402.	383.	256.	244.	0.	0.	0.	0.	***	***	***	***	***	***	***	***	***
33	***	***	423.	364.	313.	283.	2100.	1807.	0.	0.	0.	2320.	270.	364.	346.	256.	256.	270.	244.	221.	221.	210.	200.	0.	0.	***	***	***	***	***	***	***	***	***
34	***	***	244.	232.	200.	156.	0.	0.	0.	0.	0.	2564.	313.	298.	270.	190.	200.	221.	232.	210.	210.	210.	210.	181.	0.	***	***	***	***	***	***	***	***	***
35	***	***	244.	221.	200.	164.	0.	0.	0.	0.	0.	1635.	172.	210.	148.	164.	190.	190.	181.	190.	200.	200.	200.	200.	0.	***	***	***	***	***	***	***	***	***
36	***	0.	0.	0.	181.	181.	156.	0.	0.	0.	0.	0.	0.	148.	148.	164.	172.	190.	190.	200.	200.	210.	210.	141.	0.	***	***	***	***	***	***	***	***	***
37	***	0.	0.	0.	221.	1997.	270.	0.	0.	0.	0.	0.	0.	164.	164.	172.	172.	181.	181.	190.	200.	190.	190.	0.	***	***	***	***	***	***	***	***	***	***
38	***	***	0.	0.	256.	256.	232.	0.	1635.	141.	164.	0.	0.	141.	172.	181.	148.	164.	181.	210.	210.	190.	0.	***	***	***	***	***	***	***	***	***	***	***
39	***	***	***	0.	0.	0.	2564.	2439.	2696.	313.	270.	221.	172.	148.	190.	190.	172.	190.	181.	190.	200.	0.	***	***	***	***	***	***	***	***	***	***	***	***
40	***	***	***	0.	0.	0.	0.	0.	298.	298.	298.	244.	141.	148.	190.	221.	181.	190.	190.	0.	0.	***	***	***	***	***	***	***	***	***	***	***	***	***
41	***	***	***	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	148.	172.	181.	210.	221.	0.	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
42	***	***	***	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	156.	148.	[illegible]	221.	0.	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
43	***	***	***	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	148.	172.	[illegible]	0.	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
44	***	***	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	172.	200.	0.	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
45	***	***	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	190.	221.	0.	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
46	***	***	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
47	***	***	***	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	141.	0.	0.	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
48	***	***	***	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
49	***	***	***	0.	0.	0.	0.	0.	0.	0.	0.	0.	148.	0.	0.	0.	0.	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
50	***	***	***	***	0.	0.	0.	244.	256.	283.	181.	0.	164.	0.	148.	0.	0.	0.	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
51	***	***	***	***	200.	270.	256.	244.	256.	270.	283.	200.	190.	190.	270.	0.	0.	0.	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34

COMMENTS:
Evaporatio n is in [m3/day]
Time Step = 1
Time elaps ed = 0.1000E+11 [day]
FINAL STEA DY-STATE CALIBRATION RUN ... EVAPORATION LOSS AT THE END OF RUN ... 19 NOVEMBER 1988

```
0.0 0.05 0.10 0.15 0.20 0.25 0.30 0.50 1.00 8.2
  1             666
  2            66666
  3            664466666
  4            644466666
  5            5543666667
  6           3344335577777666
  7           22222355777777666666
  8          2222222555765333366666   66
  9          1111111333333333356666666665
 10          11111111111111122222556665
 11         2211111111111111122344566666
 12       66332222222211111111112344455
 13       664433221111111111112234455
 14       6444333211111111111223344
 15      444443333111111111111112344
 16      44444333331111111111112244
 17      444433322222211222222233
 18     333322222221111112222223
 19      333222222111111222222223
 20      22222222222222222222222
 21      333333333333322222222
 22     3333333333333322222222
 23     22222222222222222222222
 24    222222222222222222222222
 25   22222222222222222211111111
 26   22233333332222222211111111
 27   22333333333222222211111111
 28   23333333322222222211111111
 29   22222222222222222211111111
 30   22222222222222222211101111
 31   22222222222222101111111111
 32    2222222222222111111111111
 33    21222222222222222111111111
 34    11122222222222222111111111
 35    22222222222222222211111111
 36   0222222112222222222222222
 37   00222220112222222222222
 38    02222022222222222333332
 39     2222222222222333332
 40     222222222222333332
 41     22210122222235553
 42     22210122222555553
 43     222222233555555
 44    033333333555555
 45    033333333555553
 46    001111111333333
 47     000000111111222
 48     00000111121111
 49     00000111221101
 50      0000112222000l
 51      00011222220001
0.001 0.001 0.002 0.006 0.010 0.010 0.010 0.010 0.004 0.002 0.002 0.002 0.001 0.001 0.001 0.C
 MAY   MAY   JUNE  JUNE  JULY  JULY  AUG   AUG   SEP   SEP   OCT   OCT   NOV   NOV   DEC   DE
```

FORMAT 5X,34I1

0 = IMPERMEABLE SURFACE
1 = 5% OF RAINFALL
2 = 10%
3 = 15%
4 = 20%
5 = 25%
6 = 30%
7 = 50%
8 =100%
9 =820%

NOTE: 0.001 means 0.001 m/day, or 1 mm/day (RAINFALL).

```
0 10 20 30 50 70 100 125 150 175
  1             444
  2            44444
  3            555554444
  4            776654444
  5            6667777444
  6           6665766644446666
  7           6665777644446666644
  8          666557777443366666444   33
  9          55555666633333355644433333
 10          5555566442333335555444444
 11         55555566442223333444444444
 12       444444445533336664554444444
 13       44666655532333344466644433
 14       4466665542224444456663222
 15      4444443333332444444444222
 16      333333333332224444444433
 17      333333344444444445555555
 18     333333333333333334555555
 19      2222222222222333455555
 20      2222222223333333555555
 21      222222223333444555555
 22     3333333333344455555555
 23     3333333344445566666666
 24    33333333444446666666666
 25   222233333333466666666666
 26   222223334445566666666666
 27   222222222334555666666777
 28   111111122334445566677777
 29   111111222344455566667777
 30   222233344444445556667777
 31   333333333333444456667777
 32    33333333333333333446666
 33    33333333333333333445566
 34    33333333333333333334444
 35    33333333333333333333333
 36   444444333333333333333333
 37   44444444333333333333333
 38    444433333333333333333
 39     3333333333333333333
 40     222222222222333333
 41     2222223334455333
 42     2222223444543222
 43     222333455544433
 44    2233344555555554
 45    3344445555555555
 46    3334455556555544
 47     334455555555544
 48     33445555555544
 49     33445555555555
 50      33455555555555
 51      44555555554444
123451234567890123456789012345678901234
```

PERMEABILITY INPUT DATA FILE

LEGEND:

BLANK	K = 0	M/DAY
1	K = 10	"
2	K = 20	"
3	K = 30	"
4	K = 50	"
5	K = 70	"
6	K =100	"
7	K =125	"
8	K =150	"
9	K =175	"

END OF BOTH STEADY-STATE AND UNSTEADY-STATE CALIBRATION

APPENDIX 22

FORMAT 5X,34I1

EVAPORATION DATA FILE

0 = ZERO EVAPORATION
1 = PERMEABLE SURFACE
(Evaporation loss possible when water table comes closer than 3.0 m from the land surface)

```
 1           000
 2         00000
 3         000000000
 4         111111000
 5         1111110000
 6        111111111000000
 7        1111111111111000000
 8       111111111111111111000   00
 9       11111111111111110000000000
10       1111111111111111111110000
11      11111111111111111111111110
12    111111111111111111111111110
13    11111111111111111111111110
14    1111111111111111111111110
15   1111111111111111111111110
16   111111111111111111111110
17   111111111111111111111110
18  111111111111111111111110
19   1111111111111111111110
20   1111111111111111111110
21   111111111111111111110
22  1111111111111111111110
23  1111111111111111111110
24 11111111111111111111110
25 111111111111111111111110
26 111111111111111111111110
27 111111111111111111111110
28 111111111111111111111110
29 111111111111111111111100
30 111111111111111111111000
31 111111111111111111111000
32  11111111111111111110000
33  11111111111111111111100
34  11111111111111111111110
35  11111111111111111111110
36 000111001111111111111110
37 00011100011111111111110
38  001110111111111111110
39   0001111111111111110
40   000001111111111110
41   0000001111111110
42   0000001111111110
43   000000111111110
44  0000000000000110
45  0000000000000110
46  0000000000000110
47   000000000000110
48   00000000010000
49   00000000110000
50    00011111111000
51    11111111111000
```

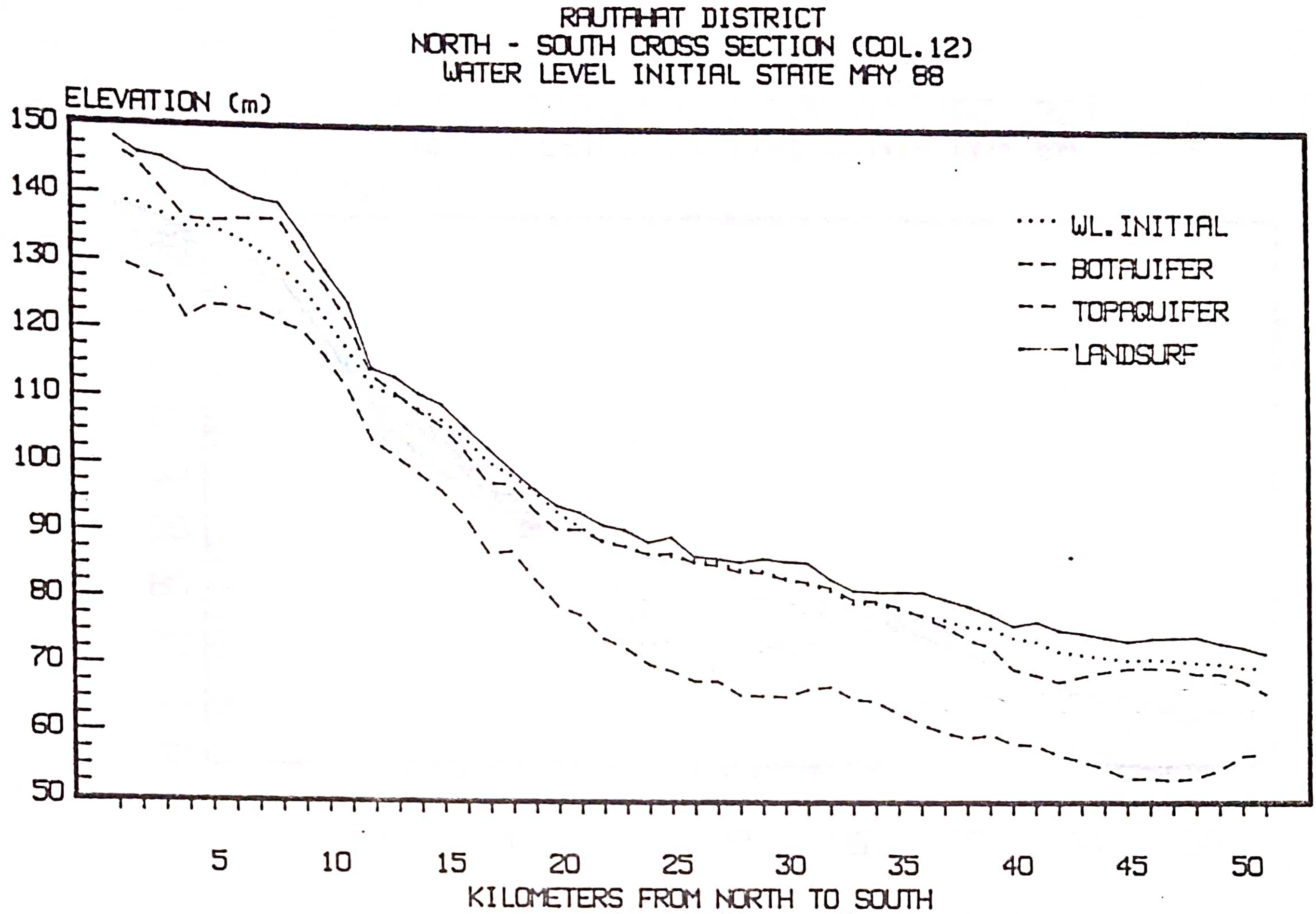
0.0085	0.0085	0.0075	0.0075	0.0055	0.0055	0.0053	0.0053	0.0045	0.0045	0.004	0.004	0.003	0.00
MAY	MAY	JUNE	JUNE	JULY	JULY	AUG	AUG	SEP	SEP	OCT	OCT	NOV	NO

NOTE: 0.0085 means 8.5 mm/day potential evaporation rate (free surface evaporation).

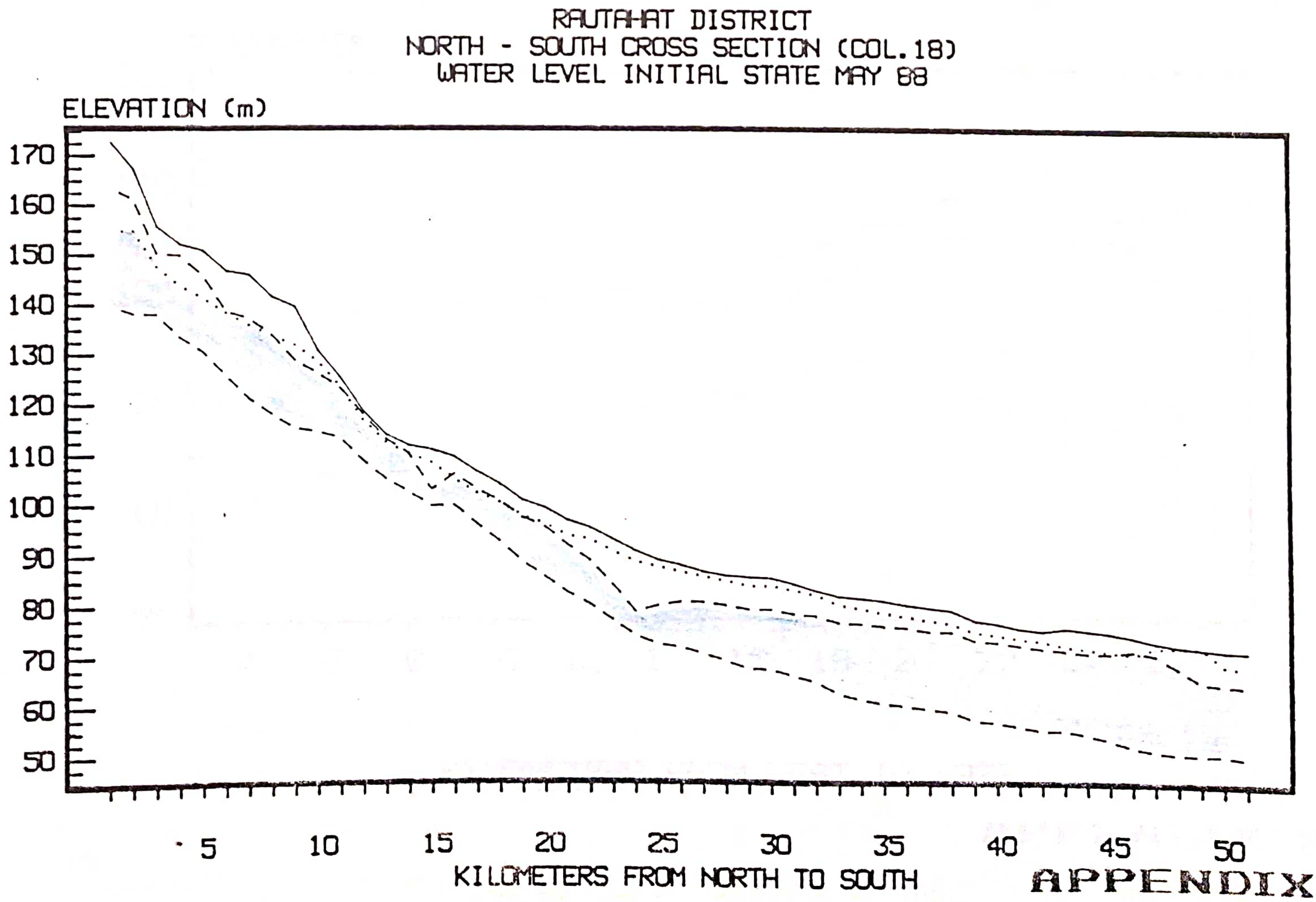
APPENDIX 23

STEADY-STATE MODEL PARAMETERS

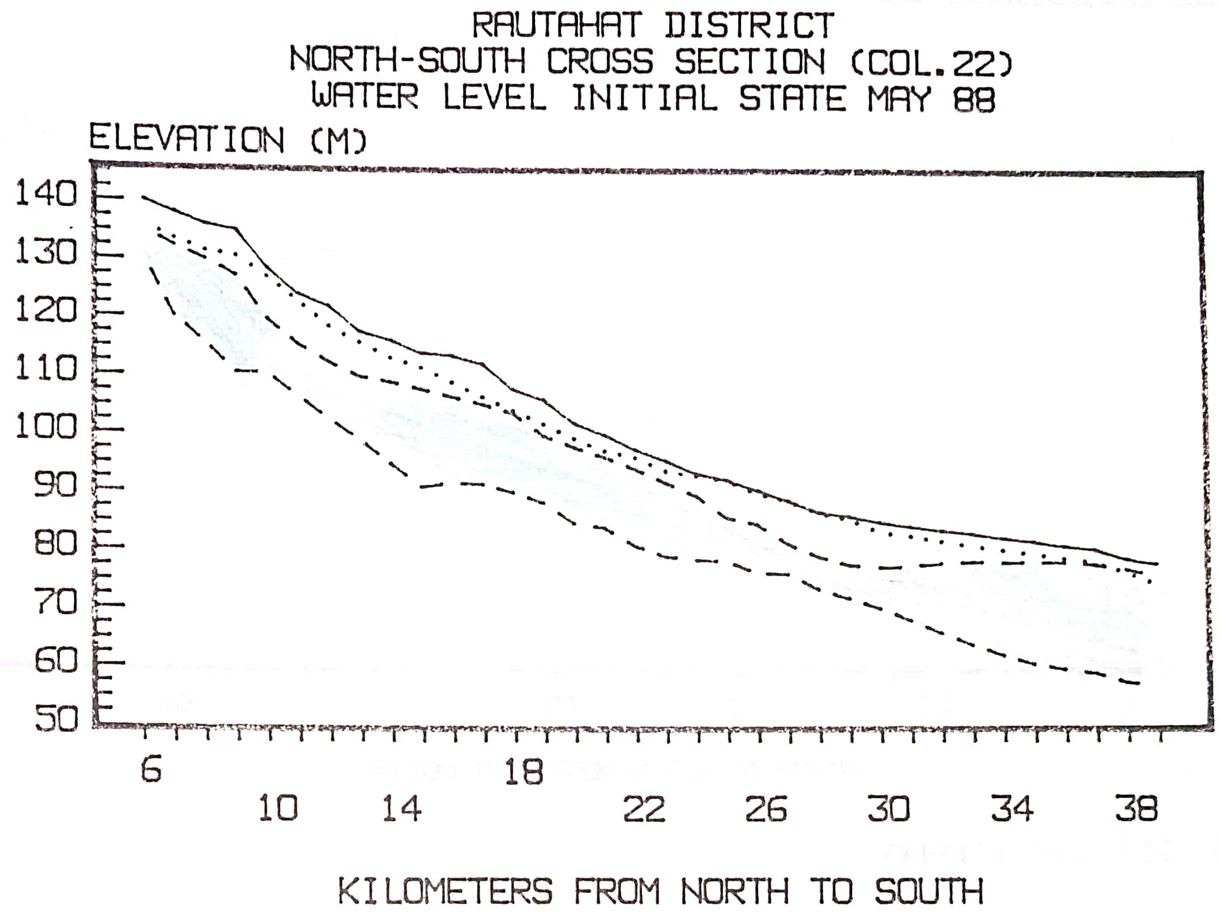
STEP	ITER	MAX. ERROR I	J	E	ERROR	PUMPING	RECHARGE	EVAP.
1	1	14	1	6.48	340.37	8600.	-410450.	230585.
1	2	19	3	0.62	54.05	8600.	-410450.	230585.
1	3	19	4	0.13	26.92	8600.	-410450.	230585.
1	4	19	3	0.11	18.29	8600.	-410450.	230585.
1	5	1	50	0.04	13.49	8600.	-410450.	230585.
1	6	3	44	0.04	10.75	8600.	-410450.	230585.
1	7	3	32	0.02	8.92	8600.	-410450.	230585.
1	8	2	27	0.03	7.81	8600.	-410450.	230585.
1	9	3	32	0.02	7.08	8600.	-410450.	230585.
1	10	2	27	0.02	6.67	8600.	-410450.	230585.
1	11	3	32	0.02	6.46	8600.	-410450.	230585.
1	12	2	25	0.02	6.28	8600.	-410450.	230585.
1	13	3	32	0.01	6.24	8600.	-410450.	230585.
1	14	2	25	0.02	6.11	8600.	-410450.	230585.
1	15	3	32	0.01	6.09	8600.	-410450.	230585.
1	16	2	25	0.02	5.96	8600.	-410450.	230585.
1	17	3	32	0.01	5.95	8600.	-410450.	230585.
1	18	2	25	0.02	5.81	8600.	-410450.	230585.
1	19	3	32	0.01	5.82	8600.	-410450.	230585.
1	20	2	25	0.02	5.68	8600.	-410450.	230585.
1	21	3	32	0.01	5.68	8600.	-410450.	230585.
1	22	2	25	0.02	5.54	8600.	-410450.	230585.
1	23	3	32	0.01	5.55	8600.	-410450.	230585.
1	24	2	25	0.02	5.41	8600.	-410450.	230585.
1	25	3	32	0.01	5.42	8600.	-410450.	230585.
1	26	2	25	0.02	5.28	8600.	-410450.	230585.
1	27	3	32	0.01	5.29	8600.	-410450.	230585.
1	28	2	25	0.01	5.15	8600.	-410450.	230585.
1	29	3	32	0.01	5.16	8600.	-410450.	230585.
1	30	2	25	0.01	5.02	8600.	-410450.	230585.
1	31	3	32	0.01	5.04	8600.	-410450.	230585.
1	32	2	25	0.01	4.90	8600.	-410450.	230585.
1	33	3	32	0.01	4.91	8600.	-410450.	230585.
1	34	2	25	0.01	4.78	8600.	-410450.	230585.
1	35	3	32	0.01	4.79	8600.	-410450.	230585.
1	36	2	25	0.01	4.66	8600.	-410450.	230585.
1	37	3	32	0.01	4.67	8600.	-410450.	230585.
1	38	2	25	0.01	4.54	8600.	-410450.	230585.
1	39	3	32	0.01	4.56	8600.	-410450.	230585.
1	40	2	25	0.01	4.43	8600.	-410450.	230585.
1	41	3	32	0.01	4.45	8600.	-410450.	230585.
1	42	2	25	0.01	4.31	8600.	-410450.	230585.
1	43	3	32	0.01	4.34	8600.	-410450.	230585.
1	44	2	25	0.01	4.21	8600.	-410450.	230585.
1	45	3	32	0.01	4.23	8600.	-410450.	230585.
1	46	2	25	0.01	4.10	8600.	-410450.	230585.
1	47	3	32	0.01	4.12	8600.	-410450.	230585.
1	48	2	25	0.01	4.00	8600.	-410450.	230585.



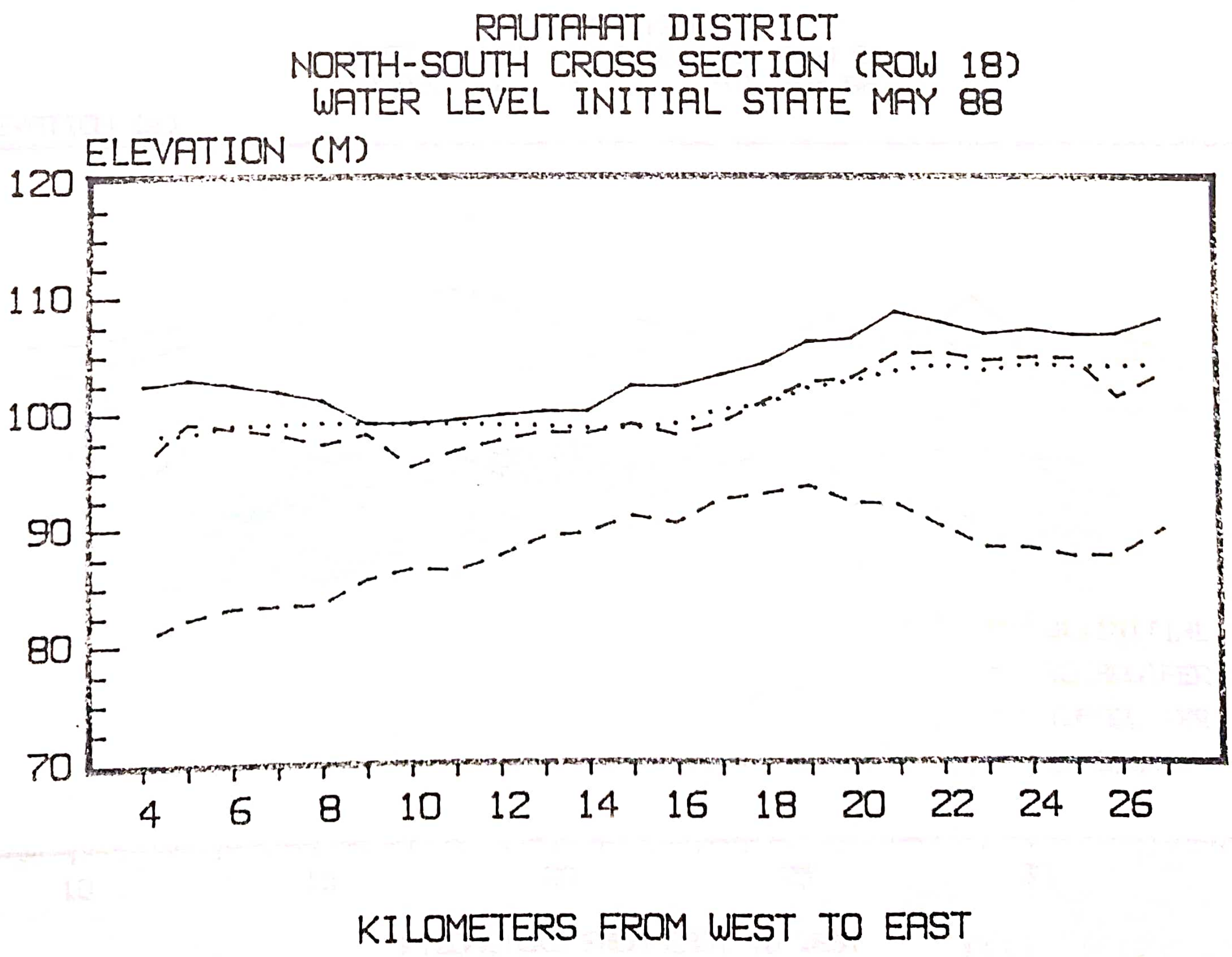
APPENDIX 25



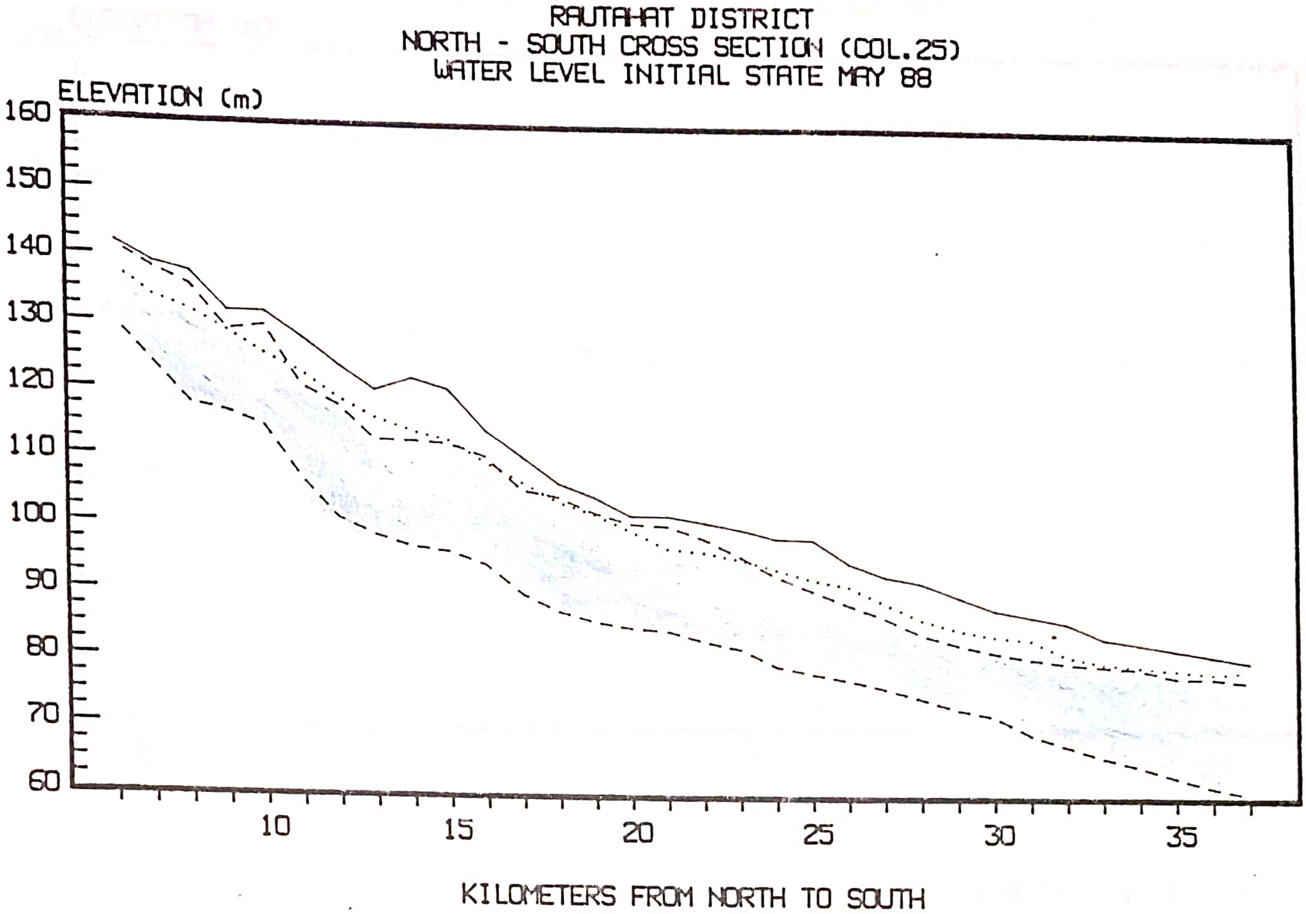
APPENDIX 26



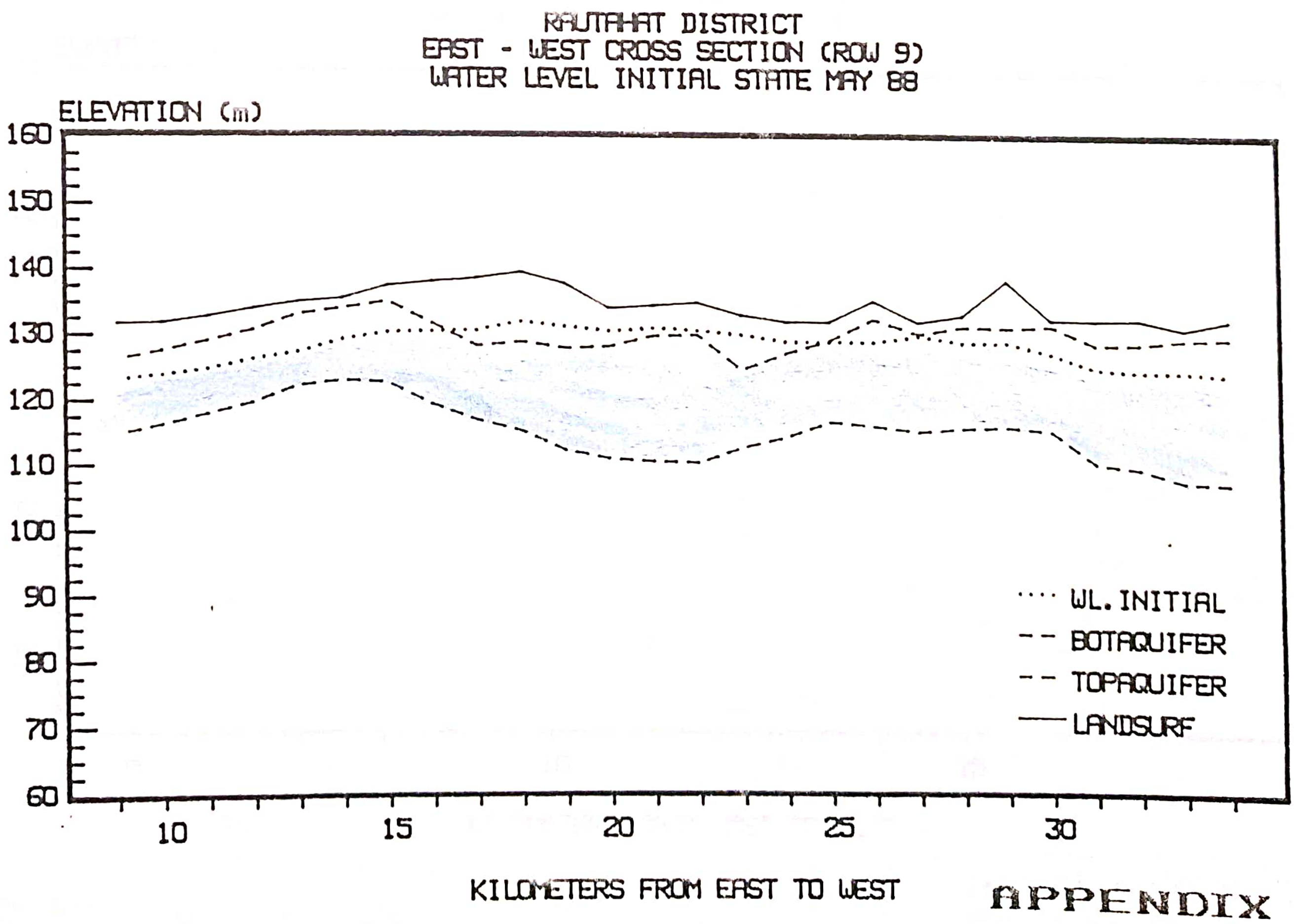
APPENDIX 27



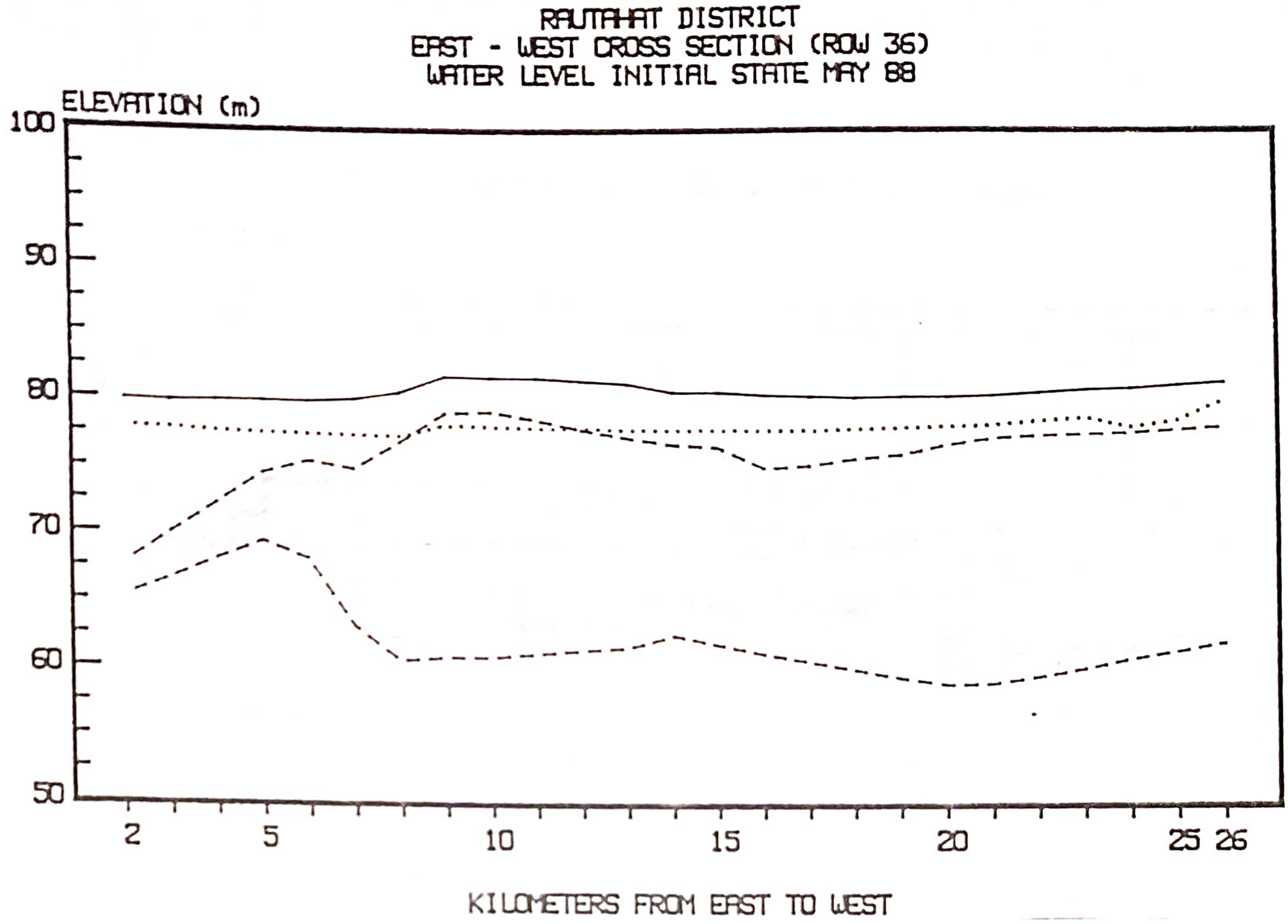
APPENDIX 28



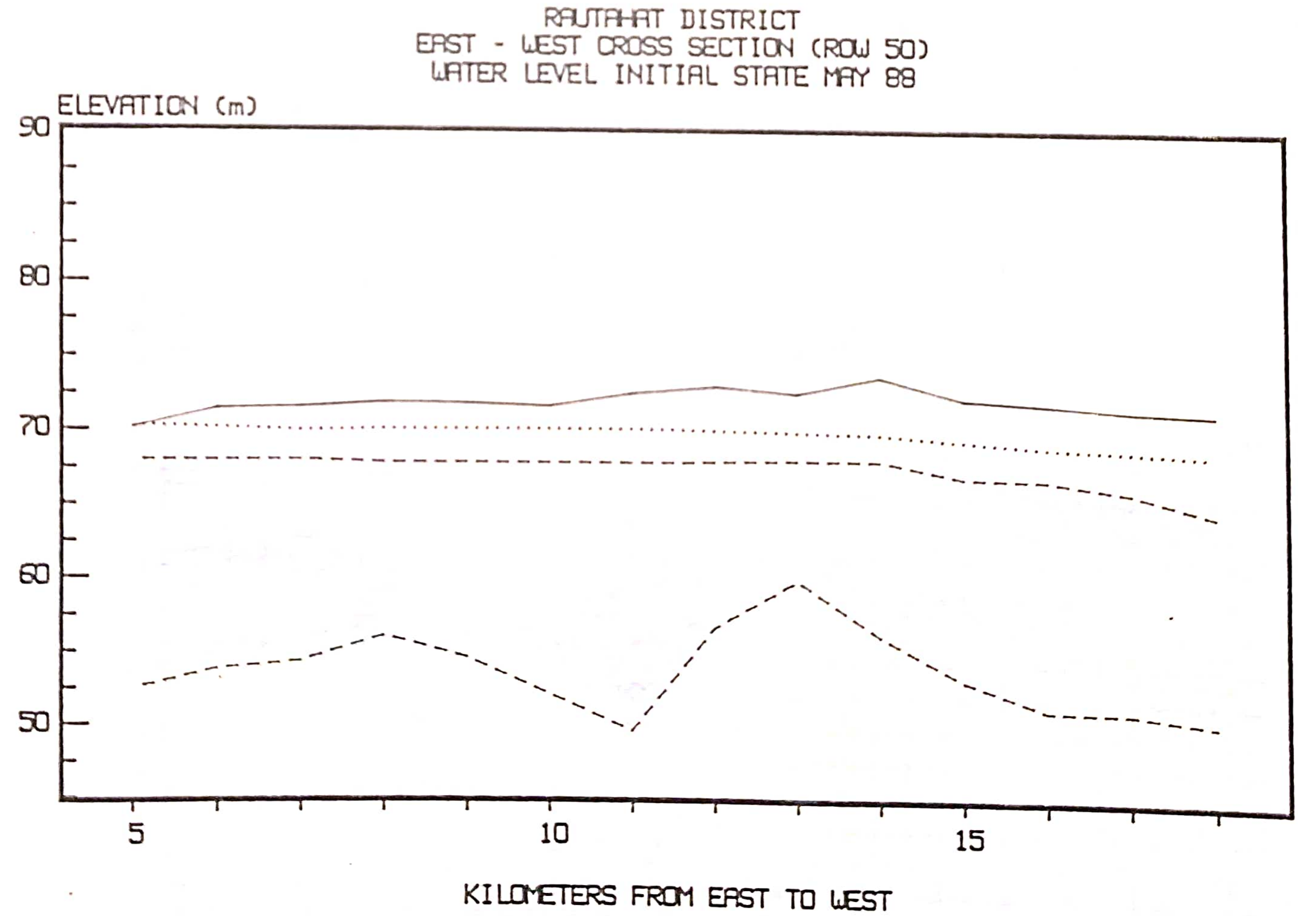
APPENDIX 29



APPENDIX 30

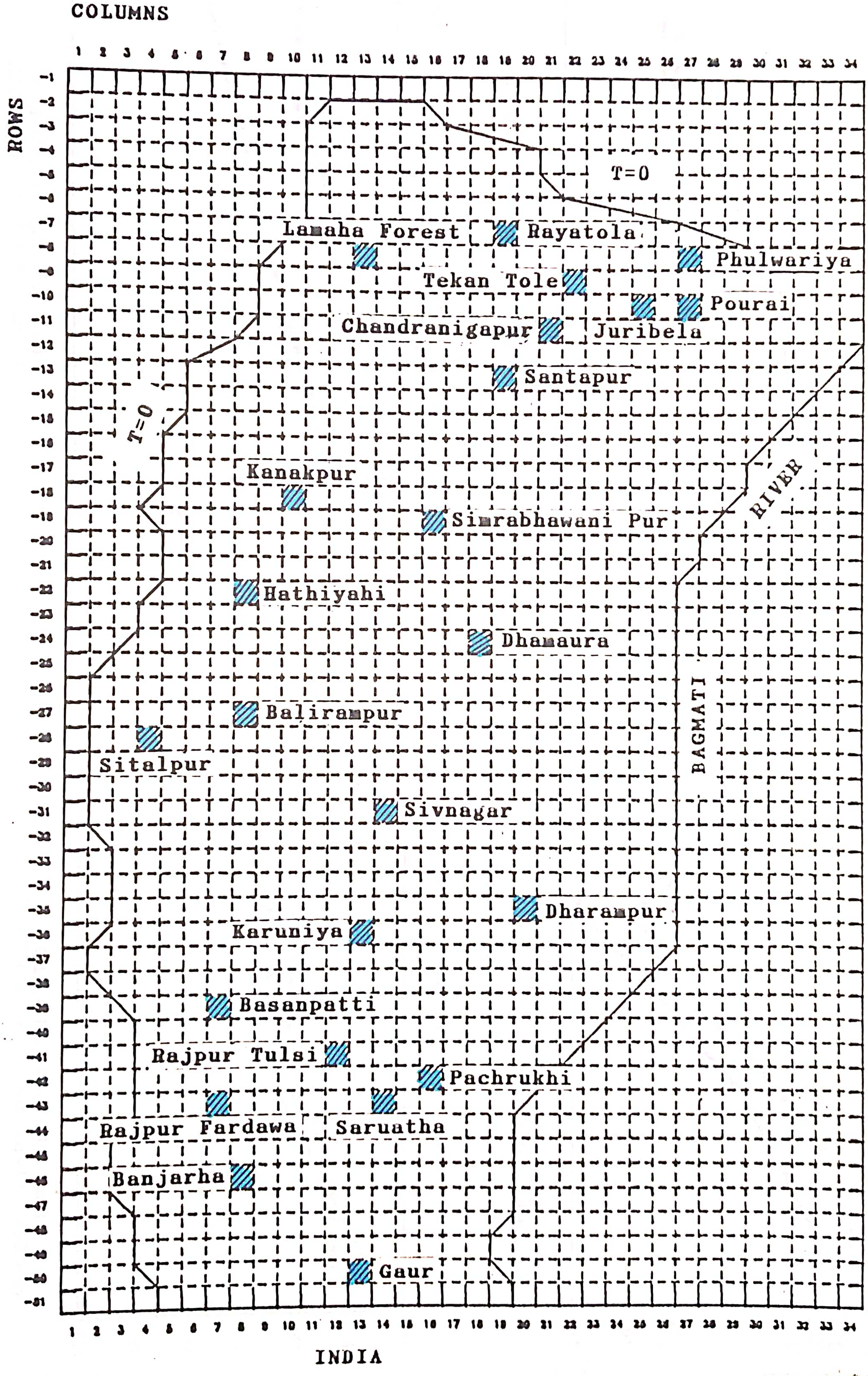


APPENDIX 31



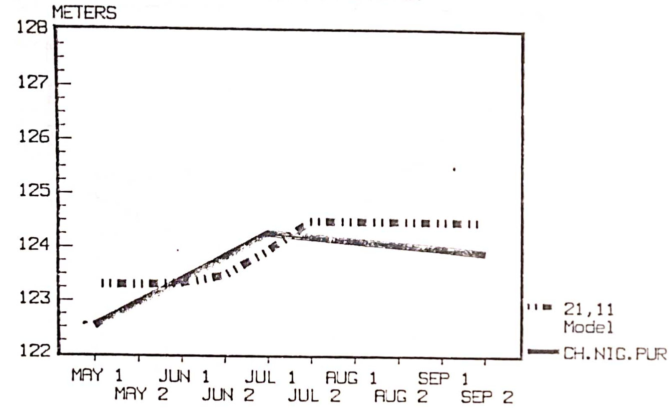
APPENDIX 32

LOCATION OF WELLS USED IN CALIBRATION

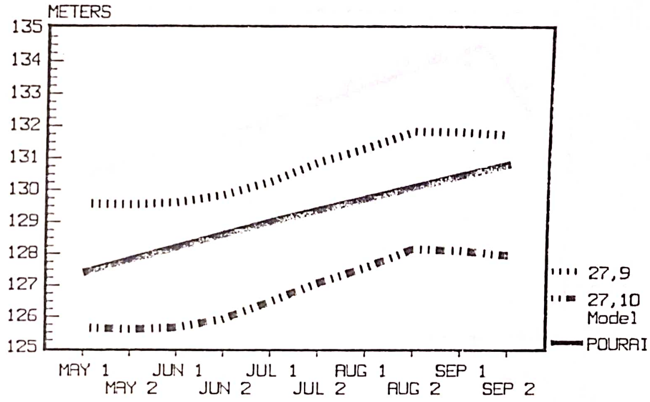


APPENDIX 34

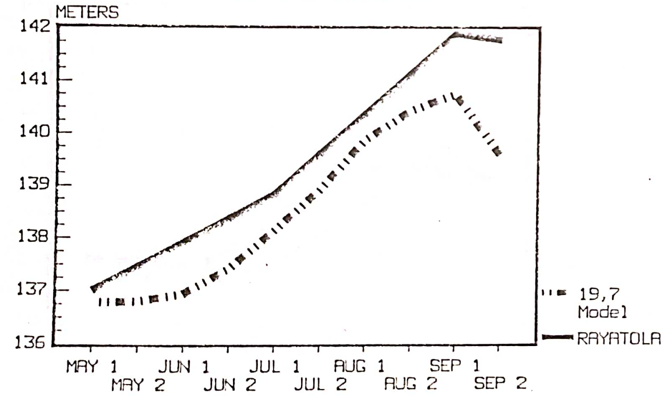
NEP/86/025 HYDROGRAPH CHANDR.NIGAR PUR
MAY - SEP 1988 (RAUTAHAT)



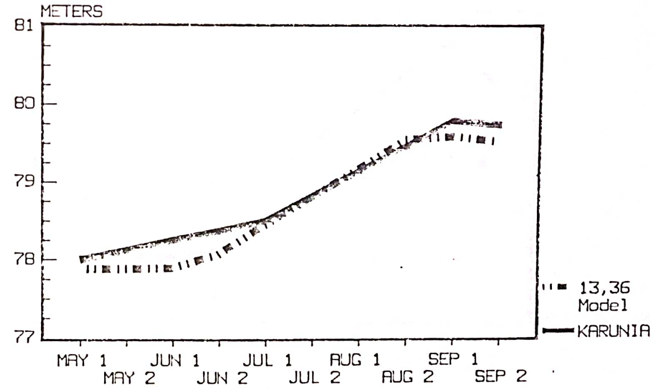
NEP/86/025 HYDROGRAPH POURAI
MAY - SEP 1988 (RAUTAHAT)



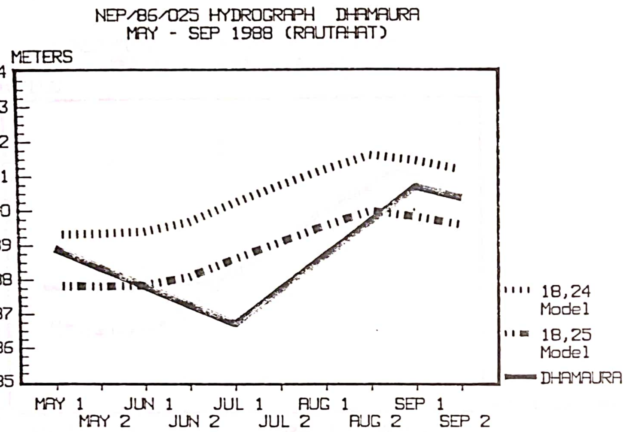
NEP/86/025 HYDROGRAPH RAYATOLA
MAY - SEP 1988 (RAUTAHAT)

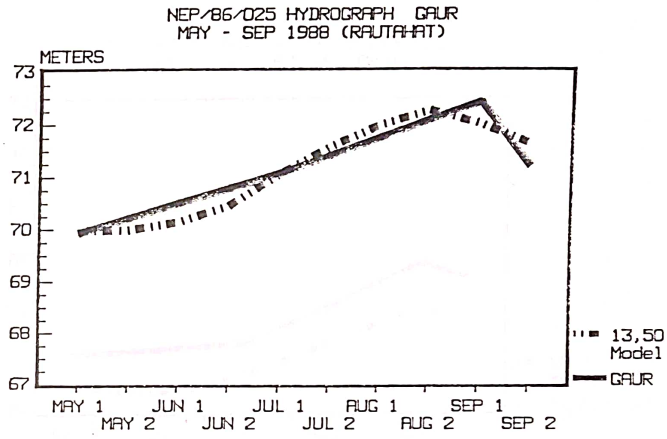


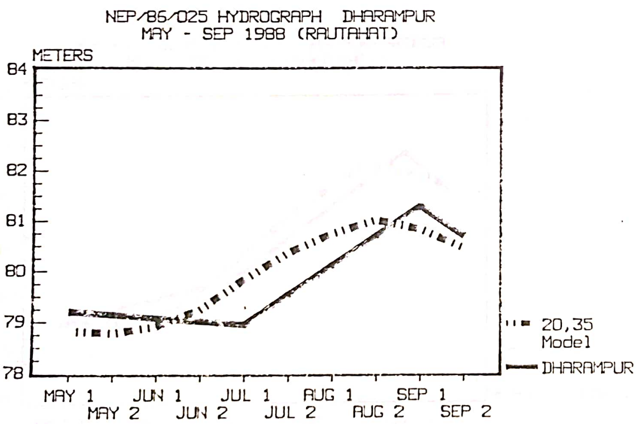
NEP/86/025 HYDROGRAPH KARUNIA
MAY - SEP 1988 (RAUTAHAT)

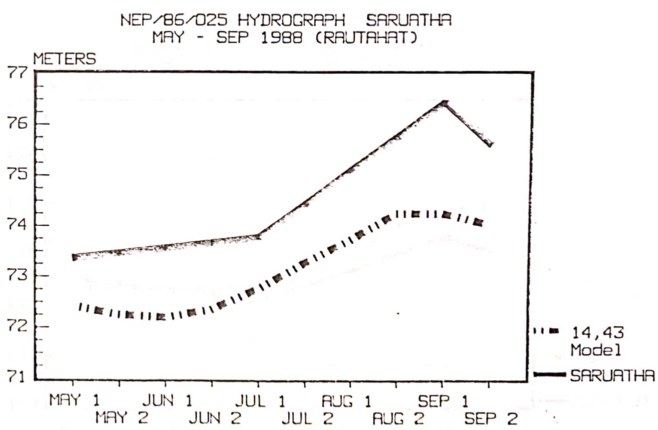


APPENDIX 3E


NEP/86/025 HYDROGRAPH DHAMAURA
MAY - SEP 1988 (RAUTAHAT)
METERS
94
93
92
91
90
89
88
87
86
85
MAY 1
JUN 1
JUL 1
AUG 1
SEP 1
MAY 2
JUN 2
JUL 2
AUG 2
SEP 2
18,24
Model
18,25
Model
DHAMAURA

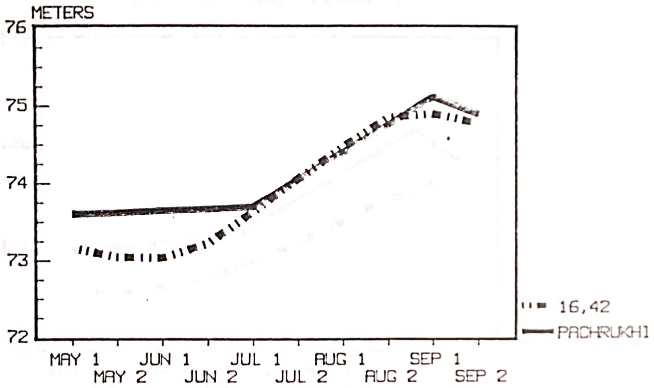

NEP/86/025 HYDROGRAPH GAUR
MAY - SEP 1988 (RAUTAHAT)
METERS
73
72
71
70
69
68
67
MAY 1
JUN 1
JUL 1
AUG 1
SEP 1
MAY 2
JUN 2
JUL 2
AUG 2
SEP 2
13,50
Model
GAUR


NEP/86/025 HYDROGRAPH DHARAMPUR
MAY - SEP 1988 (RAUTAHAT)
METERS
84
83
82
81
80
79
78
MAY 1
JUN 1
JUL 1
AUG 1
SEP 1
MAY 2
JUN 2
JUL 2
AUG 2
SEP 2
20,35
Model
DHARAMPUR

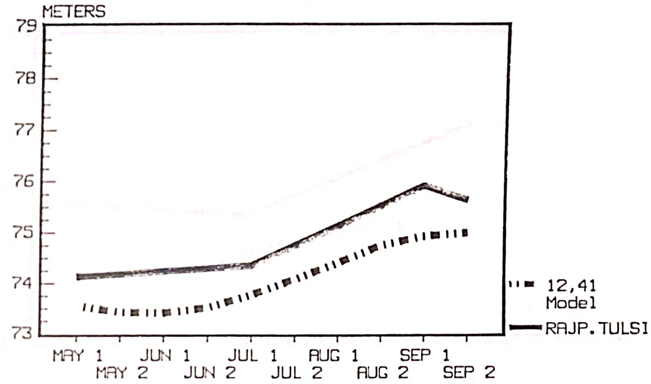

NEP/86/025 HYDROGRAPH SARUATHA
MAY - SEP 1988 (RAUTAHAT)
METERS
77
76
75
74
73
72
71
MAY 1
JUN 1
JUL 1
AUG 1
SEP 1
MAY 2
JUN 2
JUL 2
AUG 2
SEP 2
14,43
Model
SARUATHA

APPENDIX 3G

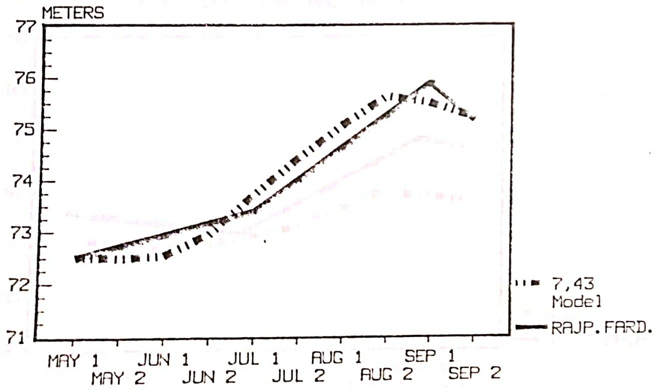
NEP/86/025 HYDROGRAPH PACHRUKHI
MAY - SEP 1988 (RAUTAHAT)



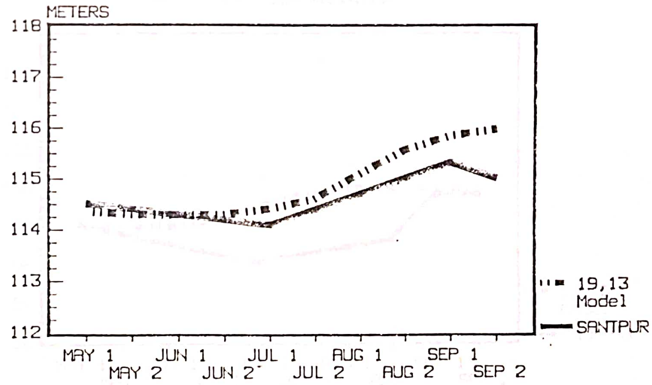
NEP/86/025 HYDROGRAPH RAJPURTULSI
MAY - SEP 1988 (RAUTAHAT)



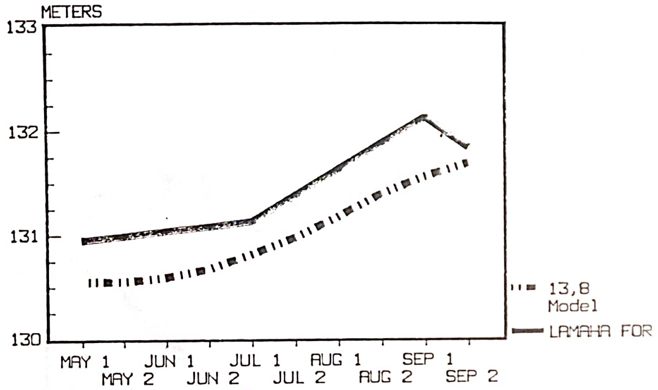
NEP/86/025 HYDROGRAPH RAJPURFARDAWA
MAY - SEP 1988 (RAUTAHAT)



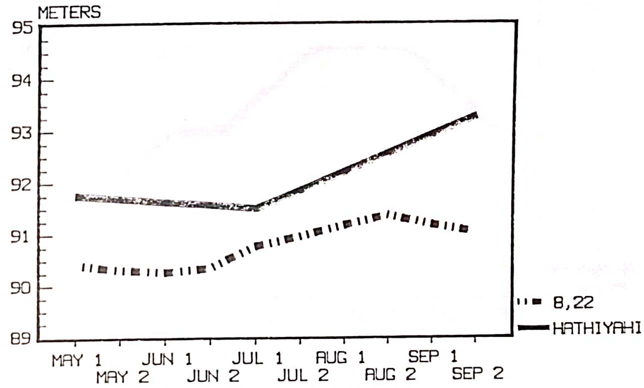
NEP/86/025 HYDROGRAPH SANTPUR
MAY - SEP 1988 (RAUTAHAT)



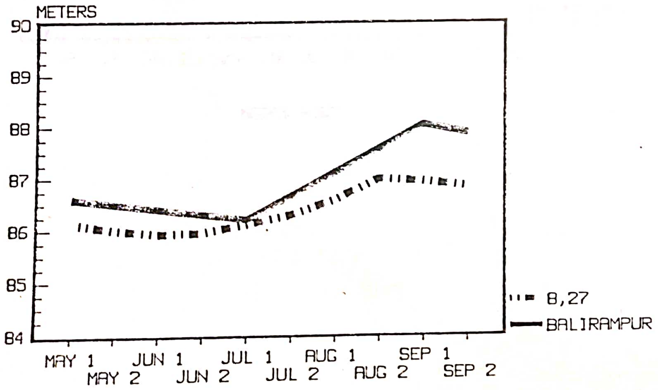
NEP/86/025 HYDROGRAPH LAMAHA FOREST
MAY - SEP 1988 (RAUTAHAT)



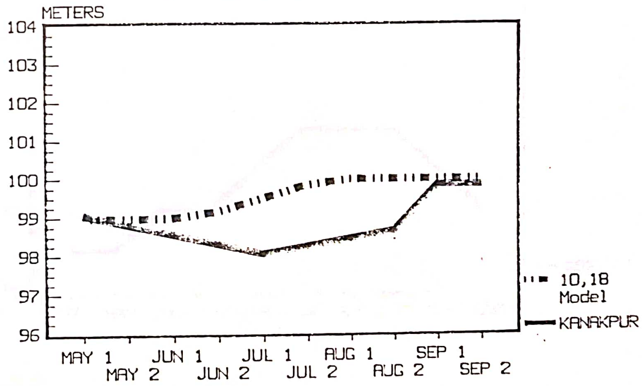
NEP/86/025 HYDROGRAPH HATHIYAHI
MAY - SEP 1988 (RAUTAHAT)



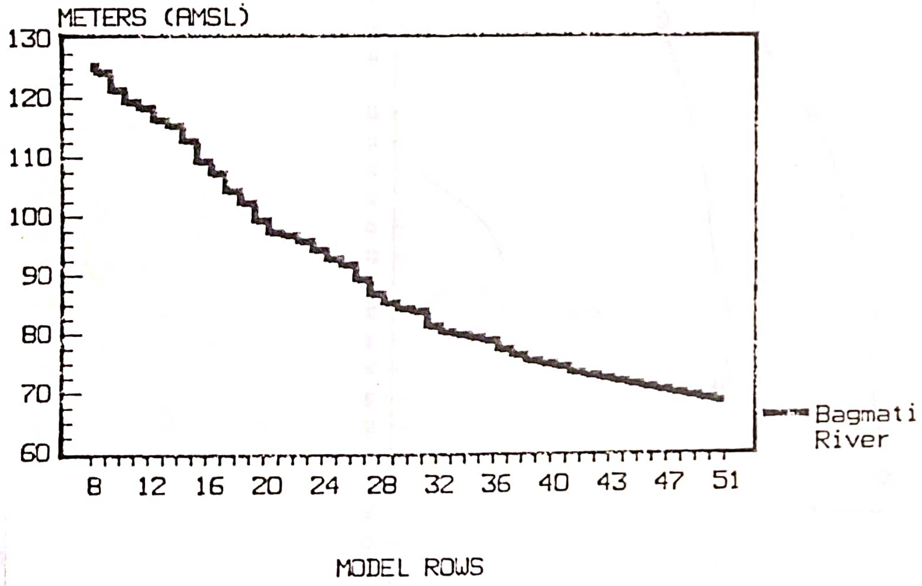
NEP/86/025 HYDROGRAPH BALIRAMPUR
MAY - SEP 1988 (RAUTAHAT)



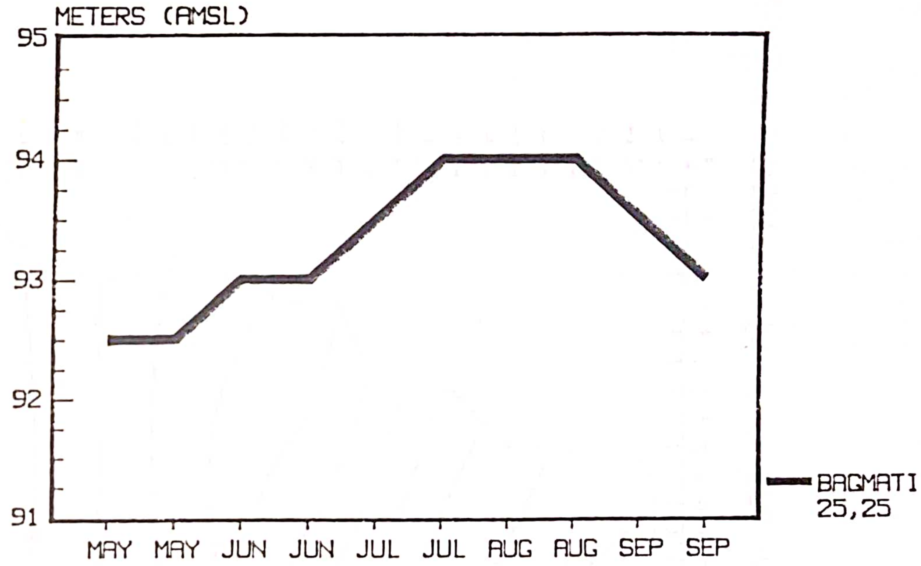
NEP/86/025 HYDROGRAPH KANAKPUR
MAY - SEP 1988 (RAUTAHAT)



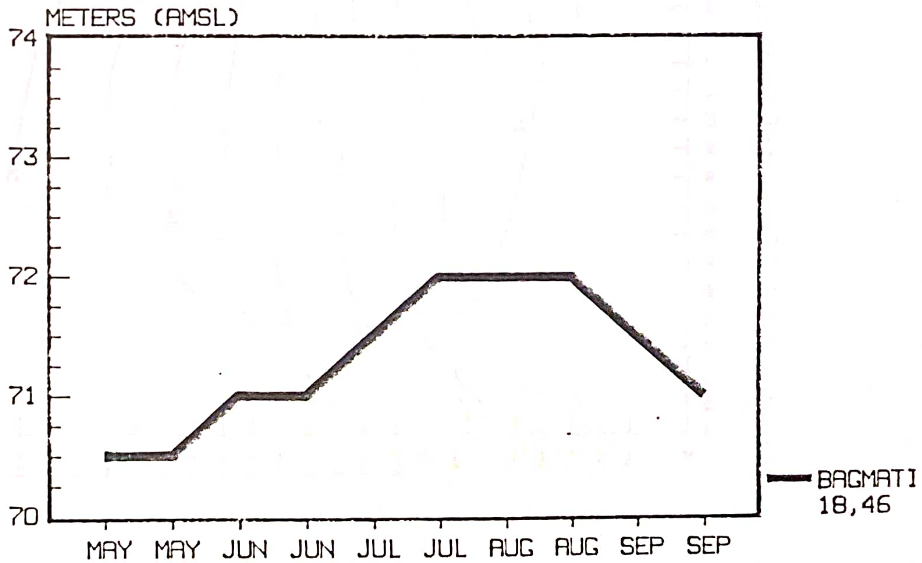
RAUTAHAT MODEL - MAY 1988
BAGMATI RIVER ELEVATION (NORTH TO SOUTH)



RAUTAHAT MODEL: BAGMATI RIVER HYDROGRAPH
MODEL CELL 25,25

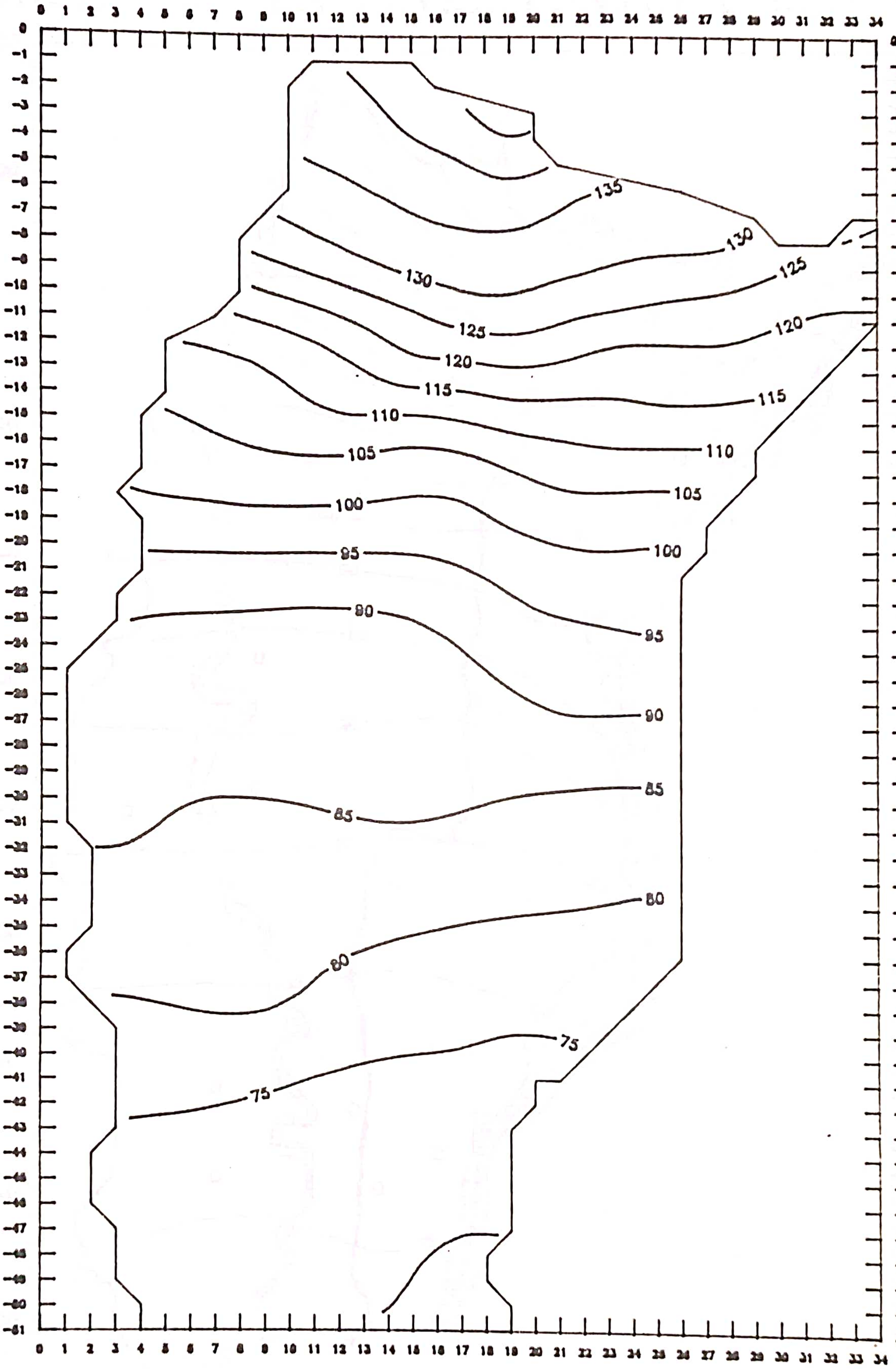


RAUTAHAT MODEL: BAGMATI RIVER
CELL 18,46

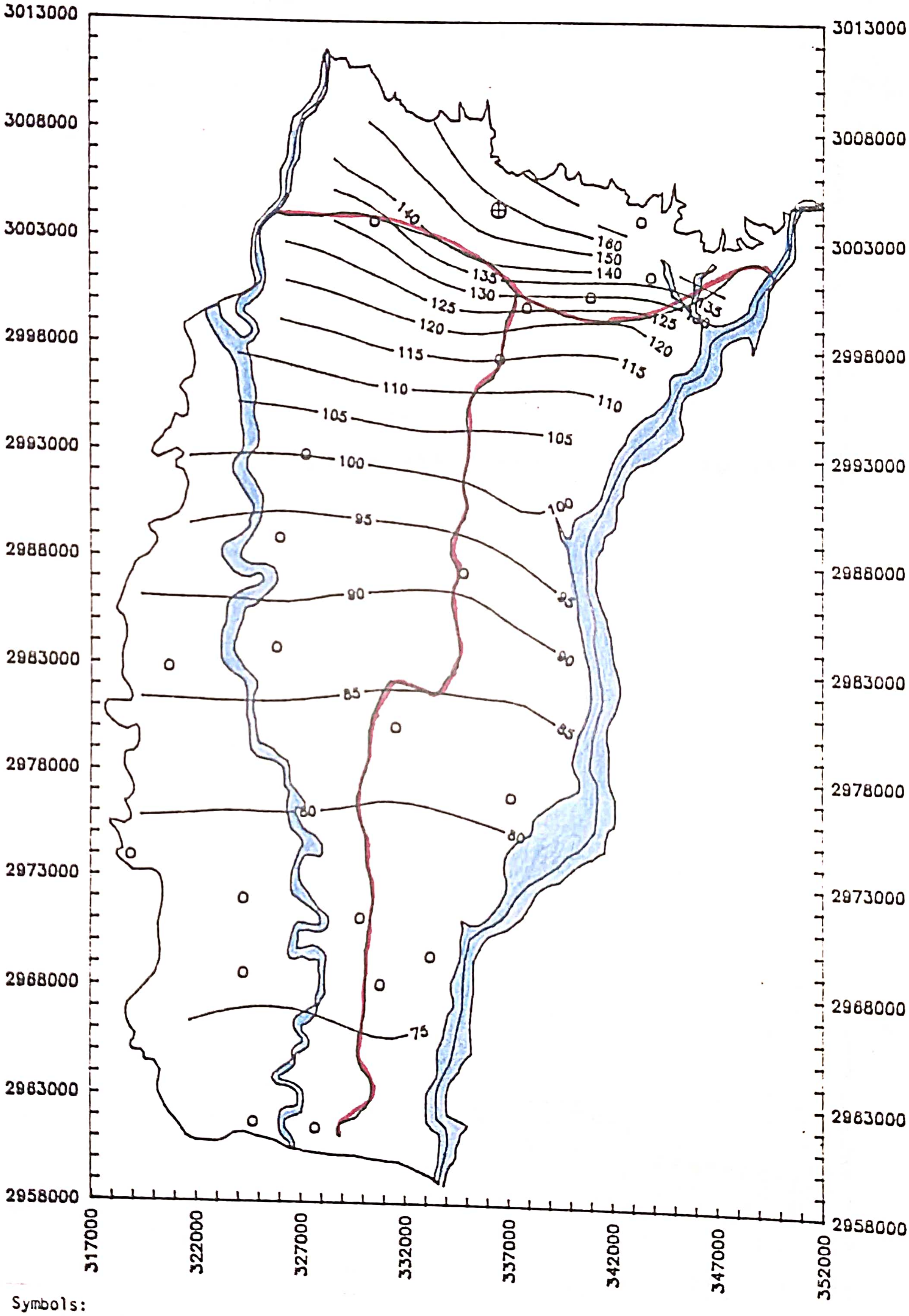


APPENDIX 38

RAUTAHAT MODEL – FINAL LEVELS IN SEPTEMBER 1988 – CALIBRATION RUN



RAUTAHAT WATER LEVEL CONTOUR MAP SEP 1988



Symbols:

Circle with Cross: Dugwells

Circle: Shallow Tube Wells

APPENDIX 40

```
0.005 0.006 0.01 0.02 0.03 0.04 0.05 0.07 0.10 1E21
  1              222
  2             22222
  3             222222111
  4             222222111
  5             2222221111
  6            2222222111112222
  7            22222221111112222222
  8           2222222211112222222222   29
  9           222222222112222222222222229
 10           2222222222222222222222229
 11          22222222223333333322222222229
 12        222222222233366333322222229
 13        2222222224778887766655559
 14        222222222556888887766666669
 15       22222222666677777766555559
 16       333556666667777777665559
 17       33355666666777777766655549
 18      33335666666777777776665549
 19       33366666663222222222229
 20       22266666622222222222229
 21       1111122222222222222229
 22      111111222222333333322229
 23      22111222222233333322229
 24     2222222222222233333322229
 25    222221111222223333322229
 26    22221111122222333333322229
 27    22211111112222222222222229
 28    22221111122222222222222229
 29    222222222222222222222229
 30    222222222222222222222229
 31    222222222222222222222229
 32     2222222222222222222229
 33     2222222222222222222229
 34     222222222222222333333229
 35     2222233444442233333339
 36    222222222444442233332229
 37    2222222334444442222222229
 38     222222222233222222229
 39      2222222233322222229
 40      222225577766666699
 41      22223377777777779
 42      2233355777788889
 43      22233226666663669
 44     222222255555552669
 45     22222222222222669
 46     222222222222229
 47      22222222222229
 48      2222222222229
 49      2222222222229
 50       2222222222229
 51       2222222222229
123451234567890123456789012345678901234
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STORAGE COEFFICIENT DATA FILE
(CONFINED CONDITIONS)

1 = 0.006
2 = 0.01
3 = 0.02
4 = 0.03
5 = 0.04
6 = 0.05
7 = 0.07
8 = 0.10
9 = CONSTANT-HEAD
(Extremely large storage coefficient)


```
0.16 0.08 0.10 0.12 0.14 0.16 0.18 0.20 0.25 1E21
  1             555
  2            55555
  3            555555444
  4            555555444
  5            5555553333
  6           555555532223555
  7           555555332223355555
  8          555555553222335533333   59
  9          5555555555533333333335559
 10          555555555333333333335559
 11         5555555555333333333335559
 12       55555555555555333335555559
 13       555555555555555555555559
 14       55555555555555555555559
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 20      554444455555555555559
 21      55444445555555555559
 22     555444445555555555559
 23     555444445555555555559
 24    5555555555555555555559
 25   55555555555555555555559
 26   22222222255555555555559
 27   222222222255555555555559
 28   2222222222222555555559
 29   22222222225555555555559
 30   3333333333555555555555559
 31   3333333333355555555555559
 32    333333333333555555555559
 33    55555555555555555555559
 34    55555555555555555555559
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 47     555555555555559
 48     55555555555559
 49     55555555555559
 50      5555555555559
 51      5555555555559
123451234567890123456789012345678901234
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STORAGE COEFFICIENT FILE
EFFECTIVE POROSITY

1 = 0.08
2 = 0.10
3 = 0.12
4 = 0.14
5 = 0.16
6 = 0.18
7 = 0.20
8 = 0.25
9 = CONSTANT HEAD
(Extremely high storage coeff.)

DEPTH TO WATER TABLE IN SEPTEMBER 1988 - MODEL OUTPUT

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1	****	****	****	****	****	****	****	****	****	****	****	7.4	4.7	5.5	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****
2	****	****	****	****	****	****	****	****	****	****	4.8	6.4	6.4	6.1	3.7	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****
3	****	****	****	****	****	****	****	****	****	****	4.3	7.4	8.6	7.8	4.2	5.0	3.0	6.4	8.0	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****
4	****	****	****	****	****	****	****	****	****	****	5.2	6.7	7.3	6.7	4.6	5.4	4.2	5.4	6.9	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****
5	****	****	****	****	****	****	****	****	****	****	7.7	7.3	7.3	8.2	6.7	5.0	5.4	7.1	6.8	7.8	****	****	****	****	****	****	****	****	****	****	****	****	****	****
6	****	****	****	****	****	****	****	****	****	9.5	8.5	6.5	8.6	8.0	4.0	4.2	6.2	5.6	5.7	5.2	2.4	1.1	3.6	7.1	2.3	****	****	****	****	****	****	****	****	****
7	****	****	****	****	****	****	****	****	****	9.1	7.3	7.0	4.9	6.4	5.5	7.6	10.7	7.3	5.4	6.8	5.6	1.6	2.2	2.5	3.2	6.0	7.3	5.9	****	****	****	****	****	****
8	****	****	****	****	****	****	****	****	9.1	8.1	6.8	8.6	10.3	7.1	5.2	5.6	5.3	4.9	3.7	4.9	6.6	1.0	2.6	3.1	3.8	4.9	3.5	2.8	5.0	****	****	****	6.5	7.5
9	****	****	****	****	****	****	****	****	7.6	7.0	7.1	7.2	6.4	4.7	5.0	4.9	4.9	5.0	3.0	0.0	0.3	1.2	0.1	0.0	0.3	3.9	0.3	1.8	2.3	4.1	5.9	7.2	6.0	8.0
10	****	****	****	****	****	****	****	****	7.2	5.7	4.8	6.5	6.1	7.5	6.8	5.7	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	3.0	3.4	4.4	3.7	6.4	5.7	5.6	5.5	****
11	****	****	****	****	****	****	****	8.3	8.1	7.4	7.3	7.3	8.1	7.1	5.9	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7	3.2	1.3	0.9	2.9	6.7	8.8	6.8	6.4	5.6	****
12	****	****	****	****	****	4.3	5.8	5.3	4.0	4.2	4.3	1.2	1.1	1.7	3.5	2.1	0.5	1.0	0.0	0.0	0.1	2.0	3.5	4.2	3.0	3.6	2.3	1.2	3.9	8.3	6.9	3.5	****	****
13	****	****	****	****	****	4.7	4.4	2.9	0.0	2.4	2.1	2.3	1.0	2.0	2.4	2.5	1.5	0.8	0.0	0.0	0.0	0.0	2.5	6.3	2.1	3.9	1.3	1.3	3.3	7.5	3.7	****	****	****
14	****	****	****	****	****	3.9	2.6	1.3	0.0	1.2	1.1	1.4	3.1	3.4	3.3	2.7	1.5	1.4	0.9	0.7	1.6	1.3	4.2	5.9	6.0	5.8	1.4	1.6	2.4	2.5	****	****	****	****
15	****	****	****	****	4.8	1.3	1.9	2.4	0.1	0.3	0.7	1.2	1.8	3.2	3.4	2.0	1.5	2.5	3.4	5.5	4.4	1.3	4.4	5.2	6.2	4.4	2.6	3.0	1.3	****	****	****	****	****
16	****	****	****	****	4.5	3.3	2.0	0.8	0.3	0.0	0.4	0.9	1.4	1.5	2.0	1.9	2.9	4.1	7.5	9.4	6.4	3.5	2.6	3.3	3.7	3.1	1.7	4.4	****	****	****	****	****	****
17	****	****	****	****	4.0	3.0	2.1	0.1	0.0	0.0	0.0	0.8	0.2	0.8	1.6	1.7	2.3	3.9	5.5	6.0	4.6	5.1	3.2	2.3	3.4	1.7	1.1	3.4	****	****	****	****	****	****
18	****	****	****	0.7	1.3	1.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.1	2.4	2.1	2.5	2.7	3.6	2.7	4.2	3.0	1.8	2.2	1.8	2.1	3.5	****	****	****	****	****	****	****
19	****	****	****	****	2.0	1.6	1.1	1.3	0.0	0.0	0.5	0.0	0.1	1.1	0.9	0.0	1.1	1.4	2.4	1.8	3.3	3.4	3.0	2.0	1.9	2.4	****	****	****	****	****	****	****	****
20	****	****	****	****	0.8	0.6	0.6	0.3	1.9	1.8	1.6	0.0	0.0	0.0	0.0	0.0	0.5	1.7	1.7	1.8	1.5	1.5	2.2	2.3	1.6	4.2	****	****	****	****	****	****	****	****
21	****	****	****	****	1.8	1.7	1.7	2.4	3.6	3.5	3.1	1.0	0.0	0.0	0.1	0.0	0.1	1.1	2.1	2.1	2.3	1.4	0.6	1.8	4.5	****	****	****	****	****	****	****	****	****
22	****	****	****	2.9	2.0	1.7	2.6	2.6	2.1	2.2	1.7	0.8	0.0	0.0	0.0	0.0	0.0	1.0	0.9	1.1	0.8	0.6	0.0	1.4	4.0	****	****	****	****	****	****	****	****	****
23	****	****	****	2.0	2.6	2.4	2.3	2.6	2.8	2.8	2.7	1.4	1.0	0.7	0.4	0.6	0.7	0.2	1.0	1.4	1.3	0.2	0.0	1.8	4.0	****	****	****	****	****	****	****	****	****
24	****	****	2.1	2.3	2.0	2.1	2.3	2.6	2.6	2.9	2.7	0.4	0.3	0.4	0.6	0.4	1.1	0.7	0.0	0.0	0.0	0.0	0.0	0.6	4.1	****	****	****	****	****	****	****	****	****
25	****	2.5	2.5	2.6	2.7	2.9	2.9	2.2	2.9	2.3	2.3	1.8	0.2	0.0	0.0	0.1	0.7	1.4	0.0	0.0	0.0	0.0	0.0	0.7	5.5	****	****	****	****	****	****	****	****	****
26	****	1.8	2.0	2.4	2.3	2.4	2.7	2.9	2.0	0.9	0.3	0.0	0.0	0.0	0.1	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.3	1.1	3.0	****	****	****	****	****	****	****	****	****
27	****	2.0	2.3	2.6	2.9	3.0	2.1	2.3	1.3	1.5	0.7	0.0	0.0	0.0	0.0	0.7	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.2	3.5	****	****	****	****	****	****	****	****	****
28	****	1.3	1.6	1.1	2.3	2.5	2.8	2.3	1.7	1.2	0.5	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.8	1.2	5.0	****	****	****	****	****	****	****	****	****
29	****	1.2	1.0	1.8	2.4	2.9	2.2	2.3	1.7	1.2	0.6	1.0	1.2	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	4.5	****	****	****	****	****	****	****	****	****
30	****	0.0	0.0	0.0	0.0	2.2	2.5	2.4	2.1	1.5	1.8	1.2	0.6	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.2	0.0	0.0	3.5	****	****	****	****	****	****	****	****	****
31	****	0.0	0.0	0.0	0.0	1.6	2.3	2.4	3.3	2.6	2.2	1.6	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.7	0.0	0.2	3.0	****	****	****	****	****	****	****	****	****
32	****	****	0.0	0.0	0.0	0.3	1.2	1.6	1.6	3.2	2.8	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.9	1.2	1.9	4.5	****	****	****	****	****	****	****	****	****
33	****	****	0.0	0.0	0.0	0.3	1.2	1.8	2.9	3.5	3.1	0.0	0.0	0.0	0.0	0.2	0.3	0.0	0.0	0.3	0.6	1.0	1.6	2.3	3.2	****	****	****	****	****	****	****	****	****
34	****	****	0.0	0.0	0.6	1.3	2.0	2.7	2.8	3.5	3.1	0.5	0.0	0.0	0.0	0.2	0.0	0.0	0.3	0.3	0.6	0.9	1.3	2.1	2.9	****	****	****	****	****	****	****	****	****
35	****	****	0.0	0.0	0.2	1.0	1.9	2.9	3.7	3.4	2.9	1.4	0.9	0.4	0.9	0.6	0.4	0.4	0.8	1.0	1.0	1.1	1.4	1.9	2.5	****	****	****	****	****	****	****	****	****
36	****	0.7	0.0	0.1	0.4	0.7	1.1	1.7	3.0	2.8	2.5	2.1	1.7	0.9	0.9	0.7	0.6	0.6	0.8	0.9	1.1	1.4	1.8	2.1	2.1	****	****	****	****	****	****	****	****	****
37	****	0.2	0.0	0.0	0.0	0.4	0.0	0.8	2.0	2.1	1.9	1.6	1.4	0.8	0.7	0.7	0.9	1.0	1.3	1.4	1.6	2.0	2.5	2.6	****	****	****	****	****	****	****	****	****	****
38	****	****	0.4	0.5	0.0	0.0	0.5	1.4	1.3	1.3	0.9	1.2	1.1	1.0	0.8	0.9	1.3	1.5	0.7	0.7	1.0	1.7	2.9	****	****	****	****	****	****	****	****	****	****	****
39	****	****	****	0.2	0.2	0.0	0.0	0.0	0.6	0.0	0.3	0.6	0.5	0.9	0.6	0.9	1.3	0.5	1.0	1.4	1.6	2.0	****	****	****	****	****	****	****	****	****	****	****	****
40	****	****	****	0.7	0.0	0.0	0.3	0.0	0.1	0.3	0.5	0.0	0.6	0.7	0.5	0.6	0.4	0.9	1.6	3.2	2.8	****	****	****	****	****	****	****	****	****	****	****	****	****
41	****	****	****	1.3	0.2	0.0	0.0	0.7	1.4	2.2	2.1	2.0	0.9	0.8	0.4	0.3	0.2	0.8	2.9	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****
42	****	****	****	1.2	0.3	0.2	0.6	1.4	2.0	1.2	1.3	1.2	1.2	1.1	0.7	1.1	0.3	1.0	3.0	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****
43	****	****	****	0.6	0.4	0.6	1.3	1.6	0.9	1.1	1.1	1.2	1.2	1.5	1.3	1.1	1.4	3.2	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****
44	****	****	0.2	0.1	0.0	0.1	1.4	1.6	1.7	0.6	0.6	0.8	1.0	1.5	1.5	1.5	1.8	3.1	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****
45	****	****	0.9	0.9	1.0	1.2	1.3	1.3	1.3	1.1	1.2	0.5	0.8	1.2	1.3	1.4	1.7	3.1	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****
46	****	****	0.7	0.7	0.9	1.0	0.2	0.0	1.7	0.8	0.7	1.3	2.0	2.2	2.1	2.1	2.6	2.8	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****
47	****	****	****	0.7	0.7	0.0	0.0	0.8	0.0	0.8	1.0	1.7	2.3	2.5	2.3	1.9	3.0	2.3	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****
48	****	****	****	0.6	0.5	0.0	0.0	0.0	0.0	0.0	1.2	2.1	3.0	3.0	2.5	1.9	2.2	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****
49	****	****	****	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.7	1.4	1.1	2.6	2.0	1.6	2.2	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****
50	****	****	****	****	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.0	0.9	2.5	1.5	1.7	1.9	2.3	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****
51	****	****	****	****	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.8	0.7	0.0	1.2	1.7	2.7	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****	****
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34

WATER LEVELS IN SEPTEMBER 1988: MODEL OUTPUT (NUMERICAL)

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	143.9	141.0	142.6	144.5	146.8	155.0	155.0	155.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	144.0	138.6	139.7	141.6	143.9	146.6	148.2	155.0	155.0	155.0	156.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	142.0	137.7	138.1	139.4	142.1	143.7	145.6	147.4	149.4	151.6	152.3	155.0	155.0	155.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	139.0	136.8	137.0	137.7	138.7	142.0	143.5	145.1	146.8	148.8	149.7	155.0	155.0	155.0	155.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	136.0	135.8	136.1	136.7	137.9	140.1	141.3	142.3	143.8	145.3	146.1	147.4	155.0	155.0	155.0	155.0	155.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	132.0	132.2	133.6	134.5	135.4	136.3	138.0	139.5	140.3	141.2	142.3	141.8	139.7	138.9	139.4	139.3	139.7	141.0	142.0	142.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	129.0	130.6	131.6	132.5	133.7	134.8	135.7	136.9	138.0	138.7	139.6	139.2	137.5	136.4	135.8	135.5	135.8	136.0	136.7	138.1	139.1	0.0	0.0	0.0	128.0	127.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	126.0	125.9	127.7	129.0	130.3	131.7	133.1	134.2	135.0	136.0	136.7	137.3	137.1	135.8	135.0	134.4	133.9	133.9	134.1	134.5	134.5	134.4	132.9	131.5	131.0	127.0	125.5
0.0	0.0	0.0	0.0	0.0	0.0	0.0	123.0	124.2	125.0	125.9	127.0	128.8	131.0	132.6	133.3	133.8	134.6	134.8	134.0	134.2	133.8	132.9	132.0	131.7	131.5	131.7	131.4	130.3	128.4	126.5	125.4	125.0	124.5
0.0	0.0	0.0	0.0	0.0	0.0	0.0	121.0	120.1	120.7	121.4	122.3	123.6	125.2	127.6	129.8	130.5	130.9	129.7	130.5	130.5	128.5	127.0	127.0	128.5	128.4	127.9	127.5	126.3	124.6	123.3	122.4	121.5	122.4
0.0	0.0	0.0	0.0	0.0	115.0	116.0	112.7	115.0	116.1	116.6	116.8	117.5	118.6	120.1	122.2	124.0	125.4	125.9	124.6	124.5	124.0	125.5	125.3	125.1	125.0	124.6	124.1	123.3	122.2	121.2	120.6	119.5	119.5
0.0	0.0	0.0	0.0	114.0	108.7	109.2	110.7	112.0	112.8	113.2	113.2	113.9	115.3	116.7	118.0	118.4	117.8	117.9	118.5	119.9	119.9	120.0	120.4	121.2	121.6	121.9	121.7	121.1	120.2	119.1	118.5	119.1	0.0
0.0	0.0	0.0	0.0	112.0	108.2	108.5	109.0	109.0	110.0	110.5	110.9	111.7	112.8	113.4	113.1	112.7	113.2	116.0	117.1	118.0	117.5	117.4	117.8	118.3	119.0	119.6	119.7	119.3	118.4	116.5	117.7	0.0	0.0
0.0	0.0	0.0	0.0	110.0	107.4	107.8	108.2	108.4	108.9	109.2	109.4	109.7	109.9	109.3	109.2	109.5	110.4	111.9	113.3	114.4	114.7	115.2	115.9	116.3	117.0	117.4	117.7	117.1	115.5	116.2	0.0	0.0	0.0
0.0	0.0	0.0	106.0	105.7	106.3	106.9	107.3	107.6	107.9	108.1	108.0	107.8	106.8	106.4	105.8	107.3	108.5	110.0	110.8	111.8	112.5	113.3	114.0	114.4	114.7	114.4	113.9	113.0	114.3	0.0	0.0	0.0	0.0
0.0	0.0	0.0	106.0	105.0	105.3	105.6	105.8	105.9	105.6	105.2	105.0	104.8	104.5	104.2	104.0	105.1	105.5	106.8	108.2	109.2	109.8	110.3	110.6	110.8	110.7	110.0	109.5	111.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	104.0	103.3	103.4	103.4	103.4	103.0	102.8	101.8	102.0	101.8	101.6	101.3	101.3	101.9	102.7	104.0	105.4	106.4	106.9	107.1	107.3	107.2	106.9	106.9	107.5	107.6	0.0	0.0	0.0	0.0	0.0
0.0	0.0	102.0	101.7	101.6	101.4	101.3	101.0	100.0	100.0	99.8	99.7	100.0	99.9	99.8	100.0	100.6	101.4	102.4	103.6	104.4	104.7	104.9	104.9	104.8	104.6	104.5	106.6	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	100.0	101.7	99.7	99.6	99.5	99.7	98.2	97.6	97.7	96.8	97.4	97.5	97.7	98.0	98.7	99.5	100.5	101.4	102.1	102.5	102.7	102.8	102.7	102.5	103.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	99.0	99.0	96.9	96.9	96.7	96.2	95.6	95.2	94.9	94.3	94.2	94.2	94.3	95.4	96.6	97.7	98.6	99.3	99.9	100.4	100.7	100.6	100.3	99.5	100.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	97.0	94.1	94.0	93.7	92.9	93.0	92.7	92.5	92.3	92.1	92.4	93.1	93.4	94.7	95.8	96.7	97.5	98.1	98.5	98.7	98.6	97.5	99.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	95.0	90.7	91.4	91.5	91.3	91.0	90.7	90.5	90.5	90.6	90.7	90.6	90.4	91.6	93.0	94.5	95.4	96.1	96.5	96.8	96.8	97.1	97.0	97.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	94.0	90.1	90.2	90.2	90.0	89.7	89.4	89.3	89.2	89.3	89.4	89.6	90.0	90.6	91.5	93.0	94.0	94.6	95.0	95.3	94.5	95.7	96.0	96.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	90.0	88.9	89.2	89.3	89.2	89.0	88.7	88.5	88.3	88.4	88.5	88.6	88.6	89.0	89.4	90.0	91.2	91.8	92.0	92.7	93.3	94.2	94.5	94.5	94.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
89.0	88.4	88.6	88.7	88.6	88.4	88.2	87.9	87.8	87.7	87.9	88.0	88.0	87.3	88.0	88.5	88.9	89.6	90.4	90.8	91.3	92.2	92.8	93.1	93.0	92.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
89.0	88.0	88.1	88.0	88.0	87.8	87.5	87.3	87.2	87.1	87.1	86.8	86.4	86.2	87.6	87.7	88.1	88.5	88.7	88.9	89.7	90.4	91.5	91.7	92.0	91.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
87.0	87.6	87.6	87.5	87.3	87.1	87.0	86.8	86.7	86.7	86.7	86.5	86.4	86.3	86.8	87.2	87.4	87.7	87.6	88.3	88.3	88.6	89.0	89.6	89.5	89.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
86.0	87.2	87.1	86.9	86.6	86.4	86.2	86.0	86.0	86.1	86.1	86.0	85.8	85.6	85.9	86.7	86.7	86.8	86.4	86.4	86.4	86.6	87.8	87.6	87.0	87.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
85.0	85.2	86.0	85.8	85.3	84.9	84.7	84.8	85.0	85.2	85.4	85.6	85.8	85.9	85.9	85.8	85.7	85.7	85.8	85.7	86.2	85.9	85.8	85.9	85.5	85.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
84.0	85.0	84.5	83.5	83.5	83.5	83.4	83.6	83.9	84.2	84.6	84.9	85.2	85.4	85.4	84.7	85.4	85.3	84.6	84.6	84.8	84.6	84.0	84.2	84.5	84.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
84.0	83.9	83.9	83.0	83.3	83.0	82.6	82.7	83.1	83.6	83.9	84.3	84.6	84.0	84.3	84.4	84.5	84.4	83.6	83.7	83.5	83.4	83.3	83.5	84.0	84.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	84.0	83.0	83.0	82.1	82.2	81.7	81.7	81.9	82.4	82.8	83.1	83.3	83.0	82.4	82.9	83.0	83.0	83.1	83.0	82.7	82.5	82.4	82.1	81.5	81.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	82.0	80.9	81.1	81.3	81.4	81.0	80.7	80.9	81.3	81.6	81.6	82.1	81.4	81.4	82.8	82.7	81.9	82.1	82.1	81.9	81.8	81.5	81.1	80.5	80.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	81.0	81.2	81.3	80.9	80.6	80.3	80.0	80.0	80.3	80.6	80.9	81.0	81.0	81.1	81.6	81.7	81.5	81.5	81.4	81.2	81.1	80.9	80.6	80.0	80.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	80.0	80.4	80.5	80.4	79.9	79.6	79.3	79.3	79.5	79.8	80.0	80.3	80.4	80.5	80.6	80.6	80.6	80.5	80.5	80.4	80.3	80.2	79.9	79.5	79.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
79.0	79.2	79.8	79.8	79.5	79.1	78.9	78.6	78.7	78.8	79.1	79.3	79.5	79.7	79.7	79.7	79.7	79.6	79.5	79.4	79.3	79.2	79.0	78.6	79.0	79.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
79.0	78.9	78.9	78.9	78.9	78.5	78.2	78.2	78.2	78.3	78.5	78.7	78.8	78.9	78.9	78.8	78.7	78.6	78.4	78.3	78.2	78.0	77.7	77.5	78.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	78.7	78.8	78.7	77.7	77.5	78.0	77.8	77.7	77.9	78.0	78.1	78.1	78.1	78.0	77.9	77.8	77.6	77.3	77.2	77.0	76.7	76.5	77.4	78.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	78.4	78.1	78.0	77.7	76.7	77.0	77.2	77.5	77.5	77.4	77.3	77.2	77.1	77.0	76.9	76.6	76.3	76.0	75.9	75.5	76.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	76.0	76.7	77.3	77.1	77.5	77.0	76.9	76.7	76.5	76.3	76.4	76.3	76.3	76.2	76.0	75.6	75.0	74.5	75.0	75.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	75.0	75.7	76.7	76.8	76.7	76.2	75.7	74.9	74.9	75.0	75.0	75.0	75.2	75.3	75.2	74.7	73.5	74.2	75.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	75.0	75.3	76.2	76.3	76.0	75.3	74.6	74.4	74.3	74.4	74.5	74.6	74.7	74.8	74.6	74.0	73.0	73.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	74.0	75.4	75.6	75.5	75.2	74.8	74.3	74.0	74.0	74.0	74.1	74.0	73.9	73.7	73.4	72.5	72.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	74.0	74.5	74.7	74.6	74.6	74.3	74.1	73.9	73.8	73.8	73.7	73.7	73.5	73.3	73.0	72.5	72.0	72.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	74.0	74.1	74.1	74.0	73.9	73.8	73.7	73.6	73.5	73.4	73.4	73.3	73.1	72.8	72.5	72.0	71.5	71.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	73.0	73.9	73.8	73.6	73.4	73.4	73.0	73.3	73.2	73.1	73.1	72.9	72.7	72.4	72.0	71.5	71.0	71.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	74.0	73.3	73.2	72.9	72.8	73.0	72.7	72.9	72.9	72.8	72.6	72.3	71.9	71.5	71.0	70.5	70.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	72.0	72.9	72.8	72.6	72.2	72.3	72.4	72.5	72.6	72.5	72.2	71.9	71.5	70.9	70.0	70.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	72.0	72.7	72.0	71.5	71.9	72.1	72.1	72.1	72.3	72.2	71.9	71.5	71.0	70.4	69.5	69.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	72.7	72.0	71.5	71.6	71.9	71.8	71.6	72.1	72.0	71.6	71.2	70.7	70.2	69.6	69.0	69.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	72.0	72.0	71.4	71.5	71.6	71.5	71.4	71.4	71.6	71.2	70.9	70.6	70.1	69.4	68.5	68.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34

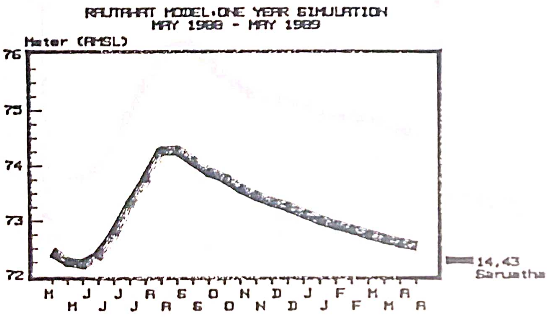
COMMENTS:
Water Levels are in [m]
Time Step = 10
Time elapsed = 0.1500E+03 [day]

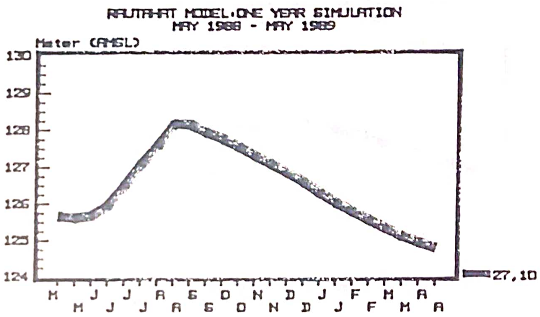
RISE OF WATER LEVELS FROM MAY THROUGH SEPTEMBER 1988 - MODEL OUTPUT

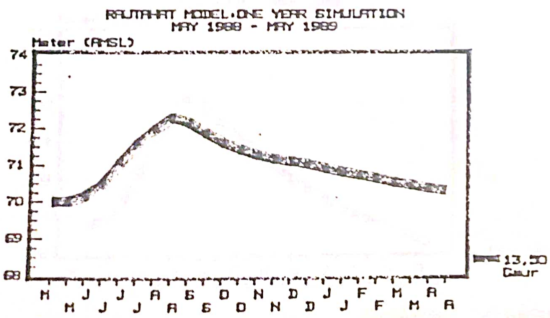
MAP OF DIFFERENCES OF WATER LEVELS (INITIAL - FINAL)
(- Sign: final levels higher than initial)
(+ Sign: final levels lower than initial)

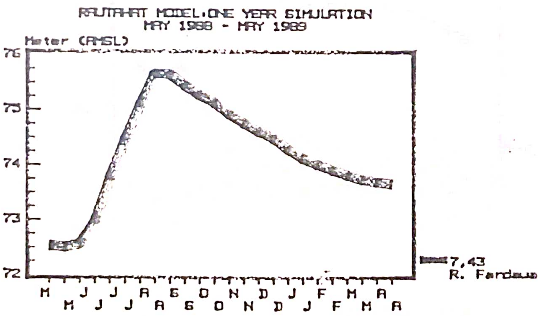
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1												-1.8	-2.4	-3.4																				
2											-0.5	-1.2	-1.8	-2.1	-2.2																			
3											-1.5	-1.1	-1.5	-1.9	-2.0	-1.1	-2.0	-1.7	-1.6															
4											-1.3	-1.8	-1.6	-1.4	-2.2	-1.8	-2.3	-2.9	-1.8															
5											-1.1	-0.9	-1.8	-1.9	-1.5	-2.8	-2.4	-2.4	-2.3	-3.1														
6										-0.6	-0.9	-0.5	-1.9	-1.9	-2.1	-2.5	-2.9	-2.7	-3.3	-2.8	-2.7	-2.9	-1.4	-1.3	-1.7									
7										-0.7	-0.8	-0.5	-1.7	-1.8	-1.8	-2.9	-2.6	-2.7	-2.6	-3.2	-2.5	-2.9	-2.3	-2.5	-1.8	-2.0	-1.7	-1.1						
8									-0.5	-0.6	-1.1	-0.8	-1.1	-1.5	-2.2	-2.2	-3.2	-2.8	-3.3	-3.1	-3.0	-3.5	-2.4	-1.9	-1.9	-2.1	-2.5	-1.5	-1.4				-1.0	-0.5
9									-0.8	-0.9	-0.9	-0.5	-1.3	-1.6	-2.1	-2.7	-3.1	-2.6	-3.6	-3.5	-3.2	-3.2	-2.9	-3.0	-2.7	-2.5	-1.7	-2.4	-1.3	-1.1	-1.5	-0.9	-0.5	-0.5
10									1.0	-0.2	-0.3	-0.5	-0.9	-0.5	-0.6	-1.4	-2.7	-2.2	-1.1	-2.7	-2.5	-1.5	-1.0	-1.0	-2.8	-2.6	-1.9	-2.0	-2.3	-1.6	-1.3	-1.4	-0.5	
11								0.8	0.0	-0.1	-0.1	0.2	0.2	-1.0	-0.6	-1.4	-1.2	-1.8	-1.7	-0.7	-1.6	-1.2	-2.5	-2.8	-2.1	-3.0	-2.6	-2.6	-1.3	-1.7	-1.6	-0.6	-0.5	
12						-2.1	-0.7	0.0	-1.0	-0.5	-0.7	-1.5	-1.4	-1.0	-0.6	-1.0	-1.4	-0.8	-0.6	-0.8	-1.7	-1.5	-1.9	-1.6	-2.1	-1.6	-1.7	-1.8	-2.1	-1.2	-0.1	-0.5		
13						-2.5	-2.3	-1.3	-1.5	-1.0	-0.9	-0.5	-1.6	-1.2	-0.6	0.2	0.0	-0.7	-1.6	-0.8	-1.2	-1.9	-1.7	-1.9	-2.1	-1.5	-2.3	-1.7	-1.8	-1.4	-0.5			
14						-2.7	-2.7	-2.6	-2.3	-1.2	-1.1	-0.9	0.2	0.4	0.4	0.0	-0.7	-0.2	-0.9	-0.7	-1.0	-1.7	-1.4	-1.9	-2.0	-2.1	-1.5	-1.3	-1.1	-0.5				
15					-3.4	-2.7	-2.9	-2.9	-2.8	-1.7	-1.5	-1.1	-0.7	0.6	0.2	0.0	-0.3	0.0	-0.5	-1.0	-1.2	-1.2	-1.0	-1.6	-1.5	-1.1	-0.7	-0.7	-0.5					
16					-2.7	-2.7	-2.7	-2.6	-2.4	-1.7	-1.1	-0.7	-0.4	-1.0	-0.6	-0.2	-0.2	-0.3	-0.4	-0.5	-1.4	-1.1	-1.4	-1.4	-1.1	-1.2	-1.3	-0.5						
17					-3.2	-2.8	-2.6	-2.4	-1.7	-1.2	-1.0	-1.2	-1.1	-0.9	-0.6	-0.5	-0.9	-0.4	-0.3	-0.5	-1.3	-0.6	-0.5	-1.2	-0.5	-1.3	-1.1	-0.5						
18				-3.6	-3.4	-2.5	-2.3	-1.9	-1.0	-1.0	-0.8	-0.9	-1.3	-1.4	-1.3	-1.1	-0.5	-0.9	-0.4	-1.0	-0.9	-0.7	-1.4	-0.8	-0.9	-0.7	-0.5							
19					-1.9	-2.1	-2.3	-2.7	-1.2	-0.6	-0.7	-0.4	-1.0	-1.1	-1.3	-1.6	-1.3	-1.6	-1.1	-1.3	-0.9	-0.8	-0.5	-0.9	-0.6	-0.5								
20					-2.0	-2.1	-2.0	-1.6	-1.1	-0.7	-1.4	-0.9	-0.9	-1.1	-1.5	-1.7	-1.7	-1.4	-1.7	-1.7	-1.5	-1.2	-1.3	-0.8	-0.7	-0.5								
21					-1.0	-1.1	-1.1	-0.5	-0.8	-0.6	-0.4	-1.2	-1.1	-1.5	-1.4	-1.8	-2.1	-1.8	-1.1	-1.1	-0.9	-1.4	-1.7	-1.5	-0.5									
22				-0.1	-1.0	-1.4	-0.5	-0.4	-0.9	-0.9	-0.4	-1.5	-1.6	-1.4	-1.4	-0.7	-2.1	-1.3	-1.6	-1.4	-1.8	-0.8	-0.7	-1.0	-0.5									
23				-1.1	-0.5	-0.7	-0.9	-0.4	-0.2	-0.5	-0.4	-1.0	-1.1	-1.2	-1.8	-1.6	-1.6	-2.1	-1.5	-1.1	-1.4	-1.6	-0.4	-0.6	-0.5									
24			-1.1	-0.9	-1.0	-0.9	-0.7	-0.5	-0.4	-0.2	-0.3	-1.3	-1.4	-2.0	-1.4	-2.0	-1.9	-2.4	-1.3	-0.4	0.0	-0.5	-0.4	-1.2	-0.5									
25		-0.6	-0.8	-0.9	-0.7	-0.4	-0.1	-0.8	-0.8	-0.7	-0.9	-1.2	-1.2	-0.7	-1.6	-1.4	-2.0	-1.8	-1.1	-0.7	-0.4	-0.1	-0.7	-0.4	-0.5									
26		-1.3	-1.4	-1.2	-1.2	-0.9	-0.5	-0.2	-1.0	-0.9	-0.9	-0.6	-0.8	-0.8	-1.4	-1.7	-1.3	-1.7	-1.6	-0.8	-1.2	-0.7	-0.9	-0.6	-0.5									
27		-0.9	-0.9	-0.8	-0.5	-0.2	-1.0	-0.7	-1.1	-0.9	-0.8	-0.5	-0.5	-0.5	-1.7	-1.3	-1.6	-1.8	-1.5	-0.8	-0.3	-0.1	-0.6	-0.3	-0.5									
28		-1.5	-1.4	-1.9	-0.9	-0.6	-0.3	-0.9	-0.8	-1.0	-1.1	-1.1	-1.0	-1.0	-1.5	-1.4	-1.6	-1.8	-1.3	-0.9	-0.5	-0.2	-0.9	-0.2	-0.5									
29		-1.4	-1.3	-1.1	-0.6	-0.1	-0.8	-0.8	-1.0	-1.2	-1.5	-0.9	-1.2	-1.4	-1.6	-1.6	-1.6	-1.7	-1.9	-1.3	-1.4	-0.6	-0.1	-0.6	-0.5									
30		-1.1	-0.7	-0.7	-0.7	-0.7	-0.5	-0.7	-1.0	-1.4	-0.9	-1.3	-1.7	-2.0	-2.1	-1.5	-1.3	-1.3	-1.6	-1.6	-1.8	-1.5	-0.2	-0.3	-0.5									
31		-0.8	-0.9	-1.1	-1.4	-1.1	-0.7	-0.8	-0.3	-0.8	-1.0	-1.7	-2.1	-1.1	-1.3	-1.2	-1.4	-1.3	-1.4	-1.5	-1.2	-1.0	-0.5	-0.2	-0.5									
32			-0.9	-1.0	-1.2	-1.3	-0.7	-0.7	-0.9	-0.5	-1.0	-1.5	-1.8	-0.6	-0.2	-0.7	-0.8	-0.8	-0.9	-1.7	-1.3	-1.0	-0.7	-0.3	-0.5									
33			-0.7	-1.0	-1.3	-1.2	-0.9	-0.6	-0.9	-0.4	-0.8	-1.9	-1.6	-1.0	-1.1	-1.5	-1.4	-1.6	-1.8	-1.7	-1.4	-1.1	-0.6	-0.1	-0.5									
34			-1.8	-1.9	-1.6	-1.4	-1.1	-0.9	-1.0	-0.4	-0.8	-1.2	-1.3	-1.4	-1.6	-2.1	-2.2	-2.0	-1.9	-2.2	-1.5	-1.2	-0.8	-0.3	-0.5									
35			-1.8	-2.0	-2.0	-1.6	-1.4	-1.2	-0.3	-0.6	-1.0	-1.2	-1.6	-1.7	-1.9	-2.0	-1.9	-1.9	-1.8	-1.7	-1.4	-1.1	-0.8	-0.3	-0.5									
36		-1.3	-2.0	-2.2	-2.0	-1.7	-1.6	-1.6	-0.6	-0.8	-1.2	-1.4	-1.7	-1.9	-1.9	-1.9	-1.9	-1.7	-1.5	-1.3	-1.1	-0.7	-0.3	-0.8	-0.5									
37		-1.6	-1.7	-1.9	-2.0	-1.8	-1.6	-1.7	-0.8	-1.0	-1.3	-1.5	-1.7	-1.8	-1.9	-1.8	-1.6	-1.4	-1.1	-0.9	-0.6	-0.3	0.2	-0.5										
38			-1.4	-1.5	-1.7	-1.7	-1.4	-1.3	-1.3	-1.6	-1.7	-1.9	-1.9	-1.9	-1.7	-1.5	-1.5	-1.1	-1.7	-1.4	-1.1	-0.6	0.5											
39				-1.7	-1.9	-1.8	-1.7	-1.8	-1.0	-1.3	-1.3	-1.4	-2.0	-1.9	-1.7	-1.4	-1.2	-1.8	-1.4	-0.9	-0.6	-1.5												
40				-1.1	-1.9	-2.0	-1.7	-1.3	-1.3	-1.1	-0.9	-1.8	-2.3	-2.1	-1.8	-1.4	-2.0	-1.4	-0.7	-0.5	-0.5													
41				-0.8	-2.1	-2.5	-2.6	-2.3	-1.9	-1.0	-1.0	-1.1	-2.1	-1.8	-1.9	-1.7	-1.9	-1.2	-0.5															
42				-1.0	-2.2	-2.7	-2.7	-2.1	-1.4	-2.2	-2.0	-2.0	-1.8	-1.7	-1.8	-1.4	-1.9	-1.0	-0.5															
43				-1.7	-2.2	-2.4	-2.7	-2.3	-2.7	-2.3	-2.2	-2.1	-2.0	-1.2	-1.1	-1.0	-0.8	-0.5																
44			-2.0	-2.5	-2.7	-3.0	-2.0	-2.0	-1.8	-2.6	-2.5	-2.1	-1.9	-1.4	-1.1	-0.8	-0.4	-0.5																
45			-2.0	-2.1	-2.0	-1.9	-2.0	-2.2	-1.8	-1.7	-1.5	-2.3	-2.0	-1.7	-1.3	-0.9	-0.3	-0.5																
46			-2.0	-2.0	-2.1	-1.9	-2.0	-1.5	-1.9	-2.4	-2.0	-1.8	-1.7	-1.6	-1.3	-1.0	-0.7	-0.5																
47				-1.6	-1.7	-1.5	-2.2	-1.6	-1.3	-2.2	-2.0	-1.8	-1.6	-1.5	-1.2	-1.0	-0.2	1.5																
48				-1.3	-1.5	-1.4	-1.6	-1.9	-2.0	-1.9	-1.9	-1.8	-1.6	-1.5	-1.3	-0.9	-0.5																	
49				-1.3	-1.0	-0.9	-1.7	-1.8	-1.7	-1.7	-1.8	-1.7	-1.7	-1.3	-1.2	-0.9	-0.5																	
50					-1.6	-1.3	-1.6	-1.8	-1.7	-1.5	-2.0	-2.0	-1.7	-1.4	-1.3	-1.2	-0.8	-0.5																
51					-2.2	-1.6	-1.7	-1.8	-1.7	-1.6	-1.5	-1.8	-1.5	-1.6	-1.6	-1.3	-0.9	-0.5																

ONE-YEAR HYDROGRAPHS (MODEL OUTPUT) - HYPOTHETICAL ONE-YEAR VERIFICATION



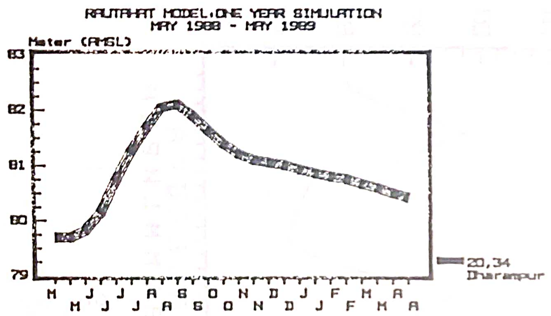


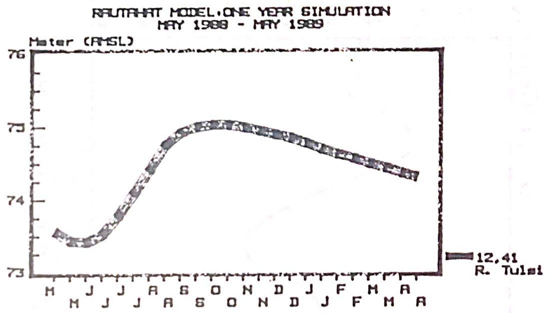


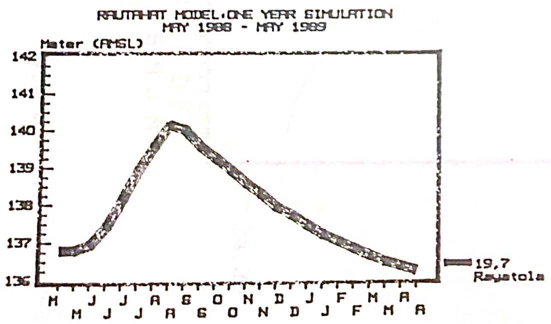


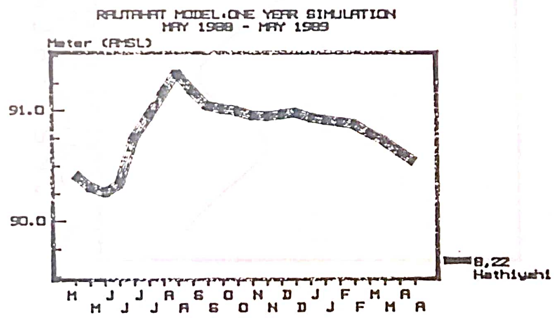
APPENDIX 46

ONE-YEAR HYDROGRAPHS (MODEL OUTPUT) - HYPOTHETICAL ONE-YEAR VERIFICATION



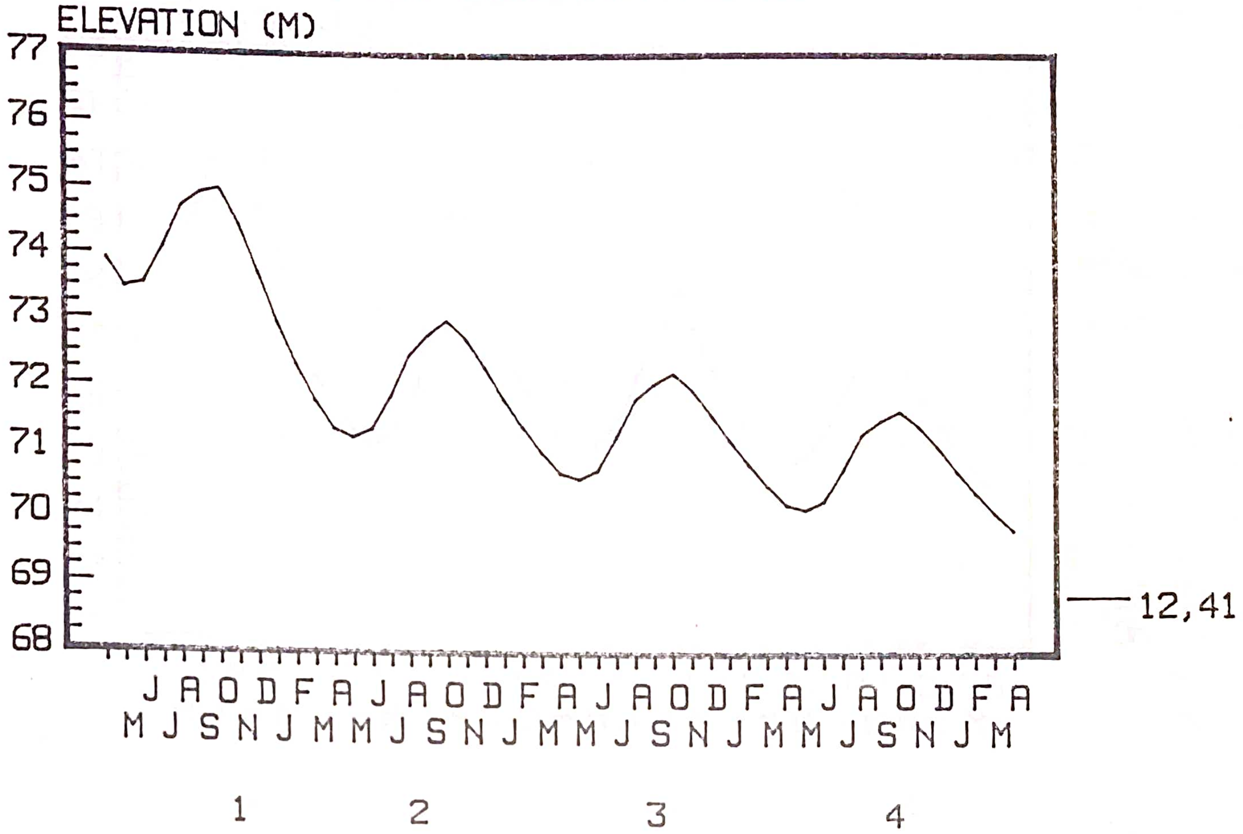






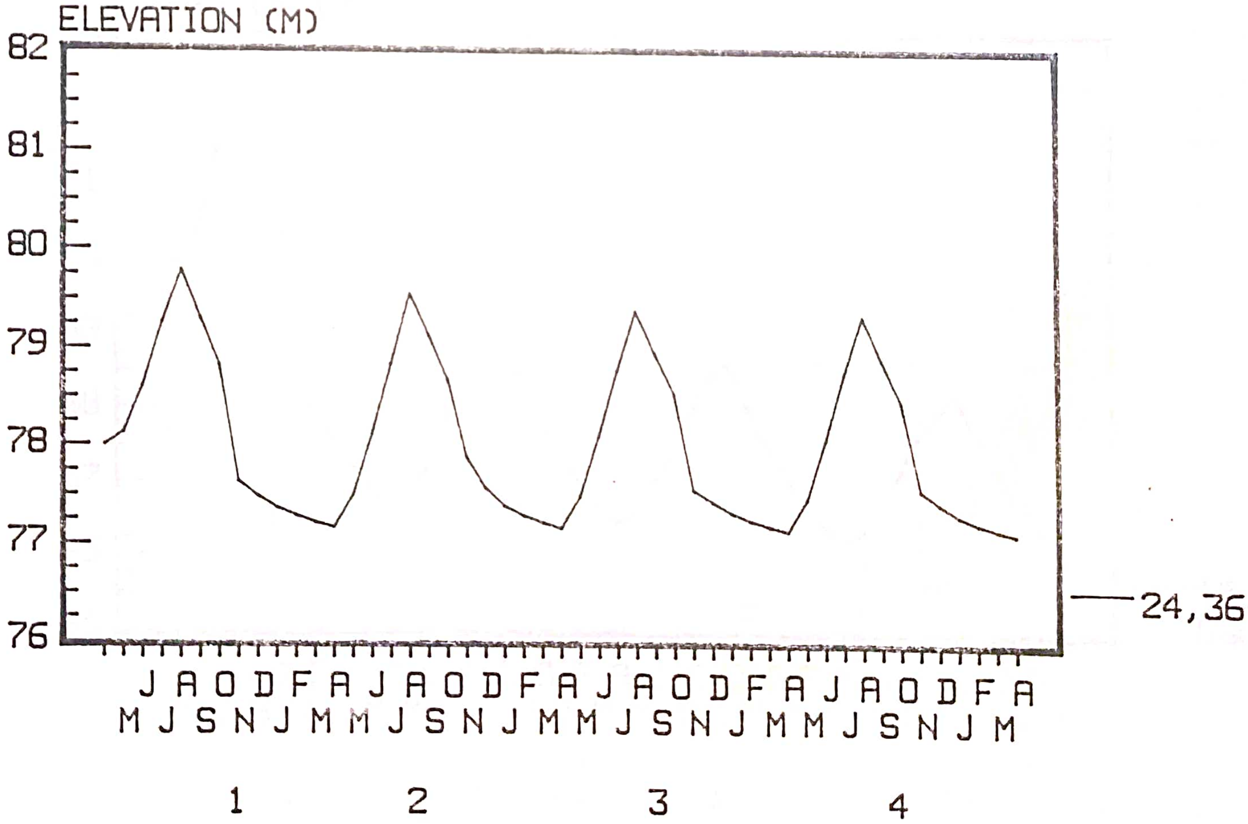
APPENDIX 47

RAUTAHAT MODEL: FUTURE PUMPING
4-YEAR SIMULATION PERIOD

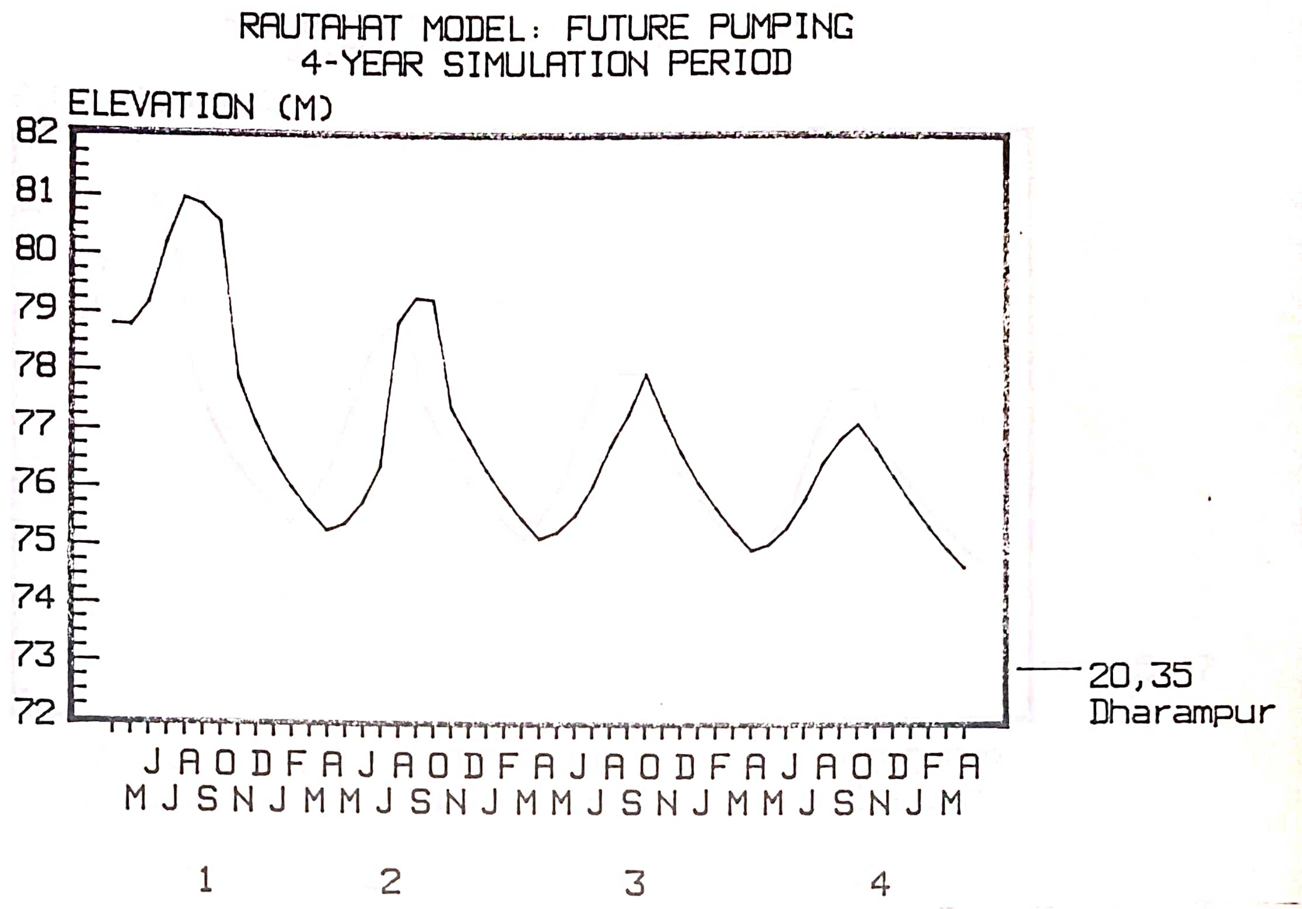


APPENDIX 48

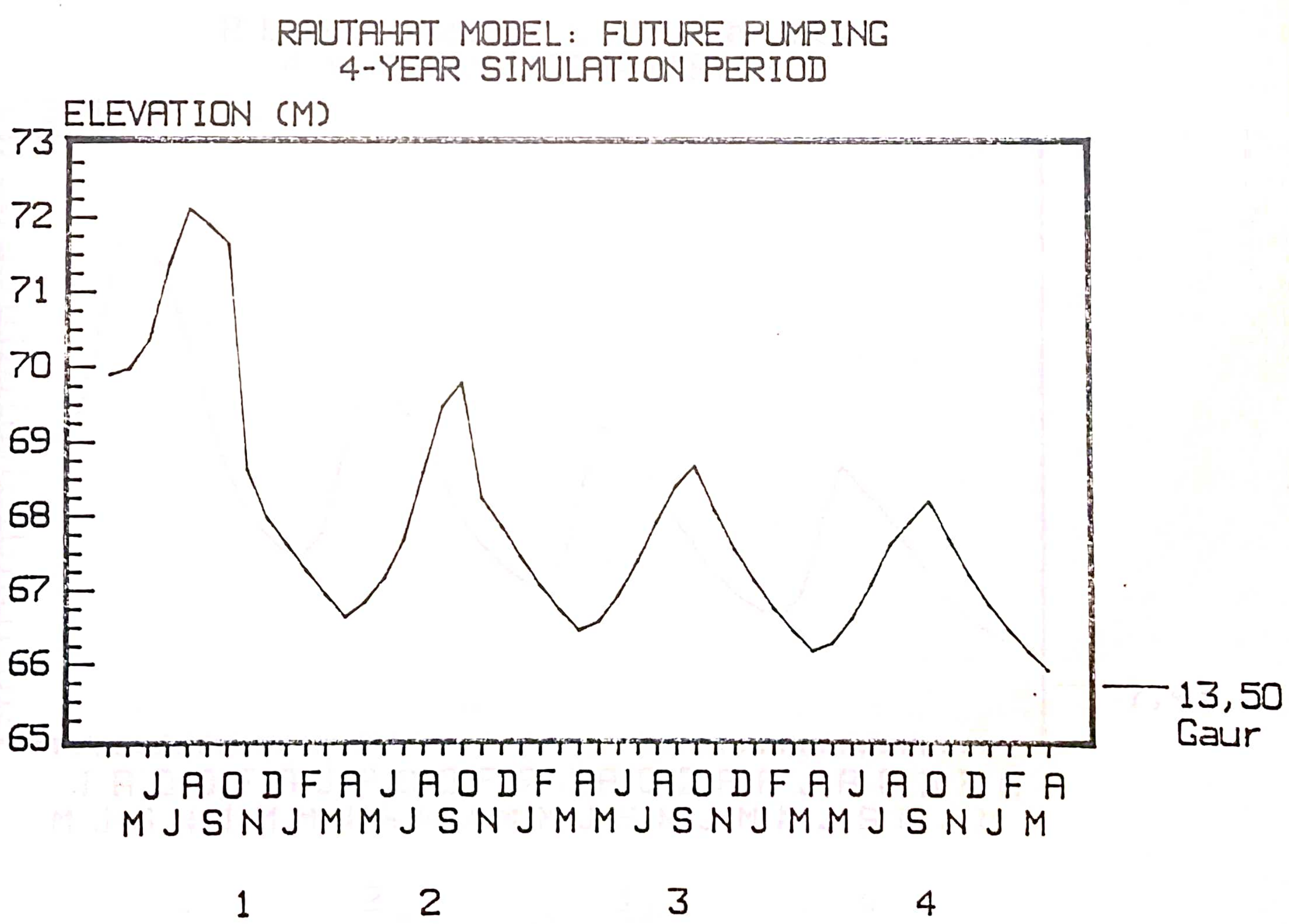
RAUTAHAT MODEL: FUTURE PUMPING
4-YEAR SIMULATION PERIOD



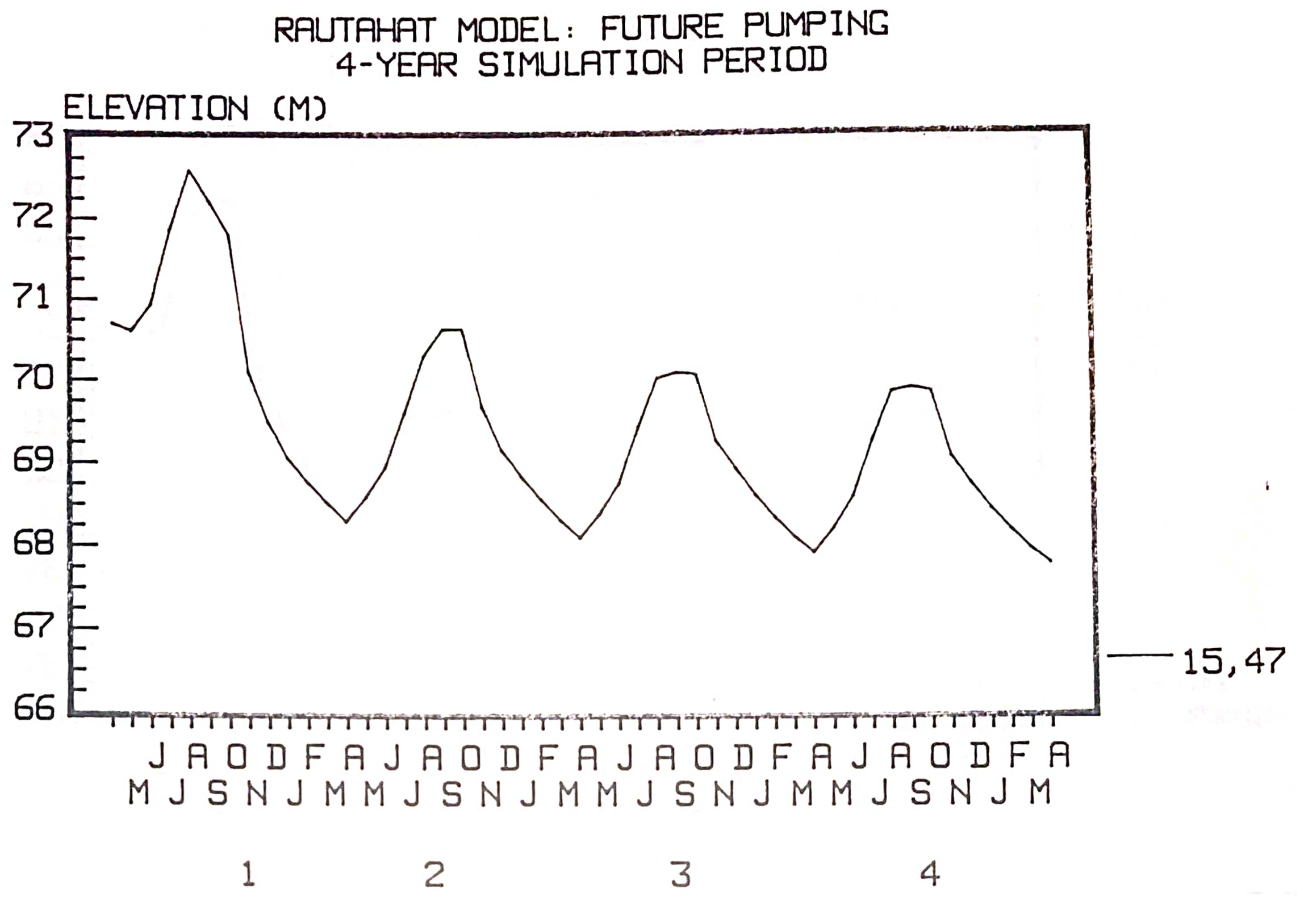
APPENDIX 49



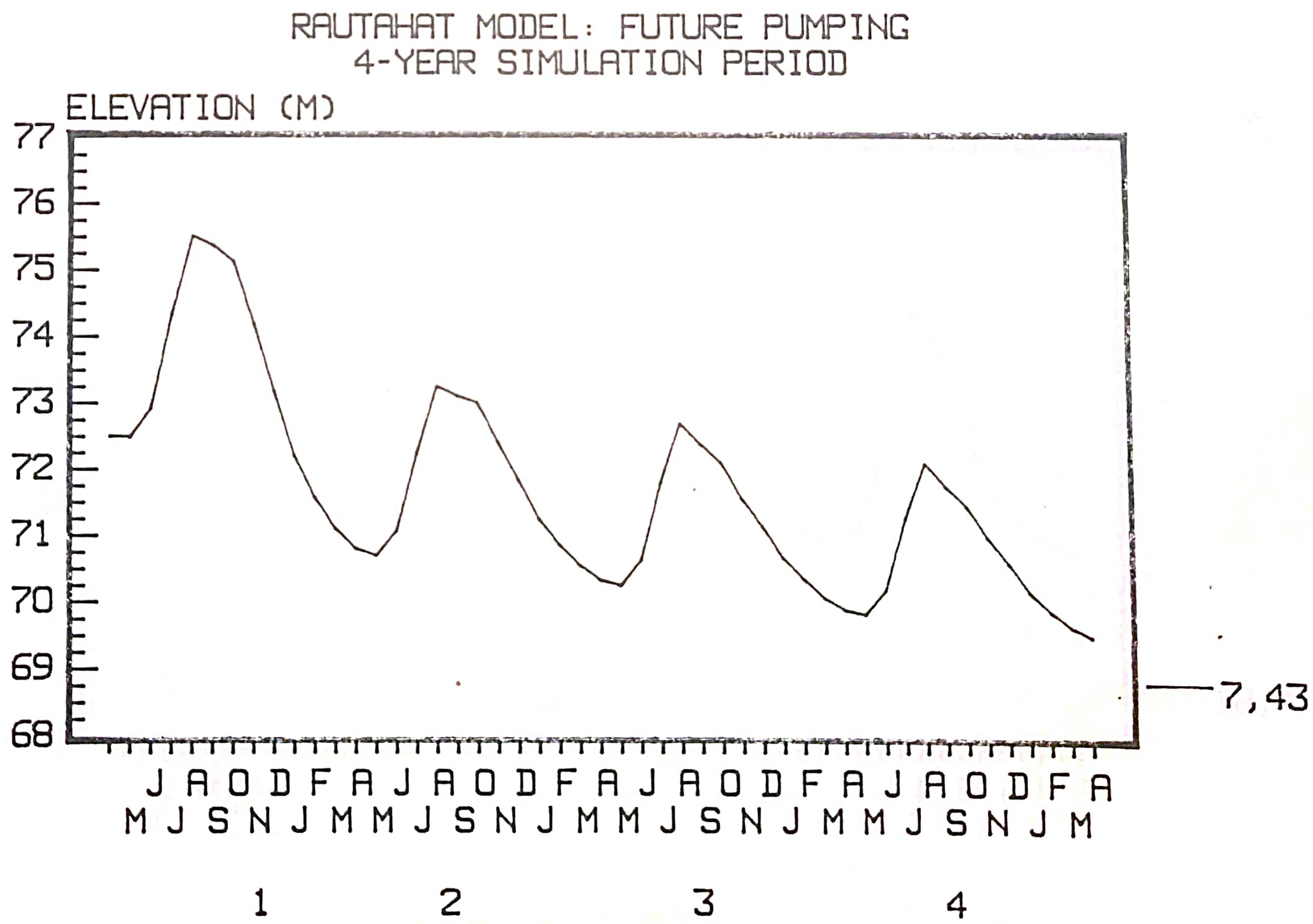
APPENDIX 50



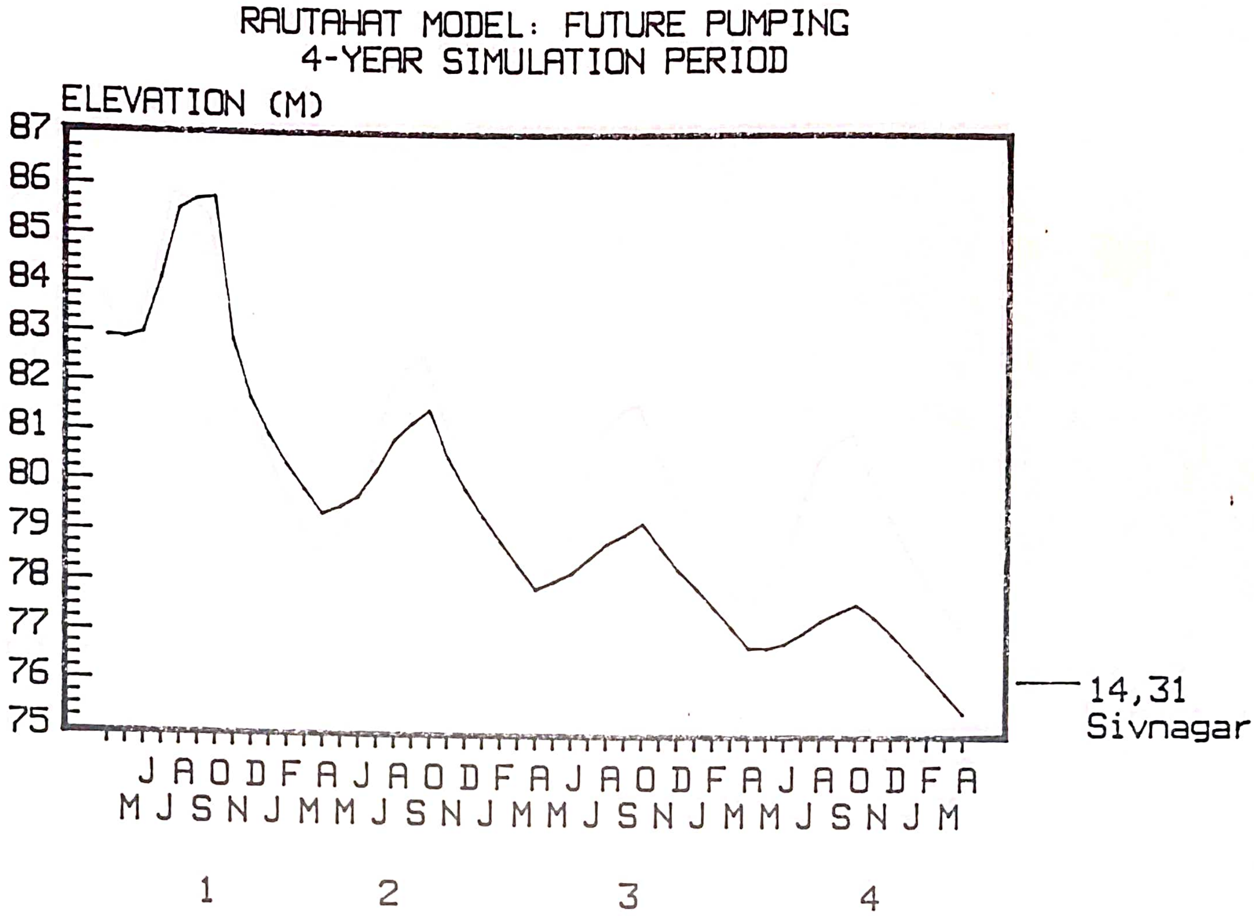
APPENDIX 51



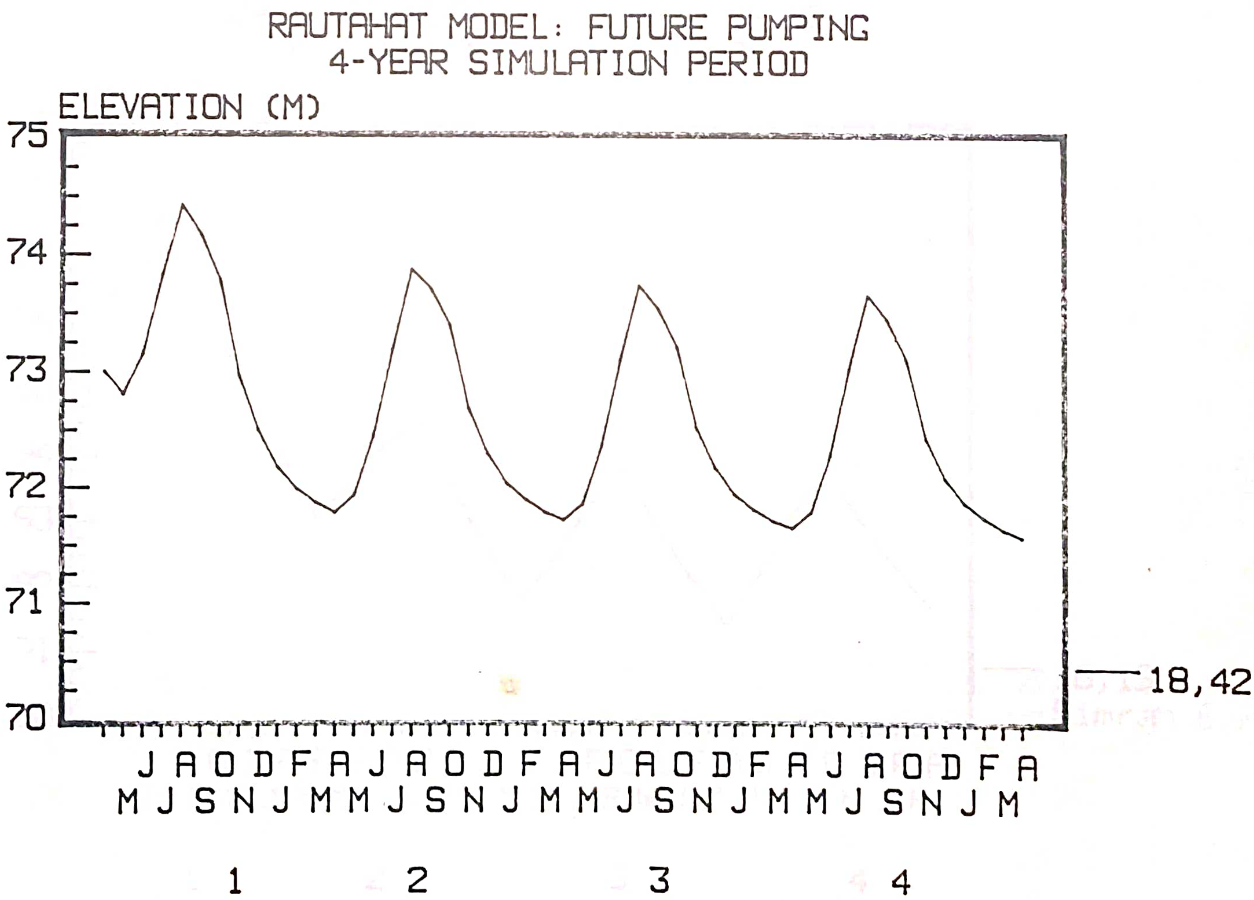
APPENDIX 52



APPENDIX 53

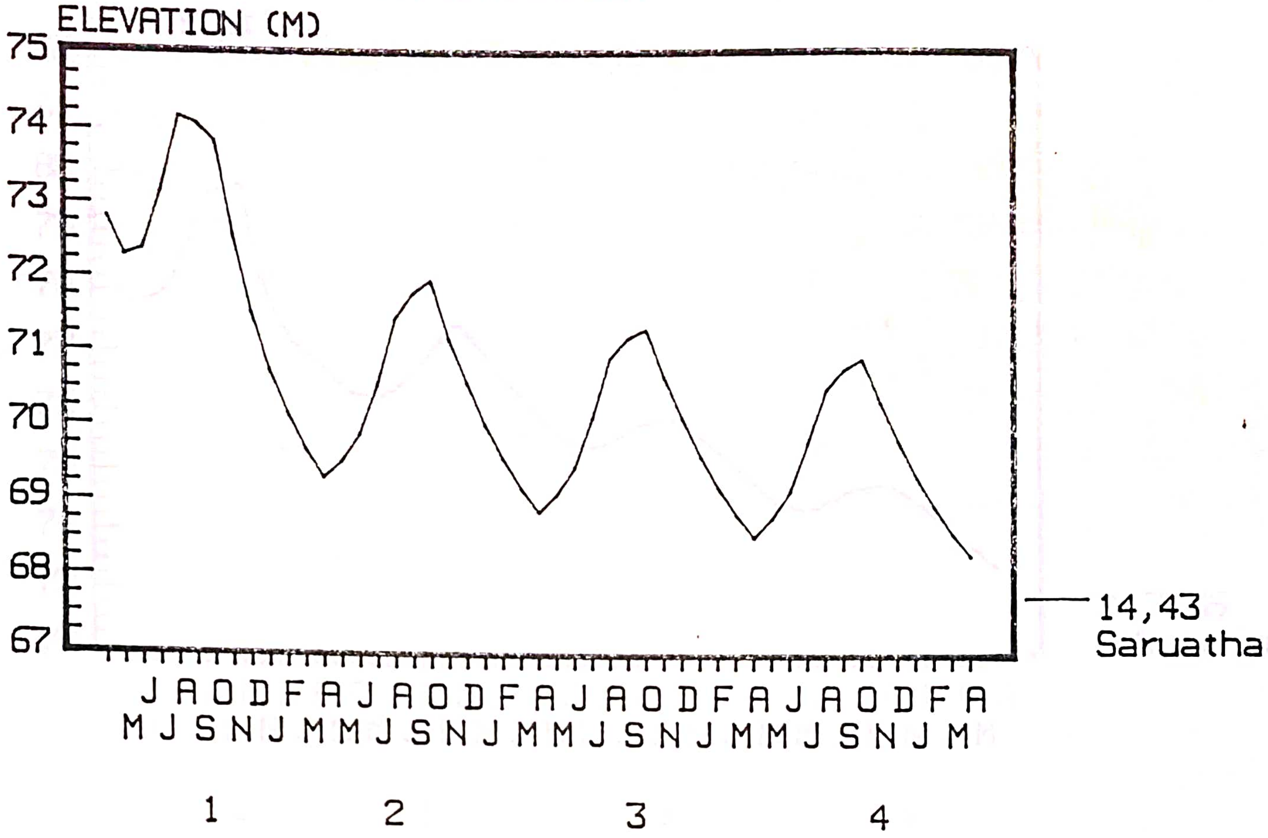


APPENDIX 54



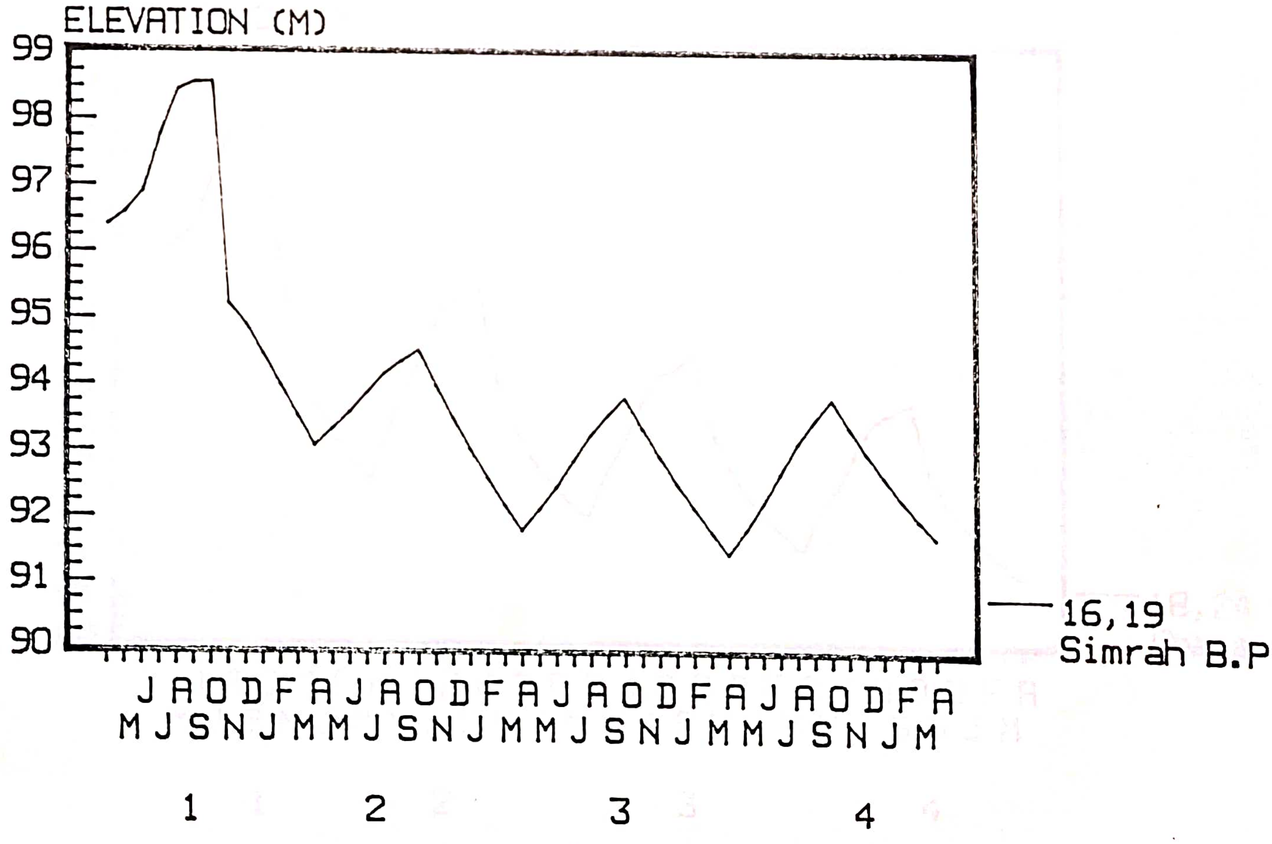
APPENDIX 55

RAUTAHAT MODEL: FUTURE PUMPING
4-YEAR SIMULATION PERIOD



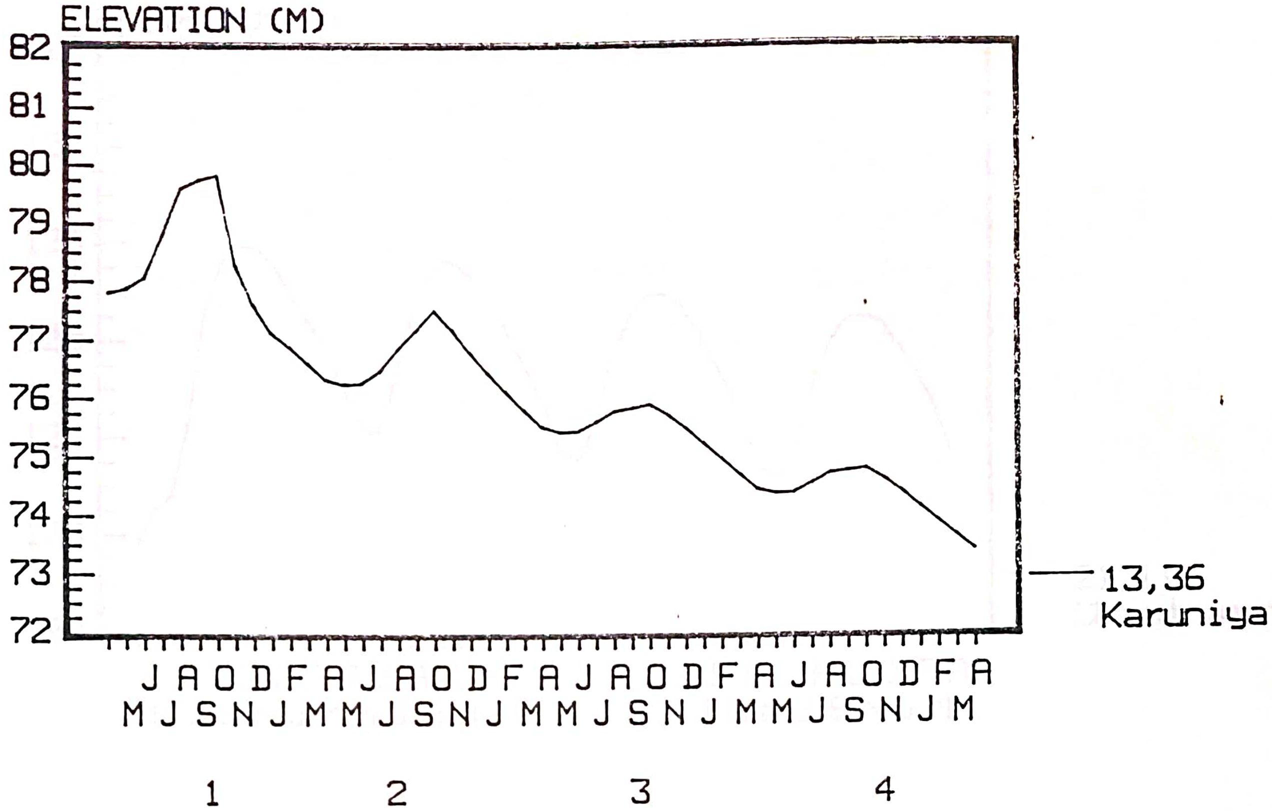
APPENDIX 56

RAUTAHAT MODEL: FUTURE PUMPING
4-YEAR SIMULATION PERIOD



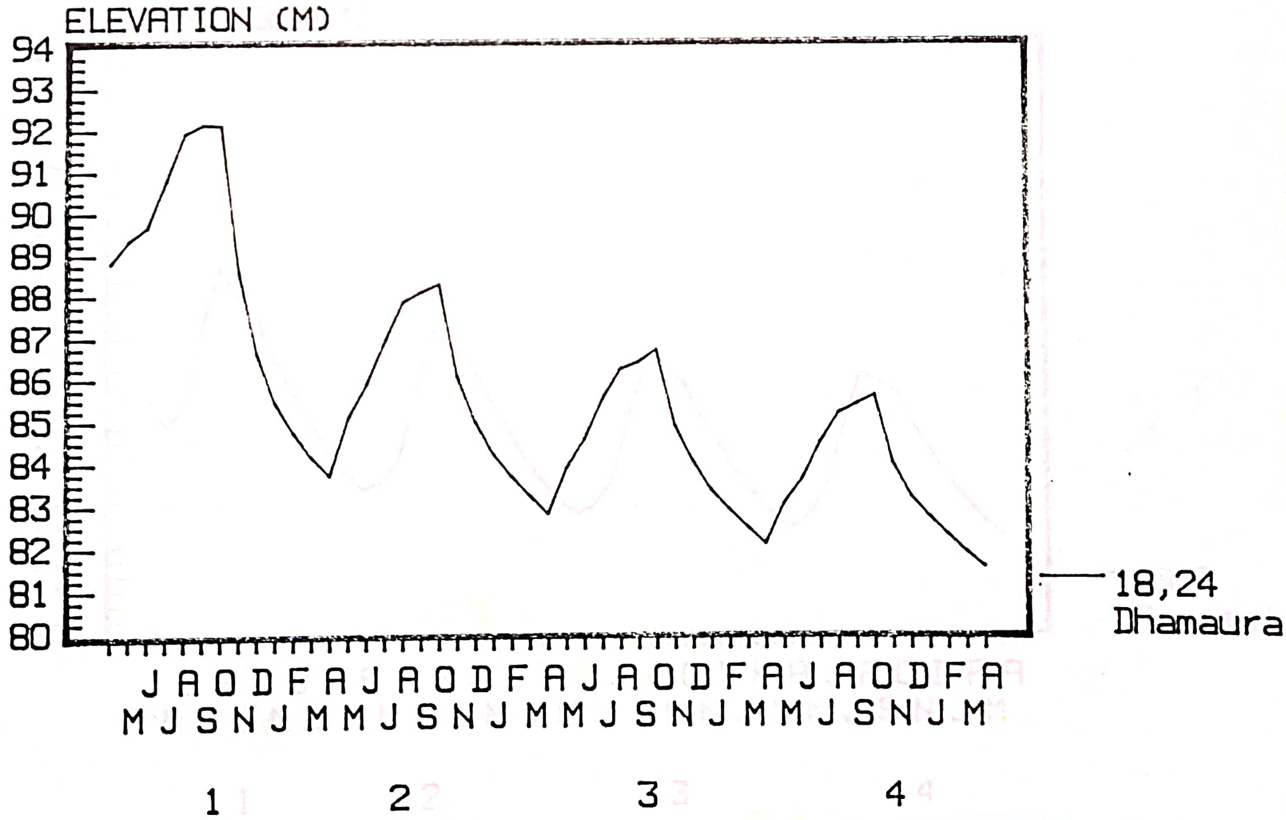
APPENDIX 57

RAUTAHAT MODEL: FUTURE PUMPING
4-YEAR SIMULATION PERIOD

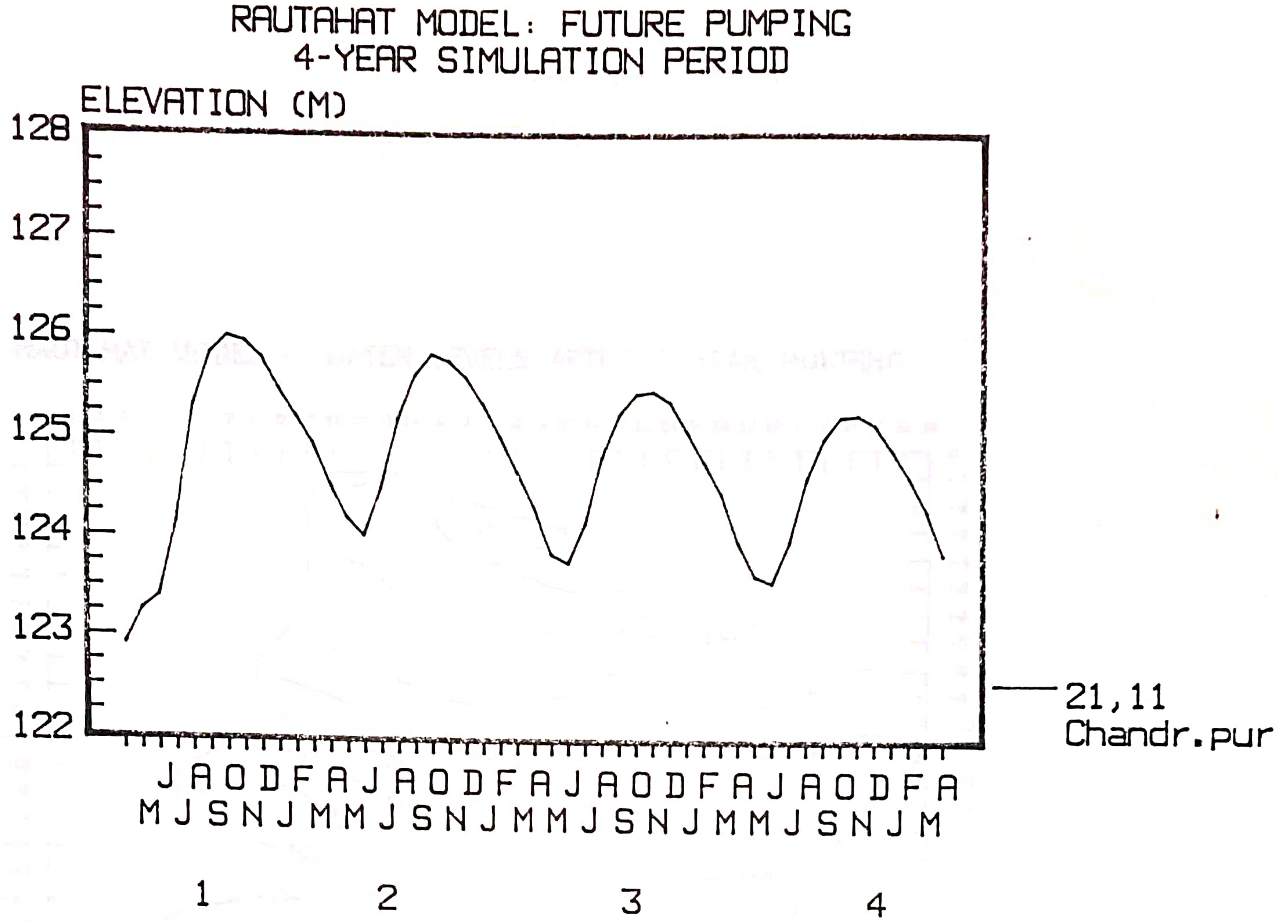


APPENDIX 58

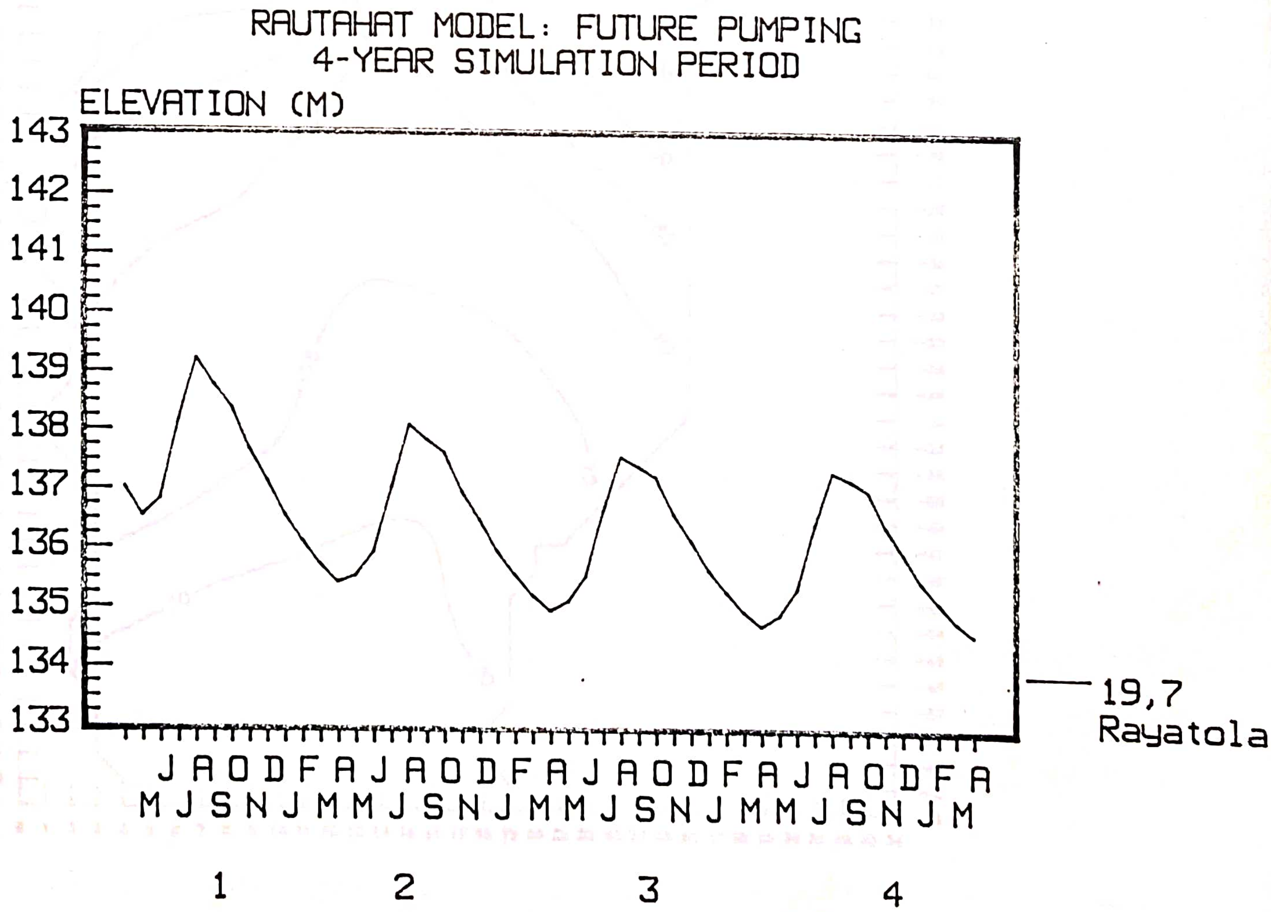
RAUTAHAT MODEL: FUTURE PUMPING
4-YEAR SIMULATION PERIOD



APPENDIX 59

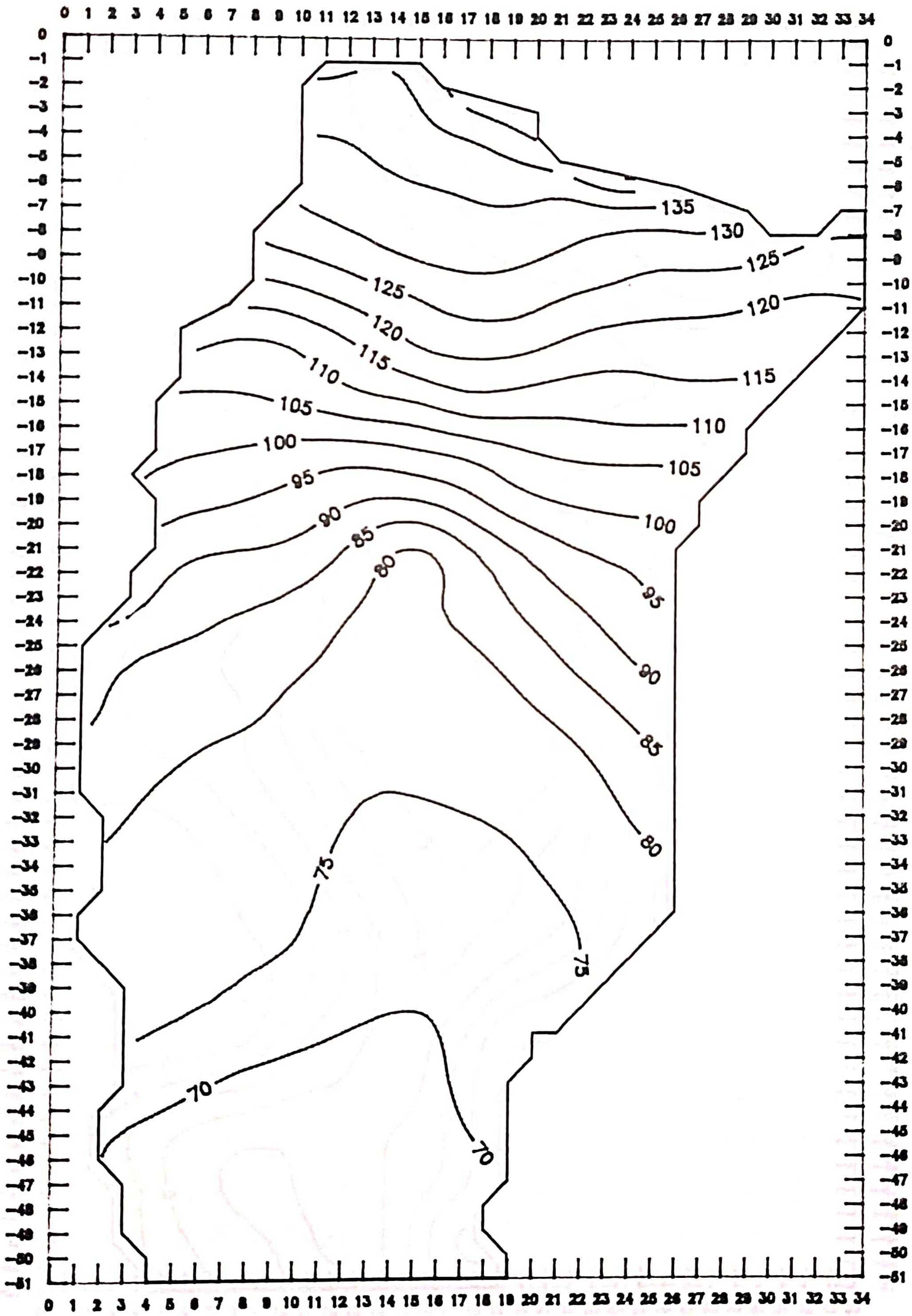


APPENDIX 60

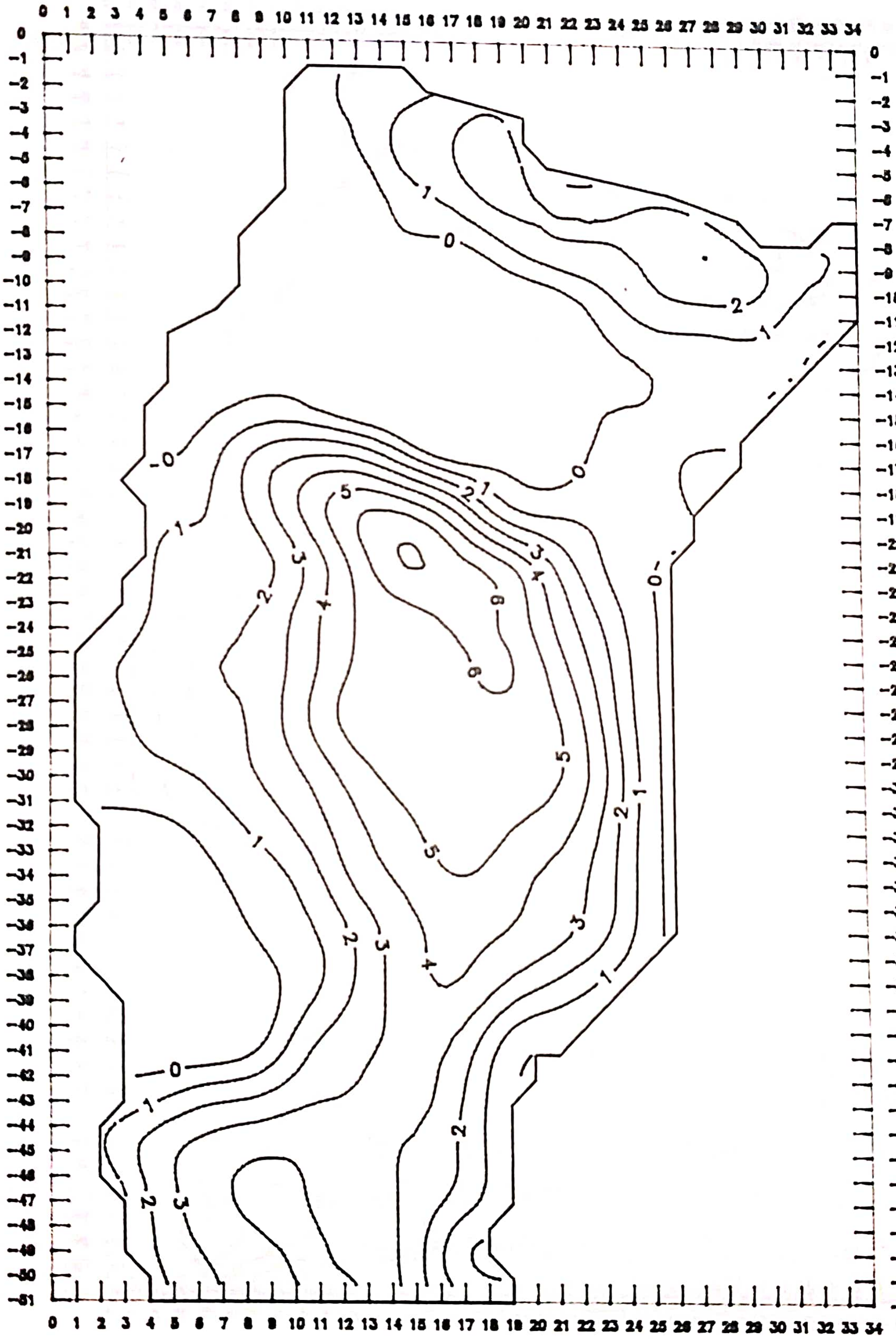


APPENDIX 61

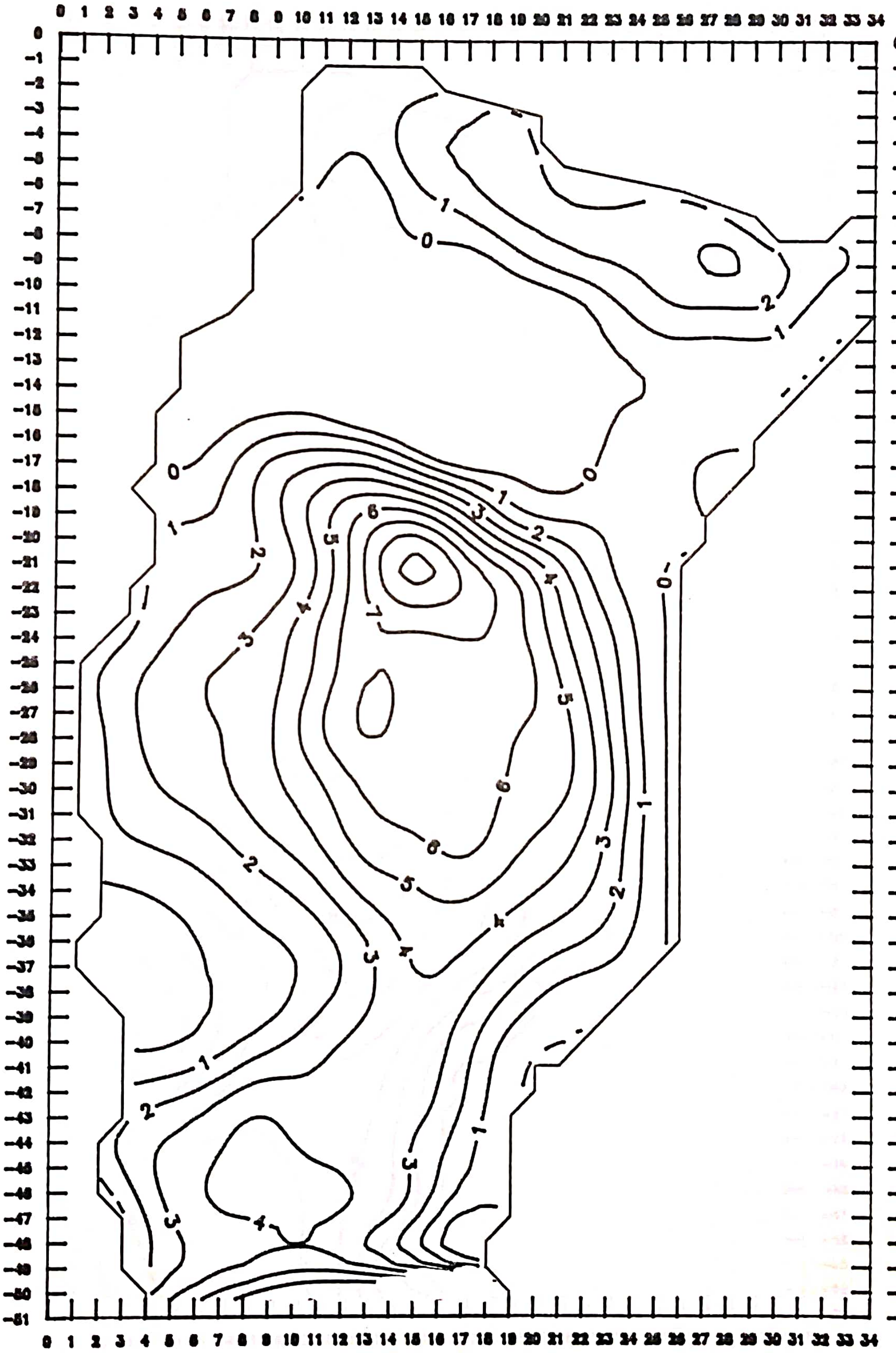
RAUTAHAT MODEL – WATER LEVELS AFTER 4-YEAR PUMPING



RAUTAHAT MODEL – DECLINE OF LEVELS AFTER 2 YEARS PUMPING

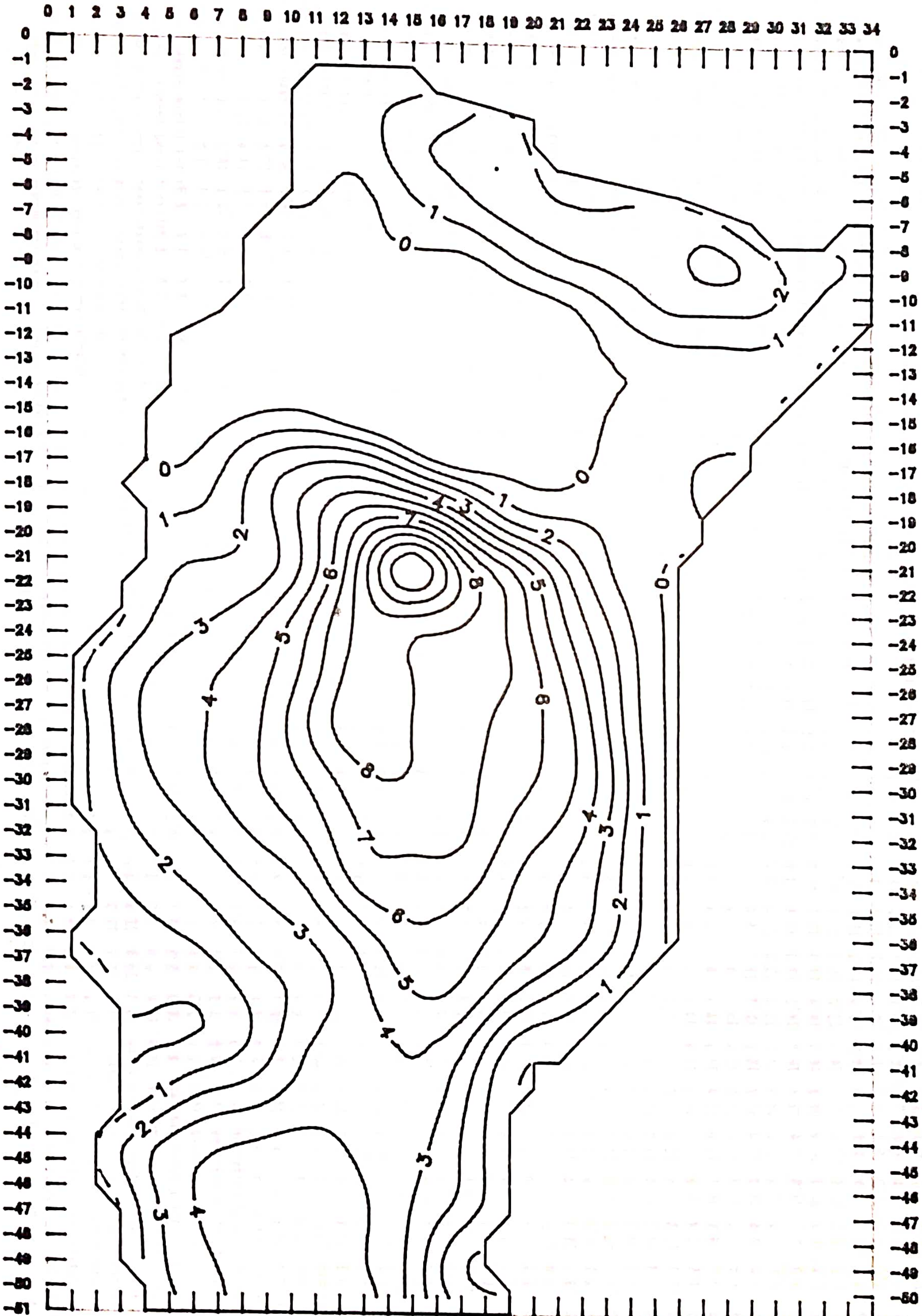


RAUTAHAT MODEL – WATER LEVELS AFTER 3-YEAR PUMPING



APPENDIX 64

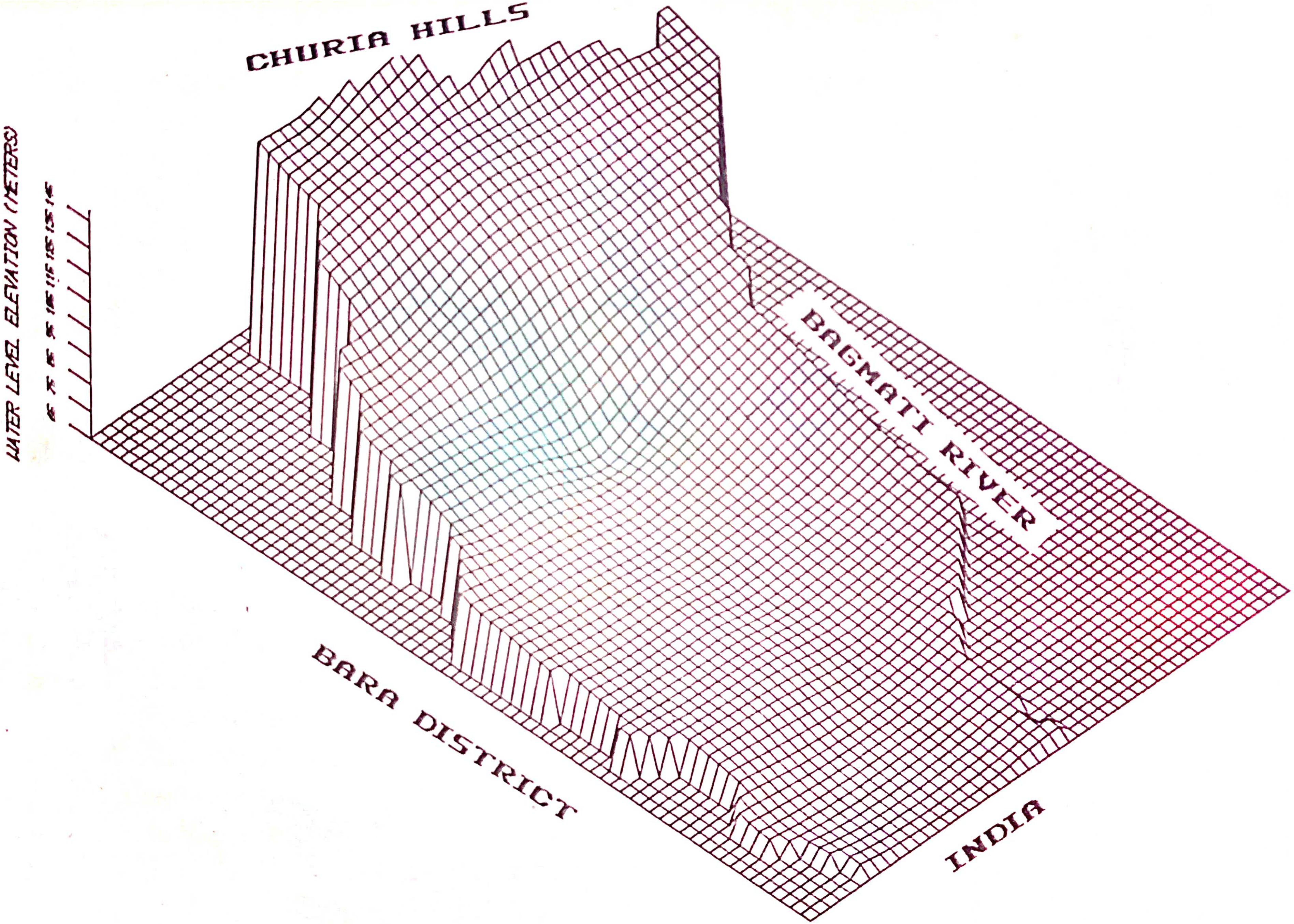
RAUTAHAT MODEL – DECLINE OF LEVELS 4-YEAR PUMPING



RAUTAHAT MODEL - SHALLOW AQUIFER SATURATED THICKNESS

AFTER FOUR YEARS OF PUMPING

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1											8.4	6.1	7.2																			
2										9.6	8.8	6.7	7.2	7.1																		
3										15.7	8.6	5.6	6.4	9.0	7.5	7.7	6.7	6.1														
4										15.2	13.5	11.3	3.9	9.1	8.9	8.5	8.4	7.5														
5										12.2	10.8	10.4	3.9	10.7	9.6	9.4	8.1	8.4	7.1													
6									10.9	10.6	9.9	9.3	8.2	6.4	7.8	9.1	10.4	11.2	9.0	5.7	3.5	1.4	1.4	5.5								
7									9.7	8.9	9.0	8.1	7.5	10.1	10.1	11.9	13.1	12.0	12.2	11.6	11.2	7.1	7.5	7.0	7.2	7.0	6.5					
8								10.1	9.0	8.2	8.6	7.8	7.1	8.8	11.1	12.9	14.6	14.8	14.6	13.2	14.5	11.2	10.9	10.9	9.1	9.4	8.5	6.9				11.2	12.7
9								9.4	8.6	7.8	7.1	6.1	6.7	8.2	12.0	11.3	13.6	15.6	17.2	19.0	18.7	11.8	12.8	10.1	10.4	11.1	10.4	9.5	8.8	12.5	13.1	15.6	16.8
10								8.0	8.2	7.5	7.1	6.3	5.0	4.1	6.4	11.8	11.7	16.4	17.3	16.3	16.1	13.1	11.6	9.3	9.5	13.0	10.4	10.4	10.2	12.6	15.9	19.0	
11							8.7	8.7	9.0	8.8	8.9	8.6	9.8	9.7	10.8	11.0	9.9	10.5	11.6	12.0	13.2	13.0	13.4	14.0	13.6	15.0	15.0	14.5	14.9	16.4	17.7	18.6	
12					10.7	9.7	9.9	10.3	9.5	10.1	9.6	9.3	9.2	8.9	10.6	8.5	9.1	9.5	11.6	14.0	12.9	13.7	14.9	16.9	17.8	18.2	18.6	17.1	18.1	18.1	15.8		
13					12.3	11.8	10.6	11.3	10.5	9.9	9.4	7.9	8.4	8.3	8.0	7.6	7.9	8.0	7.0	10.2	13.3	15.0	17.9	14.3	15.8	15.4	14.5	15.4	15.8	19.3			
14					13.9	13.3	11.3	10.8	10.9	9.8	9.3	8.7	8.0	7.9	8.1	7.6	7.8	8.0	4.6	10.4	14.9	16.4	16.5	15.9	13.5	16.1	16.0	16.5	15.4				
15				16.5	14.8	13.4	12.8	11.6	10.6	10.1	9.6	8.8	9.0	7.4	6.8	6.2	3.2	5.6	7.2	12.0	18.0	17.6	17.1	16.2	13.7	18.8	16.6	15.9					
16				14.7	14.2	13.4	12.9	12.2	11.6	10.4	9.8	9.2	8.6	7.4	5.2	5.2	6.2	5.0	6.8	12.7	16.0	16.7	16.6	15.2	11.1	15.1	14.9						
17				15.8	14.7	14.2	13.0	12.3	11.1	11.0	10.4	8.8	8.2	7.5	7.0	6.6	6.7	7.1	8.5	12.7	14.8	16.0	16.1	15.7	11.4	19.4	17.8						
18			15.1	16.4	15.1	14.3	13.6	10.5	8.7	8.8	7.2	5.3	5.3	6.4	7.7	6.6	7.7	8.2	10.6	11.6	13.8	15.7	15.9	16.5	13.8	13.5							
19				16.2	18.2	17.1	13.0	11.2	9.2	7.8	7.8	5.2	3.8	3.5	4.0	5.2	7.9	8.5	10.7	10.7	12.9	14.1	15.1	15.9	14.2								
20				17.1	16.8	15.9	4.7	12.0	10.5	9.7	8.5	5.1	1.7	0.8	0.4	2.9	5.4	7.7	10.2	12.0	13.5	13.9	14.4	14.4	12.6								
21				16.6	17.1	16.1	14.3	11.3	9.9	8.1	7.4	4.8	2.1	-0.4	0.8	3.0	4.3	5.8	8.2	10.5	11.2	12.0	12.5	12.5									
22			17.8	18.2	17.7	15.4	14.0	11.2	11.1	9.2	7.6	6.7	4.3	5.0	1.2	5.7	4.8	7.3	8.5	11.0	12.0	13.6	14.3	13.5									
23			18.7	18.3	17.7	16.3	13.9	12.3	10.9	9.2	8.2	6.5	6.4	5.7	5.7	5.5	6.7	7.0	8.2	10.1	12.0	13.8	13.5	13.6									
24		18.4	18.4	18.2	17.5	16.5	15.1	13.7	11.9	10.2	9.4	8.6	7.9	7.8	7.3	7.2	4.9	7.0	8.7	9.5	11.0	11.9	13.4	13.6									
25		18.4	18.5	18.4	18.0	17.5	16.7	16.6	15.3	13.4	11.7	10.0	8.6	8.9	8.9	8.2	8.4	7.9	7.3	8.5	8.8	9.7	11.5	12.1	12.6									
26		19.0	19.2	19.0	18.7	18.4	17.9	17.4	17.0	14.6	12.2	10.0	9.6	9.6	9.1	9.0	8.0	7.9	8.8	8.8	9.4	9.5	10.0	10.6	11.5									
27		19.2	19.1	18.8	18.3	18.0	18.8	18.8	18.2	15.7	12.2	9.4	9.2	9.8	9.7	8.9	8.6	8.5	8.8	7.7	7.6	8.1	8.5	9.7	10.7									
28		18.4	19.6	18.9	18.4	17.7	17.8	19.5	20.8	17.1	13.5	10.9	10.5	10.6	11.0	9.9	9.6	8.9	8.5	8.4	7.9	7.8	8.2	8.9	9.7									
29		16.8	19.2	19.0	17.1	16.2	16.7	17.5	18.2	16.4	13.5	11.0	10.3	10.7	11.2	11.1	10.3	9.7	8.7	7.9	7.0	7.2	7.9	8.9	9.8									
30		14.7	16.2	17.3	15.4	14.5	14.4	14.6	15.0	14.3	11.8	10.6	10.0	10.8	12.9	11.7	10.0	9.1	9.4	8.0	6.0	7.4	8.6	9.1	9.7									
31		10.8	11.7	13.0	12.5	11.8	12.4	13.0	12.0	12.1	10.9	9.3	8.4	9.9	10.1	10.7	10.2	10.0	10.4	9.7	8.9	9.1	9.9	10.7	11.5									
32		7.5	8.7	8.6	9.4	10.6	11.4	12.7	11.4	10.4	7.3	6.4	6.9	9.2	9.8	10.7	10.5	10.9	11.5	11.7	11.6	11.6	11.9	12.5									
33		3.5	5.8	8.1	9.3	10.2	11.0	11.6	11.3	10.4	9.5	6.4	8.0	8.9	9.5	10.5	12.4	12.7	13.2	13.4	13.5	13.5	13.6	13.7									
34		3.2	4.4	6.8	9.7	10.4	11.6	12.5	11.8	10.9	9.0	7.9	7.8	9.6	10.3	11.9	12.6	13.8	14.5	15.2	14.7	14.7	14.7	14.7									
35		2.8	3.9	5.6	8.6	11.3	12.9	12.4	12.8	12.2	11.1	9.8	9.1	9.5	10.7	11.6	13.2	14.1	15.4	15.8	15.8	15.4	15.6	15.0									
36		2.4	3.4	4.1	5.1	7.3	11.7	15.2	14.7	14.3	13.7	12.8	11.8	9.6	10.4	10.9	12.1	12.9	14.3	15.2	15.9	15.9	16.3	16.4	16.5									
37		3.3	3.6	4.0	4.3	3.1	11.0	17.0	16.4	15.6	14.7	13.8	11.8	10.8	10.6	11.5	12.2	13.3	14.2	15.4	15.8	16.4	16.6	17.2										
38		4.1	4.6	5.4	7.7	12.7	16.0	16.9	16.2	15.9	14.2	12.2	11.0	11.5	11.4	12.6	13.4	16.6	16.5	17.3	17.7	17.5											
39			5.5	6.7	8.7	11.8	14.4	15.9	14.3	13.5	12.8	12.4	11.5	11.3	11.9	12.5	15.1	15.9	17.3	18.2	18.5												
40			5.9	7.0	8.4	5.9	5.0	7.0	3.3	6.0	11.3	12.2	11.3	12.1	12.1	14.1	15.1	16.8	17.3	18.4													
41			6.1	7.2	7.7	7.2	5.4	3.2	5.6	8.7	10.6	12.0	11.7	12.5	13.2	14.4	15.7	16.7															
42			5.7	7.3	7.3	6.7	5.5	5.3	6.7	9.1	11.1	11.7	11.8	12.4	11.1	14.8	16.6	17.0															
43			6.6	7.7	7.5	7.1	6.8	7.6	8.9	10.8	12.1	12.0	11.7	12.7	13.9	14.5	16.1																
44		7.1	7.7	7.9	8.7	9.2	9.6	10.4	11.5	12.9	12.9	13.0	12.6	13.4	14.7	15.1	16.5																
45		8.0	9.0	10.3	10.0	11.7	12.4	13.2	13.5	13.4	14.2	13.7	13.8	14.5	15.8	15.7	17.7																
46		9.7	10.3	11.9	12.9	14.3	12.3	12.8	14.0	14.6	13.7	13.3	13.3	14.3	15.6	17.5	18.8																
47			11.9	13.1	14.3	14.2	12.5	12.5	13.9	14.0	13.8	13.2	13.5	14.6	16.6	17.7	19.2																
48			12.7	14.0	14.8	13.7	12.7	12.9	13.4	13.6	12.8	12.8	13.1	14.6	16.2	16.4																	
49			13.1	14.1	15.3	13.0	11.2	11.7	13.4	13.0	11.3	11.3	11.9	13.8	16.0	15.2																	
50				14.4	13.8	11.9	9.5	10.8	13.2	15.8	8.6	6.0	10.1	13.7	15.7	15.0	14.2																
51				13.5	12.8	11.5	10.3	10.4	11.6	10.9	8.2	7.4	10.4	14.0	14.0	15.3	14.5																



RAUTAHAT MODEL - WATER LEVEL CONTOURS AFTER 4-YEAR OF PUMPING