THE EFFECTS OF G[illegible]L EXTRACTION ON GROUNDWATER HYDROLOGY

IAN G. WILSON

JESUS COLLEGE

A thesis submitted for the degree of Doctor of Philosophy
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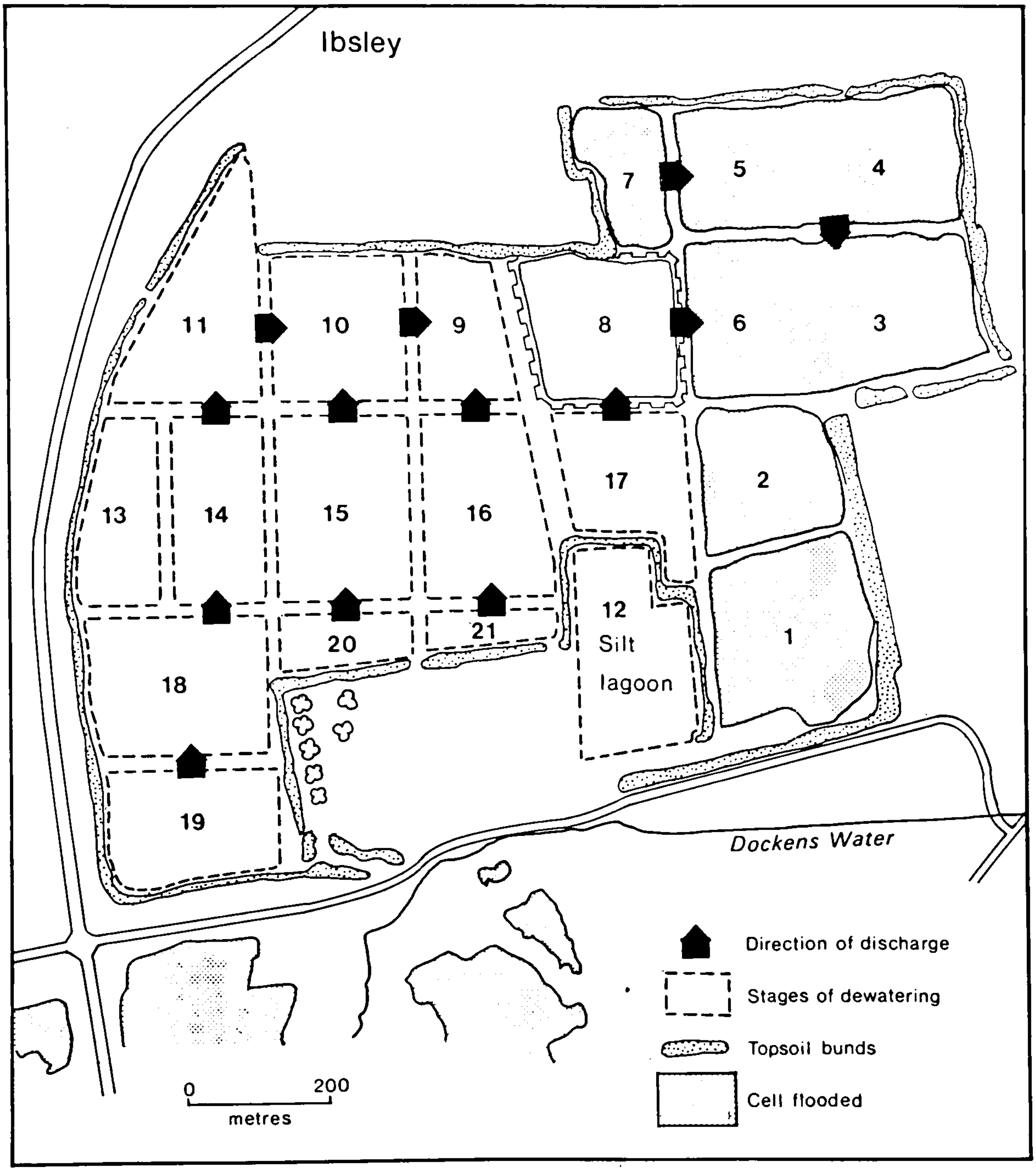


Fig. 1.1 Proposed plan of extraction on Ibsley Airfield, Ringwood.

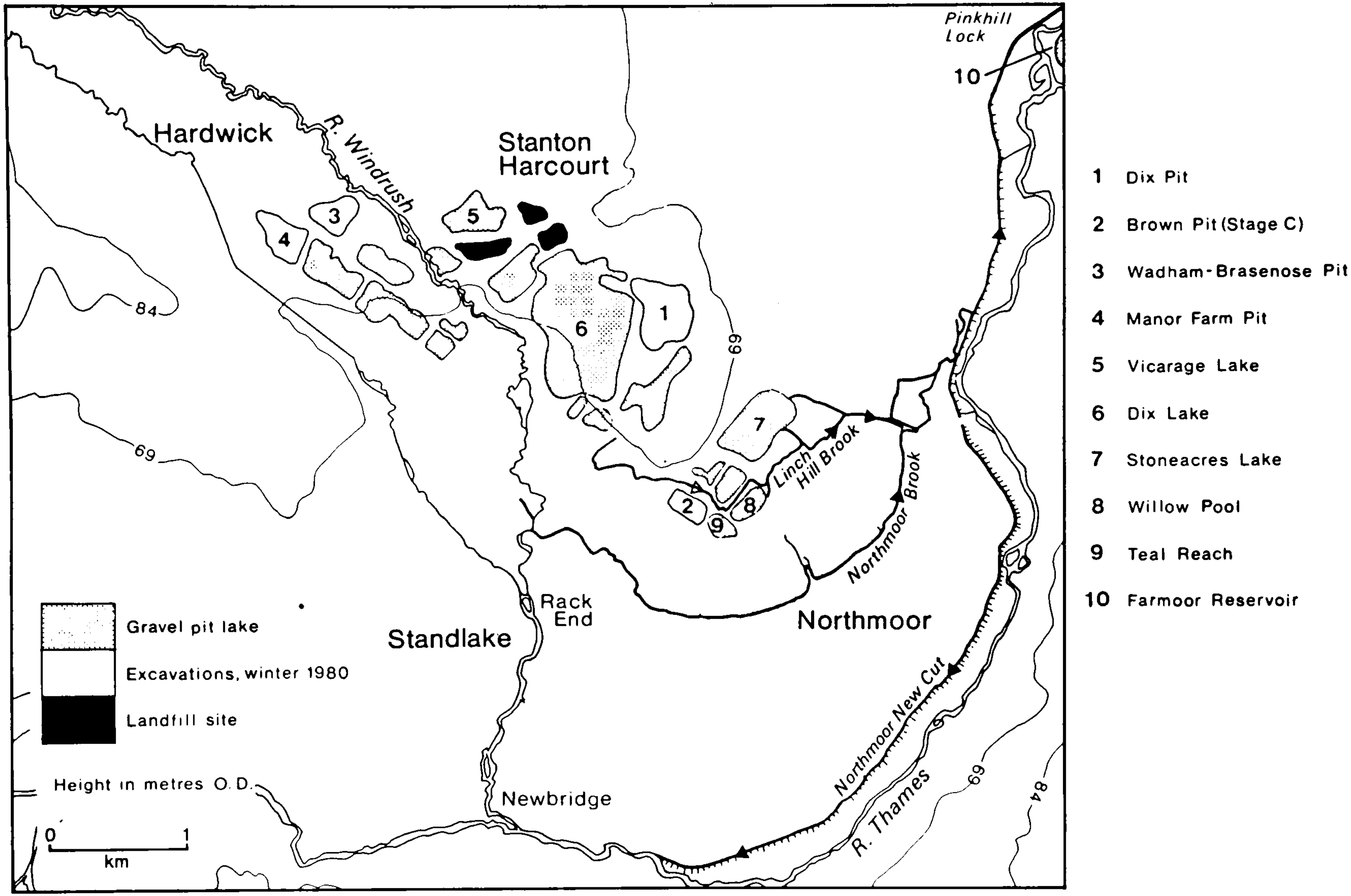


Fig. 2.1 Map of the Stanton Harcourt study area.

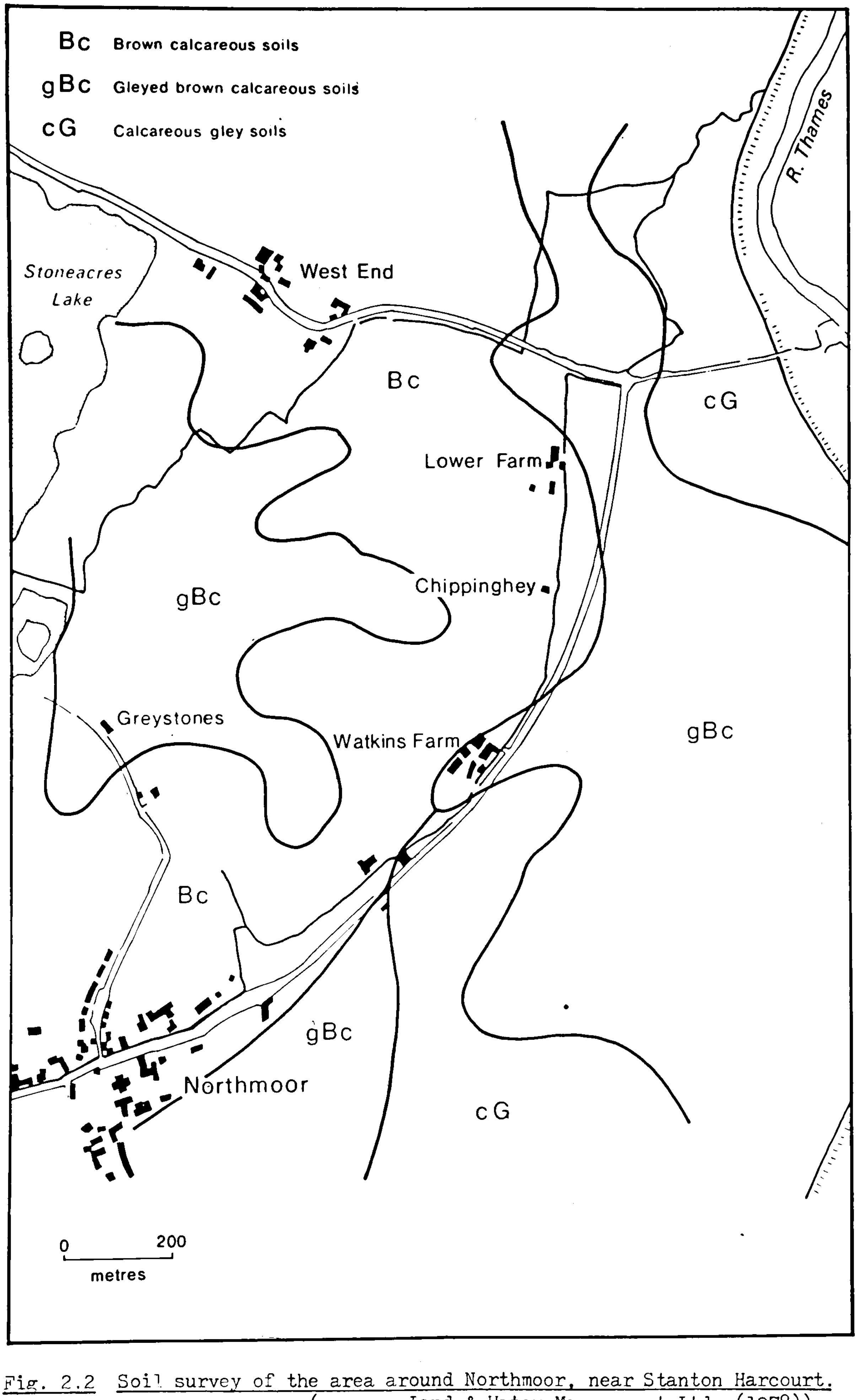


Fig. 2.2 Soil survey of the area around Northmoor, near Stanton Harcourt. (source: Land & Water Management Ltd. (1978)).

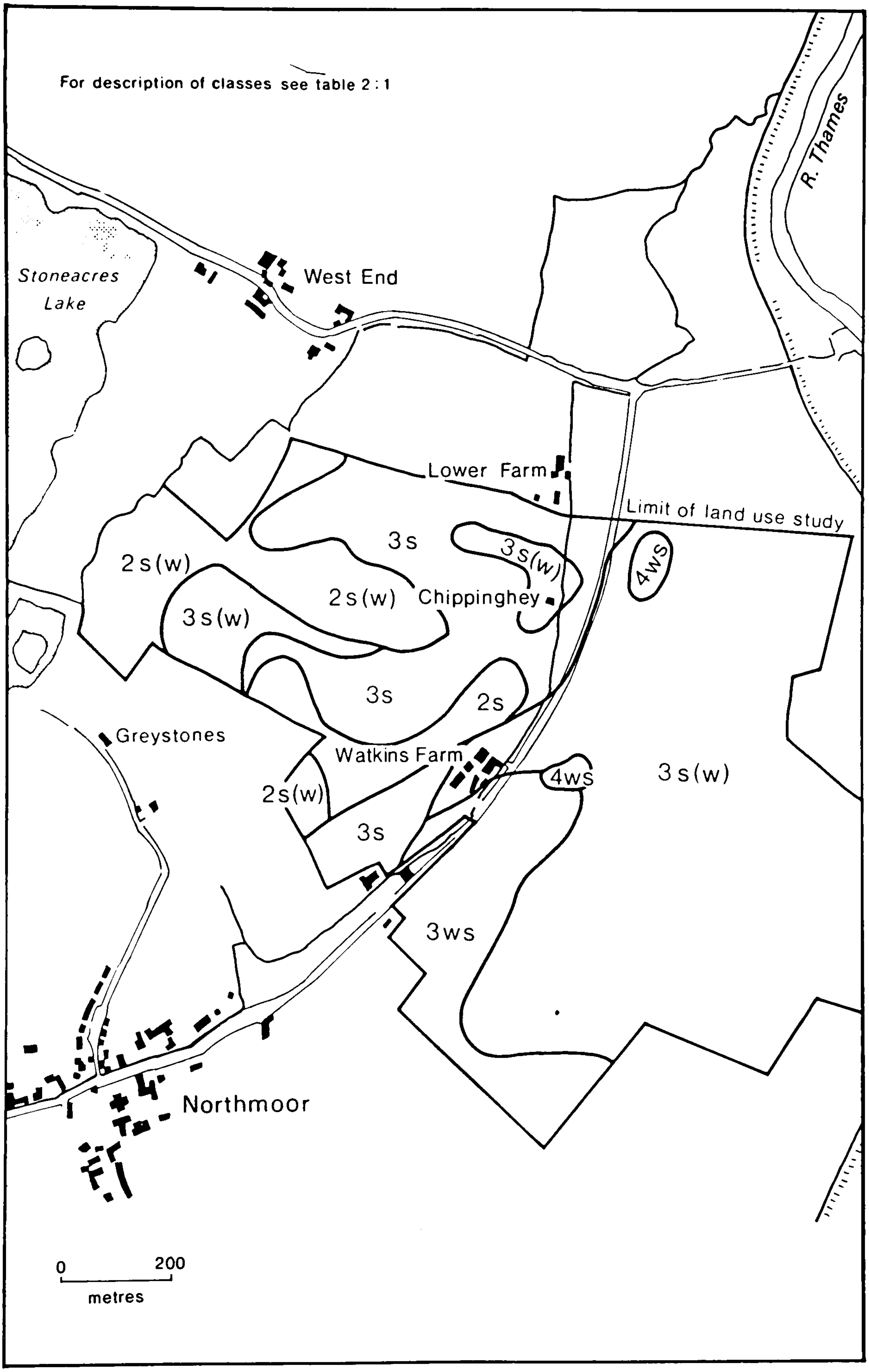


Fig. 2.3 Land-use capability map of the area around Northmoor, near Stanton Harcourt. (source: Land & Water Management Ltd. (1978)).

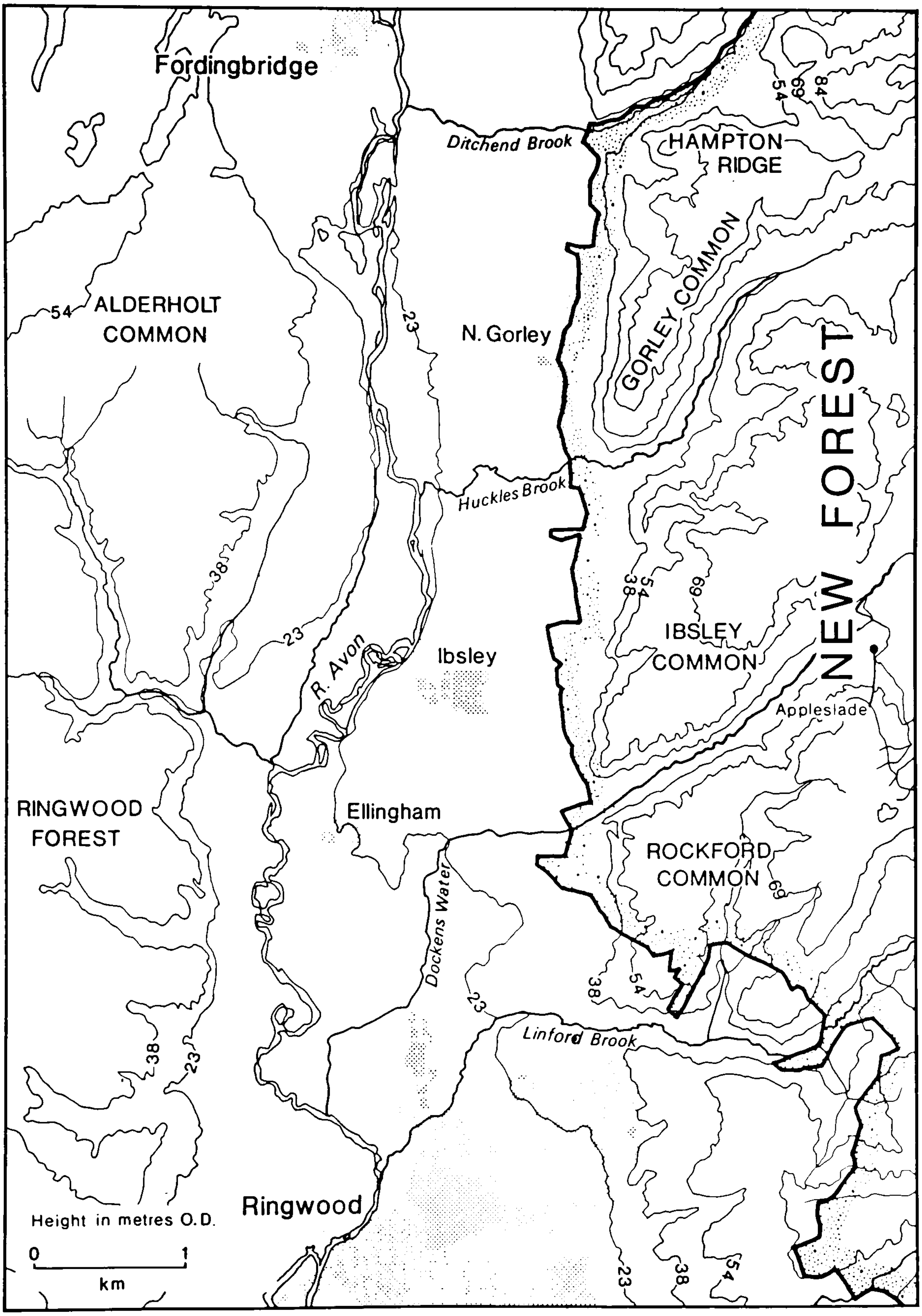


Fig. 2.4 Map of the Ringwood study area.

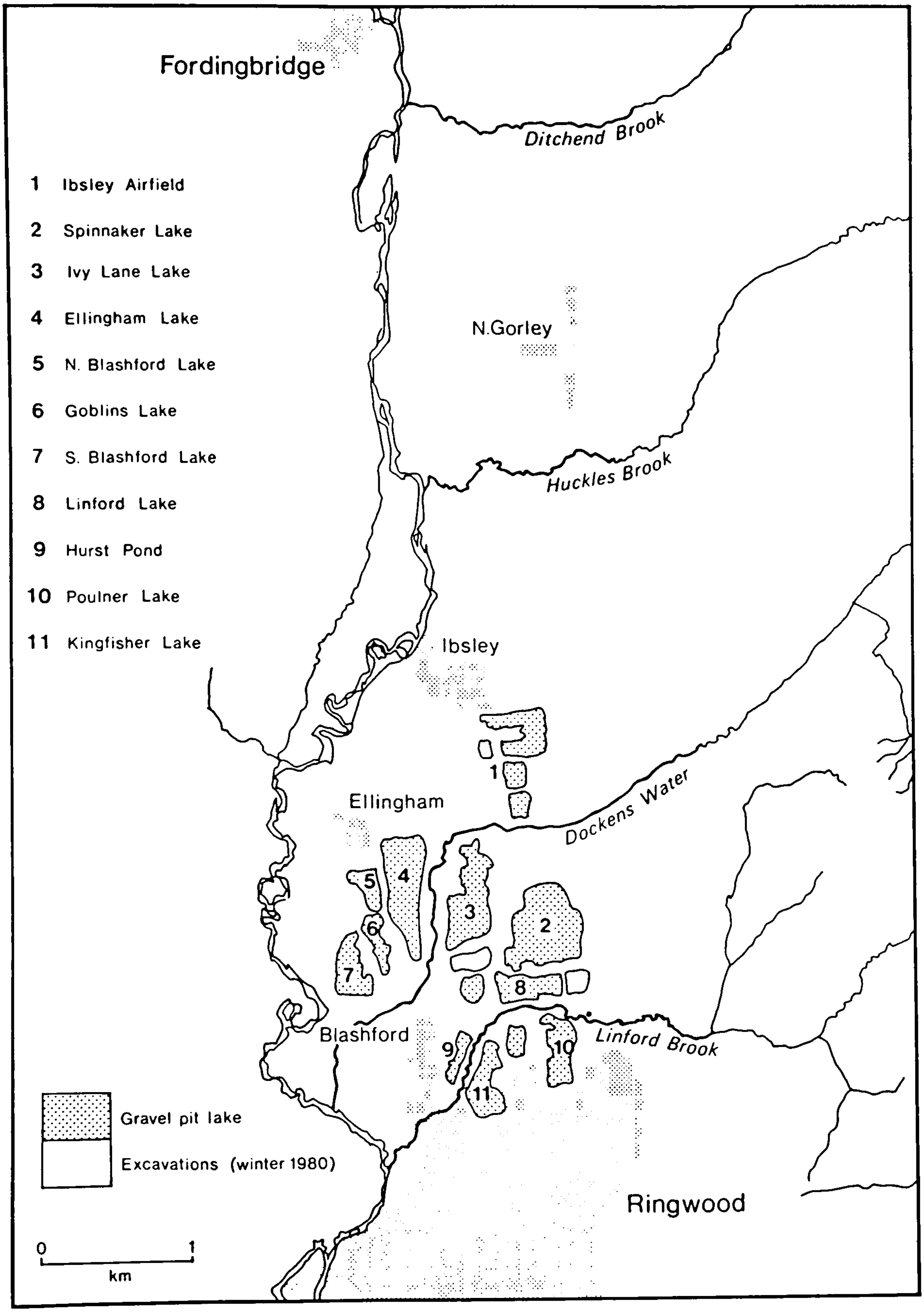


Fig. 2.5 Gravel pits in the Ringwood area.

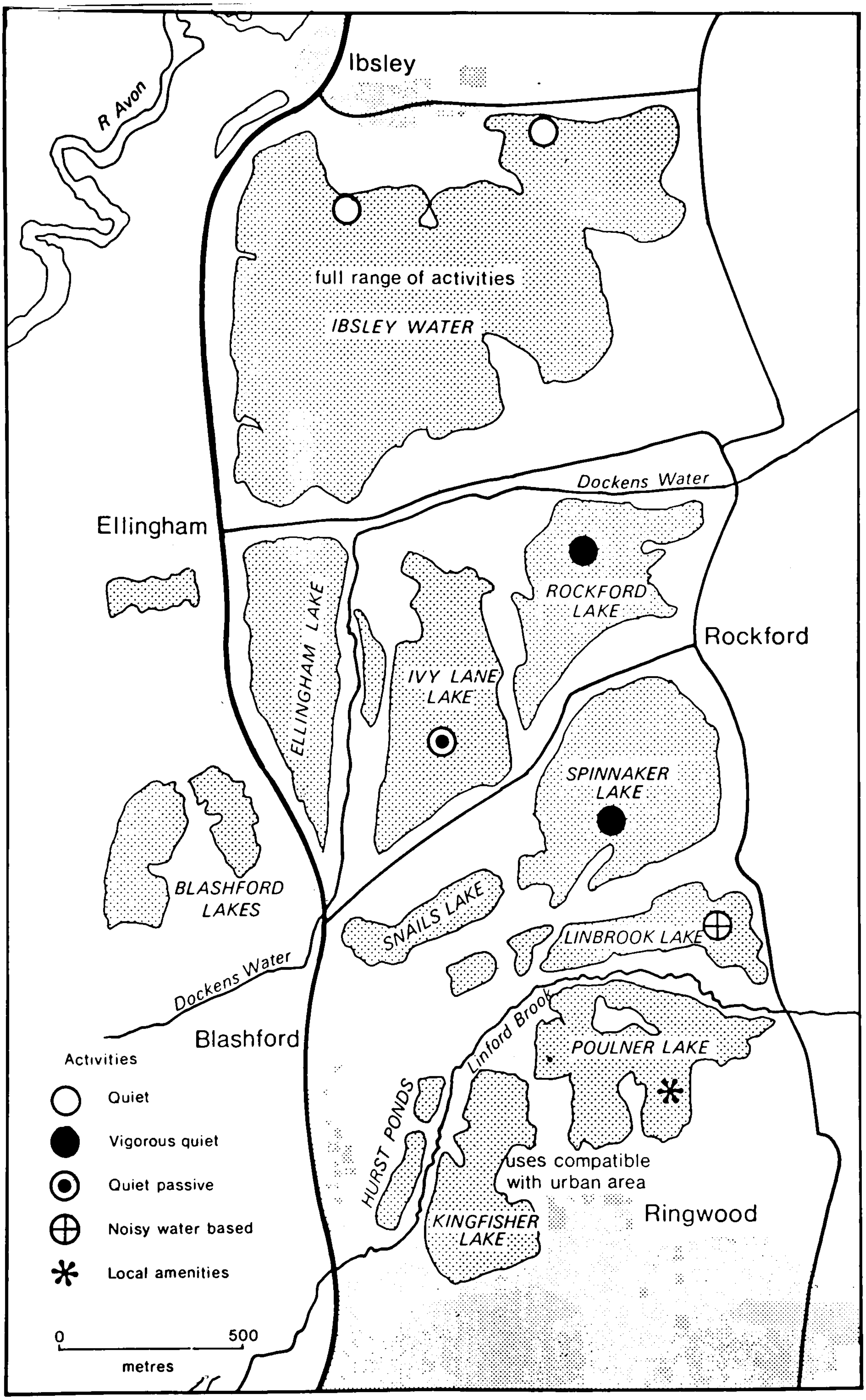


Fig. 2.6 Blashford-Ibsley Draft Local Plan proposals map.

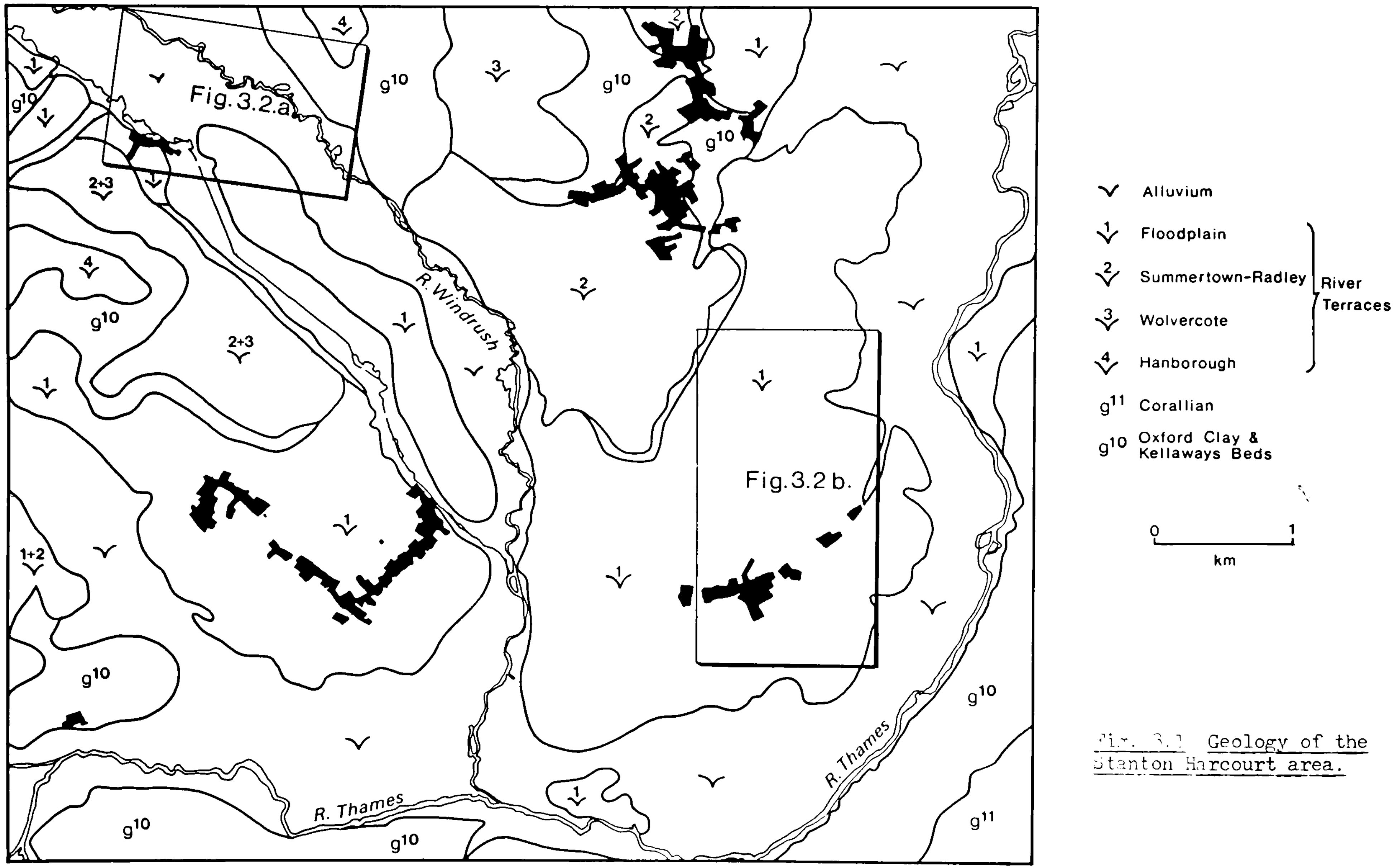


Fig. 3.1 Geology of the Stanton Harcourt area.

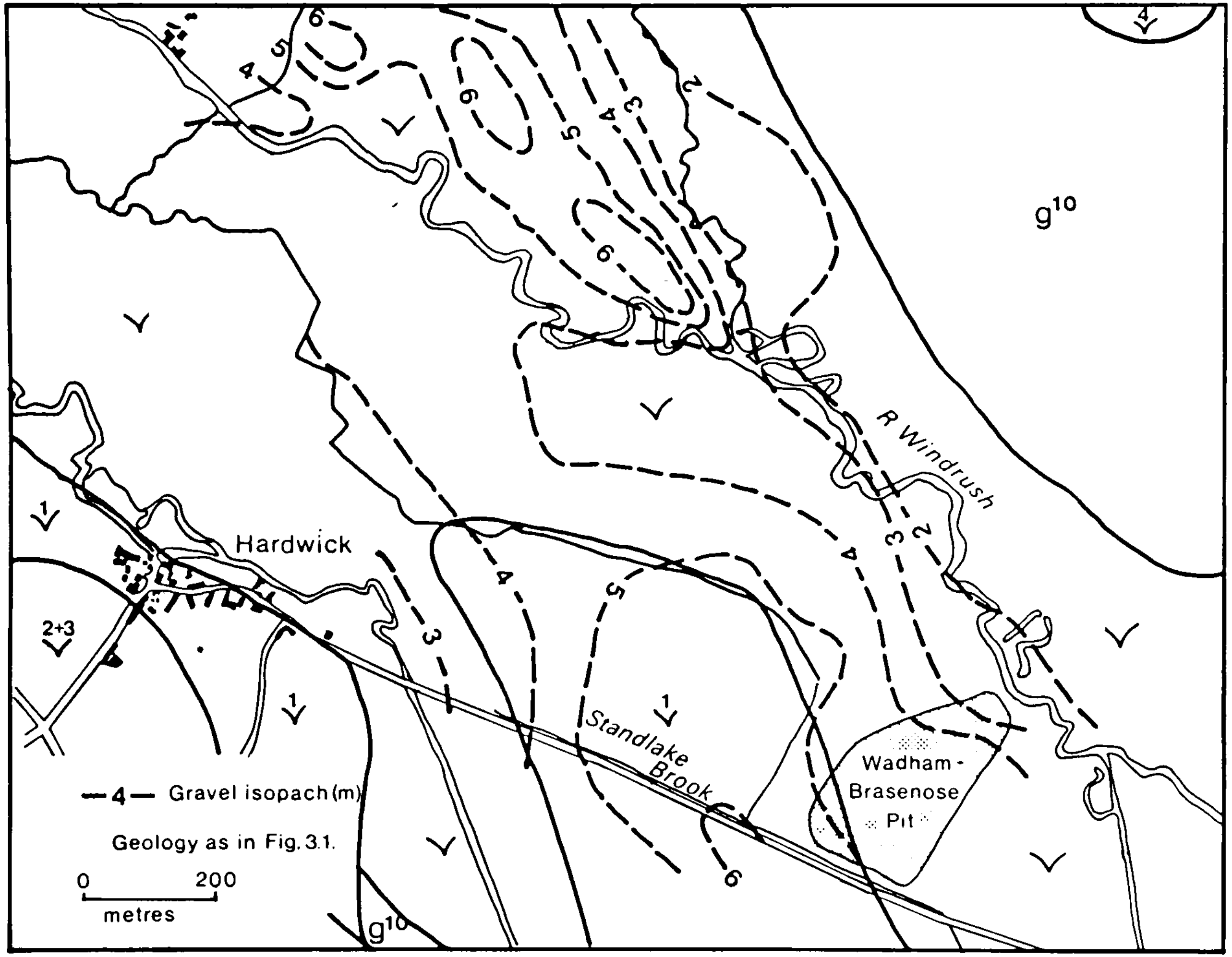


Fig. 3.2(a) Gravel thickness (in metres) around Hardwick.
(source: A.R.C. prospecting reports).

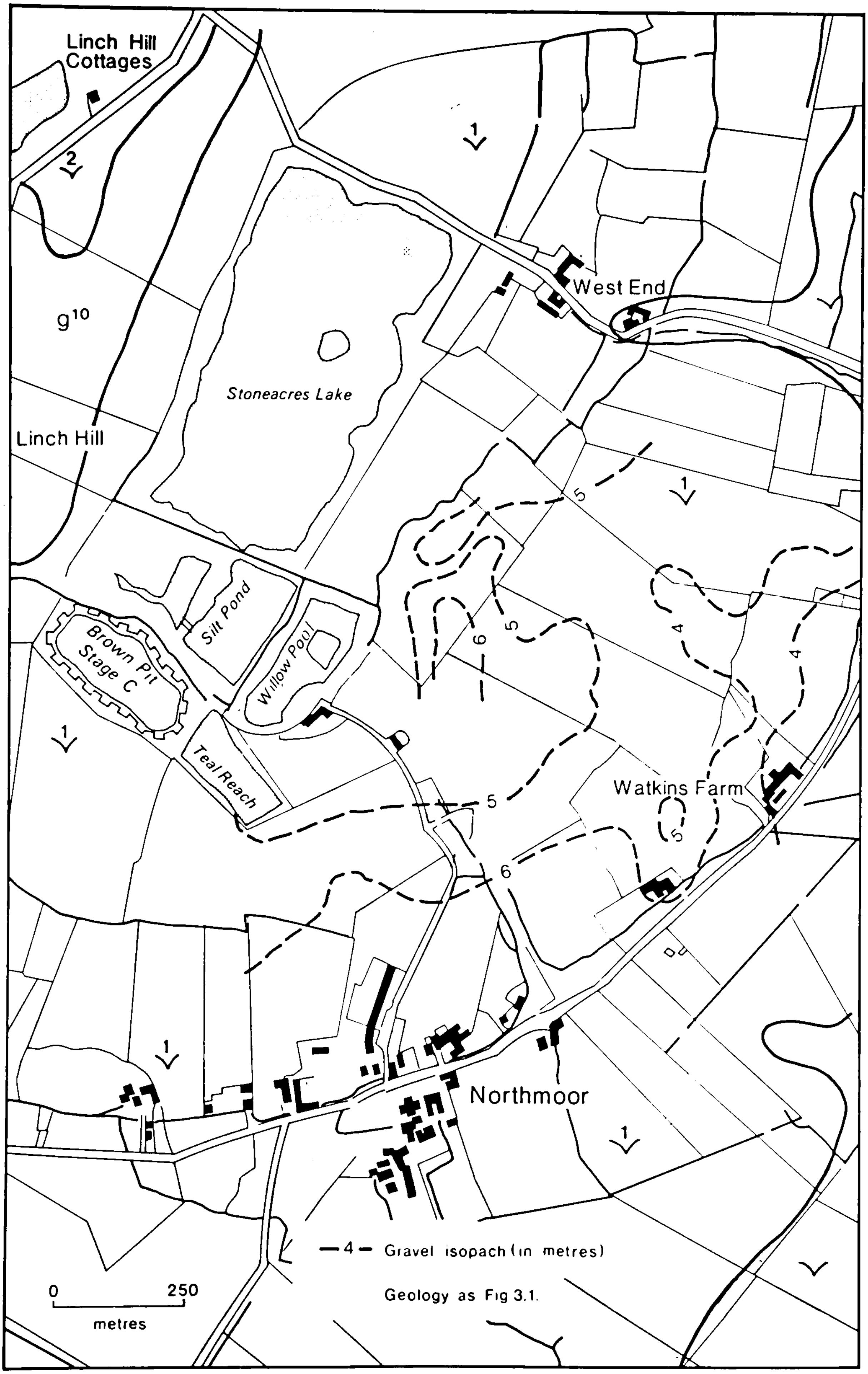


Fig. 3.2(b) Gravel thickness (in metres) around Northmoor.
(source: A.R.C. prospecting reports).

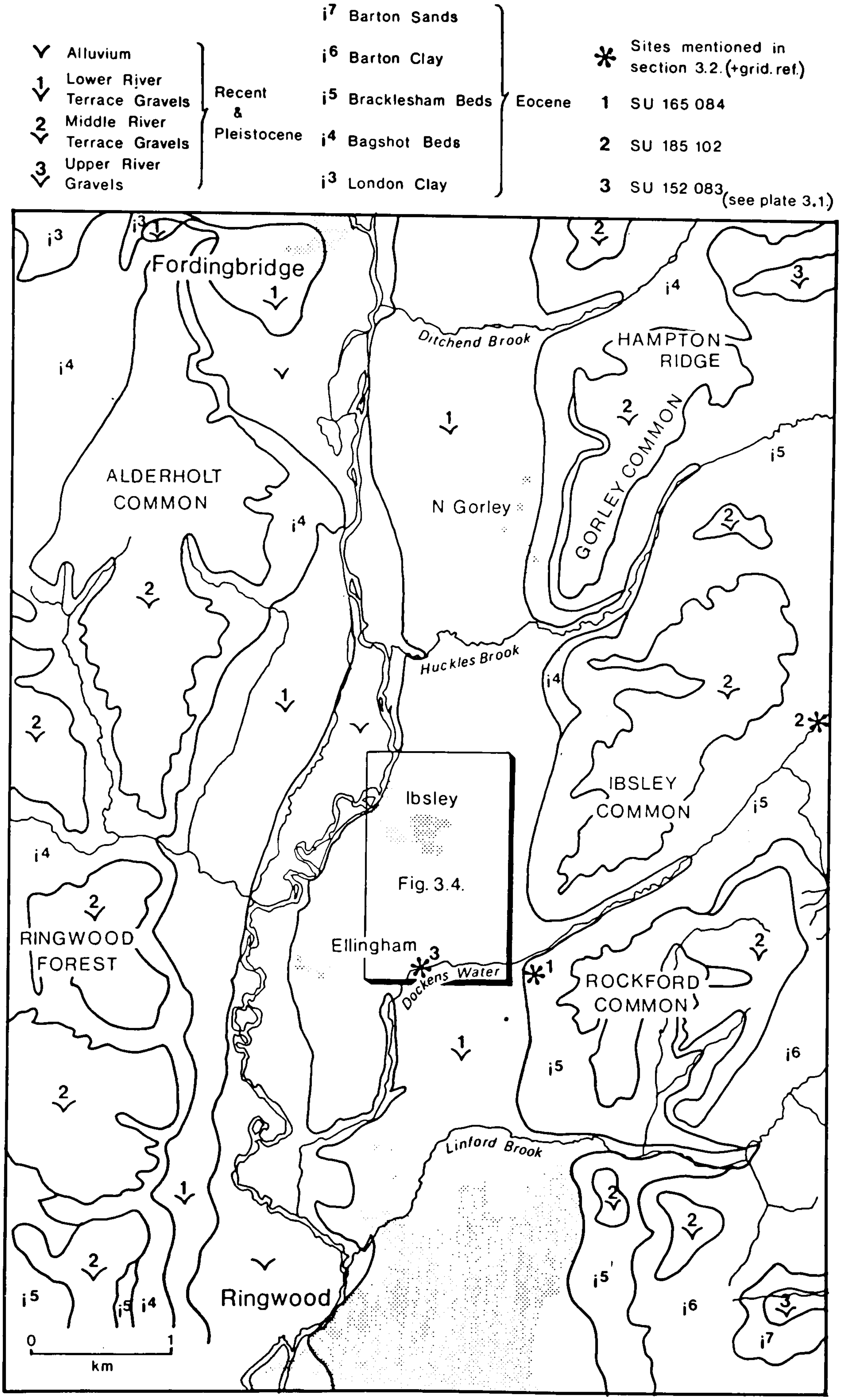


Fig. 3.3 Geology of the Ringwood area.

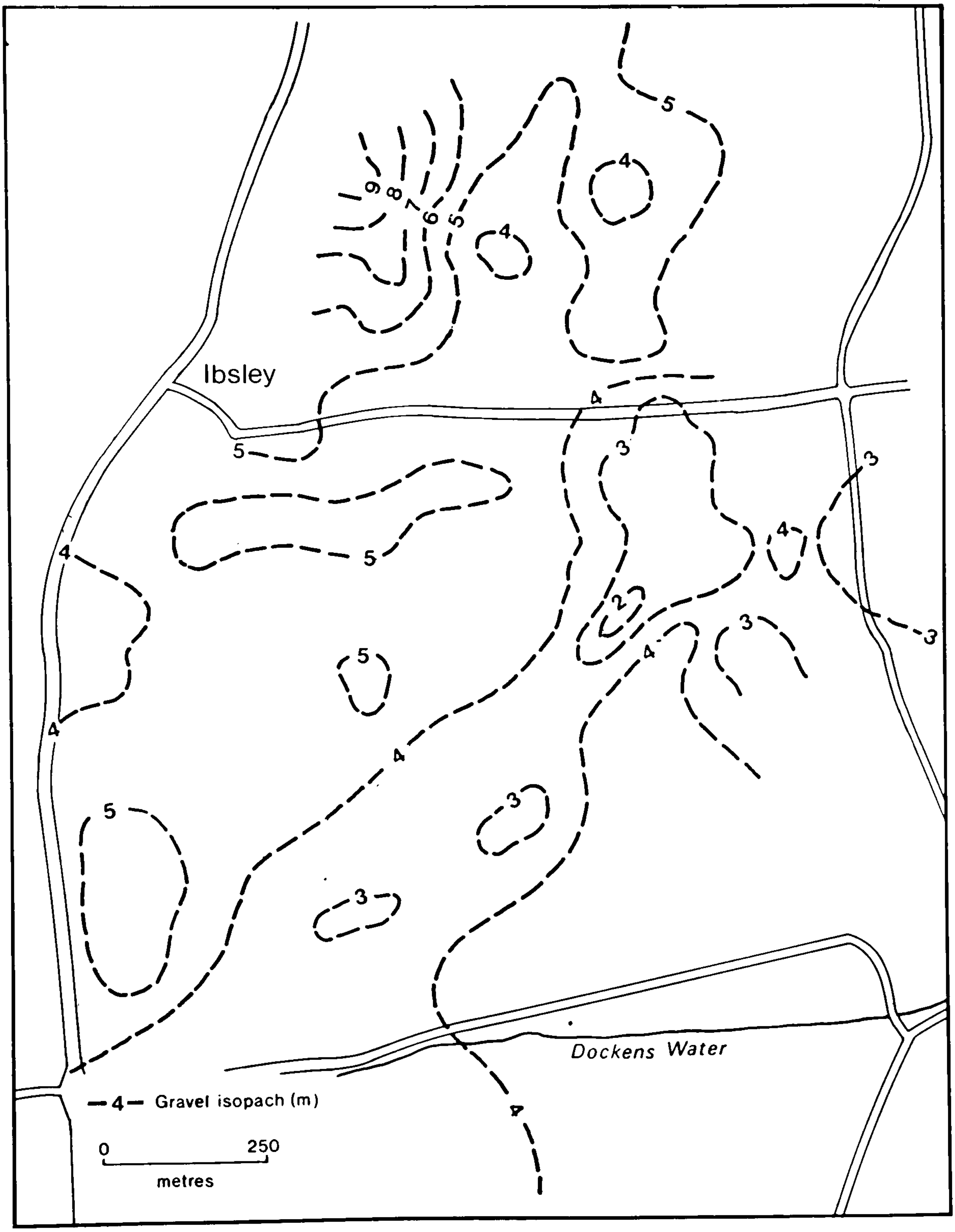


Fig. 3.4 Gravel thickness (in metres) around Ibsley.
(source: A.R.C. prospecting reports).

Key to figs. 4.1(a) and (b)

◎ 3·8 cm diam – installed by author } boreholes

o 3·8 cm diam – installed by A.R.C. } boreholes

□ Private well

▯ Stage board

▽ Rain gauge

1 Site number (prefixed by SH/)

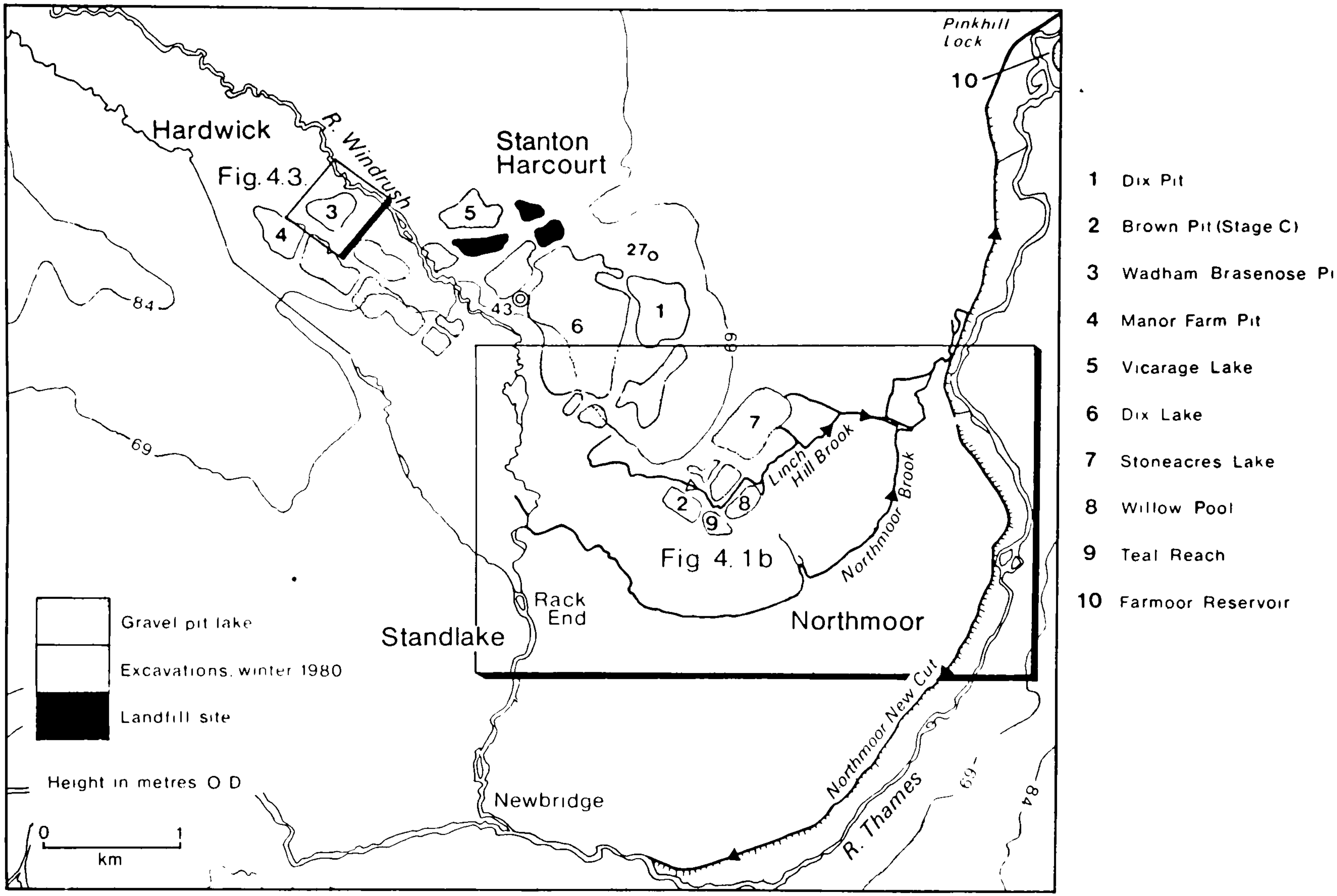


Fig. 4.1(a) Location of monitoring sites in the Stanton Harcourt study area.

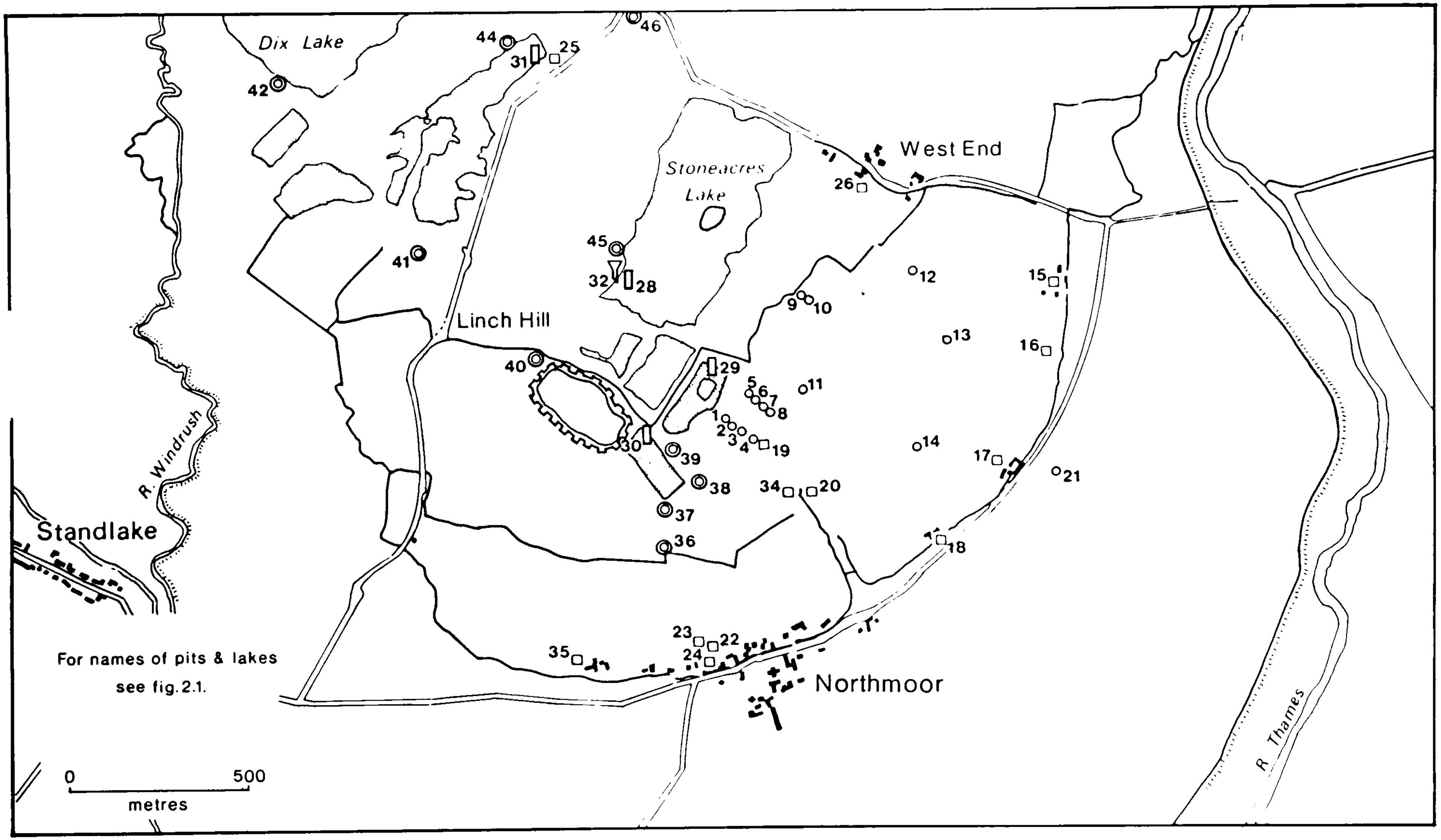


Fig. 4.1(b) Location of monitoring sites in the Northmoor area.

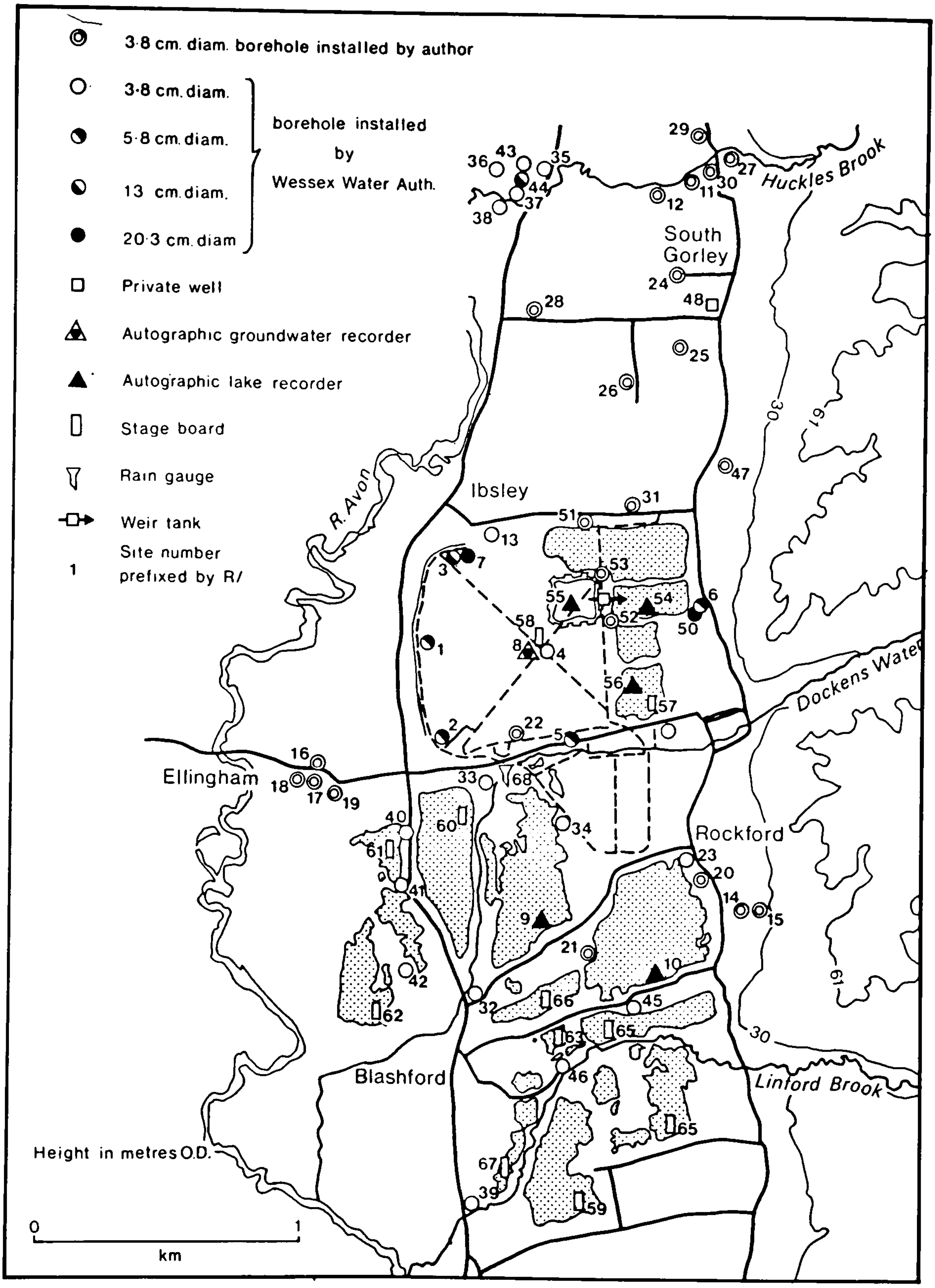


Fig. 4.2 Location of monitoring sites in the Ringwood study area.

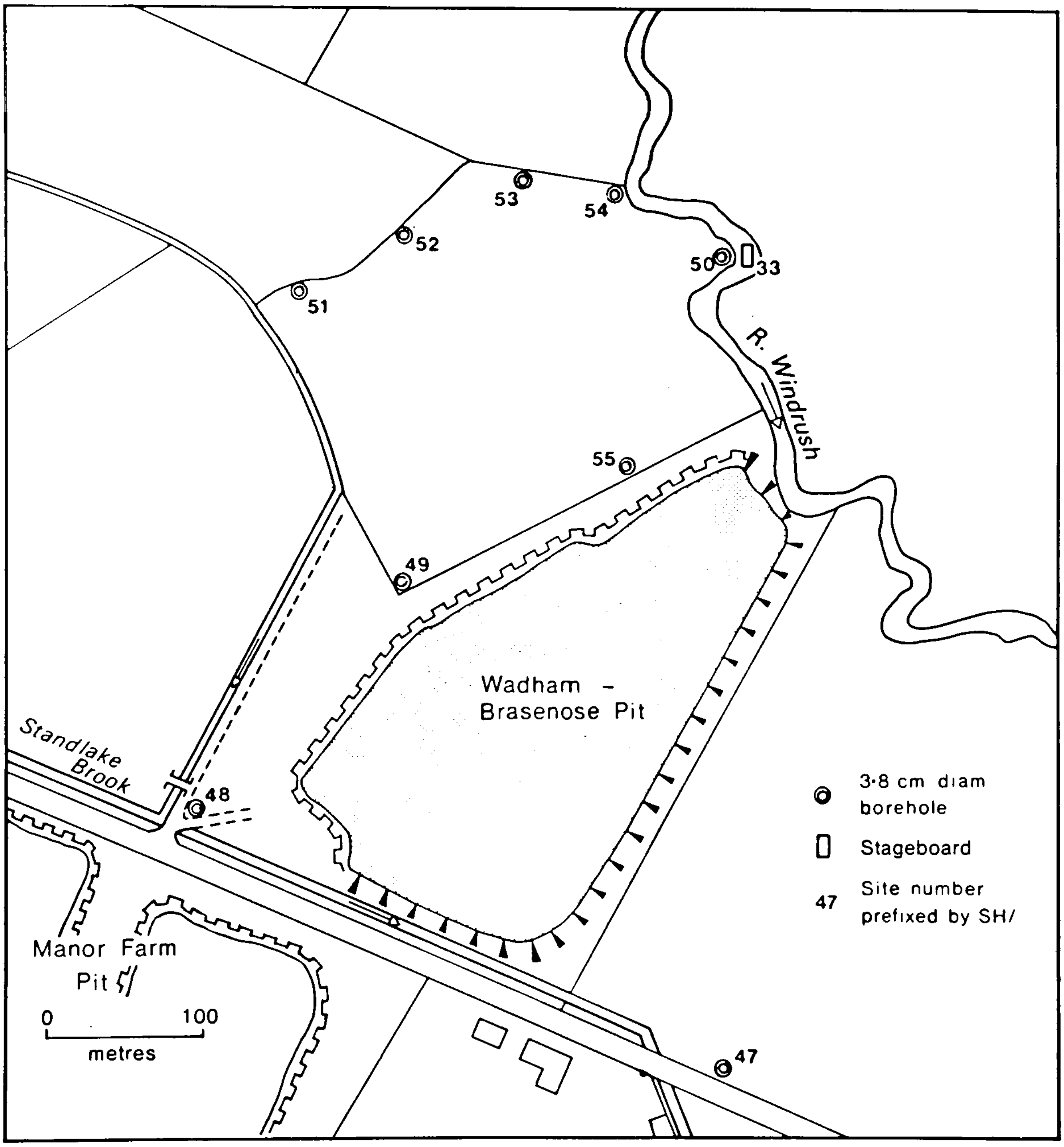


Fig 4.3 Location of monitoring sites in the Wadham-Brasenose Pit site, near Hardwick.

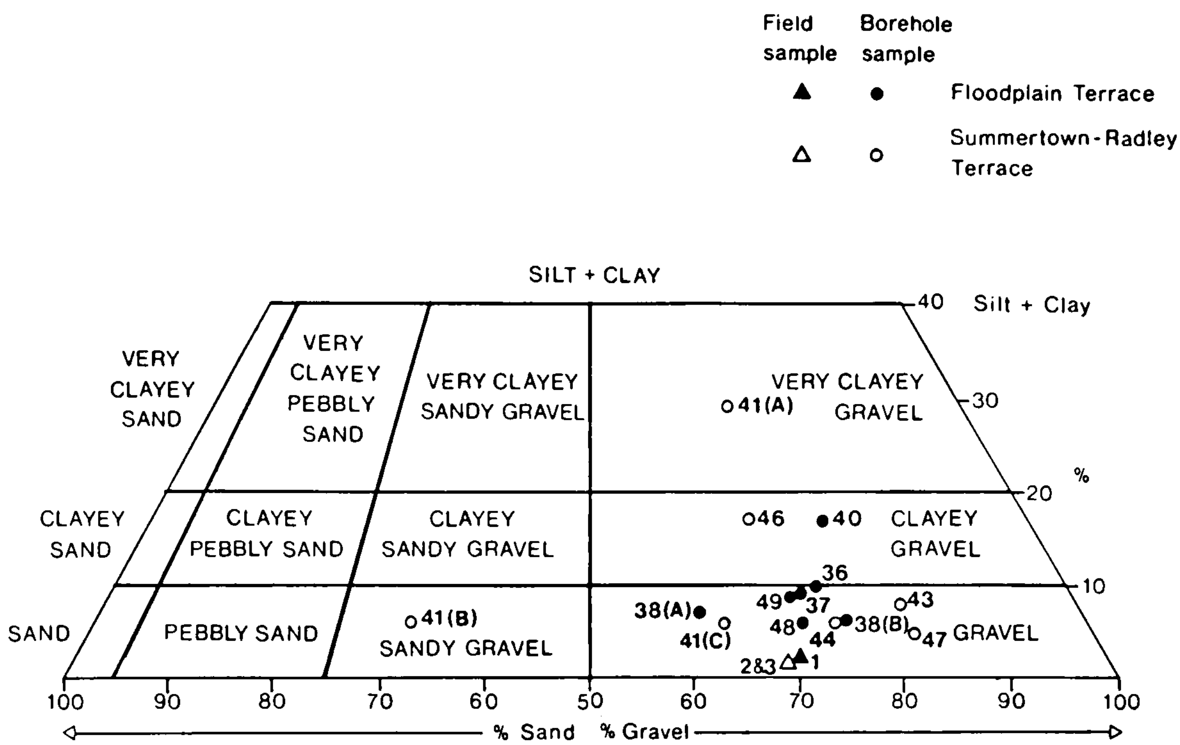


Fig. 5.1 Diagram showing the range in grading characteristics of the Stanton Harcourt 'gravel' samples.

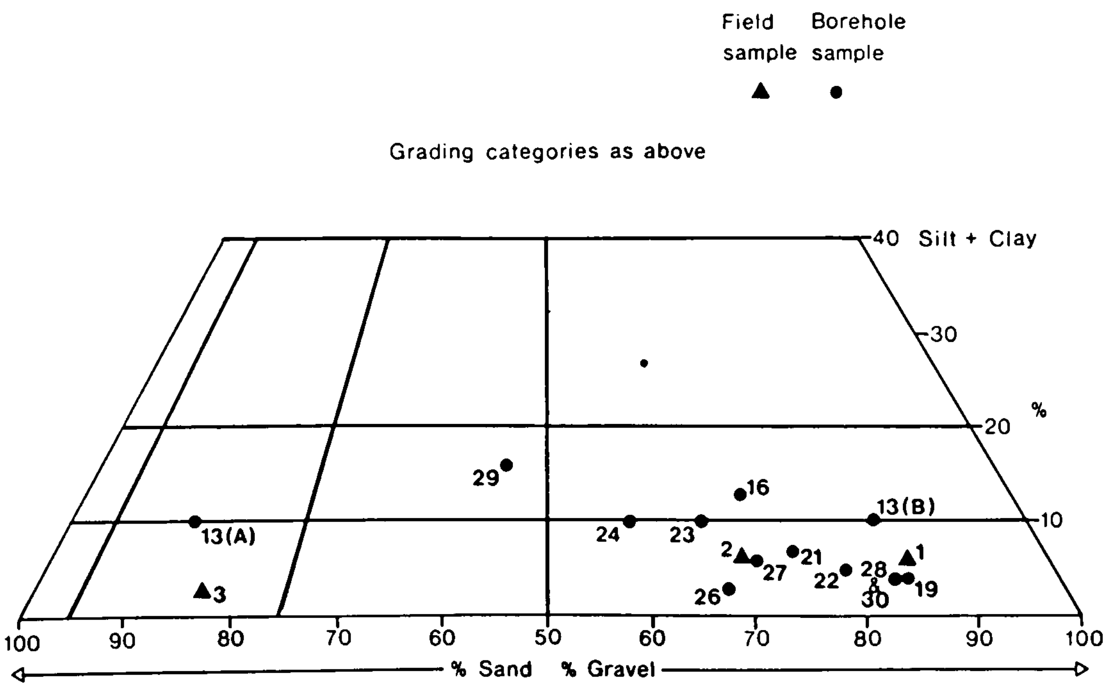


Fig. 5.2 Diagram showing the range in grading characteristics of the Ringwood 'gravel' samples.

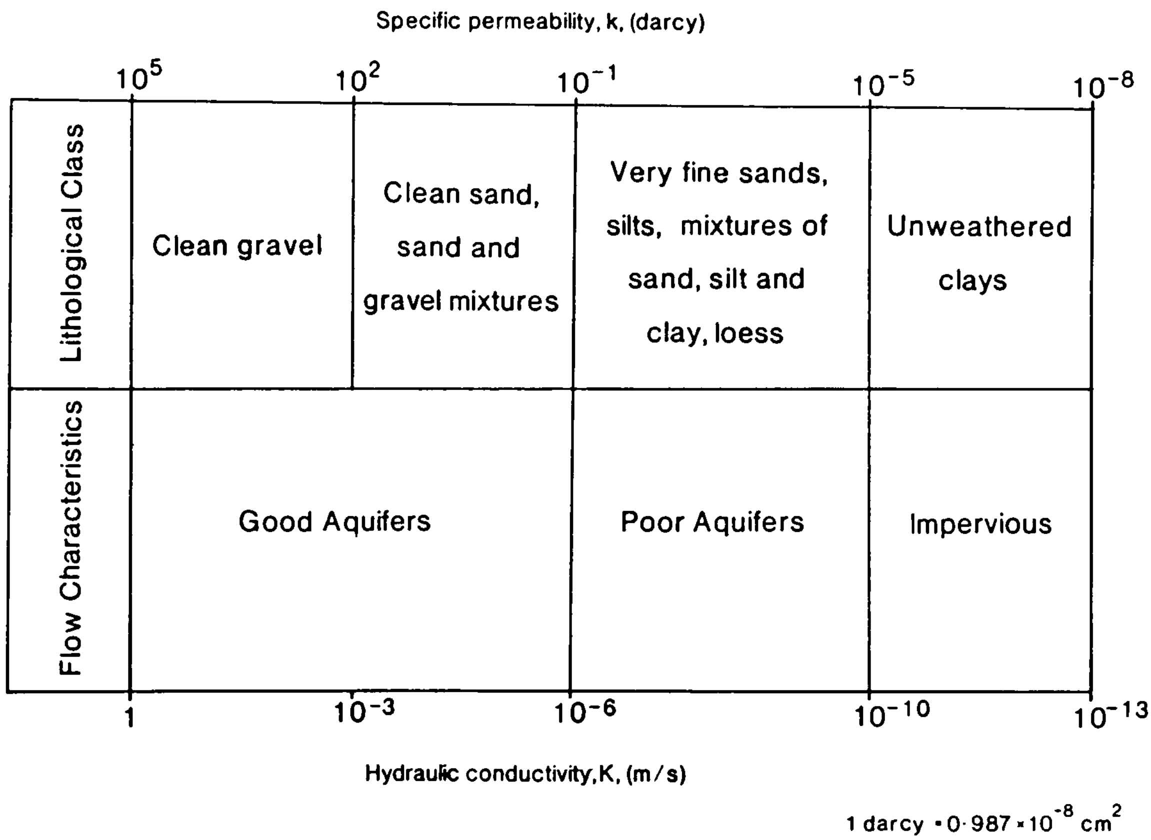


Fig. 6.1 Range of values of hydraulic conductivity and specific permeability for different classes of unconsolidated deposits. (modified from Todd, 1959).

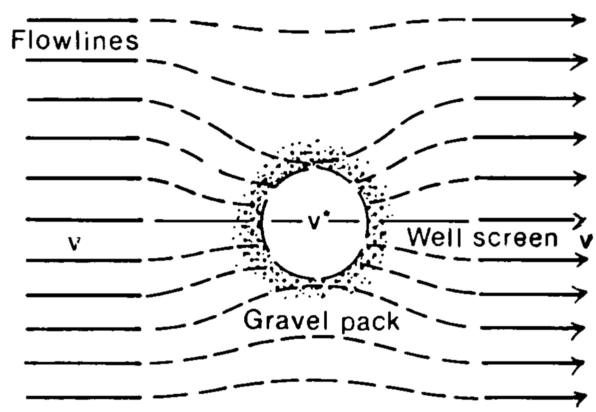


Fig. 6.2 Distortion of flow pattern caused by the presence of the well screen and sand or gravel pack.
(source: Freeze & Cherry, 1979).

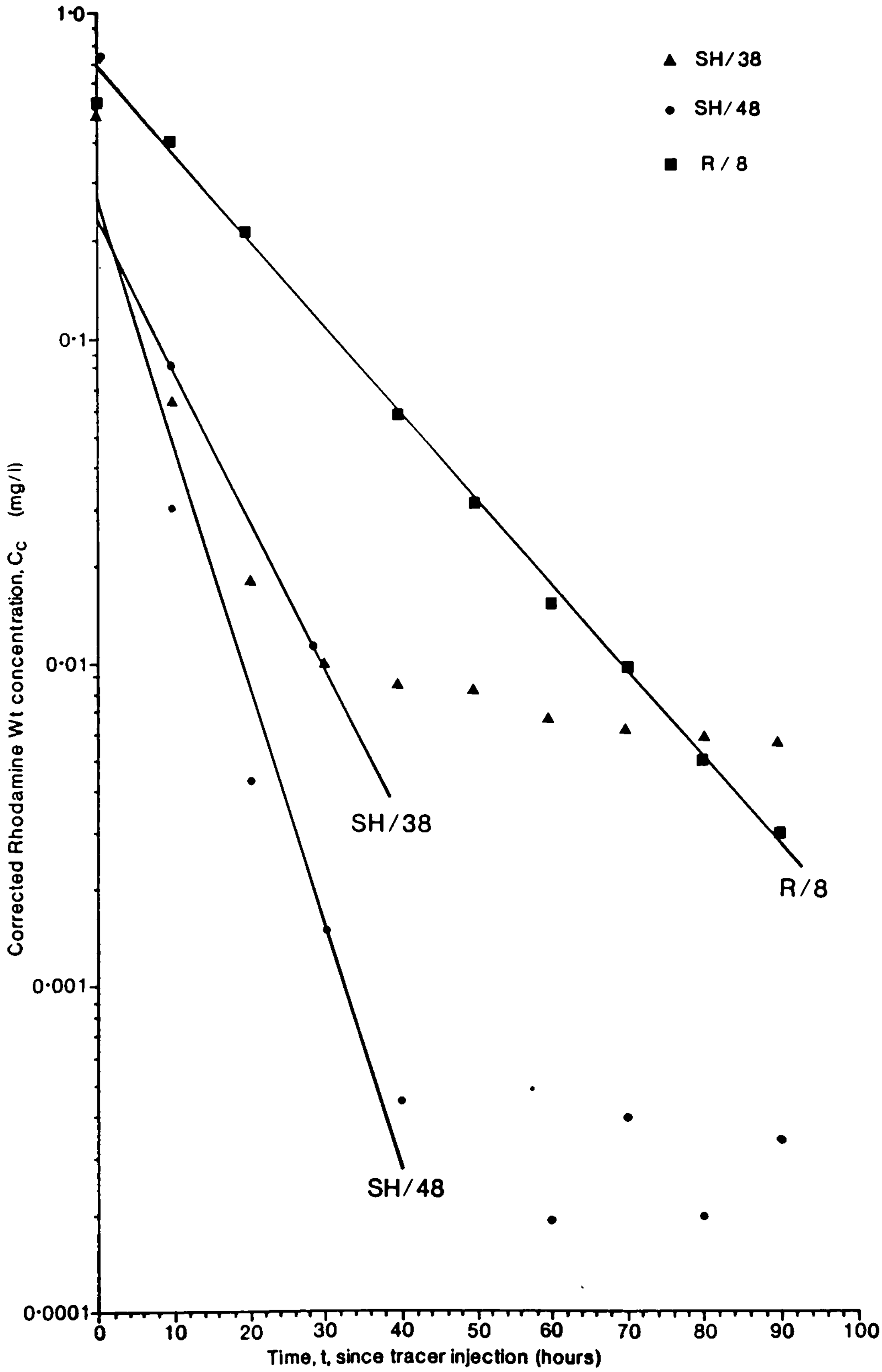


Fig. 6.3 Semi-log plots of corrected Rhodamine Wt concentration decay with time.

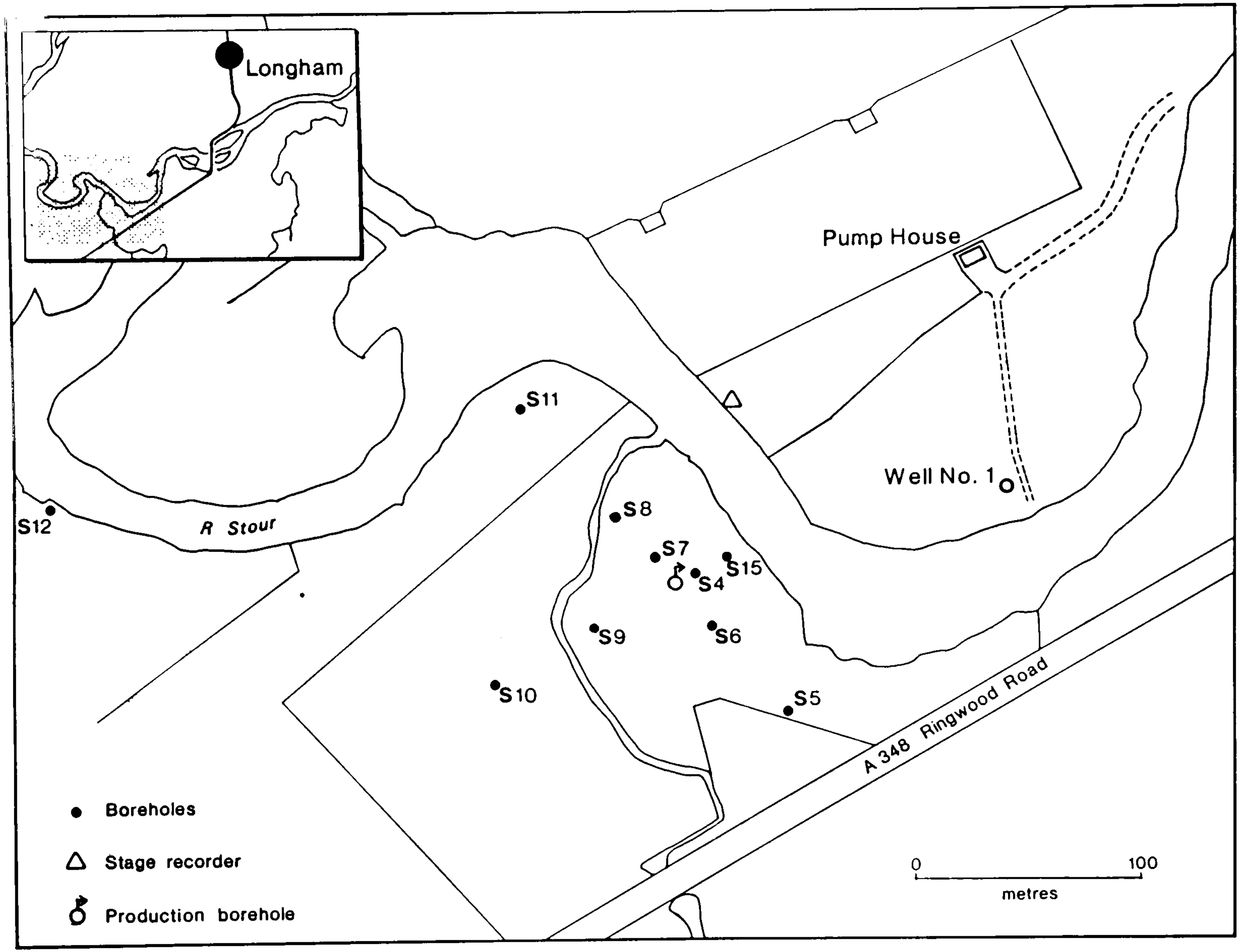


Fig. 6.4 Site of pumping test and dilution experiment at Longham, Hampshire.

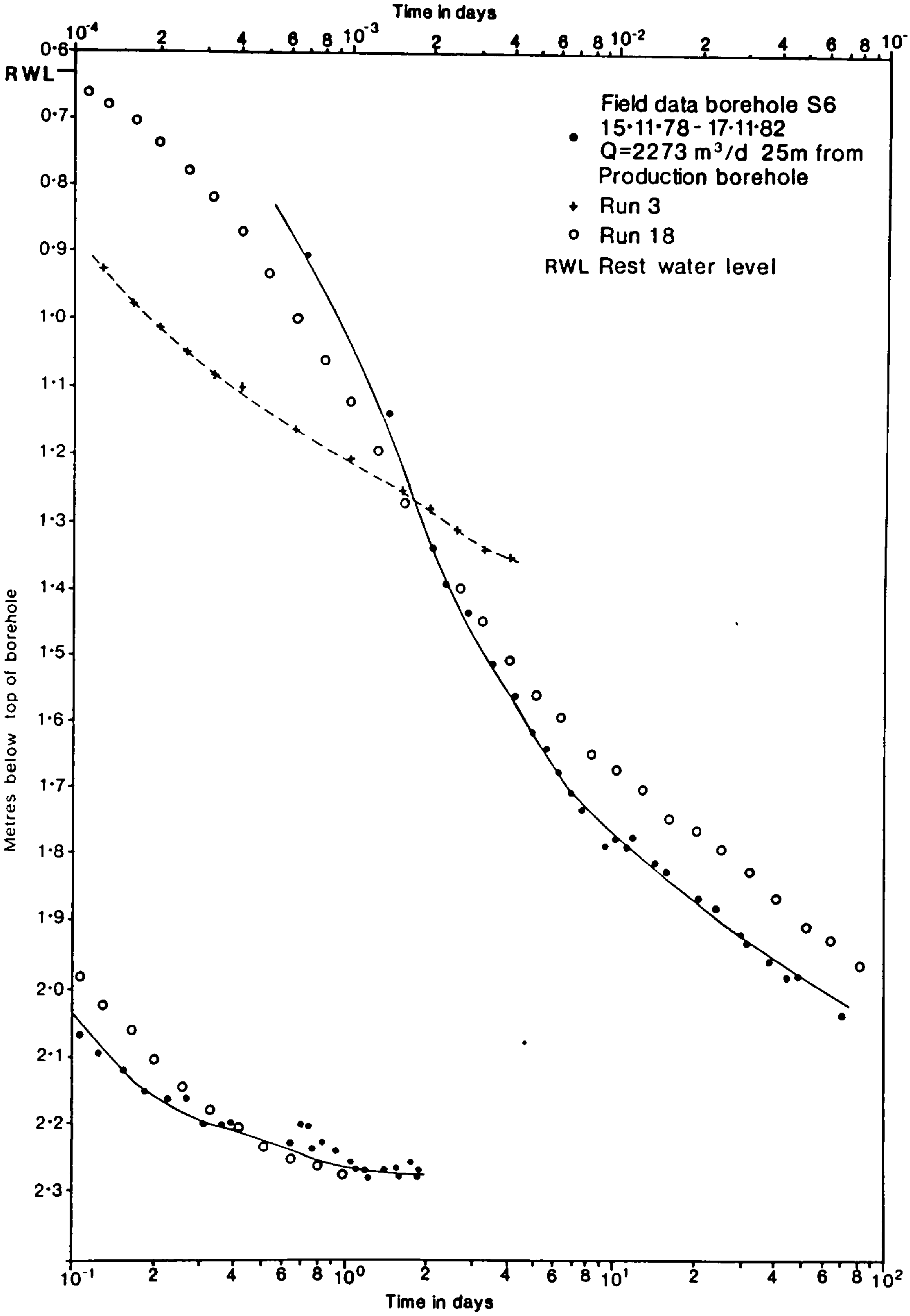
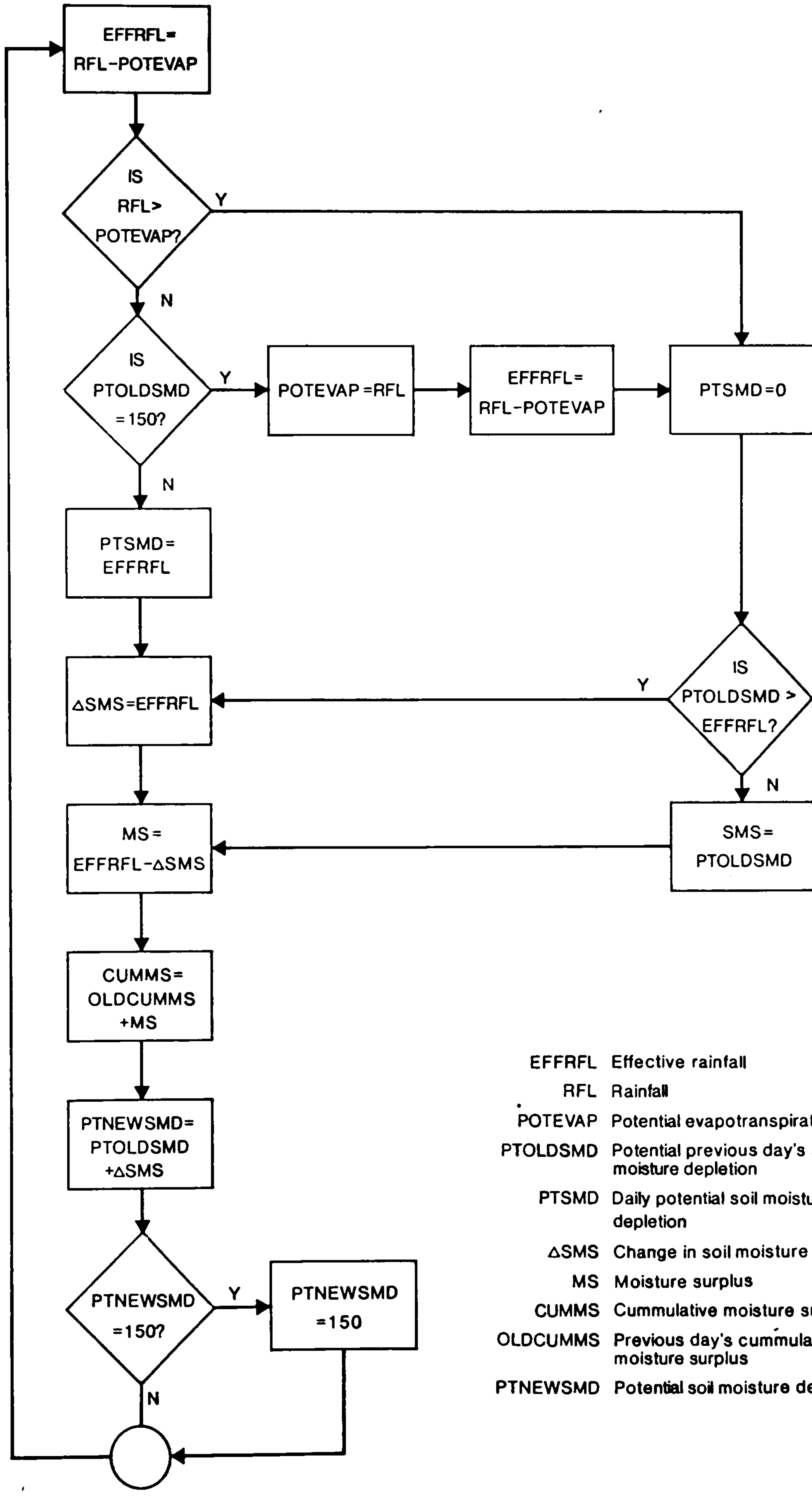


Fig. 6.5 Actual and predicted time-drawdown curves for pumping test at Longham.



EFFRFL	Effective rainfall
RFL	Rainfall
POTEVAP	Potential evapotranspiration
PTOLDSMD	Potential previous day's soil moisture depletion
PTSMD	Daily potential soil moisture depletion
ΔSMS	Change in soil moisture storage
MS	Moisture surplus
CUMMS	Cummulative moisture surplus
OLDCUMMS	Previous day's cummulative moisture surplus
PTNEWSMD	Potential soil moisture depletion

Fig. 8.1 Flow chart for Ringwood Soil Moisture Model.

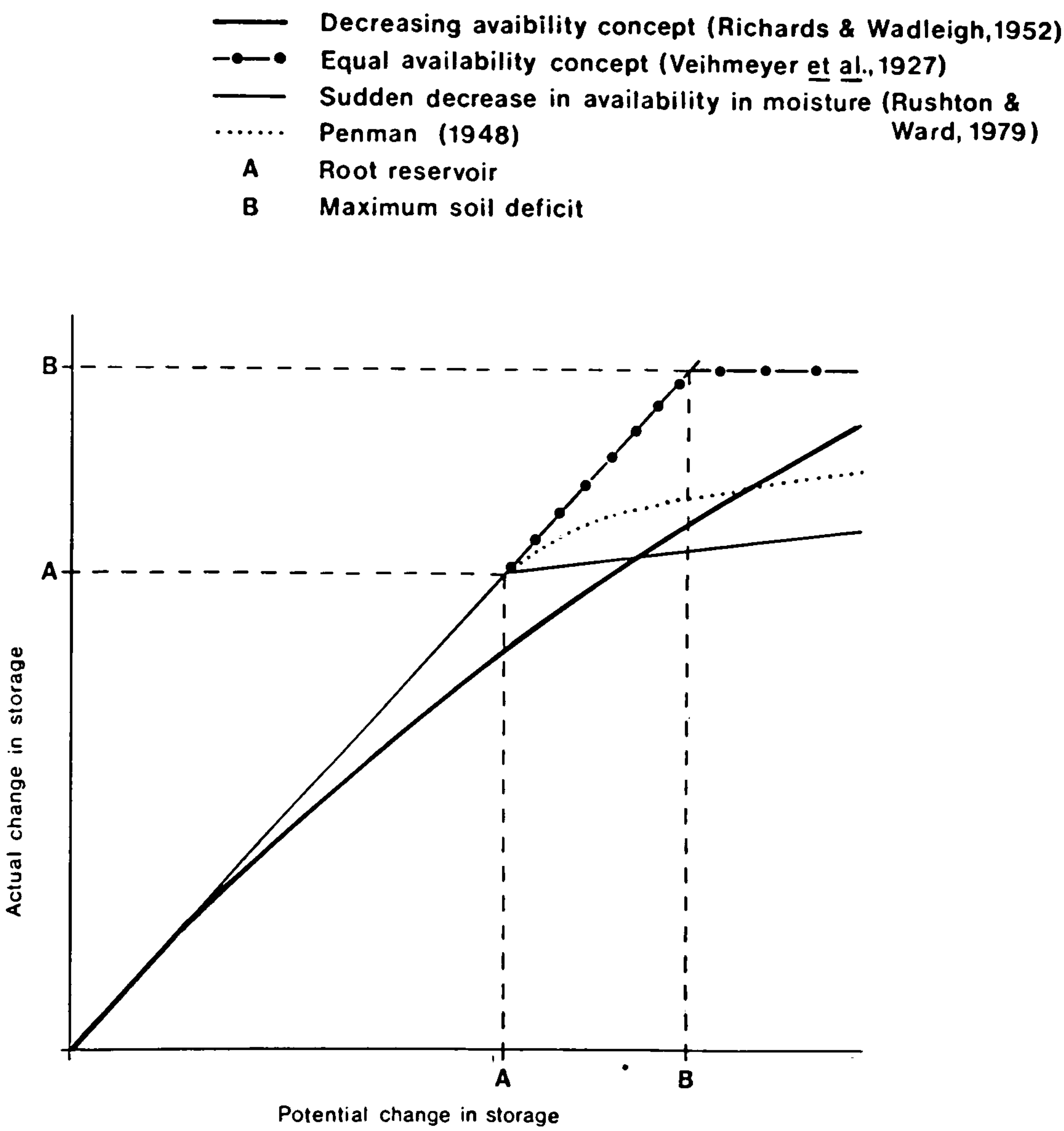


Fig. 8.2 Four drying curves for a vegetated soil.
(source: Rushton & Ward, 1979).

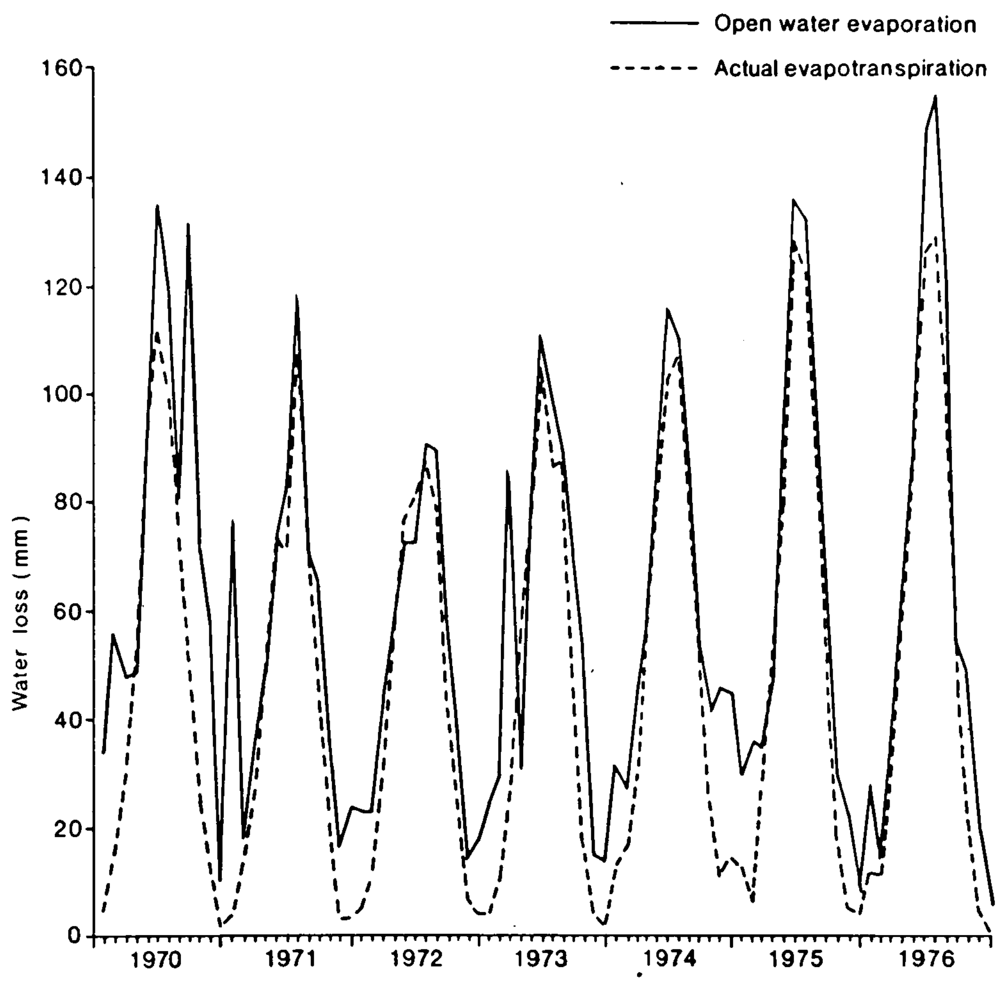
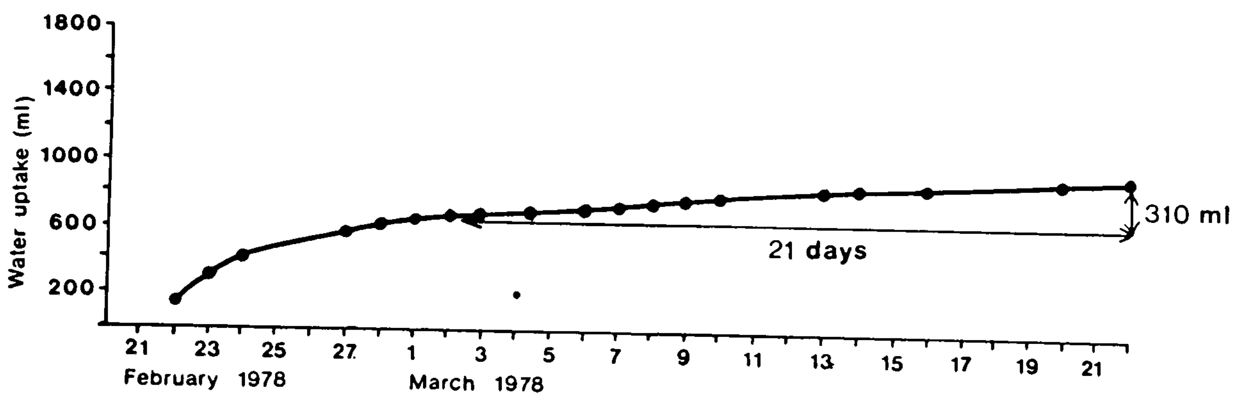


Fig. 8.3 Comparison between actual evapotranspiration and open-water evaporation in the Stanton Harcourt area.



Height of column – 36 cm
Internal diameter – 21·4 cm
Internal area – 359·7 cm^2

Rate of moisture uptake
(22·2·78 – 22·3·78)

310 ml in 21 days
= 443 ml in 30 days

$= \frac{443}{359 \cdot 7} \cdot 10$ mm/month

= 12·3 mm/month

Fig. 8.4 Graph showing rate of moisture uptake for sample of gravel (column A) from the Northmoor area, Stanton Harcourt.
(source: Land & Water Management (1978)).

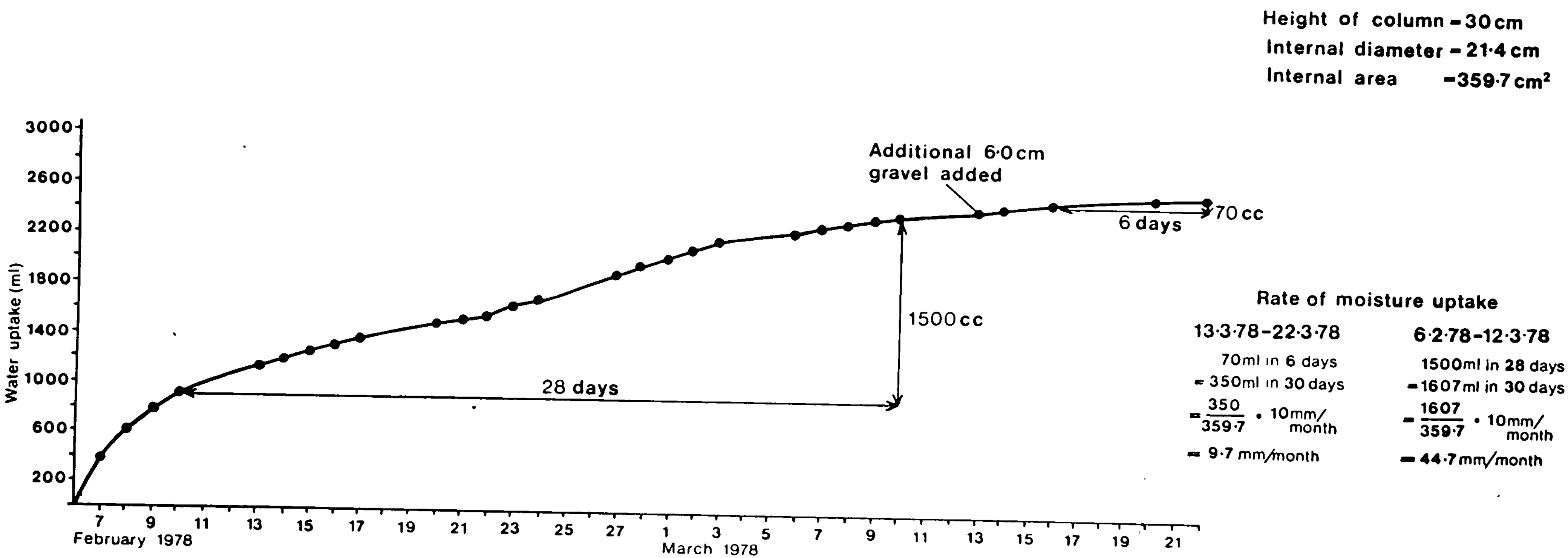


Fig. 8.5 Graph showing rate of moisture uptake for sample of gravel (column B) from the Northmoor area, Stanton Harcourt. (source: Land & Water Management (1978)).

Fig. 9.1 Hydrograph of borehole SH/9.

Fig. 9.2 Hydrograph of borehole SH/18.

Fig. 9.3 Hydrograph for borehole SH/27.

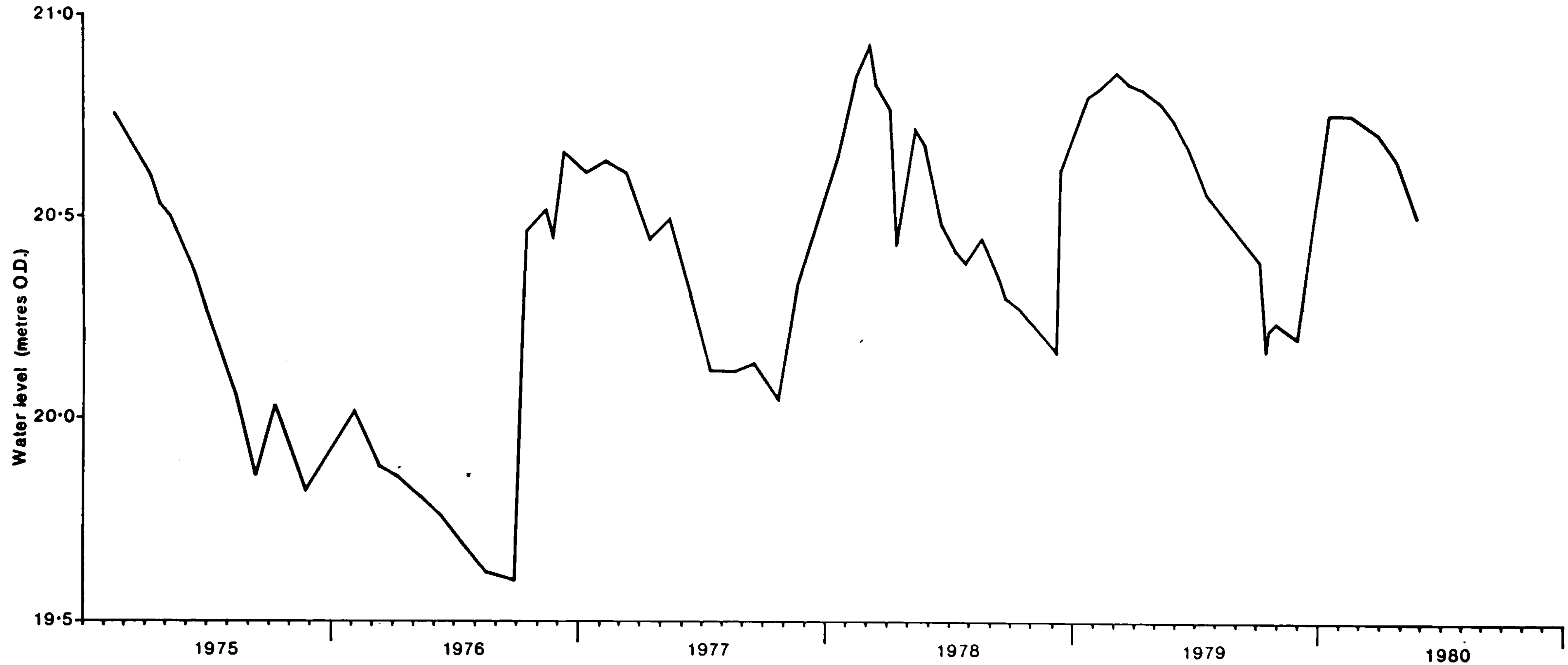


Fig. 9.4 Hydrograph for borehole R/2.

Fig. 9.5 Hydrograph for borehole R/4.

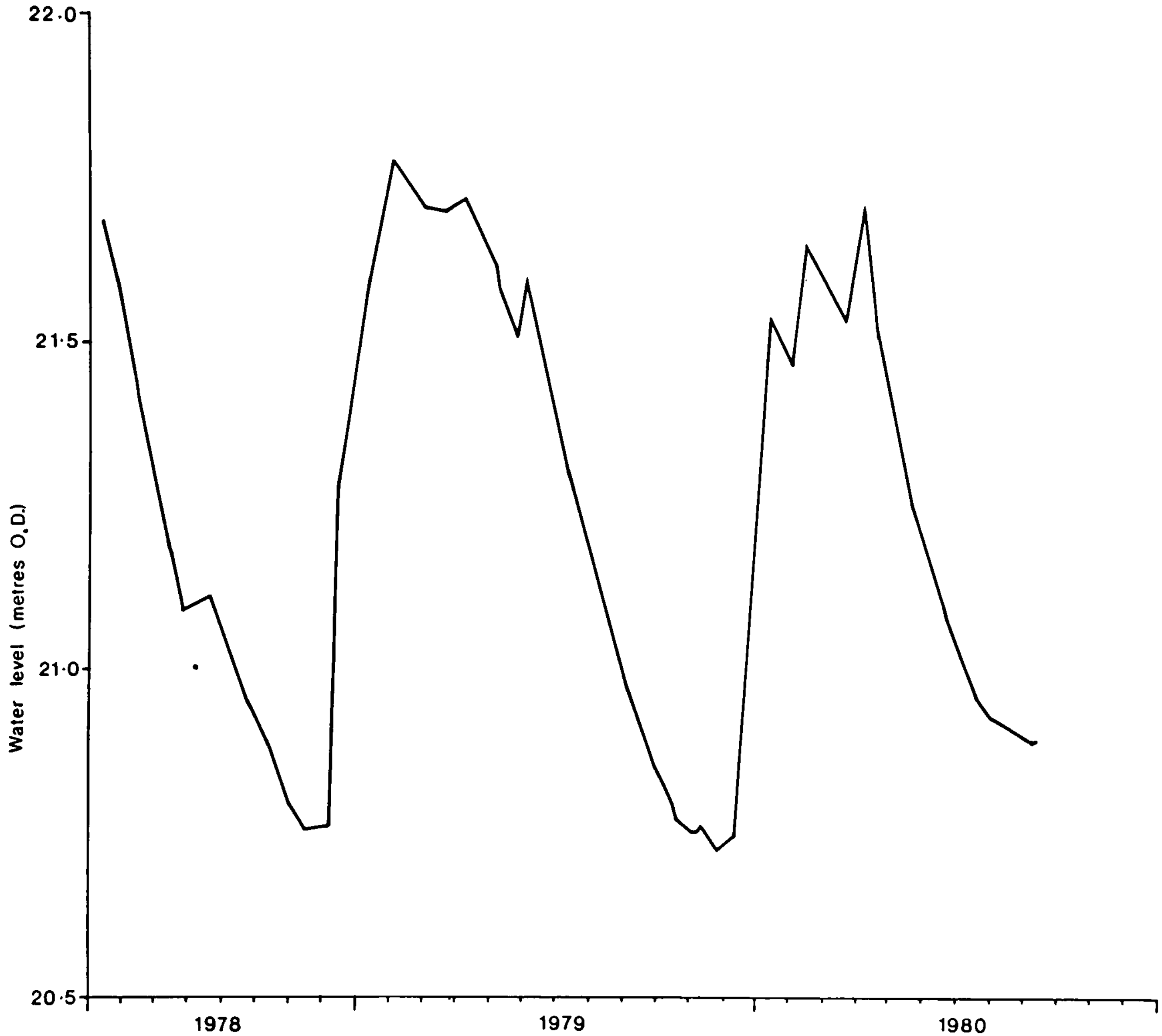


Fig. 9.6 Hydrograph for borehole R/8.

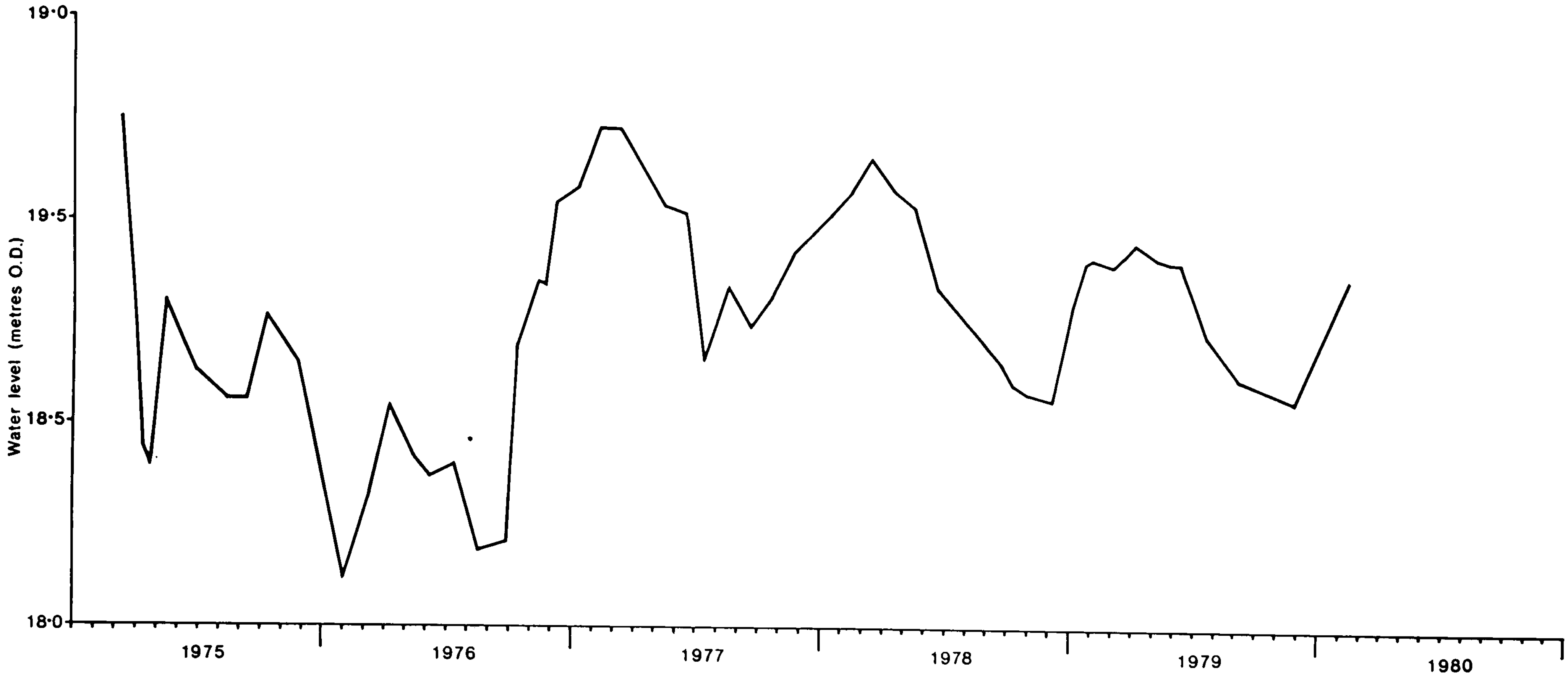


Fig. 9.7 Hydrograph for borehole R/32.

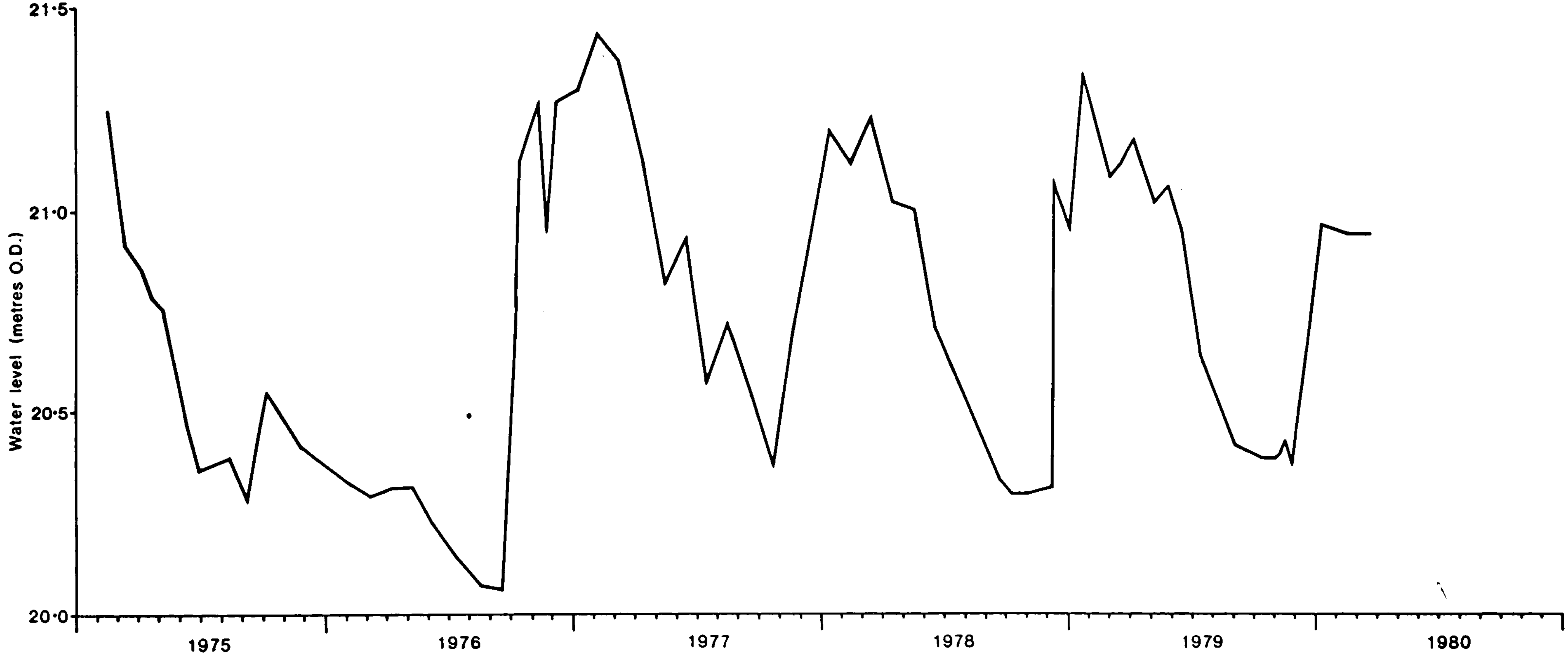


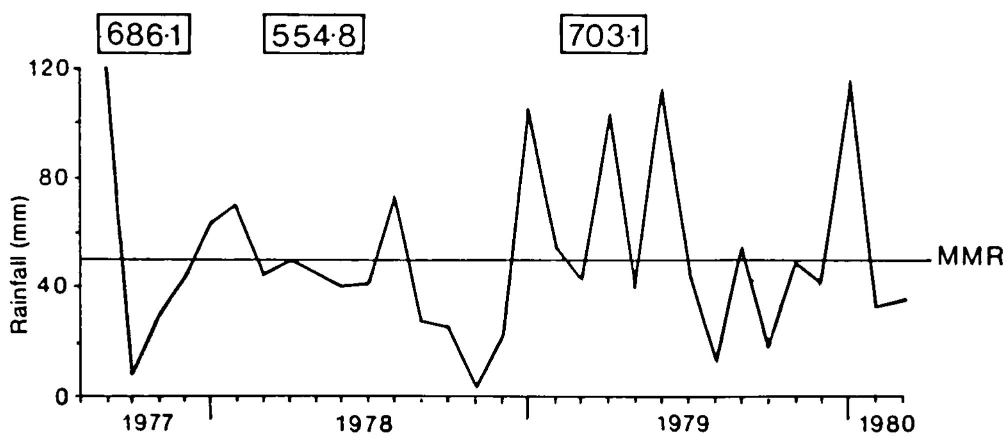
Fig 9.8 Hydrograph for borehole R/33.

a) Monthly rainfall measured at Farmoor Reservoir, Oxford

MMR Mean monthly rainfall

Figures in boxes are annual rainfall totals

Mean monthly rainfall • 49·5 mm



b) Accumulated departure from mean monthly rainfall, measured at Farmoor Reservoir, Oxford

Fig. 9.9 Rainfall graphs for Stanton Harcourt area, (Aug. 1977 - Feb. 1980).

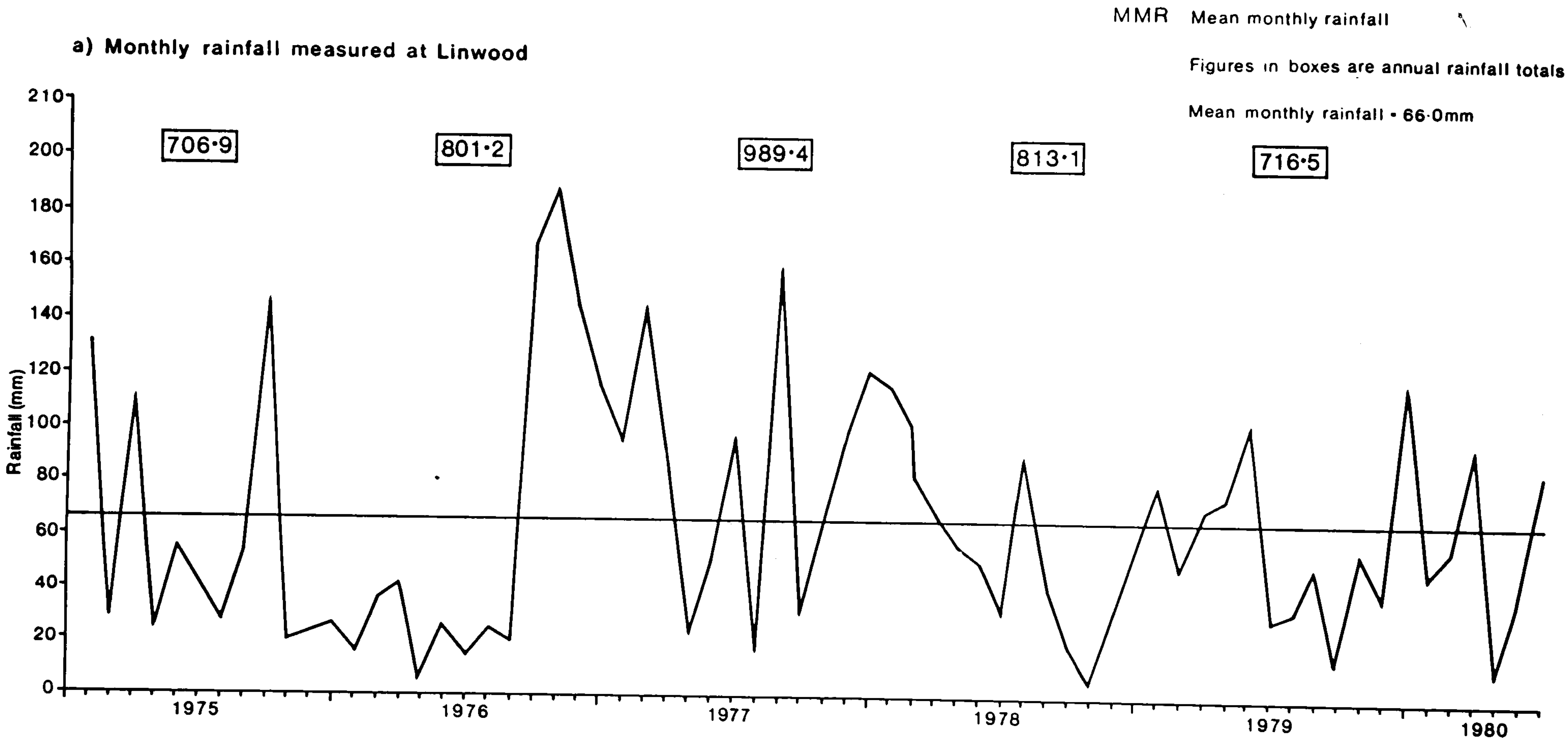


Fig. 9.10 Rainfall graphs for Ringwood area, (Jan. 1975 - Jun. 1980).

b) Accumulated departure from mean monthly rainfall; measured at Linwood

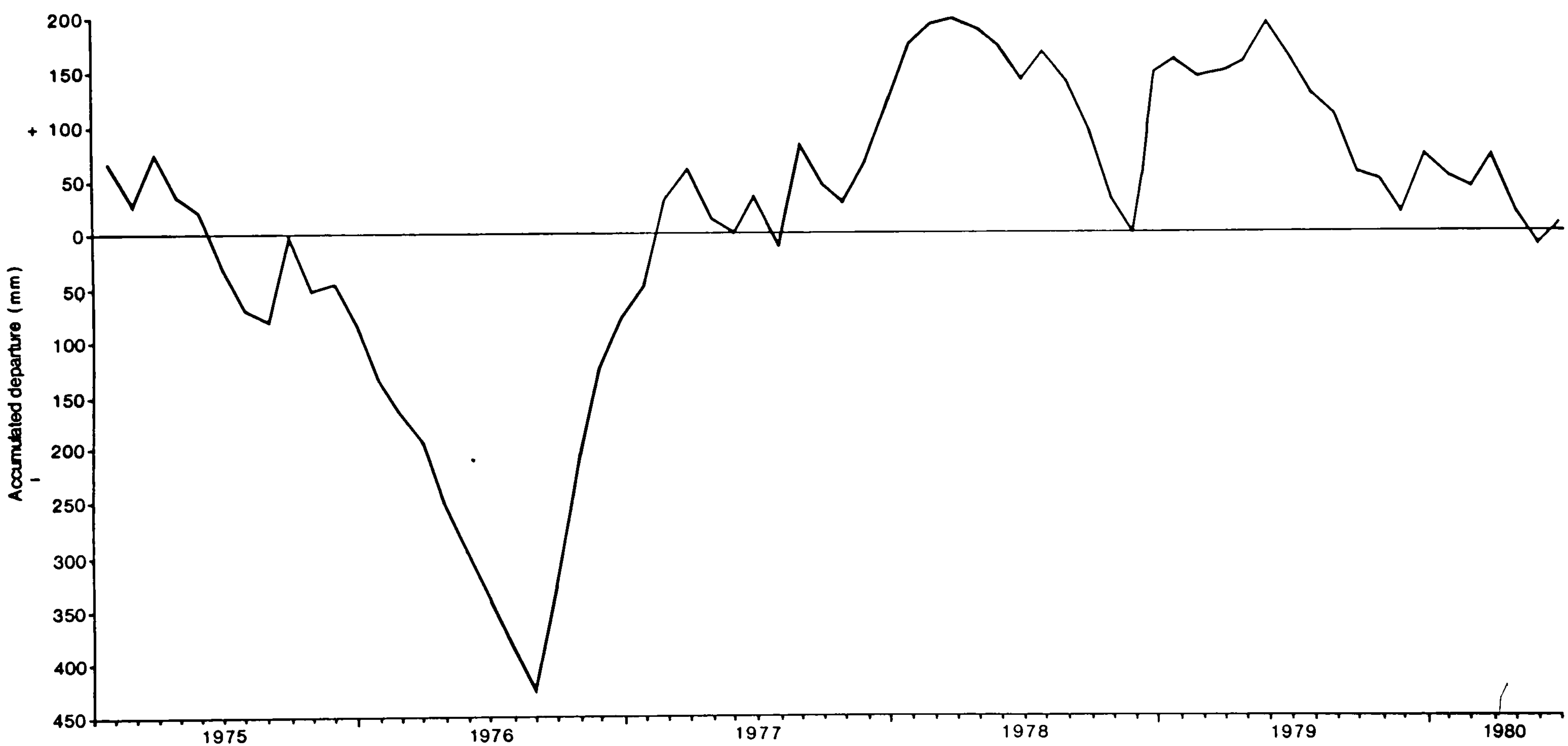


Fig. 9.10 cont'd.

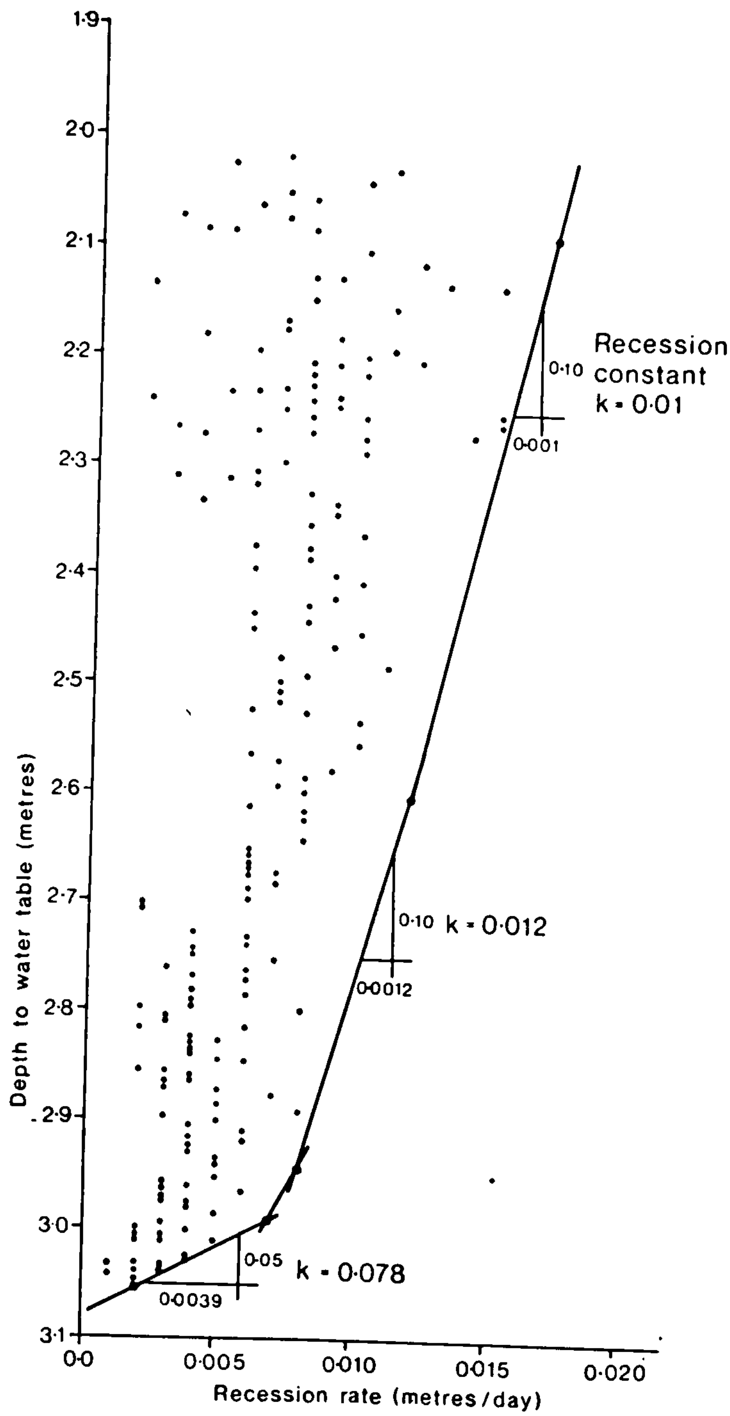


Fig. 9.11 Rates of groundwater level recession, (summer 1979) for borehole R/8.

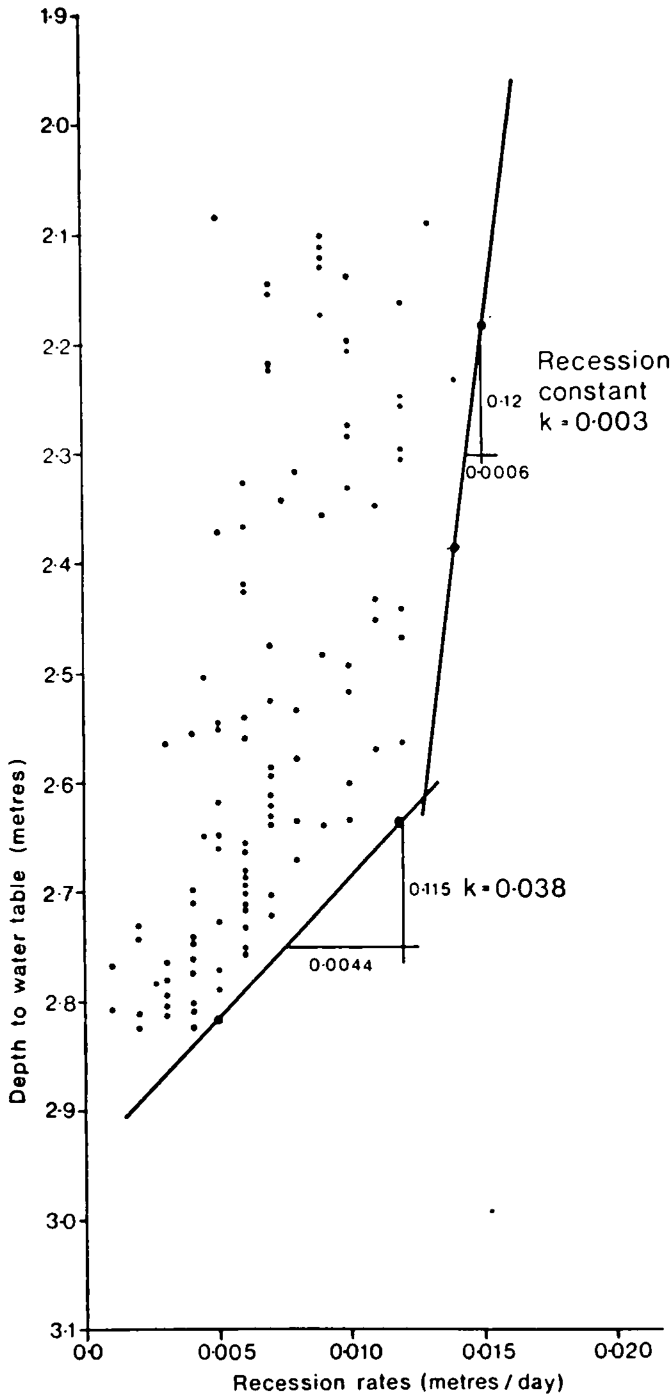


Fig. 9.12 Rates of groundwater level recession, (summer 1980) for borehole R/8.

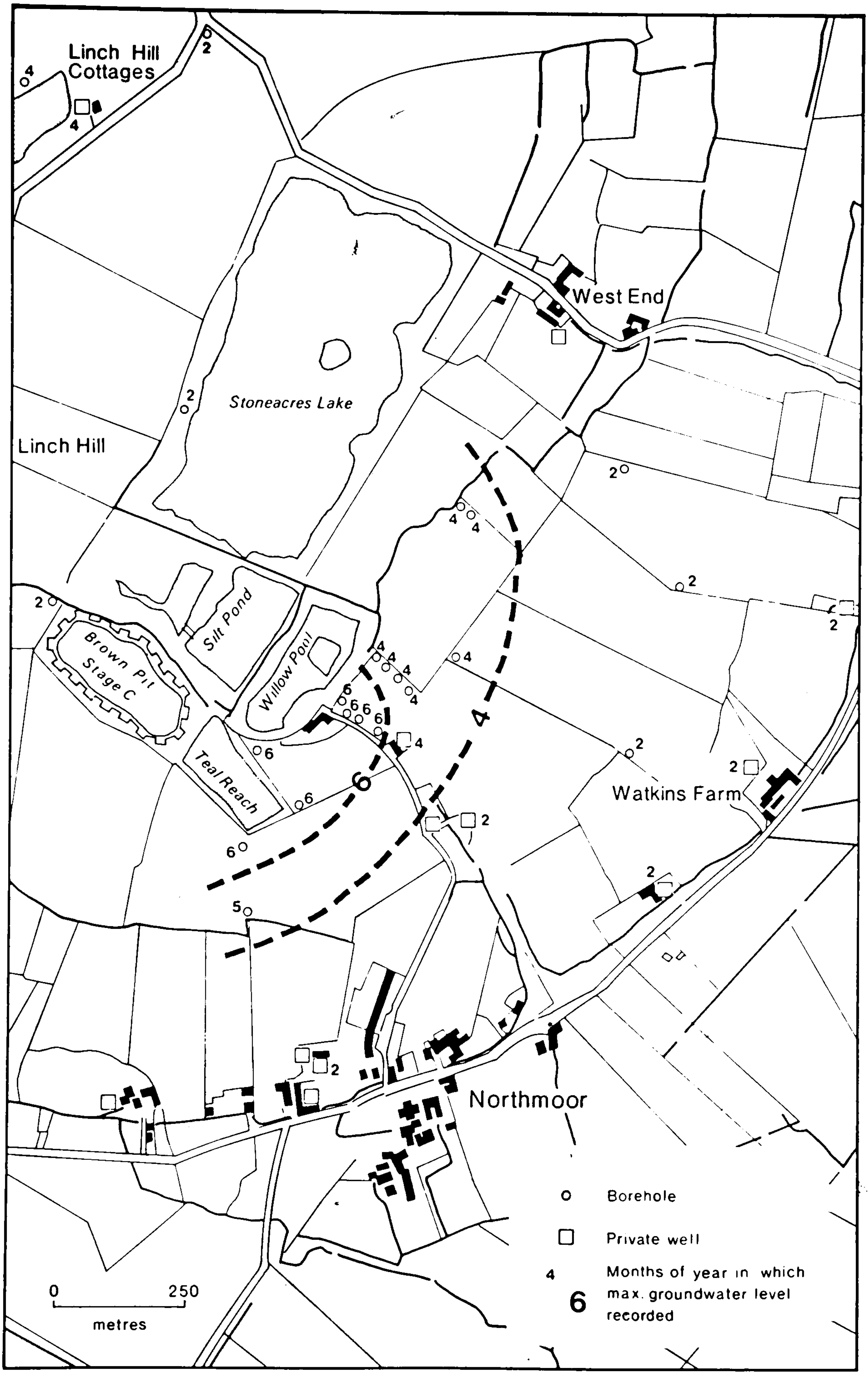


Fig. 9.13 Variation in timing of maximum groundwater levels Northmoor area, Oct 1978 - Sept. 1979.

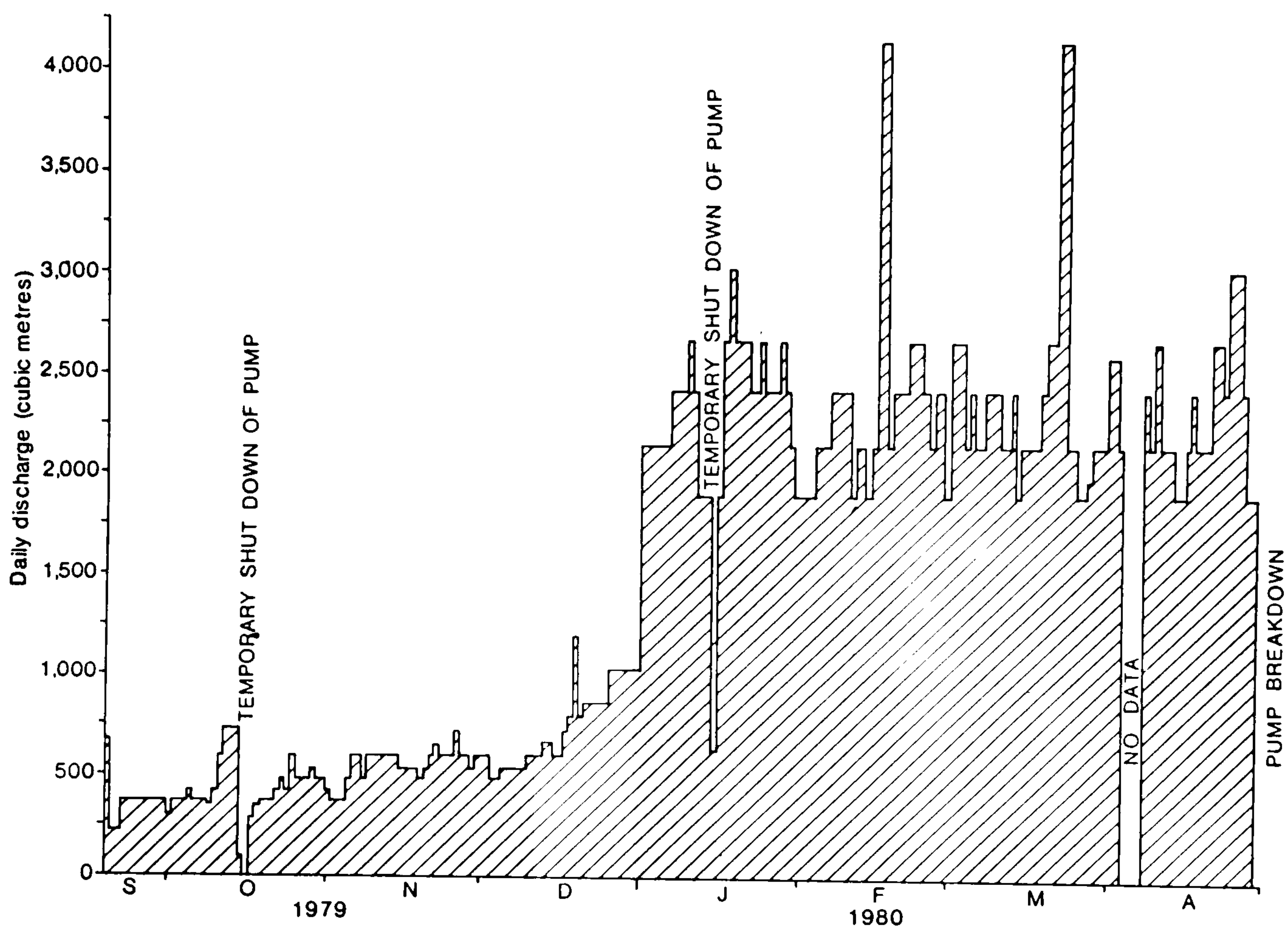


Fig. 9.14 Pumping regime-cell 8, Ellingham Pit, Ringwood (Sept. 1979 - April 1980).

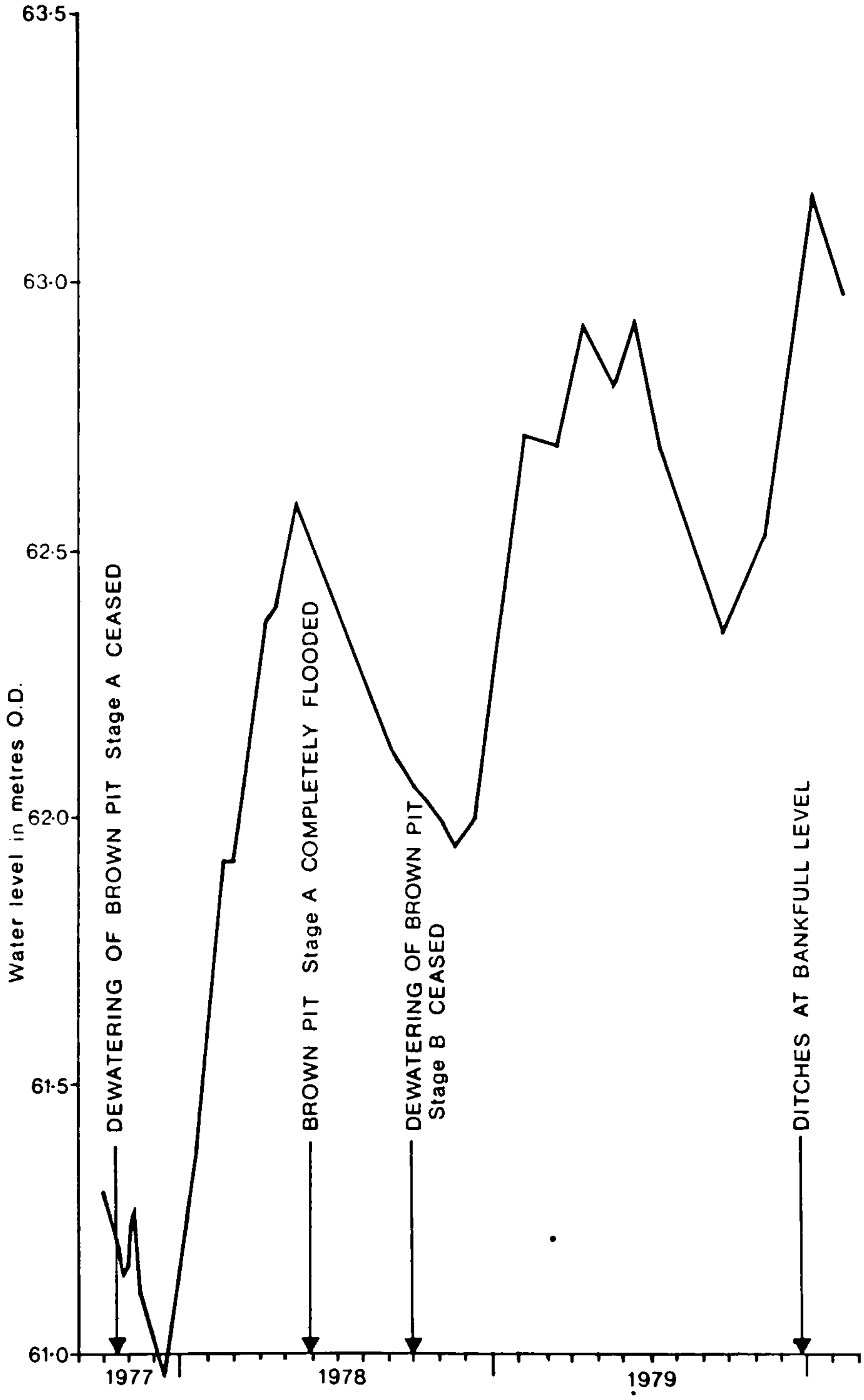


Fig. 9.15 Hydrograph for borehole SH/1.

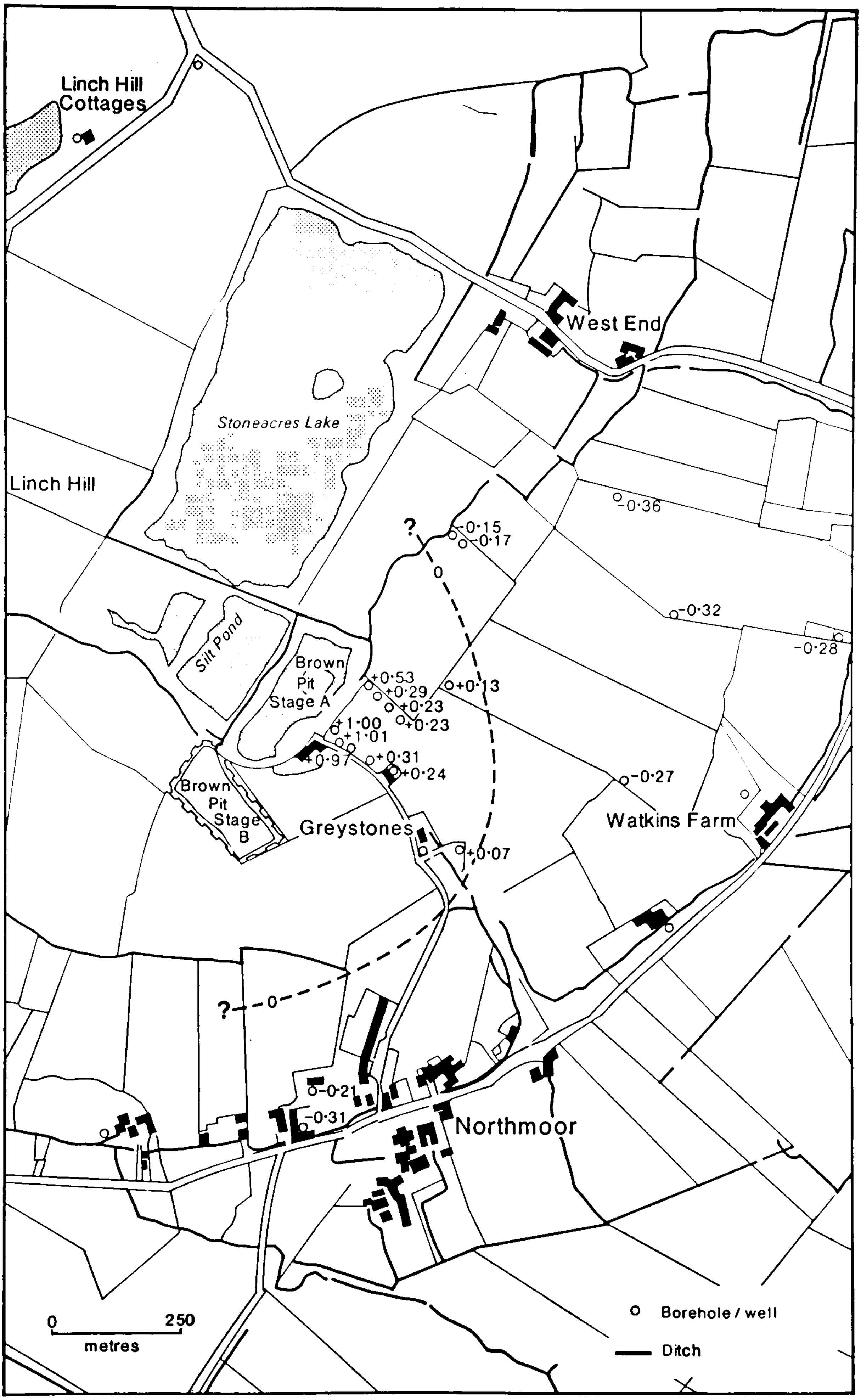


Fig. 9.16 Difference (in metres) between minimum groundwater levels in 1977 and 1978 at boreholes in the Northmoor area.

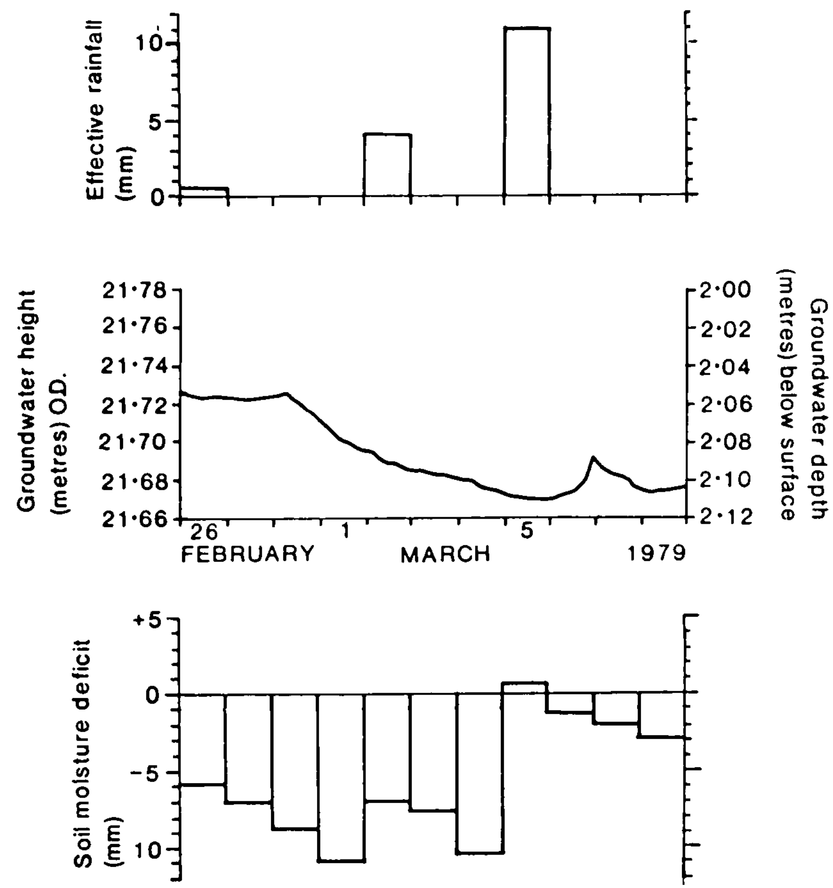


Fig. 9.17 Hydrograph of borehole R/8 (26.2.79 - 8.3.79) showing type 1 response.

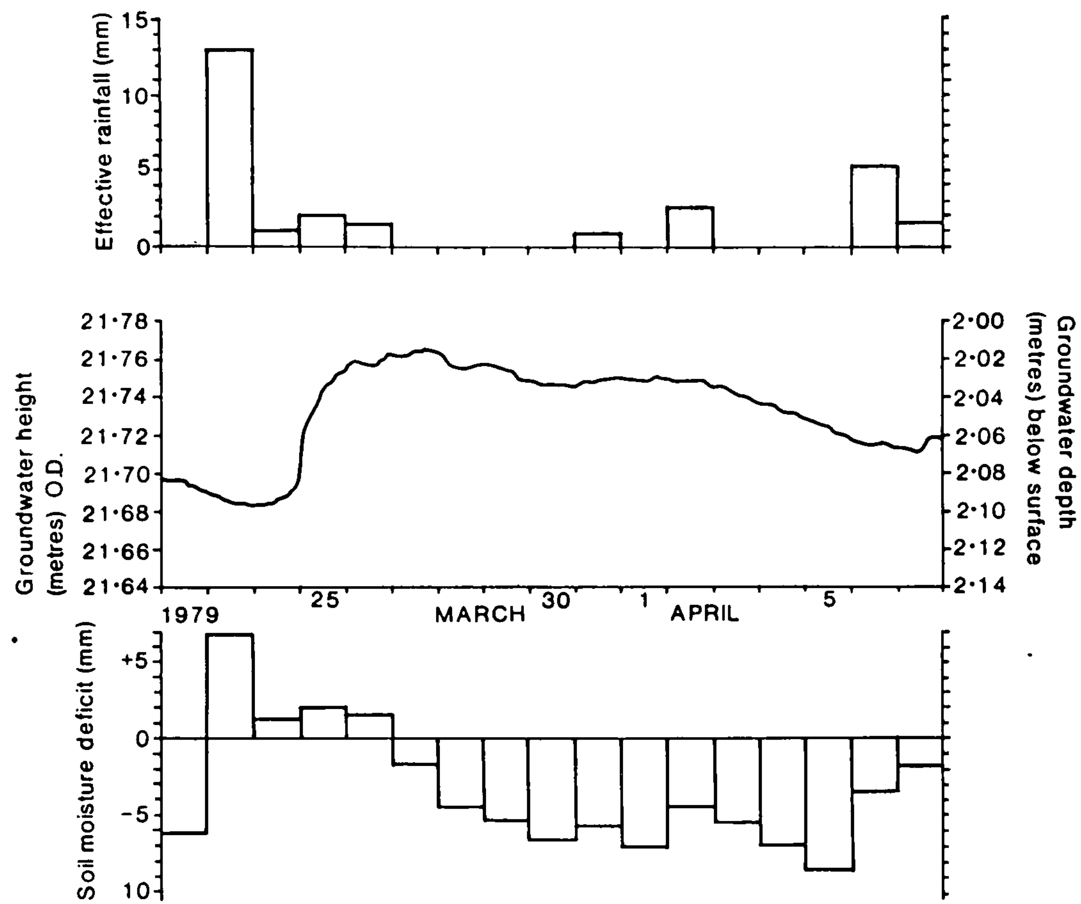


Fig. 9.18 Hydrograph for borehole R/8 (22.3.79 - 7.4.79) showing type 2 response.

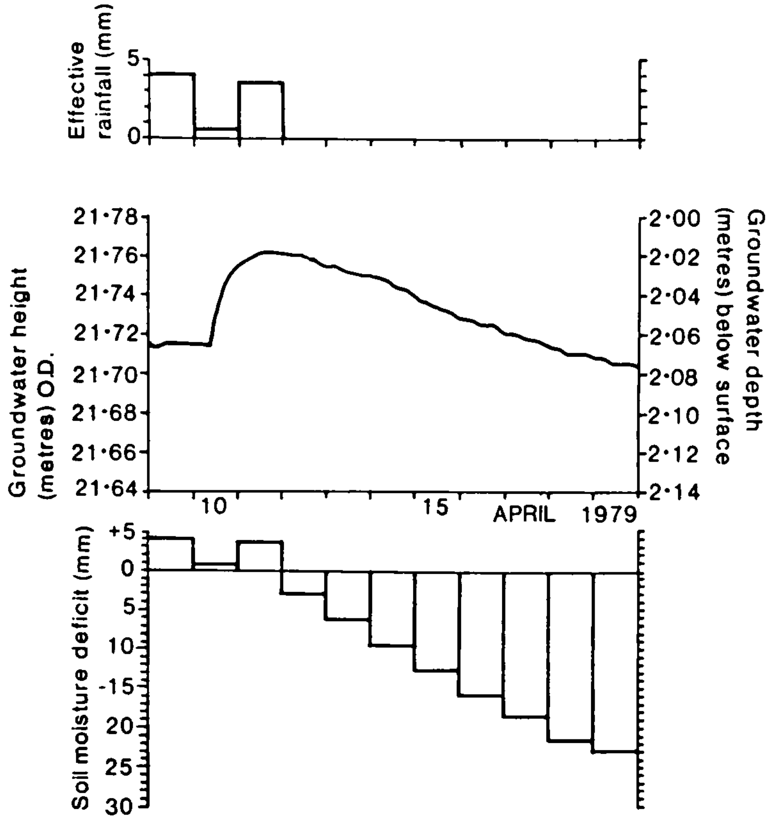


Fig. 9.19 Hydrograph for borehole R/8 (9.4.79 - 19.4.79) showing type 2 response.

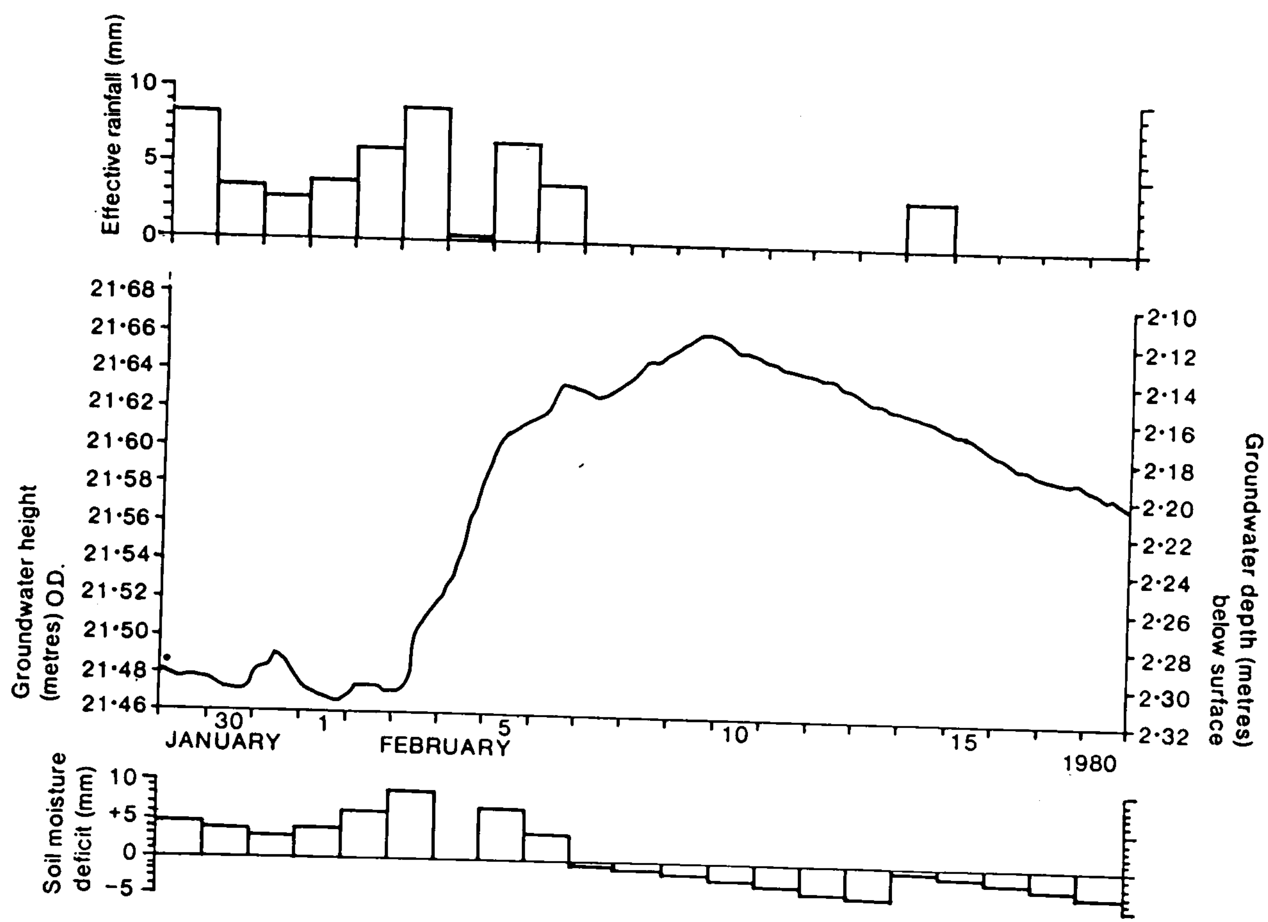


Fig. 9.20 Hydrograph for borehole R/9 (29.1.80 - 18.2.80) showing type 2 response.

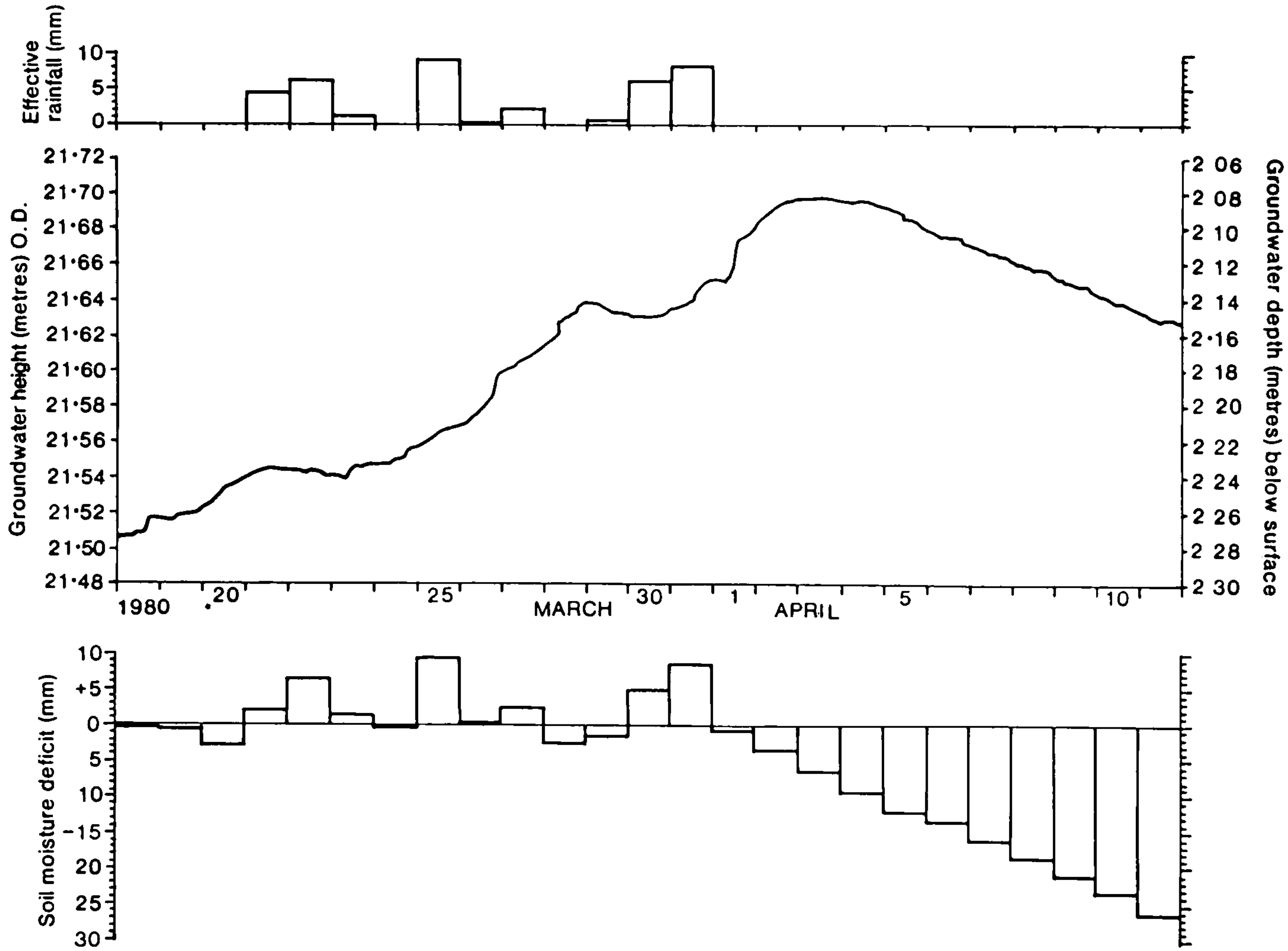


Fig. 9.21 Hydrograph for borehole R/8 (18.3.80 - 11.4.80) showing type 2 response.

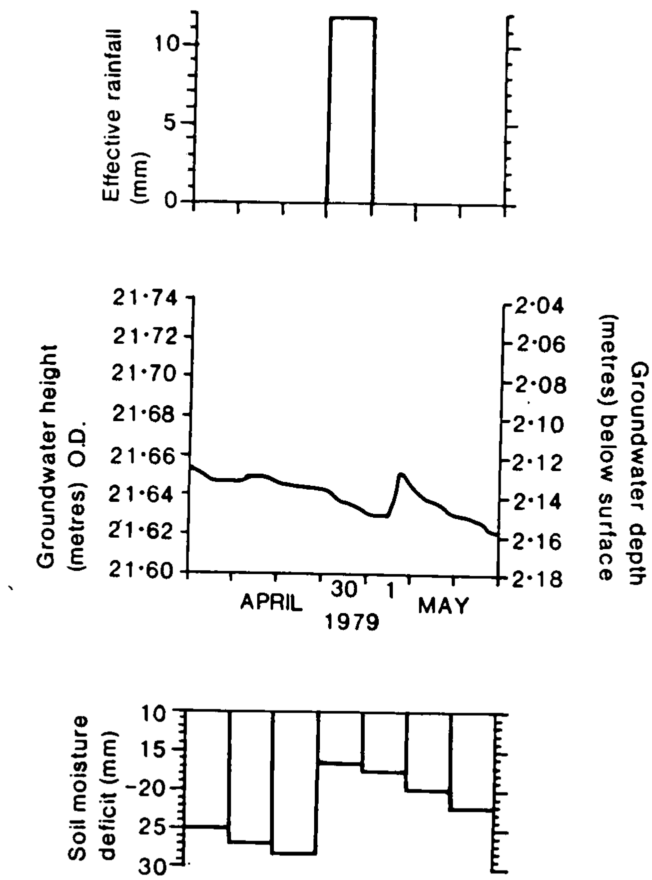


Fig. 9.22 Hydrograph for borehole R/8 (27.4.19 - 3.5.79) showing type 1 response.

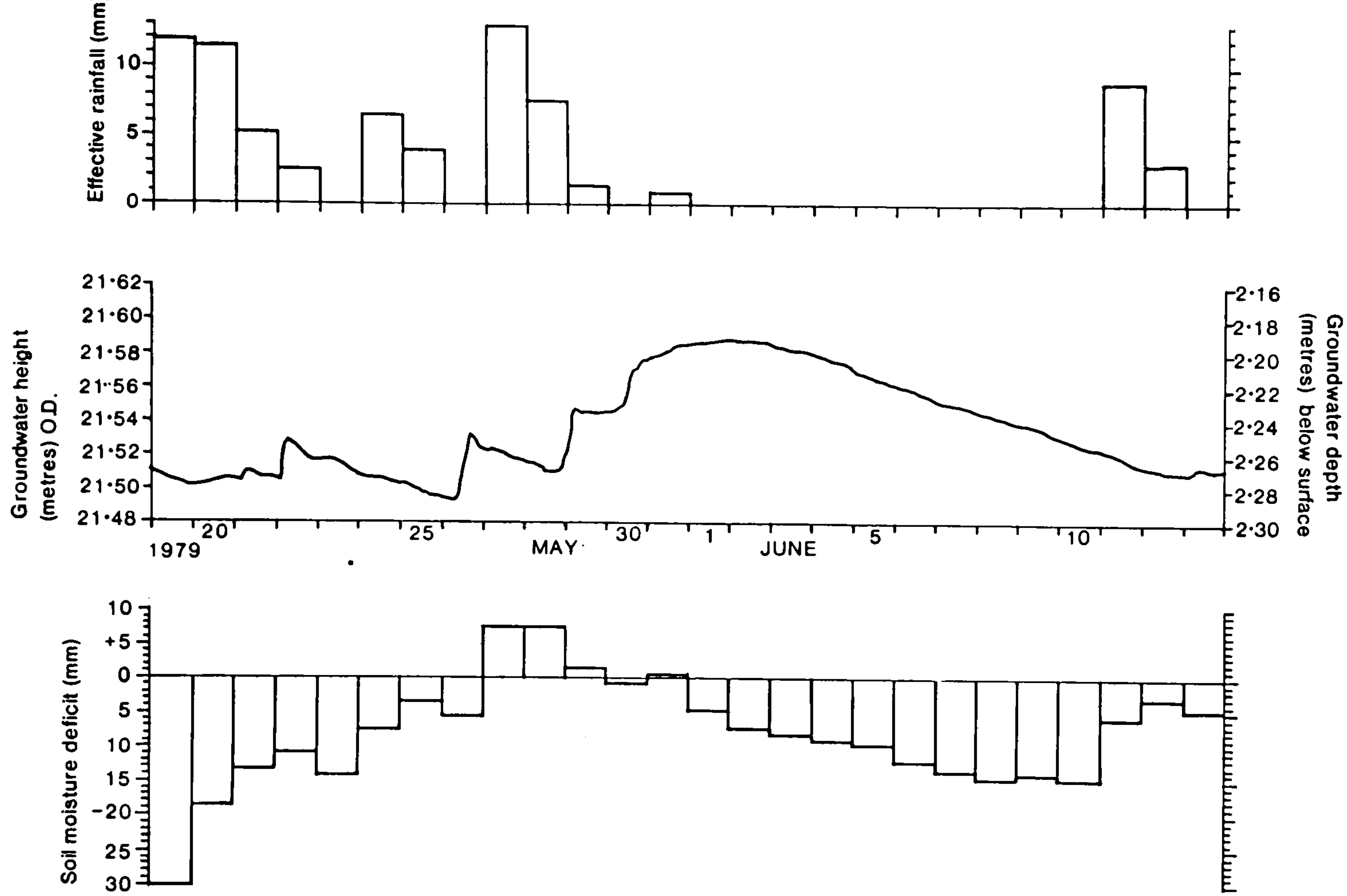


Fig. 9.23 Hydrograph for borehole R/8 (19.5.79 - 13.6.79) showing type 1 and type 2 responses.

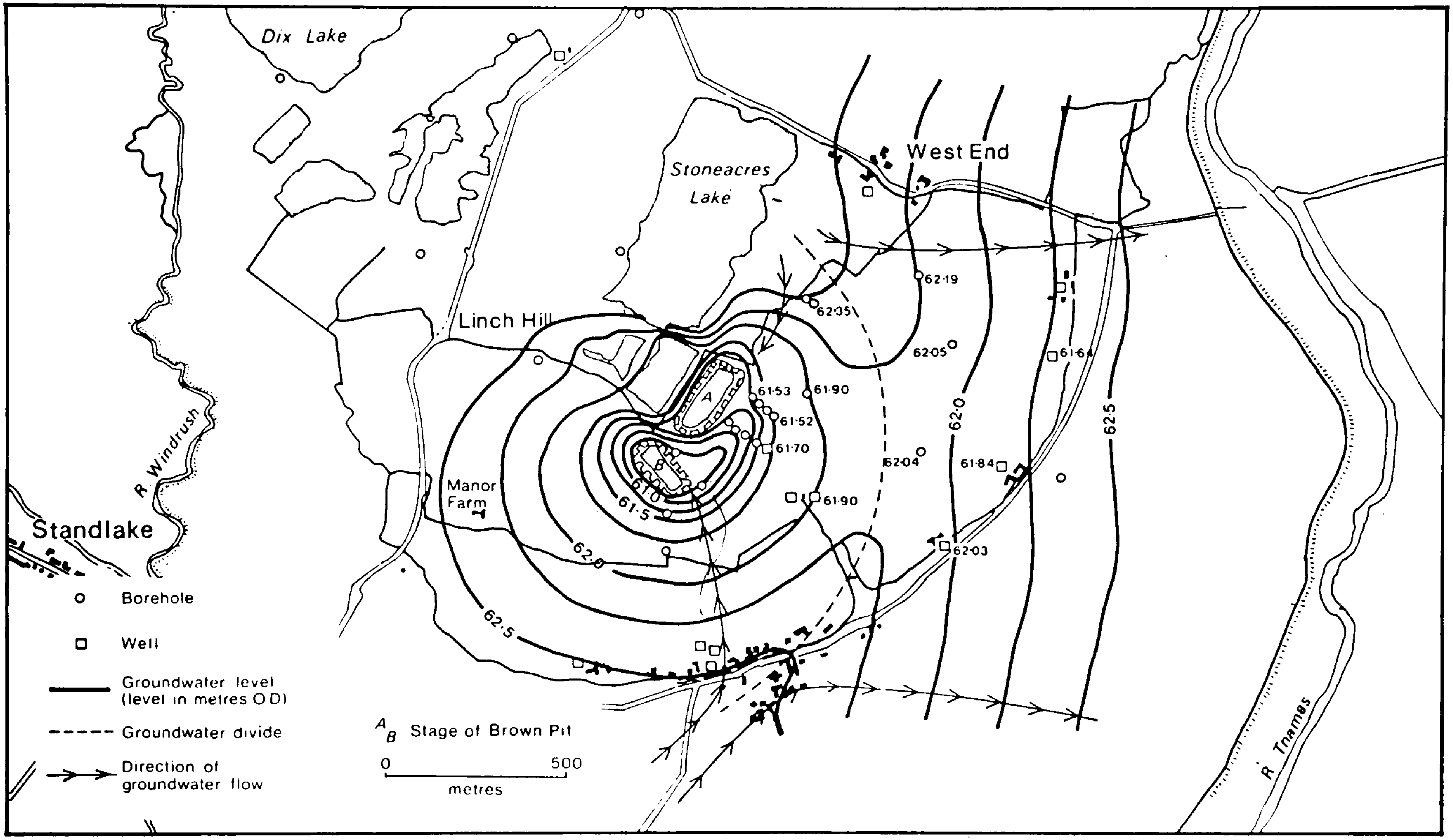


Fig. 10.1 Groundwater contour map of the Northmoor area, on 12.11.77.

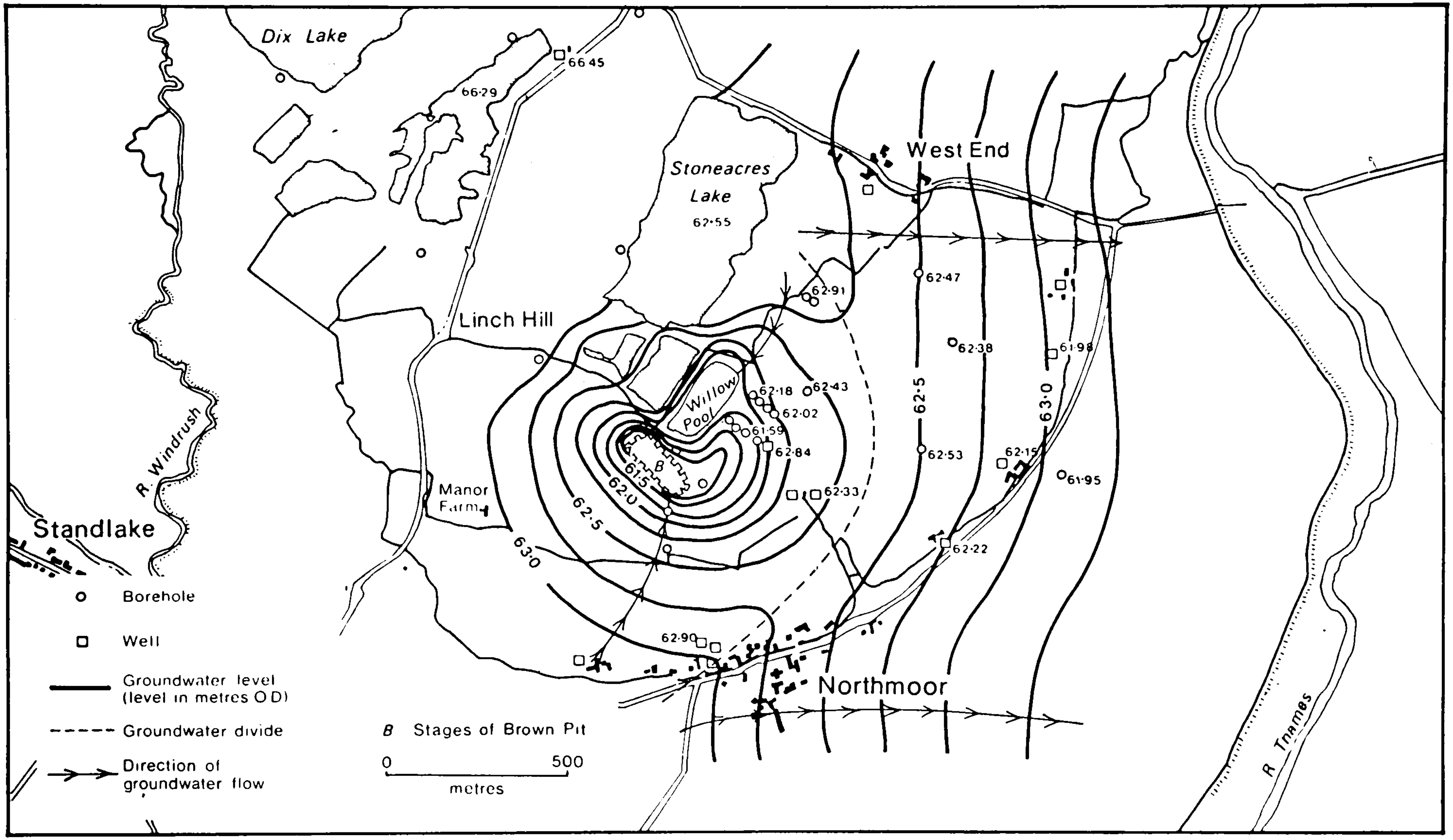


Fig. 10.2 Groundwater contour map of the Northmoor area on 2.2.78.

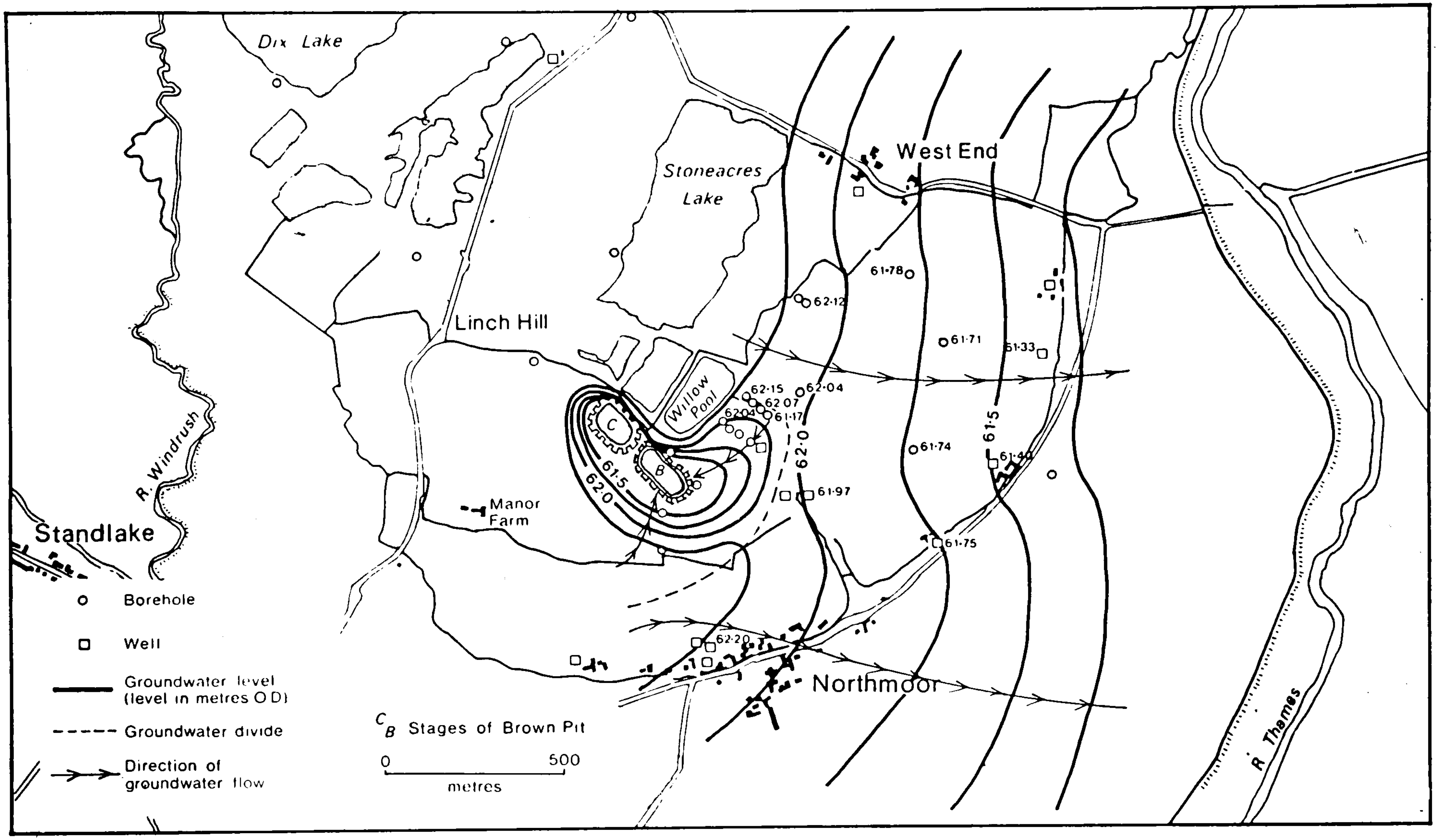


Fig 10.3 Groundwater contour map of the Northmoor area on 10.10.78.

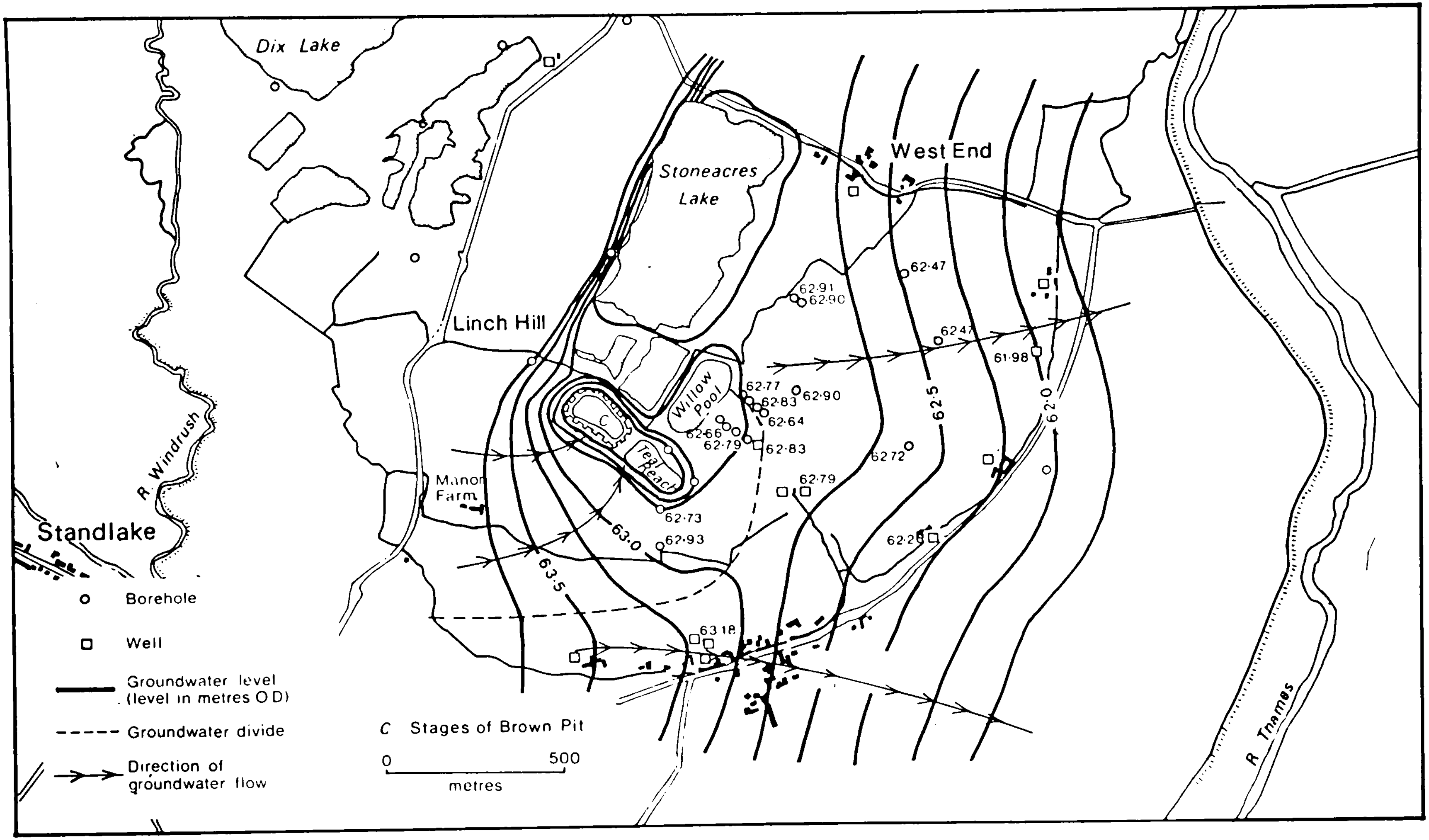


Fig. 10.4 Groundwater contour map of the Northmoor area on 8.2.79.

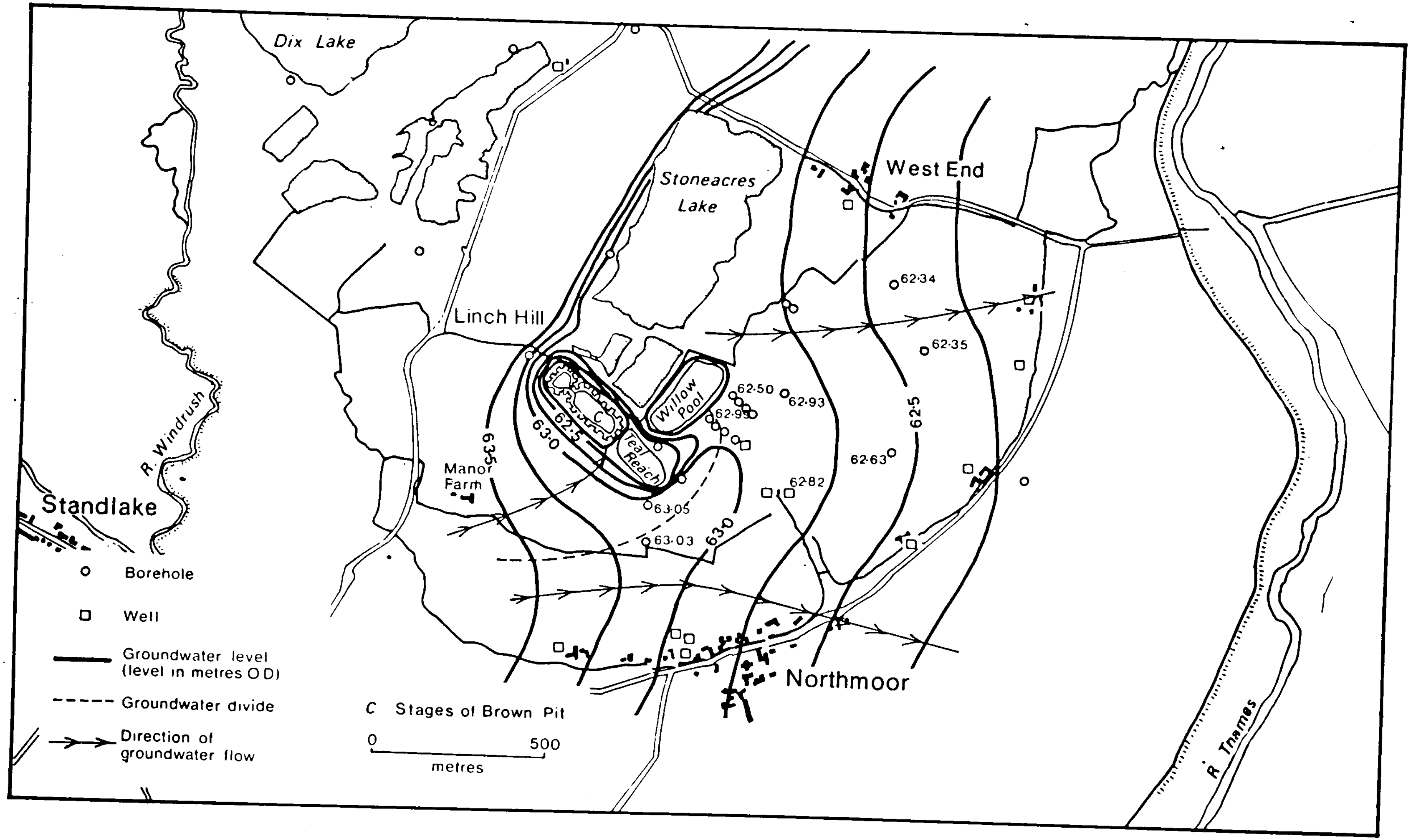


Fig. 10.5 Groundwater contour map of the Northmoor area on 12.2.80.

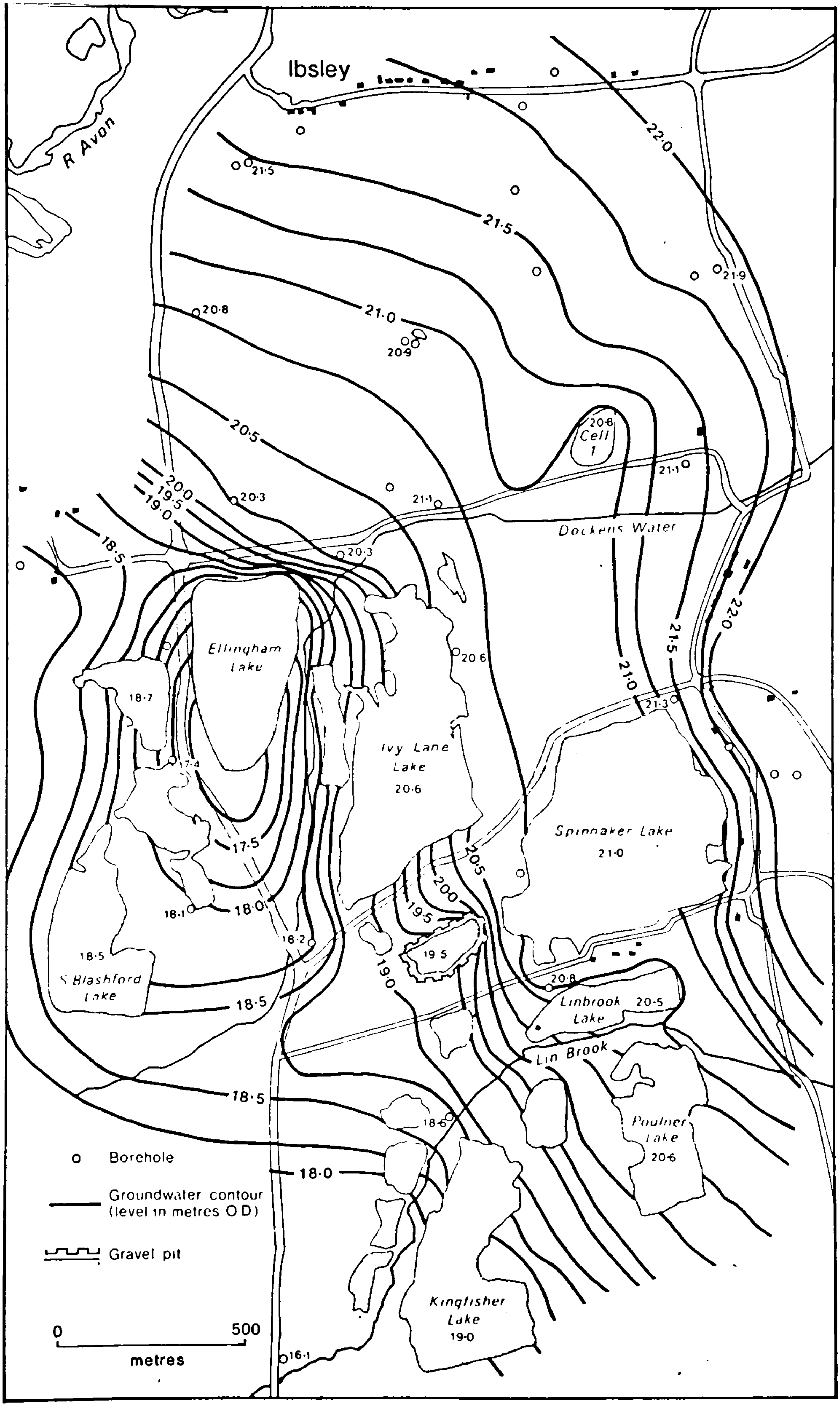


Fig. 10.6 Groundwater contour map of the Ringwood area on 9.7.75.

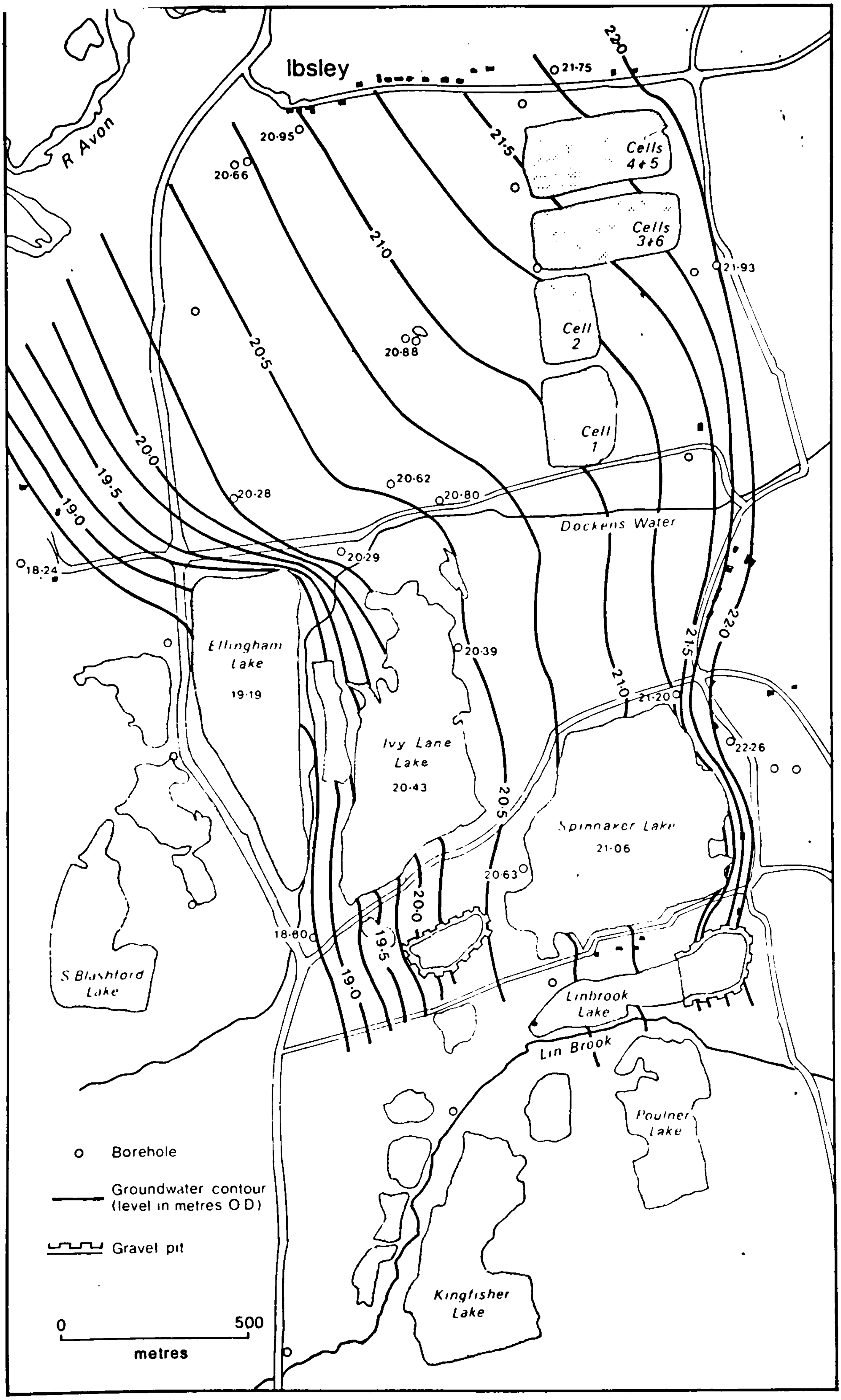


Fig. 10.8 Groundwater contour map of the Ringwood area on 11.10.78.

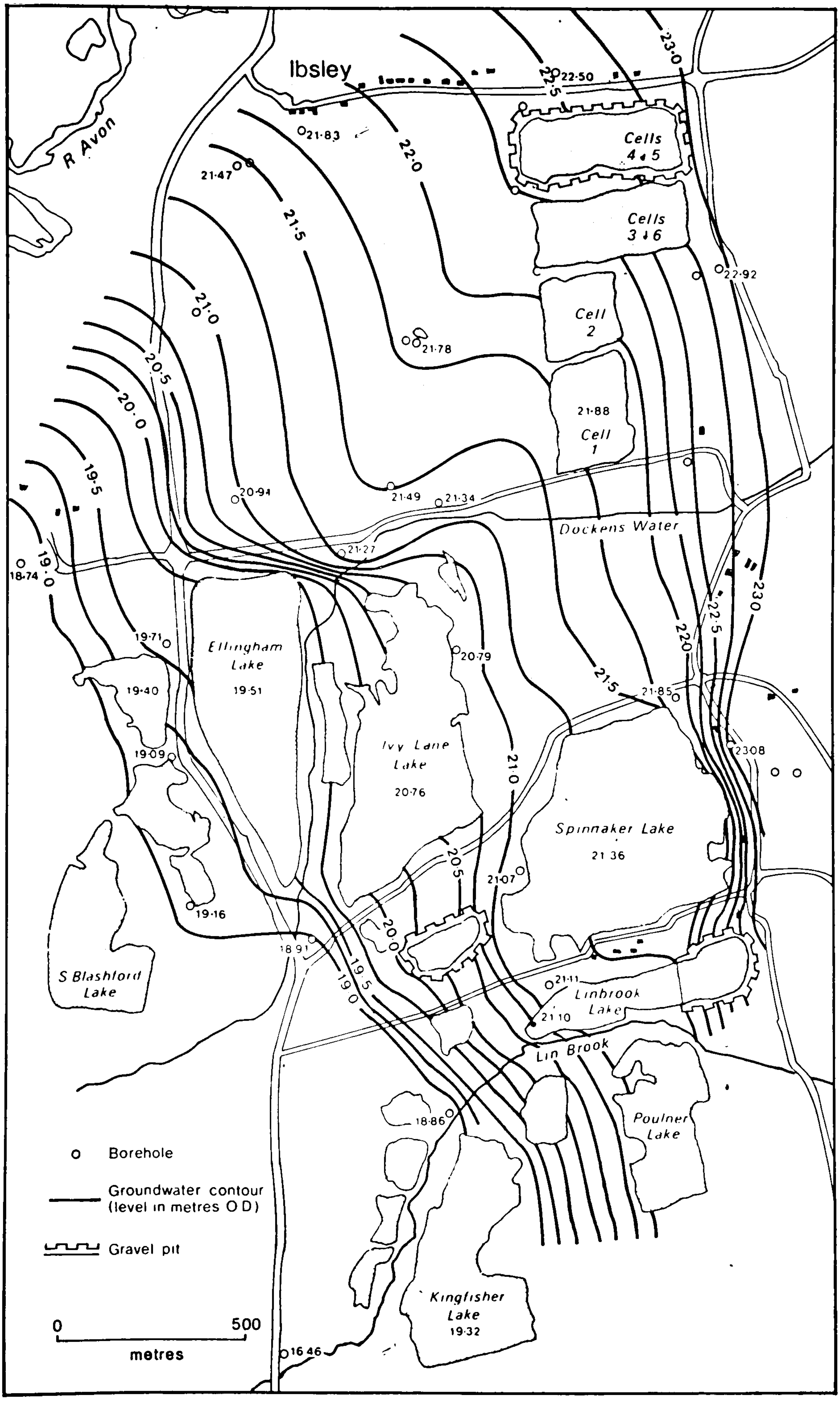


Fig. 10.9 Groundwater contour map of the Ringwood area on 1.2.79.

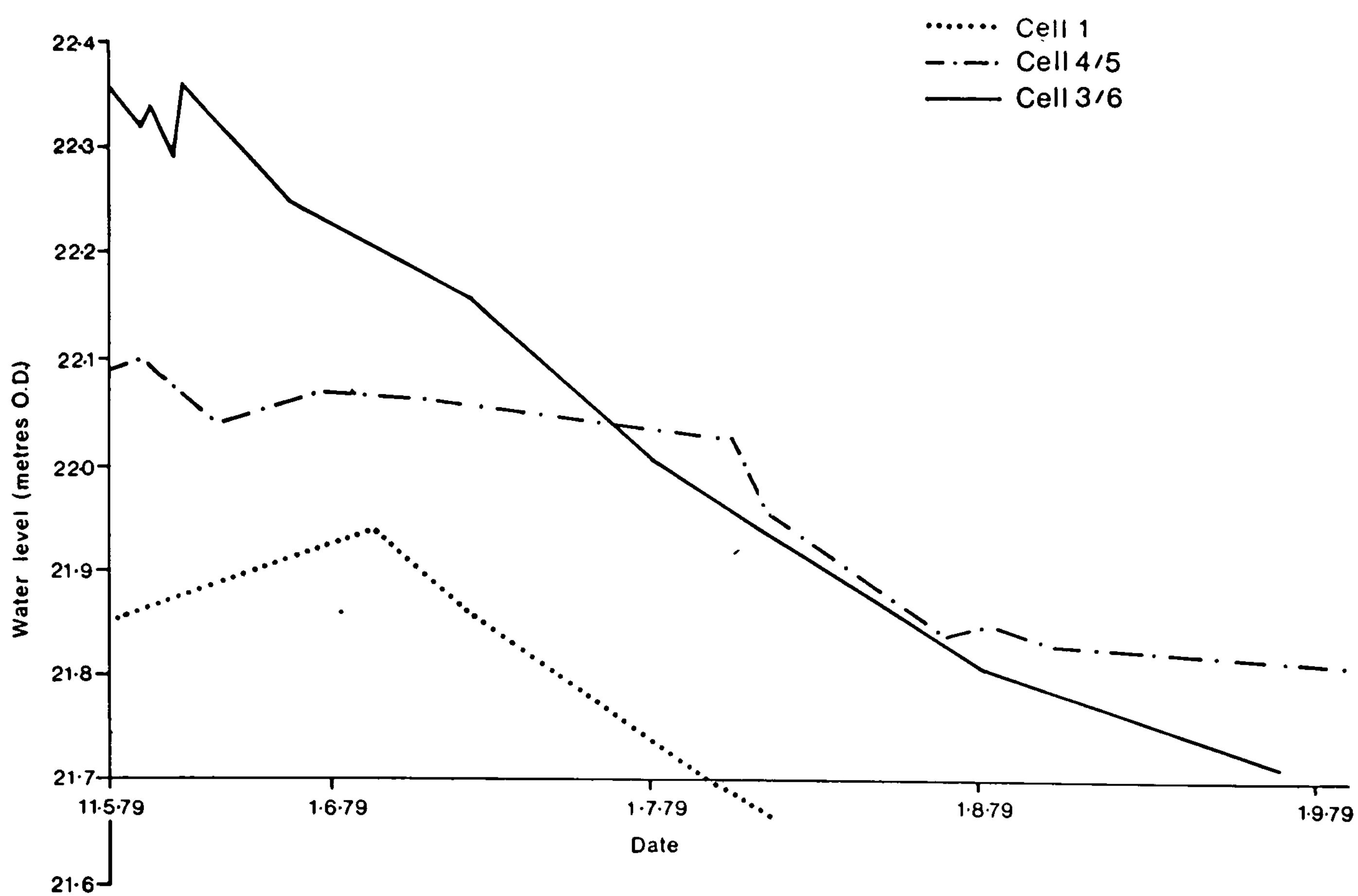


Fig. 10.10 Lake level hydrographs from Ibsley Airfield, Ringwood (11.5.79 - 3.9.79).

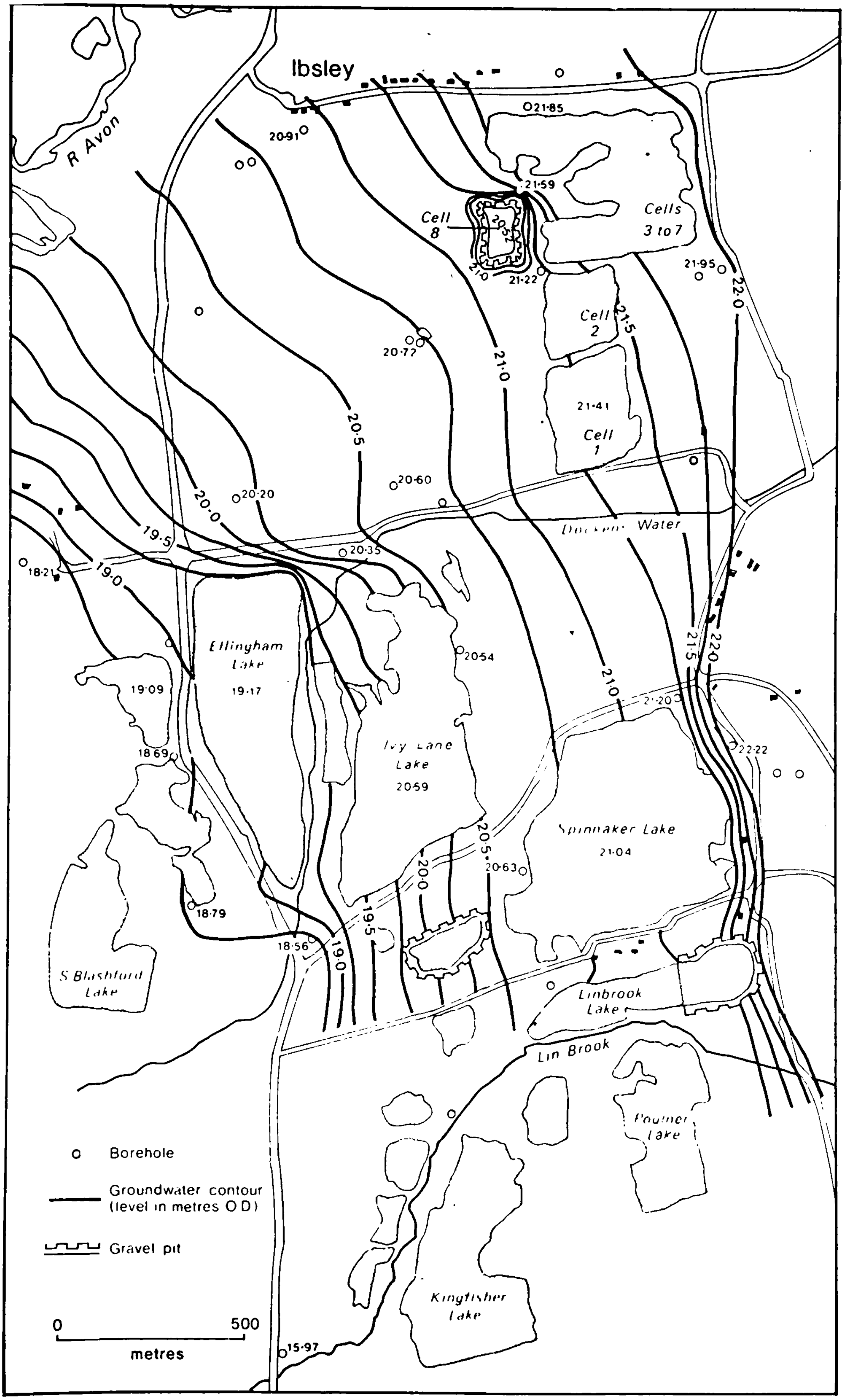


Fig. 10.11 Groundwater contour map of the Ringwood area on 29.11.79.

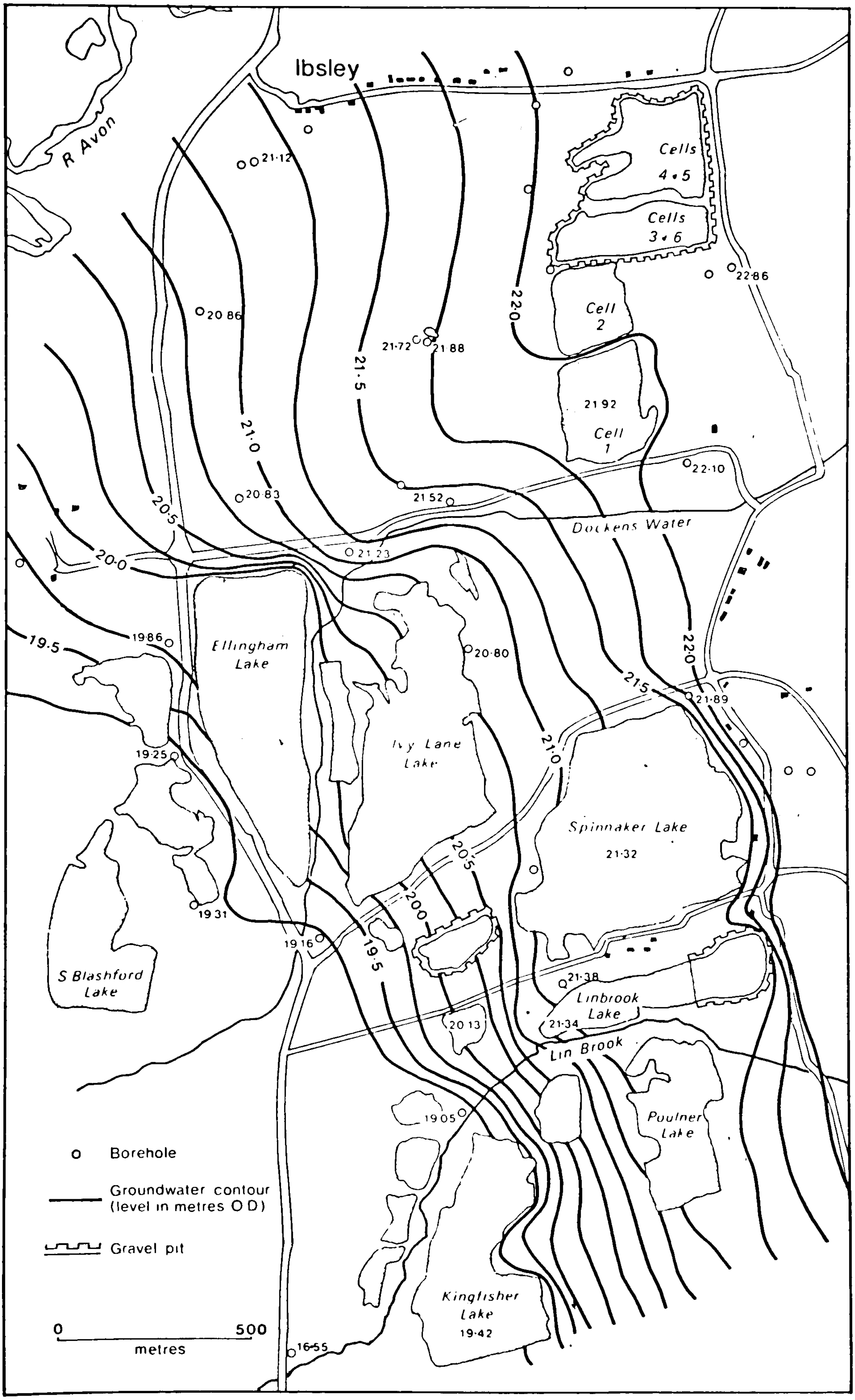


Fig. 10.7 Groundwater contour map of the Ringwood area on 14.3.78.

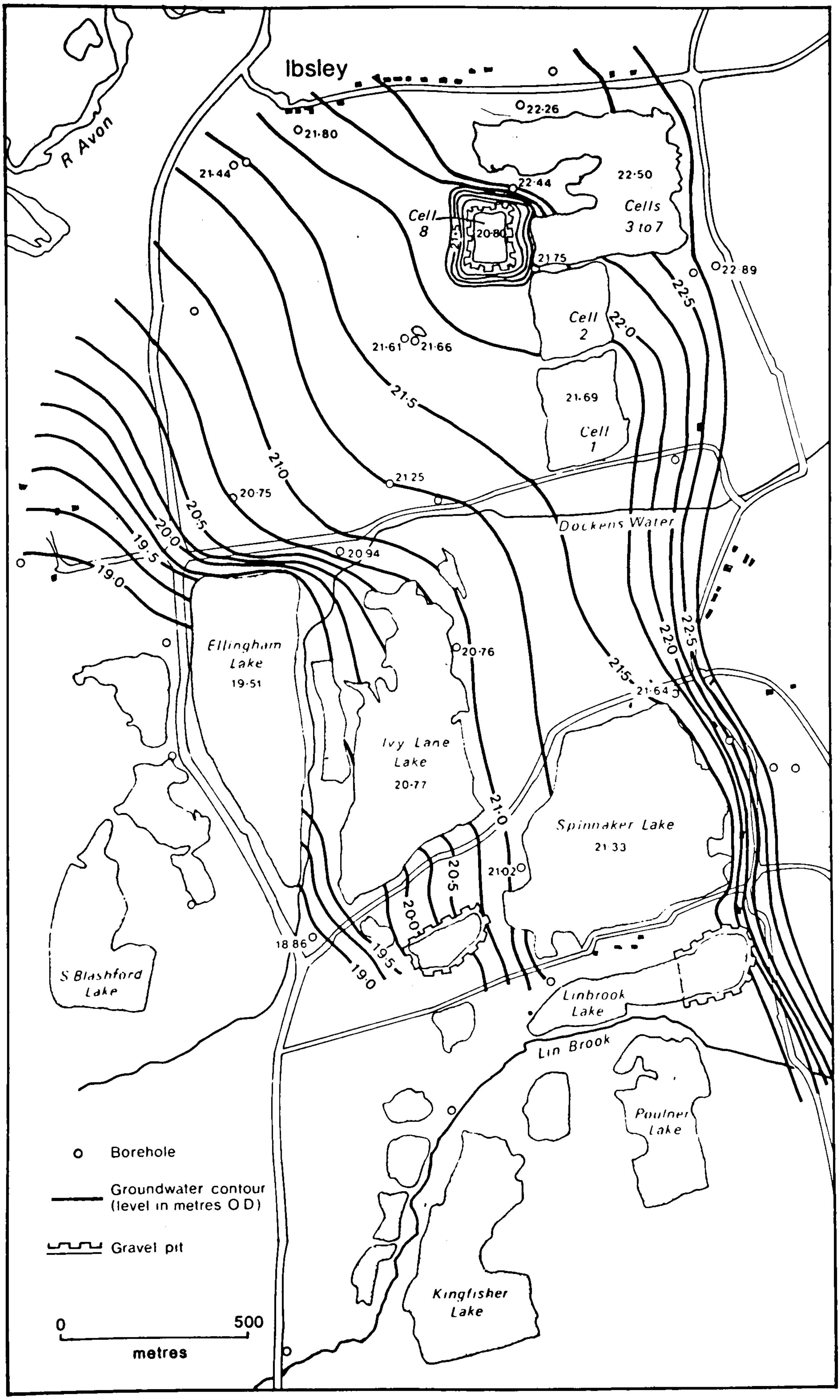


Fig. 10.12 Groundwater contour map of the Ringwood area on 15.2.80.

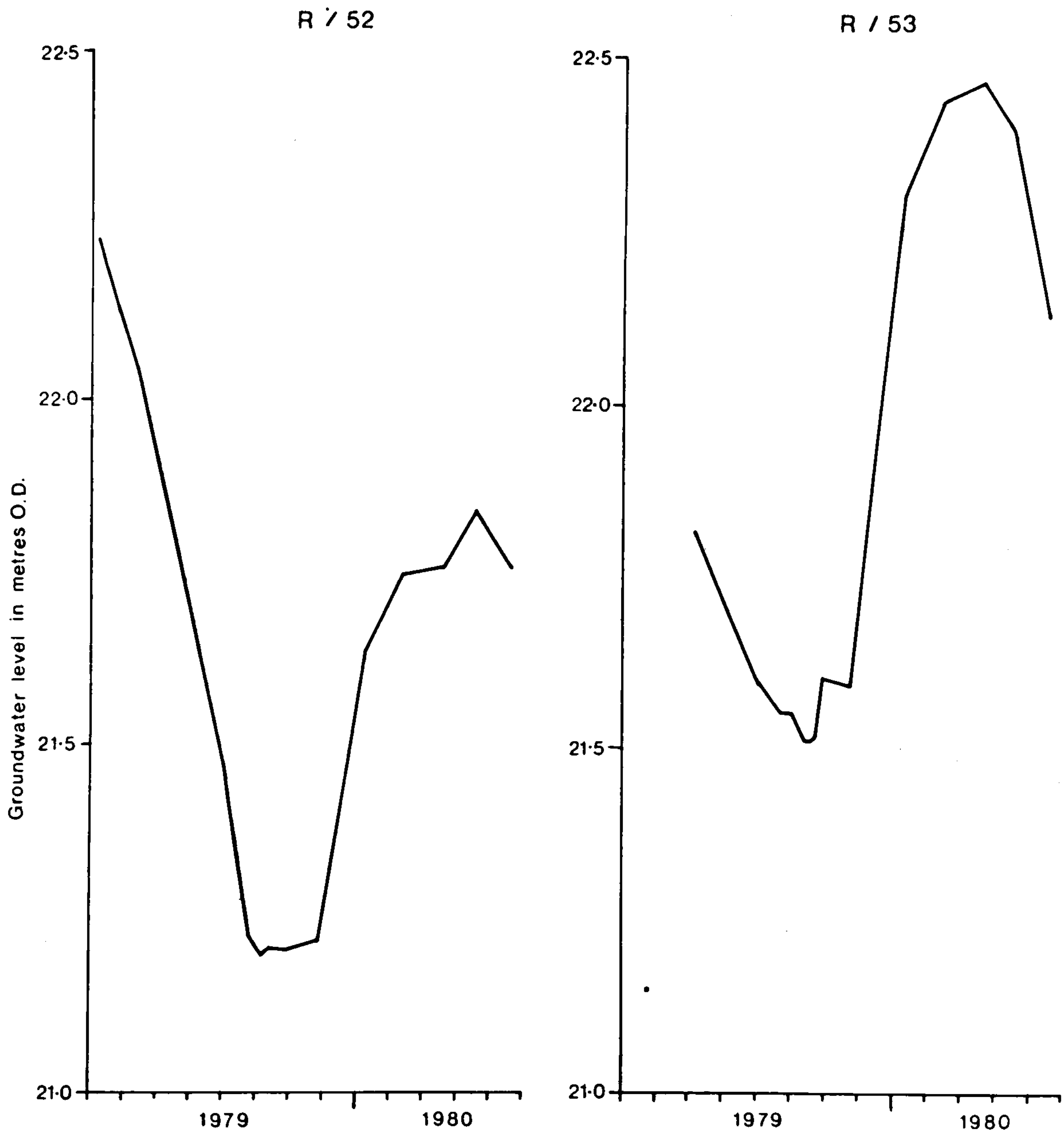


Fig. 10.13 Groundwater hydrographs of boreholes R/52 and R/53 on Ibsley Airfield.

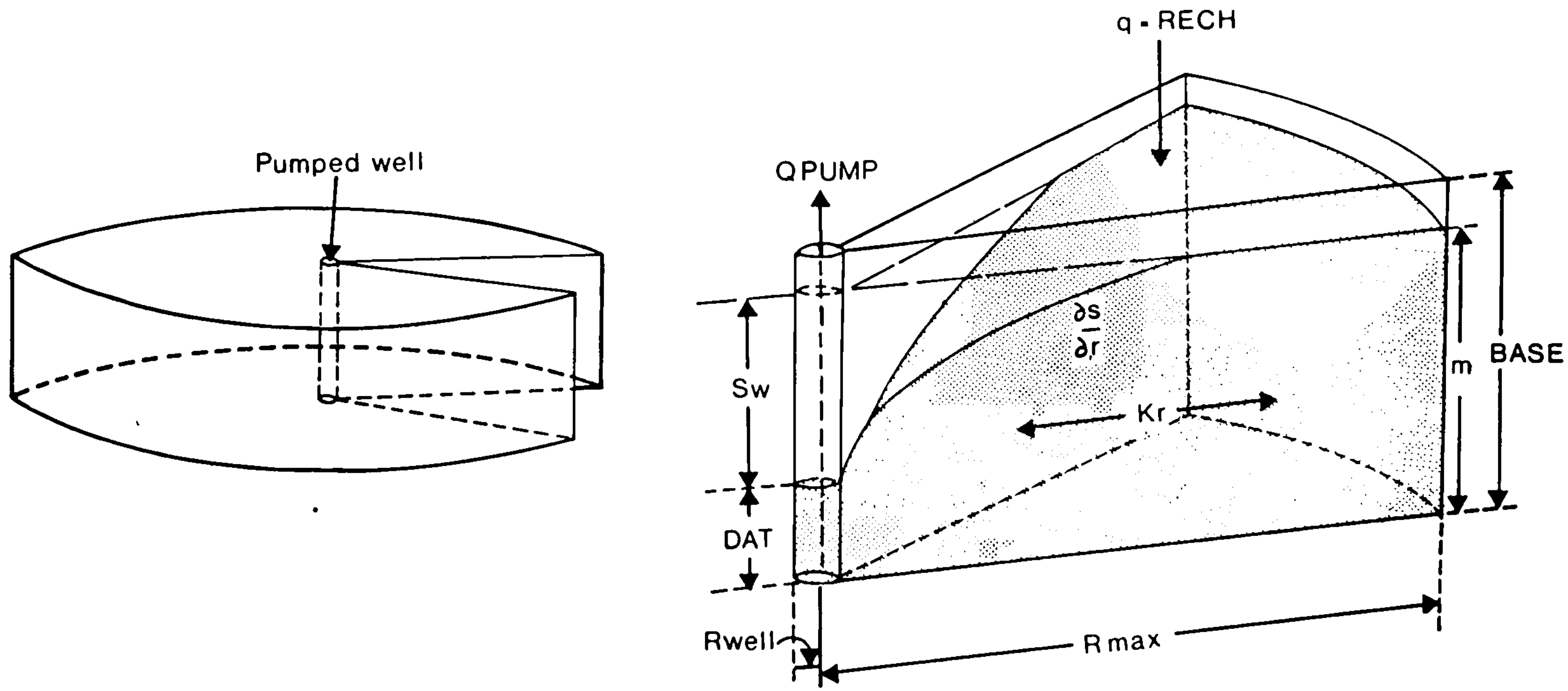


Fig. 10.14 Cylindrical unconfined aquifer and section showing drawdown of the water-table around a pumped well.

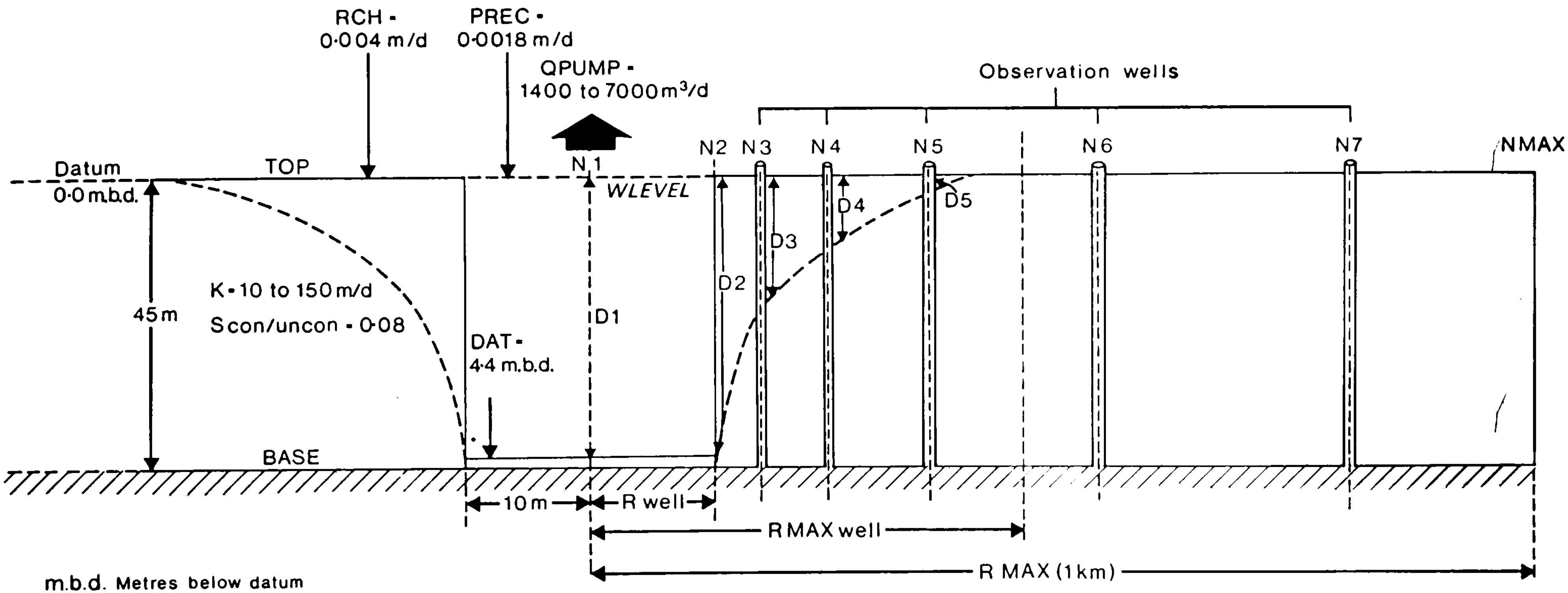


Fig. 10.15 Cross-section through a hypothetical gravel aquifer, showing example input data for the expanding pit numerical model.

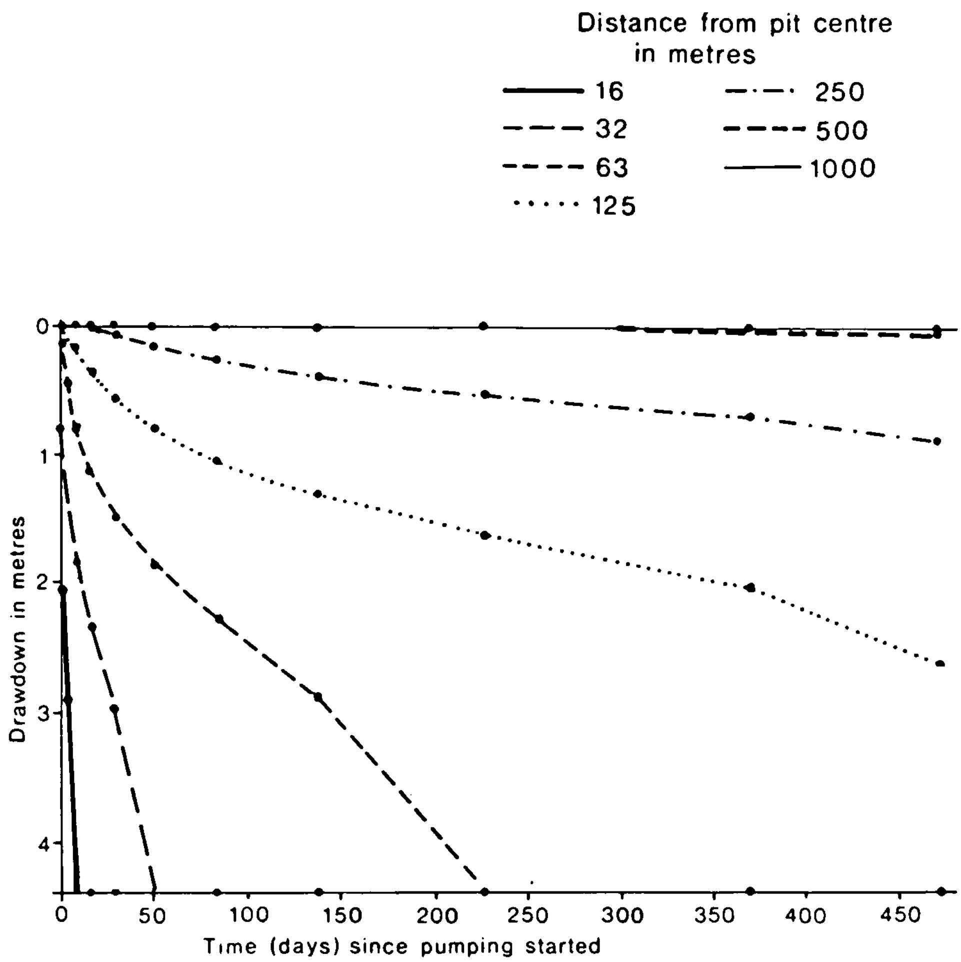


Fig. 10.6 Time versus drawdown curves during pumping phase (K = 10m/d).

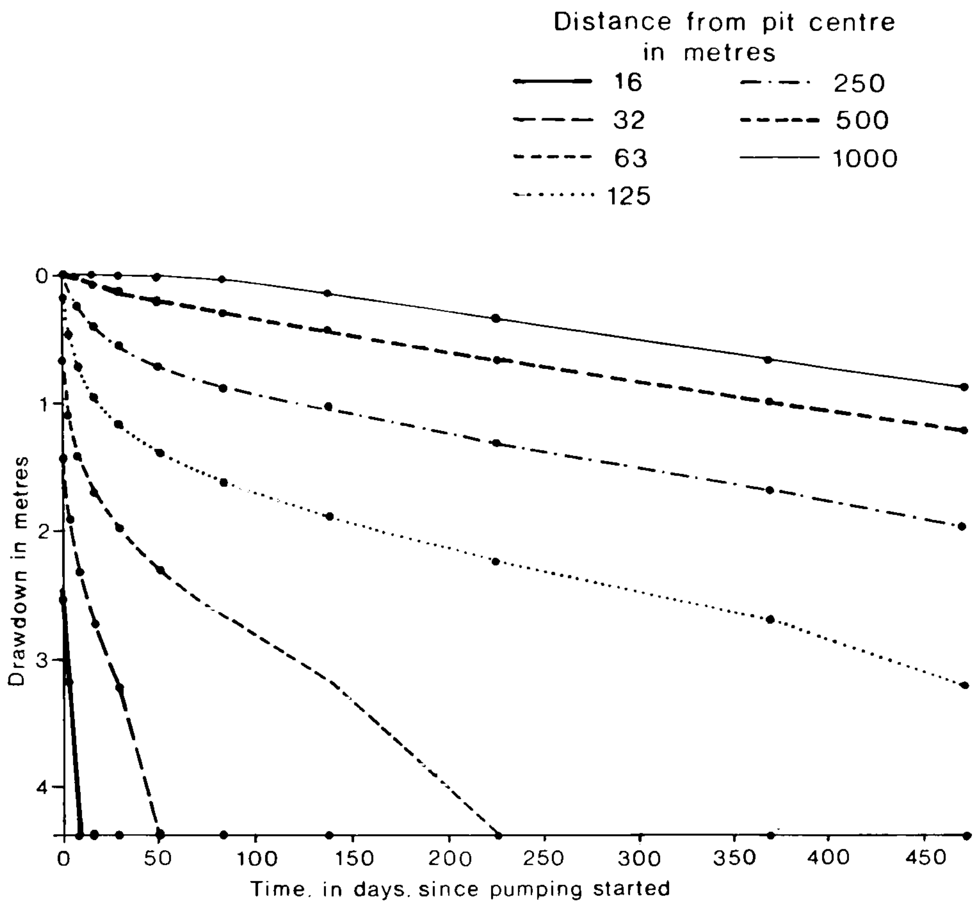


Fig. 10.17 Time versus drawdown curves during pumping phase (K = 75m/d).

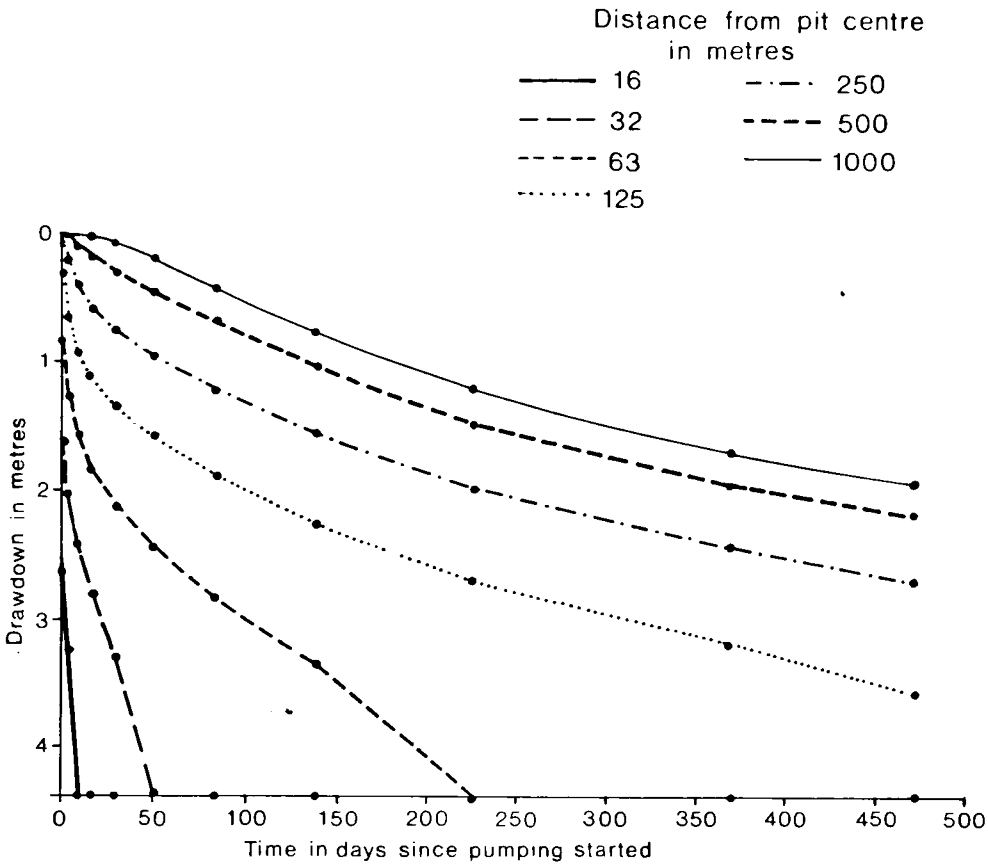


Fig 10.12 Time versus drawdown curves during pumping phase (K = 150m/d).

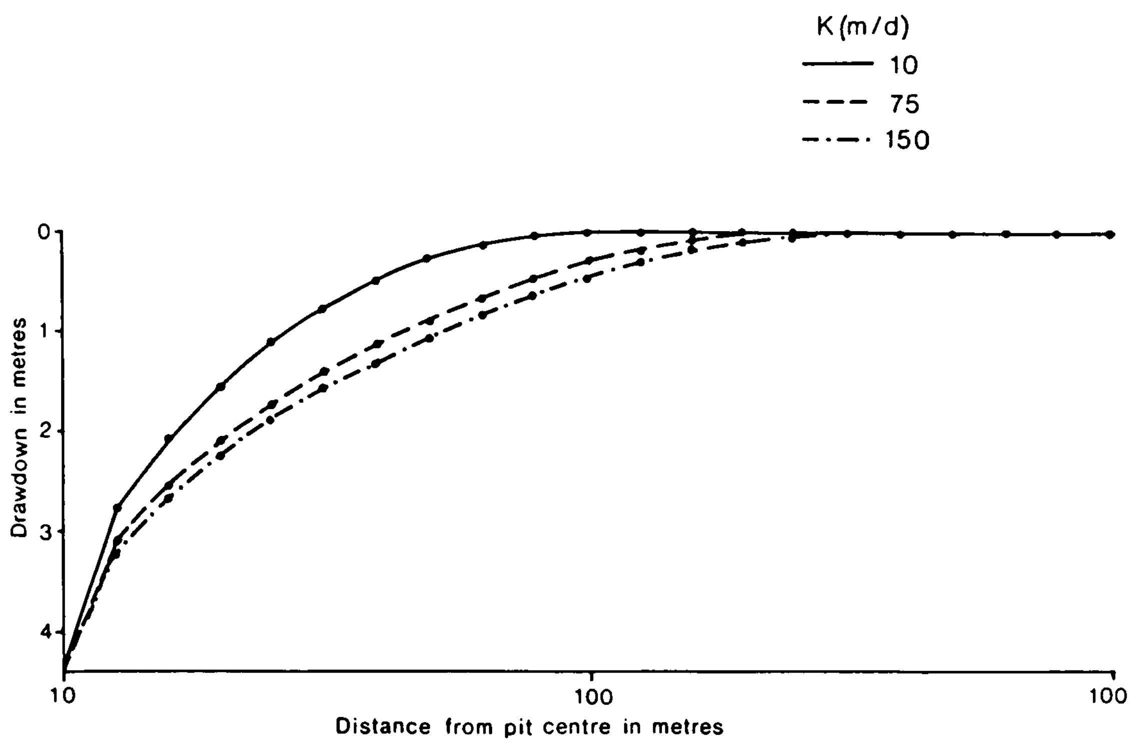


Fig. 10.19 Distance versus drawdown curves, 1.3 days from start of pumping (radius of pit = 10 metres).

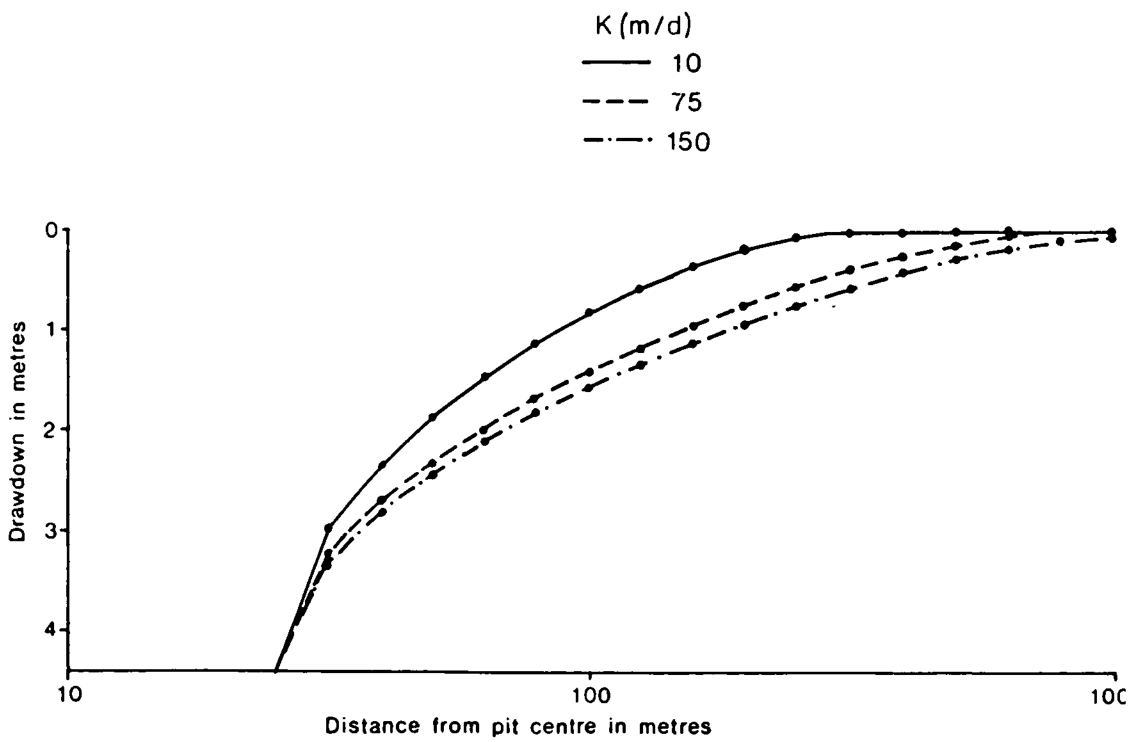


Fig. 10.20 Distance versus drawdown curves, 29.8 days from start of pumping (radius of pit = 25 metres).

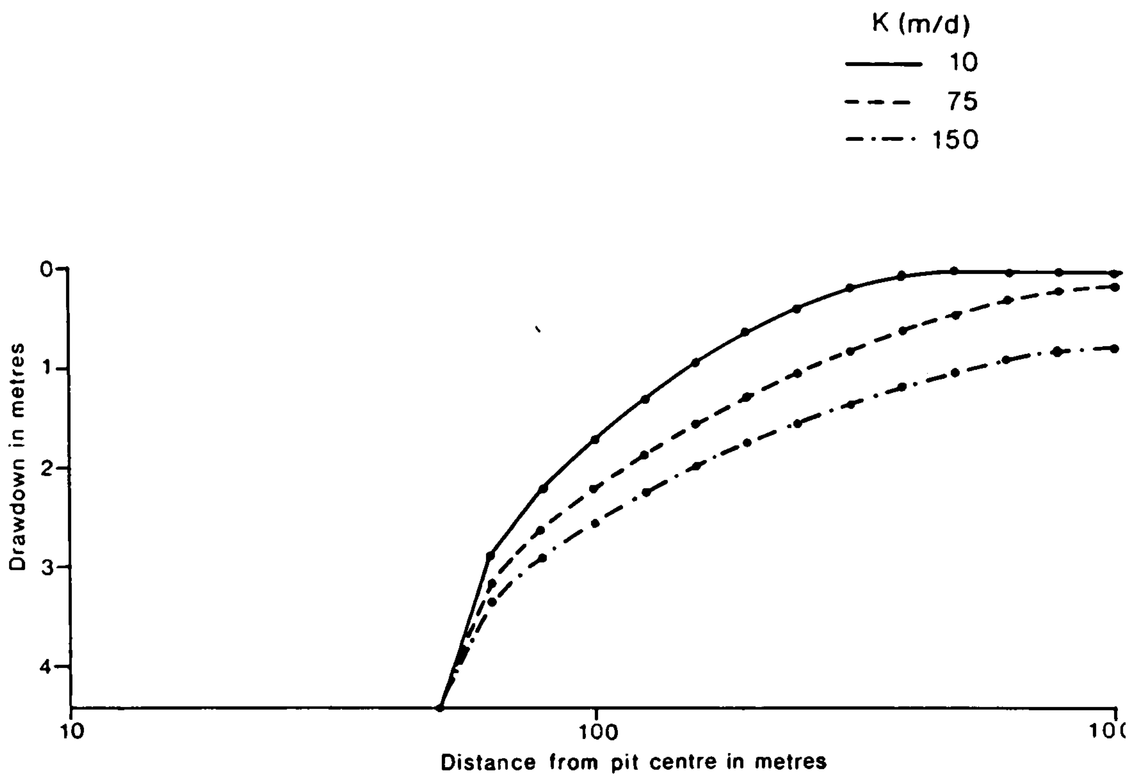


Fig. 10.21 Distance versus drawdown curves, 138.8 days from start of pumping (radius of pit = 50 metres).

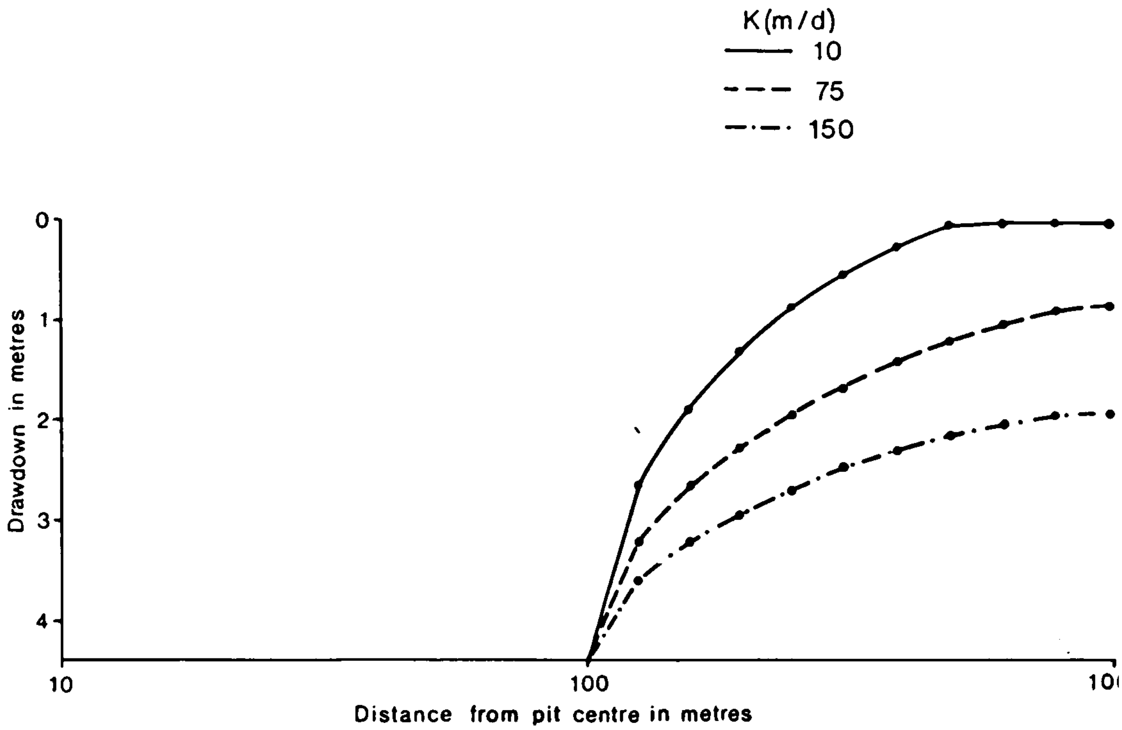


Fig. 10.22 Distance versus drawdown curves, 472.8 days from start of pumping (radius of pit = 100 metres).

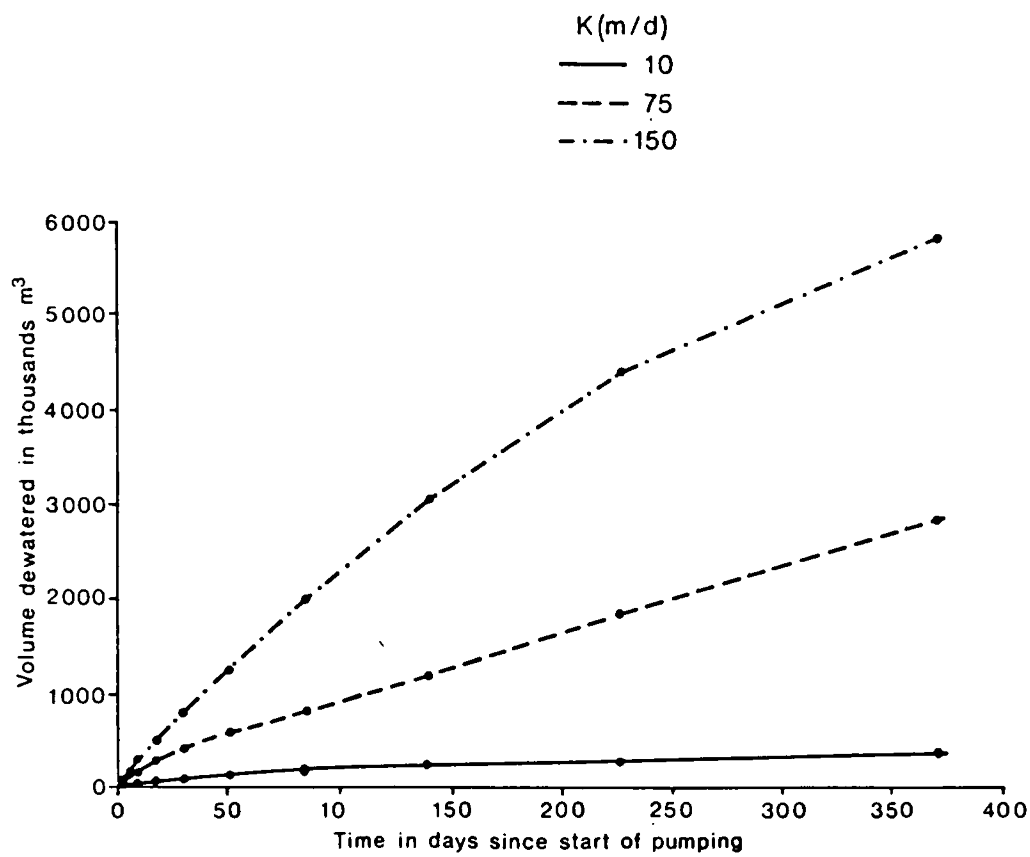


Fig. 10.23 Time versus volume of aquifer dewatered.

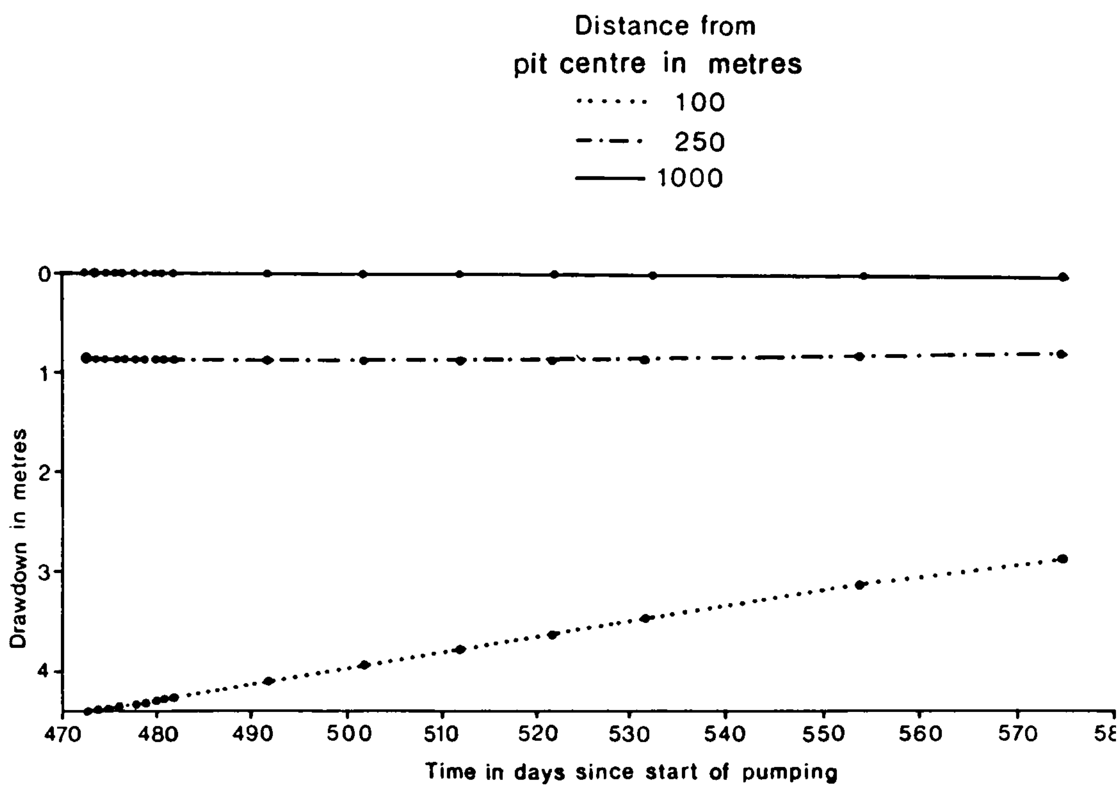


Fig. 10.24 Time versus drawdown curves during recovery phase (K = 10m/d).

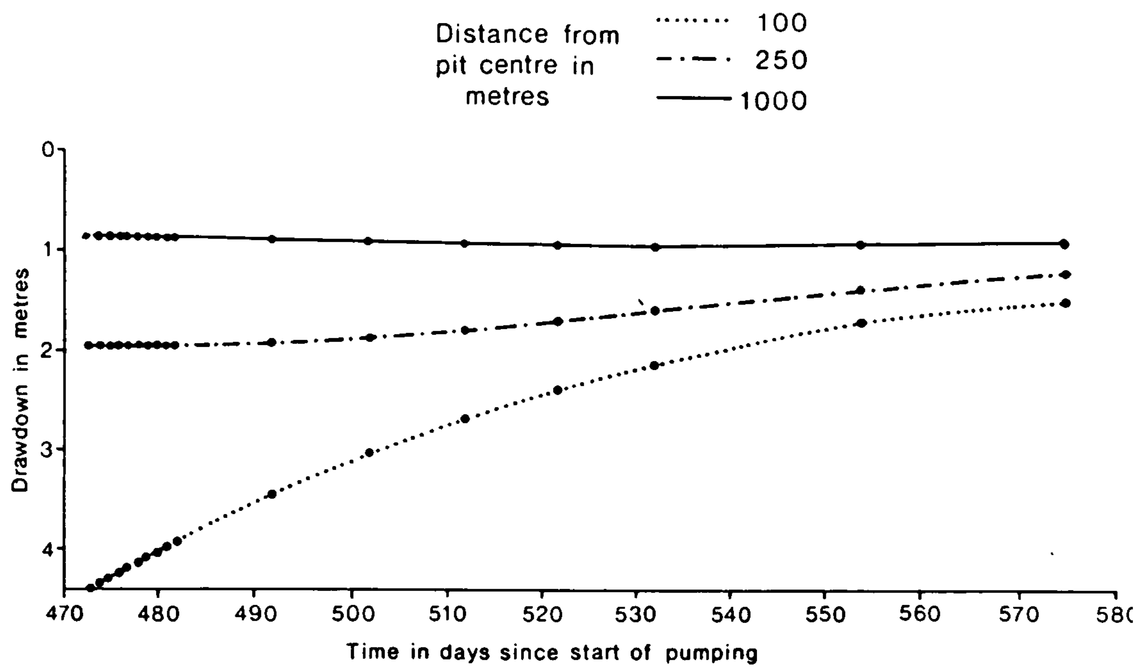


Fig. 10.25 Time versus drawdown curves during recovery phase (K = 75m/d).

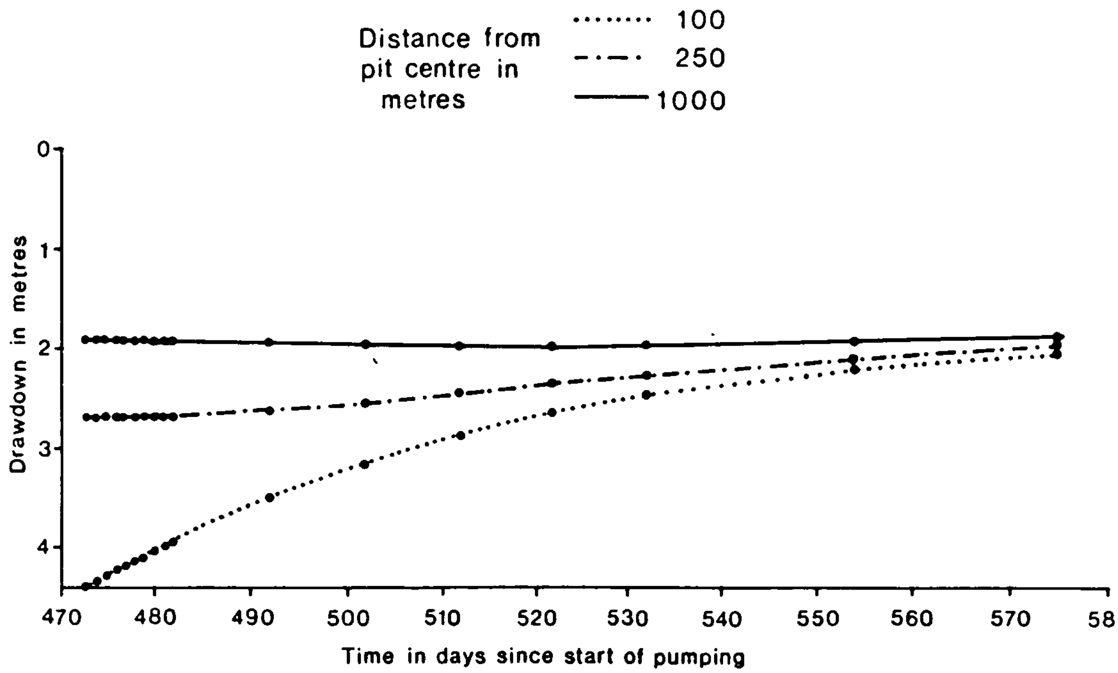


Fig. 10.26 Time versus drawdown curves during recovery phase (K = 150m/d).

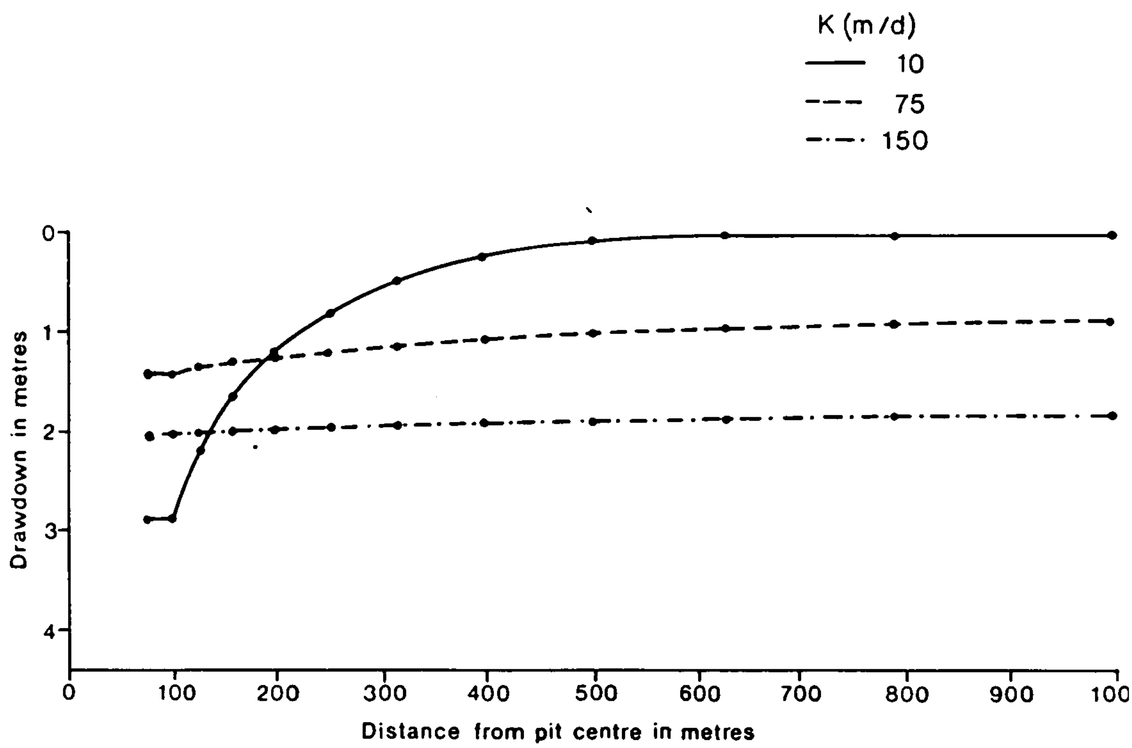


Fig. 10.27 Distance versus drawdown curves, 575 days from start of pumping (radius of pit* = 100 metres).

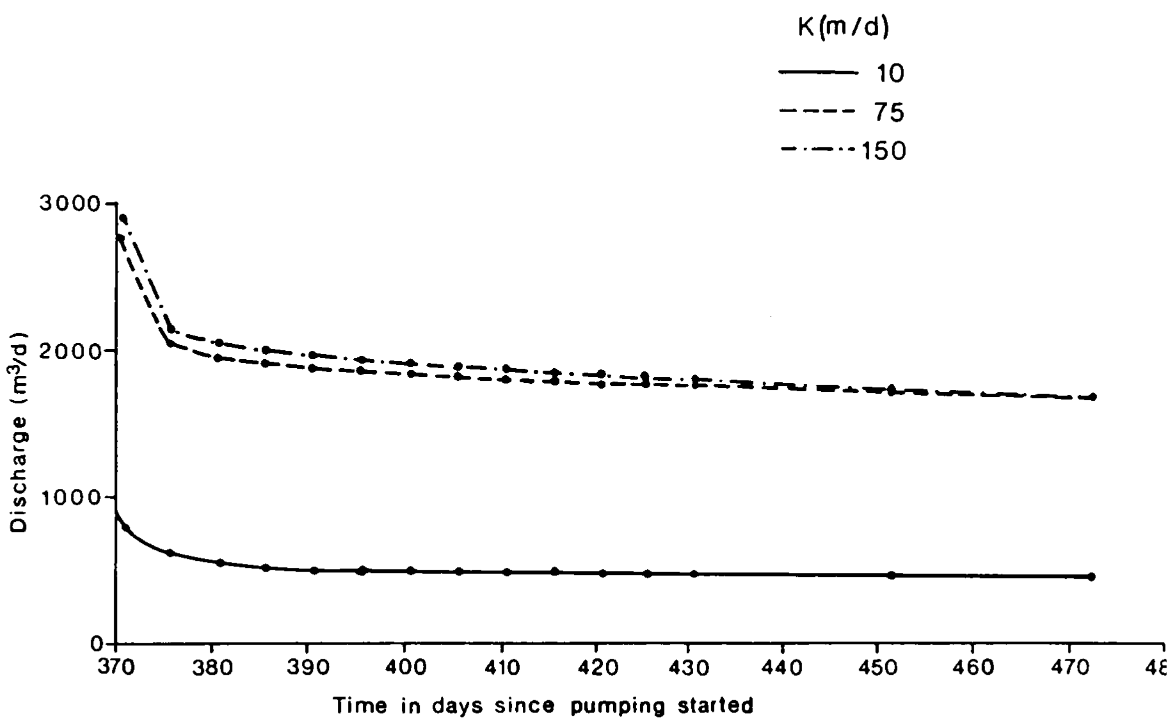


Fig. 10.28 Discharge versus time curves (pit radius = 100 metres).

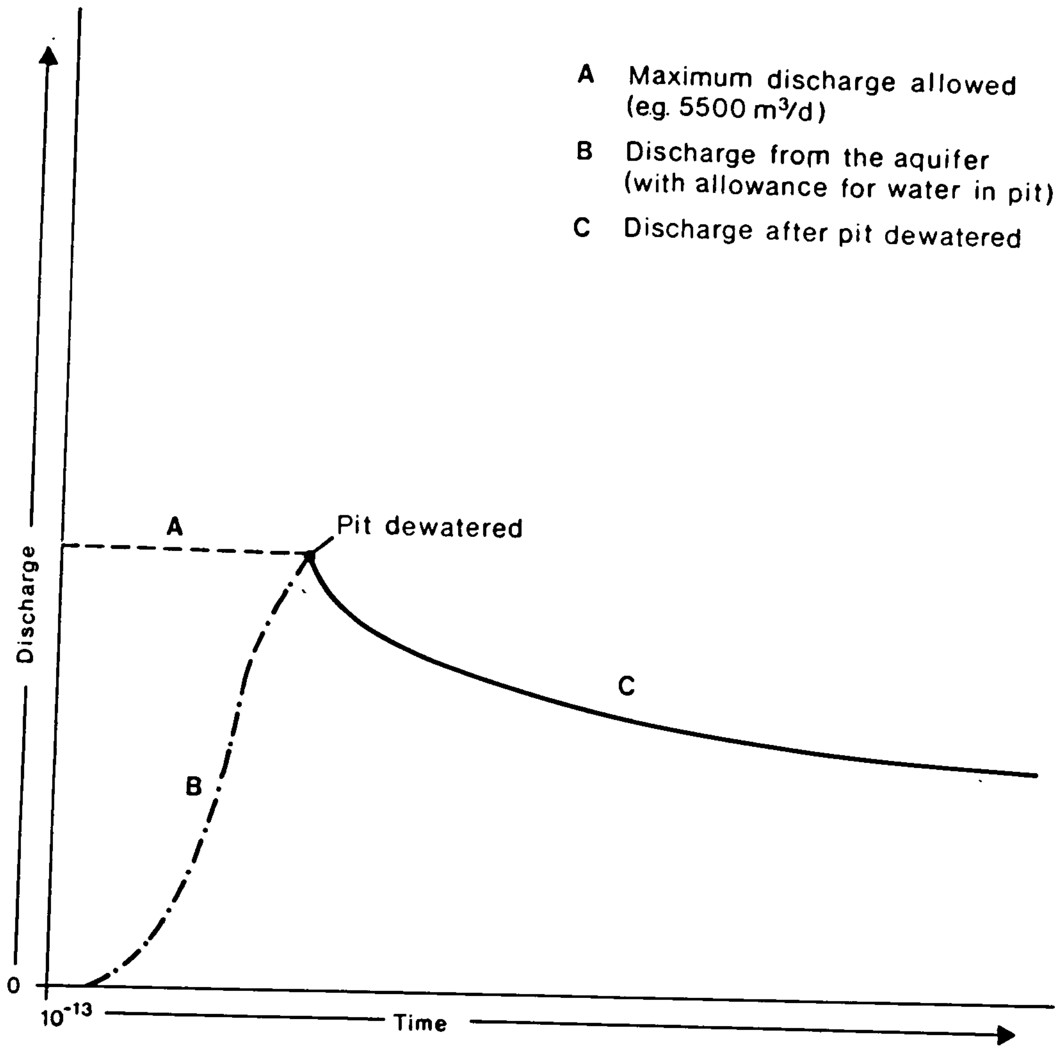


Fig. 10.29 Theoretical discharge curves for the dewatering of a gravel.

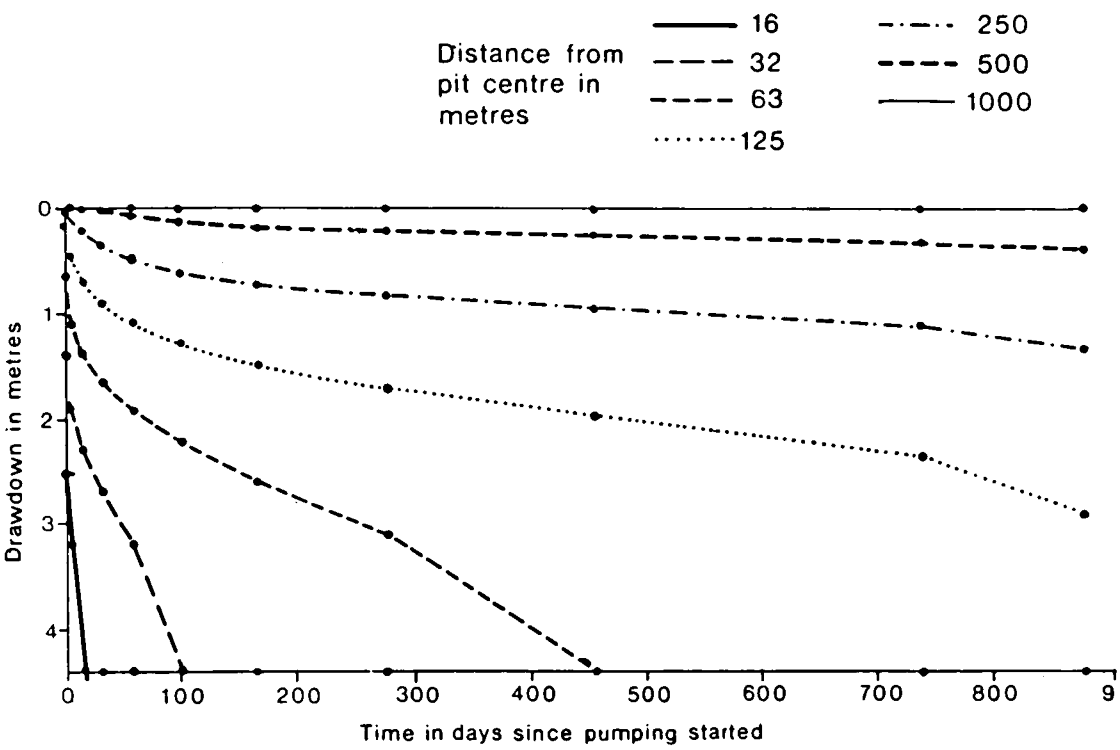


Fig. 10.30 Time versus drawdown curves during pumping phase ($Q = 1400m^3/d$).

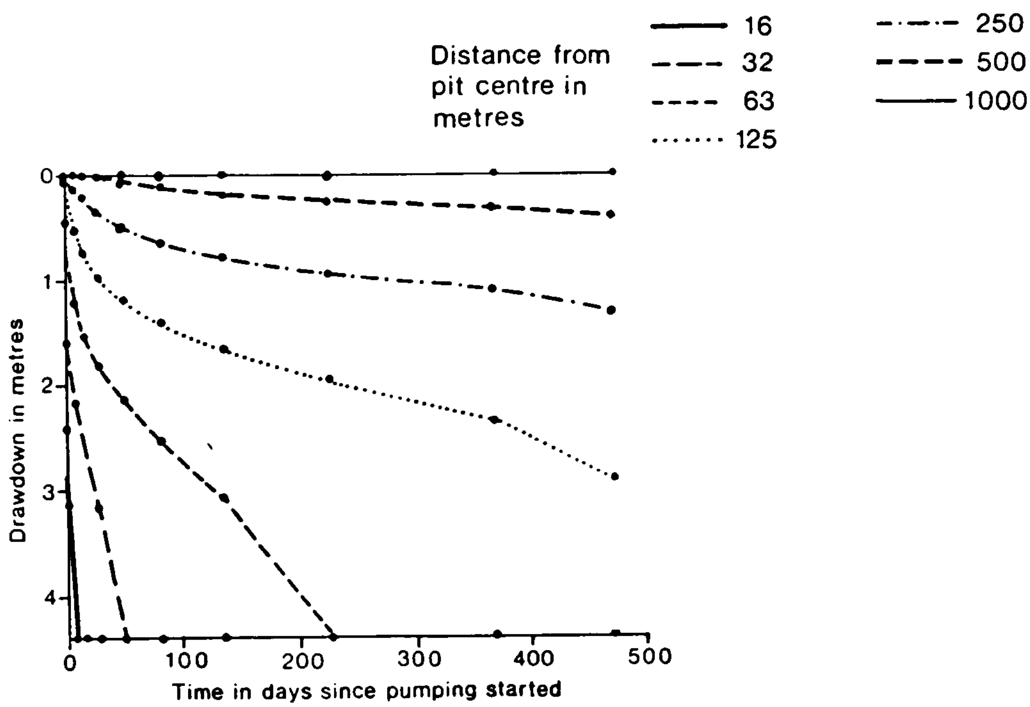


Fig. 10.31 Time versus drawdown curves during pumping phase ($Q = 4200 m^3/d$).

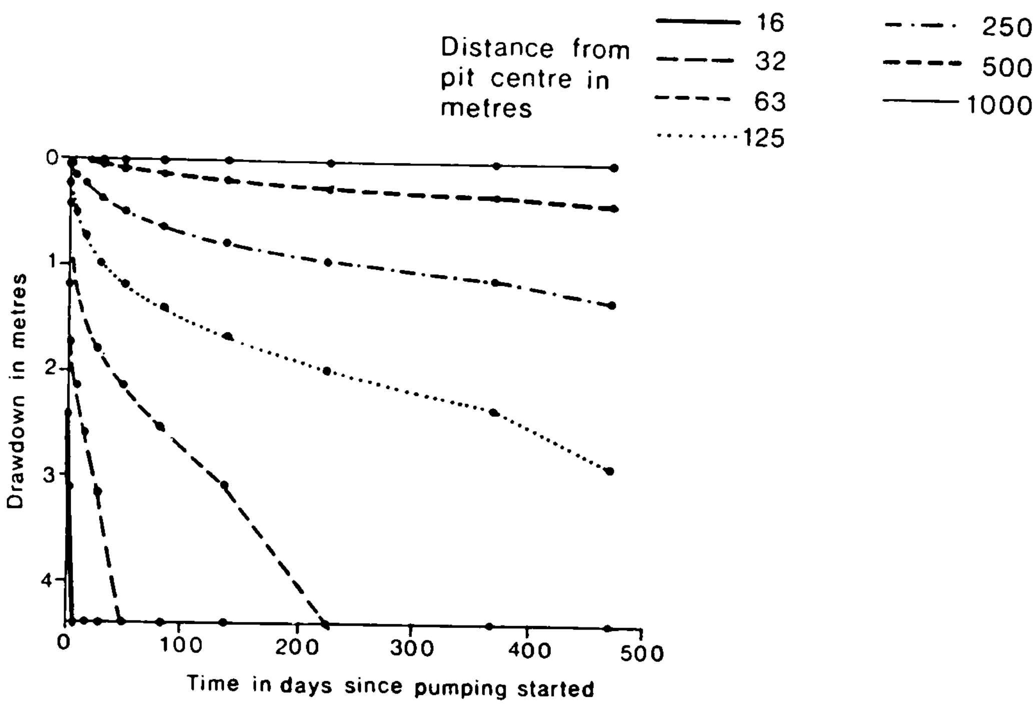


Fig. 10.32 Time versus drawdown curves during pumping phase ($Q = 7000 m^3/d$).

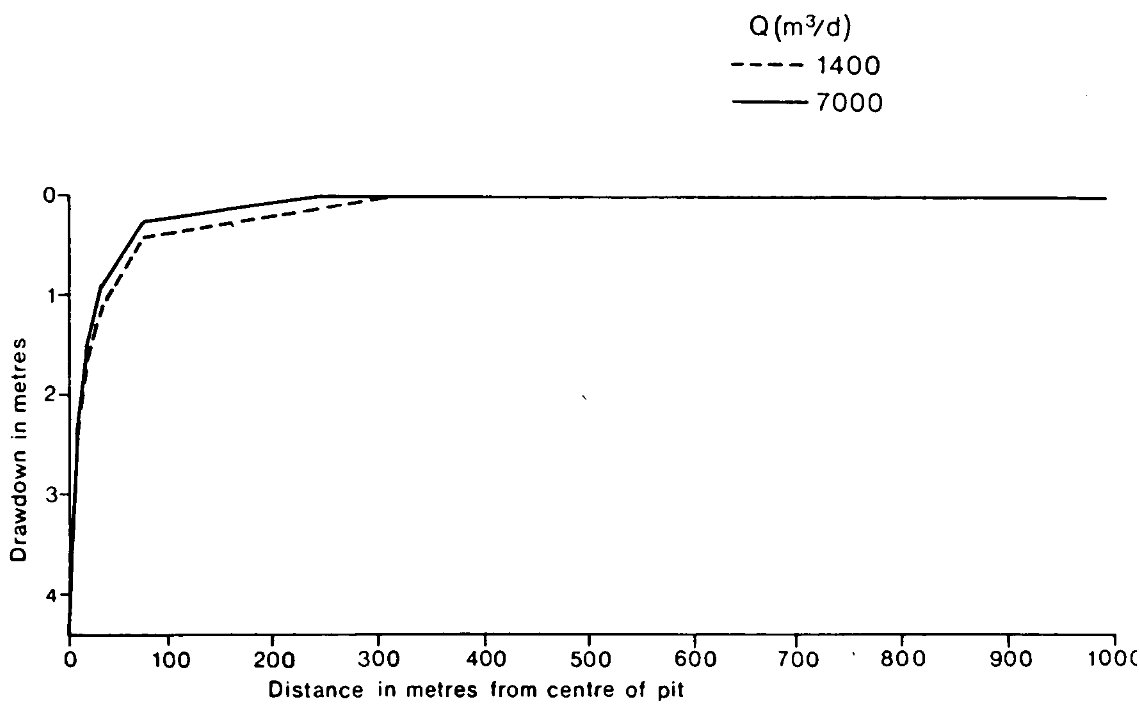


Fig. 10.33 Distance versus drawdown curves at time of constant drawdown, radius of pit = 10 metres.

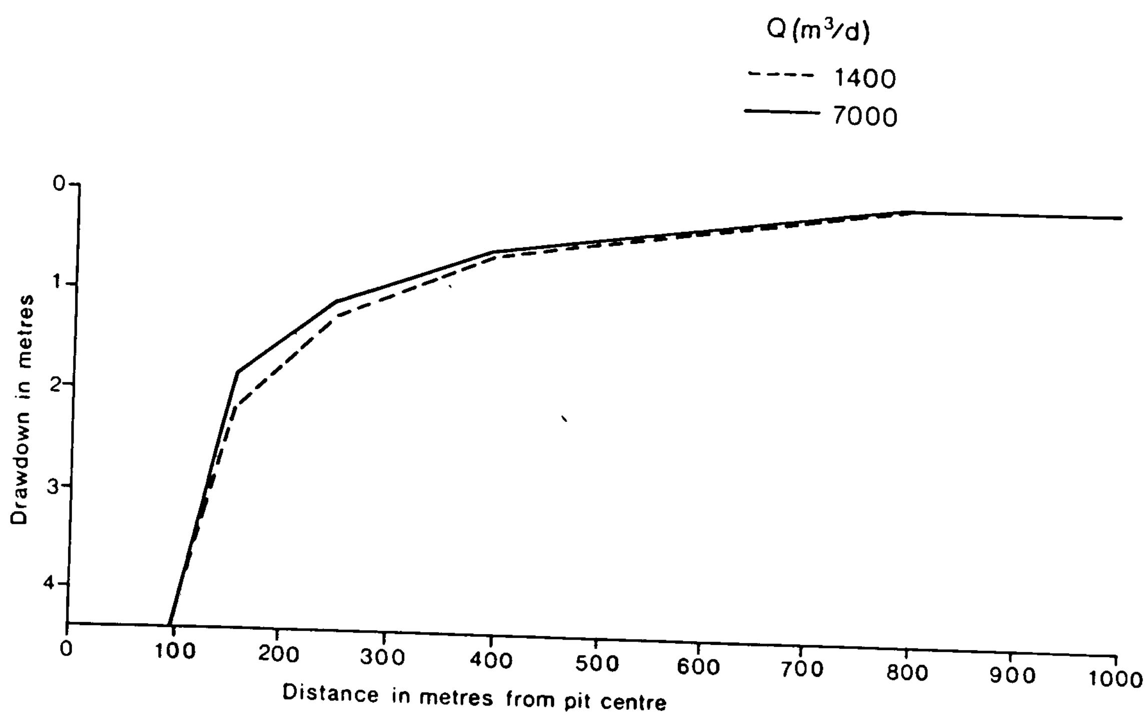


Fig. 10.34 Distance versus drawdown curves at time of constant drawdown, radius of pit = 100 metres.

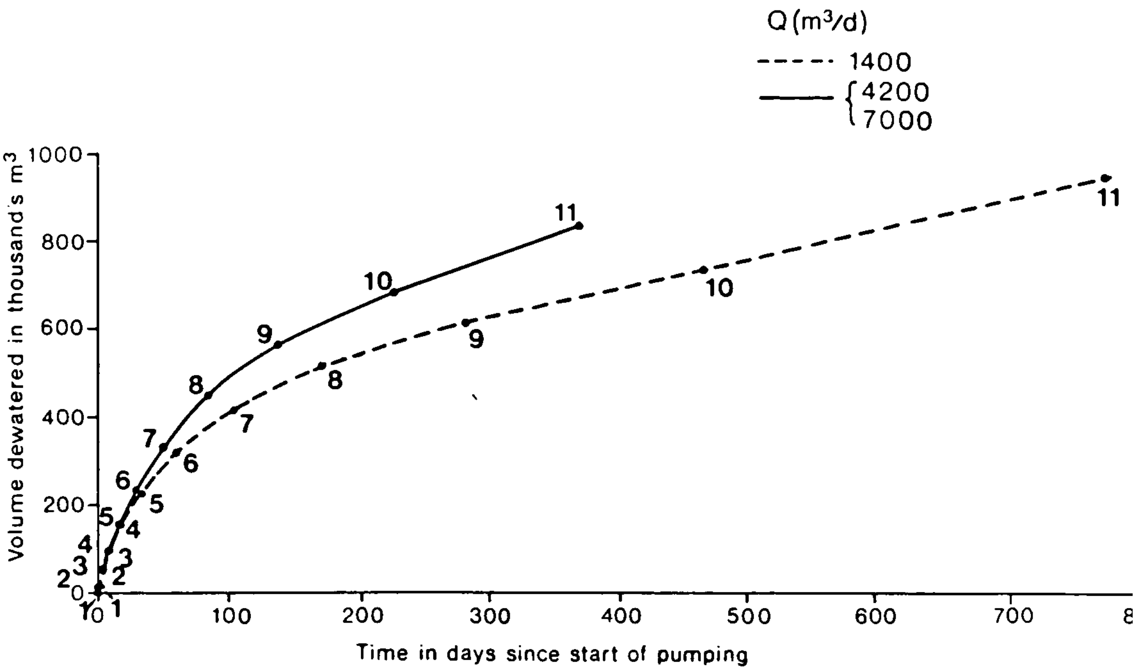


Fig. 10.35 Time versus volume of aquifer dewatered.

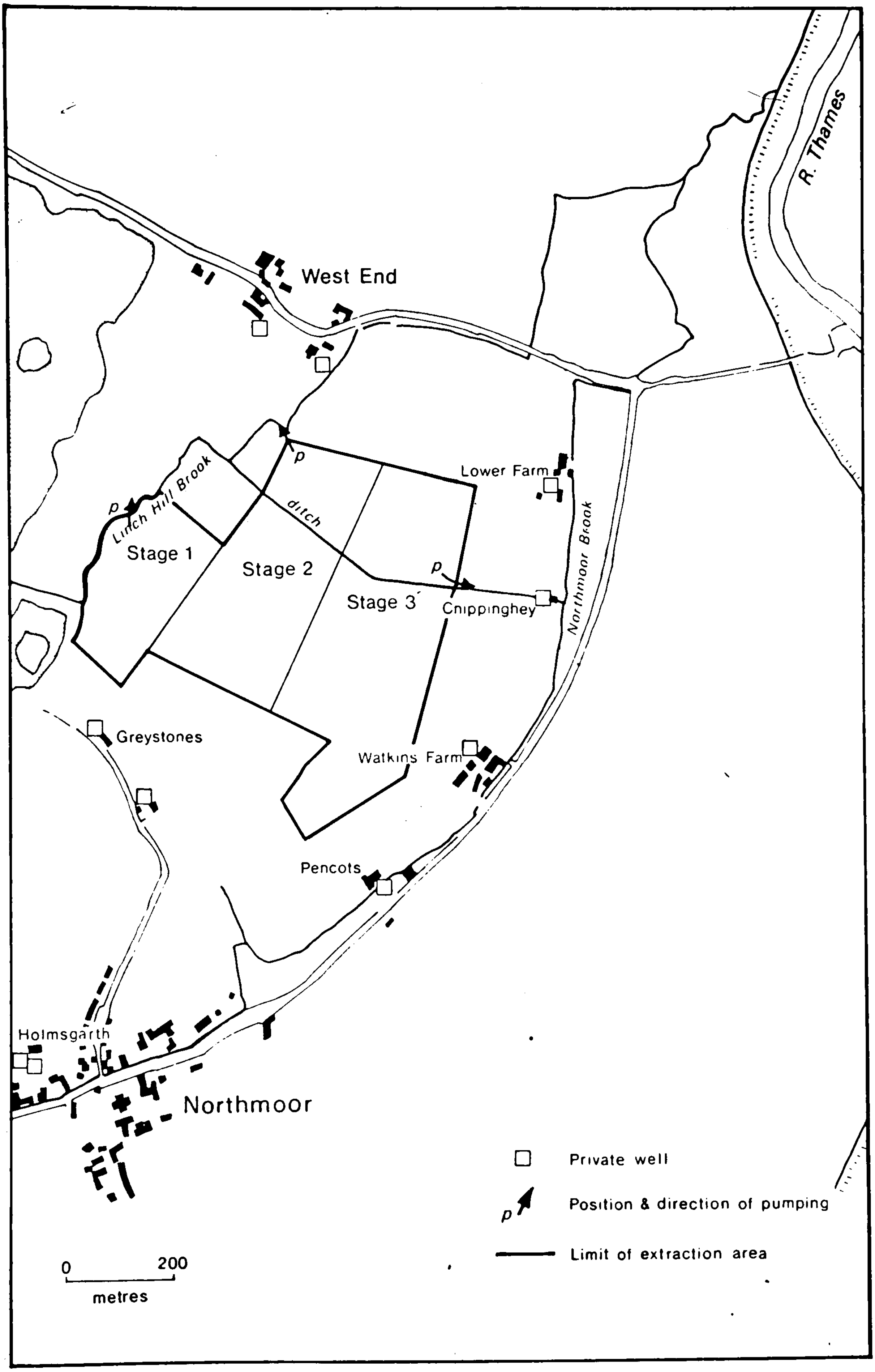


Fig. 10.36 Site of the proposed gravel pit development at Watkins Farm, Northmoor.

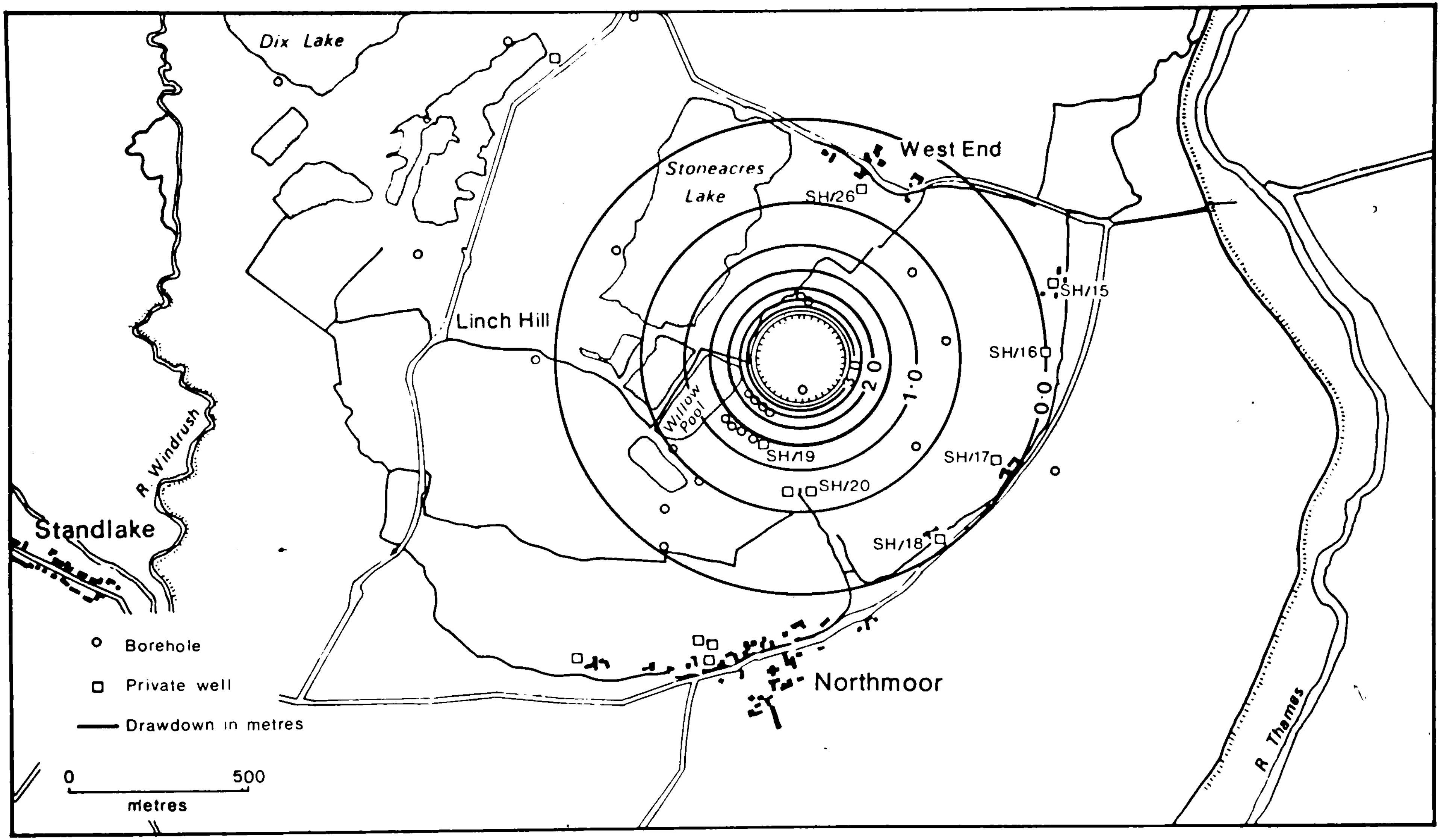


Fig. 10.37 Predicted drawdown around stage 1 of Watkins Farm gravel pit (uncorrected).

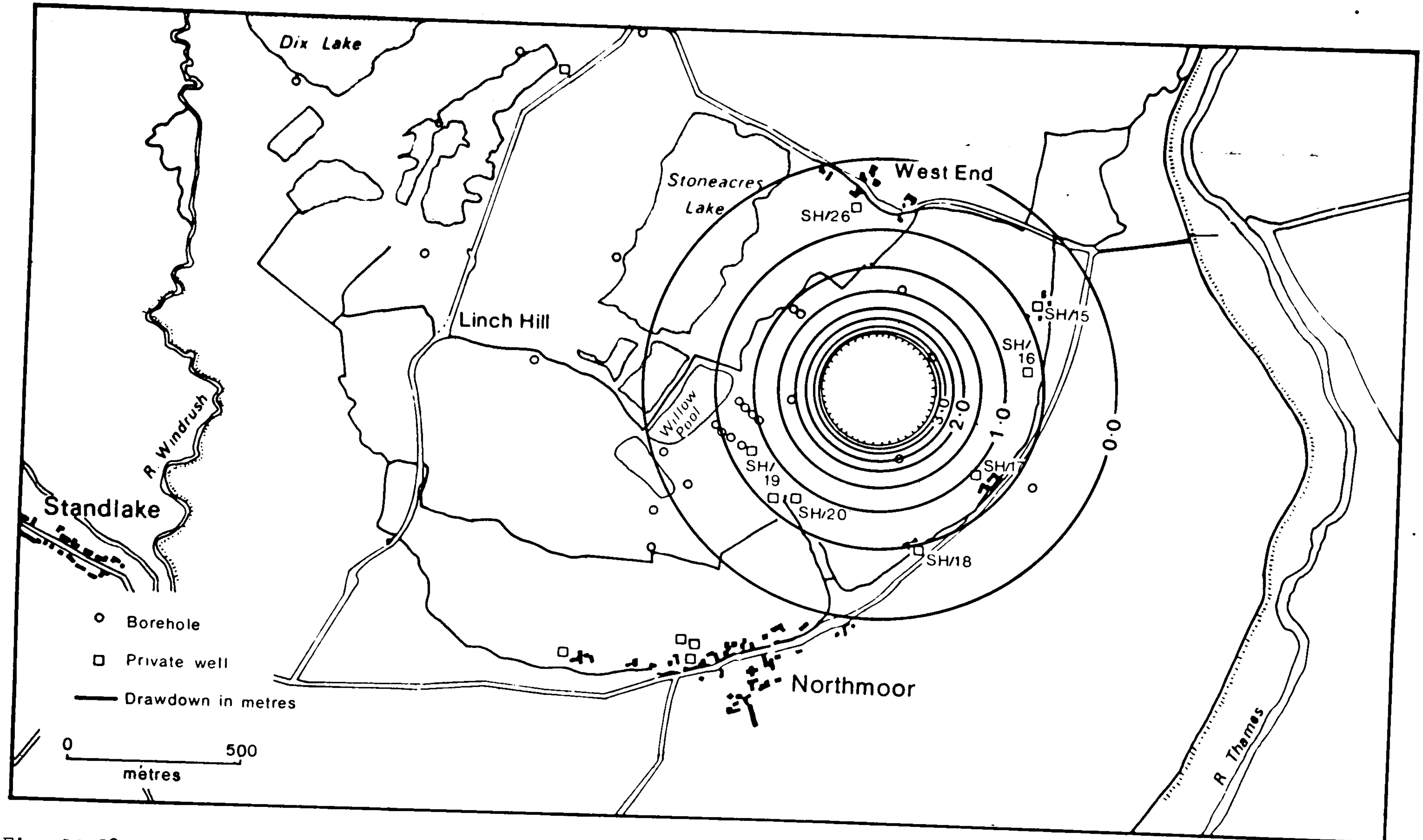


Fig 10.38 Predicted drawdown around stage 2 of Watkins Farm gravel Pit (uncorrected).

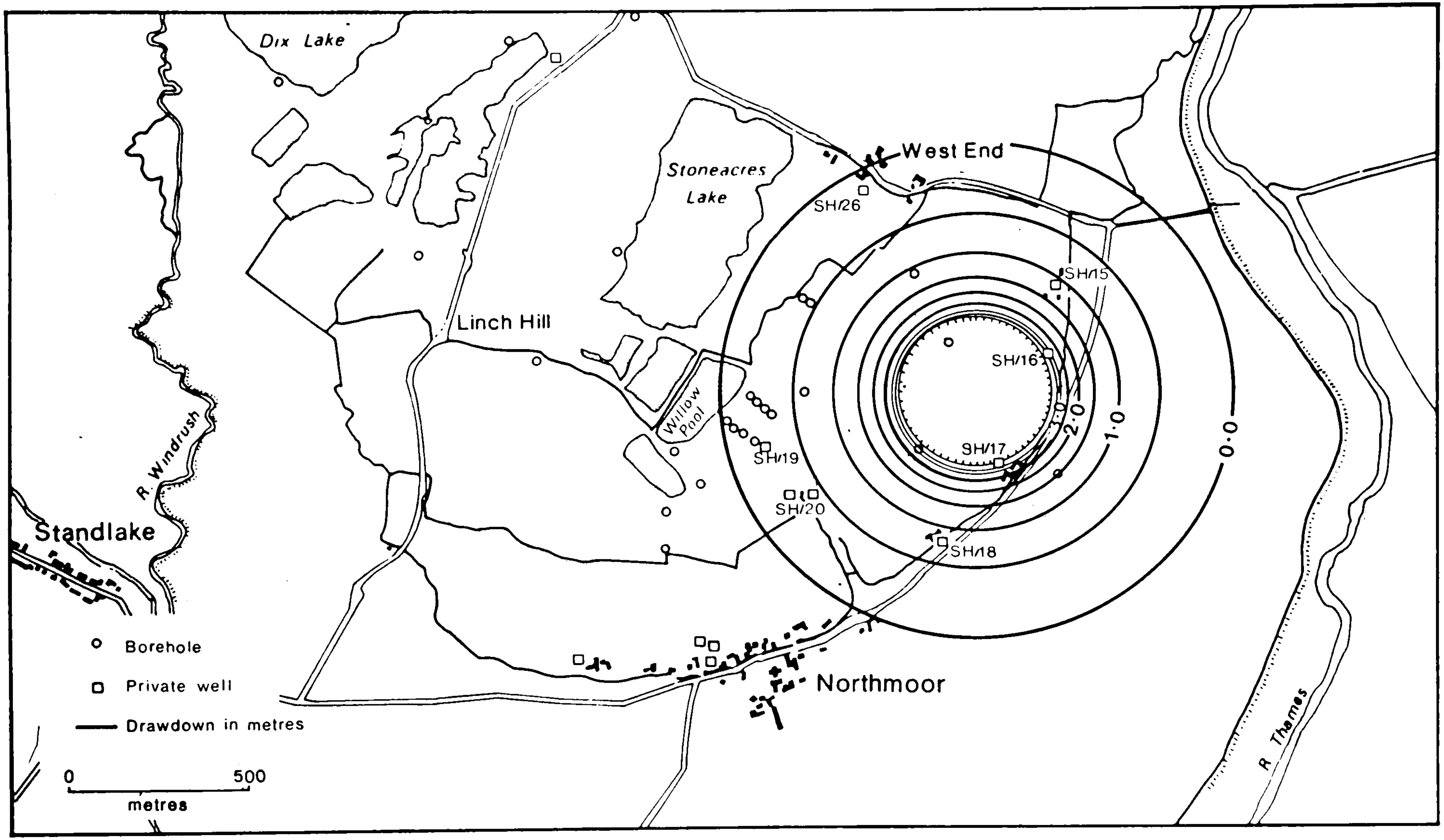


Fig 10 39 Predicted drawdown around stage 3 of Watkins Farm gravel pit (uncorrected).

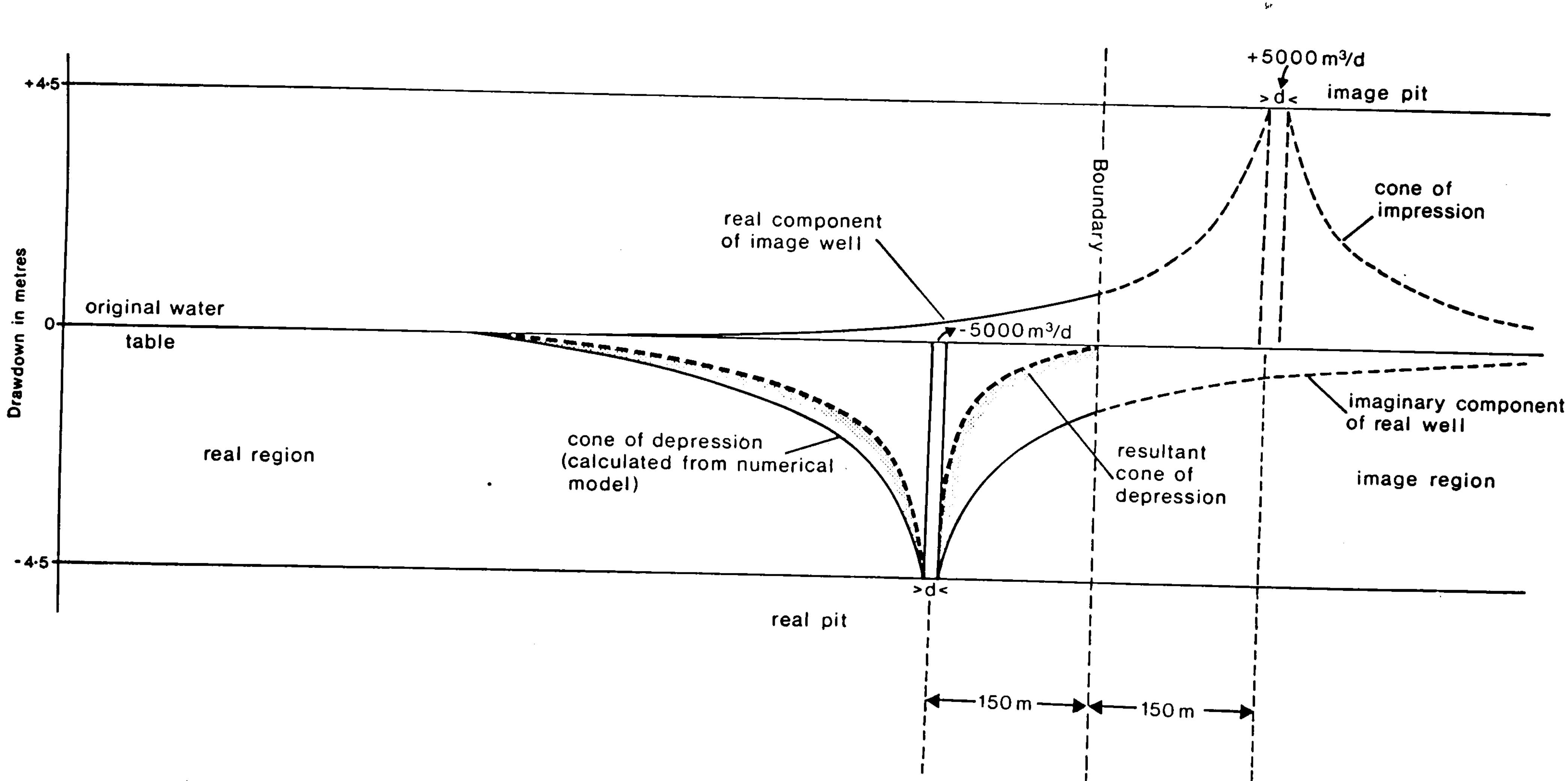


Fig. 10.40 Use of image well technique to solve boundary problems around Watkins Farm (stage 1).

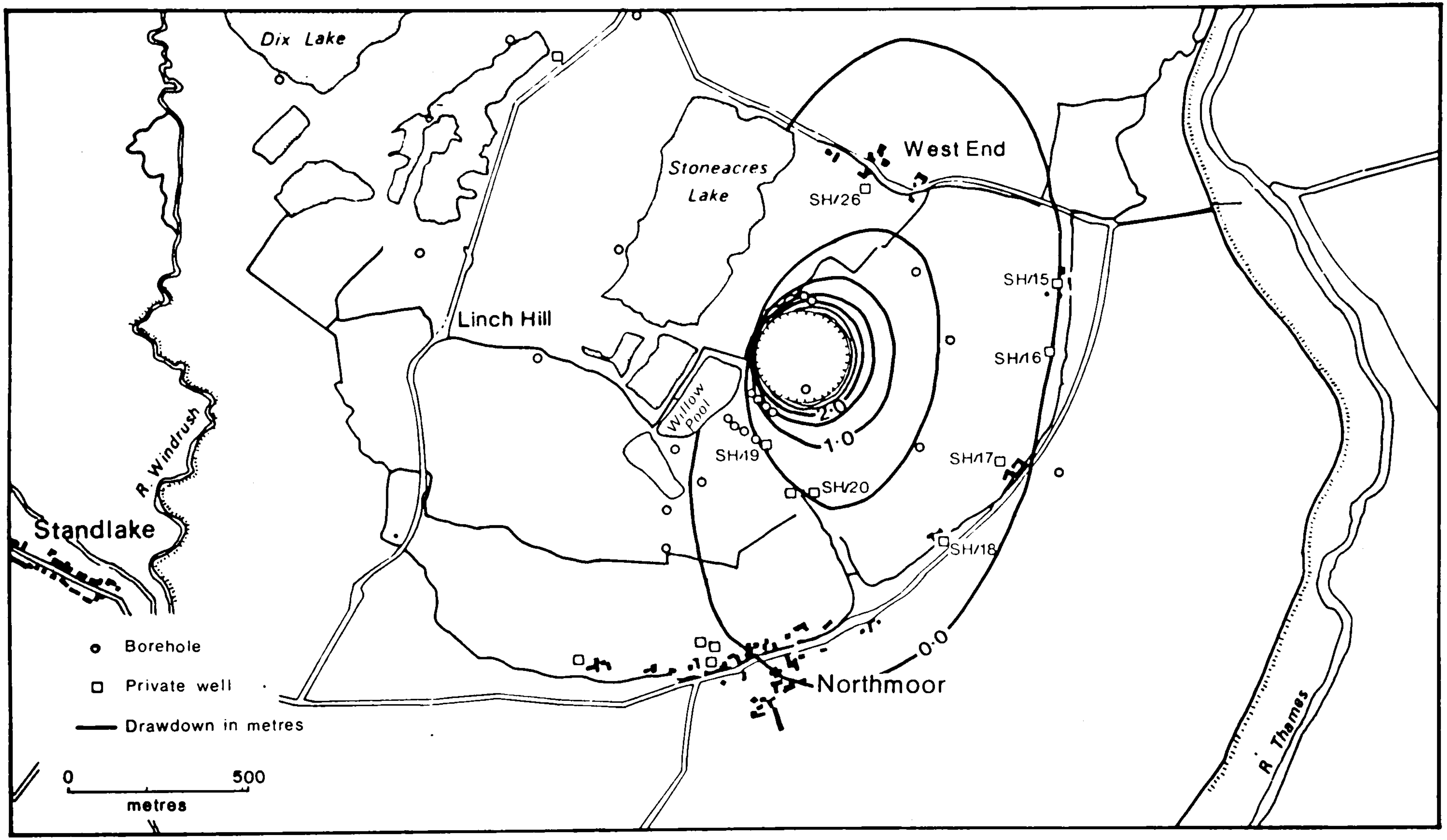


Fig. 10.41 Predicted drawdown around stage 1 of Watkins Farm gravel Pit (corrected).

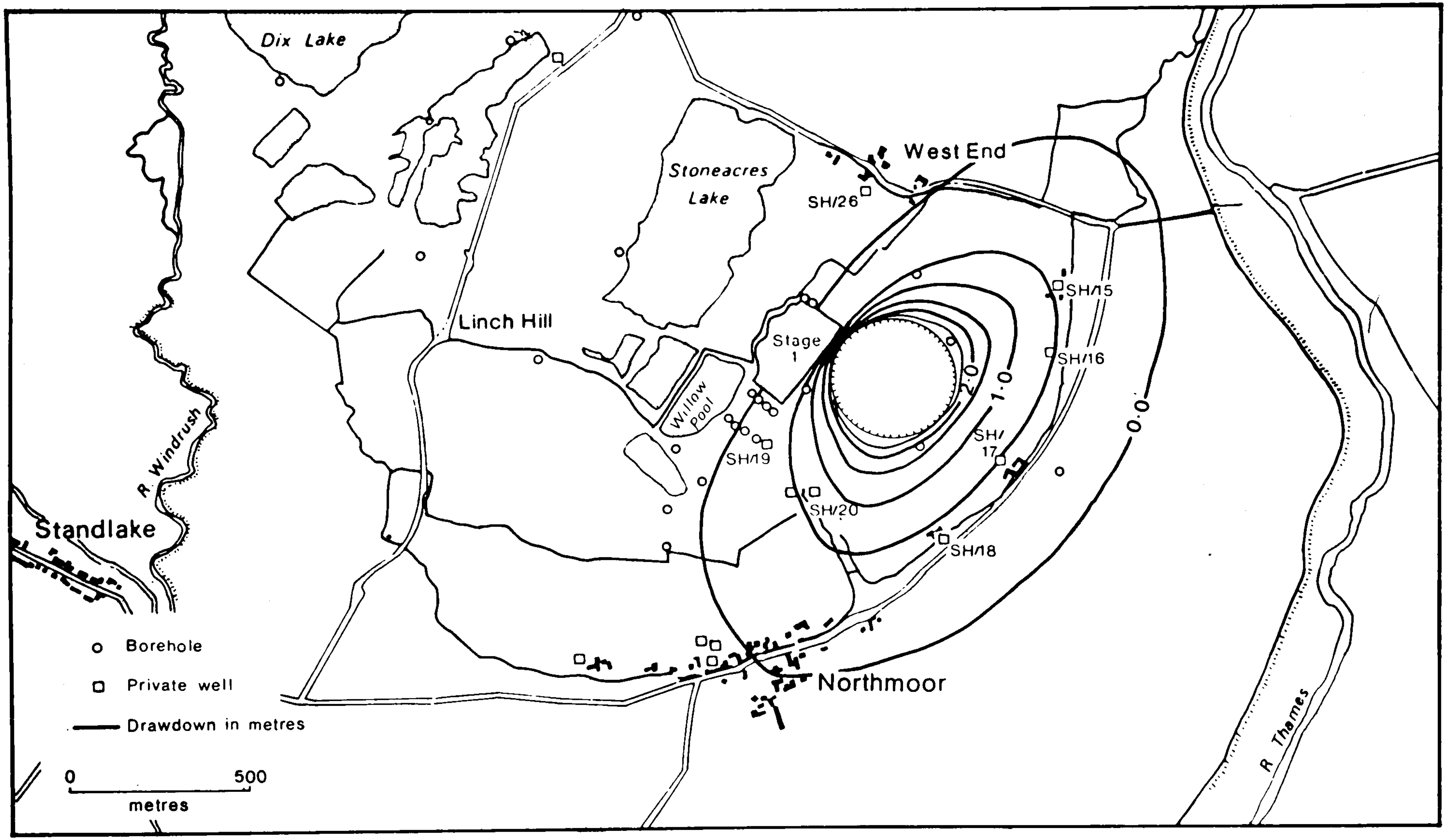


Fig. 10 42 Predicted drawdown around stage 2 of Watkins Farm gravel pit (corrected).

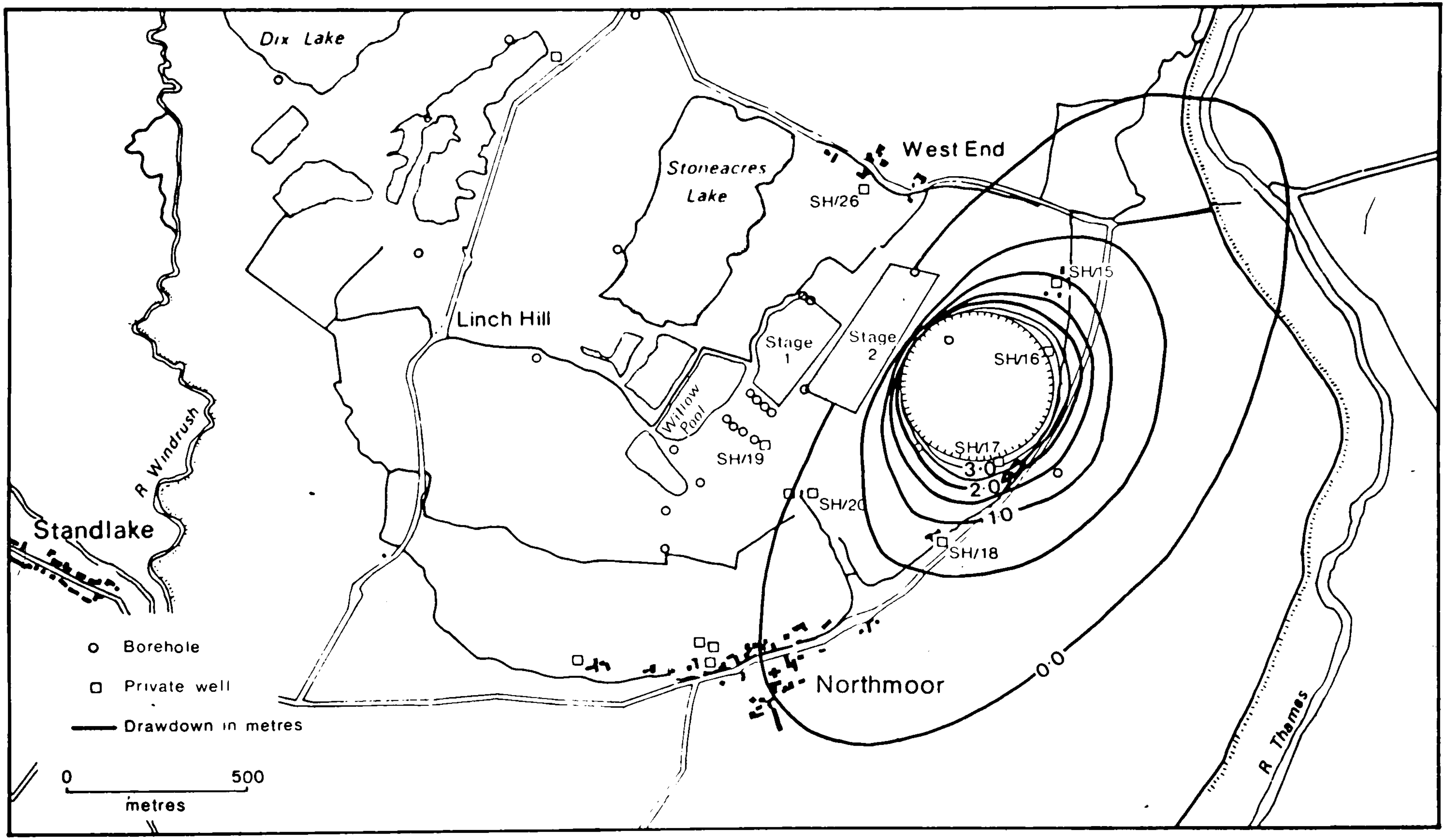


Fig 10.43 Predicted drawdown around stage 3 of Watkins Farm gravel pit (corrected).

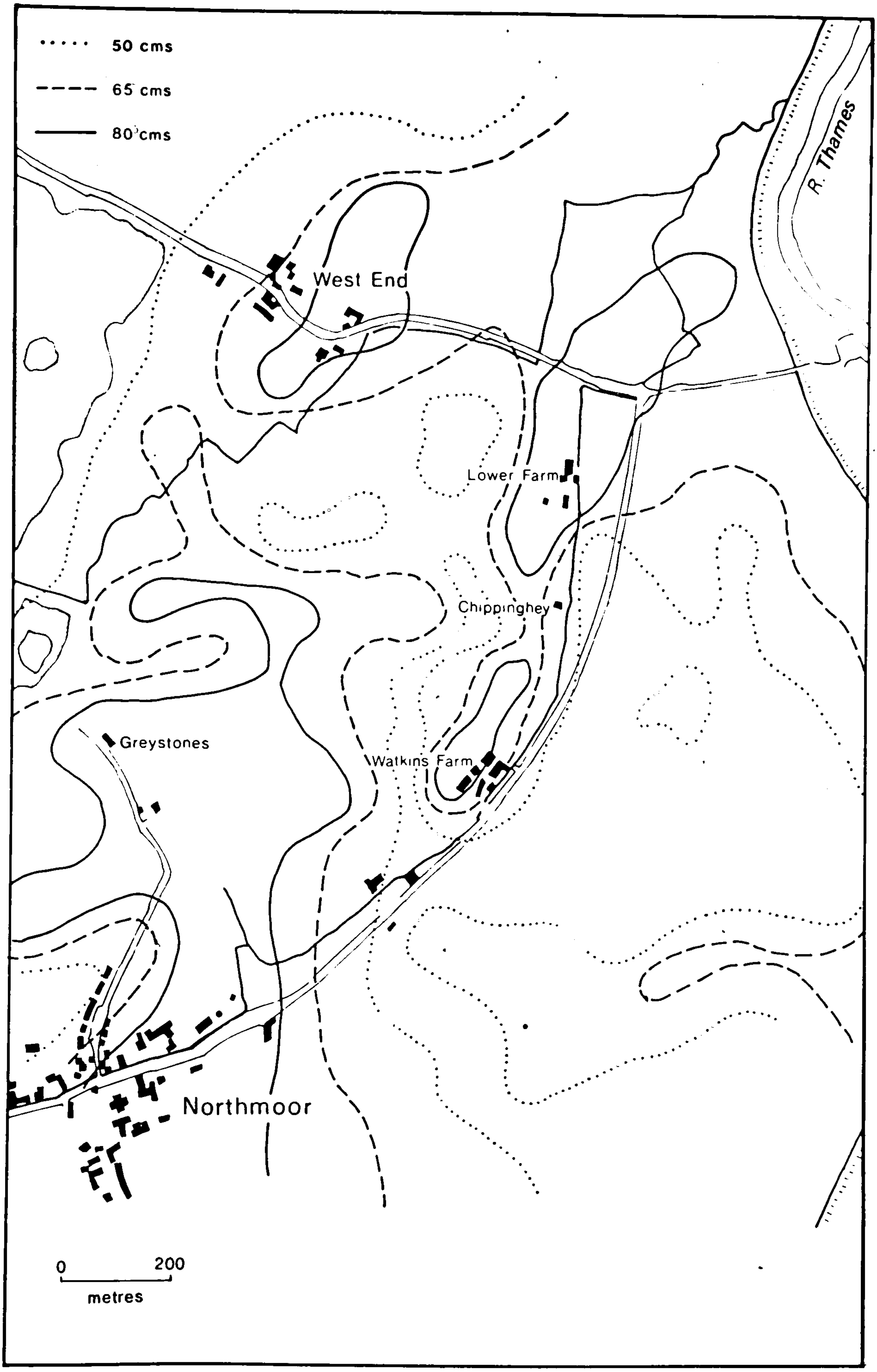


Fig. 10.44 Depth to gravel contours in the Watkins Farm area (from survey by Land & Water Management Ltd.).

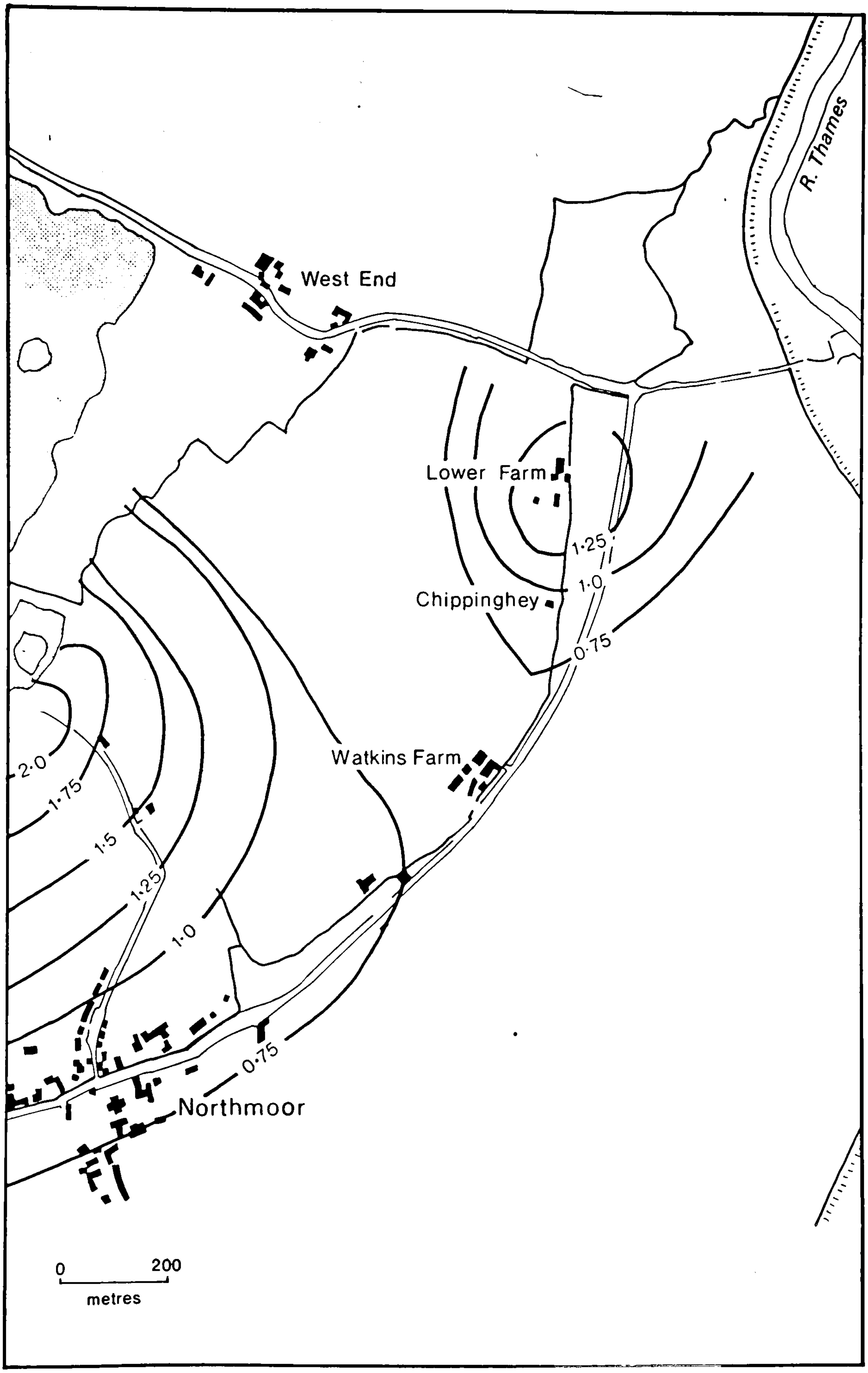


Fig. 10.45 Depth below surface of water table, Jan. 1978 (in metres), in the Watkins Farm area.

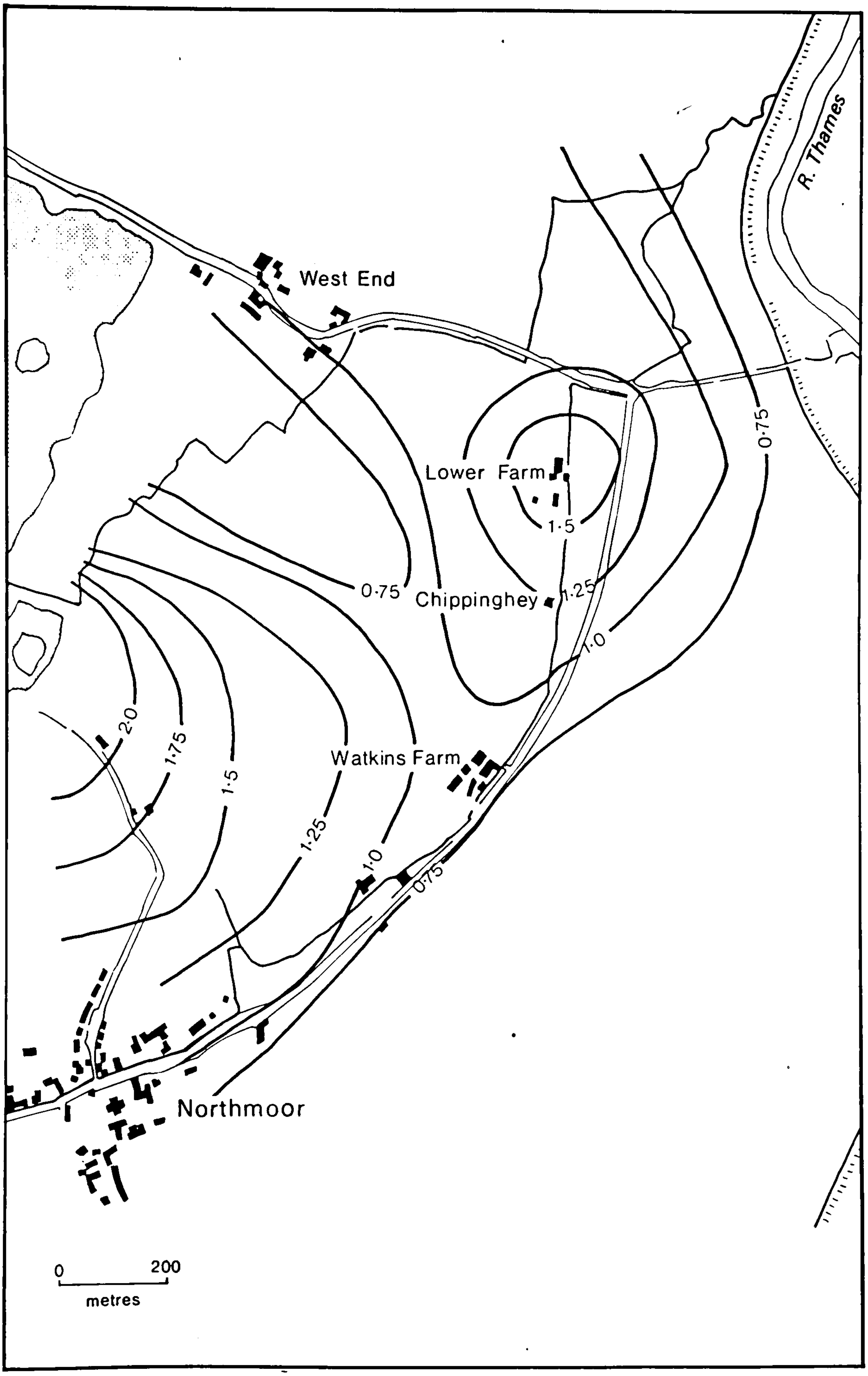


Fig. 10.46 Depth below surface of water table, Oct. 1977 (in metres), in the Watkins Farm area.

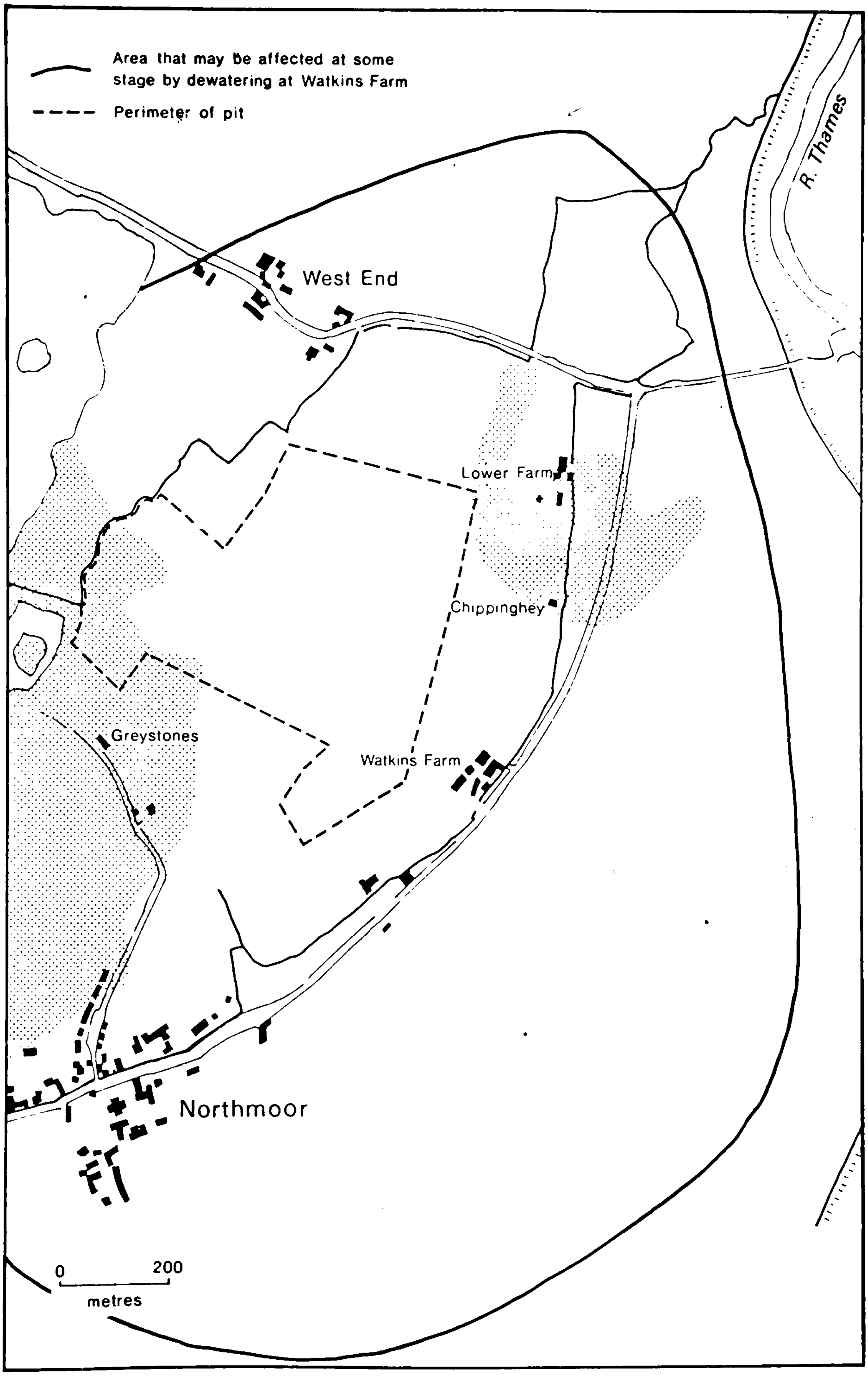


Fig. 10.47 The area around Watkins Farm (shown shaded) that cannot benefit from the existing water-table level (based on max. water levels).

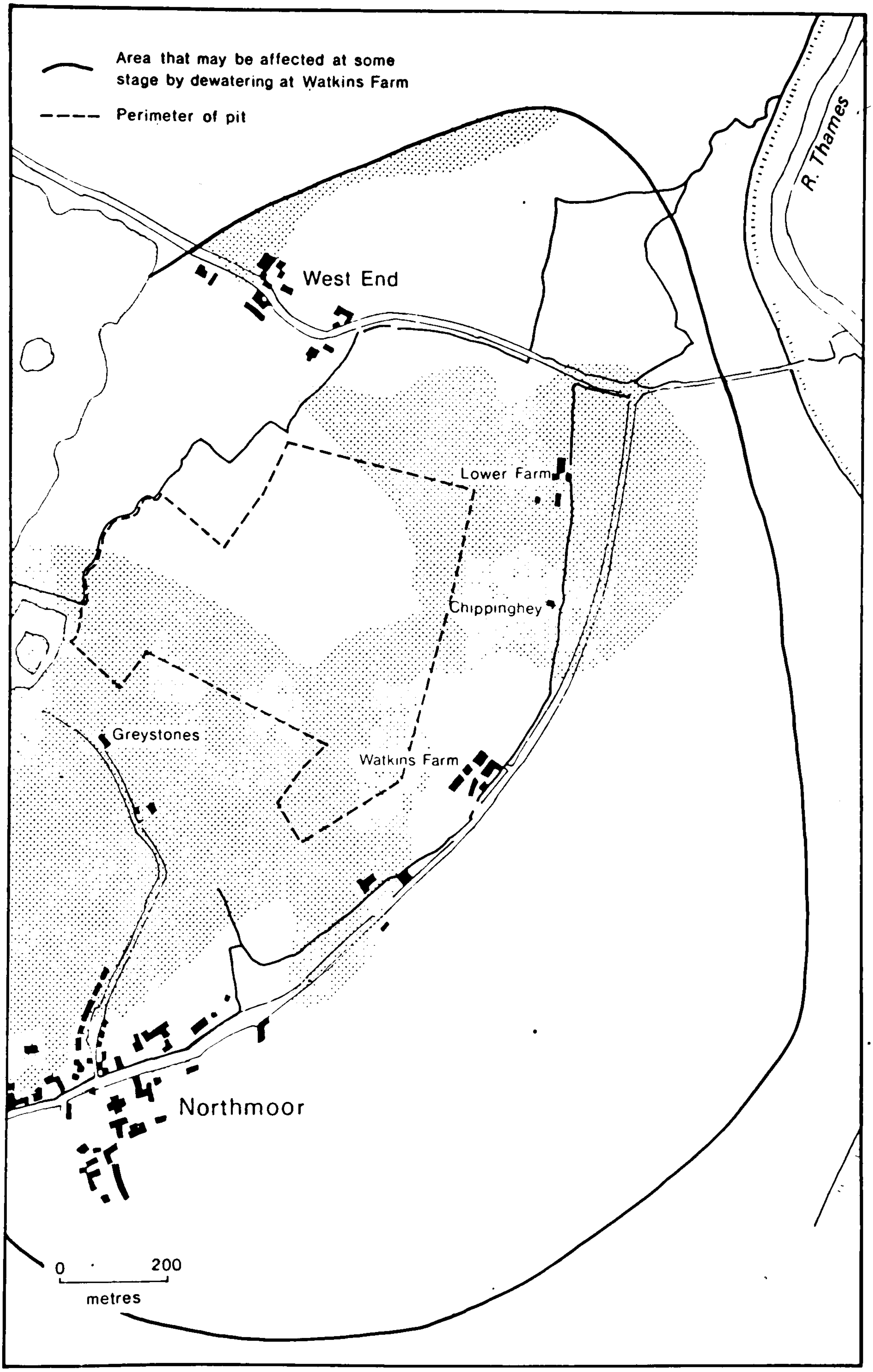


Fig. 10.48 The area around Watkins Farm (shown shaded) that cannot benefit from the existing water-table level (based on min. water levels).

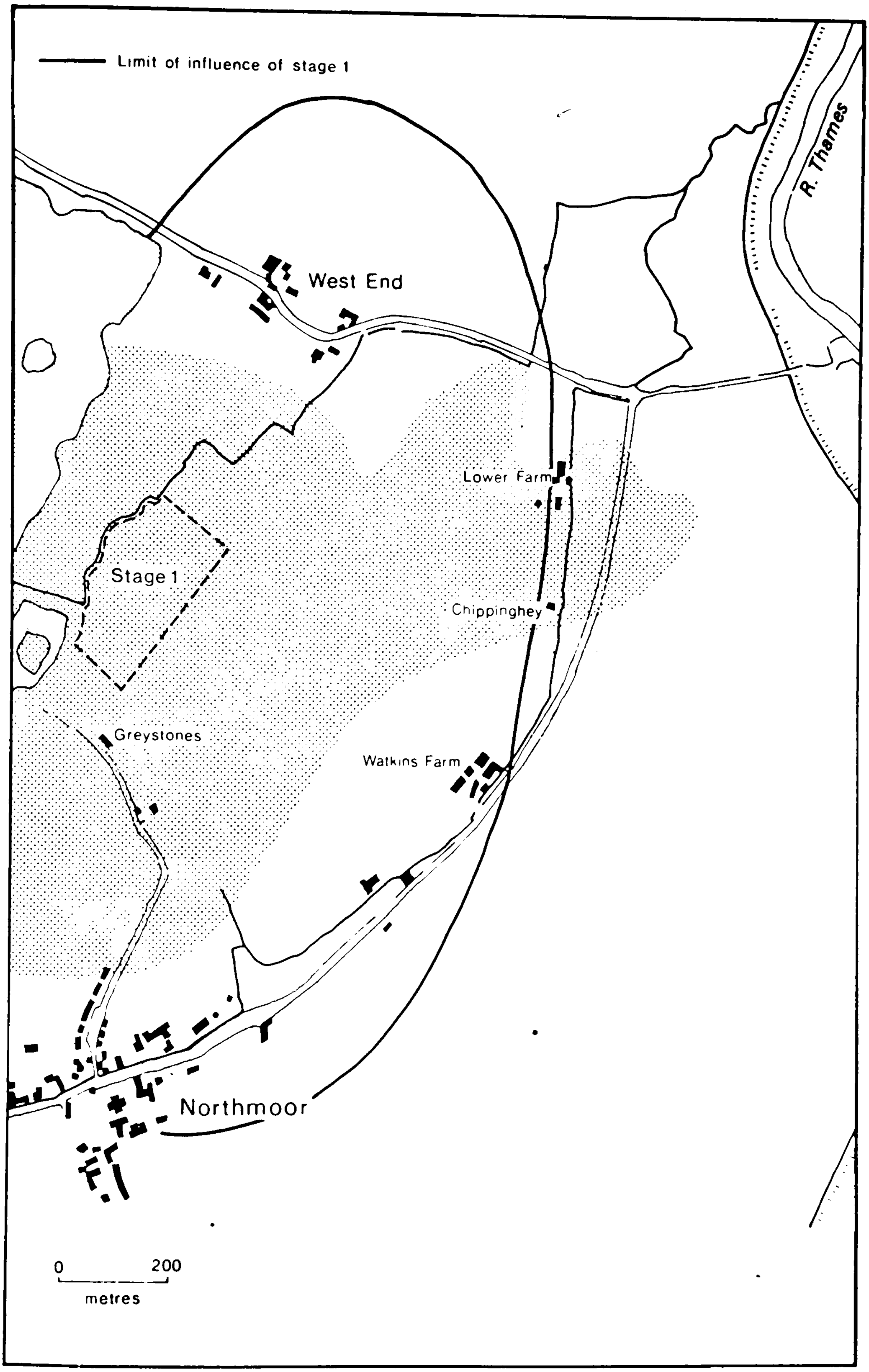


Fig. 10.49 Area around Watkins Farm that will not benefit from the water-table during dewatering of stage 1 (based on max. water-table conditions).

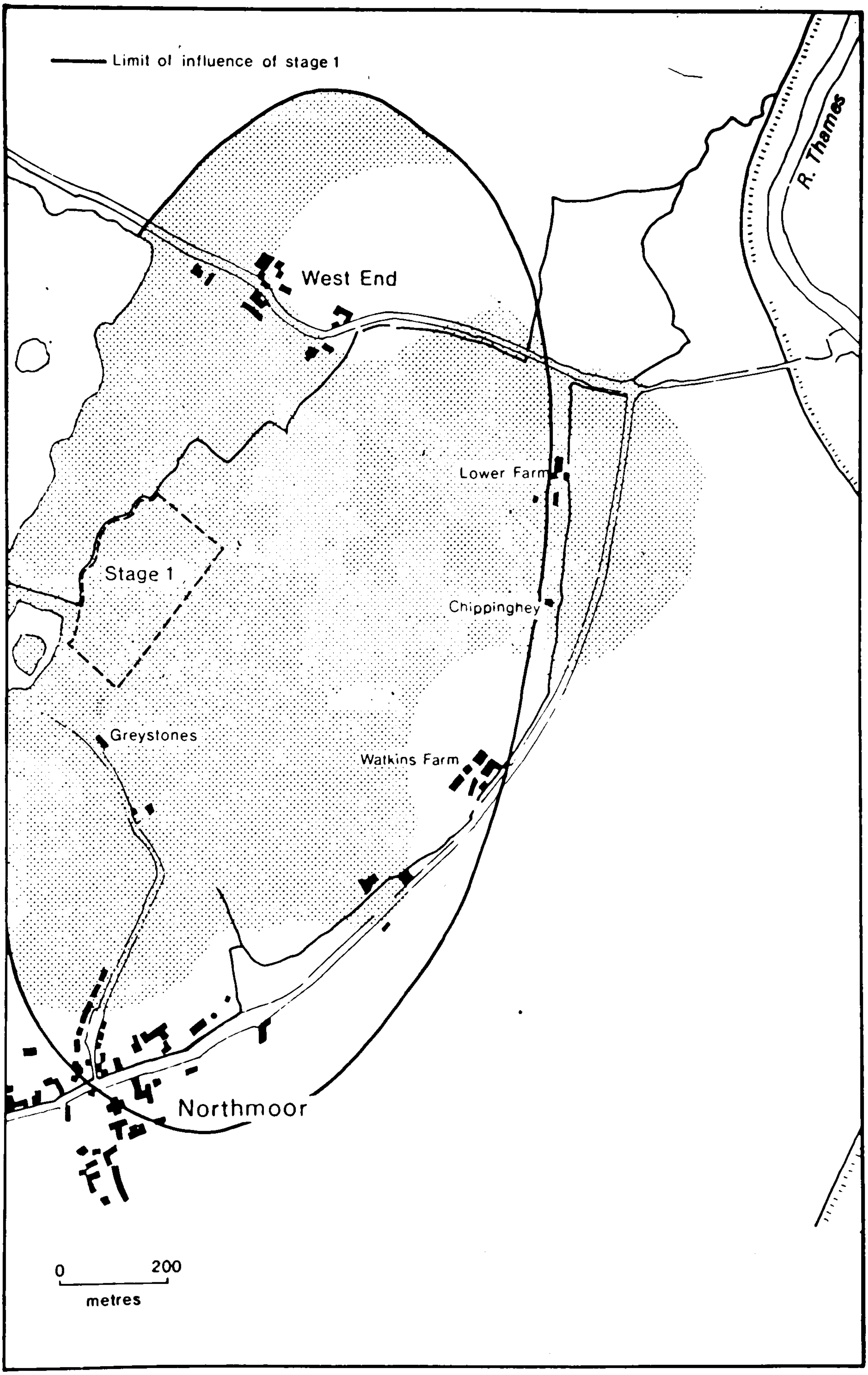


Fig 10.50 Area around Watkins Farm that will not benefit from the water-table during dewatering of stage 1 (based on min. water-table conditions).

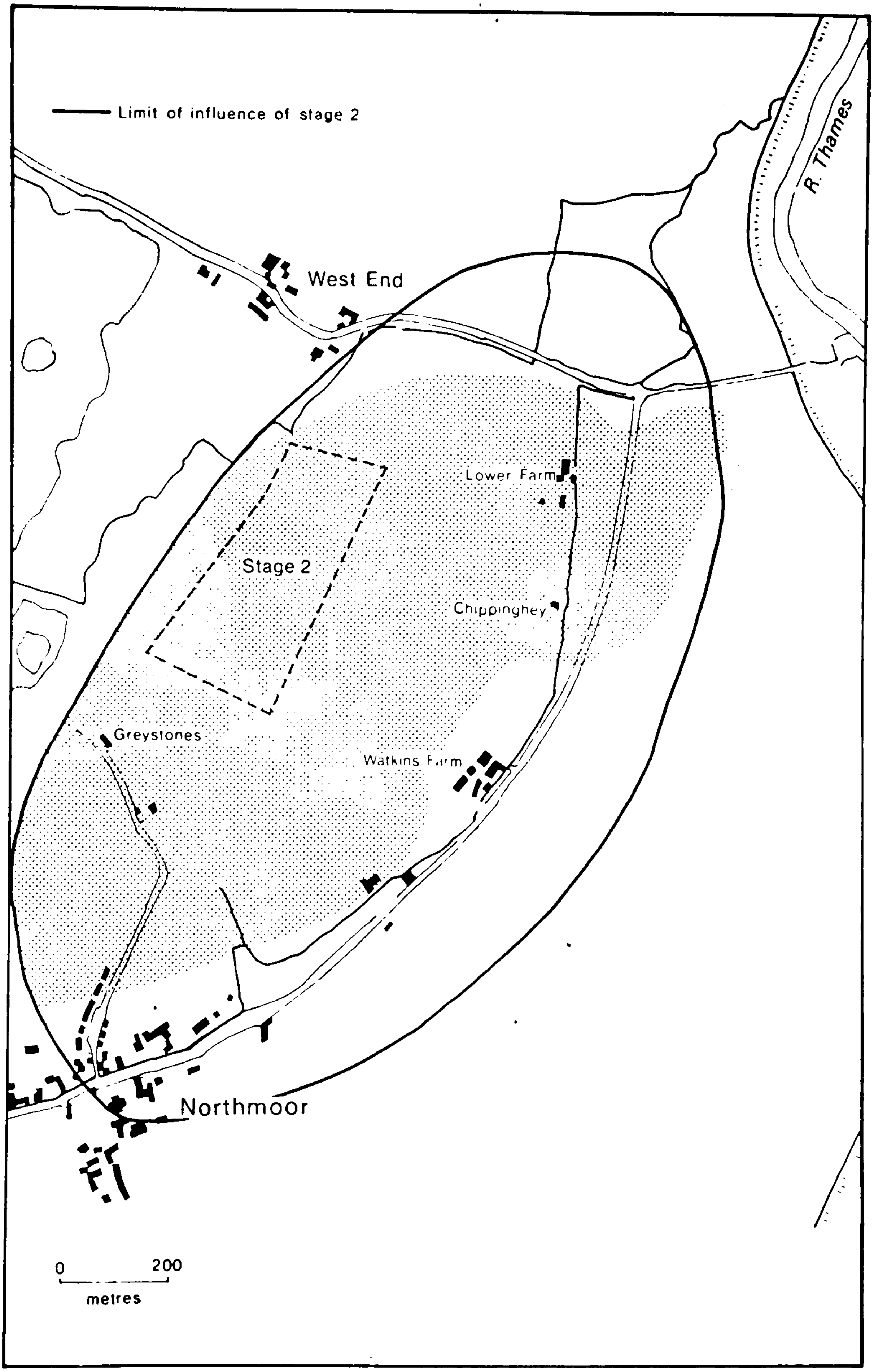


Fig. 10.51 Area around Watkins Farm that will not benefit from the water-table during dewatering of stage 2 (based on max. water-table conditions).

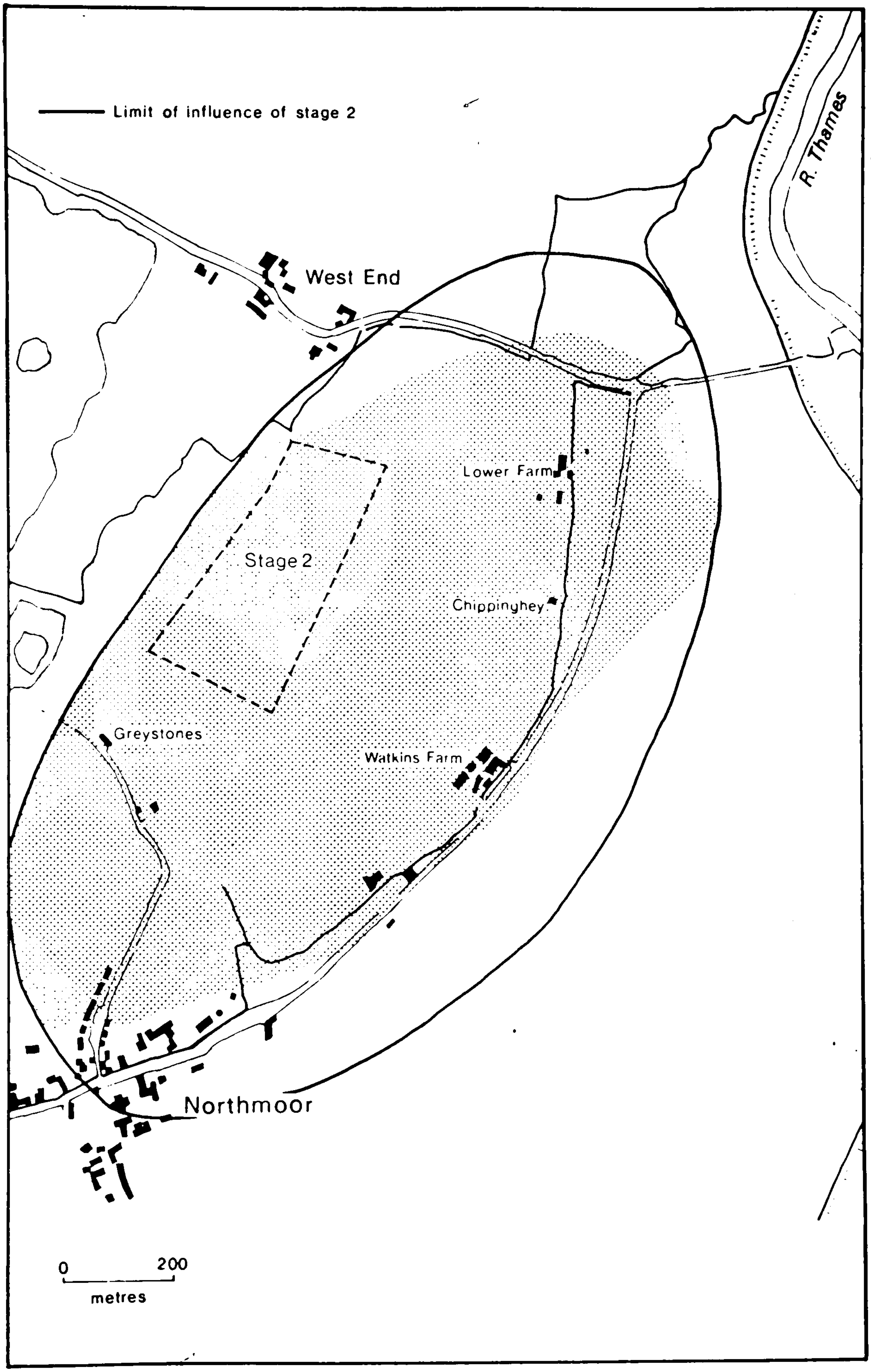


Fig. 10.52 Area around Watkins Farm that will not benefit from the water-table during dewatering of stage 2 (based on min. water-table conditions).

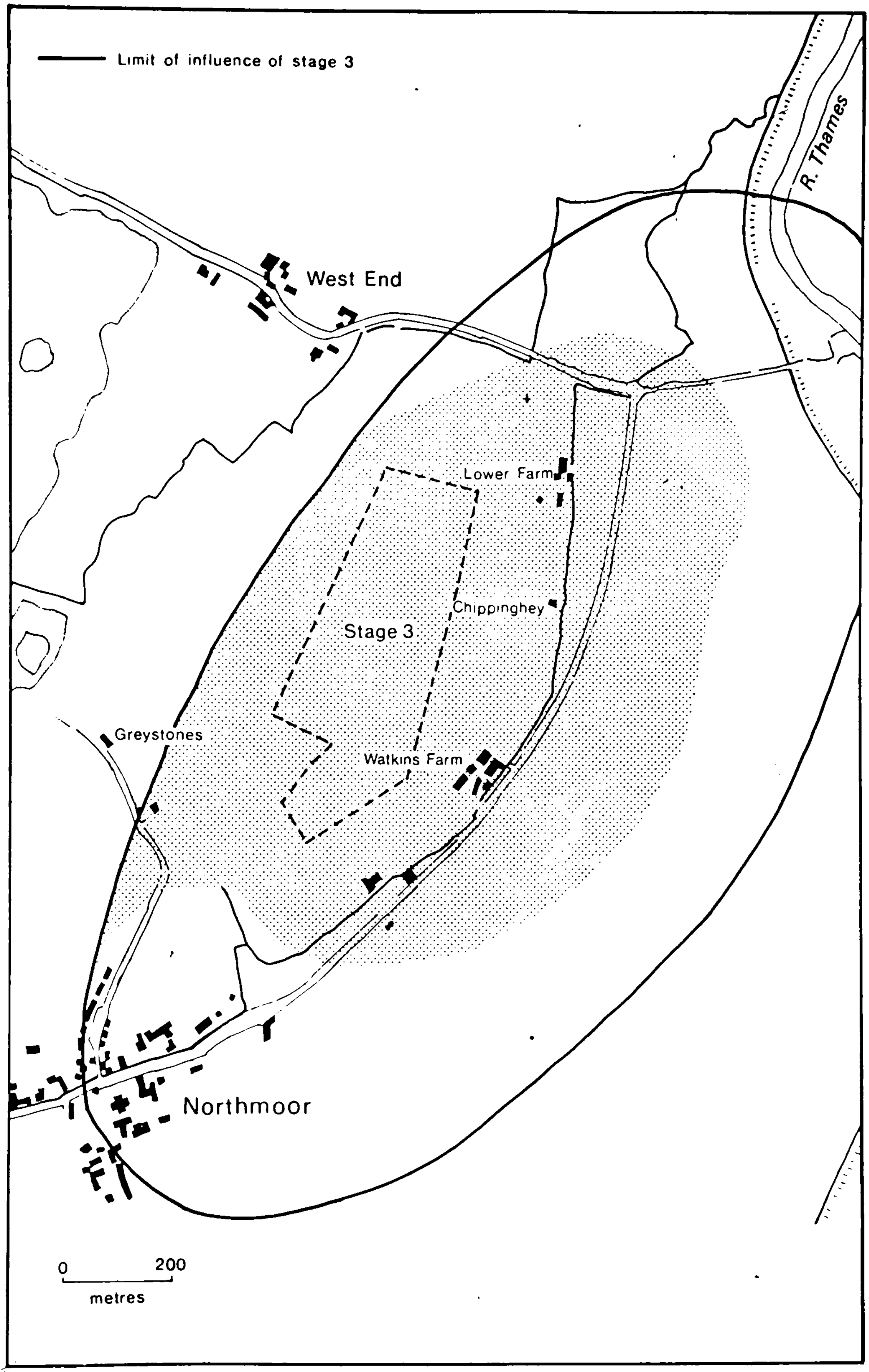


Fig. 10.53 Area around Watkins Farm that will not benefit from the water-table during dewatering of stage 3 (based on max. water-table conditions).

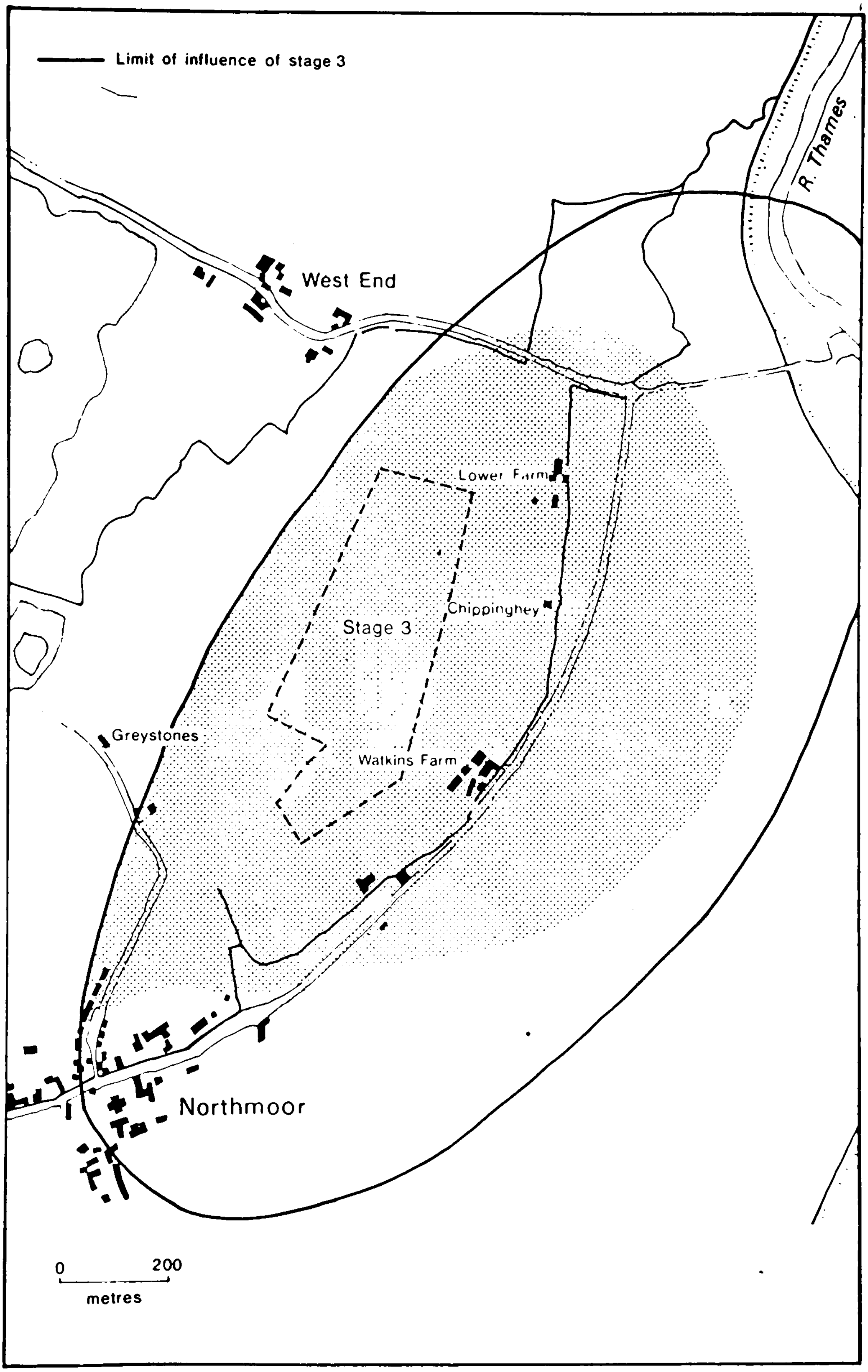


Fig. 10.54 Area around Watkins Farm that will not benefit from the water-table during dewatering of stage 3 (based on min. water-table conditions).

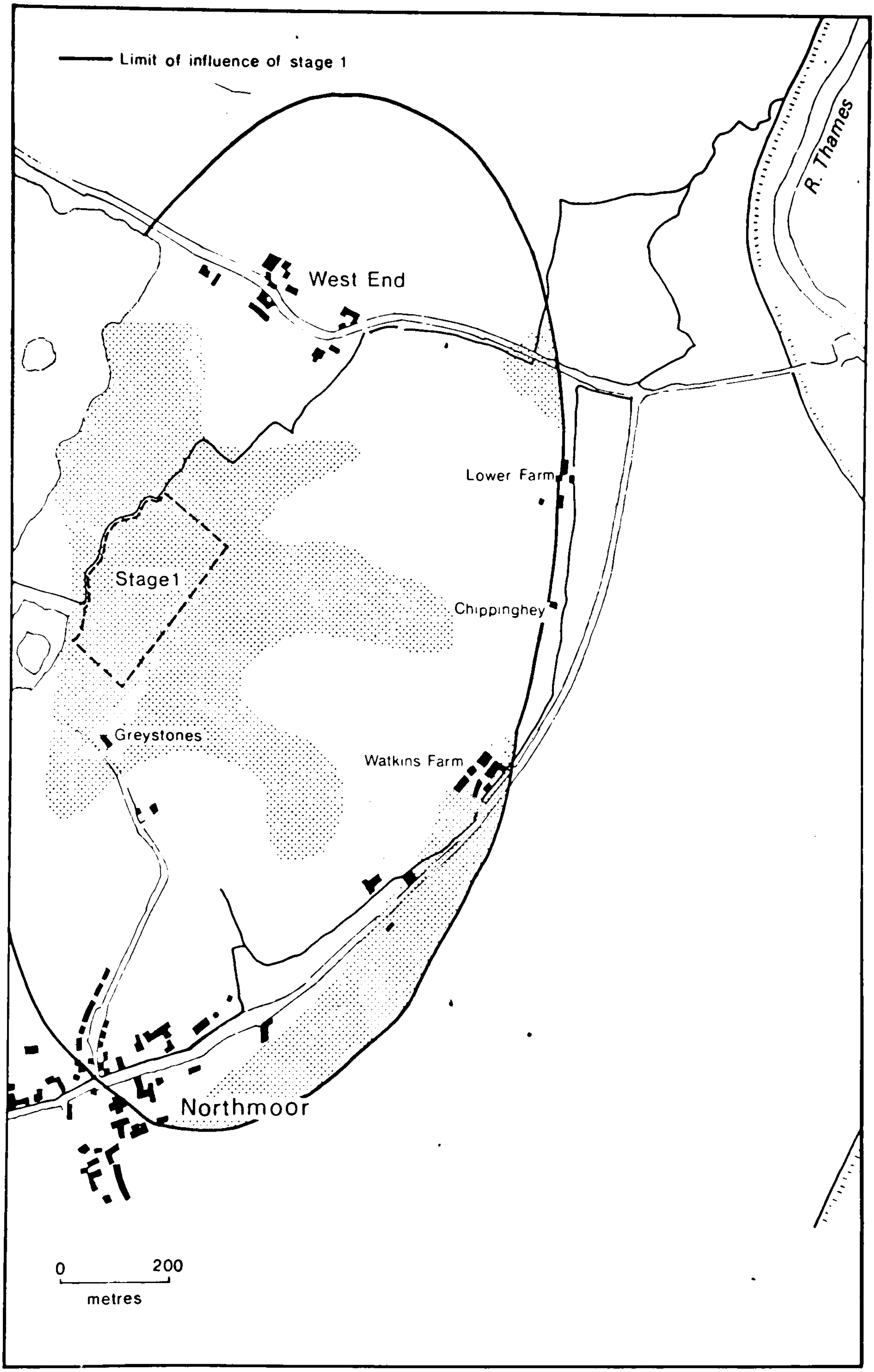


Fig 10.55 Areas around Watkins Farm that may benefit from the dewatering of stage 1.

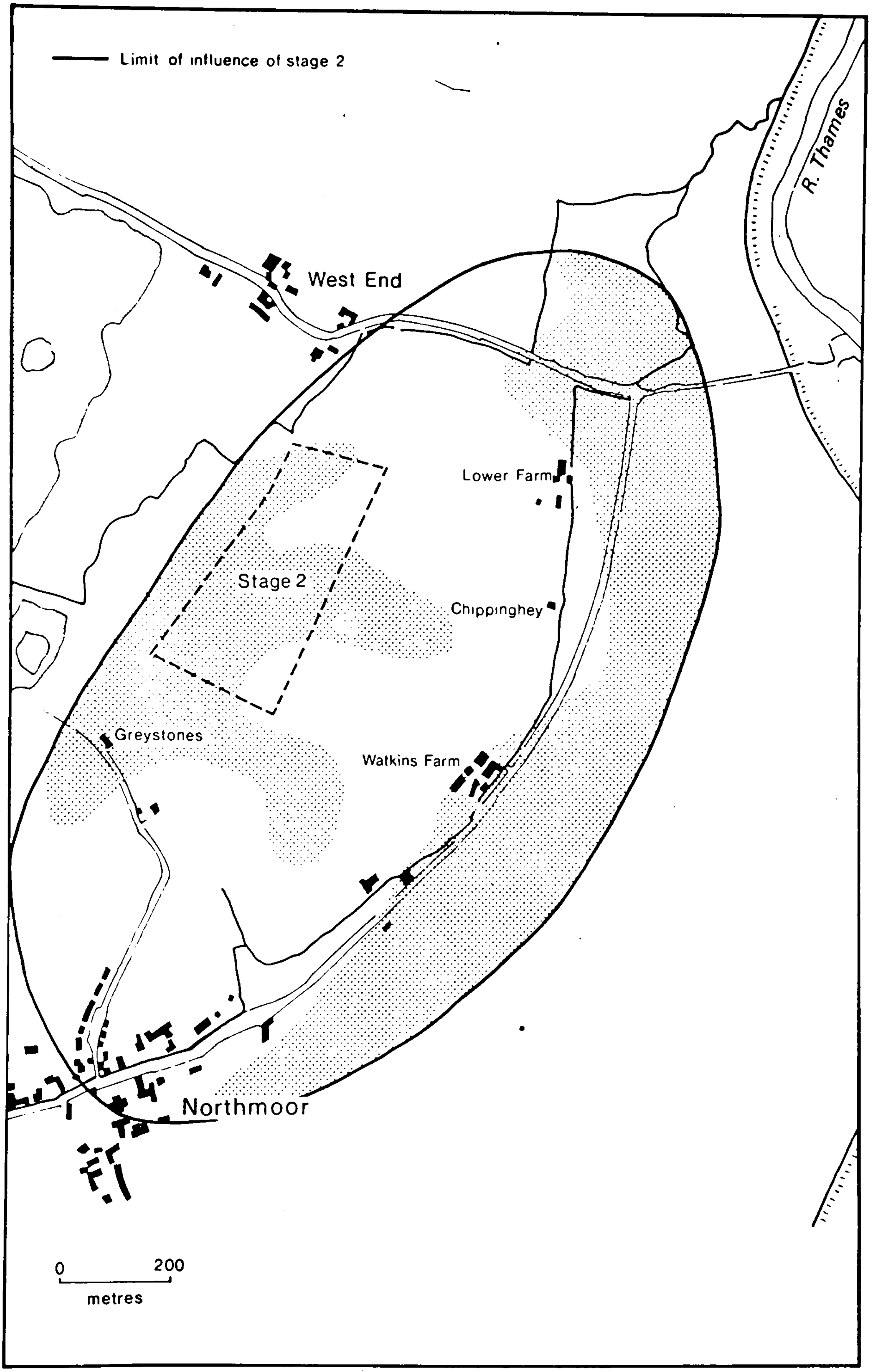


Fig. 10.56 Area around Watkins Farm that may benefit from the dewatering of stage 2.

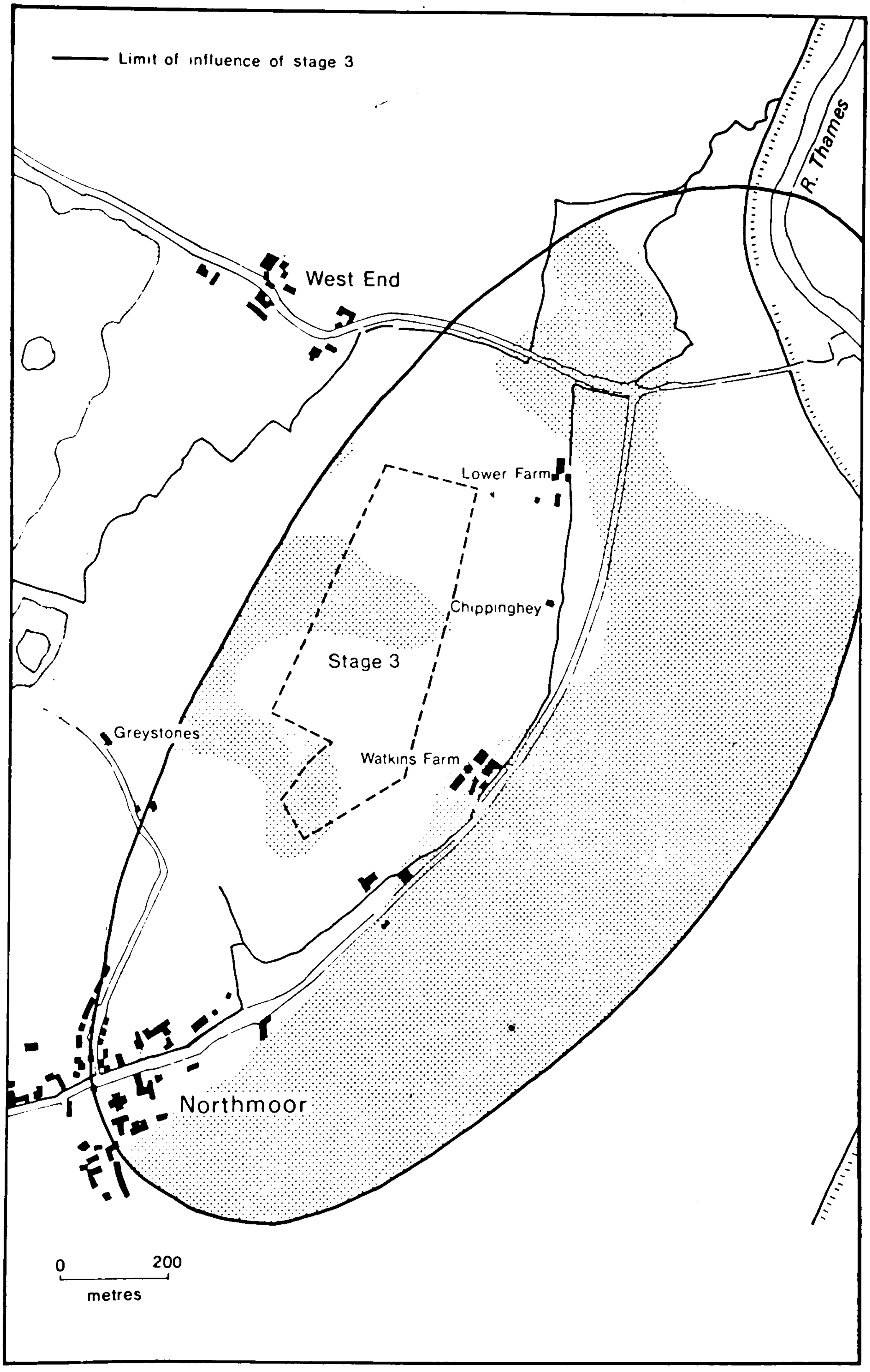


Fig. 10.57 Area around Watkins Farm that may benefit from the dewatering of stage 3.

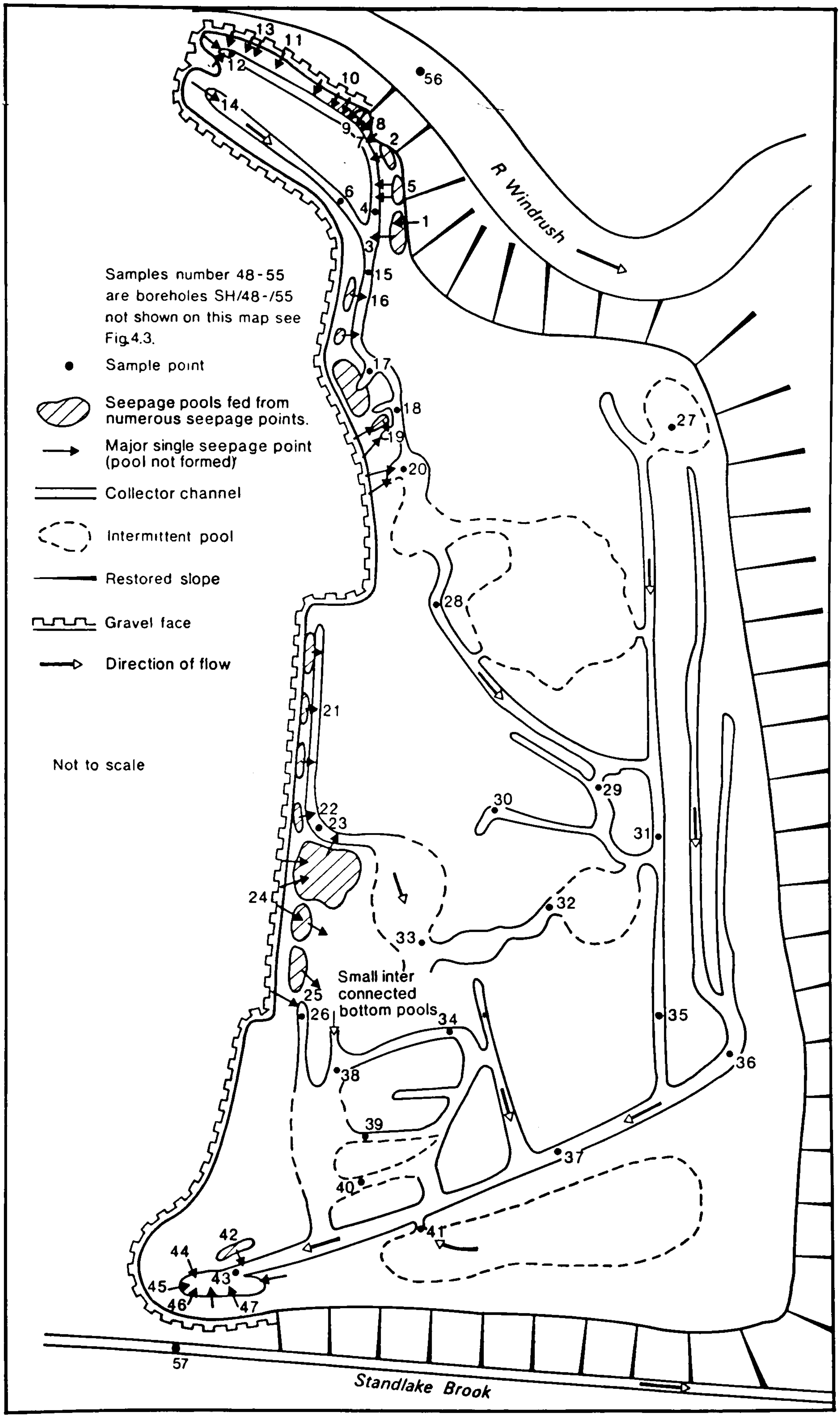


Fig 11 1 Plan of Wadham-Brasenose Pit, Hardwick, showing the distribution of sample points on 29th Feb. 1980.

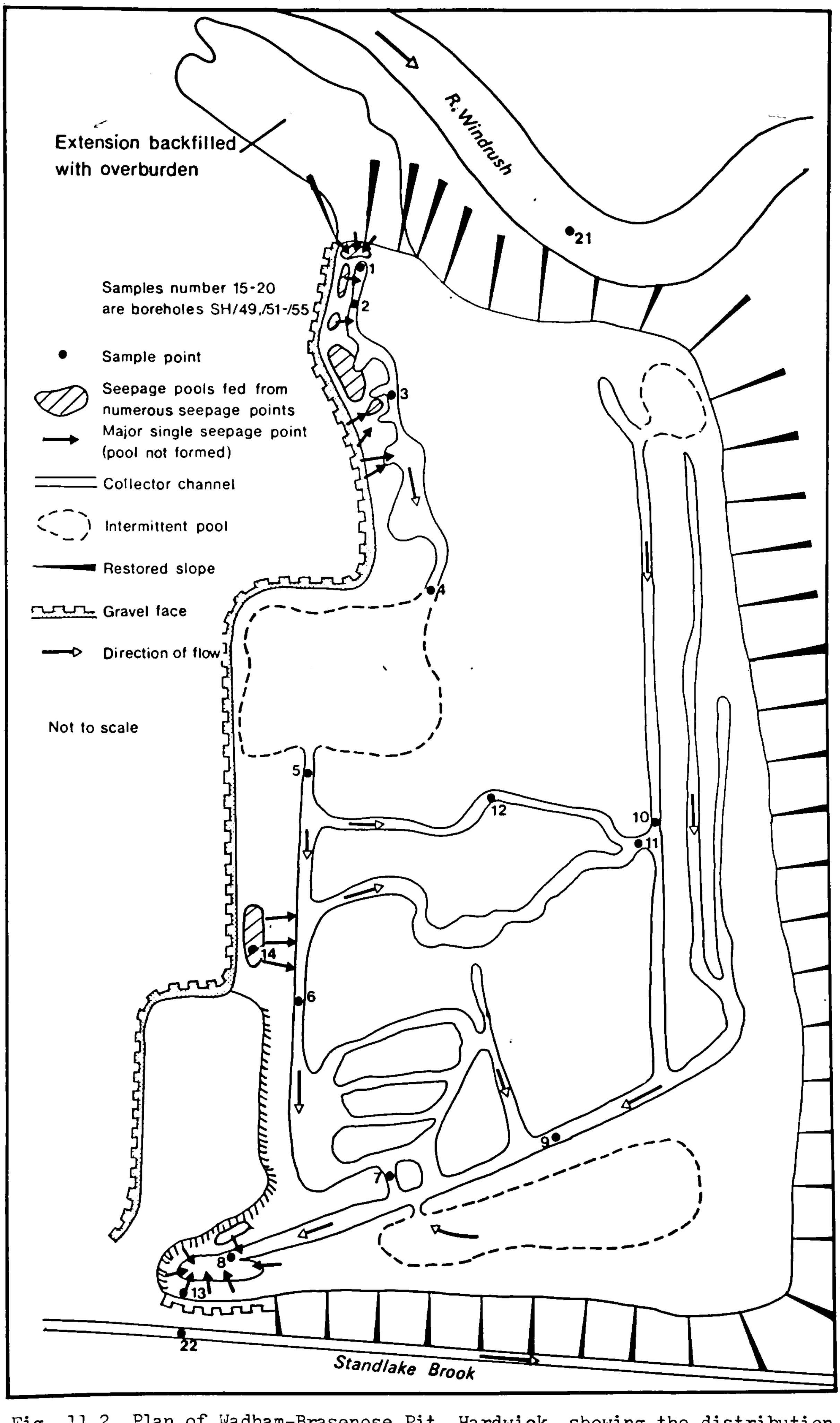


Fig. 11.2 Plan of Wadham-Brasenose Pit, Hardwick, showing the distribution of sample points on 9th May 1980.

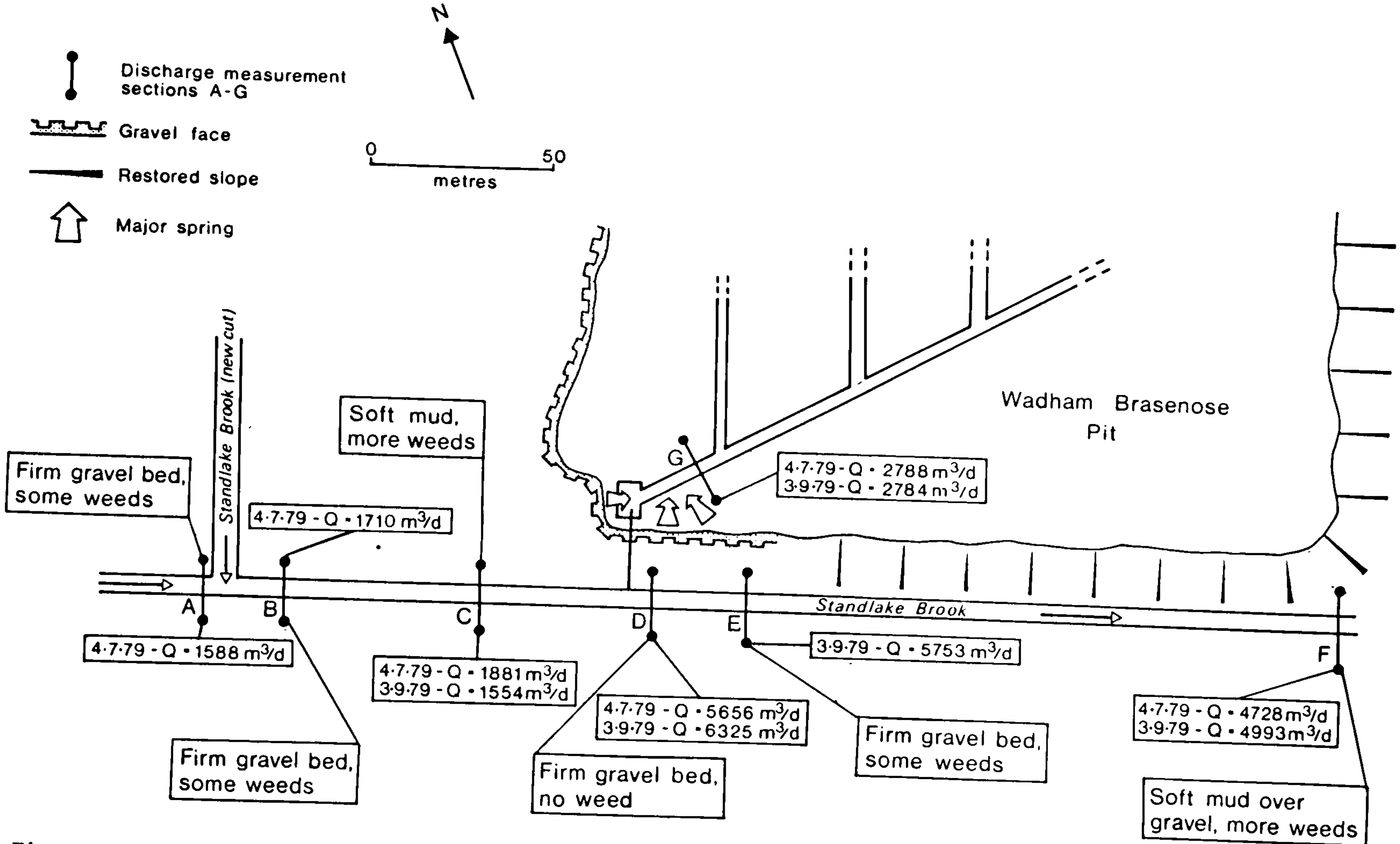


Fig. 11.3 Map showing results of inflow-outflow measurements on Standlake Brook, 4.7.79 and 3.9.79.

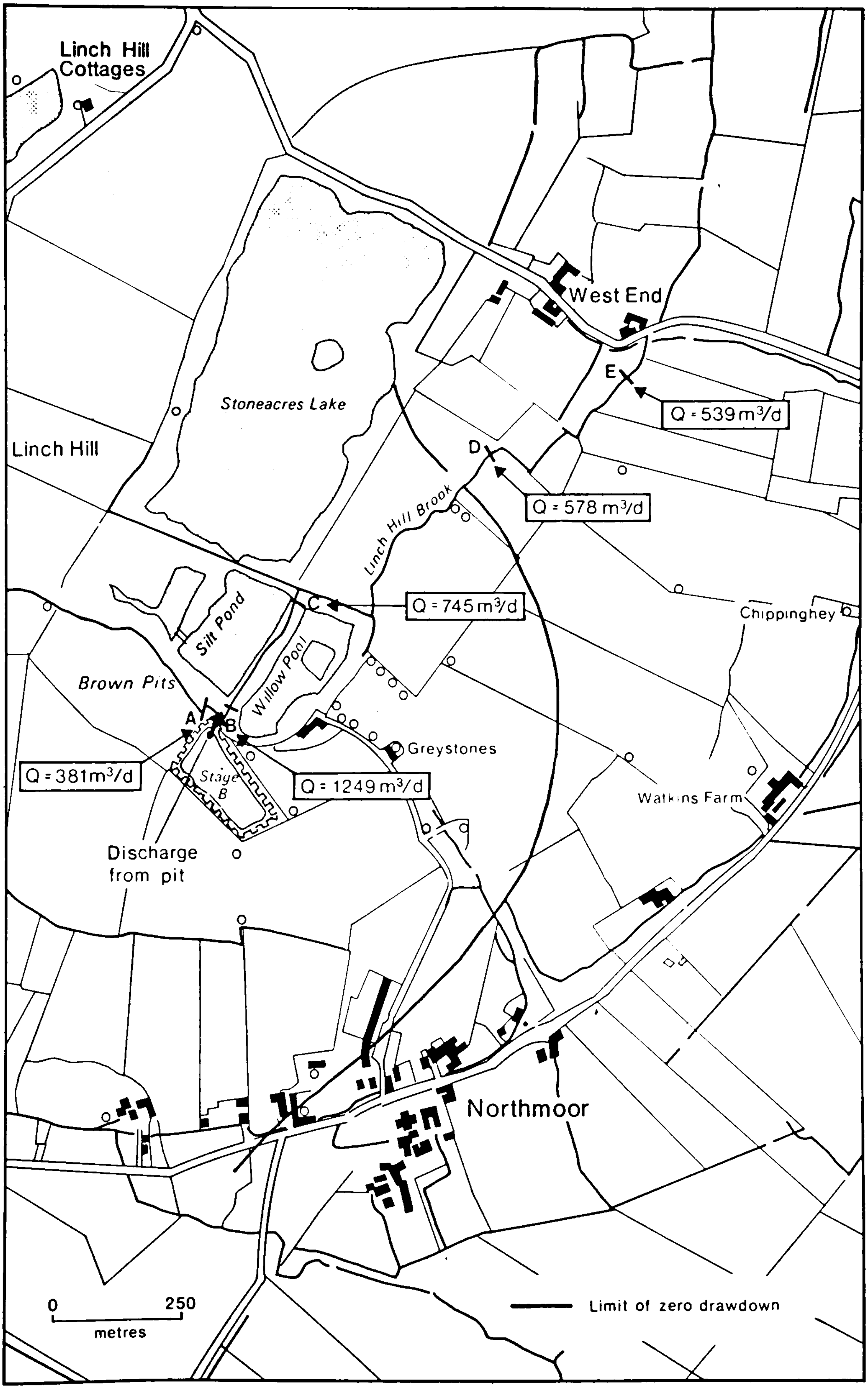


Fig. 11.4 Map showing results of inflow-outflow measurements on Linch Hill Brook, 18.3.78. (see Table 11.4)

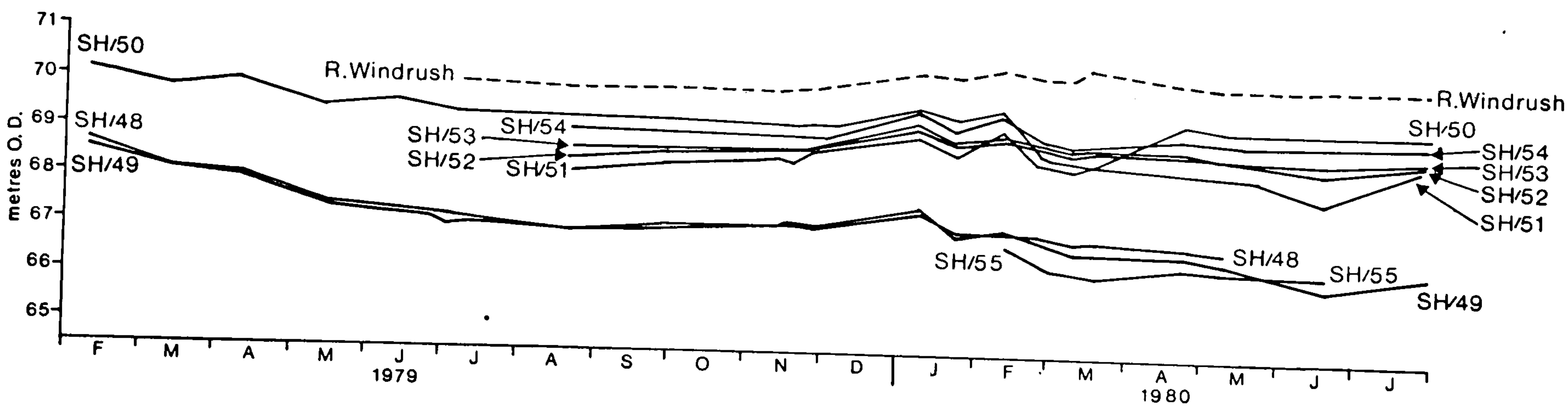


Fig. 11.5 Hydrographs of the R. Windrush and boreholes in the area of Wadham-Brasenose Pit, Hardwick.

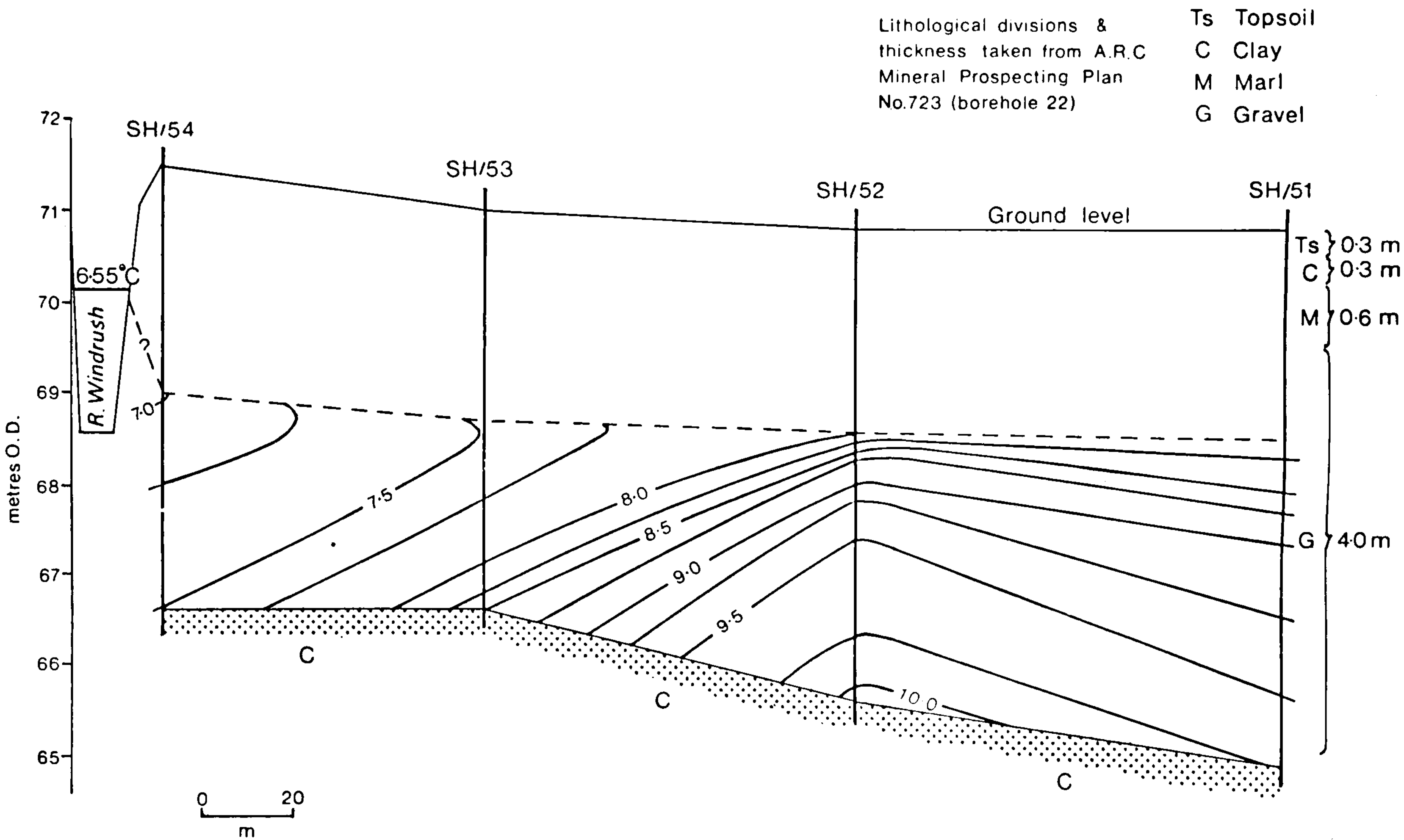


Fig. 11.6 Transect through boreholes SH/51 to SH/54 showing temperature (in °C) distribution on 26.2.80.

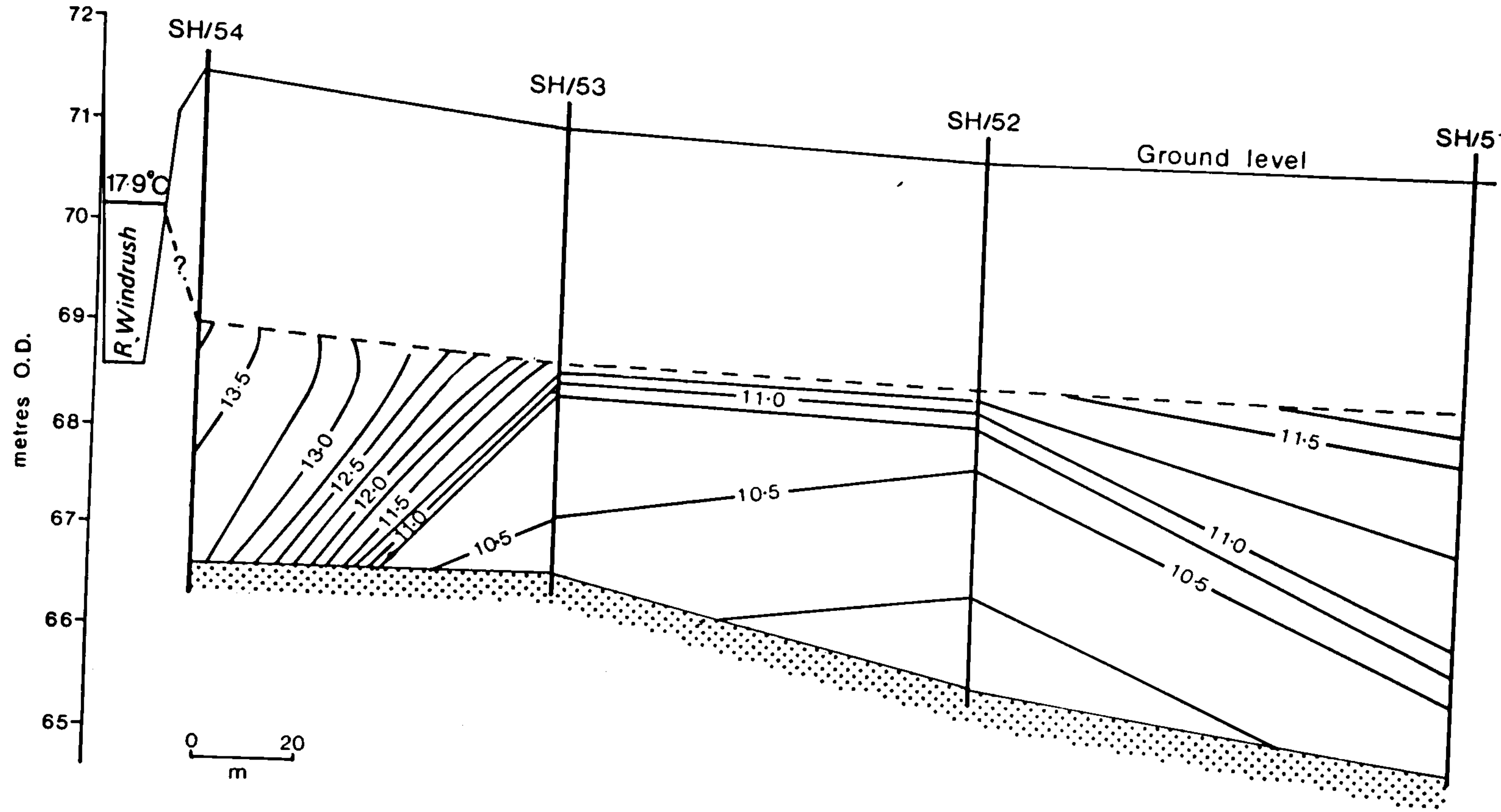


Fig. 11 7 Transect through boreholes SH/51 to SH/54 showing temperature (in °C) distribution on 30.7.80.

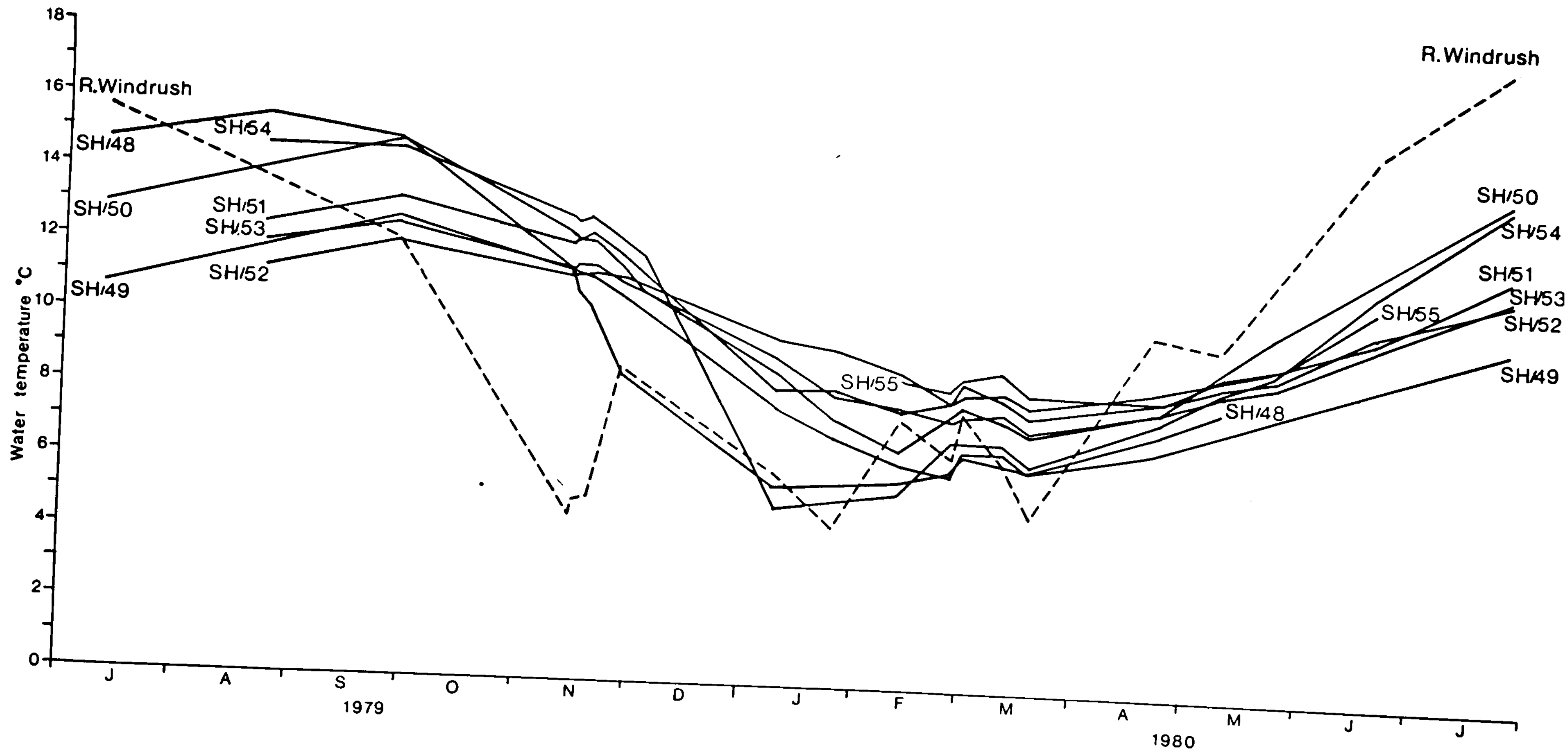


Fig. 11.8 Temperature of groundwater and river water in the Wadham-Brasenose Pit area, July 1979 to July 1980.

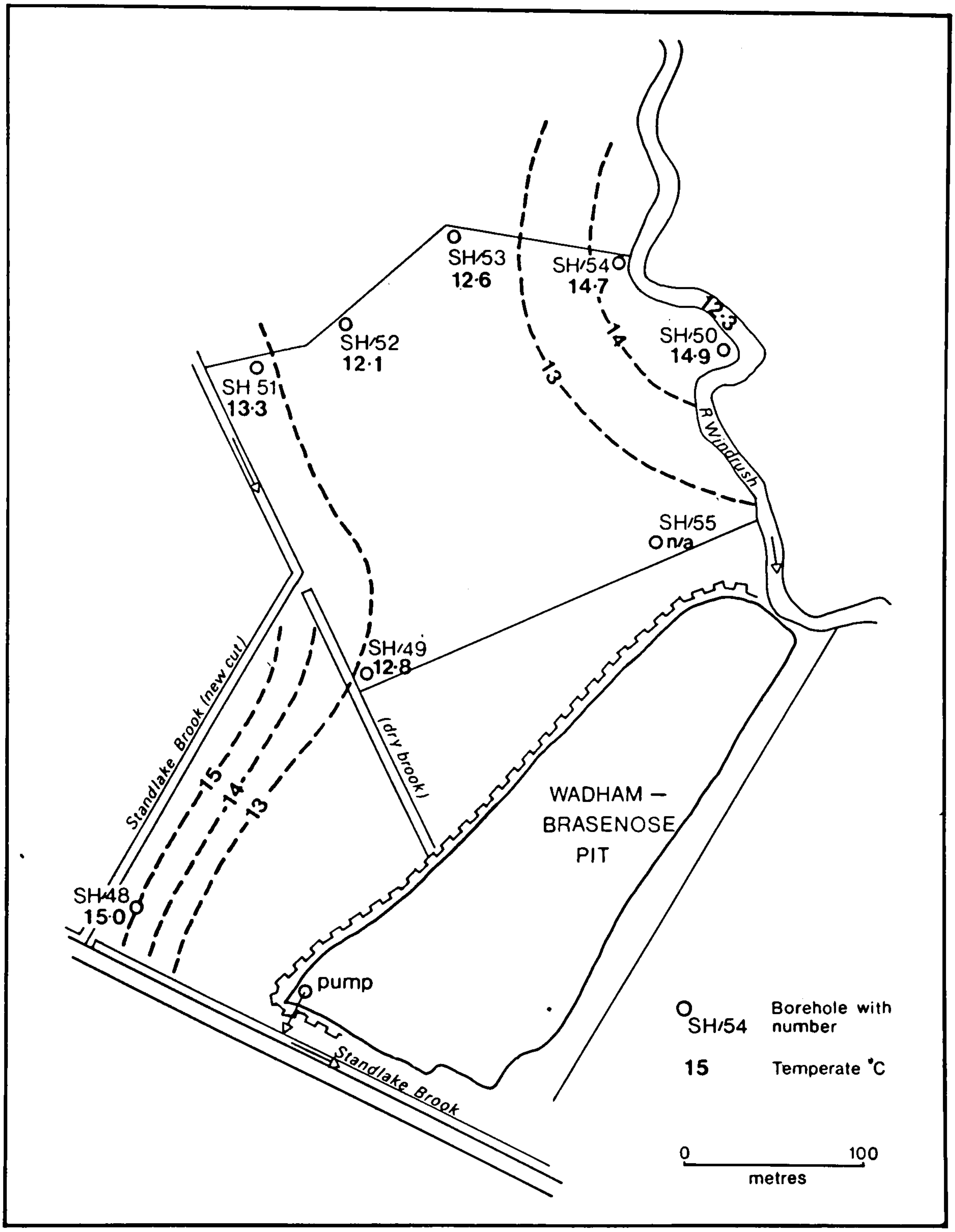


Fig. 11.9 Isothermal map of Wadham-Brasenose Pit area, 28.9.79.

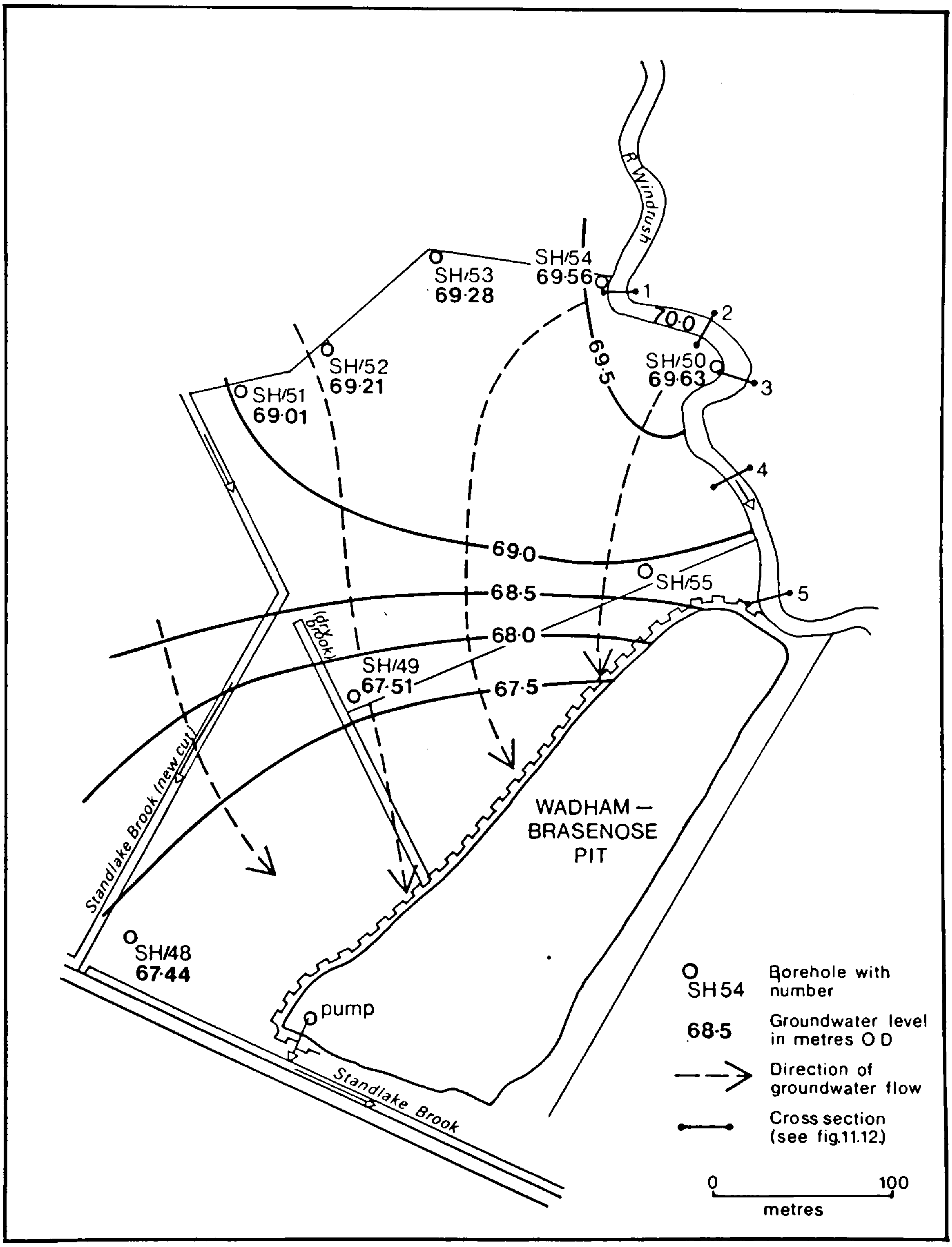


Fig. 11.10 Groundwater contour map of Wadham-Brasenose Pit area, 28.9.79.

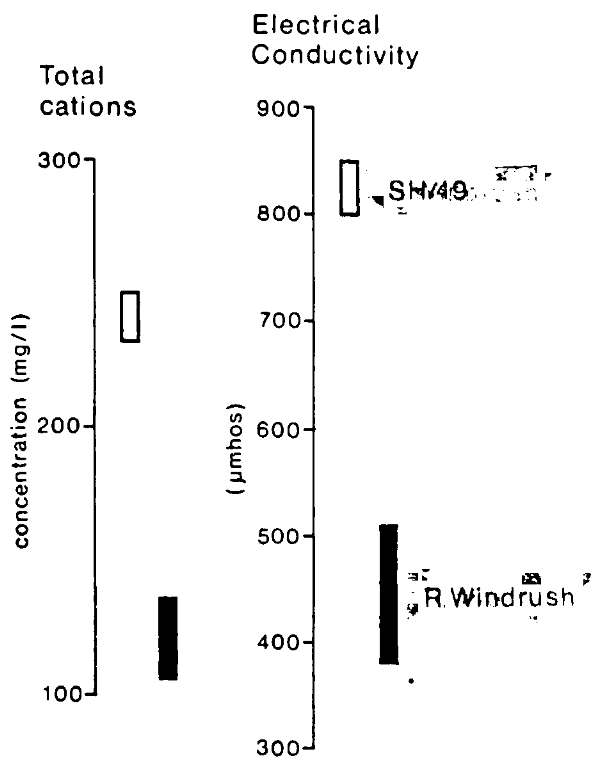


Fig. 11.11(a) Variation in range of total cations and electrical conductivity between the R. Windrush and groundwater at borehole SH/49.

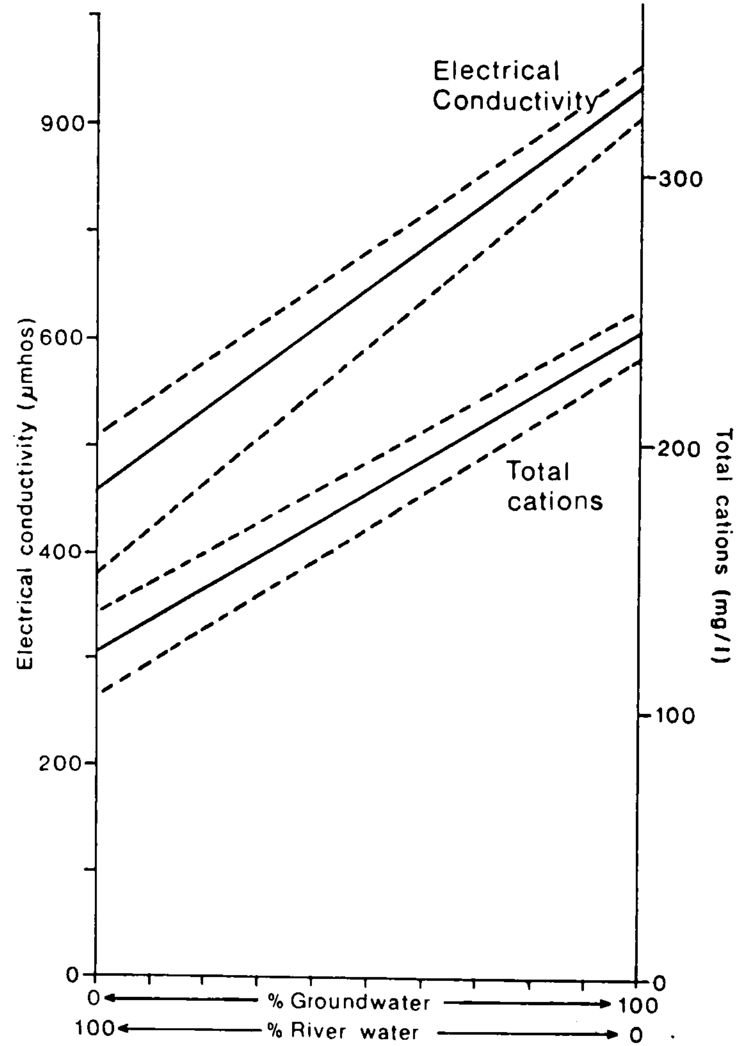


Fig. 11.11(b) Diagram for obtaining percentage of river-derived water, based on analytical results for total cations and electrical conductivity.

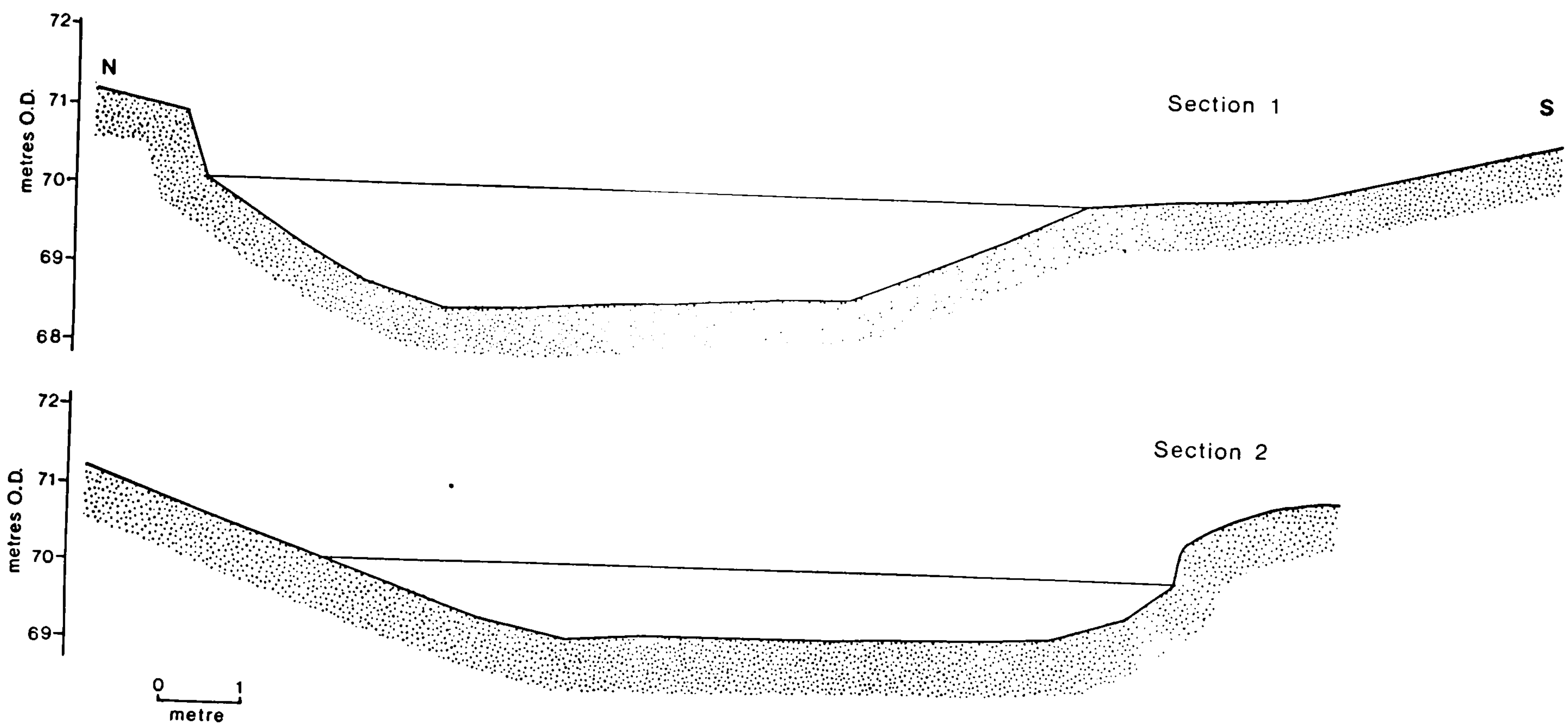


Fig. 11.12 Cross-sections through R. Windrush in the area of Wadham-Brasenose Pit (see fig. 11.10 for position of sections).

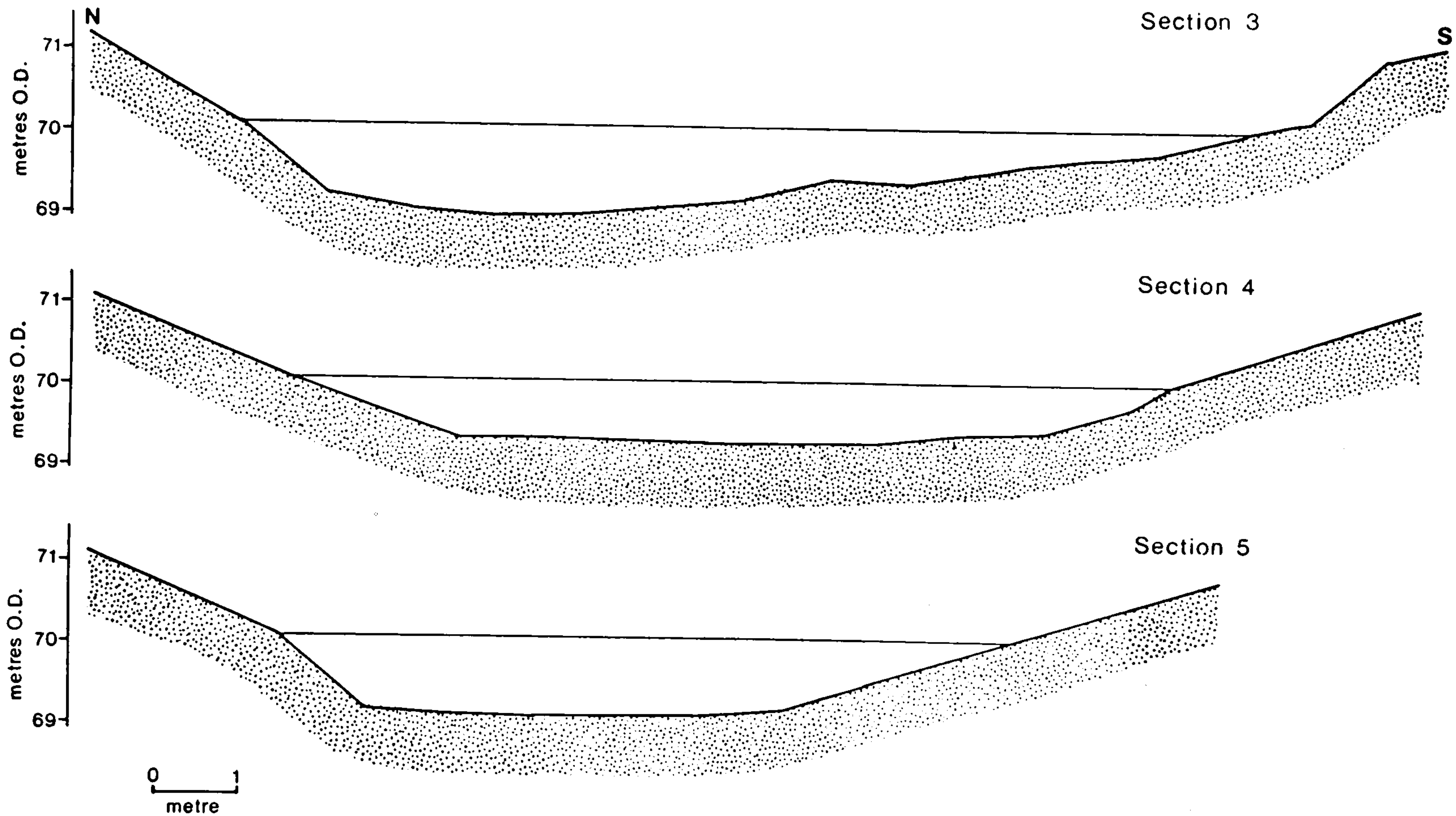


Fig. 11.12 (cont'd)

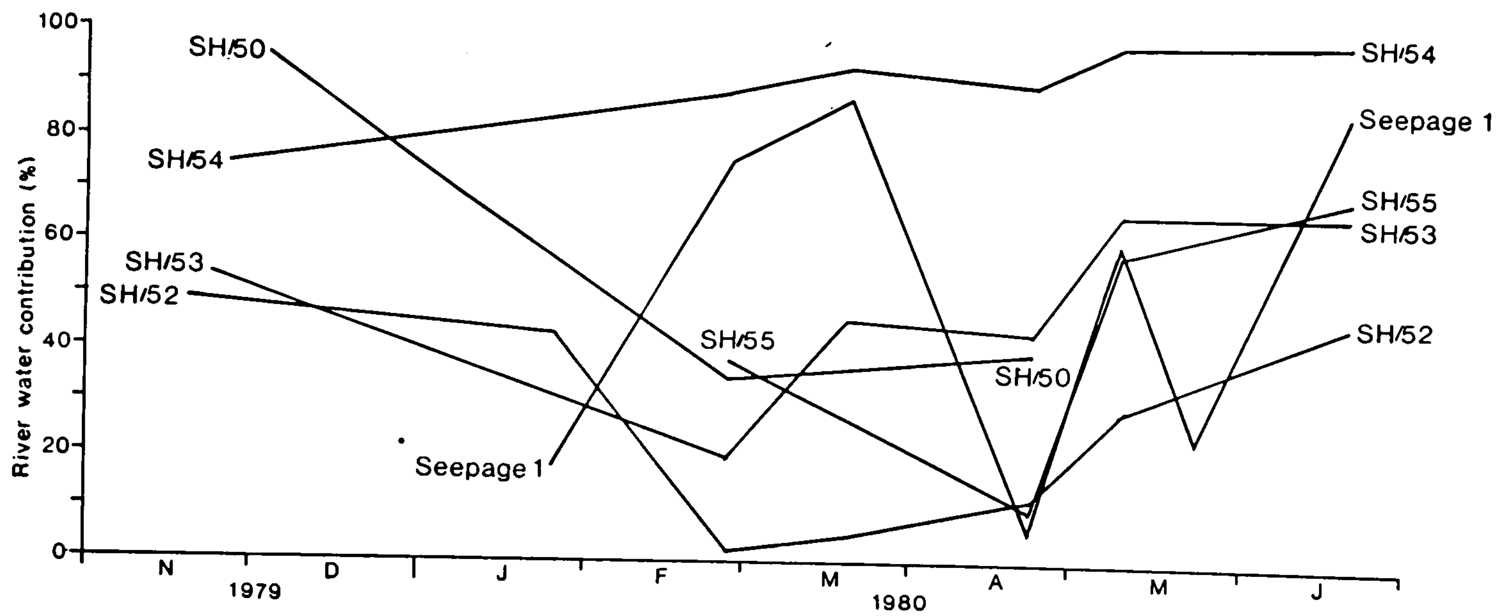


Fig. 11.13 Variation in the proportion of river water contribution in groundwater in the area around Wadham-Brasenose Pit, Nov. 1979 to June 1980.

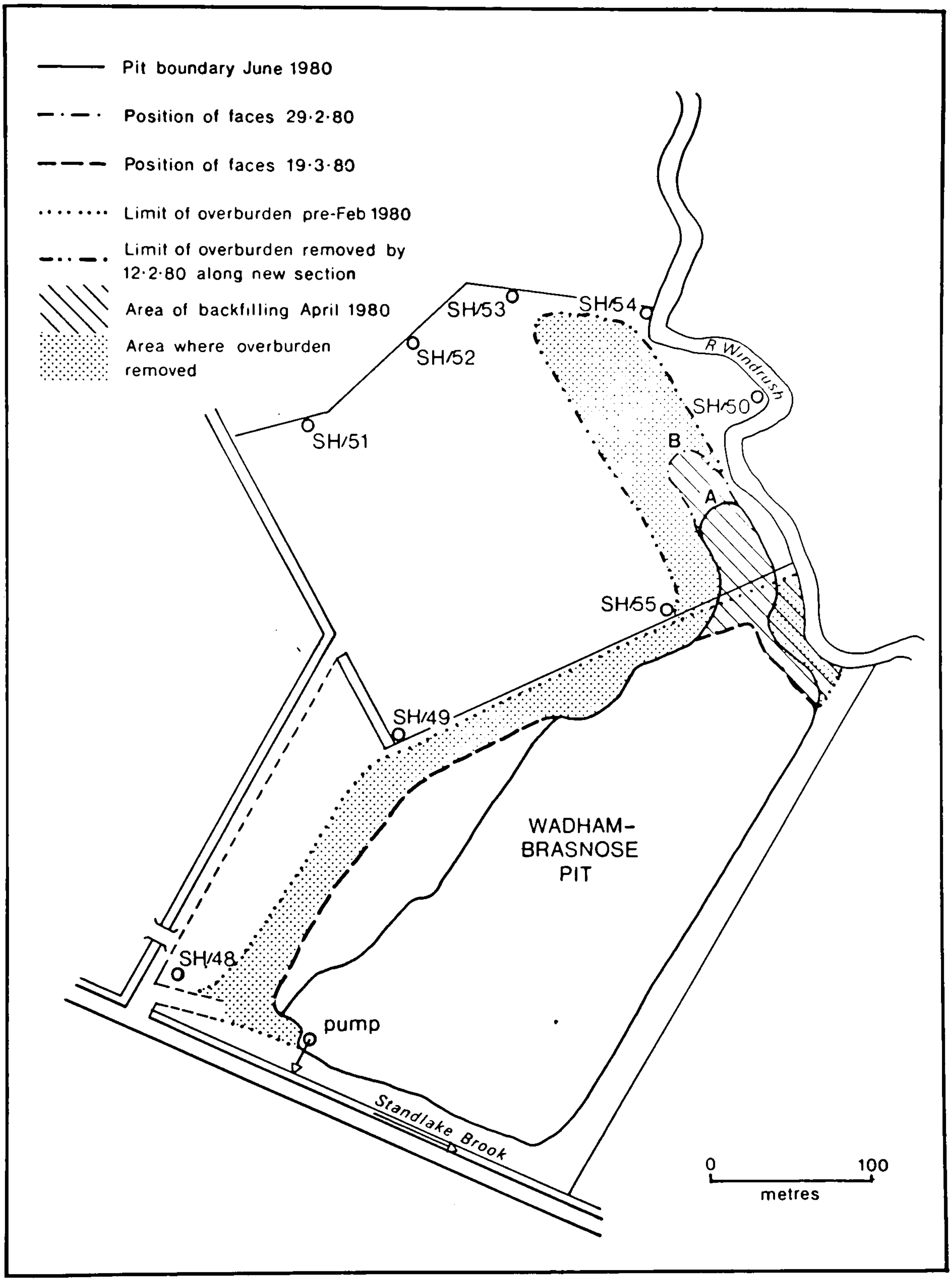


Fig. 11.14 Plan of Wadham-Brasenose Pit, Hardwick, June 1980, also showing the limits of the temporary extension, Feb-Mar 1980.

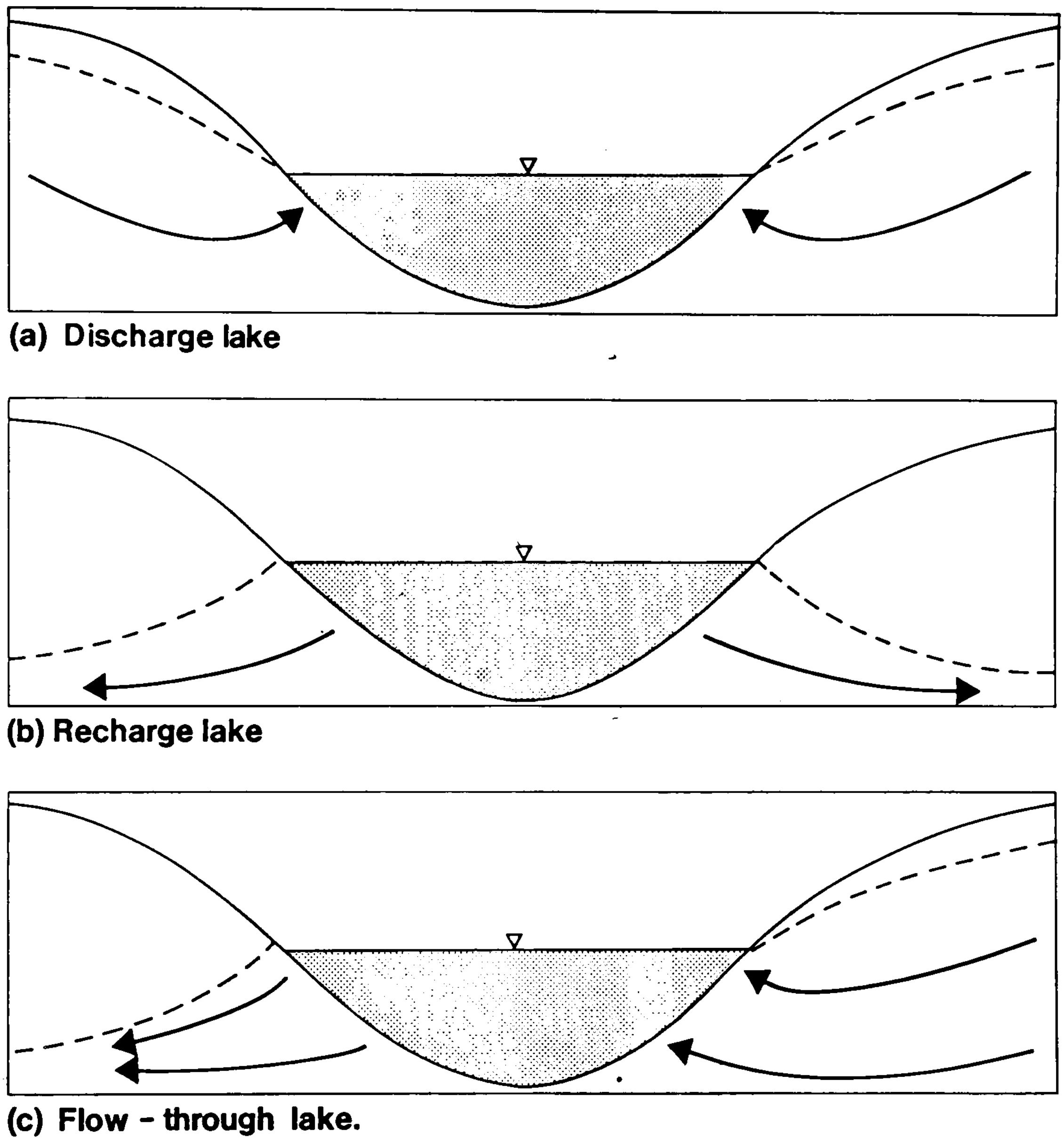


Fig. 12.1 Configuration of possible groundwater flow systems around gravel lakes. (after Born et al., 1974).

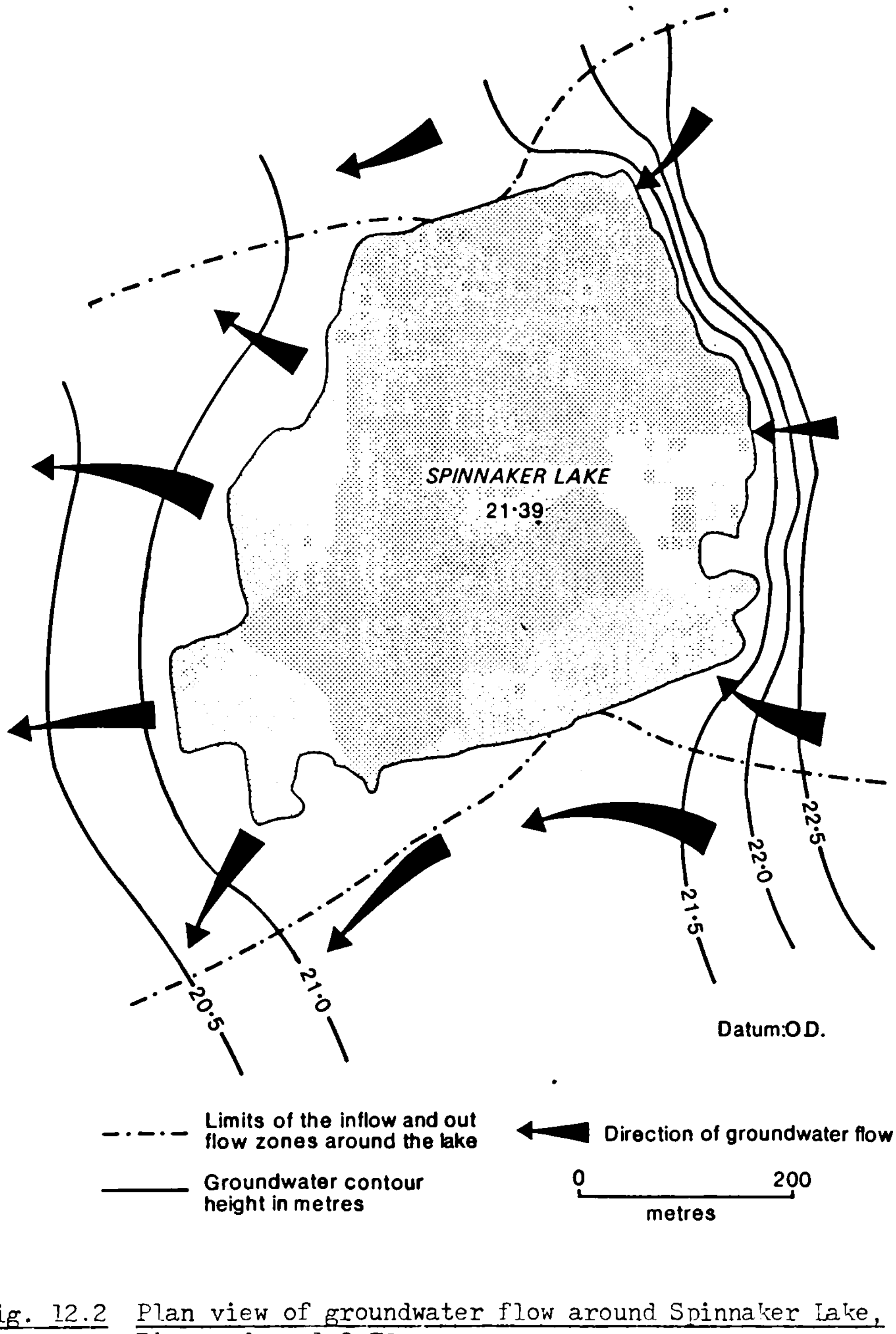


Fig. 12.2 Plan view of groundwater flow around Spinnaker Lake, Ringwood on 1.2.79.

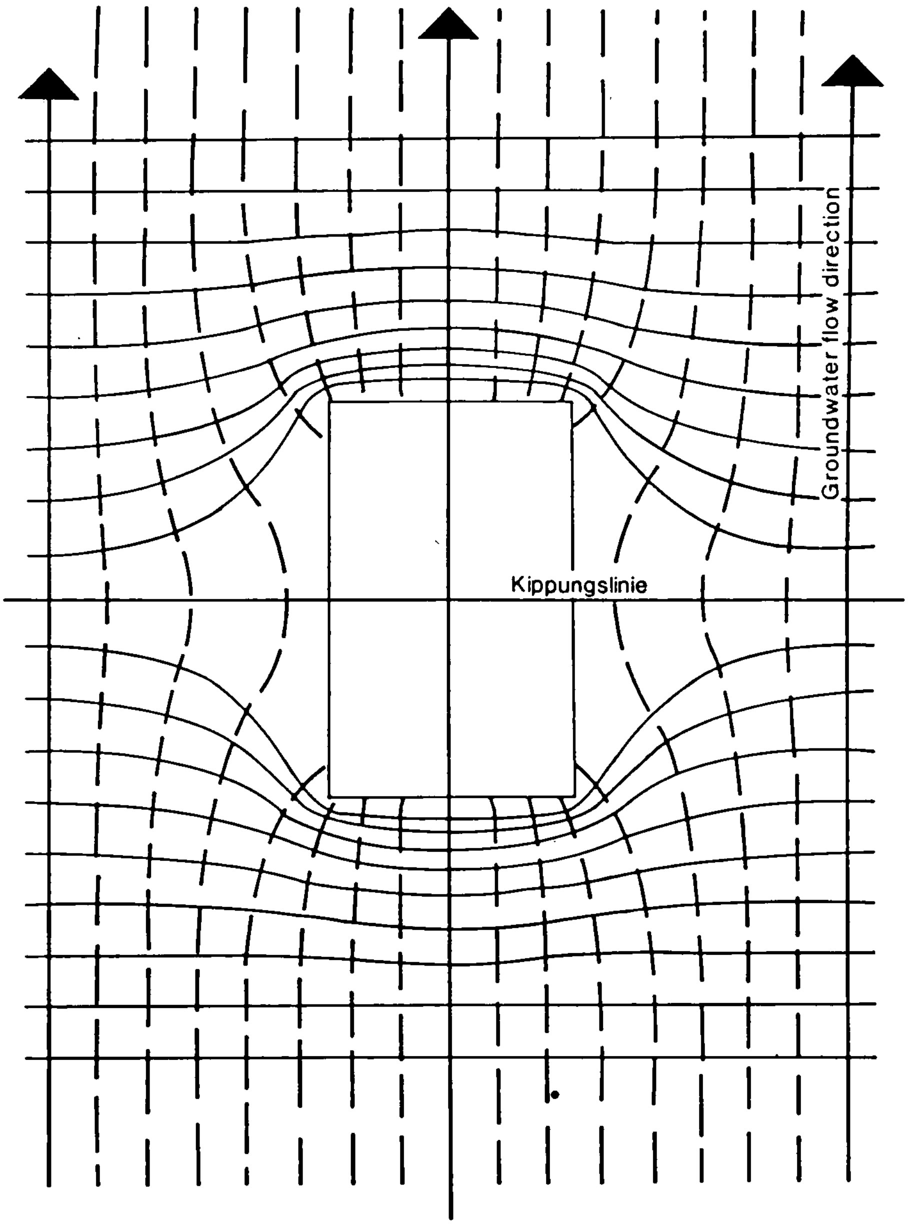


Fig. 12.3 The Theoretical Distribution of Equipotential lines (solid) and groundwater flow lines (dashed) around a gravel lake.

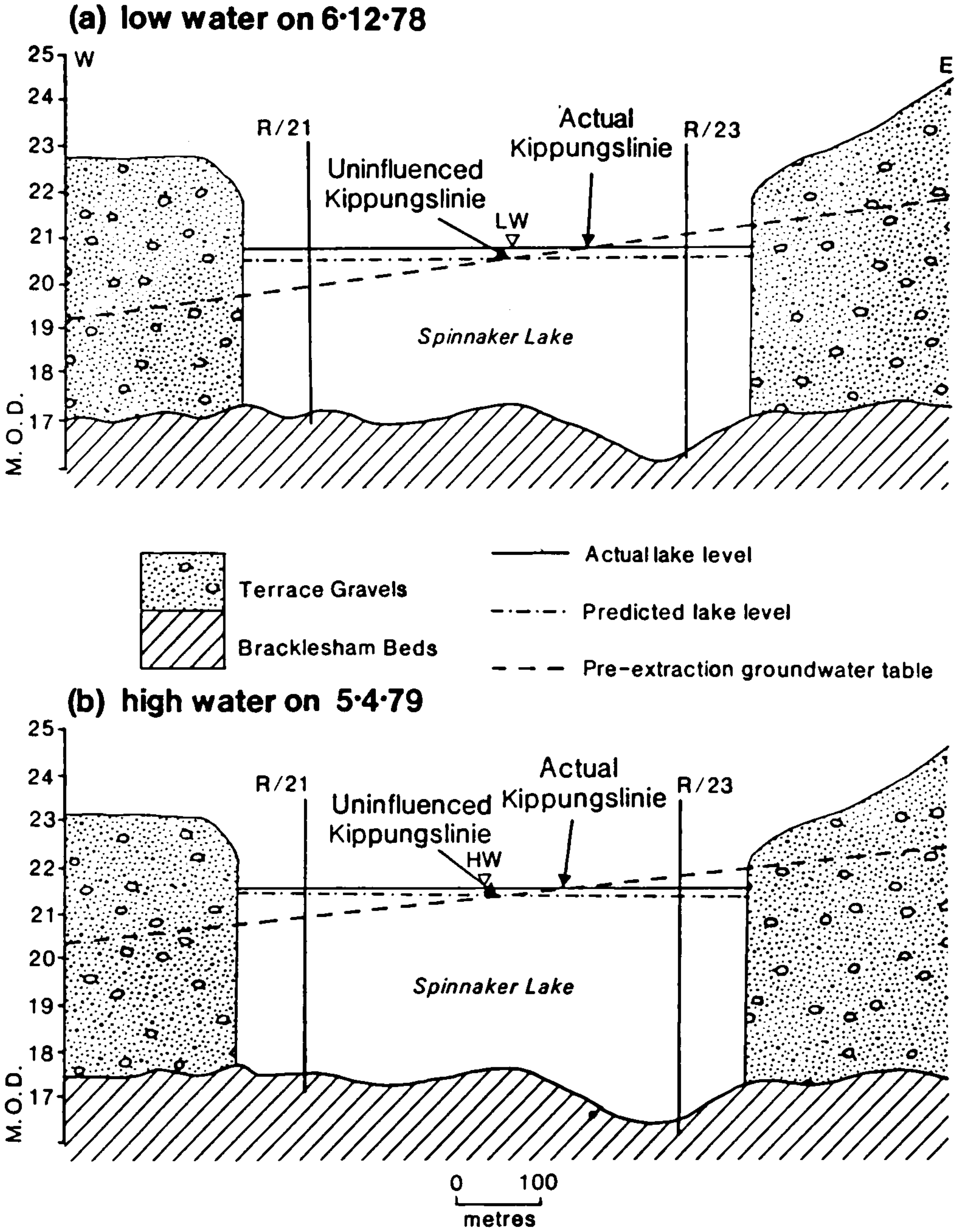


Fig. 12.4 Cross-section through Spinnaker Lake showing uninfluenced and actual Kippungslinien at low and high water.

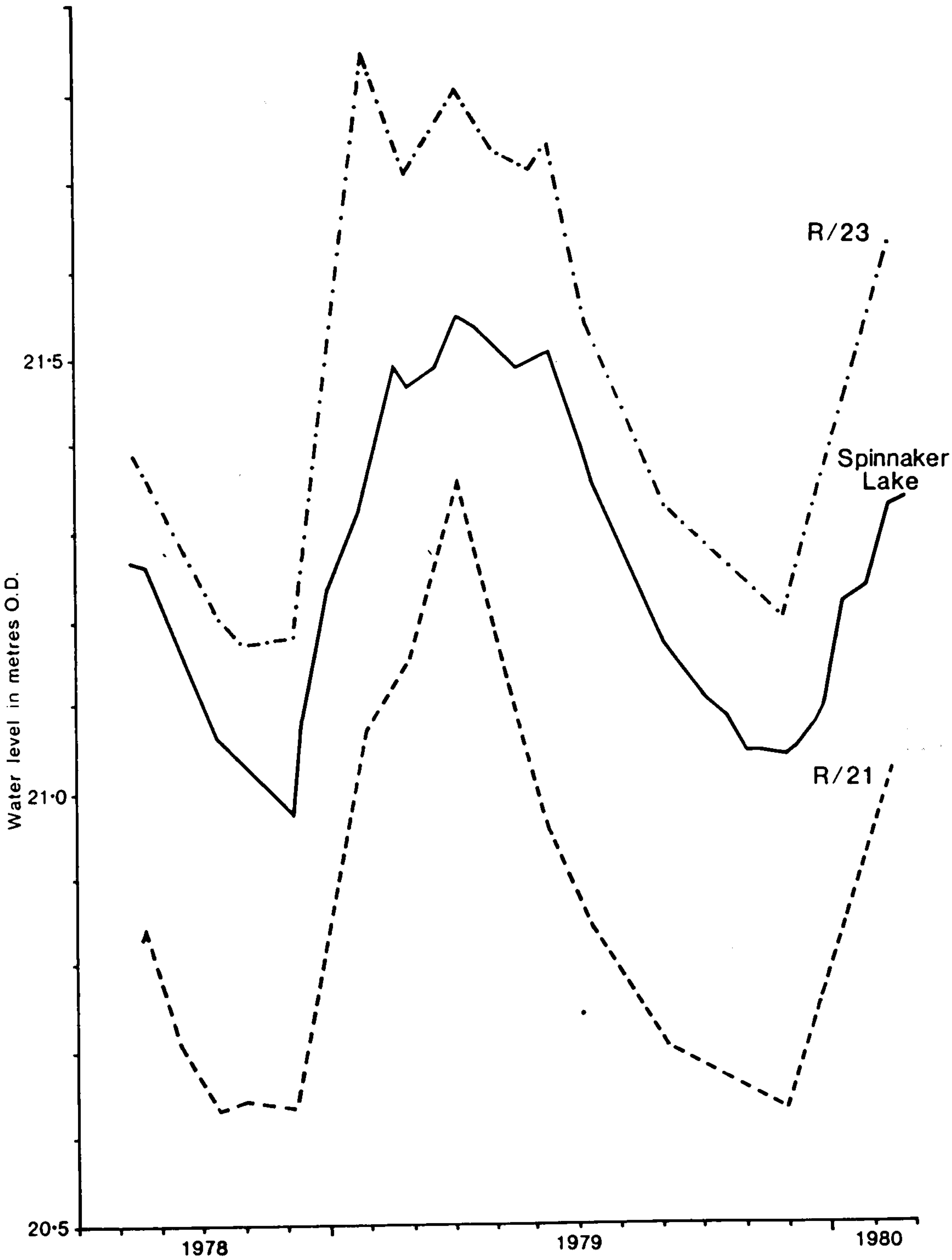


Fig. 12.5 Hydrographs of observation wells upstream and downstream of Spinnaker Lake, compared with the lake hydrograph.

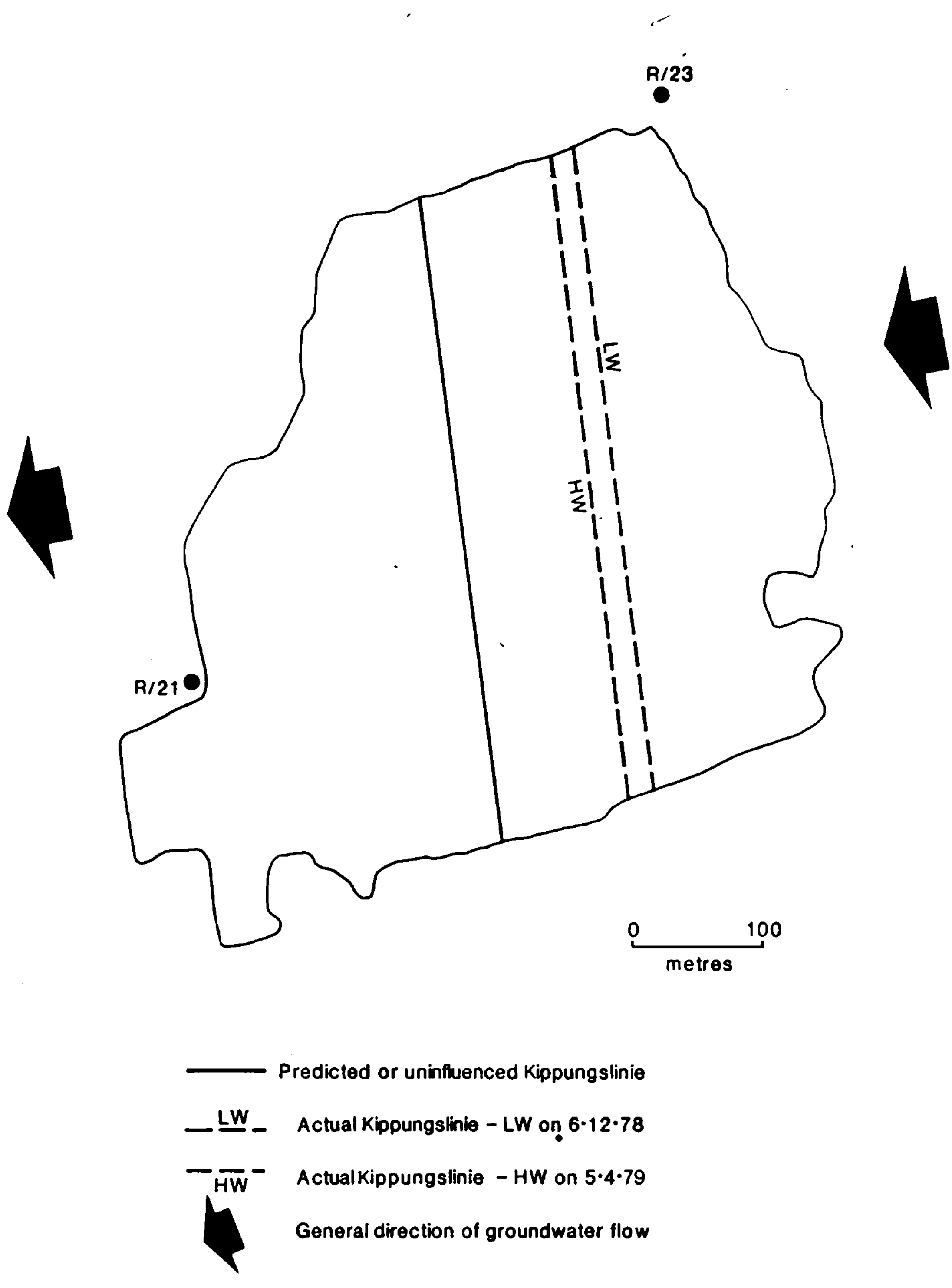


Fig. 12.6 Plan view of Spinnaker Lake showing the position of the actual and predicted Kippungslinien.

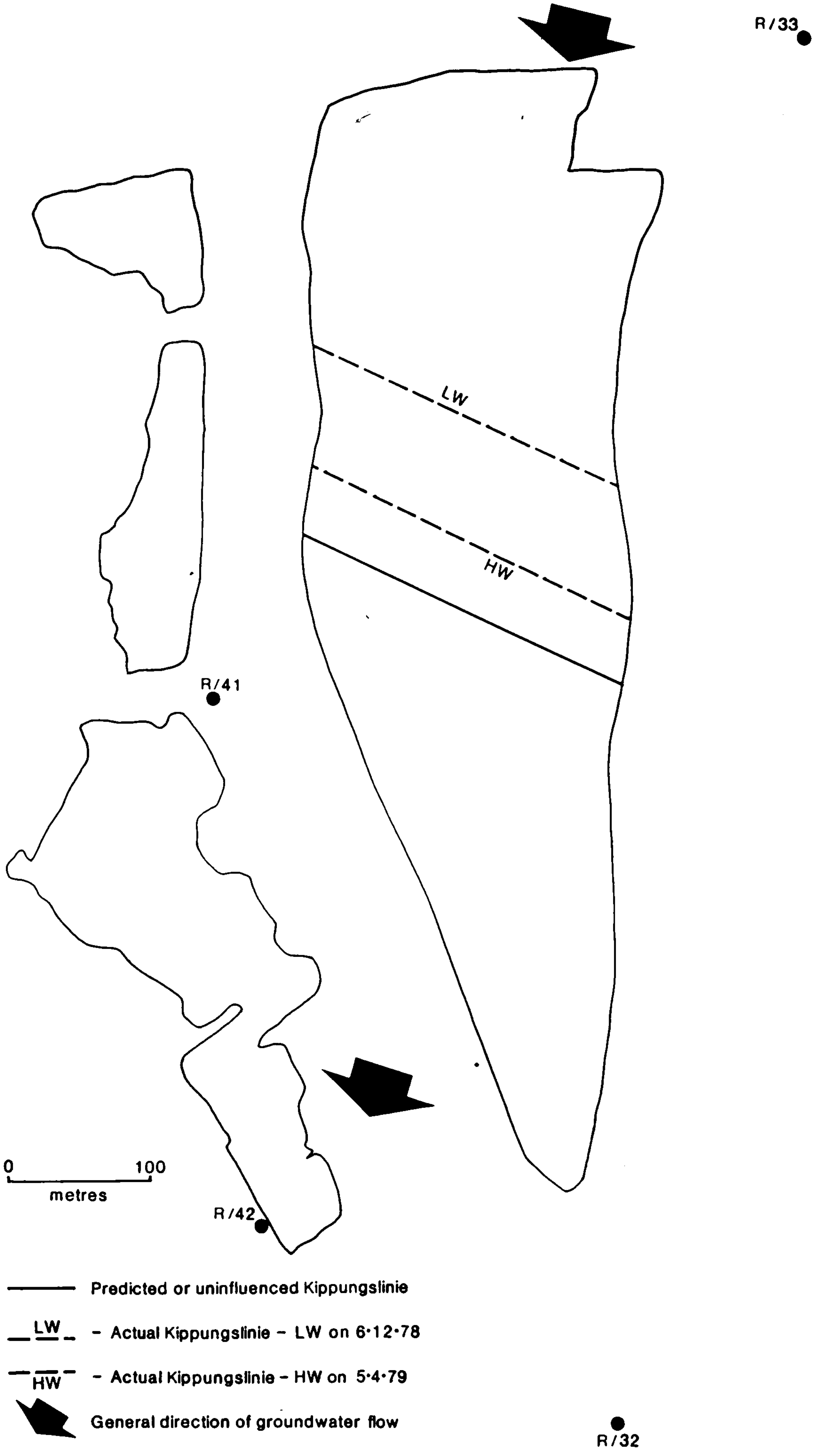


Fig. 12.7 Plan view of Ellingham Lake showing the position of the actual and predicted Kippungslinien.

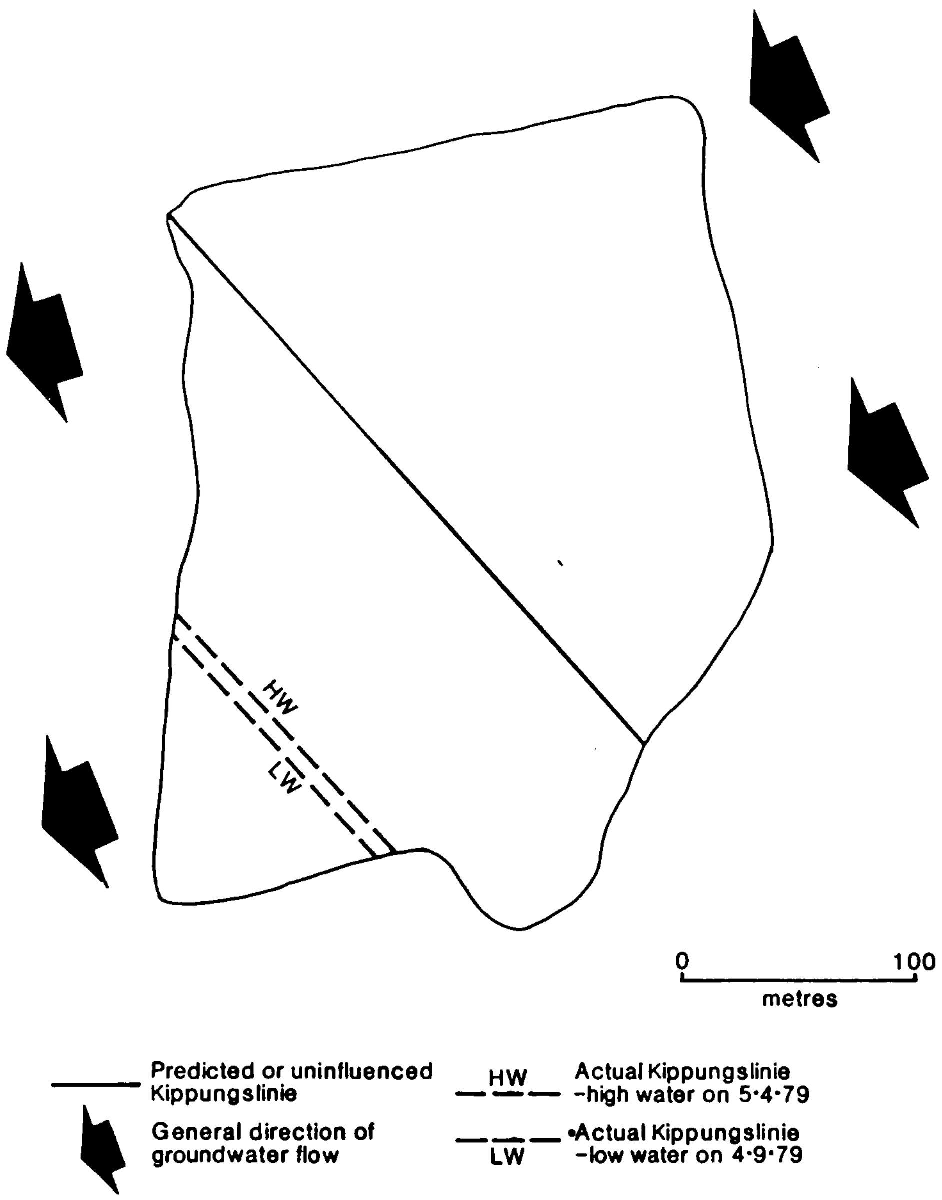


Fig. 12.8 Plan view of cell 1 on Ibsley Airfield showing the position of the actual and predicted Kippungslinien.

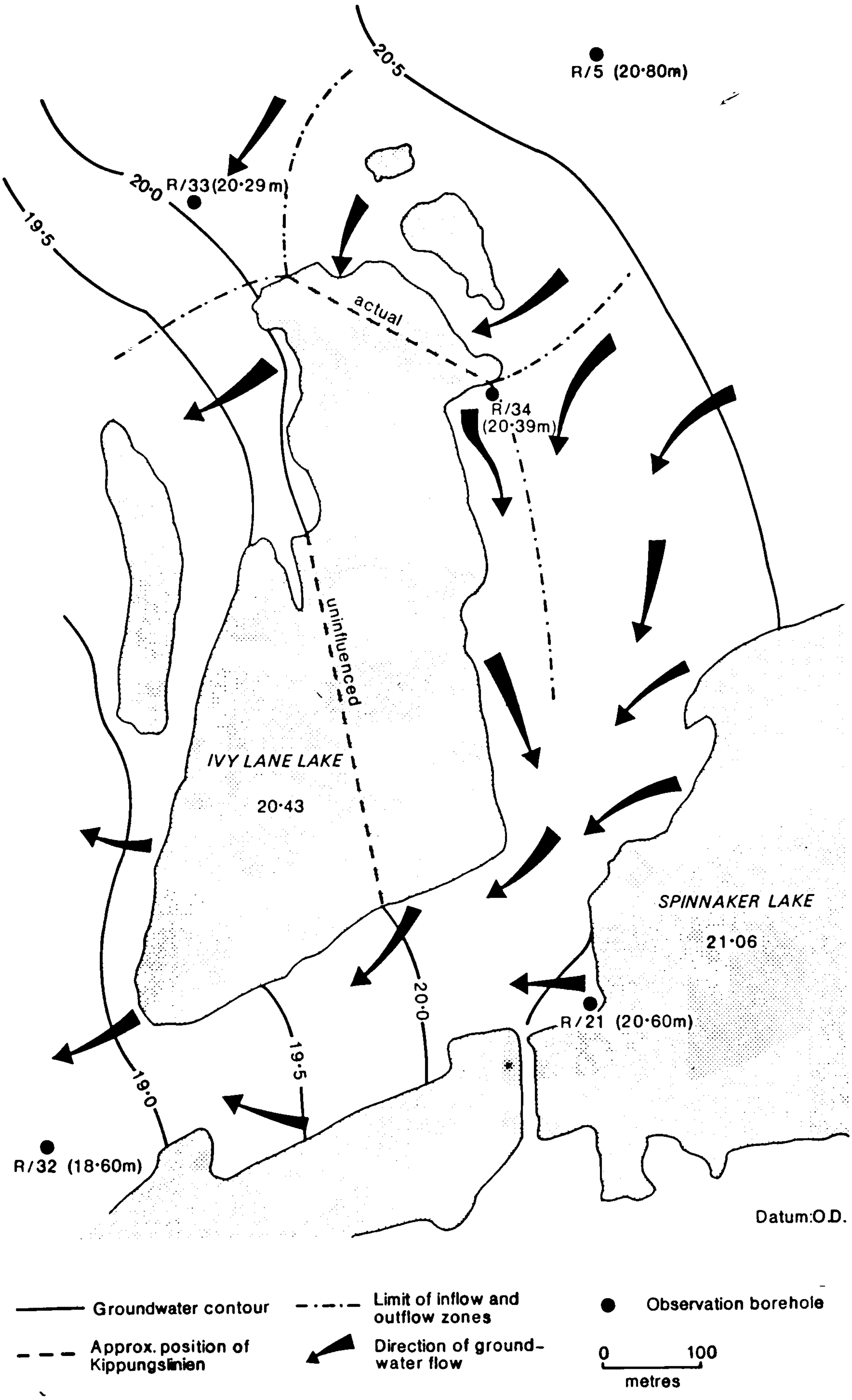


Fig. 12.9(a) Groundwater flow around Ivy Lane Lake on 11.10.78 (low water).

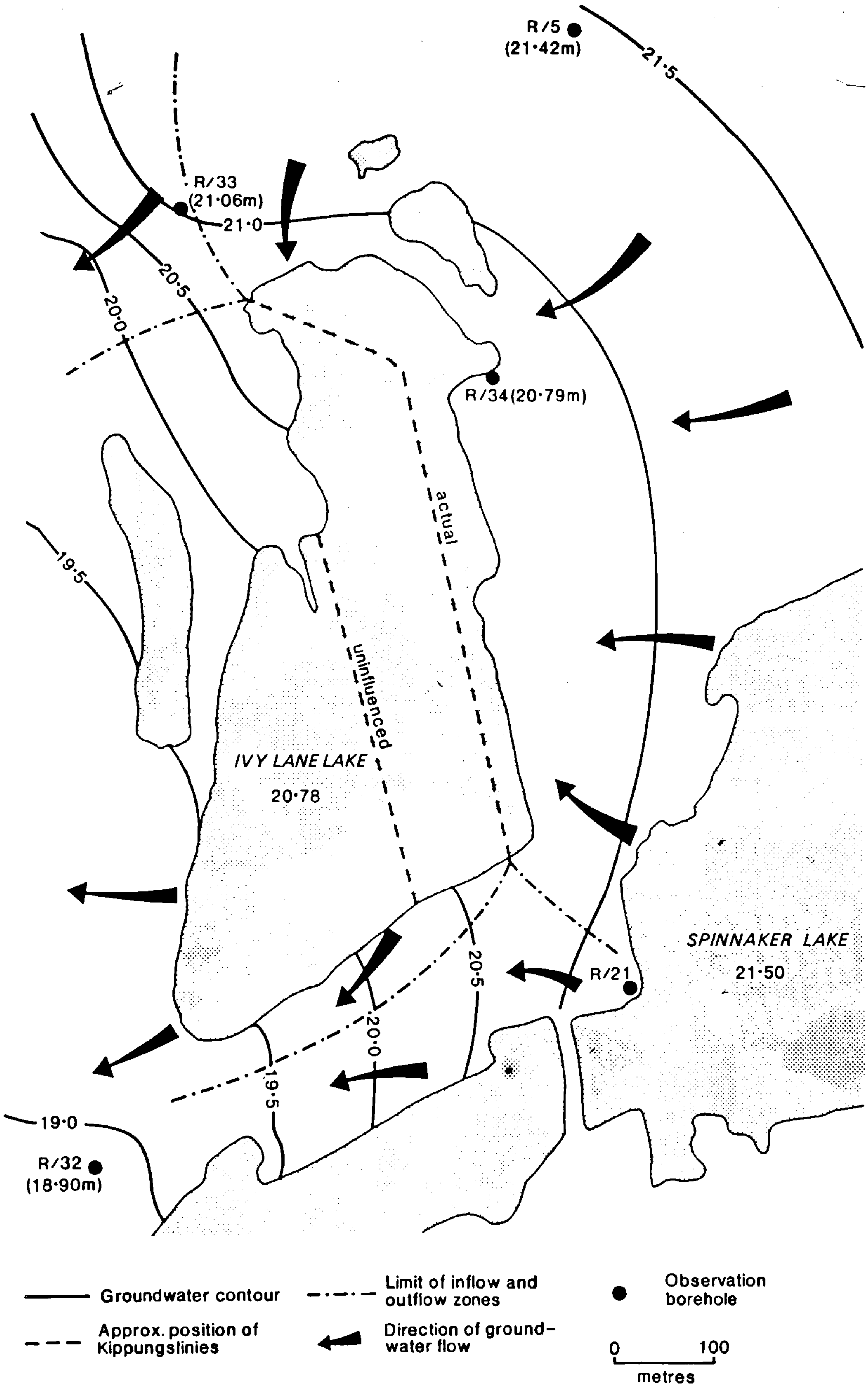


Fig. 12.9(b) Groundwater flow around Ivy Lane Lake on 28.5 79 (high water).

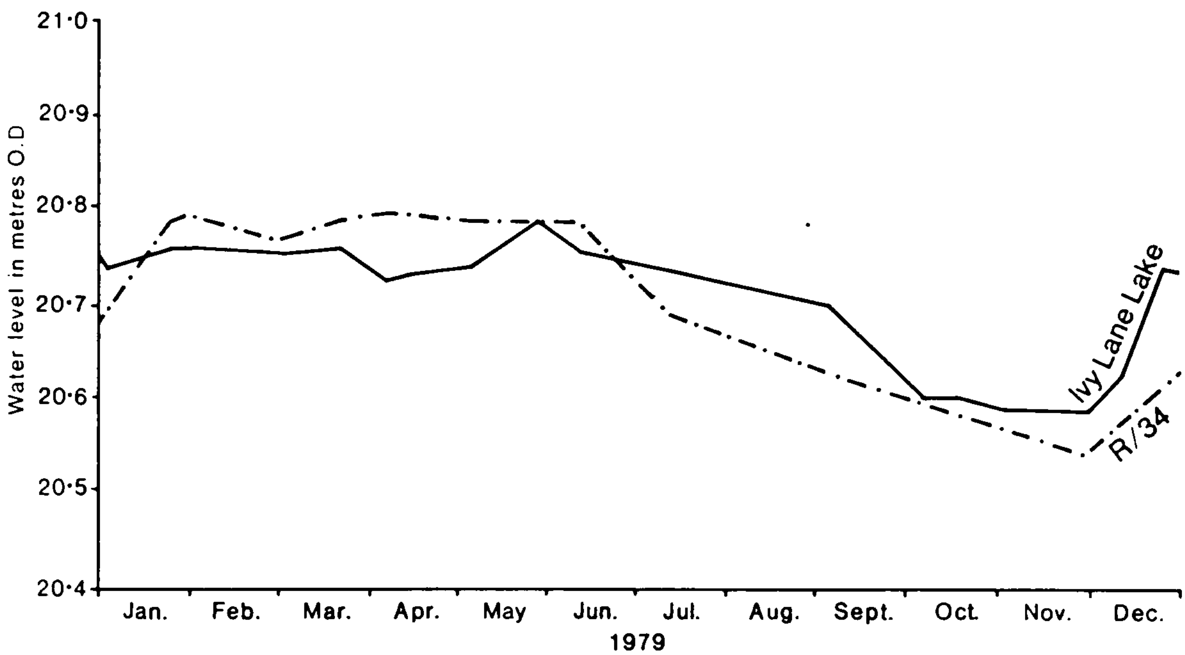


Fig. 12.10 Hydrographs of Ivy Lane Lake and observation well R/34, Jan - Dec 1979.

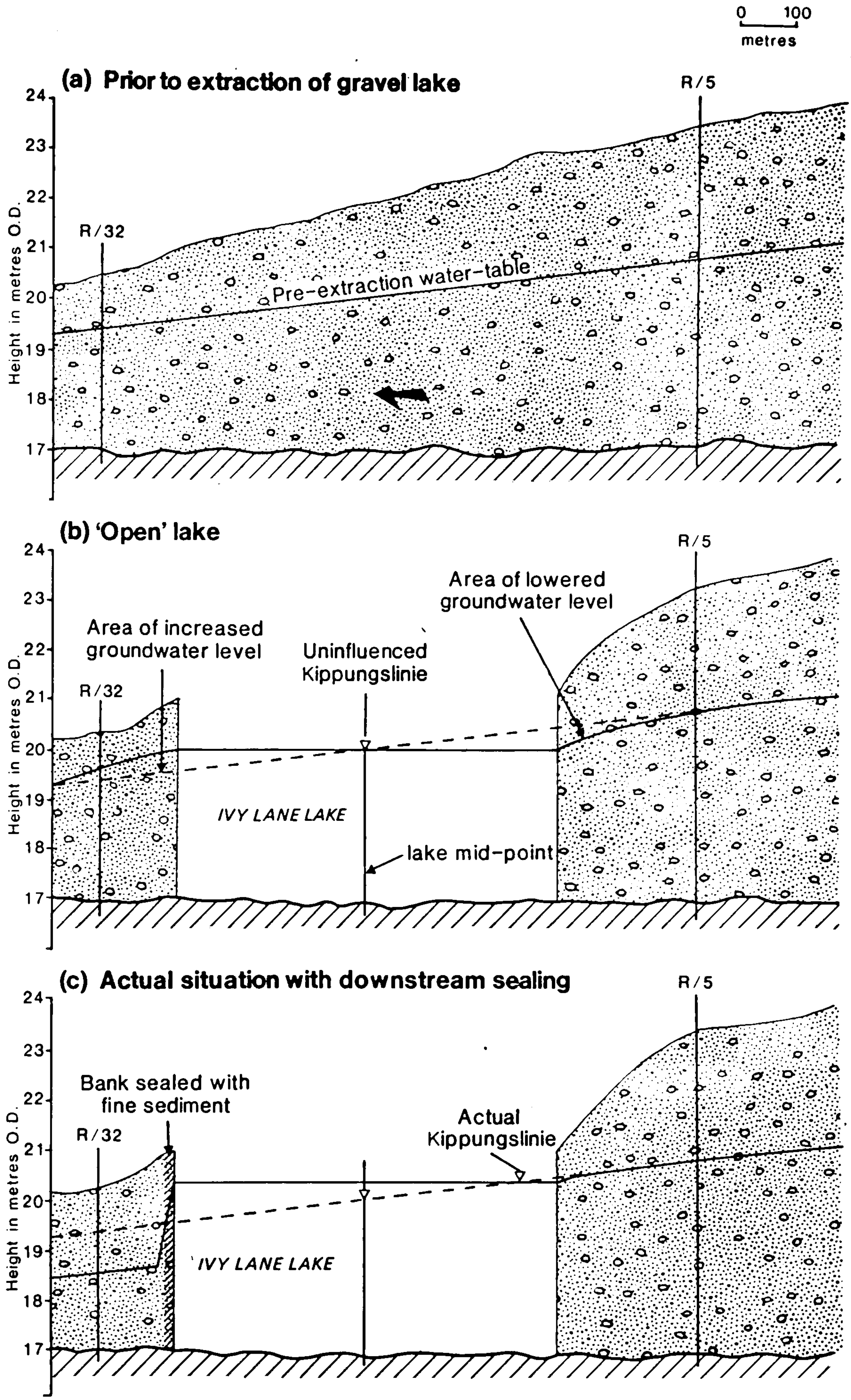


Fig. 12.11 The effect of gravel lakes on upstream and downstream groundwater levels.

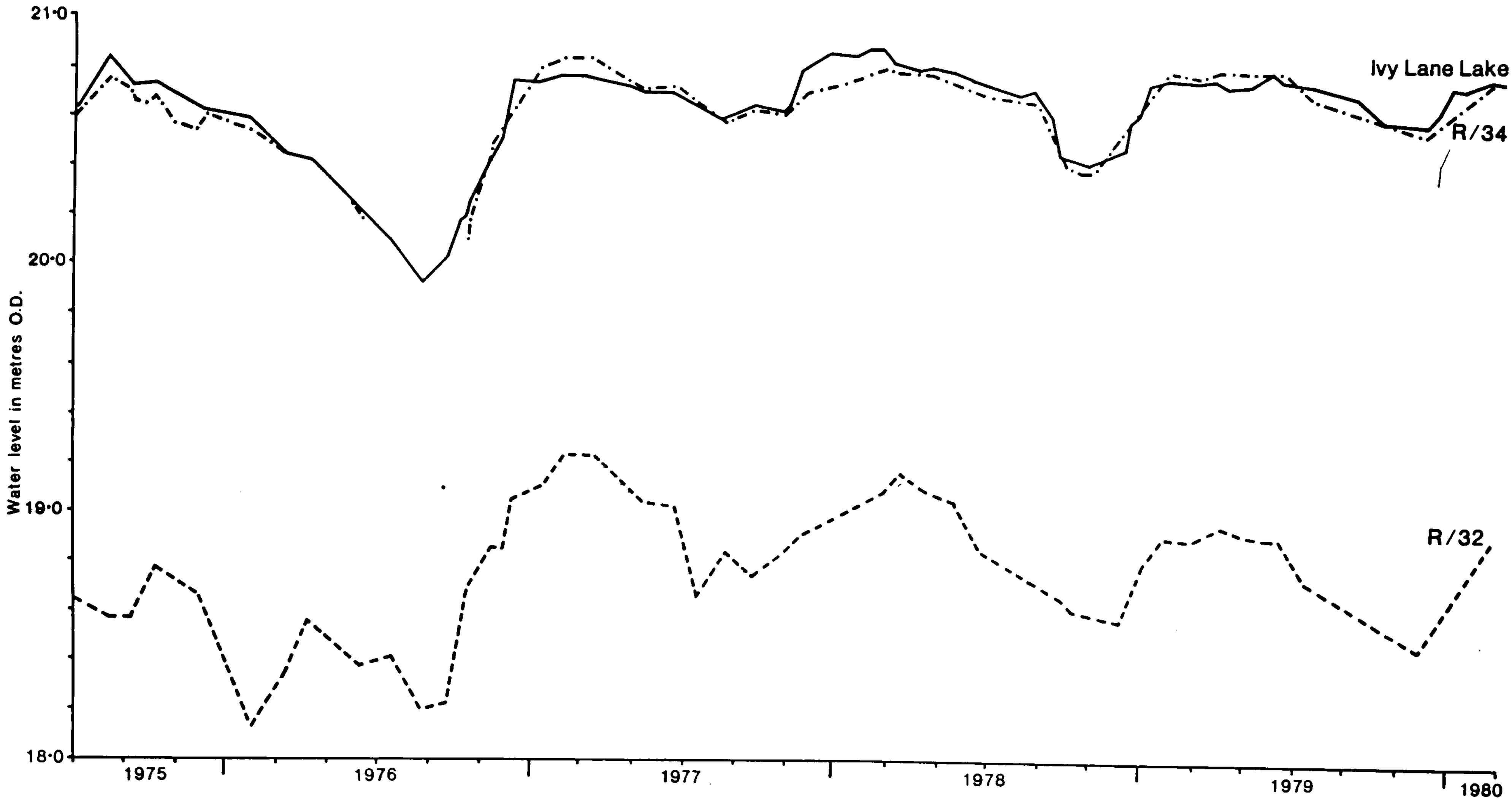
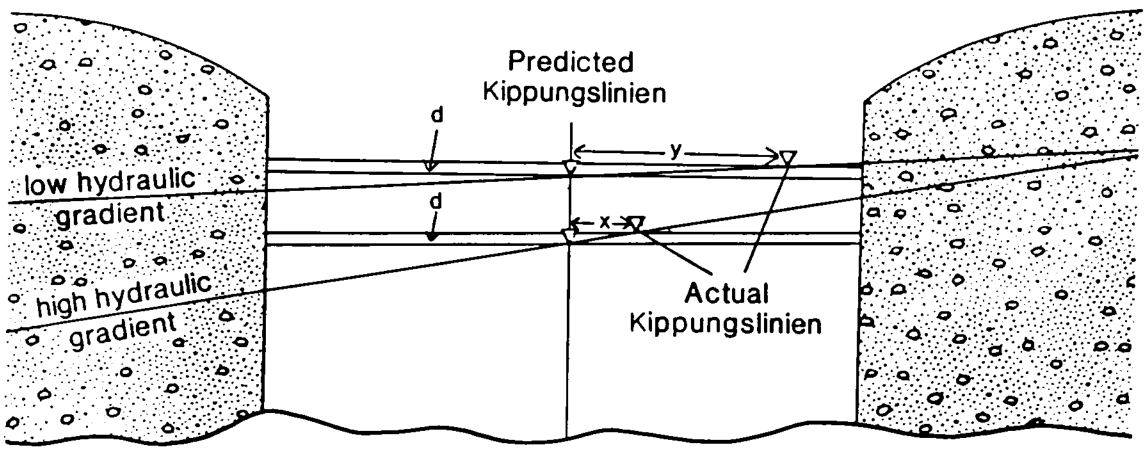


Fig. 12.12 Hydrographs of observation wells upstream and downstream of Ivy Lane Lake, compared with the lake hydrograph.



(not to scale)

d Difference in height between actual and predicted lake levels

x and y Lateral shift of actual from predicted Kippungslinien with high and low hydraulic gradient, respectively

Fig. 12.13 Diagram showing the effects of the original hydraulic gradient on lake level and Kippungslinien.

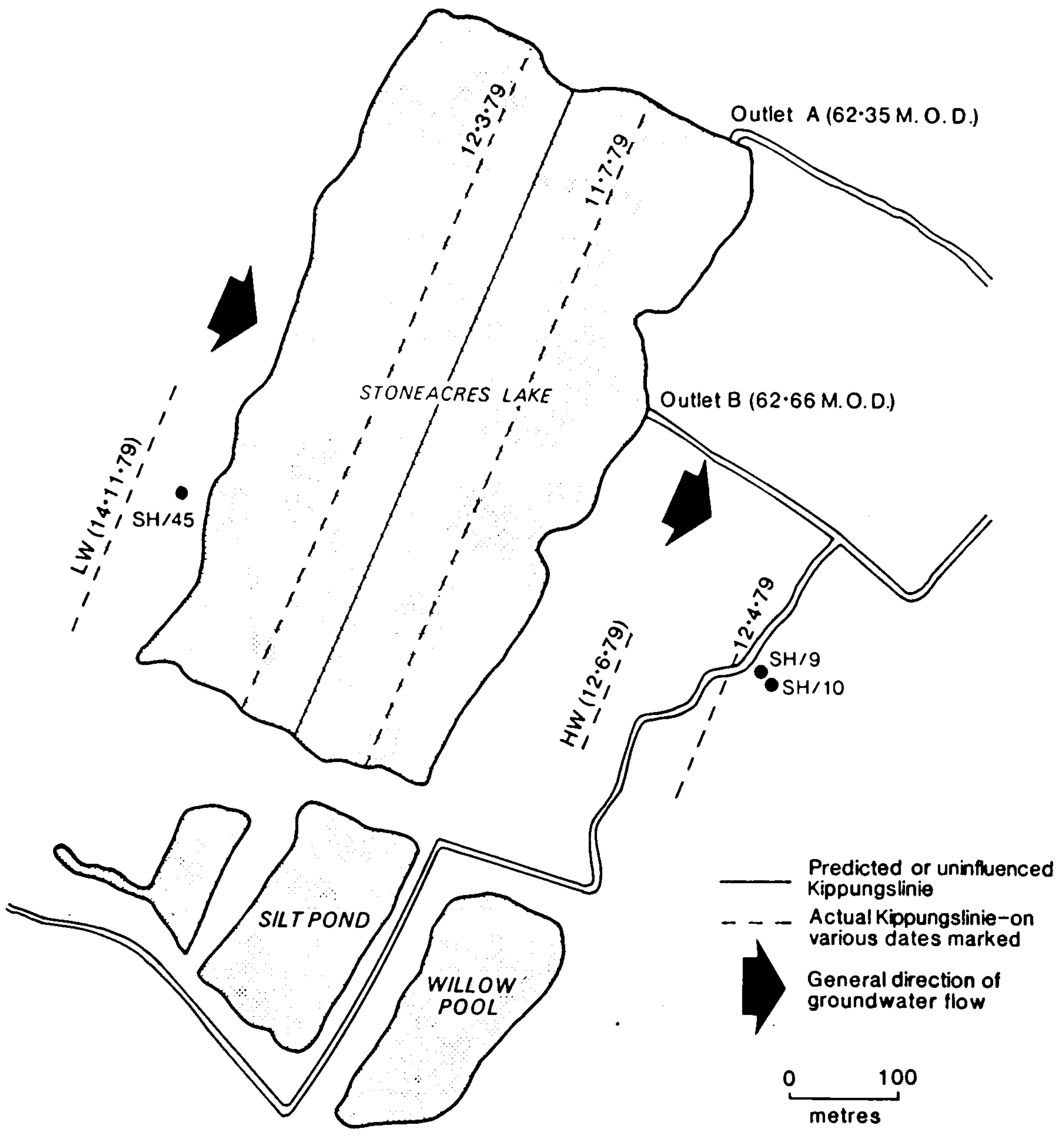


Fig. 12.14 Plan view of Stoneacres Lake showing the positions of the actual and predicted Kippungslinien.

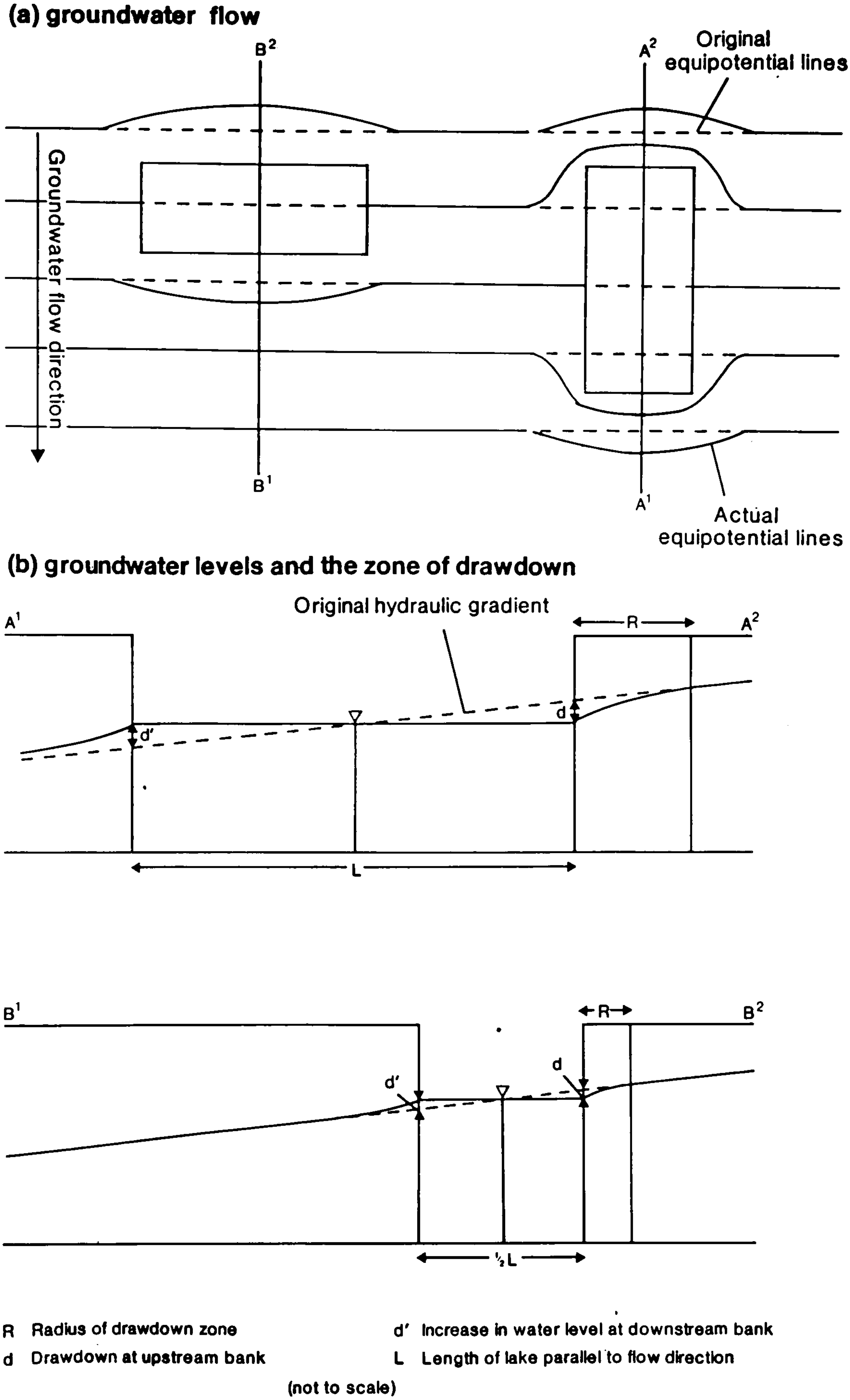


Fig. 12.15 Diagrams showing the effect of lake orientation.

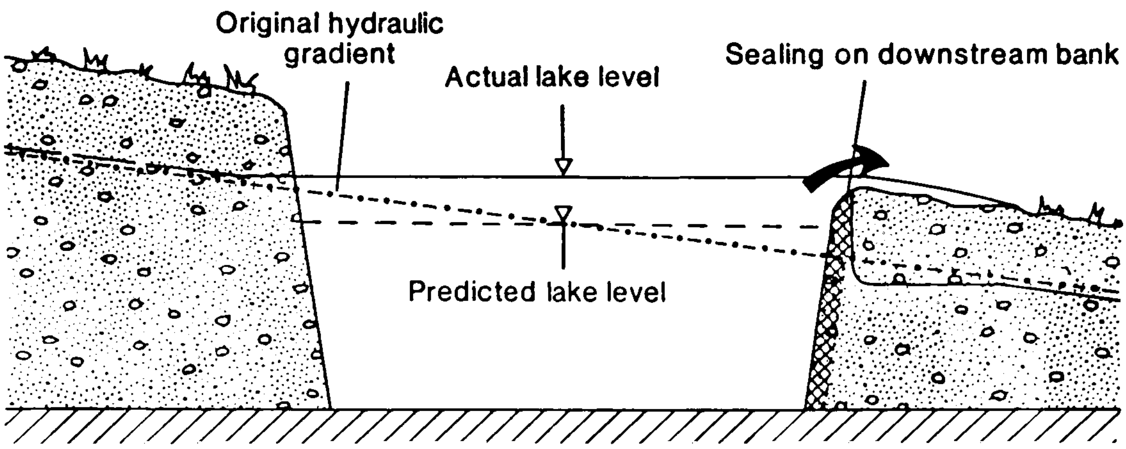


Fig. 12.16 The effect of excessive sealing on lake levels.

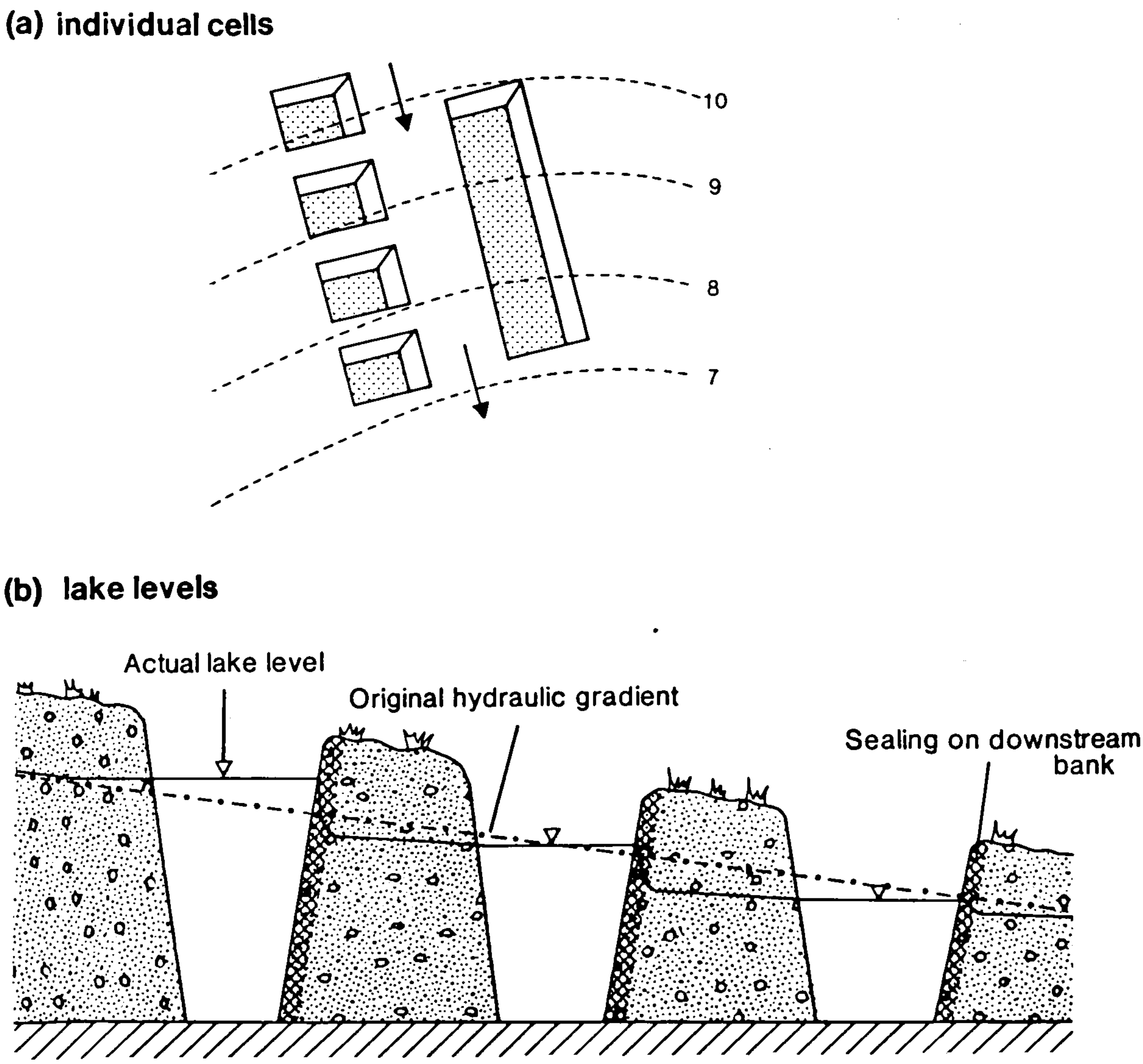


Fig. 12.17 The effect of excavating large pits as individual cells.

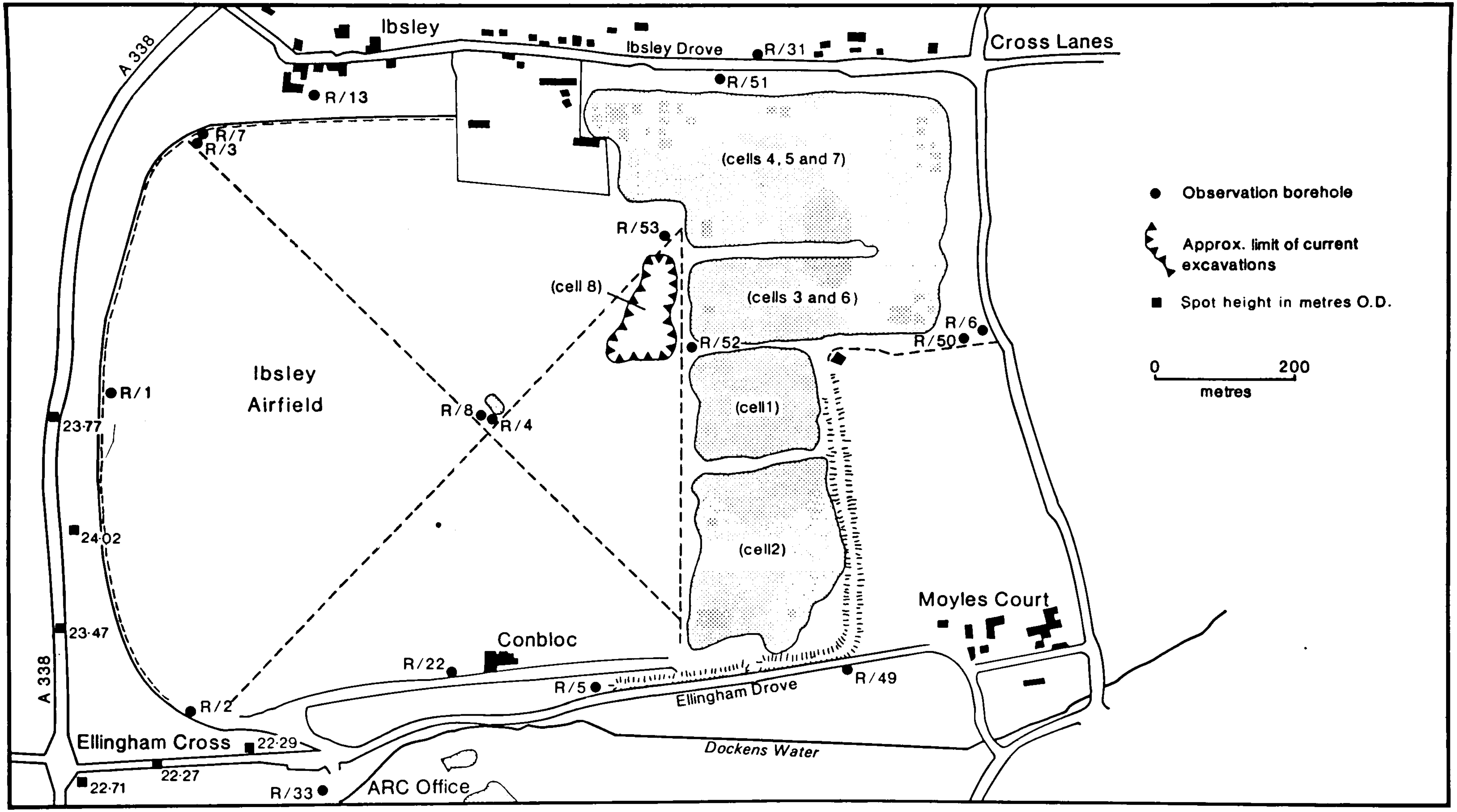


Fig. 12.18 Distribution of lakes and excavations on Ibsley Airfield, Ringwood (summer 1980).

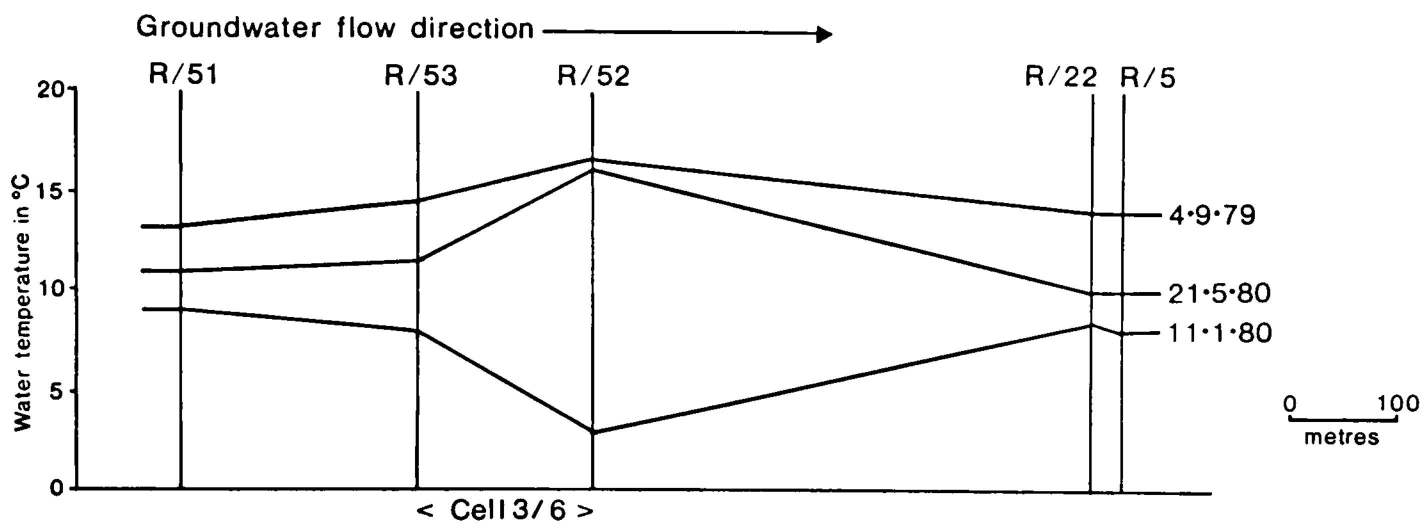


Fig. 12.19 A transect through Ibsley Airfield showing the effects of cell 3/6 on groundwater temperature on three selected dates.

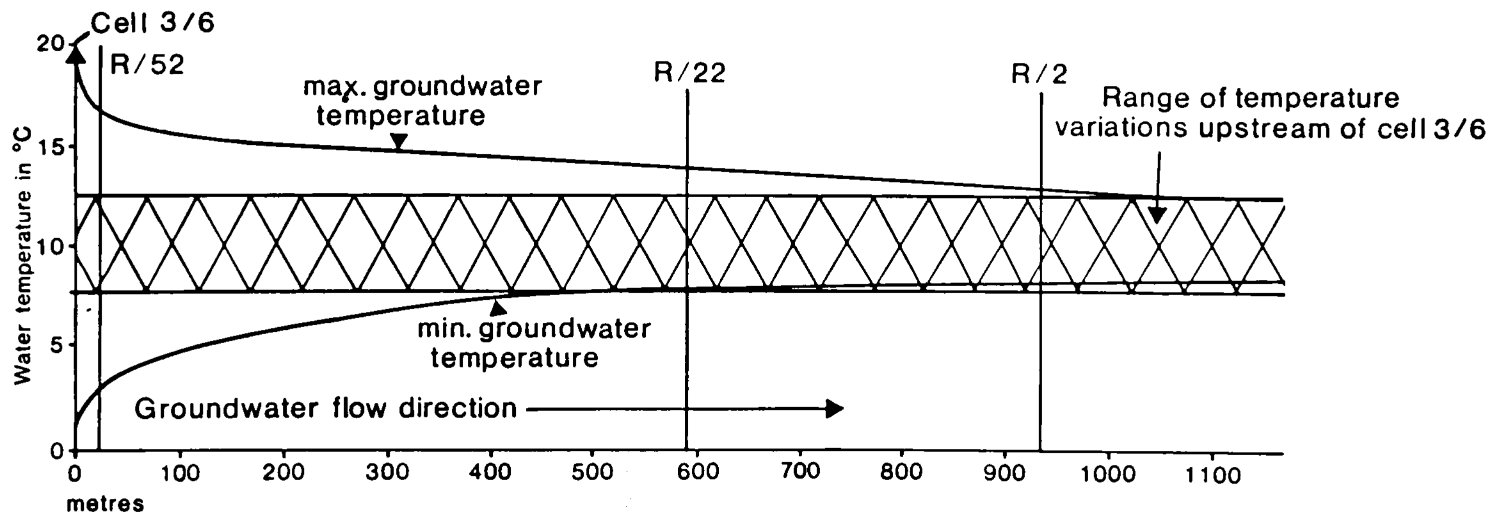


Fig 12.20 The influence of cell 3/6 on upstream and downstream temperature range.

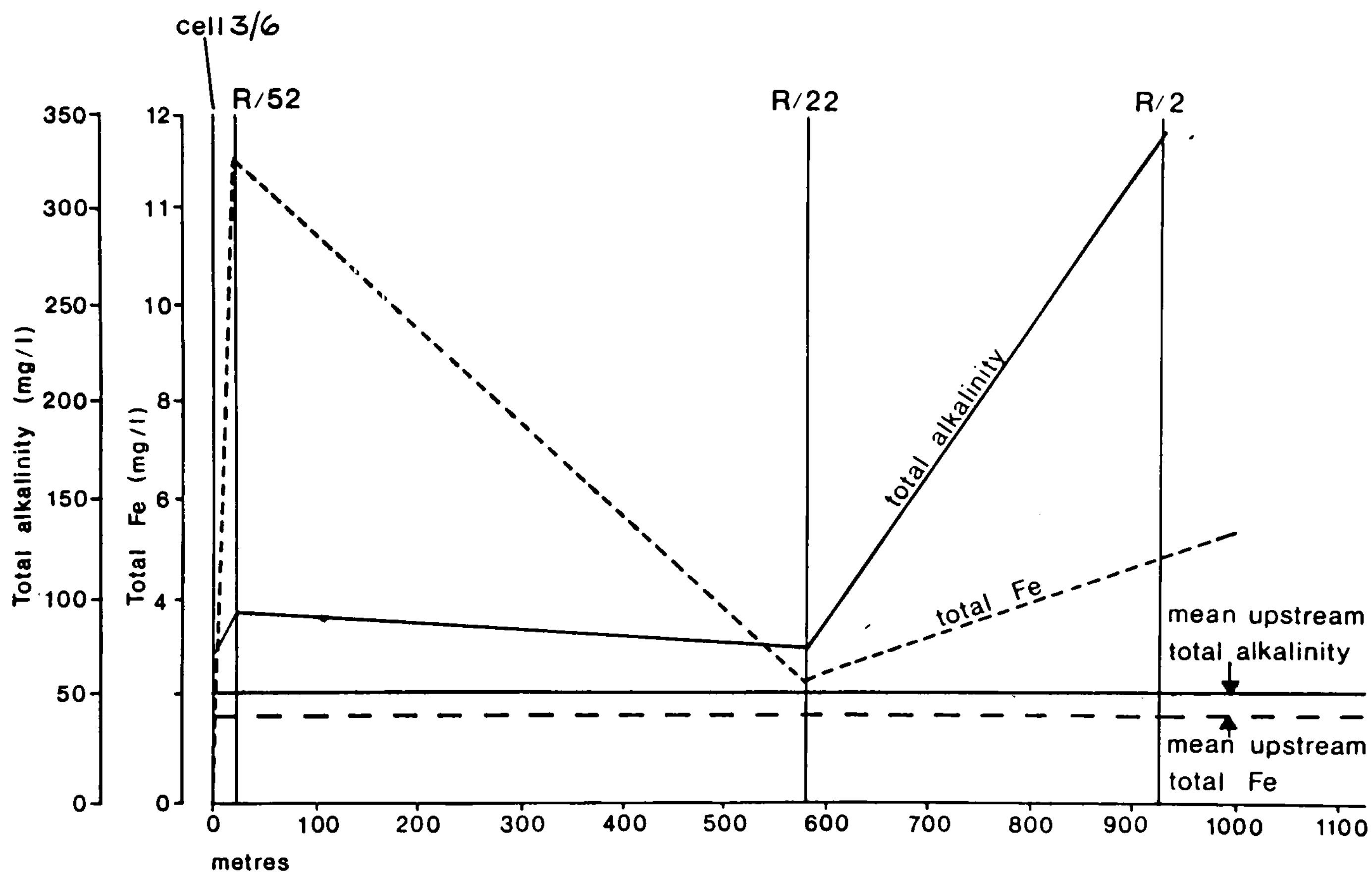


Fig. 12.21 The influence of cell 3/6 on downstream total alkalinity and total Fe contents.

APPENDIX A1

PHOTOGRAPHS

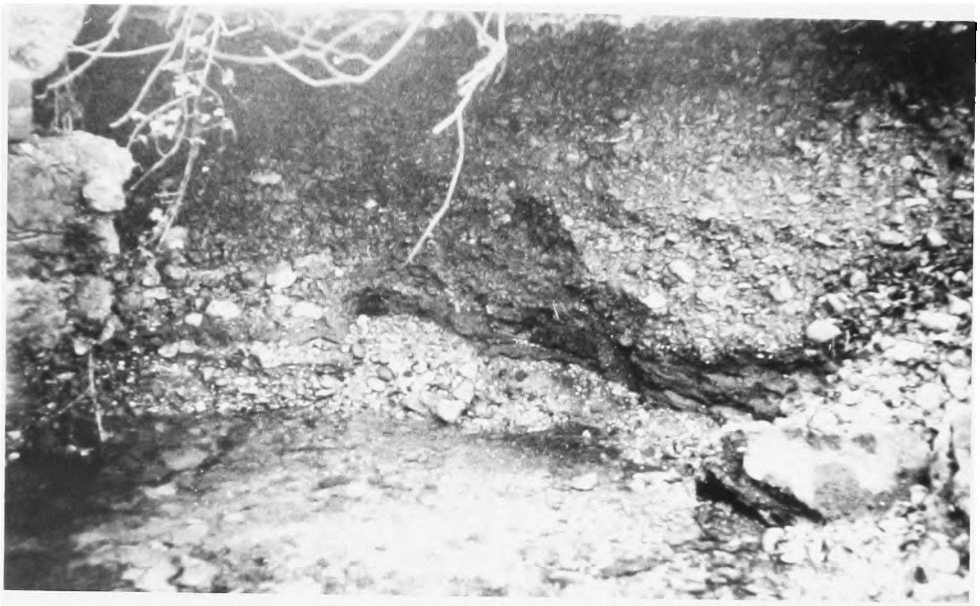


Plate 3.1 Section in Dockens Water, Ringwood (site 3 in fig. 3.3), showing an organic layer within the Lower Terrace Gravels.

Plate 3.2 Horizontal bedding in the g vels of the Summertown-Radley Terrace a Dix Pit, Stanton Harcourt.

Plate 3.3 Channel cross-section in the gravels of the Summertown-Radley Terrace at Dix Pit, Stanton Harcourt.

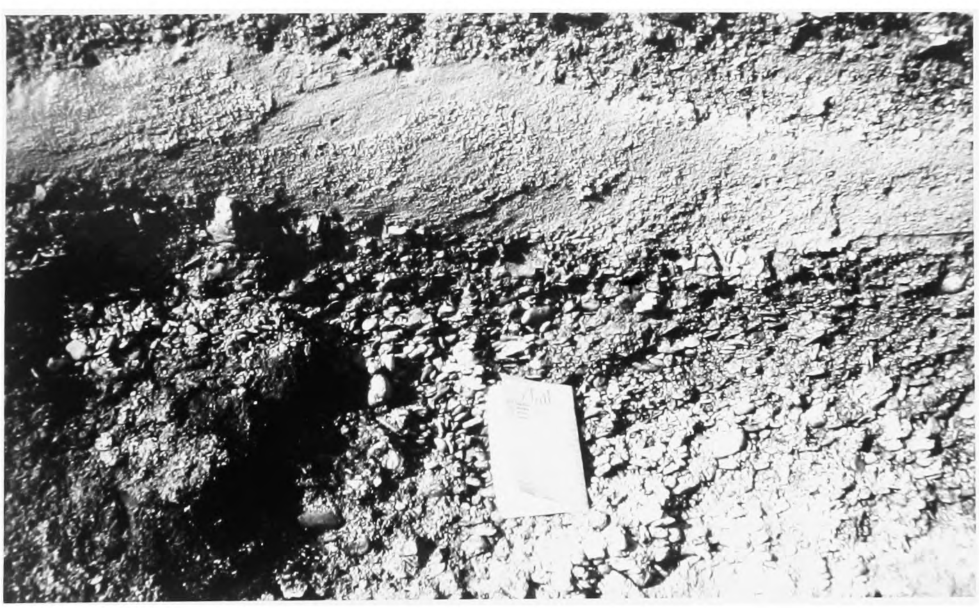


Plate 3.4 Sand lens in the gravels of the Summertown-Radley Terrace at Dix Pit, Stanton Harcourt. (notebook is 16 cm.)

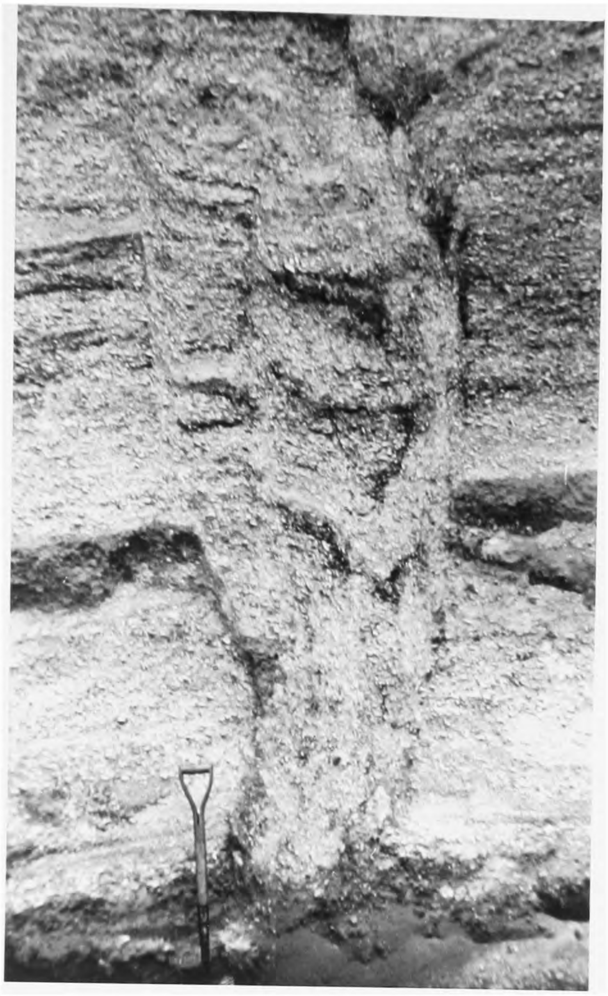


Plate 3.5

Ice-wedge cast in the gravels of the Summertown-Radley Terrace at Dix Pit, Stanton Harcourt.

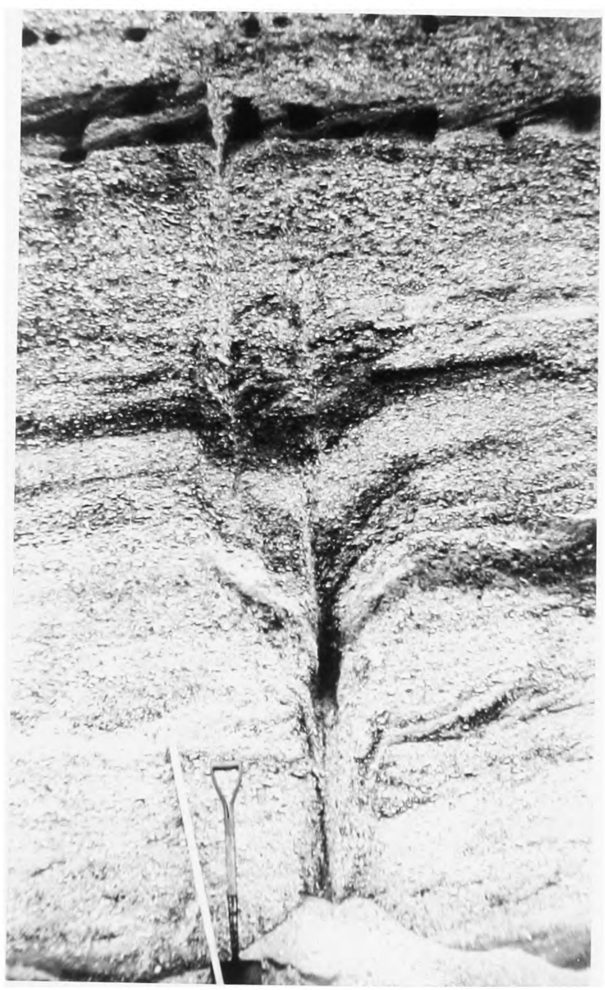


Plate 3.6

Ice-wedge cast in the gravels of the Summertown-Radley Terrace at Dix Pit, Stanton Harcourt.

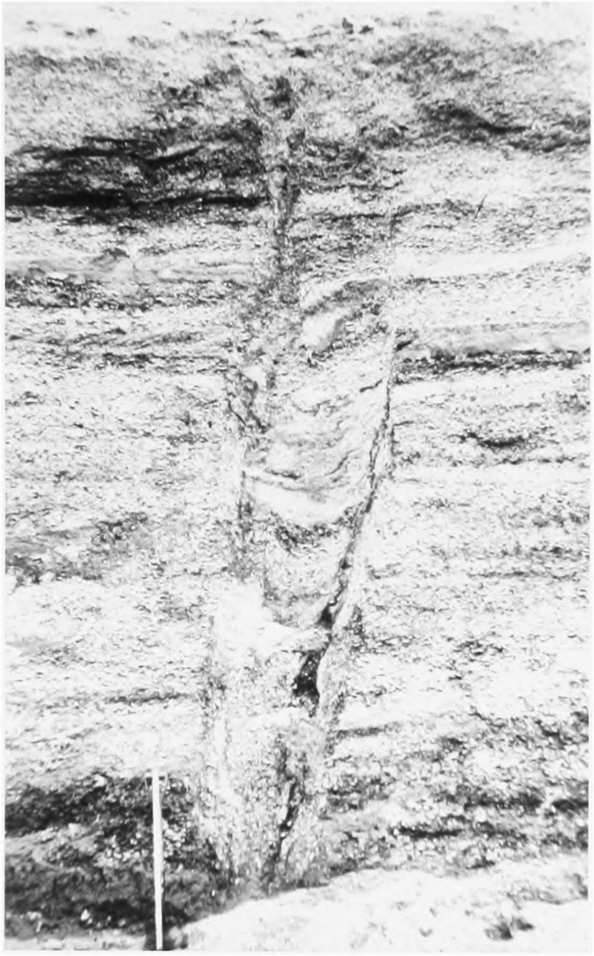


Plate 3.7

Ice-wedge cast in the gravels of the Summertown-Radley Terrace at Dix Pit, Stanton Harcourt.

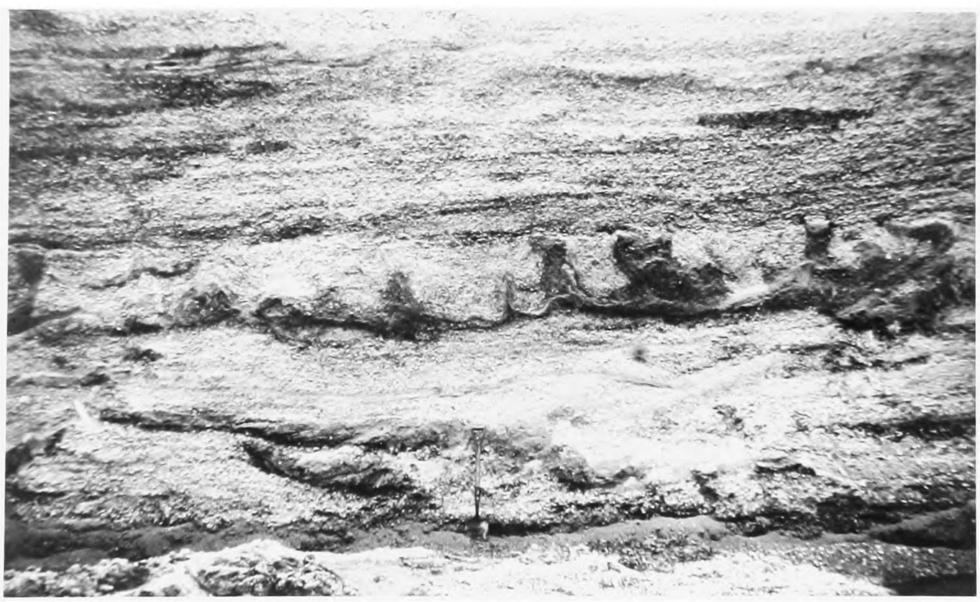


Plate 3.8 Convoluted sand lens between lower unbedded and upper horizontally bedded gravels of the Summertown-Radley Terrace at Dix Pit, Stanton Harcourt.

Plate 3.9

Convoluted gravels of the Summertown-Radley Terrace at Dix Pit, Stanton Harcourt.

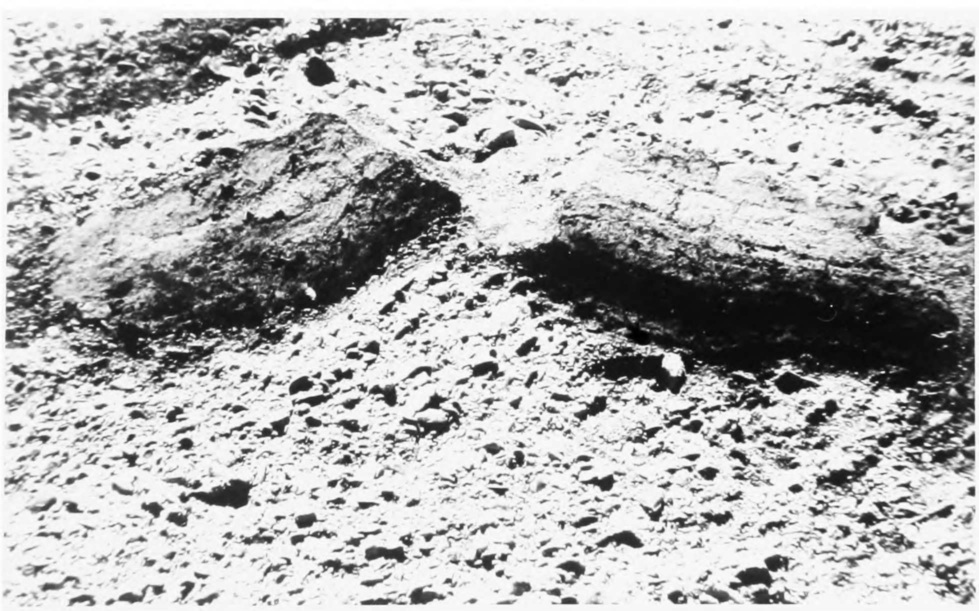


Plate 3.10 Peat blocks within the gravels of the Flood-plain Terrace at Wadham-Brasenose Pit, Hardwick.

Plate 3.11 Peat blocks and sand lens within the gravels of the Floodplain Terrace at Wadham-Brasenose Pit, Hardwick.

Plate 3.12 Peat lens within the gravels of the Flood-plain Terrace at Brown Pit, Northmoor.

Plate 4.1

Stage-board (SH/31)
in flooded gravel
pit.

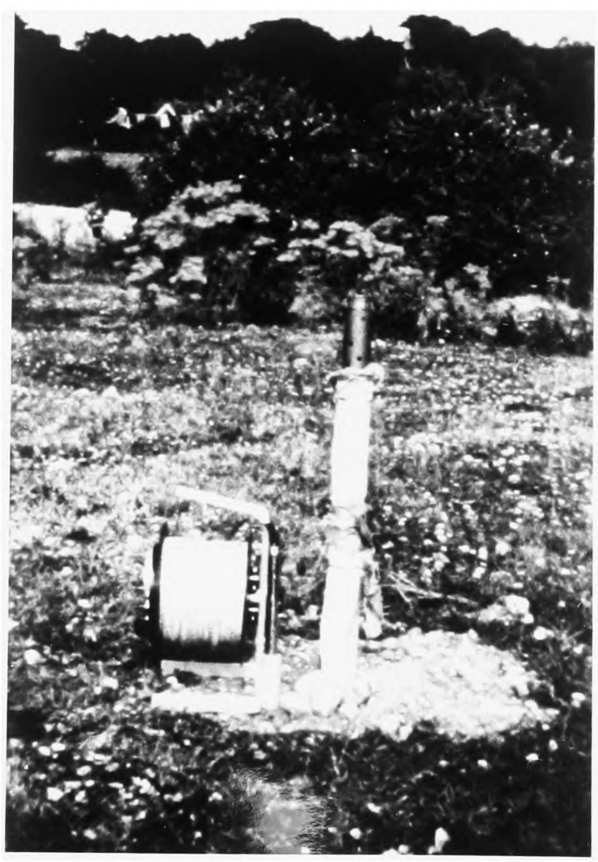


Plate 4.2

3.8cm diameter borehole
(R/47) and OTT Type KLT
electric contact gauge.

Plate 4.3 Type R16 autographic recorder in cell 8, Ibsley Airfield (R/55).

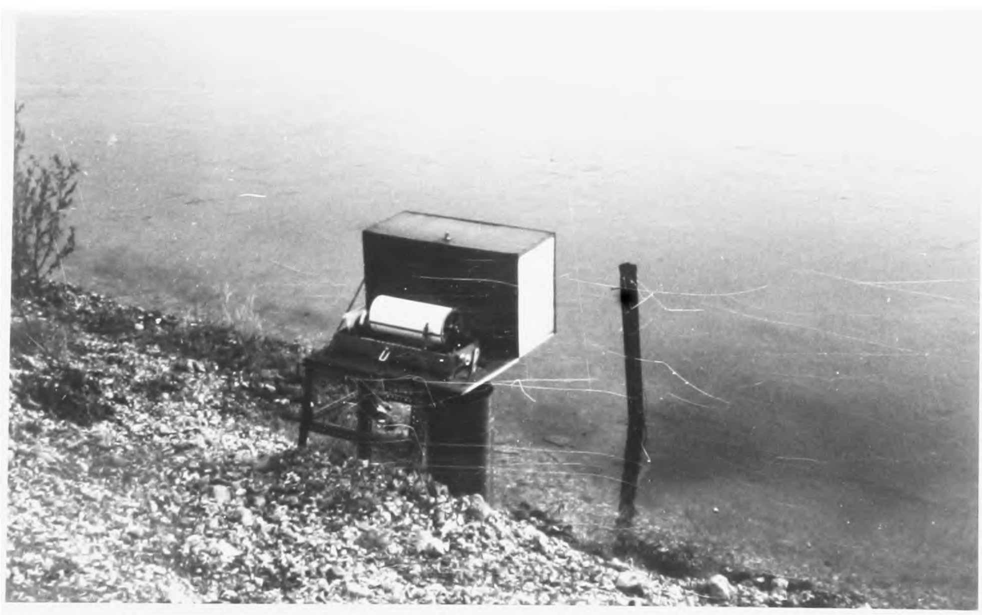


Plate 4.4 Type X autographic recorder in cell 1, Ibsley Airfield (R/56).

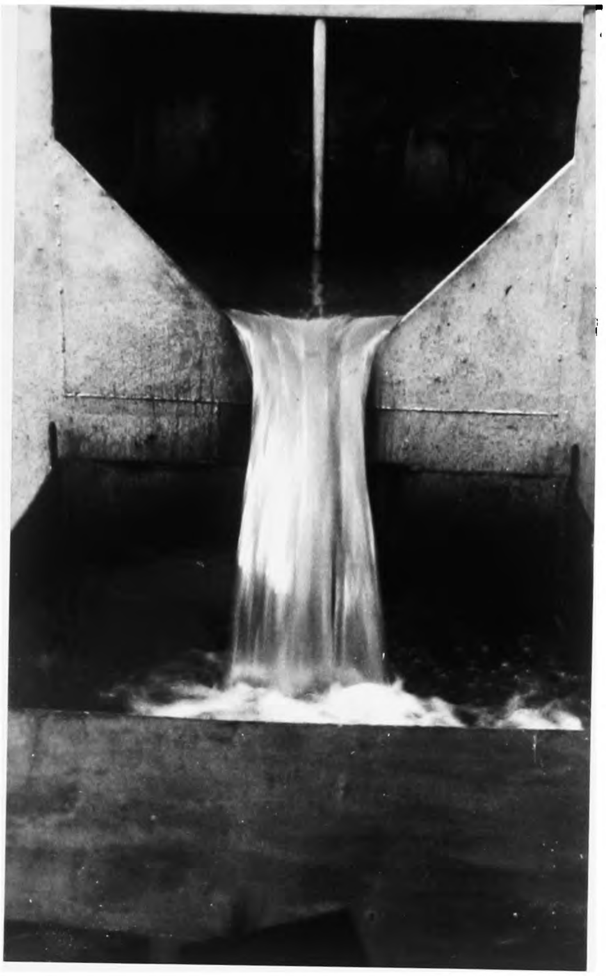


Plate 4.5

Weir tank on Ibsley Airfield, Ringwood.

Plate 4.6 Rain gauge (R/68).

Plate 10.1

Restoration of Brown Pit (stage B) with Oxford Clay.

Plate 11.1 Collector ditches excavated in Oxford Clay in the bottom of Wadham-Brasenose Pit, Hardwick.

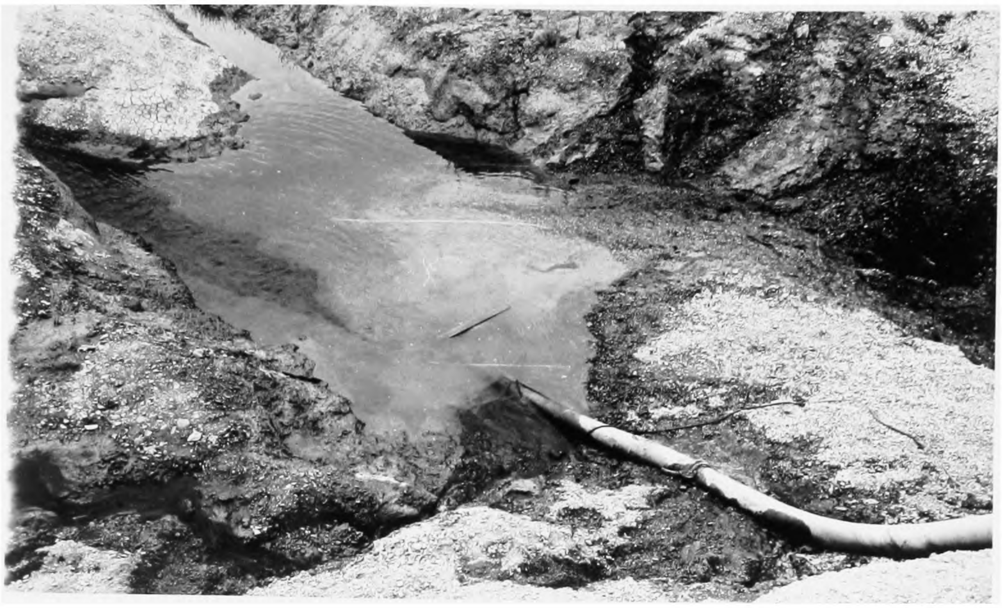


Plate 11.2 Iron precipitation around pipe outlets in Wadham-Brasenose Pit, Hardwick.

Plate 11.3 Pipe outlet in Wadham-Brasenose Pit, showing gullying of the pit face and iron precipitation.

Plate 11.4 Lenticular-shaped pipes in Wadham-Brasenose Pit, Hardwick.

Plate 11.5 Lenticular-shaped pipes in Wadham-Brasenose Pit, Hardwick.

Plate 11.6 Lenticular-shaped pipes in Wadham-Brasenose Pit, Hardwick.

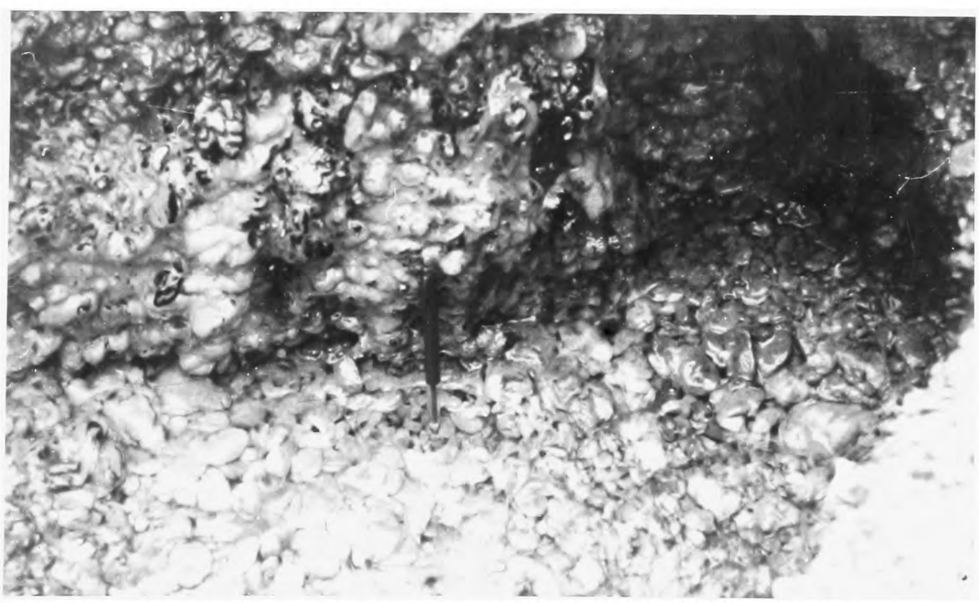


Plate 12.1 Iron precipitation coating the gravel face around a spring in Wadham-Brasenose Pit

APPENDIX A2

TECHNIQUES AND INSTRUMENTATION

RELEVANT TO CHAPTER 6

DESCRIPTION OF THE ROCK AND TAYLOR AUTOMATIC WATER SAMPLING MACHINE

This machine consists of an aluminium cabinet housing 48 polythene sample bottles (each having a maximum capacity of over 0.5 litre), together with solid-state timing and control gear, a 15 day mechanical clock, and a sample distribution mechanism. Four interchangeable timing cams could be fitted to the clock mechanism to give sampling intervals of 15 minutes, 30 minutes, 1 hour, or 2 hours.

Extraction of the water sample from the borehole and transfer to the main cabinet was achieved by the use of a separately housed peristaltic pump, powered by a 12v car battery. This was capable of suction lifts of up to 3 metres which was adequate for the majority of boreholes, although in some cases where the water-table was at a depth greater than 3 metres, this was a limiting factor.

The timing and control gears were adjusted before each dilution test began to ensure that the pumping cycle was long enough to collect sufficient water for analysis (i.e. approximately 50 ml.). A reverse pumping cycle was used to purge the suction and delivery tubes and so prevent the contamination of subsequent samples by any water remaining in the tubes.

To protect the equipment from vandalism and to prevent sample interference, the use of the automatic sampling machine was restricted to those observation boreholes which were either well-hidden from view or on land where public entry was restricted.

DETERMINATION OF RHODAMINE WT CONCENTRATION IN GROUNDWATER SAMPLES USING THE TURNER DESIGNS 10 - 005 FLUOROMETER

The fluorometer operates on the principle that all substances, when in solution, selectively absorb light of certain wavelengths. Strongly fluorescent substances (such as Rhodamine WT) convert a high percentage of this absorbed energy into emitted energy and hence fluoresce.

In the fluorometer, groundwater samples containing Rhodamine WT are irradiated by light at the peak absorption wavelength of that dye. If any dye is present in the water the irradiation causes it to fluoresce at a longer wavelength (the maximum emission wavelength). The emitted light is passed through glass filters and its intensity is measured by a photomultiplier.

A fluorometer gives a relative measure of the intensity of light emitted by a solution containing a fluorescent substance. To achieve quantitative estimates of dye concentration, the fluorometer must first be calibrated using standard solutions of known dye concentration.

The fluorescence of Rhodamine WT varies linearly with its concentration in water below 0.1 mg/l. Fluorometer readings therefore vary linearly with concentration below this level, so that a single-point calibration could be used. At dye concentrations greater than 0.1 mg/l, however, fluorometer readings are non-linear and a multi-point calibration, using several standards, is necessary to prepare a calibration curve. It was relatively easy to determine whether a calibration curve was necessary, since at the point where the fluorescence of Rhodamine WT became non-linear, the groundwater samples had a definite pink colour.

Generally, the water samples required no preparation before analysis, although any samples which appeared to contain a large amount of suspended material were first centrifuged for 15 minutes. This procedure was generally only necessary on the first few samples, where surging of the water in the borehole following injection of the dye had disturbed silt and clay at the bottom of the borehole.

The dial readings for a set of samples are converted to concentration in mg/l by three steps. Firstly, the background fluorescence reading of a groundwater sample taken prior to dye injection is subtracted from each sample reading. Secondly, a temperature correction should be applied to each sample reading. Since the standard solutions, blank, and samples were held at the same temperature (i.e. that of the laboratory), this correction was zero in this case. Finally, the corrected sample values are converted to concentration by entering into the calibration curve. No allowance was made for the possible effect on concentration of the removal of sample volumes at each time interval.

APPENDIX A3

COMPUTER PROGRAM

```
**** TSO FOREGROUND HARDCOPY ****
DSNAME=@IGW.SPF.COBOL                                        (WATBAL  )
      C FORT LEV66 RUN  LO('@IGW.SPF.LOAD(IGW)')
      C THIS PROGRAM CALCULATES A DAILY WATER DALANCE USING PRECIPITATION
      C AND POTENTIAL EVAPOTRANSPIRATION DATA.
      C ***************************************************************
      C DEFENITION OF VARIABLES :-
      C DAY = ARRAY CONTAINING DAY NORS
      C MONTH = ARRAY CONTAINING MONTH NORS
      C YEAR = ARRAY CONTAINING YEAR NORS
      C PREC = ARRAY CONTAINING DAILY PRECIPITATION VALUES
      C POTEVP = ARRAY CONTAINING DAILY POTENTIAL EVAPOTRANSPIRATION VALUES
      C ACTEVP = ACTUAL DAILY EVAPOTRANSPIRATION VALUES
      C NEWDIF = EFFECTIVE RAINFALL
      C MS = DAILY MOISTURE SURPLUS
      C CUMMS = CUMULATIVE MOISTURE SURPLUS
      C NEWST = DAILY CHANGE IN SOIL MOISTURE STORAGE
      C NEWSMD = PRESENT SOIL MOISTURE DEPLETION
      C OLDSMD = PREVIOUS DAY'S SOIL MOISTURE DEPLETION
      C NUM = NUMBER OF RECORDS IN INPUT FILE
      C ***************************************************************
      C
      C DATA INITIALISATION.
      C
            INTEGER    DAY(999),MONTH(999),YEAR(999),NUM
            REAL*8     NEWDIF,NEWST,NEWSMD,MS,ACTEVP,POTEVP(999),PREC(999)
           1           CUMMS,OLDSMD
            DATA       ACTEVP,OLDSMD,CUMMS/3*0.0/
      C ***************************************************************
      C START OF EXECUTABLE CODE.
      C ***************************************************************
      C
      C READ IN DATE AND DAILY PRECIPITATION AND POTENTIAL EVAPOTRANSPIRATION
      C DATA.
      C
            DO 10 I=1,999
         10 READ(11,20,END=30) DAY(I),MONTH(I),YEAR(I),PREC(I),POTEVP(I)
         20 FORMAT(2I2,I4,2F5.2)
         30 NUM=I
      C
      C WRITE HEADINGS.
      C
            WRITE(6,40)
         40 FORMAT(55X,'WATER DALANCE CALCULATION')
            WRITE(6,50)
         50 FORMAT(16X,'LOCATION:  RINGWOOD          DATE:  1 JAN 1980  TO  30
           1 JUN 1980')
      C
      C WRITE COLUMN HEADINGS
      C
            WRITE(6,60)
         60 FORMAT(65X,'-------------SOIL MOISTURE-------------'/19X,'DATE',5X,
           1'RAINFALL',2X,'POTEVAP',2X,'EFFRAIN',2X,'ACTEVAP',2X,'STORAGE',2X,
           2'ACC.DEF',2X,'SURPLUS',2X,'CUM.SURPLUS')
      C
      C BEGIN CALCULATIONS.
      C
            DO 140 I=1,NUM
            ACTEVP=POTEVP(I)
            NEWDIF=PREC(I)-POTEVP(I)
            IF(PREC(I).GT.POTEVP(I)) GO TO 90
            IF(OLDSMD.EQ.-150.0) GO TO 80
         70 NEWST=NEWDIF
            GO TO 110
         80 ACTEVP=PREC(I)
            NEWDIF=PREC(I)-ACTEVP
         90 IF(OLDSMD + NEWDIF) 70,100,100
        100 NEWST=DABS(OLDSMD)
        110 MS=NEWDIF-NEWST
            CUMMS=CUMMS+MS
            NEWSMD=OLDSMD+NEWST
            IF(NEWSMD.GE.-150.0) GO TO 120
            NEWSMD=-150.0
      C
      C WRITE DAILY DATA
      C
        120 WRITE(6,130) DAY(I),MONTH(I),YEAR(I),PREC(I),POTEVP(I),NEWDIF,
           1ACTEVP,NEWST,NEWSMD,MS,CUMMS
        130 FORMAT(16X,2(I2,1X),I4,3X,F4.1,6X,F4.1,3X,F7.1,4(2X,F7.1),
           1 4X,F7.1)
      C
      C RESET OLDSMD
      C
            OLDSMD=NEWSMD
        140 CONTINUE
            STOP
            END
```

Program 8.1. The Ringwood Soil Moisture Model

THE EXPANDING-PIT MODEL

A DIGITAL COMPUTER PROGRAM FOR THE ANALYSIS OF GRAVEL PIT DEWATERING

The program, written in FORTRAN for an ICL 2980 computer, described below is intended to form the basis of the analysis of groundwater drawdown around a dewatered gravel pit using a finite-difference method. Many different situations have been studied using this program, though for more complicated situations (such as vertical components of flow) additional statements or subroutines can be added. Such modifications are described by Rushton & Redshaw (1979).

This appendix contains a list of the meanings of the input variables, a listing of the computer program (program 10.1), and a sample of typical input data. Reference should be made to chapter 10, which describes the use of this program for solving dewatering problems.

Input Variables

(a) SPACE, ZETA, TMAX (F10.3, F13.8, F10.3) - These are respectively, the number of mesh intervals for a ten-fold increase in aquifer radius, the mesh increment Δa, and the maximum time interval (in days) allowed at any pit radius. TMAX is included to provide an arbitrary limit to the time taken by the solution at any one pit radius. This can be a particularly useful method of stopping the program when Rwell is at the maximum radius and it is not desired to reach a steady state situation. SPACE and ZETA have been included as input variables to make changing the mesh spacing easier. In the original program values were hard-coded which meant re-compiling the program every time the mesh spacing was changed.

(b) PERM, SCON, SUNCON (3F10.5) - The horizontal hydraulic conductivity, and the confined and unconfined storage coefficients. Which storage coefficient should be used depends upon the drawdown relative to the top of the aquifer. If the height of the water-table at a node is above the top of the aquifer, the confined storage coefficient is used. When the water-table is below the top of the aquifer the unconfined storage coefficient is used.

(c) WELLOS, WELIST (2F10.5) - The well-loss factor and the well-storage factor. These two factors were in the original program for other purposes (Rushton, 1980)[1], but have been left in this program for completeness. Throughout the simulations described in chapter 10 both factors were set to the default of 1.0. WELIST, in particular, has little or no effect on the results because when the pit is dewatered, and the level in the pit remains the same, the well loss factor does not enter into any of the drawdown calculations. Similarly, when the maximum drawdown at the pit radius R(2) is reached, WELLOS does not enter into any more of the calculations so it too has very little real effect on the solution.

(d) RWELL, RWELLM, RMAX (3F10.3) - The initial pit radius, the maximum pit radius, and the radius of the outer boundary of the aquifer.

(e) TOP, BASE, WLEVEL (3F10.5) - These are the height of the top of the aquifer, the height of the base of the aquifer, and the initial height of the water-table (in an unconfined aquifer) below an arbitrary datum level. In the solutions described in chapter 10, the datum level was fixed at the top of the aquifer, i.e. TOP = 0.0 m.

(f) PREC, RCH (2F10.5) - The average daily rainfall and recharge depths.

(g) JFIX (I1) - Specifies the conditions at the outer boundary of the aquifer. There are two choices, either (a) fixed head (JFIX = 1), or (b) free head with no flow across the boundary (JFIX = 2).

(h) NOB (J), J = 1.5 (5I3) - An array of five values corresponding to the node numbers of five 'observation wells' for which drawdown values are output after each time step.

(i) QPUMP, DAT (2F10.3) - The initial pumping rate, and the maximum drawdown at nodes 1 and 2. Any number of these records may be included to represent different pumping phases, or QPUMP may be set to 0.0 to signify the recovery phase. Setting QPUMP to a value less than 0.0 will terminate the program. If more than one of these records is included, a third field, TMAX (f10.3), is specified. This has the same effect as TMAX in (a), setting the duration of subsequent pumping phases.

<u>Sample Input Data</u>

The following input records were used in the simulation of

---

1. Personal communication

Watkins Farm stage 1 which was described in chapter 10. Two pumping phases are specified (records 9 and 10), the second specifying a recovery phase. Record 11 is a trailer record which terminates the program

```
1)  ____18.0_____0.12792139___600.0__
2)  __34.4_______0.12______0.12___
3)  ___1.0_______1.0____
4)  ____10.0_____130.0____1000.0__
5)  ___0.0_______4.6_______2.0____
6)  ___0.0018____0.0004_
7)  2
8)  __2__4__6_12_18
9)  __5000.0_______4.5__
10) _____0.0_______4.5_____400.0__
11) ____-1.0_______4.5_____401.0__
```

```
**** TSO FOREGROUND HARDCOPY ****
DSNAME=DIGW.SPF.COBOL                                          (MODEL    )
C                            EXPANDING-PIT MODEL
C                            -------------------
C
C   NUMERICAL PUMPING TEST. NO VERTICAL FLOW. WATER IN PIT.
C   PIT EXPANDS BY A SERIES OF STEPS UPTO A MAXIMUM RADIUS.
C   PROGRAM CALCULATES DRAWDOWN AND DISCHARGE FROM PIT AT
C   END OF EACH TIME-STEP.
C   IFLAG=1.......RECOVERY PHASE
C   IFLAG=2.......D(1)=DAT
C   IFLAG=3.......D(2)=DAT
C
      DIMENSION R(200),RR(200),D(200),OLDD(200),OLDR(200),T(200),H(200),
     1 RECH(200),A(200),B(200),C(200),E(200),U(200),V(200),NOB(6),
     2 ARRAY(6),VOL(200)
C
C   INPUT PARAMETERS :
C               SPACE   = NUMBER OF MESH INTERVALS FOR 10-FOLD INCREASE
C                         IN PIT RADIUS
C               ZETA      MESH INCREMENT
C               TMAX    = MAX TIME INTERVAL AT ANY PIT RADIUS
C               PERM    = HORIZONTAL PERMEABILITY
C               SCON    = CONFINED STORAGE COEFFICIENT
C               SUNCON  = UNCONFINED STORAGE COEFFICIENT
C               WELLOS  = WELL LOSS FACTOR (DEFAULT=1)
C               WELLST  = WELL STORAGE COEFFICIENT (DEFAULT=1)
C               RWELL   = INITIAL PIT RADIUS
C               RWELLM  = FINAL PIT RADIUS
C               RMAX    = RADIUS OF OUTER BOUNDARY
C               TOP     = HEIGHT OF AQUIFER TOP MEASURED BELOW A DATUM
C               BASE    = HEIGHT OF AQUIFER BASE MEASURED BELOW A DATUM
C               WLEVEL  = HEIGHT OF ORIGINAL WATER TABLE BELOW A DATUM
C               PREC      DAILY PRECIPITATION
C               RCH       DAILY RECHARGE
C
C
C
C
      READ(1,1) SPACE,ZETA,TMAX
    1 FORMAT(F10.3,F11.8,F10.3)
      READ(1,2) PERM,SCON,SUNCON
    2 FORMAT(3F10.5)
      WRITE(2,3) PERM,SCON,SUNCON
    3 FORMAT(1X,'PERMEABILITY = ',E12.4,'     CONFINED STORAGE =',
     1 E12.4,'   UNCONFINED STORAGE =',E12.4)
      READ(1,2) WELLOS,WELLST
      WRITE(2,4) WELLOS,WELLST
    4 FORMAT(1X,'WELL LOSS FACTOR =',F10.4,5X,'STORAGE AT WELL =',
     1 F10.4)
      READ(1,5) RWELL,RWELLM,RMAX
    5 FORMAT(3F10.3)
      WRITE(2,6) RWELL,RWELLM,RMAX
    6 FORMAT(1X,'WELL RADIUS = ',E12.4,' MAX WELL RADIUS =',
     1   E12.4,' OUTER BOUNDARY =',E12.4)
      READ(1,7) TOP,BASE,WLEVEL
    7 FORMAT(3F10.5)
      WRITE(2,8) TOP,BASE,WLEVEL


    8 FORMAT(1X,'TOP OF AQUIFER  =',E12.4,'  BASE OF AQUIFER =',
     1 E12.4,' INITIAL WATER LEVEL =',E12.4)
      READ(1,7) PREC,RCH
      WRITE(2,9) PREC,RCH
    9 FORMAT(1X,'PRECIPITATION    ',E12.4,'  RECHARGE    ',E12.4)
C
C   SET UP RADIAL MESH FOR INITIAL PIT RADIUS
C
      DO 10 N=1,200
      AN=1.0/SPACE*FLOAT(N-2)
      R(N)=RWELL*10.0**AN
      OLDR(N)=R(N)
      IF(R(N).LT.RMAX) GO TO 10
      R(N)=RMAX
      RR(N)=RMAX*RMAX
      NMAX=N
      NMONE=N-1
      NMTWO=N-2
      NM3=N-3
      GO TO 11
   10 RR(N)=R(N)*R(N)
   11 DELA=ZETA
      DELA2=DELA*DELA
C
C   SET UP INITIAL CONDITIONS AT EACH NODE
C   D=UNKNOWN DRAWDOWN
C   OLDD=INITIAL WATER TABLE LEVEL
C
      DO 12 N=1,NMAX
      RECH(N)=RCH
      D(N)=WLEVEL
   12 OLDD(N)=WLEVEL
C
C   SET CONDITION AT OUTER BOUNDARY.
C
      READ(1,13) JFIX
   13 FORMAT(I1)
      IF(JFIX.EQ.1) WRITE(2,14)
      IF(JFIX.NE.1) WRITE(2,15)
   14 FORMAT('   **FIXED BOUNDARY**   ')
   15 FORMAT('   **FREE BOUNDARY**   ')
C
C   ENTER NODE NUMBERS OF FIVE OBSERVATION WELLS
C   OTHER THAN R(1) AND R(NMAX)
C
      READ(1,16) (NOB(J),J=1,5)
   16 FORMAT(5I3)
      IFLAG=0
C
C   ENTER INITIAL ABSTRACTION RATE AND MAX. DRAWDOWN
C
      READ(1,17) QPUMP,DAT
   17 FORMAT(2F10.3)
      WRITE(2,18) QPUMP,DAT
   18 FORMAT(1X,'DISCHARGE   ',E12.4,2X,'TILL DRAWDOWN OF   ',
     1 E12.4,2X,'REACHED')
```

Program 10.1 The Expanding-Pit Model

```
      PI=4.0*ATAN(1.0)
      QABST=(QPUMP-(PREC*PI*RR(2)))/(2.0*PI*DELA)
      IND=0

   SET INITIAL TIME AND DELT

      TIME=0.0
      TIMIN=0.0
      DELT=1.0E-14
      GO TO 23
   19 IFLAG=3

   NEW CYCLE BEGINS. EACH CYCLE REPRESENTS AN INCREMENT IN PIT RADIUS.
   SET UP NEW RADIAL MESH FOR EACH NEW CYCLE AND RESET INITIAL VALUES.

      DO 20 N=1,NMONE
      R(N)=OLDR(N+1)
      D(N)=OLDD(N+1)
      IF(R(N).LT.RMAX) GO TO 20
      R(N)=RMAX
      RR(N)=RMAX*RMAX
      NMAX=N
      NMONE=N-1
      NMTWO=N-2
      NM3=N-3
      GO TO 21
   20 RR(N)=R(N)*R(N)
   21 DO 22 N=1,NMAX
      OLDD(N)=D(N)
   22 OLDR(N)=R(N)
      TIMIN=0.0
      DELT=1.0E-14
C
C  CALCULATE LENGTH OF TIME BETWEEN INCREMENT IN PIT RADIUS.
C
   23 PITVOL=PI*(RR(3)-RR(2))*BASE
      TIMSTOP=PITVOL/500.0
      WRITE(2,24)
   24 FORMAT(1H0)
      DO 25 I=1,5
      I1=NOD(I)
   25 ARRAY(I)=R(I1)
C
C  PRINT REPORT HEADINGS
C
      WRITE(2,26) R(1),(ARRAY(J),J=1,5),R(NMAX)
   26 FORMAT(1X,'TIME  (DAYS)     (PHASE) ',7F12.4,'  DISCHARGE')
      GO TO 28
   27 IF(IFLAG.GE.2) D(1)=OLDD(1)
      IF(IFLAG.EQ.3) D(2)=OLDD(2)
C
C  CALCULATION BEGINS FOR EACH TIME STEP.IND SET TO 100 AT LAST
C  TIME STEP. IF TIME FOR LAST CYCLE IS GREATER THAN TMAX CAL-
C  CULATIONS STOP.
C

   28 TIME=TIME+DELT

      TIMIN=TIMIN+DELT
      IF(TIMIN.GT.TMAX) GO TO 60
      IF(QPUMP.EQ.0.0) IFLAG=1
C
C  CALCULATIONS REPEATED FOUR TIMES FOR CONVERGENCE.
C
      DO 40 NUM=1,4
      DO 30 N=1,NMONE
C
C  CALCULATE AVERAGE SATURATED DEPTH.
C
      SD=BASE-0.5*(D(N)+D(N+1))
      STOR=SUNCON
      IF(SD.LT.(BASE-TOP)) GO TO 29
      SD=BASE-TOP
      STOR=SCON
C
C  H=HORIZONTAL RESISTANCE
C  T=TIME RESISTANCE
C
   29 H(N)=DELA2/(SD*PERM)
   30 T(N)=DELT/(STOR*RR(N))
C
C  CALCULATIONS TO TAKE ACCOUNT OF WATER IN WELL AND OUTER
C  BOUNDARY OF AQUIFER.
C
      H(1)=0.0001*H(1)
      H(2)=H(2)*WELLOS
      T(1)=2.0*DELT*DELA/(RR(2)*WELLST)
      T(2)=2.0*T(2)
      H(NMONE)=(ALOG(R(NMAX))-ALOG(R(NMONE)))*(ALOG(R(NMAX))-ALOG
     1 (R(NMONE)))/(SD*PERM)
      H(NMAX)=1.0E+10
      T(NMONE)=2.0*DELT*DELA/((R(NMAX)-R(NMTWO))*STOR*R(NMONE))
      T(NMAX)=1.0*DELT*DELA/((R(NMAX)-R(NMONE))*STOR*R(NMAX))
      IF(JFIX.EQ.1) T(NMAX)=1.0E-10*T(NMAX)
C
C  GAUSSIAN ELIMINATION.
C  CALCULATION OF COEFFICIENTS. EQUATION IS :
C    -A(N)*D(N-1)+B(N)*D(N)-C(N)*D(N+1)=E(N)
C  IF IFLAG.GE.2  DRAWDOWN AT N(1) KNOWN, OTHERWISE N(1) INCLUDED.
C  IF IFLAG.EQ.3  DRAWDOWN AT N(2) KNOWN, OTHERWISE N(2) INCLUDED.
C  IF IFLAG.EQ.1  RECOVERY PHASE. ALL NODES INCLUDED.
C
      IF(IFLAG.GT.1) GO TO 31
      B(1)=1.0/H(1)+1.0/T(1)
      C(1)=1.0/H(1)
      E(1)=OLDD(1)/T(1)+QABST
   31 IF(IFLAG.GT.2) GO TO 32
      A(2)=1.0/H(1)
      B(2)=1.0/H(1)+1.0/H(2)+1.0/T(2)
      C(2)=1.0/H(2)
      E(2)=OLDD(2)/T(2)-RR(2)*RECH(2)
      IF(IFLAG.EQ.2) E(2)=E(2)+DAT*A(2)
   32 CONTINUE
      DO 33 N=3,NMONE
```

```
      A(N)=1.0/H(N-1)
      B(N)=1.0/H(N-1)+1.0/H(N)+1.0/T(N)
      C(N)=1.0/H(N)
   33 E(N)=OLDD(N)/T(N)-RR(N)*RECH(N)
      A(NMAX)=1.0/H(NMONE)
      B(NMAX)=1.0/H(NMONE)+0.5/T(NMAX)
      E(NMAX)=0.5*OLDD(NMAX)/T(NMAX)-0.5*RR(NMAX)*RECH(NMAX)
      IF(IFLAG.EQ.3) E(3)=E(3)+DAT*A(3)
C
C  ELIMINATION..........FORWARD SOLUTION.
C
      IF(IFLAG.GT.1) GO TO 34
      U(1)=B(1)
      V(1)=E(1)
      U(2)=B(2)-(A(2)*C(1))/U(1)
      IF(U(2).LT.1.0E-50) U(2)=1.0E-50
      V(2)=E(2)+(A(2)*V(1))/U(1)
      IF(V(2).LT.1.0E-50) V(2)=1.0E-50
   34 IF(IFLAG.GT.2) GO TO 35
      U(3)=B(3)-(A(3)*C(2))/U(2)
      IF(U(3).LT.1.0E-50) U(3)=1.0E-50
      V(3)=E(3)+(A(3)*V(2))/U(2)
      IF(V(3).LT.1.0E-50) V(3)=1.0E-50
   35 CONTINUE
      IF(IFLAG.EQ.2) U(2)=B(2)
      IF(IFLAG.EQ.2) V(2)=E(2)
      IF(IFLAG.GT.2) U(3)=B(3)
      IF(IFLAG.GT.2) V(3)=E(3)
      DO 36 N=4,NMAX
      U(N)=B(N)-(A(N)*C(N-1))/U(N-1)
      IF(U(N).LT.1.0E-50) U(N)=1.0E-50
      V(N)=E(N)+(A(N)*V(N-1))/U(N-1)
      IF(V(N).LT.1.0E-50) V(N)=1.0E-50
   36 CONTINUE
C
C  CALCULATE DRAWDOWN AT EACH NODE...........BACKWARD SOLUTION.
C
      D(NMAX)=V(NMAX)/U(NMAX)
      IF(D(NMAX).LT.1.0E-50).OR.(D(NMAX).GT.1.0E+20)) D(NMAX)=1.0E-50
      DO 37 NN=1,NM3
      N=NMONE-NN+1
      D(N)=(V(N)+C(N)*D(N+1))/U(N)
      IF(D(N).LT.1.0E-50).OR.(D(NMAX).GT.1.0E+20)) D(N)=1.0E-50
   37 CONTINUE
      IF(IFLAG.GT.2) GO TO 39
      D(2)=(V(2)+C(2)*D(3))/U(2)
      IF(D(2).LT.1.0E-50).OR.(D(NMAX).GT.1.0E+20)) D(2)=1.0E-50
      IF(D(2).GT.DAT) D(2)=DAT
      IF(IFLAG.EQ.2) GO TO 39
      D(1)=(V(1)+C(1)*D(2))/U(1)
      IF(D(1).LT.1.0E-50).OR.(D(NMAX).GT.1.0E+20)) D(1)=1.0E-50
      IF(IFLAG.EQ.1) GO TO 40
      IF(D(1).LE.DAT) GO TO 39
      IFLAG=2
      D(1)=DAT
C
C  OUTPUT TIME TAKEN TO DEWATER PIT
C
      WRITE(2,38) TIMIN
   38 FORMAT('  **TIME TO DEWATER PIT =',E12.4,'  DAYS**')
C
C  CALCULATE VOL AQUIFER DEWATERED AND VOLUME OF WATER ABSTRACTED
C  FROM AQUIFER WHEN PIT DEWATERED.
C
      CALL VOLUMES (RR,NMAX,D,VOL,PI,STOR)
   39 CONTINUE
      IF(D(2).EQ.DAT) IFLAG=3
C
C  CALCULATE DISCHARGE FROM PIT.
C
      IF(IFLAG.LT.3) QPUMPI=(D(1)-D(2))*2.0*PI*DELA/H(1)
      IF(IFLAG.EQ.3) QPUMPI=(D(2)-D(3))*2.0*PI*DELA/H(2)
   40 CONTINUE
C
C  PRINT RESULTS AFTER EACH TIME-STEP.
C
      DO 41 I=1,5
      I1=NOB(I)
   41 ARRAY(I)=D(I1)
      IF(IFLAG.EQ.1) GO TO 42
      WRITE(2,43) TIME,TIMIN,D(1),(ARRAY(J),J=1,5),D(NMAX),QPUM PI
      GO TO 44
   42 WRITE(2,43) TIME,TIMIN,D(1),(ARRAY(J),J=1,5),D(NMAX)
   43 FORMAT(1X,10E12.4)
C
C  CALCULATE NEXT TIME INCREMENT.
C
   44 DELT=TIMIN*0.25892
      IF(TIMIN.GE.5.0000) DELT=1.0
      IF(TIMIN.GE.60.0000) DELT=7.0
      IF(OLDD(2).LT.RWELLM) GO TO 48
      IF(IFLAG - 1) 48,48,45
C
C  IF PIT AT MAX RADIUS, CHECK WHETHER EQUILIBRIUM CONDITIONS
C  REACHED. IF YES, STOP CALCULATIONS.
C
   45 DO 47 N=1,NMAX
      IF(D(N).EQ.OLDD(N)) GO TO 46
      GO TO 48
   46 IF(R(N).LT.R(NMAX)) GO TO 47
      IND=100
      GO TO 54
   47 CONTINUE
C
C  UPDATE INITIAL DRAWDOWN AT EACH NODE FOR NEXT TIME-STEP.
C
   48 DO 49 N=1,NMAX
   49 OLDD(N)=D(N)
C
C  IF RWELL < RWELLM, CHECK WHETHER REQUIRED DRAWDOWN DAT REACHED.
C  IF NO, CALCULATIONS CONTINUE. CALCULATIONS FOR RECOVERY PHASE
C  CONTINUE UNTIL TIME INCREMENT = OR > TMAX.
```

```
      IF(OLDR(2).GE.RWELLM) GO TO 50
      IF(TIMIN.GE.TIMSTOP).AND.(D(1).EQ.DAT)) GO TO 54
   50 IF(IFLAG - 1) 51,52,51
   51 GO TO 27
   52 IF(TIMIN - TMAX) 51,53,53
   53 IND=100
C
C     END OF CALCULATIONS FOR EACH CYCLE. OUTPUT RESULTS FOR
C     LAST TIME STEP.
C
   54 WRITE(2,24)
      WRITE(2,55)
   55 FORMAT(1X,'NODE NO.',4X,'RADIUS',14X,'RADIUS SQUARED',6X,
     1 'HORIZ HYD RES',7X,'TIME RESISTANCE',5X,'DRAWDOWN')
      DO 56 N=1,NMAX
   56 WRITE(2,57) N,R(N),RR(N),H(N),T(N),OLDD(N)
   57 FORMAT(1X,I4,5E20.6)
      WRITE(2,24)
C
C     CALCULATE VOL AQUIFER DEWATERED AND VOLUME OF WATER ABSTRACTED
C     FROM AQUIFER AT END OF EACH CYCLE.
C
      CALL VOLUMES (RR,NMAX,D,VOL,PI,STOR)
      WRITE(2,24)
C
C     IF RWELL < RWELLM, CALCULATION CONTINUES. IF NOT A NEW PUMPING
C     PHASE BEGINS. RESET INITIAL PARAMETERS.
C
      IF(IND.EQ.0) GO TO 19
      DELT=1.0E-14
      IND=0
      TIMIN=0
      IFLAG=0
      READ(1,17) QPUMP,DAT,TMAX
      IF(QPUMP.GT.0.0) WRITE(2,18) QPUMP,DAT
      IF(QPUMP.NE.0.0) GO TO 59
      WRITE(2,58) QPUMP,TMAX
   58 FORMAT(1X,'RECOVERY PHASE:PUMPING RATE = ',E12.4,
     1 2X,'TILL TIME OF ',E12.4,' DAYS')
      WRITE(2,24)
   59 QABST=(QPUMP-(PREC*PI*RR(2)))/(2.0*PI*DELA)
      IF(QPUMP.GE.0.0) GO TO 27
   60 STOP
      END
```

```
C
C     SUBROUTINES VOLUMES CALCULATES VOLUME OF AQUIFER DEWATERED (VA) AND
C     VOLUME OF WATER ABSTRACTED FROM AQUIFER (VW).
C
      SUBROUTINE VOLUMES (RAD,I,DRAW,CAP,PHI,SPY)
      DIMENSION RAD(I),DRAW(I),CAP(I)
      VA=0.0
      DO 61 N=3,I
      CAP(N)=PHI*(RAD(N)-RAD(N-1))*((DRAW(N)+DRAW(N-1))/2)
      VA=VA+CAP(N)
   61 CONTINUE
      VW=VA*SPY
      WRITE(2,62) VA,VW
   62 FORMAT(1X,'VOLUME OF AQUIFER DEWATERED = ',E20.10,
     1 4X,'VOLUME OF WATER ABSTRACTED = ',E20.10)
      RETURN
      END
```

APPENDIX 4

TABLES RELEVANT TO CHAPTER 8

**** TSO FOREGROUND HARDCOPY ****
DSNAME=BIGW.WATBAL

WATER BALANCE CALCULATION

LOCATION: RINGWOOD DATE: 1 JAN 1979 TO 31 DEC 1979

DATE	RAINFALL	POTEVAP	EFFRAIN	ACTEVAP	SOIL MOISTURE STORAGE	SOIL MOISTURE ACC.DEF	SOIL MOISTURE SURPLUS	SOIL MOISTURE CUM.SURPLUS
1 1 1979	0.0	0.7	-0.7	0.7	-0.7	-0.7	0.0	0.0
2 1 1979	0.0	0.7	-0.7	0.7	-0.7	-1.4	0.0	0.0
3 1 1979	0.0	0.9	-0.9	0.9	-0.9	-2.3	0.0	0.0
4 1 1979	0.0	0.9	-0.9	0.9	-0.9	-3.2	0.0	0.0
5 1 1979	0.3	0.9	-0.6	0.9	-0.6	-3.8	0.0	0.0
6 1 1979	2.7	0.9	1.8	0.9	1.8	-2.0	0.0	0.0
7 1 1979	1.3	0.9	0.4	0.9	0.4	-1.6	0.0	0.0
8 1 1979	10.0	0.9	9.1	0.9	1.6	0.0	7.5	7.5
9 1 1979	3.1	0.9	2.2	0.9	0.0	0.0	2.2	9.7
10 1 1979	0.0	0.6	-0.6	0.6	-0.6	-0.6	0.0	9.7
11 1 1979	0.0	0.6	-0.6	0.6	-0.6	-1.2	0.0	9.7
12 1 1979	0.3	0.6	-0.3	0.6	-0.3	-1.5	0.0	9.7
13 1 1979	0.7	0.6	0.1	0.6	0.1	-1.4	0.0	9.7
14 1 1979	0.0	0.6	-0.5	0.6	-0.6	-2.0	0.0	9.7
15 1 1979	2.1	0.6	1.5	0.6	1.5	-0.5	0.0	9.7
16 1 1979	1.7	0.5	1.1	0.6	0.5	0.0	0.6	10.3
17 1 1979	0.0	0.5	-0.5	0.5	-0.5	-0.5	0.0	10.3
18 1 1979	28.2	0.5	27.7	0.5	0.5	0.0	27.2	37.5
19 1 1979	0.0	0.5	-0.5	0.5	-0.5	-0.5	0.0	37.5
20 1 1979	0.0	0.5	-0.5	0.5	-0.5	-1.0	0.0	37.5
21 1 1979	3.7	0.5	3.2	0.5	1.0	0.0	2.2	39.7
22 1 1979	2.2	0.5	1.7	0.5	0.0	0.0	1.7	41.4
23 1 1979	0.0	0.5	-0.5	0.5	-0.5	-0.5	0.0	41.4
24 1 1979	4.5	0.7	3.8	0.7	0.5	0.0	3.3	44.7
25 1 1979	0.0	0.7	-0.7	0.7	-0.7	-0.7	0.0	44.7
26 1 1979	0.0	0.7	-0.7	0.7	-0.7	-1.4	0.0	44.7
27 1 1979	7.1	0.7	6.4	0.7	1.4	0.0	5.0	49.7
28 1 1979	3.3	0.7	2.6	0.7	0.0	0.0	2.6	52.3
29 1 1979	0.0	0.7	-0.7	0.7	-0.7	-0.7	0.0	52.3
30 1 1979	2.8	0.7	2.1	0.7	0.7	0.0	1.4	53.7
31 1 1979	6.2	0.9	5.3	0.9	0.0	0.0	5.3	59.0
1 2 1979	0.0	0.9	-0.9	0.9	-0.9	-0.9	0.0	59.0
2 2 1979	0.0	0.9	-0.9	0.9	-0.9	-1.8	0.0	59.0
3 2 1979	0.2	0.9	-0.7	0.9	-0.7	-2.5	0.0	59.0
4 2 1979	0.0	0.9	-0.9	0.9	-0.9	-3.4	0.0	59.0
5 2 1979	13.0	0.9	12.1	0.9	3.4	0.0	8.7	67.7
6 2 1979	2.0	0.9	1.1	0.9	0.0	0.0	1.1	68.8
7 2 1979	3.0	0.5	2.5	0.5	0.0	0.0	2.5	71.3
8 2 1979	7.2	0.5	6.7	0.5	0.0	0.0	6.7	78.0
9 2 1979	2.9	0.5	2.4	0.5	0.0	0.0	2.4	80.4
10 2 1979	1.4	0.5	0.9	0.5	0.0	0.0	0.9	81.3
11 2 1979	7.7	0.5	7.2	0.5	0.0	0.0	7.2	88.5
12 2 1979	5.2	0.5	4.7	0.5	0.0	0.0	4.7	93.2
13 2 1979	0.0	0.5	-0.5	0.5	-0.5	-0.5	0.0	93.2
14 2 1979	0.3	0.6	-0.3	0.6	-0.3	-0.8	0.0	93.2
15 2 1979	0.0	0.6	-0.6	0.6	-0.6	-1.4	0.0	93.2
16 2 1979	0.0	0.6	-0.6	0.6	-0.6	-2.0	0.0	93.2
17 2 1979	2.0	0.6	1.4	0.6	1.4	-0.6	0.0	93.2
18 2 1979	0.2	0.6	-0.4	0.6	-0.4	-1.0	0.0	93.2
19 2 1979	0.0	0.5	-0.5	0.6	-0.6	-1.5	0.0	93.2
20 2 1979	1.4	0.6	0.8	0.6	0.8	-0.8	0.0	93.2

DATE	RAINFALL	POTEVAP	EFFRAIN	ACTEVAP	SOIL MOISTURE STORAGE	SOIL MOISTURE ACC.DEF	SOIL MOISTURE SURPLUS	SOIL MOISTURE CUM.SURPLUS
21 2 1979	0.0	1.1	-1.1	1.1	-1.1	-1.9	0.0	93.2
22 2 1979	0.0	1.1	-1.1	1.1	-1.1	-3.0	0.0	93.2
23 2 1979	0.0	1.1	-1.1	1.1	-1.1	-4.1	0.0	93.2
24 2 1979	0.0	1.1	-1.1	1.1	-1.1	-5.2	0.0	93.2
25 2 1979	0.0	1.1	-1.1	1.1	-1.1	-6.3	0.0	93.2
26 2 1979	1.6	1.1	0.5	1.1	0.5	-5.8	0.0	93.2
27 2 1979	0.0	1.1	-1.1	1.1	-1.1	-6.9	0.0	93.2
28 2 1979	0.5	2.3	-1.8	2.3	-1.8	-8.7	0.0	93.2
1 3 1979	0.0	2.2	-2.2	2.2	-2.2	-10.9	0.0	93.2
2 3 1979	4.8	0.8	4.0	0.8	4.0	-6.9	0.0	93.2
3 3 1979	0.0	0.7	-0.7	0.7	-0.7	-7.6	0.0	93.2
4 3 1979	0.0	2.9	-2.9	2.9	-2.9	-10.5	0.0	93.2
5 3 1979	13.4	2.4	11.0	2.4	10.5	0.0	0.5	93.7
6 3 1979	0.0	1.3	-1.3	1.3	-1.3	-1.3	0.0	93.7
7 3 1979	2.4	3.1	-0.7	3.1	-0.7	-2.0	0.0	93.7
8 3 1979	1.6	2.4	-0.8	2.4	-0.8	-2.8	0.0	93.7
9 3 1979	5.7	1.3	4.4	1.3	2.8	0.0	1.6	95.3
10 3 1979	0.5	0.7	-0.2	0.7	-0.2	-0.2	0.0	95.3
11 3 1979	1.0	0.6	0.4	0.6	0.2	0.0	0.2	95.5
12 3 1979	4.5	2.2	2.3	2.2	0.0	0.0	2.3	97.8
13 3 1979	0.4	0.6	-0.2	0.6	-0.2	-0.2	0.0	97.8
14 3 1979	0.9	0.4	0.5	0.4	0.2	0.0	0.3	98.1
15 3 1979	0.4	0.4	0.0	0.4	0.0	0.0	0.0	98.1
16 3 1979	3.3	0.7	2.6	0.7	0.0	0.0	2.6	100.7
17 3 1979	1.1	2.0	-0.9	2.0	-0.9	-0.9	0.0	100.7
18 3 1979	0.7	1.1	-0.4	1.1	-0.4	-1.3	0.0	100.7
19 3 1979	1.9	0.5	1.4	0.5	1.3	0.0	0.1	100.8
20 3 1979	1.7	2.5	-0.8	2.5	-0.8	-0.8	0.0	100.8
21 3 1979	0.0	3.0	-3.0	3.0	-3.0	-3.8	0.0	100.8
22 3 1979	0.0	2.5	-2.5	2.5	-2.5	-6.3	0.0	100.8
23 3 1979	16.5	3.4	13.1	3.4	6.3	0.0	6.8	107.6
24 3 1979	2.6	1.5	1.1	1.5	0.0	0.0	1.1	108.7
25 3 1979	2.9	0.9	2.0	0.8	0.0	0.0	2.0	110.7
26 3 1979	2.5	1.0	1.5	1.0	0.0	0.0	1.5	112.2
27 3 1979	0.5	2.2	-1.7	2.2	-1.7	-1.7	0.0	112.2
28 3 1979	0.3	3.1	-2.8	3.1	-2.8	-4.5	0.0	112.2
29 3 1979	0.0	0.9	-0.8	0.6	-0.8	-5.3	0.0	112.2
30 3 1979	0.0	1.3	-1.3	1.3	-1.3	-6.6	0.0	112.2
31 3 1979	1.5	0.6	0.9	0.6	0.9	-5.7	0.0	112.2
1 4 1979	1.6	3.0	-1.4	3.0	-1.4	-7.1	0.0	112.2
2 4 1979	3.6	1.0	2.6	1.0	2.6	-4.5	0.0	112.2
3 4 1979	1.4	2.4	-1.0	2.4	-1.0	-5.5	0.0	112.2
4 4 1979	0.6	2.0	-1.4	2.0	-1.4	-6.9	0.0	112.2
5 4 1979	0.0	1.7	-1.7	1.7	-1.7	-8.6	0.0	112.2
6 4 1979	7.5	2.3	5.2	2.3	5.2	-3.4	0.0	112.2
7 4 1979	2.5	0.9	1.6	0.9	1.6	-1.8	0.0	112.2
8 4 1979	11.1	2.4	8.7	2.4	1.8	0.0	6.9	119.1
9 4 1979	5.3	1.2	4.1	1.2	0.0	0.0	4.1	123.2
10 4 1979	1.1	0.5	0.6	0.5	0.0	0.0	0.6	123.8
11 4 1979	5.5	2.0	3.5	2.0	0.0	0.0	3.5	127.3
12 4 1979	0.0	3.0	-3.0	3.0	-3.0	-3.0	0.0	127.3
13 4 1979	0.0	3.2	-3.2	3.2	-3.2	-6.2	0.0	127.3
14 4 1979	0.0	3.3	-3.3	3.3	-3.3	-9.5	0.0	127.3
15 4 1979	0.0	3.3	-3.3	3.3	-3.3	-12.8	0.0	127.3
16 4 1979	0.0	3.1	-3.1	3.1	-3.1	-15.9	0.0	127.3
17 4 1979	0.0	2.5	-2.5	2.5	-2.5	-18.4	0.0	127.3
18 4 1979	0.2	3.4	-3.2	3.4	-3.2	-21.6	0.0	127.3
19 4 1979	0.1	1.4	-1.3	1.4	-1.3	-22.9	0.0	127.3
20 4 1979	0.1	2.2	-2.1	2.2	-2.1	-25.0	0.0	127.3

Table 8.1 Daily soil moisture balance results (1st Jan.1979 to 31st Dec. 1979) using the Ringwood Soil Moisture Model

DATE	RAINFALL	POTEVAP	EFFRAIN	ACTEVAP	SOIL MOISTURE			
					STORAGE	ACC.DEF	SURPLUS	CUM.SURPLUS
21 4 1979	7.5	1.0	6.5	1.0	6.5	-18.5	0.0	127.3
22 4 1979	7.6	3.0	4.6	3.0	4.6	-13.9	0.0	127.3
23 4 1979	0.7	1.2	-0.5	1.2	-0.5	-14.4	0.0	127.3
24 4 1979	0.3	2.3	-2.0	2.3	-2.0	-16.4	0.0	127.3
25 4 1979	0.9	3.7	-2.8	3.7	-2.8	-19.2	0.0	127.3
26 4 1979	1.1	3.8	-2.7	3.8	-2.7	-21.9	0.0	127.3
27 4 1979	0.0	3.0	-3.0	3.0	-3.0	-24.9	0.0	127.3
28 4 1979	0.0	2.0	-2.0	2.0	-2.0	-26.9	0.0	127.3
29 4 1979	0.3	1.4	-1.1	1.4	-1.1	-28.0	0.0	127.3
30 4 1979	16.4	4.6	11.8	4.6	11.8	-16.2	0.0	127.3
1 5 1979	0.1	1.3	-1.2	1.3	-1.2	-17.4	0.0	127.3
2 5 1979	0.0	2.5	-2.5	2.5	-2.5	-19.9	0.0	127.3
3 5 1979	0.0	2.4	-2.4	2.4	-2.4	-22.3	0.0	127.3
4 5 1979	0.8	2.4	-1.6	2.4	-1.6	-23.9	0.0	127.3
5 5 1979	0.0	2.1	-2.1	2.1	-2.1	-26.0	0.0	127.3
6 5 1979	0.0	2.5	-2.5	2.5	-2.5	-28.5	0.0	127.3
7 5 1979	0.0	2.4	-2.4	2.4	-2.4	-30.9	0.0	127.3
8 5 1979	0.0	2.7	-2.7	2.7	-2.7	-33.6	0.0	127.3
9 5 1979	8.5	1.9	6.6	1.9	6.6	-27.0	0.0	127.3
10 5 1979	0.0	1.2	-1.2	1.2	-1.2	-28.2	0.0	127.3
11 5 1979	0.0	0.6	-0.6	0.6	-0.6	-28.8	0.0	127.3
12 5 1979	0.0	0.8	-0.8	0.8	-0.8	-29.6	0.0	127.3
13 5 1979	0.0	2.1	-2.1	2.1	-2.1	-31.7	0.0	127.3
14 5 1979	0.0	3.4	-3.4	3.4	-3.4	-35.1	0.0	127.3
15 5 1979	2.7	2.9	-0.2	2.9	-0.2	-35.3	0.0	127.3
16 5 1979	0.0	1.4	-1.4	1.4	-1.4	-36.7	0.0	127.3
17 5 1979	0.0	2.5	-2.5	2.5	-2.5	-39.2	0.0	127.3
18 5 1979	0.6	3.3	-2.7	3.3	-2.7	-41.9	0.0	127.3
19 5 1979	16.1	4.2	11.9	4.2	11.9	-30.0	0.0	127.3
20 5 1979	12.3	0.7	11.6	0.7	11.6	-18.4	0.0	127.3
21 5 1979	7.7	2.5	5.2	2.5	5.2	-13.2	0.0	127.3
22 5 1979	5.2	2.7	2.5	2.7	2.5	-10.7	0.0	127.3
23 5 1979	0.2	3.6	-3.4	3.6	-3.4	-14.1	0.0	127.3
24 5 1979	9.8	3.2	6.6	3.2	6.6	-7.5	0.0	127.3
25 5 1979	6.7	2.8	3.9	2.8	3.9	-3.6	0.0	127.3
26 5 1979	0.0	1.8	-1.8	1.8	-1.8	-5.4	0.0	127.3
27 5 1979	15.7	3.7	13.0	3.7	5.4	0.0	7.6	134.9
28 5 1979	8.5	1.0	7.6	1.0	0.0	0.0	7.6	142.5
29 5 1979	3.6	2.3	1.3	2.3	0.0	0.0	1.3	143.8
30 5 1979	0.0	0.6	-0.6	0.6	-0.6	-0.6	0.0	143.8
31 5 1979	2.0	1.2	0.8	1.2	0.6	0.0	0.2	144.0
1 6 1979	0.0	4.8	-4.8	4.8	-4.8	-4.8	0.0	144.0
2 6 1979	0.0	2.4	-2.4	2.4	-2.4	-7.2	0.0	144.0
3 6 1979	0.0	0.8	-0.8	0.8	-0.8	-8.0	0.0	144.0
4 6 1979	0.0	1.0	-1.0	1.0	-1.0	-9.0	0.0	144.0
5 6 1979	2.2	2.8	-0.6	2.8	-0.6	-9.6	0.0	144.0
6 6 1979	1.5	3.9	-2.4	3.9	-2.4	-12.0	0.0	144.0
7 6 1979	1.0	2.7	-1.7	2.7	-1.7	-13.7	0.0	144.0
8 6 1979	0.0	0.9	-0.9	0.9	-0.9	-14.6	0.0	144.0
9 6 1979	2.6	2.0	0.6	2.0	0.6	-14.0	0.0	144.0
10 6 1979	0.0	0.8	-0.8	0.8	-0.8	-14.8	0.0	144.0
11 6 1979	12.2	3.3	8.9	3.3	8.9	-5.9	0.0	144.0
12 6 1979	3.5	0.6	2.9	0.6	2.9	-3.0	0.0	144.0
13 6 1979	0.1	1.8	-1.7	1.8	-1.7	-4.7	0.0	144.0
14 6 1979	0.6	1.3	-0.7	1.3	-0.7	-5.4	0.0	144.0
15 6 1979	0.0	3.6	-3.6	3.6	-3.6	-9.0	0.0	144.0
16 6 1979	0.0	4.2	-4.2	4.2	-4.2	-13.2	0.0	144.0
17 6 1979	0.0	1.0	-1.0	1.0	-1.0	-14.2	0.0	144.0
18 6 1979	0.0	3.3	-3.3	3.3	-3.3	-17.5	0.0	144.0

DATE	RAINFALL	POTEVAP	EFFRAIN	ACTEVAP	SOIL MOISTURE			
					STORAGE	ACC.DEF	SURPLUS	CUM.SURPLUS
19 6 1979	0.0	5.2	-5.2	5.2	-5.2	-22.7	0.0	144.0
20 6 1979	0.6	2.7	-2.1	2.7	-2.1	-24.8	0.0	144.0
21 6 1979	0.0	2.7	-2.7	2.7	-2.7	-27.5	0.0	144.0
22 6 1979	1.8	4.9	-3.1	4.9	-3.1	-30.6	0.0	144.0
23 6 1979	3.3	2.2	1.1	2.2	1.1	-29.5	0.0	144.0
24 6 1979	2.3	3.3	-1.0	3.3	-1.0	-30.5	0.0	144.0
25 6 1979	0.0	1.8	-1.8	1.8	-1.8	-32.3	0.0	144.0
26 6 1979	0.0	1.5	-1.5	1.5	-1.5	-33.8	0.0	144.0
27 6 1979	0.0	3.9	-3.9	3.9	-3.9	-37.7	0.0	144.0
28 6 1979	0.0	1.7	-1.7	1.7	-1.7	-39.4	0.0	144.0
29 6 1979	0.0	3.5	-3.5	3.5	-3.5	-42.9	0.0	144.0
30 6 1979	0.0	1.1	-1.1	1.1	-1.1	-44.0	0.0	144.0
1 7 1979	0.0	4.8	-4.8	4.8	-4.8	-48.8	0.0	144.0
2 7 1979	0.0	4.5	-4.5	4.5	-4.5	-53.3	0.0	144.0
3 7 1979	0.0	4.2	-4.2	4.2	-4.2	-57.5	0.0	144.0
4 7 1979	0.0	4.2	-4.2	4.2	-4.2	-61.7	0.0	144.0
5 7 1979	0.0	4.7	-4.7	4.7	-4.7	-66.4	0.0	144.0
6 7 1979	0.0	4.7	-4.7	4.7	-4.7	-71.1	0.0	144.0
7 7 1979	0.2	3.3	-3.1	3.3	-3.1	-74.2	0.0	144.0
8 7 1979	0.0	2.9	-2.9	2.9	-2.9	-77.1	0.0	144.0
9 7 1979	0.0	4.1	-4.1	4.1	-4.1	-81.2	0.0	144.0
10 7 1979	0.0	4.0	-4.0	4.0	-4.0	-85.2	0.0	144.0
11 7 1979	0.0	1.8	-1.8	1.8	-1.8	-87.0	0.0	144.0
12 7 1979	0.0	3.6	-3.6	3.6	-3.6	-90.6	0.0	144.0
13 7 1979	0.2	4.8	-4.6	4.8	-4.6	-95.2	0.0	144.0
14 7 1979	0.0	4.5	-4.5	4.5	-4.5	-99.7	0.0	144.0
15 7 1979	0.0	2.5	-2.5	2.5	-2.5	-102.2	0.0	144.0
16 7 1979	0.0	2.4	-2.4	2.4	-2.4	-104.6	0.0	144.0
17 7 1979	0.2	4.9	-4.7	4.9	-4.7	-109.3	0.0	144.0
18 7 1979	0.0	2.5	-2.5	2.5	-2.5	-111.8	0.0	144.0
19 7 1979	0.0	1.9	-1.9	1.9	-1.9	-113.7	0.0	144.0
20 7 1979	0.0	4.8	-4.8	4.8	-4.8	-118.5	0.0	144.0
21 7 1979	0.0	3.6	-3.6	3.6	-3.6	-122.1	0.0	144.0
22 7 1979	0.1	3.7	-3.6	3.7	-3.6	-125.7	0.0	144.0
23 7 1979	0.0	3.1	-3.1	3.1	-3.1	-128.8	0.0	144.0
24 7 1979	0.0	4.7	-4.7	4.7	-4.7	-133.5	0.0	144.0
25 7 1979	0.0	3.3	-3.3	3.3	-3.3	-136.8	0.0	144.0
26 7 1979	0.0	3.3	-3.3	3.3	-3.3	-140.1	0.0	144.0
27 7 1979	18.3	4.3	14.0	4.3	14.0	-126.1	0.0	144.0
28 7 1979	4.1	2.6	1.5	2.6	1.5	-124.6	0.0	144.0
29 7 1979	4.7	2.1	2.6	2.1	2.6	-122.0	0.0	144.0
30 7 1979	5.4	1.6	3.8	1.6	3.8	-118.2	0.0	144.0
31 7 1979	0.1	3.8	-3.7	3.8	-3.7	-121.9	0.0	144.0
1 8 1979	0.0	3.7	-3.7	3.7	-3.7	-125.6	0.0	144.0
2 8 1979	0.8	3.1	-2.3	3.1	-2.3	-127.9	0.0	144.0
3 8 1979	0.0	2.4	-2.4	2.4	-2.4	-130.3	0.0	144.0
4 8 1979	0.0	3.5	-3.5	3.5	-3.5	-133.8	0.0	144.0
5 8 1979	0.5	3.5	-3.0	3.5	-3.0	-136.8	0.0	144.0
6 8 1979	0.5	2.2	-1.7	2.2	-1.7	-138.5	0.0	144.0
7 8 1979	13.1	1.7	11.4	1.7	11.4	-127.1	0.0	144.0
8 8 1979	0.0	3.1	-3.1	3.1	-3.1	-130.2	0.0	144.0
9 8 1979	3.0	3.3	-0.3	3.3	-0.3	-130.5	0.0	144.0
10 8 1979	0.0	2.4	-2.4	2.4	-2.4	-132.9	0.0	144.0
11 8 1979	1.3	1.9	-0.6	1.9	-0.6	-133.5	0.0	144.0
12 8 1979	4.4	1.7	2.7	1.7	2.7	-130.8	0.0	144.0
13 8 1979	0.0	0.7	-0.7	0.7	-0.7	-131.5	0.0	144.0
14 8 1979	0.0	4.2	-4.2	4.2	-4.2	-135.7	0.0	144.0
15 8 1979	10.8	2.6	8.2	2.6	8.2	-127.5	0.0	144.0
16 8 1979	0.0	2.6	-2.6	2.6	-2.6	-130.1	0.0	144.0

DATE	RAINFALL	POTEVAP	EFFRAIN	ACTEVAP	SOIL MOISTURE STORAGE	ACC.DEF	SURPLUS	CUM.SURPLUS
17 8 1979	0.4	1.8	-1.4	1.8	-1.4	-131.5	0.0	144.0
18 8 1979	0.0	1.7	-1.7	1.7	-1.7	-133.2	0.0	144.0
19 8 1979	1.1	1.6	-0.5	1.6	-0.5	-133.7	0.0	144.0
20 8 1979	0.0	3.5	-3.5	3.5	-3.5	-137.2	0.0	144.0
21 8 1979	0.0	3.7	-3.7	3.7	-3.7	-140.9	0.0	144.0
22 8 1979	4.4	2.4	2.0	2.4	2.0	-138.9	0.0	144.0
23 8 1979	3.9	2.0	1.9	2.0	1.9	-137.0	0.0	144.0
24 8 1979	3.2	2.5	0.7	2.5	0.7	-136.3	0.0	144.0
25 8 1979	0.0	1.0	-1.0	1.0	-1.0	-137.3	0.0	144.0
26 8 1979	0.0	2.1	-2.1	2.1	-2.1	-139.4	0.0	144.0
27 8 1979	0.0	3.1	-3.1	3.1	-3.1	-142.5	0.0	144.0
28 8 1979	0.0	3.4	-3.4	3.4	-3.4	-145.9	0.0	144.0
29 8 1979	0.0	3.4	-3.4	3.4	-3.4	-149.3	0.0	144.0
30 8 1979	0.0	3.7	-3.7	3.7	-3.7	-150.0	0.0	144.0
31 8 1979	1.8	0.8	1.0	0.8	1.0	-149.0	0.0	144.0
1 9 1979	1.6	2.0	-0.4	2.0	-0.4	-149.4	0.0	144.0
2 9 1979	0.0	3.3	-3.3	3.3	-3.3	-150.0	0.0	144.0
3 9 1979	0.0	1.2	0.0	0.0	0.0	-150.0	0.0	144.0
4 9 1979	0.0	2.9	0.0	0.0	0.0	-150.0	0.0	144.0
5 9 1979	0.0	3.0	0.0	0.0	0.0	-150.0	0.0	144.0
6 9 1979	0.0	2.5	0.0	0.0	0.0	-150.0	0.0	144.0
7 9 1979	0.1	2.7	0.0	0.1	0.0	-150.0	0.0	144.0
8 9 1979	0.0	2.3	0.0	0.0	0.0	-150.0	0.0	144.0
9 9 1979	0.0	0.9	0.0	0.0	0.0	-150.0	0.0	144.0
10 9 1979	0.0	0.9	0.0	0.0	0.0	-150.0	0.0	144.0
11 9 1979	0.0	2.9	0.0	0.0	0.0	-150.0	0.0	144.0
12 9 1979	0.0	1.7	0.0	0.0	0.0	-150.0	0.0	144.0
13 9 1979	0.0	3.6	0.0	0.0	0.0	-150.0	0.0	144.0
14 9 1979	0.0	3.4	0.0	0.0	0.0	-150.0	0.0	144.0
15 9 1979	0.0	3.5	0.0	0.0	0.0	-150.0	0.0	144.0
16 9 1979	0.0	[illegible]	0.0	0.0	0.0	-150.0	0.0	144.0
17 9 1979	4.3	3.0	1.3	3.0	1.3	-148.7	0.0	144.0
18 9 1979	4.0	0.8	3.2	0.8	3.2	-145.5	0.0	144.0
19 9 1979	0.0	2.3	-2.3	2.3	-2.3	-147.8	0.0	144.0
20 9 1979	1.3	2.3	-1.0	2.3	-1.0	-148.8	0.0	144.0
21 9 1979	0.0	2.3	-2.3	2.3	-2.3	-150.0	0.0	144.0
22 9 1979	1.0	2.3	0.0	1.0	0.0	-150.0	0.0	144.0
23 9 1979	0.0	2.3	0.0	0.0	0.0	-150.0	0.0	144.0
24 9 1979	0.1	2.3	0.0	0.1	0.0	-150.0	0.0	144.0
25 9 1979	1.5	2.3	0.0	1.5	0.0	-150.0	0.0	144.0
26 9 1979	0.0	1.1	0.0	0.0	0.0	-150.0	0.0	144.0
27 9 1979	0.0	2.3	0.0	0.0	0.0	-150.0	0.0	144.0
28 9 1979	0.0	3.0	0.0	0.0	0.0	-150.0	0.0	144.0
29 9 1979	0.1	1.7	0.0	0.1	0.0	-150.0	0.0	144.0
30 9 1979	0.0	0.9	0.0	0.0	0.0	-150.0	0.0	144.0
1 10 1979	0.2	3.2	0.0	0.2	0.0	-150.0	0.0	144.0
2 10 1979	1.5	3.5	0.0	1.5	0.0	-150.0	0.0	144.0
3 10 1979	0.0	0.6	0.0	0.0	0.0	-150.0	0.0	144.0
4 10 1979	0.0	1.3	0.0	0.0	0.0	-150.0	0.0	144.0
5 10 1979	8.9	2.5	6.4	2.5	6.4	-143.6	0.0	144.0
6 10 1979	0.0	1.5	-1.5	1.5	-1.5	-145.1	0.0	144.0
7 10 1979	4.8	2.0	2.8	2.0	2.8	-142.3	0.0	144.0
8 10 1979	5.8	0.6	5.2	0.6	5.2	-137.1	0.0	144.0
9 10 1979	4.7	1.6	3.1	1.6	3.1	-134.0	0.0	144.0
10 10 1979	0.4	0.3	0.1	0.3	0.1	-133.9	0.0	144.0
11 10 1979	2.8	1.2	1.6	1.2	1.6	-132.3	0.0	144.0
12 10 1979	0.6	1.1	-0.5	1.1	-0.5	-132.8	0.0	144.0
13 10 1979	0.0	0.9	-0.9	0.9	-0.9	-133.7	0.0	144.0
14 10 1979	0.0	1.4	-1.4	1.4	-1.4	-135.1	0.0	144.0

DATE	RAINFALL	POTEVAP	EFFRAIN	ACTEVAP	SOIL MOISTURE STORAGE	ACC.DEF	SURPLUS	CUM.SURPLUS
15 10 1979	0.0	0.9	-0.9	0.9	-0.9	-136.0	0.0	144.0
16 10 1979	1.2	0.3	0.9	0.3	0.9	-135.1	0.0	144.0
17 10 1979	0.0	1.3	-1.3	1.3	-1.3	-136.4	0.0	144.0
18 10 1979	0.0	2.7	-2.7	2.7	-2.7	-139.1	0.0	144.0
19 10 1979	0.0	2.2	-2.2	2.2	-2.2	-141.3	0.0	144.0
20 10 1979	0.0	2.0	-2.0	2.0	-2.0	-143.3	0.0	144.0
21 10 1979	0.9	1.8	-0.9	1.8	-0.9	-144.2	0.0	144.0
22 10 1979	1.3	0.8	0.5	0.8	0.5	-143.7	0.0	144.0
23 10 1979	10.2	0.6	9.6	0.6	9.6	-134.1	0.0	144.0
24 10 1979	2.2	1.9	0.3	1.9	0.3	-133.8	0.0	144.0
25 10 1979	5.8	0.8	5.0	0.8	5.0	-128.8	0.0	144.0
26 10 1979	0.0	0.8	-0.8	0.8	-0.8	-129.6	0.0	144.0
27 10 1979	0.1	1.2	-1.1	1.2	-1.1	-130.7	0.0	144.0
28 10 1979	0.0	0.4	-0.4	0.4	-0.4	-131.1	0.0	144.0
29 10 1979	3.7	1.5	2.2	1.5	2.2	-128.9	0.0	144.0
30 10 1979	0.3	0.4	-0.1	0.4	-0.1	-129.0	0.0	144.0
31 10 1979	0.0	1.6	-1.6	1.6	-1.6	-130.6	0.0	144.0
1 11 1979	3.5	1.6	1.9	1.6	1.9	-128.7	0.0	144.0
2 11 1979	0.8	1.6	-0.8	1.6	-0.8	-129.5	0.0	144.0
3 11 1979	2.8	1.6	1.2	1.6	1.2	-128.3	0.0	144.0
4 11 1979	2.9	1.6	1.3	1.6	1.3	-127.0	0.0	144.0
5 11 1979	0.9	1.6	-0.7	1.6	-0.7	-127.7	0.0	144.0
6 11 1979	3.7	1.6	2.1	1.6	2.1	-125.6	0.0	144.0
7 11 1979	4.0	1.0	3.0	1.0	3.0	-122.6	0.0	144.0
8 11 1979	0.3	1.0	-0.7	1.0	-0.7	-123.3	0.0	144.0
9 11 1979	0.0	1.0	-1.0	1.0	-1.0	-124.3	0.0	144.0
10 11 1979	9.4	1.0	8.4	1.0	8.4	-116.9	0.0	144.0
11 11 1979	0.0	1.0	-1.0	1.0	-1.0	-116.9	0.0	144.0
12 11 1979	2.9	1.0	1.9	1.0	1.9	-115.0	0.0	144.0
13 11 1979	0.0	1.0	-1.0	1.0	-1.0	-116.0	0.0	144.0
14 11 1979	0.8	0.6	0.2	0.6	0.2	-115.8	0.0	144.0
15 11 1979	0.0	0.6	-0.6	0.6	-0.6	-116.4	0.0	144.0
16 11 1979	1.1	0.6	0.5	0.6	0.5	-115.9	0.0	144.0
17 11 1979	0.0	0.6	-0.6	0.6	-0.6	-116.5	0.0	144.0
18 11 1979	0.0	0.6	-0.6	0.6	-0.6	-117.1	0.0	144.0
19 11 1979	0.0	0.6	-0.6	0.6	-0.6	-117.7	0.0	144.0
20 11 1979	0.7	0.6	0.1	0.6	0.1	-117.6	0.0	144.0
21 11 1979	0.4	0.7	-0.3	0.7	-0.3	-117.9	0.0	144.0
22 11 1979	1.2	0.7	0.5	0.7	0.5	-117.4	0.0	144.0
23 11 1979	0.0	0.7	-0.7	0.7	-0.7	-118.1	0.0	144.0
24 11 1979	0.0	0.7	-0.7	0.7	-0.7	-118.8	0.0	144.0
25 11 1979	0.9	0.7	0.2	0.7	0.2	-118.6	0.0	144.0
26 11 1979	0.0	0.7	-0.7	0.7	-0.7	-119.3	0.0	144.0
27 11 1979	0.0	0.7	-0.7	0.7	-0.7	-120.0	0.0	144.0
28 11 1979	0.1	1.1	-1.0	1.1	-1.0	-121.0	0.0	144.0
29 11 1979	1.3	1.1	0.2	1.1	0.2	-120.8	0.0	144.0
30 11 1979	0.5	1.1	-0.6	1.1	-0.6	-121.4	0.0	144.0
1 12 1979	0.0	1.1	-1.1	1.1	-1.1	-122.5	0.0	144.0
2 12 1979	0.0	1.1	-1.1	1.1	-1.1	-123.6	0.0	144.0
3 12 1979	0.0	1.1	-1.1	1.1	-1.1	-124.7	0.0	144.0
4 12 1979	3.1	1.1	2.0	1.1	2.0	-122.7	0.0	144.0
5 12 1979	3.0	1.3	1.7	1.3	1.7	-121.0	0.0	144.0
6 12 1979	2.3	1.3	1.0	1.3	1.0	-120.0	0.0	144.0
7 12 1979	6.4	1.3	5.1	1.3	5.1	-114.9	0.0	144.0
8 12 1979	9.6	1.3	8.3	1.3	8.3	-106.6	0.0	144.0
9 12 1979	4.4	1.3	3.1	1.3	3.1	-103.5	0.0	144.0
10 12 1979	0.0	1.3	-1.3	1.3	-1.3	-104.8	0.0	144.0
11 12 1979	6.2	1.3	4.9	1.3	4.9	-99.9	0.0	144.0
12 12 1979	26.7	1.7	25.0	1.7	25.0	-74.9	0.0	144.0

DATE	RAINFALL	POTEVAP	EFFRAIN	ACTEVAP	SOIL MOISTURE STORAGE	ACC.DEF	SURPLUS	CUM.SURPLUS
13 12 1979	8.4	1.7	6.7	1.7	6.7	-68.2	0.0	144.0
14 12 1979	0.8	1.7	-0.9	1.7	-0.9	-69.1	0.0	144.0
15 12 1979	1.0	1.7	-0.7	1.7	-0.7	-69.8	0.0	144.0
16 12 1979	1.3	1.7	-0.4	1.7	-0.4	-70.2	0.0	144.0
17 12 1979	2.1	1.7	0.4	1.7	0.4	-69.8	0.0	144.0
18 12 1979	0.0	1.7	-1.7	1.7	-1.7	-71.5	0.0	144.0
19 12 1979	0.0	0.5	-0.5	0.5	-0.5	-72.0	0.0	144.0
20 12 1979	0.0	0.5	-0.5	0.5	-0.5	-72.5	0.0	144.0
21 12 1979	0.0	0.5	-0.5	0.5	-0.5	-73.0	0.0	144.0
22 12 1979	0.0	0.5	-0.5	0.5	-0.5	-73.5	0.0	144.0
23 12 1979	0.0	0.5	-0.5	0.5	-0.5	-74.0	0.0	144.0
24 12 1979	0.0	0.5	-0.5	0.5	-0.5	-74.5	0.0	144.0
25 12 1979	15.7	0.5	15.2	0.5	15.2	-59.3	0.0	144.0
26 12 1979	24.6	0.7	23.9	0.7	23.9	-35.4	0.0	144.0
27 12 1979	2.3	0.7	1.6	0.7	1.6	-33.8	0.0	144.0
28 12 1979	0.0	0.7	-0.7	0.7	-0.7	-34.5	0.0	144.0
29 12 1979	0.0	0.7	-0.7	0.7	-0.7	-35.2	0.0	144.0
30 12 1979	0.0	0.7	-0.7	0.7	-0.7	-35.9	0.0	144.0
31 12 1979	0.0	0.7	-0.7	0.7	-0.7	-36.6	0.0	144.0

**** TSO FOREGROUND HARDCOPY ****
DSNAME=OIGW.WATBAL2

WATER BALANCE CALCULATION

LOCATION: RINGWOOD DATE: 1 JAN 1980 TO 30 JUN 1980

DATE	RAINFALL	POTEVAP	EFFRAIN	ACTEVAP	SOIL MOISTURE STORAGE	ACC.DEF	SURPLUS	CUM.SURPLUS
1 1 1980	0.8	0.7	0.1	0.7	0.0	0.0	0.1	0.1
2 1 1980	9.0	0.5	8.5	0.5	0.0	0.0	8.5	8.6
3 1 1980	0.2	0.5	-0.3	0.5	-0.3	-0.3	0.0	8.6
4 1 1980	0.0	0.5	-0.5	0.5	-0.5	-0.8	0.0	8.6
5 1 1980	0.0	0.5	-0.5	0.5	-0.5	-0.8	0.0	8.6
6 1 1980	0.0	0.5	-0.5	0.5	-0.5	-1.3	0.0	8.6
7 1 1980	0.0	0.5	-0.5	0.5	-0.5	-1.8	0.0	8.6
8 1 1980	0.0	0.5	-0.5	0.5	-0.5	-2.3	0.0	8.6
9 1 1980	0.0	0.5	-0.5	0.5	-0.5	-2.8	0.0	8.6
10 1 1980	0.0	0.5	-0.5	0.5	-0.5	-3.3	0.0	8.6
11 1 1980	0.0	0.5	-0.5	0.5	-0.5	-3.8	0.0	8.6
12 1 1980	0.0	0.5	-0.5	0.5	-0.5	-4.3	0.0	8.6
13 1 1980	0.0	0.5	-0.5	0.5	-0.5	-4.8	0.0	8.6
14 1 1980	0.0	0.5	-0.5	0.5	-0.5	-5.3	0.0	8.6
15 1 1980	0.0	0.5	-0.5	0.5	-0.5	-5.8	0.0	8.6
16 1 1980	0.0	0.9	-0.9	0.9	-0.9	-6.3	0.0	8.6
17 1 1980	0.2	0.9	-0.7	0.9	-0.7	-7.2	0.0	8.6
18 1 1980	5.3	0.9	4.4	0.9	4.4	-7.9	0.0	8.6
19 1 1980	12.7	0.9	11.8	0.9	3.5	-3.5	0.0	8.6
20 1 1980	1.9	0.9	1.0	0.9	0.0	0.0	8.3	16.9
21 1 1980	0.0	0.9	-0.9	0.9	-0.9	0.0	1.0	17.9
22 1 1980	0.2	0.9	-0.7	0.9	-0.7	-0.9	0.0	17.9
23 1 1980	0.0	0.4	-0.4	0.4	-0.4	-1.6	0.0	17.9
24 1 1980	0.0	0.4	-0.4	0.4	-0.4	-2.0	0.0	17.9
25 1 1980	0.0	0.4	-0.4	0.4	-0.4	-2.4	0.0	17.9
26 1 1980	0.0	0.4	-0.4	0.4	-0.4	-2.8	0.0	17.9
27 1 1980	0.0	0.4	-0.4	0.4	-0.4	-3.2	0.0	17.9
28 1 1980	0.3	0.4	-0.1	0.4	-0.1	-3.6	0.0	17.9
29 1 1980	8.7	0.4	8.3	0.4	3.7	-3.7	0.0	17.9
30 1 1980	4.1	0.7	3.4	0.7	0.0	0.0	4.6	22.5
31 1 1980	3.4	0.7	2.7	0.7	0.0	0.0	3.4	25.9
1 2 1980	4.6	0.7	3.9	0.7	0.0	0.0	2.7	28.6
2 2 1980	6.8	0.7	6.1	0.7	0.0	0.0	3.9	32.5
3 2 1980	9.5	0.7	8.8	0.7	0.0	0.0	6.1	38.6
4 2 1980	0.8	0.7	0.1	0.7	0.0	0.0	8.8	47.4
5 2 1980	7.3	0.7	6.6	0.7	0.0	0.0	0.1	47.5
6 2 1980	4.4	0.7	3.7	0.7	0.0	0.0	6.6	54.1
7 2 1980	0.3	0.7	-0.4	0.7	-0.4	0.0	3.7	57.8
8 2 1980	0.5	0.7	-0.2	0.7	-0.2	-0.4	0.0	57.8
9 2 1980	0.0	0.7	-0.7	0.7	-0.7	-0.6	0.0	57.8
10 2 1980	0.0	0.7	-0.7	0.7	-0.7	-1.3	0.0	57.8
11 2 1980	0.0	0.7	-0.7	0.7	-0.7	-2.0	0.0	57.8
12 2 1980	0.0	0.7	-0.7	0.7	-0.7	-2.7	0.0	57.8
13 2 1980	0.4	0.7	-0.3	0.7	-0.3	-3.4	0.0	57.8
14 2 1980	4.0	0.7	3.3	0.7	3.3	-3.7	0.0	57.8
15 2 1980	0.2	0.7	-0.5	0.7	-0.5	-0.4	0.0	57.8
16 2 1980	0.0	0.7	-0.7	0.7	-0.7	-0.9	0.0	57.8
17 2 1980	0.0	0.7	-0.7	0.7	-0.7	-1.6	0.0	57.8
18 2 1980	0.0	0.7	-0.7	0.7	-0.7	-2.3	0.0	57.8
19 2 1980	4.6	0.7	3.9	0.7	3.0	-3.0	0.0	57.8
20 2 1980	4.5	0.7	3.8	0.7	0.0	0.0	0.9	58.7
21 2 1980	3.6	0.7	2.9	0.7	0.0	0.0	3.8	62.5
22 2 1980	0.2	0.7	-0.5	0.7	-0.5	-0.5	0.0	65.4
23 2 1980	4.6	0.7	3.9	0.7	0.5	0.0	3.4	68.8
24 2 1980	0.0	0.7	-0.7	0.7	-0.7	-0.7	0.0	68.8
25 2 1980	0.0	0.7	-0.7	0.7	-0.7	-1.4	0.0	68.8
26 2 1980	0.0	0.7	-0.7	0.7	-0.7	-2.1	0.0	68.8
27 2 1980	0.3	1.1	-0.8	1.1	-0.8	-2.9	0.0	68.8
28 2 1980	0.0	0.3	-0.3	0.3	-0.3	-3.2	0.0	68.8
29 2 1980	0.0	0.8	-0.8	0.8	-0.8	-4.0	0.0	68.8
1 3 1980	0.0	0.4	-0.4	0.4	-0.4	-4.4	0.0	68.8
2 3 1980	0.0	0.9	-0.9	0.9	-0.9	-5.3	0.0	68.8
3 3 1980	0.0	1.5	-1.5	1.5	-1.5	-6.8	0.0	68.8
4 3 1980	8.1	1.5	6.6	1.5	6.6	-0.2	0.0	68.8
5 3 1980	3.3	0.5	2.8	0.5	0.2	0.0	2.6	71.4
6 3 1980	1.6	0.6	1.0	0.6	0.0	0.0	1.0	72.4
7 3 1980	0.1	1.3	-1.2	1.3	-1.2	-1.2	0.0	72.4
8 3 1980	3.6	0.6	3.0	0.6	1.2	0.0	1.8	74.2
9 3 1980	0.0	3.2	-3.2	3.2	-3.2	-3.2	0.0	74.2
10 3 1980	1.2	1.9	-0.7	1.9	-0.7	-3.9	0.0	74.2
11 3 1980	6.2	0.4	5.8	0.4	3.9	0.0	1.9	76.1
12 3 1980	0.0	0.4	-0.4	0.4	-0.4	-0.4	0.0	76.1
13 3 1980	0.0	2.9	-2.9	2.9	-2.9	-3.3	0.0	76.1
14 3 1980	0.0	1.5	-1.5	1.5	-1.5	-4.8	0.0	76.1
15 3 1980	0.2	0.4	-0.2	0.4	-0.2	-5.0	0.0	76.1
16 3 1980	4.8	0.4	4.4	0.4	4.4	-0.6	0.0	76.1
17 3 1980	11.5	1.3	10.2	1.3	0.6	0.0	9.6	85.7
18 3 1980	0.3	0.4	-0.1	0.4	-0.1	-0.1	0.0	85.7
19 3 1980	0.0	0.5	-0.5	0.5	-0.5	-0.6	0.0	85.7
20 3 1980	0.0	2.1	-2.1	2.1	-2.1	-2.7	0.0	85.7
21 3 1980	5.9	1.1	4.8	1.1	2.7	0.0	2.1	87.8
22 3 1980	8.3	1.8	6.5	1.8	0.0	0.0	6.5	94.3
23 3 1980	1.9	0.5	1.4	0.5	0.0	0.0	1.4	95.7
24 3 1980	0.8	1.0	-0.2	1.0	-0.2	-0.2	0.0	95.7
25 3 1980	11.7	2.1	9.6	2.1	0.2	0.0	9.4	105.1
26 3 1980	0.7	0.4	0.3	0.4	0.0	0.0	0.3	105.4
27 3 1980	3.7	1.1	2.6	1.1	0.0	0.0	2.6	108.0
28 3 1980	0.0	2.4	-2.4	2.4	-2.4	-2.4	0.0	108.0
29 3 1980	4.2	3.3	0.9	3.3	0.9	-1.5	0.0	108.0
30 3 1980	7.3	0.8	6.5	0.8	1.5	0.0	5.0	113.0
31 3 1980	9.1	0.4	8.7	0.4	0.0	0.0	8.7	121.7
1 4 1980	0.0	0.7	-0.7	0.7	-0.7	-0.7	0.0	121.7
2 4 1980	0.0	2.8	-2.8	2.8	-2.8	-3.5	0.0	121.7
3 4 1980	0.0	2.9	-2.9	2.9	-2.9	-6.4	0.0	121.7
4 4 1980	0.0	2.8	-2.8	2.8	-2.8	-9.2	0.0	121.7
5 4 1980	0.0	2.9	-2.9	2.9	-2.9	-12.1	0.0	121.7
6 4 1980	0.0	1.3	-1.3	1.3	-1.3	-13.4	0.0	121.7
7 4 1980	0.0	2.6	-2.6	2.6	-2.6	-16.0	0.0	121.7
8 4 1980	0.0	2.3	-2.3	2.3	-2.3	-18.3	0.0	121.7
9 4 1980	0.0	2.6	-2.6	2.6	-2.6	-20.9	0.0	121.7
10 4 1980	0.0	2.4	-2.4	2.4	-2.4	-23.3	0.0	121.7
11 4 1980	0.0	3.2	-3.2	3.2	-3.2	-26.5	0.0	121.7
12 4 1980	0.0	4.0	-4.0	4.0	-4.0	-30.5	0.0	121.7
13 4 1980	0.0	3.7	-3.7	3.7	-3.7	-34.2	0.0	121.7
14 4 1980	0.0	2.6	-2.6	2.6	-2.6	-36.8	0.0	121.7
15 4 1980	0.0	1.8	-1.8	1.8	-1.8	-38.6	0.0	121.7
16 4 1980	0.0	2.5	-2.5	2.5	-2.5	-41.1	0.0	121.7
17 4 1980	0.0	3.3	-3.3	3.3	-3.3	-44.4	0.0	121.7
18 4 1980	0.0	3.8	-3.8	3.8	-3.8	-48.2	0.0	121.7
19 4 1980	0.0	5.0	-5.0	5.0	-5.0	-53.2	0.0	121.7

Table 8.2 Daily soil moisture balance results (1st Jan. 1980 to 30th Jun. 1980) using the Ringwood Soil Moisture Model

DATE	RAINFALL	POTEVAP	EFFRAIN	ACTEVAP	------------SOIL STORAGE	ACC.DEF	MOISTURE------------ SURPLUS	CUM.SURPLUS
20 4 1980	0.0	4.4	-4.4	4.4	-4.4	-57.6	0.0	121.7
21 4 1980	0.0	5.3	-5.3	5.3	-5.3	-62.9	0.0	121.7
22 4 1980	0.2	1.3	-1.1	1.3	-1.1	-64.0	0.0	121.7
23 4 1980	0.0	3.1	-3.1	3.1	-3.1	-67.1	0.0	121.7
24 4 1980	0.4	2.4	-2.0	2.4	-2.0	-69.1	0.0	121.7
25 4 1980	0.1	1.0	-0.9	1.0	-0.9	-70.0	0.0	121.7
26 4 1980	1.4	2.6	-1.2	2.6	-1.2	-71.2	0.0	121.7
27 4 1980	0.0	0.6	-0.6	0.6	-0.6	-71.8	0.0	121.7
28 4 1980	0.0	3.2	-3.2	3.2	-3.2	-75.0	0.0	121.7
29 4 1980	5.4	0.9	4.5	0.9	4.5	-70.5	0.0	121.7
30 4 1980	3.7	1.8	1.9	1.8	1.9	-68.6	0.0	121.7
1 5 1980	1.0	2.1	-1.1	2.1	-1.1	-69.7	0.0	121.7
2 5 1980	0.0	3.5	-3.5	3.5	-3.5	-73.2	0.0	121.7
3 5 1980	0.0	3.5	-3.5	3.5	-3.5	-76.7	0.0	121.7
4 5 1980	0.0	3.4	-3.4	3.4	-3.4	-80.1	0.0	121.7
5 5 1980	0.0	3.6	-3.6	3.6	-3.6	-83.7	0.0	121.7
6 5 1980	0.0	1.9	-1.9	1.9	-1.9	-85.6	0.0	121.7
7 5 1980	0.0	1.9	-1.9	1.9	-1.9	-87.5	0.0	121.7
8 5 1980	0.0	2.6	-2.6	2.6	-2.6	-90.1	0.0	121.7
9 5 1980	0.0	5.0	-5.0	5.0	-5.0	-95.1	0.0	121.7
10 5 1980	0.0	5.3	-5.3	5.3	-5.3	-100.4	0.0	121.7
11 5 1980	0.0	5.2	-5.2	5.2	-5.2	-105.6	0.0	121.7
12 5 1980	0.0	4.1	-4.1	4.1	-4.1	-109.7	0.0	121.7
13 5 1980	0.0	5.3	-5.3	5.3	-5.3	-115.0	0.0	121.7
14 5 1980	0.0	6.0	-6.0	6.0	-6.0	-121.0	0.0	121.7
15 5 1980	0.0	6.1	-6.1	6.1	-6.1	-127.1	0.0	121.7
16 5 1980	0.0	6.3	-6.3	6.3	-6.3	-133.4	0.0	121.7
17 5 1980	0.0	4.3	-4.3	4.3	-4.3	-137.7	0.0	121.7
18 5 1980	1.7	3.7	-2.0	3.7	-2.0	-139.7	0.0	121.7
19 5 1980	16.0	4.8	11.2	4.8	11.2	-128.5	0.0	121.7
20 5 1980	0.0	1.4	-1.4	1.4	-1.4	-129.9	0.0	121.7
21 5 1980	0.0	2.2	-2.2	2.2	-2.2	-132.1	0.0	121.7
22 5 1980	0.0	3.0	-3.0	3.0	-3.0	-135.1	0.0	121.7
23 5 1980	0.0	2.6	-2.6	2.6	-2.6	-137.7	0.0	121.7
24 5 1980	0.0	2.4	-2.4	2.4	-2.4	-140.1	0.0	121.7
25 5 1980	0.2	4.0	-3.8	4.0	-3.8	-143.9	0.0	121.7
26 5 1980	0.0	1.3	-1.3	1.3	-1.3	-145.2	0.0	121.7
27 5 1980	0.6	4.7	-4.1	4.7	-4.1	-149.3	0.0	121.7
28 5 1980	0.5	3.8	-3.3	3.8	-3.3	-150.0	0.0	121.7
29 5 1980	16.9	3.2	13.7	3.2	13.7	-136.3	0.0	121.7
30 5 1980	0.3	3.9	-3.6	3.9	-3.6	-139.9	0.0	121.7
31 5 1980	0.4	1.5	-1.1	1.5	-1.1	-141.0	0.0	121.7
1 6 1980	0.1	5.1	-5.0	5.1	-5.0	-146.0	0.0	121.7
2 6 1980	0.0	1.0	-1.0	1.0	-1.0	-147.0	0.0	121.7
3 6 1980	0.0	2.8	-2.8	2.8	-2.8	-149.8	0.0	121.7
4 6 1980	0.0	5.2	-5.2	5.2	-5.2	-150.0	0.0	121.7
5 6 1980	0.0	4.8	0.0	0.0	0.0	-150.0	0.0	121.7
6 6 1980	0.1	4.9	0.0	0.1	0.0	-150.0	0.0	121.7
7 6 1980	0.0	3.3	0.0	0.0	0.0	-150.0	0.0	121.7
8 6 1980	0.0	2.9	0.0	0.0	0.0	-150.0	0.0	121.7
9 6 1980	12.8	2.5	10.3	2.5	10.3	-139.7	0.0	121.7
10 6 1980	0.0	1.6	-1.6	1.6	-1.6	-141.3	0.0	121.7
11 6 1980	7.4	2.0	5.4	2.0	5.4	-135.9	0.0	121.7
12 6 1980	11.1	3.4	7.7	3.4	7.7	-128.2	0.0	121.7
13 6 1980	0.0	4.0	-4.0	4.0	-4.0	-132.2	0.0	121.7
14 6 1990	5.3	0.9	4.4	0.9	4.4	-127.8	0.0	121.7
15 6 1980	2.7	3.4	-0.7	3.4	-0.7	-128.5	0.0	121.7
16 6 1980	3.6	3.1	0.5	3.1	0.5	-129.0	0.0	121.7
17 6 1990	0.0	2.9	-2.9	2.9	-2.9	-130.9	0.0	121.7

DATE	RAINFALL	POTEVAP	EFFRAIN	ACTEVAP	------------SOIL STORAGE	ACC.DEF	MOISTURE------------ SURPLUS	CUM.SURPLUS
18 6 1980	0.0	2.7	-2.7	2.7	-2.7	-133.6	0.0	121.7
19 6 1980	1.5	1.9	-0.4	1.9	-0.4	-134.0	0.0	121.7
20 6 1980	11.5	4.1	7.4	4.1	7.4	-126.6	0.0	121.7
21 6 1980	8.3	3.2	5.1	3.2	5.1	-121.5	0.0	121.7
22 6 1980	3.1	3.1	0.0	3.1	0.0	-121.5	0.0	121.7
23 6 1980	2.5	2.8	-0.3	2.8	-0.3	-121.8	0.0	121.7
24 6 1980	0.0	3.9	-3.9	3.9	-3.9	-125.7	0.0	121.7
25 6 1980	0.0	4.1	-4.1	4.1	-4.1	-129.8	0.0	121.7
26 6 1980	9.9	3.9	6.0	3.9	6.0	-123.8	0.0	121.7
27 6 1980	0.1	4.7	-4.6	4.7	-4.6	-128.4	0.0	121.7
28 6 1980	0.0	2.1	-2.1	2.1	-2.1	-130.5	0.0	121.7
29 6 1980	4.2	4.9	-0.6	4.8	-0.6	-131.1	0.0	121.7
30 6 1980	0.0	3.1	-3.1	3.1	-3.1	-134.2	0.0	121.7

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WATER LEVEL DATA

(All levels in metres O.D.)

For location of sites
see figs. 4.1 to 4.3.

Site No.	2.8.77	27.9.77	18.10.77	19.10.77	22.10.77	24.10.77	27.10.77	4.11.77	12.11.77	8.12.77	21.1.78	2.2.78
SH/1		61.30	61.19	61.18	61.14	61.14	61.17	61.26	61.12	60.95	61.39	61.73
SH/2		61.32	61.11	61.10	61.06	61.08	61.11	61.22	61.03	60.84	61.28	61.56
SH/3		61.42	61.17	61.15	61.13	61.14	61.17	61.28	61.08	60.89	61.31	61.59
SH/4		61.84	61.71	61.70	61.68	61.67	61.66	61.66	61.63	61.60	61.89	62.03
SH/5		62.58	61.64	61.61	61.55	61.53	61.51	61.55	61.56	61.67	62.02	62.18
SH/6		62.29	61.82	61.81	61.77	61.75	61.73	61.71	61.73	61.76	62.11	62.27
SH/7		61.74	61.86	61.85	61.82	61.79	61.78	61.76	61.95	61.77	62.13	62.29
SH/8		61.54	61.60	61.60	61.57	61.55	61.54	61.52	61.52	61.49	61.84	62.02
SH/9		62.80	62.45			62.27			62.52	62.76	62.81	62.91
SH/10		62.69	62.38			62.24			62.35	62.56	62.71	62.81
SH/11		62.17	61.97		61.95	61.93	61.92	61.87	61.90	61.90	62.28	62.43
SH/12		62.23	62.15			62.08			62.17	62.43	62.41	62.47
SH/13		62.06	61.99			61.97			62.05	62.13	62.33	62.38
SH/14		62.05	61.98		61.97	61.96		62.01	62.04	62.03	62.43	62.53
SH/15	60.26	60.45	60.43								60.74	
SH/16	61.40	61.56	61.56			61.57			61.64	61.67	61.75	61.98
SH/17	61.65	61.79	61.75			61.75			61.84	61.61	62.08	62.15
SH/18	62.04	62.00	61.96			61.96			62.03	62.18	62.17	62.22
SH/19		61.90	61.77		61.75	61.74	61.74	61.72	61.70	DRY	61.96	62.14
SH/20		62.05	61.95		61.93	61.92	61.71	61.90	61.90	61.87	62.20	62.33
SH/21		61.69	61.69			61.48			61.80	61.92	61.90	61.95
SH/22	62.64		62.43						62.38	62.34	62.76	62.89
SH/23	63.09		62.98						62.79	62.79		62.98

Site No.	2·8·77	27·9·77	18·10·77	19·10·77	22·10·77	24·10·77	27·10·77	4·11·77	12·11·77	8·12·77	21·1·78	2·2·78
SH/24	62·74		62·54						62·50	62·50	62·91	63·01
SH/25	67·36		66·26						66·10		66·33	66·45
SH/26												
SH/27												65·88
SH/28												62·49
SH/29												
SH/30												
SH/31												66·29
SH/33												
SH/34												
SH/35												
SH/36												
SH/37												
SH/38												
SH/39												
SH/40												
SH/41												
SH/42												
SH/43												
SH/44												
SH/45												
SH/46												
SH/47												

Site No.	28.2.78	6.4.78	20.4.78	10.5.78	6.6.78	4.7.78	25.7.78	18.8.78	12.9.78	29.9.78	10.10.78	8.11.78
SH/1	61.92	62.37	62.40	62.59					62.10	62.06	62.04	61.99
SH/2	61.73	62.26	62.30	62.47	62.31	62.14	62.05	62.05	61.93	61.93	61.91	61.86
SH/3	61.71	62.26	62.30	62.48	62.31	62.13	62.04	62.02	61.95	61.92	61.90	61.89
SH/4	62.00	62.33	62.34	62.53	62.32	62.14	61.98	62.06	61.99	61.97	61.94	61.93
SH/5	62.29	62.45	62.47	62.63	62.46	62.35	62.32	62.31	62.22	62.19	62.15	62.09
SH/6	62.28	62.44	62.44	62.63	62.73	62.27	62.22	62.45	62.13	62.13	62.10	62.04
SH/7	62.28	62.44	62.43	62.63		62.24	62.20	62.22	62.14	62.11	62.07	62.04
SH/8	61.98	62.14	62.13	62.34	62.11	61.92	61.85	61.87	61.81	61.80	61.77	61.75
SH/9	62.72	62.60	62.63	62.64	62.37	62.34	62.42	62.40	62.30	62.25	62.15	62.12
SH/10	62.69	62.59	62.57	62.61	62.34	62.24	62.31	62.35	62.24	62.20	62.12	62.07
SH/11	62.37	62.44	62.42	62.62	62.35	62.18	62.15	62.19	62.12	62.10	62.07	62.02
SH/12		62.26	62.31	62.25	62.00	61.78	61.80	61.98	61.86	61.82	61.78	61.72
SH/13		62.18	62.17	62.21	61.86	61.64	61.59	61.81	61.77	61.74	61.71	61.65
SH/14		62.26	62.18	62.39	61.99	61.80	61.73	61.85	61.79	61.77	61.74	61.70
SH/15												
SH/16		61.88	61.82	61.88		61.53		61.64	61.42	61.37	61.33	61.29
SH/17		61.93	61.90	62.09	61.76	61.58	61.74	61.66	61.57	61.25	61.49	61.43
SH/18	62.17	62.12		62.16	62.00	61.90	61.83	61.91	61.83	61.80	61.78	61.75
SH/19	62.09	62.35	62.36	62.56	62.34	62.16	62.06	62.06	62.02	62.00	61.97	61.95
SH/20	62.27	62.35	62.34	62.52	62.28	62.12	62.06	62.07	62.01	61.98	61.97	61.95
SH/21		61.78	61.84	DESTROYED								
SH/22	62.79	62.76		62.83		62.44		62.30	62.24	62.13	62.20	62.15
SH/23	62.87	62.89						62.85	62.77	62.85	62.86	62.85

Site No.	28.2.78	6.4.78	20.4.78	10.5.78	6.6.78	4.7.78	25.7.78	18.8.78	12.9.78	29.9.78	10.10.78	8.11.78
SH/24	62.89	62.80		62.92				62.42	62.30		62.19	62.31
SH/25	66.54	66.59	66.56	66.65	66.60	66.24	66.37	66.45	66.41	66.35	66.35	66.33
SH/26												
SH/27	65.95	65.94	65.94	66.00	65.90	65.78	65.76	65.82	65.72	65.67	65.65	65.63
SH/28	62.55	62.47	62.38	62.37	62.29		(-0.06)	(+0.34)	(+0.22)	(-0.27)		62.33
SH/29		(+0.28)	(+0.06)	(+0.10)	(-0.07)	(-0.08)	(-0.04)	(+0.10)	(-0.20)	(-0.06)	(-0.02)	(-0.23)
SH/30												
SH/31	66.37	66.41	66.38	66.46	66.45	66.25	66.21	66.32	66.31	66.23	66.22	66.20
SH/33												
SH/34												
SH/35												
SH/36												
SH/37												
SH/38												
SH/39												
SH/40												
SH/41												
SH/42												
SH/43												
SH/44												
SH/45												
SH/46												
SH/47												

Site No.	21·11·78	14·12·78	8·2·79	12·3·79	12·4·79	16·5·79	12·6·79	15·6·79	19·6·79	22·6·79	25·6·79	28·6·79
SH/1	61·95	62·00	62·72	62·70	62·92	62·81	62·93					
SH/2	61·85	61·90	62·66	62·64	62·85	62·74	62·88					
SH/3	61·86	61·90	62·71	62·65	62·89	62·76	62·91					
SH/4	61·91	61·96	62·79	62·68	62·90	62·77	62·92					
SH/5	62·04	62·12	62·77	62·74	62·92	62·79	62·89					
SH/6	62·00	62·07	62·83	62·74	62·92	62·79	62·90					
SH/7	61·99	62·06	62·85	62·74	62·92	62·78	62·90					
SH/8	61·72	61·79	62·64	62·40	62·68	62·53	62·67					
SH/9	62·21	62·53	62·91	62·83	62·93	62·71	62·77					
SH/10	62·11	62·42	62·90	62·78	62·91	62·67	62·73					
SH/11	62·00	62·11	62·90	62·72	62·90	62·74	62·84					
SH/12	61·81	62·27	62·47	62·41	62·43	62·25						
SH/13	61·65	61·97	62·47	62·33	62·43	62·22						
SH/14	61·69	61·96	62·72	62·49	62·63	62·32						
SH/15												
SH/16	61·31	61·72	61·98	61·93	61·96	61·85						
SH/17	61·43	61·63	62·35	62·00	62·20	62·02	62·16					
SH/18	61·75	62·07	62·26	62·20	62·24	62·14	62·20					
SH/19	61·94	62·01	62·83	62·69	62·91	62·77	62·91					
SH/20	61·94	62·12	62·79	62·61	62·79	62·61	62·76					
SH/21												
SH/22	62·24	62·35	63·12	62·93	62·99	62·91	63·04					
SH/23	62·85	62·84	63·18	63·03	63·18	62·98	63·15					

Site No.	21.11.78	14.12.78	8.2 79	12.3 79	12.4.79	16.5.79	12.6.79	15.6.79	19.6.79	22.6 79	25.6.79	28.6.79
SH/24												
SH/25	66.30	66.39	66.76	66.77	66.98	66.88	66.94					
SH/26												
SH/27	65.65	65.70	66.07	66.09	66.31	66.41	66.52					
SH/28	62.33	62.38	62.65	62.73	62.75	62.71	62.79					
SH/29	(+0.05)	(+0.02)		62.97	63.17	63.09	63.18					
SH/30					62.09	62.33	62.51					
SH/31	66.23	66.29	66.30	66.31	66.49	66.50	66.50					
SH/33												
SH/34												
SH/35												
SH/36			62.93	62.87	63.03	63.35	63.04					
SH/37			62.73.	62.70	62.99	62.88	63.06					
SH/38			62.63	62.51	62.84	62.79	62.94					
SH/39			62.13	62.21	62.52	62.51	62.69					
SH/40			63.89	63.56	63.72	63.48	63.78	63.74	63.64			
SH/41			65.91	65.81	65.91	65.77	65.90	65.85	65.79	65.75		
SH/42			DESTROYED									
SH/43			66.73	66.74	66.89	66.91	67.09		66.87	66.86	66.87	
SH/44			66.69	66.75	66.93	66.87	66.93			66.86	66.87	66.87
SH/45			63.46	63.11	63.34	62.99	63.27	63.21				
SH/46			68.24	68.03	68.11	67.89	67.93					
SH/47												

Site No.	21.11.78	14.12.78	8.2.79	12.3.79	12.4.79	16.5.79	12.6.79	15.6 79	19.6.79	22.6.79	25.6.79	28.6.79
SH/48			68.70	68.07	68.02	67.38	67.25				67.20	
SH/49			68.58	68.07	68.04	67.45	67.35					
SH/50			70.09	69.82	69.93	69.45	69.60					
SH/51												
SH/52												
SH/53												
SH/54												
SH/55												

Site No.	2·7·79	11·7·79	16·7·79	20·7·79	23·8·79	28·9·79	14·11·79	15·11·79	19·11·79	23·11·79	27·11·79	3·12·79
SH/1		62·70				62·35	62·54					
SH/2		62·63				DESTROYED						
SH/3		62·63				DESTROYED						
SH/4		62·61				62·29	62·37					
SH/5		62·65				62·37	62·75					
SH/6		62·61				DESTROYED						
SH/7		62·60				DESTROYED						
SH/8		62·35				DESTROYED						
SH/9		62·55				62·33	62·84					
SH/10		62·49				62·24	62·72					
SH/11		62·52				62·28	62·48					
SH/12												
SH/13		61·97					61·94					
SH/14		62·11					61·94					
SH/15												
SH/16												
SH/17												
SH/18		62·05										
SH/19							62·35					
SH/20		62·47				62·18	62·25					
SH/21												
SH/22		62·74										
SH/23		62·86										

Site No.	2.7.79	11.7.79	16.7.79	20.7.79	23.8.79	28.9.79	14.11.79	15.11.79	19.11.79	23.11.79	27.11.79	3.12.79
SH/24		66.78										
SH/25												
SH/26												
SH/27		66.29				65.94	65.77					
SH/28		62.67		62.55	62.39	62.32						
SH/29		63.07		62.88	62.78	63.19						
SH/30		62.47			62.14	62.03						
SH/31		66.36			66.06	66.09						
SH/33		70.01		69.94	69.98	68.95		69.95	69.96		69.98	
SH/34												
SH/35												
SH/36		62.80		62.70		62.36	62.34					
SH/37		62.79				62.29	62.25					
SH/38		62.67	62.63	62.61		62.27	62.34					
SH/39		62.42	62.39			62.00	61.98					
SH/40		63.33				63.02	63.15					
SH/41		65.65				65.52	65.57					
SH/42												
SH/43		66.82				66.58	66.59					
SH/44	66.82	66.76				66.46	66.46					
SH/45		62.82			62.49	62.34	62.27					
SH/46		67.67				67.34	67.24					
SH/47												

Site No.	2.7.79	11.7.79	16.7.79	20.7.79	23.8.79	28.9.79	14.11.79	15.11.79	19.11.79	23.11.79	27.11.79	3.12.79
SH/48	67.05	67.10			66.98	67.14	67.14	67.14	67.17		67.10	
SH/49	67.24	67.17			66.97	67.04	67.15	67.19	67.21		67.14	
SH/50		69.38			69.37	69.34	69.24	69.24	69.23		69.28	69.26
SH/51					68.28	68.43	68.52	68.53	68.45		68.67	
SH/52					68.51	68.65	68.70	68.71	68.73	68.75	68.75	
SH/53					68.72	68.73	68.75	68.76	68.76	68.76	68.77	
SH/54					69.10	69.08	69.03	69.03	69.03		69.01	68.99
SH/55												

Site No.	7.12.79	9.1.80	25.1.80	12.2.80	26.2.80	29.2.80	11.3.80	19.3.80	23.4.80	9.5.80	23.5.80	16.6.80
SH/1		63.17		62.99								
SH/2												
SH/3												
SH/4		63.04		62.95								
SH/5		62.81		62.50								
SH/6												
SH/7												
SH/8												
SH/9		62.99		62.69								
SH/10		62.94		62.67								
SH/11		63.08		62.93								
SH/12				62.34								
SH/13		62.40		62.35								
SH/14		62.72		62.63								
SH/15												
SH/16												
SH/17												
SH/18												
SH/19												
SH/20		62.84		62.82								
SH/21												
SH/22												
SH/23												

Site No.	7.12.79	9.1.80	25.1.80	12.2.80	26.2.80	29.2.80	11.3.80	19.3.80	23.4.80	9.5.80	23.5.80	16.6.80
SH/24												
SH/25												
SH/26												
SH/27		66.18		66.28								
SH/28		62.56		62.66	62.64		62.64					
SH/29		63.48		63.26								
SH/30		DESTROYED										
SH/31		66.34		66.35								
SH/33		70.37	70.24	70.43	70.29	70.26	70.26	70.47	70.21	70.13	70.11	70.11
SH/34												
SH/35												
SH/36		63.00		63.03								
SH/37		63.00		63.05								
SH/38		63.00		63.02								
SH/39		62.54		62.48								
SH/40		63.74		63.28								
SH/41		65.72		65.75								
SH/42												
SH/43		66.82		66.94								
SH/44		66.76		66.84								
SH/45		DESTROYED										
SH/46				68.14								
SH/47												

Site No.	7.12.79	9.1.80	25.1.80	12 2 80	26.2 80	29.2.80	11.3.80	19.3.80	23.4.80	9.5.80	23.5.80	16.6.80
SH/48		67.44	67.04	67.06	67.02	66.98	66.87	66.89	66.80	66.70	DRY	
SH/49		67.53	66.96	67.15	66.88	66.82	66.66	66.65	66.65	66.50	66.34	
SH/50	69.26	69.63	69.39	69.61	68 70	68.63	68.56	68.49	69.38	69.22	69.20	
SH/51		69.01	68.63	69 18	68.51	68.48	68.40	68 49	68 36	68.27	68 22	
SH/52		69.21	68.88	69.01	68 81	68 79	68 73	68.76	68.72	68.64	68.58	
SH/53		69.28	68 95	69.07	68.89	68.85	68.77	68 82	68.79	68.65	68.65	
SH/54		69.56	69.17	69.48	69.08	68.98	68.89	68 96	69.08	68.77	68.95	
SH/55				66.81	66.44	66.32	66.20	66.19	66.40	66.32	66.32	

Site No.	19.6.80	30.7.80									
SH/24											
SH/25											
SH/26											
SH/27											
SH/28											
SH/29											
SH/30											
SH/31											
SH/33	70.12	70.12									
SH/34											
SH/35											
SH/36											
SH/37											
SH/38											
SH/39											
SH/40											
SH/41											
SH/42											
SH/43											
SH/44											
SH/45											
SH/46											
SH/47											

Site No.	19.6.80	30.7.80									
SH/48											
SH/49	66.00	66.30									
SH/50	69.19	69.21									
SH/51	67.83	68.57									
SH/52	68.40	68.63									
SH/53	68.60	68.69									
SH/54	68.95	68.97									
SH/55	66.28	DESTROYED									

Site No.	17.1.78	14.2.78	16.2.78	2.3.78	14.3.78	4.4.78	18.4.78	11.5.78	18.5.78	23.5.78	8.6.78	19.6.78
R/1	20.79	20.82	20.83	20.85	20.86	20.88	20.84	20.85	20.85	20.96	20.85	20.84
R/2	20.65	20.85	20.83	20.93	20.83	20.77	20.43	20.72	20.68	20.65	20.55	20.49
R/3	21.07	21.10	21.10	21.11	21.12	21.14	21.05	21.01	20.95	20.96	20.89	20.82
R/4	21.48	21.71	21.70	21.83	21.72	21.72	21.57	21.60	21.53	21.50	21.34	21.26
R/5	21.24	21.47	21.46	21.62	21.52	21.34	21.59	21.49	21.42	21.42	21.29	21.21
R/6	22.56	22.99	22.67	23.00	22.86	22.85	22.64	22.73	22.68	22.63	22.49	22.41
R/7								21.38		21.31	21.17	
R/8								21.69		21.60	21.44	
R/9				20.83		20.80	20.81	20.79	20.74	20.77	20.76	20.69
R/10	21.25		21.30		21.33		21.33		21.33			21.40
R/11												
R/12												
R/13												
R/14												
R/15												
R/16												
R/17												
R/18												
R/19												
R/20												
R/21												
R/22												
R/23	21.67		21.76		21.89		21.81		21.77			21.56

Site No.	17.1.78	14.2.78	16.2.78	2.3.78	14.3.78	4.4.78	18.4.78	11.5.78	16.5.78	23.5.78	8.6.78	19.6.78
R/24												
R/25												
R/26												
R/27												
R/28												
R/29												
R/30												
R/31												
R/32	19.02		19.08		19.16		19.08		19.04			18.84
R/33	21.19		21.12		21.23		21.02		21.00			20.71
R/34	20.76		20.79		20.80		20.79		20.77			20.70
R/35	23.69		23.65		23.72		23.64		23.59			23.50
R/36	22.94		22.97.		22.96		23.00		22.89			22.81
R/37	23.30		23.29		23.39		23.24		23.17			22.99
R/38	22.91		23.11		23.12		22.86		22.82			22.27
R/39	16.40		16.53		16.55		16.40		16.43			16.13
R/40	19.61		19.83		19.86		19.74		19.72			19.43
R/41	19.12		19.19		19.25		19.17		19.16			18.99
R/42	19.15		19.23		19.31		19.22		19.18			18.98
R/43	23.06		23.26		23.25		23.03		23.00			22.88
R/44	23.05		23.25		23.23		23.12		22.99			22.86
R/45	21.14		21.26		21.38		21.27		21.23			21.02
R/46	18.89		18.95		19.03		20.90		18.69			18.68

Site No.	17.1.78	14.2.78	16.2.78	2.3.78	14.3.78	4.4.78	18.4.78	11.5.78	12.5.78	23.5.78	8.6.78	19.6.78
R/47	DESTROYED											
R/48												
R/49	21.73		22.05		22.10		22.00		21.70			21.64
R/50												
R/51												
R/52												
R/53												
R/54												
R/55												
R/56												
R/57	21.57		21.85		21.92		21.85		22.09			21.49
R/58	21.63		21.82	21.87	21.88	21.83	21.70	21.70	21.66	21.60	21.44	21.36
R/59	19.34		19.40 •		19.42		19.31		19.35			19.18
R/60						19.73	19.68	19.67		19.62	19.52	
R/61	19.29		19.58		19.61		19.47		19.43			19.19
R/62	19.34		19.51		19.56		19.42		19.36			19.14
R/63												
R/64	21.14		21.28		21.34		21.24		21.22			21.04
R/65												
R/66	19.82		20.02		20.13		20.08		20.09			19.72 .
R/67	18.84		18.81									

Site No.	11.7.78	27.7.78	19.8.78	22.8.78	13.9.78	26.9.78	11.10.78	31.10.78	6.12.78	11.12.78	3.1.79	23.1.79
R/1	20.83	20.82	20.79	20.79	DRY							
R/2	20.42	20.39	20.45	20.49	20.35	20.30	20.28	20.25	20.17	20.62		20.80
R/3	20.82	20.75	20.70	20.70	20.70	20.66	20.66	20.66	20.65	20.65	20.66	20.69
R/4	21.11	21.02	21.04	20.94	20.94	20.88	20.80	20.74	20.70	20.89	21.47	
R/5	21.12	20.99	21.04	21.03	20.96	20.84	20.80	20.73	DRY	DRY	21.02	21.25
R/6	22.22	22.12	22.13	22.11	22.03	22.03	21.93	DRY	DRY	22.05	22.57	22.82
R/7	20.95	20.86	20.86		20.77	DRY	DRY	DRY	DRY	20.74	21.32	
R/8	21.18	21.09	21.11		21.00	20.94	20.88	20.79	20.76	21.28	21.57	
R/9	20.72	20.70	20.72	20.67	20.61				20.49	20.58	20.74	20.76
R/10		21.28		21.26			21.06		20.47	21.08	21.24	21.32
R/11	25.61	25.60	25.65		25.60	25.58	25.57	25.58	25.59			
R/12	24.79	24.69	24.71		24.81	24.80	24.79	24.77	24.83			
R/13	21.23	21.15	21.16		21.08	21.03	20.98	20.91	20.85		21.65	
R/14	22.44	22.28	22.35		22.26	22.21	22.18	22.11	22.08		22.65	
R/15	22.45	22.37	22.36		22.27	22.22	22.20	22.20	22.19		22.66	
R/16	17.80	17.64	17.67		17.90	17.67	17.56	17.55	17.66		17.80	
R/17	17.69	17.79	17.58		17.71	17.56	17.46	17.45	17.52		17.66	
R/18	17.73	17.84	17.62		17.75	17.61	17.52	17.50	17.59		17.71	
R/19	18.29	18.45	18.43		18.33	18.27	18.24	18.18	18.14		18.59	
R/20	22.57	22.46	22.48		22.37	22.31	22.26	22.22	22.19		22.77	
R/21	20.82	20.62	20.84		20.71	20.67	20.63	20.64	20.63			
R/22	20.89	20.76	20.93		20.80	20.71	20.62	20.55	20.53	20.79	21.24	
R/23						21.26	21.20	21.17	21.18			21.78

Site No.	11.7.78	27.7.78	19.8.78	22.8.78	13.9.78	26.9.78	11.10.78	31.10.78	6.12.78	11.12.78	3.1.79	23.1.79
R/24	24.11	24.02	24.07		24.01	23.98	23.95	23.92	23.92			
R/25	23.62	23.57	23.61		23.54	23.52	23.49	23.47	23.48			
R/26	22.72	22.68	22.72		22.70	22.70	22.69	22.68	22.68			
R/27	25.93	25.89	25.94		25.87	25.85	25.84	25.82	25.81			
R/28	21.83	21.79	21.81		21.75	21.73	21.72	21.70	21.70			
R/29	26.44	26.40	26.49		26.37	26.33	26.30	26.29	26.39			
R/30	26.11	26.08	26.11		26.04	26.01	25.98	25.98	26.01			
R/31	21.89	21.83	21.94		21.82	21.78	21.76	21.74	21.74		22.38	
R/32						18.65	18.60	18.58	18.56		18.80	18.90
R/33						20.32	20.29	20.29	20.31	21.07	20.95	21.33
R/34				20.67		20.42	20.39	20.39	20.42			20.79
R/35				23.50			23.48	23.50	23.51		23.66	23.73
R/36				22.88			22.82	22.77	22.75		22.88	22.91
R/37				22.94			22.96	22.90	22.94		23.80	23.18
R/38				22.10				22.04	22.04		22.19	23.05
R/39												16.52
R/40												19.67
R/41												19.08
R/42							18.87					19.16
R/43				22.86			22.88	22.88	22.88		23.30	
R/44				22.87			22.86	22.87	22.86		23.25	
R/45				20.83								21.04
R/46												18.84

Site No.	11.7.78	27.7.78	19.8.78	22.8.78	13.9.78	26.9.78	11.10.78	31.10.78	6.12.78	11.12.78	3.1.79	23.1.79
R/47												
R/48												
R/49				21.43								21.93
R/50												
R/51												
R/52												
R/53												
R/54												
R/55												
R/56												21.72
R/57				21.28								
R/58	21.19	21.10	21.11	21.06	21.01	20.96	20.90			21.56	21.67	21.83
R/59												
R/60	19.35	19.30	19.35		19.25	19.30	19.19	19.12	19.10			
R/61												19.31
R/62												19.50
R/63												
R/64				20.87								21.07
R/65												REMOVED
R/66												REMOVED
R/67												

Site No.	1.2.79	1.3.79	22.3.79	5.4.79	4.5 79	7.5 79	9.5.79	28.5.79	13.6.79	12.7.79	4.9.79	27.9.79
R/1												
R/2	20.81	20.86	20.83	20.82	20.78			20.74	20.68	20.56	20.45	20.40
R/3	20.71	20.77	20.80	20.83	20.86			20.87	20.89	20.63	20.66	
R/4	21.67	21.66	21.65	21.68	21.56			21.45	21.46	21.24	20.94	20.82
R/5	21.34	21.50	21.49	21.52	21.51			21.42	21.46	21.24	20.97	
R/6	22.92	22.81	22.83	22.87	22.71			22.59	22.57	22.35	22.04	21.94
R/7	21.47	21.41	21.38	21.44	21.32			21.19	21.24	21.08	20.77	
R/8	21.78	21.71	21.70	21.72	21.62	21.60		21.51	21.51	21.30	20.97	20.87
R/9	20.76	20.75	20.76	20.73	20.74			20.79	20.76	20.74	20.70	
R/10		21.47	21.49	21.55					21.51	21.36	21.17	
R/11	26.33	25.98		26.10					25.92	25.64		
R/12	25.72	25.30		25.41					25.15	24.88		
R/13	21.83	21.79	21.74	21.81	21.67			21.52	21.57	21.38	21.08	
R/14	22.97	22.87		23.00					22.82	22.56		
R/15	22.98	22.90		23.03					22.91	DRY		
R/16	18.17	18.35		18.50	17.78			17.81	17.83	17.75		
R/17	18.02	18.16		18.28	17.65			17.67	17.69	17.62		
R/18	18.07	18.17		18.29	17.71			17.74	17.77			
R/19	18.74	18.71		18.72	18.63			18.61	18.60	18.45		
R/20	23.08	23.02		23.15					22.94	22.68		
R/21	21.07	21.15		21.36	21.16				20.95	20.84	20.70	
R/22	21.49	21.41	21.44	21.48	21.38			21.34	21.27	21.04	20.81	
R/23	21.85	21.72		21.81	21.74			21.72	21.75	21.53	21.33	

Site No.	1·2·79	1·3·79	22 3 79	5·4 79	4·5 79	7·5·79	9·5·79	28·5·79	13 6·79	12 7 79	4·9·79	27·9·79
R/24	24·87	24·55		24·64				24 39	24 41	24 18		
R/25	24·22	24·01		24·07					23·86	23·65		
R/26	23·10	23·00		23·02					22·84	22·73		
R/27	27·11	26·54		26·73				26·32	26·34	25·98		
R/28	22·38	22·33		22·38					22·18	21·92		
R/29	27·01	26·76		26·84					26·80	26·47		
R/30	26·59	26·33		26·48					26·42	26·18		
R/31	22·51	22·45	22·39	22·45	22·33			22·22	22·25	21 99	DESTROYED	
R/32	18·91	18 89	18·92	18·95	18·91			18·90	18·90	18 73	18·62	
R/33	21·27	21·08	21·12	21·17	21·02			21·06	20·95	20 64	20·41	
R/34	20·79	20·77	20·79	20·80	20·79			20·79	20·79	20·69	20·63	
R/35	23·78	23·63		23·66								
R/36	22·92	22·94		22·93								
R/37	23·90	23·81		23·90								
R/38	22·39	22·26		22·43								
R/39	16·46	16·37		16·54					16·37	16·12	16·02	
R/40	19·71	19·69		19·69				19·48	19·51	DRY		
R/41	19·09	19·09		19·15					19·09	19·07		
R/42	19·16	19·17		19·20				19·11	19·09	18·85		
R/43	23·27	23·18		23·21								
R/44	23·26	23·16		23·20								
R/45	21·11	21 22		21·30					21·22	21·03	20·78	
R/46	18·86	18·79		18·86					18·80	DRY	DRY	

Site No.	1·2·79	1·3·79	22·3·79	5·4·79	4·5·79	7·5·79	9·5·79	28·5·79	12·6·79	12·7·79	4·9·79	27·9·79
R/47												
R/48												
R/49	22·01	22·10	22·09	22·15	22·02			21·89	21·87	21·59		
R/50												
R/51						22·23		22·16	22·20	21·92	21·78	
R/52						22·27	22·23	22·13	22·04		21·45	21 23
R/53										21·81	21·59	21·55
R/54								22·21	22 16	21 94		
R/55												
R/56	21·88	22·00	21·98	22·03	21·91			21·78	21·76	21·50	21·19	
R/57												
R/58	21·84	21·76	21·75	21·78	21·66	21·64		21 56	21 55	21 34	21·01	
R/59	19·32	19·31		19·32								
R/60	19·51	19·56	19·59	19·61	19·58	19·56		19·54	19·53	19·37	19·23	
R/61	19·40	19·40		19·35				19·22	19·22			
R/62												
R/63												
R/64	21·10	21 21		21·26					21 27	21·02		
R/65												
R/66												
R/67												

Site No.	1.10.79	5.10.79	9.10.79	17.10.79	22.10.79	26.10.79	30.10.79	2.11.79	7.11.79	12.11.79	29.11.79	9.12.79
R/1												
R/2	20.39	20.36	20.18	20.22			20.24				20.20	
R/3				20.66			20.65	20.15			20.17	
R/4	20.80	20.78		20.74			20.69				20.66	
R/5			20.84			20.74			20.72	20.71	DRY	
R/6									21.96		21.95	
R/7				DRY								
R/8	20.84	20.83	20.81	20.79	20.78	20.78	20.76	20.76	20.75	20.76	20.72	20.74
R/9		20.60		20.60			20.59				20.59	
R/10											21.04	
R/11												
R/12												
R/13				20.94							20.91	
R/14												
R/15												
R/16											17.51	
R/17											17.45	
R/18												
R/19											18.21	
R/20											22.22	
R/21											20.63	
R/22			20.67	20.65	20.63	20.64					20.60	
R/23											21.20	

Site No.	1·10·79	5·10·79	9·10·79	17·10·79	22·10·79	26·10·79	30·10·79	2·11 79	7·11·79	12·11·79	29·11·79	
R/24												
R/25												
R/26												
R/27												
R/28												
R/29												
R/30												
R/31												
R/32											18·56	
R/33				20·38			20·38	20·38	20·39	20 42	20·35	
R/34											20·54	
R/35												
R/36												
R/37												
R/38												
R/39											15·97	
R/40												
R/41											18·69	
R/42											18·79	
R/43												
R/44												
R/45												
R/46												

Site No.	1.10.79	5.10.79	9.10.79	17.10.79	22.10.79	26.10.79	30.10.79	2.11.79	7.11.79	12.11.79	29.11.79	9.12.79
R/47												
R/48												
R/49												
R/50												
R/51											21.85	
R/52		21.20	21.20	21.21	21.21	21.22	21.21	21.21			21.22	
R/53	21.55	21.54	21.53	21.51	21.51	21.52	21.60				21.59	
R/54												
R/55				20.51							20.52	
R/56		21.09					21.42				21.41	
R/57												
R/58							20.83					
R/59												
R/60				19.16							19.17	
R/61											19.09	
R/62												
R/63												
R/64												
R/65												
R/66												
R/67												

Site No.	11·1·80	15·2·80	22·3·80	22·4·80	21·5·80	20·6 80	22·7·80	1·8·80	11·9 80			
R/1												
R/2	20·75	20·75	20·71	20·64	20·50							
R/3	20·24	20·34	20·48	20·57								
R/4	21·37	21·44	21 38	21·38	21·13							
R/5	21·82	DESTROYED										
R/6	22·68	22·89	22·84	22·83	22·63							
R/7	21·35	21·44	21·33	21·33	21·10							
R/8	21·54	21·61	21·54	21·51	21·25	21·09	20·96	20·93	20·89			
R/9	20·73	20·77	20·75	20·71	20·71							
R/10	21·22	21·33										
R/11												
R/12												
R/13	21·69	21·80										
R/14												
R/15												
R/16												
R/17												
R/18												
R/19												
R/20												
R/21		21·02										
R/22	21·30	21·25	21·22	21·19	21·05							
R/23		21·64										

Site No.	11·1·80	15·2·80	22·3·80	22·4·80	21·5·80	20·6·80	22·7·80	1·8·80	11·9·80			
R/24												
R/25												
R/26												
R/27												
R/28												
R/29												
R/30												
R/31												
R/32		18·86										
R/33	20·96	20·94	20·94									
R/34		20·76										
R/35												
R/36												
R/37												
R/38												
R/39												
R/40												
R/41												
R/42												
R/43												
R/44												
R/45												
R/46												

Site No.	11·1·80	15·2·80	22·3·80	22·4·80	21·5·80	20·6·80	22·7·80	1·8·80	11·9·80			
R/47												
R/48												
R/49												
R/50												
R/51	22·15	22·26	22·17	22·15	21·85							
R/52	21·64	21·75	21·76	21·84	21·76							
R/53	22·30	22·44	22·47	22·39	22·13							
R/54	22·16	22·50	22·51	22·54	22·33							
R/55	20·57	20·80	20·91	21·27	20·68							
R/56	21·69	21·69	21·68	21·68	21·54							
R/57				-								
R/58	21·59	21·66	21·58	21·56	21·29							
R/59												
R/60	19·40	19·51										
R/61												
R/62												
R/63												
R/64												
R/65												
R/66												
R/67												