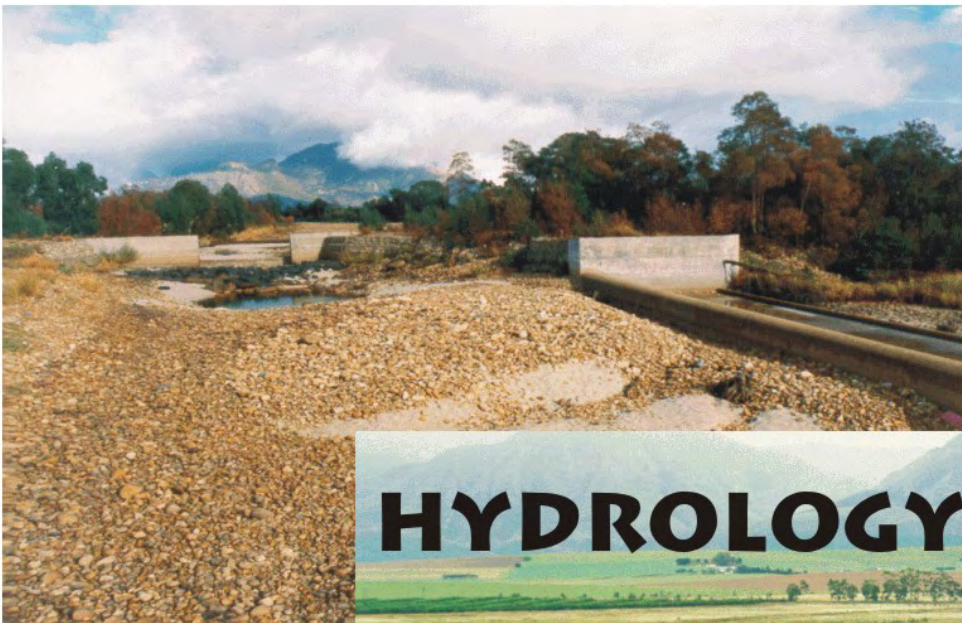




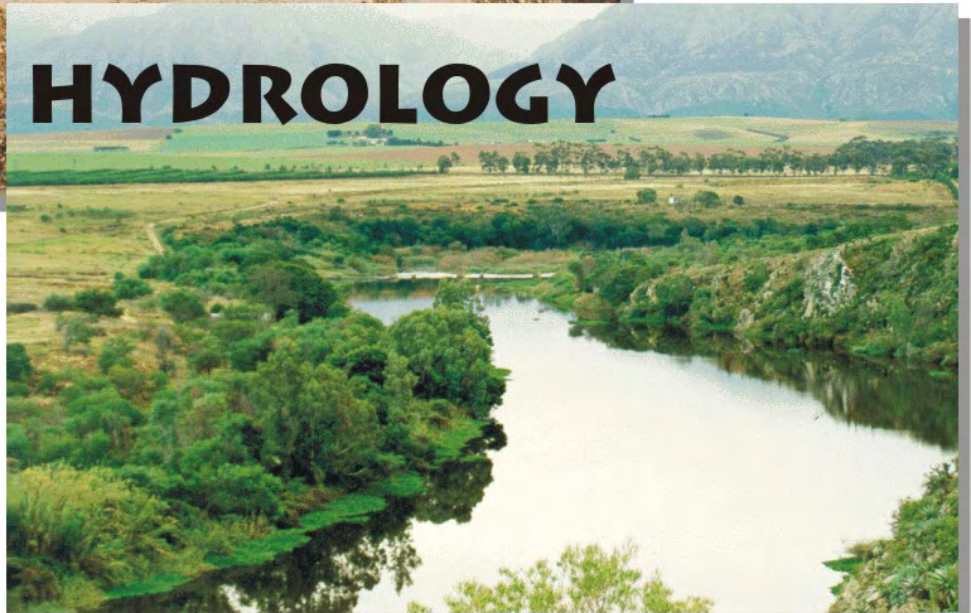
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DEPARTMENT OF WATER AFFAIRS  
AND FORESTRY  
DIRECTORATE OF WATER RESOURCES PLANNING

# BREEDE RIVER BASIN STUDY



## HYDROLOGY



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CONSULTING SERVICES



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# **DEPARTMENT OF WATER AFFAIRS AND FORESTRY**

## **BREEDE RIVER BASIN STUDY**

### **HYDROLOGY**

*Final*

**MAY 2003**

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This report is to be referred to in bibliographies as :

Department of Water Affairs and Forestry, South Africa. 2003. *Hydrology*. Prepared by J van Rensburg of Ninham Shand (Pty) Ltd as part of the Breede River Basin Study. DWAF Report No. PH 00/00/2402.



**TITLE** : Hydrology

**AUTHOR** : J van Rensburg

**PROJECT NAME** : Breede River Basin Study

**PROJECT NO.** : 8718

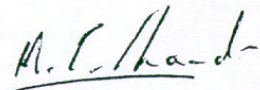
**REPORT STATUS** : Final

**DWAF REPORT NO.** : PH 00/00/2402

**DATE** : First draft : April 2002  
Final : May 2003

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Approved for Ninham Shand (Pty) Ltd

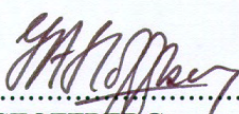


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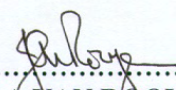
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# BREDE RIVER BASIN STUDY

## HYDROLOGY

### EXECUTIVE SUMMARY

#### 1. INTRODUCTION

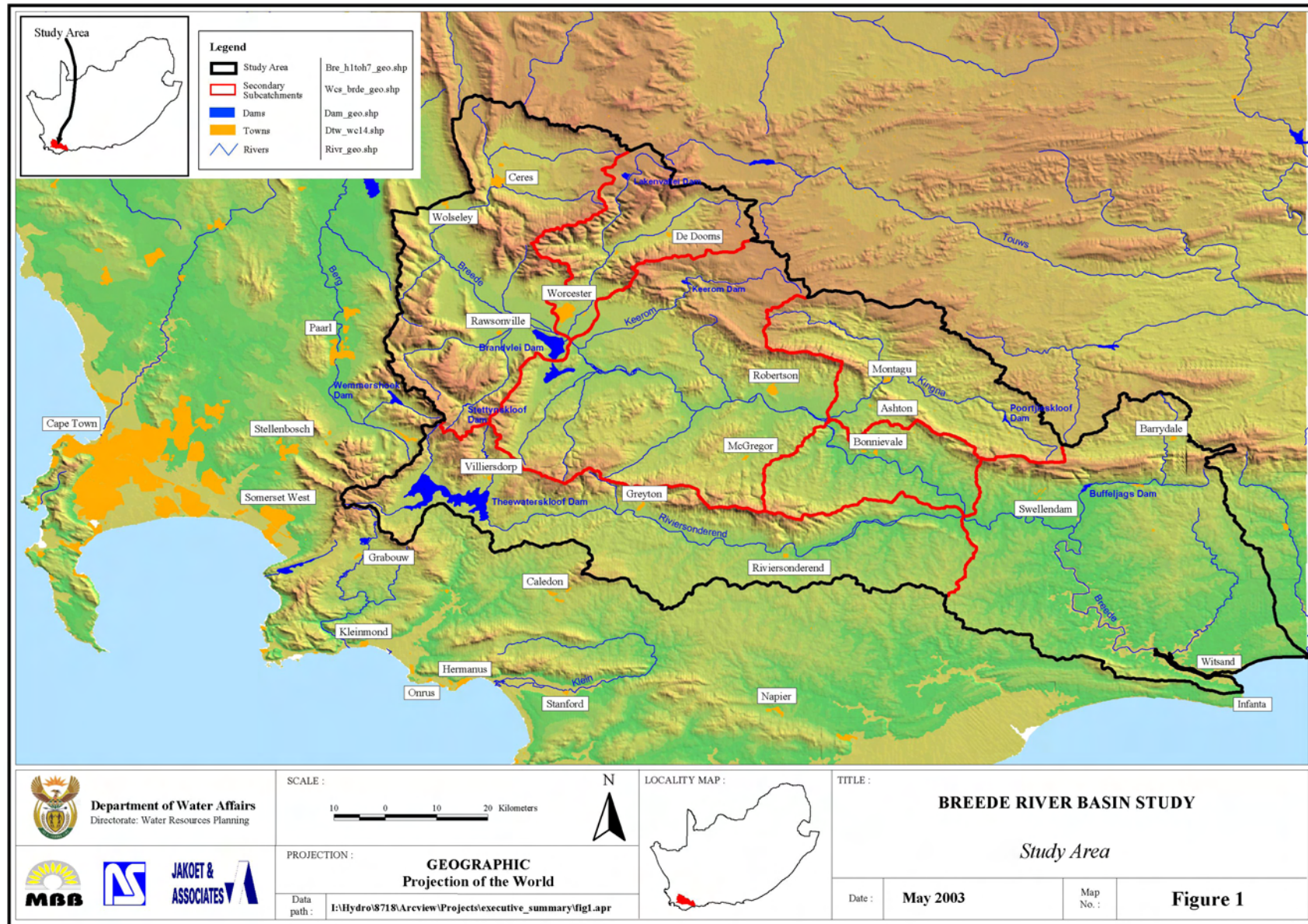
This report documents the hydrology component of the Breede River Basin Study (BRBS), including the various tasks undertaken for the catchment modelling of the Breede River catchment. The main aim of the hydrological component of the BRBS was to provide monthly runoff sequences at any point of interest in the catchment. These sequences were used in the yield analyses relating to present and future land-use development scenarios and water demands, as well as for a number of possible scheme development scenarios.

A map of the Breede River catchment is shown in Figure 1. The Breede River is the largest river in the Western Cape. It comprises six drainage areas, i.e. the Ceres Basin, Upper Breede River, Hex River, Middle Breede River, Riviersonderend and the Lower Breede River.

The Breede River catchment has high mountainous areas in the upper reaches, changing to flat river valleys. It falls within the winter rainfall region of the Western Cape, and rainfall in the catchment also varies considerably, mainly as a result of the variation in altitude. Rainfall is highly seasonal, with roughly 80% of the annual precipitation falling between April and September.

Afforestation occurs mainly in the upper Riviersonderend catchment, with small areas of afforestation scattered over the remainder of the catchment. Invasive alien vegetation is scattered throughout the catchment, with the highest levels of infestation occurring in the Riviersonderend and Lower Breede River catchments. Some alien vegetation areas have been cleared as part of the Working for Water Programme.

The predominant land-use in the catchment is agriculture, mainly focusing on the production of fruit and wine, with the Ceres Valley being the most important fruit producing area in the region. Irrigation water is sourced from numerous farm dams, river tributaries and the main river channel. Releases for irrigation are made from the Brandvlei Dam to supply irrigation demands via the Breede River as well as via an extensive network of canals.



## 2. GENERAL APPROACH

The main aim of the hydrology task was to enable river flow information to be provided at any point of interest in the catchment. To this end, it was necessary to :

- review the hydrology previously completed for the Breede River Hydrological Study (BRHS, DWAF, 1995) and determine whether it is necessary to extend or improve on the reliability of the hydrology;
- configure and calibrate the catchment model for the Upper Breede (H100), Riviersonderend (H600) and Lower Breede (H700) portions of the Breede River catchment; and
- use the calibrated model parameters to generate runoff sequences at all points of interest.

In light of budgetary constraints and following detailed comparisons carried out as part of the Inception Phase of the study for the Molenaars River catchment and Ceres Basin and a less detailed review of calibrations in the remainder of the BRHS study area, it was recommended that :

- catchment models for the Upper Breede River (H100) be recalibrated for the same periods used in the BRHS, with the main aim of, if possible, improving the calibrations. For this exercise the BRHS land-use information was used;
- hydrology of the H200, H300, H400 and H500 regions produced during the BRHS, be accepted;
- catchment models be configured and calibrated for the Riviersonderend (H600), covering the period up to the 1997/98 hydrological year (limited by the observed flow record at gauge H6H009);
- catchment models be configured and calibrated for the Lower Breede (H700) catchments, covering the period up to the 1998/99 hydrological year for the Buffeljags Dam catchment;
- calibration of the models for the Lower Breede River span the period up to the 1990 hydrological year (the last year of the BRHS calibration period), since the H500 flows feed into the Lower Breede River. This had to be done since problems were experienced with the incremental calibration at the Lower Breede River gauge H7H006.

Based on the fact that high return period droughts, and by implication the critical period, were contained within the shorter (1926 to 1990) flow sequences, the above recommendations would therefore not impact on the yield analysis task of the BRBS. It should be noted that, in spite of the limited hydrological model calibrations, the land-use development database of the Breede River Basin was updated to the year 2000.

The general approach followed in order to allow flow sequence generation, was :



- Assembling, capturing and mapping spatial data for use in the catchment model, i.e. rainfall isohyets, evaporation isolines, monthly catchment rainfall, irrigated crop types and areas, afforested and alien invasive vegetation areas and water demands.
- Using the BRHS sub-catchments for the Upper Breede catchment (H100) and discretisation of the Riviersonderend and Lower Breede catchments based on watersheds and available recorded flow data.
- Calibration of the Pitman model.
- Configuration of sub-catchments to include the modelling of inter-basin transfers, farm dams and the time varying effect of increase or decrease in cumulative farm dam capacities, afforestation and alien invasive vegetation areas and variable irrigation demands.
- Naturalising patched observed flow records by adding back the demands met from the catchment simulation. Long-term naturalised flow sequences were generated by catchment simulation with no demands in place and by concatenating the simulated and naturalised observed portions.

### 3. RESULTS

The calibration results of the study are summarised in Table E1 below, while the cumulative naturalised and present development mean annual runoff for the entire basin are shown in Table E2. Figures E1 and E2 show the cumulative naturalised runoff and present day runoff respectively for the entire Breede River catchment.

**TABLE E1 : SUMMARY OF RESULTS OF BREEDE RIVER BASIN STUDY  
HYDROLOGY**

| GAUGED<br>CATCHMENT | QUATERNARY<br>CATCHMENT | MAP<br>(mm) | INCREMENTAL<br>AREA (km <sup>2</sup> ) | CALIBRATION<br>PERIOD | NATURALISED<br>MAR<br>(1927 – 1990)<br>(10 <sup>6</sup> x m <sup>3</sup> ) | NATURALISED<br>RUNOFF<br>PERCENTAGE |
|---------------------|-------------------------|-------------|----------------------------------------|-----------------------|----------------------------------------------------------------------------|-------------------------------------|
| H1H013              |                         | 1160        | 53                                     | 1964 – 1990           | 30.9                                                                       | 50.4                                |
| H1H003              | H10A                    | 600         | 589                                    | 1964 – 1990           | 123.9                                                                      | 35.1                                |
| H1H006              | H10D                    | 2364        | 96                                     | 1964 – 1990           | 134.9                                                                      | 59.4                                |
| H1H007              | H10E                    | 2140        | 84                                     | 1961 – 1990           | 125.4                                                                      | 69.7                                |
| H1H018              |                         | 1945        | 113                                    | 1968 – 1990           | 144.1                                                                      | 66.0                                |
| H4H017              |                         | 686         | 2273                                   | 1981 - 1988           | 322.6                                                                      | 20.9                                |
| H6H005              |                         | 1005        | 24                                     | 1982 – 1997           | 11.6                                                                       | 47.9                                |
| H6H009              | H60K                    | 495         | 1486                                   | 1967 – 1997           | 146.6                                                                      | 19.9                                |
| H7H006              | H70A                    | 395         | 1112                                   | 1970 - 1990           | 55.6                                                                       | 12.7                                |
| H7R001              | H70E                    | 600         | 619                                    | 1970 - 1998           | 121.7                                                                      | 32.8                                |

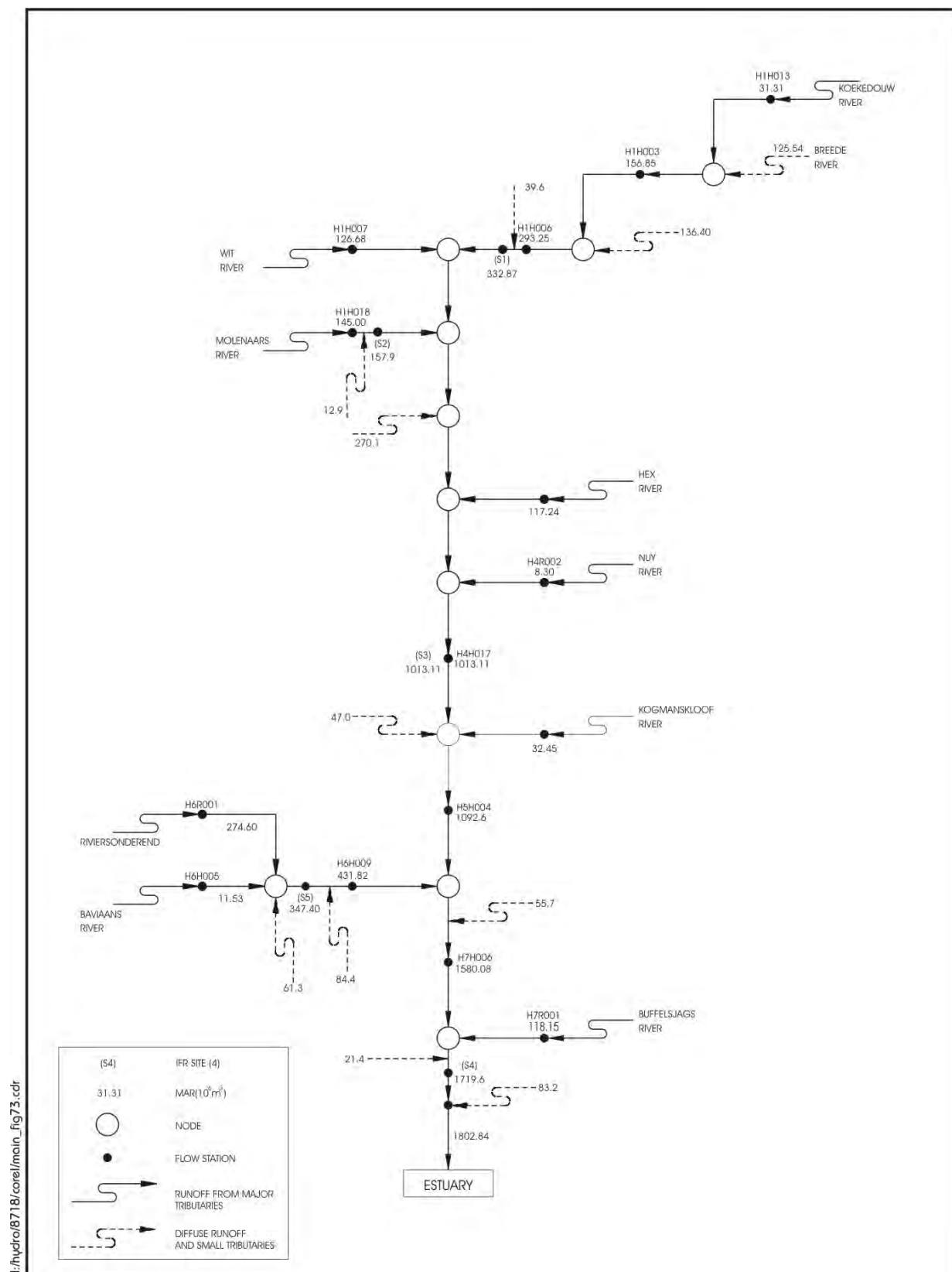


**Figure E1 : Schematic representation of naturalised flows in the Breede River**

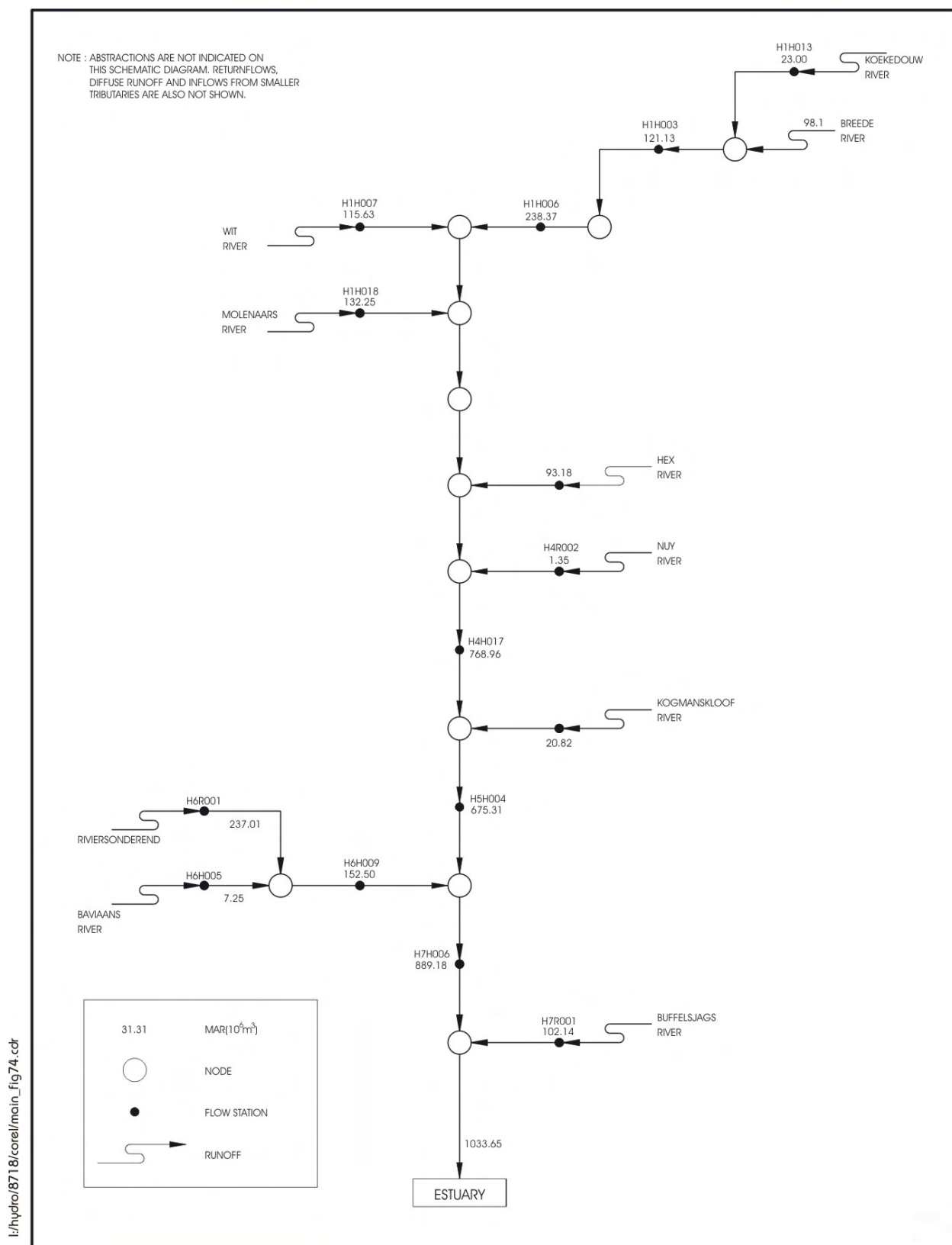


Figure E2 : Schematic representation of present day (2000) flows in the Brede River (1927 - 1990)



**TABLE E2 : NATURALISED AND PRESENT DAY MEAN ANNUAL RUNOFFS FOR THE BREEDE RIVER CATCHMENT**

| GAUGE            | CUMULATIVE NATURALISED<br>MAR (1927 – 1990)<br>(10 <sup>6</sup> x m <sup>3</sup> ) | CUMULATIVE PRESENT DAY<br>MAR (1927 – 1990)<br>(10 <sup>6</sup> x m <sup>3</sup> ) |
|------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| H1H013           | 31.3                                                                               | 23.0                                                                               |
| H1H003           | 156.9                                                                              | 121.1                                                                              |
| H1H006           | 293.7                                                                              | 238.4                                                                              |
| H1H007           | 126.7                                                                              | 115.6                                                                              |
| H1H018           | 145.0                                                                              | 132.3                                                                              |
| Hex River Valley | 115.0                                                                              | 93.2                                                                               |
| H4R002           | 8.3                                                                                | 1.4                                                                                |
| H4H017           | 1013.1                                                                             | 769.0                                                                              |
| H300             | 32.5                                                                               | 20.8                                                                               |
| H5H004           | 1092.6                                                                             | 675.3                                                                              |
| H6R001           | 274.6                                                                              | 237.0                                                                              |
| H6H005           | 11.5                                                                               | 7.3                                                                                |
| H6H009           | 431.8                                                                              | 152.5                                                                              |
| H7H006           | 1580.1                                                                             | 889.2                                                                              |
| H7R001           | 118.2                                                                              | 102.1                                                                              |
| Estuary          | 1802.8                                                                             | 1033.7                                                                             |

## 4. CONCLUSIONS AND RECOMMENDATIONS

### 4.1 RAINFALL DATA

Rainfall data forms one of the most important data requirements when undertaking hydrological modelling. Sufficient rainfall station coverage of the catchment, especially in the higher lying mountainous areas, where very few rainfall stations, if any, are located, is a major problem. The mountainous areas experience the highest rainfall in the catchment, and as such, produce the majority of runoff from the catchment. It is, therefore, important to establish rainfall stations in the appropriate locations within the catchment to allow sufficient spatial coverage.

It is important that reliable data records with sufficiently long record periods be available for use in the hydrological modelling. Although a few rainfall stations within the catchment have records covering more than 70 years, numerous gauges have relatively short periods of record. This, along with the problem of poor data quality at some of the stations, caused some concern.

Therefore it is recommended that the quality of existing stations should be maintained and improved, where necessary, and that new stations be established in areas where there is inadequate coverage at present.

The mean annual precipitations were obtained from digital information supplied by the Computing Centre for Water Research (CCWR). As was the case with previous hydrological studies conducted in the Western Cape, anomalies existed in the mean annual precipitation (MAP) values for the mountainous areas, where the CCWR MAPs were lower than the values determined in previous studies. These inaccuracies should be corrected using recorded observed data since these mountainous areas contribute significantly to the overall catchment mean annual runoff (MAR) and thus need to be modelled accurately.

## **4.2 FLOW DATA**

The catchment generally has sufficient coverage of the number and distribution of flow gauging stations, for measuring runoff at most of the significant points. The length of the observed records was, apart from the record at gauge H4H017, sufficient to allow reliable catchment modelling. In some of the records, the stage measurements exceeded the rating curves and these should be reviewed in order to improve on the quality of the data. The existing gauges should be maintained to allow for continuous recordings.

It is essential that all catchment and inter sub-catchment transfers should be measured accurately, the most important being the transfers from the Theewaterskloof Dam to the Berg Water Management Area and the releases from the Greater Brandvlei Dam.

## **4.3 LAND-USE AND LAND COVER**

Land-use data used in the hydrological modelling was obtained from aerial photography using Geographic Information Systems (GIS). As indicated earlier, the hydrological models for H100 were recalibrated using the land-use information from the BRHS, while updated land-use information was used for the hydrological model calibration in H600 and parts of H700. The present day (2000) land-use areas were used in calculating present day demands of irrigated areas, afforested areas, alien vegetation and open water bodies.

Irrigation is by far the largest user of water within the catchment. The irrigated crops were combined into four categories, i.e. orchards, vines, pastures and cash crops. Irrigated areas in the Upper and Middle Breede and Hex River Valley catchments were reduced to allow for those areas irrigated from groundwater sources. The areas irrigated from groundwater sources were based on estimates and should be determined accurately in order to determine the demand on the surface water resources, especially in the Hex River Valley where groundwater sources contribute more than 50% of the irrigation water supplied.

The areas of afforestation and alien vegetation were also obtained from the aerial photography. Accurate identification from the aerial photography of alien vegetation with regard to species and density proved to be very difficult. Although accurate information on alien infestation was available from the Cape Nature Conservation (CNC), only portions of the catchment were covered. Updated

information should, however, be available from the Working for Water Program and the CNC, once the entire Breede River catchment has been mapped.

Water use by invasive alien vegetation was calculated using age-biomass models and a proportional flow reduction model for the relationships between biomass and flow reductions. The water use by the alien vegetation in the riverine areas should be revised and verified, since the existing models could be under-estimating flow reduction.

# BREDE RIVER BASIN STUDY

## HYDROLOGY

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## APPENDICES

Appendix A : Patched monthly rainfall data

Appendix B : B1 -B12 : hydrological data

Appendix C : Investigation into the need to update or improve available hydrological modelling

## ABBREVIATIONS

|                                      |                                          |
|--------------------------------------|------------------------------------------|
| BRBS                                 | Breede River Basin Study                 |
| BRHS                                 | Breede River Hydrological Study          |
| CNC                                  | Cape Nature Conservation                 |
| CCWR                                 | Computing Centre for Water Research      |
| DT                                   | Discharge Table                          |
| DWAF                                 | Department of Water Affairs and Forestry |
| FSA                                  | Full supply area                         |
| GCTMA                                | Greater Cape Town Metropolitan Area      |
| GIS                                  | Geographical Information Systems         |
| ha                                   | hectares                                 |
| IFR                                  | Instream flow requirements               |
| km                                   | Kilometre                                |
| km <sup>2</sup>                      | Square kilometres                        |
| MAE                                  | Mean annual evaporation                  |
| MAP                                  | Mean annual precipitation                |
| MAR                                  | Mean annual runoff                       |
| MBB                                  | Murray, Biesenbach & Badenhorst          |
| mm                                   | millimetres                              |
| m <sup>3</sup>                       | Cubic metres                             |
| Mm <sup>3</sup> x 10 <sup>6</sup> /a | Million cubic metres per annum           |
| RSE                                  | Riviersonderend                          |
| SD                                   | Standard Deviation                       |
| WCSA                                 | Western Cape System Analysis             |
| WFW                                  | Working for Water                        |
| 10 <sup>6</sup> x m <sup>3</sup>     | Million cubic metres                     |



# **BREEDERIVER BASIN STUDY**

## **HYDROLOGY**

### **1. INTRODUCTION**

The development of the Greater Cape Town Metropolitan Area (GCTMA) and adjacent towns, as well as the agricultural needs of the south western region of the Western Cape, make the efficient utilisation of available water resources a necessity. Rapid population growth, industrial development, improving living standards and the needs of irrigation have severely taxed the water resources of the GCTMA and the surrounding environment. Therefore, the optimum utilisation of the water resources on a regional basis is necessary and the judicious planning of the further development of the water resources.

The existing and potential water resources of, and demands on, the main rivers supplying water to the GCTMA and adjacent towns were studied under the Western Cape System Analysis (WCSA, DWAF, 1993). The study included the Berg River catchment and a number of other catchments close to Cape Town, as well as parts of the Breede River Basin. A number of schemes which could potentially transfer water from the Breede River Basin to the GCTMA were identified and investigated at a reconnaissance level during this study, and as possible alternatives in the subsequent feasibility studies of the Skuifraam Dam (Berg Water) Scheme. However, it was recognised that the desirability of transferring water from the Breede River to the Berg River catchment and ultimately to the GCTMA needed to be addressed by evaluating the potential use of water resources in the Breede River Basin and assessing the quantity and quality of water that could be made available for external use from the resources of the Breede River. For this purpose, a comprehensive study of the Breede River Basin is required.

The Department of Water Affairs and Forestry (DWAF) commissioned the Breede River Basin Study (BRBS) in order to assess the status of the existing water resources and developments for water supply in the Breede River and Riviersonderend valleys and to identify opportunities, at reconnaissance level, for their potential future development. Ninham Shand Pty (Ltd), in association with MBB and Jakoet & Associates, were contracted by DWAF to undertake the BRBS.

The main aim of the hydrology task was to enable river flow information to be provided at any point of interest in the basin. To this end, it was necessary to :

- review the hydrology previously completed for the Breede River Hydrological Study (BRHS, DWAF, 1995) and determine whether it is necessary to extend or improve on the reliability of the hydrology;
- configure and calibrate the catchment model for the Upper Breede (H100), Riviersonderend (H600) and Lower Breede (H700) portions of the Breede River Basin; and

- use the calibrated model parameters to generate runoff sequences at all points of interest.

In light of budgetary constraints and following detailed comparisons carried out as part of the Inception Phase of the study for the Molenaars River catchment and Ceres Basin, and a less detailed review of calibrations in the remainder of the BRHS study area, it was recommended that :

- catchment models for the Upper Breede River (H100) be recalibrated for the same periods used in the BRHS, with the main aim of, if possible, improving the calibration. For this exercise the BRHS land-use information was used;
- hydrology of the H200, H300, H400 and H500 regions of the Basin produced during the BRHS, be accepted;
- catchment models be configured and calibrated for the Riviersonderend (H600), covering the period up to the 1997/98 hydrological year (limited by the observed flow record at gauge H6H009);
- catchment models be configured and calibrated for the Lower Breede (H700) catchments, covering the period up to the 1998/99 hydrological year for the Buffeljags Dam catchment;
- note that calibration of the models for the Lower Breede River mainstem spanned the period up to the 1990 hydrological year (the last year of the BRHS calibration period), since the H500 flows feed into the lower Breede River catchment mainstem. This had to be done since problems were experienced conducting an incremental calibration at the Lower Breede River gauge H7H006.

Based on the fact that high return period droughts, and by implication the critical period, were contained within the shorter (1926 to 1990) flow sequences, the above recommendations would therefore not impact on the yield analysis task of the BRBS. It should be noted that, in spite of the limited hydrological model calibrations, the land-use development database of the Breede River Basin was updated to the year 2000.

Appendix C provides a summary of the investigations carried out as part of the Inception Phase into the need to update or improve the available hydrological modelling in the Breede River Basin. A comparison of the calibrations at flow gauges H1H003 and H1H018 is included in Appendix C.

## 2. CATCHMENT DESCRIPTION

### 2.1 LOCATION

The Breede River, with a total catchment area of 12 600 km<sup>2</sup>, is the largest river in the Western Cape. It originates in the Ceres Valley approximately 100 km north east of Cape Town, and flows in a south easterly direction past Worcester to join the Riviersonderend until, after approximately 320 km, it reaches St Sebastian Bay in the Indian Ocean near Witsand/Infanta on the Southern Cape coast.

The Breede River Catchment comprises the drainage areas of six basins, comprising seven sub-regions or secondary catchments. The six basins are the Ceres Basin; Upper Breede River; Hex River; Middle Breede River; Riviersonderend; and the Lower Breede River. Figure 2.1 shows the location and map of the study area.

### 2.2 DRAINAGE, TOPOGRAPHY AND LAND-USE

#### **Drainage**

The headwaters of the Breede River are located in the Ceres Valley, from where it drains through Michell's Pass, continuing in a south easterly direction until its confluence with the Hex River near Worcester. The flow continues in a south easterly direction to join the Riviersonderend before it reaches the Indian Ocean at St Sebastian Bay.

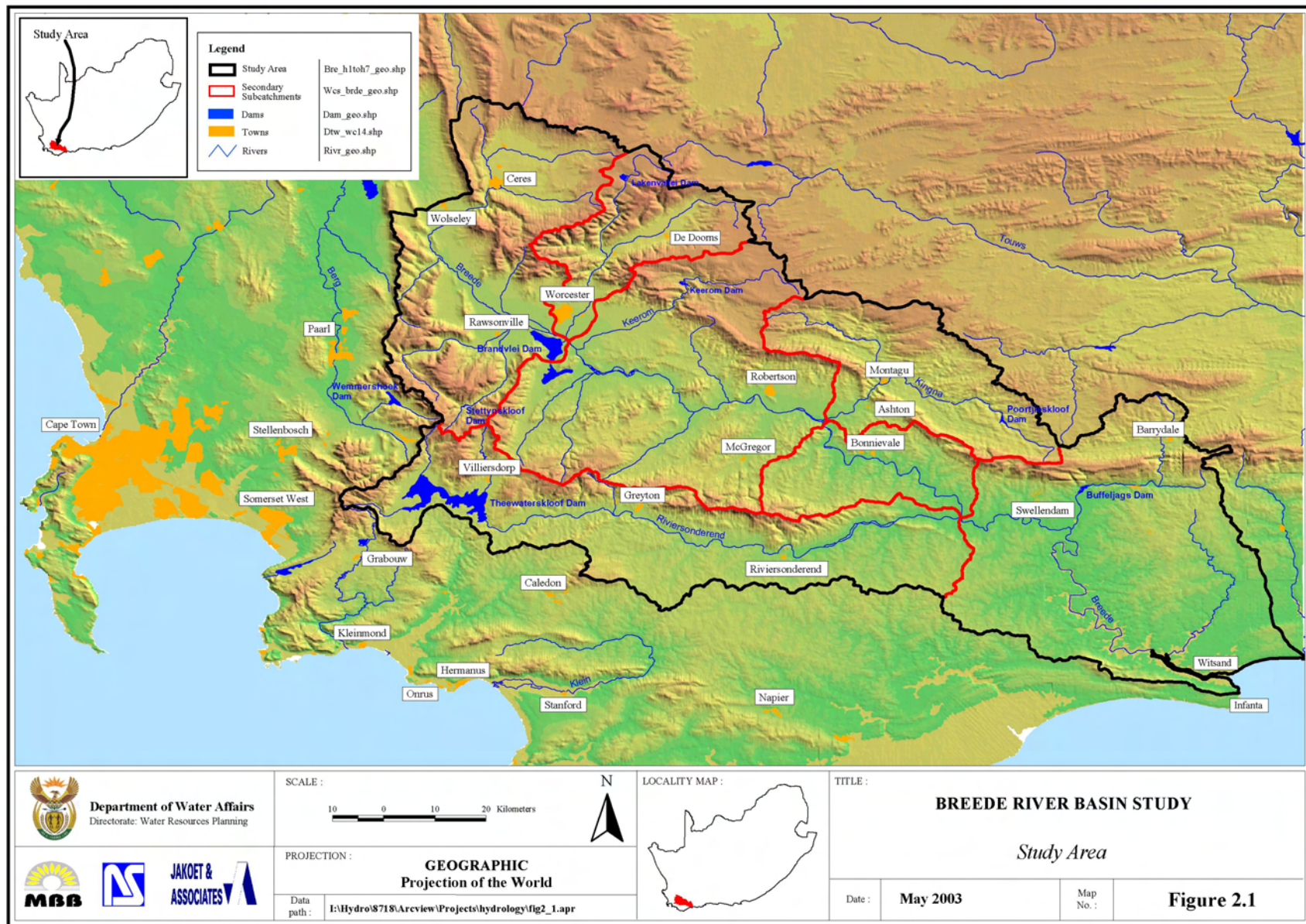
The Breede River Catchment comprises the drainage areas of seven sub-regions. Figure 2.2 shows the seven sub-regions, along with the quaternary catchments covering the study area. These are the Ceres Basin (from the source to Michell's Pass - first part of H1); the Upper Breede River (from Michell's Pass to Greater Brandvlei Dam - rest of H1); the Hex River (H2); the Middle Breede River (from Greater Brandvlei Dam to the confluence with the Riviersonderend - H3, H4 and H5); the Riviersonderend (H6); and the Lower Breede River (H7). A brief description of each basin is given below.

#### ***The Ceres Basin (De Vlake to Michell's Pass, first part of H1)***

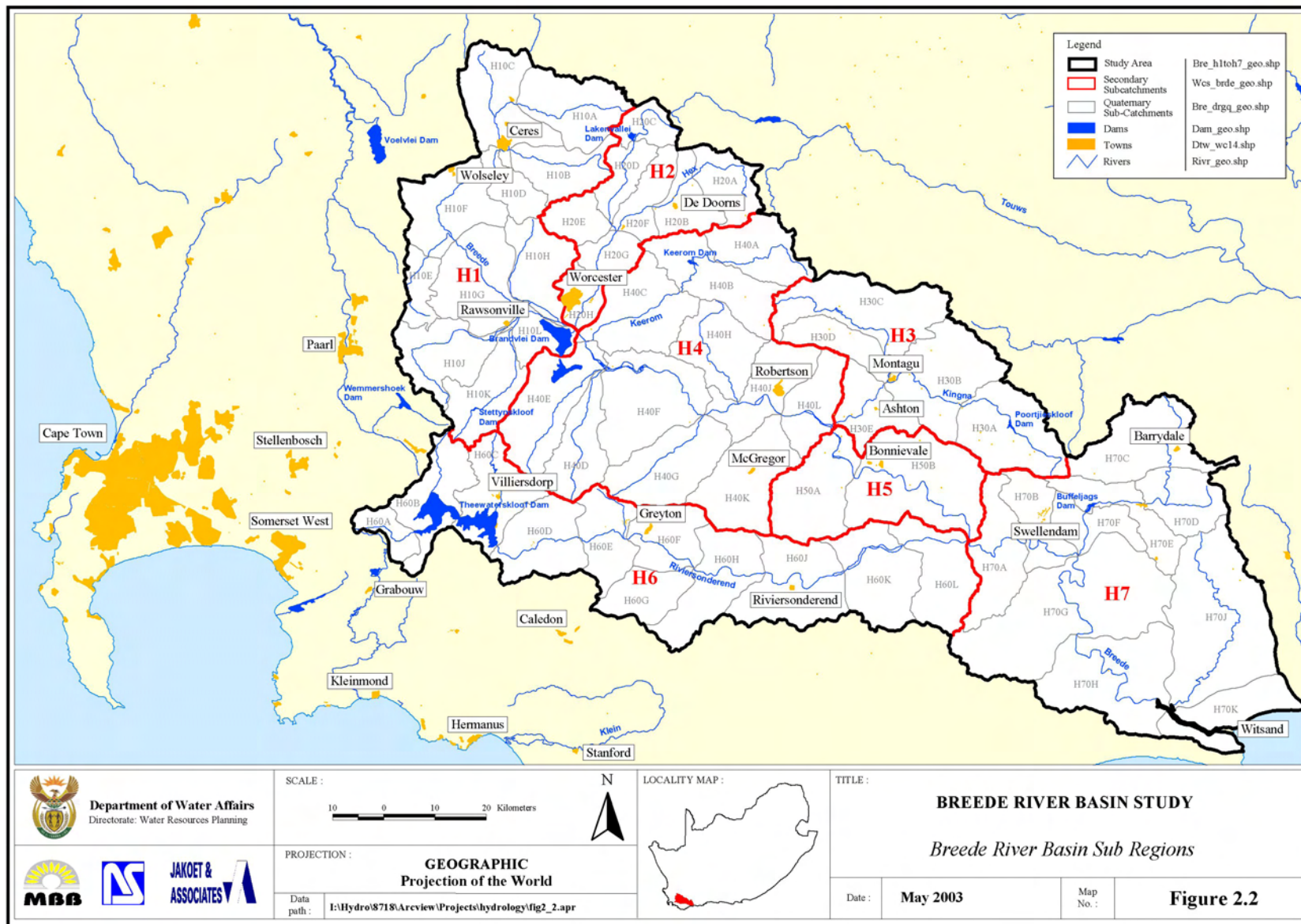
The Breede River starts off as the Modder River, flowing through the undisturbed Skurweberg before becoming known as the Dwars River, which flows through agricultural land before its confluence with the Koekoedou River immediately upstream of Ceres. Downstream of Ceres, the Dwars is joined by the Titus River, then flows south through Michell's Pass, and is met by numerous tributaries en route, the most notable of these being the unimpacted Witels River, which drains the western portion of the Hex River Mountains.

#### ***The Upper Breede River (from Michell's Pass to the Greater Brandvlei Dam, H1)***

About 18 km downstream of Michell's Pass, the Breede River is met by the Wit River, and a further 7 km downstream by the Slanghoek River. The Wit River drains the south-western slopes of the Slanghoekberge and the Obiekwaberg, and the Slanghoek River drains the eastern slopes of the Slanghoekberge.







The Molenaars River originates in the Du Toit's Kloof Pass in the Klein Drakenstein Mountains and is also fed by streams on the southern slopes of the Witteberg, the northern Du Toitsberge (via the Tierstel River) and the south-eastern slopes of the Slanghoekberge. The Molenaars River is known as the Smalblaar River downstream of its confluence with the Tierstel River. The Molenaars River joins the Breede River just north of Rawsonville.

The Jan Du Toit's River drains the Waaihoekberge and joins the Breede River just upstream of Rawsonville. The Holsloot River, draining the southern slopes of the Du Toitskloofberge and the northern slopes of the Stettynsberge, joins the Breede River just upstream of the Papenkuils Wetland and Brandvlei Dam.

### ***The Hex River Basin (H2)***

The Hex River has its source on the southern slopes of the Bontberg Mountains and flows in a south-westerly direction as a relatively pristine mountain stream until it reaches the Hex River Valley. Several mountain streams from the high mountains on either side feed into the Hex River in this region. The Rooiels River, draining the slopes of the Hex River Mountains to the north of the river, joins the Breede near De Doorns. The Sandriftskloof, with two in-channel dams, the Roode Elsberg and Lakenvallei Dams and Amandel Rivers, join the Breede River downstream of Sandhills.

Downstream of Sandhills, the Hex River flows south into the Breede River Valley for about 10 km, through orchards and vineyards east of Worcester to its confluence with the Breede River just north of Brandvlei Dam.

### ***The Middle Breede River (H4, H3, H5)***

The middle reaches of the Breede River comprise the area between the Brandvlei Dam and the confluence with the Riviersonderend. Several smaller tributaries such as the Nuy (or Koo), Kogmanskloof (H300), Doring, Poesjenels, Konings, Keisers, Groot and Boesmans Rivers (H500) join the Breede River within this reach.

### ***The Riviersonderend (H6)***

The Riviersonderend has its origin in the Groot Drakenstein and Franschoek Mountains and flows eastward from the high lying areas in the west, into Theewaterskloof Dam and continues in an easterly direction to join the Breede River about 20 km west of Swellendam.

### ***The Lower Breede River (H7)***

Downstream of its confluence with the Riviersonderend, the Breede River flows in an easterly direction until it is joined by the Buffeljags River, to the south-east of Swellendam. The Buffeljags River originates as a series of mountain streams on the northern slopes of the Langeberg Range and enters the Buffeljags Dam, from where it flows in a southerly direction to meet the Breede River. Meandering further through wheat fields for about 50 km, the Breede River broadens into an estuary and finally reaches the sea at Sebastian Bay.

## **Topography**

The topography of the Breede River Basin can best be described following the six sub-basins.

### ***Ceres Basin (from the source to Michell's Pass - first part of H1)***

The Ceres Basin is surrounded by the Gydo mountain range to the north, the Witsenberg mountain range to the west and the Hex River mountains to the east and south-east. Elevations vary from about 2000 m in the Hex River mountains to 500 m in the Ceres valley.

### ***Upper Breede River (from Michell's Pass to Greater Brandvlei Dam - rest of H1)***

The Upper Breede Basin, Voëlvlei, Elandskloof and Limietberg mountains to the west, the Witsenberg and Du Toitsberg mountains to the south. Elevations vary from about 2000 m in the Hex River mountains to 200 m in the Upper Breede valley.

### ***Hex River (H2)***

The Hex River is surrounded by the Hex River mountains to north and Kwadousberg mountains to the east. Elevations vary from about 2000 m in the Hex River mountains to below 450 m in the Hex River valley.

### ***Middle Breede River (Greater Brandvlei Dam to Riviersonderend confluence - H3, H4 and H5)***

The Middle Breede River is surrounded by the Langeberg mountains to the north and the Riviersonderend mountains to the south. Elevations vary from about 1700 m in the mountains to about 190 m in the valley.

### ***Riviersonderend (H6)***

The Riviersonderend is surrounded by the Franschhoek mountains to the west, the Stettyns and Riviersonderend mountains to the north. Elevations vary from about 1400 m in the mountains to about 80 m at the confluence with the Breede River.

### ***Lower Breede River (H7)***

The Lower Breede River is bounded by the Langeberg mountains to the north. Elevations vary from about 1400 m in the mountains to about 80m in the low lying areas and down to sea level at the river mouth.

## **Land-use**

Land-use in the basin is predominantly cultivated lands. Irrigation occurs mainly along the flatter areas between mountain ranges, particularly along river courses in valleys. The focus of the agricultural sector is on the production of fruit and wine. The Ceres Valley is the most important fruit producing area in the region, while the Breede River region produces fruit, wine grapes and vegetables. Wheat fields dominate the southern portion of the basin.

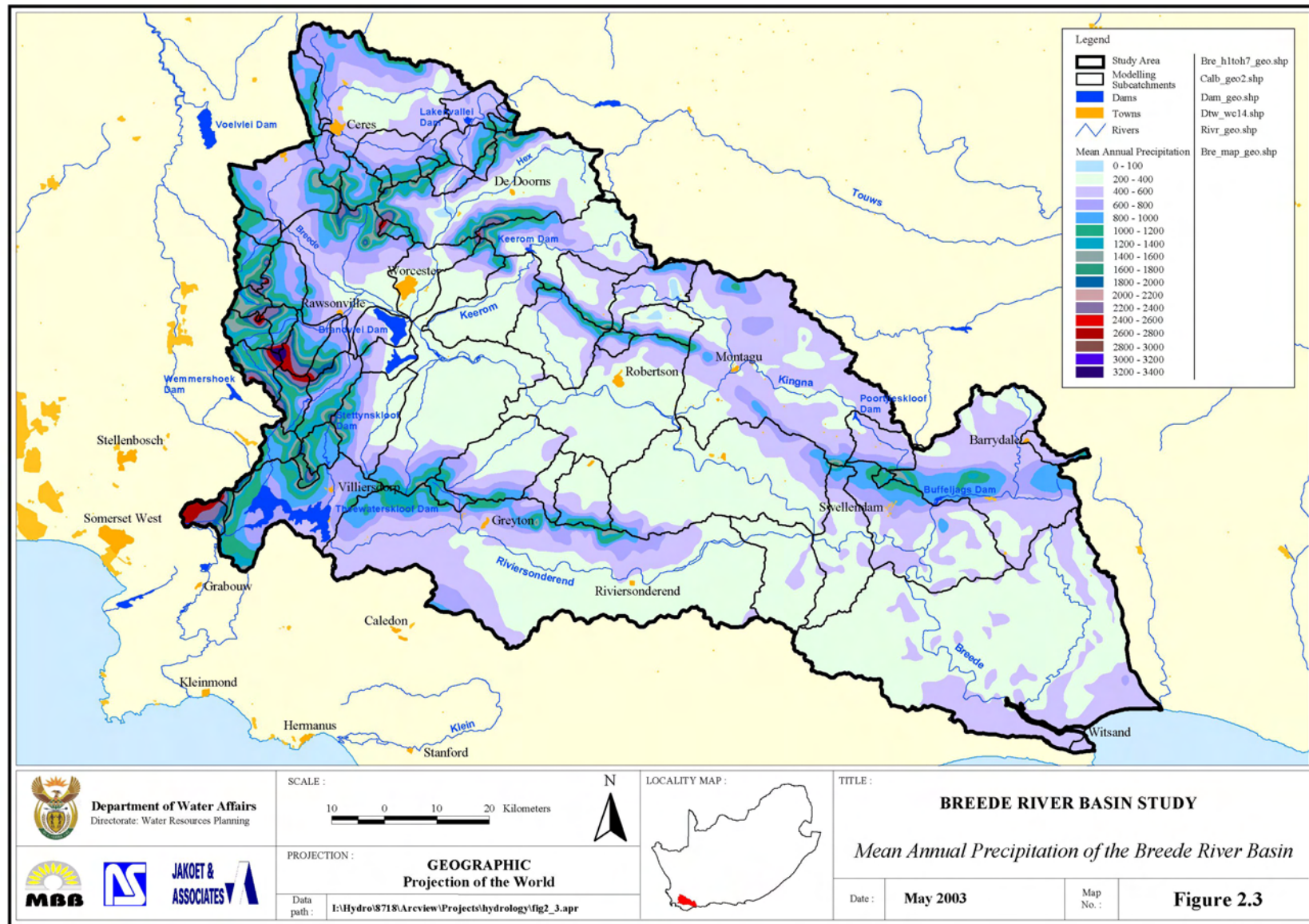
Small areas of forestry are found throughout the Basin, but predominate in the high altitude and rainfall areas. Alien invasive vegetation is found throughout the Basin, with the Riviersonderend area experiencing the highest density and area infestation.

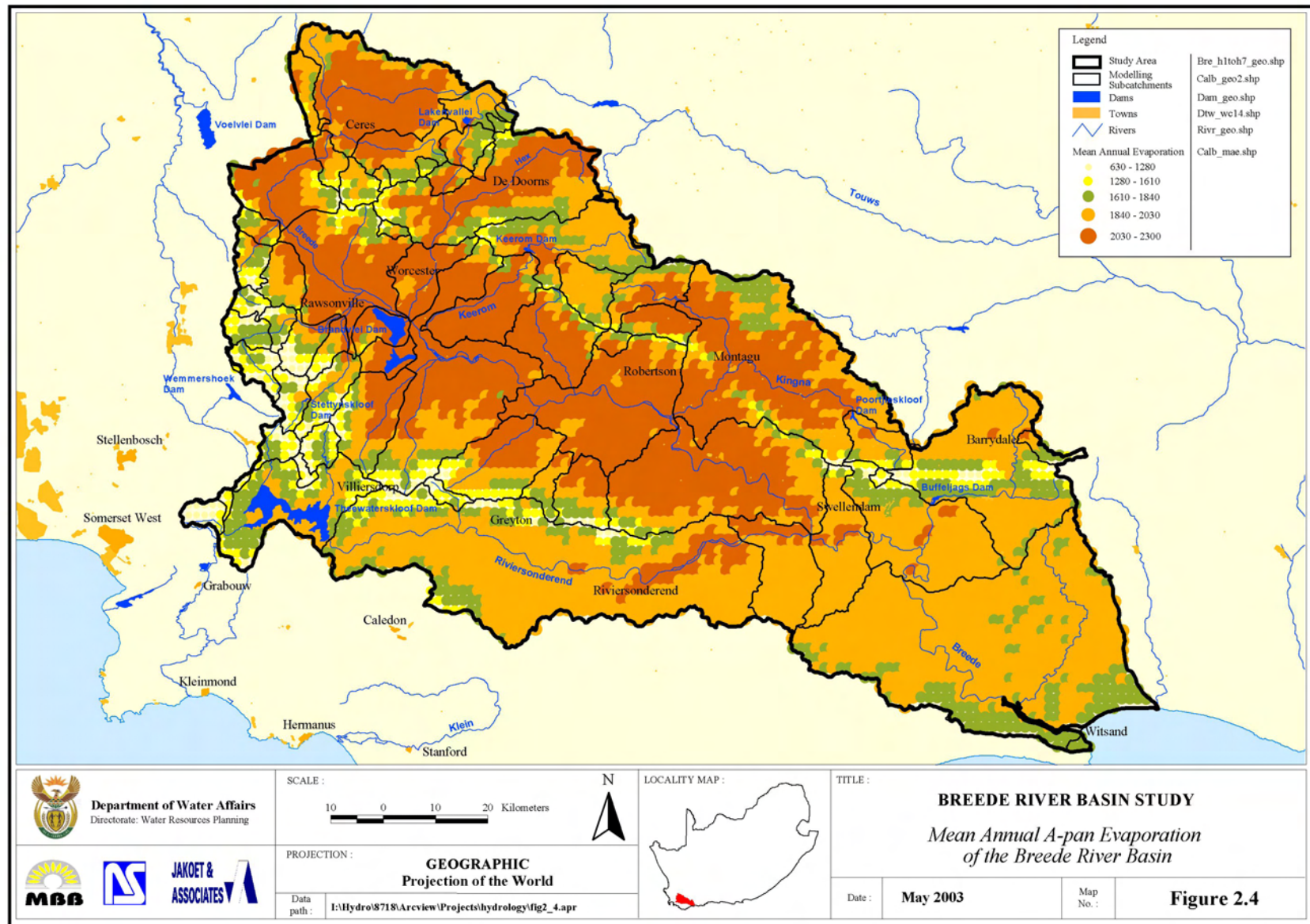
## 2.3 CLIMATE

The study area falls within the winter rainfall region of South Africa, although the northern fringe of the Basin falls within the semi-arid Karoo where rainfall is unpredictable. Rainfall is strongly seasonal, with roughly 80% of the annual precipitation falling between the months of April and September, resulting from north-westerly frontal systems. The rainfall pattern over the study area varies considerably, mainly as a result of the variation in altitude. The highest rainfall of about 2 300 mm/a occurs in the high-lying mountainous areas along the western border of the basin, while the low-lying middle-reaches of the Breede River Valley and the area north of the Langeberg mountain range receives the lowest rainfall within the basin. In these regions, the average rainfall is about 400 mm/a. In the south of the Breede River Basin along the Riviersonderend and lower reaches of the Breede River, the rainfall varies between about 2 300 mm/a in the upper Riviersonderend to about 400 mm/a in the lower reaches of the Breede River Basin and is mainly driven by onshore south-easterly winds. Figure 2.3 shows the distribution of rainfall over the Breede River Basin based on the Computing Centre for Water Research (CCWR) isohyets.

Summers tend to be dry and hot with generally high evaporation. The gross mean annual Symons Pan evaporation is estimated to vary from about 1800 mm/a in the Upper and Middle Breede Valley down to about 1000 mm/a in the Du Toits and Franschhoek mountains. Figure 2.4 shows the distribution of evaporation, based on the CCWR mean monthly isohyets. Temperatures vary between a minimum of -1°C in the winter and maximums in the mid 30's in the summer months.







### 3. MODELLING STRATEGY

Generally, a two-phased modelling strategy is used to simulate monthly flow sequences at various points of interest in the study area :

- the calibration of a standard rainfall/runoff catchment model for sub-catchments upstream of selected flow stations throughout the catchment
- the rainfall/runoff catchment model is then used to generate monthly flows representing present and naturalised development scenarios.

During the inception phase of the BRBS, a review of existing information was undertaken to assess whether the hydrology completed for the BRHS needed to be improved or extended to the present day (a summary of the review is contained in Appendix C). The review included re-calibrating and extending the hydrology for representative sub-catchments (high- and low rainfall, and a reasonable mix of upstream impacts) previously covered by the BRHS. Based on detailed comparisons carried out for the Molenaars Catchment and Ceres Basin, and a less detailed review of calibrations in the remainder of the BRHS study area, it was recommended that :

- although the use of longer flow records could improve the calibration of the catchment models, no extension of the BRHS hydrology was to be carried out, as the high return period droughts are contained within the shorter (1926 to 1990) flow sequences
- a limited exercise be carried out to replace BRHS hydrology in selected catchments to improve the simulation of low flows.

Based on the above evaluations, it was decided that the :

- catchment models for the Upper Breede River (H100) be recalibrated for the same periods used in the BRHS, with the main aim of, if possible, improving the calibration. For this exercise the BRHS land-use information was used;
- hydrology of the H200, H300, H400 and H500 regions of the Basin produced during the BRHS, be accepted;
- catchment models be configured and calibrated for the Riviersonderend (H600), covering the period up to the 1997/98 hydrological year; (limited by the observed flow record at gauge H6H009)
- catchment models be configured and calibrated for the Lower Breede (H700) catchments, covering the period up to the 1998/99 hydrological year for the Buffeljags Dam catchment;

Note that calibration of the models for the Lower Breede River mainstem spanned the period up to the 1990 hydrological year (the last year of the BRHS calibration period), since the H500 flows feed into the lower Breede River catchment mainstem. This had to be done since problems were experienced in conducting an incremental calibration at the Lower Breede River gauge H7H006.

### 3.1 REQUIREMENTS FOR MODELLING DEVELOPED CATCHMENTS

The Breede River Basin is a developed catchment, with many aspects of the development impacting on the streamflows. When modelling the runoff from a catchment, the factors affecting runoff should be considered. These include :

- winter runoff storage in farm dams with increasing capacity over time and river abstraction for the purpose of filling farms dams by the end of winter
- irrigation water sources (groundwater, farm dams, run-of-river)
- growth in farm dam numbers over time
- runoff from increasing farm dam sub-catchment areas as a result of increasing numbers of farm dams
- the simulation of low flows.

Details of the above aspects follow in Section 4.

The following suite of standard mathematical models was used for the hydrological modelling :

#### ***Pitman Model :***

The rainfall-runoff modelling system SHELL (Berg and Beuster, 1992), based on the Pitman model (Pitman, 1973), was configured for each calibration point and calibrated on the observed flow record by making use of catchment rainfall and historical water use determined from time-varying land-use information.

#### ***RESSIM model :***

This routine is used for reservoir simulation on a monthly basis and is included in the SHELL modelling system.

#### ***CATCHRN model***

This routine combines monthly rainfall records of varying lengths from different rainfall records to produce a single record of monthly data in units of percentage mean annual precipitation.

#### ***UTILITY routines***

A suite of routines is available for among other purposes

- evaluating irrigation water consumption (included in SHELL)
- evaluating afforestation and alien vegetation water consumption (included in SHELL)
- several free-standing programs used for manipulating data files.

### **3.2 MODELLING DYNAMIC TIME VARYING DATA**

Calibration of the Pitman model is achieved by comparing simulated runoff with observed runoff. The variation in catchment and land-use characteristics, therefore, needs to be taken into account during the calibration process. To quantify variation in catchment and land-use characteristics during the period of the observed flow record, a geographical information system (GIS) was used to abstract the characteristics from aerial photographs for different time slices. The data is then manipulated to yield dynamic information about the catchment for use in the hydrological modelling.

The SHELL model was developed to allow dynamically varying areas and capacities to be modelled in the Pitman and Ressim routines, allowing the entire hydrological system of a catchment to be set up in a single configuration. Calibration then involves changing the Pitman parameters and re-running the defined configuration.

### **3.3 MODELLING INCREMENTAL SUB-CATCHMENTS**

When modelling a large catchment with more than one flow gauge on the river, it has to be decided whether a cumulative or incremental calibration will be conducted at the downstream gauge. Incremental sub-catchments are defined as sub-catchments that are located downstream of one or more flow gauges.

A cumulative calibration is done when all upstream gauged inflows (from the respective gauges flowing into the sub-catchment) are added to the runoff simulated for the incremental sub-catchment, comparing this total simulated runoff with the cumulative observed flow at the downstream gauge. If the summed flow from the upstream catchments is much larger than the incremental sub-catchment runoff, the relative effect of the Pitman parameters is small and large adjustments could be required to obtain an acceptable calibration. The resulting parameter set may no longer be representative of the incremental sub-catchment and this may lead to unrealistic flows being simulated for the incremental catchment.

For the incremental sub-catchment calibration, the simulated runoff has to be compared with the "observed" runoff from the incremental sub-catchment. The gauge, however, measures cumulative flow and in order to determine the incremental observed runoff, all upstream gauged flows have to be subtracted from the measured flow at the outlet of the incremental sub-catchment. When determining the "observed" incremental runoff, negative flows could be obtained. These negative flows could be due to abstractions from the river between the two flow gauges, represent seepage or unknown losses or be the result of measurement inaccuracies. For the Pitman model calibration, these negative flows are set to zero, with the resulting record representing the "observed" incremental flow record.

Based on the above, it was decided to follow the incremental calibration process in this study.

## 4. MODELLING PROCEDURE

### 4.1 STREAMFLOW

Monthly observed streamflow records, for use in the hydrological calibration process, were required for the Upper Breede (H100), Riviersonderend (H600) and Lower Breede (H700) catchments. Since it was decided only to improve on the hydrology of the Upper Breede River (H100) catchment, calibration of the Pitman model was based on the same flow records used during the BRHS.

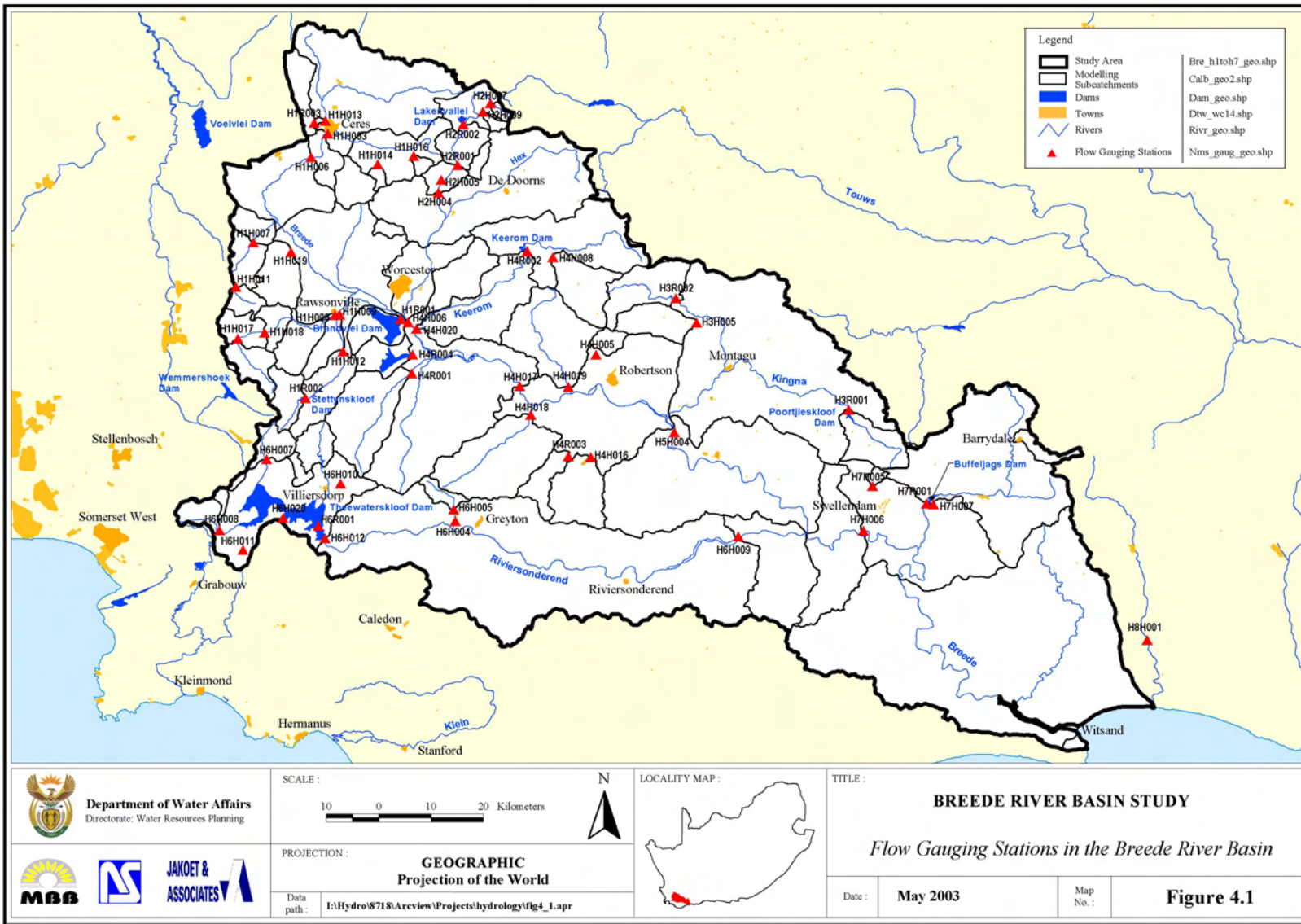
In the case of the portion of the Riviersonderend (H600) catchment upstream of Theewaterskloof Dam, it was decided to use the recently updated hydrology produced during the Skuifraam Dam Feasibility Study (DWAF, 1997). Modelling of the H600 was, therefore, limited to the portion of the catchment between Theewaterskloof Dam and the Riviersonderend confluence with the Breede River. Although the entire H700 catchment had to be modelled, only two flow records of sufficient length were available for use.

The details of the flow gauges used in the catchment model calibrations are given in Table 4.1, while the locations of these gauges, and other gauges within the Breede Basin, are shown on Figure 4.1. The raw observed streamflow data and patched observed flow data can be found in Appendices B1 - B12. Note that the full record periods for the H100 flow gauges were not used in the recalibration of the H100 catchments models, but only the corresponding period used in the BRHS Hydrology, as described in the Introduction.

**TABLE 4.1 : GAUGING STATIONS USED FOR CALIBRATION**

| STATION NUMBER | RIVER                    | PLACE          | LATITUDE  | LONGITUDE | CATCHMENT AREA (km <sup>2</sup> ) | DATE OPENED | DATE RECORDER INSTALLED | DATE CLOSED | RECORD PERIOD     |
|----------------|--------------------------|----------------|-----------|-----------|-----------------------------------|-------------|-------------------------|-------------|-------------------|
| H1H013         | Koekoedou                | Ceres          | 33°26'05" | 19°17'54" | 53                                | 24/02/65    | 24/02/65                | -           | 10/1964 - 9/1998  |
| H1H003         | Breede                   | Ceres          | 33°22'52" | 19°18'10" | 657                               | 22/02/23    | 17/05/62                | -           | 10/1923 - 9/1998  |
| H1H006         | Breede                   | Witbrug        | 33°25'18" | 19°16'06" | 753                               | 16/04/50    | 17/05/62                | -           | 10/1950 - 9/1998  |
| H1H007         | Wit                      | Drosterskloof  | 33°34'05" | 19°08'54" | 84                                | 10/04/50    | 16/05/62                | -           | 10/1950 - 9/1998  |
| H1H018         | Molenaars                | Haweqias       | 33°43'24" | 19°10'13" | 113                               | 27/02/69    | 27/02/69                | -           | 10/1969 - 9/1999  |
| H4H017         | Breede                   | Le Chasseur    | 33°49'05" | 19°41'41" | 4336                              | 29/04/80    | 29/04/80                | -           | 10/1980 - 9/1998  |
| H6H005         | Baviaans                 | Genadendal     | 34°01'44" | 19°33'27" | 24                                | 25/06/63    | 25/06/63                | -           | 10/1963 - 9/1998  |
| H6H009         | Riviersonderend          | Reenen         | 34°04'32" | 20°08'44" | 2007                              | 01/05/64    | 01/05/64                | -           | 10/1964 - 9/1998  |
| H7R001         | Inflow to Buffeljags Dam | Buffeljags Dam | 34°01'07" | 20°32'02" | 601                               | 10/01/67    | 05/10/70                | -           | 11/1970 - 10/2000 |
| H7H006         | Breede                   | Swellendam     | 34°03'57" | 20°24'15" | 9842                              | 16/03/66    | 16/03/66                | -           | 3/1967 - 9/1997   |







## 4.2 RAINFALL RECORDS

Reliable monthly rainfall records are required for the calibration of the Pitman model. Rainfall records were obtained from four sources :

- DWAF
- the CCWR
- the Department of Agriculture
- the Weather Bureau.

Since only the H100, H600 and H700 catchments of the Breede River Basin were modelled as part of the BRBS, rainfall records in and in close proximity to these catchments were needed. Although quite a number of rainfall stations were available for use, a large portion of the records, however, contained any one or a combination of the following :

- insufficient number of years with complete monthly rainfall records
- large gaps in the records, i.e. no rainfall was recorded for a number of consecutive months
- single, sporadic missing monthly rainfall records
- rainfall records exhibiting non-linearity due to external influences on the rainfall gauge
- monthly records that have been erroneously recorded and are outliers when compared to the rest of the records.

In order to obtain reliable monthly rainfall data from the available records the raw data are processed in three steps :

- pre-screening of the raw monthly data to identify gross outliers and non-linearity
- classifying rainfall stations into groups of similar trends and identifying outliers using statistical techniques
- patching of gross outliers and missing monthly rainfall data.

### Screening and Infilling

Only rainfall stations within the catchment boundary and those in close proximity to the catchment, were considered. From these, only those with more than 17 years of data were selected and evaluated. Non-linearity in the individual monthly records is identified using a single mass plot of the rainfall data. Gauges exhibiting excessive non-linearity were excluded from the evaluation, or only portions of such records were used.

Infilling of missing, incomplete, or outlier monthly values were achieved by using the CLASSR and PATCHR (Pegram, 1989) computer routines. The software implements a classification scheme to identify statistical similarity in groups of rain gauge records, an outlier recognition scheme and multi-site regression techniques for infilling of missing values and outliers. Note that only missing or incomplete values contained in the original records were patched and no synthetic extensions were done. Tables 4.2a and 4.2b list the rainfall stations used in the Breede River Basin Study. The patched monthly rainfall data for these stations are listed in Appendix A.

**TABLE 4.2a : RAINFALL STATIONS USED IN BRBS HYDROLOGY : H100**

| RAINFALL STATION NO. | USED FOR SUB-CATCHMENT         | PERIOD OF RECORD | LENGTH OF RECORD |
|----------------------|--------------------------------|------------------|------------------|
| 022038_8             | H1H007, H1H018, H4H017         | 1920 - 1998      | 79               |
| 022113_2             | H1H018, H1R002                 | 1920 - 1998      | 78               |
| 22264p               | H1R002                         | 1959 - 1975      | 17               |
| 022284a              | H1H007, H1H018, H4H017         | 1970 - 1983      | 14               |
| 022368_4             | H1H007, H4H017                 | 1932 - 1977      | 46               |
| 022475_4             | H1R002                         | 1982 - 1998      | 17               |
| 022504_X             | H1H018, H1R002                 | 1932 - 1994      | 62               |
| 022521_9             | H4H017, H1R001                 | 1920 - 1976      | 57               |
| 022789a              | H4H017, H1R001                 | 1943 - 1988      | 46               |
| 022792_8             | H4H017, H1R001                 | 1936 - 1979      | 44               |
| 022803_2             | H4H017, H1R001                 | 1925 - 1998      | 74               |
| 23039p               | H1R001                         | 1927 - 1977      | 51               |
| 042227_3             | H1H013, H1H003                 | 1920 - 1998      | 78               |
| 042326_X             | H1H013, H1H003, H1H006         | 1920 - 1998      | 78               |
| 042357_A             | H1H013, H1H006, H1H007, H4H017 | 1924 - 1998      | 74               |
| 042415_9             | H1H006                         | 1920 - 1961      | 42               |
| 042499_P             | H1H013                         | 1961 - 1981      | 20               |
| 042582_2             | H1H003                         | 1951 - 1998      | 47               |
| 043019_P             | H1H003                         | 1949 - 1976      | 27               |
| 043139_P             | H1H003                         | 1951 - 1997      | 46               |

**TABLE 4.2b : RAINFALL STATIONS USED IN BRBS HYDROLOGY : H600 AND H700**

| RAINFALL STATION NO. | USED FOR SUB-CATCHMENT      | PERIOD OF RECORD | LENGTH OF RECORD |
|----------------------|-----------------------------|------------------|------------------|
| 007008_a             | H6H009                      | 1972 - 1998      | 27               |
| 007183_7             | H6H005, H6H009              | 1968 - 1998      | 31               |
| 007698_a             | H6H009                      | 1931 - 1974      | 44               |
| 008136_a             | H6H009, H7H006              | 1923 - 1998      | 76               |
| 008367_2             | H6H009, H7H006              | 1930 - 1998      | 69               |
| 008683_p             | IFR Site 4, Estuary         | 1926 - 1977      | 52               |
| 008713_a             | IFR Site 4, Estuary         | 1978 - 1998      | 21               |
| 008751_7             | H7H006, H7R001              | 1929 - 1998      | 70               |
| 008782_0             | H7H006                      | 1926 - 1998      | 73               |
| 008876_9             | IFR Site 4, Estuary         | 1926 - 1964      | 39               |
| 009365_5             | H7R001, IFR Site 4, Estuary | 1943 - 1998      | 56               |
| 009430_2             | IFR Site 4, Estuary         | 1935 - 1988      | 54               |
| 009458_a             | IFR Site 4, Estuary         | 1972 - 1995      | 26               |
| 022539_X             | H6H005, H6H009              | 1924 - 1998      | 75               |
| 023895               | H7H006                      | 1947 - 1981      | 35               |
| 024057               | H7H006                      | 1958 - 1978      | 21               |
| 024146               | H7H006                      | 1925 - 1990      | 66               |
| 024324               | H7H006                      | 1970 - 1984      | 15               |
| 024447               | H7H006                      | 1953 - 1980      | 46               |
| 025414_8             | H7R001                      | 1924 - 1998      | 75               |
| 025599_3             | H7R001                      | 1919 - 1998      | 80               |

Long-term catchment rainfall records for catchments upstream of calibration points and points of interest were subsequently generated from the infilled records. Where possible, rainfall records were updated to the 1998 hydrological year. Catchment rainfall records for H100 were truncated at the 1990 hydrological year, while the catchment records for H600 and H700 extended to the 1998 hydrological year.

Figure 4.2 shows the locations of the rainfall stations in and in close proximity to the Breede River Basin used in the hydrology. Note that only the rainfall stations used in this study are shown.

### **Sub-catchment Mean Annual Precipitation**

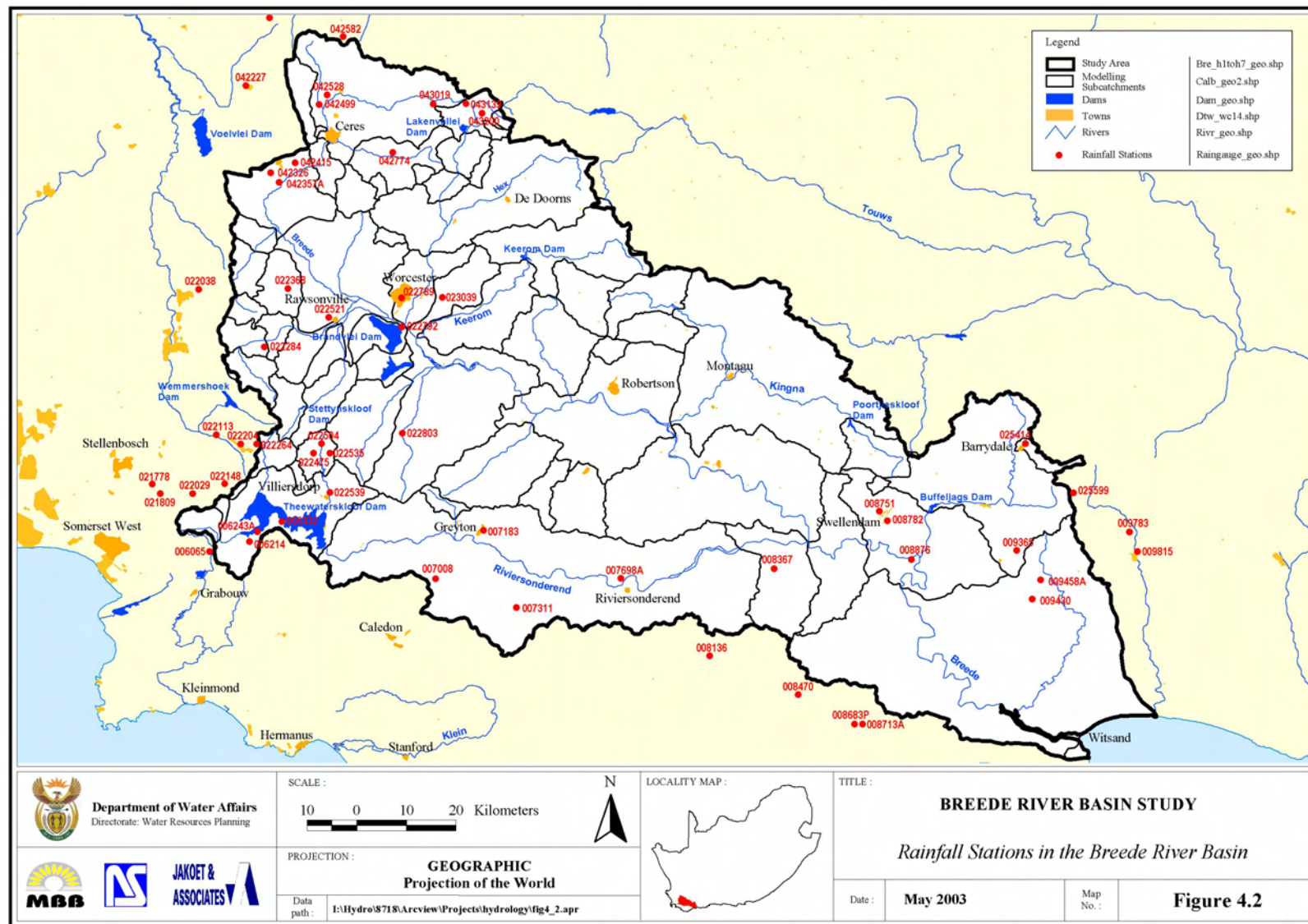
An isohyetal map of the Breede River Basin, prepared from the CCWR isohyets, is shown in Figure 2.3. In the high lying areas of the Franschhoek and Du Toits mountains, the mean annual precipitation (MAP) is around 2800 mm, while the MAP drops down to about 400 mm/a in the valleys and to the east where the valleys widen. It is clear from the figure that large spatial variability is experienced (in MAP), mainly as a result of the orographic influence of the mountains.

The above isohyetal map was used to determine sub-catchment MAPs for use in the catchment model calibration. It is, however, known that the CCWR isohyets underestimate rainfall in the mountainous areas of the Western Cape, the reason being that very few, if any, rainfall gauges are located high in the mountains. During the calibration of the hydrological model for some of the mountainous sub-catchments, difficulties were experienced in calibrating the model with the MAP obtained from the CCWR isohyetal map. Dividing a sub-catchment into high and low MAP and increasing the MAP of the high MAP area to take account of the difference in MAP, resulted in acceptable calibrations. The approach followed in adjusting the high area MAPs, is described below.

The areas in which the CCWR isohyets underestimate rainfall are the mountainous areas with steep slopes and high runoff coefficients. These catchments are usually undeveloped as a result of the steep slopes. The Western Cape System Analysis and Palmiet studies (DWAF, 1993), previously conducted in the Western Cape, included steep, undeveloped and gauged mountainous catchments. The Pitman model was calibrated for these catchments during the above studies. A graph of catchment slope, determined using a GIS, versus the runoff coefficient as percentage of MAP, was produced for these catchments and is shown in Figure 4.3. A best-fit line and 15% confidence band were then fitted to these points. The runoff coefficient versus slope graph ultimately allowed a non-dimensional presentation of rainfall versus slope.

Figure 4.3 was used in the following manner to adjust the MAP of the high rainfall areas for those sub-catchments where adjustment was deemed necessary :

- steep slope areas were defined as areas with an average slope of at least 20%
- sub-catchments, within the mountainous area and for which MAP adjustment was necessary to achieve an acceptable model calibration, were divided into a steep and flat areas. The sub-division was such that the steep portion of the catchment had a slope of at least 20% and the area did not include any land-use development.



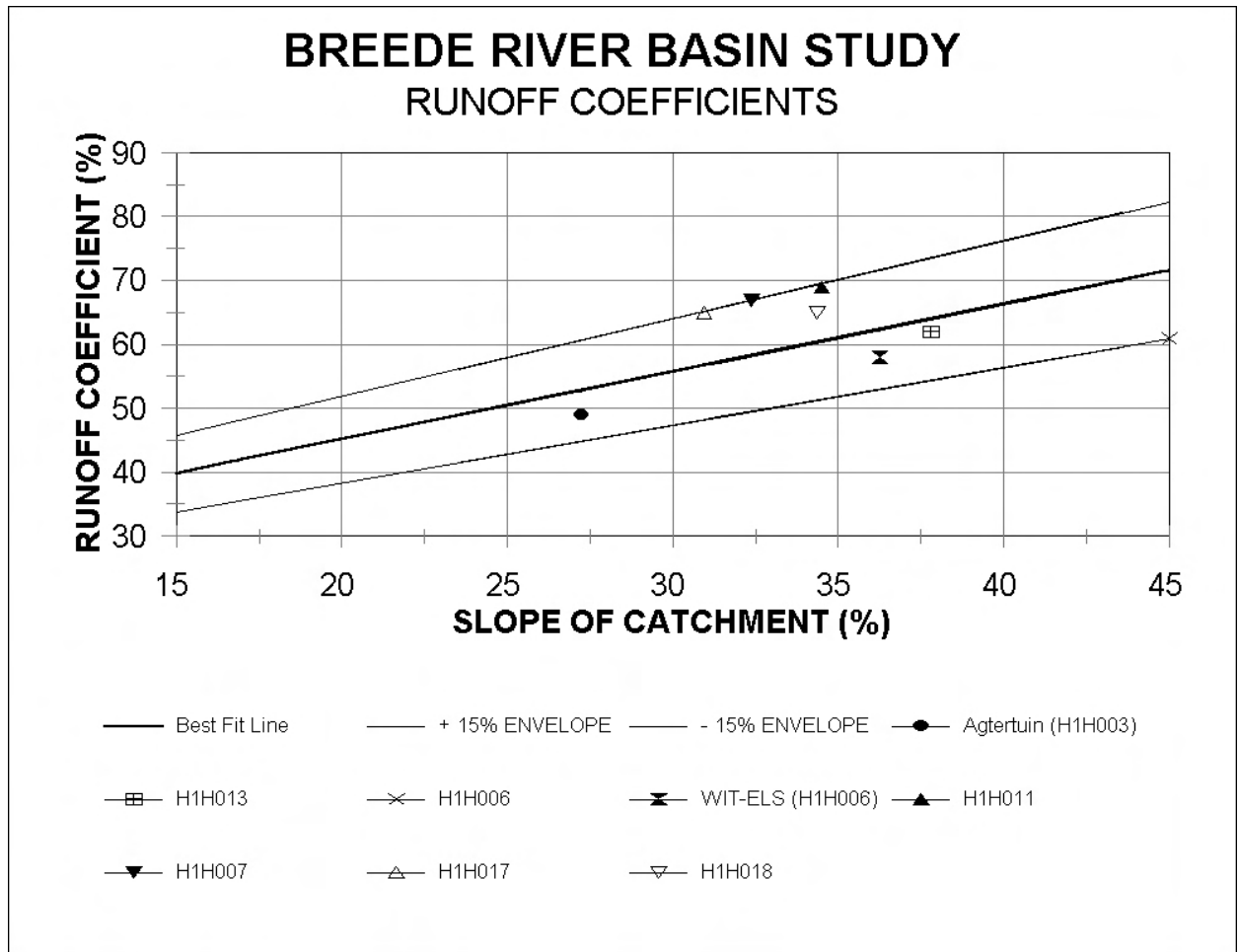


**Figure 4.3 : Catchment slope vs runoff co-efficient for adjacent catchments**

- the runoff coefficient for the runoff generated from the steep portion of the sub-catchment (high MAP area) was plotted on the runoff coefficient vs slope graph during the calibration process (see Figure 4.3).
- if the runoff coefficient fell outside the 15% confidence band, the MAP was adjusted up or down and the calibration and MAP adjustment process repeated until an acceptable calibration was achieved and the steep area runoff coefficient was within the 15% confidence band.

### 4.3 EVAPORATION

Monthly evaporation is required for Pitman catchment modelling, the simulation of evaporation from reservoir surfaces and for the calculation of irrigation water demands. Only six evaporation stations were available in the H100, H600 and H700 regions of the Breede River Basin. These were, however, insufficient to extrapolate to the entire Upper Breede, Riviersonderend and Lower Breede catchments. It was, therefore, decided to use the A-pan evaporation records obtained from the database of the CCWR.

Evaporation information from the CCWR was in the format of 1'x1' grid mean monthly Class A-pan evaporation. Using a GIS, these monthly A-pan grid values were intersected with the Breede River study area sub-catchments to allow calculation of mean monthly and mean annual catchment evaporation. Appropriate mathematical equations were then used to convert the A-pan evaporation to S-pan and reservoir evaporation. Figure 2.4 shows the distribution of A-pan evaporation, based on the CCWR mean monthly isohyets.

#### 4.4 LAND-USE DATA AND DEMAND SEQUENCES PREPARATION

The land-use component of the BRBS was undertaken by MBB's Robertson office, with the objective of providing :

- historical land-use data for the entire catchment
- land-use information for the hydrological and agricultural studies
- agricultural water demand information.

Land-use information (irrigation, afforestation, alien vegetation and farm dams) for the entire Breede River Basin was updated to the year 2000. Although the updated land-use information was not used in the recalibration of the hydrological models for the Upper Breede (H100) catchments, the updated land-use information was used both in producing present day flow sequences for the entire Breede River Basin, as well as the Yield Assessment task of the study.

##### ***Irrigation***

In the BRHS, historical land-use data sets were generated for time slices covering the years 1967, 1973, 1980 and 1987. The Riviersonderend (H600) and Lower Breede (H700) catchments were however not included in the BRHS, and no historical land-use data existed for these two catchments.

During this study, present day (year 2000) irrigation areas were digitised for the entire catchment from new colour aerial photography undertaken in November 1999 to March 2000. 1 : 30 000 photographs were scanned and transferred to GIS to capture present day irrigation areas.

For the historical time slices, existing 1 : 50 000 aerial photographs were scanned and crop type and land-use digitised for catchments H600 and H700.

Since the digitised irrigated areas included roads, fields and homesteads, a factor of 2.5% was used to reduce the gross irrigated areas to net irrigated areas. The MBB irrigated areas distinguished between vineyards, orchards, pastures and cash crops.

Groundwater is an important source of irrigation water, especially in the Upper Breede and Hex River valleys. Since the use of groundwater to supply irrigation demands was excluded from the catchment modelling during the BRHS, it was decided to follow the same approach during this study. The irrigation areas, determined using GIS, included irrigation supplied from groundwater sources. These digitised areas, therefore, had to be adjusted to take account of areas supplied from groundwater.



A groundwater assessment was conducted by Groundwater Consulting Services as part of the BRBS and is described in the report "*Breede River Basin Study : Groundwater Assessment*". The report, based on various sources, provided an indication of the extent of groundwater use in terms of the areas supplied from groundwater as well as volumes abstracted. Based on this, the BRHS 1995 report "*Bedryfsreëls*" (DWAF, 1995) and the "*Watervoorsiening aan die Worcester-Oos Gebied*" report (DWAF, 1995), estimates were made of the area of irrigation supplied from groundwater. These areas were then subtracted from the total irrigated area to determine the irrigated area supplied from surface water resources. Table 4.3 shows a summary of the adjustments made to allow for groundwater.

**TABLE 4.3 : ADJUSTMENT OF IRRIGATION AREAS TO ALLOW FOR GROUNDWATER**

| CATCHMENT   | QUATERNARY      | IRRIGATED AREA SUPPLIED FROM SURFACE AND GROUNDWATER | CROP TYPE |       | TOTAL WATER DEMAND | ANNUAL GROUND-WATER USE | GROUND-WATER USE AS % TOTAL WATER DEMANDS | % IRRIGATION SUPPLIED FROM SURFACE WATER | IRRIGATED AREA SUPPLIED FROM SURFACE WATER |
|-------------|-----------------|------------------------------------------------------|-----------|-------|--------------------|-------------------------|-------------------------------------------|------------------------------------------|--------------------------------------------|
|             |                 |                                                      | ORCHARD   | VINES |                    |                         |                                           |                                          |                                            |
|             |                 | (ha)                                                 | %         | %     | Mm <sup>3</sup> /a | Mm <sup>3</sup> /a      | %                                         | %                                        | ha                                         |
| Ceres       | H10A - C        | 7 020                                                | 92        | 8     | 66                 | 10,45                   | 16                                        | 84                                       | 5 909                                      |
| Wolseley    | H10F            | 3 406                                                | 68        | 32    | 29                 | 17,1                    | 59                                        | 41                                       | 1 398                                      |
| Jan du Toit | H10H            | 856                                                  | 29        | 71    | 6                  | 3,8                     | 63                                        | 37                                       | 314                                        |
| Rawsonville | H10G, J, K, L   | 10 072                                               | 10        | 90    | 69                 | 20,9                    | 30                                        | 70                                       | 7 021                                      |
| Hex Valley  | H20A-F          | 5 210                                                | 14        | 86    | 36                 | 19                      | 53                                        | 47                                       | 2 460                                      |
| Worcester   | H20G-H, H40C, E | 6 876                                                | 33        | 67    | 51,5               | 9,5                     | 18                                        | 82                                       | 5 608                                      |
|             |                 |                                                      |           |       |                    | 80,75                   |                                           |                                          | 22 709                                     |

The present day (year 2000) irrigation areas for the BRB sub-regions are shown in Table 4.4.

**TABLE 4.4 : BREEDE RIVER BASIN PRESENT DAY (2000) IRRIGATION AREAS**

| SUB-REGION   | IRRIGATED AREA SUPPLIED FROM SURFACE WATER | CROP TYPE       |                      | SURFACE WATER DEMAND |
|--------------|--------------------------------------------|-----------------|----------------------|----------------------|
|              |                                            | ORCHARD & VINES | PASTURE & CASH CROPS |                      |
|              | (ha)                                       | ha              | ha                   | Mm <sup>3</sup> /a   |
| H100         | 14564                                      | 13677           | 887                  | 132,92               |
| H200         | 3071                                       | 2874            | 197                  | 26,99                |
| H300         | 5828                                       | 5198            | 630                  | 44,20                |
| H400         | 20445                                      | 16871           | 3574                 | 234,04               |
| H500         | 6570                                       | 4758            | 1812                 | 80,01                |
| H600         | 11418                                      | 7832            | 3586                 | 113,33               |
| H700         | 5316                                       | 1977            | 3339                 | 89,51                |
| <b>TOTAL</b> | 67212                                      | 53187           | 14025                | 721,00               |

Monthly irrigation demands were calculated using the IRRDEM routine developed by BKS Inc. IRRDEM produces a time series of irrigation water demands for the specified irrigated area using the following input :

- irrigation area at the end of the calibration period
- growth rate per annum in irrigation area
- catchment MAP
- monthly rainfall as percentage MAP
- ratio of areas for each crop
- monthly crop factors
- effective rainfall factor for each month
- monthly A-pan evaporation
- irrigation efficiency for each irrigation method.

The different effective rainfall factors used for each month are shown in Table 4.5, while the irrigation efficiencies used for the different irrigation methods are shown in Table 4.6.

**TABLE 4.5 : RAINFALL EFFICIENCY FACTORS (%)**

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 50  | 50  | 20  | 20  | 20  | 20  | 50  | 50  | 70  | 70  | 70  | 50  |

**TABLE 4.6 : IRRIGATION EFFICIENCY FACTORS**

| METHOD    | EFFICIENCY (%) |
|-----------|----------------|
| Flood     | 60             |
| Sprinkler | 70             |
| Micro     | 80             |
| Drip      | 90             |

For those runoff modules where irrigation took place from both farm dams and rivers downstream of farm dams, the irrigation demand was factored to obtain the portion of irrigation demand from farm dams and that portion supplied from the rivers.

### ***Afforestation***

Present day forestry areas were digitised for the entire catchment from new colour aerial photography undertaken in November/December 1999. Most of the afforestation occurs within the Riviersonderend catchment, with small areas of afforestation scattered over the remainder of the Basin. The afforestation demands were modelled using the relevant algorithms in SHELL. These algorithms are based on the CSIR flow reduction curves (Scott, 1997). Input to the routines include

the growth in forestry area over the calibration period, assuming sub-optimal growth conditions with a 27-year rotation period.

### ***Invasive Alien Vegetation***

Alien vegetation was modelled as a separate land-use in the BRBS. Although alien vegetation is scattered throughout the catchment, the highest levels of infestation occurred in the Riviersonderend and Lower Breede River catchments. Present day alien vegetation areas were digitised for the entire catchment from new colour aerial photography undertaken in November/December 1999. The aliens were classified according to location, i.e. upland or riparian, and density class, i.e. medium, sparse or dense. Using aerial photography to identify aliens is, without site specific knowledge of the catchment, a daunting task. Alien species can quite easily be mistaken for either natural vegetation or commercial plantation. It was, therefore, decided to approach the Cape Nature Conservation (CNC) for additional information on areas infested by alien vegetation and it was established that the CNC and Working for Water Program mapped alien vegetation areas on 1:50 000 maps.

In 1994, as part of his Phd-studies, Dr. Christo Marais of Working for Water conducted a survey of alien infestation in the Breede River Basin. Alien infested areas were drawn in on 1:50 000 maps and labelled according to species and density classes. The areas covered were mainly the Riviersonderend catchment downstream of Theewaterskloof Dam, as well as the Upper Breede catchment. The focus in the Upper Breede catchment was on the riparian vegetation, since limited upland infestation occurred in the catchment. A GIS coverage of Dr Marais' data was kindly made available by the Western Cape Nature Conservation Board (CNC), Scientific Support Services. The mapping consisted of the infested areas being divided into polygons with details of the different species and ages of alien vegetation that occurred there, as well as their densities.

The CNC, as the local watch-dog authority responsible for managing the catchments, had GIS information on the Riviersonderend catchment. The CNC data was captured from areas of infestation drawn on 1:50 000 maps by CNC officials working in the catchments. This data also reflected some of the historical changes due to fires and clearing done as part of the Working for Water Program. This data, being more comprehensive than the BRBS data, included information on species and specific density classes. The CNC, via Mr Tjerck Hoedstra, kindly provided a GIS coverage of the above information. After discussion with Dr Marias, the CNC data was accepted as the best available source of information on alien areas in the Riviersonderend catchment. The information was, however, not complete and a few gaps were filled in after a conversation between Dr Marais and Mr H van Tonder of CNC.

Note that the areas of alien infestation in the H100 region were based on a combination of the BRBS areas taken from the aerial photography and the C Marais 1994 data. The H600 areas were based on the CNC data, while the H700 areas were based on the BRBS data, but verified via inputs by Dr Marais and CNC officials.

The classification of alien infestation density classes used in the CNC data is shown in Table 4.7.

**TABLE 4.7 : CLASSIFICATION OF ALIEN INFESTATION DENSITY CLASSES**

| DENSITY CLASS  | CANOPY COVER AS % |
|----------------|-------------------|
| Rare           | < 0,1             |
| Occasional     | < 1               |
| Very scattered | 1 - 5             |
| Scattered      | 5 - 25            |
| Medium         | 25 - 50           |
| Dense          | 50 - 75           |
| Closed         | > 75              |

The Upper Breede (H100), Riviersonderend (H600) and Lower Breede River (H700) catchments had to be modelled as part of the BRBS. Since the hydrological model was configured and calibrated for the three abovementioned catchments, historical time slice information on alien spread (or decline, depending on the management of the catchments) was needed. The catchment of Theewaterskloof Dam has already been modelled with alien vegetation as part of the Skuifraam Dam Feasibility Study.

The total present day areas of alien infestation in the H100, H600 and H700 catchments of the Breede River Basin are shown in Table 4.8. These areas are a combination of the different density classes. The condensed areas within each sub-catchment are shown in the relevant sections of Appendix B.

**TABLE 4.8 : TOTAL AREAS OF ALIEN INFESTATION**

| CATCHMENT    | TOTAL AREA (ha) |
|--------------|-----------------|
| H100         | 21 420          |
| H600         | 60 068          |
| H700         | 15 169          |
| <b>Total</b> | <b>96 657</b>   |

Dr Christo Marais developed an alien spread model ((Marais, 2000) and hereinafter called the Marais-model) for forecasting the spread of aliens for different management scenarios, while at the same time calculating the cost of the specific management scenario. Although this model is primarily used for forecasting future scenarios, the model can also be used for "back-predicting" or modelling the historical spread of aliens within a specific catchment, based on assumptions regarding the management of the catchment in terms of clearing and the occurrence of fires. The Marais Model was used to simulate the historical growth in alien infestation in the H100, H600 and H700 catchments.

Alien vegetation demand sequences were calculated using the relevant routines in SHELL. At the time this study was undertaken, the latest available streamflow reduction models were used (Le Maitre *et al*, 2001).

The models are based on the biomass of the vegetation, which is determined initially using separate age-biomass models for each type of vegetation, namely tall trees, medium trees and tall shrubs. The equations are as follows:

$$\text{Tall tree biomass (t/ha)} = 300 / (1 + e^{3.67947 \times \text{Age in years}^{-1.4109}}), r^2 = 0,96, n = 9, P < 0,01$$

$$\text{Medium tree biomass (t/ha)} = 96,0732 * \log_{10}(\text{Age in years}) - 4,8081, r^2 = 0,98, n = 4, P = 0,01$$

$$\text{Tall shrub biomass (t/ha)} = 76 / (1 + e^{3.18628 \times \text{Age in years}^{-1.25973}}), r^2 = 0,68, n = 12, P < 0,01$$

A proportional flow reduction model is used for the relationship between biomass and flow reductions. Low flows and annual flows are adjusted separately, and there are separate cases for vegetation occurring in upland or riparian sites. The equations are as follows:

**Long lag curves (mostly used for upland situations):**

$$\text{Annual flow reduction (\%)} = 115 / (1 + e^{14,2216 \times \text{biomass (t/ha)}^{-2,9194}}), r^2 = 0,83, n = 34, P < 0,01$$

$$\text{Low flow reduction (\%)} = 122 / (1 + e^{10,0252 \times \text{biomass}^{-2,0927}}), r^2 = 0,68, n = 34, P < 0,01$$

**Short lag curves (mostly used for riverine situations):**

$$\text{Annual flow reduction (\%)} = 103 / (1 + e^{2,2958 \times e^{\text{Biomass[t/ha]} * -0,02388}}), r^2 = 0,86, n = 13, P < 0,01$$

$$\text{Low flow reduction (\%)} = 102 / (1 + e^{1,9677 \times e^{\text{Biomass[t/ha]} * -0,02474}}), r^2 = 0,68, n = 10, P < 0,01$$

Input to the routines included tree types (tall trees, medium trees or tall shrub), growth conditions (upland or riparian) and using an average age of 20 years.

It was found that, using the SHELL routines, the flow reductions for riparian alien vegetation were less than anticipated. Sensitivity analyses indicated that the approach followed in calculating riparian alien vegetation streamflow reductions, under-estimated riparian alien water use. It was then decided to use an interim approach whereby riparian alien demands were calculated based on the potential evapotranspiration of the riparian area. This approach resulted in a significant increase in riparian alien vegetation water use.

**Urban and Industrial Demands**

There are limited urban and industrial developments in the Basin. Urban demands, for the number of small towns in the Basin, are either measured or estimated. This data is then prepared as monthly time sequences for use in the calibration and naturalisation process.

## 4.5 FARM DAM DATA

The present day (year 2000) farm dam areas and capacities in the Breede Basin had to be determined in order to quantify the growth in farm dam numbers and capacity for the study area of the BRHS and to provide new farm dam information for the lower Riviersonderend and Lower Breede catchments.

MBB conducted the farm dam investigation. The farm dams were identified from the year 2000 photography and all dams with a surface area bigger than 1000 m<sup>2</sup> were digitised. This data was grouped into the seven sub-basins of the Breede River catchment and included the following information for each dam:

- X and Y coordinates
- type of dam (valley, hillside and hilltop)
- digitised perimeter of dam
- digitised surface area of the dam

Available information on farm dam characteristics in the seven sub-basins was then obtained from various sources. These were the following:

- DWAF dam safety register (179 dams)
- WRC Report 298/4.1/94 : Surface water resources of South Africa 1990 (246 dams) (WR90)
- Ninham Shand's register of dams they were involved with (78 dams)
- MBB's register of dams they were involved with (74 dams)
- J van Breda's register of dams they were involved with (22 dams)

The original source of the WRC register was the DWAF dam safety register, but it also included a number of additional dams, mainly dams without safety classifications.

The different dam characteristics from the different sources were then compared with each other and a decision was made on what appeared to be the most reliable characteristic for each particular dam. Much of the data was incomplete, and also contained obvious errors. A new database of accepted characteristics, taken from the different sources, was then created for each dam. This information included :

- coordinates
- surface area of the dam (FSL)
- capacity
- maximum water depth
- volume at 25 %, 50 % and 75 % of the maximum water depth.

Based on the above procedure, 154 dams "qualified" for inclusion into the table (in terms of reliability of data). The last two mentioned characteristics, however, were available for only a few of the dams. The information from the above database was matched with the appropriate record of the

digitised dam database. Many dams were again disqualified due to big discrepancies in full supply surface areas.

After many attempts to come up with a reliable capacity/full supply area and full supply area/water height relationships (including previous work done in this regard), the following procedure was decided upon:

Accept the capacity/surface area relationship as linear, namely:

Capacity = A \* full supply surface area

To determine the "A" coefficient for the valley dams, all these dams were divided into different full supply surface areas, namely surface areas bigger than 50 hectares, areas between 25 and 50 hectares, areas between 2 and 25 hectares, and areas smaller than 2 hectares. Four different coefficients were calculated, and applied to the entire region.

The "A" coefficients for the hillside and hilltop dams were determined making use of all the dams with known data for the entire region.

Where reliable information on dam capacities existed for certain dams, these values were used instead of calculating a new capacity.

The full supply area/water depth relationship was accepted to be logarithmic, i.e. :

Water depth (full supply) = B \* full supply area ^ C

For the valley and hillside dam types the "B" and "C" coefficients were calculated from the available data. Two sets of coefficients were calculated for the region, one set for the H100, H200, H400 and H600 sub-regions, and a second set for the H300, H500 and H700 sub-regions.

For the hilltop dams there were no dams available with reliable information, and theoretical values for the coefficients were calculated.

The dam contents/water depth relationship for each of the dam types was calculated as a percentage of the capacity of the dam water depths of 25 %, 50 % and 75 % of the full supply water depth.

The accuracies of the generated formulae were verified by comparing the result of the formulae with the available information for the different area categories. The calculated values as a percentage of the actual values were as follows:



- larger than 50 hectares : 110 %
- between 25 and 50 hectares : 87 %
- between 2 and 25 hectares : 100%
- smaller than 2 hectares : 88%

For sub-regions H600 and H700 it was further required to determine the existence of farm dams during previous time slices for which previous aerial photography existed. These time slices were for the years 1973, 1980 and 1987. The procedure followed here was to superimpose the photography of each of these time slices on top of the 2000 photography and identify those dams which were constructed during the alternative intervals.

The coefficients determined for the different regions are shown in Tables 4.9, 4.10 and 4.11.

**TABLE 4.9 : FARM DAMS VOLUME / SURFACE AREA RELATIONSHIP**

| DAM TYPE * | FULL SUPPLY SURFACE AREA<br>(ha) | COEFFICIENT (A) |
|------------|----------------------------------|-----------------|
| V          | < 2                              | 42              |
|            | 2 - 24.9                         | 49              |
|            | 25 - 49.9                        | 81              |
|            | > 50                             | 134             |
| P          | All areas                        | 40              |
| H          | All areas                        | 47              |

**TABLE 4.10 : FARM DAMS WATER DEPTH / SURFACE AREA RELATIONSHIP**

| REGION             | TYPE DAM * | COEFFICIENT B | COEFFICIENT C |
|--------------------|------------|---------------|---------------|
| 100, 200, 400, 600 | V          | 4             | 0.5           |
|                    | P          | 4             | 0.4           |
|                    | H          | 5             | 0.45          |
| 300, 500, 700      | V          | 1.8           | 0.45          |
|                    | P          | 6             | 0.50          |
|                    | H          | 1.75          | 0.45          |

**TABLE 4.11 : FARM DAMS VOLUME / WATER DEPTH RELATIONSHIP**

| TYPE DAM * | % OF FULL SUPPLY CAPACITY AT WATER DEPTH |      |      |
|------------|------------------------------------------|------|------|
|            | 25%                                      | 50%  | 75%  |
| V          | 7.3                                      | 25.0 | 55.0 |
| P          | 11.5                                     | 30.5 | 59.2 |
| H          | 6.6                                      | 21.5 | 51.9 |

- \* V = valley  
P = hilltop  
H = hillside

The above farm dam analysis was based on farm dams with a full supply area (FSA) of greater than 1 000 m<sup>2</sup>. However, numerous farm dams with a FSA smaller than 1 000 m<sup>2</sup> exist in the Basin and the storage capacities of these dams had to be taken into account. The farm dam information compiled for the Upper Riviersonderend as part of the Western Cape System Analysis, was analysed. In the Upper Riviersonderend, all farm dams were included in the database. It was, therefore,

possible to obtain the proportional contribution of farm dams with a FSA smaller than 1 000 m<sup>2</sup> to total farm dam storage capacity within a specific sub-catchment. Based on the above, the farm dam capacities calculated in this study could be adjusted to include the farm dams with a FSA smaller than 1000 m<sup>2</sup>.

Table 4.12 shows the present day (year 2000) farm dam capacities in the Breede River Basin.

**TABLE 4.12 : PRESENT DAY FARM DAM CAPACITIES IN BREEDE RIVER BASIN**

| TYPE DAM | FULL SUPPLY CAPACITY* |
|----------|-----------------------|
|          | Mm <sup>3</sup>       |
| H100     | 101.40                |
| H200     | 10.60                 |
| H300     | 25.06                 |
| H400     | 90.30                 |
| H500     | 28.65                 |
| H600     | 16.90                 |
| H700     | 27.73                 |

\* Note that the farm dam capacity shown is for the H600 incremental area downstream of Theewaterskloof Dam, and capacities excluded capacities of large reservoirs.

#### 4.6 WINTER FILLING OF FARM DAMS

Apart from the irrigation areas forming part of the Government Water Supply Scheme and thus receiving water from amongst other, the Greater Brandvlei Dam, irrigation in the summer months in the Breede River Basin is generally from farm dams. For this purpose, additional water is abstracted from the river in winter months to supplement the natural runoff into the farm dams.

In the case of the Upper Breede (H100), the winter filling assumptions used in the BRHS were accepted for the BRBS. These assumptions were based on water being diverted or pumped from the river during winter to ensure the respective dummy dams were full at the beginning of summer. A similar approach was used for the Lower Riviersonderend and Lower Breede catchments. For the Lower Riviersonderend, the winter filling also included pumping the remainder of the irrigation water released from Theewaterskloof Dam after supplying run-of-river abstractions into the farm dams. The volumes pumped were modeled as a percentage of the total runoff at the abstraction point. Where the pumped volume exceeded the farm dam capacity, it was assumed that the water spilled and returned to the river for the downstream users.

#### 4.7 DIVISION OF SUB-CATCHMENT AREAS

Since one of the aims of the hydrology task was to improve the reliability of the hydrology for the Upper Breede (H100), the catchment sub-division of the BRHS was used in the BRBS for this portion of the catchment.

For the Lower Riviersonderend (H600) and Lower Breede (H700) catchments, sub-division was based on the location of flow gauging stations and the reliability of their data. The Lower Riviersonderend was divided into three sub-catchments, with the most downstream sub-catchment forming part of the Lower Breede for calibration purposes. Although the Lower Breede was divided into four sub-catchments, only two of these were gauged. The remaining two sub-catchments were ungauged and runoff was simulated based on a transfer of parameters from adjacent sub-catchments.

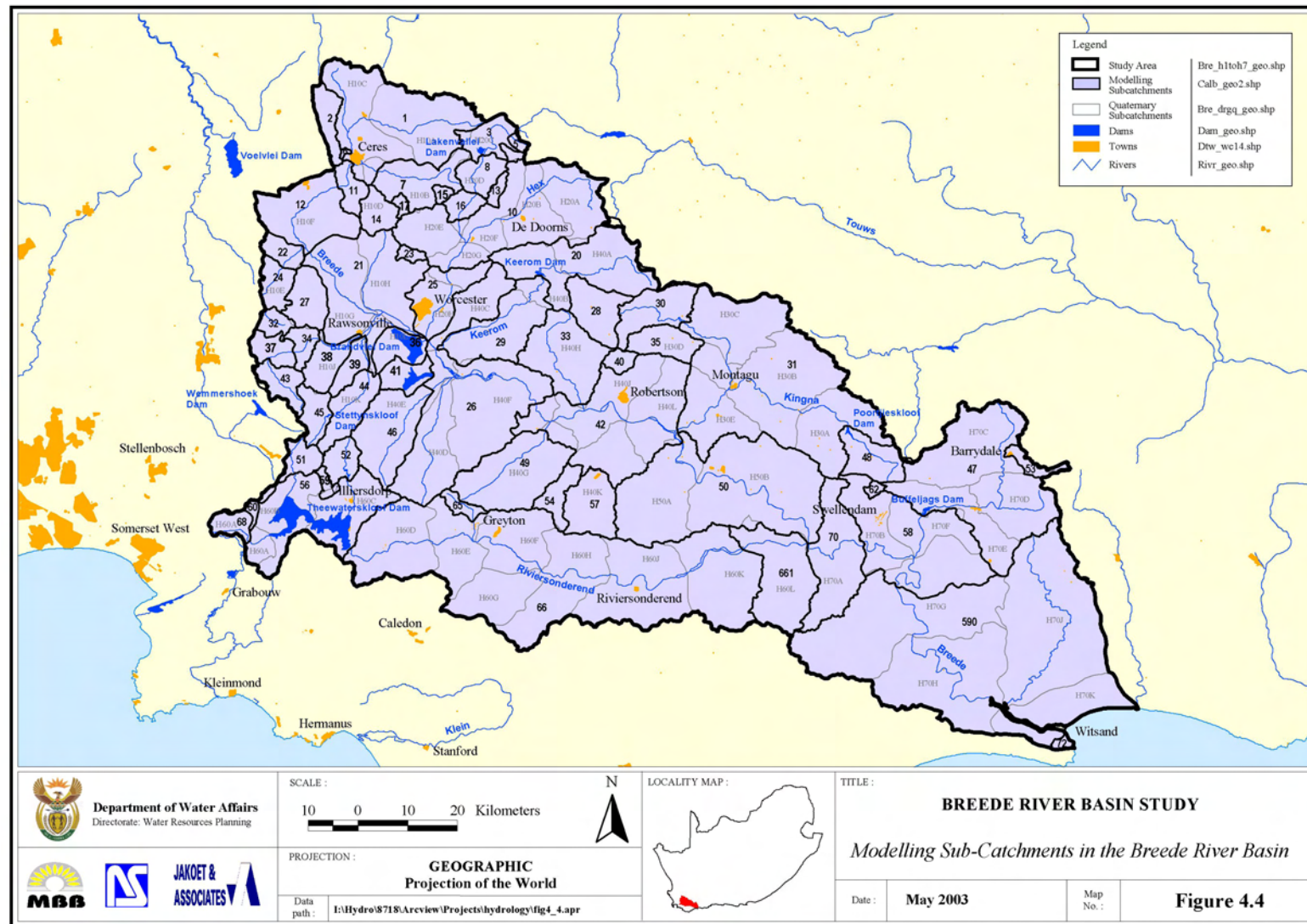
Figure 4.4 shows the sub-catchments of the Breede River Basin. The relevant sub-catchment number for each calibration catchment is given in Section 5 (Calibration Results and Discussions).

#### 4.8 HYDROLOGICAL SUB-CATCHMENT CONFIGURATION

Following the collection and preparation of all required data to model the catchment, each runoff module was configured in SHELL. Although each sub-catchment is unique, the same basic modelling procedures, described below, are required.

The Pitman model is used to simulate runoff draining into farm dams and areas draining directly into rivers downstream of farm dams. Input data includes :

- catchment area upstream and downstream of farm dams at the end of each time period to allow for growth in catchment areas upstream of farm dams.
- sub-catchment MAP.
- monthly time series of rainfall as a % of MAP.
- sub-catchment mean monthly S-pan evaporation.
- forestry area and growth in forestry.
- Pitman parameter set.
- start and end year of calibration period.



The RESSIM routine is used to simulate the operation of the "dummy" farm dams and reservoirs where the reservoir was not used as calibration point. Input data for the reservoir simulation comprises :

- monthly rainfall (tenths of mm's)
- mean monthly S-pan evaporation factored for open water surfaces
- time series of reservoir demands
- simulated inflow sequence to the reservoir
- a and b coefficients describing the area/capacity curve
- calibration period
- volume of water in storage at the start of the simulation period
- capacity and dead storage for the end of each time period (these reflect the growth or reduction in the number of farm dams with time).

Spills from the "dummy" farm dams and irrigation return flows were added to the simulated runoff from the catchment downstream of farm dams. From this sequence, run-of-river irrigation, winter filling and urban demands are then subtracted. If the resultant simulated runoff contains, after subtraction, negative monthly flows, these were set to zero and considered to be unmet demands. Irrigation return flows and imports are added to the runoff.

The end result is the simulated runoff sequence for each hydrological sub-catchment.

#### **4.9 CALIBRATION OF THE PITMAN MODEL**

Following the completion of the sub-catchment configuration in SHELL, the next process was the calibration of the runoff modules for the sub-catchments.

Rainfall input files for the Pitman model and model parameters are used to simulate runoff with the Pitman model. Regional parameters extracted from the WR90, or from the previous studies of the catchment, are used for initial runoff simulation. The initial simulated runoff is compared to the observed record at the gauging station, in terms of the goodness-of-fit of the following :

- MARs
- standard deviations (SDs)
- log of MARs
- log of SDs
- the comparative graphs of time series, seasonal distributions, yield-storage and drought sequence curves.

Missing or exceeded values in the observed flow records were patched by re-substituting simulated flows for the required months at the end of each Pitman model calibration iteration.

The Pitman parameters were adjusted in order to improve the correlation between observed and simulated flow records. During the adjustment, some previously patched monthly flows required revision. The calibration process is complete when the Pitman parameters result in a simulated runoff that compares with the observed runoff as closely as possible. The target limits set for the calibration are shown in Table 4.13.

**TABLE 4.13 : LIMITS FOR ACCEPTABLE PITMAN CALIBRATION**

| PROPERTY              | LIMIT                  |
|-----------------------|------------------------|
| MAR                   | < 5%                   |
| SD                    | < 15%                  |
| Time series           | as similar as possible |
| Seasonal distribution | as similar as possible |
| Storage vs yield      | as similar as possible |

#### 4.10 NATURALISED RUNOFF SEQUENCES

After completion of the calibration process, naturalised extended flow sequences can be produced at the location of the flow gauging station. This procedure involves two steps :

- generating a natural simulated runoff sequence using the Pitman routine and calibrated parameters. All land-use components are set to zero during this step.
- naturalising the observed record by subtracting imports or adding demands met by the system. This record is then joined to the natural simulated sequence from above. The demands met by the system include :
  - irrigation demands met by farm dams
  - evaporation from the farm dams
  - irrigation demand met by the river
  - abstractions (urban and other)

The flows subtracted include :

- imports
- irrigation return flows

The demands met by the farm dams, including evaporation losses from these dams, are obtained by subtracting the "dummy" dam spills from the inflow to the "dummy" dam.

#### **4.11 RUNOFF SEQUENCES REPRESENTING PRESENT DAY (2000) DEVELOPMENT CONDITIONS**

When evaluating the feasibility of proposed dam sites, runoff sequences reflecting present or future development conditions are required. The following process is followed to produce these sequences :

- the hydrological sub-catchment configuration is re-run for each calibration sub-catchment, using irrigation, forestry and alien vegetation areas set at present development levels
- from this run, the present day demands are determined for the different land-use components
- the present day imports, exports and diversions are calculated from the average of the last five years and this average is used to create a sequence spanning the full extended simulation period
- for each sub-catchment, the present day demands calculated above are then subtracted from the long-term naturalised incremental runoff
- the resultant flow sequence is a runoff sequence representing present day development conditions.

A summary of natural and present day runoff at the respective calibration points in the Basin is shown in Section 6.

## 5. CALIBRATION RESULTS AND DISCUSSION

As discussed in Section 1 and Section 3, the Upper Breede (H100) catchment models were recalibrated using the same periods and land-use information used in the BRHS. The summary tables included in this section summarise the hydrological and land-use data used during the calibration process at the respective calibration points. Updated present day land-use information for the respective catchments are also shown in Appendix B.

### 5.1 H1H013 : SUB-CATCHMENT NUMBERS 2, 6 (Figure 4.4)

#### 5.1.1 Summary of Sub-catchment Data

Flow Station Number : H1H013  
 River Name : Koekoedouw  
 Place : Ceres

**TABLE 5.1 : SUMMARY OF DATA FOR SUB-CATCHMENT H1H013**

| DESCRIPTION                                |   |                | VALUE                    |
|--------------------------------------------|---|----------------|--------------------------|
| Sub-catchment area                         | : | high MAP area  | 14,3 km <sup>2</sup>     |
|                                            | : | low MAP area   | 38,7 km <sup>2</sup>     |
| Sub-catchment MAP                          | : | high MAP       | 2006 mm/a                |
|                                            | : | low MAP (CCWR) | 846 mm/a                 |
| Sub-catchment MAE                          |   |                | 1835 mm/a                |
| Afforested area                            |   |                | -                        |
| Area of alien vegetation                   |   |                | 0,64 km <sup>2</sup>     |
| Irrigation area                            |   |                | 2,89 km <sup>2</sup>     |
| Farm dam capacity                          |   |                | 2,16 Mm <sup>3</sup>     |
| Calibration period (hydrological years)    |   |                | 1964 - 1990              |
| Observed MAR for calibration period        |   |                | 24,37 Mm <sup>3</sup> /a |
| Incremental naturalised MAR (1925 - 1990)  |   |                | 30,93 Mm <sup>3</sup> /a |
| Incremental naturalised runoff coefficient |   |                | 50,4%                    |
| Cumulative naturalised MAR                 |   |                | 30,93 Mm <sup>3</sup> /a |

Note : information in the Table 5.1 represents 1990 development

Details of the data used in the model calibration process are given in Appendix B1. Table 5.2 summarises the contents of this Appendix.



**TABLE 5.2 : SUMMARY OF DATA IN APPENDIX B1**

| APPENDIX NO. | CONTENTS                                                                                       | FORMAT      |
|--------------|------------------------------------------------------------------------------------------------|-------------|
| B1.1         | Land-use data<br>Evaporation data<br>Reservoir data<br>Irrigation crop factors and percentages | Tables      |
| B1.2         | Observed data (original) H1H013                                                                | Time series |
| B1.3         | Percentage rainfall file used in the calibration                                               |             |
| B1.4         | Upland alien vegetation demand downstream of farm dams                                         |             |
| B1.5         | Riparian alien vegetation demand                                                               |             |
| B1.6         | Irrigation from farm dams                                                                      |             |
| B1.7         | Irrigation from river upstream of Ceres Dam                                                    |             |
| B1.8         | Irrigation from river downstream of Ceres Dam                                                  |             |
| B1.9         | Abstraction from Ceres Dam                                                                     |             |
| B1.10        | Simulated flow record                                                                          |             |
| B1.11        | Patched observed flow record H1H013                                                            |             |
| B1.12        | Incremental naturalised flow sequence                                                          |             |
| B1.13        | Cumulative present day flow sequence                                                           |             |

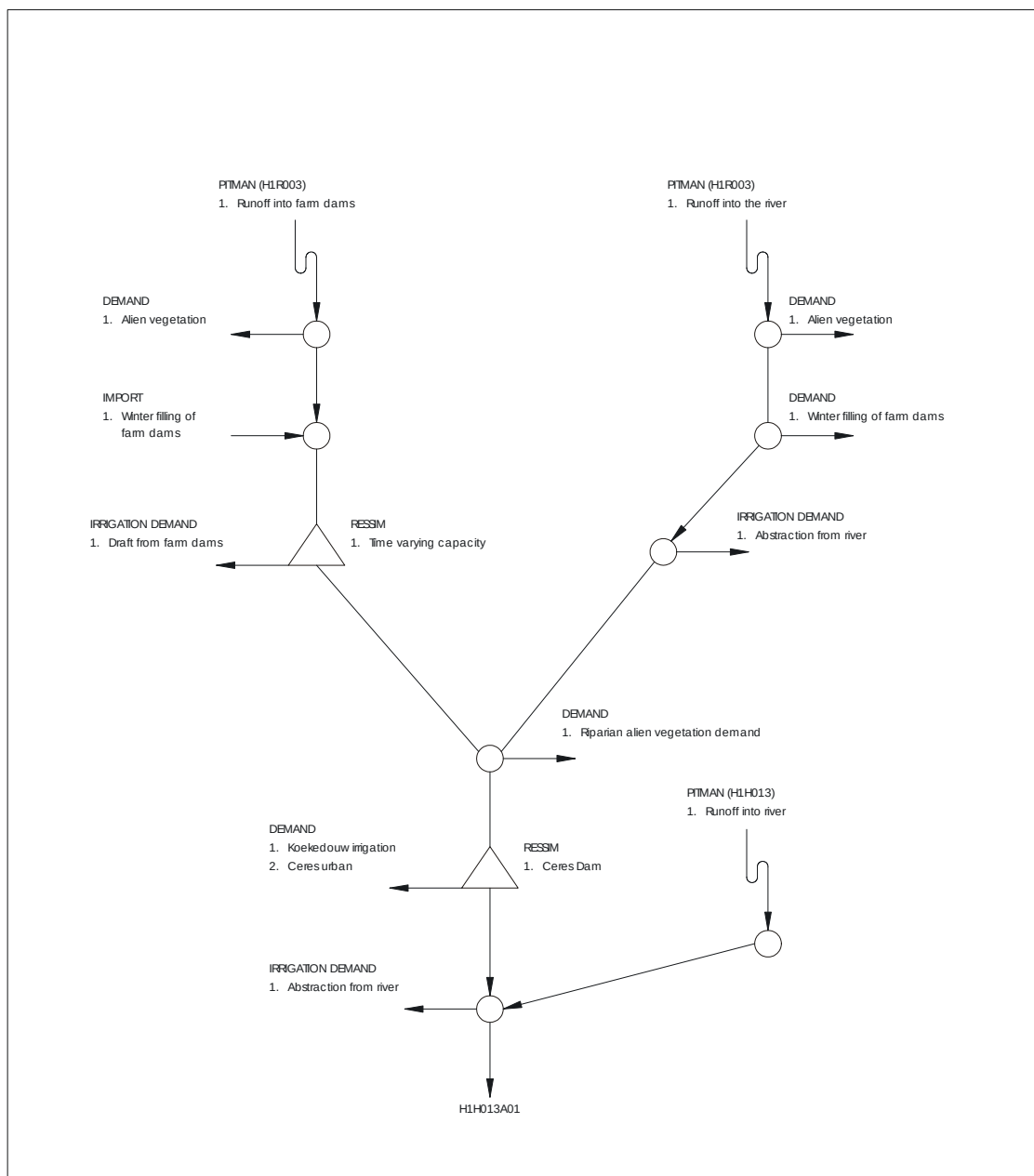
### 5.1.2 Preliminary

During the initial calibration process, difficulties were experienced in obtaining an acceptable Pitman calibration using the CCWR MAPs and modelling the H1H013 sub-catchment as one catchment. Both simulated peak and low flows were lower than the observed data, with all indications that the catchment MAP was too low.

The catchment was, therefore, divided into a high and low MAP catchment following the assumptions and process described in Section 4.2. The selected high MAP area had a slope of almost 38%.

### 5.1.3 Model Configuration

Figure 5.1 shows a schematic representation of the sub-catchment configuration. This sub-catchment contains numerous farm dams and is intensively irrigated. Irrigation demands are met from both farm dams and run-of-river abstractions. Upland alien vegetation demands are met only by local runoff, while riparian alien demands were modelled as being supplied from the main stream at the outlet of the catchment. Winter abstraction from the river to fill the farm dams was also included.



Note : the above is a schematic diagram only and does not show all the detail included in the hydrological model

**Figure 5.1 : H1H013 : Sub-catchment model configuration**

This sub-catchment included the original Ceres Dam. The inflow/outflow record for Ceres Dam had to be simulated since no flow data existed for this dam. Although the Ceres Dam had a capacity of only 0,302 Mm<sup>3</sup>, a number of users obtained their water from the dam. The abstractions for these users were included in the model configuration.

The Ceres Dam was rebuilt and raised in 1998, with the capacity of the new dam at 13.65 Mm<sup>3</sup>.

#### 5.1.4 Evaluation and Preparation of Flow Sequences

Observed flow data was available from October 1964 to September 1998. Catchment model calibration was for the period 1964 to 1990 to coincide with the BRHS.

The flow data was previously evaluated as accurate, although the record contained a number of gaps and exceeded values.

#### 5.1.5 Calibration (Calibration period : Oct 1964 - Sep 1990)

The details of the rainfall stations used in the calibration are shown in Table 5.3 below.

**TABLE 5.3 : RAINFALL STATIONS USED FOR CALIBRATION OF H1H013**

| RAINFALL STATION<br>NUMBER | PERIOD OF RECORD<br>(HYDROLOGICAL YEARS) | LENGTH OF RECORD<br>(YEARS) |
|----------------------------|------------------------------------------|-----------------------------|
| 0422227_3                  | 1920 - 1998                              | 78                          |
| 042326_X                   | 1920 - 1998                              | 78                          |
| 042357_A                   | 1924 - 1998                              | 74                          |
| 042499_P                   | 1961 - 1981                              | 20                          |

The final calibration parameters are shown in Table 5.4 along with the statistics for the observed data and final simulated record.

**TABLE 5.4 : CALIBRATION SUMMARY FOR H1H013**

| FINAL ITERATION                                       | PITMAN PARAMETERS        |           |                             |              |         |        |      |     |     |     |   |
|-------------------------------------------------------|--------------------------|-----------|-----------------------------|--------------|---------|--------|------|-----|-----|-----|---|
|                                                       | POW                      | SL        | ST                          | FT           | GW      | ZMIN   | ZMAX | PI  | TL  | GL  | R |
|                                                       | 2                        | 0         | 300                         | 100          | 20      | 0      | 550  | 1.5 | 0.2 | 1.5 | 0 |
| FLOW RECORD                                           | STATISTICS (1964 - 1990) |           |                             |              |         |        |      |     |     |     |   |
|                                                       | MAR (Mm <sup>3</sup> /a) | MAR (LOG) | ST.DEV (Mm <sup>3</sup> /a) | ST.DEV (LOG) | CV      | SI     |      |     |     |     |   |
| Patched observed                                      | 24,37                    | 1,34      | 11,68                       | 0,2          | 47,92   | 37,56  |      |     |     |     |   |
| Final simulation                                      | 24,27                    | 1,34      | 11,02                       | 0,21         | 45,41   | 37,72  |      |     |     |     |   |
| (Simulated - patched observed)/<br>(Patched observed) | -0,39 %                  | -0,05 %   | -5,6 %                      | 0,8 %        | -5,23 % | 0,42 % |      |     |     |     |   |

Figure 5.2 shows a graphical representation of the observed and simulated flows for the final parameter set.

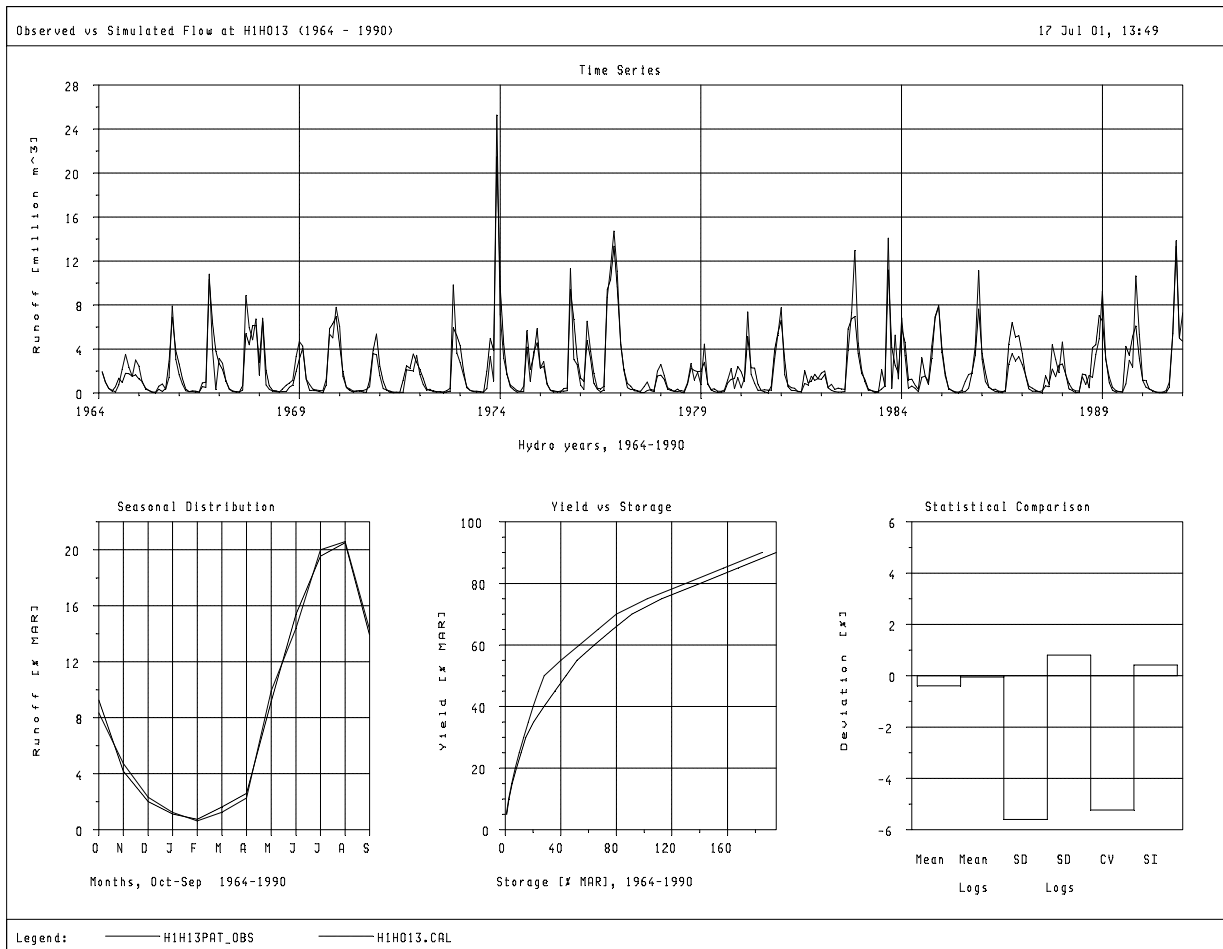


**Figure 5.2 : Graphical comparison of observed and simulated flows for H1H013**

Referring to Figure 5.2, the simulated and observed time series and seasonal distributions compare favourably. The simulated yield is slightly lower than the observed yield. All the statistics are within acceptable limits.

## 5.2 H1H003 : SUB-CATCHMENT NUMBERS 1, 7, 15, 17 (Figure 4.4)

### 5.2.1 Summary of Sub-catchment Data

Flow Station Number : H1H003  
 River Name : Breede River  
 Place : Ceres

**TABLE 5.5 : SUMMARY OF DATA FOR SUB-CATCHMENT H1H003**

| DESCRIPTION                                |   |                      | VALUE                     |
|--------------------------------------------|---|----------------------|---------------------------|
| Sub-catchment area                         | : | Agtertuin (high MAP) | 49,0 km <sup>2</sup>      |
|                                            | : | Agtertuin (low MAP)  | 437,2 km <sup>2</sup>     |
|                                            | : | H1H003 inc (low MAP) | 102,8 km <sup>2</sup>     |
| Sub-catchment MAP                          | : | Agtertuin (high MAP) | 1 148 mm/a                |
|                                            | : | Agtertuin (CCWR MAP) | 546 mm/a                  |
|                                            | : | H1H003 (CCWR MAP)    | 566 mm/a                  |
| Sub-catchment MAE                          | : | Agtertuin            | 1890 mm/a                 |
|                                            | : | H1H003 inc           | 1926 mm/a                 |
| Afforested area                            |   |                      | -                         |
| Area of alien vegetation                   | : | Agtertuin (high MAP) | 0,03 km <sup>2</sup>      |
|                                            | : | Agtertuin (low MAP)  | 0,07 km <sup>2</sup>      |
|                                            | : | H1H003 inc           | 3,91 km <sup>2</sup>      |
| Irrigation area                            |   |                      | 56,43 km <sup>2</sup>     |
| Farm dam capacity                          |   |                      | 34,57 Mm <sup>3</sup>     |
| Calibration period (hydrological years)    |   |                      | 1964 - 1990               |
| Observed MAR for calibration period        |   |                      | 106,51 Mm <sup>3</sup> /a |
| Incremental naturalised MAR (1925 - 1990)  |   |                      | 123,89 Mm <sup>3</sup> /a |
| Incremental naturalised runoff coefficient |   |                      | 35,1 %                    |
| Cumulative naturalised MAR (1925 - 1990)   |   |                      | 154,82 Mm <sup>3</sup> /a |

Note : information in the Table 5.5 represents 1990 development

Details of the data used in the model calibration process are given in Appendix B2. Table 5.6 summarises the contents of this Appendix.

**TABLE 5.6 : SUMMARY OF DATA IN APPENDIX B2**

| APPENDIX NO. | CONTENTS                                                                                       | FORMAT      |
|--------------|------------------------------------------------------------------------------------------------|-------------|
| B2.1         | Land-use data<br>Evaporation data<br>Reservoir data<br>Irrigation crop factors and percentages | Tables      |
| B2.2         | Observed data (original ) H1H003                                                               | Time series |
| B2.3         | Percentage rainfall file used in the calibration                                               |             |
| B2.4         | Upland alien vegetation demand in Agtertuin sub-catchment                                      |             |
| B2.5         | Riparian alien vegetation demand in Agtertuin sub-catchment                                    |             |
| B2.6         | Upland alien vegetation demand upstream of Ben Etive Dam                                       |             |
| B2.7         | Upland alien vegetation demand upstream of Rooikloof Dam                                       |             |
| B2.8         | Upland alien vegetation demand downstream of farm dams in H1H003 sub-catchment                 |             |
| B2.9         | Upland alien vegetation demand upstream of farm dams in H1H003 sub-catchment                   |             |
| B2.10        | Riparian alien vegetation demand                                                               |             |
| B2.12        | Irrigation from rivers in H1H003 sub-catchment                                                 |             |
| B2.13        | Irrigation from farm dams in H1H003 sub-catchment                                              |             |
| B2.14        | Irrigation from Ben Etive Dam                                                                  |             |
| B2.15        | Irrigation from Rooikloof Dam                                                                  |             |
| B2.16        | Irrigation from river in Agtertuin sub-catchment                                               |             |
| B2.17        | Irrigation from farm dams in Agtertuin sub-catchment                                           |             |
| B2.18        | Rietvlei Irrigation Board irrigation abstraction                                               |             |
| B2.19        | Simulated flow record                                                                          |             |
| B2.20        | Incremental patched observed flow record H1H003                                                |             |
| B2.21        | Incremental naturalised flow sequence                                                          |             |
| B2.22        | Cumulative present day (2000) flow sequence                                                    |             |

### 5.2.2 Preliminary

Three sub-catchments are located upstream of the H1H003 sub-catchment. They are the following :

- H1H013
- the ungauged Agtertuin incremental catchment
- the H1H003 incremental sub-catchment between flow gauges H1H003 and H1H013, but excluding the ungauged Agtertuin catchment.

The H1H003 incremental sub-catchment, for calibration purposes, consisted of the incremental catchment between H1H013 and H1H003, inclusive of the ungauged Agtertuin catchment. Model calibration was based on the incremental runoff at gauge H1H003.

During the initial calibration process, difficulties were experienced obtaining an acceptable Pitman calibration using the CCWR MAPs, under-simulating the winter peaks and the MAR over the calibration period. A sensitivity analysis revealed that this was as a result of low catchment MAP.

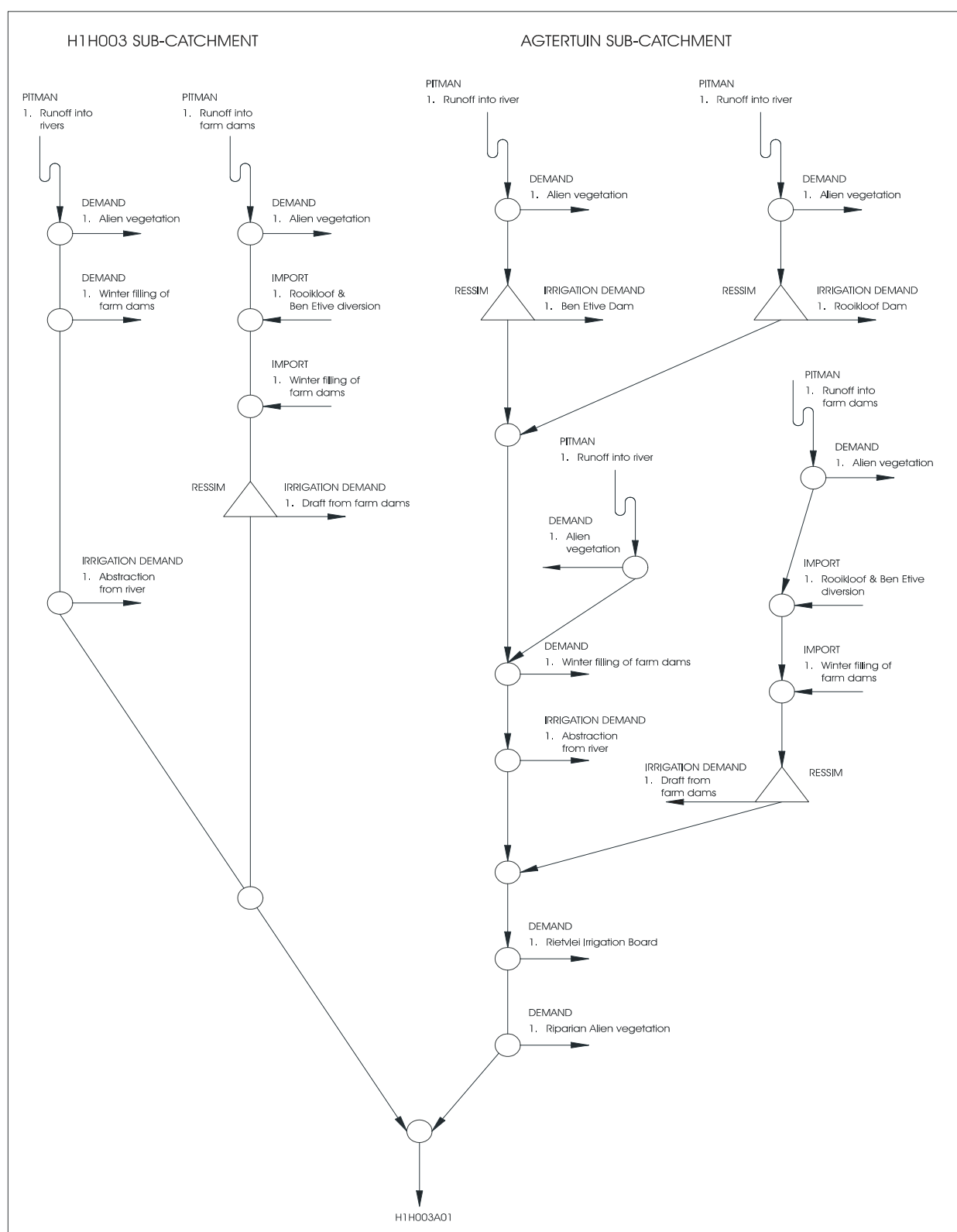
The catchment was, therefore, divided into a high and low MAP catchment following the assumptions and process described in Section 4.2. The Agtertuin catchment was, based on slopes and simulated runoff coefficients, divided into high and low MAP areas, while the entire H1H003 incremental area was modelled as a low MAP area, using the CCWR MAPs. The selected high MAP area had a slope of about 27%.

### 5.2.3 Model Configuration

Figure 5.3 shows a schematic representation of the sub-catchment configuration. The incremental catchment is effectively modelled as two separate sub-catchments, i.e. the Agtertuin and H1H003 incremental sub-catchments.

The Agtertuin catchment included the Ben Etive and Rooikloof Dams, as well as a number of farm dams and irrigation. Irrigation demands within the catchment are met from both farm dams and run-of-river abstractions. Water for irrigation is diverted out of this catchment into the Ceres catchment from the Ben Etive and Rooikloof Dams, as well as from run-of-river abstractions. Upland alien vegetation demands are met only by local runoff, while riparian alien demands were modelled as being supplied from the main stream at the outlet of the catchment. Winter abstraction from the river to fill the farm dams was also included.

The Ceres catchment contains numerous farm dams and is intensively irrigated, with irrigation water diverted into the catchment from both the Agtertuin and H1H013 incremental catchments.



Note : the above is a schematic diagram only and does not show all the detail included in the hydrological model

**Figure 5.3 : H1H003 Sub-catchment model configuration**



### 5.2.4 Evaluation and Preparation of Flow Sequences

Observed flow data at gauge H1H003 was available from October 1923 to date. An automatic recorder was only installed in May 1962. Catchment model calibration was done only for the period 1964 to 1990, the overlapping period of recorded flow data at the flow gauges H1H013 and H1H003, and to coincide with the end date of 1990 used in the BRHS.

The flow data was previously evaluated as accurate, although the record contained a number of gaps and exceeded values, mainly as a result of exceeding the discharge table (DT) limits.

### 5.2.5 Calibration (Calibration period : Oct 1964 - Sep 1990)

The details of the rainfall stations used in the calibration are shown in Table 5.7 below.

**TABLE 5.7 : RAINFALL STATIONS USED FOR CALIBRATION OF H1H003**

| RAINFALL STATION<br>NUMBER | PERIOD OF RECORD<br>(HYDROLOGICAL YEARS) | LENGTH OF RECORD<br>(YEARS) |
|----------------------------|------------------------------------------|-----------------------------|
| 042227_3                   | 1920 - 1998                              | 78                          |
| 042326_X                   | 1920 - 1998                              | 78                          |
| 043139_P                   | 1951 - 1997                              | 46                          |
| 043019_P                   | 1949 - 1976                              | 27                          |
| 042582_2                   | 1951 - 1998                              | 47                          |

The final calibration parameters are shown in Table 5.8 along with the statistics for the observed data and final simulated record.

**TABLE 5.8 : CALIBRATION SUMMARY FOR H1H003**

| FINAL<br>ITERATION                                    | PITMAN PARAMETERS |                             |              |                                |                 |         |       |     |    |    |   |
|-------------------------------------------------------|-------------------|-----------------------------|--------------|--------------------------------|-----------------|---------|-------|-----|----|----|---|
|                                                       | POW               | SL                          | ST           | FT                             | GW              | ZMIN    | ZMAX  | PI  | TL | GL | R |
|                                                       | 2                 | 0                           | 200          | 70                             | 0               | 0       | 400   | 1.5 | 0  | 0  | 0 |
| FLOW RECORD                                           |                   | STATISTICS (1964 - 1990)    |              |                                |                 |         |       |     |    |    |   |
|                                                       |                   | MAR<br>(Mm <sup>3</sup> /a) | MAR<br>(LOG) | ST.DEV<br>(Mm <sup>3</sup> /a) | ST.DEV<br>(LOG) | CV      | SI    |     |    |    |   |
| Patched observed                                      |                   | 106,51                      | 1,95         | 82,19                          | 0,26            | 77,17   | 42,96 |     |    |    |   |
| Final simulation                                      |                   | 103,34                      | 1,96         | 58,68                          | 0,23            | 56,79   | 39,42 |     |    |    |   |
| (Simulated - patched observed)/<br>(Patched observed) |                   | -2,97%                      | -0,48%       | -28,6%                         | -12,33%         | -26,41% | 8,25% |     |    |    |   |

Figure 5.4 shows a graphical representation of the observed and simulated flows for the final parameter set.

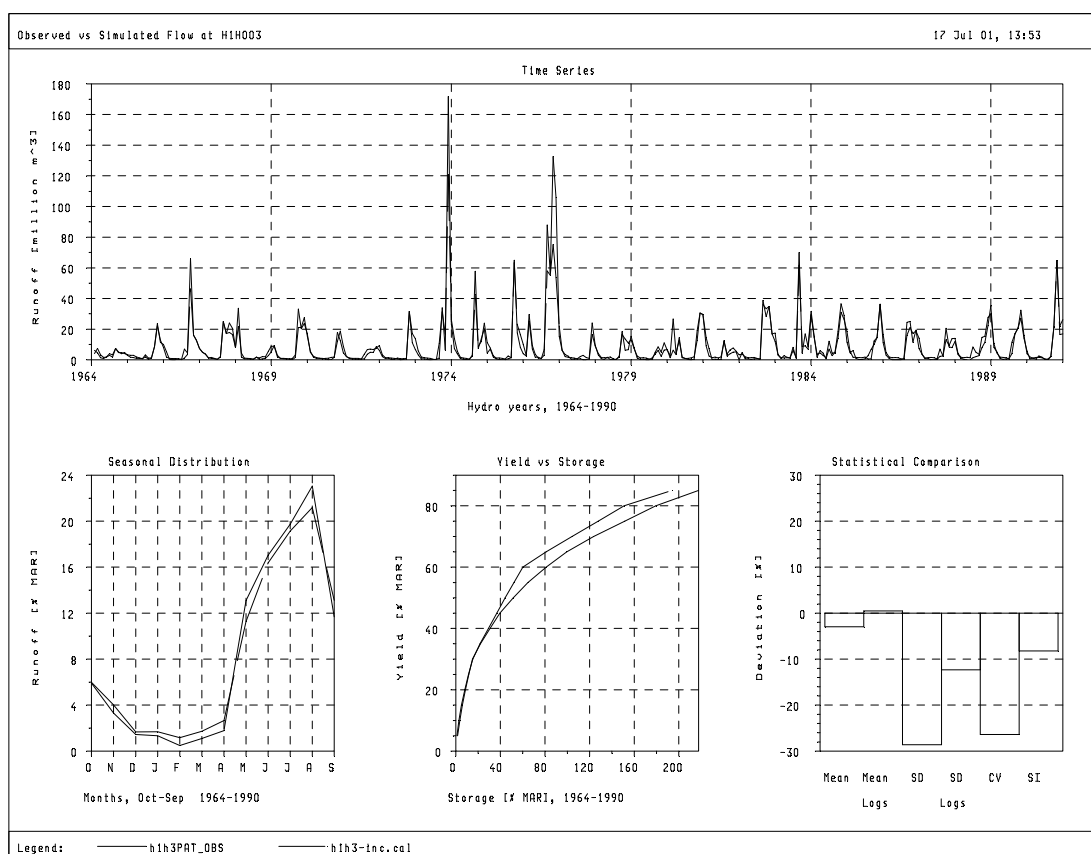


**Figure 5.4 : Graphical comparison of observed and simulated flows for H1H003**

Referring to Figure 5.4, the simulated and observed time series compares favourably, although the simulated peaks are under-estimating the observed peaks. Simulated low flows are slightly lower than the observed low flows in the early part of the record and slightly higher during the latter part of the record. The seasonal distribution confirms the under-estimation of the peaks and over-estimation of low flows, respectively. The simulated yield over-estimates the observed yield due to the higher simulated low flows.

### 5.3 H1H006 : SUB-CATCHMENT NUMBERS 11, 14 (Figure 4.4)

#### 5.3.1 Summary of Sub-catchment Data

Flow Station Number : H1H006  
 River Name : Breede River  
 Place : Witbrug

**TABLE 5.9 : SUMMARY OF DATA FOR SUB-CATCHMENT H1H006**

| DESCRIPTION                                |   |            | VALUE                     |
|--------------------------------------------|---|------------|---------------------------|
| Sub-catchment area                         | : | Witels     | 50,9 km <sup>2</sup>      |
|                                            | : | H1H006 inc | 45,1 km <sup>2</sup>      |
| Sub-catchment MAP                          | : | Witels     | 2 244 mm/a                |
|                                            | : | H1H006 inc | 2 500 mm/a                |
| Sub-catchment MAE                          |   |            | 1 835 mm/a                |
| Afforested area                            |   |            | -                         |
| Area of alien vegetation                   |   |            | 8,22 km <sup>2</sup>      |
| Irrigation area                            |   |            | -                         |
| Farm dam capacity                          |   |            | -                         |
| Calibration period (hydrological years)    |   |            | 1964 - 1990               |
| Observed MAR for calibration period        |   |            | 123,63 Mm <sup>3</sup> /a |
| Incremental naturalised MAR (1925 - 1990)  |   |            | 134,85 Mm <sup>3</sup> /a |
| Incremental naturalised runoff coefficient |   |            | 59,4 %                    |
| Cumulative naturalised MAR (1925 - 1990)   |   |            | 289,67 Mm <sup>3</sup> /a |

Note : information in the Table 5.9 represents 1990 development

Details of the data used in the model calibration process are given in Appendix B3. Table 5.10 summarises the contents of this Appendix.

**TABLE 5.10 : SUMMARY OF DATA IN APPENDIX B3**

| APPENDIX NO. | CONTENTS                                                                                       | FORMAT      |
|--------------|------------------------------------------------------------------------------------------------|-------------|
| B3.1         | Land-use data<br>Evaporation data<br>Reservoir data<br>Irrigation crop factors and percentages | Tables      |
| B3.2         | Observed data (original) H1H006                                                                | Time series |
| B3.3         | Percentage rainfall file used in the calibration                                               |             |
| B3.4         | Upland alien vegetation demand (tall trees) in Witels sub-catchment                            |             |
| B3.5         | Upland alien vegetation demand (tall trees) in H1H006 sub-catchment                            |             |
| B3.6         | Upland alien vegetation demand (tall shrubs) in H1H006 sub-catchment                           |             |
| B3.7         | Riparian alien vegetation demand in H1H006 sub-catchment                                       |             |
| B3.8         | Canal abstraction upstream of gauge H1H006                                                     |             |
| B3.9         | Incremental simulated flow record at H1H006                                                    |             |
| B3.10        | Patched observed incremental flow record at H1H006                                             |             |
| B3.11        | Incremental naturalised flow sequence at H1H006                                                |             |
| B3.12        | Cumulative present day (2000) flow sequence at H1H006                                          |             |

### 5.3.2 Preliminary

The H1H006 incremental sub-catchment consisted of the incremental area between H1H003 and H1H006, inclusive of the ungauged Witels River catchment, with model calibration based on the incremental runoff at gauge H1H006.

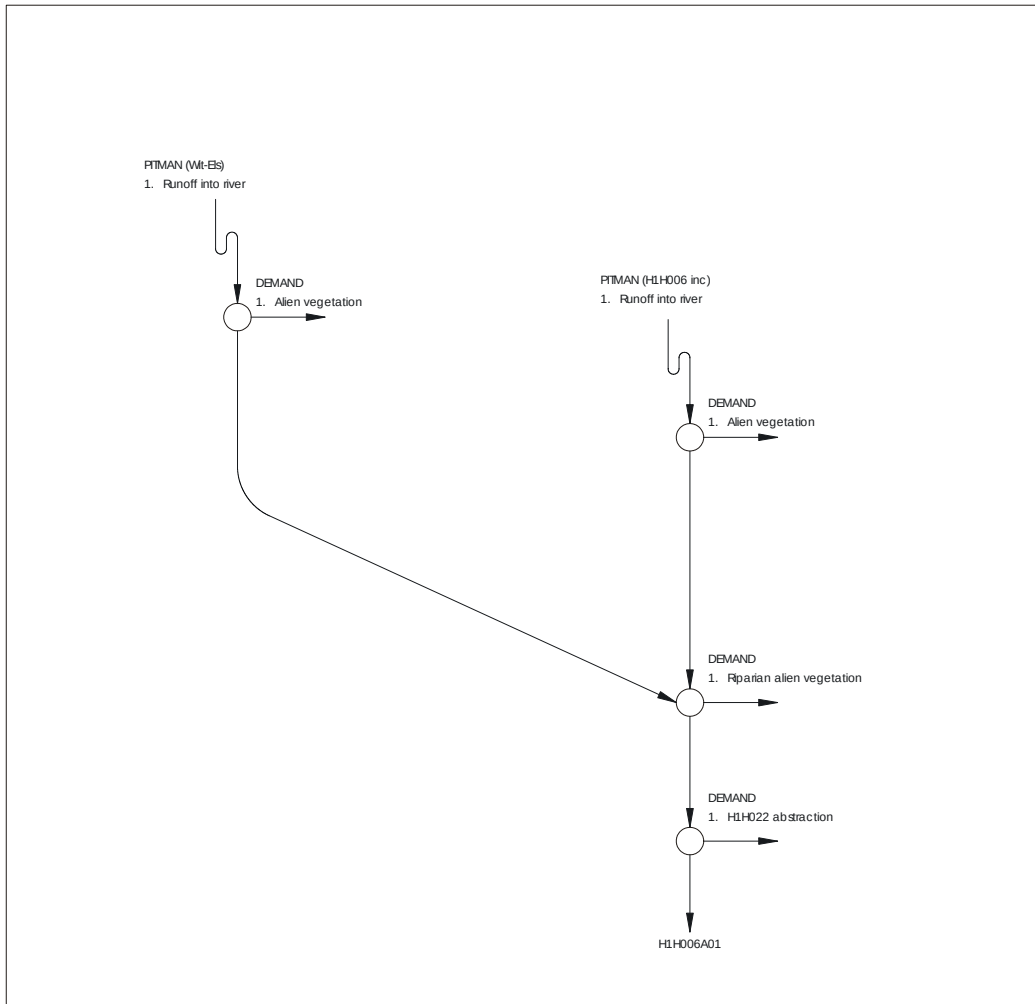
During the initial calibration process, difficulties were experienced obtaining an acceptable Pitman calibration using the CCWR MAPs, since the simulated monthly flows were consistently lower than the recorded monthly flows. As a result, the simulated MAR was significantly lower than the observed MAR.

Based on the average slope of the area, the catchment was modelled as a high MAP catchment, following the assumptions and process described in Section 4.2. The average slope of the catchment was about 40%.

### 5.3.3 Model Configuration

Figure 5.5 shows a schematic representation of the sub-catchment configuration. The incremental catchment is effectively modelled as two separate sub-catchments, i.e. the Witels and H1H003 incremental sub-catchments.

The incremental catchment does not contain any development, apart from scattered areas of alien invasive vegetation. An outlet canal, situated immediately upstream of the gauge H1H006, supplies water to Wolseley, to irrigation in the Wolseley catchment and to users in the Tulbagh area, which is outside the Breede River catchment area. Flow in the canal is recorded at gauge H1H022. Flow in the canal is recorded at gauge H1H022.



Note : the above is a schematic diagram only and does not show all the detail included in the hydrological model

**Figure 5.5 : H1H006 Sub-catchment model configuration**

### 5.3.4 Evaluation and Preparation of Flow Sequences

Observed flow data at gauge H1H006 was available from 1950 to 1997 and an automatic recorder was installed in May 1962. Catchment model calibration was for the period 1964 to 1990, to coincide with the calibration period at gauge H1H003.

The BRHS reported problems with high approach velocities and upstream pool siltation at gauge H1H006. Not all base flows were measured as a result of the diversion into the canal upstream of H1H006. In the BRHS, the gauging station was found unsuitable for calibration, but was used to verify that the tendencies between observed and simulated flows were compatible.

Gauge H1H006 is located in an important location from a monitoring point of view. It was, therefore, decided to follow the same approach as in the BRHS and to use the gauge for calibration purposes, while at the same time taking account of the unreliable nature of the flow data.

### 5.3.5 Calibration (Calibration Period : Oct 1964 - Sep 1990)

The details of the rainfall stations used in the calibration are shown in Table 5.11 below.

**TABLE 5.11 : RAINFALL STATIONS USED FOR CALIBRATION OF H1H006**

| RAINFALL STATION<br>NUMBER | PERIOD OF RECORD<br>(HYDROLOGICAL YEARS) | LENGTH OF RECORD<br>(YEARS) |
|----------------------------|------------------------------------------|-----------------------------|
| 042357_a                   | 1924 - 1998                              | 75                          |
| 042326_X                   | 1920 - 1998                              | 79                          |
| 042415_9                   | 1920 - 1961                              | 42                          |

The final calibration parameters are shown in Table 5.12 along with the statistics for the observed data and final simulated record.

**TABLE 5.12 : CALIBRATION SUMMARY FOR H1H006**

| FINAL<br>ITERATION                                    | PITMAN PARAMETERS |                          |           |                             |              |       |       |     |    |     |   |
|-------------------------------------------------------|-------------------|--------------------------|-----------|-----------------------------|--------------|-------|-------|-----|----|-----|---|
|                                                       | POW               | SL                       | ST        | FT                          | GW           | ZMIN  | ZMAX  | PI  | TL | GL  | R |
|                                                       | 2                 | 0                        | 450       | 65                          | 10           | 0     | 650   | 1.5 | 0  | 1.5 | 0 |
| FLOW RECORD                                           |                   | STATISTICS (1964 - 1990) |           |                             |              |       |       |     |    |     |   |
|                                                       |                   | MAR (Mm <sup>3</sup> /a) | MAR (LOG) | ST.DEV (Mm <sup>3</sup> /a) | ST.DEV (LOG) | CV    | SI    |     |    |     |   |
| Patched observed                                      |                   | 123,63                   | 2,06      | 53,06                       | 0,17         | 42,92 | 39,53 |     |    |     |   |
| Final simulation                                      |                   | 124,07                   | 2,06      | 50,32                       | 0,18         | 40,55 | 42,2  |     |    |     |   |
| (Simulated - patched observed)/<br>(Patched observed) |                   | 0,36%                    | 0,06%     | -5,16%                      | 3,54%        | -5,5% | 6,76% |     |    |     |   |

Figure 5.6 shows a graphical representation of the observed and simulated flows for the final parameter set.

Referring to Figure 5.6 overleaf, the simulated and observed time series compares reasonably. The simulated low flows are generally lower than the observed low flows, while there is a slight over-simulation of peak flows. These tendencies are confirmed by the seasonal distribution. The simulated yield under-estimates the observed yield due to the lower simulated low flows.

All the statistics are within acceptable limits.

An acceptable calibration was achieved based on the above and considering the unreliable nature of the observed data.

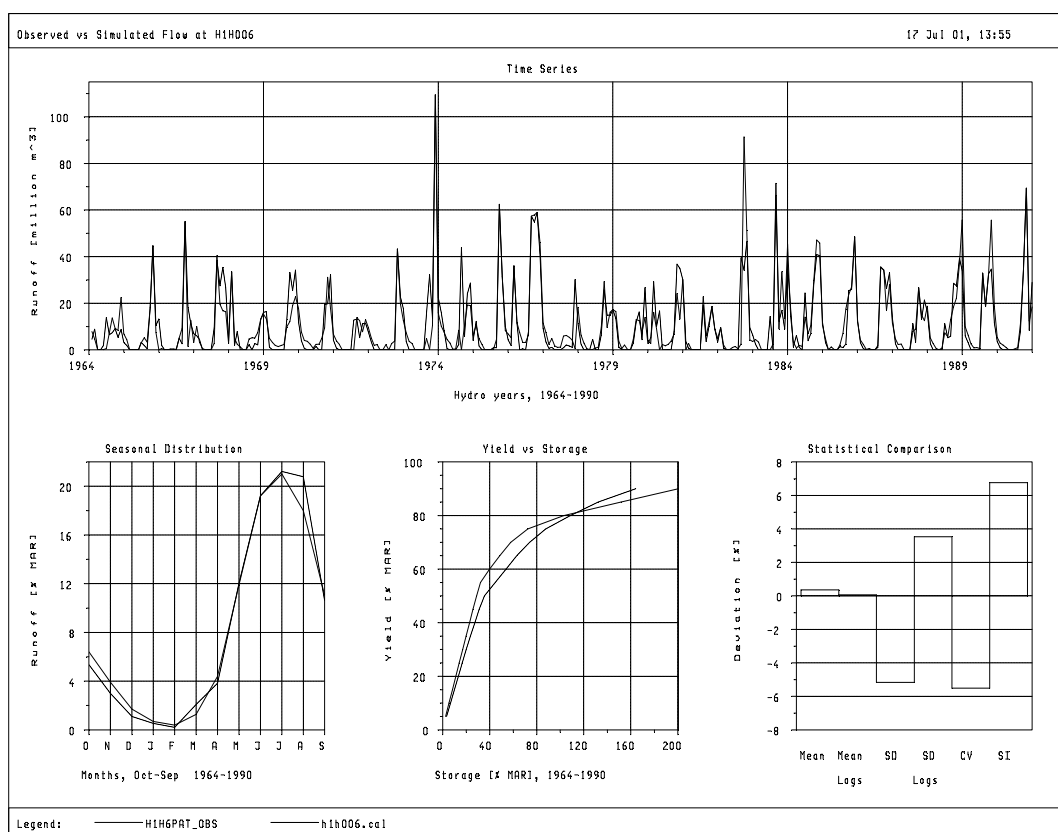


**Figure 5.6 : Graphical comparison of observed and simulated flows for H1H006**

## 5.4 H1H007 : SUB-CATCHMENT NUMBERS 24, 32 (Figure 4.4)

### 5.4.1 Summary of Sub-catchment Data

Flow Station Number : H1H007  
 River Name : Wit River  
 Place : Drosterkloof

**TABLE 5.13 : SUMMARY OF DATA FOR SUB-CATCHMENT H1H007**

| DESCRIPTION                                | VALUE                     |
|--------------------------------------------|---------------------------|
| Sub-catchment area : H1H011                | 28 km <sup>2</sup>        |
| : H1H007                                   | 56 km <sup>2</sup>        |
| Sub-catchment MAP : H1H011                 | 2 260 mm/a                |
| : H1H007                                   | 2 080 mm/a                |
| Sub-catchment MAE (S-pan)                  | 1 551 mm/a                |
| Afforested area                            | -                         |
| Area of alien vegetation                   | 4,957 km <sup>2</sup>     |
| Irrigation area                            | -                         |
| Farm dam capacity                          | -                         |
| Calibration period (hydrological years)    | 1961 - 1990               |
| Observed MAR for calibration period        | 129,87 Mm <sup>3</sup> /a |
| Incremental naturalised MAR (1925 - 1990)  | 125,39 Mm <sup>3</sup> /a |
| Incremental naturalised runoff coefficient | 69,7 %                    |
| Cumulative naturalised MAR (1925 - 1990)   | 125,39 Mm <sup>3</sup> /a |

Note : information in the Table 5.13 represents 1990 development

Details of the data used in the model calibration process are given in Appendix B4. Table 5.14 summarises the contents of this Appendix.

**TABLE 5.14 : SUMMARY OF DATA IN APPENDIX B4**

| APPENDIX NO. | CONTENTS                                                                                       | FORMAT      |
|--------------|------------------------------------------------------------------------------------------------|-------------|
| B4.1         | Land-use data<br>Evaporation data<br>Reservoir data<br>Irrigation crop factors and percentages | Tables      |
| B4.2         | Observed data (original ) H1H007                                                               | Time series |
| B4.3         | Percentage rainfall file used in the calibration                                               |             |
| B4.4         | Upland alien vegetation demand (tall trees) upstream of H1H011                                 |             |
| B4.5         | Upland alien vegetation demand (tall trees) upstream of H1H007                                 |             |
| B4.6         | Upland alien vegetation demand (tall shrubs) upstream of H1H007                                |             |
| B4.7         | Gawie-se-Water Abstraction                                                                     |             |
| B4.8         | Simulated flow record                                                                          |             |
| B4.9         | Patched observed flow record H1H007                                                            |             |
| B4.10        | Incremental naturalised flow sequence at H1H007                                                |             |
| B4.11        | Cumulative present day (2000) flow sequence at H1H007                                          |             |



#### 5.4.2 Preliminary

Two sub-catchments are located upstream of the H1H007 sub-catchment. They are the following :

- H1H011
- the H1H007 incremental sub-catchment between flow gauges H1H011 and H1H007.

No flow data was available for gauge H1H011, which opened in 1953 and closed in 1954. The "Gawie se Water" diversion to the Berg River catchment is at the site of H1H011. Apart from alien invasive vegetation, the incremental catchment between H1H011 and H1H007 is undeveloped.

During the initial calibration process, difficulties were experienced obtaining an acceptable Pitman calibration using the CCWR MAPs, since the simulated monthly flows were consistently lower than the recorded monthly flows. As a result, the simulated MAR was significantly lower than the observed MAR.

The catchment was, based on the average slope of the area, modelled as a high MAP catchment, following the assumptions and process described in Section 4.2. The catchment had an average slope of 33%.

#### 5.4.3 Model Configuration

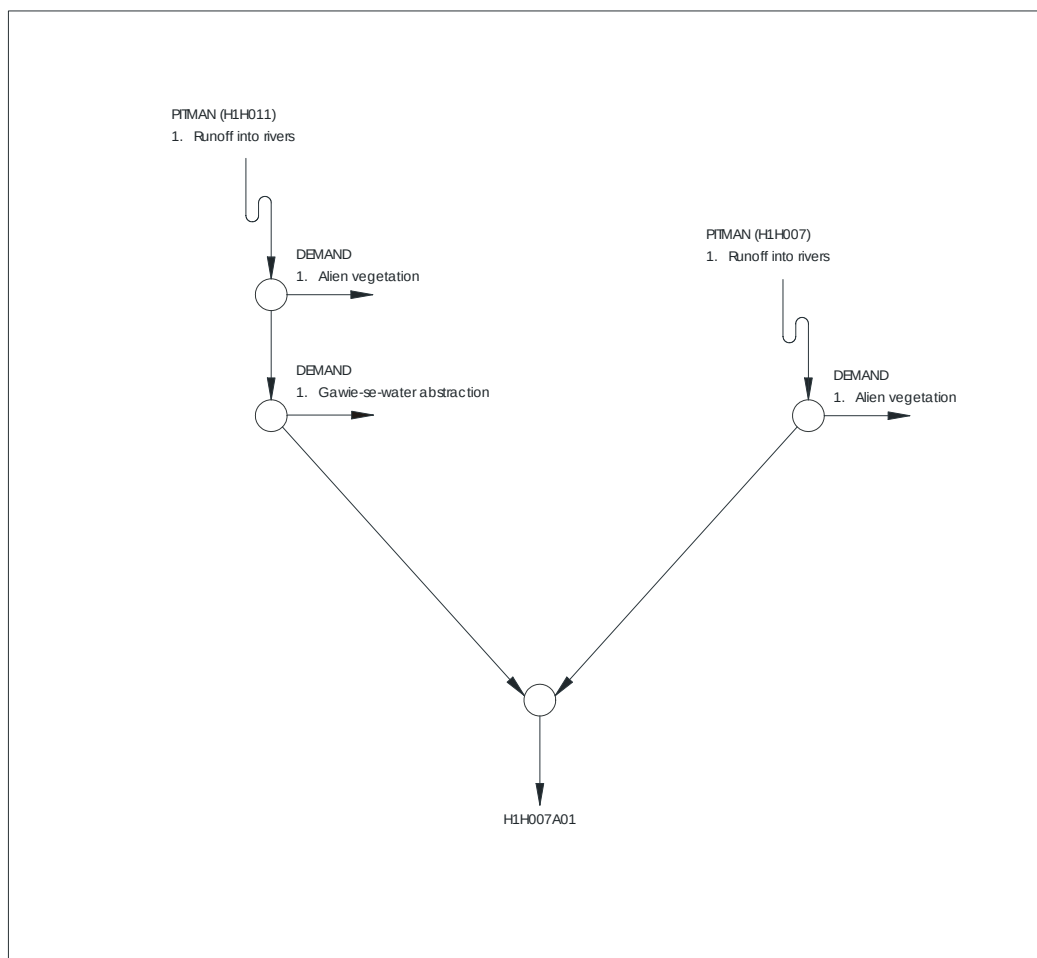
Figure 5.7 shows a schematic representation of the sub-catchment configuration. Apart from some alien invasive vegetation scattered throughout the catchment, this is an undeveloped catchment. The abstraction for "Gawie se Water" takes place at the site of the old gauge H1H011.

#### 5.4.4 Evaluation and Preparation of Flow Sequences at H1H007

Observed flow data was available from 1950 to 1998, but calibration was for the period 1961 to 1990 (an automatic recorder was installed in 1961 and for the end data to coincide with the BRHS).

The BRHS reported problems with the upstream pool often filled by boulders, resulting in high approach velocities. The record also contained a number of exceeded values (pluses) and submergence problems. In the BRHS, the gauging station was found unsuitable for calibration, but was used to verify that the tendencies between observed and simulated flows were compatible.

It was, therefore, decided to follow the same approach as in the BRHS and use the gauge for calibration purposes, while at the same time taking account of the unreliable nature of the flow data.



Note : the above is a schematic diagram only and does not show all the detail included in the hydrological model

**Figure 5.7 : H1H007 sub-catchment model configuration**

#### 5.4.5 Calibration (Calibration period : Oct 1961 - Sep 1990)

The details of the rainfall stations used in the calibration are shown in Table 5.15 below.

**TABLE 5.15 : RAINFALL STATIONS USED FOR CALIBRATION OF H1H007**

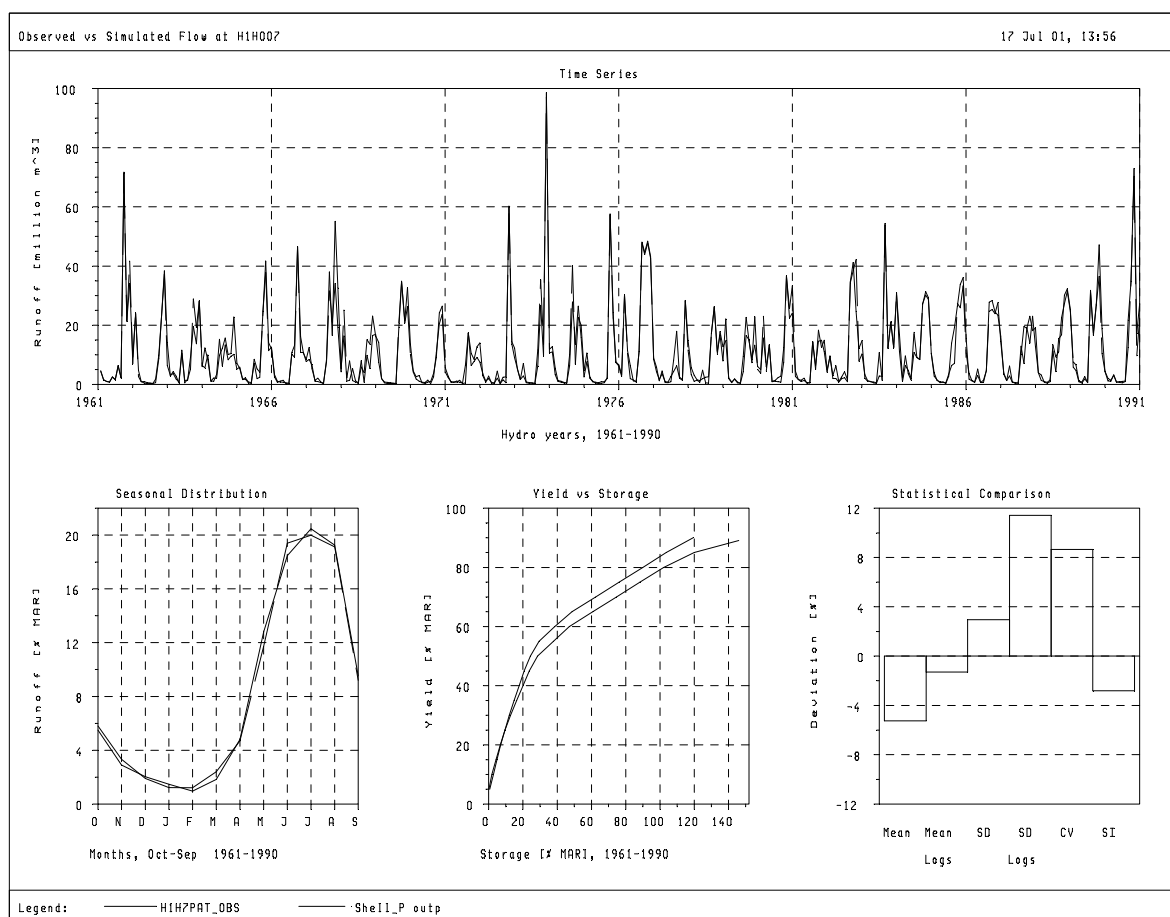
| RAINFALL STATION<br>NUMBER | PERIOD OF RECORD<br>(HYDROLOGICAL YEARS) | LENGTH OF RECORD<br>(YEARS) |
|----------------------------|------------------------------------------|-----------------------------|
| 022038_8                   | 1920 - 1998                              | 79                          |
| 022368_4                   | 1932 - 1977                              | 46                          |
| 0222284a                   | 1970 - 1983                              | 14                          |
| 042357_a                   | 1924 - 1998                              | 75                          |

The final calibration parameters are shown in Table 5.16 along with the statistics for the observed data and final simulated record.

**TABLE 5.16 : CALIBRATION DATA FOR H1H007**

| FINAL<br>ITERATION                                    | PITMAN PARAMETERS           |              |                                |                 |       |       |      |     |    |     |   |
|-------------------------------------------------------|-----------------------------|--------------|--------------------------------|-----------------|-------|-------|------|-----|----|-----|---|
|                                                       | POW                         | SL           | ST                             | FT              | GW    | ZMIN  | ZMAX | PI  | TL | GL  | R |
|                                                       | 2                           | 0            | 300                            | 90              | 15    | 0     | 390  | 1.5 | 0  | 1.5 | 0 |
| FLOW RECORD                                           | STATISTICS (1961 - 1990)    |              |                                |                 |       |       |      |     |    |     |   |
|                                                       | MAR<br>(Mm <sup>3</sup> /a) | MAR<br>(LOG) | ST.DEV<br>(Mm <sup>3</sup> /a) | ST.DEV<br>(LOG) | CV    | SI    |      |     |    |     |   |
| Patched observed                                      | 129,87                      | 2,1          | 38,53                          | 0,12            | 29,67 | 38,84 |      |     |    |     |   |
| Final simulation                                      | 123,06                      | 2,07         | 39,67                          | 0,14            | 32,24 | 37,75 |      |     |    |     |   |
| (Simulated - patched observed)/<br>(Patched observed) | -5,25%                      | -1,29%       | 2,95%                          | 11,42%          | 8,65% | 2,81% |      |     |    |     |   |

Figure 5.8 shows a graphical representation of the observed and simulated flows for the final parameter set.

**Figure 5.8 : Graphical comparison of observed and simulated flows for H1H007**

Referring to Figure 5.8, the simulated and observed time series and seasonal distribution compares favourably. The simulated yield under-estimates the observed yield due to the slightly lower simulated low flows.

All the statistics are within acceptable limits.

An acceptable calibration was achieved based on the above and considering the unreliable nature of the observed data.

## 5.5 H1H018 : SUB-CATCHMENT NUMBERS 37, 43 (Figure 4.4)

### 5.5.1 Summary of Sub-catchment Data

Flow Station Number : H1H018  
 River Name : Molenaars  
 Place : Ouplaas

**TABLE 5.17 : SUMMARY OF DATA FOR SUB-CATCHMENT H1H018**

| DESCRIPTION                                | VALUE                     |
|--------------------------------------------|---------------------------|
| Sub-catchment area                         | 113,0 km <sup>2</sup>     |
| Sub-catchment MAP                          | 1945 mm/a                 |
| Sub-catchment MAE                          | 1 486 mma                 |
| Afforested area                            | -                         |
| Area of alien vegetation                   | 17.2 km <sup>2</sup>      |
| Irrigation area                            | 1.1 km <sup>2</sup>       |
| Farm dam capacity                          | -                         |
| Calibration period (hydrological years)    | 1968 - 1990               |
| Observed MAR for calibration period        | 153,01 Mm <sup>3</sup> /a |
| Incremental naturalised MAR (1925 - 1990)  | 144,13 Mm <sup>3</sup> /a |
| Incremental naturalised runoff coefficient | 66 %                      |
| Cumulative naturalised MAR (1925 - 1990)   | 144,13 Mm <sup>3</sup> /a |

Note : information in the Table 5.17 represents 1990 development

Details of the data used in the model calibration process are given in Appendix B5. Table 5.18 summarises the contents of this Appendix.

**TABLE 5.18 : SUMMARY OF DATA IN APPENDIX B5**

| APPENDIX NO. | CONTENTS                                                                                       | FORMAT      |
|--------------|------------------------------------------------------------------------------------------------|-------------|
| B5.1         | Land-use data<br>Evaporation data<br>Reservoir data<br>Irrigation crop factors and percentages | Tables      |
| B5.2         | Observed data (original ) H1H018                                                               | Time series |
| B5.3         | Percentage rainfall file used in the calibration                                               |             |
| B5.4         | Upland alien vegetation demand (tall trees) upstream of H1H017                                 |             |
| B5.5         | Upland alien vegetation demand (tall shrubs) upstream of H1H018                                |             |
| B5.6         | Riparian alien vegetation demand upstream of H1H018                                            |             |
| B5.7         | Upland alien vegetation demand (tall trees) upstream of H1H018                                 |             |
| B5.8         | Upland alien vegetation demand (tall shrubs) upstream of H1H018                                |             |
| B5.9         | Riparian alien vegetation demand upstream of H1H018                                            |             |
| B5.10        | Irrigation from rivers                                                                         |             |
| B5.11        | Simulated flow record                                                                          |             |
| B5.12        | Patched observed flow record H1H018                                                            |             |
| B5.13        | Incremental naturalised flow sequence at H1H018                                                |             |
| B5.14        | Cumulative present day (2000) flow sequence at H1H018                                          |             |

### 5.5.2 Preliminary

Two sub-catchments are located upstream of the H1H018 sub-catchment. They are the following :

- H1H017
- H1H033.

The gauging structure at H1H017 was deemed unreliable during the BRHS and was not used for calibration, while gauge H1H033 was only opened in 1989 with seven months of flow data available at the time of the BRHS. Although gauge H1H033 was identified as being reliable, it was excluded from the model calibration since the calibration period ended in 1990.

Although using the CCWR MAPs resulted in a reasonable calibration, the runoff coefficients were outside the 15% confidence bands shown on Figure 4.3 and it was deemed necessary to adjust the MAPs.

Following the assumptions and process described in Section 4.2, the entire H1H018 catchment was, based on a slope of about 33% and simulated runoff coefficients, modelled as a high MAP area.

### 5.5.3 Model Configuration

Figure 5.9 shows a schematic representation of the sub-catchment configuration. This is a relatively undeveloped catchment, with only a small area of irrigation and some trout farming. The catchment, however, contains a fairly large area of invasive alien vegetation. Upland alien vegetation demands are met only by local runoff, while riparian alien demands were modelled as being supplied from the main stream at the outlet of the catchment.

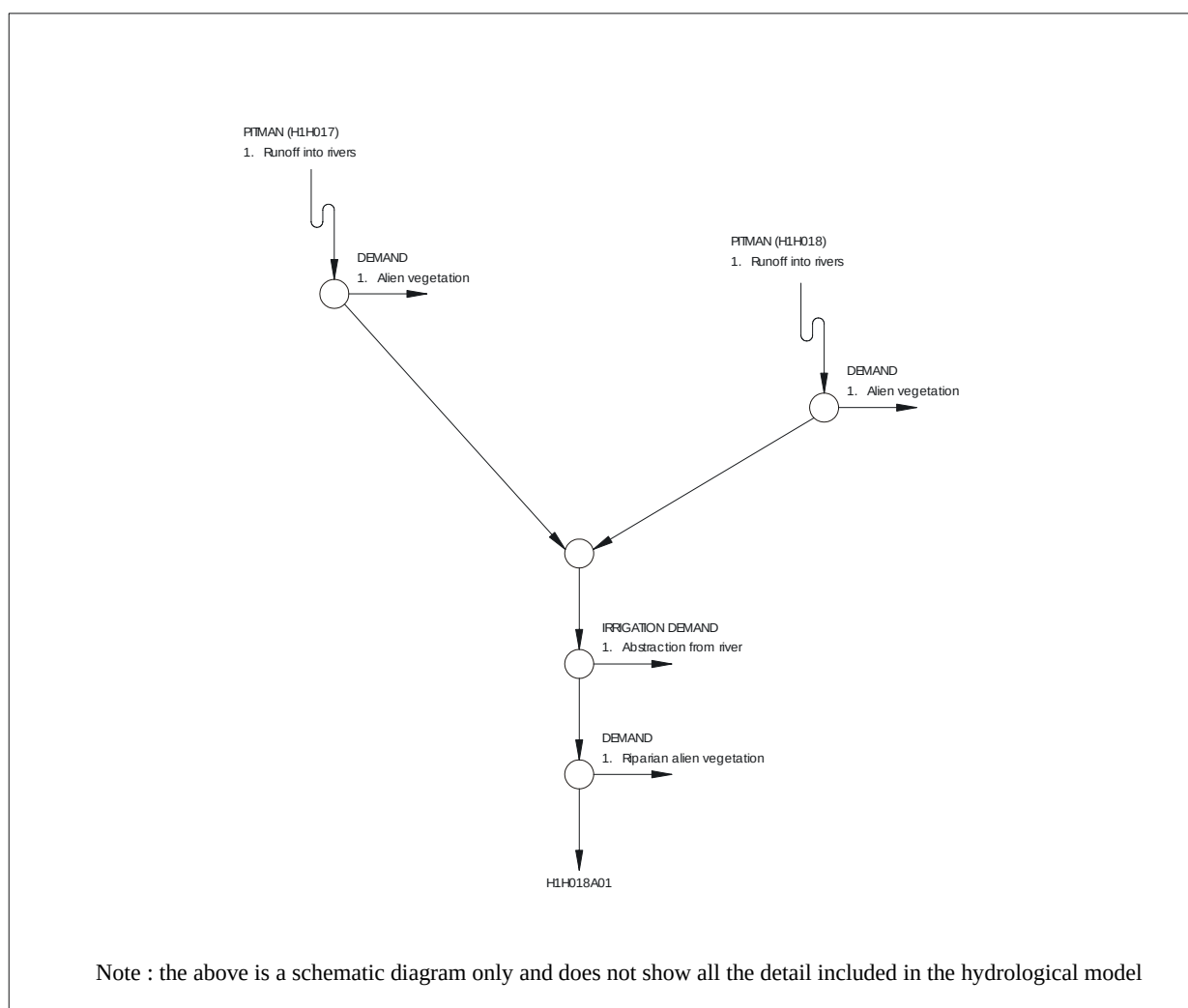


**Figure 5.9 : H1H018 Sub-catchment model configuration**

#### 5.5.4 Evaluation and Preparation of Flow Sequences

Observed flow data was available at gauge H1H018 from October 1968 to September 1998, but the calibration period only covered the period 1968 to 1990 (to coincide with the BRHS end date).

Although there are regular problems with rocks inundating the upstream pool at the gauge, the station has been regarded as reliable.

#### 5.5.5 Calibration (Calibration period : Oct 1968 - Sep 1990)

The details of the rainfall stations used in the calibration are shown in Table 5.19.

**TABLE 5.19 : RAINFALL STATIONS USED FOR CALIBRATION OF H1H018**

| RAINFALL STATION<br>NUMBER | PERIOD OF RECORD<br>(HYDROLOGICAL YEARS) | LENGTH OF RECORD<br>(YEARS) |
|----------------------------|------------------------------------------|-----------------------------|
| 022038_8                   | 1920 - 1998                              | 78                          |
| 022284_4                   | 1970 - 1983                              | 13                          |
| 022113_2                   | 1920 - 1998                              | 78                          |
| 022504_X                   | 1932 - 1994                              | 62                          |

The final calibration parameters are shown in Table 5.20 along with the statistics for the observed data and final simulated record.

**TABLE 5.20 : CALIBRATION SUMMARY FOR H1H018**

| FINAL<br>ITERATION                                    | PITMAN PARAMETERS        |    |           |     |                             |      |              |     |       |     |       |
|-------------------------------------------------------|--------------------------|----|-----------|-----|-----------------------------|------|--------------|-----|-------|-----|-------|
|                                                       | POW                      | SL | ST        | FT  | GW                          | ZMIN | ZMAX         | PI  | TL    | GL  | R     |
|                                                       | 2                        | 0  | 275       | 120 | 25                          | 0    | 550          | 1,5 | 0     | 1,5 | 0     |
| FLOW RECORD                                           | STATISTICS (1968 - 1990) |    |           |     |                             |      |              |     |       |     |       |
|                                                       | MAR (Mm <sup>3</sup> /a) |    | MAR (LOG) |     | ST.DEV (Mm <sup>3</sup> /a) |      | ST.DEV (LOG) |     | CV    |     | SI    |
| Patched observed                                      | 153,01                   |    | 2,16      |     | 50,82                       |      | 0,14         |     | 33,21 |     | 37,97 |
| Final simulation                                      | 149,97                   |    | 2,15      |     | 52,3                        |      | 0,15         |     | 34,88 |     | 38,91 |
| (Simulated - patched observed)/<br>(Patched observed) | -1,99%                   |    | -0,52%    |     | 2,92%                       |      | 6%           |     | 5,01% |     | 2,47% |

Figure 5.10 shows a graphical representation of the observed and simulated flows for the final parameter set.

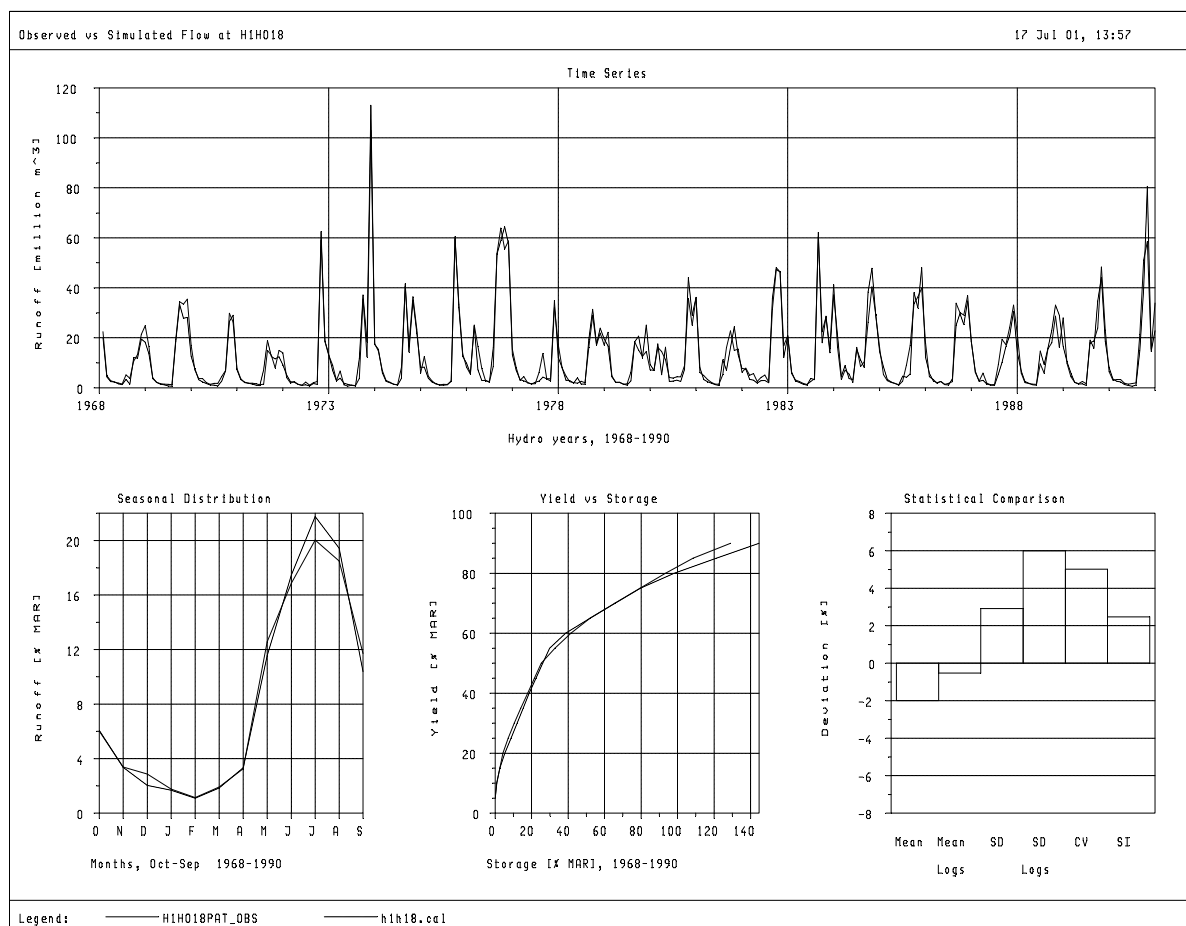


**Figure 5.10 : Graphical comparison of observed and simulated flows for H1H018**

Referring to Figure 5.10, the simulated and observed time series and seasonal distributions compare favourably, apart from the slight over-simulation of some of the peaks, which is also indicated by the seasonal distribution. The simulated and observed yields also compare favourably. All the statistics are within acceptable limits.



## 5.6 H4H017 : SUB-CATCHMENT NUMBERS 12, 21, 22, 23, 25, 27, 34, 38, 39, 41, 43, 44, 45, 46 (Figure 4.4)

### 5.6.1 Summary of Sub-catchment Data

Flow Station Number : H4H017  
 River Name : Breede River  
 Place : Le Chasseur

**TABLE 5.21 : SUMMARY OF DATA FOR SUB-CATCHMENT H4H017**

| DESCRIPTION                 |                       | VALUE                 |
|-----------------------------|-----------------------|-----------------------|
| Sub-catchment area :        | Low Wit               | 36 km <sup>2</sup>    |
|                             | Wolseley              | 227 km <sup>2</sup>   |
|                             | Slanghoek             | 66 km <sup>2</sup>    |
|                             | H1H020                | 13 km <sup>2</sup>    |
|                             | Rawsonville           | 392 km <sup>2</sup>   |
|                             | Ouplaas               | 38,3 km <sup>2</sup>  |
|                             | H1H008                | 63,7 km <sup>2</sup>  |
|                             | Stettynskloof         | 55 km <sup>2</sup>    |
|                             | H1H012                | 91 km <sup>2</sup>    |
|                             | H1H009                | 47 km <sup>2</sup>    |
|                             | Low Hex               | 131,9 km <sup>2</sup> |
|                             | Greater Brandvlei Dam | 88,4 km <sup>2</sup>  |
|                             | Moordkuil             | 178,6 km <sup>2</sup> |
|                             | H4H020                | 229,4 km <sup>2</sup> |
|                             | H4H017 incremental    | 615,7 km <sup>2</sup> |
| Sub-catchment MAP (CCWR) :  | Low Wit               | 990 mm/a              |
|                             | Wolseley              | 767 mm/a              |
|                             | Slanghoek             | 1 028 mm/a            |
|                             | H1H020                | 1 493 mm/a            |
|                             | Rawsonville           | 715 mm/a              |
|                             | Ouplaas               | 1 577 mm/a            |
|                             | H1H008                | 1 510 mm/a            |
|                             | Stettynskloof         | 1 730 mm/a            |
|                             | H1H012                | 1 101 mm/a            |
|                             | H1H009                | 1 124 mm/a            |
|                             | Low Hex               | 436 mm/a              |
|                             | Greater Brandvlei Dam | 471 mm/a              |
|                             | Moordkuil             | 621 mm/a              |
|                             | H4H020                | 398 mm/a              |
|                             | H4H017 incremental    | 447 mm/a              |
| Sub-catchment MAE (S-pan) : | Low Wit               | 1 592 mm/a            |
|                             | Wolseley              | 1 741 mm/a            |
|                             | Slanghoek             | 1 551 mm/a            |
|                             | H1H020                | 1 712 mm/a            |
|                             | Rawsonville           | 1 741 mm/a            |
|                             | Ouplaas               | 1 442 mm/a            |
|                             | H1H008                | 1 393 mm/a            |
|                             | Stettynskloof         | 1 393 mm/a            |
|                             | H1H012                | 1 393 mm/a            |
|                             | H1H009                | 1 266 mm/a            |
|                             | Low Hex               | 1 712 mm/a            |
|                             | Greater Brandvlei Dam | 1 712 mm/a            |
|                             | Moordkuil             | 1 644 mm/a            |
|                             | H4H020                | 1 659 mm/a            |
|                             | H4H017 incremental    | 1 644 mm/a            |

| DESCRIPTION                                |                         | VALUE                                |
|--------------------------------------------|-------------------------|--------------------------------------|
| Afforested area                            |                         | -                                    |
| Area of alien vegetation                   | : Low Wit               | 5,67 km <sup>2</sup>                 |
|                                            | : Wolseley              | 8,86 km <sup>2</sup>                 |
|                                            | : Slanghoek             | 2,55 km <sup>2</sup>                 |
|                                            | : H1H020                | 1,32 km <sup>2</sup>                 |
|                                            | : Rawsonville           | 13,18 km <sup>2</sup>                |
|                                            | : Ouplaas               | 5,68 km <sup>2</sup>                 |
|                                            | : H1H008                | 6,05 km <sup>2</sup>                 |
|                                            | : Stettynskloof         | 8,22 km <sup>2</sup>                 |
|                                            | : H1H012                | 8,22 km <sup>2</sup>                 |
|                                            | : H1H009                | 1,60 km <sup>2</sup>                 |
|                                            | : Low Hex               | -                                    |
|                                            | : Greater Brandvlei Dam | 0,37 km <sup>2</sup>                 |
|                                            | : Moordkuil             | 3,2 km <sup>2</sup>                  |
|                                            | : H4H020                | -                                    |
|                                            | : H4H017 incremental    | 20,5 km <sup>2</sup>                 |
| Irrigation area                            | : Low Wit               | 0,27 km <sup>2</sup>                 |
|                                            | : Wolseley              | 23,2 km <sup>2</sup>                 |
|                                            | : Slanghoek             | 8,15 km <sup>2</sup>                 |
|                                            | : H1H020                | -                                    |
|                                            | : Rawsonville           | 43,05 km <sup>2</sup>                |
|                                            | : Ouplaas               | -                                    |
|                                            | : H1H008                | 0,57 km <sup>2</sup>                 |
|                                            | : Stettynskloof         | -                                    |
|                                            | : H1H012                | -                                    |
|                                            | : H1H009                | 0,75 km <sup>2</sup>                 |
|                                            | : Low Hex               | 4,26 km <sup>2</sup>                 |
|                                            | : Greater Brandvlei Dam | 10,33 km <sup>2</sup> (Bossieveld)   |
|                                            | : Moordkuil             | 9,11 km <sup>2</sup>                 |
|                                            | : H4H020                | 34,65 km <sup>2</sup>                |
|                                            | : H4H017 incremental    | 63,05 km <sup>2</sup>                |
| Farm dam capacity                          | : Low Wit               | -                                    |
|                                            | : Wolseley              | 3,36 Mm <sup>3</sup>                 |
|                                            | : Slanghoek             | 1,16 Mm <sup>3</sup>                 |
|                                            | : H1H020                | -                                    |
|                                            | : Rawsonville           | 7,33 Mm <sup>3</sup>                 |
|                                            | : Ouplaas               | -                                    |
|                                            | : H1H008                | -                                    |
|                                            | : Stettynskloof         | -                                    |
|                                            | : H1H012                | -                                    |
|                                            | : H1H009                | -                                    |
|                                            | : Low Hex               | 2,87 Mm <sup>3</sup>                 |
|                                            | : Greater Brandvlei Dam | 1,24 Mm <sup>3</sup> /a (Bossieveld) |
|                                            | : Moordkuil             | 5,11 Mm <sup>3</sup>                 |
|                                            | : H4H020                | 14,1 Mm <sup>3</sup>                 |
|                                            | : H4H017 incremental    | 11,18 Mm <sup>3</sup>                |
| Calibration period (hydrological years)    |                         | 1981 - 1988                          |
| Observed MAR for calibration period        |                         | 426,81 Mm <sup>3</sup> /a            |
| Incremental naturalised MAR (1925 - 1990)  |                         | 322,60 Mm <sup>3</sup> /a            |
| Incremental naturalised runoff coefficient |                         | 20,9 %                               |
| Cumulative naturalised MAR (1925 - 1990)   |                         | 999,38 Mm <sup>3</sup> /a            |

Note : information in the Table 5.21 represents 1990 development

Details of the data used in the model calibration process are given in Appendix B6. Table 5.22 summarises the contents of this Appendix.

**TABLE 5.22 : SUMMARY OF DATA IN APPENDIX B6**

| APPENDIX NO | CONTENTS                                                                                                 | FORMAT      |
|-------------|----------------------------------------------------------------------------------------------------------|-------------|
| B6.1        | Land-use data<br>Evaporation data<br>Reservoir data<br>Irrigation crop factors and percentages           | Tables      |
| B6.2        | Observed data H4H017                                                                                     | Time series |
| B6.3        | Percentage rainfall file used for calibration Lower Wit River sub-catchment                              |             |
| B6.4        | Percentage rainfall file used for calibration Wolseley sub-catchment                                     |             |
| B6.5        | Percentage rainfall file used for calibration Slanghoek sub-catchment                                    |             |
| B6.6        | Percentage rainfall file used for calibration Rawsonville, H1H020, H1H008, H1H012, H1H009 sub-catchments |             |
| B6.7        | Percentage rainfall file used for calibration Ouplaas sub-catchment                                      |             |
| B6.8        | Percentage rainfall file used for calibration Stettynskloof sub-catchment                                |             |
| B6.9        | Percentage rainfall file used for calibration Greater Brandvlei Dam sub-catchment                        |             |
| B6.10       | Upland alien vegetation demand (tall trees) Lower Wit River                                              |             |
| B6.11       | Upland alien vegetation demand (tall shrubs) Lower Wit River                                             |             |
| B6.12       | Riparian alien vegetation demand (tall trees) Lower Wit River                                            |             |
| B6.13       | Upland alien vegetation demand (tall trees) Wolseley sub-catchment                                       |             |
| B6.14       | Upland alien vegetation demand (tall shrubs) Wolseley sub-catchment                                      |             |
| B6.15       | Riparian alien vegetation demand (tall trees) Wolseley sub-catchment                                     |             |
| B6.16       | Upland alien vegetation demand (tall trees) Slanghoek sub-catchment                                      |             |
| B6.17       | Upland alien vegetation demand (tall shrubs) Slanghoek sub-catchment                                     |             |
| B6.18       | Riparian alien vegetation demand (tall trees) Slanghoek sub-catchment                                    |             |
| B6.19       | Upland alien vegetation demand (tall trees) Ouplaas sub-catchment                                        |             |
| B6.20       | Upland alien vegetation demand (tall shrubs) Ouplaas sub-catchment                                       |             |
| B6.21       | Upland alien vegetation demand (tall trees) H1H008 sub-catchment                                         |             |
| B6.22       | Upland alien vegetation demand (tall shrubs) H1H008 sub-catchment                                        |             |
| B6.23       | Riparian alien vegetation demand (tall trees) H1H008 sub-catchment                                       |             |
| B6.24       | Upland alien vegetation demand (tall trees) Rawsonville sub-catchment                                    |             |
| B6.25       | Upland alien vegetation demand (tall shrubs) Rawsonville sub-catchment                                   |             |
| B6.26       | Riparian alien vegetation demand (tall trees) Rawsonville sub-catchment                                  |             |
| B6.27       | Riparian alien vegetation demand (tall trees) H1H020 sub-catchment                                       |             |
| B6.28       | Upland alien vegetation demand (tall trees) upstream Stettynskloof Dam                                   |             |
| B6.29       | Upland alien vegetation demand (tall shrubs) upstream Stettynskloof Dam                                  |             |
| B6.30       | Upland alien vegetation demand (tall trees) H1H012 sub-catchment                                         |             |
| B6.31       | Upland alien vegetation demand (tall shrubs) H1H012 sub-catchment                                        |             |
| B6.32       | Upland alien vegetation demand (tall trees) H1H009 sub-catchment                                         |             |
| B6.33       | Upland alien vegetation demand (tall shrubs) H1H009 sub-catchment                                        |             |
| B6.34       | Upland alien vegetation demand (tall trees) H1R001 sub-catchment                                         |             |
| B6.35       | Upland alien vegetation demand (tall trees) H4R004 sub-catchment                                         |             |
| B6.36       | Upland alien vegetation demand (tall trees) H4H017 sub-catchment                                         |             |
| B6.37       | Upland alien vegetation demand (tall trees) H4R001 sub-catchment                                         |             |

| APPENDIX NO | CONTENTS                                               | FORMAT |
|-------------|--------------------------------------------------------|--------|
| B6.38       | Irrigation from rivers Lower Wit River sub-catchment   |        |
| B6.39       | Irrigation from farm dams Wolseley sub-catchment       |        |
| B6.40       | Irrigation from rivers Wolseley sub-catchment          |        |
| B6.41       | Irrigation from farm dams Slanghoek sub-catchment      |        |
| B6.42       | Irrigation from rivers Slanghoek sub-catchment         |        |
| B6.43       | Irrigation from farm dams Rawsonville sub-catchment    |        |
| B6.44       | Irrigation from rivers Rawsonville sub-catchment       |        |
| B6.45       | Irrigation from rivers H1H008 sub-catchment            |        |
| B6.46       | Irrigation from rivers H1H009 sub-catchment            |        |
| B6.47       | Irrigation from farm dams Lower Hex sub-catchment      |        |
| B6.48       | Irrigation from rivers Lower Hex sub-catchment         |        |
| B6.49       | Irrigation releases from Greater Brandvlei Dam         |        |
| B6.50       | Bossieveld Irrigation Board abstraction from farm dams |        |
| B6.51       | Irrigation from rivers H4H017 sub-catchment            |        |
| B6.52       | Irrigation from farm dams Moordkuil sub-catchment      |        |
| B6.53       | Irrigation from farm dams H4H020 sub-catchment         |        |
| B6.54       | Irrigation from farm dams H4H017 sub-catchment         |        |
| B6.55       | Canal inflows from H1H022                              |        |
| B6.56       | Worcester urban demand from Stettynskloof Dam          |        |
| B6.57       | Spills from Keerom Dam                                 |        |
| B6.58       | Transfer from Hex River valley to Nuy River catchment  |        |
| B6.59       | Simulated flow record at H4H017                        |        |
| B6.60       | Patched observed flow record at H4H017                 |        |
| B6.61       | Incremental naturalised flow sequence at H4H017        |        |
| B6.62       | Cumulative present day (2000) flow sequence at H4H017  |        |

### 5.6.2 Preliminary

One of the objectives of the hydrology task was to improve the hydrology of the Upper Breede catchment. No flow gauges within the H100 area were, however, available for model calibration downstream of gauges H1H006, H1H007 and H1H018. During the BRHS, runoff from the incremental area between the above gauges and the H100 outlet at Brandvlei Dam was simulated using parameters transferred from the calibrated sub-catchments and simulating runoff for the ungauged sub-catchments.

The first gauge on the Breede River downstream of Brandvlei Dam (and H100) was at H4H017 (Le Chasseur). The catchment area of this gauge included the entire H200 (Hex Valley catchment), the Nuy River and Moordkuil Dam catchments. In order to be consistent with the Upper Breede calibrations, it was decided to conduct an incremental catchment calibration at H4H017. The incremental runoff at H4H017 was calculated by subtracting from the recorded flow at H4H017, the recorded flows at H1H006, H1H007, H1H018, H2H006 (the most downstream gauge on the Hex River), as well as the spills/releases from Keerom Dam.

The incremental H4H017 catchment consisted of a number of sub-catchments previously simulated in the BRHS. The same sub-catchment disaggregation was used in the BRBS.

Gauge H4H017 only opened in April 1980. The calibration period was, however, only from 1981 to 1988, the period for which data was available for the diversion from Smalblaar and Holsloot Rivers to Greater Brandvlei Dam.

The H4H017 incremental naturalised runoff sequence was after calibration disaggregated to the respective sub-catchments of the H4H017 incremental catchment using ratios of simulated MARs. A comparison of the natural runoff from the Stettynskloof and Molenaars sub-catchments revealed that the Stettynskloof low flows were under-estimated in comparison with the Molenaars River low flows. The Stettynskloof Dam sub-catchment is located in a high rainfall and mountainous area similar to that of the Molenaars River catchment (H1H018). Based on hydrologically similar catchments, the Molenaars parameters were transferred to the Stettynskloof catchment and a natural runoff sequence simulated. The simulated Stettynskloof incremental sequence was then subtracted from the original incremental natural H4H017 sequence and the balance distributed to the remaining sub-catchments forming part of the H4H017 sub-catchment.

### 5.6.3 Model Configuration

Figure 5.11 shows a schematic representation of the sub-catchment configuration. The H4H017 incremental catchment consisted of a number of sub-catchments used in the BRHS. These sub-catchments were used in the model configuration of the H4H017 incremental catchment.

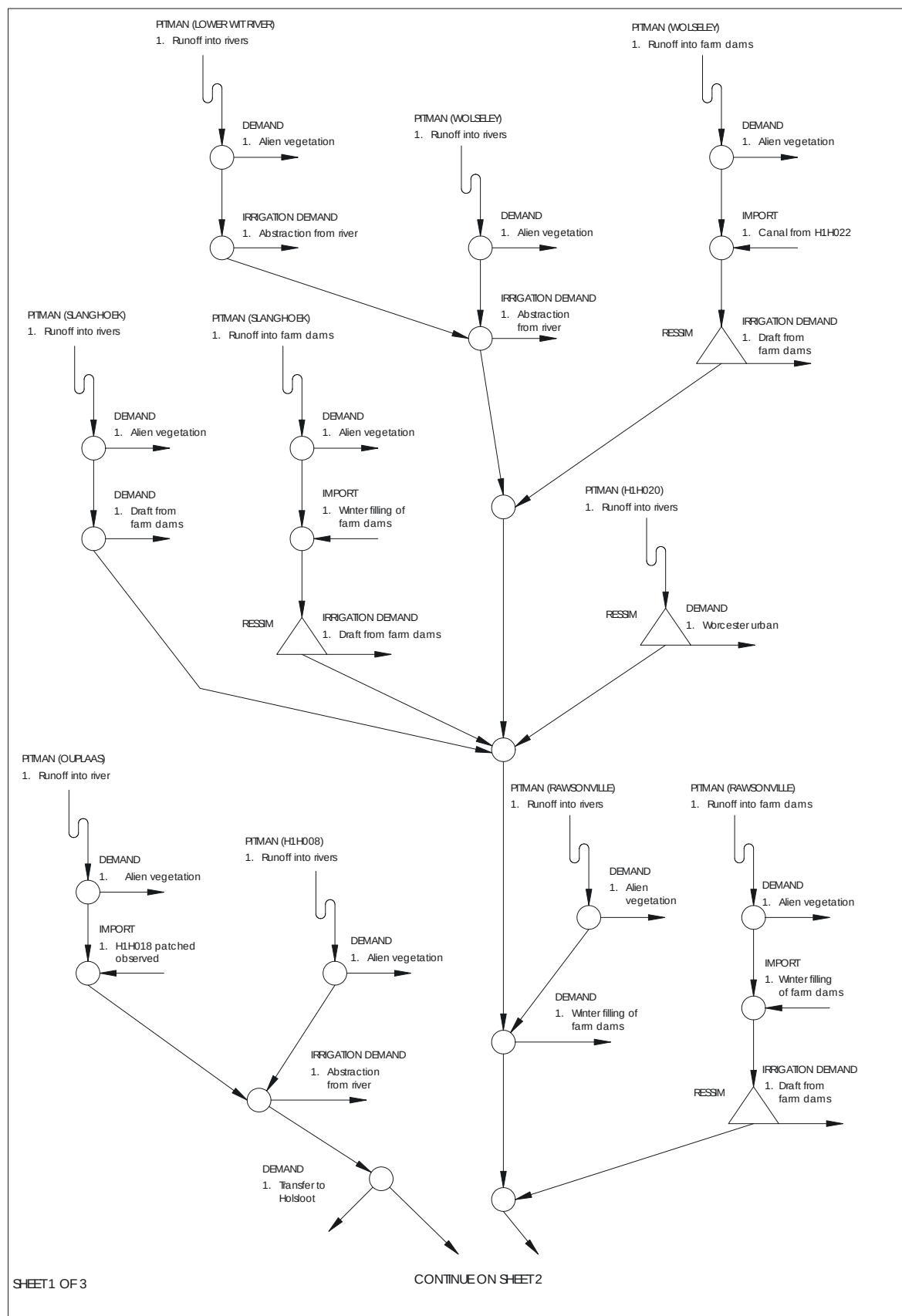
The H4H017 incremental catchment is intensively irrigated and contains numerous farm dams. Irrigation demands are met from both farm dams and run-of-river abstractions, while winter filling of farm dams occurs in most of the sub-catchments. Upland alien vegetation demands are met only by local runoff, while riparian alien demands were modelled as being supplied from the main stream at the outlet of the specific sub-catchment. As discussed in Section 4.4, the irrigation areas were reduced to allow for the portion of irrigation supplied by groundwater.

The H4H017 incremental catchment included the Stettynskloof, Fairy Glen and Greater Brandvlei Dams. Releases and abstractions for irrigation and urban demands were included in the model, as well as the diversions from the Smalblaar and Holsloot Rivers to the Greater Brandvlei Dam.

### 5.6.4 Evaluation and Preparation of Flow Sequences

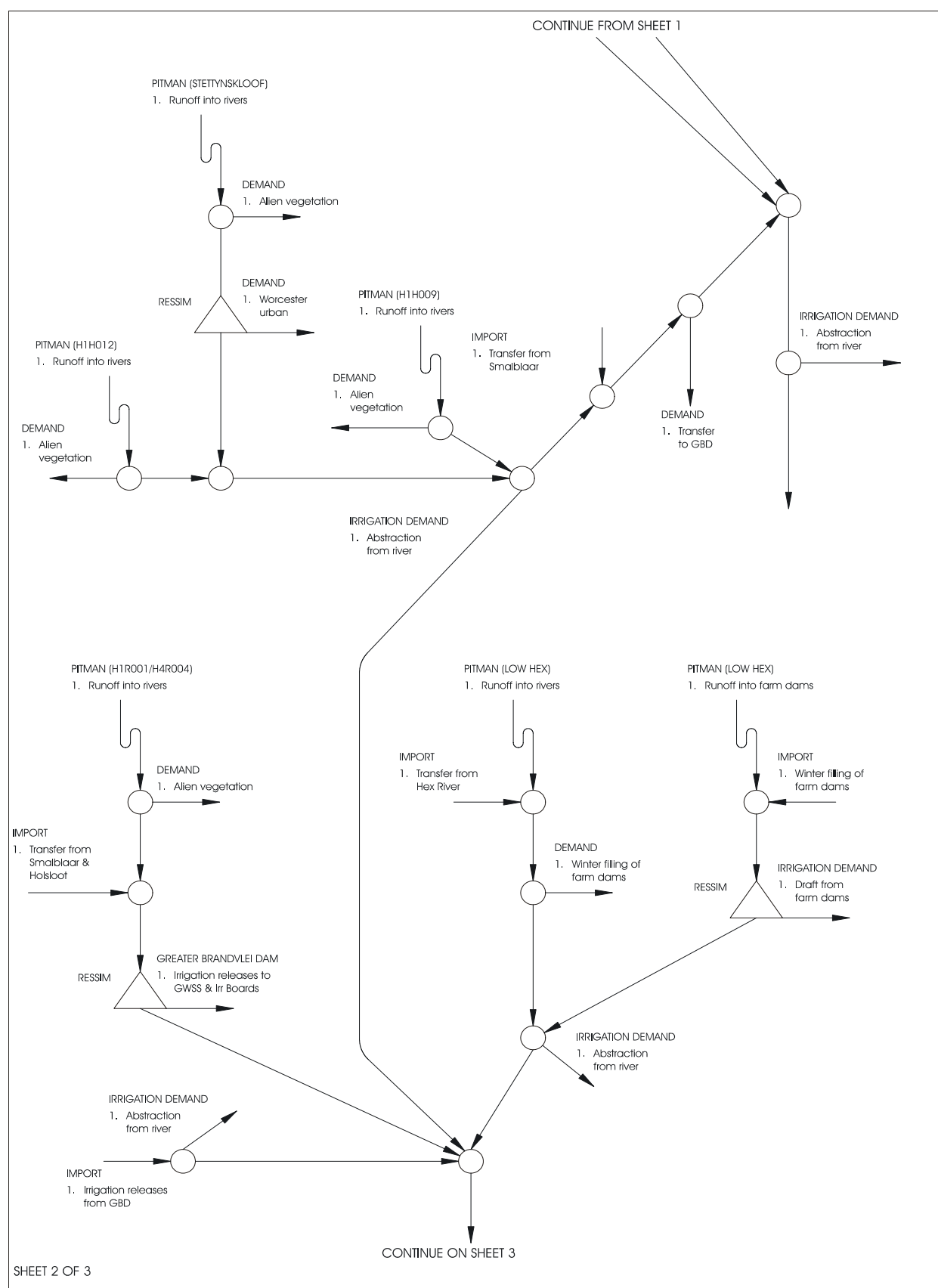
Observed flow data was available from April 1980 to 1998. The calibration period was limited to the hydrological years 1981 to 1988, the period for which diversion information from the Smalblaar and Holsloot Rivers to the Greater Brandvlei Dam, was available.

The observed flow data at H4H017 was during the BRHS rated as good.



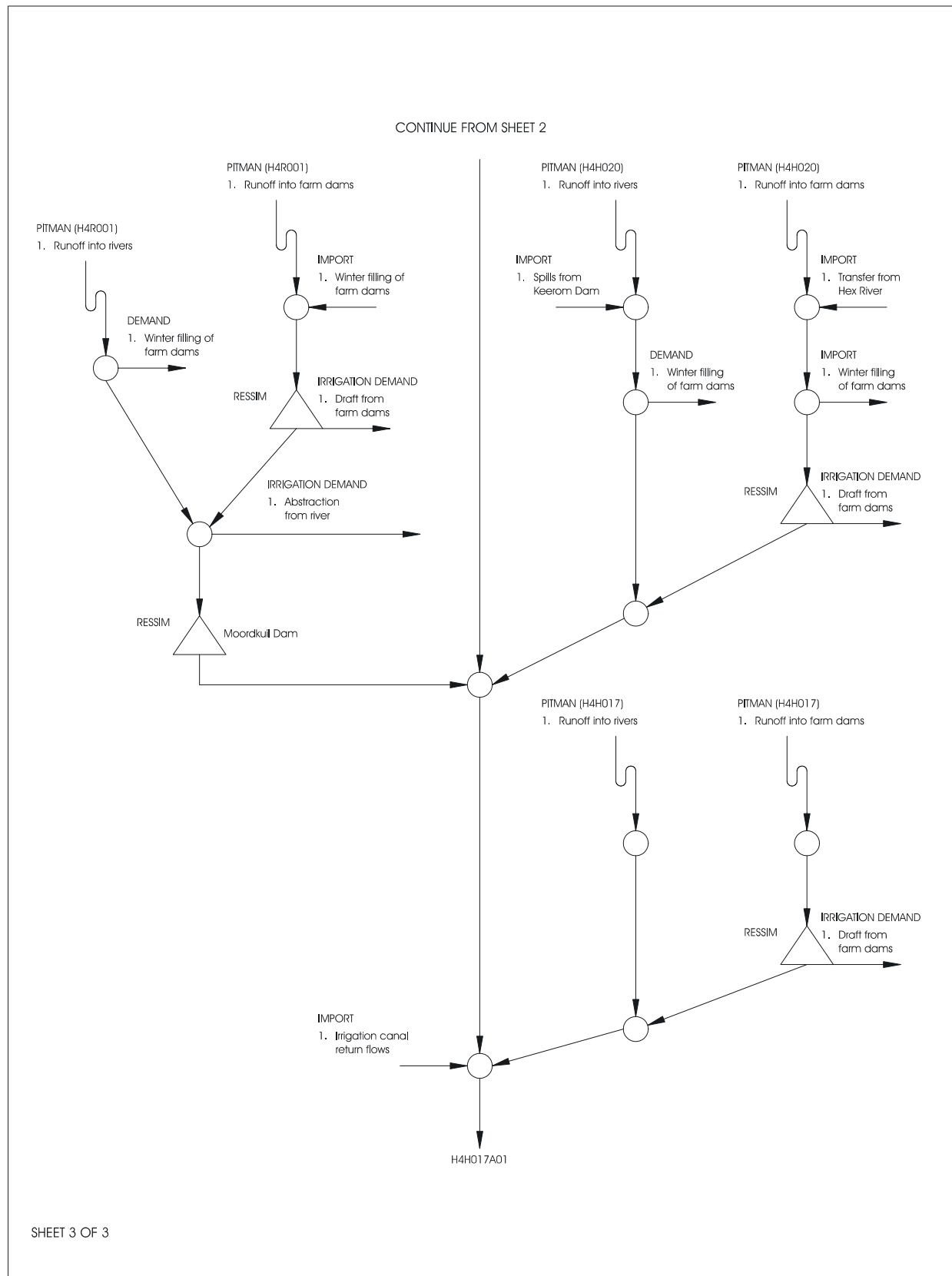
Note : the above is a schematic diagram only and does not show all the detail included in the hydrological model

**Figure 5.11 : H4H017 sub-catchment model configuration**



Note : the above is a schematic diagram only and does not show all the detail included in the hydrological model

**Figure 5.11 : H4H017 sub-catchment model configuration (continued)**



Note : the above is a schematic diagram only and does not show all the detail included in the hydrological model

**Figure 5.11 : H4H017 sub-catchment model configuration (continued)**



### 5.6.5 Calibration (Calibration period : Oct 1981 - Sep 1988)

The details of the rainfall stations used for the different sub-catchments of the H4H017 incremental sub-catchment, are shown in Tables 5.23a and 5.23b, below.

**TABLE 5.23a : RAINFALL STATIONS USED FOR CALIBRATION OF H4H017**

| USED FOR SUB-CATCHMENT                              | RAINFALL STATION NUMBER | PERIOD OF RECORD | LENGTH OF RECORD (YEARS) |
|-----------------------------------------------------|-------------------------|------------------|--------------------------|
| Lower Wit River                                     | 022038_8                | 1920 - 1998      | 79                       |
|                                                     | 022368_4                | 1932 - 1977      | 46                       |
|                                                     | 022284a                 | 1970 - 1983      | 14                       |
|                                                     | 042357_a                | 1924 - 1998      | 75                       |
| Wolseley                                            | 022789a                 | 1943 - 1988      | 46                       |
|                                                     | 22792                   | 1936 - 1979      | 44                       |
|                                                     | 022521_9                | 1920 - 1976      | 57                       |
|                                                     | 22803                   | 1925 - 1998      | 74                       |
| Slanghoek                                           | 022368_4                | 1932 - 1977      | 46                       |
|                                                     | 022038_8                | 1920 - 1998      | 79                       |
|                                                     | 022521_9                | 1920 - 1976      | 57                       |
|                                                     | 22284a                  | 1970 - 1983      | 14                       |
| Rawsonville<br>H1H020<br>H1H008<br>H1H012<br>H1H009 | 022504_x                | 1932 - 1994      | 63                       |
|                                                     | 22264p                  | 1959 - 1975      | 17                       |
|                                                     | 022521_9                | 1920 - 1976      | 57                       |
|                                                     | 22792                   | 1936 - 1979      | 44                       |
|                                                     | 22803                   | 1925 - 1998      | 74                       |
| Ouplaas                                             | 022038_8                | 1920 - 1998      | 79                       |
|                                                     | 22284a                  | 1970 - 1983      | 14                       |
|                                                     | 022113_2                | 1920 - 1998      | 79                       |
|                                                     | 022504_x                | 1932 - 1994      | 63                       |
| Stettynskloof                                       | 22264p                  | 1959 - 1975      | 17                       |
|                                                     | 022475_4                | 1982 - 1998      | 17                       |
|                                                     | 022113_2                | 1920 - 1998      | 78                       |
|                                                     | 022504_x                | 1932 - 1994      | 63                       |
| Greater Brandvlei Dam                               | 22792                   | 1936 - 1979      | 44                       |
|                                                     | 22789a                  | 1943 - 1988      | 46                       |
|                                                     | 23039p                  | 1927 - 1977      | 51                       |
|                                                     | 022521_9                | 1920 - 1976      | 57                       |
|                                                     | 22803                   | 1925 - 1998      | 74                       |

Rainfall for the sub-catchments in the Lower Hex and H400 areas, were taken from the BRHS. The rainfall stations used for these sub-catchments, are shown in Table 5.23b.

**TABLE 5.23b : RAINFALL STATIONS USED FOR CALIBRATION OF H4H017**

| USED FOR<br>SUB-CATCHMENT | RAINFALL STATION<br>NUMBER | PERIOD OF RECORD | LENGTH OF RECORD<br>(YEARS) |
|---------------------------|----------------------------|------------------|-----------------------------|
| Lower Hex                 | 22759                      | 1925 – 1998      | 66                          |
|                           | 22789_4                    | 1942 – 1986      | 45                          |
|                           | 227924a                    | 1944 – 1990      | 47                          |
|                           | 23011                      | 1935 – 1977      | 43                          |
|                           | 23039                      | 1925 – 1984      | 60                          |
| H402                      | 22539a                     | 1925 – 1990      | 66                          |
|                           | 22653                      | 1927 – 1955      | 29                          |
|                           | 22709_9                    | 1964 – 1981      | 18                          |
|                           | 22825                      | 1978 – 1990      | 13                          |
|                           | 22803                      | 1931 – 1990      | 60                          |
| H405                      | 23218                      | 1932 – 1977      | 46                          |
|                           | 23161                      | 1920 – 1998      | 79                          |
|                           | 23100                      | 1920 – 1976      | 57                          |
|                           | 23071                      | 1970 – 1983      | 14                          |
|                           | 23011                      | 1935 – 1977      | 43                          |
|                           | 22825                      | 1978 – 1990      | 13                          |
|                           | 23039                      | 1925 – 1984      | 60                          |
| H406                      | 22825                      | 1978 – 1990      | 13                          |
|                           | 22803                      | 1931 – 1990      | 60                          |
|                           | 23317                      | 1950 – 1984      | 25                          |
|                           | 23039                      | 1925 – 1984      | 60                          |
|                           | 23011                      | 1935 – 1977      | 43                          |
|                           | 23100                      | 1955 – 1984      | 30                          |
|                           | 22759                      | 1925 – 1990      | 66                          |

The final calibration parameters are shown in Table 5.24 along with the statistics for the observed data and final simulated record.

**TABLE 5.24 : CALIBRATION SUMMARY FOR H4H017**

| FINAL<br>ITERATION                                    | PITMAN PARAMETERS        |    |           |    |                             |      |              |     |         |    |         |
|-------------------------------------------------------|--------------------------|----|-----------|----|-----------------------------|------|--------------|-----|---------|----|---------|
|                                                       | POW                      | SL | ST        | FT | GW                          | ZMIN | ZMAX         | PI  | TL      | GL | R       |
|                                                       | 2                        | 0  | 300       | 4  | 0                           | 100  | 900          | 1,5 | 0       | 0  | 0       |
| FLOW RECORD                                           | STATISTICS (1981 - 1988) |    |           |    |                             |      |              |     |         |    |         |
|                                                       | MAR (Mm <sup>3</sup> /a) |    | MAR (LOG) |    | ST.DEV (Mm <sup>3</sup> /a) |      | ST.DEV (LOG) |     | CV      |    | SI      |
| Patched observed                                      | 426,78                   |    | 2,6       |    | 137,09                      |      | 0,18         |     | 32,12   |    | 32,85   |
| Final simulation                                      | 447,31                   |    | 2,63      |    | 128,5                       |      | 0,14         |     | 28,73   |    | 28,31   |
| (Simulated - patched observed)/<br>(Patched observed) | 4,81%                    |    | 1,09%     |    | -6,27%                      |      | -19,96%      |     | -10,57% |    | -13,82% |

Figure 5.12 shows a graphical representation of the observed and simulated flows for the final parameter set.

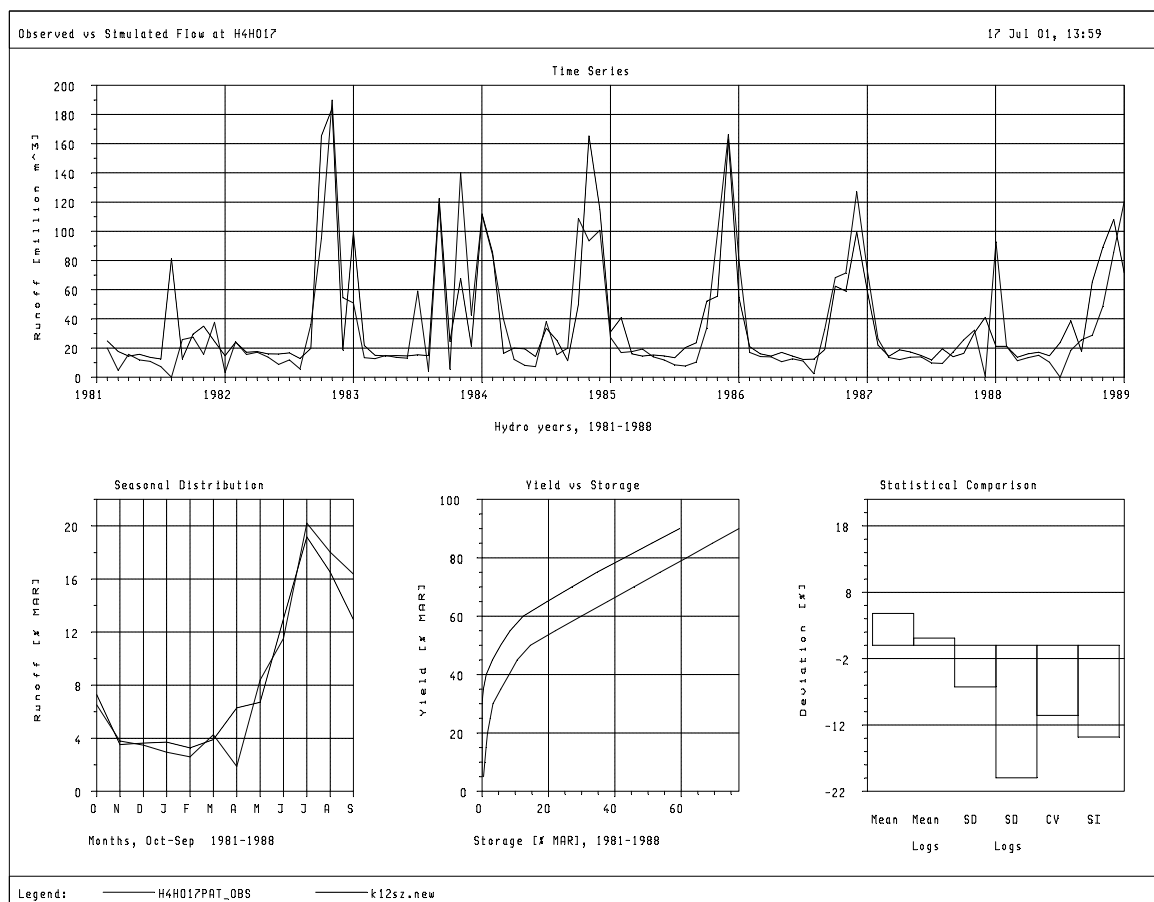


**Figure 5.12 : Graphical comparison of observed and simulated flows for H4H017**

Referring to Figure 5.12, the simulated and observed time series shows reasonable comparison. There are three months where the observed flows are zero, which is the result of subtracting the upstream inflows from the observed flows at H4H017. The seasonal distributions and simulated and observed yields reveal an over-estimation of low flows. This is both as a result of the zero and low "incremental observed" flows and uncertainties regarding releases for irrigation from Greater Brandvlei Dam and return flows from irrigation.

The statistics are within acceptable limits considering the uncertainties with regard to the "observed" flows and irrigation releases and return flows.

## 5.7 H6H005 : SUB-CATCHMENT NUMBER 65 (Figure 4.4)

### 5.7.1 Summary of Sub-catchment Data

Flow Station Number : H6H005  
 River Name : Baviaanskloof  
 Place : Genadendal

**TABLE 5.25 : SUMMARY OF DATA FOR SUB-CATCHMENT H6H005**

| DESCRIPTION                                | VALUE                    |
|--------------------------------------------|--------------------------|
| Sub-catchment area                         | 24 km <sup>2</sup>       |
| Sub-catchment MAP (CCWR)                   | 1005 mm/a                |
| Sub-catchment MAE (S-pan CCWR)             | 1117 mm/a                |
| Afforested area                            | -                        |
| Area of alien vegetation                   | 19,77 km <sup>2</sup>    |
| Irrigation area                            | -                        |
| Farm dam capacity                          | -                        |
| Calibration period (hydrological years)    | 1982 - 1997              |
| Observed MAR for calibration period        | 6,7 Mm <sup>3</sup> /a   |
| Incremental naturalised MAR (1925 - 1990)  | 11,55 Mm <sup>3</sup> /a |
| Incremental naturalised runoff coefficient | 47,9 %                   |
| Cumulative naturalised MAR (1925 - 1990)   | 11,55 Mm <sup>3</sup> /a |

Note : information in the Table 5.25 represents 1998 development

Details of the data used in the model calibration process are given in Appendix B7. Table 5.26 summarises the contents of this Appendix.

**TABLE 5.26 : SUMMARY OF DATA IN APPENDIX B7**

| APPENDIX NO. | CONTENTS                                                                                       | FORMAT      |
|--------------|------------------------------------------------------------------------------------------------|-------------|
| B7.1         | Land-use data<br>Evaporation data<br>Reservoir data<br>Irrigation crop factors and percentages | Tables      |
| B7.2         | Observed data (original ) H6H005                                                               | Time series |
| B7.3         | Percentage rainfall file used in the calibration                                               |             |
| B7.4         | Upland alien vegetation demand (tall trees)                                                    |             |
| B7.5         | Upland alien vegetation demand (tall shrubs)                                                   |             |
| B7.6         | Genadendal domestic abstraction                                                                |             |
| B7.7         | Simulated flow record                                                                          |             |
| B7.8         | Patched observed flow record H6H005                                                            |             |
| B7.9         | Incremental naturalised flow sequence at H6H005                                                |             |
| B7.10        | Cumulative present day (2000) flow sequence at H6H005                                          |             |

### 5.7.2 Model Configuration

Figure 5.13 shows a schematic representation of the sub-catchment configuration. The only development in this catchment was vast areas of alien invasive vegetation.

### 5.7.3 Evaluation and Preparation of Flow Sequences

Observed flow data was available for the period 1963 to 1998. The observed data, however, contained a number of gaps and periods of suspiciously high flows. A canal abstracting water from the upstream pool of the gauge, was ungauged for a large portion of the record. The calibration period was, based on the most complete portion of the observed record, set to the period October 1982 to September 1998.

Subsequent to completing the calibration process, it became evident that the flow data should be regarded as inaccurate. A number of discharge tables were prepared for the period prior to 1995, all with limits of approximately 8 m<sup>3</sup>/s as a result of severe submergence problems. The gauge was raised in 1995 and the observed record subsequent to 1995 regarded as accurate. Although flow in the canal was supposed to be gauged, the recorder was out of order.

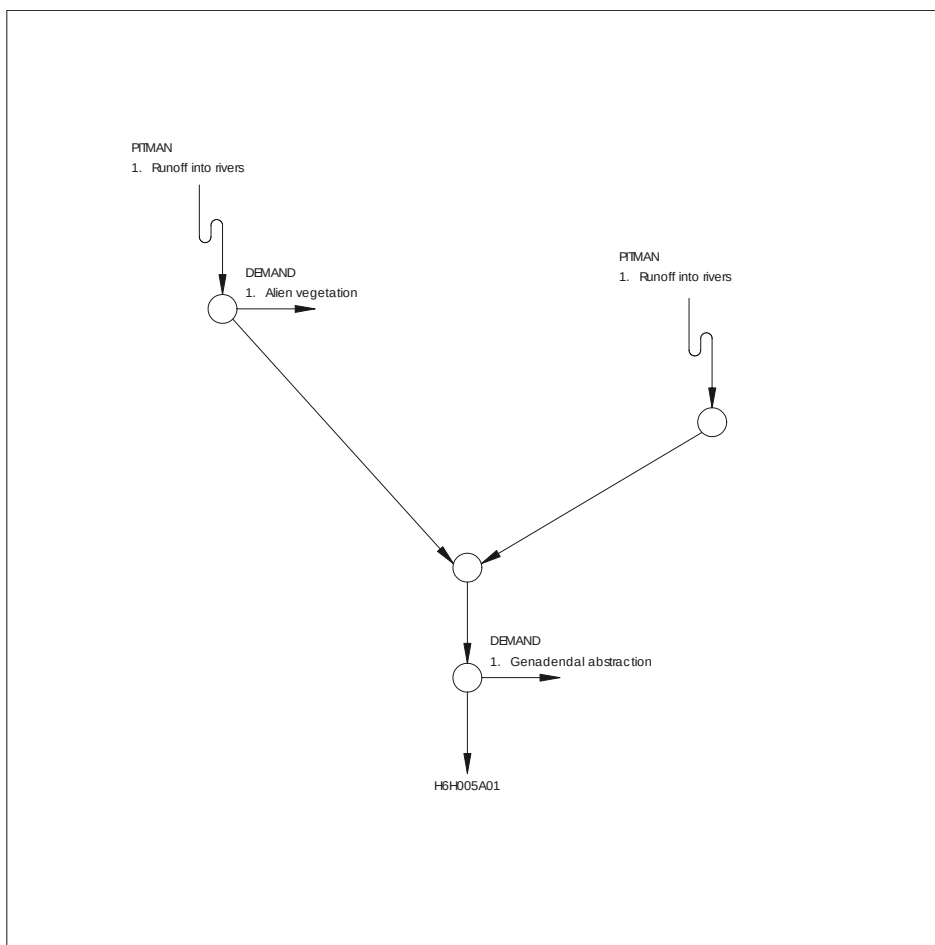
### 5.7.4 Calibration (Calibration period : Oct 1982 - Sep 1998)

The details of the rainfall stations used in the calibration are shown in Table 5.27 below.

**TABLE 5.27 : RAINFALL STATIONS USED FOR CALIBRATION OF H6H005**

| RAINFALL STATION NUMBER | PERIOD OF RECORD<br>(HYDROLOGICAL YEARS) | LENGTH OF RECORD<br>(YEARS) |
|-------------------------|------------------------------------------|-----------------------------|
| 007183_7                | 1968 - 1998                              | 31                          |
| 022539_X                | 1924 - 1998                              | 75                          |

The final calibration parameters are shown in Table 5.28 along with the statistics for the observed data and final simulated record.



Note : the above is a schematic diagram only and does not show all the detail included in the hydrological model

**Figure 5.13 : H6H005 Sub-catchment model configuration**

**TABLE 5.28 : CALIBRATION SUMMARY FOR H6H005**

| FINAL<br>ITERATION                                    | PITMAN PARAMETERS |                          |           |                |    |              |      |         |      |        |   |    |
|-------------------------------------------------------|-------------------|--------------------------|-----------|----------------|----|--------------|------|---------|------|--------|---|----|
|                                                       | POW               | SL                       | ST        | FT             | GW | ZMIN         | ZMAX | PI      | TL   | GL     | R | FF |
|                                                       | 2                 | 0                        | 450       | 40             | 0  | 50           | 300  | 1,5     | 0,25 | 0      | 0 |    |
| FLOW RECORD                                           |                   | STATISTICS (1982 - 1997) |           |                |    |              |      |         |      |        |   |    |
|                                                       |                   | MAR (Mm³/a)              | MAR (LOG) | ST.DEV (Mm³/a) |    | ST.DEV (LOG) |      | CV      |      | SI     |   |    |
| Patched observed                                      |                   | 6,7                      | 0,81      | 2,08           |    | 0,14         |      | 31,07   |      | 24,12  |   |    |
| Final simulation                                      |                   | 6,59                     | 0,8       | 1,81           |    | 0,13         |      | 27,42   |      | 23,06  |   |    |
| (Simulated - patched observed)/<br>(Patched observed) |                   | -1,59%                   | -0,35%    | -13,14%        |    | -9,35%       |      | -11,74% |      | -4,39% |   |    |
|                                                       |                   | STATISTICS (1972 - 1979) |           |                |    |              |      |         |      |        |   |    |
| Patched observed                                      |                   | 6,24                     | 075       | 2,63           |    | 0,22         |      | 42,16   |      | 29,16  |   |    |
| Simulation comparison                                 |                   | 5,97                     | 0,71      | 3,49           |    | 0,26         |      | 58,44   |      | 29,73  |   |    |
| (Simulated - patched observed)/<br>(Patched observed) |                   | 4,36%                    | -5,49%    | 32,56%         |    | 18,62%       |      | 38,61%  |      | 1,96%  |   |    |

Figure 5.14 shows a graphical representation of the observed and simulated flows for the final parameter set.

Table 5.28 also shows a comparison of the observed and simulated MARs for the period 1972 to 1979. The observed flow data over this period was consistent with the flows over the calibration period. The hydrological years 1970/71 and 1980/81 contained flow data that was inaccurate due to the gauging structure being damaged and had to be excluded from the calibration process.

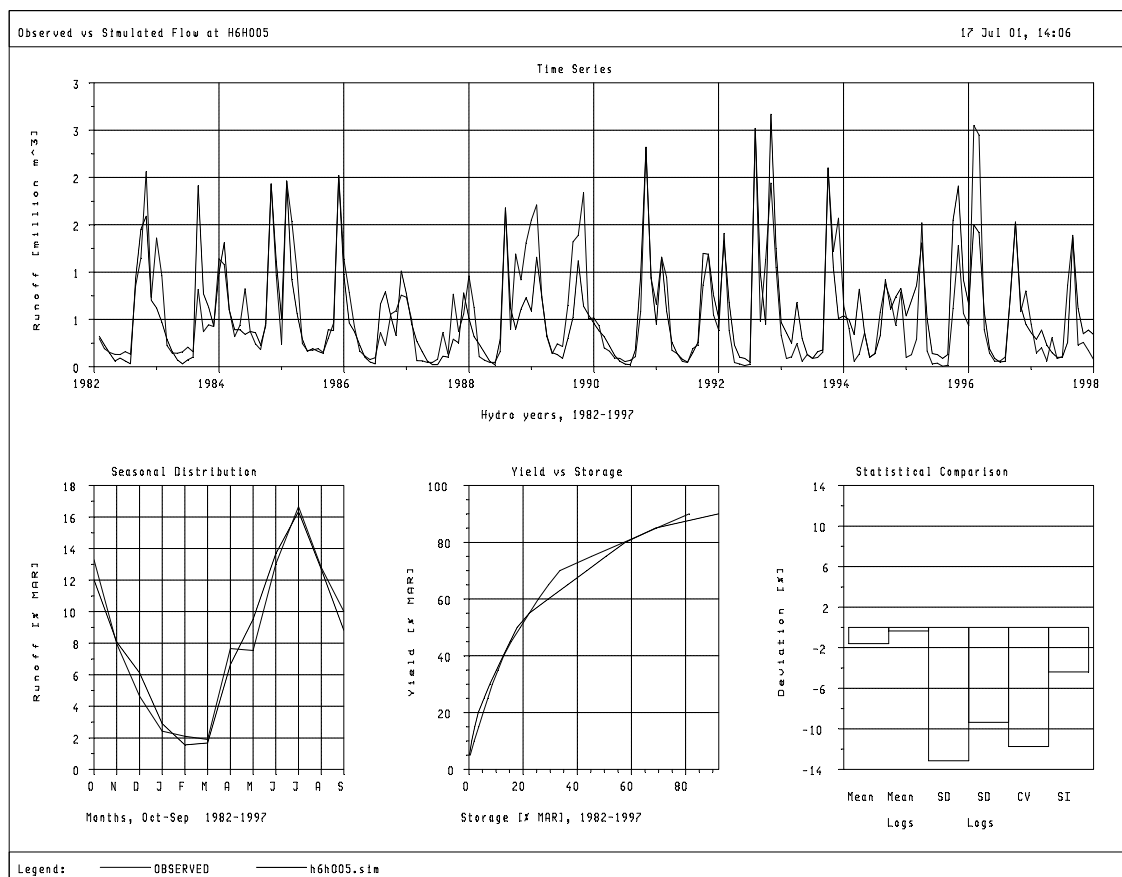


**Figure 5.14 : Graphical comparison of observed and simulated flows for H6H005**

Referring to Figure 5.14, the simulated and observed time series shows reasonable comparison, with peak flows under and over simulated. The seasonal distributions compare favourably, with a slight under-estimation of low flows. The simulated and observed yields also compare favourably. All the statistics are within acceptable limits considering the poor quality of the observed data.

## 5.8 H6H009 : SUB-CATCHMENT NUMBER 66 (Figure 4.4)

### 5.8.1 Summary of Sub-catchment Data

Flow Station Number : H6H009  
 River Name : Riviersonderend  
 Place : Reenen

**TABLE 5.29 : SUMMARY OF DATA FOR SUB-CATCHMENT H6H009**

| DESCRIPTION                                | VALUE                     |
|--------------------------------------------|---------------------------|
| Sub-catchment area                         | 1486,0 km <sup>2</sup>    |
| Sub-catchment MAP (CCWR)                   | 495 mm/a                  |
| Sub-catchment MAE (S-pan CCWR)             | 1 505 mm/a                |
| Afforested area                            | 16,0 km <sup>2</sup>      |
| Area of alien vegetation                   | 61,77 km <sup>2</sup>     |
| Irrigation area                            | 50,0 km <sup>2</sup>      |
| Farm dam capacity                          | 16,0 Mm <sup>3</sup>      |
| Calibration period (hydrological years)    | 1967 - 1997               |
| Observed MAR for calibration period        | 329,68 Mm <sup>3</sup> /a |
| Incremental naturalised MAR (1927 - 1990)  | 146,59 Mm <sup>3</sup> /a |
| Incremental naturalised runoff coefficient | 19,9 %                    |
| Cumulative naturalised MAR (1927 - 1990)   | 438,20 Mm <sup>3</sup> /a |

Note : information in the Table 5.29 represents 1997 development

Details of the data used in the model calibration process are given in Appendix B8. Table 5.30 summarises the contents of this Appendix.



**TABLE 5.30 : SUMMARY OF DATA IN APPENDIX B8**

| APPENDIX NO. | CONTENTS                                                                                       | FORMAT      |
|--------------|------------------------------------------------------------------------------------------------|-------------|
| B8.1         | Land-use data<br>Evaporation data<br>Reservoir data<br>Irrigation crop factors and percentages | Tables      |
| B8.2         | Observed data (original ) H6H009                                                               | Time series |
| B8.3         | Percentage rainfall file used in the calibration                                               |             |
| B8.4         | Upper alien vegetation demand (tall trees) upstream of farm dams                               |             |
| B8.5         | Upland alien vegetation demand (tall shrubs) upstream of farm dams                             |             |
| B8.6         | Riparian alien vegetation demand (tall trees) upstream of farm dams                            |             |
| B8.7         | Afforestation demand upstream of farm dams                                                     |             |
| B8.8         | Upland alien vegetation demand (tall trees) downstream of farm dams                            |             |
| B8.9         | Upland alien vegetation demand (tall shrubs) downstream of farm dams                           |             |
| B8.10        | Riparian alien vegetation demand (tall trees) downstream of farm dams                          |             |
| B8.11        | Irrigation demand from rivers                                                                  |             |
| B8.12        | Irrigation demand from farm dams                                                               |             |
| B8.13        | Releases/spills from Theewaterskloof Dam                                                       |             |
| B8.14        | Ruensveld-East demand                                                                          |             |
| B8.15        | Ruensveld-West demand                                                                          |             |
| B8.16        | Simulated flow record                                                                          |             |
| B8.17        | Patched observed flow record H6H009                                                            |             |
| B8.18        | Incremental naturalised flow sequence at H6H009                                                |             |
| B8.19        | Cumulative present day (2000) flow sequence at H6H009                                          |             |

### 5.8.2 Preliminary

The H6H009 catchment area includes the catchment areas of Theewaterskloof Dam (H6R001) and the Baviaanskloof River (H6H005). For the sake of consistency, an incremental calibration was attempted. In order to determine the incremental "observed" runoff, the recorded spill/release record at Theewaterskloof Dam, as well as the observed flows at H6H005, were subtracted from the observed flows at H6H009. The resultant incremental runoff from the catchment contained a fair number of negative values. It was found that the negative values could be ascribed to the fact that irrigation water releases were made for irrigation between Theewaterskloof Dam and H6H009. Following an incremental calibration would therefore result in an under-supply of irrigation demands in the H6H009 incremental catchment.

Based on the above, it was decided to conduct a cumulative calibration at H6H009, using the observed spill/release record from Theewaterskloof Dam as inflow to the H6H009 incremental catchment.

### 5.8.3 Model Configuration

Figure 5.15 shows a schematic representation of the sub-catchment configuration. This sub-catchment contains numerous farm dams and is intensively irrigated. Irrigation demands are met

from both farm dams and run-of-river abstractions. Upland alien vegetation demands are met only by local runoff, while riparian alien demands were modelled as being supplied from the main stream at the outlet of the catchment.

#### 5.8.4 Evaluation and Preparation of Flow Sequences

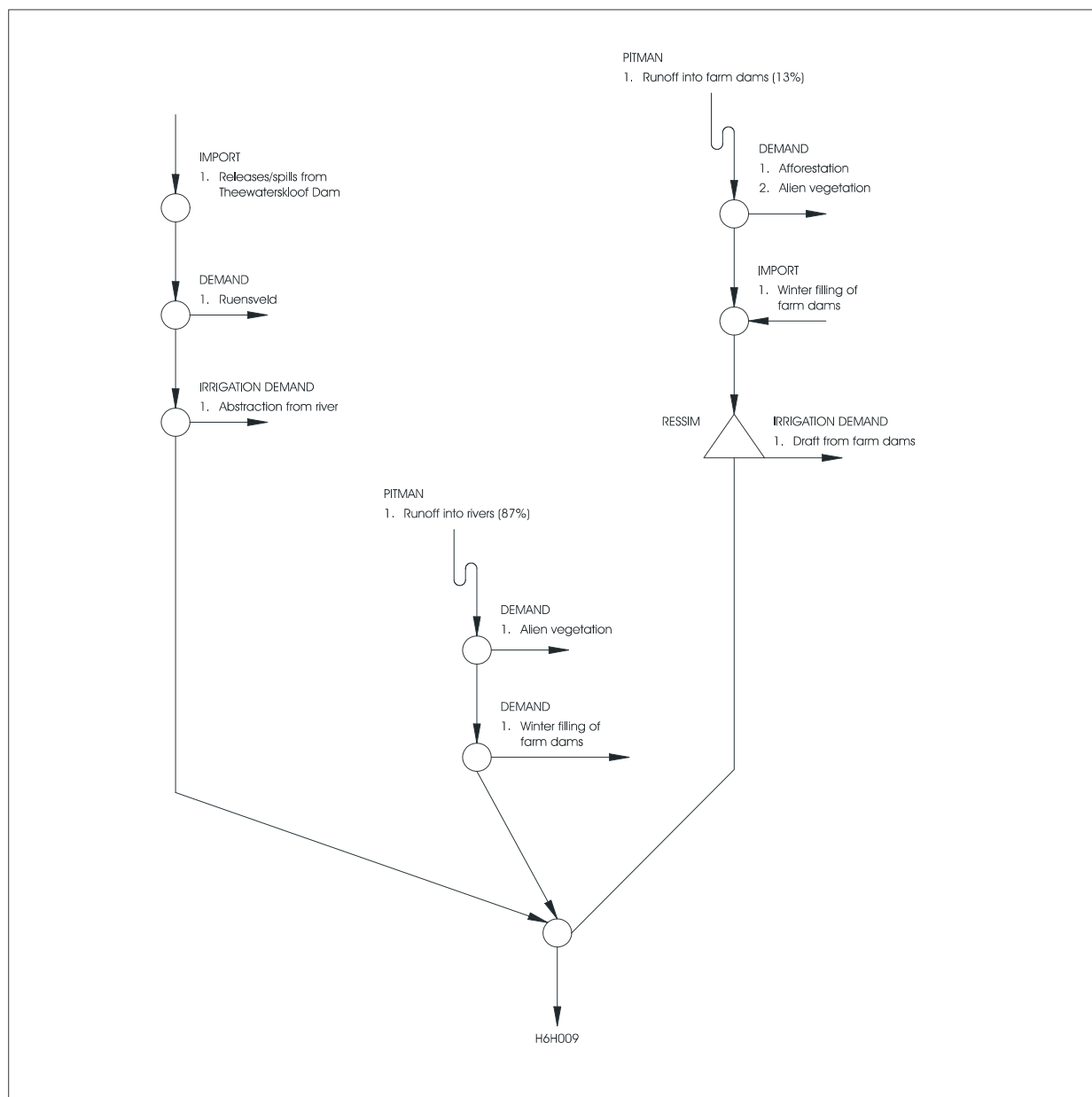
Observed flow data was available from October 1964 to September 1998. The recorded flow data contained a few exceeded values, but were generally accepted as being reliable based on an evaluation of the gauge.

#### 5.8.5 Calibration (Calibration period : October 1967 - September 1997)

The details of the rainfall stations used in the calibration are shown in Table 5.31 below.

**TABLE 5.31 : RAINFALL STATIONS USED FOR CALIBRATION OF H6H009**

| RAINFALL STATION NUMBER | PERIOD OF RECORD<br>(HYDROLOGICAL YEARS) | LENGTH OF RECORD<br>(YEARS) |
|-------------------------|------------------------------------------|-----------------------------|
| 007008_a                | 1972 - 1998                              | 27                          |
| 007183_7                | 1968 - 1998                              | 21                          |
| 007698_a                | 1931 - 1974                              | 44                          |
| 008136_a                | 1923 - 1998                              | 76                          |
| 008367_2                | 1930 - 1998                              | 69                          |
| 022539_X                | 1924 - 1998                              | 75                          |



Note : the above is a schematic diagram only and does not show all the detail included in the hydrological model

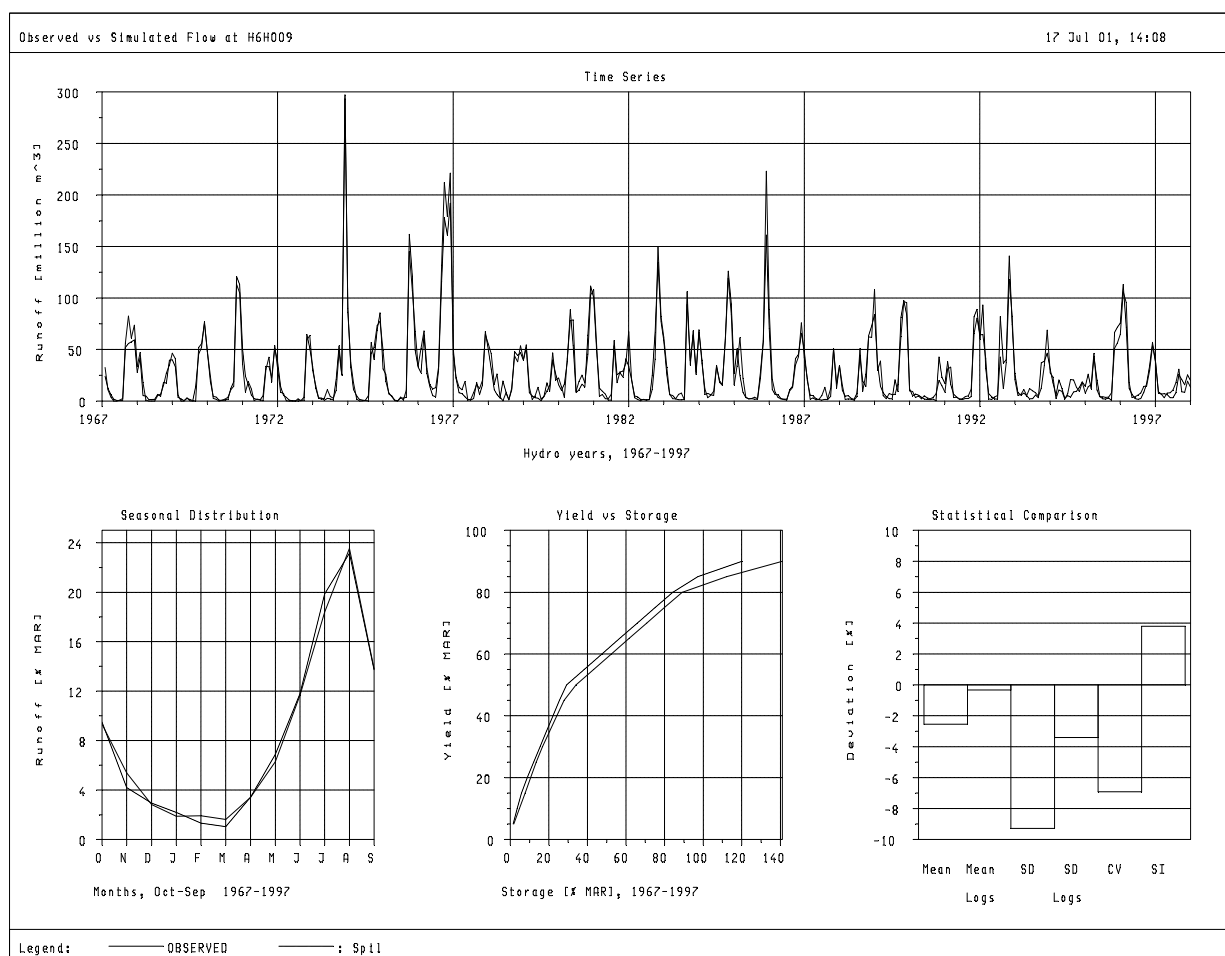
**Figure 5.15 : H6H009 Sub-catchment model configuration**

The final calibration parameters are shown in Table 5.32 along with the statistics for the observed data and final simulated record.

**TABLE 5.32 : CALIBRATION SUMMARY FOR H6H009**

| FINAL<br>ITERATION                                    | PITMAN PARAMETERS |                          |           |                |        |              |       |     |       |    |       |
|-------------------------------------------------------|-------------------|--------------------------|-----------|----------------|--------|--------------|-------|-----|-------|----|-------|
|                                                       | POW               | SL                       | ST        | FT             | GW     | ZMIN         | ZMAX  | PI  | TL    | GL | R     |
|                                                       | 2                 | 0                        | 300       | 40             | 0      | 5            | 200   | 1,5 | 0,25  | 0  | 0     |
| FLOW RECORD                                           |                   | STATISTICS (1967 - 1997) |           |                |        |              |       |     |       |    |       |
|                                                       |                   | MAR (Mm³/a)              | MAR (LOG) | ST.DEV (Mm³/a) |        | ST.DEV (LOG) |       | CV  |       | SI |       |
| Raw observed                                          |                   |                          |           |                |        |              |       |     |       |    |       |
| Patched observed                                      |                   | 329,68                   |           | 2,47           | 170,67 |              | 0,22  |     | 51,77 |    | 35,01 |
| Final simulation                                      |                   | 321,30                   |           | 2,46           | 154,82 |              | 0,21  |     | 48,19 |    | 36,34 |
| (Simulated - patched observed)/<br>(Patched observed) |                   | -2,5%                    |           | -0,3%          | -9,3%  |              | -3,4% |     | -6,9% |    | 3,8%  |

Figure 5.16 shows a graphical representation of the observed and simulated flows for the final parameter set.

**Figure 5.16 : Graphical comparison of observed and simulated flows for H6H009**

Referring to Figure 5.16, the simulated and observed time series and seasonal distributions compare favourably. Low flows were slightly over-estimated during the first half of the record and slightly under-estimated over the latter part of the record. The simulated and observed yields compare favourably.

The statistics are within acceptable limits.

## 5.9 H7H006 : SUB-CATCHMENT NUMBERS 50, 70, 661 (Figure 4.4)

### 5.9.1 Summary of Sub-catchment Data

Flow Station Number : H7H006  
 River Name : Breede River  
 Place : Swellendam

**TABLE 5.33 : SUMMARY OF DATA FOR SUB-CATCHMENT H7H006**

| DESCRIPTION                                |   |        | VALUE                      |
|--------------------------------------------|---|--------|----------------------------|
| Sub-catchment area                         | : | 50     | 661,98 km <sup>2</sup>     |
|                                            | : | 661    | 224,9 km <sup>2</sup>      |
|                                            | : | H7H006 | 224,98 km <sup>2</sup>     |
| Sub-catchment MAP<br>(CCWR)                | : | 50     | 404 mm/a                   |
|                                            | : | 661    | 258 mm/a                   |
|                                            | : | H7H006 | 507 mm/a                   |
| Sub-catchment MAE<br>(CCWR)                | : | 60     | 1 659 mm/a                 |
|                                            | : | 661    | 1 594 mm/a                 |
|                                            | : | H7H006 | 1 523 mm/a                 |
| Afforested area                            | : | 50     | 0,0 km <sup>2</sup>        |
|                                            | : | 661    | 0,45 km <sup>2</sup>       |
|                                            | : | H7H006 | 0,23 km <sup>2</sup>       |
| Area of alien vegetation                   | : | 50     | 0 km <sup>2</sup>          |
|                                            | : | 661    | 0 km <sup>2</sup>          |
|                                            | : | H7H006 | 3,11 km <sup>2</sup>       |
| Irrigation area                            | : | 50     | 21,68 km <sup>2</sup>      |
|                                            | : | 661    | 5,26 km <sup>2</sup>       |
|                                            | : | H7H006 | 5,17 km <sup>2</sup>       |
| Farm dam capacity                          | : | 50     | 6,98 Mm <sup>3</sup>       |
|                                            | : | 661    | 0,304 Mm <sup>3</sup>      |
|                                            | : | H7H006 | 1,869 Mm <sup>3</sup>      |
| Calibration period (hydrological years)    |   |        | 1970 - 1990                |
| Observed MAR for calibration period        |   |        | 1263,23 Mm <sup>3</sup> /a |
| Incremental naturalised MAR                |   |        | 55,61 Mm <sup>3</sup> /a   |
| Incremental naturalised runoff coefficient |   |        | 12,7 %                     |
| Cumulative naturalised MAR                 |   |        | 1571,79 Mm <sup>3</sup> /a |

Note : information in the Table 5.29 represents 1990 development

Details of the data used in the model calibration process are given in Appendix B9. Table 5.34 summarises the contents of this Appendix.

**TABLE 5.34 : SUMMARY OF DATA IN APPENDIX B9**

| APPENDIX NO. | CONTENTS                                                                                       | FORMAT      |
|--------------|------------------------------------------------------------------------------------------------|-------------|
| B9.1         | Land-use data<br>Evaporation data<br>Reservoir data<br>Irrigation crop factors and percentages | Tables      |
| B9.2         | Observed data (original) H7H006                                                                | Time series |
| B9.3         | Percentage rainfall file used in the calibration : sub-catchment 661                           |             |
| B9.4         | Percentage rainfall file used in the calibration : sub-catchment 50                            |             |
| B9.5         | Percentage rainfall file used in the calibration : sub-catchment 70                            |             |
| B9.6         | Afforestation demand downstream of farm dams in sub-catchment 661                              |             |
| B9.7         | Afforestation demand upstream of farm dams in sub-catchment 70                                 |             |
| B9.8         | Alien vegetation demands downstream of farm dams in sub-catchment 70                           |             |
| B9.9         | Riparian alien vegetation demands in sub-catchment 70                                          |             |
| B9.10        | Irrigation from farm dams in sub-catchment 661                                                 |             |
| B9.11        | Irrigation from farm dams in sub-catchment 50                                                  |             |
| B9.12        | Irrigation from farm dams in sub-catchment 70                                                  |             |
| B9.13        | Irrigation return flows from Angora irrigation canal                                           |             |
| B9.14        | Irrigation return flows from Boesman irrigation canal                                          |             |
| B9.15        | Irrigation return flows from Jack Moon irrigation canal                                        |             |
| B9.16        | Irrigation return flows from Wentzel irrigation canal                                          |             |
| B9.17        | Simulated flow record                                                                          |             |
| B9.18        | Patched observed flow record H7H006                                                            |             |
| B9.19        | Incremental naturalized flow sequence (1927 - 1990)                                            |             |
| B9.20        | Cumulative present day (2000) flow sequence at H7H006                                          |             |

### 5.9.2 Preliminary

The H7H006 catchment consists of three sub-catchments, one each on the lower Riviersonderend (661) and Breede Rivers (50) before the confluence of the two rivers, and a further sub-catchment between the confluence of the two rivers and the gauge H7H006 (70). All three sub-catchments contain irrigation and a number of farm dams. Sub-catchment 50, along the Lower Breede River, is intensively irrigated and also contains the Zanddrift and Angora canals and return flows.

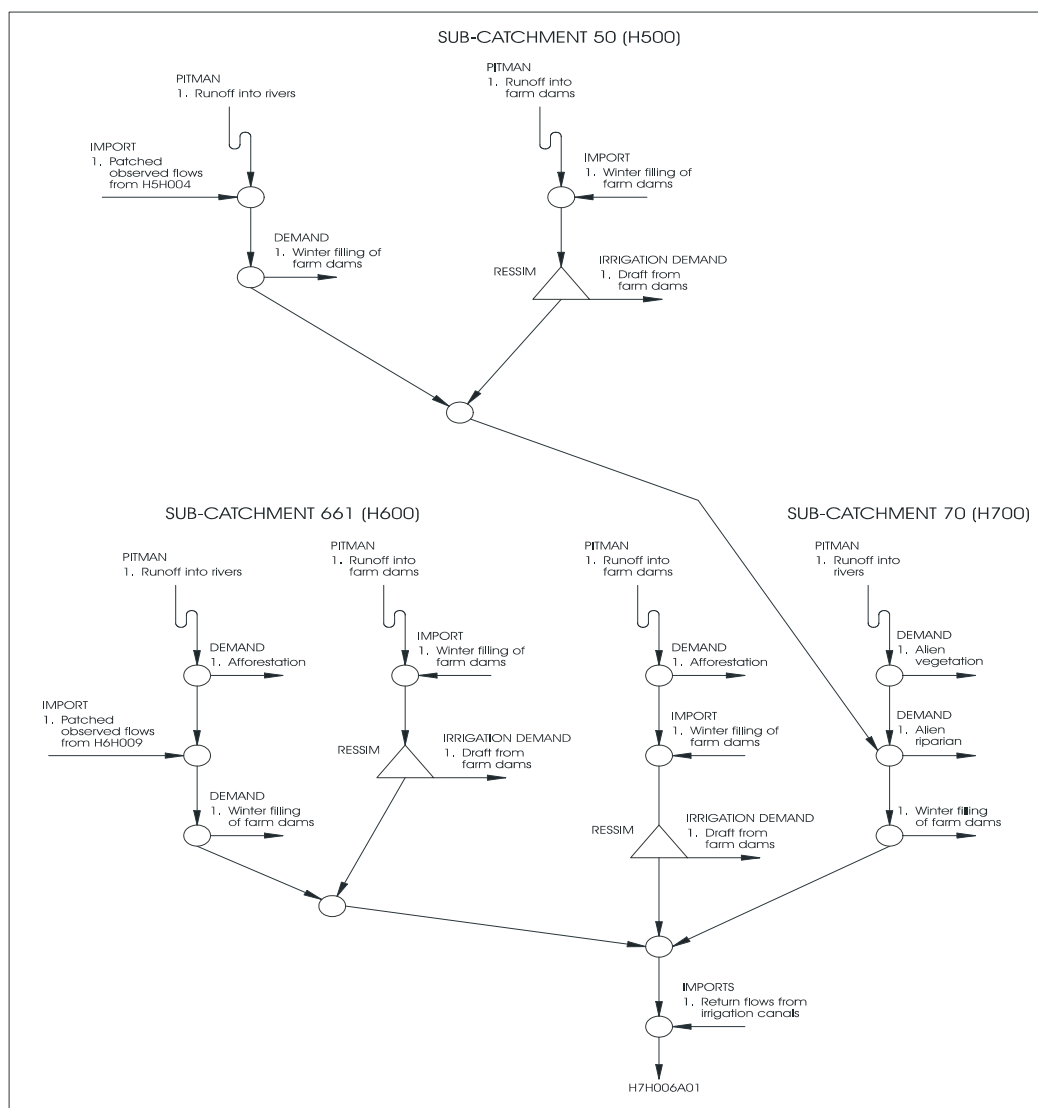
The H7H006 incremental catchment has the recorded inflows from gauges H5H004 (Breede River) and H6H009 (Riviersonderend) flowing into the incremental catchment. The incremental runoff from this catchment, determined by subtracting the H5H004 and H6H009 recorded flows from the flows recorded at H7H006, contained a number of large negative values. This meant that there was either substantial abstraction from the incremental catchment, or one of the three flow records were incorrect. In spite of this, an incremental calibration was attempted, but difficulties were experienced

simulating the low flows accurately. This, along with the uncertainties regarding the flow records, prompted the decision to conduct a cumulative calibration instead.

### 5.9.3 Model Configuration

Figure 5.17 shows a schematic representation of the sub-catchment configuration. These three sub-catchments contain numerous farm dams and are intensively irrigated, especially sub-catchment 50 on the Breede River. Irrigation demands are met from both farm dams and run-of-river abstractions, including the winter filling of farm dams. Return flows from the Zanddrift and Angora canals reach the Breede River within this sub-catchment.

The sub-catchment contains small areas of afforestation and alien vegetation.



Note : the above is a schematic diagram only and does not show all the detail included in the hydrological model

**Figure 5.17 : H7H006 Sub-catchment model configuration**

### 5.9.4 Evaluation and Preparation of Flow Sequences

Observed flow data was available for different periods at the three gauges. The overlapping period of 1970 to 1990 was used for the calibration. An evaluation of the gauges indicated that the recorded data could be classed as good, although gauge H5H004 had a limited gauging capacity and high flows were not recorded accurately.

### 5.9.5 Calibration (Calibration period : October 1970 - September 1990)

The details of the rainfall stations used in the calibration are shown in Table 5.35 below.

**TABLE 5.35 : RAINFALL STATIONS USED FOR CALIBRATION OF H7H006**

| SUB-CATCHMENT | RAINFALL STATION NUMBER | PERIOD OF RECORD (HYDROLOGICAL YEARS) | LENGTH OF RECORD (YEARS) |
|---------------|-------------------------|---------------------------------------|--------------------------|
| 50            | 023985                  | 1947 - 1981                           | 35                       |
|               | 024057                  | 1958 - 1978                           | 21                       |
|               | 024146                  | 1925 - 1990                           | 66                       |
|               | 024324                  | 1970 - 1984                           | 15                       |
|               | 024447                  | 1953 - 1980                           | 28                       |
|               | 008367                  | 1931 - 1990                           | 60                       |
| 661           | 008136_a                | 1923 - 1998                           | 76                       |
|               | 008367_2                | 1930 - 1998                           | 69                       |
| 70            | 008782_0                | 1926 - 1998                           | 73                       |
|               | 008367_2                | 1930 - 1998                           | 69                       |
|               | 008751_7                | 1929 - 1998                           | 70                       |

The final calibration parameters are shown in Table 5.36 along with the statistics for the observed data and final simulated record.

**TABLE 5.36 : CALIBRATION SUMMARY FOR H7H006**

| FINAL ITERATION                                       | PITMAN PARAMETERS        |    |           |    |                             |      |              |     |       |    |        |
|-------------------------------------------------------|--------------------------|----|-----------|----|-----------------------------|------|--------------|-----|-------|----|--------|
|                                                       | POW                      | SL | ST        | FT | GW                          | ZMIN | ZMAX         | PI  | TL    | GL | R      |
|                                                       | 2                        | 0  | 250       | 8  | 0                           | 20   | 200          | 1,5 | 0,25  | 0  | 0      |
| FLOW RECORD                                           | STATISTICS (1970 - 1990) |    |           |    |                             |      |              |     |       |    |        |
|                                                       | MAR (Mm <sup>3</sup> /a) |    | MAR (LOG) |    | ST.DEV (Mm <sup>3</sup> /a) |      | ST.DEV (LOG) |     | CV    |    | SI     |
| Patched observed                                      | 1263,23                  |    | 3,04      |    | 744,73                      |      | 0,24         |     | 58,96 |    | 40,05  |
| Final simulation                                      | 1352,69                  |    | 3,07      |    | 787327                      |      | 0,23         |     | 58,2  |    | 39,94  |
| (Simulated - patched observed)/<br>(Patched observed) | 7,1%                     |    | 1,11%     |    | 5,71%                       |      | -4,57%       |     | -1,3% |    | -0,27% |

Figure 5.18 shows a graphical representation of the observed and simulated flows for the final parameter set.



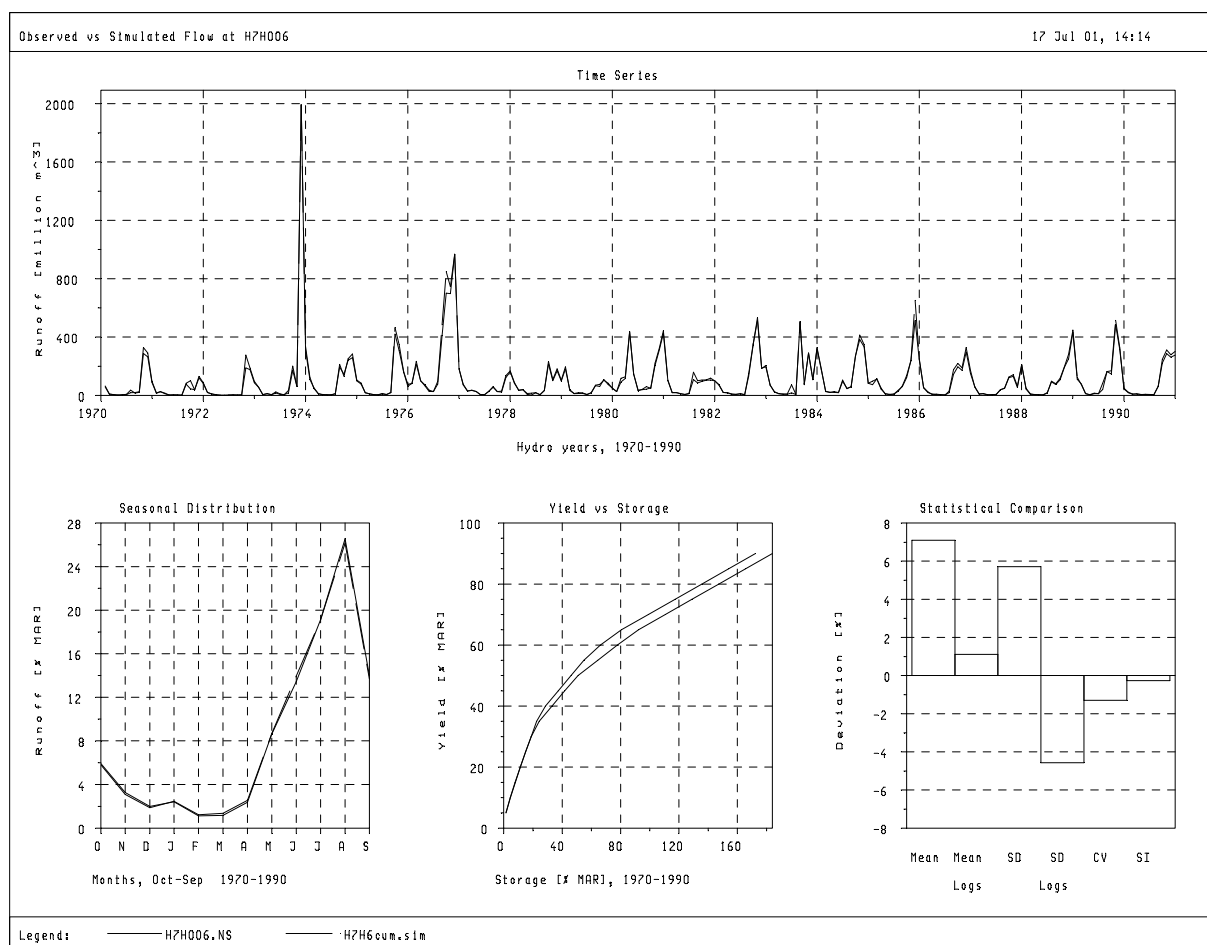


**Figure 5.18 : Graphical comparison of observed and simulated flows for H7H006**

Referring to Figure 5.18, the simulated and observed time series and seasonal distributions compare favourably. The simulated and observed yields compared reasonably, with a slight over-estimation for the larger storage capacities. Apart from the MAR, the statistics are within acceptable limits. The difference in MAR could largely be ascribed to the large inflow from gauges H5H004 and H6H009 into the incremental catchment.

As a result of difficulties experienced during the calibration process (see Section 5.9.2), a cumulative calibration was used for this sub-catchment. Since the incremental simulated flows are small compared to the upstream inflows, the above graphs don't necessarily indicate the accuracy of the calibration, but rather a comparison of upstream observed inflow and downstream observed flow.

## 5.10 H7R001 : SUB-CATCHMENT NUMBER 47, 53 (Figure 4.4)

### 5.10.1 Summary of Sub-catchment Data

Flow Station Number : H7R001  
 River Name : Buffeljags River  
 Place : Buffeljags Dam inflow

**TABLE 5.37 : SUMMARY OF DATA FOR SUB-CATCHMENT H7R001**

| DESCRIPTION                                |   |          | VALUE                  |
|--------------------------------------------|---|----------|------------------------|
| Sub-catchment area                         | : | Low MAP  | 518 km <sup>2</sup>    |
|                                            | : | High MAP | 101 km <sup>2</sup>    |
| Sub-catchment MAP                          | : | CCWR MAP | 526 mm/a               |
|                                            | : | High MAP | 973 mm/a               |
| Sub-catchment MAE (S-pan CCWR)             |   |          | 1 473 mm/a             |
| Afforested area                            |   |          | 8,29 km <sup>2</sup>   |
| Area of alien vegetation                   |   |          | 6,52 km <sup>2</sup>   |
| Irrigation area                            |   |          | 16,49 km <sup>2</sup>  |
| Farm dam capacity                          |   |          | 10,68 Mm <sup>3</sup>  |
| Calibration period (hydrological years)    |   |          | 1970 - 1998            |
| Observed MAR for calibration period        |   |          | 112,35 Mm <sup>3</sup> |
| Incremental naturalised MAR (1927 - 1998)  |   |          | 121,69 Mm <sup>3</sup> |
| Incremental naturalised runoff coefficient |   |          | 32,8 %                 |
| Cumulative naturalised MAR (1927 - 1998)   |   |          | 121,69 Mm <sup>3</sup> |

Note : information in the Table 5.37 represents 1998 development

Details of the data used in the model calibration process are given in Appendix B10. Table 5.38 summarises the contents of this Appendix.

**TABLE 5.38 : SUMMARY OF DATA IN APPENDIX B10**

| APPENDIX NO. | CONTENTS                                                                                       | FORMAT      |
|--------------|------------------------------------------------------------------------------------------------|-------------|
| B10.1        | Land-use data<br>Evaporation data<br>Reservoir data<br>Irrigation crop factors and percentages | Tables      |
| B10.2        | Observed data (original ) H7R001                                                               | Time series |
| B10.3        | Percentage rainfall file used in the calibration                                               |             |
| B10.4        | Upland alien vegetation demand (tall trees) downstream of farm dams                            |             |
| B10.5        | Upland alien vegetation demand (tall shrubs) downstream of farm dams                           |             |
| B10.6        | Riparian alien vegetation demand (tall trees)                                                  |             |
| B10.7        | Afforestation demand upstream of farm dams                                                     |             |
| B10.8        | Irrigation from farm dams                                                                      |             |
| B10.9        | Buffeljags Dam simulated flow record                                                           |             |
| B10.10       | Incremental naturalised flow sequence at H7R001                                                |             |
| B10.11       | Cumulative present day (2000) flow sequence at H7R001                                          |             |

### 5.10.2 Model Configuration

Figure 5.19 shows a schematic representation of the sub-catchment configuration. This sub-catchment contains numerous farm dams and is intensively irrigated. Irrigation demands are met from both farm dams and run-of-river abstractions. Upland alien vegetation demands are met only by local runoff, while riparian alien demands were modelled as being supplied from the main stream at the outlet of the catchment.

### 5.10.3 Evaluation and Preparation of Flow Sequences

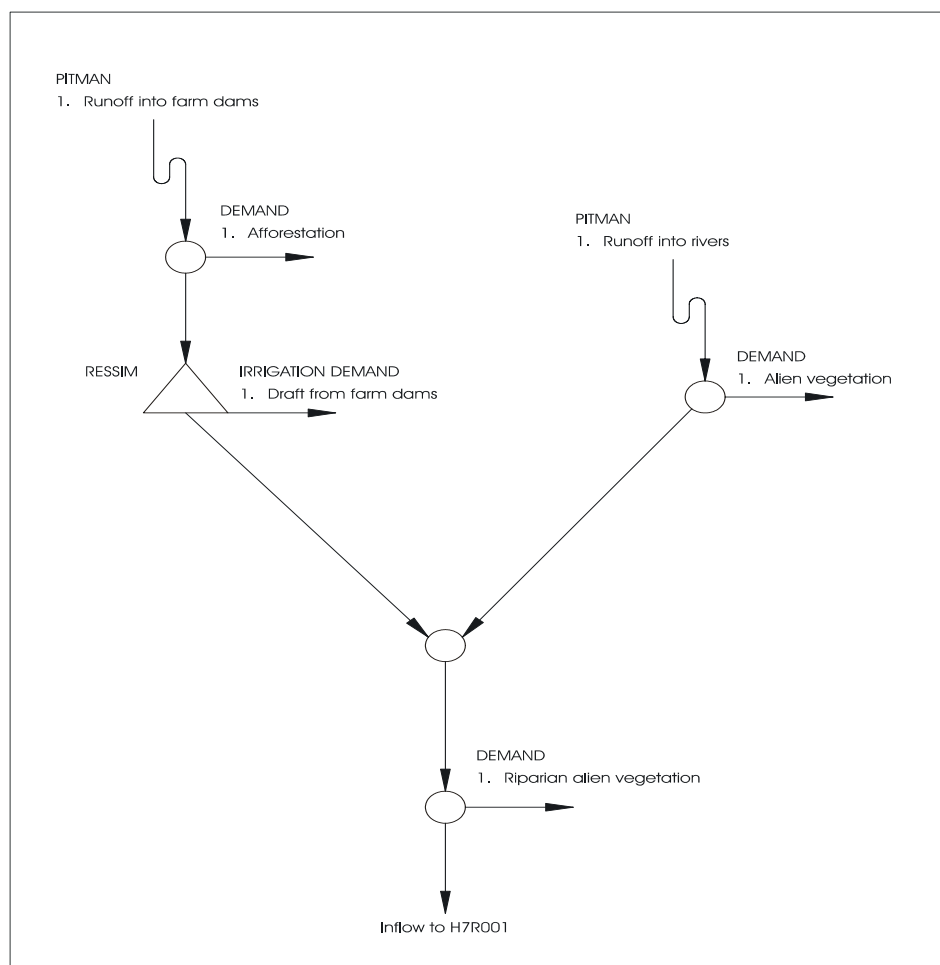
Since no observed inflow record was available at the dam, DWAF computed an inflow record based on a dam mass balance calculation of Buffeljags Dam. The calculated inflow record spanned the period October 1970 to September 2000.

### 5.10.4 Calibration (Calibration period : October 1970 - September 1999)

The details of the rainfall stations used in the calibration are shown in Table 5.39 below.

**TABLE 5.39 : RAINFALL STATIONS USED FOR CALIBRATION OF H7R001**

| RAINFALL STATION<br>NUMBER | PERIOD OF RECORD<br>(HYDROLOGICAL YEARS) | LENGTH OF RECORD<br>(YEARS) |
|----------------------------|------------------------------------------|-----------------------------|
| 025599_3                   | 1919 - 1998                              | 80                          |
| 025414_8                   | 1924 - 1998                              | 75                          |
| 008751_7                   | 1929 - 1998                              | 70                          |
| 009365_5                   | 1943 - 1998                              | 56                          |



Note : the above is a schematic diagram only and does not show all the detail included in the hydrological model

**Figure 5.19 : H7R001 Sub-catchment model configuration**

The final calibration parameters are shown in Table 5.40 along with the statistics for the observed data and final simulated record.

**TABLE 5.40 : CALIBRATION SUMMARY FOR H7R001**

| FINAL<br>ITERATION                                    | PITMAN PARAMETERS |                          |           |                             |              |        |        |     |      |    |   |
|-------------------------------------------------------|-------------------|--------------------------|-----------|-----------------------------|--------------|--------|--------|-----|------|----|---|
|                                                       | POW               | SL                       | ST        | FT                          | GW           | ZMIN   | ZMAX   | PI  | TL   | GL | R |
|                                                       | 2                 | 0                        | 200       | 50                          | 10           | 0      | 200    | 1,5 | 0,25 | 2  | 0 |
| FLOW RECORD                                           |                   | STATISTICS (1970 - 1998) |           |                             |              |        |        |     |      |    |   |
|                                                       |                   | MAR (Mm <sup>3</sup> /a) | MAR (LOG) | ST.DEV (Mm <sup>3</sup> /a) | ST.DEV (LOG) | CV     | SI     |     |      |    |   |
| Patched observed                                      |                   | 112,35                   | 2,02      | 46,85                       | 0,18         | 41,7   | 7,77   |     |      |    |   |
| Final simulation                                      |                   | 113,19                   | 2,02      | 45,3                        | 0,17         | 40,02  | 7,23   |     |      |    |   |
| (Simulated - patched observed)/<br>(Patched observed) |                   | -0,75%                   | -0,27%    | -3,31%                      | -3,23%       | -4,03% | -6,97% |     |      |    |   |

Figure 5.20 shows a graphical representation of the observed and simulated flows for the final parameter set.

Referring to Figure 5.20, the simulated and observed time series compared reasonably, considering the nature of the observed record. Low flows were over-estimated in the early part of the record and under-estimated during the latter part of the record. Comparison of the seasonal distributions were less favourable, while the simulated and observed yields compared favourably.

The statistics are within acceptable limits.

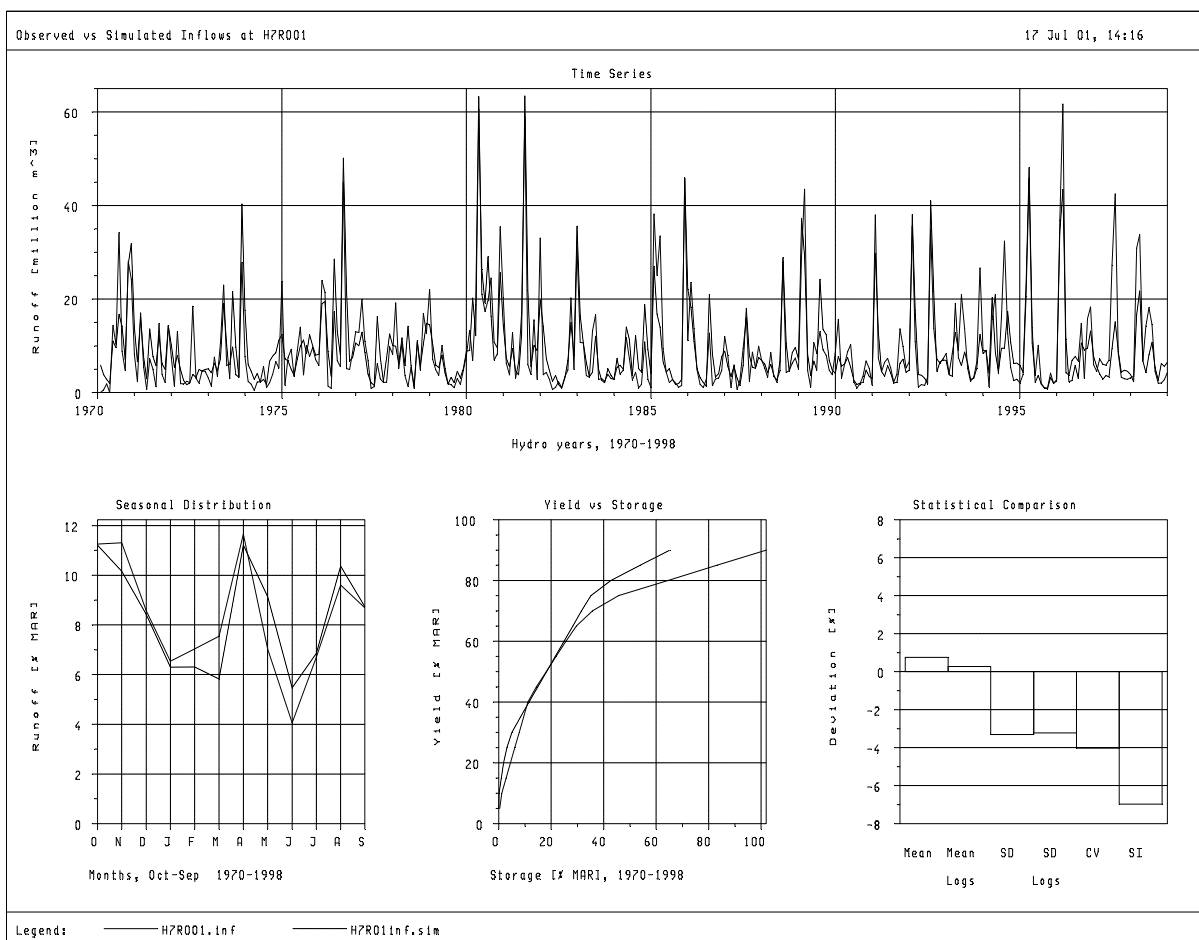


**Figure 5.20 : Graphical comparison of observed and simulated flows to Buffeljags Dam**

## 5.11 IFR SITE 4 : INCREMENTAL SUB-CATCHMENT NUMBER 58 (Figure 4.4)

### 5.11.1 Summary of Sub-catchment Data

Flow Station Number : none  
 River Name : Breede River  
 Place : IFR Site 4

**TABLE 5.41 : SUMMARY OF DATA FOR SUB-CATCHMENT IFR SITE 4**

| DESCRIPTION                                | VALUE                   |
|--------------------------------------------|-------------------------|
| Sub-catchment area                         | 421,3 km <sup>2</sup>   |
| Sub-catchment MAP (CCWR)                   | 411 mm/a                |
| Sub-catchment MAE (S-pan CCWR)             | 1 502 mm/a              |
| Afforested area                            | -                       |
| Area of alien vegetation                   | 4,65 km <sup>2</sup>    |
| Irrigation area                            | 26,48 km <sup>2</sup>   |
| Farm dam capacity                          | 8,43 Mm <sup>3</sup>    |
| Simulation period (hydrological years)     | 1927 - 1990             |
| Simulated MAR for simulation period        | 967,45 Mm <sup>3</sup>  |
| Incremental naturalised MAR                | 21,33 Mm <sup>3</sup>   |
| Incremental naturalised runoff coefficient | 12,3 %                  |
| Cumulative naturalised MAR                 | 1711,27 Mm <sup>3</sup> |

Note : information in the Table 5.41 represents 1990 development

Details of the data used in the model calibration process are given in Appendix B11. Table 5.42 summarises the contents of this Appendix.

**TABLE 5.42 : SUMMARY OF DATA IN APPENDIX B11**

| APPENDIX NO. | CONTENTS                                                                                       | FORMAT      |
|--------------|------------------------------------------------------------------------------------------------|-------------|
| B11.1        | Land-use data<br>Evaporation data<br>Reservoir data<br>Irrigation crop factors and percentages | Tables      |
| B11.2        | Percentage rainfall file used in the calibration                                               | Time series |
| B11.3        | Alien vegetation demand (tall trees) upstream of farm dams                                     |             |
| B11.4        | Alien vegetation demand (tall shrubs) upstream of farm dams                                    |             |
| B11.5        | Riparian alien vegetation demand (tall trees)                                                  |             |
| B11.6        | Irrigation from farm dams                                                                      |             |
| B11.7        | Spills/releases from Buffeljags Dam                                                            |             |
| B11.8        | Simulated flow record                                                                          |             |
| B11.9        | Incremental naturalised flow sequence at IFR Site 4                                            |             |
| B11.10       | Cumulative present day (2000) flow sequence at IFR Site 4                                      |             |

### 5.11.2 Preliminary

IFR Site 4 is on the Breede River downstream of the confluence of the Breede and Buffeljags Rivers. The lower portion of the Breede River is ungauged, hence no Pitman model calibration was possible. Runoff could, however, be generated by transferring calibrated Pitman parameters from the adjacent H7H006 catchment.

Since no calibration was done, the Pitman model was used to produce incremental simulated runoff, cumulative present day and cumulative naturalised runoff sequences at IFR Site 4.

### 5.11.3 Model Configuration

Figure 5.21 shows a schematic representation of the sub-catchment configuration. Although wheat is planted on most of the irrigable land, the sub-catchment contains areas irrigated by water sourced from both farm dams and run-of-river abstractions. Alien invasive vegetation is scattered throughout the sub-catchment. Upland alien vegetation demands are met only by local runoff, while riparian alien demands were modelled as being supplied from the main stream at the outlet of the catchment.

### 5.11.4 Evaluation and Preparation of Flow Sequences

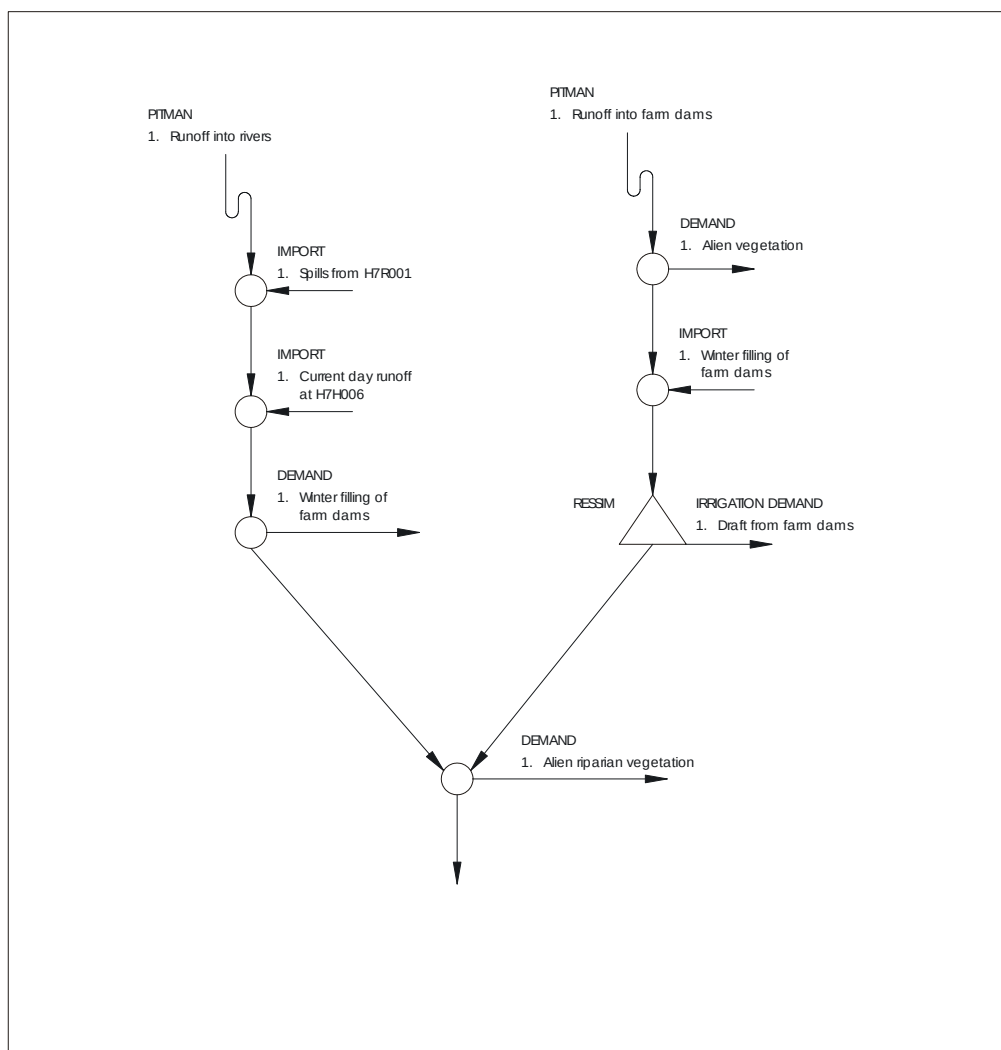
No observed flow record was available.

### 5.11.5 Simulation (Simulation period : Oct 1927 - Sep 1990)

The details of the rainfall stations used in the calibration are shown in Table 5.43 below.

**TABLE 5.43 : RAINFALL STATIONS USED FOR CALIBRATION OF IFR SITE 4**

| RAINFALL STATION<br>NUMBER | PERIOD OF RECORD<br>(HYDROLOGICAL YEARS) | LENGTH OF RECORD<br>(YEARS) |
|----------------------------|------------------------------------------|-----------------------------|
| 008683_p                   | 1926 - 1977                              | 50                          |
| 008713_a                   | 1978 - 1998                              | 21                          |
| 008876_9                   | 1926 - 1964                              | 39                          |
| 009365_5                   | 1943 - 1998                              | 56                          |
| 009430_2                   | 1935 - 1988                              | 54                          |
| 009458_a                   | 1972 - 1995                              | 24                          |



Note : the above is a schematic diagram only and does not show all the detail included in the hydrological model

**Figure 5.21 : IFR Site 4 sub-catchment model configuration**

The final simulation parameters are shown in Table 5.44 along with the statistics for the simulated record.

**TABLE 5.44 : SIMULATION SUMMARY FOR IFR SITE 4**

| FINAL<br>ITERATION | PITMAN PARAMETERS        |    |           |                             |    |              |      |       |      |       |   |
|--------------------|--------------------------|----|-----------|-----------------------------|----|--------------|------|-------|------|-------|---|
|                    | POW                      | SL | ST        | FT                          | GW | ZMIN         | ZMAX | PI    | TL   | GL    | R |
|                    | 2                        | 0  | 250       | 8                           | 0  | 20           | 200  | 1,5   | 0,25 | 0     | 0 |
| FLOW RECORD        | STATISTICS (1965 - 1990) |    |           |                             |    |              |      |       |      |       |   |
|                    | MAR (Mm <sup>3</sup> /a) |    | MAR (LOG) | ST.DEV (Mm <sup>3</sup> /a) |    | ST.DEV (LOG) |      | CV    |      | SI    |   |
| Final simulation   | 967,45                   |    | 2,92      | 578,9                       |    | 0,24         |      | 59,84 |      | 47112 |   |

Figure 5.22 shows a graphical representation of the simulated flows for the final parameter set.



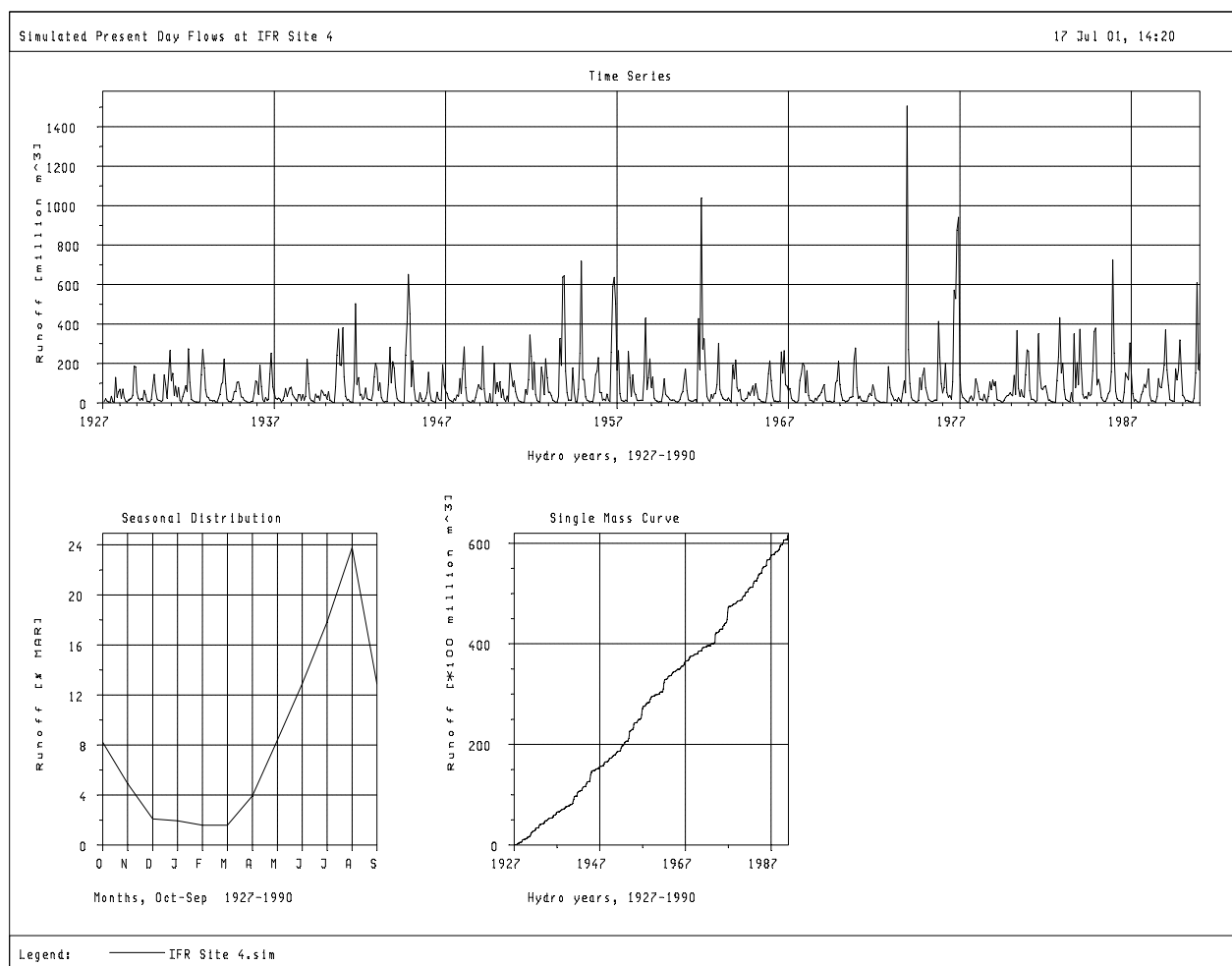


**Figure 5.22 : Graphical representation of simulated flows at IFR Site 4**

## 5.12 ESTUARY : SUB-CATCHMENT NUMBER 590, 71, 72 (Figure 4.4)

### 5.12.1 Summary of Sub-catchment data

Flow Station Number : Estuary  
 River Name : Breede River  
 Place : Estuary

**TABLE 5.45 : SUMMARY OF DATA FOR ESTUARY SUB-CATCHMENT**

| DESCRIPTION                                | VALUE                      |
|--------------------------------------------|----------------------------|
| Sub-catchment area                         | 1 652,2 km <sup>2</sup>    |
| Sub-catchment MAP (CCWR)                   | 411 mm/a                   |
| Sub-catchment MAE (S-pan CCWR)             | 1 502 mm/a                 |
| Afforested area                            | -                          |
| Area of alien vegetation                   | 29,92 km <sup>2</sup>      |
| Irrigation area                            | 3,43 km <sup>2</sup>       |
| Farm dam capacity                          | 3,96 Mm <sup>3</sup>       |
| Calibration period (hydrological years)    | 1927 - 1990                |
| Observed MAR for calibration period        | -                          |
| Incremental naturalised MAR (1927 - 1990)  | 83,28                      |
| Incremental naturalised runoff coefficient | 12,2%                      |
| Cumulative naturalised MAR (1927 - 1990)   | 1802,84 Mm <sup>3</sup> /a |

Note : information in the Table 5.45 represents 1990 development

Details of the data used in the model calibration process are given in Appendix B12. Table 5.46 summarises the contents of this Appendix.

**TABLE 5.46 : SUMMARY OF DATA IN APPENDIX B12**

| APPENDIX NO. | CONTENTS                                                                                       | FORMAT |
|--------------|------------------------------------------------------------------------------------------------|--------|
| B12.1        | Land-use data<br>Evaporation data<br>Reservoir data<br>Irrigation crop factors and percentages | Tables |
| B12.2        | Percentage rainfall file used in the calibration                                               |        |
| B12.3        | Alien vegetation demand (tall trees) upstream of farm dams                                     |        |
| B12.4        | Alien vegetation demand (tall shrubs) upstream of farm dams                                    |        |
| B12.5        | Riparian alien vegetation demand (tall trees)                                                  |        |
| B12.6        | Irrigation from farm dams                                                                      |        |
| B12.7        | Simulated flow record                                                                          |        |
| B12.8        | Incremental naturalised flow sequence at Breede River Estuary                                  |        |
| B12.9        | Cumulative present day (2000) flow sequence at Breede River Estuary                            |        |

### 5.12.2 Preliminary

The Estuary sub-catchment is the most downstream catchment on the Breede River, covering the area downstream of IFR Site 4 to the estuary. The sub-catchment is ungauged, hence no Pitman model calibration was possible. Runoff could, however, be generated by transferring calibrated Pitman parameters from the H7H006 catchment.

Since no calibration was done, the Pitman model was only used to produce incremental simulated runoff, cumulative present day and cumulative naturalised runoff at the estuary.

### 5.12.3 Model Configuration

Figure 5.23 shows a schematic representation of the sub-catchment configuration. Although wheat is planted on most of the irrigable land, the sub-catchment contains areas irrigated by water sourced from both farm dams and run-of-river abstractions. Alien invasive vegetation is scattered throughout the sub-catchment. Upland alien vegetation demands are met only by local runoff, while riparian alien demands were modelled as being supplied from the main stream at the outlet of the catchment.

### 5.12.4 Evaluation and Preparation of Flow Sequences

No observed flow record was available.

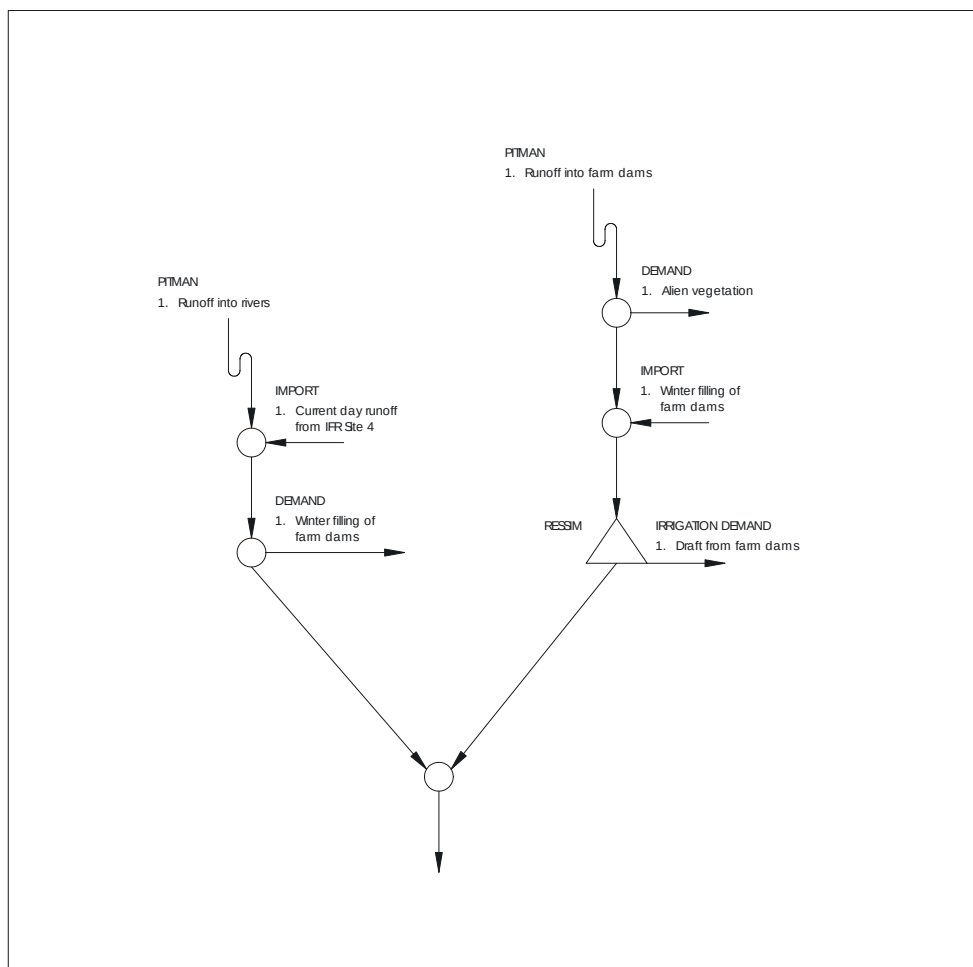
### 5.12.5 Simulation (Simulation period : Oct 1927 - Sep 1990)

The details of the rainfall stations used in the calibration are shown in Table 5.47 below.

**TABLE 5.47 : RAINFALL STATIONS USED FOR SIMULATION OF ESTUARY SUB-CATCHMENT**

| RAINFALL STATION<br>NUMBER | PERIOD OF RECORD<br>(HYDROLOGICAL YEARS) | LENGTH OF RECORD<br>(YEARS) |
|----------------------------|------------------------------------------|-----------------------------|
| 008683_p                   | 1926 - 1977                              | 52                          |
| 008713_a                   | 1978 - 1998                              | 21                          |
| 008876_9                   | 1926 - 1964                              | 39                          |
| 009365_5                   | 1943 - 1998                              | 56                          |
| 009430_2                   | 1935 - 1988                              | 54                          |
| 009458_a                   | 1972 - 1995                              | 26                          |

The final simulation parameters are shown in Table 5.48 along with the statistics for the simulated record.



Note : the above is a schematic diagram only and does not show all the detail included in the hydrological model

**Figure 5.23 : Estuary sub-catchment model configuration**

**TABLE 5.48 : SIMULATION SUMMARY FOR ESTUARY SUB-CATCHMENT**

| FINAL<br>ITERATION       | PITMAN PARAMETERS |                          |     |           |                             |      |              |       |      |      |   |
|--------------------------|-------------------|--------------------------|-----|-----------|-----------------------------|------|--------------|-------|------|------|---|
|                          | POW               | SL                       | ST  | FT        | GW                          | ZMIN | ZMAX         | PI    | TL   | GL   | R |
|                          | 2                 | 0                        | 250 | 8         | 0                           | 20   | 200          | 1.5   | 0.25 | 0    | 0 |
| STATISTICS (1927 - 1990) |                   |                          |     |           |                             |      |              |       |      |      |   |
| FLOW RECORD              |                   | MAR (Mm <sup>3</sup> /a) |     | MAR (LOG) | ST.DEV (Mm <sup>3</sup> /a) |      | ST.DEV (LOG) | CV    |      | SI   |   |
| Final simulation         |                   | 1033.65                  |     | 2.95      | 606.37                      |      | 0.24         | 58.66 |      | 33.1 |   |

Figure 5.24 shows a graphical representation of the simulated flows for the final parameter set.

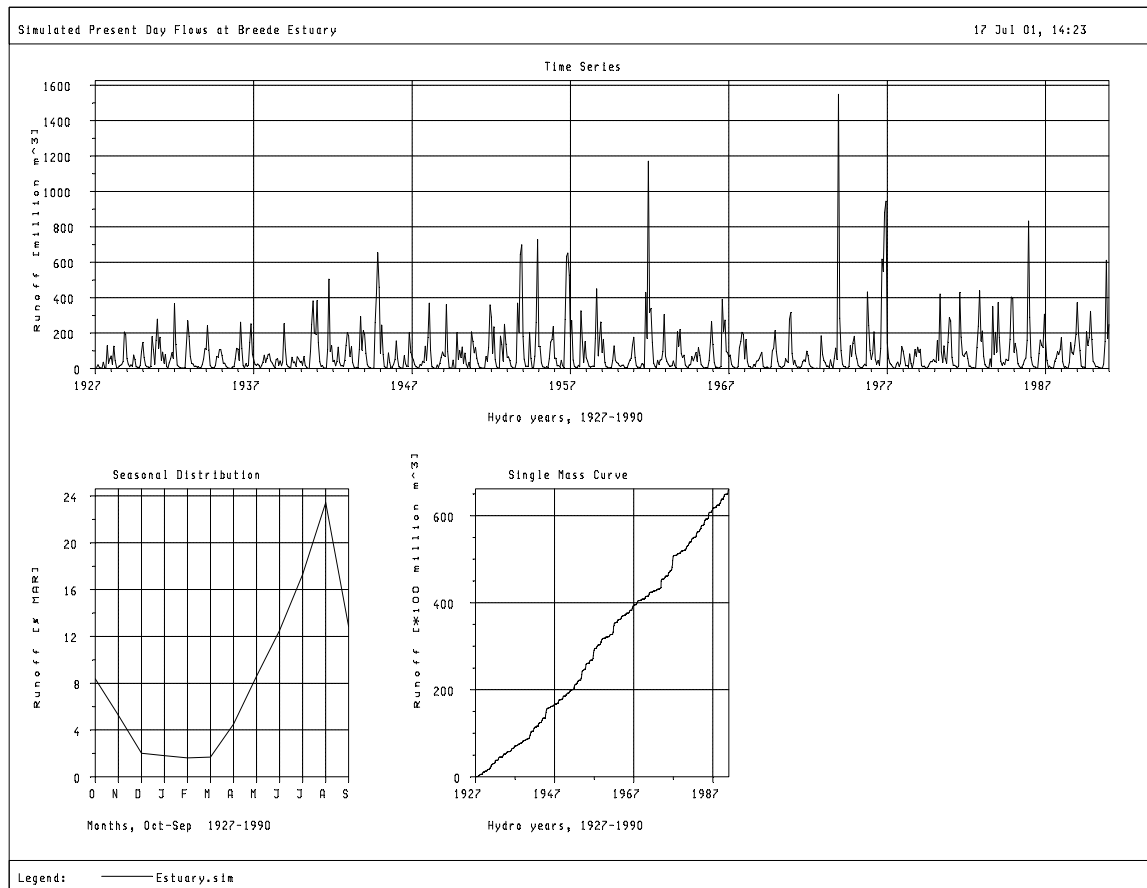


**Figure 5.24 : Graphical representation of simulated flows for the estuary sub-catchment**

## **6. FLOW SEQUENCE GENERATION**

### **6.1 NATURALISED RUNOFF SEQUENCES**

The naturalisation process, described in Section 4.10, was used to produce natural runoff sequences at the flow gauging stations of each of the sub-catchments. Figure 6.1 shows the cumulative naturalised MARs at the respective flow gauging stations in the Breede River Basin, while Table 6.1 provides a summary of the MARs. The natural MARs shown are for the overlapping period 1927 to 1990.

Note that Figure 6.1 shows the cumulative natural runoff for the entire Breede River Basin, including natural runoff from the sub-catchments that were not calibrated as part of the BRBS (H200, H300, H400, H500). Table 6.2 compares the cumulative natural MAR from the BRBS, BRHS and WR90 at common locations in the Breede Basin.

### **6.2 RUNOFF SEQUENCES REPRESENTING PRESENT (2000) DEVELOPMENT CONDITIONS**

Present day sequences, representing 2000 development conditions, were produced for each calibration sub-catchment following the process described in Section 4.11. Figure 6.2 shows the present day MARs at the respective flow gauging stations in the Breede River Basin, while Table 6.1. 1 provides a summary of the MARs. The MARs shown are for the overlapping period 1927 to 1990.

Note that Figure 6.2 shows the present day runoff for the entire Breede River Basin, including present day runoff from the sub-catchments that were not calibrated as part of the BRBS. The H200 present day runoff was taken from the recent Hex Valley Study (Ninham Shand, 2000), while present day runoff sequences were calculated for the H300, H400 and H500 areas based on the hydrological model configurations used for these areas in the BRHS.

In the case of Riviersonderend (H600), the hydrological configurations used during the Skuifraam Dam Study were used to generate present day sequences upstream of Theewaterskloof Dam. The operation of the Elandskloof Dam was modelled in SHELL, which included the releases for downstream irrigation demands.

The operation of Theewaterskloof Dam had to be simulated in order to allow simulation of a present day release and spill sequence for use in the present day sequences of the H6H009 incremental catchment. The irrigation and Cape Town urban demands supplied from Theewaterskloof Dam were modelled using 12 average monthly demands, based on the last five years of actual abstractions. These assumptions allowed the simulation of a spill/release record from Theewaterskloof Dam, although it should be kept in mind that the simplification could impact on supply of demands over the critical period of the dam.

In the case of the Lower Breede (H700), the SHELL models configured for the Lower Breede (H700), were used with the transferred parameters to simulate present day sequences.

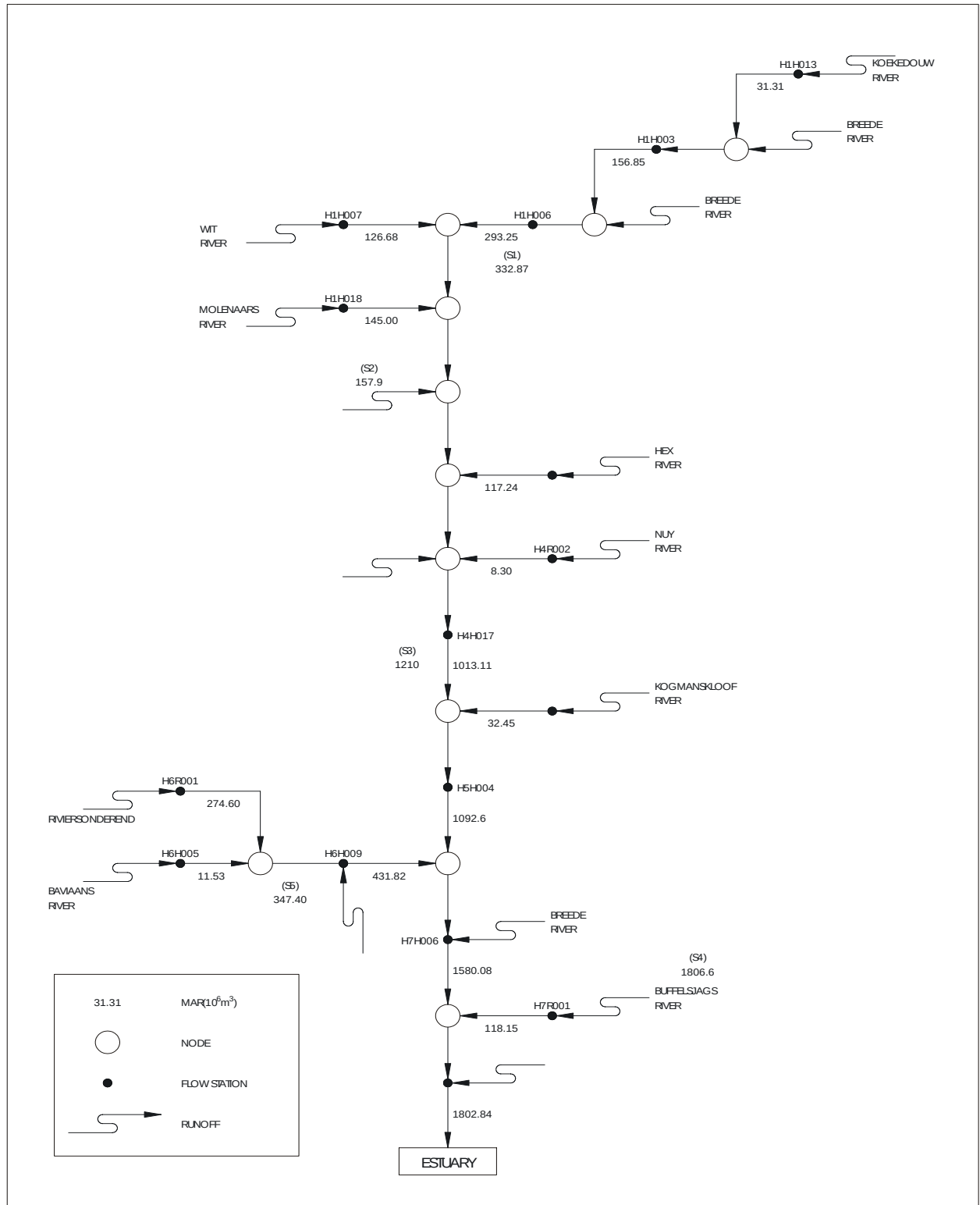
**TABLE 6.1 CUMULATIVE NATURAL AND PRESENT DAY (2000) MARs FOR THE BREEDER RIVER BASIN FOR THE PERIOD 1927 TO 1990**

| GAUGING STATION | NATURAL RUNOFF                      |                                    | PRESENT DAY RUNOFF                  |                                    |
|-----------------|-------------------------------------|------------------------------------|-------------------------------------|------------------------------------|
|                 | INCREMENTAL<br>(Mm <sup>3</sup> /a) | CUMULATIVE<br>(Mm <sup>3</sup> /a) | INCREMENTAL<br>(Mm <sup>3</sup> /a) | CUMULATIVE<br>(Mm <sup>3</sup> /a) |
| H1H013          | 31.3                                | 31.3                               | 23.0                                | 23.0                               |
| H1H003          |                                     | 156.9                              |                                     | 121.1                              |
| H1H006          |                                     | 293.3                              |                                     | 238.4                              |
| H1H007          | 126.7                               | 126.7                              | 115.6                               | 115.6                              |
| H1H018          | 145.0                               | 145.0                              | 132.3                               | 132.3                              |
| H4R002          | 8.3                                 | 8.3                                | 1.4                                 | 1.4                                |
| H4H017          |                                     | 1013.1                             |                                     | 768.9                              |
| H300            |                                     | 32.5                               |                                     | 20.8                               |
| H5H004          |                                     | 1092.6                             |                                     | 675.3                              |
| H6R001          |                                     | 274.6                              |                                     | 237.0                              |
| H6H005          |                                     | 11.5                               |                                     | 7.3                                |
| H6H009          |                                     | 431.8                              |                                     | 152.5                              |
| H7H006          |                                     | 1580.1                             |                                     | 889.2                              |
| H7R001          |                                     | 118.2                              |                                     | 102.0                              |
| ESTUARY         |                                     | 1802.8                             |                                     | 1033.7                             |

**TABLE 6.2 COMPARISON OF CUMULATIVE NATURAL MARs FROM THE BRBS, BRHS AND WR90**

| GAUGING STATION | QUATERNARY CATCHMENT | BRBS                                | BRHS                                | WR90                                |
|-----------------|----------------------|-------------------------------------|-------------------------------------|-------------------------------------|
|                 |                      | 1927 - 1990<br>(Mm <sup>3</sup> /a) | 1925 - 1990<br>(Mm <sup>3</sup> /a) | 1920 - 1989<br>(Mm <sup>3</sup> /a) |
| H1H006          | H10D                 | 293.3                               | 258.3                               | 205.5                               |
| H1H007          | H10E                 | 126.7                               | 96.3                                | 90.4                                |
| H4H017          | H40F                 | 1013.1                              | 1065.2                              | 1045.3                              |
| H500 outflow    | H50B                 | 1092.6                              | 1172.5                              | 1207.1                              |
| H6H009          | H60K                 | 431.8                               |                                     | 449.9                               |
| H7H006          | H70A                 | 1580.1                              |                                     | 1679.7                              |
| H7R001          | H70E                 | 118.2                               |                                     | 100.6                               |
| ESTUARY         | H70K                 | 1802.8                              |                                     | 1872.5                              |

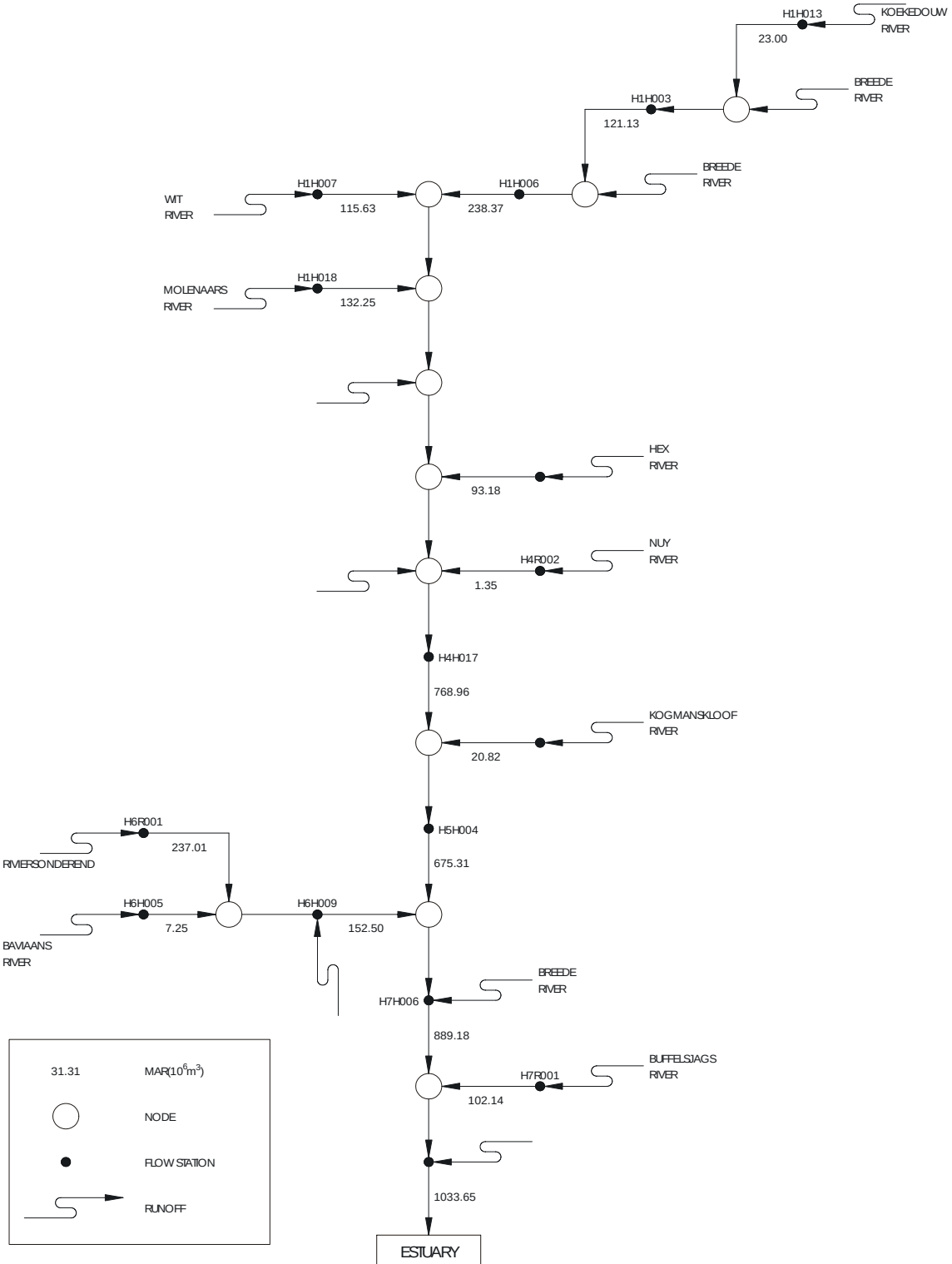
- Notes
1. Note that the MARs quoted above are for different periods.
  2. The Hex River hydrology was not re-done as part of the BRBS, but was based on the hydrology from the report “*Ondersoek na die benutbare water by die Sesbek verdeelstruktuur (Ninham Shand 2000)*”.



Note : The nodes shown on the diagram represent gauging stations used for model calibration as part of the BRBS or inflow from nodes calibrated as part of the BRHS.

**Figure 6.1 : Schematic representation of naturalised flows in the Breede River**





Note : The nodes shown on the diagram represent gauging stations used for model calibration as part of the BRBS or inflow from nodes calibrated as part of the BRHS.

**Figure 6.2 : Schematic representation of present day (2000) flows in the Breede River (1927 - 1990)**

## **7. CONCLUSIONS AND RECOMMENDATIONS**

### **7.1 RAINFALL DATA**

Rainfall data forms one of the most important data requirements when undertaking hydrological modelling. Sufficient rainfall station coverage of the Basin, especially in the higher lying mountainous areas where very few rainfall stations, if any, are located, is a major problem. The mountainous areas experience the highest rainfall in the catchment, and as such, produce the majority of runoff from the catchment. It is, therefore, important to establish rainfall stations in the appropriate locations within the catchment to allow sufficient spatial coverage of the Basin.

It is important that reliable data records with sufficiently long record periods be available for use in the hydrological modelling. Although a few rainfall stations within the catchment have records covering 70+ years, numerous gauges have relatively short periods of record. This, along with the problem of poor data quality at some of the stations, caused some concern.

It is thus recommended that the quality of existing stations should be maintained and improved on, where necessary, and that new stations be established in areas where there is inadequate coverage at present.

The mean annual precipitations were obtained from digital information supplied by the CCWR. As was the case with previous hydrological studies conducted in the Western Cape, anomalies existed in the mean annual precipitation (MAP) values for the mountainous areas, where the CCWR MAPs were lower than the estimated values. These inaccuracies should be verified by recorded data since these mountainous areas contribute significantly to the overall catchment MAR and thus need to be modelled accurately.

### **7.2 FLOW DATA**

The Basin generally has sufficient coverage of the number and distribution of flow gauging stations, measuring runoff at most of the significant points. The lengths of the records were, apart from the record at gauge H4H017, sufficient to allow reliable catchment modelling. In some of the records, the stage measurements exceeded the rating curves and these should be reviewed in order to improve the quality of the data. The existing gauges should be maintained to allow continuous recordings.

It is essential that all catchment and inter sub-catchment transfers should be measured accurately, the most important being the transfers from the Theewaterskloof Dam to the Greater Cape Metropolitan Area and the releases and abstractions from the Greater Brandvlei Dam.

### 7.3 LAND-USE AND LAND COVER

Land-use data used in the hydrological modelling was obtained from aerial photography using GIS.

Irrigation is by far the largest user of water within the catchment. The irrigated crops were combined into four categories, i.e. orchards, vines, pastures and cash crops. Irrigated areas in the Upper and Middle Breede and Hex River Valley catchments were reduced to allow for those areas irrigated from groundwater sources. The areas irrigated from groundwater sources were based on estimates and should be determined accurately in order to enable the demands on the surface water resources to be assessed, especially in the Hex River Valley where groundwater sources contribute more than 50% of the irrigation water supplied.

The areas of afforestation and alien vegetation were also obtained from the aerial photography. Accurate identification from the aerial photography of alien vegetation with regard to species and density proved to be very difficult. Although accurate information on alien infestation was available from the CNC, only portions of the Basin were covered. Updated information should be available from the Working for Water Program and the CNC, once the entire Basin has been mapped.

Alien vegetation water demands were calculated using age-biomass models and a proportional flow reduction model for the relationships between biomass and flow reductions. The water use by the alien vegetation plants in the riverine area should be revised and verified, since the existing models could be under-estimating flow reduction due to riverine vegetation.

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# **APPENDIX A**

## **Patched Monthly Rainfall Data**

| Appendix A1                                                               |        |        |        |        |        |        |         |        |        |        |        |        |        |
|---------------------------------------------------------------------------|--------|--------|--------|--------|--------|--------|---------|--------|--------|--------|--------|--------|--------|
| File : 022038_8.PAT                                                       |        |        |        |        |        |        |         |        |        |        |        |        |        |
| Units : mm                                                                |        |        |        |        |        |        |         |        |        |        |        |        |        |
| Descrip. : Patched monthly rainfall for station 022038 8 for 1920 to 1998 |        |        |        |        |        |        |         |        |        |        |        |        |        |
| Year                                                                      | Oct    | Nov    | Dec    | Jan    | Feb    | Mar    | Apr     | May    | Jun    | Jul    | Aug    | Sep    | Total  |
| 1920                                                                      | 29.50+ | 29.50+ | 29.50+ | 30.70  | 52.60  | 13.20  | 71.40   | 12.70  | 295.10 | 124.80 | 104.20 | 46.60  | 839.8  |
| 1921                                                                      | 32.30  | 24.60  | 48.80  | 68.50  | 24.60  | 49.70  | 53.10   | 86.70  | 152.30 | 61.10  | 135.60 | 30.00  | 767.3  |
| 1922                                                                      | 22.90  | 25.40  | 2.50   | 20.30  | 2.60   | 9.10   | 95.40   | 237.40 | 192.30 | 103.70 | 102.10 | 76.90  | 890.6  |
| 1923                                                                      | 40.10  | 115.50 | 30.20  | 23.90  | 2.80   | 23.40  | 23.30   | 61.40  | 156.50 | 62.40  | 130.80 | 68.70  | 739.0  |
| 1924                                                                      | 68.10  | 74.50  | 2.50   | 26.20  | 8.10   | 6.40   | 12.30   | 73.10  | 301.70 | 175.70 | 44.80  | 32.90  | 826.3  |
| 1925                                                                      | 86.10  | 53.60  | 11.50  | 7.60   | 39.50  | 0.00   | 18.80   | 150.00 | 33.20  | 114.10 | 67.60  | 39.20  | 621.2  |
| 1926                                                                      | 133.50 | 16.90  | 0.00   | 8.60   | 48.70  | 1.30   | 62.60   | 87.90  | 97.80  | 64.20  | 132.10 | 31.00  | 684.6  |
| 1927                                                                      | 6.30   | 75.80  | 20.80  | 28.80  | 0.00   | 30.70  | 18.60   | 4.40   | 160.30 | 57.00  | 76.10  | 84.80  | 563.6  |
| 1928                                                                      | 17.00  | 14.20  | 24.60  | 0.00   | 3.80   | 22.80  | 75.70   | 169.10 | 99.00  | 142.50 | 73.70  | 37.10  | 679.5  |
| 1929                                                                      | 19.80  | 22.00  | 38.20  | 22.90  | 27.50  | 21.90  | 39.50   | 5.10   | 12.70  | 90.00  | 89.90  | 153.70 | 543.2  |
| 1930                                                                      | 37.90  | 42.70  | 14.00  | 0.00   | 36.70  | 0.00   | 110.80  | 107.30 | 49.40  | 66.20  | 155.60 | 120.80 | 741.4  |
| 1931                                                                      | 66.60  | 3.60   | 23.10  | 34.00  | 131.10 | 22.80  | 16.70   | 158.50 | 128.50 | 74.00  | 87.30  | 79.90  | 826.1  |
| 1932                                                                      | 20.50  | 11.20  | 25.60  | 21.10  | 19.60  | 17.20  | 15.70   | 85.00  | 227.20 | 127.10 | 75.30  | 26.30  | 671.8  |
| 1933                                                                      | 78.30  | 8.60   | 15.70  | 2.00   | 20.50  | 70.90  | 19.00   | 127.40 | 52.10  | 73.80  | 58.70  | 72.00  | 599.0  |
| 1934                                                                      | 49.80  | 65.10  | 6.40   | 3.00   | 14.70  | 34.10  | 86.30   | 107.60 | 53.30  | 124.50 | 111.10 | 88.10  | 744.0  |
| 1935                                                                      | 25.60  | 48.50  | 5.80   | 61.50  | 14.50  | 31.40  | 7.30    | 89.80  | 45.90  | 76.90  | 85.30  | 92.80  | 585.3  |
| 1936                                                                      | 23.60  | 20.60  | 54.60  | 13.50  | 0.00   | 115.90 | 61.20   | 99.00  | 186.70 | 145.30 | 53.60  | 31.80  | 895.8  |
| 1937                                                                      | 37.30  | 8.90   | 4.60   | 32.90  | 22.90  | 8.40   | 139.70  | 118.00 | 66.10  | 82.50  | 67.50  | 96.40  | 685.2  |
| 1938                                                                      | 30.40  | 25.50  | 15.70  | 0.00   | 39.80  | 9.70   | 61.50   | 122.50 | 50.50  | 78.50  | 124.40 | 61.20  | 619.7  |
| 1939                                                                      | 19.00  | 40.10  | 24.40  | 3.00   | 47.30  | 34.20  | 79.30   | 109.00 | 130.60 | 53.30  | 46.30  | 91.60  | 678.1  |
| 1940                                                                      | 35.90  | 67.60  | 17.30  | 59.20  | 26.10  | 8.90   | 156.80  | 191.00 | 191.60 | 95.30  | 135.80 | 174.60 | 1160.1 |
| 1941                                                                      | 44.70  | 16.70  | 41.50  | 10.60  | 2.50   | 2.80   | 19.60   | 216.20 | 252.00 | 65.00  | 130.00 | 31.90  | 833.5  |
| 1942                                                                      | 42.10  | 6.40   | 8.10   | 61.10  | 28.70  | 52.00  | 37.90   | 43.60  | 79.30  | 124.30 | 135.10 | 97.50  | 716.1  |
| 1943                                                                      | 31.30  | 54.10  | 0.00   | 21.40  | 0.30   | 10.90  | 51.80   | 159.30 | 221.30 | 88.20  | 122.30 | 69.80  | 830.7  |
| 1944                                                                      | 71.80  | 51.30  | 52.60  | 0.00   | 0.80   | 7.40   | 66.10   | 190.70 | 215.80 | 160.00 | 97.80  | 16.00  | 930.3  |
| 1945                                                                      | 35.90  | 24.90  | 13.40  | 5.50   | 1.30   | 37.50  | 86.70   | 108.20 | 72.30  | 93.70  | 89.80  | 127.30 | 696.5  |
| 1946                                                                      | 84.50  | 27.20  | 16.30  | 0.00   | 0.00   | 70.10  | 31.30   | 86.10  | 60.60  | 147.60 | 90.20  | 35.90  | 649.8  |
| 1947                                                                      | 28.70  | 23.20  | 4.10   | 6.80   | 13.50  | 46.90  | 45.30   | 95.30  | 68.90  | 147.60 | 80.40  | 90.40  | 651.1  |
| 1948                                                                      | 82.60  | 13.40  | 31.00  | 6.90   | 0.80   | 9.20   | 94.60   | 66.00  | 83.30  | 117.70 | 113.20 | 66.10  | 684.8  |
| 1949                                                                      | 61.70  | 58.90  | 14.20  | 3.50   | 0.00   | 12.40  | 132.30  | 19.00  | 69.90  | 223.20 | 20.60  | 111.80 | 727.5  |
| 1950                                                                      | 30.50  | 71.90  | 36.40  | 27.90  | 1.80   | 0.00   | 187.40+ | 84.50  | 199.80 | 106.50 | 84.20  | 51.80  | 882.7  |
| 1951                                                                      | 38.10  | 68.60  | 0.00   | 0.80   | 11.10  | 25.10  | 52.80   | 112.20 | 72.10  | 107.80 | 200.20 | 152.80 | 841.6  |
| 1952                                                                      | 43.70  | 106.60 | 7.60   | 5.80   | 6.90   | 23.70  | 201.80  | 194.80 | 69.40  | 152.30 | 154.70 | 9.50   | 976.8  |
| 1953                                                                      | 12.80  | 48.70  | 25.10  | 16.60  | 27.00  | 32.20  | 110.80  | 251.60 | 82.90  | 208.80 | 146.70 | 34.80  | 998.0  |
| 1954                                                                      | 57.80  | 8.40   | 40.80  | 1.20   | 73.90  | 19.50  | 46.30   | 41.70  | 131.70 | 188.20 | 195.60 | 28.20  | 833.3  |
| 1955                                                                      | 68.90  | 50.50  | 15.70  | 1.80   | 9.70   | 27.20  | 50.60   | 121.40 | 171.40 | 122.00 | 136.50 | 23.20  | 798.9  |
| 1956                                                                      | 28.90  | 4.50   | 26.80  | 17.20  | 93.90  | 30.70  | 51.40   | 227.60 | 126.90 | 168.30 | 95.90  | 62.20  | 934.3  |
| 1957                                                                      | 124.80 | 12.10  | 0.00   | 18.80  | 84.60  | 25.10  | 42.90   | 149.70 | 89.60  | 20.20  | 0.00   | 48.30  | 616.1  |
| 1958                                                                      | 50.30  | 62.40  | 0.00   | 27.00  | 19.50  | 20.10  | 148.30  | 347.20 | 25.70  | 17.80  | 83.80  | 46.50  | 848.6  |
| 1959                                                                      | 53.40  | 3.90   | 16.30  | 7.50   | 15.30+ | 52.00  | 56.20   | 138.10 | 145.40 | 36.00  | 42.70  | 28.50  | 595.3  |
| 1960                                                                      | 51.20  | 3.70   | 18.70  | 49.50  | 8.70   | 15.20  | 35.90   | 87.40  | 163.50 | 66.90  | 107.60 | 143.50 | 751.8  |
| 1961                                                                      | 39.50  | 0.00   | 10.10  | 18.30  | 55.00  | 34.30  | 93.30   | 36.30  | 350.10 | 89.10  | 167.10 | 41.60  | 934.7  |
| 1962                                                                      | 123.50 | 22.50  | 4.30   | 17.60  | 8.90   | 7.20   | 13.30   | 42.80  | 67.10  | 154.30 | 145.30 | 49.30  | 656.1  |
| 1963                                                                      | 17.70  | 46.90  | 49.20  | 0.30   | 102.90 | 7.90   | 32.20   | 67.70  | 128.10 | 102.50 | 103.10 | 35.30  | 693.8  |
| 1964                                                                      | 54.50  | 83.90  | 15.30  | 33.60  | 34.30  | 97.90  | 63.10   | 122.90 | 52.60  | 50.20  | 75.40  | 31.60  | 715.3  |
| 1965                                                                      | 43.60  | 5.40   | 38.60  | 4.70   | 12.60  | 92.60  | 32.70   | 52.20  | 114.20 | 163.30 | 46.90  | 61.40  | 668.2  |
| 1966                                                                      | 6.50   | 16.70  | 6.80   | 14.00  | 0.80   | 11.40  | 109.90  | 76.70  | 182.80 | 17.80  | 60.20  | 46.20  | 549.8  |
| 1967                                                                      | 66.10  | 50.80  | 4.50   | 39.80  | 8.00   | 2.90   | 141.40  | 139.30 | 112.50 | 192.80 | 73.40  | 9.80   | 841.3  |
| 1968                                                                      | 89.40  | 23.00  | 28.10  | 43.80  | 7.80   | 18.10  | 73.70   | 16.20  | 100.20 | 58.00  | 110.90 | 76.80  | 646.0  |
| 1969                                                                      | 26.60  | 7.90   | 6.00   | 6.30   | 21.20  | 5.10   | 6.80    | 147.60 | 186.00 | 91.40  | 93.50  | 59.70  | 658.1  |
| 1970                                                                      | 33.40  | 22.30  | 33.60  | 7.70   | 3.50   | 32.60  | 9.60    | 43.00  | 28.20  | 97.80  | 147.30 | 25.90  | 484.9  |
| 1971                                                                      | 20.60  | 4.20   | 24.30  | 29.00  | 29.10  | 28.20  | 81.00   | 101.40 | 68.50  | 78.30  | 69.90+ | 43.10  | 577.6  |
| 1972                                                                      | 36.80  | 0.00   | 72.20  | 2.10   | 0.00   | 68.50  | 10.50   | 76.30  | 21.00  | 213.90 | 89.60  | 60.40  | 651.3  |
| 1973                                                                      | 30.40  | 20.70  | 75.80  | 6.40   | 5.00   | 13.40  | 2.40    | 172.60 | 164.70 | 72.50  | 301.20 | 66.30  | 931.4  |
| 1974                                                                      | 109.40 | 32.60  | 8.50   | 24.20  | 13.50  | 3.20   | 32.60   | 222.10 | 79.80  | 142.00 | 52.90  | 15.20  | 736.0  |
| 1975                                                                      | 66.80  | 44.20  | 8.20   | 0.00   | 3.80   | 22.20  | 44.80   | 59.80  | 297.60 | 106.20 | 64.80  | 65.00  | 783.4  |
| 1976                                                                      | 40.30  | 117.00 | 57.20  | 39.50  | 44.10  | 24.70  | 98.80+  | 199.00 | 182.30 | 185.40 | 164.90 | 74.50  | 1227.7 |
| 1977                                                                      | 34.50  | 20.20  | 42.40  | 19.80  | 30.10  | 49.50  | 79.70   | 68.80  | 14.20  | 17.70  | 147.20 | 76.90  | 601.0  |
| 1978                                                                      | 28.80  | 8.30   | 40.70  | 24.80  | 77.50  | 10.00  | 11.30+  | 140.30 | 93.20  | 65.00  | 94.20  | 63.20  | 657.3  |
| 1979                                                                      | 103.80 | 24.00  | 1.10   | 42.00  | 28.70  | 0.00   | 74.80   | 158.50 | 119.50 | 59.30+ | 94.60  | 31.90  | 738.2  |
| 1980                                                                      | 26.30  | 112.60 | 62.80  | 112.10 | 7.80   | 39.30  | 44.20   | 33.00  | 90.10  | 155.50 | 129.80 | 128.30 | 941.8  |
| 1981                                                                      | 20.00  | 14.70  | 29.00  | 29.20  | 4.70   | 19.30  | 115.80  | 96.50  | 147.30 | 78.00  | 66.30  | 20.80  | 641.6  |
| 1982                                                                      | 74.00  | 30.30  | 48.50  | 10.70  | 57.50  | 55.30  | 26.40   | 192.90 | 197.40 | 103.10 | 41.40  | 90.30  | 927.8  |
| 1983                                                                      | 10.00  | 36.10  | 24.60  | 7.80   | 3.20   | 98.60  | 32.00   | 252.30 | 59.70  | 84.20  | 45.50  | 122.10 | 776.1  |
| 1984                                                                      | 81.80  | 0.50   | 82.20  | 41.50  | 40.50  | 86.50  | 86.20   | 57.50  | 171.10 | 164.30 | 105.60 | 60.50  | 978.2  |
| 1985                                                                      | 14.10  | 9.00   | 11.30  | 21.50  | 15.10  | 55.00  | 80.00   | 63.80  | 174.20 | 141.40 | 143.80 | 59.00  | 788.2  |
| 1986                                                                      | 6.20   | 17.50  | 11.50  | 71.20  | 18.30  | 31.20  | 56.20   | 113.70 | 107.20 | 127.40 | 128.10 | 88.70  | 777.2  |
| 1987                                                                      | 27.20  | 11.70  | 59.90  | 0.00   | 0.00   | 16.00  | 99.70   | 77.50  | 97.60  | 108.00 | 126.80 | 75.20  | 699.6  |
| 1988                                                                      | 22.50  | 13.70  | 24.00  | 9.40   | 40.00  | 101.00 | 67.50   | 98.10  | 103.40 | 153.70 | 140.90 | 110.00 | 884.2  |
| 1989                                                                      | 43.30  | 68.50  | 4.00   | 20.50  | 48.50  | 0.00   | 179.80  | 110.70 | 162.70 | 192.70 | 65.00  | 32.20  | 927.9  |
| 1990                                                                      | 1.90   | 33.00  | 59.50  | 10.00  | 18.00  | 4.30   | 28.00   | 118.50 | 187.90 | 400.30 | 62.10  | 107.30 | 1030.8 |
| 1991                                                                      | 47.30  | 14.90  | 16.30  | 0.80   | 35.20  | 41.50  | 47.10   | 113.60 | 276.10 | 112.60 | 85.70  | 72.60  | 863.7  |
| 1992                                                                      | 126.20 | 15.20  | 3.10   | 10.70  | 28.90  | 6.50   | 177.10  | 169.50 | 115.50 | 178.10 | 80.10  | 26.10  | 937.0  |
| 1993                                                                      | 4.60   | 7.00   | 21.70  | 15.00  | 4.50   | 9.20   | 75.90   | 40.60  | 271.00 |        |        |        |        |

| Appendix A2                                                               |        |        |        |        |        |        |        |         |         |        |         |        |        |
|---------------------------------------------------------------------------|--------|--------|--------|--------|--------|--------|--------|---------|---------|--------|---------|--------|--------|
| File : 022113_2.NSP                                                       |        |        |        |        |        |        |        |         |         |        |         |        |        |
| Units : mm                                                                |        |        |        |        |        |        |        |         |         |        |         |        |        |
| Descrip. : Patched monthly rainfall for station 022113 2 for 1920 to 1998 |        |        |        |        |        |        |        |         |         |        |         |        |        |
| Year                                                                      | Oct    | Nov    | Dec    | Jan    | Feb    | Mar    | Apr    | May     | Jun     | Jul    | Aug     | Sep    | Total  |
| 1920                                                                      | 67.10  | 20.50  | 33.00  | 41.20  | 30.50  | 25.90  | 45.20  | 8.90    | 376.80  | 142.60 | 114.30  | 53.50  | 959.5  |
| 1921                                                                      | 24.10  | 16.00  | 46.50  | 77.00  | 13.40  | 56.40  | 36.50  | 75.90   | 233.40  | 55.80  | 137.40  | 54.30  | 826.7  |
| 1922                                                                      | 20.20  | 23.40  | 16.50  | 21.90  | 0.50   | 12.20  | 76.50  | 196.30  | 240.60  | 129.60 | 94.40   | 69.40  | 901.5  |
| 1923                                                                      | 41.60  | 149.00 | 6.80   | 12.50  | 0.00   | 35.50  | 24.40  | 102.10  | 158.10  | 66.30  | 125.70  | 68.10  | 790.1  |
| 1924                                                                      | 69.00  | 78.50  | 1.30   | 39.30  | 0.00   | 0.00   | 28.00  | 89.60   | 354.80  | 151.30 | 83.60   | 21.80  | 917.2  |
| 1925                                                                      | 73.60  | 53.30+ | 19.30  | 9.40   | 37.60  | 3.80   | 28.90  | 168.20  | 70.10   | 135.10 | 109.40  | 43.40  | 752.1  |
| 1926                                                                      | 143.90 | 24.90  | 0.00   | 3.80   | 57.90  | 2.10   | 56.60  | 105.40  | 68.60   | 87.60  | 127.90  | 47.40  | 726.1  |
| 1927                                                                      | 5.00   | 74.50  | 45.40  | 27.70  | 0.00   | 40.90  | 28.50  | 5.00    | 284.90  | 115.30 | 89.10   | 101.20 | 817.5  |
| 1928                                                                      | 16.50  | 20.10  | 27.40  | 0.00   | 7.10   | 8.40   | 85.50  | 110.70  | 67.60   | 144.20 | 98.70   | 31.60  | 617.8  |
| 1929                                                                      | 27.90  | 22.50  | 37.00  | 26.70  | 24.70  | 57.60  | 30.20  | 0.00    | 20.60   | 122.90 | 119.80  | 189.40 | 679.3  |
| 1930                                                                      | 42.50  | 56.80  | 17.30  | 0.00   | 29.20  | 6.20+  | 82.00  | 42.70   | 32.00   | 65.40  | 105.60  | 72.00  | 551.7  |
| 1931                                                                      | 88.20  | 0.00   | 9.20   | 11.20  | 54.90  | 9.40   | 8.90   | 147.40  | 97.00   | 86.10  | 61.60   | 61.00  | 634.9  |
| 1932                                                                      | 16.50  | 0.80   | 13.20  | 9.60   | 15.90  | 7.90   | 8.30   | 78.00   | 151.20  | 88.10  | 81.00   | 16.30  | 486.8  |
| 1933                                                                      | 42.40  | 3.00   | 0.00   | 4.40   | 14.00  | 28.00  | 8.10   | 117.80  | 46.70   | 61.60  | 41.40   | 52.70  | 420.1  |
| 1934                                                                      | 52.90  | 26.20  | 7.10   | 7.90   | 27.20  | 31.80  | 88.10  | 106.10  | 57.80   | 100.00 | 57.00   | 48.80  | 610.9  |
| 1935                                                                      | 9.40   | 28.50  | 7.50+  | 61.00  | 18.50+ | 16.00  | 5.40   | 61.50   | 50.70   | 65.30  | 109.20  | 84.80  | 517.8  |
| 1936                                                                      | 18.80  | 13.20  | 61.70  | 23.60  | 1.60   | 49.50  | 82.10  | 121.70  | 252.10  | 162.80 | 49.10   | 42.70  | 878.9  |
| 1937                                                                      | 37.70  | 7.80   | 1.80   | 45.70  | 18.10  | 11.10  | 95.90  | 104.90  | 54.60   | 92.60  | 72.50   | 112.70 | 655.4  |
| 1938                                                                      | 31.90  | 76.00  | 15.30  | 0.00   | 64.40  | 13.00  | 78.40  | 203.90  | 35.30   | 73.50  | 132.40  | 49.60  | 773.7  |
| 1939                                                                      | 16.40  | 50.60  | 61.00  | 5.60   | 83.10  | 39.50  | 84.00+ | 110.20  | 162.10  | 88.50  | 81.30   | 73.30  | 855.6  |
| 1940                                                                      | 56.30  | 92.40  | 17.00  | 67.80  | 12.00  | 15.50  | 214.00 | 168.90  | 161.90  | 152.00 | 122.70  | 219.60 | 1300.1 |
| 1941                                                                      | 70.80  | 14.80  | 36.00  | 16.10  | 3.30   | 5.10   | 26.40  | 174.50  | 325.80  | 71.70  | 171.00  | 26.50  | 942.0  |
| 1942                                                                      | 39.50  | 0.00   | 10.30  | 24.60  | 11.50  | 50.80  | 52.00  | 36.50   | 75.60   | 98.00  | 154.80  | 60.20  | 613.8  |
| 1943                                                                      | 52.70  | 53.70  | 0.00   | 15.30  | 0.00   | 13.70  | 54.80+ | 156.20  | 270.50  | 176.80 | 151.50  | 63.80  | 1009.0 |
| 1944                                                                      | 82.60  | 53.50  | 57.40  | 0.00   | 0.00   | 3.30   | 68.80  | 257.90  | 316.60  | 331.40 | 143.80  | 10.80  | 1326.1 |
| 1945                                                                      | 38.10  | 28.40  | 25.90  | 8.30   | 30.50  | 40.70  | 59.70  | 97.60   | 32.00   | 86.10  | 111.90  | 153.10 | 712.3  |
| 1946                                                                      | 113.10 | 19.90  | 8.90   | 0.00   | 0.00   | 77.20  | 39.30  | 137.90  | 61.80   | 271.90 | 111.90  | 21.70  | 863.6  |
| 1947                                                                      | 85.10  | 15.00  | 0.00   | 2.30   | 12.70  | 12.00  | 25.90  | 138.80  | 101.40  | 151.60 | 83.80   | 147.20 | 775.8  |
| 1948                                                                      | 80.10  | 11.70  | 20.80  | 7.30   | 0.00   | 7.10   | 81.00  | 59.60   | 83.80   | 116.60 | 116.70  | 78.30  | 663.0  |
| 1949                                                                      | 62.20  | 52.80  | 10.20  | 0.30   | 0.00   | 2.10   | 156.20 | 20.10   | 67.60   | 276.10 | 26.80   | 133.50 | 807.9  |
| 1950                                                                      | 39.80  | 101.70 | 44.10  | 40.40  | 2.30   | 0.30   | 172.00 | 58.00   | 281.40  | 126.80 | 85.70   | 76.40  | 1028.9 |
| 1951                                                                      | 47.50  | 50.70  | 0.00   | 0.00   | 9.70   | 34.10  | 93.50  | 106.30  | 71.10   | 100.40 | 207.30  | 178.50 | 899.1  |
| 1952                                                                      | 50.90  | 99.60  | 3.10   | 6.20   | 2.50   | 21.10  | 213.40 | 163.30  | 64.00   | 151.40 | 96.90   | 14.50  | 886.9  |
| 1953                                                                      | 29.70  | 64.00  | 12.40  | 11.00  | 18.60  | 36.50  | 139.40 | 256.90  | 134.10  | 228.50 | 142.80  | 29.50  | 1103.4 |
| 1954                                                                      | 55.50  | 15.90  | 34.00  | 0.00   | 131.40 | 12.50  | 44.60  | 26.10   | 71.00   | 197.20 | 232.30  | 35.00  | 855.5  |
| 1955                                                                      | 76.30  | 81.00  | 16.00  | 10.50  | 5.00   | 31.30  | 82.40  | 146.30  | 239.50  | 180.00 | 218.50  | 91.50  | 1178.3 |
| 1956                                                                      | 46.90  | 4.50   | 24.00  | 6.00   | 74.00  | 44.00  | 55.00  | 349.50  | 181.40  | 193.20 | 149.80  | 49.50  | 1177.8 |
| 1957                                                                      | 125.00 | 5.50   | 0.00   | 11.50  | 58.20  | 35.80  | 31.90  | 173.90  | 68.00   | 21.00  | 99.00   | 33.50  | 663.3  |
| 1958                                                                      | 36.70  | 40.00  | 0.00   | 14.50  | 10.50  | 20.80  | 121.50 | 222.70  | 30.80   | 23.10  | 90.50   | 21.80  | 632.9  |
| 1959                                                                      | 57.00  | 1.00   | 12.80  | 13.50  | 6.20   | 33.00  | 40.50  | 74.20   | 163.10  | 30.30  | 24.60   | 13.40  | 469.6  |
| 1960                                                                      | 32.30  | 0.00   | 10.90  | 27.30  | 10.00  | 3.60   | 23.70  | 81.60   | 144.80  | 63.80  | 110.60  | 148.70 | 657.3  |
| 1961                                                                      | 26.00  | 0.00   | 25.90  | 11.80  | 41.00  | 61.50  | 105.00 | 43.20   | 345.20  | 107.00 | 203.60  | 56.80  | 1027.0 |
| 1962                                                                      | 126.70 | 13.80  | 1.50   | 51.60  | 0.00   | 4.60   | 20.50  | 43.20   | 73.30   | 187.00 | 181.50  | 35.50  | 739.2  |
| 1963                                                                      | 15.50  | 54.50  | 51.00  | 2.50   | 85.20  | 9.00   | 50.20  | 113.00  | 156.70  | 103.50 | 116.00  | 22.00  | 779.1  |
| 1964                                                                      | 65.50  | 52.00  | 11.50  | 61.00  | 58.50  | 110.50 | 91.50  | 215.50  | 81.50   | 54.00  | 95.50   | 41.80  | 938.8  |
| 1965                                                                      | 31.50  | 14.00  | 55.50  | 4.50   | 9.80   | 138.30 | 43.50  | 68.50   | 102.50  | 161.40 | 112.10  | 54.70  | 796.3  |
| 1966                                                                      | 2.70   | 22.70  | 24.50  | 18.70  | 1.00   | 11.60  | 151.50 | 86.00   | 198.70  | 59.50  | 46.00   | 58.70  | 681.6  |
| 1967                                                                      | 58.90  | 60.50  | 1.30   | 46.30  | 15.30  | 0.00   | 109.70 | 140.40+ | 151.50  | 149.80 | 91.70   | 14.80  | 840.2  |
| 1968                                                                      | 116.80 | 22.50  | 30.00  | 56.50  | 13.60  | 17.20  | 57.40  | 11.50   | 117.50  | 112.60 | 110.00  | 109.40 | 775.0  |
| 1969                                                                      | 79.20  | 6.70   | 1.00   | 11.10  | 26.60  | 1.70   | 2.50   | 173.10  | 204.30  | 125.80 | 157.50  | 73.90  | 863.4  |
| 1970                                                                      | 36.50  | 39.00  | 46.60  | 0.30   | 0.00   | 27.50  | 12.00  | 55.00   | 103.00  | 161.20 | 151.10  | 23.10  | 655.3  |
| 1971                                                                      | 22.50  | 2.90   | 40.00  | 29.70  | 15.60  | 8.90   | 121.80 | 78.00   | 96.40   | 47.20  | 75.20   | 56.50  | 594.7  |
| 1972                                                                      | 19.30  | 0.00   | 27.20  | 0.00   | 0.00   | 37.30  | 15.50  | 60.90   | 25.90   | 176.40 | 84.10   | 67.50  | 514.1  |
| 1973                                                                      | 33.10  | 13.50  | 73.70  | 8.40   | 3.90   | 9.20   | 2.00   | 141.10  | 169.50  | 82.20  | 268.40  | 112.20 | 917.2  |
| 1974                                                                      | 95.20  | 60.60  | 11.00  | 18.00  | 12.00  | 8.50   | 34.00  | 207.00  | 110.00  | 231.50 | 94.30   | 27.50  | 909.6  |
| 1975                                                                      | 43.10  | 37.00  | 3.00   | 0.00   | 2.30   | 36.50  | 40.50  | 38.00   | 314.00  | 199.00 | 90.00   | 55.00  | 858.4  |
| 1976                                                                      | 19.00  | 121.50 | 29.80  | 26.50  | 59.50  | 21.00  | 198.00 | 281.50  | 340.00  | 320.00 | 169.70* | 86.00  | 1672.5 |
| 1977                                                                      | 39.90  | 25.00  | 21.50  | 19.00  | 17.60  | 48.80  | 32.80  | 67.00   | 21.90   | 42.80  | 183.10  | 38.70  | 558.1  |
| 1978                                                                      | 92.70  | 7.00   | 44.10  | 27.50  | 68.50  | 10.00  | 39.00  | 138.20  | 144.80  | 82.80  | 93.40   | 92.50  | 840.5  |
| 1979                                                                      | 121.00 | 0.00   | 0.00   | 31.50  | 55.50  | 45.00  | 72.50  | 128.20  | 160.00  | 26.50  | 108.20  | 80.00  | 828.4  |
| 1980                                                                      | 60.80  | 68.50  | 74.00  | 70.00  | 25.00  | 68.50  | 56.00  | 40.20   | 92.40   | 187.60 | 74.90   | 76.70  | 894.6  |
| 1981                                                                      | 66.60  | 28.00  | 12.00  | 29.50  | 0.00   | 15.00  | 75.50  | 89.60+  | 94.50   | 170.00 | 62.00   | 30.00  | 672.7  |
| 1982                                                                      | 57.80  | 33.70  | 53.30  | 7.70   | 56.10  | 40.40  | 15.90  | 182.50  | 217.90+ | 98.80  | 58.30   | 137.20 | 959.6  |
| 1983                                                                      | 16.60  | 12.50  | 25.50  | 25.60  | 0.00   | 79.80  | 65.70  | 249.80  | 45.90   | 128.50 | 51.10   | 141.80 | 842.8  |
| 1984                                                                      | 97.60  | 1.30   | 108.30 | 37.00  | 46.70  | 102.30 | 94.90  | 53.70   | 219.20  | 207.10 | 96.70   | 85.70  | 1150.5 |
| 1985                                                                      | 41.50  | 11.80  | 12.20  | 15.20  | 19.00  | 83.00  | 58.70  | 51.50   | 209.00  | 147.90 | 251.80  | 59.40  | 961.0  |
| 1986                                                                      | 16.20  | 17.90  | 7.70   | 64.20  | 26.40  | 22.30  | 56.80  | 158.10  | 197.70  | 124.60 | 157.40  | 107.80 | 957.1  |
| 1987                                                                      | 27.80  | 21.60  | 50.10  | 20.70+ | 23.30+ | 31.90+ | 64.30+ | 117.80  | 67.70   | 117.80 | 108.00  | 78.30  | 729.3  |
| 1988                                                                      | 28.30  | 8.50   | 18.90  | 4.50   | 38.50  | 131.20 | 74.20  | 122.20  | 99.00   | 126.90 | 114.60  | 68.80  | 835.6  |
| 1989                                                                      | 45.20  | 60.00  | 3.00   | 20.20  | 36.00  | 4.80   | 180.20 | 105.60  | 174.60  | 208.10 | 73.40   | 34.50  | 945.6  |
| 1990                                                                      | 2.80   | 29.10  | 44.90  | 3.50   | 8.00   | 5.80   | 34.40  | 107.60  | 205.20  | 300.80 | 67.90   | 108.00 | 918.0  |
| 1991                                                                      | 43.30  | 17.00  | 3.00   | 0.20   | 32.20  | 29.80  | 47.00  | 105.50  | 313.30  | 121.90 | 84.30   | 72.70  | 870.2  |
| 1992                                                                      | 104.10 | 24.40  | 2.00   | 9.00   | 27.60  | 5.70   | 177.60 | 176.70  | 134.00  | 187.40 | 98.30   | 26.60  | 973.4  |
| 1993                                                                      | 7.60   | 7.00   | 22.30  | 10.00  | 2.00   | 8.60   | 76.0   |         |         |        |         |        |        |



## Appendix A3

File : 22264P.PAT  
 Units : mm  
 Descrip. : Patched monthly rainfall for station 022264 p for 1959 to 1975

| Year  | Oct    | Nov    | Dec    | Jan   | Feb    | Mar    | Apr    | May    | Jun     | Jul     | Aug    | Sep    | Total |
|-------|--------|--------|--------|-------|--------|--------|--------|--------|---------|---------|--------|--------|-------|
| 1959  | 60.10+ | 10.40+ | 18.50+ | 20.90 | 10.20  | 35.70  | 36.40  | 120.80 | 180.80  | 42.60   | 36.60  | 38.90  | 611.9 |
| 1960  | 64.30  | 4.70   | 31.30  | 56.20 | 26.40  | 18.60  | 41.40  | 70.60  | 101.10  | 74.70   | 89.20  | 133.90 | 712.4 |
| 1961  | 51.80  | 0.40   | 19.60  | 17.40 | 33.80  | 58.90  | 85.40  | 35.90  | 287.50  | 91.90   | 214.20 | 53.80  | 950.6 |
| 1962  | 161.40 | 29.20  | 5.30   | 33.10 | 5.00   | 11.90  | 24.40  | 65.40  | 80.90   | 213.90  | 132.60 | 25.30  | 788.4 |
| 1963  | 29.10  | 10.20  | 50.40  | 4.40  | 55.90  | 1.00   | 95.60  | 65.10  | 142.90  | 82.60   | 121.90 | 36.00  | 695.1 |
| 1964  | 34.50  | 69.50  | 2.50   | 64.50 | 45.00  | 77.50  | 91.50  | 191.50 | 72.50   | 140.00  | 83.00  | 28.00  | 900.0 |
| 1965  | 48.50  | 28.50  | 69.80  | 5.50  | 16.50  | 118.80 | 34.30  | 70.00  | 129.80  | 126.80  | 122.20 | 62.50  | 833.2 |
| 1966  | 6.00   | 2.80   | 27.00  | 12.50 | 2.30   | 6.50   | 154.30 | 99.00  | 173.00  | 66.30   | 51.50  | 47.80  | 649.0 |
| 1967  | 68.50  | 53.80  | 87.50  | 45.00 | 18.00  | 2.00   | 90.20  | 144.60 | 195.80  | 157.00  | 103.30 | 18.70+ | 984.4 |
| 1968  | 127.40 | 26.30  | 35.60  | 38.70 | 28.80  | 23.00  | 74.60  | 10.00  | 118.50  | 111.00  | 126.10 | 122.20 | 842.2 |
| 1969  | 88.20  | 16.60  | 2.10   | 14.40 | 32.50  | 4.90   | 5.80   | 149.10 | 175.50  | 136.90  | 162.50 | 72.70  | 861.2 |
| 1970  | 46.20  | 40.60  | 37.20  | 11.50 | 8.40   | 27.30  | 22.90  | 78.00  | 103.40  | 148.10  | 156.00 | 30.10  | 709.7 |
| 1971  | 22.00  | 18.10  | 38.50  | 38.10 | 57.80  | 29.10  | 80.50  | 76.80  | 99.70   | 59.40   | 102.10 | 59.30  | 681.4 |
| 1972  | 17.80  | 0.30   | 28.10  | 8.90  | 20.30  | 27.60  | 23.50  | 73.00  | 52.30   | 165.60  | 74.50  | 66.40  | 558.3 |
| 1973  | 22.50  | 22.10  | 50.30  | 12.00 | 2.20   | 21.20  | 7.30   | 160.20 | 247.10  | 100.90  | 239.90 | 89.10  | 974.8 |
| 1974  | 96.70  | 64.20  | 10.20  | 27.70 | 11.60  | 12.20  | 46.70  | 226.20 | 118.20  | 162.90  | 95.30  | 20.10  | 892.0 |
| 1975  | 58.70  | 34.50  | 1.90   | 0.00+ | 11.20+ | 34.40+ | 48.70+ | 41.90+ | 281.90+ | 170.90+ | 94.60+ | 55.90+ | 834.6 |
| AVE : | 59.04  | 25.42  | 30.34  | 24.16 | 22.70  | 30.04  | 56.68  | 98.71  | 150.64  | 120.68  | 117.97 | 56.51  | 792.9 |
| SD :  | 40.76  | 21.49  | 24.31  | 18.94 | 17.56  | 30.36  | 39.30  | 58.23  | 70.64   | 47.07   | 52.66  | 33.38  | 130.0 |

Appendix A4

File : 22284A.PAT  
Units : mm

Descrip. : Patched monthly rainfall for station 022284 p for 1970 to 1983

| Year  | Oct    | Nov    | Dec    | Jan    | Feb   | Mar   | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Total  |
|-------|--------|--------|--------|--------|-------|-------|--------|--------|--------|--------|--------|--------|--------|
| 1970  | 29.60+ | 16.00+ | 10.80+ | 5.00   | 1.00  | 35.40 | 4.70   | 57.00  | 93.30  | 212.40 | 145.30 | 3.00   | 613.5  |
| 1971  | 16.70  | 4.50   | 19.00  | 43.40  | 11.00 | 17.60 | 57.50  | 176.70 | 67.20  | 53.40  | 49.90  | 42.20  | 559.1  |
| 1972  | 18.90  | 0.00   | 21.30  | 2.90   | 0.00  | 27.50 | 5.40   | 15.30  | 7.60   | 725.90 | 82.00  | 88.70  | 995.5  |
| 1973  | 36.10  | 7.10   | 49.70  | 1.10   | 7.30  | 1.10  | 0.00   | 49.70  | 394.30 | 102.10 | 828.20 | 57.20  | 1533.9 |
| 1974  | 61.20  | 40.60  | 13.60  | 25.50  | 17.00 | 5.40  | 163.90 | 284.10 | 72.30  | 151.20 | 139.60 | 47.30  | 1021.7 |
| 1975  | 72.20  | 13.90  | 0.00   | 0.00   | 18.00 | 42.50 | 23.60  | 64.10  | 382.10 | 98.10  | 42.10  | 34.60  | 791.2  |
| 1976  | 12.40  | 263.20 | 90.30  | 51.30  | 30.10 | 5.40  | 133.40 | 245.00 | 313.30 | 330.10 | 422.20 | 30.20  | 1926.9 |
| 1977  | 16.20  | 15.30  | 38.10  | 18.50  | 6.30  | 62.60 | 59.20  | 47.90  | 10.20  | 14.00  | 226.50 | 84.40  | 599.2  |
| 1978  | 8.90   | 6.10   | 37.10  | 12.40  | 52.90 | 1.20  | 6.10   | 203.60 | 314.50 | 85.80  | 170.10 | 117.50 | 1016.2 |
| 1979  | 100.20 | 1.10   | 0.00   | 41.10  | 2.50  | 0.00  | 38.60  | 112.50 | 83.20  | 91.40  | 171.50 | 26.40  | 668.5  |
| 1980  | 44.20  | 183.80 | 29.80  | 114.10 | 1.50  | 16.30 | 14.70  | 11.90  | 49.20  | 352.50 | 158.40 | 325.10 | 1301.5 |
| 1981  | 22.20  | 14.30  | 7.20   | 18.50  | 0.00  | 15.90 | 92.10  | 66.20  | 71.10  | 126.00 | 92.90  | 20.40  | 546.8  |
| 1982  | 73.50  | 19.00  | 43.70  | 0.40   | 23.70 | 62.00 | 38.80  | 257.40 | 316.00 | 413.00 | 46.30  | 73.90  | 1367.7 |
| 1983  | 4.70   | 7.60   | 3.80   | 5.20   | 0.00  | 72.40 | 56.20  | 420.10 | 158.30 | 195.20 | 153.20 | 255.70 | 1332.4 |
| AVE : | 36.93  | 42.32  | 26.03  | 24.24  | 12.24 | 26.09 | 49.59  | 143.68 | 166.61 | 210.79 | 194.87 | 86.19  | 1019.6 |
| SD :  | 29.20  | 78.96  | 24.73  | 31.07  | 15.21 | 25.08 | 50.03  | 123.00 | 143.53 | 190.02 | 206.27 | 92.76  | 424.2  |

| Appendix A5                                                               |        |        |        |        |        |        |        |        |         |         |         |         |        |
|---------------------------------------------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|---------|--------|
| File : 022368_4.PAT                                                       |        |        |        |        |        |        |        |        |         |         |         |         |        |
| Units : mm                                                                |        |        |        |        |        |        |        |        |         |         |         |         |        |
| Descrip. : Patched monthly rainfall for station 022368 4 for 1932 to 1977 |        |        |        |        |        |        |        |        |         |         |         |         |        |
| Year                                                                      | Oct    | Nov    | Dec    | Jan    | Feb    | Mar    | Apr    | May    | Jun     | Jul     | Aug     | Sep     | Total  |
| 1932                                                                      | 26.90  | 5.10   | 36.90  | 24.60  | 55.70  | 14.00  | 4.60   | 112.10 | 372.00  | 238.90  | 92.40   | 44.90   | 1028.1 |
| 1933                                                                      | 87.90  | 1.00   | 18.30  | 7.60   | 16.50  | 30.00  | 8.60   | 104.90 | 126.30  | 71.60   | 108.20  | 111.00  | 691.9  |
| 1934                                                                      | 113.40 | 33.60  | 0.50   | 4.90   | 24.40  | 43.00  | 67.10  | 132.10 | 106.80  | 136.20  | 132.30  | 102.10  | 896.4  |
| 1935                                                                      | 13.00  | 53.30  | 0.30   | 48.10  | 15.30  | 4.10   | 5.10   | 128.20 | 51.10   | 188.40  | 198.60  | 84.90   | 790.4  |
| 1936                                                                      | 18.50  | 52.80  | 103.10 | 8.40   | 0.50   | 93.00  | 90.70  | 155.50 | 294.00  | 244.50  | 42.10   | 18.30   | 1121.4 |
| 1937                                                                      | 19.70  | 1.30   | 24.80  | 162.40 | 20.10  | 7.60   | 50.50  | 210.70 | 81.60   | 114.50  | 109.50  | 86.50   | 889.2  |
| 1938                                                                      | 34.80  | 26.70  | 16.70  | 0.00   | 43.50  | 12.00  | 66.90  | 157.60 | 40.10   | 70.10   | 166.60  | 96.10   | 731.1  |
| 1939                                                                      | 6.30   | 50.80  | 10.70  | 5.60   | 37.10  | 30.30  | 136.40 | 80.40  | 158.80  | 64.00   | 66.30   | 46.10   | 692.8  |
| 1940                                                                      | 20.30  | 97.90  | 0.00   | 43.40  | 18.10  | 0.00   | 112.00 | 372.50 | 246.90  | 155.90  | 172.60  | 355.30  | 1594.9 |
| 1941                                                                      | 81.00  | 0.00   | 6.40   | 21.80  | 0.30   | 0.00   | 18.30  | 227.30 | 542.50  | 66.70   | 93.20   | 0.00    | 1057.5 |
| 1942                                                                      | 26.50  | 0.00   | 18.30  | 33.80  | 8.10   | 69.60  | 50.80  | 73.60  | 169.80+ | 218.90  | 211.80  | 96.00   | 977.2  |
| 1943                                                                      | 42.90  | 128.70 | 0.00   | 28.00  | 0.00   | 42.40  | 50.80  | 181.10 | 353.40  | 109.20  | 164.70  | 76.70   | 1177.9 |
| 1944                                                                      | 25.10  | 57.70  | 55.60  | 0.00   | 0.00   | 11.40  | 58.60  | 165.00 | 360.20  | 304.40  | 190.10+ | 6.60    | 1234.7 |
| 1945                                                                      | 8.00   | 22.10  | 37.40  | 1.00   | 0.00   | 11.90  | 100.40 | 93.10  | 37.50   | 88.90   | 224.50  | 225.30  | 850.7  |
| 1946                                                                      | 75.90  | 10.10  | 10.40  | 0.00   | 0.00   | 72.10  | 30.50  | 89.40  | 50.30   | 376.70  | 122.60  | 42.90   | 880.9  |
| 1947                                                                      | 59.40  | 22.80  | 0.50   | 3.60   | 9.70   | 58.30  | 65.30  | 213.80 | 86.10   | 205.00  | 95.00   | 264.00  | 1083.5 |
| 1948                                                                      | 82.80  | 8.90   | 16.80  | 3.80   | 0.00   | 14.90  | 78.80  | 84.00  | 118.50  | 159.90  | 164.50  | 124.90  | 857.8  |
| 1949                                                                      | 69.30  | 105.50 | 24.40  | 0.00   | 0.00   | 3.00   | 143.70 | 7.40   | 70.60   | 277.10  | 9.40    | 159.00  | 869.4  |
| 1950                                                                      | 25.70  | 110.20 | 35.80  | 48.80  | 0.00   | 1.00   | 258.40 | 99.40  | 290.50  | 133.50  | 106.60  | 82.70   | 1192.6 |
| 1951                                                                      | 70.20  | 116.10 | 0.80   | 3.60   | 27.70  | 27.90  | 29.00  | 252.50 | 70.40   | 137.90  | 294.40  | 186.20  | 1216.7 |
| 1952                                                                      | 60.60  | 98.30  | 5.80   | 10.90  | 4.10   | 2.50   | 240.60 | 306.40 | 86.00   | 188.90  | 147.60  | 17.70   | 1169.4 |
| 1953                                                                      | 31.90  | 50.20  | 18.50  | 11.50  | 0.40   | 18.10  | 161.20 | 310.00 | 127.50  | 369.40  | 191.60  | 86.00   | 1376.3 |
| 1954                                                                      | 103.00 | 18.00  | 77.80  | 0.00   | 51.20  | 7.00   | 45.00  | 24.00  | 192.00  | 277.60  | 406.30  | 39.00   | 1240.9 |
| 1955                                                                      | 148.00 | 68.00  | 13.70  | 6.50   | 12.30  | 17.50  | 47.00  | 157.50 | 233.50  | 201.70  | 229.70  | 46.50   | 1181.9 |
| 1956                                                                      | 43.00  | 11.00  | 26.00  | 6.50   | 185.50 | 26.80  | 39.80  | 256.00 | 282.80  | 348.00  | 160.10  | 76.50   | 1462.0 |
| 1957                                                                      | 125.20 | 8.00   | 0.00   | 7.20   | 78.50  | 5.50   | 29.30  | 170.50 | 94.80   | 20.70   | 168.50  | 38.00   | 746.2  |
| 1958                                                                      | 64.20  | 29.00  | 0.00   | 0.00   | 23.00  | 32.00  | 126.80 | 450.00 | 33.00   | 15.00   | 137.00  | 37.00   | 947.0  |
| 1959                                                                      | 110.00 | 0.00   | 23.00  | 0.00   | 11.00  | 37.50  | 82.00  | 158.50 | 273.00  | 37.50   | 29.00   | 37.50   | 799.0  |
| 1960                                                                      | 23.50  | 8.00   | 30.00  | 32.50  | 24.00  | 0.00   | 29.00  | 78.00  | 179.50  | 74.50   | 132.00  | 143.50  | 754.5  |
| 1961                                                                      | 21.50  | 0.00   | 29.50  | 13.50  | 44.50  | 26.50  | 60.50  | 30.50  | 399.50  | 102.50  | 255.00  | 44.00   | 1027.5 |
| 1962                                                                      | 175.50 | 0.00   | 2.50   | 37.50  | 3.00   | 8.50   | 3.00   | 22.50  | 89.00   | 177.00  | 248.00  | 57.00   | 823.5  |
| 1963                                                                      | 2.50   | 38.50  | 3.50   | 0.00   | 146.00 | 14.50  | 30.00  | 38.50  | 218.00  | 138.50  | 151.50  | 45.00   | 826.5  |
| 1964                                                                      | 51.00  | 76.50  | 4.50   | 16.50  | 66.00  | 127.00 | 51.00  | 94.00  | 88.00   | 117.50  | 67.50   | 34.50   | 794.0  |
| 1965                                                                      | 78.00  | 26.00  | 51.00  | 0.00   | 0.00   | 68.00  | 50.00  | 53.00  | 275.50  | 268.00  | 95.00   | 112.50  | 1077.0 |
| 1966                                                                      | 5.00   | 0.00   | 24.00  | 0.00   | 0.00   | 36.00  | 105.00 | 119.00 | 353.50  | 90.00   | 91.50   | 72.00   | 896.0  |
| 1967                                                                      | 59.00  | 77.50  | 0.00   | 12.50  | 0.00   | 0.00   | 0.00   | 263.40 | 161.00  | 214.50+ | 140.00  | 26.00   | 953.9  |
| 1968                                                                      | 211.00 | 13.00  | 45.00  | 36.00  | 6.00   | 6.00   | 128.50 | 32.00  | 112.00  | 59.00   | 101.50  | 137.50  | 887.5  |
| 1969                                                                      | 36.00  | 3.00   | 7.00   | 2.00   | 6.00   | 1.00   | 21.80  | 210.50 | 285.00  | 172.50  | 213.50  | 59.50   | 1017.8 |
| 1970                                                                      | 0.00   | 38.50  | 33.50  | 0.00   | 0.00   | 33.00  | 1.00   | 85.00  | 133.50  | 144.50  | 137.50  | 0.00    | 606.5  |
| 1971                                                                      | 48.50  | 17.50  | 21.00  | 57.00  | 24.00  | 14.00  | 68.00  | 166.50 | 60.00   | 44.00   | 91.50   | 74.00   | 686.0  |
| 1972                                                                      | 0.00   | 0.00   | 42.00  | 0.00   | 0.00   | 55.00  | 8.50   | 47.50  | 17.50   | 368.00  | 104.50  | 106.00  | 749.0  |
| 1973                                                                      | 71.00  | 8.50   | 49.00  | 4.00   | 10.00  | 4.00   | 0.00   | 90.00  | 252.00  | 150.50  | 557.00  | 69.50   | 1265.5 |
| 1974                                                                      | 92.00  | 49.50  | 41.00  | 19.00  | 18.50  | 15.00  | 172.50 | 337.00 | 26.50   | 171.50  | 178.00  | 35.00   | 1155.5 |
| 1975                                                                      | 116.00 | 2.00   | 1.00   | 0.00   | 15.00  | 54.50+ | 32.00  | 25.00  | 443.50  | 181.50  | 38.00   | 74.00   | 982.5  |
| 1976                                                                      | 14.00  | 264.50 | 133.50 | 40.50  | 30.50  | 5.00   | 97.00  | 488.00 | 349.50  | 306.50  | 246.00  | 43.00   | 2018.0 |
| 1977                                                                      | 30.50  | 0.00   | 102.00 | 19.30+ | 32.10+ | 64.00+ | 84.70+ | 97.70+ | 0.00+   | 0.00+   | 233.50+ | 100.40+ | 764.2  |
| AVE :                                                                     | 57.15  | 39.35  | 26.14  | 17.01  | 23.23  | 26.64  | 68.28  | 153.30 | 182.47  | 165.25  | 159.06  | 83.07   | 1000.9 |
| SD :                                                                      | 47.41  | 50.10  | 29.65  | 27.19  | 36.46  | 27.96  | 59.48  | 112.51 | 131.25  | 99.33   | 96.20   | 68.54   | 268.1  |

Appendix A6

File : 022475\_4.PAT

Units : mm

Descrip. : Patched monthly rainfall for station 022475 4 for 1982 to 1998

| Year  | Oct    | Nov    | Dec    | Jan   | Feb    | Mar    | Apr    | May     | Jun     | Jul     | Aug     | Sep    | Total  |
|-------|--------|--------|--------|-------|--------|--------|--------|---------|---------|---------|---------|--------|--------|
| 1982  | 56.80+ | 24.00+ | 24.60+ | 5.30+ | 45.90+ | 51.60+ | 32.30+ | 222.20+ | 299.00  | 263.30  | 80.40   | 167.00 | 1272.4 |
| 1983  | 17.80  | 3.40   | 7.00   | 10.30 | 5.60   | 39.50  | 93.00  | 418.00  | 113.30  | 170.60  | 70.80   | 297.50 | 1246.8 |
| 1984  | 157.20 | 7.60   | 91.00  | 64.10 | 49.90  | 169.80 | 85.70  | 44.60   | 188.20  | 229.20  | 158.30  | 87.60  | 1333.2 |
| 1985  | 54.80  | 28.70  | 35.30  | 4.40  | 21.30  | 88.40  | 47.70  | 51.00   | 246.60+ | 142.70  | 248.50  | 55.70  | 1025.1 |
| 1986  | 22.20  | 59.20  | 7.50   | 7.50  | 6.40   | 8.90   | 62.40  | 213.20  | 187.50  | 103.90  | 181.80  | 80.70  | 941.2  |
| 1987  | 10.60  | 2.90   | 35.90  | 0.70  | 1.20   | 16.40  | 183.10 | 88.00   | 146.30  | 98.30   | 185.70  | 96.70  | 865.8  |
| 1988  | 35.50  | 16.70  | 12.40  | 5.50  | 23.00  | 154.30 | 98.50  | 119.10  | 136.00  | 177.00+ | 200.70  | 181.90 | 1160.6 |
| 1989  | 90.70  | 20.30  | 2.00   | 14.00 | 28.70  | 12.10  | 151.70 | 158.20  | 212.90  | 225.90  | 139.70  | 22.90  | 1079.1 |
| 1990  | 14.50  | 64.00  | 24.90  | 16.70 | 3.30   | 5.50   | 64.60  | 168.50  | 260.50  | 388.40  | 83.40   | 190.20 | 1284.5 |
| 1991  | 63.70  | 26.20  | 4.80   | 1.50  | 22.00  | 28.80  | 93.50+ | 108.40+ | 373.60+ | 195.30  | 159.00  | 56.10  | 1132.9 |
| 1992  | 163.30 | 9.80   | 1.20   | 16.50 | 29.80  | 2.20   | 318.30 | 124.20  | 142.30  | 436.00+ | 61.20   | 36.90  | 1341.7 |
| 1993  | 0.00   | 10.00  | 43.50  | 10.70 | 8.50   | 0.00   | 52.40  | 23.80   | 475.80  | 126.50  | 47.40   | 120.20 | 918.8  |
| 1994  | 32.50  | 4.50   | 60.00  | 25.50 | 10.50  | 32.80  | 20.20  | 113.40  | 148.60  | 225.80  | 142.10  | 43.50  | 859.4  |
| 1995  | 143.20 | 30.00  | 79.00  | 4.00  | 30.10  | 38.50  | 28.00  | 89.00   | 445.50  | 223.30  | 203.00  | 202.50 | 1516.1 |
| 1996  | 137.50 | 123.00 | 55.60  | 10.10 | 9.00   | 11.50  | 63.50  | 100.50  | 330.00  | 53.70   | 49.80   | 0.00   | 944.2  |
| 1997  | 24.50  | 137.50 | 32.80  | 36.70 | 7.20   | 34.40  | 45.80  | 241.60  | 65.10   | 117.50  | 77.80+  | 22.30  | 843.2  |
| 1998  | 15.70  | 63.00  | 37.50  | 7.30  | 0.00   | 0.00   | 42.60  | 114.50+ | 221.30+ | 173.70+ | 138.20+ | 93.90+ | 907.7  |
| AVE : | 61.21  | 37.11  | 32.65  | 14.16 | 17.79  | 40.86  | 87.25  | 141.07  | 234.85  | 197.12  | 131.05  | 103.27 | 1098.4 |
| SD :  | 55.85  | 40.44  | 26.83  | 15.75 | 15.21  | 50.94  | 73.37  | 93.97   | 116.71  | 98.86   | 61.71   | 80.11  | 206.2  |

| Appendix A7 |                                                                  |         |        |        |        |        |         |        |         |         |         |         |        |
|-------------|------------------------------------------------------------------|---------|--------|--------|--------|--------|---------|--------|---------|---------|---------|---------|--------|
| File        | : 022504_X.NSP                                                   |         |        |        |        |        |         |        |         |         |         |         |        |
| Units       | : mm                                                             |         |        |        |        |        |         |        |         |         |         |         |        |
| Descrip.    | : Patched monthly rainfall for station 022504 X for 1932 to 1994 |         |        |        |        |        |         |        |         |         |         |         |        |
| Year        | Oct                                                              | Nov     | Dec    | Jan    | Feb    | Mar    | Apr     | May    | Jun     | Jul     | Aug     | Sep     | Total  |
| 1932        | 35.30                                                            | 16.20   | 22.90  | 8.60   | 9.10   | 5.60   | 17.30   | 120.00 | 278.20  | 236.30  | 110.10  | 46.10   | 905.7  |
| 1933        | 32.10                                                            | 13.00   | 46.90  | 3.80   | 33.30  | 7.10   | 0.00    | 92.80  | 131.50+ | 63.20   | 83.10   | 118.60  | 625.4  |
| 1934        | 92.70                                                            | 45.40+  | 0.00   | 7.60   | 21.60  | 25.20  | 65.20   | 122.50 | 102.10  | 87.60   | 58.20   | 66.50   | 694.6  |
| 1935        | 1.00                                                             | 77.70   | 9.70   | 37.60  | 2.80   | 12.70  | 5.60    | 86.20  | 73.70   | 152.70  | 141.20  | 34.00   | 634.9  |
| 1936        | 9.70                                                             | 73.60   | 108.50 | 0.00   | 3.30   | 19.80  | 72.00   | 120.10 | 231.60  | 165.40  | 20.30   | 36.10   | 860.4  |
| 1937        | 0.00                                                             | 48.50   | 0.00   | 38.40  | 0.00   | 13.70  | 54.90   | 92.90  | 45.90   | 56.40   | 75.60   | 104.60  | 530.9  |
| 1938        | 12.70                                                            | 17.80   | 0.00   | 8.90*  | 56.10  | 28.80+ | 41.40   | 101.60 | 31.80   | 7.90    | 79.50+  | 39.30   | 425.8  |
| 1939        | 0.00                                                             | 29.20   | 17.20+ | 0.00   | 47.00  | 12.70  | 119.40  | 43.70  | 124.50  | 81.30   | 15.20   | 44.70   | 534.9  |
| 1940        | 12.50                                                            | 81.30   | 0.00   | 58.40  | 0.00   | 0.00   | 108.80  | 276.80 | 185.50  | 130.80  | 101.80  | 231.20  | 1187.1 |
| 1941        | 70.10                                                            | 1.30    | 25.40  | 0.00   | 0.00   | 0.00   | 11.20   | 96.00  | 317.30  | 31.20   | 111.00  | 0.00    | 663.5  |
| 1942        | 30.30+                                                           | 0.00    | 0.00   | 38.10  | 0.00   | 50.80  | 0.00    | 0.00   | 191.30  | 90.60   | 139.00  | 34.50   | 574.6  |
| 1943        | 27.40                                                            | 51.80   | 12.70  | 0.00   | 10.70  | 27.90  | 7.60    | 70.60  | 237.50  | 44.50   | 100.30  | 92.80   | 683.8  |
| 1944        | 6.40                                                             | 14.50   | 12.70  | 0.00   | 0.00   | 0.00   | 48.80   | 110.80 | 227.10  | 232.10  | 138.70  | 1.50    | 792.6  |
| 1945        | 47.20                                                            | 24.40   | 0.00   | 0.00   | 0.00   | 12.70  | 0.00    | 47.80  | 25.40   | 55.70   | 64.00   | 120.20  | 397.4  |
| 1946        | 27.40                                                            | 0.00    | 0.00   | 0.00   | 0.00   | 50.80  | 4.10    | 57.40  | 34.30   | 166.00  | 67.30   | 0.00    | 407.3  |
| 1947        | 53.30                                                            | 24.90   | 3.90+  | 0.00   | 0.00   | 43.20  | 0.00    | 83.80  | 43.40   | 63.00   | 0.00    | 181.60  | 497.1  |
| 1948        | 71.10                                                            | 0.00    | 0.00   | 0.00   | 0.00   | 0.00   | 20.30   | 50.80  | 68.60   | 69.90   | 78.70   | 101.60  | 461.0  |
| 1949        | 47.00                                                            | 60.50   | 0.00   | 1.30   | 0.00   | 0.00   | 54.60   | 0.00   | 19.30   | 213.70  | 0.00    | 162.60  | 559.0  |
| 1950        | 15.20                                                            | 59.70   | 0.00   | 40.90  | 0.00   | 9.10   | 83.30   | 22.90  | 205.00  | 45.70   | 0.00    | 115.80* | 597.6  |
| 1951        | 0.00                                                             | 77.10+  | 0.00   | 0.00   | 4.50+  | 7.80+  | 3.80    | 138.40 | 82.60   | 114.30  | 168.60  | 117.60* | 714.7  |
| 1952        | 0.00                                                             | 137.10  | 0.00   | 0.00   | 0.00   | 0.00   | 160.50  | 113.00 | 33.50   | 126.50  | 75.00   | 0.00    | 645.6  |
| 1953        | 63.00                                                            | 50.00+  | 0.00   | 0.00   | 0.00   | 31.00  | 0.00    | 190.00 | 135.60  | 339.00  | 163.50  | 30.00   | 1002.1 |
| 1954        | 44.50                                                            | 20.00   | 42.50  | 0.00   | 149.70 | 0.00   | 34.00   | 27.00  | 155.60  | 140.30  | 307.30  | 30.20   | 951.1  |
| 1955        | 129.00                                                           | 60.50   | 12.50  | 17.00  | 10.00  | 10.00  | 11.00   | 89.50  | 174.90  | 81.80   | 120.00  | 55.00   | 771.2  |
| 1956        | 51.90                                                            | 0.00    | 57.70  | 0.00   | 79.00  | 21.00  | 63.50   | 231.00 | 279.50  | 209.00  | 133.00  | 58.00   | 1183.6 |
| 1957        | 135.50                                                           | 0.00    | 0.00   | 0.00   | 27.50  | 27.00  | 32.00   | 135.00 | 92.00   | 10.00   | 183.00  | 19.10   | 661.1  |
| 1958        | 68.50                                                            | 40.00   | 2.50   | 28.00  | 15.20  | 20.50  | 141.50  | 302.00 | 12.00   | 55.00   | 145.00  | 39.00   | 869.2  |
| 1959        | 112.50                                                           | 0.00    | 15.80  | 25.00  | 0.00   | 30.00  | 20.00   | 68.50  | 192.00  | 30.00   | 17.90   | 69.70   | 581.4  |
| 1960        | 30.00                                                            | 11.00   | 24.50  | 37.80  | 12.90  | 19.00  | 57.90   | 56.40  | 72.30   | 115.60  | 123.40  | 106.70  | 667.5  |
| 1961        | 25.00                                                            | 0.30    | 10.10  | 14.50  | 15.10  | 21.60  | 64.20   | 27.40  | 278.40  | 82.90   | 256.10  | 26.80   | 822.4  |
| 1962        | 177.80                                                           | 51.10   | 10.30  | 45.80  | 2.10   | 5.60   | 35.70   | 34.60  | 62.10   | 152.00  | 211.90  | 26.50   | 815.5  |
| 1963        | 19.00                                                            | 22.50   | 28.00  | 5.30   | 53.50  | 0.00   | 21.00   | 43.90  | 211.00  | 120.50  | 97.50   | 82.00   | 704.2  |
| 1964        | 22.00                                                            | 71.50   | 0.00   | 19.00  | 38.50  | 95.70  | 50.30   | 95.20  | 65.00   | 80.60   | 65.80   | 58.80   | 662.4  |
| 1965        | 50.70                                                            | 35.20   | 71.60  | 11.10  | 1.00   | 54.30  | 38.50   | 30.00  | 166.00  | 125.80  | 79.90   | 61.90   | 726.0  |
| 1966        | 4.70                                                             | 9.10    | 0.00   | 0.00   | 1.30   | 7.70   | 79.10   | 57.70  | 177.90  | 73.50   | 63.20   | 41.50   | 515.7  |
| 1967        | 48.00                                                            | 40.00   | 0.00   | 9.10   | 16.00  | 2.10   | 58.10   | 144.50 | 124.10  | 116.30  | 105.00  | 18.50   | 681.7  |
| 1968        | 146.80                                                           | 20.00   | 1.30   | 8.00   | 20.50  | 0.00   | 46.80   | 12.50  | 68.00   | 46.00   | 62.60   | 86.50   | 519.0  |
| 1969        | 119.30                                                           | 0.00    | 0.00   | 0.00   | 25.50  | 0.00   | 0.70    | 86.50  | 134.00  | 142.40  | 114.20  | 51.70   | 674.3  |
| 1970        | 60.90                                                            | 2.00    | 0.00   | 0.00   | 0.00   | 28.30  | 13.00   | 77.50  | 69.00   | 127.50  | 91.00   | 5.00    | 474.2  |
| 1971        | 0.00                                                             | 13.50   | 10.00  | 24.50  | 10.80  | 9.80   | 90.50+  | 159.90 | 67.50   | 51.30   | 62.00   | 36.00   | 535.8  |
| 1972        | 16.60                                                            | 3.00    | 22.30  | 4.50   | 0.80   | 20.20  | 16.90   | 24.10  | 13.00   | 235.00  | 85.90   | 78.30   | 520.6  |
| 1973        | 26.00                                                            | 8.00    | 32.50  | 9.00   | 8.50   | 2.60   | 1.50    | 78.00  | 131.10  | 102.10  | 530.30  | 80.60   | 1010.2 |
| 1974        | 81.50                                                            | 18.30   | 16.90  | 16.00  | 11.00  | 9.20   | 66.00   | 213.60 | 61.40   | 112.60  | 124.20  | 24.30   | 755.0  |
| 1975        | 69.70                                                            | 13.80   | 0.10   | 0.00   | 5.70   | 28.70  | 32.00   | 45.00  | 231.00  | 133.00  | 42.70   | 36.60   | 638.3  |
| 1976        | 36.60                                                            | 137.30* | 103.20 | 29.60  | 39.60  | 12.00  | 78.00   | 327.50 | 180.10  | 244.20  | 234.00  | 37.90   | 1460.0 |
| 1977        | 13.60                                                            | 29.50   | 27.00  | 29.50  | 0.40   | 35.00  | 27.80   | 20.80  | 21.00   | 29.00   | 207.50  | 65.00   | 506.1  |
| 1978        | 45.80                                                            | 0.00    | 55.50  | 25.80  | 61.90  | 0.00   | 12.50   | 95.50  | 156.00  | 88.50   | 108.70  | 131.00  | 781.2  |
| 1979        | 61.70                                                            | 12.00   | 5.50   | 38.50  | 9.00   | 1.20   | 43.50   | 115.50 | 101.00  | 60.50   | 117.00  | 20.30   | 585.7  |
| 1980        | 55.00                                                            | 127.10  | 48.70* | 184.80 | 6.20   | 32.80  | 57.80   | 10.40  | 42.50   | 197.00  | 148.60  | 168.80  | 1079.7 |
| 1981        | 18.70                                                            | 17.40   | 15.30  | 18.20  | 2.50   | 7.90   | 147.70  | 29.80  | 81.40   | 90.30   | 55.70   | 28.70   | 513.6  |
| 1982        | 38.50                                                            | 11.70   | 32.80  | 6.90   | 68.00  | 56.80  | 26.80   | 187.70 | 177.20  | 211.00  | 53.20   | 132.20  | 1002.8 |
| 1983        | 18.70                                                            | 3.10    | 3.50   | 6.40   | 7.30   | 34.60  | 68.90   | 338.90 | 80.10   | 131.30  | 47.20   | 194.30  | 934.3  |
| 1984        | 135.00                                                           | 5.40    | 67.70+ | 67.50  | 46.20  | 144.70 | 64.40   | 34.80  | 149.30  | 199.70  | 150.90  | 62.50   | 1128.1 |
| 1985        | 63.00                                                            | 18.90   | 33.90  | 2.90   | 19.90  | 73.60  | 29.00   | 34.80  | 172.40  | 103.30  | 199.70  | 41.20   | 792.6  |
| 1986        | 20.90                                                            | 39.50   | 3.60   | 6.40   | 6.10   | 7.00   | 67.20   | 167.50 | 120.60  | 75.20   | 154.90  | 68.50   | 737.4  |
| 1987        | 8.70                                                             | 1.60    | 29.50  | 0.80+  | 0.00*  | 29.00+ | 59.70+  | 58.80  | 113.40  | 57.40   | 158.50  | 55.50   | 572.9  |
| 1988        | 26.40                                                            | 14.80   | 9.60   | 3.00   | 14.80  | 124.90 | 103.30  | 74.40  | 123.90  | 141.30  | 114.60  | 67.40   | 818.4  |
| 1989        | 85.10                                                            | 16.90   | 1.00   | 9.20   | 28.50  | 31.90  | 53.00+  | 95.20+ | 141.90+ | 148.80  | 101.40  | 15.90   | 728.8  |
| 1990        | 12.80                                                            | 48.00   | 17.90  | 15.70  | 2.50   | 3.60   | 43.20   | 119.90 | 198.90+ | 256.80  | 49.70   | 118.00+ | 887.0  |
| 1991        | 70.30                                                            | 14.40   | 7.60   | 2.00   | 30.60+ | 35.80+ | 92.00   | 63.80+ | 237.40+ | 120.70  | 113.40+ | 36.60   | 824.6  |
| 1992        | 133.10+                                                          | 9.50    | 0.40   | 13.20  | 46.00+ | 2.10   | 218.90+ | 72.80+ | 109.70+ | 368.40+ | 57.20   | 35.70   | 1067.0 |
| 1993        | 0.00                                                             | 11.40   | 40.50  | 1.70   | 6.40+  | 5.00   | 48.20   | 55.00  | 332.80+ | 97.40+  | 38.50   | 105.50  | 742.4  |
| 1994        | 27.00                                                            | 2.80    | 60.50+ | 20.70  | 13.10  | 32.70  | 19.70   | 97.50  | 116.50  | 148.20+ | 106.50+ | 45.70+  | 690.9  |
| AVE :       | 47.07                                                            | 29.60   | 18.77  | 15.89  | 17.49  | 22.90  | 49.44   | 96.48  | 132.06  | 122.00  | 111.59  | 66.71   | 730.0  |
| SD :        | 42.18                                                            | 32.93   | 24.91  | 26.89  | 25.75  | 28.26  | 43.65   | 76.00  | 79.97   | 74.51   | 81.80   | 50.39   | 214.2  |

| Appendix A8                                                               |        |        |        |       |        |        |        |        |        |        |        |        |        |
|---------------------------------------------------------------------------|--------|--------|--------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| File : 022521_9.PAT                                                       |        |        |        |       |        |        |        |        |        |        |        |        |        |
| Units : mm                                                                |        |        |        |       |        |        |        |        |        |        |        |        |        |
| Descrip. : Patched monthly rainfall for station 022521 9 for 1920 to 1976 |        |        |        |       |        |        |        |        |        |        |        |        |        |
| Year                                                                      | Oct    | Nov    | Dec    | Jan   | Feb    | Mar    | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Total  |
| 1920                                                                      | 17.60+ | 17.60+ | 17.60+ | 15.30 | 33.00  | 0.00   | 27.90  | 0.00   | 663.20 | 96.60  | 78.80  | 3.80   | 971.4  |
| 1921                                                                      | 19.50+ | 8.90   | 0.00   | 0.00  | 0.00   | 31.50+ | 16.60  | 61.80+ | 178.30 | 57.20  | 117.90 | 12.70  | 504.4  |
| 1922                                                                      | 7.60   | 0.00   | 0.00   | 0.00  | 0.00   | 0.00   | 3.80   | 82.60  | 156.30 | 48.70  | 0.00   | 43.20  | 342.2  |
| 1923                                                                      | 24.90+ | 76.80+ | 18.10+ | 0.00  | 0.00   | 6.40   | 5.10   | 0.00   | 114.40 | 36.90  | 108.00 | 19.00  | 409.6  |
| 1924                                                                      | 20.30  | 24.20  | 0.00   | 0.00  | 0.00   | 0.00   | 0.00   | 20.30  | 384.90 | 100.40 | 0.00   | 0.00   | 550.1  |
| 1925                                                                      | 45.70  | 12.70  | 0.00   | 0.00  | 33.00  | 0.00   | 0.00   | 81.30  | 0.00   | 54.60  | 45.70  | 0.00   | 273.0  |
| 1926                                                                      | 102.90 | 2.50   | 0.00   | 0.00  | 6.40   | 0.00   | 19.00  | 68.60  | 101.60 | 26.70  | 122.20 | 25.40  | 475.3  |
| 1927                                                                      | 0.00   | 69.80  | 0.00   | 0.00  | 0.00   | 21.60  | 0.00   | 0.00   | 218.10 | 105.50 | 49.60  | 76.20  | 540.8  |
| 1928                                                                      | 0.00   | 10.20  | 0.00   | 0.00  | 0.00   | 15.20  | 111.80 | 22.80  | 87.60  | 111.80 | 94.00  | 0.00   | 453.4  |
| 1929                                                                      | 0.00   | 0.00   | 25.40  | 8.90  | 20.30  | 2.50   | 0.00   | 0.00   | 11.50  | 12.70  | 64.80  | 114.40 | 260.5  |
| 1930                                                                      | 17.80  | 19.10  | 0.00   | 0.00  | 8.10   | 0.00   | 85.20  | 152.50 | 16.60  | 61.00  | 152.50 | 109.20 | 622.0  |
| 1931                                                                      | 44.50  | 0.00   | 12.70  | 12.70 | 62.30  | 6.40   | 8.90   | 76.20  | 81.30  | 123.30 | 68.60  | 36.80  | 533.7  |
| 1932                                                                      | 15.20  | 0.00   | 24.90  | 11.50 | 15.20  | 13.70  | 6.90   | 60.70  | 211.70 | 149.80 | 36.10  | 36.60  | 582.3  |
| 1933                                                                      | 29.00  | 5.80   | 9.10   | 7.30  | 10.40  | 23.60  | 2.30   | 55.20  | 75.70  | 30.30  | 67.60  | 64.30  | 380.6  |
| 1934                                                                      | 69.90  | 10.90  | 0.00   | 0.00  | 7.40   | 10.20  | 46.50  | 81.00  | 88.60  | 65.80  | 67.80  | 52.20  | 500.3  |
| 1935                                                                      | 0.00   | 53.30  | 0.00   | 17.80 | 0.00   | 0.00   | 9.90   | 57.90  | 44.70  | 137.70 | 100.60 | 49.60  | 471.5  |
| 1936                                                                      | 6.90   | 31.80  | 85.80  | 1.30  | 0.00   | 68.60  | 87.80  | 103.90 | 217.60 | 124.20 | 21.60  | 12.70  | 762.2  |
| 1937                                                                      | 11.40  | 0.00   | 7.60   | 78.70 | 11.40  | 8.60   | 48.30  | 116.80 | 64.80  | 50.80  | 99.00  | 51.00  | 548.4  |
| 1938                                                                      | 10.20  | 26.90  | 15.30  | 0.00  | 38.20  | 21.60  | 58.50  | 99.10  | 31.70  | 67.20  | 84.00  | 63.50  | 516.2  |
| 1939                                                                      | 0.00   | 53.10  | 25.10  | 2.50  | 25.40  | 5.10   | 155.00 | 66.10  | 107.40 | 44.20  | 51.10  | 21.60  | 556.6  |
| 1940                                                                      | 11.40  | 66.10  | 0.00   | 20.30 | 8.90   | 0.00   | 72.40  | 372.10 | 205.60 | 133.30 | 118.10 | 292.10 | 1300.3 |
| 1941                                                                      | 63.40  | 0.00   | 20.30  | 43.20 | 0.00+  | 0.00   | 12.70  | 129.60 | 424.10 | 37.60  | 77.20  | 6.90   | 815.0  |
| 1942                                                                      | 21.60  | 0.00   | 44.40  | 22.10 | 0.00   | 72.50  | 25.40  | 48.30  | 116.10 | 157.90 | 154.90 | 72.40  | 735.6  |
| 1943                                                                      | 21.60  | 53.40  | 0.00   | 11.40 | 0.00   | 26.40  | 33.00  | 69.90  | 226.20 | 120.40 | 131.20 | 44.20  | 737.7  |
| 1944                                                                      | 30.20  | 26.70  | 18.00  | 0.00  | 0.00   | 0.00   | 41.90  | 124.90 | 297.40 | 262.80 | 136.40 | 0.00   | 938.3  |
| 1945                                                                      | 35.60  | 12.70  | 27.90  | 0.00  | 12.70  | 17.80  | 40.60  | 50.80+ | 39.60  | 57.20  | 138.40 | 136.70 | 570.0  |
| 1946                                                                      | 36.80  | 0.00   | 13.50  | 0.00  | 0.00   | 43.90  | 16.50  | 33.00  | 49.00  | 184.60 | 82.10  | 19.80  | 479.2  |
| 1947                                                                      | 34.80  | 16.00  | 0.00   | 3.80  | 7.60   | 67.80  | 38.40  | 81.50  | 113.90 | 124.50 | 53.70  | 175.00 | 717.0  |
| 1948                                                                      | 38.50  | 5.00   | 2.50   | 0.00  | 0.00   | 0.00   | 40.60  | 51.80  | 90.40  | 86.00  | 109.50 | 85.50  | 509.8  |
| 1949                                                                      | 61.70  | 69.70  | 11.40  | 0.30  | 0.00   | 1.50   | 69.00  | 0.00   | 34.50  | 158.40 | 5.80   | 104.00 | 516.3  |
| 1950                                                                      | 1.30   | 74.80  | 19.50  | 43.40 | 0.00   | 0.00   | 126.70 | 45.10  | 217.30 | 86.90  | 55.00  | 77.10  | 747.1  |
| 1951                                                                      | 35.30  | 57.70  | 1.00   | 4.80  | 19.10  | 7.10   | 13.40  | 155.50 | 46.30  | 87.70  | 137.50 | 105.30 | 670.7  |
| 1952                                                                      | 50.50  | 69.80  | 24.40  | 1.80  | 1.70   | 1.40   | 200.50 | 165.60 | 27.60  | 108.90 | 66.10  | 8.00   | 726.3  |
| 1953                                                                      | 15.20  | 24.00  | 16.50  | 2.50  | 6.30   | 33.40  | 72.20  | 315.30 | 88.00  | 221.30 | 156.00 | 46.90  | 997.6  |
| 1954                                                                      | 56.60  | 6.40   | 29.00  | 0.00  | 80.90  | 1.90   | 11.50  | 7.50   | 102.40 | 136.10 | 268.60 | 14.50  | 715.4  |
| 1955                                                                      | 60.40  | 58.50  | 7.50   | 4.60  | 10.40  | 12.00  | 5.70   | 91.40  | 153.80 | 89.50  | 112.70 | 23.80  | 630.3  |
| 1956                                                                      | 20.80  | 0.00   | 29.20  | 1.40  | 110.50 | 36.60  | 9.40   | 164.90 | 165.50 | 239.40 | 118.30 | 18.80  | 914.8  |
| 1957                                                                      | 75.80  | 4.50   | 0.00   | 2.50  | 29.40  | 6.70   | 23.30  | 85.00  | 49.00  | 9.20   | 98.80  | 20.20  | 404.4  |
| 1958                                                                      | 66.60  | 63.00  | 0.00   | 4.50  | 24.00  | 9.00   | 82.60  | 274.70 | 17.00  | 13.50  | 72.30  | 14.00  | 641.2  |
| 1959                                                                      | 57.20  | 0.00   | 18.50  | 0.00  | 2.00   | 15.50  | 30.70  | 74.80  | 129.00 | 25.00  | 8.00   | 51.00  | 411.7  |
| 1960                                                                      | 7.80   | 4.00   | 28.70  | 10.10 | 8.50   | 21.30  | 23.40  | 55.30  | 108.60 | 29.70  | 87.10  | 104.30 | 488.8  |
| 1961                                                                      | 10.70  | 0.00   | 9.00   | 30.50 | 19.00  | 15.70  | 44.00  | 13.80  | 303.00 | 73.40  | 174.60 | 13.10  | 706.8  |
| 1962                                                                      | 121.00 | 14.00  | 0.00   | 25.00 | 0.00   | 1.00   | 3.50   | 28.30  | 63.40  | 87.50  | 140.50 | 32.00  | 516.2  |
| 1963                                                                      | 13.50  | 17.00  | 15.50  | 0.00  | 97.60  | 0.00   | 21.40  | 31.00  | 148.40 | 47.50  | 93.00  | 24.00  | 508.9  |
| 1964                                                                      | 14.50  | 43.50  | 0.00   | 0.00  | 28.50  | 68.80  | 38.00  | 62.00  | 42.50  | 29.00  | 53.60  | 29.90  | 410.3  |
| 1965                                                                      | 19.00  | 7.50   | 28.10  | 0.00  | 0.00   | 51.50  | 36.40  | 23.20  | 123.20 | 102.30 | 63.90  | 56.50  | 511.6  |
| 1966                                                                      | 2.00   | 1.50   | 0.00   | 6.50  | 0.00   | 0.00   | 38.50  | 44.70  | 171.00 | 55.50  | 43.00  | 29.00  | 391.7  |
| 1967                                                                      | 26.00  | 45.00  | 0.00   | 5.00  | 0.80   | 23.00  | 52.50  | 164.80 | 77.00  | 127.00 | 84.50  | 4.90   | 610.5  |
| 1968                                                                      | 115.00 | 16.00  | 6.50   | 6.50  | 0.00   | 0.00   | 73.00  | 4.50   | 41.00  | 28.00  | 84.50  | 95.50  | 470.5  |
| 1969                                                                      | 64.00  | 0.00   | 0.00   | 0.00  | 0.00   | 21.50  | 0.00   | 0.00   | 75.80  | 111.00 | 99.30  | 91.00  | 488.1  |
| 1970                                                                      | 21.50  | 15.50  | 12.00  | 2.50  | 0.00   | 24.00  | 0.00   | 44.00  | 30.50  | 100.50 | 102.50 | 0.00   | 353.0  |
| 1971                                                                      | 11.00  | 4.00   | 0.00   | 26.00 | 0.00   | 5.50   | 34.40  | 96.50  | 35.50  | 41.00  | 25.00  | 57.50  | 336.4  |
| 1972                                                                      | 17.50  | 0.00   | 30.00  | 0.00  | 2.00   | 12.00  | 5.50   | 19.50  | 3.10   | 242.00 | 94.00  | 48.00  | 473.6  |
| 1973                                                                      | 37.00  | 0.00   | 23.00  | 2.00  | 0.00   | 3.50   | 0.00   | 43.10  | 132.80 | 56.00  | 398.80 | 35.00  | 731.2  |
| 1974                                                                      | 44.00  | 28.00  | 10.00  | 3.00  | 20.00  | 11.00  | 121.00 | 207.00 | 41.50  | 102.00 | 87.00  | 29.50  | 704.0  |
| 1975                                                                      | 48.50  | 16.00  | 0.00   | 6.00  | 14.00  | 43.00  | 103.50 | 35.40  | 168.50 | 132.50 | 16.00  | 21.90  | 605.3  |
| 1976                                                                      | 0.00   | 148.50 | 20.00  | 45.00 | 19.00  | 1.60   | 174.50 | 236.50 | 266.00 | 172.50 | 238.00 | 15.00  | 1336.6 |
| AVE :                                                                     | 31.78  | 24.43  | 12.42  | 8.61  | 14.31  | 15.27  | 42.62  | 83.05  | 128.35 | 94.23  | 94.87  | 47.89  | 597.8  |
| SD :                                                                      | 28.48  | 29.60  | 15.14  | 14.85 | 23.43  | 19.72  | 46.05  | 77.91  | 117.43 | 59.79  | 66.30  | 50.39  | 216.6  |

| Appendix A9                                                               |       |        |       |        |       |       |        |        |       |       |        |        |       |       |
|---------------------------------------------------------------------------|-------|--------|-------|--------|-------|-------|--------|--------|-------|-------|--------|--------|-------|-------|
| File : 22789A.PAT                                                         |       |        |       |        |       |       |        |        |       |       |        |        |       |       |
| Units : mm                                                                |       |        |       |        |       |       |        |        |       |       |        |        |       |       |
| Descrip. : Patched monthly rainfall for station 022789 A for 1943 to 1988 |       |        |       |        |       |       |        |        |       |       |        |        |       |       |
| Year                                                                      | Oct   | Nov    | Dec   | Jan    | Feb   | Mar   | Apr    | May    | Jun   | Jul   | Aug    | Sep    | Total |       |
| 1943                                                                      | 7.10+ | 29.00+ | 2.20+ | 0.00   | 0.00  | 12.20 | 11.20  | 27.20  | 85.30 | 38.00 | 73.30  | 30.40  | 315.9 |       |
| 1944                                                                      | 15.20 | 0.00   | 0.00  | 0.00   | 0.00  | 0.00  | 0.00   | 11.40  | 74.90 | 47.50 | 59.00  | 44.20  | 4.30  | 256.5 |
| 1945                                                                      | 50.00 | 3.30   | 0.00  | 0.00   | 0.00  | 0.00  | 9.20   | 12.70  | 2.10  | 22.40 | 9.70   | 3.00   | 69.00 | 181.4 |
| 1946                                                                      | 13.40 | 0.00   | 7.90  | 0.00   | 0.00  | 25.40 | 15.00  | 16.70  | 5.60  | 40.20 | 19.00  | 5.30   | 148.5 |       |
| 1947                                                                      | 6.40  | 4.60   | 0.00  | 11.50  | 3.00  | 25.10 | 16.30  | 56.30  | 0.00  | 29.90 | 4.30   | 52.30  | 209.7 |       |
| 1948                                                                      | 30.30 | 0.00   | 14.00 | 0.00   | 0.00  | 0.00  | 26.40  | 15.00  | 15.50 | 22.20 | 35.60  | 16.30  | 175.3 |       |
| 1949                                                                      | 5.60  | 103.60 | 0.00  | 0.00   | 0.00  | 2.00  | 10.20  | 9.70   | 2.50  | 66.90 | 0.00   | 52.30  | 252.8 |       |
| 1950                                                                      | 19.30 | 40.60  | 6.60  | 36.80  | 0.00  | 0.00  | 10.40  | 8.60   | 42.20 | 28.70 | 22.90  | 36.30  | 252.4 |       |
| 1951                                                                      | 0.00  | 13.00  | 0.00  | 0.00   | 19.00 | 0.00  | 2.50   | 58.80  | 60.20 | 55.80 | 62.20  | 62.50  | 334.0 |       |
| 1952                                                                      | 6.60  | 46.40  | 0.00  | 0.00   | 36.80 | 0.00  | 70.10  | 26.70  | 10.60 | 34.60 | 10.20  | 14.00  | 256.0 |       |
| 1953                                                                      | 29.20 | 11.40  | 0.00  | 0.00   | 9.10  | 36.90 | 8.10   | 60.90  | 65.10 | 70.20 | 68.00  | 0.00   | 358.9 |       |
| 1954                                                                      | 12.70 | 5.60   | 11.90 | 0.00   | 64.20 | 29.20 | 7.90   | 6.10   | 44.40 | 59.40 | 54.90  | 6.10   | 302.4 |       |
| 1955                                                                      | 21.60 | 8.40   | 0.00  | 4.60   | 14.50 | 0.00  | 0.00   | 35.10  | 73.70 | 21.30 | 19.30  | 0.00   | 198.5 |       |
| 1956                                                                      | 21.80 | 0.00   | 29.20 | 0.00   | 26.40 | 34.00 | 1.80   | 81.90  | 63.00 | 46.50 | 41.20  | 25.60  | 371.4 |       |
| 1957                                                                      | 6.70  | 0.00   | 0.00  | 0.00   | 7.60  | 39.30 | 31.00  | 35.20  | 11.70 | 0.00  | 28.10  | 7.90   | 167.5 |       |
| 1958                                                                      | 12.60 | 6.10   | 0.00  | 3.60   | 27.90 | 6.60  | 35.70  | 48.50  | 6.60  | 11.60 | 30.70  | 6.80   | 196.7 |       |
| 1959                                                                      | 59.20 | 0.00   | 0.00  | 0.00   | 0.00  | 4.30  | 4.60   | 25.90  | 23.40 | 22.40 | 0.00   | 11.20  | 151.0 |       |
| 1960                                                                      | 2.00  | 6.40   | 7.10  | 3.60   | 0.00  | 8.30  | 23.30  | 5.30   | 11.40 | 14.50 | 37.30  | 52.80  | 172.0 |       |
| 1961                                                                      | 18.00 | 0.00   | 0.00  | 10.20  | 10.40 | 13.40 | 18.00  | 11.20  | 80.70 | 28.70 | 103.60 | 8.90   | 303.1 |       |
| 1962                                                                      | 58.90 | 10.70  | 0.00  | 21.30  | 0.00  | 0.00  | 1.80   | 22.30  | 19.10 | 7.60  | 49.20  | 0.00   | 190.9 |       |
| 1963                                                                      | 17.30 | 6.10   | 0.00  | 5.30   | 0.00  | 13.20 | 7.10   | 30.30  | 71.00 | 18.80 | 43.70  | 13.60  | 226.4 |       |
| 1964                                                                      | 11.20 | 45.70  | 0.00  | 0.00   | 6.90  | 25.60 | 11.40  | 99.40  | 12.20 | 19.10 | 8.50   | 5.80   | 245.8 |       |
| 1965                                                                      | 25.10 | 16.10  | 5.70  | 0.80   | 0.00  | 12.50 | 8.10   | 15.00  | 34.30 | 18.00 | 37.90  | 19.60  | 193.1 |       |
| 1966                                                                      | 1.50  | 0.00   | 0.00  | 0.00   | 2.80  | 1.50  | 29.50  | 21.70  | 34.50 | 17.80 | 12.00  | 6.10   | 127.4 |       |
| 1967                                                                      | 5.30  | 23.40  | 0.00  | 1.30   | 0.00  | 0.00  | 12.00  | 17.60  | 44.20 | 19.10 | 25.20  | 13.00  | 161.1 |       |
| 1968                                                                      | 32.50 | 12.50  | 0.00  | 0.80   | 6.90  | 1.80  | 43.70  | 0.00   | 25.20 | 3.80  | 5.90   | 15.00  | 148.1 |       |
| 1969                                                                      | 37.30 | 1.00   | 0.00  | 0.00   | 9.40  | 0.00  | 1.00   | 10.30  | 41.00 | 49.30 | 40.50  | 12.90  | 202.7 |       |
| 1970                                                                      | 26.70 | 0.90   | 6.00  | 0.20   | 2.50  | 24.60 | 7.90   | 18.70  | 43.40 | 57.70 | 36.50  | 2.20   | 227.3 |       |
| 1971                                                                      | 7.10  | 3.90   | 9.20  | 4.30   | 7.60  | 10.30 | 12.40  | 15.20  | 8.30  | 9.90  | 4.10   | 20.00  | 112.3 |       |
| 1972                                                                      | 0.70  | 0.00   | 3.00  | 0.30   | 10.70 | 2.10  | 6.20   | 1.60   | 10.20 | 45.20 | 28.80  | 13.90  | 122.7 |       |
| 1973                                                                      | 4.00  | 3.80   | 1.10  | 0.70   | 3.60  | 6.30  | 0.00   | 35.00  | 38.60 | 13.50 | 181.00 | 15.10  | 302.7 |       |
| 1974                                                                      | 18.70 | 3.30   | 1.90  | 14.00  | 0.50  | 0.80  | 3.90   | 55.50  | 17.00 | 33.40 | 52.70  | 4.90   | 206.6 |       |
| 1975                                                                      | 23.70 | 6.60   | 0.40  | 18.20  | 11.20 | 22.50 | 22.60  | 7.60   | 61.20 | 23.70 | 10.90  | 10.40  | 219.0 |       |
| 1976                                                                      | 20.00 | 69.20  | 14.10 | 0.00   | 21.10 | 2.90  | 97.70  | 74.80  | 38.10 | 76.20 | 58.60  | 9.00   | 481.7 |       |
| 1977                                                                      | 0.80  | 21.70  | 20.80 | 3.60   | 0.00  | 8.10  | 14.90  | 0.90   | 6.90  | 13.60 | 51.00  | 7.70   | 150.0 |       |
| 1978                                                                      | 4.30  | 14.80  | 30.90 | 9.20   | 33.30 | 0.00+ | 0.40   | 21.30  | 74.20 | 22.10 | 14.00  | 18.50  | 243.0 |       |
| 1979                                                                      | 8.20  | 0.00   | 0.70  | 2.60   | 0.50  | 1.50  | 17.10  | 37.50  | 22.20 | 8.90  | 40.20  | 6.80   | 146.2 |       |
| 1980                                                                      | 18.40 | 57.10  | 10.40 | 134.50 | 11.40 | 18.80 | 12.90  | 7.00   | 5.50  | 63.20 | 48.70  | 39.40  | 427.3 |       |
| 1981                                                                      | 34.80 | 0.00   | 0.50  | 7.70   | 3.00  | 9.20  | 116.10 | 10.00  | 34.80 | 21.50 | 20.30  | 5.80   | 263.7 |       |
| 1982                                                                      | 14.20 | 1.80   | 9.40  | 1.20   | 11.50 | 18.60 | 1.60   | 46.00  | 74.20 | 53.00 | 12.70  | 23.10  | 267.3 |       |
| 1983                                                                      | 2.50  | 0.00   | 0.00  | 7.20   | 0.00  | 68.30 | 16.90  | 107.70 | 4.60  | 23.80 | 6.40   | 84.70  | 322.1 |       |
| 1984                                                                      | 31.30 | 0.00   | 17.60 | 21.30  | 7.10  | 20.20 | 19.50  | 9.30   | 30.90 | 84.00 | 26.90  | 11.60  | 279.7 |       |
| 1985                                                                      | 73.40 | 1.60   | 14.40 | 0.00   | 3.80  | 6.00  | 11.40  | 2.40   | 51.30 | 20.20 | 63.10  | 25.00  | 272.6 |       |
| 1986                                                                      | 15.60 | 16.60  | 0.00  | 1.30   | 3.00  | 0.90  | 56.00  | 49.70  | 44.00 | 26.80 | 48.50  | 18.20  | 280.6 |       |
| 1987                                                                      | 0.00  | 0.00   | 1.70  | 0.00   | 0.00  | 5.00  | 39.50  | 11.90  | 31.40 | 6.10  | 60.30  | 11.50  | 167.4 |       |
| 1988                                                                      | 11.70 | 0.00   | 4.00  | 2.50   | 24.30 | 16.80 | 79.40  | 9.10   | 48.80 | 16.80 | 48.70  | 54.00+ | 316.1 |       |
| AVE :                                                                     | 18.32 | 12.94  | 5.02  | 7.14   | 8.70  | 11.81 | 21.03  | 29.22  | 34.76 | 31.15 | 36.83  | 20.21  | 237.1 |       |
| SD :                                                                      | 16.73 | 21.34  | 7.72  | 20.60  | 12.74 | 14.02 | 25.43  | 26.94  | 24.11 | 21.19 | 31.51  | 20.00  | 81.1  |       |

| Appendix A10                                                            |        |        |        |       |       |       |        |        |        |        |        |        |       |
|-------------------------------------------------------------------------|--------|--------|--------|-------|-------|-------|--------|--------|--------|--------|--------|--------|-------|
| File : 022792.PAT                                                       |        |        |        |       |       |       |        |        |        |        |        |        |       |
| Units : mm                                                              |        |        |        |       |       |       |        |        |        |        |        |        |       |
| Descrip. : Patched monthly rainfall for station 022792 for 1936 to 1979 |        |        |        |       |       |       |        |        |        |        |        |        |       |
| Year                                                                    | Oct    | Nov    | Dec    | Jan   | Feb   | Mar   | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Total |
| 1936                                                                    | 8.90+  | 46.50+ | 21.60+ | 0.00+ | 7.50+ | 11.90 | 6.00   | 12.10  | 19.20  | 29.10  | 4.10   | 8.40   | 175.3 |
| 1937                                                                    | 0.50   | 0.90   | 8.60   | 1.50  | 0.80  | 7.60  | 10.60  | 10.70  | 9.60   | 6.90   | 11.10  | 12.80  | 81.6  |
| 1938                                                                    | 4.70   | 2.60   | 6.70   | 0.00  | 37.10 | 6.00  | 7.40   | 19.70  | 5.40   | 25.90+ | 70.30+ | 15.10+ | 200.9 |
| 1939                                                                    | 11.30+ | 0.00+  | 2.10+  | 0.00  | 11.00 | 0.70  | 16.30  | 4.50   | 18.00  | 6.70   | 1.90   | 2.90   | 75.4  |
| 1940                                                                    | 5.50   | 19.90  | 1.20   | 2.90  | 0.40  | 0.00  | 19.50  | 44.50  | 97.20  | 15.30  | 12.30  | 29.10  | 247.8 |
| 1941                                                                    | 19.40+ | 0.00   | 0.00+  | 3.80  | 2.90+ | 0.00+ | 1.00   | 31.20  | 48.40  | 2.90   | 5.70   | 4.30   | 119.6 |
| 1942                                                                    | 5.00   | 2.10   | 13.90  | 11.60 | 1.80  | 20.70 | 16.20  | 2.30   | 29.10  | 29.30  | 21.80  | 26.90  | 180.7 |
| 1943                                                                    | 6.50+  | 24.00+ | 2.70+  | 0.30  | 0.00+ | 4.20  | 6.10+  | 10.70  | 48.50+ | 15.00+ | 28.60  | 29.40  | 176.0 |
| 1944                                                                    | 39.70  | 10.70  | 4.60   | 0.00  | 0.00  | 0.50  | 17.80  | 75.80  | 88.90  | 79.30  | 85.40  | 4.60   | 407.3 |
| 1945                                                                    | 29.20  | 9.10   | 0.00   | 0.00  | 2.80  | 13.60 | 11.70  | 9.90   | 22.60  | 18.30  | 46.30  | 74.50  | 238.0 |
| 1946                                                                    | 19.80  | 0.00   | 2.30   | 0.00  | 0.00  | 36.60 | 8.20   | 30.10  | 21.40  | 70.20  | 28.70  | 10.00  | 227.3 |
| 1947                                                                    | 4.90   | 1.80   | 8.90   | 15.00 | 3.80  | 32.90 | 15.80  | 55.70  | 15.50  | 49.10  | 6.30   | 78.50  | 288.2 |
| 1948                                                                    | 31.50  | 0.00   | 4.80   | 0.30  | 0.00  | 3.80  | 27.20  | 26.70  | 30.40  | 57.40  | 45.80  | 34.10  | 262.0 |
| 1949                                                                    | 37.10  | 72.40  | 0.00   | 3.30  | 0.80  | 2.00  | 37.40  | 14.00  | 6.80   | 81.70  | 1.00   | 56.70  | 313.2 |
| 1950                                                                    | 37.60  | 50.20  | 11.70  | 36.30 | 0.00  | 1.80  | 43.20  | 11.90  | 77.50  | 39.50  | 25.90  | 48.20  | 383.8 |
| 1951                                                                    | 8.50   | 14.90  | 0.50   | 0.00  | 10.70 | 0.80  | 8.20   | 73.90  | 30.20  | 57.40  | 66.60  | 56.40  | 328.1 |
| 1952                                                                    | 12.50  | 76.20  | 9.90   | 0.00  | 0.80  | 0.20  | 106.30 | 43.90  | 13.20  | 61.70  | 15.30  | 10.00  | 350.0 |
| 1953                                                                    | 11.80  | 14.20  | 14.90  | 2.50  | 12.00 | 25.00 | 15.50  | 109.30 | 51.50  | 115.50 | 62.70  | 27.50  | 462.4 |
| 1954                                                                    | 18.70  | 4.90   | 6.40   | 0.00  | 74.90 | 0.80  | 13.50  | 10.70  | 68.00  | 72.60  | 87.50  | 3.50   | 361.5 |
| 1955                                                                    | 22.70  | 17.10  | 3.50   | 6.50  | 14.50 | 1.60  | 0.10   | 68.40  | 83.00  | 38.90  | 40.10  | 7.60   | 304.0 |
| 1956                                                                    | 12.80  | 0.00   | 16.60  | 0.00  | 31.80 | 24.50 | 0.70   | 91.30  | 79.20  | 56.20  | 68.50  | 23.50  | 405.1 |
| 1957                                                                    | 16.40  | 0.00   | 0.00   | 0.00  | 12.00 | 29.70 | 17.50  | 45.30  | 33.90  | 1.60   | 44.60  | 9.00   | 210.0 |
| 1958                                                                    | 35.50  | 14.90  | 4.00   | 4.50  | 22.30 | 0.00  | 56.10  | 108.50 | 9.00   | 16.10  | 41.60  | 5.10   | 317.6 |
| 1959                                                                    | 45.10  | 0.00   | 2.50   | 0.00  | 0.00  | 0.00  | 11.20  | 31.80  | 52.10  | 24.00  | 2.20   | 18.10  | 187.0 |
| 1960                                                                    | 0.00   | 0.00   | 14.70  | 20.50 | 0.00  | 0.50  | 7.50   | 11.70  | 13.60  | 15.90  | 10.70  | 61.80  | 156.9 |
| 1961                                                                    | 0.60   | 0.00   | 0.00+  | 0.00  | 10.40 | 5.00  | 46.00  | 18.50  | 140.80 | 35.50  | 139.00 | 10.80+ | 406.6 |
| 1962                                                                    | 80.20  | 14.90  | 0.00   | 11.50 | 0.00  | 1.10  | 0.00   | 40.20  | 25.80  | 34.10  | 65.50  | 1.10   | 274.4 |
| 1963                                                                    | 13.00  | 10.50  | 10.50  | 0.00  | 7.50  | 9.50  | 10.00  | 39.00  | 81.00  | 28.60  | 36.60  | 15.30  | 261.5 |
| 1964                                                                    | 14.00  | 45.00  | 0.00   | 2.50  | 21.70 | 12.10 | 5.00   | 15.10  | 7.90   | 4.50   | 4.60   | 2.50   | 134.9 |
| 1965                                                                    | 7.80   | 8.40   | 6.40   | 0.00  | 0.00  | 9.10  | 7.80   | 1.00   | 66.00  | 5.30   | 54.00  | 12.50  | 178.3 |
| 1966                                                                    | 2.10   | 0.00   | 0.00   | 1.50  | 2.00  | 6.00  | 48.60  | 30.40  | 52.50  | 22.90  | 19.60  | 2.30   | 187.9 |
| 1967                                                                    | 10.50  | 17.80  | 0.00   | 2.00  | 0.00  | 2.50  | 19.70  | 39.70  | 68.60  | 51.50  | 52.10  | 0.70   | 265.1 |
| 1968                                                                    | 40.80  | 13.70  | 0.00   | 0.00  | 7.50  | 4.00  | 46.40  | 3.00   | 31.90  | 8.80   | 16.50  | 51.50  | 224.1 |
| 1969                                                                    | 52.00  | 3.00   | 0.00   | 0.00  | 15.60 | 0.00  | 0.00   | 16.80  | 49.40  | 65.60  | 53.20  | 7.00   | 262.6 |
| 1970                                                                    | 23.00  | 3.50   | 26.50  | 0.00  | 0.00  | 33.00 | 8.00   | 23.80  | 19.10  | 84.40  | 58.40  | 0.00   | 279.7 |
| 1971                                                                    | 3.50   | 0.00   | 4.00   | 13.50 | 0.20  | 4.50  | 25.10  | 49.00  | 20.20  | 21.10  | 4.00   | 34.30  | 179.4 |
| 1972                                                                    | 7.00   | 0.00   | 7.30   | 1.00  | 6.50  | 0.00  | 3.10   | 3.40   | 11.30  | 75.20  | 25.80  | 36.50  | 177.1 |
| 1973                                                                    | 1.80   | 0.00   | 8.00   | 0.00  | 16.00 | 11.60 | 0.00   | 36.50  | 53.60  | 31.20  | 220.00 | 13.50  | 392.2 |
| 1974                                                                    | 29.00  | 9.50   | 0.00   | 9.00  | 1.00  | 0.00  | 12.60  | 86.20  | 22.80  | 53.80  | 39.50  | 7.30   | 270.7 |
| 1975                                                                    | 19.00  | 4.20   | 0.00   | 0.00  | 23.70 | 48.50 | 16.80  | 16.70  | 124.60 | 31.90  | 15.30  | 10.20  | 310.9 |
| 1976                                                                    | 21.00  | 58.10  | 39.00  | 7.50  | 17.80 | 0.00  | 36.40  | 148.60 | 49.80  | 60.40  | 107.80 | 15.10  | 561.5 |
| 1977                                                                    | 3.90   | 16.50  | 61.70  | 0.00  | 0.00  | 17.20 | 25.90  | 4.30   | 8.00   | 14.00  | 75.00  | 23.90  | 250.4 |
| 1978                                                                    | 5.60   | 10.00  | 17.50  | 5.20  | 29.00 | 0.00  | 8.00   | 21.30  | 52.20  | 47.30  | 32.00  | 26.10  | 254.2 |
| 1979                                                                    | 11.60  | 0.00   | 0.00   | 8.50  | 1.60  | 3.50  | 14.70  | 37.10+ | 37.10+ | 14.80+ | 39.40+ | 21.00  | 189.3 |
| AVE :                                                                   | 18.00  | 13.58  | 7.80   | 3.89  | 9.28  | 8.93  | 18.53  | 36.03  | 43.06  | 38.12  | 43.03  | 21.58  | 261.8 |
| SD :                                                                    | 16.56  | 19.63  | 11.71  | 6.99  | 14.05 | 12.03 | 19.81  | 33.21  | 32.28  | 26.94  | 41.13  | 20.39  | 101.3 |



| Appendix A11                                                              |        |        |        |        |        |       |        |        |        |        |        |        |       |
|---------------------------------------------------------------------------|--------|--------|--------|--------|--------|-------|--------|--------|--------|--------|--------|--------|-------|
| File : 022803.PAT                                                         |        |        |        |        |        |       |        |        |        |        |        |        |       |
| Units : mm                                                                |        |        |        |        |        |       |        |        |        |        |        |        |       |
| Descrip. : Patched monthly rainfall for station 022803 2 for 1925 to 1998 |        |        |        |        |        |       |        |        |        |        |        |        |       |
| Year                                                                      | Oct    | Nov    | Dec    | Jan    | Feb    | Mar   | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Total |
| 1925                                                                      | 17.10+ | 10.80+ | 8.40+  | 0.00   | 4.80   | 0.00  | 1.50   | 22.60  | 8.40   | 57.50  | 23.10  | 11.50  | 165.7 |
| 1926                                                                      | 47.50  | 18.60  | 0.00   | 0.00   | 5.30   | 0.00  | 34.80  | 9.40   | 42.20  | 3.00   | 53.90  | 0.00   | 214.7 |
| 1927                                                                      | 0.00   | 10.40  | 8.40+  | 10.90  | 0.00   | 8.90  | 0.00   | 0.00   | 40.40  | 12.30+ | 18.10+ | 22.60+ | 132.0 |
| 1928                                                                      | 0.00+  | 25.40+ | 7.60   | 0.00   | 0.00   | 32.30 | 31.50  | 25.40  | 33.00  | 57.90  | 38.20  | 0.00   | 251.3 |
| 1929                                                                      | 1.50   | 0.00+  | 6.60+  | 26.50+ | 48.60+ | 7.00+ | 0.00+  | 15.30+ | 9.40+  | 10.70+ | 48.80+ | 25.20+ | 199.6 |
| 1930                                                                      | 6.30+  | 8.10+  | 2.20+  | 0.00   | 1.00   | 1.80  | 50.00  | 4.30   | 3.30   | 46.70  | 44.70  | 13.70  | 182.1 |
| 1931                                                                      | 53.30  | 2.50   | 9.10   | 2.80   | 46.50  | 0.00  | 0.00   | 28.20  | 28.70  | 28.00  | 3.80   | 45.70  | 248.6 |
| 1932                                                                      | 0.00   | 0.00   | 5.10   | 0.00   | 0.00   | 13.50 | 9.40   | 26.20  | 56.30  | 53.00  | 46.40  | 3.10   | 213.0 |
| 1933                                                                      | 3.10   | 9.10   | 11.20  | 10.00  | 18.30  | 0.00  | 0.00   | 17.00+ | 29.50+ | 37.60+ | 60.70+ | 37.40  | 233.9 |
| 1934                                                                      | 35.10  | 5.10   | 0.00   | 0.00   | 0.00   | 0.00  | 43.70  | 49.00  | 27.30  | 27.60  | 23.40  | 14.50  | 225.7 |
| 1935                                                                      | 3.00   | 14.00  | 0.00   | 11.90  | 0.00   | 0.00  | 10.70  | 32.00  | 12.70  | 33.30  | 28.90  | 31.20  | 177.7 |
| 1936                                                                      | 4.10   | 51.30  | 34.60  | 0.00   | 0.00   | 16.00 | 15.30  | 36.30  | 15.30  | 45.90  | 3.30   | 18.80  | 240.9 |
| 1937                                                                      | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00  | 30.50  | 28.50  | 24.80  | 15.20  | 21.80  | 14.50  | 135.3 |
| 1938                                                                      | 7.60   | 9.40   | 12.70  | 30.00  | 16.80  | 9.70  | 22.60  | 49.50  | 10.90  | 23.60  | 51.50  | 15.70  | 260.0 |
| 1939                                                                      | 7.90+  | 0.00   | 3.80   | 0.00   | 12.20  | 0.00  | 0.00   | 38.60  | 49.00  | 18.10+ | 4.80+  | 0.00   | 134.4 |
| 1940                                                                      | 0.00   | 41.50  | 0.00   | 13.50  | 11.40  | 0.00+ | 42.40  | 61.70  | 79.80  | 35.60  | 25.90  | 27.70  | 339.5 |
| 1941                                                                      | 9.20   | 27.90  | 0.00   | 13.70  | 0.00   | 0.00  | 0.00   | 58.20  | 57.80  | 0.00   | 15.80  | 3.60   | 186.2 |
| 1942                                                                      | 15.20  | 0.00   | 30.20  | 32.00  | 0.00   | 25.40 | 26.20  | 0.00   | 21.60  | 41.10  | 21.30  | 42.10  | 255.1 |
| 1943                                                                      | 0.00   | 19.10  | 2.50+  | 0.00   | 0.00   | 0.00  | 0.00   | 31.80  | 0.00   | 0.00   | 34.80+ | 21.70+ | 109.9 |
| 1944                                                                      | 29.40+ | 11.10+ | 1.20+  | 0.00+  | 0.00+  | 1.90+ | 25.40  | 88.40  | 25.40  | 69.30  | 22.90  | 25.40  | 300.4 |
| 1945                                                                      | 41.90  | 0.00   | 0.00   | 0.00   | 0.00   | 3.80  | 5.40   | 5.60   | 4.80   | 25.40  | 2.80   | 49.70  | 139.4 |
| 1946                                                                      | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 35.80 | 2.50   | 23.70  | 11.20  | 59.20  | 6.40   | 5.30   | 144.1 |
| 1947                                                                      | 1.30   | 7.90   | 6.10   | 0.00   | 6.10   | 72.40 | 0.00   | 10.20  | 26.90  | 35.10  | 0.00   | 37.60  | 203.6 |
| 1948                                                                      | 60.70  | 0.00   | 0.00   | 0.00   | 0.00   | 2.50  | 40.60  | 16.30  | 17.60  | 20.80  | 28.20  | 16.30  | 203.0 |
| 1949                                                                      | 3.80   | 38.60  | 0.00   | 0.00   | 0.00   | 0.00  | 39.40  | 7.60   | 6.10   | 88.20  | 3.00   | 32.30  | 219.0 |
| 1950                                                                      | 41.70  | 22.80  | 10.20  | 44.50  | 0.00   | 0.00  | 30.80  | 7.30   | 42.40  | 56.10  | 5.60   | 7.60   | 269.0 |
| 1951                                                                      | 31.80  | 8.60   | 0.00   | 0.00   | 12.70  | 0.00  | 10.70  | 37.10  | 38.10  | 53.60  | 55.20  | 45.50  | 293.3 |
| 1952                                                                      | 6.60   | 48.60  | 6.40   | 0.00   | 16.30  | 0.00  | 52.60  | 25.90  | 8.10   | 44.10  | 14.80  | 0.00   | 223.4 |
| 1953                                                                      | 26.20  | 29.20  | 0.00   | 0.00   | 0.00   | 15.00 | 15.00  | 70.00  | 43.00  | 41.50  | 41.00  | 3.50   | 284.4 |
| 1954                                                                      | 0.00   | 0.00   | 0.00   | 0.00   | 109.50 | 0.00  | 16.50  | 10.50  | 30.50  | 81.50  | 85.30  | 4.00   | 337.8 |
| 1955                                                                      | 15.40  | 18.00  | 0.00   | 11.00  | 3.50   | 0.00  | 2.00   | 44.50  | 64.50  | 28.50  | 28.50  | 9.70   | 225.6 |
| 1956                                                                      | 15.00  | 0.00   | 10.00  | 0.00   | 29.00  | 27.30 | 6.00   | 75.00  | 120.20 | 50.20  | 49.90  | 13.50  | 396.1 |
| 1957                                                                      | 21.60  | 0.00   | 0.00   | 0.00   | 15.50  | 12.00 | 22.50  | 72.80  | 24.50  | 0.00   | 66.40  | 6.50   | 241.8 |
| 1958                                                                      | 25.50  | 8.50   | 0.00   | 15.00  | 20.00  | 12.00 | 40.50  | 73.00  | 5.00   | 18.00  | 42.50  | 19.00  | 279.0 |
| 1959                                                                      | 59.20  | 0.00   | 4.50   | 5.80   | 0.00   | 8.00  | 0.00   | 35.00  | 42.00  | 17.00  | 0.00   | 4.40   | 175.9 |
| 1960                                                                      | 1.10   | 1.50   | 5.50   | 11.00  | 0.00   | 23.50 | 14.00  | 26.80  | 20.00  | 28.30  | 31.20  | 54.20  | 217.1 |
| 1961                                                                      | 8.90   | 0.00   | 0.00   | 34.20  | 12.00  | 8.00  | 10.50  | 10.30  | 102.50 | 31.30  | 106.40 | 0.00   | 324.1 |
| 1962                                                                      | 76.30  | 24.00  | 0.00   | 0.00   | 10.30  | 0.00  | 0.00   | 33.70  | 23.50  | 56.70  | 63.40  | 3.00   | 290.9 |
| 1963                                                                      | 9.50   | 9.50   | 13.50  | 0.00   | 14.90  | 8.00  | 11.50  | 17.80  | 67.30  | 15.30  | 52.00  | 11.50  | 230.8 |
| 1964                                                                      | 23.70  | 64.20  | 0.00   | 0.00   | 8.00   | 56.90 | 9.00   | 25.70  | 21.70  | 22.00  | 19.50  | 2.00   | 252.7 |
| 1965                                                                      | 22.00  | 12.00  | 15.80  | 0.00   | 0.00   | 20.50 | 11.30  | 11.00  | 30.70  | 32.90  | 43.30  | 21.00  | 220.5 |
| 1966                                                                      | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00  | 64.00  | 28.30  | 74.40  | 13.00  | 21.50  | 0.00   | 201.2 |
| 1967                                                                      | 8.50   | 24.90  | 0.00   | 7.00   | 0.00   | 0.00  | 17.00  | 24.90  | 87.40  | 36.20  | 42.30  | 5.50   | 253.7 |
| 1968                                                                      | 19.00  | 16.00  | 0.00   | 0.00   | 0.00   | 0.00  | 21.00  | 0.00   | 18.00  | 10.50  | 13.40  | 21.50  | 119.4 |
| 1969                                                                      | 29.50  | 0.00   | 0.00   | 0.00   | 31.00  | 0.00  | 0.00   | 13.50  | 26.50  | 41.10  | 33.20  | 13.00  | 187.8 |
| 1970                                                                      | 12.30  | 0.00   | 0.00   | 0.00   | 0.00   | 16.00 | 14.60  | 26.40  | 21.50  | 61.70  | 49.50  | 0.00   | 202.0 |
| 1971                                                                      | 0.00   | 0.00   | 9.00   | 10.50  | 0.00   | 0.00  | 49.00  | 34.40  | 20.50  | 22.00  | 25.50  | 26.50  | 197.4 |
| 1972                                                                      | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00  | 0.00   | 0.00   | 17.50  | 56.20  | 21.00  | 10.00  | 104.7 |
| 1973                                                                      | 0.00   | 0.00   | 6.00   | 0.00   | 28.00  | 5.00  | 0.00   | 38.60  | 28.80  | 13.00  | 211.90 | 12.00  | 343.3 |
| 1974                                                                      | 49.30  | 1.20   | 0.00   | 0.00   | 0.00   | 0.00  | 8.00   | 74.50  | 18.50  | 21.50  | 53.50  | 8.00   | 234.5 |
| 1975                                                                      | 13.50  | 0.00   | 0.00   | 0.00   | 8.00   | 38.80 | 11.00  | 22.00  | 108.00 | 22.50  | 38.50  | 12.00  | 274.3 |
| 1976                                                                      | 25.00  | 34.00  | 15.00  | 0.00   | 25.50  | 0.00  | 59.00  | 84.50  | 48.50  | 75.30  | 68.00  | 7.00   | 441.8 |
| 1977                                                                      | 0.00   | 19.50  | 3.50   | 2.70+  | 6.40   | 23.00 | 13.00  | 8.80   | 8.00   | 11.40  | 63.80  | 10.50+ | 170.6 |
| 1978                                                                      | 11.50  | 0.00   | 34.20+ | 9.70+  | 45.70  | 0.00  | 0.00   | 33.80  | 44.30  | 31.90  | 23.90+ | 16.90+ | 251.9 |
| 1979                                                                      | 8.70+  | 0.00   | 0.00   | 12.10  | 0.00   | 0.00  | 21.10  | 26.40  | 38.60  | 15.80+ | 27.10  | 17.80  | 167.6 |
| 1980                                                                      | 6.60   | 40.40+ | 20.90  | 185.20 | 30.20  | 19.80 | 32.00  | 9.00   | 9.50   | 56.50  | 46.60  | 33.40  | 490.1 |
| 1981                                                                      | 31.20+ | 6.00   | 2.20   | 3.50   | 0.00   | 4.90  | 130.20 | 8.00   | 37.40  | 22.10  | 19.50  | 2.00   | 267.0 |
| 1982                                                                      | 13.30+ | 7.20   | 0.00   | 1.00   | 10.70  | 12.20 | 13.30  | 79.80  | 64.10  | 53.80+ | 8.10   | 54.00  | 317.5 |
| 1983                                                                      | 0.00   | 0.00   | 0.00   | 9.40   | 0.00   | 40.50 | 14.60  | 83.10  | 4.60   | 13.50  | 8.80   | 51.30  | 225.8 |
| 1984                                                                      | 42.80  | 0.00   | 21.90  | 23.00  | 22.80  | 29.70 | 15.00  | 16.00  | 31.60+ | 87.00  | 28.30  | 15.20  | 333.3 |
| 1985                                                                      | 36.10  | 3.50   | 19.40  | 0.00   | 10.80  | 19.50 | 23.90  | 2.60   | 50.80+ | 33.10  | 81.30  | 28.50  | 309.5 |
| 1986                                                                      | 22.50  | 9.00   | 0.00   | 0.00   | 3.00   | 0.00  | 30.30  | 38.10  | 44.00+ | 21.20  | 51.70  | 17.90  | 237.7 |
| 1987                                                                      | 0.00   | 0.00   | 4.00   | 0.00   | 0.00   | 4.00  | 17.30  | 12.00  | 33.70  | 9.20   | 42.40  | 10.10  | 132.7 |
| 1988                                                                      | 4.20   | 0.00   | 1.00   | 0.00   | 1.50   | 43.10 | 71.80  | 10.30  | 57.80  | 29.10  | 50.30  | 50.80  | 319.9 |
| 1989                                                                      | 21.00  | 7.50   | 0.00   | 3.60   | 19.50  | 3.50  | 68.50  | 39.30  | 62.50  | 32.90  | 7.50   | 0.00   | 265.8 |
| 1990                                                                      | 6.50   | 3.50   | 12.80  | 10.50  | 0.00   | 23.80 | 15.50  | 30.00  | 45.30  | 80.20  | 7.50   | 31.00  | 266.6 |
| 1991                                                                      | 15.00  | 0.00   | 0.00   | 0.00   | 7.20   | 3.50  | 37.50  | 26.50  | 52.50  | 51.60  | 24.20  | 9.50   | 227.5 |
| 1992                                                                      | 40.70  | 2.00   | 0.00   | 0.00   | 13.50  | 0.00  | 214.70 | 31.50  | 34.00  | 85.60  | 21.20  | 4.50   | 447.7 |
| 1993                                                                      | 0.00   | 0.00   | 16.00  | 1.50   | 0.00   | 15.60 | 45.50  | 30.20  | 106.00 | 27.00  | 12.50  | 20.50  | 274.8 |
| 1994                                                                      | 12.00  | 0.00   | 27.00  | 48.50  | 4.20   | 18.50 | 4.00   | 66.20  | 28.00  | 18.00  | 45.50  | 3.50   | 275.4 |
| 1995                                                                      | 36.00  | 16.00  | 100.00 | 3.80   | 10.50  | 14.00 | 4.60   | 28.00  | 78.50  | 59.00  | 33.00  | 24.50  | 407.9 |
| 1996                                                                      | 39.00  | 34.50  | 14.50  | 0.00   | 0.00   | 5.00  | 25.00  | 69.00  | 70.00  | 17.00  | 23.50  | 0.00   | 297.5 |
| 1997                                                                      | 8.50   | 35.00  | 0.00   | 42.00  | 0.00   | 13.50 | 21.50  | 78.20  | 7.50   | 16.00  | 7.50   | 0.00   | 229.7 |
| 1998                                                                      | 0.00   | 10.80+ | 38.00  | 0.00   | 0.00   | 0.00  | 13.50  | 29.00  | 36.30+ | 34.20+ | 36.30+ | 16.80+ | 214.9 |
| AVE :                                                                     | 16.83  | 11.20  | 7.58   | 8.74   | 9.48   | 10.49 | 23.80  | 31.96  | 37.04  | 35.15  | 34.95  | 16.96  | 244.2 |
| SD :                                                                      | 17.85  | 14.71  | 14.30  | 23.69  | 16.68  | 14.65 | 31.66  | 23.76  | 26.91  | 22.11  | 30.17  | 15.09  | 78.1  |

## Appendix A12

File : 23039P.PAT  
Units : mm  
Descrip. : Patched monthly rainfall for station 023039P for 1927 to 1977

| Year  | Oct   | Nov    | Dec   | Jan   | Feb   | Mar    | Apr    | May   | Jun   | Jul   | Aug    | Sep   | Total |
|-------|-------|--------|-------|-------|-------|--------|--------|-------|-------|-------|--------|-------|-------|
| 1927  | 0.00+ | 12.70+ | 7.50+ | 0.00  | 0.00  | 29.20  | 4.60   | 0.00  | 42.20 | 3.80  | 13.00  | 26.20 | 139.2 |
| 1928  | 0.00  | 33.80  | 23.40 | 0.00  | 0.00  | 20.80  | 17.30  | 27.70 | 10.20 | 45.00 | 16.30  | 13.00 | 207.5 |
| 1929  | 7.40  | 0.00   | 5.80  | 25.40 | 47.20 | 7.60   | 0.00   | 6.60  | 5.80  | 2.30  | 38.40  | 29.50 | 176.0 |
| 1930  | 4.30  | 9.10   | 1.50  | 7.60  | 0.00  | 6.40   | 69.10  | 7.40  | 0.00  | 42.70 | 34.00  | 2.00  | 184.1 |
| 1931  | 30.70 | 16.50  | 5.20  | 0.00  | 66.30 | 0.00   | 0.00   | 31.20 | 25.70 | 12.70 | 0.00   | 49.80 | 238.1 |
| 1932  | 9.10  | 8.90   | 9.10  | 0.00  | 0.00  | 22.40  | 6.90   | 22.90 | 32.80 | 42.70 | 36.80  | 2.50  | 194.1 |
| 1933  | 0.00  | 13.70  | 10.20 | 19.10 | 6.10  | 12.20  | 3.00   | 8.10  | 22.40 | 27.20 | 48.30  | 31.00 | 201.3 |
| 1934  | 43.90 | 26.40  | 0.00  | 3.00  | 0.00  | 0.00   | 9.70   | 39.90 | 34.80 | 24.90 | 11.70  | 18.50 | 212.8 |
| 1935  | 0.00  | 6.60   | 0.00  | 8.90  | 0.00  | 0.00   | 18.80  | 7.90  | 9.70  | 27.70 | 37.60  | 27.40 | 144.6 |
| 1936  | 4.80  | 48.30  | 22.40 | 0.00  | 12.70 | 45.00  | 7.10   | 15.70 | 38.10 | 58.90 | 0.00   | 25.40 | 278.4 |
| 1937  | 6.40  | 3.30   | 17.50 | 0.00  | 0.00  | 13.20  | 26.40  | 12.20 | 20.10 | 10.70 | 18.50  | 11.70 | 140.0 |
| 1938  | 17.80 | 9.90   | 16.50 | 0.00  | 46.50 | 19.80  | 14.00  | 16.30 | 5.30  | 15.70 | 55.60  | 6.60  | 224.0 |
| 1939  | 5.80  | 0.00   | 0.00  | 0.00  | 20.30 | 25.40  | 8.90   | 3.80  | 25.70 | 15.20 | 6.40   | 14.20 | 125.7 |
| 1940  | 4.60  | 26.90  | 0.00  | 22.10 | 0.00  | 0.00   | 49.80  | 58.70 | 43.70 | 27.90 | 28.20  | 34.50 | 296.4 |
| 1941  | 35.30 | 1.80   | 0.00  | 2.80  | 3.60  | 0.00   | 8.60   | 61.70 | 64.30 | 3.60  | 19.60  | 8.90  | 210.2 |
| 1942  | 16.00 | 0.00   | 34.50 | 30.20 | 6.10  | 42.40  | 45.50  | 4.60  | 17.80 | 29.50 | 37.80  | 52.30 | 316.7 |
| 1943  | 4.60  | 30.00  | 1.80  | 0.00  | 0.00  | 13.20  | 10.90  | 21.80 | 61.00 | 0.00  | 47.50  | 21.60 | 212.4 |
| 1944  | 9.10  | 5.60   | 0.00  | 0.00  | 0.00  | 0.00   | 7.10   | 62.70 | 32.30 | 41.10 | 29.70  | 10.40 | 198.0 |
| 1945  | 46.50 | 6.40   | 0.00  | 0.00  | 0.00  | 13.00  | 8.10   | 3.80  | 14.70 | 6.40  | 2.00   | 71.10 | 172.0 |
| 1946  | 8.60  | 0.00   | 6.90  | 0.00  | 0.00  | 25.40  | 20.80  | 24.40 | 2.50  | 33.00 | 13.20  | 5.30  | 140.1 |
| 1947  | 10.90 | 7.60   | 0.00  | 13.20 | 0.00  | 21.10  | 20.80  | 16.30 | 19.60 | 18.30 | 1.50   | 30.00 | 159.3 |
| 1948  | 33.30 | 4.10   | 8.60  | 0.00  | 0.00  | 0.00   | 30.50  | 13.50 | 8.40  | 21.80 | 27.40  | 13.70 | 161.3 |
| 1949  | 4.10  | 83.10  | 0.00  | 0.00  | 0.00  | 2.30   | 16.30  | 12.70 | 3.00  | 48.80 | 0.00   | 35.10 | 205.4 |
| 1950  | 22.40 | 62.20  | 0.00  | 51.80 | 0.00  | 0.00   | 12.20  | 3.00  | 43.20 | 20.60 | 14.00  | 33.50 | 262.9 |
| 1951  | 3.30  | 20.80  | 0.00  | 0.00  | 28.40 | 0.00   | 7.10   | 42.90 | 46.70 | 40.10 | 46.70  | 32.50 | 268.5 |
| 1952  | 2.30  | 40.10  | 6.10  | 0.00  | 18.30 | 0.00   | 62.00  | 19.60 | 15.00 | 31.50 | 7.10   | 12.70 | 214.7 |
| 1953  | 23.10 | 12.40  | 17.80 | 0.00  | 10.20 | 31.00  | 7.90   | 57.40 | 34.00 | 64.30 | 51.10  | 7.10  | 316.3 |
| 1954  | 9.10  | 5.30   | 3.00  | 0.00  | 59.20 | 11.40  | 8.90   | 4.30  | 36.60 | 42.90 | 43.40  | 10.40 | 234.5 |
| 1955  | 11.40 | 0.00   | 4.30  | 0.00  | 18.00 | 0.00   | 0.00   | 30.50 | 55.40 | 21.80 | 19.80  | 0.00  | 161.2 |
| 1956  | 17.50 | 0.00   | 19.10 | 0.00  | 20.60 | 34.30  | 0.00   | 69.60 | 67.60 | 31.50 | 32.50  | 31.20 | 323.9 |
| 1957  | 9.10  | 0.00   | 0.00  | 0.00  | 5.60  | 19.30  | 18.80  | 34.80 | 10.90 | 0.00  | 21.60  | 6.40  | 126.5 |
| 1958  | 13.70 | 5.10   | 0.00  | 0.00  | 26.70 | 10.90  | 35.30  | 45.20 | 5.10  | 16.00 | 26.90  | 3.80  | 188.7 |
| 1959  | 50.50 | 0.00   | 0.00  | 0.00  | 0.00  | 1.80   | 3.60   | 25.10 | 24.40 | 26.40 | 0.00   | 25.90 | 157.7 |
| 1960  | 0.00  | 8.40   | 8.60  | 7.10  | 0.00  | 10.70  | 14.20  | 7.10  | 13.70 | 9.40  | 9.70   | 62.20 | 151.1 |
| 1961  | 19.80 | 0.00   | 0.00  | 17.80 | 12.40 | 8.90   | 22.60  | 17.00 | 68.30 | 19.30 | 89.40  | 3.80  | 279.3 |
| 1962  | 39.10 | 11.70  | 0.00  | 14.50 | 0.00  | 2.50   | 0.00   | 20.30 | 23.40 | 14.20 | 38.90  | 1.30  | 165.9 |
| 1963  | 15.20 | 30.50  | 21.60 | 0.00  | 2.50  | 0.00   | 24.60  | 27.70 | 62.00 | 10.20 | 32.80  | 21.80 | 248.9 |
| 1964  | 9.70  | 54.40  | 0.00  | 0.00  | 7.60  | 25.40  | 15.20  | 20.10 | 11.20 | 20.60 | 18.50  | 6.90  | 189.6 |
| 1965  | 18.30 | 13.70  | 10.70 | 0.00  | 0.00  | 18.50  | 9.70   | 11.70 | 32.50 | 10.90 | 42.90  | 27.70 | 196.6 |
| 1966  | 0.00  | 0.00   | 0.00  | 0.00  | 0.00  | 1.00   | 46.00  | 22.90 | 36.60 | 9.90  | 17.00  | 5.10  | 138.5 |
| 1967  | 6.90  | 22.60  | 0.00  | 2.30  | 0.00  | 2.00   | 17.00  | 6.60  | 46.50 | 13.20 | 21.60  | 14.20 | 152.9 |
| 1968  | 29.50 | 14.70  | 0.00  | 4.10  | 7.10  | 0.00   | 38.90  | 0.00  | 25.90 | 1.80  | 7.60   | 11.70 | 141.3 |
| 1969  | 20.60 | 2.50   | 0.00  | 0.00  | 7.60  | 0.00   | 0.00   | 12.20 | 15.00 | 38.90 | 30.50  | 11.40 | 138.7 |
| 1970  | 20.30 | 0.00   | 1.80  | 0.00  | 2.50  | 21.60  | 7.10   | 23.40 | 13.00 | 85.30 | 50.30  | 1.80  | 227.1 |
| 1971  | 9.90  | 6.40   | 6.10  | 7.60  | 3.00  | 24.40  | 0.00   | 20.80 | 0.00  | 12.20 | 4.10   | 35.10 | 129.6 |
| 1972  | 0.00  | 0.00   | 5.80  | 0.00  | 14.70 | 4.30   | 0.00   | 6.60  | 9.90  | 40.60 | 8.60   | 2.80  | 93.3  |
| 1973  | 2.50  | 5.60   | 5.80  | 0.00  | 20.80 | 11.40  | 0.00   | 51.30 | 38.60 | 7.60  | 149.10 | 17.30 | 310.0 |
| 1974  | 16.50 | 2.00   | 0.00  | 1.00  | 0.00  | 4.00   | 4.00   | 40.00 | 26.00 | 30.00 | 44.00  | 0.00  | 167.5 |
| 1975  | 12.00 | 0.00   | 0.00  | 52.00 | 12.00 | 18.00  | 26.00  | 0.00  | 65.00 | 20.00 | 9.00   | 4.00  | 218.0 |
| 1976  | 29.00 | 54.00  | 7.00  | 0.00  | 22.00 | 0.00   | 95.00  | 47.00 | 37.00 | 58.00 | 37.00  | 7.00  | 393.0 |
| 1977  | 0.00  | 0.00   | 54.00 | 2.70+ | 0.00+ | 10.50+ | 13.40+ | 2.00+ | 4.70+ | 9.00+ | 42.90+ | 7.30+ | 146.5 |
| AVE : | 14.02 | 14.26  | 6.72  | 5.75  | 9.96  | 11.59  | 17.52  | 22.53 | 27.61 | 24.83 | 28.25  | 18.54 | 201.6 |
| SD :  | 13.13 | 18.73  | 10.41 | 11.92 | 15.65 | 12.06  | 19.59  | 18.56 | 19.47 | 18.26 | 25.30  | 16.29 | 63.2  |

| Appendix A13                                                              |        |        |        |       |        |       |        |        |        |         |        |        |       |
|---------------------------------------------------------------------------|--------|--------|--------|-------|--------|-------|--------|--------|--------|---------|--------|--------|-------|
| File : 042227_3.PAT                                                       |        |        |        |       |        |       |        |        |        |         |        |        |       |
| Units : mm                                                                |        |        |        |       |        |       |        |        |        |         |        |        |       |
| Descrip. : Patched monthly rainfall for station 042227 3 for 1920 to 1998 |        |        |        |       |        |       |        |        |        |         |        |        |       |
| Year                                                                      | Oct    | Nov    | Dec    | Jan   | Feb    | Mar   | Apr    | May    | Jun    | Jul     | Aug    | Sep    | Total |
| 1920                                                                      | 33.90+ | 15.80+ | 15.80+ | 22.10 | 41.10  | 8.90  | 37.60  | 0.00   | 267.50 | 129.60  | 70.10  | 43.50  | 685.9 |
| 1921                                                                      | 11.40  | 6.60   | 34.80  | 46.50 | 10.70  | 9.40  | 33.80  | 39.10  | 109.80 | 38.30   | 107.40 | 0.00   | 447.8 |
| 1922                                                                      | 18.60  | 8.40   | 0.00   | 35.60 | 0.50   | 3.00  | 63.60  | 76.30  | 112.80 | 53.10   | 63.00  | 21.30  | 456.2 |
| 1923                                                                      | 19.50  | 34.50  | 5.10   | 2.00  | 0.00   | 10.40 | 21.80  | 9.40   | 120.20 | 41.20   | 77.40  | 32.50  | 374.0 |
| 1924                                                                      | 56.80  | 14.30  | 0.00   | 11.90 | 0.00   | 0.00  | 0.50   | 21.40  | 238.30 | 95.00   | 23.90  | 4.30   | 466.4 |
| 1925                                                                      | 77.40  | 43.20  | 4.80   | 0.00  | 23.10  | 0.00  | 9.90   | 68.70  | 15.00  | 94.00   | 30.20  | 13.50  | 379.8 |
| 1926                                                                      | 86.80  | 21.00  | 0.00   | 7.60  | 14.00  | 0.00  | 29.60  | 26.40  | 48.70  | 13.90   | 79.20  | 23.60  | 350.8 |
| 1927                                                                      | 3.60   | 48.00  | 11.20  | 14.80 | 0.00   | 16.20 | 2.00   | 0.80   | 134.30 | 42.50   | 44.50  | 36.90  | 354.8 |
| 1928                                                                      | 23.80  | 15.60  | 5.70   | 0.00  | 2.50   | 7.60  | 33.40  | 54.10  | 70.40  | 88.00   | 51.60  | 23.60  | 376.3 |
| 1929                                                                      | 14.00  | 8.90   | 26.50  | 12.50 | 29.70  | 10.20 | 11.70  | 6.40   | 6.90   | 38.50   | 32.30  | 110.10 | 307.7 |
| 1930                                                                      | 32.40  | 21.00  | 2.30   | 0.00  | 7.60   | 8.60  | 53.60  | 78.80  | 21.30  | 46.90   | 101.60 | 53.20  | 427.3 |
| 1931                                                                      | 32.80  | 0.00   | 15.20  | 4.10  | 102.90 | 0.00  | 0.00   | 69.10  | 69.30  | 65.80   | 39.40  | 55.00  | 453.6 |
| 1932                                                                      | 18.80  | 5.10   | 8.90   | 6.40  | 12.20  | 16.80 | 0.00   | 92.20  | 109.80 | 132.90  | 41.60  | 30.70  | 475.4 |
| 1933                                                                      | 11.50  | 12.90  | 30.50  | 7.40  | 7.60   | 36.60 | 4.30   | 63.10  | 58.70  | 35.30   | 24.20  | 81.50  | 373.6 |
| 1934                                                                      | 78.00  | 39.90  | 0.00   | 4.10  | 11.70  | 26.90 | 57.50  | 63.30  | 71.30  | 51.50   | 78.50  | 34.80  | 517.5 |
| 1935                                                                      | 5.40   | 25.90  | 2.30   | 28.70 | 2.30   | 21.00 | 9.60   | 77.20  | 25.60  | 65.00   | 84.50  | 98.30  | 445.8 |
| 1936                                                                      | 19.90  | 12.40  | 51.40  | 3.60  | 2.00   | 49.70 | 39.00  | 62.00  | 112.50 | 115.60  | 29.80  | 4.10   | 502.0 |
| 1937                                                                      | 29.60  | 0.00   | 13.50  | 14.50 | 6.40   | 5.60  | 77.90  | 85.80  | 39.10  | 41.50   | 56.20  | 51.90  | 422.0 |
| 1938                                                                      | 24.70  | 12.00  | 15.20  | 0.00  | 26.00  | 3.30  | 20.10  | 82.30  | 34.80  | 31.00   | 69.70  | 45.50  | 364.6 |
| 1939                                                                      | 6.80   | 15.30  | 7.10   | 5.60  | 36.80  | 8.70  | 58.40  | 30.20  | 76.60+ | 32.40   | 11.50  | 45.50  | 334.9 |
| 1940                                                                      | 17.80  | 28.30  | 10.20  | 52.30 | 0.80   | 3.80  | 70.40  | 141.50 | 121.00 | 68.80   | 69.30  | 121.40 | 705.6 |
| 1941                                                                      | 59.90  | 10.90  | 11.90  | 8.10+ | 0.00+  | 2.00  | 5.10   | 87.50  | 208.20 | 34.20   | 55.80  | 8.40   | 492.0 |
| 1942                                                                      | 35.80  | 3.60   | 11.70  | 35.80 | 26.50  | 30.40 | 13.10  | 32.50  | 78.00  | 114.70  | 115.20 | 51.00  | 548.3 |
| 1943                                                                      | 30.30  | 42.50  | 0.00   | 9.40  | 0.00   | 20.80 | 37.70  | 114.30 | 144.50 | 17.90   | 122.20 | 53.00  | 592.6 |
| 1944                                                                      | 28.60  | 36.30  | 19.10  | 0.00  | 0.00   | 1.00  | 42.50  | 175.60 | 144.00 | 100.30  | 91.30  | 4.30   | 643.0 |
| 1945                                                                      | 30.00  | 17.80  | 6.40   | 1.80  | 1.80   | 21.90 | 23.40  | 41.60  | 30.00  | 26.90   | 41.00  | 127.60 | 370.2 |
| 1946                                                                      | 31.20  | 7.60   | 9.40   | 0.00  | 0.00   | 52.40 | 5.50   | 51.60  | 13.00  | 128.00  | 38.30  | 30.50  | 367.5 |
| 1947                                                                      | 41.30  | 9.40   | 0.00   | 3.80  | 22.60  | 84.10 | 45.60  | 71.60  | 49.00  | 97.30   | 14.70  | 101.80 | 541.2 |
| 1948                                                                      | 38.30  | 8.90   | 7.30   | 5.10  | 0.00   | 2.30  | 46.50  | 33.10  | 53.30  | 57.40   | 53.80  | 59.20  | 365.2 |
| 1949                                                                      | 59.40  | 78.70  | 10.60  | 0.00  | 0.00   | 7.10  | 115.60 | 14.50  | 27.70  | 142.50  | 0.00   | 128.20 | 584.3 |
| 1950                                                                      | 53.60  | 72.60  | 23.40  | 38.90 | 0.00   | 0.00  | 50.50  | 41.10  | 159.30 | 63.80   | 66.50  | 43.40  | 613.1 |
| 1951                                                                      | 39.80  | 39.00  | 0.00   | 3.00  | 15.20  | 15.70 | 17.30  | 126.20 | 75.20  | 103.60  | 101.90 | 47.60  | 584.5 |
| 1952                                                                      | 31.70  | 73.20  | 5.30   | 0.00  | 0.00   | 6.00  | 131.50 | 112.80 | 24.30  | 113.70  | 66.80  | 2.20   | 567.5 |
| 1953                                                                      | 17.00  | 51.70  | 31.50  | 9.50  | 5.00   | 16.90 | 70.50  | 205.80 | 54.00  | 156.80  | 130.80 | 23.00  | 772.5 |
| 1954                                                                      | 31.00  | 6.50   | 37.10  | 0.00  | 65.50  | 17.80 | 22.90  | 11.10  | 108.50 | 109.80  | 167.90 | 19.00  | 597.1 |
| 1955                                                                      | 81.50  | 23.00  | 13.50  | 16.80 | 10.50  | 5.50  | 10.00  | 64.90  | 97.50  | 51.50   | 55.50  | 24.50  | 454.7 |
| 1956                                                                      | 13.50  | 0.00   | 25.00  | 0.00  | 76.70  | 29.00 | 31.00  | 0.00   | 108.00 | 98.00   | 87.50  | 33.00  | 501.7 |
| 1957                                                                      | 116.50 | 0.00   | 0.00   | 4.50  | 31.50  | 0.00  | 23.00  | 81.00  | 43.50  | 7.50    | 0.00   | 27.00  | 334.5 |
| 1958                                                                      | 27.00  | 20.00  | 0.00   | 5.50  | 19.70  | 16.00 | 66.10+ | 155.30 | 28.00  | 9.00    | 80.00  | 29.00  | 455.6 |
| 1959                                                                      | 57.00  | 0.00   | 26.00  | 0.00  | 3.00   | 29.00 | 27.50  | 61.20  | 84.00  | 19.50   | 21.00  | 22.50  | 350.7 |
| 1960                                                                      | 17.00  | 9.50   | 13.50  | 20.00 | 2.50   | 10.20 | 25.00  | 37.50  | 36.00  | 55.00   | 66.50  | 87.50  | 380.2 |
| 1961                                                                      | 15.50  | 0.00   | 0.00   | 10.00 | 23.80  | 65.50 | 47.00  | 38.50  | 193.50 | 76.00   | 135.50 | 24.00  | 629.3 |
| 1962                                                                      | 112.50 | 35.00  | 3.50   | 2.00  | 0.00   | 7.50  | 2.80   | 7.00   | 76.20  | 76.60   | 163.70 | 15.00  | 501.8 |
| 1963                                                                      | 14.50  | 50.50  | 27.00  | 0.70  | 16.10  | 13.00 | 15.00  | 47.50  | 88.50  | 71.00   | 108.50 | 40.50  | 492.8 |
| 1964                                                                      | 23.50  | 52.00  | 0.00   | 13.00 | 59.50  | 50.50 | 45.00  | 59.50  | 29.50  | 22.00   | 31.50  | 18.80  | 404.8 |
| 1965                                                                      | 39.00  | 7.70   | 16.50  | 0.00  | 3.00   | 43.00 | 34.00  | 24.20  | 85.10  | 92.20   | 21.00  | 38.20  | 403.9 |
| 1966                                                                      | 0.60   | 6.50   | 1.00   | 6.00  | 4.00   | 0.00  | 69.80  | 30.50  | 147.50 | 51.20   | 53.00  | 34.50  | 404.6 |
| 1967                                                                      | 36.50  | 36.00  | 0.00   | 11.00 | 12.00  | 0.00  | 52.00  | 77.90  | 0.00   | 80.50   | 64.50  | 2.50   | 372.9 |
| 1968                                                                      | 125.80 | 14.50  | 1.50   | 6.50  | 5.00   | 11.50 | 45.50  | 6.00   | 37.50  | 26.00   | 54.10  | 52.50  | 386.4 |
| 1969                                                                      | 95.00  | 9.50   | 0.00   | 0.00  | 6.50   | 0.00  | 0.70   | 0.00   | 117.50 | 82.00   | 79.40  | 39.70  | 430.3 |
| 1970                                                                      | 23.00  | 0.00   | 4.50   | 5.50  | 0.00   | 40.00 | 3.00   | 28.00  | 58.50  | 78.00   | 49.50  | 0.00   | 290.0 |
| 1971                                                                      | 3.10   | 4.00   | 6.40   | 17.50 | 8.50   | 11.20 | 67.20  | 81.70  | 48.50  | 57.50   | 20.70  | 25.30  | 351.6 |
| 1972                                                                      | 22.50  | 0.00   | 40.70  | 0.00  | 4.50   | 26.50 | 4.50   | 32.50  | 11.00  | 127.50  | 48.50  | 50.40  | 368.6 |
| 1973                                                                      | 32.30  | 8.50   | 36.60  | 2.70  | 0.00   | 8.50  | 24.00  | 124.40 | 83.00  | 46.50   | 273.00 | 46.50  | 686.0 |
| 1974                                                                      | 57.40  | 18.00  | 10.00  | 12.00 | 7.00   | 6.50  | 35.00  | 117.00 | 21.50  | 61.00   | 69.00  | 11.80  | 426.2 |
| 1975                                                                      | 54.90  | 9.10   | 5.50   | 3.50  | 10.60  | 16.00 | 83.00  | 22.30  | 152.70 | 85.60   | 29.00  | 19.80  | 492.0 |
| 1976                                                                      | 18.00  | 111.50 | 57.40  | 11.90 | 20.90  | 12.90 | 53.60  | 135.50 | 108.80 | 139.40  | 72.00  | 43.90  | 785.8 |
| 1977                                                                      | 16.70  | 16.50  | 18.30  | 12.00 | 4.30   | 36.70 | 26.70  | 8.90   | 15.70  | 3.60    | 94.50  | 42.50  | 296.4 |
| 1978                                                                      | 14.80  | 3.50   | 27.30  | 16.20 | 43.20  | 4.00  | 7.00   | 67.00  | 62.60  | 47.30   | 29.90  | 43.00  | 365.8 |
| 1979                                                                      | 33.00  | 3.00   | 1.00   | 22.50 | 13.00  | 2.00  | 24.40  | 57.90  | 53.00  | 13.00   | 66.70  | 12.00  | 301.5 |
| 1980                                                                      | 28.00  | 142.50 | 43.00  | 71.50 | 0.00   | 23.00 | 26.10  | 14.50  | 25.40  | 110.80  | 72.00  | 94.00  | 650.8 |
| 1981                                                                      | 18.60  | 9.00   | 0.00   | 29.50 | 1.00   | 39.20 | 111.10 | 28.10  | 78.40  | 35.10   | 14.10  | 4.60   | 368.7 |
| 1982                                                                      | 43.60  | 8.70   | 22.30  | 0.00  | 44.80  | 31.50 | 7.10   | 155.70 | 107.40 | 61.30   | 26.00  | 34.10  | 542.5 |
| 1983                                                                      | 23.10  | 15.90  | 6.00   | 5.50  | 1.00   | 90.20 | 39.20  | 173.80 | 10.30  | 55.30   | 19.20  | 108.60 | 548.1 |
| 1984                                                                      | 58.90  | 0.00   | 61.30  | 46.00 | 41.50  | 79.50 | 49.40  | 38.00  | 60.30  | 105.30  | 79.60  | 44.50  | 664.3 |
| 1985                                                                      | 4.30   | 2.50   | 18.90  | 3.50  | 11.00  | 26.00 | 18.10  | 17.80  | 88.00  | 78.80   | 100.30 | 38.80  | 408.0 |
| 1986                                                                      | 12.80  | 13.00  | 0.00   | 5.00  | 9.00   | 6.20  | 42.20  | 112.30 | 106.10 | 55.80   | 67.50  | 44.70  | 474.6 |
| 1987                                                                      | 1.00   | 0.00   | 16.50  | 0.00  | 0.00   | 13.80 | 92.00  | 18.00  | 57.00  | 35.30   | 54.50  | 50.00  | 338.1 |
| 1988                                                                      | 9.50   | 10.00  | 5.50   | 0.00+ | 23.00  | 75.00 | 68.00  | 44.00  | 93.50  | 63.50   | 94.00  | 72.30  | 558.3 |
| 1989                                                                      | 39.70  | 14.70  | 1.00   | 11.30 | 25.00  | 6.00  | 93.90  | 95.80  | 81.80  | 72.50   | 41.70  | 2.00   | 485.4 |
| 1990                                                                      | 1.00   | 21.50  | 21.60  | 6.50  | 0.00   | 5.00  | 26.50  | 37.50  | 135.00 | 182.70  | 19.80  | 55.60  | 512.7 |
| 1991                                                                      | 34.50  | 12.60  | 6.50   | 0.00  | 33.20  | 18.00 | 58.10  | 47.70  | 106.90 | 87.30   | 74.00  | 25.10  | 503.9 |
| 1992                                                                      | 64.40  | 21.60  | 5.00   | 3.50  | 15.50  | 5.00  | 38.20+ | 96.50  | 71.00  | 119.50  | 39.00  | 13.00  | 492.2 |
| 1993                                                                      | 2.00   | 8.50   | 12.00  | 0.00  | 0.00   | 2.00  | 68.50  | 37.00  | 155.50 | 63.00   | 11.50  | 78.00  | 438.0 |
| 1994                                                                      | 18.00  | 0.00   | 1.50   | 2.00  | 1.00   | 13.50 | 12.00  | 105.50 | 30.40+ | 123.90+ | 91.90  | 14.70+ | 414.4 |
| 1995                                                                      | 61.00  | 9.00   | 14.80+ | 0.00  | 25.80  | 23.00 | 18.00  | 44.50  | 81.10+ | 65.50+  | 70.00+ | 78.20  | 490.9 |
| 1996                                                                      | 0.00+  | 47.70  | 49.00  | 6.50  | 0.00   | 11.10 | 35.40+ | 39.60  | 0.00+  | 23.90   | 82.40+ | 1.30   | 296.9 |
| 1997                                                                      | 6.50   | 39.30  | 33.00  | 66.10 | 0.00   | 0.00  | 12.50  | 75.00+ | 0.00+  | 65.00   | 25.70  | 11.00  | 334.1 |
| 1998                                                                      | 16.10  | 50.80  | 33.10  | 0.00  | 2.50   | 0.00  | 39.60  | 0.00+  | 81.60+ | 63.00+  | 63.10+ | 66.00+ | 415.8 |
| AVE :                                                                     | 33.49  | 21.69  | 14.18  | 10.78 | 13.86  | 18.20 | 37.23  | 60.95  | 78.36  | 70.03   | 64.21  | 41.16  | 464.1 |
| SD :                                                                      | 27.44  | 25.29  | 14.92  | 15.14 | 19.26  | 20.67 | 28.76  | 46.24  | 54.48  | 38.47   | 42.44  | 31.41  | 115.2 |

| Appendix A14                                                              |        |        |        |        |        |         |        |         |         |         |         |        |        |
|---------------------------------------------------------------------------|--------|--------|--------|--------|--------|---------|--------|---------|---------|---------|---------|--------|--------|
| File : 042326_X.PAT                                                       |        |        |        |        |        |         |        |         |         |         |         |        |        |
| Units : mm                                                                |        |        |        |        |        |         |        |         |         |         |         |        |        |
| Descrip. : Patched monthly rainfall for station 042326 X for 1920 to 1998 |        |        |        |        |        |         |        |         |         |         |         |        |        |
| Year                                                                      | Oct    | Nov    | Dec    | Jan    | Feb    | Mar     | Apr    | May     | Jun     | Jul     | Aug     | Sep    | Total  |
| 1920                                                                      | 38.30+ | 19.10+ | 19.10+ | 25.70  | 42.40  | 23.40   | 47.70  | 6.10    | 413.80  | 184.00  | 93.70   | 37.30  | 950.6  |
| 1921                                                                      | 23.40  | 12.50  | 28.20  | 60.30  | 5.60   | 27.80   | 31.40  | 53.50   | 150.60  | 32.80   | 137.30  | 5.60   | 569.0  |
| 1922                                                                      | 13.70  | 8.90   | 2.30   | 17.30  | 0.80   | 1.00    | 49.80  | 100.90  | 177.70  | 86.50   | 70.90   | 53.90  | 583.7  |
| 1923                                                                      | 34.80  | 48.90+ | 8.30   | 4.10   | 2.80   | 20.10   | 14.20  | 23.80   | 174.70  | 47.50   | 135.70+ | 65.50  | 580.4  |
| 1924                                                                      | 65.50  | 37.30  | 0.00   | 10.70  | 2.50   | 2.00    | 2.50   | 43.70   | 313.70  | 122.30  | 28.80   | 16.80  | 645.8  |
| 1925                                                                      | 103.90 | 51.60  | 3.80   | 0.00   | 26.90  | 0.00    | 5.60   | 89.20   | 21.30   | 105.20  | 58.30   | 22.30  | 488.1  |
| 1926                                                                      | 104.20 | 31.80  | 0.00   | 15.70  | 38.40  | 0.00    | 49.90  | 79.20   | 66.50   | 24.90   | 139.00  | 35.60  | 585.2  |
| 1927                                                                      | 6.40   | 85.30  | 19.30  | 21.40  | 0.00   | 24.40   | 5.80   | 0.50    | 242.50  | 46.50   | 96.30   | 76.70  | 625.1  |
| 1928                                                                      | 5.70+  | 10.70  | 6.30   | 0.00   | 3.80   | 10.70   | 96.60  | 73.90   | 79.10   | 117.10  | 103.00  | 18.10  | 525.0  |
| 1929                                                                      | 10.70  | 7.80   | 46.90  | 22.90  | 25.60  | 7.90    | 18.50  | 9.90    | 11.90   | 70.40   | 88.90   | 145.90 | 467.3  |
| 1930                                                                      | 25.30  | 25.60  | 6.70   | 0.00   | 12.20  | 0.00    | 73.50  | 118.00  | 28.10   | 45.90   | 207.60  | 75.60  | 618.5  |
| 1931                                                                      | 43.20  | 5.10   | 13.20  | 28.20  | 129.50 | 12.70   | 13.20  | 98.70   | 104.60  | 110.70  | 44.20   | 51.00  | 654.3  |
| 1932                                                                      | 13.50  | 2.00   | 10.70  | 15.80  | 22.10  | 13.00   | 4.00   | 80.50   | 171.30  | 152.30  | 70.10   | 35.30  | 590.6  |
| 1933                                                                      | 38.60  | 9.40   | 18.00  | 10.90  | 16.20  | 35.10   | 13.70  | 90.80   | 75.20   | 56.10   | 62.20   | 93.50  | 519.7  |
| 1934                                                                      | 90.00  | 49.00+ | 0.00+  | 4.60   | 7.90   | 29.60   | 58.40  | 83.20   | 49.50   | 113.20  | 87.70   | 66.30  | 639.4  |
| 1935                                                                      | 16.20  | 43.50  | 5.80   | 30.70  | 6.90   | 20.50   | 4.40   | 103.70  | 26.20   | 79.20   | 115.10  | 75.00  | 527.2  |
| 1936                                                                      | 19.80  | 11.90  | 87.20  | 12.40  | 0.00   | 47.30   | 62.40  | 88.80   | 149.40  | 181.60  | 37.90   | 12.50  | 711.2  |
| 1937                                                                      | 27.80  | 4.60   | 18.80  | 69.70  | 11.40  | 2.80    | 64.30  | 133.40  | 50.60   | 48.50   | 83.90   | 88.00  | 603.8  |
| 1938                                                                      | 22.90  | 20.10  | 17.80  | 0.00   | 61.20  | 5.30    | 52.10  | 114.10  | 28.00   | 53.20   | 122.20  | 54.60  | 551.5  |
| 1939                                                                      | 5.80   | 25.30  | 50.60  | 10.40  | 37.60  | 16.50   | 77.80  | 49.40   | 112.50  | 53.80   | 37.90   | 36.80  | 514.4  |
| 1940                                                                      | 27.00  | 54.70  | 4.60   | 58.70  | 10.10  | 1.00    | 114.10 | 210.20  | 174.30  | 0.00    | 102.80  | 193.80 | 951.3  |
| 1941                                                                      | 65.50  | 6.90   | 9.50   | 4.30   | 0.00   | 3.80    | 14.50  | 145.40  | 329.30  | 41.90   | 63.50   | 9.20   | 693.8  |
| 1942                                                                      | 34.40  | 0.00   | 31.60  | 37.40  | 7.80   | 30.00   | 28.20  | 45.00   | 83.60   | 165.00  | 161.40  | 83.40  | 707.8  |
| 1943                                                                      | 28.50  | 52.90  | 0.00   | 5.30   | 0.00   | 20.30   | 48.50  | 126.00  | 284.40  | 29.00   | 87.90   | 65.20  | 748.0  |
| 1944                                                                      | 25.90  | 47.80  | 6.90   | 0.00   | 0.00   | 3.80    | 57.20  | 167.50  | 230.40  | 125.40  | 101.60  | 14.10  | 780.6  |
| 1945                                                                      | 15.80  | 20.30  | 8.50   | 0.00   | 1.80   | 20.30   | 42.70  | 33.90   | 31.20   | 49.60   | 81.10   | 154.50 | 459.7  |
| 1946                                                                      | 35.50  | 5.90   | 7.30   | 0.00   | 0.00   | 55.60   | 20.40  | 45.70   | 32.70   | 185.80  | 64.60   | 28.90  | 482.4  |
| 1947                                                                      | 47.70  | 9.40   | 0.00   | 3.10   | 16.80  | 85.20   | 76.40  | 120.70  | 66.20   | 139.40  | 27.00   | 137.40 | 729.3  |
| 1948                                                                      | 47.70  | 14.20  | 6.80   | 5.80   | 0.00   | 4.30    | 57.30  | 62.90   | 73.20   | 95.50   | 91.00   | 110.90 | 569.6  |
| 1949                                                                      | 66.80  | 64.80  | 10.90  | 1.50   | 0.00   | 4.60    | 156.10 | 14.70   | 30.80   | 199.20  | 2.80    | 109.10 | 661.3  |
| 1950                                                                      | 31.20  | 69.20  | 26.70  | 49.80  | 0.00   | 0.00    | 95.20  | 57.90   | 204.80  | 93.20   | 65.00   | 58.50  | 751.5  |
| 1951                                                                      | 44.90  | 88.90  | 1.00   | 0.00   | 20.30  | 23.10   | 29.70  | 155.50  | 62.60   | 80.60   | 172.30  | 74.10  | 753.0  |
| 1952                                                                      | 39.90  | 60.10  | 0.00   | 1.00   | 1.50   | 5.40    | 147.90 | 165.40  | 42.70   | 145.90  | 74.70   | 2.00   | 686.5  |
| 1953                                                                      | 11.30  | 57.30  | 27.90  | 9.10   | 3.50   | 7.50    | 93.60  | 185.30  | 71.20   | 186.30  | 146.00  | 55.60  | 854.6  |
| 1954                                                                      | 34.80  | 8.20   | 39.30  | 0.00   | 81.30  | 6.00    | 34.10  | 21.30   | 125.90  | 138.70  | 251.20  | 18.50  | 759.3  |
| 1955                                                                      | 82.20  | 69.40  | 9.60   | 11.10  | 19.50  | 11.90   | 18.00  | 88.10   | 157.20  | 92.00   | 99.70   | 25.50  | 684.2  |
| 1956                                                                      | 24.00  | 0.00   | 5.90   | 4.80   | 123.20 | 48.70   | 25.20  | 191.60  | 201.10  | 176.80  | 123.10  | 48.80  | 973.2  |
| 1957                                                                      | 129.30 | 4.80   | 0.00   | 5.20   | 47.10  | 5.90    | 27.20  | 119.70  | 75.90   | 31.40   | 146.90  | 31.80  | 625.2  |
| 1958                                                                      | 31.10  | 31.60  | 0.00   | 7.10   | 21.50  | 10.50   | 110.00 | 283.80  | 30.30   | 19.80   | 111.70  | 30.20  | 687.6  |
| 1959                                                                      | 85.80  | 0.00   | 13.80  | 3.30   | 7.00   | 24.80   | 47.20  | 126.30  | 143.80  | 24.50   | 25.10   | 23.50  | 525.1  |
| 1960                                                                      | 15.00  | 2.50   | 13.70  | 38.00  | 1.50   | 6.50    | 48.60+ | 105.90  | 83.00   | 65.10   | 108.80  | 108.50 | 597.1  |
| 1961                                                                      | 12.50  | 0.00   | 9.50   | 14.50  | 33.70  | 37.00   | 51.00  | 34.40   | 290.70  | 77.30   | 166.70  | 40.00  | 767.3  |
| 1962                                                                      | 109.70 | 41.00  | 0.00   | 9.00   | 0.00   | 4.00    | 8.50   | 13.50   | 72.50   | 106.50  | 222.80  | 16.50  | 604.0  |
| 1963                                                                      | 11.00  | 40.50  | 31.60+ | 0.00   | 60.10  | 0.00    | 47.50  | 64.50   | 167.50  | 73.80   | 176.50  | 28.00  | 701.0  |
| 1964                                                                      | 34.80  | 63.00  | 7.50   | 19.20  | 46.50  | 77.00   | 50.00  | 51.50   | 55.50   | 27.50   | 44.00   | 17.90  | 494.4  |
| 1965                                                                      | 30.70  | 5.50   | 29.00  | 0.00   | 3.00   | 56.60   | 46.40  | 20.00   | 107.90  | 142.20  | 40.40   | 65.70  | 547.4  |
| 1966                                                                      | 1.50   | 2.80   | 10.50  | 16.60  | 6.50   | 0.00    | 65.00  | 39.00   | 185.50  | 65.70   | 43.50   | 44.00  | 480.6  |
| 1967                                                                      | 48.50  | 45.90  | 0.00   | 12.00  | 4.50   | 0.00    | 90.50  | 149.40  | 116.00  | 110.60  | 96.00   | 3.00   | 676.4  |
| 1968                                                                      | 141.50 | 17.00  | 17.00  | 3.00   | 10.30  | 4.00    | 52.70  | 26.50   | 47.00   | 28.70   | 72.00   | 56.50  | 476.2  |
| 1969                                                                      | 82.00  | 8.50   | 3.50   | 2.50   | 9.50   | 2.00    | 1.50   | 94.10   | 145.90  | 106.00  | 122.60  | 44.20  | 622.3  |
| 1970                                                                      | 22.00  | 15.50  | 10.90  | 2.60   | 3.50   | 54.00   | 0.00   | 34.20   | 94.70   | 82.30   | 105.60  | 5.50   | 430.8  |
| 1971                                                                      | 7.50   | 4.50   | 6.50   | 8.00   | 11.00  | 0.00    | 101.40 | 86.00   | 61.00   | 55.00   | 57.30   | 38.20  | 436.4  |
| 1972                                                                      | 44.70  | 0.00   | 30.50  | 0.00   | 0.00   | 28.50   | 5.00   | 45.30   | 17.50   | 180.00  | 99.50   | 77.00  | 528.0  |
| 1973                                                                      | 30.50  | 6.00   | 31.50  | 0.00   | 2.00   | 2.00    | 0.00   | 116.00  | 153.00  | 74.00   | 318.00  | 77.00  | 810.0  |
| 1974                                                                      | 82.00  | 42.00  | 0.00   | 20.50  | 13.50  | 7.50    | 46.80  | 189.80  | 47.60   | 96.20   | 106.80  | 12.30  | 665.0  |
| 1975                                                                      | 82.50  | 22.00  | 5.50   | 0.00   | 18.50  | 14.50   | 48.50  | 33.00   | 240.00  | 101.00  | 41.00   | 18.00  | 624.5  |
| 1976                                                                      | 11.50  | 168.00 | 72.90  | 23.50  | 27.00  | 10.30   | 73.50  | 215.50  | 194.50  | 191.00  | 152.00  | 35.00  | 1174.7 |
| 1977                                                                      | 17.00  | 14.50  | 43.00  | 6.00   | 13.00  | 38.50   | 49.00  | 26.30+  | 22.00   | 1.00    | 139.00  | 55.10+ | 424.4  |
| 1978                                                                      | 9.50   | 0.00   | 12.00  | 12.60+ | 77.50  | 0.00    | 10.30  | 74.60   | 134.50  | 77.50   | 64.50   | 87.50  | 560.5  |
| 1979                                                                      | 73.00  | 1.50   | 0.00   | 24.50  | 15.00  | 0.00    | 50.50  | 85.40   | 88.50   | 16.00   | 91.00   | 9.50   | 454.9  |
| 1980                                                                      | 33.00  | 136.50 | 101.20 | 120.00 | 0.00   | 29.70   | 31.50  | 10.50   | 71.00   | 147.50  | 124.00  | 103.50 | 908.4  |
| 1981                                                                      | 20.50  | 12.50  | 0.00   | 40.50  | 2.50   | 31.80   | 106.50 | 53.50   | 64.00   | 68.00   | 36.50   | 0.00   | 436.3  |
| 1982                                                                      | 71.70  | 14.00  | 24.50  | 0.00   | 27.50  | 27.00   | 9.00   | 176.30  | 138.00  | 149.50  | 37.00   | 42.50  | 717.0  |
| 1983                                                                      | 0.00   | 11.50  | 4.50   | 3.50   | 1.00   | 100.50  | 36.20  | 265.00  | 64.00   | 56.50   | 45.00   | 129.50 | 717.2  |
| 1984                                                                      | 74.50  | 0.00   | 69.00  | 33.40  | 21.80  | 132.30+ | 46.10+ | 55.30   | 114.80  | 163.00+ | 121.00+ | 51.00  | 882.2  |
| 1985                                                                      | 5.00   | 3.50   | 8.50   | 11.00  | 13.50  | 59.50   | 37.60  | 30.50+  | 132.10+ | 83.50   | 167.60+ | 55.30+ | 607.6  |
| 1986                                                                      | 14.50  | 20.00  | 0.00   | 22.00  | 4.50   | 9.00    | 50.00  | 169.70+ | 127.80  | 86.50+  | 106.50  | 54.50  | 665.0  |
| 1987                                                                      | 3.00   | 1.00   | 29.50  | 0.00   | 3.20+  | 9.50    | 90.90+ | 54.80   | 139.30+ | 54.20+  | 72.40+  | 80.00+ | 537.8  |
| 1988                                                                      | 5.20+  | 10.50  | 7.00   | 1.50   | 28.00+ | 93.00   | 47.50  | 59.90   | 105.30  | 89.50   | 126.30  | 119.00 | 692.7  |
| 1989                                                                      | 39.50  | 39.00  | 0.00   | 8.00   | 27.00  | 22.50   | 149.30 | 109.00  | 129.40+ | 98.10+  | 55.30+  | 4.00   | 681.1  |
| 1990                                                                      | 2.00   | 24.50  | 32.00  | 3.50   | 6.60   | 16.00   | 37.00  | 85.40   | 133.90  | 219.30  | 37.90   | 108.80 | 706.9  |
| 1991                                                                      | 28.40  | 15.20  | 5.50   | 0.00   | 31.70  | 37.70   | 82.10  | 69.70+  | 209.60  | 113.00  | 78.20   | 38.30  | 709.4  |
| 1992                                                                      | 73.70+ | 25.50  | 2.70   | 7.00   | 23.80  | 8.50    | 120.00 | 154.00  | 92.30   | 201.30  | 54.30   | 25.50  | 788.6  |
| 1993                                                                      | 0.80   | 9.60   | 24.80  | 0.80   | 0.00   | 5.10    | 79.80  | 53.00   | 290.00  | 72.90   | 23.60   | 109.10 | 669.5  |
| 1994                                                                      | 25.20  | 5.40   | 10.60  | 4.20+  | 5.60   | 12.90   | 6.20   | 88.40   | 89.60   | 109.50  | 75.90   | 19.60  | 453.1  |
| 1995                                                                      | 79.30+ | 6.30   | 76.00  | 4.10   | 24.70  | 27.30   | 26.20  | 65.40   | 202.20  | 116.50  | 157.10  | 141.70 | 926.8  |
| 1996                                                                      | 40.90  | 74.60  | 42.40  | 9.60   | 2.70   | 12.20   | 23.40  | 51.80   | 255.90+ | 35.60   | 73.90   | 3.70   | 626.7  |
| 1997                                                                      | 9.10   | 61.80  | 16.30  | 32.80  | 0.00   | 3.80    | 23.80  | 264.30  | 70.40   | 110.40  | 47.80   | 21.30  | 661.8  |
| 1998                                                                      | 24.20  | 78.80+ | 21.00+ | 0.00   | 15.00  | 0.00    | 45.00  | 49.30+  | 121.50+ | 95.10+  | 95.10+  | 54.60+ | 599.6  |
| AVE :                                                                     | 38.44  | 28.20  | 17.52  | 13.71  | 17.86  | 20.93   | 49.17  | 90.87   | 123.73  | 94.92   | 96.50   | 54.97  | 646.8  |
| SD :                                                                      | 31.97  | 31.36  | 21.07  | 19.47  | 25.01  | 25.69   | 36.54  | 63.45   | 83.46   | 52.96   | 54.77   | 41.60  | 144.0  |

| Appendix A15                                                              |        |        |        |        |        |        |        |        |         |         |         |        |        |
|---------------------------------------------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|--------|--------|
| File : 042357_A.PAT                                                       |        |        |        |        |        |        |        |        |         |         |         |        |        |
| Units : mm                                                                |        |        |        |        |        |        |        |        |         |         |         |        |        |
| Descrip. : Patched monthly rainfall for station 042357 A for 1924 to 1998 |        |        |        |        |        |        |        |        |         |         |         |        |        |
| Year                                                                      | Oct    | Nov    | Dec    | Jan    | Feb    | Mar    | Apr    | May    | Jun     | Jul     | Aug     | Sep    | Total  |
| 1924                                                                      | 68.20+ | 34.10+ | 0.00+  | 11.70+ | 3.60+  | 2.90+  | 5.10+  | 37.10+ | 217.50  | 145.70+ | 29.90+  | 7.60   | 563.4  |
| 1925                                                                      | 82.20  | 29.50  | 0.00   | 0.00   | 17.30  | 0.00   | 3.00   | 63.30  | 17.50   | 69.80   | 47.70   | 19.70+ | 350.0  |
| 1926                                                                      | 80.20  | 15.00  | 0.00+  | 8.90   | 33.40+ | 0.00   | 31.30  | 60.50+ | 45.80   | 16.70   | 129.40+ | 22.90  | 444.1  |
| 1927                                                                      | 0.00   | 61.90  | 17.80+ | 11.70  | 0.00   | 19.10  | 6.80   | 0.00   | 175.50  | 31.10   | 69.60+  | 46.10  | 439.6  |
| 1928                                                                      | 0.00   | 9.40   | 4.80   | 0.00   | 8.80   | 12.20  | 62.00  | 57.10  | 52.10   | 93.60   | 67.20   | 15.50  | 382.7  |
| 1929                                                                      | 5.80   | 8.80   | 20.10  | 18.40  | 2.80   | 6.30   | 18.00  | 6.30   | 5.90    | 40.30   | 79.00   | 98.40  | 310.1  |
| 1930                                                                      | 22.00  | 15.50  | 5.10   | 0.00   | 10.20  | 0.00   | 57.90  | 74.00  | 21.70   | 36.90   | 158.70  | 52.90  | 454.9  |
| 1931                                                                      | 34.00  | 2.50   | 7.40   | 12.70  | 96.10  | 7.70   | 8.40   | 85.90  | 63.10   | 75.30   | 34.30   | 44.50  | 471.9  |
| 1932                                                                      | 12.00  | 1.80   | 8.90   | 10.20  | 13.90  | 13.20  | 3.30   | 44.90  | 96.60   | 103.40  | 41.90   | 21.20  | 371.3  |
| 1933                                                                      | 27.30  | 7.90   | 34.80  | 10.10  | 10.70  | 27.00  | 14.20  | 46.60  | 42.40   | 40.90   | 48.60   | 63.30  | 373.8  |
| 1934                                                                      | 60.70  | 31.90  | 0.00   | 4.60   | 17.30  | 19.60  | 56.90  | 54.20  | 28.20   | 78.30   | 71.40   | 48.30  | 471.4  |
| 1935                                                                      | 8.90   | 23.80  | 3.00   | 24.60  | 4.30   | 13.90  | 3.00   | 23.40  | 15.30   | 46.20   | 80.50   | 59.20  | 306.1  |
| 1936                                                                      | 15.50  | 10.20  | 54.50  | 5.80   | 0.00   | 21.30  | 29.20  | 74.50  | 106.70  | 130.90  | 32.30   | 5.60   | 486.5  |
| 1937                                                                      | 17.80  | 0.00   | 14.20  | 51.90  | 8.60   | 7.60   | 54.50  | 106.20 | 47.50   | 37.30   | 54.40   | 55.90  | 455.9  |
| 1938                                                                      | 21.70  | 8.90   | 0.00   | 12.70  | 59.00  | 3.30   | 39.80  | 87.10  | 26.30   | 38.40   | 93.90   | 50.20  | 441.3  |
| 1939                                                                      | 0.00   | 20.30  | 30.30  | 3.60   | 29.20  | 15.10  | 69.80  | 39.00  | 76.60   | 45.10   | 30.10   | 34.10  | 393.2  |
| 1940                                                                      | 17.10  | 52.90  | 5.60   | 32.30  | 5.60   | 0.00   | 57.20  | 139.00 | 145.50  | 85.80   | 83.40   | 164.40 | 788.8  |
| 1941                                                                      | 54.90  | 9.20   | 9.10   | 6.90   | 0.00   | 1.00   | 12.20  | 103.10 | 274.10  | 33.40   | 68.00   | 8.60   | 580.5  |
| 1942                                                                      | 33.60  | 4.10   | 14.70  | 24.90  | 11.10  | 30.50  | 33.40  | 35.30  | 75.70   | 114.30  | 127.20  | 74.30  | 579.1  |
| 1943                                                                      | 23.00  | 47.00  | 0.00   | 21.40  | 0.00   | 21.10  | 43.00  | 88.20  | 173.20  | 56.90   | 103.10  | 48.60  | 625.5  |
| 1944                                                                      | 30.20  | 41.40  | 16.00  | 0.00   | 0.00   | 1.80   | 28.70  | 142.20 | 181.10  | 92.00   | 87.40   | 4.60   | 625.4  |
| 1945                                                                      | 21.10  | 14.70  | 8.80   | 0.00   | 0.00   | 21.60  | 38.40  | 33.80  | 20.30   | 37.50   | 59.10   | 114.10 | 369.4  |
| 1946                                                                      | 32.80  | 4.30   | 4.90   | 0.00   | 0.00   | 44.00  | 14.20  | 36.10  | 19.80   | 139.70  | 45.30   | 17.80  | 358.9  |
| 1947                                                                      | 38.40  | 5.60   | 0.00   | 0.80   | 12.90  | 68.10  | 39.20  | 80.40  | 34.50   | 106.30  | 18.80   | 111.20 | 516.2  |
| 1948                                                                      | 43.80  | 7.80   | 6.40   | 3.30   | 0.00   | 3.80   | 40.60  | 43.90  | 65.30   | 62.50   | 72.40   | 49.80  | 399.6  |
| 1949                                                                      | 58.50  | 55.40  | 10.20  | 1.00   | 0.00   | 4.60   | 102.40 | 13.50  | 31.50   | 141.10  | 0.00    | 80.40  | 498.6  |
| 1950                                                                      | 25.50  | 62.40  | 19.60  | 33.00  | 0.00   | 0.00   | 51.00  | 50.10  | 181.40  | 85.10   | 53.20   | 59.80  | 621.1  |
| 1951                                                                      | 40.90  | 62.80  | 4.80   | 4.10   | 25.70  | 17.10  | 31.20  | 141.00 | 62.50   | 71.20   | 145.80  | 63.30  | 670.4  |
| 1952                                                                      | 33.80  | 66.30  | 2.30   | 1.30   | 1.50   | 5.80   | 167.80 | 154.30 | 41.60   | 149.20  | 71.60   | 0.80+  | 696.3  |
| 1953                                                                      | 6.90+  | 49.20+ | 28.00+ | 6.30   | 11.70  | 22.10  | 73.70  | 182.60 | 72.30   | 179.70  | 140.20  | 54.60  | 827.3  |
| 1954                                                                      | 31.70  | 5.40   | 38.10  | 0.00   | 70.60  | 5.80   | 42.20  | 27.70  | 102.90  | 141.20  | 208.70  | 32.10  | 706.4  |
| 1955                                                                      | 73.70  | 39.60  | 37.80  | 7.60   | 18.50  | 16.90  | 11.10  | 83.50  | 148.60  | 89.40   | 95.60   | 26.10  | 648.4  |
| 1956                                                                      | 19.50  | 0.30   | 8.70   | 2.50   | 114.50 | 52.70  | 24.90  | 170.10 | 189.50  | 141.80  | 97.10   | 45.20  | 866.8  |
| 1957                                                                      | 114.00 | 5.00   | 0.00   | 3.30   | 34.50  | 4.80   | 22.30  | 129.30 | 58.50   | 12.00   | 81.60   | 30.60  | 495.9  |
| 1958                                                                      | 37.50  | 32.10  | 0.00   | 5.00   | 23.10  | 12.20  | 89.10  | 268.40 | 21.00   | 17.60   | 97.80   | 18.10  | 621.9  |
| 1959                                                                      | 92.70  | 1.80   | 18.50  | 2.00   | 10.20  | 21.00  | 41.90  | 110.20 | 125.20  | 19.10   | 19.90   | 22.60  | 485.1  |
| 1960                                                                      | 9.70   | 2.50   | 10.90  | 43.60  | 4.10   | 9.40   | 32.20  | 50.00  | 75.90   | 51.80   | 96.50   | 114.10 | 500.7  |
| 1961                                                                      | 15.90  | 0.00   | 8.10   | 13.30  | 39.40  | 47.50  | 49.60  | 31.00  | 326.30  | 105.80  | 186.70  | 28.00  | 851.6  |
| 1962                                                                      | 113.60 | 16.80  | 1.80   | 17.80  | 0.00   | 3.00   | 13.40  | 14.90  | 82.00   | 98.80   | 188.60  | 12.70  | 563.4  |
| 1963                                                                      | 13.20  | 50.20  | 39.40  | 0.00   | 53.60  | 9.90   | 53.00  | 61.60  | 154.50  | 80.40   | 153.10  | 30.00  | 698.9  |
| 1964                                                                      | 27.20  | 66.70  | 4.30   | 20.60  | 52.20  | 106.50 | 66.80  | 62.60  | 43.70   | 30.70   | 41.60   | 22.90  | 545.8  |
| 1965                                                                      | 31.00  | 9.20   | 33.30  | 0.50   | 2.00   | 59.00  | 43.90  | 20.10  | 90.30   | 158.60  | 43.50   | 59.70  | 551.1  |
| 1966                                                                      | 2.90   | 4.60   | 3.80   | 24.10  | 3.80   | 0.50   | 65.50  | 57.90  | 224.80  | 63.30   | 46.80   | 37.00  | 535.0  |
| 1967                                                                      | 51.60  | 49.00  | 4.10   | 13.70  | 6.10   | 0.00   | 71.70  | 175.90 | 105.00  | 118.50  | 82.30   | 5.90   | 683.8  |
| 1968                                                                      | 144.70 | 16.00  | 119.70 | 6.20   | 9.90   | 8.10   | 50.60  | 13.70  | 43.10   | 26.20   | 81.80   | 82.90  | 602.9  |
| 1969                                                                      | 77.20  | 12.20  | 5.30   | 4.60   | 15.50  | 3.00   | 2.10   | 93.50  | 152.90  | 95.00   | 107.20  | 59.80  | 628.3  |
| 1970                                                                      | 30.50  | 17.20  | 16.30  | 4.80   | 2.00   | 54.00  | 3.00   | 38.30  | 110.80  | 95.00   | 110.80  | 10.60  | 493.3  |
| 1971                                                                      | 7.70   | 8.20   | 10.50  | 11.00  | 14.70  | 9.30   | 85.70  | 89.10+ | 36.30+  | 49.50   | 42.00   | 50.50  | 414.5  |
| 1972                                                                      | 19.50  | 0.00   | 27.50  | 1.00   | 0.00   | 38.50  | 5.00   | 34.10  | 14.50   | 179.00  | 76.00   | 67.00  | 462.1  |
| 1973                                                                      | 22.10  | 7.50   | 26.00  | 1.00   | 1.00   | 8.50   | 0.00   | 90.30  | 136.00  | 60.00   | 326.00  | 79.50  | 757.9  |
| 1974                                                                      | 69.00  | 74.00  | 10.00  | 23.00  | 8.00   | 7.00   | 56.50  | 174.00 | 35.50   | 80.50   | 90.00   | 8.50   | 636.0  |
| 1975                                                                      | 69.50  | 14.50  | 4.50   | 0.00   | 18.50  | 19.50  | 44.00  | 30.50  | 227.00  | 101.00  | 40.50   | 19.50  | 589.0  |
| 1976                                                                      | 12.50  | 150.50 | 78.50  | 22.50  | 26.00  | 7.50   | 76.00  | 224.80 | 149.00  | 162.00  | 106.00  | 45.50  | 1060.8 |
| 1977                                                                      | 15.50  | 17.00  | 40.00  | 6.00   | 6.00   | 36.00  | 33.50  | 52.00  | 10.10   | 1.50    | 134.00  | 67.50  | 419.1  |
| 1978                                                                      | 11.50  | 2.00   | 21.00  | 22.00  | 50.00  | 3.00   | 8.00   | 61.50  | 111.00  | 53.10   | 53.50   | 58.00  | 454.6  |
| 1979                                                                      | 68.50  | 2.50   | 0.00   | 32.00  | 10.00  | 2.50   | 61.00  | 83.50  | 88.00   | 18.50   | 111.00  | 18.00  | 495.5  |
| 1980                                                                      | 27.20  | 135.50 | 52.50  | 79.50  | 0.00   | 24.00  | 27.50  | 16.50  | 63.00   | 138.00  | 104.50  | 107.50 | 775.7  |
| 1981                                                                      | 18.00  | 13.50  | 10.50  | 38.00  | 1.50   | 27.50  | 112.50 | 37.50  | 66.50   | 70.80   | 42.60   | 6.50   | 445.4  |
| 1982                                                                      | 68.00  | 14.00  | 24.50  | 0.00   | 34.50  | 24.00  | 15.20  | 168.50 | 138.50  | 137.60  | 37.00   | 35.20  | 697.0  |
| 1983                                                                      | 4.50   | 11.50  | 4.00   | 3.00   | 0.00   | 95.80  | 34.30  | 237.70 | 37.50   | 71.30   | 35.50   | 128.40 | 663.5  |
| 1984                                                                      | 85.40  | 1.50   | 64.20  | 45.50  | 18.00  | 120.50 | 52.50  | 59.00  | 101.00  | 100.00  | 134.00  | 49.00  | 830.6  |
| 1985                                                                      | 15.50  | 3.50   | 7.50   | 7.50   | 12.50  | 41.00  | 45.00  | 52.50  | 105.80  | 93.00   | 140.50  | 50.50  | 574.8  |
| 1986                                                                      | 13.50  | 14.00  | 0.00   | 21.00  | 9.30   | 9.00   | 51.50  | 148.50 | 137.80  | 87.10   | 113.50  | 59.00  | 664.2  |
| 1987                                                                      | 2.00   | 3.00   | 25.50  | 1.00   | 0.00   | 12.50  | 84.20  | 48.10  | 108.00  | 46.00   | 85.00   | 57.50  | 472.8  |
| 1988                                                                      | 11.00  | 7.30   | 11.00  | 2.00   | 25.50  | 83.00  | 72.50  | 51.00  | 119.50  | 93.10   | 129.50  | 112.50 | 717.9  |
| 1989                                                                      | 44.00  | 35.00  | 4.00   | 4.50   | 34.20  | 12.00  | 158.50 | 91.70  | 107.50  | 123.90  | 35.00   | 6.00   | 656.3  |
| 1990                                                                      | 3.50   | 18.00  | 27.50  | 8.00   | 4.50   | 8.00   | 30.50  | 62.30  | 161.00  | 200.50  | 30.00   | 106.60 | 660.4  |
| 1991                                                                      | 45.50  | 19.00  | 4.00   | 0.00   | 27.50  | 47.50  | 69.50  | 59.90  | 190.90  | 102.50  | 56.50   | 27.50  | 650.3  |
| 1992                                                                      | 88.20  | 25.30  | 4.00   | 7.30   | 25.90  | 2.50   | 117.80 | 146.90 | 75.20   | 191.50  | 47.60   | 24.00  | 756.2  |
| 1993                                                                      | 1.00   | 4.50   | 22.00  | 1.50   | 0.00   | 6.50   | 50.80  | 44.80  | 226.90  | 49.90   | 19.80   | 85.90  | 513.6  |
| 1994                                                                      | 23.10  | 6.00   | 10.70  | 6.90   | 5.60   | 15.60  | 6.00   | 75.30  | 105.00  | 102.90  | 65.60   | 14.60  | 437.3  |
| 1995                                                                      | 106.70 | 4.60   | 95.00  | 4.40   | 25.80  | 25.50  | 20.40  | 73.30  | 227.40  | 126.00  | 122.00  | 128.70 | 959.8  |
| 1996                                                                      | 38.80  | 75.70  | 46.00  | 4.30   | 1.10   | 7.30   | 23.00  | 56.70  | 177.20  | 26.90   | 69.80   | 4.00   | 530.8  |
| 1997                                                                      | 4.60   | 49.90  | 18.50  | 33.00  | 0.00   | 3.00   | 22.60  | 220.40 | 58.90   | 80.00   | 30.40   | 14.40  | 535.7  |
| 1998                                                                      | 21.20  | 70.50  | 64.70  | 1.40+  | 9.10+  | 0.00+  | 36.70+ | 83.10+ | 102.00+ | 83.10+  | 83.10+  | 49.20+ | 604.1  |
| AVE :                                                                     | 36.28  | 25.09  | 18.61  | 11.72  | 16.17  | 20.29  | 43.74  | 81.14  | 101.19  | 84.79   | 83.27   | 48.23  | 570.5  |
| SD :                                                                      | 31.76  | 29.24  | 22.80  | 14.59  | 21.74  | 25.08  | 33.73  | 58.15  | 69.51   | 46.68   | 51.99   | 35.74  | 153.3  |

## Appendix A16

File : 042415\_9.PAT  
Units : mm  
Descrip. : Patched monthly rainfall for station 042415 9 for 1920 to 1961

| Year  | Oct    | Nov    | Dec    | Jan    | Feb    | Mar    | Apr    | May     | Jun     | Jul    | Aug     | Sep    | Total |
|-------|--------|--------|--------|--------|--------|--------|--------|---------|---------|--------|---------|--------|-------|
| 1920  | 38.80+ | 19.40+ | 19.40+ | 48.90  | 60.70  | 15.80  | 46.40  | 6.40    | 394.80  | 153.90 | 90.50   | 37.60  | 932.6 |
| 1921  | 19.00  | 11.70+ | 25.60  | 57.80+ | 8.50+  | 22.90+ | 39.20+ | 53.00+  | 148.10  | 40.50  | 124.90  | 11.30  | 562.5 |
| 1922  | 19.90  | 9.70   | 4.60   | 25.10+ | 0.30   | 19.30  | 63.10  | 94.70+  | 189.90  | 69.50  | 68.60   | 45.00+ | 609.7 |
| 1923  | 38.90  | 49.00  | 14.00  | 4.50+  | 2.10   | 19.90  | 26.00  | 22.10   | 157.10  | 41.70  | 120.70  | 45.90  | 541.9 |
| 1924  | 78.30  | 41.00  | 0.00   | 12.10  | 3.00   | 1.50   | 8.80+  | 45.30   | 290.30  | 151.40 | 43.40   | 16.50  | 691.6 |
| 1925  | 93.10+ | 55.90  | 6.50   | 1.30   | 40.20  | 0.00   | 6.40   | 123.30  | 28.90   | 88.80  | 58.30   | 20.40  | 523.1 |
| 1926  | 95.40  | 24.90  | 0.00   | 14.70  | 37.60  | 0.30   | 65.00  | 66.30   | 53.60   | 21.20  | 143.70  | 16.80  | 539.5 |
| 1927  | 7.90   | 58.90  | 18.60  | 23.60  | 0.00   | 26.80  | 7.10   | 3.30    | 187.10  | 49.90  | 65.80   | 76.20  | 525.2 |
| 1928  | 7.10   | 12.60  | 8.70   | 0.00   | 6.40   | 18.00  | 71.10  | 91.90   | 65.00   | 98.80  | 81.90   | 24.20  | 485.7 |
| 1929  | 19.10  | 14.00  | 33.50  | 28.30  | 31.30  | 9.40   | 33.90  | 7.70    | 11.70   | 80.80  | 87.60   | 136.40 | 493.7 |
| 1930  | 33.00  | 26.70  | 5.80   | 0.30   | 20.80  | 0.30   | 79.90  | 94.00   | 24.10   | 63.40  | 169.70  | 71.50  | 589.5 |
| 1931  | 59.20  | 3.30   | 22.40  | 21.60  | 158.90 | 8.20   | 12.40  | 124.00  | 86.70   | 72.10  | 54.20   | 58.00  | 681.0 |
| 1932  | 17.20  | 5.80   | 13.70  | 11.90  | 26.70  | 16.50  | 4.30   | 76.20   | 157.20  | 137.50 | 75.00   | 29.30  | 571.3 |
| 1933  | 27.20  | 10.50  | 24.20  | 6.70   | 12.00  | 43.20  | 10.90  | 82.00   | 76.60   | 64.30  | 69.90   | 81.40  | 508.9 |
| 1934  | 72.70  | 49.00  | 0.00   | 3.30   | 20.60  | 40.90  | 65.40  | 86.80   | 64.10   | 111.30 | 97.70   | 73.10  | 684.9 |
| 1935  | 15.50  | 39.60  | 5.90   | 33.80  | 10.20  | 18.80  | 11.70  | 81.00   | 29.10   | 76.50  | 98.60   | 79.20  | 499.9 |
| 1936  | 15.00  | 12.00  | 55.90  | 6.70   | 0.50   | 53.10  | 53.90  | 86.40   | 137.30  | 151.20 | 42.00   | 14.10  | 628.1 |
| 1937  | 32.50  | 5.10   | 15.20  | 63.80  | 7.40   | 8.60   | 79.70  | 137.20  | 56.50   | 49.00  | 63.20   | 77.90  | 596.1 |
| 1938  | 27.90  | 16.00  | 16.00  | 0.00   | 66.60  | 11.40  | 40.40  | 110.80  | 19.60   | 54.90  | 109.80  | 43.10  | 516.5 |
| 1939  | 9.40   | 18.30  | 13.90  | 10.40  | 39.10+ | 32.00  | 51.80  | 43.70   | 99.00   | 55.60  | 38.80   | 47.00+ | 459.0 |
| 1940  | 29.70  | 47.60+ | 10.90  | 41.70  | 8.20   | 1.80   | 97.60+ | 190.90+ | 159.30+ | 5.80+  | 112.50  | 132.80 | 838.8 |
| 1941  | 78.30  | 9.50+  | 11.60+ | 9.70   | 0.00+  | 3.30   | 16.90+ | 133.90+ | 276.90  | 43.70  | 87.30   | 15.80  | 686.9 |
| 1942  | 36.70+ | 1.80   | 26.30+ | 40.40  | 16.50  | 31.80+ | 50.70  | 36.80   | 113.30  | 117.80 | 116.90  | 72.00+ | 661.0 |
| 1943  | 31.40+ | 51.40+ | 0.00+  | 7.90+  | 0.00   | 19.90  | 60.90  | 104.80  | 249.10  | 63.60  | 130.40  | 61.50  | 780.9 |
| 1944  | 35.00  | 26.50  | 18.00  | 0.00   | 0.00   | 2.00   | 55.10  | 161.40  | 183.30  | 124.90 | 85.90   | 10.40  | 702.5 |
| 1945  | 17.80  | 14.50  | 18.30  | 0.00   | 4.10   | 18.60  | 31.80  | 59.20   | 33.20   | 64.30  | 61.50   | 149.10 | 472.4 |
| 1946  | 39.90  | 9.60   | 11.20  | 0.00   | 0.00   | 51.10  | 17.30  | 42.60   | 33.50   | 165.40 | 67.40   | 32.00  | 470.0 |
| 1947  | 37.10  | 5.60   | 0.00   | 0.00   | 20.30  | 88.10  | 63.60  | 108.50  | 65.30   | 112.70 | 31.70   | 100.60 | 633.5 |
| 1948  | 46.70  | 7.60   | 12.40  | 9.60   | 0.00   | 0.50   | 56.70  | 55.70   | 72.40   | 92.30  | 97.60   | 68.90  | 520.4 |
| 1949  | 71.60  | 49.60  | 14.20  | 0.00   | 0.00   | 4.50   | 121.10 | 14.30   | 27.70   | 192.30 | 4.30    | 111.60 | 611.2 |
| 1950  | 51.60  | 79.50  | 30.30  | 65.00  | 0.00   | 0.00   | 88.20  | 58.20   | 174.40  | 87.80  | 60.00   | 56.70+ | 751.7 |
| 1951  | 48.20  | 53.00  | 0.00   | 2.80   | 28.70  | 24.40  | 30.00  | 105.00  | 68.50   | 91.60  | 155.50  | 68.40  | 676.1 |
| 1952  | 42.20  | 80.20  | 2.90+  | 0.00   | 2.30   | 8.50   | 158.70 | 143.40  | 37.10   | 145.70 | 74.70   | 0.00   | 695.7 |
| 1953  | 5.50   | 47.30  | 30.80+ | 7.80   | 9.00   | 24.40  | 90.10  | 149.20  | 65.80   | 169.60 | 99.10   | 34.60  | 733.2 |
| 1954  | 28.00  | 10.70  | 26.40  | 0.00   | 60.70  | 14.90  | 38.60  | 21.00   | 117.70  | 136.90 | 223.40  | 14.60  | 692.9 |
| 1955  | 62.10  | 82.30  | 0.20   | 15.30  | 15.50  | 15.70  | 16.80  | 70.10   | 134.50  | 99.50  | 82.90   | 26.90  | 621.8 |
| 1956  | 24.10  | 0.00   | 1.60   | 3.00   | 118.10 | 40.80  | 22.70  | 188.10  | 149.10  | 178.90 | 102.70  | 51.10  | 880.2 |
| 1957  | 114.80 | 4.90   | 0.00   | 5.40   | 45.00  | 10.70  | 23.60  | 133.00  | 62.80   | 15.90  | 68.40   | 34.40  | 518.9 |
| 1958  | 44.20  | 36.40  | 0.00   | 3.70   | 24.10  | 10.70  | 87.00  | 307.50  | 24.90   | 18.90  | 83.40   | 25.30  | 666.1 |
| 1959  | 75.00  | 0.00   | 25.20  | 5.40   | 9.30   | 23.60  | 47.40  | 131.60  | 148.60  | 18.80  | 22.60   | 28.30  | 535.8 |
| 1960  | 16.80  | 24.30  | 12.20  | 42.50  | 9.30   | 21.00  | 30.50  | 87.20   | 74.40   | 58.70  | 88.00   | 114.10 | 579.0 |
| 1961  | 13.30  | 0.00+  | 7.40+  | 14.20+ | 32.00+ | 48.80+ | 55.30+ | 36.20+  | 261.70+ | 73.90+ | 152.00+ | 39.40+ | 734.2 |
| AVE : | 39.93  | 26.80  | 13.42  | 15.46  | 22.76  | 19.81  | 48.52  | 89.87   | 114.53  | 88.36  | 88.39   | 53.65  | 621.5 |
| SD :  | 26.54  | 23.62  | 12.01  | 18.70  | 32.20  | 18.24  | 33.39  | 59.29   | 86.89   | 48.79  | 41.64   | 36.96  | 114.1 |

## Appendix A17

File : 042499\_P.PAT

Units : mm

Descrip. : Patched monthly rainfall for station 042499 p for 1961 to 1981

| Year  | Oct    | Nov    | Dec    | Jan   | Feb   | Mar   | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Total  |
|-------|--------|--------|--------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|
| 1961  | 7.30+  | 2.10+  | 8.30+  | 7.60  | 23.90 | 38.90 | 97.50  | 56.40  | 330.50 | 146.10 | 262.10 | 55.90  | 1036.6 |
| 1962  | 196.80 | 36.60  | 0.00   | 3.60  | 0.00  | 0.00  | 13.20  | 3.00   | 93.70  | 137.70 | 295.70 | 38.40  | 818.7  |
| 1963  | 21.30  | 50.30  | 22.90  | 0.00  | 31.00 | 0.00  | 42.90  | 50.80  | 199.10 | 93.50  | 147.30 | 94.00  | 753.1  |
| 1964  | 0.00   | 0.00   | 0.00   | 25.40 | 72.40 | 64.50 | 53.30  | 124.50 | 62.20  | 33.00  | 45.70  | 36.10  | 517.1  |
| 1965  | 0.00   | 6.40   | 27.40  | 20.30 | 7.60  | 74.90 | 38.10  | 42.70  | 172.70 | 147.30 | 48.80  | 44.50  | 630.7  |
| 1966  | 3.80   | 7.60   | 0.00   | 44.50 | 0.00  | 0.00  | 77.50  | 70.90  | 338.30 | 122.20 | 95.30  | 63.50  | 823.6  |
| 1967  | 78.50  | 40.60  | 5.60   | 31.00 | 6.10  | 16.30 | 77.50  | 228.10 | 153.40 | 128.00 | 126.00 | 8.10   | 899.2  |
| 1968  | 208.00 | 0.00   | 26.90  | 8.10  | 0.00  | 0.00  | 52.10  | 25.40  | 73.20  | 25.40  | 120.40 | 122.40 | 661.9  |
| 1969  | 119.40 | 5.10   | 0.00   | 2.50  | 0.00  | 0.00  | 0.00   | 150.90 | 226.80 | 162.10 | 140.00 | 88.90  | 895.7  |
| 1970  | 0.00   | 0.00   | 0.00   | 0.00  | 0.00  | 27.90 | 0.00   | 48.30  | 20.30  | 195.60 | 133.40 | 0.00   | 425.5  |
| 1971  | 0.00   | 7.60   | 12.70  | 87.60 | 0.00  | 14.20 | 81.30  | 121.90 | 108.00 | 160.00 | 48.30  | 64.30  | 705.9  |
| 1972  | 20.30  | 0.00   | 47.00  | 0.00  | 0.00  | 30.50 | 12.70  | 58.40  | 20.30  | 175.80 | 148.60 | 138.70 | 652.3  |
| 1973  | 16.30  | 24.10  | 36.10  | 2.50  | 17.80 | 21.60 | 21.60  | 112.50 | 189.00 | 102.60 | 406.40 | 152.40 | 1102.9 |
| 1974  | 102.90 | 30.50  | 14.00  | 44.40 | 12.70 | 15.70 | 25.40  | 248.90 | 78.70  | 167.60 | 214.40 | 0.00   | 955.2  |
| 1975  | 88.40  | 12.70  | 0.00   | 0.00  | 12.70 | 1.00  | 76.20  | 63.00  | 296.70 | 120.70 | 76.20  | 12.70  | 760.3  |
| 1976  | 39.60  | 143.30 | 144.30 | 25.40 | 12.70 | 0.00  | 0.00   | 333.20 | 229.60 | 274.30 | 158.50 | 114.30 | 1475.2 |
| 1977  | 17.80  | 0.00   | 25.40  | 25.40 | 12.70 | 0.00  | 78.70  | 63.50  | 25.40  | 0.00+  | 120.00 | 101.60 | 470.5  |
| 1978  | 15.20  | 0.00   | 91.40  | 25.40 | 33.00 | 0.00  | 25.40  | 101.60 | 166.40 | 106.70 | 76.20  | 81.30  | 722.6  |
| 1979  | 101.60 | 0.00   | 0.00   | 30.00 | 40.00 | 12.00 | 42.00  | 146.00 | 150.00 | 20.00  | 124.00 | 14.00  | 679.6  |
| 1980  | 56.00  | 164.00 | 39.00  | 76.00 | 40.00 | 24.00 | 44.00  | 15.00  | 93.00  | 192.00 | 173.00 | 183.00 | 1099.0 |
| 1981  | 18.00  | 33.50  | 0.00   | 50.00 | 0.00  | 55.50 | 111.00 | 44.50  | 117.00 | 103.00 | 76.10+ | 11.70+ | 620.3  |
| AVE : | 52.91  | 26.88  | 23.86  | 24.27 | 15.36 | 18.90 | 46.21  | 100.45 | 149.73 | 124.46 | 144.59 | 67.90  | 795.5  |
| SD :  | 62.89  | 45.15  | 35.61  | 25.03 | 18.93 | 22.88 | 33.35  | 83.59  | 95.83  | 66.05  | 88.85  | 53.61  | 245.0  |

| Appendix A18                                                              |         |        |        |        |        |        |        |        |         |         |         |         |        |
|---------------------------------------------------------------------------|---------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|---------|--------|
| File : 042582_2.PAT                                                       |         |        |        |        |        |        |        |        |         |         |         |         |        |
| Units : mm                                                                |         |        |        |        |        |        |        |        |         |         |         |         |        |
| Descrip. : Patched monthly rainfall for station 042582 2 for 1951 to 1998 |         |        |        |        |        |        |        |        |         |         |         |         |        |
| Year                                                                      | Oct     | Nov    | Dec    | Jan    | Feb    | Mar    | Apr    | May    | Jun     | Jul     | Aug     | Sep     | Total  |
| 1951                                                                      | 64.20   | 124.90 | 0.00   | 0.00   | 0.00   | 0.00   | 30.50  | 120.20 | 46.50   | 116.60  | 184.40  | 56.90   | 844.2  |
| 1952                                                                      | 0.00    | 53.30  | 34.30  | 0.00   | 20.00  | 0.00   | 179.50 | 232.00 | 45.00   | 115.00  | 144.40  | 0.00    | 723.5  |
| 1953                                                                      | 165.10  | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 185.00 | 254.50 | 85.50   | 265.00  | 80.00   | 35.50   | 1070.6 |
| 1954                                                                      | 61.50   | 57.50  | 0.00   | 0.00+  | 14.20+ | 12.10+ | 34.30+ | 26.00+ | 153.50+ | 138.00+ | 275.20+ | 27.10+  | 799.4  |
| 1955                                                                      | 112.00+ | 67.00+ | 20.40+ | 0.00   | 24.00  | 0.00   | 0.00   | 108.00 | 112.00  | 137.00  | 103.00  | 0.00    | 683.4  |
| 1956                                                                      | 0.00    | 0.00   | 0.00   | 0.00   | 0.00   | 11.50  | 1.20   | 292.30 | 92.00   | 152.50  | 68.40   | 59.90   | 677.8  |
| 1957                                                                      | 61.00   | 14.00  | 0.00   | 0.00   | 0.00   | 0.00   | 53.00  | 55.50  | 60.00   | 0.00    | 140.00  | 4.30    | 387.8  |
| 1958                                                                      | 53.00   | 0.00   | 0.00   | 0.00   | 31.50  | 11.00  | 121.50 | 205.00 | 12.50   | 0.00    | 120.00  | 101.00  | 655.5  |
| 1959                                                                      | 47.50   | 0.00   | 12.00  | 0.00   | 0.00   | 44.00  | 15.00  | 131.00 | 113.50  | 0.00    | 52.00   | 18.50   | 433.5  |
| 1960                                                                      | 0.00    | 0.00   | 31.50  | 18.50+ | 13.70+ | 9.30+  | 49.80+ | 90.10+ | 125.80+ | 86.20+  | 88.30+  | 133.50+ | 646.7  |
| 1961                                                                      | 2.40+   | 0.00+  | 3.30+  | 0.00   | 11.50  | 18.50  | 72.50  | 44.00  | 205.00  | 73.50   | 192.50  | 51.50   | 674.7  |
| 1962                                                                      | 152.00  | 64.00  | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 12.50  | 103.50  | 101.00  | 264.30  | 19.00   | 716.3  |
| 1963                                                                      | 20.00   | 44.50  | 0.00   | 0.00   | 0.00   | 0.00   | 42.00  | 37.20  | 165.00  | 69.00   | 111.50  | 59.50   | 548.7  |
| 1964                                                                      | 45.00   | 57.00  | 0.00   | 0.00   | 18.50  | 77.00  | 27.00  | 70.00  | 27.00   | 32.00   | 84.00   | 28.50   | 466.0  |
| 1965                                                                      | 26.50   | 6.50   | 10.00  | 0.00   | 0.00   | 51.50  | 0.00   | 29.50  | 133.10+ | 108.30  | 38.00   | 37.00   | 440.4  |
| 1966                                                                      | 0.00    | 17.00  | 3.00   | 0.00   | 10.00  | 0.00   | 56.00  | 40.70  | 227.50  | 86.50   | 60.00   | 17.00   | 517.7  |
| 1967                                                                      | 82.00   | 21.60  | 0.00   | 0.00   | 0.00   | 0.00   | 63.20  | 125.50 | 139.50  | 108.00  | 110.00  | 0.00    | 649.8  |
| 1968                                                                      | 115.50  | 0.00   | 28.00  | 0.00   | 0.00   | 0.00   | 60.50  | 0.00   | 41.50   | 12.00   | 58.00   | 99.00   | 414.5  |
| 1969                                                                      | 101.50  | 0.00   | 7.00   | 0.00   | 0.00   | 0.00   | 0.00   | 102.00 | 186.30  | 107.50  | 181.50  | 41.00   | 726.8  |
| 1970                                                                      | 0.00    | 0.00   | 9.00   | 0.00   | 9.50   | 14.00  | 0.00   | 0.00   | 47.50   | 192.70  | 87.20   | 23.50   | 383.4  |
| 1971                                                                      | 4.50    | 15.50  | 0.00   | 33.50  | 0.00   | 5.10   | 67.50  | 80.00  | 56.50   | 87.00   | 61.30   | 48.50   | 459.4  |
| 1972                                                                      | 10.00   | 0.00   | 45.80  | 0.00   | 0.00   | 30.00  | 0.00   | 28.50  | 26.00   | 171.30  | 118.50  | 58.50   | 488.6  |
| 1973                                                                      | 29.00   | 8.00   | 19.00  | 0.00   | 0.00   | 13.00  | 0.00   | 74.00  | 120.50  | 100.00  | 321.00  | 68.00   | 752.5  |
| 1974                                                                      | 43.00   | 24.00  | 14.00  | 6.50   | 11.00  | 7.00   | 69.50  | 171.60 | 39.00   | 105.50  | 101.00  | 0.00    | 592.1  |
| 1975                                                                      | 77.50   | 0.00   | 0.00   | 8.00   | 0.00   | 0.00   | 21.50  | 34.00  | 251.50  | 132.30  | 60.00   | 14.50   | 599.3  |
| 1976                                                                      | 35.00   | 156.00 | 96.00  | 10.00  | 11.00  | 0.00   | 55.50  | 307.00 | 219.00  | 222.50  | 200.50  | 47.00   | 1359.5 |
| 1977                                                                      | 14.50   | 0.00   | 47.50  | 0.00   | 0.00   | 0.00   | 28.90  | 25.00  | 19.00   | 11.50   | 129.50  | 130.00  | 405.9  |
| 1978                                                                      | 37.00   | 0.00   | 32.70+ | 25.50  | 23.00  | 24.00  | 0.00   | 63.00  | 213.50  | 106.00  | 39.50   | 62.00   | 626.2  |
| 1979                                                                      | 62.80   | 8.00   | 0.00   | 34.50  | 20.00  | 0.00   | 44.90+ | 111.70 | 111.00  | 18.00   | 105.50  | 16.50   | 532.9  |
| 1980                                                                      | 51.50   | 152.00 | 30.50  | 104.50 | 10.50  | 34.60+ | 23.70+ | 11.50  | 46.10+  | 176.50  | 154.00  | 163.50  | 958.9  |
| 1981                                                                      | 36.00   | 21.00  | 0.00   | 54.50  | 0.00   | 76.00  | 118.50 | 26.40  | 63.80   | 69.50   | 39.00+  | 7.00    | 511.7  |
| 1982                                                                      | 75.50   | 16.00  | 19.50  | 4.00   | 59.00  | 32.20  | 7.00   | 268.50 | 226.50  | 184.50  | 48.00   | 36.50   | 977.2  |
| 1983                                                                      | 13.00   | 8.50   | 14.50  | 2.50   | 13.50  | 86.50  | 52.50  | 291.00 | 21.00   | 90.00   | 58.80   | 228.80  | 880.6  |
| 1984                                                                      | 117.70  | 3.00   | 85.50  | 68.00  | 18.00  | 151.50 | 79.50  | 81.50  | 138.50  | 141.00  | 127.70  | 82.00   | 1093.9 |
| 1985                                                                      | 14.90   | 18.00  | 54.00  | 16.00  | 10.00  | 71.50  | 27.10  | 55.50  | 125.50  | 111.50  | 186.50  | 61.00   | 751.5  |
| 1986                                                                      | 10.50   | 17.20  | 0.00   | 18.50  | 0.00   | 2.00   | 47.00  | 141.00 | 132.70  | 75.80   | 82.30   | 60.50+  | 587.5  |
| 1987                                                                      | 6.00+   | 0.00   | 24.50  | 8.00   | 1.00   | 73.70  | 110.00 | 46.30  | 146.00  | 55.60   | 99.50   | 69.70   | 640.3  |
| 1988                                                                      | 21.60   | 11.00  | 25.50  | 8.50   | 9.70   | 119.30 | 58.50  | 49.50  | 115.80  | 94.40   | 175.80  | 163.50  | 853.1  |
| 1989                                                                      | 51.00   | 68.50  | 13.50  | 13.00  | 24.00  | 24.00  | 115.20 | 146.50 | 125.50  | 168.40  | 48.90   | 4.80    | 803.3  |
| 1990                                                                      | 10.00   | 34.00  | 31.00  | 22.50  | 2.60   | 20.00  | 41.50  | 93.00  | 173.00  | 248.50  | 54.20   | 120.20  | 850.5  |
| 1991                                                                      | 48.50   | 12.00  | 0.00   | 0.00   | 24.50  | 26.50  | 103.70 | 103.50 | 174.50  | 105.70  | 99.50   | 29.00+  | 727.4  |
| 1992                                                                      | 133.50  | 28.00  | 0.00   | 0.80   | 29.20  | 5.00   | 102.40 | 150.30 | 115.20  | 298.00  | 51.50   | 0.40    | 914.3  |
| 1993                                                                      | 0.00    | 18.00  | 7.00   | 1.50   | 0.00   | 0.50   | 35.60  | 56.20  | 290.00  | 68.10   | 21.00   | 79.20   | 577.1  |
| 1994                                                                      | 12.50   | 10.50  | 17.50  | 5.00   | 0.00   | 39.50  | 17.00  | 112.60 | 121.00  | 144.00  | 103.50  | 13.50   | 596.6  |
| 1995                                                                      | 128.10+ | 33.50  | 62.00  | 0.00   | 19.00  | 34.00  | 44.50  | 56.00  | 213.50  | 174.30  | 150.50  | 139.50  | 1054.9 |
| 1996                                                                      | 82.00   | 80.00  | 70.00  | 28.50  | 0.00   | 17.50  | 60.00  | 43.50  | 247.70+ | 28.00   | 39.40+  | 0.00    | 696.6  |
| 1997                                                                      | 3.00    | 88.50  | 20.00  | 33.00  | 0.00   | 3.50   | 19.60  | 215.00 | 89.50   | 90.50   | 50.00   | 38.00   | 650.6  |
| 1998                                                                      | 19.00   | 92.00  | 21.70  | 0.00   | 15.10  | 0.00   | 44.50  | 45.50  | 129.80+ | 111.30+ | 96.80+  | 61.40+  | 637.1  |
| AVE :                                                                     | 47.02   | 30.22  | 18.96  | 10.94  | 9.46   | 23.87  | 49.72  | 101.34 | 122.37  | 110.22  | 109.72  | 54.50   | 688.3  |
| SD :                                                                      | 44.62   | 39.59  | 23.43  | 20.44  | 12.04  | 33.86  | 44.34  | 82.77  | 70.35   | 67.74   | 66.12   | 50.97   | 207.8  |



| Appendix A19                                                              |        |       |       |       |       |       |        |        |        |        |        |       |       |
|---------------------------------------------------------------------------|--------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|-------|-------|
| File : 043019_P.PAT                                                       |        |       |       |       |       |       |        |        |        |        |        |       |       |
| Units : mm                                                                |        |       |       |       |       |       |        |        |        |        |        |       |       |
| Descrip. : Patched monthly rainfall for station 043019 p for 1949 to 1976 |        |       |       |       |       |       |        |        |        |        |        |       |       |
| Year                                                                      | Oct    | Nov   | Dec   | Jan   | Feb   | Mar   | Apr    | May    | Jun    | Jul    | Aug    | Sep   | Total |
| 1949                                                                      | 22.30+ | 7.60+ | 7.60+ | 0.00  | 0.00  | 7.60  | 52.10  | 2.50   | 19.00  | 82.60  | 0.00   | 68.60 | 269.9 |
| 1950                                                                      | 26.70  | 17.80 | 0.00  | 0.00  | 0.00  | 0.00  | 34.30  | 0.00   | 57.20  | 0.00   | 25.40  | 12.70 | 174.1 |
| 1951                                                                      | 0.00   | 0.00  | 0.00  | 0.00  | 0.00  | 12.70 | 10.20  | 50.80  | 45.70  | 63.50  | 62.20  | 13.00 | 258.1 |
| 1952                                                                      | 14.00  | 72.40 | 0.00  | 0.00  | 0.00  | 0.00  | 104.10 | 40.60  | 17.80  | 83.80  | 5.10   | 0.00  | 337.8 |
| 1953                                                                      | 38.10  | 0.00  | 30.50 | 0.00  | 0.00  | 11.40 | 45.70  | 113.00 | 26.70  | 127.00 | 47.00  | 30.50 | 469.9 |
| 1954                                                                      | 0.00   | 0.00  | 19.00 | 0.00  | 50.80 | 0.00  | 12.70  | 6.30   | 47.00  | 100.60 | 77.50  | 7.60  | 321.5 |
| 1955                                                                      | 27.90  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00   | 7.60   | 43.20  | 80.00  | 21.80  | 0.00  | 180.5 |
| 1956                                                                      | 0.00   | 0.00  | 0.00  | 0.00  | 25.40 | 0.00  | 0.00   | 73.70  | 175.30 | 82.60  | 90.20  | 0.00  | 447.2 |
| 1957                                                                      | 0.00   | 0.00  | 0.00  | 0.00  | 12.70 | 0.00  | 0.00   | 25.40  | 19.00  | 0.00   | 14.00  | 25.40 | 96.5  |
| 1958                                                                      | 0.00   | 0.00  | 0.00  | 0.00  | 0.00  | 25.40 | 45.70  | 141.00 | 10.20  | 0.00   | 61.00  | 25.40 | 308.7 |
| 1959                                                                      | 0.00   | 0.00  | 0.00  | 0.00+ | 0.50+ | 8.70+ | 24.30+ | 46.60+ | 84.20+ | 6.10+  | 7.80+  | 8.00+ | 186.2 |
| 1960                                                                      | 8.70+  | 0.00+ | 8.50+ | 20.30 | 0.00  | 19.00 | 38.10  | 0.00   | 54.90  | 39.40  | 53.60  | 64.80 | 307.3 |
| 1961                                                                      | 8.90   | 0.00  | 0.00  | 0.00  | 8.90  | 20.30 | 20.30  | 19.00  | 114.30 | 31.70  | 114.30 | 22.90 | 360.6 |
| 1962                                                                      | 101.60 | 19.00 | 0.00  | 10.20 | 0.00  | 0.00  | 20.30  | 12.70  | 70.40  | 67.80  | 130.80 | 0.00  | 432.8 |
| 1963                                                                      | 40.60  | 3.80  | 30.50 | 0.00  | 12.70 | 0.00  | 41.90  | 24.10  | 101.60 | 17.80  | 34.30  | 26.70 | 334.0 |
| 1964                                                                      | 31.70  | 21.60 | 0.00  | 19.00 | 35.60 | 30.50 | 30.50  | 59.70  | 22.90  | 11.40  | 19.00  | 15.70 | 297.6 |
| 1965                                                                      | 25.40  | 0.00  | 5.10  | 0.00  | 0.00  | 49.50 | 12.70  | 38.10  | 27.90  | 62.20  | 40.40  | 14.00 | 275.3 |
| 1966                                                                      | 0.00   | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 71.10  | 50.80  | 94.00  | 20.30  | 27.90  | 16.50 | 280.6 |
| 1967                                                                      | 30.50  | 35.60 | 0.00  | 0.00  | 0.00  | 0.00  | 16.50  | 93.50  | 65.30  | 44.40  | 29.70  | 0.00  | 315.5 |
| 1968                                                                      | 69.90  | 17.80 | 0.00  | 0.00  | 0.00  | 0.00  | 32.30  | 0.00   | 6.30   | 5.10   | 25.40  | 24.90 | 181.7 |
| 1969                                                                      | 35.60  | 0.00  | 0.00  | 0.00  | 3.00  | 0.00  | 0.00   | 36.60  | 56.90  | 67.10  | 33.50  | 33.50 | 266.2 |
| 1970                                                                      | 19.00  | 0.00  | 10.20 | 0.00  | 0.00  | 0.00  | 31.50  | 0.00   | 22.40  | 15.20  | 107.70 | 52.80 | 258.8 |
| 1971                                                                      | 0.00   | 0.00  | 7.60  | 0.00  | 0.00  | 11.20 | 35.60  | 36.60  | 58.90  | 5.10   | 66.00  | 65.00 | 286.0 |
| 1972                                                                      | 0.00   | 0.00  | 35.60 | 0.00  | 0.00  | 20.80 | 0.00   | 22.10  | 19.00  | 85.60  | 85.10  | 41.90 | 310.1 |
| 1973                                                                      | 0.00   | 6.30  | 18.80 | 0.00  | 5.10  | 0.00  | 0.00   | 90.20  | 114.30 | 31.70  | 232.40 | 50.80 | 549.6 |
| 1974                                                                      | 49.50  | 29.20 | 0.00  | 12.70 | 0.00  | 5.10  | 38.10  | 132.10 | 30.20  | 29.20  | 69.90  | 0.00  | 396.0 |
| 1975                                                                      | 40.60  | 0.00  | 0.00  | 0.00  | 0.00  | 16.50 | 60.20  | 20.30  | 144.80 | 56.60  | 51.30  | 0.00  | 390.3 |
| 1976                                                                      | 21.60  | 79.20 | 45.70 | 0.00  | 47.00 | 12.70 | 92.50  | 144.50 | 110.50 | 147.30 | 94.00  | 21.60 | 816.6 |
| AVE :                                                                     | 21.88  | 11.08 | 7.82  | 2.22  | 7.20  | 8.98  | 31.10  | 45.99  | 59.28  | 48.72  | 58.12  | 22.94 | 325.3 |
| SD :                                                                      | 24.36  | 20.88 | 12.96 | 5.77  | 14.51 | 12.15 | 27.26  | 44.51  | 43.56  | 40.21  | 48.68  | 21.39 | 137.3 |

| Appendix A20                                                              |        |         |        |         |        |        |         |         |         |         |         |        |        |
|---------------------------------------------------------------------------|--------|---------|--------|---------|--------|--------|---------|---------|---------|---------|---------|--------|--------|
| File : 043139_P.PAT                                                       |        |         |        |         |        |        |         |         |         |         |         |        |        |
| Units : mm                                                                |        |         |        |         |        |        |         |         |         |         |         |        |        |
| Descrip. : Patched monthly rainfall for station 043139 p for 1951 to 1997 |        |         |        |         |        |        |         |         |         |         |         |        |        |
| Year                                                                      | Oct    | Nov     | Dec    | Jan     | Feb    | Mar    | Apr     | May     | Jun     | Jul     | Aug     | Sep    | Total  |
| 1951                                                                      | 40.20+ | 20.90+  | 20.90+ | 20.90+  | 20.90+ | 20.90+ | 19.50   | 120.40  | 48.30   | 116.30  | 120.80  | 57.20  | 627.2  |
| 1952                                                                      | 21.30  | 75.40   | 5.80   | 3.60    | 13.50  | 2.00   | 119.00  | 105.40  | 41.10   | 260.00  | 71.80   | 2.00   | 720.9  |
| 1953                                                                      | 5.30   | 39.50   | 41.00  | 10.00   | 7.30   | 28.40  | 57.00   | 182.70  | 56.70   | 201.40  | 118.50  | 23.40  | 771.2  |
| 1954                                                                      | 39.70  | 14.40   | 34.00  | 1.20    | 104.00 | 37.00  | 37.10   | 19.80   | 158.20  | 211.00  | 239.70  | 35.60  | 931.7  |
| 1955                                                                      | 82.30  | 43.90   | 16.60  | 8.40    | 22.50  | 28.00  | 15.50   | 109.90  | 154.00  | 116.50  | 67.60+  | 16.00  | 681.2  |
| 1956                                                                      | 15.00  | 4.50    | 26.20  | 4.10    | 129.60 | 39.00  | 32.90   | 214.00  | 186.10  | 169.00  | 98.50+  | 58.00  | 976.9  |
| 1957                                                                      | 113.50 | 4.60    | 28.50  | 10.50   | 44.00  | 17.30  | 49.80   | 149.00  | 75.50   | 7.80    | 84.90   | 35.20  | 620.6  |
| 1958                                                                      | 28.90  | 14.60   | 30.00  | 9.00    | 34.10  | 39.50  | 124.10+ | 221.00  | 21.50   | 25.50   | 133.00  | 42.60  | 723.8  |
| 1959                                                                      | 84.50  | 0.00    | 20.00  | 0.00    | 13.00  | 56.50  | 29.50   | 102.00  | 159.00  | 13.80   | 35.70   | 21.10  | 535.1  |
| 1960                                                                      | 13.50  | 0.70    | 31.50  | 34.90   | 16.50  | 49.80  | 53.40   | 46.70   | 129.50  | 92.80   | 96.50   | 90.20  | 656.0  |
| 1961                                                                      | 17.70  | 1.50    | 6.00   | 27.00   | 11.40  | 29.00  | 49.50   | 28.00   | 196.60  | 84.60   | 145.40  | 30.70  | 627.4  |
| 1962                                                                      | 104.50 | 44.70   | 3.00   | 40.20   | 11.00  | 3.20   | 11.90   | 26.30   | 102.50  | 121.60  | 177.50  | 30.30  | 676.7  |
| 1963                                                                      | 37.20  | 47.00   | 69.00  | 0.00    | 26.00  | 21.00  | 23.50   | 29.50   | 104.00  | 99.00   | 99.00   | 62.00  | 617.2  |
| 1964                                                                      | 34.50  | 45.50   | 2.50   | 21.10   | 41.00  | 69.50  | 83.70   | 80.80   | 31.00   | 38.50   | 63.00   | 30.00  | 541.1  |
| 1965                                                                      | 43.60  | 10.70   | 53.50  | 4.10    | 4.00   | 86.30+ | 28.80   | 18.50   | 68.10+  | 132.50  | 71.00   | 48.00  | 569.1  |
| 1966                                                                      | 3.70   | 5.50    | 7.50   | 8.50    | 6.50   | 0.30   | 128.50  | 80.60   | 196.30  | 52.00   | 62.60   | 49.50  | 601.5  |
| 1967                                                                      | 58.50  | 33.50   | 0.00   | 13.00   | 4.70   | 1.90   | 57.00   | 216.50  | 125.00  | 130.80  | 80.20   | 22.00  | 743.1  |
| 1968                                                                      | 138.50 | 16.00   | 17.20  | 39.30   | 31.50  | 0.00   | 65.80   | 10.10   | 52.80   | 24.20   | 60.60   | 53.40  | 509.4  |
| 1969                                                                      | 82.30  | 0.70    | 0.80   | 1.90    | 13.00  | 0.00   | 5.00    | 70.80   | 127.60  | 100.70  | 111.50  | 61.00  | 575.3  |
| 1970                                                                      | 25.00  | 3.20    | 17.70  | 0.00    | 3.50   | 18.50  | 5.10    | 21.50   | 62.00   | 124.20  | 61.70   | 10.50  | 352.9  |
| 1971                                                                      | 33.50  | 34.80   | 0.00   | 26.50   | 13.70  | 11.50+ | 63.90   | 66.40   | 37.00   | 5.00    | 23.80+  | 67.60  | 383.7  |
| 1972                                                                      | 0.00   | 0.00    | 0.00   | 0.00    | 0.00   | 41.10+ | 0.80    | 23.50   | 13.80+  | 208.20+ | 31.00+  | 45.90+ | 364.3  |
| 1973                                                                      | 25.00+ | 7.40+   | 30.60+ | 7.00    | 27.50  | 30.00  | 2.50    | 60.00   | 207.00  | 70.50   | 178.10  | 52.20+ | 697.8  |
| 1974                                                                      | 56.20  | 100.50  | 11.00  | 19.00   | 8.00   | 14.00+ | 109.90+ | 225.80+ | 32.10+  | 51.50+  | 123.40+ | 4.10   | 755.5  |
| 1975                                                                      | 65.20+ | 17.70   | 6.50   | 8.50    | 25.50  | 28.10  | 42.00+  | 33.20   | 244.60+ | 57.10+  | 45.70+  | 21.30  | 595.4  |
| 1976                                                                      | 24.10  | 156.50+ | 65.10+ | 6.20    | 47.60  | 28.00  | 96.70   | 164.90+ | 215.70+ | 170.70+ | 106.30  | 36.60  | 1118.4 |
| 1977                                                                      | 12.70  | 37.60   | 26.20  | 38.60   | 7.20   | 24.00+ | 61.40   | 19.80   | 15.80   | 8.30    | 165.80+ | 47.10  | 464.5  |
| 1978                                                                      | 11.00  | 15.60   | 45.70+ | 3.60+   | 38.00  | 3.50   | 6.50    | 67.10+  | 93.40   | 69.10+  | 32.00   | 53.50  | 439.0  |
| 1979                                                                      | 48.00  | 4.60    | 0.00   | 24.20   | 14.60  | 8.00   | 26.00   | 74.50   | 79.00   | 12.10   | 89.50   | 19.50  | 400.0  |
| 1980                                                                      | 33.40  | 157.20  | 16.80  | 139.00+ | 9.80   | 31.80  | 28.30+  | 10.40   | 44.90   | 90.70   | 168.50+ | 61.50  | 792.3  |
| 1981                                                                      | 20.00  | 4.00    | 0.90   | 50.00   | 0.00   | 63.70  | 97.30   | 32.20   | 63.20   | 44.40   | 19.40   | 8.00   | 403.1  |
| 1982                                                                      | 60.20  | 17.90   | 22.00  | 0.20    | 36.20  | 24.90  | 16.10   | 124.20  | 134.90  | 127.00+ | 43.40   | 36.20  | 643.2  |
| 1983                                                                      | 9.50   | 10.50   | 13.70  | 8.10    | 0.00   | 53.80+ | 36.50   | 185.20  | 30.60   | 37.90   | 14.80   | 99.50  | 500.1  |
| 1984                                                                      | 60.10+ | 0.00    | 57.30+ | 45.00   | 8.80   | 83.10  | 61.10   | 49.70   | 107.20  | 122.70  | 57.40   | 49.40  | 701.8  |
| 1985                                                                      | 12.70  | 13.30   | 56.30  | 11.50   | 13.70  | 52.00+ | 45.60   | 36.00   | 97.00   | 69.90   | 132.40  | 46.10  | 586.5  |
| 1986                                                                      | 20.60  | 9.90    | 0.00   | 26.00   | 0.00+  | 3.50   | 52.80+  | 80.60   | 100.10  | 79.50   | 89.00+  | 51.90  | 513.9  |
| 1987                                                                      | 3.10   | 0.80    | 25.00  | 1.50    | 4.80   | 40.00  | 76.00+  | 25.60   | 95.70   | 55.30   | 117.30  | 59.50  | 504.6  |
| 1988                                                                      | 12.80  | 2.70    | 27.80  | 23.60   | 22.50+ | 96.80  | 93.50   | 32.30   | 110.10  | 73.10   | 92.80   | 107.10 | 695.1  |
| 1989                                                                      | 31.20  | 41.20   | 7.70   | 5.70    | 24.80  | 7.10   | 86.00   | 116.30  | 99.90   | 106.30  | 25.50   | 4.20   | 555.9  |
| 1990                                                                      | 4.90   | 18.30   | 23.40  | 22.40   | 3.40   | 14.80  | 22.10   | 55.70   | 92.70   | 176.40  | 45.00   | 83.10  | 562.2  |
| 1991                                                                      | 58.20  | 8.60    | 3.90   | 0.00    | 14.70  | 19.70  | 65.70   | 63.30   | 108.50  | 107.40  | 76.30   | 28.70  | 555.0  |
| 1992                                                                      | 63.70  | 25.60   | 0.00   | 3.80    | 12.10  | 15.10  | 144.00  | 85.40   | 78.20   | 138.00  | 29.90   | 7.50   | 603.3  |
| 1993                                                                      | 3.10   | 7.70    | 20.90  | 4.10    | 0.00   | 12.10  | 58.10   | 32.60   | 167.80  | 37.60   | 15.70   | 74.00  | 433.7  |
| 1994                                                                      | 39.50  | 1.30    | 50.10  | 86.60   | 30.40  | 34.30  | 9.80    | 104.90+ | 54.50   | 85.90+  | 80.50+  | 17.90  | 595.7  |
| 1995                                                                      | 88.70+ | 5.50    | 68.70  | 1.30    | 20.90  | 24.60  | 23.30+  | 29.00   | 82.50   | 109.90  | 79.00   | 94.70  | 628.1  |
| 1996                                                                      | 71.60  | 61.20   | 49.20+ | 17.80   | 0.00   | 11.20  | 53.00   | 46.70   | 147.00  | 49.60   | 48.90+  | 17.00  | 573.2  |
| 1997                                                                      | 5.20   | 49.90+  | 13.50  | 17.00   | 0.00   | 7.30   | 15.70   | 146.80  | 91.00+  | 89.60+  | 48.70+  | 35.20+ | 519.9  |
| AVE :                                                                     | 39.66  | 26.32   | 22.85  | 18.19   | 20.05  | 28.34  | 50.88   | 81.82   | 100.85  | 93.10   | 84.67   | 42.72  | 609.5  |
| SD :                                                                      | 32.46  | 35.42   | 20.31  | 24.83   | 24.45  | 23.74  | 36.81   | 62.57   | 57.50   | 59.41   | 49.62   | 26.03  | 153.1  |

Appendix A21

File : 007008\_A.NSP

Units : mm

Descrip. : Patched monthly rainfall for station 007008 a for 1972 to 1998

| Year  | Oct    | Nov    | Dec    | Jan   | Feb    | Mar   | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Total |
|-------|--------|--------|--------|-------|--------|-------|--------|--------|--------|--------|--------|--------|-------|
| 1972  | 20.10* | 21.70* | 10.60* | 7.10  | 7.00   | 12.20 | 28.20  | 34.30  | 19.80  | 63.10  | 41.00  | 39.80  | 304.9 |
| 1973  | 7.70   | 40.70  | 24.70  | 13.00 | 13.40  | 31.20 | 8.00   | 92.40  | 25.10  | 19.60  | 191.40 | 64.60  | 531.8 |
| 1974  | 62.30  | 22.60  | 1.10   | 26.60 | 7.30   | 5.00  | 15.40  | 79.60  | 26.60  | 75.80  | 82.90  | 32.90  | 438.1 |
| 1975  | 24.10  | 14.40  | 5.30   | 0.00  | 25.00  | 47.20 | 44.30  | 55.60  | 141.70 | 62.20  | 61.10  | 62.30  | 543.2 |
| 1976  | 58.70  | 65.20  | 36.80  | 16.60 | 50.90  | 33.50 | 50.10  | 87.90  | 58.60  | 93.40  | 64.10  | 34.20  | 650.0 |
| 1977  | 10.60  | 47.70  | 44.10  | 22.70 | 16.60  | 19.00 | 46.70  | 15.50  | 22.10  | 61.00  | 87.20  | 57.00  | 450.2 |
| 1978  | 40.10  | 16.00  | 30.30  | 28.10 | 91.90  | 1.70  | 0.00   | 80.00  | 57.60  | 67.30  | 39.40  | 42.90  | 495.3 |
| 1979  | 49.90  | 4.80   | 15.00  | 26.20 | 6.40   | 15.50 | 34.10  | 51.30  | 74.80  | 20.10  | 55.10  | 26.80  | 380.0 |
| 1980  | 38.20  | 73.40  | 33.30  | 89.80 | 55.50  | 70.40 | 99.10  | 20.80  | 34.40  | 111.60 | 88.60  | 59.90  | 775.0 |
| 1981  | 19.80  | 21.20  | 21.30  | 13.30 | 6.00   | 14.80 | 126.30 | 12.10  | 65.20  | 27.90  | 41.10  | 26.60  | 395.6 |
| 1982  | 26.40  | 16.00  | 24.20  | 12.50 | 47.00  | 14.70 | 20.80  | 153.50 | 83.30  | 78.50  | 37.90  | 75.30  | 590.1 |
| 1983  | 12.30  | 18.80  | 19.50  | 15.20 | 20.90  | 34.30 | 31.10  | 91.00  | 14.10  | 37.80  | 12.20  | 51.30  | 358.5 |
| 1984  | 80.30  | 13.20  | 74.40  | 36.00 | 59.60  | 48.00 | 73.60  | 9.70   | 51.10  | 127.30 | 41.90  | 14.00  | 629.1 |
| 1985  | 80.40  | 32.00  | 30.90  | 2.90  | 39.90  | 45.60 | 53.80  | 13.80  | 49.40  | 43.50  | 197.70 | 48.20  | 638.1 |
| 1986  | 37.00  | 34.60  | 3.00   | 12.20 | 18.90  | 17.70 | 69.30  | 66.40  | 62.90  | 33.30  | 79.40  | 53.20  | 487.9 |
| 1987  | 17.40  | 5.50   | 21.10  | 1.20  | 8.60   | 11.40 | 47.80  | 44.30  | 72.70  | 37.30  | 93.50  | 49.00  | 409.8 |
| 1988  | 24.80  | 14.40  | 8.60   | 10.70 | 3.40   | 95.40 | 165.10 | 34.20  | 87.40  | 99.20  | 82.70  | 73.80  | 699.7 |
| 1989  | 72.60  | 36.60  | 3.20   | 21.10 | 47.60  | 19.20 | 80.90  | 59.80  | 93.60  | 29.90  | 37.40  | 24.80  | 526.7 |
| 1990  | 26.80  | 26.40  | 18.70  | 17.30 | 5.30   | 23.20 | 32.00  | 52.10  | 76.50  | 137.60 | 16.10  | 47.00  | 479.0 |
| 1991  | 77.20  | 15.20  | 25.40  | 5.30  | 11.30  | 16.40 | 76.90  | 65.60  | 60.90  | 66.80  | 55.20  | 48.40  | 524.6 |
| 1992  | 81.60  | 14.20  | 2.30   | 8.40  | 44.50  | 9.50  | 241.10 | 50.10  | 81.00  | 129.20 | 52.00  | 11.90  | 725.8 |
| 1993  | 9.30   | 10.90  | 49.90  | 8.80  | 29.20  | 50.00 | 63.70  | 58.20  | 144.30 | 44.70  | 48.40  | 33.90  | 551.3 |
| 1994  | 39.20  | 2.90   | 72.50  | 10.10 | 9.30   | 47.60 | 31.00  | 99.40  | 57.90  | 63.50  | 96.90  | 15.20  | 545.5 |
| 1995  | 56.50  | 30.50  | 145.90 | 10.50 | 29.70  | 29.80 | 17.70  | 37.80  | 56.40  | 77.40  | 35.80  | 42.70  | 570.7 |
| 1996  | 102.40 | 69.00  | 49.80  | 10.60 | 8.40   | 14.90 | 63.30  | 132.40 | 73.70  | 37.10  | 60.90  | 9.40   | 631.9 |
| 1997  | 35.50  | 76.30  | 12.00  | 42.40 | 15.10  | 32.20 | 54.50  | 148.30 | 39.00  | 45.70  | 50.40  | 14.80  | 566.2 |
| 1998  | 14.10  | 101.30 | 105.50 | 9.20* | 11.40* | 0.00* | 71.10* | 42.60* | 35.60* | 51.20* | 66.10* | 41.60* | 549.7 |
| AVE : | 41.68  | 31.31  | 32.94  | 17.70 | 25.56  | 28.16 | 60.96  | 62.54  | 61.69  | 64.52  | 67.27  | 40.80  | 535.1 |
| SD :  | 27.00  | 25.29  | 33.54  | 17.61 | 22.03  | 21.80 | 50.91  | 39.18  | 32.13  | 33.58  | 42.93  | 18.71  | 113.7 |

## Appendix A22

File : 007183\_7.NSP

Units : mm

Descrip. : Patched monthly rainfall for station 007183 7 for 1968 to 1998

| Year  | Oct    | Nov    | Dec    | Jan    | Feb   | Mar    | Apr    | May    | Jun    | Jul    | Aug     | Sep    | Total |
|-------|--------|--------|--------|--------|-------|--------|--------|--------|--------|--------|---------|--------|-------|
| 1968  | 25.40  | 66.10  | 15.50  | 33.50  | 42.30 | 24.30  | 75.50  | 10.00  | 60.20  | 35.30  | 32.00   | 29.00  | 449.1 |
| 1969  | 27.80  | 22.00  | 17.10+ | 38.60  | 69.50 | 17.80  | 7.00   | 23.00  | 41.00  | 50.70  | 77.00   | 4.60   | 396.1 |
| 1970  | 59.20  | 20.30  | 40.00  | 11.60  | 66.70 | 48.80  | 79.60  | 65.50  | 62.10  | 117.60 | 104.00  | 23.40  | 698.8 |
| 1971  | 34.50  | 67.50  | 87.10  | 36.30  | 47.60 | 15.90  | 64.50  | 59.10  | 74.00  | 47.60  | 73.40   | 44.70  | 652.2 |
| 1972  | 7.60   | 20.40  | 1.40   | 3.00   | 5.00  | 7.60   | 16.60  | 11.00  | 15.70  | 19.10  | 21.60   | 14.20  | 143.2 |
| 1973  | 2.20   | 18.10  | 16.60  | 51.80  | 71.70 | 43.60+ | 1.10   | 73.80+ | 37.10  | 2.60   | 132.30+ | 65.40  | 516.3 |
| 1974  | 7.50   | 12.00  | 0.80   | 88.40  | 24.30 | 10.70  | 16.60  | 54.30+ | 26.30  | 58.00  | 66.80+  | 35.40+ | 401.1 |
| 1975  | 28.00  | 45.80  | 44.00  | 0.90   | 29.50 | 84.00  | 57.20  | 50.70  | 113.60 | 42.30  | 42.40   | 31.20  | 569.6 |
| 1976  | 70.00  | 88.50  | 18.50  | 7.60   | 39.00 | 79.20  | 46.90  | 75.10  | 52.30  | 77.80  | 60.90   | 40.80  | 656.6 |
| 1977  | 15.80  | 69.20  | 71.10  | 72.40  | 18.70 | 28.90  | 34.80  | 25.60  | 38.70  | 48.20  | 74.80   | 44.50  | 542.7 |
| 1978  | 44.40  | 32.10  | 51.50  | 32.30  | 84.30 | 6.40   | 2.00   | 67.60  | 45.40+ | 74.20  | 38.80   | 51.70  | 530.7 |
| 1979  | 44.40  | 11.00  | 17.40  | 37.00  | 15.90 | 2.70   | 25.70  | 32.10  | 46.40  | 17.80  | 23.80   | 29.80+ | 304.0 |
| 1980  | 85.50  | 86.70  | 49.80  | 209.00 | 77.00 | 54.50  | 70.50  | 31.50  | 27.50  | 73.50  | 104.00  | 69.30  | 938.8 |
| 1981  | 46.00  | 17.50  | 50.50  | 8.00   | 29.00 | 56.50  | 142.50 | 11.00  | 72.50  | 42.50  | 68.00   | 59.00  | 603.0 |
| 1982  | 35.50  | 11.50  | 17.50  | 17.00  | 46.40 | 14.80  | 19.50  | 87.00  | 74.20  | 77.00  | 29.50   | 44.00  | 473.9 |
| 1983  | 21.00  | 26.00  | 4.00   | 35.50  | 40.00 | 47.30  | 43.00  | 63.20  | 31.50  | 47.90  | 12.70   | 47.50  | 419.6 |
| 1984  | 85.30  | 37.80  | 53.30  | 80.60  | 73.90 | 41.70  | 50.70  | 9.00   | 56.40  | 119.90 | 32.50   | 9.30   | 650.4 |
| 1985  | 219.30 | 49.70  | 88.00  | 35.10  | 51.70 | 49.60  | 54.60  | 11.40  | 38.20+ | 40.40+ | 158.10+ | 35.70+ | 831.8 |
| 1986  | 65.00  | 35.20  | 12.50  | 10.10  | 38.00 | 35.30+ | 118.00 | 47.70  | 38.70  | 30.80+ | 63.80   | 60.30  | 555.4 |
| 1987  | 25.70  | 6.00   | 28.40  | 1.00   | 22.30 | 48.00  | 49.50+ | 31.40  | 53.70+ | 35.30+ | 84.80   | 31.80  | 417.9 |
| 1988  | 42.20  | 17.50  | 31.90  | 27.50  | 15.30 | 66.50  | 197.50 | 15.30  | 66.70  | 41.30  | 49.00   | 46.50  | 617.2 |
| 1989  | 122.30 | 79.50  | 24.00  | 26.00  | 79.00 | 36.00  | 86.50  | 69.00  | 74.50  | 20.00  | 51.00   | 30.50  | 698.3 |
| 1990  | 62.70  | 44.50  | 38.50  | 37.50  | 39.50 | 28.00  | 28.00  | 47.00  | 65.50  | 107.00 | 20.50   | 21.50  | 540.2 |
| 1991  | 145.20 | 22.00  | 81.00  | 28.50  | 45.00 | 22.50  | 49.00  | 66.50  | 46.50  | 54.50  | 37.50   | 32.00  | 630.2 |
| 1992  | 105.50 | 47.50  | 0.00   | 10.50  | 53.00 | 29.00  | 162.00 | 45.00  | 52.00  | 84.50  | 53.50   | 36.00  | 678.5 |
| 1993  | 6.50   | 52.00  | 120.50 | 36.50  | 78.50 | 26.50  | 72.50  | 42.50  | 79.00  | 36.00  | 78.50   | 41.00  | 670.0 |
| 1994  | 59.50  | 2.00   | 136.00 | 49.00  | 31.00 | 72.50  | 108.00 | 90.50  | 31.50  | 37.50  | 58.50   | 14.50  | 690.5 |
| 1995  | 50.50  | 105.00 | 132.50 | 35.00  | 33.00 | 49.50  | 18.00  | 24.00  | 60.50  | 94.50  | 27.00   | 49.50  | 679.0 |
| 1996  | 122.50 | 136.00 | 23.00  | 17.50  | 26.00 | 43.00  | 39.50  | 86.00+ | 52.50  | 25.00  | 68.50   | 14.00  | 653.5 |
| 1997  | 56.50  | 46.00  | 19.50  | 72.50  | 63.50 | 67.00  | 84.00  | 96.00  | 25.00  | 36.50  | 49.00   | 15.00  | 630.5 |
| 1998  | 25.50  | 133.50 | 237.50 | 50.00  | 22.00 | 56.50  | 49.00  | 168.00 | 27.50  | 21.50  | 45.00   | 38.10+ | 874.1 |
| AVE : | 56.42  | 46.09  | 49.34  | 38.72  | 44.47 | 39.18  | 60.32  | 51.28  | 51.18  | 52.15  | 59.33   | 35.81  | 584.3 |
| SD :  | 47.14  | 35.61  | 51.40  | 39.04  | 22.18 | 21.90  | 46.54  | 34.19  | 20.66  | 29.81  | 32.94   | 16.46  | 163.1 |

| Appendix A23                                                              |         |        |        |        |        |        |        |         |        |        |        |        |       |
|---------------------------------------------------------------------------|---------|--------|--------|--------|--------|--------|--------|---------|--------|--------|--------|--------|-------|
| File : 007698_A.NSP                                                       |         |        |        |        |        |        |        |         |        |        |        |        |       |
| Units : mm                                                                |         |        |        |        |        |        |        |         |        |        |        |        |       |
| Descrip. : Patched monthly rainfall for station 007698 a for 1931 to 1974 |         |        |        |        |        |        |        |         |        |        |        |        |       |
| Year                                                                      | Oct     | Nov    | Dec    | Jan    | Feb    | Mar    | Apr    | May     | Jun    | Jul    | Aug    | Sep    | Total |
| 1931                                                                      | 98.10+  | 20.00+ | 78.30+ | 16.90+ | 32.80+ | 5.30   | 2.80   | 33.00   | 46.30  | 39.90  | 9.20   | 111.70 | 494.3 |
| 1932                                                                      | 38.00   | 48.80+ | 17.20  | 4.00   | 19.80  | 26.80  | 12.50  | 39.40   | 60.10  | 31.20  | 65.90  | 1.30   | 365.0 |
| 1933                                                                      | 20.30   | 27.20  | 10.10  | 39.90  | 50.80  | 25.40  | 33.10  | 16.10   | 7.10   | 71.80  | 77.40  | 36.90  | 416.1 |
| 1934                                                                      | 49.00   | 36.90  | 0.00   | 6.10   | 9.60   | 27.90  | 58.40  | 76.00   | 42.60  | 29.40  | 20.80  | 29.00  | 385.7 |
| 1935                                                                      | 12.40   | 43.80+ | 19.30  | 10.50  | 20.40  | 4.10   | 16.50+ | 51.60   | 27.40  | 48.80  | 32.50  | 56.10+ | 343.4 |
| 1936                                                                      | 28.70   | 83.20  | 36.80  | 4.60   | 13.70  | 33.60  | 19.10  | 9.20    | 47.30  | 57.40  | 13.20  | 54.50  | 401.3 |
| 1937                                                                      | 13.80   | 36.30  | 51.30  | 19.00  | 4.60   | 81.90  | 59.10  | 62.40   | 24.60  | 38.70  | 53.50  | 68.20  | 513.4 |
| 1938                                                                      | 46.40+  | 18.60  | 26.40  | 10.60  | 79.00  | 41.90  | 31.80  | 12.70   | 3.40   | 40.90  | 87.40  | 22.10  | 421.2 |
| 1939                                                                      | 22.10   | 10.00  | 33.80  | 5.10   | 71.10  | 30.30  | 47.50  | 18.90   | 45.40  | 20.00  | 7.60   | 52.40  | 364.2 |
| 1940                                                                      | 28.20   | 58.50  | 1.50   | 10.20  | 18.10  | 5.60   | 86.80  | 66.00   | 58.80+ | 29.20  | 42.40  | 39.10  | 444.4 |
| 1941                                                                      | 59.40   | 18.60  | 7.90   | 29.90  | 14.40  | 45.60  | 11.70  | 73.30   | 49.30  | 22.40  | 24.00  | 31.90  | 388.4 |
| 1942                                                                      | 113.10  | 9.30   | 64.70  | 95.70  | 30.30  | 48.50  | 64.40  | 5.80    | 36.80  | 27.70  | 30.60  | 52.00  | 578.9 |
| 1943                                                                      | 33.60   | 61.00+ | 3.10   | 3.80   | 6.80   | 18.50  | 17.50  | 39.50   | 68.40  | 5.10   | 64.60  | 91.20  | 413.1 |
| 1944                                                                      | 31.20   | 3.00   | 3.80   | 0.00   | 4.80+  | 9.50+  | 32.00+ | 114.30+ | 61.70+ | 48.90+ | 52.00+ | 12.70+ | 373.9 |
| 1945                                                                      | 133.80+ | 5.70+  | 5.70+  | 5.10+  | 16.90+ | 77.90+ | 16.70+ | 22.00+  | 28.30+ | 36.00+ | 12.00+ | 38.10+ | 398.2 |
| 1946                                                                      | 32.90+  | 3.60+  | 4.70+  | 3.90+  | 14.70+ | 78.40+ | 78.40+ | 35.30+  | 36.10+ | 71.00+ | 10.80+ | 29.60+ | 399.4 |
| 1947                                                                      | 43.30+  | 36.00+ | 7.00+  | 7.60+  | 10.50+ | 53.50+ | 26.80+ | 25.30   | 34.50  | 49.40  | 8.40   | 45.30  | 347.6 |
| 1948                                                                      | 172.10  | 3.80   | 5.90   | 19.70  | 5.30+  | 0.00   | 51.50  | 37.40   | 10.90  | 31.90  | 23.70  | 17.00  | 379.2 |
| 1949                                                                      | 2.60    | 159.00 | 0.00   | 0.00   | 6.60   | 3.50   | 32.40  | 26.10   | 5.60   | 56.60  | 10.90  | 29.10  | 332.4 |
| 1950                                                                      | 93.10   | 85.20  | 10.90  | 72.20  | 1.50   | 40.40  | 37.80+ | 15.70   | 55.80  | 33.50  | 36.90  | 106.10 | 589.1 |
| 1951                                                                      | 22.60   | 2.50   | 0.00   | 0.00   | 26.00  | 31.70  | 23.90  | 25.50   | 31.10  | 27.10  | 64.30  | 76.30  | 331.0 |
| 1952                                                                      | 16.00   | 136.70 | 0.00   | 6.40   | 11.90  | 5.10   | 70.50  | 20.30   | 29.30  | 44.30  | 10.20  | 47.80  | 398.5 |
| 1953                                                                      | 31.00   | 53.60  | 0.00   | 0.00   | 19.20  | 31.50  | 42.60  | 106.30  | 35.50  | 70.00  | 70.30  | 9.00   | 469.0 |
| 1954                                                                      | 8.50    | 29.80  | 0.00   | 18.00  | 95.00  | 3.00   | 7.00   | 24.80   | 46.00  | 69.00  | 71.20  | 22.00  | 394.3 |
| 1955                                                                      | 41.80   | 4.50   | 7.00   | 19.50  | 20.50  | 29.50  | 10.00  | 74.60   | 52.50  | 77.50  | 36.30  | 14.20  | 387.9 |
| 1956                                                                      | 25.00   | 29.50  | 61.50  | 0.00   | 43.00  | 48.50  | 17.50  | 83.70   | 108.10 | 67.50  | 70.50  | 53.70  | 608.5 |
| 1957                                                                      | 85.00   | 0.00   | 7.50   | 0.00   | 12.10  | 82.20  | 46.80  | 123.60  | 39.50  | 4.50   | 92.40  | 12.50  | 506.1 |
| 1958                                                                      | 45.20   | 25.20  | 13.10  | 70.10  | 43.00  | 56.50  | 83.50+ | 55.50   | 14.00  | 73.00  | 82.30  | 21.50  | 582.9 |
| 1959                                                                      | 59.40   | 0.00   | 19.80  | 35.50  | 5.00   | 46.50  | 8.50   | 32.80   | 50.80  | 42.70  | 18.50  | 26.50  | 346.0 |
| 1960                                                                      | 11.00   | 26.00  | 45.00  | 62.50  | 0.00   | 34.80  | 61.30  | 70.20   | 23.00  | 40.40  | 48.50  | 58.70  | 481.4 |
| 1961                                                                      | 33.20   | 1.50   | 2.00   | 29.20  | 29.00  | 48.30  | 60.60  | 20.00   | 59.30  | 26.50  | 127.00 | 9.40   | 446.0 |
| 1962                                                                      | 50.50   | 69.10  | 0.00   | 24.00  | 16.00  | 18.90  | 46.70  | 20.40+  | 24.50  | 37.30  | 22.20  | 2.30   | 331.9 |
| 1963                                                                      | 54.70   | 41.60  | 60.20  | 22.00  | 12.80  | 88.30  | 18.70  | 16.00   | 68.60  | 24.20  | 55.00  | 32.00  | 494.1 |
| 1964                                                                      | 32.20   | 73.70  | 4.70   | 6.80   | 42.50  | 31.50  | 27.00  | 60.70   | 23.50  | 62.40  | 25.80  | 1.50   | 392.3 |
| 1965                                                                      | 102.50  | 63.00  | 30.00  | 38.00  | 7.00   | 12.00  | 38.20  | 29.10+  | 17.00  | 18.00+ | 187.10 | 37.10  | 579.0 |
| 1966                                                                      | 1.00    | 11.00  | 0.90   | 10.50  | 17.70  | 21.50  | 130.10 | 47.80   | 60.50  | 26.00  | 58.40  | 39.90  | 425.3 |
| 1967                                                                      | 21.30   | 38.50  | 17.00  | 3.50   | 3.50   | 21.30  | 10.00  | 41.70   | 52.50  | 12.70  | 47.50  | 22.00  | 291.5 |
| 1968                                                                      | 17.00   | 41.90  | 6.20   | 16.50  | 32.50  | 15.00  | 54.50  | 6.80    | 47.60  | 33.20  | 15.00  | 8.60   | 294.8 |
| 1969                                                                      | 27.50   | 4.80   | 7.10   | 23.40  | 63.40  | 8.50   | 1.90   | 22.80   | 35.40  | 37.40  | 66.70  | 6.40   | 305.3 |
| 1970                                                                      | 39.80   | 6.70   | 24.00  | 1.80   | 43.50  | 54.50  | 36.50  | 53.30   | 39.60  | 71.50  | 87.40  | 13.50  | 472.1 |
| 1971                                                                      | 11.70   | 38.30+ | 21.70  | 18.40  | 24.30  | 11.60  | 57.00  | 45.70   | 23.50  | 37.50  | 57.80  | 34.60  | 382.1 |
| 1972                                                                      | 5.70    | 38.10  | 14.00  | 0.00   | 5.50   | 24.20  | 24.30  | 21.80   | 44.00  | 31.70  | 33.50  | 29.00  | 271.8 |
| 1973                                                                      | 5.00    | 19.50  | 3.30   | 47.90  | 77.60  | 27.40  | 13.80  | 71.10   | 13.20  | 6.20   | 116.70 | 50.00  | 451.7 |
| 1974                                                                      | 37.20   | 7.40   | 1.00   | 29.30  | 0.00   | 17.60  | 17.10  | 35.90   | 21.60  | 40.50  | 63.30  | 37.50  | 308.4 |
| AVE :                                                                     | 42.20   | 34.80  | 16.69  | 19.28  | 24.61  | 32.47  | 37.38  | 42.96   | 38.89  | 40.25  | 50.27  | 36.14  | 415.9 |
| SD :                                                                      | 36.61   | 34.44  | 20.27  | 21.97  | 23.22  | 23.67  | 26.79  | 28.75   | 20.37  | 19.52  | 36.71  | 25.99  | 85.8  |

| Appendix A24                                                              |        |        |        |        |        |        |        |        |        |        |        |        |       |
|---------------------------------------------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| File : 008136_A.NSP                                                       |        |        |        |        |        |        |        |        |        |        |        |        |       |
| Units : mm                                                                |        |        |        |        |        |        |        |        |        |        |        |        |       |
| Descrip. : Patched monthly rainfall for station 008136 a for 1923 to 1998 |        |        |        |        |        |        |        |        |        |        |        |        |       |
| Year                                                                      | Oct    | Nov    | Dec    | Jan    | Feb    | Mar    | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Total |
| 1923                                                                      | 41.10+ | 30.90+ | 23.10+ | 20.10+ | 12.70  | 9.70   | 18.00  | 20.80  | 42.60  | 15.00  | 43.50  | 24.90  | 302.4 |
| 1924                                                                      | 16.70  | 61.70  | 3.60   | 19.60  | 3.60   | 43.90  | 27.90  | 16.50  | 89.90  | 33.90  | 16.80  | 41.10  | 375.2 |
| 1925                                                                      | 17.80  | 8.10   | 0.00   | 4.30   | 0.00   | 15.40  | 28.70  | 22.90  | 18.40  | 85.20  | 46.90  | 30.50  | 278.2 |
| 1926                                                                      | 67.40  | 33.90+ | 7.10+  | 2.80   | 14.00  | 26.40  | 5.30   | 32.60  | 15.20  | 18.20+ | 30.50  | 17.60+ | 271.0 |
| 1927                                                                      | 18.20+ | 6.50+  | 10.00+ | 0.00   | 11.40  | 41.60  | 0.00   | 0.00   | 14.70  | 0.00   | 17.30  | 37.40  | 157.1 |
| 1928                                                                      | 0.00   | 22.90  | 0.00   | 5.30+  | 31.60+ | 59.60+ | 17.60  | 24.40  | 28.10  | 30.20  | 27.00  | 23.40  | 270.1 |
| 1929                                                                      | 24.50  | 14.70  | 81.90  | 19.30  | 41.40  | 57.50  | 25.90  | 33.80  | 11.50  | 13.20  | 63.30  | 36.20  | 423.2 |
| 1930                                                                      | 77.30  | 31.20  | 7.30   | 39.00  | 13.20  | 58.00  | 113.30 | 10.70  | 14.50  | 111.20 | 62.90  | 37.30  | 575.9 |
| 1931                                                                      | 97.60  | 19.10  | 77.50  | 13.10  | 46.10  | 12.00  | 10.90  | 28.70  | 46.10  | 47.50  | 15.00  | 112.50 | 526.1 |
| 1932                                                                      | 26.70  | 54.80  | 14.50  | 8.70   | 12.50  | 51.70  | 19.40  | 48.20  | 39.90  | 32.40  | 56.40  | 12.50  | 377.7 |
| 1933                                                                      | 13.90  | 37.90  | 27.50  | 40.30  | 29.00  | 25.00  | 12.00  | 24.90  | 18.40  | 68.90  | 72.60  | 44.10  | 414.5 |
| 1934                                                                      | 46.80  | 56.70  | 1.50   | 4.40   | 5.60   | 11.50  | 43.50  | 83.30  | 37.40  | 20.80  | 13.60  | 32.20  | 357.3 |
| 1935                                                                      | 16.80  | 36.30  | 25.90  | 9.20   | 8.10   | 1.10   | 9.90   | 42.90  | 21.10  | 63.50  | 22.30  | 48.30  | 305.4 |
| 1936                                                                      | 29.00  | 120.50 | 41.90  | 10.40  | 3.30   | 32.50  | 24.40  | 7.10   | 34.70  | 48.20  | 0.00   | 53.40  | 405.4 |
| 1937                                                                      | 17.10  | 37.50  | 75.70  | 19.60  | 11.70  | 81.80  | 44.60  | 42.80  | 36.90  | 46.70  | 39.00  | 44.80  | 498.2 |
| 1938                                                                      | 49.30  | 29.50  | 13.40  | 15.20  | 77.20  | 61.40  | 21.50  | 0.00   | 5.80   | 33.90  | 76.80  | 18.80  | 402.8 |
| 1939                                                                      | 34.00  | 11.60  | 19.80  | 0.80   | 86.60  | 27.20  | 22.60  | 22.60  | 40.00  | 19.80  | 7.60   | 25.30  | 357.5 |
| 1940                                                                      | 20.10  | 78.00  | 1.50   | 48.20  | 2.00   | 6.90   | 68.40  | 18.30  | 56.00  | 33.70  | 53.60  | 39.90  | 426.6 |
| 1941                                                                      | 90.90  | 2.30   | 5.30   | 30.70  | 7.60   | 47.80  | 15.20  | 65.10  | 37.50  | 0.00   | 21.20  | 14.00  | 337.6 |
| 1942                                                                      | 64.10  | 0.00   | 66.40  | 78.30  | 25.90  | 20.30  | 23.10  | 7.90   | 38.40  | 12.20  | 27.80  | 32.20  | 396.6 |
| 1943                                                                      | 18.50  | 83.90+ | 15.50  | 4.30   | 5.80   | 14.70  | 14.50  | 59.00  | 51.30  | 6.40   | 56.00  | 78.10  | 408.0 |
| 1944                                                                      | 35.50  | 5.00   | 7.60   | 0.00   | 3.80   | 8.90   | 21.60  | 95.30  | 56.50  | 12.70  | 45.70  | 16.50  | 309.1 |
| 1945                                                                      | 132.00 | 0.00   | 3.80   | 5.30   | 10.20  | 78.20  | 15.00  | 14.00  | 26.50  | 28.00  | 11.70  | 27.90  | 352.6 |
| 1946                                                                      | 34.50  | 4.30   | 1.50   | 0.00   | 7.60   | 89.30  | 31.20  | 32.50  | 30.20  | 56.80  | 15.80  | 49.10  | 352.8 |
| 1947                                                                      | 49.40  | 49.10  | 8.70   | 10.10  | 8.40   | 42.50  | 36.90  | 4.10   | 30.70  | 35.00  | 4.30   | 21.20  | 300.4 |
| 1948                                                                      | 141.30 | 10.20  | 13.20  | 20.70  | 5.60   | 1.80   | 59.10  | 30.70  | 12.50  | 29.20  | 27.70  | 16.60  | 368.6 |
| 1949                                                                      | 4.30   | 154.80 | 2.80   | 2.50   | 0.00   | 4.50   | 31.70  | 19.80  | 7.60   | 32.80  | 17.50  | 31.30  | 309.6 |
| 1950                                                                      | 48.30  | 91.10  | 20.10  | 58.00  | 7.60   | 24.70  | 38.90  | 20.00  | 62.30  | 40.00  | 41.20  | 79.20  | 531.4 |
| 1951                                                                      | 19.90  | 11.40  | 2.80   | 12.40  | 45.60  | 20.10  | 17.20  | 23.90  | 34.40  | 25.20  | 67.80  | 69.10  | 349.8 |
| 1952                                                                      | 29.30  | 112.40 | 17.40  | 9.40   | 12.70  | 3.70+  | 57.30  | 21.70  | 40.10  | 51.00  | 22.40+ | 34.70  | 412.1 |
| 1953                                                                      | 40.00  | 29.60  | 12.00  | 4.30   | 16.60  | 33.40  | 29.80  | 97.30  | 36.60  | 54.90  | 66.60  | 5.00   | 426.1 |
| 1954                                                                      | 8.50   | 21.70  | 8.70   | 25.90  | 79.20  | 3.80   | 23.10  | 18.50  | 52.90  | 87.20  | 58.20  | 22.60  | 410.3 |
| 1955                                                                      | 47.40  | 10.80  | 7.00   | 6.40   | 14.10  | 33.60  | 20.20  | 69.40  | 45.50  | 68.40  | 40.10  | 12.00  | 374.9 |
| 1956                                                                      | 45.50  | 3.00   | 20.80  | 0.00   | 42.30  | 85.00  | 10.50  | 90.00  | 118.40 | 55.20  | 75.80  | 55.00  | 601.5 |
| 1957                                                                      | 85.80  | 0.00   | 3.50   | 0.00   | 7.50   | 55.60  | 41.00  | 122.20 | 31.20  | 4.00   | 70.20  | 12.60  | 433.6 |
| 1958                                                                      | 33.90  | 8.50   | 15.00  | 32.00  | 37.80  | 31.20  | 96.00  | 51.90  | 10.30  | 78.00  | 62.80  | 27.10  | 484.5 |
| 1959                                                                      | 63.40  | 10.00  | 2.50   | 12.00  | 17.30  | 33.50  | 14.30  | 41.60  | 50.10  | 29.80+ | 18.00  | 25.00  | 317.5 |
| 1960                                                                      | 11.30  | 29.50  | 40.00  | 57.30  | 4.60   | 29.20  | 38.20  | 53.20  | 22.00  | 28.00  | 41.70  | 45.50  | 400.5 |
| 1961                                                                      | 35.30  | 0.80   | 11.90  | 45.00  | 56.20  | 58.20  | 41.30  | 19.10  | 51.70  | 21.60  | 161.80 | 11.30  | 514.2 |
| 1962                                                                      | 97.80  | 94.80  | 0.00   | 34.30  | 37.00  | 55.90  | 31.60  | 21.60  | 19.00  | 60.50  | 26.80  | 11.00  | 490.3 |
| 1963                                                                      | 54.40  | 45.00  | 35.00  | 29.00  | 9.00   | 113.20 | 25.30  | 25.60  | 56.70  | 29.30  | 55.40  | 32.50  | 510.4 |
| 1964                                                                      | 22.40  | 79.50  | 9.00   | 9.50   | 48.00  | 48.50  | 30.00  | 53.80  | 21.50  | 60.50  | 21.20  | 9.50   | 413.4 |
| 1965                                                                      | 54.70  | 77.00  | 17.50  | 34.20  | 5.00   | 12.00  | 18.80  | 35.20  | 12.30  | 14.10  | 129.00 | 43.20  | 453.0 |
| 1966                                                                      | 6.90   | 15.20  | 12.50  | 3.50   | 15.30  | 32.00  | 157.50 | 67.50  | 54.20  | 23.00  | 43.80  | 45.00  | 476.4 |
| 1967                                                                      | 36.00  | 38.70  | 11.00  | 4.00   | 6.20   | 18.40  | 19.80  | 39.60  | 53.50  | 5.80   | 40.50  | 29.00  | 302.5 |
| 1968                                                                      | 26.00  | 30.50  | 7.50   | 15.30  | 24.00  | 4.50   | 62.90  | 6.00   | 47.80  | 21.00  | 16.50  | 2.90   | 264.9 |
| 1969                                                                      | 15.20  | 6.50   | 3.00   | 0.40   | 77.80  | 0.00   | 0.00   | 12.60  | 38.00  | 32.30+ | 60.50  | 13.00  | 259.3 |
| 1970                                                                      | 32.10  | 6.80   | 17.90  | 0.00   | 26.30  | 30.00  | 54.00  | 43.00  | 25.90  | 95.30  | 67.50  | 17.00+ | 415.8 |
| 1971                                                                      | 15.50  | 45.50  | 25.00  | 13.00  | 22.00  | 21.50  | 67.00  | 43.50  | 40.00  | 31.50  | 67.90  | 28.80  | 421.2 |
| 1972                                                                      | 5.50   | 30.50  | 4.50   | 8.50   | 5.00   | 16.10  | 7.00   | 28.10  | 26.00  | 20.00  | 27.70  | 16.00  | 194.9 |
| 1973                                                                      | 4.00   | 2.00   | 6.00   | 24.90  | 53.00  | 5.50   | 6.50   | 58.50  | 15.30  | 0.00   | 99.70  | 23.70  | 299.1 |
| 1974                                                                      | 43.30  | 13.90  | 2.10   | 38.40  | 2.00   | 15.20  | 13.90  | 35.20  | 17.80  | 40.40  | 68.10  | 35.70  | 326.0 |
| 1975                                                                      | 17.80  | 20.60  | 6.70   | 3.50   | 15.10  | 56.80  | 66.00  | 44.20  | 94.20  | 38.10  | 29.00  | 28.30  | 420.3 |
| 1976                                                                      | 55.00  | 55.50  | 20.80  | 5.30   | 68.70  | 25.50  | 91.90  | 81.90  | 40.40  | 51.90  | 47.60  | 32.50  | 577.0 |
| 1977                                                                      | 5.50   | 48.60  | 33.40  | 17.10  | 20.40  | 23.50  | 53.60  | 21.10  | 16.60  | 88.20  | 52.40  | 20.40  | 400.8 |
| 1978                                                                      | 34.50  | 10.70  | 46.50  | 34.40  | 110.20 | 1.20   | 1.90   | 66.60  | 26.20  | 53.80  | 48.20  | 35.60  | 469.8 |
| 1979                                                                      | 23.50  | 0.20   | 19.80  | 37.50  | 12.70  | 4.20   | 25.70  | 20.30  | 42.90  | 4.20   | 33.50  | 31.60  | 256.1 |
| 1980                                                                      | 35.20  | 78.40  | 34.10  | 139.00 | 70.40  | 50.00  | 41.40  | 40.90  | 23.80  | 56.80  | 62.40  | 35.70  | 668.1 |
| 1981                                                                      | 28.10  | 26.80  | 34.30  | 12.00  | 14.30  | 30.70  | 132.20 | 13.10  | 43.60  | 25.10  | 25.60  | 55.50  | 441.3 |
| 1982                                                                      | 26.20  | 8.80   | 17.50  | 7.20   | 27.00  | 15.80  | 47.00  | 57.60  | 78.90  | 57.40  | 18.60  | 44.80  | 406.8 |
| 1983                                                                      | 20.80  | 26.20  | 12.70  | 9.70   | 41.70  | 47.50  | 21.60  | 55.30  | 16.60  | 35.40  | 10.20  | 36.50  | 334.2 |
| 1984                                                                      | 43.60  | 27.60  | 44.20  | 75.80  | 46.50  | 39.80  | 50.30  | 8.90   | 37.50  | 114.20 | 16.00  | 9.30   | 513.7 |
| 1985                                                                      | 94.60  | 36.00  | 31.70  | 7.00   | 18.70  | 27.10  | 24.60  | 10.80  | 24.20  | 35.30  | 153.60 | 33.30  | 496.9 |
| 1986                                                                      | 50.90  | 32.00  | 15.50  | 0.70   | 10.70  | 12.90  | 98.60  | 21.30  | 34.10  | 17.30  | 48.00  | 42.30  | 384.3 |
| 1987                                                                      | 11.90  | 3.00   | 17.20  | 0.00   | 26.90  | 26.40  | 70.70  | 17.10  | 28.30  | 15.20  | 40.10  | 27.80  | 284.6 |
| 1988                                                                      | 20.60  | 6.00   | 39.60  | 11.80  | 16.30  | 67.20  | 108.80 | 18.10  | 58.70  | 45.00  | 44.60  | 32.10  | 468.8 |
| 1989                                                                      | 89.90  | 25.70  | 4.80   | 9.10   | 51.80  | 74.50  | 113.10 | 59.10  | 59.60  | 18.00  | 20.50  | 18.50  | 544.6 |
| 1990                                                                      | 18.60  | 19.60  | 27.60  | 45.20  | 17.70  | 10.70  | 10.10  | 28.20  | 52.20  | 66.40  | 11.20  | 21.70  | 329.2 |
| 1991                                                                      | 104.00 | 31.90  | 23.20  | 10.20  | 19.40  | 33.70  | 46.20  | 54.50  | 39.70  | 60.30+ | 37.40  | 35.10  | 495.6 |
| 1992                                                                      | 145.20 | 29.70  | 11.70  | 3.50   | 35.80  | 17.60  | 137.60 | 51.90  | 41.00  | 73.70  | 33.90  | 25.10  | 606.7 |
| 1993                                                                      | 9.80   | 20.30  | 48.90  | 34.60  | 38.40  | 40.20  | 76.30  | 42.60  | 71.00  | 32.00  | 61.60  | 15.40  | 491.1 |
| 1994                                                                      | 36.80  | 1.60   | 92.90  | 31.70  | 18.30  | 79.40  | 48.20  | 71.30  | 20.60  | 31.10  | 33.70  | 23.50  | 489.1 |
| 1995                                                                      | 23.90  | 56.20  | 127.60 | 15.00  | 21.90  | 31.20  | 11.30  | 19.50  | 32.70  | 80.70  | 10.60  | 36.50  | 467.1 |
| 1996                                                                      | 89.20  | 63.50  | 24.60  | 11.70  | 7.30   | 33.90  | 39.70  | 55.20  | 31.50  | 42.80  | 64.10  | 10.50  | 474.0 |
| 1997                                                                      | 44.20  | 39.40  | 9.10   | 64.80  | 37.20  | 75.40  | 98.70  | 82.50  | 33.60  | 34.80  | 23.60  | 10.70  | 554.0 |
| 1998                                                                      | 9.60   | 84.50  | 114.60 | 31.50+ | 45.60+ | 31.30+ | 61.90+ | 46.30+ | 9.40+  | 25.70+ | 28.90+ | 31.50+ | 520.8 |
| AVE :                                                                     | 40.88  | 33.80  | 22.75  | 20.11  | 25.66  | 33.85  | 42.12  | 38.11  | 36.88  | 39.68  | 43.41  | 31.15  | 408.4 |
| SD :                                                                      | 32.53  | 31.75  | 25.77  | 23.05  | 23.41  | 24.81  | 34.63  | 25.48  | 20.64  | 25.82  | 30.19  | 18.11  | 100.8 |

## Appendix A25

File : 008367\_2.NSP

Units : mm

Descrip. : Patched monthly rainfall for station 008367 2 for 1930 to 1998

| Year  | Oct    | Nov    | Dec    | Jan    | Feb    | Mar    | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Total |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| 1930  | 60.70+ | 25.10+ | 4.50+  | 29.80+ | 7.80+  | 20.80  | 92.60  | 1.30   | 8.90   | 85.00  | 28.20  | 26.30+ | 391.0 |
| 1931  | 55.90  | 17.80  | 49.10  | 3.00   | 22.40  | 0.00   | 2.00   | 22.50  | 38.20  | 29.00  | 7.60   | 46.20  | 293.7 |
| 1932  | 13.40  | 21.80  | 7.60   | 0.00   | 5.60   | 29.70  | 3.60   | 44.40  | 37.20  | 23.90  | 42.80  | 1.80   | 231.8 |
| 1933  | 0.00   | 53.00  | 0.00   | 38.80  | 20.90  | 13.30  | 2.30   | 7.90   | 0.00   | 47.60  | 45.50  | 29.20  | 258.5 |
| 1934  | 63.50  | 36.00  | 0.00   | 0.00   | 2.50   | 9.90   | 44.80  | 53.80  | 32.00  | 19.90  | 12.70  | 32.70  | 307.8 |
| 1935  | 10.70  | 40.70  | 8.90   | 13.20  | 4.80   | 41.90  | 5.10   | 29.10  | 13.20  | 49.40  | 19.00  | 39.70  | 275.7 |
| 1936  | 28.00  | 88.30  | 36.10  | 0.00   | 0.00   | 21.60  | 15.50  | 4.60   | 17.40  | 50.70  | 1.50+  | 36.70  | 300.4 |
| 1937  | 19.10  | 3.00   | 31.80  | 7.10   | 3.30   | 44.70  | 37.00  | 54.90  | 25.40  | 30.20  | 23.30  | 30.60+ | 310.4 |
| 1938  | 14.50  | 16.30  | 0.00   | 24.90  | 55.80  | 46.30  | 31.50  | 0.80   | 2.30   | 25.70  | 86.70  | 8.60   | 313.4 |
| 1939  | 8.10   | 2.30   | 10.90  | 8.90   | 20.40  | 59.40  | 41.40  | 31.80  | 35.80  | 4.80   | 1.50   | 24.90  | 250.2 |
| 1940  | 1.50   | 57.20  | 7.10   | 8.90   | 0.00   | 6.30   | 52.50  | 44.50  | 44.80  | 30.20  | 50.70  | 13.70  | 317.4 |
| 1941  | 40.70  | 4.50   | 7.90+  | 25.40  | 0.00   | 13.20  | 8.10   | 77.80  | 44.20  | 12.90  | 13.90  | 13.30  | 261.9 |
| 1942  | 43.00  | 17.50  | 46.00  | 51.20  | 29.10  | 28.70  | 28.80  | 24.90  | 13.90  | 15.00  | 18.50  | 52.30  | 368.9 |
| 1943  | 6.90   | 99.90  | 1.30   | 0.00   | 0.00   | 13.50  | 10.90  | 42.20  | 48.70  | 21.30  | 45.70  | 67.30  | 357.7 |
| 1944  | 23.90  | 3.10   | 0.00   | 0.00   | 0.00   | 6.20   | 22.80  | 61.40  | 50.30  | 37.90  | 36.20  | 17.80  | 259.6 |
| 1945  | 113.60 | 6.90   | 0.00   | 0.00   | 16.60  | 71.00  | 9.10   | 8.20   | 14.50  | 16.00  | 10.20  | 10.50+ | 276.6 |
| 1946  | 12.20  | 9.10   | 0.00   | 0.00   | 10.20  | 69.10  | 16.30  | 17.00  | 16.20  | 40.70  | 3.60   | 44.50  | 238.9 |
| 1947  | 26.70  | 31.80  | 0.00   | 18.00  | 0.00   | 7.90   | 23.40  | 12.20  | 19.70  | 42.40  | 2.00   | 22.80  | 206.9 |
| 1948  | 97.00  | 14.20+ | 5.10   | 11.20  | 3.80   | 2.50   | 50.30  | 39.50  | 9.90   | 31.00  | 18.60  | 9.70   | 292.8 |
| 1949  | 0.00   | 130.70 | 0.00   | 0.00   | 3.30   | 2.50   | 31.90  | 15.70  | 1.50   | 52.20  | 21.80  | 21.80  | 281.4 |
| 1950  | 39.60  | 64.60  | 30.50  | 84.10  | 3.00   | 6.40   | 19.00  | 4.70   | 45.50+ | 36.20  | 20.50  | 40.00+ | 394.1 |
| 1951  | 11.90  | 5.00   | 3.60   | 8.10   | 29.80  | 3.60   | 8.40   | 12.10  | 25.10  | 26.10  | 74.70  | 59.00  | 267.4 |
| 1952  | 27.60  | 93.50  | 2.50   | 7.60   | 7.60   | 0.00   | 36.90  | 12.00  | 34.70  | 47.00  | 19.60+ | 21.00  | 310.0 |
| 1953  | 28.50  | 33.00  | 6.00   | 2.50   | 12.00  | 17.00  | 27.90+ | 94.60  | 48.40  | 48.20  | 87.70  | 10.00  | 415.8 |
| 1954  | 6.50   | 17.80  | 10.00  | 20.00  | 81.50  | 2.80   | 16.30  | 10.80  | 45.20  | 55.50  | 64.90  | 20.70  | 352.0 |
| 1955  | 17.70  | 8.00   | 0.00   | 29.70  | 4.20   | 36.70  | 9.60   | 58.80  | 28.10  | 32.50  | 29.70  | 16.80  | 271.8 |
| 1956  | 38.30  | 0.00   | 36.70  | 0.00   | 32.70  | 24.90  | 9.80   | 84.60  | 78.90  | 39.30  | 57.20  | 61.90  | 464.3 |
| 1957  | 131.70 | 0.00   | 0.00   | 0.00   | 15.00  | 34.20  | 39.70  | 116.60 | 47.90  | 0.00   | 55.20  | 5.00   | 445.3 |
| 1958  | 21.70  | 11.50  | 0.00   | 34.80  | 20.00  | 24.90  | 66.10  | 56.60  | 13.20  | 113.90 | 77.10  | 15.70  | 455.5 |
| 1959  | 53.00  | 13.00  | 0.00   | 9.00   | 3.20   | 18.30  | 10.40  | 33.90+ | 49.40  | 40.20  | 4.20   | 9.00   | 243.6 |
| 1960  | 14.80  | 24.20  | 32.30  | 28.60  | 1.60   | 18.80  | 20.70  | 66.30  | 7.20   | 37.70  | 35.80+ | 42.10  | 336.1 |
| 1961  | 23.70  | 0.00   | 0.00   | 29.80  | 13.50  | 43.40  | 32.90  | 13.80  | 39.30  | 11.20  | 225.80 | 3.20   | 436.6 |
| 1962  | 68.10  | 136.80 | 0.00   | 12.40  | 2.80   | 21.70  | 30.40  | 29.40  | 15.30  | 49.60  | 12.60  | 1.40   | 380.5 |
| 1963  | 42.40  | 45.50  | 32.40  | 0.00   | 45.10  | 49.00  | 22.10  | 8.70   | 58.60  | 21.60  | 40.80  | 26.40+ | 392.6 |
| 1964  | 30.20  | 40.80  | 1.20   | 3.80   | 22.90+ | 35.20  | 20.70  | 47.40  | 23.10  | 65.60  | 25.60  | 3.70   | 320.2 |
| 1965  | 64.20  | 41.00  | 20.80  | 0.00   | 9.00   | 19.10  | 34.60  | 37.60  | 7.20   | 16.30  | 98.10  | 47.40  | 395.3 |
| 1966  | 8.40   | 5.80   | 0.00   | 0.00   | 4.60   | 15.70  | 137.00 | 54.40  | 46.70  | 28.40  | 22.30  | 40.20  | 363.5 |
| 1967  | 25.00  | 35.60  | 1.60   | 7.10   | 4.10   | 10.20  | 13.20  | 19.90  | 42.60  | 7.00   | 36.50  | 16.30  | 219.1 |
| 1968  | 22.50  | 26.50  | 0.00   | 14.70  | 24.90  | 2.50   | 52.80  | 11.20  | 36.90  | 25.10  | 19.00  | 3.60   | 239.7 |
| 1969  | 18.30  | 1.20   | 0.00   | 0.20   | 30.20  | 0.00   | 0.00   | 17.50  | 20.80  | 20.50  | 49.70  | 3.50   | 161.9 |
| 1970  | 21.70  | 0.90   | 6.00   | 1.40   | 8.50   | 31.80  | 28.90  | 26.70  | 20.50  | 83.40  | 81.50  | 16.90  | 328.2 |
| 1971  | 14.80  | 29.40  | 31.40  | 12.10  | 27.30  | 10.30  | 52.20  | 38.80  | 59.20  | 19.30  | 59.80  | 35.20  | 389.8 |
| 1972  | 1.80   | 13.40  | 15.80  | 4.30   | 0.50   | 3.00   | 6.10   | 25.70  | 24.90  | 20.90  | 28.80  | 16.50  | 161.7 |
| 1973  | 4.40   | 23.50  | 3.50   | 3.60   | 72.20  | 29.00  | 0.40   | 104.70 | 16.40  | 0.00   | 100.80 | 35.60  | 394.1 |
| 1974  | 25.00  | 29.70  | 0.00   | 31.40  | 5.50   | 19.50  | 13.00  | 44.20  | 56.50  | 44.30  | 48.90  | 35.50  | 353.5 |
| 1975  | 21.20  | 17.50  | 0.00   | 4.60   | 3.00   | 56.80  | 46.90  | 24.50  | 97.40  | 46.50  | 35.80  | 19.30  | 373.5 |
| 1976  | 53.40  | 24.20  | 21.10  | 0.00   | 50.90  | 20.10  | 76.70  | 66.90  | 30.70  | 49.40  | 26.40  | 14.50  | 434.3 |
| 1977  | 4.20   | 34.00  | 15.20  | 10.50  | 18.80  | 15.90  | 40.00  | 10.10  | 21.70  | 71.30  | 63.30  | 8.00   | 313.0 |
| 1978  | 9.90   | 24.80  | 32.70  | 30.20  | 80.10  | 0.00   | 0.00   | 57.80  | 28.10  | 40.60  | 55.70  | 30.00  | 389.9 |
| 1979  | 31.50  | 4.40   | 16.20  | 28.30  | 9.80   | 17.10  | 17.30  | 24.50  | 38.00  | 6.80   | 24.20  | 29.60  | 247.7 |
| 1980  | 38.90  | 68.90  | 28.90+ | 83.10  | 45.60+ | 55.90  | 52.50  | 28.50  | 14.50  | 52.40  | 61.00  | 45.70  | 575.9 |
| 1981  | 24.80  | 9.80   | 19.70  | 24.20  | 4.10   | 26.30+ | 147.20 | 4.10+  | 63.60  | 25.50+ | 20.30+ | 36.40  | 406.0 |
| 1982  | 21.00  | 7.50   | 6.50   | 0.00   | 18.90  | 4.30   | 20.50  | 43.10  | 60.40  | 51.60+ | 16.00  | 34.50  | 284.3 |
| 1983  | 15.30  | 13.00  | 2.50   | 5.40   | 10.40  | 29.00  | 24.50  | 48.50  | 14.50  | 25.60  | 3.70   | 29.50  | 221.9 |
| 1984  | 31.60  | 12.00  | 25.20  | 30.50  | 39.00  | 28.00  | 28.50  | 8.00   | 33.50  | 90.00  | 8.40   | 12.60  | 347.3 |
| 1985  | 68.40  | 39.20  | 21.70  | 2.00   | 16.50  | 27.20  | 19.50  | 4.00   | 15.00  | 21.40  | 112.50 | 22.20  | 369.6 |
| 1986  | 36.00  | 14.10  | 0.00   | 0.00   | 0.00   | 3.50   | 48.40  | 26.90  | 40.70  | 27.00  | 27.50  | 74.90  | 299.0 |
| 1987  | 4.00   | 0.00   | 16.00  | 0.00   | 4.00   | 17.70+ | 18.50  | 19.50  | 32.50  | 12.40  | 25.00  | 22.70  | 172.3 |
| 1988  | 13.70  | 7.00   | 36.50  | 4.00   | 8.00   | 45.50  | 76.50  | 9.50   | 34.50  | 38.00  | 44.20  | 17.00  | 334.4 |
| 1989  | 79.90  | 13.50  | 0.00   | 2.00   | 26.00  | 26.00  | 107.50 | 33.50  | 56.50  | 7.00   | 12.50  | 8.00   | 372.4 |
| 1990  | 17.50  | 9.50   | 28.00  | 23.20  | 5.00   | 3.20   | 15.20  | 17.50  | 37.20  | 42.00  | 2.00   | 1.00   | 201.3 |
| 1991  | 67.00  | 10.00  | 14.50  | 0.50   | 2.50   | 21.50  | 21.00  | 26.50  | 32.50  | 42.50  | 13.00  | 24.20  | 275.7 |
| 1992  | 79.50+ | 25.50  | 0.00   | 1.00   | 28.00  | 11.00  | 100.00 | 50.00  | 36.00  | 37.00  | 22.50  | 19.50  | 410.0 |
| 1993  | 2.00   | 2.00   | 36.00  | 13.50  | 10.00  | 33.90  | 66.50  | 30.50  | 54.00  | 25.00  | 28.00  | 11.00  | 312.4 |
| 1994  | 25.70  | 0.00   | 89.50  | 8.50   | 20.00  | 60.50  | 22.50  | 55.50  | 12.00  | 23.00  | 27.00  | 12.50  | 356.7 |
| 1995  | 66.50  | 44.50  | 88.50  | 7.50   | 12.00  | 28.70  | 0.50   | 37.00  | 20.00  | 60.00  | 4.50   | 20.00  | 389.7 |
| 1996  | 136.50 | 71.50  | 10.00  | 0.00   | 0.00   | 16.50  | 65.00  | 56.70  | 31.00  | 68.50  | 31.00  | 0.00   | 486.7 |
| 1997  | 31.30+ | 33.50  | 9.00   | 55.50  | 5.00   | 35.00  | 56.50  | 64.50  | 0.00   | 20.00  | 6.50   | 8.50   | 325.3 |
| 1998  | 0.00   | 123.50 | 123.00 | 5.50   | 2.00   | 18.70+ | 30.00  | 74.00  | 9.50   | 24.70+ | 30.40+ | 23.00+ | 464.3 |
| AVE : | 33.06  | 28.84  | 15.82  | 13.41  | 16.06  | 23.03  | 34.01  | 35.47  | 31.59  | 35.71  | 37.22  | 24.08  | 328.3 |
| SD :  | 30.17  | 31.62  | 22.90  | 18.01  | 18.81  | 17.75  | 30.66  | 25.74  | 19.30  | 21.83  | 35.09  | 16.79  | 82.4  |

## Appendix A26

File : 008683\_P.NSP

Units : mm

Descrip. : Patched monthly rainfall for station 008683 p for 1926 to 1977

| Year  | Oct    | Nov    | Dec   | Jan    | Feb    | Mar    | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Total |
|-------|--------|--------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| 1926  | 54.90+ | 29.50+ | 5.70+ | 0.00   | 40.10  | 0.00   | 26.40  | 22.10  | 15.00  | 4.80   | 44.40  | 1.00   | 243.9 |
| 1927  | 18.80  | 15.50  | 9.40  | 13.50  | 3.30   | 40.90  | 0.00   | 2.80   | 6.90   | 4.10   | 21.80  | 19.60  | 156.6 |
| 1928  | 8.10   | 100.10 | 30.20 | 0.00   | 38.10  | 23.90  | 13.20  | 17.80  | 10.90  | 67.10  | 21.80  | 10.20  | 341.4 |
| 1929  | 29.20  | 1.30   | 23.10 | 10.90  | 38.90  | 27.70  | 6.90   | 25.90  | 14.50  | 16.30  | 28.20  | 18.80  | 241.7 |
| 1930  | 37.30  | 17.50  | 6.10  | 10.20  | 8.10   | 25.90  | 82.30  | 1.80   | 3.00   | 98.60  | 17.50  | 13.20  | 321.5 |
| 1931  | 78.50  | 15.20  | 53.80 | 28.40  | 42.70  | 7.10   | 18.80  | 21.30  | 20.80  | 37.10  | 6.30   | 119.40 | 449.4 |
| 1932  | 14.50  | 42.90  | 5.30  | 2.50   | 16.30  | 29.20  | 23.90  | 34.30  | 14.00  | 15.00  | 46.20  | 2.50   | 246.6 |
| 1933  | 6.30   | 19.60  | 11.20 | 44.70  | 19.30  | 23.90  | 1.00   | 8.40   | 10.40  | 46.70  | 58.70  | 28.70  | 278.9 |
| 1934  | 31.00  | 17.80  | 0.00  | 10.20  | 32.50  | 3.00   | 41.40  | 56.60  | 28.20  | 12.70  | 12.70  | 33.80  | 279.9 |
| 1935  | 9.10   | 39.10  | 18.30 | 6.60   | 1.00   | 4.80   | 8.90   | 31.20  | 13.70  | 54.90  | 12.20  | 38.60  | 238.4 |
| 1936  | 24.90  | 99.80  | 40.90 | 0.00   | 1.50   | 23.60  | 11.70  | 2.80   | 11.20  | 27.90  | 0.00   | 25.70  | 270.0 |
| 1937  | 15.20  | 17.30  | 43.70 | 10.40  | 0.00   | 42.70  | 32.80  | 21.30  | 22.60  | 36.10  | 18.50  | 21.30  | 281.9 |
| 1938  | 37.10  | 24.60  | 15.50 | 9.90   | 50.80  | 64.30  | 24.40  | 6.30   | 4.10   | 40.60  | 64.30  | 13.20  | 355.1 |
| 1939  | 7.00   | 17.80  | 8.90  | 0.00   | 61.00  | 17.50  | 37.30  | 27.90  | 20.80  | 10.20  | 0.00   | 9.40   | 218.4 |
| 1940  | 11.20  | 50.80  | 0.00  | 29.20  | 0.00   | 15.00  | 66.80  | 33.00  | 31.20  | 27.90  | 25.90  | 14.00  | 305.0 |
| 1941  | 45.70  | 14.50  | 20.60 | 20.80  | 2.50   | 16.80  | 7.10   | 46.20  | 27.90  | 1.30   | 20.10  | 8.60   | 232.1 |
| 1942  | 10.40  | 8.10   | 67.10 | 79.50  | 8.60   | 24.10  | 24.90  | 7.90   | 25.90  | 37.60  | 23.60  | 57.20  | 374.9 |
| 1943  | 16.50  | 84.60  | 7.90  | 7.10   | 7.40   | 21.60  | 33.30  | 51.60  | 54.40  | 10.20  | 45.50  | 74.90  | 415.0 |
| 1944  | 42.70  | 4.30   | 7.90  | 0.00   | 6.10   | 2.50   | 20.30  | 62.20  | 50.00  | 25.90  | 54.10  | 17.80  | 293.8 |
| 1945  | 113.30 | 42.90  | 1.30  | 10.90  | 17.00  | 74.20  | 12.40  | 12.20  | 21.60  | 16.00  | 9.90   | 12.70  | 344.4 |
| 1946  | 27.70  | 5.80   | 0.00  | 3.80   | 11.40  | 86.90  | 23.10  | 23.10  | 15.50  | 53.80  | 10.70  | 33.80  | 295.6 |
| 1947  | 27.40  | 31.00  | 11.20 | 5.10   | 16.30  | 57.70  | 32.50  | 12.20  | 23.10  | 56.40  | 11.20  | 35.30  | 319.4 |
| 1948  | 144.00 | 27.90  | 13.20 | 21.10  | 6.30   | 7.90   | 76.20  | 26.70  | 8.10   | 25.40  | 26.40  | 16.80  | 400.0 |
| 1949  | 1.50   | 127.50 | 4.60  | 3.30   | 3.00   | 6.10   | 30.50  | 24.60  | 4.10   | 37.30  | 14.70  | 18.80  | 276.0 |
| 1950  | 32.00  | 55.10  | 15.00 | 61.00  | 0.00   | 39.90  | 33.00  | 23.90  | 45.20  | 46.20  | 30.50  | 63.00  | 444.8 |
| 1951  | 32.50  | 0.00   | 15.00 | 10.40  | 39.40  | 16.80  | 15.50  | 22.10  | 27.40  | 21.30  | 90.20  | 137.20 | 427.8 |
| 1952  | 34.30  | 97.30  | 17.80 | 10.40  | 3.30   | 0.00   | 34.50  | 19.00  | 46.00  | 64.80  | 19.80  | 63.50  | 410.7 |
| 1953  | 61.20  | 41.90  | 0.00  | 0.00   | 0.00   | 11.70  | 0.00   | 134.90 | 24.60  | 62.20  | 118.90 | 0.00   | 455.4 |
| 1954  | 0.00   | 30.70  | 0.00  | 43.90  | 64.80  | 0.00   | 10.70  | 9.40   | 53.30  | 53.60  | 48.70+ | 49.50  | 364.6 |
| 1955  | 49.00  | 8.60   | 0.00  | 0.00   | 7.60   | 33.00  | 13.00  | 55.40  | 30.50  | 49.80  | 87.60  | 17.80  | 352.3 |
| 1956  | 38.10  | 8.90   | 14.00 | 0.00   | 24.10  | 67.10  | 14.70  | 63.00  | 100.80 | 36.30  | 77.70  | 24.40  | 469.1 |
| 1957  | 46.20  | 0.00   | 0.00  | 0.00   | 4.10   | 33.00  | 15.20  | 99.80  | 13.50  | 0.00   | 49.80  | 5.10   | 266.7 |
| 1958  | 16.00  | 12.20  | 27.70 | 34.50  | 36.10  | 15.50  | 95.50  | 53.80  | 4.10   | 98.80  | 78.00  | 16.50  | 488.7 |
| 1959  | 93.50  | 20.30  | 4.10  | 82.60  | 0.00   | 25.70  | 0.00   | 33.50  | 35.80  | 25.70  | 0.00   | 31.70  | 352.9 |
| 1960  | 9.70   | 0.00   | 37.30 | 69.60  | 18.50  | 9.40   | 25.70  | 73.40  | 19.60  | 29.20  | 26.40  | 29.20  | 348.0 |
| 1961  | 12.70  | 0.00   | 0.00  | 39.60  | 12.70  | 96.50  | 28.40  | 17.80  | 40.60  | 16.80  | 164.80 | 0.00   | 429.9 |
| 1962  | 110.50 | 7.10   | 9.70  | 20.60  | 20.80  | 20.10  | 37.30  | 20.80  | 14.50  | 39.40  | 21.60  | 5.80   | 328.2 |
| 1963  | 39.10  | 31.70  | 30.50 | 10.20  | 55.90  | 117.90 | 36.60  | 10.40  | 69.60  | 17.00  | 37.30  | 30.50  | 486.7 |
| 1964  | 25.90  | 41.70  | 0.00  | 0.00   | 29.50  | 26.20  | 18.00  | 49.30  | 6.30   | 77.70  | 11.70  | 0.00   | 286.3 |
| 1965  | 72.40  | 56.60  | 12.70 | 6.90   | 0.00   | 13.20  | 16.30  | 35.80  | 2.30   | 9.70   | 83.60  | 48.80  | 358.3 |
| 1966  | 5.60   | 21.10  | 3.80  | 0.00   | 29.70  | 47.80  | 147.30 | 59.70  | 39.10  | 30.20  | 19.80  | 37.60  | 441.7 |
| 1967  | 16.80  | 26.70  | 4.60  | 0.00   | 12.70  | 38.10  | 11.70  | 26.70  | 38.40  | 0.00   | 35.10  | 5.10   | 215.9 |
| 1968  | 23.10  | 28.40  | 0.00  | 5.10   | 15.00  | 5.10   | 34.00  | 3.30   | 67.30  | 7.60   | 11.20  | 15.50  | 215.6 |
| 1969  | 9.40   | 2.50   | 0.00  | 26.40  | 35.60  | 0.00   | 0.00   | 14.70  | 18.80  | 30.50  | 37.80  | 11.20  | 186.9 |
| 1970  | 21.80  | 1.00   | 10.20 | 3.80   | 36.30  | 65.50  | 58.20  | 36.10  | 41.10  | 102.60 | 64.80  | 3.00   | 444.4 |
| 1971  | 14.50  | 70.90  | 6.30  | 10.20  | 17.80  | 7.10   | 50.00  | 30.20  | 19.60  | 25.90  | 40.40  | 54.10  | 347.0 |
| 1972  | 0.00   | 15.20  | 0.00  | 7.90   | 4.30   | 6.30   | 19.00  | 28.20  | 38.90  | 15.70  | 26.40  | 15.70  | 177.6 |
| 1973  | 3.80   | 13.00  | 7.60  | 21.30  | 49.30  | 14.50  | 0.00   | 49.50  | 10.20  | 8.60   | 94.70  | 23.60  | 296.1 |
| 1974  | 24.90  | 0.00   | 0.00  | 13.50  | 22.90  | 6.30   | 3.80   | 27.90  | 17.80  | 25.40  | 35.10  | 54.10  | 231.7 |
| 1975  | 14.00  | 3.30   | 0.00  | 2.30   | 13.50  | 58.70  | 106.20 | 17.30  | 77.20  | 41.40  | 23.10  | 15.20  | 372.2 |
| 1976  | 44.20  | 16.50  | 0.00  | 0.00   | 58.70  | 18.30  | 59.70  | 77.00  | 43.40  | 37.30  | 21.10  | 39.40  | 415.6 |
| 1977  | 0.00   | 38.90  | 20.30 | 37.30+ | 27.30+ | 14.90+ | 42.20+ | 17.30+ | 10.70+ | 39.10+ | 40.90+ | 22.10+ | 311.0 |
| AVE : | 32.00  | 28.94  | 12.36 | 16.26  | 20.62  | 28.00  | 30.43  | 32.51  | 27.20  | 34.17  | 38.30  | 28.17  | 329.0 |
| SD :  | 30.67  | 29.50  | 14.88 | 20.72  | 18.49  | 26.51  | 29.24  | 25.67  | 20.80  | 24.86  | 32.44  | 27.27  | 86.1  |



Appendix A27

File : 008713\_A.NSP

Units : mm

Descrip. : Patched monthly rainfall for station 008713 a for 1978 to 1998

| Year  | Oct    | Nov    | Dec    | Jan    | Feb    | Mar    | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Total |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| 1978  | 36.00+ | 21.70+ | 40.00+ | 33.50  | 136.70 | 0.40   | 0.10   | 43.50  | 30.50  | 40.30  | 57.90  | 24.40  | 465.0 |
| 1979  | 45.40  | 2.30   | 42.00  | 28.50  | 22.30  | 5.50   | 20.60  | 26.70  | 66.10  | 5.90   | 26.60  | 40.30  | 332.2 |
| 1980  | 48.60  | 89.70  | 28.90  | 109.70 | 27.60  | 57.20  | 119.90 | 27.50  | 32.60  | 43.40  | 57.60  | 39.80  | 682.5 |
| 1981  | 27.10  | 66.80  | 33.10  | 9.50   | 10.60  | 36.80  | 131.90 | 7.70   | 51.90  | 40.60  | 54.70  | 46.70  | 517.4 |
| 1982  | 27.20  | 14.10  | 20.30  | 5.40   | 58.30  | 17.90  | 47.20  | 50.40  | 85.30  | 55.50  | 20.20  | 79.00  | 480.8 |
| 1983  | 11.60  | 19.20  | 15.80  | 10.00  | 41.70  | 43.60  | 26.20  | 58.80  | 28.50  | 27.30  | 11.50  | 30.50  | 324.7 |
| 1984  | 47.10  | 16.20  | 31.00  | 61.20  | 48.60  | 16.60  | 62.50  | 17.10  | 61.00  | 98.60  | 13.90  | 8.60   | 482.4 |
| 1985  | 97.40  | 25.40  | 30.80  | 15.70  | 17.60  | 36.40  | 25.60  | 9.70   | 16.60  | 35.20  | 197.90 | 51.70  | 560.0 |
| 1986  | 46.40  | 38.50  | 16.20  | 0.00   | 3.10   | 15.60  | 119.10 | 35.30  | 31.30  | 15.20  | 57.50  | 40.10  | 418.3 |
| 1987  | 4.80   | 0.00   | 24.30  | 0.00   | 19.30  | 18.60  | 54.20  | 26.60  | 35.00  | 23.40  | 49.00  | 25.50  | 280.7 |
| 1988  | 12.40  | 12.10  | 45.30  | 13.00  | 17.60  | 71.70  | 83.70  | 12.70  | 67.40  | 44.10  | 48.80  | 27.20  | 456.0 |
| 1989  | 92.50  | 21.20  | 6.30   | 15.30  | 38.00  | 10.90  | 108.80 | 58.40  | 67.60  | 23.50  | 22.90  | 23.10  | 488.5 |
| 1990  | 20.00  | 27.80  | 21.20  | 25.10  | 13.90  | 11.80  | 8.10   | 33.30  | 38.70  | 42.70  | 14.40  | 20.80  | 277.8 |
| 1991  | 74.60  | 26.80  | 17.70  | 11.70  | 18.20  | 52.70  | 38.60  | 60.80  | 35.30  | 49.00  | 28.80  | 34.70  | 448.9 |
| 1992  | 119.30 | 23.40  | 2.00   | 4.00   | 32.80  | 16.00  | 111.60 | 57.60  | 44.50  | 63.40  | 30.40  | 36.70  | 541.7 |
| 1993  | 5.40   | 20.40  | 52.00  | 32.00  | 29.20  | 21.00  | 64.50  | 25.00  | 83.70  | 34.50  | 51.70  | 6.60   | 426.0 |
| 1994  | 34.70  | 1.30   | 138.60 | 41.50  | 19.70  | 84.00  | 73.20  | 83.60  | 18.40  | 38.50  | 38.10  | 53.70  | 625.3 |
| 1995  | 29.90  | 62.70  | 61.90  | 12.10  | 24.90  | 24.40  | 10.10  | 18.10  | 27.30  | 80.30  | 10.40  | 30.70  | 392.8 |
| 1996  | 123.30 | 60.10  | 35.10  | 16.80  | 30.60  | 23.60  | 39.70  | 61.30+ | 54.80  | 33.00  | 51.60  | 12.50  | 542.4 |
| 1997  | 97.90  | 36.60  | 4.00   | 61.00  | 17.90  | 74.10  | 117.80 | 71.00  | 36.40  | 47.00  | 26.00  | 14.30  | 604.0 |
| 1998  | 7.10   | 77.60  | 58.30  | 31.10+ | 50.70+ | 24.90+ | 78.80+ | 51.60+ | 10.20+ | 33.40+ | 30.90+ | 32.30+ | 486.9 |
| AVE : | 48.03  | 31.61  | 34.51  | 25.58  | 32.35  | 31.60  | 63.91  | 39.84  | 43.96  | 41.66  | 42.90  | 32.34  | 468.3 |
| SD :  | 37.84  | 25.41  | 29.12  | 25.97  | 27.68  | 23.75  | 41.92  | 21.82  | 21.36  | 20.72  | 39.20  | 16.92  | 107.9 |

| Appendix A28                                                              |        |         |         |        |        |        |        |         |        |        |         |        |        |
|---------------------------------------------------------------------------|--------|---------|---------|--------|--------|--------|--------|---------|--------|--------|---------|--------|--------|
| File : 008751_7.NSP                                                       |        |         |         |        |        |        |        |         |        |        |         |        |        |
| Units : mm                                                                |        |         |         |        |        |        |        |         |        |        |         |        |        |
| Descrip. : Patched monthly rainfall for station 008751 7 for 1929 to 1998 |        |         |         |        |        |        |        |         |        |        |         |        |        |
| Year                                                                      | Oct    | Nov     | Dec     | Jan    | Feb    | Mar    | Apr    | May     | Jun    | Jul    | Aug     | Sep    | Total  |
| 1929                                                                      | 70.20+ | 51.90+  | 138.10+ | 45.90  | 110.80 | 98.10  | 50.30  | 65.00   | 23.90  | 22.00  | 85.80   | 44.40  | 806.4  |
| 1930                                                                      | 143.90 | 65.80   | 39.80   | 148.80 | 77.70  | 103.40 | 125.90 | 26.50   | 44.90  | 110.70 | 45.10   | 73.50  | 1006.0 |
| 1931                                                                      | 77.30  | 54.80   | 318.00  | 40.50  | 61.60  | 72.00  | 4.90   | 31.90   | 57.40  | 43.50  | 33.20   | 251.10 | 1046.2 |
| 1932                                                                      | 85.50  | 118.10+ | 48.50   | 7.90   | 52.80  | 46.10  | 17.10  | 72.60   | 38.70  | 32.80  | 102.10+ | 15.70  | 637.9  |
| 1933                                                                      | 27.20  | 115.60  | 50.80   | 93.20  | 156.00 | 96.90  | 17.50  | 10.70   | 19.10  | 97.80  | 120.40  | 60.00  | 865.2  |
| 1934                                                                      | 191.60 | 123.90  | 37.00+  | 24.20  | 42.10  | 51.80  | 62.40  | 96.10   | 69.80  | 29.50  | 29.80   | 75.80  | 834.0  |
| 1935                                                                      | 57.10  | 114.70  | 66.20   | 30.70  | 88.70  | 20.60  | 6.60   | 103.90  | 26.50  | 78.10  | 35.10   | 138.30 | 766.5  |
| 1936                                                                      | 63.50  | 321.30  | 69.40   | 46.50  | 43.40  | 170.50 | 26.90  | 2.00    | 38.90  | 53.10  | 26.20   | 73.30  | 935.0  |
| 1937                                                                      | 44.20  | 77.00   | 120.60+ | 94.20  | 30.50  | 101.70 | 126.80 | 42.20   | 30.80  | 55.10  | 60.10+  | 80.50+ | 863.7  |
| 1938                                                                      | 91.10  | 76.80   | 72.70   | 66.10+ | 138.60 | 122.30 | 31.80  | 8.70    | 4.90   | 61.00  | 185.40  | 61.00  | 920.4  |
| 1939                                                                      | 57.50  | 53.80   | 35.60   | 54.60  | 265.60 | 103.40 | 52.30  | 10.30   | 32.00  | 26.40  | 23.60   | 137.50 | 852.6  |
| 1940                                                                      | 52.70  | 118.70  | 32.50   | 34.20  | 74.00  | 43.00  | 132.30 | 51.10   | 90.50  | 45.20  | 59.60   | 45.60  | 779.4  |
| 1941                                                                      | 151.20 | 48.30   | 34.40   | 145.50 | 40.40  | 72.20  | 72.30  | 101.90+ | 38.10  | 52.60  | 29.20   | 41.20  | 827.3  |
| 1942                                                                      | 88.70  | 33.80   | 100.40  | 182.40 | 87.40  | 74.10  | 95.70  | 0.00    | 32.40+ | 14.60  | 55.90   | 120.90 | 886.3  |
| 1943                                                                      | 85.40  | 192.30  | 34.50   | 30.20  | 30.80  | 138.90 | 46.20  | 65.60   | 65.20  | 30.00  | 65.50   | 129.80 | 914.4  |
| 1944                                                                      | 114.10 | 27.70   | 15.80   | 12.80  | 54.90  | 47.90  | 38.90  | 78.00   | 63.80  | 78.60  | 80.70   | 74.80  | 688.0  |
| 1945                                                                      | 136.80 | 21.00   | 46.10   | 53.80  | 66.30  | 204.00 | 54.30  | 23.10   | 25.70  | 51.10  | 44.90   | 37.50  | 764.6  |
| 1946                                                                      | 49.80  | 33.50   | 10.20   | 27.70  | 77.40  | 158.80 | 61.80  | 64.80   | 51.80  | 78.30  | 8.90    | 114.50 | 737.5  |
| 1947                                                                      | 66.50  | 143.80  | 29.80   | 96.50  | 29.70  | 106.20 | 78.10  | 15.50   | 32.70  | 35.50  | 14.00   | 51.70  | 700.0  |
| 1948                                                                      | 191.30 | 45.00   | 23.60   | 60.80  | 45.80  | 21.10  | 63.50  | 28.70   | 8.90   | 33.00  | 50.60   | 67.80+ | 640.1  |
| 1949                                                                      | 91.80  | 175.00  | 16.20   | 47.30  | 13.00  | 9.60   | 60.10  | 54.90   | 6.60   | 61.80  | 56.10   | 30.20  | 622.6  |
| 1950                                                                      | 145.20 | 146.70  | 55.60   | 112.40 | 27.70  | 148.20 | 83.20  | 36.40   | 66.00  | 38.30  | 64.90   | 105.20 | 1029.8 |
| 1951                                                                      | 39.60  | 12.50   | 21.00   | 107.60 | 42.50  | 54.70  | 42.80  | 33.60   | 24.10  | 53.30  | 83.20   | 147.70 | 662.6  |
| 1952                                                                      | 78.00  | 159.50  | 72.20   | 67.30  | 90.40+ | 23.20  | 74.00  | 17.60   | 55.30  | 91.20  | 50.30   | 113.10 | 892.1  |
| 1953                                                                      | 113.70 | 104.30  | 33.50   | 22.50  | 28.00  | 79.70  | 116.40 | 104.80  | 43.30  | 52.10  | 135.00  | 75.00  | 908.3  |
| 1954                                                                      | 25.80  | 107.90  | 14.00   | 209.00 | 189.80 | 38.60  | 30.70  | 42.00   | 59.90  | 73.80  | 62.00   | 74.30  | 927.8  |
| 1955                                                                      | 47.00  | 11.50   | 29.50   | 59.00  | 71.30  | 85.70  | 90.00  | 110.80  | 43.30  | 52.70  | 51.40   | 30.80  | 683.0  |
| 1956                                                                      | 120.70 | 14.90   | 68.00   | 25.50  | 88.60  | 67.10  | 34.30  | 113.00  | 88.10  | 45.50  | 137.30  | 88.70  | 891.7  |
| 1957                                                                      | 131.20 | 4.20    | 46.20   | 16.70  | 40.00  | 189.40 | 46.70  | 258.20  | 46.50  | 7.70   | 157.90  | 21.70  | 966.4  |
| 1958                                                                      | 87.60+ | 54.70   | 84.10   | 105.00 | 120.20 | 122.40 | 138.40 | 70.90   | 20.60  | 71.30  | 190.50  | 35.60  | 1101.3 |
| 1959                                                                      | 116.70 | 33.00   | 26.10   | 61.00  | 40.30  | 162.00 | 54.60  | 55.10   | 51.50  | 54.70  | 37.00   | 66.50  | 758.5  |
| 1960                                                                      | 49.30  | 105.40  | 119.50  | 139.80 | 44.00  | 80.50  | 88.00  | 99.20   | 18.20  | 55.50  | 57.00   | 99.00  | 955.4  |
| 1961                                                                      | 113.10 | 51.70   | 38.50   | 39.00  | 71.60  | 134.80 | 141.80 | 37.10   | 42.00  | 49.70  | 434.90  | 30.50  | 1184.7 |
| 1962                                                                      | 165.60 | 166.70  | 24.80   | 102.50 | 65.70  | 221.60 | 103.30 | 146.50  | 28.50  | 56.80  | 28.10   | 21.00  | 1131.1 |
| 1963                                                                      | 143.00 | 50.50   | 23.70   | 156.50 | 15.50  | 154.20 | 32.50  | 26.10   | 106.10 | 31.30  | 61.90   | 108.70 | 910.0  |
| 1964                                                                      | 70.70  | 90.20   | 9.20    | 71.10  | 71.00  | 83.50  | 40.80  | 92.70   | 38.50  | 64.70  | 58.00   | 16.50  | 706.9  |
| 1965                                                                      | 154.90 | 188.50  | 59.00   | 198.50 | 46.00  | 29.50  | 72.00  | 81.80   | 31.00  | 25.30  | 192.50  | 82.70  | 1161.7 |
| 1966                                                                      | 13.50  | 20.00   | 87.50   | 48.50  | 122.00 | 137.70 | 216.00 | 107.10  | 63.30  | 54.80  | 88.00   | 124.50 | 1082.9 |
| 1967                                                                      | 44.00  | 88.00   | 27.70   | 17.00  | 13.20  | 86.60  | 63.70  | 75.90   | 83.40  | 3.90   | 88.00   | 57.00  | 648.4  |
| 1968                                                                      | 31.50  | 147.90  | 22.40   | 50.90  | 109.70 | 51.90  | 52.80  | 14.50   | 67.90  | 54.20  | 41.00   | 31.60  | 676.3  |
| 1969                                                                      | 43.20  | 40.10   | 12.20   | 98.80  | 120.70 | 19.50  | 13.60  | 5.20    | 41.40  | 69.40  | 81.00   | 11.00  | 556.1  |
| 1970                                                                      | 82.20  | 18.00   | 54.00   | 21.50  | 152.30 | 100.80 | 186.30 | 105.50  | 36.50  | 153.50 | 113.00  | 23.60  | 1047.2 |
| 1971                                                                      | 52.50  | 149.00  | 49.50   | 74.00+ | 109.50 | 76.20  | 52.50  | 90.00   | 31.90  | 41.30+ | 105.50  | 53.00  | 884.9  |
| 1972                                                                      | 9.00   | 135.00  | 52.00   | 44.00  | 58.40+ | 33.50+ | 81.20+ | 37.10   | 83.00  | 44.50  | 38.10   | 49.00  | 664.8  |
| 1973                                                                      | 42.50  | 90.00   | 0.30+   | 126.60 | 186.10 | 56.20+ | 47.50  | 99.60+  | 29.80  | 2.50   | 147.20+ | 50.50  | 878.8  |
| 1974                                                                      | 48.30+ | 47.00   | 3.00    | 99.20  | 27.60  | 85.50  | 20.50  | 80.80   | 88.50  | 63.40  | 65.10   | 116.00 | 744.9  |
| 1975                                                                      | 35.20  | 108.10  | 99.50   | 41.00  | 98.00  | 123.00 | 83.00  | 79.00   | 89.00  | 72.00  | 38.70   | 82.50  | 949.0  |
| 1976                                                                      | 104.80 | 116.00  | 49.50   | 23.00  | 252.50 | 54.50  | 77.50  | 168.50  | 58.00  | 50.00  | 78.00   | 91.50  | 1123.8 |
| 1977                                                                      | 52.50  | 105.30  | 52.00   | 46.50  | 28.40  | 37.50  | 111.30 | 65.50   | 28.50  | 88.50  | 85.10   | 72.60  | 773.7  |
| 1978                                                                      | 114.40 | 39.00   | 146.10  | 48.30  | 150.00 | 21.00  | 19.30+ | 136.50  | 28.50  | 85.50  | 90.80   | 78.00  | 957.4  |
| 1979                                                                      | 40.00  | 43.60   | 89.90   | 94.10  | 91.50  | 21.10  | 64.80  | 29.00   | 68.60  | 23.60  | 69.90   | 87.10  | 723.2  |
| 1980                                                                      | 107.50 | 105.00  | 101.40  | 259.60 | 84.20  | 112.80 | 86.70  | 90.00   | 28.80+ | 85.50  | 105.00  | 64.40  | 1230.9 |
| 1981                                                                      | 49.00  | 30.30   | 107.30  | 34.00  | 53.50  | 189.60 | 264.30 | 16.70   | 84.30  | 68.20  | 90.30   | 160.30 | 1147.8 |
| 1982                                                                      | 62.10  | 35.80   | 57.10   | 22.50  | 79.00  | 24.50  | 36.70  | 63.00   | 73.30  | 113.50 | 37.00   | 145.50 | 750.0  |
| 1983                                                                      | 64.00  | 162.00+ | 63.50   | 51.00  | 121.00 | 144.00 | 52.00  | 32.00   | 28.50  | 64.00  | 14.50   | 20.50  | 817.0  |
| 1984                                                                      | 78.00  | 45.20+  | 85.00   | 169.00 | 117.50 | 36.90  | 106.00 | 14.50   | 52.00  | 136.50 | 25.50   | 22.00  | 888.1  |
| 1985                                                                      | 265.00 | 135.50  | 71.40   | 75.60  | 84.50  | 63.50  | 74.50  | 23.50   | 28.50  | 35.00  | 332.50  | 42.00  | 1231.5 |
| 1986                                                                      | 168.50 | 83.00   | 44.10   | 44.50  | 61.00  | 69.00  | 129.50 | 42.00   | 33.00  | 43.00  | 83.00   | 79.00  | 879.6  |
| 1987                                                                      | 38.50  | 4.50    | 92.50   | 36.50  | 79.00  | 130.00 | 166.50 | 38.50   | 55.00  | 56.00  | 70.50   | 32.00  | 799.5  |
| 1988                                                                      | 51.00  | 40.00   | 99.00   | 56.50  | 75.70  | 95.00  | 253.50 | 22.30   | 53.70  | 63.50  | 82.50   | 36.50  | 929.2  |
| 1989                                                                      | 230.50 | 124.90  | 75.80   | 53.70  | 144.40 | 75.40  | 149.00 | 85.30   | 94.50  | 9.90   | 55.50   | 46.20  | 1145.1 |
| 1990                                                                      | 123.30 | 96.20   | 80.00   | 80.70  | 104.30 | 47.10  | 51.20  | 62.10   | 55.00  | 95.50  | 29.90   | 46.20  | 871.5  |
| 1991                                                                      | 284.90 | 11.00   | 122.20  | 87.00  | 86.10  | 54.00  | 48.70  | 78.50   | 91.50  | 89.70  | 33.70   | 66.80  | 1054.1 |
| 1992                                                                      | 144.90 | 101.80  | 13.00   | 80.90  | 69.30  | 56.70  | 139.70 | 75.50   | 41.00  | 90.60  | 50.20   | 64.30  | 927.9  |
| 1993                                                                      | 26.40  | 75.10   | 127.90  | 80.10  | 142.00 | 131.50 | 78.00  | 36.00   | 51.00  | 35.50  | 133.50  | 37.00  | 954.0  |
| 1994                                                                      | 81.00  | 15.50   | 199.50  | 126.60 | 98.00  | 128.00 | 151.50 | 90.00   | 25.60  | 46.50  | 48.30   | 46.80  | 1057.3 |
| 1995                                                                      | 50.20  | 152.90  | 220.00  | 83.00  | 37.70  | 90.00  | 28.00  | 38.80   | 16.30  | 72.30  | 9.20    | 47.10  | 845.5  |
| 1996                                                                      | 138.50 | 187.90  | 33.40   | 28.40  | 89.20  | 78.70  | 62.20  | 95.80   | 54.70  | 55.70  | 140.00  | 45.40  | 1009.9 |
| 1997                                                                      | 98.70  | 69.00   | 68.30   | 87.50  | 79.90+ | 168.30 | 175.10 | 60.00   | 25.00  | 33.70  | 42.60   | 37.10  | 945.2  |
| 1998                                                                      | 36.90  | 225.70  | 154.90  | 114.10 | 98.60  | 144.70 | 132.70 | 63.10   | 20.90  | 33.90  | 57.60   | 69.50+ | 1152.6 |
| AVE :                                                                     | 90.74  | 88.05   | 66.10   | 74.88  | 83.78  | 89.75  | 81.30  | 62.87   | 46.81  | 56.43  | 79.78   | 69.69  | 890.2  |
| SD :                                                                      | 57.05  | 61.33   | 53.99   | 51.26  | 50.59  | 50.60  | 55.37  | 44.10   | 23.79  | 28.92  | 68.20   | 42.39  | 163.4  |

| Appendix A29                                                              |        |        |        |        |        |        |        |         |        |        |        |        |       |
|---------------------------------------------------------------------------|--------|--------|--------|--------|--------|--------|--------|---------|--------|--------|--------|--------|-------|
| File : 008782_0.NSP                                                       |        |        |        |        |        |        |        |         |        |        |        |        |       |
| Units : mm                                                                |        |        |        |        |        |        |        |         |        |        |        |        |       |
| Descrip. : Patched monthly rainfall for station 008782 0 for 1926 to 1998 |        |        |        |        |        |        |        |         |        |        |        |        |       |
| Year                                                                      | Oct    | Nov    | Dec    | Jan    | Feb    | Mar    | Apr    | May     | Jun    | Jul    | Aug    | Sep    | Total |
| 1926                                                                      | 89.00  | 70.10  | 13.50  | 25.40  | 94.50  | 71.20  | 45.80  | 85.70   | 36.70  | 19.30  | 62.60  | 22.10  | 635.9 |
| 1927                                                                      | 31.00  | 12.90  | 18.60  | 43.90  | 17.00  | 92.30  | 31.50  | 28.00   | 60.90  | 25.40  | 54.20  | 104.30 | 520.0 |
| 1928                                                                      | 26.40  | 144.80 | 82.60  | 21.60  | 65.30  | 123.80 | 16.80  | 72.40   | 42.50  | 84.10  | 69.80  | 47.10  | 797.2 |
| 1929                                                                      | 52.70  | 33.10  | 100.90 | 43.50  | 109.60 | 101.90 | 48.50  | 59.10   | 23.60  | 20.20  | 85.10  | 55.40  | 733.6 |
| 1930                                                                      | 107.50 | 67.30  | 27.70  | 101.80 | 68.80  | 93.20  | 131.10 | 27.60   | 38.90  | 94.60  | 49.80  | 68.10  | 876.4 |
| 1931                                                                      | 66.20  | 44.30  | 213.30 | 27.20  | 60.50  | 48.30  | 6.40   | 31.30   | 59.10  | 55.30  | 36.20  | 234.40 | 882.5 |
| 1932                                                                      | 76.30  | 89.10  | 39.40  | 5.10   | 34.50  | 51.10  | 14.00  | 75.70   | 58.40  | 46.90  | 84.00  | 15.90  | 590.4 |
| 1933                                                                      | 22.10  | 125.90 | 28.50  | 83.00  | 75.40  | 111.50 | 15.70  | 15.00   | 10.10  | 110.10 | 112.10 | 59.90  | 769.3 |
| 1934                                                                      | 179.00 | 87.20  | 17.70  | 18.10  | 27.20  | 54.30  | 62.60  | 90.90   | 66.60  | 19.90  | 32.70  | 73.20  | 729.4 |
| 1935                                                                      | 57.20  | 109.20 | 46.00+ | 27.50  | 74.20  | 17.10  | 8.90   | 109.90  | 24.20  | 80.20  | 46.50  | 116.30 | 717.2 |
| 1936                                                                      | 67.30  | 239.60 | 68.70  | 41.30  | 40.10  | 149.10 | 24.60  | 2.00    | 45.70  | 50.70  | 21.10  | 70.10  | 820.3 |
| 1937                                                                      | 45.20  | 71.40  | 83.40  | 71.70  | 25.40  | 83.60  | 117.60 | 42.70   | 38.20  | 49.80  | 50.60  | 66.00  | 745.6 |
| 1938                                                                      | 86.80  | 66.30  | 63.40  | 42.70  | 131.20 | 118.50 | 43.20  | 8.10    | 3.90   | 62.30  | 164.50 | 51.10  | 842.0 |
| 1939                                                                      | 44.80  | 41.40  | 24.10  | 35.50  | 200.60 | 80.40  | 61.20  | 10.30   | 41.00  | 31.40  | 21.30  | 105.90 | 697.9 |
| 1940                                                                      | 50.60  | 112.80 | 24.20  | 29.10  | 59.60  | 31.70  | 129.20 | 64.40   | 107.70 | 51.00  | 71.30  | 51.60  | 783.2 |
| 1941                                                                      | 132.70 | 49.10  | 22.40  | 115.80 | 30.20  | 54.70  | 75.30  | 94.70   | 46.30  | 53.90  | 32.30  | 45.70  | 753.1 |
| 1942                                                                      | 81.90  | 29.40  | 98.50  | 156.80 | 74.10  | 64.90  | 70.50  | 21.80   | 24.60  | 20.30  | 65.40  | 112.00 | 820.2 |
| 1943                                                                      | 62.90  | 169.40 | 25.20  | 24.40  | 21.60  | 119.90 | 45.00  | 80.80   | 80.60  | 28.60  | 73.90  | 125.40 | 857.7 |
| 1944                                                                      | 99.70  | 24.40  | 7.70   | 6.30   | 34.60  | 34.00  | 44.00  | 86.40   | 70.20  | 79.20  | 93.80  | 50.70  | 631.0 |
| 1945                                                                      | 132.90 | 18.80  | 24.40  | 61.00  | 47.80  | 195.70 | 46.30  | 26.70   | 31.00  | 42.80  | 37.80  | 41.00  | 706.2 |
| 1946                                                                      | 41.40  | 30.20  | 7.90   | 22.80  | 60.50  | 146.10 | 56.50  | 62.10   | 48.60  | 88.90  | 10.20  | 97.00  | 672.2 |
| 1947                                                                      | 48.60  | 115.50 | 23.10  | 53.80  | 51.50  | 103.60 | 78.80  | 23.40   | 33.10  | 40.70  | 8.10   | 59.40  | 639.6 |
| 1948                                                                      | 201.90 | 39.60  | 19.30  | 59.70  | 17.00  | 17.00  | 57.70  | 35.30   | 10.60  | 31.30  | 51.30  | 52.40  | 593.1 |
| 1949                                                                      | 54.40  | 155.80 | 9.40   | 30.70  | 13.40  | 11.40  | 69.30  | 44.00   | 6.40   | 63.10  | 53.50  | 30.10  | 541.5 |
| 1950                                                                      | 121.90 | 116.30 | 28.80  | 115.30 | 14.50  | 117.30 | 64.20  | 32.70   | 75.50  | 48.00  | 40.20  | 83.90  | 858.6 |
| 1951                                                                      | 30.30  | 9.70   | 11.90  | 76.90  | 39.40  | 32.50  | 25.10  | 34.30   | 22.30  | 35.70  | 76.60  | 112.00 | 506.7 |
| 1952                                                                      | 55.10  | 175.50 | 51.50  | 41.10  | 63.30  | 20.80  | 65.70+ | 22.50   | 46.00  | 88.50  | 32.50  | 67.80  | 730.3 |
| 1953                                                                      | 92.20  | 76.10  | 24.90  | 10.00  | 23.00  | 52.50  | 110.90 | 86.30   | 45.00  | 59.00  | 113.00 | 47.50  | 740.4 |
| 1954                                                                      | 27.00  | 69.50  | 9.50   | 117.50 | 179.00 | 26.10  | 27.00  | 29.90   | 47.60  | 85.50  | 67.70  | 58.50  | 744.8 |
| 1955                                                                      | 31.00  | 4.00   | 16.00  | 37.00  | 44.50  | 81.00  | 56.50  | 89.50   | 46.50  | 36.00  | 48.00  | 26.50  | 516.5 |
| 1956                                                                      | 103.00 | 6.00   | 44.30  | 12.00  | 87.00  | 53.00  | 15.00  | 100.40+ | 120.00 | 75.00  | 123.50 | 70.50  | 809.7 |
| 1957                                                                      | 102.00 | 0.00   | 8.10   | 8.00   | 32.30  | 139.00 | 31.50  | 204.00  | 39.70+ | 8.00   | 122.00 | 21.00  | 715.6 |
| 1958                                                                      | 65.00  | 22.50  | 44.00  | 71.50  | 76.50  | 81.50  | 115.00 | 65.00   | 16.00  | 81.50  | 108.50 | 22.00  | 769.0 |
| 1959                                                                      | 113.50 | 17.50  | 23.80  | 30.50  | 12.50  | 67.00  | 48.00  | 32.80   | 51.00  | 48.10+ | 24.00  | 52.50  | 521.2 |
| 1960                                                                      | 23.50  | 56.00  | 94.50  | 71.00  | 42.50  | 30.50  | 51.20  | 87.00   | 10.00  | 52.50  | 58.00  | 76.20  | 652.9 |
| 1961                                                                      | 89.50  | 19.50  | 18.50  | 41.80  | 74.50  | 106.50 | 109.50 | 25.50   | 35.00  | 34.50  | 307.00 | 9.00   | 870.8 |
| 1962                                                                      | 114.00 | 101.50 | 7.00   | 88.00  | 37.00  | 132.50 | 60.50  | 97.50   | 23.90  | 61.50  | 26.00  | 8.00   | 757.4 |
| 1963                                                                      | 97.00  | 47.50  | 35.00  | 116.00 | 75.50  | 108.50 | 22.50  | 18.00   | 110.00 | 29.00  | 52.50  | 71.50  | 783.0 |
| 1964                                                                      | 96.50  | 84.50  | 0.60   | 43.00  | 40.50  | 66.00  | 38.00  | 66.50   | 30.00  | 60.50  | 43.50  | 0.00   | 569.6 |
| 1965                                                                      | 128.50 | 115.00 | 32.50  | 86.00  | 17.50  | 24.00  | 57.50  | 74.00   | 26.00  | 21.30  | 169.60 | 62.00  | 813.9 |
| 1966                                                                      | 0.00   | 14.00  | 15.00  | 36.50  | 84.00  | 68.00  | 195.50 | 69.00   | 59.00  | 44.50  | 74.00  | 104.00 | 763.5 |
| 1967                                                                      | 30.00  | 64.20  | 14.50  | 13.90+ | 8.20   | 46.00  | 45.00  | 73.00   | 54.50  | 2.00   | 80.00  | 24.50  | 455.8 |
| 1968                                                                      | 24.50  | 99.50  | 14.00  | 32.00  | 75.00  | 29.50  | 43.50  | 14.50   | 62.00  | 40.00  | 34.00  | 23.00  | 491.5 |
| 1969                                                                      | 25.50  | 17.00  | 0.00   | 66.00  | 53.00  | 14.00  | 8.00   | 25.00   | 37.00  | 65.00  | 75.50  | 13.00  | 399.0 |
| 1970                                                                      | 48.50  | 3.50   | 37.00  | 36.00  | 103.50 | 57.00  | 123.50 | 125.00  | 40.30  | 95.50  | 93.40+ | 9.50   | 772.7 |
| 1971                                                                      | 43.50  | 74.50  | 15.00  | 54.50  | 73.00  | 54.50  | 62.00  | 72.00   | 40.00  | 37.00  | 82.00  | 41.50  | 649.5 |
| 1972                                                                      | 7.00   | 82.00  | 35.50  | 20.20  | 37.00  | 16.50  | 64.00  | 41.00   | 68.00  | 38.50  | 54.00  | 35.50  | 499.2 |
| 1973                                                                      | 35.00  | 30.50  | 0.00   | 49.00  | 127.50 | 43.00  | 22.00  | 95.00   | 37.00  | 0.00   | 125.50 | 38.50  | 603.0 |
| 1974                                                                      | 32.00  | 2.50   | 0.00   | 65.00  | 24.00  | 48.00  | 4.50   | 60.50   | 71.00  | 53.50  | 69.00  | 50.10  | 480.1 |
| 1975                                                                      | 29.50  | 77.50  | 42.00  | 24.00  | 59.00  | 73.80  | 64.60  | 58.00   | 79.70  | 55.70  | 36.50  | 55.90  | 656.2 |
| 1976                                                                      | 74.60  | 93.50  | 38.00  | 12.60  | 163.70 | 41.80  | 68.50  | 144.20  | 57.50  | 44.80  | 59.20  | 78.50  | 876.9 |
| 1977                                                                      | 43.80  | 88.30  | 44.70  | 59.60  | 17.30  | 32.00  | 86.70  | 56.50   | 11.80  | 73.70  | 70.00  | 43.60  | 628.0 |
| 1978                                                                      | 81.40+ | 33.30  | 93.40  | 40.60  | 120.30 | 15.90  | 14.50+ | 104.20  | 28.10+ | 73.00  | 51.00  | 64.50  | 720.2 |
| 1979                                                                      | 34.00+ | 12.20  | 57.00  | 62.60+ | 49.20  | 29.00  | 53.00  | 27.60   | 65.00  | 23.40  | 46.20  | 69.50  | 528.7 |
| 1980                                                                      | 82.50  | 99.80  | 67.20  | 164.20 | 63.30  | 88.90  | 71.10  | 72.80+  | 26.20  | 88.70  | 93.10  | 56.00  | 973.8 |
| 1981                                                                      | 37.60  | 22.50  | 78.30+ | 33.50  | 36.10+ | 128.60 | 241.70 | 13.10   | 68.80  | 54.50  | 51.10  | 113.10 | 878.9 |
| 1982                                                                      | 34.00  | 22.60  | 35.80  | 9.20   | 52.40  | 12.10  | 25.50  | 42.70   | 63.70  | 72.10  | 21.60  | 97.50  | 489.2 |
| 1983                                                                      | 66.40  | 124.50 | 34.90  | 30.50  | 49.60  | 101.40 | 44.70  | 46.30   | 18.90  | 41.60  | 8.20   | 30.50  | 597.5 |
| 1984                                                                      | 53.40  | 22.60  | 49.60  | 111.50 | 85.60  | 27.10  | 93.80  | 14.90   | 43.90  | 132.80 | 18.10  | 17.50  | 670.8 |
| 1985                                                                      | 167.40 | 65.00  | 30.30  | 47.70  | 43.50  | 59.30  | 48.40  | 15.60   | 31.40  | 28.10  | 239.30 | 27.90  | 803.9 |
| 1986                                                                      | 113.50 | 47.20  | 20.50  | 20.80  | 25.20  | 24.50  | 101.60 | 40.70   | 33.20  | 39.10  | 72.30  | 51.10  | 589.7 |
| 1987                                                                      | 19.90  | 0.90   | 52.90  | 14.30  | 22.40  | 69.10  | 117.60 | 39.10   | 48.40  | 34.00  | 49.10  | 36.10  | 503.8 |
| 1988                                                                      | 17.70  | 21.50  | 54.20  | 31.40  | 40.20  | 64.30  | 194.60 | 17.80   | 38.70  | 56.20  | 64.50  | 30.20  | 631.3 |
| 1989                                                                      | 143.80 | 84.70  | 41.20  | 23.60  | 61.90  | 44.90  | 138.40 | 67.70   | 80.60  | 9.20   | 39.00  | 28.20  | 763.2 |
| 1990                                                                      | 81.70  | 62.30  | 59.90  | 54.50  | 50.60  | 23.20  | 24.40  | 44.40   | 49.20  | 75.40  | 24.30  | 27.60  | 577.5 |
| 1991                                                                      | 182.20 | 15.90  | 74.60  | 49.10  | 64.80  | 36.10  | 31.90  | 69.60   | 91.30  | 73.00  | 21.90  | 57.20  | 767.6 |
| 1992                                                                      | 124.40 | 64.10  | 9.20   | 96.60  | 53.10  | 42.20  | 122.00 | 64.40   | 24.60  | 81.70  | 42.20  | 44.70  | 769.2 |
| 1993                                                                      | 12.20  | 44.60  | 90.50  | 38.10  | 92.30  | 91.20  | 75.90  | 40.80   | 47.10  | 32.30  | 113.20 | 22.80  | 701.0 |
| 1994                                                                      | 63.10  | 7.80   | 162.20 | 79.60  | 49.70  | 96.60  | 110.70 | 99.00   | 29.20  | 56.90  | 44.70  | 33.70  | 833.2 |
| 1995                                                                      | 60.30  | 100.80 | 162.50 | 49.80  | 29.90  | 71.70  | 17.80  | 50.80   | 22.40  | 72.30  | 6.60   | 53.70  | 698.6 |
| 1996                                                                      | 109.00 | 150.80 | 20.30  | 23.30  | 62.00  | 64.70  | 54.70  | 94.50   | 66.10  | 50.20  | 69.30  | 35.10  | 800.0 |
| 1997                                                                      | 63.80  | 47.90  | 33.40  | 72.00  | 51.00  | 123.50 | 150.90 | 64.90+  | 27.20  | 30.30  | 40.20  | 23.80  | 728.9 |
| 1998                                                                      | 20.10  | 145.00 | 108.40 | 80.50  | 70.90  | 82.30  | 91.70  | 45.50   | 19.70  | 31.10  | 46.80  | 55.30+ | 797.3 |
| AVE :                                                                     | 70.01  | 64.54  | 42.92  | 50.92  | 58.81  | 67.60  | 65.91  | 57.18   | 45.14  | 51.79  | 65.98  | 55.31  | 696.1 |
| SD :                                                                      | 44.35  | 49.81  | 39.57  | 34.70  | 37.77  | 40.03  | 47.08  | 35.63   | 24.25  | 26.02  | 49.10  | 36.24  | 126.3 |

| Appendix A30                                                              |        |        |       |        |        |        |        |        |        |        |         |        |       |
|---------------------------------------------------------------------------|--------|--------|-------|--------|--------|--------|--------|--------|--------|--------|---------|--------|-------|
| File : 008876_9.NSP                                                       |        |        |       |        |        |        |        |        |        |        |         |        |       |
| Units : mm                                                                |        |        |       |        |        |        |        |        |        |        |         |        |       |
| Descrip. : Patched monthly rainfall for station 008876 9 for 1926 to 1964 |        |        |       |        |        |        |        |        |        |        |         |        |       |
| Year                                                                      | Oct    | Nov    | Dec   | Jan    | Feb    | Mar    | Apr    | May    | Jun    | Jul    | Aug     | Sep    | Total |
| 1926                                                                      | 63.00  | 44.40  | 3.80  | 10.40  | 46.70  | 49.60  | 24.50  | 32.50  | 29.40  | 9.70   | 56.40   | 8.70   | 379.1 |
| 1927                                                                      | 3.90   | 17.80  | 10.70 | 8.10   | 2.00   | 54.10  | 16.60  | 5.60   | 25.20  | 22.80  | 28.50   | 63.10  | 258.4 |
| 1928                                                                      | 10.90  | 109.50 | 34.30 | 0.00   | 12.40  | 32.10  | 5.10   | 43.90  | 21.60  | 72.40  | 55.10   | 24.70  | 422.0 |
| 1929                                                                      | 19.50  | 9.10   | 25.30 | 16.00  | 97.00  | 59.10  | 48.60  | 30.50  | 18.00  | 7.90   | 75.40   | 31.40  | 437.8 |
| 1930                                                                      | 24.10  | 26.60  | 0.00  | 20.80  | 15.80  | 48.40  | 98.80  | 8.30   | 10.10  | 70.90  | 35.70   | 30.40+ | 389.9 |
| 1931                                                                      | 75.90  | 23.40  | 61.00 | 6.60   | 41.80  | 9.60   | 1.30   | 28.40  | 43.70  | 35.80  | 10.20   | 148.40 | 486.1 |
| 1932                                                                      | 18.10  | 35.30  | 26.90 | 4.60   | 16.30  | 29.70  | 8.60   | 23.60  | 44.20  | 23.20  | 53.20   | 9.40+  | 293.1 |
| 1933                                                                      | 19.10  | 42.40  | 5.60  | 45.00  | 10.90  | 35.00  | 13.30+ | 19.10  | 14.00  | 69.60  | 64.00   | 34.10  | 372.1 |
| 1934                                                                      | 118.10 | 67.20  | 3.80  | 7.10   | 28.40  | 18.80  | 25.10  | 63.60  | 40.40  | 19.80  | 19.00   | 36.30  | 447.6 |
| 1935                                                                      | 21.30  | 43.60  | 23.70 | 12.70  | 19.70+ | 13.70  | 8.40   | 51.30  | 11.20  | 43.80  | 23.70   | 53.60  | 326.7 |
| 1936                                                                      | 29.40  | 98.50  | 59.50 | 10.10  | 28.70  | 34.40  | 11.70  | 1.80   | 20.90  | 54.60  | 7.60    | 52.50  | 409.7 |
| 1937                                                                      | 28.20  | 33.50  | 31.00 | 18.50  | 4.30   | 54.60  | 64.10  | 47.30  | 24.80  | 38.80  | 30.70   | 45.60  | 421.4 |
| 1938                                                                      | 30.50  | 62.20  | 29.20 | 13.00  | 89.90  | 60.20  | 36.80  | 10.80  | 4.00   | 47.00  | 104.20  | 27.60  | 515.4 |
| 1939                                                                      | 13.00  | 13.90  | 8.40  | 37.20  | 74.10  | 27.50  | 42.90  | 7.80   | 39.40  | 13.50  | 5.80    | 30.70  | 314.2 |
| 1940                                                                      | 24.10  | 56.50  | 6.60  | 48.80  | 21.70  | 1.50   | 71.30  | 48.70  | 76.90  | 39.80+ | 36.50   | 44.50  | 476.9 |
| 1941                                                                      | 56.10  | 21.60  | 15.70 | 46.70  | 7.20   | 25.40  | 29.00  | 49.80  | 41.20  | 21.90  | 20.10   | 27.40  | 362.1 |
| 1942                                                                      | 43.20  | 0.80   | 48.00 | 73.70  | 24.40  | 37.60  | 31.30  | 32.00  | 10.40  | 15.20  | 52.30   | 54.60  | 423.5 |
| 1943                                                                      | 27.20  | 105.40 | 14.00 | 3.00   | 9.70   | 29.50  | 32.50  | 73.30  | 59.90  | 13.90  | 42.30   | 63.30  | 474.0 |
| 1944                                                                      | 26.90  | 13.70  | 5.10  | 7.90   | 1.00   | 6.10   | 23.30  | 69.80  | 57.40  | 54.90  | 42.10   | 48.00  | 356.2 |
| 1945                                                                      | 87.20  | 11.90  | 8.10  | 6.40   | 23.90  | 105.20 | 19.40  | 19.30  | 15.00  | 27.50  | 12.80   | 22.90  | 359.6 |
| 1946                                                                      | 24.80  | 15.00  | 0.00  | 4.80   | 11.70  | 61.40  | 15.00  | 35.10  | 25.90  | 63.80  | 6.10    | 39.90  | 303.5 |
| 1947                                                                      | 24.10  | 49.80  | 0.00  | 13.70  | 14.70  | 44.40  | 49.50+ | 7.70   | 38.60  | 37.20  | 1.80    | 24.30  | 305.8 |
| 1948                                                                      | 124.20 | 18.10  | 11.70 | 17.30  | 0.00   | 0.00   | 57.20  | 44.50  | 3.30   | 27.70  | 19.90   | 10.50  | 334.4 |
| 1949                                                                      | 0.00   | 136.00 | 0.00  | 1.30   | 16.70  | 6.60   | 63.20  | 18.00  | 4.30   | 39.90  | 41.40   | 19.80  | 347.2 |
| 1950                                                                      | 49.30  | 71.90  | 7.40  | 98.30  | 0.00   | 31.20  | 29.00  | 13.40  | 56.90  | 35.20  | 23.70   | 30.20  | 446.5 |
| 1951                                                                      | 18.30  | 6.10   | 0.00  | 16.00  | 12.50  | 7.40   | 21.60  | 12.20  | 22.90  | 37.70  | 66.20   | 69.80  | 290.7 |
| 1952                                                                      | 29.50  | 92.00  | 13.70 | 0.00   | 27.60  | 0.00   | 44.50  | 19.50  | 29.50  | 73.50  | 21.90   | 40.80  | 392.5 |
| 1953                                                                      | 49.50  | 54.70  | 17.20 | 0.00   | 19.00  | 14.30  | 65.30  | 76.30  | 34.00  | 51.00  | 109.10+ | 14.50  | 504.9 |
| 1954                                                                      | 5.00   | 24.50  | 6.50  | 17.50  | 86.50  | 0.00   | 22.00  | 8.50   | 37.50  | 62.50  | 61.00   | 40.70  | 372.2 |
| 1955                                                                      | 26.00  | 9.00   | 0.00  | 14.50  | 15.00  | 64.00  | 16.50  | 78.00  | 45.00  | 16.00  | 32.50   | 0.00   | 316.5 |
| 1956                                                                      | 53.50  | 5.50   | 30.50 | 5.50   | 52.50  | 23.00  | 8.00   | 101.00 | 86.50  | 32.50  | 77.50   | 46.00  | 522.0 |
| 1957                                                                      | 29.50  | 0.00   | 4.00  | 0.00   | 17.10  | 66.50  | 22.50  | 124.50 | 24.50  | 0.00   | 62.50   | 3.00   | 354.1 |
| 1958                                                                      | 27.50  | 15.00  | 15.00 | 33.50  | 28.50  | 36.00  | 106.50 | 47.50  | 7.50   | 84.00  | 86.50   | 22.50  | 510.0 |
| 1959                                                                      | 70.00  | 2.50   | 0.00  | 14.00  | 13.50  | 41.50  | 12.00  | 23.50  | 56.80  | 25.00  | 19.00   | 36.50  | 314.3 |
| 1960                                                                      | 10.00  | 28.50  | 57.50 | 45.50  | 0.00   | 30.00  | 30.50  | 70.50  | 6.50   | 30.00  | 51.00   | 39.00  | 399.0 |
| 1961                                                                      | 35.00  | 7.50   | 0.00  | 29.00  | 26.00  | 61.50  | 54.50  | 17.50  | 32.50  | 23.00  | 242.00  | 0.00   | 528.5 |
| 1962                                                                      | 45.00  | 44.90  | 0.00  | 22.50  | 7.00   | 54.50  | 6.00   | 60.00  | 23.50  | 52.00  | 27.50   | 0.00   | 342.9 |
| 1963                                                                      | 45.50  | 25.60+ | 35.00 | 58.00  | 55.00  | 56.00  | 0.00   | 17.00  | 74.50  | 13.00  | 27.50   | 53.20+ | 460.3 |
| 1964                                                                      | 34.50+ | 56.40+ | 8.40+ | 18.10+ | 30.90+ | 36.60+ | 37.10+ | 69.10+ | 19.50+ | 35.70+ | 26.60+  | 9.60+  | 382.5 |
| AVE :                                                                     | 36.95  | 38.47  | 16.09 | 20.67  | 25.90  | 35.05  | 32.65  | 38.75  | 31.73  | 36.99  | 45.62   | 34.81  | 393.7 |
| SD :                                                                      | 27.87  | 33.72  | 17.54 | 21.77  | 24.99  | 23.44  | 25.30  | 28.79  | 21.00  | 20.93  | 41.75   | 26.30  | 73.4  |

| Appendix A31                                                              |        |        |        |        |        |         |        |        |        |         |         |        |       |
|---------------------------------------------------------------------------|--------|--------|--------|--------|--------|---------|--------|--------|--------|---------|---------|--------|-------|
| File : 009365_5.NSP                                                       |        |        |        |        |        |         |        |        |        |         |         |        |       |
| Units : mm                                                                |        |        |        |        |        |         |        |        |        |         |         |        |       |
| Descrip. : Patched monthly rainfall for station 009365 5 for 1943 to 1998 |        |        |        |        |        |         |        |        |        |         |         |        |       |
| Year                                                                      | Oct    | Nov    | Dec    | Jan    | Feb    | Mar     | Apr    | May    | Jun    | Jul     | Aug     | Sep    | Total |
| 1943                                                                      | 20.10+ | 82.90+ | 14.90+ | 9.10   | 9.10   | 60.70   | 28.20  | 113.80 | 52.30  | 48.30+  | 60.50   | 66.50+ | 566.4 |
| 1944                                                                      | 39.70  | 25.40  | 0.00   | 0.00   | 12.10  | 13.50   | 33.30  | 98.50+ | 59.00+ | 39.20+  | 73.40   | 64.50  | 458.6 |
| 1945                                                                      | 99.10  | 32.70+ | 11.60+ | 5.80   | 23.50  | 113.20+ | 23.20  | 18.30  | 31.20  | 40.10   | 31.50   | 35.90  | 466.1 |
| 1946                                                                      | 24.70  | 22.00+ | 2.00   | 5.50+  | 31.10  | 97.80   | 30.60  | 53.20  | 32.50  | 79.10   | 0.00    | 104.20 | 482.7 |
| 1947                                                                      | 35.00  | 50.60  | 12.70  | 36.60  | 19.10  | 53.00+  | 63.20+ | 12.20  | 30.20  | 37.00+  | 9.60+   | 46.10  | 405.3 |
| 1948                                                                      | 166.20 | 25.20  | 13.70  | 23.60+ | 12.70  | 8.10    | 45.20  | 44.00  | 13.40+ | 34.00   | 30.80   | 29.30  | 446.2 |
| 1949                                                                      | 17.30  | 130.00 | 0.00   | 18.30  | 5.10   | 27.00   | 56.50+ | 19.50  | 6.60   | 70.90   | 33.60   | 23.90  | 408.7 |
| 1950                                                                      | 77.40  | 88.50+ | 30.30  | 92.30+ | 0.00   | 62.50   | 29.20  | 52.90  | 70.40  | 80.50+  | 36.80+  | 77.50  | 698.3 |
| 1951                                                                      | 18.50  | 10.70  | 18.00  | 39.20  | 24.90+ | 18.40+  | 36.40  | 23.30  | 30.00  | 34.80   | 66.40   | 107.70 | 428.3 |
| 1952                                                                      | 37.60  | 81.30  | 27.30  | 28.80+ | 20.80  | 0.00    | 70.20  | 23.00  | 49.40  | 108.90  | 41.40   | 56.20  | 544.9 |
| 1953                                                                      | 89.50  | 71.50+ | 16.20  | 12.50  | 27.00  | 47.80   | 83.00+ | 108.80 | 35.00+ | 50.90   | 112.60  | 18.60  | 673.4 |
| 1954                                                                      | 23.70  | 49.40  | 16.20+ | 65.70  | 114.50 | 10.00   | 28.50  | 24.50  | 37.80  | 77.90   | 61.70   | 40.60+ | 550.5 |
| 1955                                                                      | 71.90+ | 24.00  | 4.00   | 6.00   | 10.00  | 72.20   | 39.70  | 93.00  | 55.10  | 33.70   | 56.40   | 19.50  | 485.5 |
| 1956                                                                      | 87.40  | 15.50  | 53.00  | 13.50  | 69.70  | 36.30   | 31.30  | 84.60  | 97.70  | 45.60   | 100.50  | 65.20  | 700.3 |
| 1957                                                                      | 67.80  | 4.50   | 29.00  | 0.00   | 26.80  | 61.90   | 62.80  | 170.20 | 31.60  | 11.30   | 93.40   | 16.80  | 576.1 |
| 1958                                                                      | 39.30  | 23.00  | 24.20  | 50.20+ | 68.20  | 68.90   | 133.00 | 67.90  | 22.30  | 114.70  | 91.00   | 40.80  | 743.5 |
| 1959                                                                      | 101.40 | 14.20  | 20.60  | 25.30  | 20.80  | 53.10   | 23.40  | 88.10  | 65.60  | 39.20   | 17.00   | 44.50+ | 513.2 |
| 1960                                                                      | 18.00  | 54.50  | 60.30  | 67.20  | 8.00   | 30.20   | 48.10  | 62.90  | 29.60  | 49.40   | 110.90  | 44.50  | 583.6 |
| 1961                                                                      | 49.00  | 17.30  | 18.50  | 34.30  | 51.80  | 55.80   | 63.60  | 21.30  | 49.60  | 29.00   | 173.00  | 15.00  | 578.2 |
| 1962                                                                      | 79.70  | 67.80  | 14.00  | 30.70  | 1.50   | 120.60  | 52.90  | 74.40  | 30.20  | 54.10   | 29.50   | 5.00   | 560.4 |
| 1963                                                                      | 57.00  | 32.70  | 26.00  | 80.00  | 22.20  | 61.90   | 27.20  | 21.60  | 76.60  | 19.70   | 46.10   | 65.30  | 536.3 |
| 1964                                                                      | 26.70  | 79.50  | 7.50   | 24.90+ | 38.50  | 38.20   | 55.20  | 86.30  | 16.50  | 53.00   | 27.80   | 14.40  | 468.5 |
| 1965                                                                      | 85.00  | 87.80  | 35.50  | 42.80  | 6.50   | 21.60   | 38.20  | 71.50  | 17.80  | 26.50   | 134.50  | 74.90  | 642.6 |
| 1966                                                                      | 9.00   | 14.10  | 19.00  | 15.50  | 53.40  | 66.40   | 236.50 | 81.60  | 55.90  | 47.90   | 55.50   | 50.90  | 705.7 |
| 1967                                                                      | 26.40  | 44.70  | 6.00   | 4.20   | 8.60   | 21.20   | 41.00  | 108.10 | 76.00  | 11.50   | 67.00   | 33.80  | 448.5 |
| 1968                                                                      | 31.60  | 57.60  | 11.50  | 12.40  | 22.20  | 22.40   | 39.20  | 20.20  | 67.30  | 35.60   | 42.70   | 30.30  | 393.0 |
| 1969                                                                      | 24.20  | 9.00   | 4.50   | 52.80  | 57.20  | 4.60    | 4.00   | 21.30  | 28.00  | 47.40   | 66.90   | 13.20  | 333.1 |
| 1970                                                                      | 38.20  | 11.80  | 27.00  | 11.00  | 74.10  | 64.70   | 87.20  | 62.20+ | 40.10  | 124.70+ | 88.40   | 21.50  | 650.9 |
| 1971                                                                      | 19.00  | 78.80  | 15.40  | 9.50   | 60.50  | 41.20   | 79.30  | 61.00  | 22.40  | 32.90   | 71.90   | 42.50  | 534.4 |
| 1972                                                                      | 13.50  | 42.80  | 28.10  | 16.50  | 2.30   | 28.20   | 43.00  | 40.10  | 48.50  | 23.30   | 45.60   | 37.60  | 369.5 |
| 1973                                                                      | 21.10  | 35.90  | 59.40  | 30.90  | 92.60  | 43.50   | 3.00   | 95.70  | 15.00  | 5.00    | 109.50  | 34.50  | 546.1 |
| 1974                                                                      | 28.20  | 24.00  | 0.00   | 29.30  | 5.50   | 19.50   | 32.00  | 67.20  | 27.80  | 64.10   | 63.00   | 56.00  | 416.6 |
| 1975                                                                      | 18.00  | 39.20  | 9.00   | 18.50  | 48.50  | 55.20   | 51.50  | 43.50  | 76.40  | 41.60   | 38.50   | 27.80  | 467.7 |
| 1976                                                                      | 69.60  | 73.10  | 31.50  | 8.50   | 72.20  | 38.00   | 60.80  | 129.30 | 44.90  | 27.50   | 29.00   | 46.80  | 631.2 |
| 1977                                                                      | 37.00  | 57.50  | 41.00  | 21.50  | 9.30   | 11.00   | 63.40  | 32.50  | 27.50  | 49.50   | 50.60   | 49.30  | 450.1 |
| 1978                                                                      | 42.80  | 26.50  | 38.20  | 18.60  | 100.70 | 5.90    | 13.50  | 63.50  | 31.90  | 53.40   | 56.70   | 50.50+ | 502.2 |
| 1979                                                                      | 50.00  | 19.70  | 38.80  | 73.50  | 22.20  | 24.50   | 31.30  | 26.90  | 52.80  | 12.10   | 47.40   | 46.30  | 445.5 |
| 1980                                                                      | 47.60  | 88.20  | 47.30  | 148.30 | 51.00  | 71.10   | 139.10 | 57.80  | 38.60  | 50.20   | 101.20+ | 32.50  | 872.9 |
| 1981                                                                      | 29.60  | 17.70  | 67.00  | 22.10  | 68.00  | 80.10   | 176.90 | 3.80   | 49.10  | 42.30   | 36.70   | 90.70  | 684.0 |
| 1982                                                                      | 23.70  | 16.00  | 17.00  | 5.10   | 44.20  | 1.90    | 32.00  | 45.90  | 55.30  | 62.50   | 16.90   | 81.70  | 402.2 |
| 1983                                                                      | 27.60  | 34.70  | 18.60  | 15.70  | 38.80  | 79.00   | 23.10  | 41.50  | 10.50  | 35.10   | 8.70    | 21.70  | 355.0 |
| 1984                                                                      | 50.00  | 18.90  | 37.40  | 63.80  | 36.30  | 26.20   | 91.40  | 4.30   | 54.40  | 105.10  | 15.80   | 8.70   | 512.3 |
| 1985                                                                      | 83.60  | 58.80  | 73.20  | 12.80  | 26.60  | 41.20   | 14.80  | 11.70  | 29.80  | 30.80   | 192.60  | 42.30  | 618.2 |
| 1986                                                                      | 70.50  | 26.10  | 14.20  | 13.00  | 13.00  | 14.70   | 102.60 | 23.30  | 36.80  | 28.80   | 53.70   | 58.60  | 455.3 |
| 1987                                                                      | 11.50  | 0.00   | 38.10  | 4.00   | 16.20  | 47.50   | 61.50  | 48.00  | 49.80  | 28.80   | 33.70   | 50.60  | 389.7 |
| 1988                                                                      | 25.20  | 12.50  | 21.10  | 14.50  | 20.00  | 68.00   | 108.00 | 18.50  | 47.50  | 43.00   | 42.00   | 30.60  | 450.9 |
| 1989                                                                      | 105.00 | 52.40  | 25.50  | 29.00  | 37.50  | 29.00   | 115.50 | 49.50  | 62.00  | 6.00    | 26.50   | 17.50  | 555.4 |
| 1990                                                                      | 52.00  | 33.20  | 38.00  | 39.00  | 45.00  | 22.30   | 16.00  | 29.00  | 44.00  | 25.50   | 11.50   | 26.50  | 382.0 |
| 1991                                                                      | 135.00 | 16.60+ | 13.20  | 20.00  | 38.00  | 33.50   | 16.50  | 50.20  | 61.50  | 42.50   | 15.00   | 46.00  | 488.0 |
| 1992                                                                      | 138.00 | 39.50  | 0.00   | 45.00  | 50.50  | 24.50   | 166.50 | 70.00  | 25.50  | 32.80   | 30.20   | 36.00  | 658.5 |
| 1993                                                                      | 9.50   | 29.50  | 78.00  | 22.50  | 64.50  | 80.20   | 69.00  | 24.50  | 25.80  | 22.50   | 49.40   | 17.50  | 492.9 |
| 1994                                                                      | 42.40  | 10.00  | 101.60 | 39.00  | 55.00  | 57.50   | 61.00  | 66.00  | 44.00  | 31.00   | 30.00   | 30.00  | 567.5 |
| 1995                                                                      | 26.20  | 80.00  | 105.00 | 25.50  | 16.00  | 53.00   | 5.50   | 21.50  | 8.00   | 62.50   | 11.00   | 38.00  | 452.2 |
| 1996                                                                      | 118.50 | 140.50 | 37.50  | 10.00  | 32.00  | 83.00   | 45.50  | 118.50 | 51.50  | 66.00   | 65.00   | 16.00  | 784.0 |
| 1997                                                                      | 10.00  | 58.00  | 8.00   | 56.00  | 34.50  | 74.50   | 144.50 | 53.50  | 14.00  | 35.60   | 14.50   | 15.50  | 518.6 |
| 1998                                                                      | 7.20   | 95.00  | 43.50  | 36.50  | 52.00  | 37.00   | 50.50  | 31.50  | 18.00  | 24.80   | 36.50   | 40.70+ | 473.2 |
| AVE :                                                                     | 49.53  | 43.81  | 28.02  | 29.59  | 35.58  | 44.70   | 59.44  | 54.57  | 40.73  | 45.18   | 54.68   | 41.41  | 527.2 |
| SD :                                                                      | 36.66  | 31.52  | 23.71  | 26.67  | 26.25  | 27.97   | 46.42  | 35.42  | 19.84  | 25.81   | 39.29   | 23.06  | 115.5 |

| Appendix A32                                                              |        |        |        |        |        |        |         |        |        |        |        |        |       |
|---------------------------------------------------------------------------|--------|--------|--------|--------|--------|--------|---------|--------|--------|--------|--------|--------|-------|
| File : 009430_2.NSP                                                       |        |        |        |        |        |        |         |        |        |        |        |        |       |
| Units : mm                                                                |        |        |        |        |        |        |         |        |        |        |        |        |       |
| Descrip. : Patched monthly rainfall for station 009430 2 for 1935 to 1988 |        |        |        |        |        |        |         |        |        |        |        |        |       |
| Year                                                                      | Oct    | Nov    | Dec    | Jan    | Feb    | Mar    | Apr     | May    | Jun    | Jul    | Aug    | Sep    | Total |
| 1935                                                                      | 23.00+ | 55.90+ | 25.90+ | 5.60+  | 19.50+ | 13.40+ | 11.00+  | 54.60+ | 17.40+ | 43.10+ | 24.50+ | 51.90+ | 345.8 |
| 1936                                                                      | 39.30+ | 161.60 | 60.00  | 0.50   | 2.30   | 32.50  | 9.10    | 0.00   | 19.70  | 25.20  | 11.20  | 28.10  | 389.5 |
| 1937                                                                      | 9.60   | 54.90  | 47.70  | 11.20  | 2.50   | 61.00  | 36.10   | 36.50  | 33.50  | 30.60  | 43.90  | 28.80  | 396.3 |
| 1938                                                                      | 6.60   | 49.00  | 15.20  | 8.30   | 42.40  | 71.60  | 33.60   | 11.90  | 13.10+ | 36.10  | 87.30  | 21.80  | 396.9 |
| 1939                                                                      | 13.50  | 18.30  | 11.90  | 21.60  | 93.20  | 13.00  | 49.30   | 12.10  | 21.90  | 8.00   | 8.30   | 30.20  | 301.3 |
| 1940                                                                      | 30.50  | 84.80  | 5.10   | 43.70  | 0.00   | 0.00   | 82.00   | 45.90  | 59.60  | 51.60  | 45.20  | 35.30  | 483.7 |
| 1941                                                                      | 80.20  | 24.40  | 16.50  | 34.00  | 11.40  | 19.40  | 9.90    | 27.60  | 36.70  | 13.00  | 24.40  | 15.80  | 313.3 |
| 1942                                                                      | 72.60  | 10.50  | 77.30  | 139.00 | 21.10  | 32.30  | 41.90   | 19.80  | 18.50  | 11.20  | 19.80  | 69.30  | 533.3 |
| 1943                                                                      | 9.40   | 59.40  | 0.00   | 0.00   | 6.40   | 29.70  | 18.60   | 72.30  | 49.10  | 33.90  | 46.40  | 74.40  | 399.6 |
| 1944                                                                      | 32.30  | 12.00  | 0.00   | 0.00   | 4.30   | 7.10   | 16.80   | 78.90  | 52.30  | 25.40  | 44.20  | 21.60  | 294.9 |
| 1945                                                                      | 59.70  | 24.90  | 3.10   | 0.00   | 12.70  | 105.50 | 0.00    | 18.50  | 9.60   | 25.40  | 9.70   | 23.20  | 292.3 |
| 1946                                                                      | 12.20  | 11.40  | 0.00   | 0.00   | 20.80+ | 77.00  | 14.80   | 26.40  | 20.70  | 52.00  | 0.00   | 33.10  | 268.4 |
| 1947                                                                      | 20.80  | 30.70  | 0.00   | 11.40  | 9.90   | 39.90  | 46.80   | 13.20  | 19.20  | 23.70  | 0.80   | 30.70  | 247.1 |
| 1948                                                                      | 136.70 | 5.10   | 8.10   | 14.90  | 10.20  | 0.00   | 65.50   | 29.90  | 2.30   | 16.30  | 19.30  | 10.20  | 318.5 |
| 1949                                                                      | 4.60   | 137.00 | 0.00   | 1.30   | 2.80   | 5.10   | 43.70+  | 14.70  | 3.30   | 41.10  | 27.00  | 17.20  | 297.8 |
| 1950                                                                      | 51.30  | 77.80  | 12.90  | 78.30  | 0.00   | 22.40  | 35.60   | 25.40  | 62.50  | 54.40  | 28.70  | 67.10  | 516.4 |
| 1951                                                                      | 14.70  | 3.60   | 0.00   | 21.60  | 12.40  | 16.50  | 12.50   | 21.00  | 26.40  | 14.70  | 64.30  | 115.80 | 323.5 |
| 1952                                                                      | 20.10  | 84.20  | 20.70  | 23.90  | 2.50   | 7.60   | 46.00   | 21.50  | 32.70  | 99.00  | 24.50  | 72.50  | 455.2 |
| 1953                                                                      | 55.50  | 64.50  | 8.50   | 3.50   | 12.00  | 26.00  | 57.20   | 85.00  | 26.40  | 36.50  | 100.50 | 5.50   | 481.1 |
| 1954                                                                      | 7.20   | 38.00  | 10.50  | 37.50  | 87.50  | 1.80   | 16.20   | 13.60  | 30.00  | 46.50  | 57.00  | 26.50  | 372.3 |
| 1955                                                                      | 65.10  | 5.50   | 13.00  | 3.50   | 7.00   | 52.50  | 22.50   | 68.00  | 43.20  | 44.50  | 37.50  | 30.60+ | 392.9 |
| 1956                                                                      | 41.00  | 4.00   | 21.70  | 14.00  | 63.00  | 37.50  | 12.90   | 77.00  | 98.00  | 46.70  | 67.00  | 49.00  | 531.8 |
| 1957                                                                      | 54.50  | 0.00   | 0.00   | 0.00   | 15.20  | 58.10  | 55.00   | 115.80 | 22.00  | 0.00   | 53.50  | 12.80  | 386.9 |
| 1958                                                                      | 23.20  | 25.00  | 15.10+ | 41.50  | 37.50  | 41.00  | 85.00   | 58.50  | 1.20   | 127.50 | 70.00  | 23.00  | 548.5 |
| 1959                                                                      | 107.10 | 3.50   | 26.00  | 4.00   | 17.30  | 33.80  | 19.70   | 36.00  | 46.00  | 24.00  | 13.50  | 37.00  | 367.9 |
| 1960                                                                      | 10.70  | 24.50  | 60.50  | 39.60  | 5.60   | 59.50  | 31.30   | 53.80  | 17.00  | 33.40  | 71.20  | 32.50  | 439.6 |
| 1961                                                                      | 38.20  | 6.50   | 8.70+  | 27.80+ | 19.00  | 67.00  | 49.50   | 17.50  | 37.50  | 17.00  | 157.00 | 5.50   | 451.2 |
| 1962                                                                      | 38.50  | 49.00  | 0.00   | 5.50   | 0.00   | 55.00  | 45.20   | 38.50  | 19.50  | 33.50  | 17.00  | 0.00   | 301.7 |
| 1963                                                                      | 28.80  | 25.60  | 27.00  | 47.50  | 11.00  | 60.20  | 17.50   | 11.00  | 78.00  | 12.20  | 48.20  | 50.50  | 417.5 |
| 1964                                                                      | 33.50  | 69.80  | 6.00   | 20.50  | 25.00  | 33.50  | 17.00   | 83.50  | 21.00  | 45.50  | 24.10  | 4.70   | 384.1 |
| 1965                                                                      | 89.20  | 70.70  | 20.00  | 17.00  | 0.00   | 45.00  | 35.00   | 49.50  | 7.00   | 5.00   | 128.00 | 33.00  | 499.4 |
| 1966                                                                      | 6.00   | 4.90   | 0.00   | 7.50   | 26.50  | 39.50  | 194.00  | 75.70  | 49.20  | 37.10  | 43.90  | 57.50  | 541.8 |
| 1967                                                                      | 14.30  | 21.90  | 8.00   | 9.70   | 16.50  | 13.50  | 25.30   | 31.50  | 62.60  | 5.80   | 51.20  | 8.60   | 268.9 |
| 1968                                                                      | 17.00  | 42.50  | 3.20   | 6.90   | 15.50  | 10.50  | 20.00   | 13.50  | 47.00  | 20.70  | 15.20  | 23.00  | 235.0 |
| 1969                                                                      | 30.00  | 5.40   | 10.50  | 30.00  | 26.00  | 3.00   | 0.00    | 17.20  | 28.00  | 40.50  | 47.60  | 9.50   | 247.7 |
| 1970                                                                      | 21.00  | 8.50   | 18.00  | 8.00   | 51.00  | 39.50  | 118.50  | 36.00  | 31.20  | 118.20 | 74.50  | 5.60   | 530.0 |
| 1971                                                                      | 18.40  | 60.70  | 7.70   | 9.00   | 39.50  | 30.50  | 54.30   | 33.00  | 12.50  | 36.00  | 58.50  | 30.50  | 390.6 |
| 1972                                                                      | 1.00   | 30.30  | 8.50   | 5.00   | 0.00   | 6.60   | 26.00   | 26.80  | 24.00  | 26.50  | 25.80  | 22.00  | 202.5 |
| 1973                                                                      | 9.30   | 21.00  | 55.50  | 26.00  | 113.50 | 25.00  | 11.00   | 64.50  | 14.00  | 5.00   | 107.00 | 29.00  | 480.8 |
| 1974                                                                      | 28.00  | 10.00  | 0.00   | 18.40  | 10.00  | 13.00  | 11.80   | 40.10  | 38.00  | 33.40  | 63.80  | 63.50  | 330.0 |
| 1975                                                                      | 13.70  | 25.50  | 7.20   | 5.50   | 44.20  | 45.50  | 49.50   | 39.00  | 86.50  | 46.80  | 44.00  | 21.50  | 428.9 |
| 1976                                                                      | 58.30  | 52.50  | 8.50   | 5.00   | 68.00  | 20.50  | 66.50   | 102.00 | 43.90  | 32.50  | 40.00  | 35.10  | 532.8 |
| 1977                                                                      | 19.20  | 49.80  | 44.00  | 14.00  | 16.60  | 14.30  | 43.20   | 18.00  | 16.20  | 40.00  | 48.60  | 58.60  | 382.5 |
| 1978                                                                      | 33.50  | 22.00  | 36.00  | 26.50  | 119.00 | 2.00   | 0.00    | 34.00  | 25.50  | 43.50  | 46.50  | 36.70  | 425.2 |
| 1979                                                                      | 33.50  | 0.00   | 30.00  | 41.00  | 8.00   | 8.80   | 17.00   | 13.00  | 44.50  | 8.00   | 30.50  | 39.50  | 273.8 |
| 1980                                                                      | 29.50  | 91.80  | 36.20+ | 149.50 | 36.80+ | 43.50  | 146.00  | 46.40+ | 19.50  | 62.50  | 72.50  | 15.30+ | 749.5 |
| 1981                                                                      | 10.00  | 16.00  | 54.90+ | 13.10+ | 18.00  | 62.00  | 156.80+ | 3.00   | 54.00  | 34.90+ | 26.50  | 56.00  | 505.2 |
| 1982                                                                      | 16.40+ | 23.00  | 17.50  | 9.00   | 19.50  | 12.50  | 18.00   | 48.50  | 49.00  | 68.00  | 28.00  | 63.50  | 372.9 |
| 1983                                                                      | 21.00  | 64.50  | 18.00  | 8.40   | 39.00  | 42.00  | 22.00   | 43.50  | 20.00  | 48.10  | 0.00   | 19.50  | 346.0 |
| 1984                                                                      | 36.50  | 26.00  | 24.00  | 55.00  | 62.00  | 22.00  | 53.00   | 11.50  | 34.70  | 139.50 | 15.00  | 5.00   | 484.2 |
| 1985                                                                      | 94.00  | 37.50  | 55.80+ | 30.00  | 27.00  | 27.50  | 23.50   | 12.50  | 25.00  | 32.20  | 176.00 | 12.00  | 553.0 |
| 1986                                                                      | 51.70  | 43.50  | 6.00   | 8.00   | 13.50  | 15.50  | 91.00   | 24.50  | 43.50  | 19.70  | 46.00  | 54.00  | 416.9 |
| 1987                                                                      | 0.00   | 0.00+  | 23.50  | 2.00   | 17.50  | 34.50  | 48.50   | 10.50  | 35.50  | 18.50  | 47.00  | 33.50+ | 271.0 |
| 1988                                                                      | 18.10+ | 5.00+  | 14.70+ | 12.30+ | 11.50+ | 44.00+ | 88.50+  | 11.30+ | 36.40+ | 30.40+ | 33.60+ | 13.10+ | 318.9 |
| AVE :                                                                     | 33.52  | 36.19  | 18.69  | 21.80  | 25.44  | 31.49  | 42.99   | 36.92  | 33.07  | 37.50  | 46.59  | 32.78  | 397.0 |
| SD :                                                                      | 28.39  | 33.82  | 18.96  | 29.26  | 27.92  | 22.84  | 39.55   | 26.44  | 20.40  | 28.59  | 35.85  | 22.79  | 106.5 |

## Appendix A33

File : 009458\_A.NSP

Units : mm

Descrip. : Patched monthly rainfall for station 009458 a for 1972 to 1995

| Year  | Oct    | Nov    | Dec    | Jan    | Feb   | Mar    | Apr    | May    | Jun   | Jul    | Aug    | Sep    | Total |
|-------|--------|--------|--------|--------|-------|--------|--------|--------|-------|--------|--------|--------|-------|
| 1972  | 5.60+  | 30.30+ | 16.20+ | 14.20  | 0.80  | 24.90  | 11.00  | 25.10  | 31.80 | 22.70  | 29.00  | 21.80  | 233.4 |
| 1973  | 10.70  | 14.20  | 44.60  | 23.20  | 95.10 | 23.60  | 8.60   | 70.40  | 15.20 | 1.80   | 110.40 | 38.00  | 455.8 |
| 1974  | 26.60  | 35.30  | 11.20  | 23.20  | 1.40  | 12.40  | 26.20  | 62.00  | 11.60 | 49.60  | 65.40  | 52.50  | 377.4 |
| 1975  | 13.80  | 36.60  | 9.00   | 17.50  | 34.20 | 39.40  | 37.50  | 24.60  | 71.60 | 52.40  | 29.50  | 23.40  | 389.5 |
| 1976  | 68.00  | 55.20  | 27.10  | 16.40  | 52.80 | 37.80  | 60.30  | 124.90 | 48.50 | 37.80  | 30.10  | 29.90  | 588.8 |
| 1977  | 45.40  | 47.20  | 39.30  | 17.40  | 9.60  | 10.60  | 43.70  | 22.70  | 15.20 | 38.90  | 42.80  | 50.40  | 383.2 |
| 1978  | 25.10  | 23.70  | 37.00  | 27.60  | 94.70 | 5.30   | 12.70  | 47.90  | 34.00 | 45.70  | 46.10  | 35.90  | 435.7 |
| 1979  | 32.90  | 4.20   | 3.20   | 65.50  | 13.10 | 24.50  | 22.00  | 11.90  | 50.50 | 5.60   | 32.50  | 41.60  | 307.5 |
| 1980  | 36.40  | 71.00  | 32.30  | 111.30 | 23.80 | 70.90  | 128.00 | 39.90  | 26.00 | 54.20  | 90.80  | 32.50  | 717.1 |
| 1981  | 18.60  | 19.50  | 29.10  | 1.30   | 15.00 | 49.60  | 151.00 | 4.00   | 53.70 | 22.50  | 37.30  | 73.30  | 474.9 |
| 1982  | 23.50  | 18.00  | 12.20  | 4.00   | 77.50 | 10.00  | 22.50  | 40.20  | 47.30 | 56.00  | 27.50  | 62.10  | 400.8 |
| 1983  | 26.50  | 36.40  | 18.50  | 6.70   | 21.20 | 47.30  | 14.30  | 38.60  | 8.90  | 27.00  | 5.00   | 19.00  | 269.4 |
| 1984  | 37.50  | 16.40+ | 18.00  | 55.10  | 23.00 | 25.50  | 94.00  | 6.00   | 51.50 | 101.00 | 12.50  | 10.00  | 450.5 |
| 1985  | 89.50  | 46.00  | 32.00  | 3.00   | 30.50 | 18.00  | 24.50  | 3.50   | 20.30 | 26.00  | 161.60 | 28.70  | 483.6 |
| 1986  | 50.70  | 22.00  | 0.00   | 6.00   | 14.20 | 8.50   | 98.60  | 25.10  | 30.00 | 22.70  | 47.40  | 39.00  | 364.2 |
| 1987  | 6.90   | 0.00   | 28.80  | 0.50   | 6.50  | 40.40  | 43.00  | 19.00  | 45.00 | 14.30  | 33.00  | 40.90  | 278.3 |
| 1988  | 18.70  | 6.50   | 8.30   | 9.00   | 10.80 | 63.90  | 94.90  | 9.00   | 56.30 | 33.90  | 37.40  | 21.30  | 370.0 |
| 1989  | 119.00 | 45.90  | 14.00  | 14.00  | 29.50 | 13.90  | 113.60 | 35.30  | 72.10 | 11.00  | 28.90  | 10.80  | 508.0 |
| 1990  | 30.30  | 27.00  | 28.90  | 26.00  | 28.20 | 14.70  | 6.30   | 42.30  | 37.40 | 28.30  | 10.30  | 30.20  | 309.9 |
| 1991  | 97.60  | 1.00   | 19.90  | 8.60   | 28.50 | 14.20  | 22.80  | 49.10  | 61.00 | 47.60  | 14.00  | 47.40  | 411.7 |
| 1992  | 105.30 | 40.90  | 3.30   | 27.00  | 45.30 | 13.00  | 111.00 | 69.50  | 34.00 | 38.80  | 27.60  | 32.80  | 548.5 |
| 1993  | 6.40   | 12.90  | 73.40  | 16.30  | 45.10 | 24.60  | 55.20  | 36.30  | 29.90 | 30.50  | 67.20  | 11.20  | 409.0 |
| 1994  | 40.50  | 14.50  | 82.50  | 19.80  | 42.00 | 57.00  | 58.00  | 72.30  | 23.70 | 31.10  | 41.50  | 26.20  | 509.1 |
| 1995  | 22.50  | 56.00  | 81.20+ | 18.60+ | 9.60+ | 38.00+ | 7.50+  | 18.20+ | 6.90+ | 53.90+ | 9.60+  | 34.90+ | 356.9 |
| AVE : | 39.92  | 28.36  | 27.92  | 22.18  | 31.35 | 28.67  | 52.80  | 37.41  | 36.77 | 35.55  | 43.23  | 33.91  | 418.1 |
| SD :  | 32.57  | 18.95  | 23.09  | 24.40  | 26.49 | 18.64  | 43.61  | 27.97  | 19.07 | 20.85  | 35.45  | 15.72  | 109.3 |

| Appendix A34 |                                                                  |         |         |         |         |         |         |         |          |         |         |         |         |
|--------------|------------------------------------------------------------------|---------|---------|---------|---------|---------|---------|---------|----------|---------|---------|---------|---------|
| File         | : 022539_X.NSP                                                   |         |         |         |         |         |         |         |          |         |         |         |         |
| Units        | : mm                                                             |         |         |         |         |         |         |         |          |         |         |         |         |
| Descrip.     | : Patched monthly rainfall for station 022539 X for 1924 to 1998 |         |         |         |         |         |         |         |          |         |         |         |         |
| Year         | Oct                                                              | Nov     | Dec     | Jan     | Feb     | Mar     | Apr     | May     | Jun      | Jul     | Aug     | Sep     | Total   |
| 1924         | 37.60                                                            | 41.40   | 0.00    | 27.40   | 10.90   | 0.00    | 7.90    | 17.70   | 251.80   | 82.30   | 40.90   | 33.00   | 550.9   |
| 1925         | 48.50                                                            | 44.60   | 0.00    | 5.80    | 17.70   | 8.60    | 9.40    | 76.20   | 63.30    | 111.90  | 61.30   | 38.00   | 485.3   |
| 1926         | 87.00                                                            | 22.40   | 0.00    | 4.10    | 3.60    | 7.40    | 35.50   | 58.40   | 85.80    | 21.80   | 128.20  | 23.30   | 477.5   |
| 1927         | 5.10                                                             | 71.70   | 27.50   | 29.20   | 0.00    | 23.00   | 0.00    | 5.60    | 164.30   | 77.60   | 94.70   | 85.00   | 583.7   |
| 1928         | 3.80                                                             | 42.50   | 27.50   | 0.00    | 7.90    | 10.90   | 51.10   | 50.80   | 49.50    | 127.60  | 101.90  | 16.00   | 489.5   |
| 1929         | 10.70                                                            | 31.80   | 24.50   | 24.40   | 39.30   | 32.80   | 11.70   | 15.30   | 44.00    | 22.60   | 135.20  | 143.60  | 535.9   |
| 1930         | 9.10                                                             | 37.00   | 8.10    | 20.90   | 24.40   | 7.60    | 133.90  | 34.50   | 18.30    | 77.70   | 111.30  | 67.80   | 550.6   |
| 1931         | 121.90                                                           | 0.00    | 16.00   | 39.60   | 59.40   | 19.30   | 0.00    | 61.70   | 58.90    | 98.80   | 15.80   | 112.80  | 604.2   |
| 1932         | 39.50                                                            | 37.50   | 30.20   | 13.20   | 10.20   | 16.90   | 15.50   | 69.90   | 178.10   | 158.10  | 68.40   | 32.80   | 670.3   |
| 1933         | 7.40                                                             | 14.80   | 23.10   | 1.30    | 18.70   | 9.70    | 6.10    | 62.00   | 108.70   | 55.80   | 60.30   | 76.40   | 444.3   |
| 1934         | 62.20                                                            | 22.30   | 0.00    | 4.80    | 21.10#  | 18.30   | 73.00   | 106.20  | 64.30    | 51.90   | 30.30   | 29.00   | 483.4   |
| 1935         | 10.00                                                            | 67.60   | 2.80    | 42.50   | 6.70    | 25.10   | 8.40    | 74.70   | 43.90    | 148.00  | 119.30  | 62.90   | 611.9   |
| 1936         | 28.90                                                            | 107.00  | 79.80   | 9.40    | 11.00   | 33.30   | 30.50   | 59.70   | 159.70   | 136.40  | 12.70   | 56.50   | 724.9   |
| 1937         | 18.80                                                            | 17.30   | 7.90    | 12.70   | 9.20    | 32.30   | 72.00   | 54.00   | 37.30    | 42.60   | 78.90   | 91.30   | 474.3   |
| 1938         | 36.60                                                            | 14.80   | 20.80   | 1.50    | 31.00   | 49.30   | 45.10   | 71.90   | 24.40+   | 41.00   | 98.70   | 27.40   | 462.5   |
| 1939         | 3.30                                                             | 14.00   | 10.50   | 1.30    | 55.60   | 25.90   | 133.10  | 44.40   | 133.50   | 58.20   | 18.80   | 29.60   | 528.2   |
| 1940         | 23.90                                                            | 84.80   | 10.50   | 47.30   | 9.30    | 4.80    | 111.20  | 125.90  | 173.20   | 105.50  | 122.40  | 162.50  | 981.3   |
| 1941         | 63.30                                                            | 19.30   | 29.80   | 20.90   | 12.20   | 25.40   | 18.30   | 112.10  | 265.90   | 27.70   | 87.30   | 24.10   | 706.3   |
| 1942         | 31.70                                                            | 0.00    | 49.60   | 66.90   | 34.20   | 54.10   | 22.10   | 54.40   | 131.10+  | 121.80  | 129.10  | 65.80   | 760.8   |
| 1943         | 36.30                                                            | 47.00   | 12.10   | 0.00    | 2.00    | 20.10   | 23.90   | 68.50   | 200.70   | 23.30   | 108.20  | 81.00   | 623.1   |
| 1944         | 24.50                                                            | 15.10   | 15.00   | 0.00    | 0.00    | 3.50    | 47.00   | 154.80  | 154.70   | 242.10  | 140.30  | 12.20   | 809.2   |
| 1945         | 83.30                                                            | 17.80   | 1.50    | 4.10    | 18.50   | 31.50   | 11.70   | 42.90   | 26.50    | 52.50   | 36.50   | 125.90  | 452.7   |
| 1946         | 27.50                                                            | 0.00    | 9.10    | 0.00    | 0.00    | 55.40   | 17.80   | 54.80   | 24.60    | 142.10  | 52.10   | 43.90   | 427.3   |
| 1947         | 16.10                                                            | 23.40   | 8.90    | 11.90   | 6.90    | 64.00   | 39.90   | 82.30   | 42.10    | 105.30  | 22.50   | 162.40  | 585.7   |
| 1948         | 48.50                                                            | 5.10    | 12.70   | 5.60    | 1.80    | 0.00    | 69.40   | 51.80   | 54.10    | 63.10   | 94.80   | 81.10   | 488.0   |
| 1949         | 48.20                                                            | 86.50   | 11.70   | 11.20   | 0.00    | 2.60    | 81.50   | 14.20   | 25.80    | 217.30  | 17.50   | 132.80  | 649.3   |
| 1950         | 44.90                                                            | 89.60   | 29.40   | 52.50   | 0.00    | 8.90    | 62.20   | 34.10   | 204.80   | 81.20   | 65.90   | 117.80  | 791.3   |
| 1951         | 35.00                                                            | 80.50   | 3.50    | 0.00    | 8.60    | 5.30    | 22.80   | 151.60  | 41.40    | 98.60   | 153.00  | 102.90  | 703.2   |
| 1952         | 54.70                                                            | 112.30  | 24.40   | 2.50+   | 8.50+   | 3.50    | 168.80  | 106.60  | 36.50    | 120.90  | 74.30   | 17.30   | 730.3   |
| 1953         | 40.40                                                            | 52.90   | 12.50   | 4.20    | 19.40   | 41.00   | 44.60   | 187.40  | 110.50   | 253.30  | 194.30  | 52.00   | 1012.5  |
| 1954         | 34.20                                                            | 11.50   | 24.70   | 4.00    | 185.10  | 5.50    | 39.10   | 34.00   | 118.40   | 111.50  | 225.50  | 31.00   | 824.5   |
| 1955         | 105.30                                                           | 48.00   | 6.50    | 31.00   | 22.70   | 10.00   | 12.30   | 85.50   | 138.50   | 64.50   | 75.00   | 23.00   | 622.3   |
| 1956         | 41.80                                                            | 11.70   | 37.00   | 0.00    | 46.70   | 30.80   | 18.00   | 215.00  | 197.50   | 146.50  | 130.20  | 42.50   | 917.7   |
| 1957         | 66.30                                                            | 0.00    | 0.00    | 0.00    | 33.50   | 37.00   | 22.50   | 115.00  | 82.00    | 6.50    | 139.70  | 22.50   | 525.0   |
| 1958         | 42.10                                                            | 10.00   | 0.00    | 32.00   | 18.00   | 22.00   | 119.20  | 183.70  | 24.20    | 39.00   | 117.70  | 28.50   | 636.4   |
| 1959         | 65.50                                                            | 4.00    | 13.00   | 20.00   | 3.00    | 16.50   | 20.00   | 58.80   | 110.50   | 41.00   | 10.00   | 59.80   | 422.1   |
| 1960         | 14.50                                                            | 15.00   | 11.50   | 37.70   | 10.00   | 21.00   | 29.50   | 49.50   | 63.50    | 51.70   | 53.50   | 135.90  | 493.3   |
| 1961         | 29.20                                                            | 0.00    | 0.00    | 27.00   | 8.00    | 26.50   | 81.90   | 29.50   | 202.00   | 76.50   | 304.40  | 24.70   | 809.7   |
| 1962         | 156.70                                                           | 64.00   | 12.30   | 11.50   | 4.00    | 7.00    | 11.80   | 32.00   | 54.40    | 82.90   | 160.50  | 6.50    | 603.6   |
| 1963         | 25.50                                                            | 22.50   | 23.50   | 12.20   | 31.00   | 17.00   | 40.50   | 34.00   | 178.00   | 86.10   | 117.10  | 46.50   | 633.9   |
| 1964         | 17.50                                                            | 45.50   | 0.00    | 7.00    | 26.50   | 47.00   | 56.50   | 77.50   | 54.00    | 50.10   | 66.00   | 30.50   | 478.1   |
| 1965         | 79.50                                                            | 39.50   | 57.60   | 0.00    | 2.00    | 37.80   | 25.80   | 36.70   | 143.50   | 89.00   | 77.00   | 50.00   | 638.4   |
| 1966         | 17.50                                                            | 3.50    | 0.00    | 0.00    | 0.00    | 0.00    | 48.00   | 69.00   | 113.00   | 73.50   | 68.50   | 17.50   | 510.5   |
| 1967         | 39.00                                                            | 41.80   | 8.00    | 5.50    | 14.00   | 2.30    | 36.80   | 87.80   | 123.40   | 94.70   | 71.40   | 23.70   | 448.4   |
| 1968         | 98.80                                                            | 17.00   | 0.00    | 15.50   | 19.50   | 9.00    | 52.80   | 4.00    | 60.60    | 36.70   | 50.70   | 66.40   | 431.0   |
| 1969         | 92.30                                                            | 4.50    | 0.00    | 0.00    | 29.00   | 1.00    | 0.00    | 53.70   | 115.30   | 124.30  | 134.40  | 44.70   | 599.2   |
| 1970         | 40.50                                                            | 0.00    | 23.20   | 6.20    | 2.20    | 17.60   | 19.20   | 72.90   | 77.00    | 143.80  | 104.50  | 14.60   | 521.7   |
| 1971         | 24.40                                                            | 20.40#  | 10.70   | 38.40   | 22.40   | 19.10   | 71.40   | 92.30   | 70.80    | 40.10   | 66.20   | 41.20   | 517.4   |
| 1972         | 25.70                                                            | 15.00   | 9.50    | 7.50    | 2.60    | 8.40    | 24.10   | 29.60   | 14.80    | 137.70  | 62.00   | 54.80   | 391.7   |
| 1973         | 15.60                                                            | 22.00   | 15.00   | 9.70    | 9.00    | 19.10   | 9.00    | 77.70   | 68.20    | 60.30   | 419.60  | 52.70   | 777.9   |
| 1974         | 61.70                                                            | 15.80   | 5.80    | 14.20   | 9.50    | 0.30    | 30.60   | 169.40  | 40.90    | 93.20   | 127.70  | 20.80   | 589.9   |
| 1975         | 45.90                                                            | 14.60   | 0.30    | 0.10    | 11.20   | 38.20   | 18.70   | 42.10   | 204.50   | 108.10  | 42.00   | 44.00   | 569.7   |
| 1976         | 41.80                                                            | 129.10  | 49.80   | 16.50   | 57.00   | 15.40   | 101.00+ | 208.90  | 122.30   | 195.50  | 204.60  | 25.10   | 1167.0  |
| 1977         | 7.30                                                             | 21.50   | 47.00   | 19.30   | 5.30    | 24.10   | 32.90   | 15.00   | 20.60    | 32.30   | 149.70  | 44.00   | 419.0   |
| 1978         | 22.30                                                            | 11.30   | 41.20   | 27.70   | 60.40   | 1.10    | 1.20    | 70.20   | 148.50   | 74.50   | 70.70   | 57.40*  | 586.5   |
| 1979         | 62.40                                                            | 1.90    | 2.70    | 17.70   | 6.10    | 3.30    | 23.50   | 103.70  | 95.90    | 36.90   | 81.70   | 44.10+  | 479.9   |
| 1980         | 39.90                                                            | 96.90   | 57.70   | 158.50  | 16.70   | 34.70   | 68.30   | 2.70    | 34.70    | 168.00  | 115.20  | 135.90  | 929.2   |
| 1981         | 35.40                                                            | 8.30    | 8.20    | 9.40    | 1.00    | 13.70   | 128.00  | 20.20   | 114.60   | 43.10   | 52.50   | 15.90   | 450.3   |
| 1982         | 17.40                                                            | 11.60   | 25.10   | 15.80   | 50.90   | 38.90   | 10.60   | 133.90  | 164.70   | 157.00  | 51.30   | 95.70   | 772.9   |
| 1983         | 24.80*                                                           | 1.40    | 6.10    | 14.30   | 11.00   | 43.60   | 45.20   | 265.60  | 19.60*   | 120.80* | 34.40   | 154.00* | 740.8   |
| 1984         | 115.20                                                           | 4.90    | 68.20*  | 45.90   | 47.30   | 88.50   | 67.50   | 16.30   | 85.90    | 177.50  | 100.50  | 33.60   | 851.3   |
| 1985         | 68.80                                                            | 15.80   | 56.70   | 2.30    | 37.90   | 54.60   | 24.20   | 20.00   | 108.00   | 68.90   | 151.20  | 34.30   | 642.7   |
| 1986         | 34.60                                                            | 39.30   | 0.70    | 9.20    | 14.90   | 10.40   | 72.10   | 130.50  | 92.30    | 35.60   | 137.70  | 63.10   | 640.4   |
| 1987         | 5.80                                                             | 3.70    | 14.20   | 3.80+   | 0.00+   | 30.60+  | 59.60+  | 38.50   | 79.70    | 42.90   | 96.80   | 48.80   | 424.4   |
| 1988         | 24.40                                                            | 7.10    | 5.80    | 7.00    | 11.70   | 82.50   | 90.70   | 37.40   | 75.10    | 111.00  | 100.70  | 59.40   | 612.8   |
| 1989         | 75.30                                                            | 26.20   | 0.10    | 14.70   | 17.30   | 8.00    | 53.60   | 85.70   | 139.30   | 78.90   | 75.80   | 14.90   | 589.8   |
| 1990         | 15.70                                                            | 29.30   | 13.60   | 15.10   | 0.20    | 10.20   | 34.10   | 76.20   | 150.80   | 221.10  | 27.90   | 94.70   | 688.9   |
| 1991         | 58.00                                                            | 3.10    | 6.30    | 4.80    | 11.10   | 14.90   | 67.70   | 58.50   | 190.90   | 134.00  | 95.10   | 34.90   | 679.3   |
| 1992         | 116.00                                                           | 5.80    | 1.60    | 14.20   | 39.80   | 2.30    | 239.40  | 53.20   | 92.00    | 300.30  | 48.20   | 15.20   | 928.0   |
| 1993         | 2.90                                                             | 13.30   | 55.00   | 3.20    | 10.30   | 5.30    | 40.40   | 56.10   | 263.60   | 83.60   | 32.50   | 74.10   | 640.3   |
| 1994         | 29.60                                                            | 2.20    | 51.10   | 13.00   | 8.50    | 31.00   | 28.50   | 111.40  | 93.80    | 124.90  | 89.20   | 21.70   | 604.9   |
| 1995         | 101.60                                                           | 53.60   | 82.30   | 4.90    | 27.20   | 31.20   | 13.40   | 67.70   | 222.80   | 163.20  | 103.30  | 81.30   | 952.5   |
| 1996         | 106.30                                                           | 54.10   | 30.40   | 3.20    | 7.20    | 2.90    | 37.50   | 114.90  | 201.60   | 34.40   | 57.90   | 2.70    | 653.1   |
| 1997         | 22.80                                                            | 78.30   | 15.10   | 19.00   | 0.70    | 15.30   | 42.80   | 160.50  | 47.40    | 68.30   | 42.60   | 11.50   | 524.3   |
| 1998         | 6.50                                                             | 46.90   | 85.30   | 10.20   | 0.90    | 4.20    | 45.10   | 65.50   | 72.90    | 60.10   | 121.30  | 56.10+  | 575.0   |
| AVE          | : 43.77                                                          | : 30.84 | : 19.90 | : 15.93 | : 18.69 | : 21.34 | : 46.53 | : 75.56 | : 104.93 | : 96.77 | : 95.19 | : 56.10 | : 625.5 |
| SD           | : 33.08                                                          | : 30.49 | : 21.47 | : 21.98 | : 25.19 | : 18.96 | : 42.04 | : 53.27 | : 65.27  | : 59.34 | : 64.58 | : 40.19 | : 162.3 |



| Appendix A35                                                             |       |       |       |       |        |       |        |       |       |       |        |       |       |
|--------------------------------------------------------------------------|-------|-------|-------|-------|--------|-------|--------|-------|-------|-------|--------|-------|-------|
| File : P023895.NSI                                                       |       |       |       |       |        |       |        |       |       |       |        |       |       |
| Units : mm                                                               |       |       |       |       |        |       |        |       |       |       |        |       |       |
| Descrip. : Patched monthly rainfall for station P023895 for 1952 to 1981 |       |       |       |       |        |       |        |       |       |       |        |       |       |
| Year                                                                     | Oct   | Nov   | Dec   | Jan   | Feb    | Mar   | Apr    | May   | Jun   | Jul   | Aug    | Sep   | Total |
| 1952                                                                     | 10.50 | 73.90 | 17.00 | 6.40  | 4.60   | 1.30  | 54.90  | 12.20 | 38.40 | 42.90 | 9.90   | 25.90 | 297.9 |
| 1953                                                                     | 31.50 | 17.30 | 11.90 | 11.20 | 1.00   | 29.00 | 13.50  | 83.30 | 46.70 | 46.00 | 44.50  | 15.50 | 351.4 |
| 1954                                                                     | 0.00  | 7.90  | 2.80  | 0.80  | 127.50 | 5.10  | 2.50   | 12.20 | 16.80 | 44.20 | 26.20  | 5.10  | 251.1 |
| 1955                                                                     | 8.60  | 0.00  | 0.00  | 1.50  | 29.20  | 7.10  | 2.00   | 36.60 | 40.10 | 21.10 | 23.90  | 7.10  | 177.2 |
| 1956                                                                     | 29.00 | 0.00  | 21.80 | 0.00  | 25.70  | 19.80 | 0.00   | 90.40 | 61.00 | 23.60 | 59.20  | 16.50 | 347.0 |
| 1957                                                                     | 52.10 | 0.00  | 0.00  | 0.00  | 17.00  | 12.50 | 28.70  | 72.40 | 10.90 | 2.80  | 33.80  | 8.60  | 238.8 |
| 1958                                                                     | 37.80 | 10.20 | 2.00  | 21.10 | 22.90  | 24.60 | 72.10  | 56.40 | 5.10  | 63.80 | 24.90  | 16.00 | 356.9 |
| 1959                                                                     | 39.60 | 2.30  | 4.10  | 2.30  | 2.80   | 11.70 | 3.60   | 19.60 | 27.90 | 29.20 | 15.20  | 16.00 | 174.3 |
| 1960                                                                     | 0.00  | 8.90  | 24.40 | 10.20 | 0.00   | 15.50 | 43.70  | 41.20 | 6.60  | 12.70 | 23.10  | 36.10 | 222.4 |
| 1961                                                                     | 16.50 | 0.00  | 1.30  | 36.10 | 5.30   | 20.80 | 34.80  | 12.20 | 54.90 | 12.50 | 139.20 | 5.60  | 339.2 |
| 1962                                                                     | 67.30 | 63.50 | 1.00  | 17.50 | 4.60   | 26.20 | 8.40   | 78.00 | 22.10 | 28.50 | 13.50  | 0.00  | 330.6 |
| 1963                                                                     | 22.10 | 43.70 | 40.40 | 30.00 | 1.00   | 8.60  | 37.60  | 9.10  | 66.50 | 9.70  | 36.10  | 25.40 | 330.2 |
| 1964                                                                     | 20.80 | 84.10 | 2.50  | 0.00  | 23.60  | 14.50 | 41.40  | 39.60 | 9.90  | 42.40 | 31.00  | 0.00  | 309.8 |
| 1965                                                                     | 24.90 | 26.70 | 17.50 | 0.00  | 0.00   | 6.60  | 26.90  | 25.70 | 14.20 | 2.30  | 77.70  | 25.20 | 247.7 |
| 1966                                                                     | 2.50  | 2.00  | 0.80  | 0.00  | 8.10   | 15.70 | 73.20  | 36.30 | 30.20 | 12.70 | 21.10  | 11.70 | 214.3 |
| 1967                                                                     | 23.60 | 27.20 | 3.60  | 0.00  | 2.00   | 6.60  | 16.80  | 22.10 | 53.60 | 8.60  | 44.50  | 7.10  | 215.7 |
| 1968                                                                     | 13.70 | 40.40 | 0.00  | 13.70 | 14.70  | 5.10  | 62.50  | 1.50  | 34.50 | 13.70 | 16.00  | 12.70 | 228.5 |
| 1969                                                                     | 23.60 | 7.60  | 0.00  | 0.00  | 15.80  | 2.50  | 0.00   | 11.70 | 38.60 | 30.20 | 58.20  | 7.60  | 195.8 |
| 1970                                                                     | 25.70 | 0.00  | 14.00 | 2.30  | 8.90   | 36.60 | 39.90  | 37.90 | 13.20 | 70.60 | 88.10  | 8.90  | 346.1 |
| 1971                                                                     | 5.30  | 21.60 | 9.40  | 11.20 | 7.10   | 60.20 | 0.00   | 27.70 | 7.90  | 22.60 | 23.40  | 40.60 | 237.0 |
| 1972                                                                     | 10.90 | 8.40  | 10.70 | 7.10  | 1.50   | 8.40  | 3.10   | 33.80 | 22.60 | 19.30 | 43.70  | 29.00 | 198.5 |
| 1973                                                                     | 5.60  | 9.90  | 2.80  | 10.90 | 54.60  | 18.30 | 3.60   | 56.90 | 19.30 | 1.80  | 123.70 | 26.20 | 333.6 |
| 1974                                                                     | 25.20 | 25.90 | 0.00  | 21.80 | 17.80  | 0.50  | 14.50  | 44.20 | 32.00 | 39.60 | 50.80  | 16.30 | 288.6 |
| 1975                                                                     | 13.70 | 10.20 | 5.10  | 0.00  | 19.60  | 43.20 | 32.50  | 41.70 | 82.60 | 24.60 | 24.60  | 11.20 | 309.0 |
| 1976                                                                     | 53.60 | 57.70 | 5.10  | 1.80  | 43.40  | 7.60  | 99.60  | 68.80 | 30.00 | 74.70 | 32.30  | 21.10 | 495.7 |
| 1977                                                                     | 3.80  | 29.70 | 21.60 | 2.00  | 2.80   | 12.20 | 30.00  | 3.30  | 12.70 | 19.10 | 50.80  | 12.50 | 200.5 |
| 1978                                                                     | 13.20 | 12.20 | 21.10 | 3.10  | 46.50  | 0.50  | 0.00   | 44.70 | 33.30 | 32.00 | 27.70  | 19.80 | 254.1 |
| 1979                                                                     | 21.10 | 0.00  | 4.10  | 19.30 | 0.00   | 10.40 | 12.50  | 33.80 | 36.30 | 4.10  | 26.40  | 26.40 | 194.4 |
| 1980                                                                     | 18.30 | 62.20 | 29.70 | 89.90 | 48.80  | 47.80 | 46.70  | 29.70 | 14.20 | 51.80 | 69.30  | 33.80 | 542.2 |
| 1981                                                                     | 15.20 | 3.60  | 24.40 | 33.80 | 3.80   | 3.60  | 144.00 | 1.30  | 19.80 | 38.10 | 11.20  | 20.30 | 319.1 |
| AVE :                                                                    | 21.19 | 21.90 | 9.97  | 11.80 | 18.69  | 16.08 | 31.63  | 36.14 | 30.06 | 28.17 | 42.33  | 16.94 | 284.9 |
| SD :                                                                     | 16.23 | 24.52 | 10.79 | 18.23 | 25.96  | 14.75 | 33.52  | 24.63 | 19.35 | 19.96 | 31.21  | 10.42 | 86.9  |

## Appendix A36

File : P024057.NSI

Units : mm

Descrip. : Patched monthly rainfall for station P024057 for 1958 to 1978

| Year  | Oct   | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul   | Aug    | Sep   | Total |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|-------|
| 1958  | 18.60 | 13.50 | 5.60  | 24.90 | 25.10 | 15.70 | 66.80 | 55.10 | 0.00  | 49.00 | 27.20  | 10.20 | 311.7 |
| 1959  | 35.80 | 0.00  | 0.00  | 3.30  | 0.80  | 4.60  | 0.00  | 13.70 | 24.90 | 24.10 | 14.70  | 6.60  | 128.5 |
| 1960  | 0.00  | 10.20 | 22.90 | 20.30 | 0.80  | 12.70 | 30.50 | 37.30 | 4.60  | 15.00 | 23.40  | 31.20 | 208.9 |
| 1961  | 18.50 | 2.80  | 0.00  | 27.40 | 6.40  | 20.60 | 25.00 | 12.70 | 48.00 | 7.40  | 133.40 | 0.00  | 303.1 |
| 1962  | 57.40 | 52.30 | 0.00  | 7.60  | 4.30  | 17.00 | 0.00  | 46.00 | 21.30 | 34.00 | 18.30  | 0.00  | 258.2 |
| 1963  | 21.80 | 27.90 | 33.00 | 0.00  | 16.50 | 0.00  | 33.50 | 13.00 | 60.70 | 9.40  | 45.70  | 26.40 | 287.9 |
| 1964  | 27.40 | 41.70 | 0.00  | 0.00  | 22.40 | 16.00 | 17.80 | 38.90 | 11.70 | 35.80 | 30.50  | 0.00  | 242.2 |
| 1965  | 32.30 | 27.20 | 20.60 | 3.30  | 0.00  | 17.30 | 28.20 | 24.10 | 15.50 | 8.10  | 59.70  | 29.70 | 266.0 |
| 1966  | 0.00  | 0.00  | 0.00  | 0.00  | 4.60  | 17.30 | 95.80 | 38.90 | 34.50 | 10.20 | 21.30  | 8.90  | 231.5 |
| 1967  | 21.80 | 26.20 | 6.10  | 3.80  | 15.20 | 0.00  | 17.00 | 11.20 | 64.80 | 9.10  | 29.50  | 20.80 | 225.5 |
| 1968  | 30.50 | 33.80 | 0.00  | 20.60 | 13.00 | 2.80  | 68.10 | 0.00  | 38.60 | 12.20 | 12.70  | 6.90  | 239.2 |
| 1969  | 15.50 | 0.00  | 0.00  | 0.00  | 14.20 | 2.50  | 1.00  | 20.30 | 23.60 | 25.10 | 52.10  | 3.00  | 157.3 |
| 1970  | 16.80 | 0.00  | 6.90  | 0.00  | 3.30  | 27.20 | 70.60 | 31.50 | 11.70 | 68.30 | 69.90  | 7.60  | 313.8 |
| 1971  | 3.00  | 19.30 | 5.80  | 6.40  | 0.00  | 15.70 | 28.40 | 34.30 | 14.20 | 24.90 | 29.70  | 24.90 | 206.6 |
| 1972  | 0.00  | 4.60  | 5.30  | 0.00  | 0.00  | 0.00  | 0.00  | 18.50 | 17.00 | 11.10 | 35.30  | 15.70 | 107.5 |
| 1973  | 0.00  | 11.40 | 0.00  | 5.10  | 30.90 | 10.20 | 0.00  | 54.60 | 10.20 | 6.60  | 120.70 | 14.50 | 264.2 |
| 1974  | 15.80 | 26.70 | 0.00  | 3.60  | 26.90 | 0.00  | 11.20 | 33.00 | 9.70  | 47.50 | 25.70  | 14.20 | 214.3 |
| 1975  | 1.40  | 0.00  | 0.00  | 0.00  | 1.50  | 49.30 | 34.80 | 34.50 | 77.50 | 17.00 | 20.80  | 15.20 | 252.0 |
| 1976  | 26.90 | 42.40 | 0.00  | 0.00  | 35.10 | 2.50  | 76.20 | 58.40 | 21.60 | 57.70 | 25.10  | 14.00 | 359.9 |
| 1977  | 0.00  | 7.40  | 22.40 | 0.00  | 0.50  | 7.60  | 22.90 | 3.30  | 9.70  | 16.30 | 37.80  | 11.40 | 139.3 |
| 1978  | 8.90  | 13.20 | 16.50 | 6.20  | 22.00 | 0.00  | 10.60 | 21.10 | 57.00 | 20.10 | 18.90  | 20.90 | 215.4 |
| AVE : | 16.78 | 17.17 | 6.91  | 6.31  | 11.60 | 11.38 | 30.44 | 28.59 | 27.47 | 24.23 | 40.59  | 13.43 | 234.9 |
| SD :  | 15.19 | 16.10 | 9.97  | 8.90  | 11.56 | 11.99 | 28.73 | 16.85 | 22.02 | 18.00 | 32.33  | 9.51  | 64.4  |

| Appendix A37                                                             |       |        |       |       |        |       |        |        |       |       |        |       |       |
|--------------------------------------------------------------------------|-------|--------|-------|-------|--------|-------|--------|--------|-------|-------|--------|-------|-------|
| File : W024146.NSI                                                       |       |        |       |       |        |       |        |        |       |       |        |       |       |
| Units : mm                                                               |       |        |       |       |        |       |        |        |       |       |        |       |       |
| Descrip. : Patched monthly rainfall for station W024146 for 1925 to 1982 |       |        |       |       |        |       |        |        |       |       |        |       |       |
| Year                                                                     | Oct   | Nov    | Dec   | Jan   | Feb    | Mar   | Apr    | May    | Jun   | Jul   | Aug    | Sep   | Total |
| 1925                                                                     | 13.20 | 9.40   | 2.30  | 0.00  | 4.60   | 4.80  | 11.20  | 20.20  | 18.60 | 45.90 | 18.60  | 20.10 | 168.9 |
| 1926                                                                     | 40.60 | 32.40  | 0.00  | 9.90  | 16.80  | 11.70 | 48.00  | 30.50  | 25.10 | 4.90  | 38.20  | 8.60  | 266.7 |
| 1927                                                                     | 0.00  | 10.90  | 15.50 | 7.60  | 3.00   | 98.80 | 7.60   | 6.40   | 1.30  | 15.10 | 22.20  | 35.00 | 223.4 |
| 1928                                                                     | 4.10  | 69.30  | 18.00 | 1.50  | 0.00   | 24.50 | 11.40  | 22.70  | 11.90 | 57.50 | 45.90  | 6.90  | 273.7 |
| 1929                                                                     | 8.00  | 13.20  | 13.90 | 12.70 | 72.60  | 32.50 | 9.60   | 18.30  | 6.10  | 6.10  | 49.10  | 24.20 | 266.3 |
| 1930                                                                     | 12.20 | 24.40  | 0.00  | 0.00  | 12.40  | 14.00 | 70.40  | 0.00   | 0.00  | 49.80 | 34.00  | 11.90 | 229.1 |
| 1931                                                                     | 62.00 | 23.90  | 0.00  | 14.70 | 21.60  | 0.00  | 0.00   | 9.70   | 44.70 | 14.70 | 0.00   | 99.20 | 290.5 |
| 1932                                                                     | 0.00  | 33.00  | 4.10  | 0.00  | 0.00   | 10.20 | 0.00   | 20.60  | 22.90 | 29.80 | 56.60  | 0.00  | 177.2 |
| 1933                                                                     | 0.00  | 0.00   | 0.00  | 0.00  | 4.10   | 29.50 | 0.00   | 18.00  | 4.30  | 31.50 | 38.30  | 27.70 | 153.4 |
| 1934                                                                     | 38.70 | 21.10  | 0.00  | 0.00  | 13.70  | 7.90  | 25.70  | 46.20  | 16.80 | 0.00  | 22.90  | 14.70 | 207.7 |
| 1935                                                                     | 0.00  | 19.10  | 2.80  | 0.00  | 1.50   | 9.70  | 3.30   | 21.30  | 6.60  | 26.60 | 12.70  | 21.10 | 124.7 |
| 1936                                                                     | 0.00  | 69.90  | 25.40 | 6.60  | 0.00   | 32.30 | 11.40  | 0.00   | 20.50 | 50.10 | 0.00   | 36.40 | 252.6 |
| 1937                                                                     | 23.90 | 4.10   | 33.50 | 0.00  | 0.00   | 21.70 | 71.00  | 23.20  | 21.60 | 37.80 | 10.40  | 19.40 | 266.6 |
| 1938                                                                     | 18.80 | 7.60   | 19.10 | 1.30  | 58.40  | 33.50 | 13.40  | 6.60   | 2.50  | 32.70 | 85.00  | 6.80  | 285.7 |
| 1939                                                                     | 4.10  | 2.80   | 8.60  | 7.60  | 25.90  | 52.10 | 45.50  | 11.40  | 30.20 | 2.50  | 2.50   | 19.30 | 212.5 |
| 1940                                                                     | 29.90 | 30.50  | 0.00  | 8.10  | 0.00   | 0.80  | 67.30  | 51.80  | 37.40 | 50.80 | 23.90  | 21.10 | 321.6 |
| 1941                                                                     | 35.90 | 4.80   | 0.00  | 24.40 | 3.80   | 0.00  | 11.40  | 51.30  | 44.20 | 15.80 | 9.30   | 18.30 | 219.2 |
| 1942                                                                     | 29.40 | 9.70   | 56.60 | 60.50 | 30.70  | 41.90 | 41.50  | 10.90  | 22.20 | 9.90  | 30.30  | 54.60 | 398.2 |
| 1943                                                                     | 14.70 | 54.20  | 13.70 | 0.00  | 0.00   | 19.60 | 17.40  | 44.20  | 50.60 | 15.80 | 36.80  | 42.60 | 309.6 |
| 1944                                                                     | 20.30 | 5.60   | 0.00  | 0.00  | 0.00   | 1.50  | 13.70  | 50.10  | 52.60 | 56.10 | 31.00  | 6.10  | 237.0 |
| 1945                                                                     | 73.70 | 13.50  | 2.00  | 2.00  | 2.10   | 52.80 | 8.40   | 11.30  | 8.90  | 16.00 | 8.40   | 25.60 | 224.7 |
| 1946                                                                     | 25.60 | 7.10   | 6.10  | 0.00  | 1.00   | 51.90 | 17.30  | 20.80  | 11.90 | 46.70 | 2.30   | 13.40 | 204.1 |
| 1947                                                                     | 19.00 | 27.70  | 6.30  | 17.20 | 6.40   | 32.40 | 23.10  | 13.50  | 21.80 | 29.30 | 5.60   | 24.00 | 226.3 |
| 1948                                                                     | 89.40 | 0.80   | 21.10 | 2.00  | 2.00   | 0.00  | 47.50  | 16.80  | 7.90  | 26.70 | 12.20  | 11.50 | 237.9 |
| 1949                                                                     | 0.80  | 122.40 | 0.00  | 0.00  | 0.00   | 2.00  | 38.10  | 22.10  | 3.30  | 45.50 | 27.20  | 21.90 | 283.3 |
| 1950                                                                     | 28.40 | 44.10  | 5.60  | 56.20 | 0.00   | 18.00 | 44.40  | 7.40   | 33.80 | 24.90 | 7.90   | 41.90 | 312.6 |
| 1951                                                                     | 10.40 | 0.00   | 0.00  | 1.00  | 17.50  | 10.60 | 23.10  | 14.70  | 28.70 | 28.90 | 53.00  | 49.60 | 237.5 |
| 1952                                                                     | 24.90 | 62.00  | 18.80 | 0.00  | 4.30   | 4.50  | 47.10  | 16.20  | 36.70 | 35.60 | 12.60  | 29.20 | 291.9 |
| 1953                                                                     | 52.60 | 16.20  | 9.50  | 1.00  | 6.00   | 29.20 | 15.90  | 81.70  | 57.60 | 37.80 | 49.20  | 15.10 | 371.8 |
| 1954                                                                     | 0.00  | 12.20  | 0.00  | 5.30  | 107.90 | 11.50 | 10.50  | 13.50  | 32.30 | 43.70 | 58.20  | 22.40 | 317.5 |
| 1955                                                                     | 9.20  | 1.70   | 0.00  | 21.00 | 19.80  | 27.00 | 3.00   | 46.00  | 27.30 | 22.00 | 26.40  | 15.80 | 219.2 |
| 1956                                                                     | 39.30 | 3.30   | 32.00 | 0.70  | 36.30  | 18.90 | 1.10   | 82.30  | 55.50 | 20.50 | 48.50  | 46.80 | 385.2 |
| 1957                                                                     | 33.50 | 0.00   | 0.00  | 0.00  | 6.60   | 24.20 | 24.00  | 110.20 | 23.10 | 2.00  | 32.20  | 6.90  | 262.7 |
| 1958                                                                     | 35.90 | 13.20  | 0.80  | 8.70  | 24.80  | 21.80 | 79.40  | 54.80  | 1.40  | 52.70 | 36.50  | 6.60  | 336.6 |
| 1959                                                                     | 43.30 | 1.50   | 3.00  | 0.00  | 9.40   | 17.70 | 4.50   | 15.00  | 30.50 | 27.90 | 17.10  | 14.20 | 184.1 |
| 1960                                                                     | 3.50  | 14.80  | 15.00 | 41.30 | 0.80   | 7.90  | 38.60  | 38.80  | 3.20  | 12.50 | 30.80  | 26.50 | 233.7 |
| 1961                                                                     | 27.80 | 4.00   | 0.20  | 26.00 | 1.70   | 20.00 | 31.10  | 18.70  | 42.30 | 8.50  | 128.10 | 6.20  | 314.6 |
| 1962                                                                     | 59.90 | 73.40  | 0.00  | 23.30 | 3.50   | 33.70 | 12.60  | 62.00  | 38.50 | 37.00 | 12.80  | 0.00  | 356.7 |
| 1963                                                                     | 24.50 | 62.20  | 37.70 | 20.70 | 19.10  | 5.20  | 28.20  | 9.20   | 67.70 | 9.80  | 59.10  | 40.70 | 384.1 |
| 1964                                                                     | 44.00 | 36.20  | 1.20  | 0.00  | 20.50  | 14.50 | 17.00  | 36.00  | 17.50 | 13.50 | 28.00  | 1.50  | 229.9 |
| 1965                                                                     | 3.00  | 31.50  | 0.00  | 0.00  | 0.00   | 23.50 | 0.00   | 25.50  | 0.00  | 18.90 | 59.50  | 28.50 | 190.4 |
| 1966                                                                     | 2.50  | 0.00   | 0.00  | 0.20  | 1.50   | 12.50 | 107.60 | 30.00  | 24.00 | 11.00 | 29.00  | 12.70 | 231.0 |
| 1967                                                                     | 16.20 | 26.50  | 47.80 | 5.50  | 1.70   | 2.00  | 9.50   | 17.30  | 42.10 | 13.50 | 33.50  | 11.10 | 226.7 |
| 1968                                                                     | 10.00 | 33.50  | 0.00  | 17.00 | 15.50  | 6.20  | 106.20 | 1.50   | 44.50 | 10.60 | 7.00   | 0.00  | 252.0 |
| 1969                                                                     | 18.10 | 2.90   | 0.00  | 0.00  | 27.70  | 0.00  | 0.00   | 21.90  | 32.00 | 12.50 | 43.60  | 3.20  | 161.9 |
| 1970                                                                     | 21.10 | 0.00   | 0.00  | 4.00  | 12.40  | 25.00 | 95.00  | 17.70  | 22.10 | 80.20 | 79.40  | 4.50  | 361.4 |
| 1971                                                                     | 5.20  | 104.90 | 0.00  | 41.00 | 10.40  | 25.10 | 38.80  | 42.40  | 16.50 | 22.50 | 19.50  | 29.30 | 355.6 |
| 1972                                                                     | 5.00  | 7.00   | 5.10  | 9.00  | 1.10   | 5.00  | 15.20  | 13.20  | 15.00 | 21.90 | 17.00  | 18.80 | 133.3 |
| 1973                                                                     | 0.40  | 24.50  | 11.80 | 9.40  | 36.70  | 26.40 | 2.10   | 66.70  | 14.80 | 0.80  | 29.00  | 34.30 | 256.9 |
| 1974                                                                     | 24.30 | 17.20  | 0.00  | 20.50 | 6.80   | 5.00  | 5.50   | 35.90  | 29.20 | 31.50 | 44.40  | 13.70 | 234.0 |
| 1975                                                                     | 17.80 | 13.30  | 3.30  | 0.00  | 7.00   | 29.20 | 22.90  | 21.20  | 62.10 | 22.00 | 21.00  | 23.00 | 242.8 |
| 1976                                                                     | 35.00 | 37.30  | 6.50  | 5.50  | 46.60  | 40.00 | 213.00 | 81.10  | 12.50 | 31.00 | 21.10  | 20.50 | 550.1 |
| 1977                                                                     | 0.00  | 25.20  | 7.50  | 2.70  | 5.40   | 10.10 | 38.20  | 7.50   | 0.00  | 13.50 | 37.40  | 12.30 | 159.8 |
| 1978                                                                     | 4.60  | 3.10   | 24.30 | 14.60 | 75.20  | 1.00  | 0.00   | 33.20  | 25.70 | 41.10 | 46.50  | 21.50 | 290.8 |
| 1979                                                                     | 21.40 | 0.00   | 1.00  | 18.50 | 0.50   | 11.50 | 16.40  | 21.20  | 36.60 | 4.50  | 24.00  | 20.10 | 175.7 |
| 1980                                                                     | 20.50 | 84.40  | 4.30  | 68.00 | 66.00  | 63.50 | 45.30  | 36.10  | 12.00 | 56.40 | 65.90  | 32.10 | 554.5 |
| 1981                                                                     | 36.30 | 9.70   | 9.00  | 28.00 | 6.00   | 23.50 | 129.30 | 15.00  | 32.50 | 26.40 | 13.20  | 1.00  | 329.9 |
| 1982                                                                     | 18.00 | 5.50   | 0.00  | 0.00  | 9.00   | 0.00  | 11.90  | 34.70  | 45.90 | 40.20 | 13.50  | 79.30 | 258.0 |
| AVE :                                                                    | 21.74 | 23.94  | 8.51  | 10.78 | 15.32  | 20.01 | 31.92  | 28.91  | 25.13 | 26.78 | 31.52  | 22.06 | 266.6 |
| SD :                                                                     | 19.66 | 27.29  | 12.65 | 15.78 | 22.24  | 18.49 | 38.41  | 22.86  | 17.28 | 17.46 | 23.41  | 18.35 | 84.9  |

Appendix A38

File : P024324.NSI

Units : mm

Descrip. : Patched monthly rainfall for station W024324 for 1970 to 1981

| Year  | Oct   | Nov   | Dec   | Jan    | Feb   | Mar   | Apr   | May    | Jun   | Jul    | Aug    | Sep   | Total |
|-------|-------|-------|-------|--------|-------|-------|-------|--------|-------|--------|--------|-------|-------|
| 1970  | 36.70 | 16.10 | 40.90 | 11.90  | 45.00 | 42.20 | 65.30 | 56.20  | 32.60 | 112.80 | 99.80  | 7.40  | 566.9 |
| 1971  | 15.20 | 59.40 | 18.50 | 8.60   | 48.50 | 30.70 | 37.10 | 68.10  | 33.80 | 25.40  | 39.90  | 51.80 | 437.0 |
| 1972  | 4.30  | 13.70 | 16.80 | 6.10   | 4.80  | 7.40  | 32.00 | 37.80  | 45.00 | 29.00  | 54.90  | 31.80 | 283.6 |
| 1973  | 5.10  | 35.30 | 24.60 | 44.20  | 64.00 | 30.20 | 12.20 | 116.10 | 16.80 | 6.40   | 141.70 | 47.80 | 544.4 |
| 1974  | 28.40 | 31.00 | 0.00  | 27.20  | 33.30 | 28.40 | 9.10  | 61.00  | 45.50 | 44.70  | 53.10  | 40.90 | 402.6 |
| 1975  | 10.20 | 42.20 | 19.80 | 9.70   | 35.60 | 48.50 | 92.20 | 90.70  | 87.90 | 28.50  | 23.60  | 40.40 | 529.3 |
| 1976  | 53.10 | 54.10 | 18.80 | 18.00  | 56.40 | 17.80 | 72.40 | 131.80 | 22.90 | 48.30  | 46.50  | 32.30 | 572.4 |
| 1977  | 9.40  | 21.80 | 35.10 | 6.60   | 6.40  | 16.30 | 43.70 | 36.60  | 19.10 | 26.90  | 53.60  | 32.30 | 307.8 |
| 1978  | 33.50 | 37.30 | 50.60 | 41.90  | 80.80 | 18.50 | 15.80 | 80.50  | 40.90 | 60.70  | 50.00  | 63.50 | 574.0 |
| 1979  | 29.00 | 5.10  | 19.80 | 28.70  | 21.60 | 11.90 | 20.10 | 26.40  | 54.40 | 16.00  | 31.00  | 33.30 | 297.3 |
| 1980  | 37.30 | 47.20 | 39.90 | 102.90 | 54.40 | 58.40 | 74.40 | 50.60  | 17.30 | 68.80  | 121.20 | 48.00 | 720.4 |
| 1981  | 26.90 | 32.50 | 27.20 | 20.30  | 22.90 | 33.50 | 72.40 | 0.00   | 31.50 | 63.50  | 10.00  | 85.10 | 425.8 |
| AVE : | 24.09 | 32.98 | 26.00 | 27.18  | 39.48 | 28.65 | 45.56 | 62.98  | 37.31 | 44.25  | 60.44  | 42.88 | 471.8 |
| SD :  | 15.24 | 16.57 | 13.66 | 27.18  | 23.11 | 15.37 | 28.72 | 37.53  | 20.04 | 29.12  | 39.85  | 19.18 | 135.1 |

## Appendix A39

File : P024447.NSI

Units : mm

Descrip. : Patched monthly rainfall for station W024447 for 1953 to 1978

| Year  | Oct    | Nov   | Dec   | Jan   | Feb    | Mar   | Apr    | May    | Jun    | Jul    | Aug    | Sep   | Total |
|-------|--------|-------|-------|-------|--------|-------|--------|--------|--------|--------|--------|-------|-------|
| 1953  | 41.30  | 68.30 | 18.70 | 29.00 | 30.20  | 33.50 | 136.70 | 58.70  | 69.30  | 123.70 | 32.30  | 5.10  | 646.8 |
| 1954  | 30.50  | 4.30  | 0.00  | 66.80 | 121.90 | 27.20 | 25.40  | 56.10  | 61.00  | 83.60  | 52.10  | 52.60 | 581.5 |
| 1955  | 27.90  | 0.00  | 20.10 | 19.10 | 36.30  | 27.40 | 32.30  | 50.30  | 38.10  | 17.80  | 43.20  | 34.30 | 346.8 |
| 1956  | 83.60  | 3.10  | 47.80 | 11.90 | 52.60  | 23.40 | 22.90  | 85.10  | 84.10  | 57.40  | 77.50  | 56.60 | 606.0 |
| 1957  | 56.40  | 0.00  | 22.90 | 3.30  | 17.00  | 32.80 | 33.00  | 190.50 | 32.50  | 3.80   | 71.60  | 21.80 | 485.6 |
| 1958  | 82.80  | 18.80 | 28.50 | 55.60 | 28.70  | 56.90 | 121.90 | 73.70  | 11.90  | 71.10  | 78.70  | 22.90 | 651.5 |
| 1959  | 61.50  | 10.20 | 16.50 | 22.90 | 22.90  | 62.00 | 16.50  | 20.80  | 43.20  | 17.80  | 14.00  | 53.30 | 361.6 |
| 1960  | 30.20  | 40.60 | 45.70 | 53.30 | 34.30  | 33.00 | 95.80  | 68.10  | 12.70  | 33.80  | 49.30  | 43.90 | 540.7 |
| 1961  | 59.70  | 14.70 | 0.00  | 72.40 | 5.10   | 68.60 | 63.50  | 25.40  | 45.50  | 22.40  | 301.00 | 22.10 | 700.4 |
| 1962  | 106.70 | 69.30 | 4.60  | 16.50 | 21.80  | 34.30 | 52.10  | 52.60  | 37.60  | 68.30  | 22.10  | 5.30  | 491.2 |
| 1963  | 90.70  | 31.50 | 44.50 | 72.10 | 76.20  | 29.20 | 37.60  | 12.70  | 112.50 | 19.30  | 68.60  | 88.90 | 683.8 |
| 1964  | 35.30  | 65.80 | 13.50 | 24.90 | 64.80  | 43.20 | 37.90  | 38.90  | 20.30  | 68.60  | 35.10  | 6.60  | 454.9 |
| 1965  | 104.90 | 22.10 | 38.10 | 33.00 | 30.20  | 12.70 | 17.30  | 47.80  | 10.20  | 30.70  | 155.20 | 52.10 | 554.3 |
| 1966  | 6.40   | 6.90  | 11.40 | 25.40 | 25.40  | 22.90 | 168.90 | 63.00  | 44.50  | 25.90  | 39.40  | 12.70 | 452.8 |
| 1967  | 10.20  | 42.40 | 14.00 | 9.70  | 8.90   | 26.70 | 15.20  | 29.20  | 89.40  | 9.90   | 39.90  | 47.00 | 342.5 |
| 1968  | 24.90  | 71.10 | 2.50  | 24.10 | 29.00  | 6.10  | 34.80  | 7.60   | 52.10  | 27.70  | 10.40  | 24.60 | 314.9 |
| 1969  | 14.00  | 16.50 | 0.00  | 38.10 | 32.30  | 8.90  | 1.30   | 36.80  | 25.40  | 38.60  | 86.10  | 17.80 | 315.8 |
| 1970  | 32.30  | 14.00 | 48.30 | 10.20 | 47.80  | 45.50 | 78.70  | 61.00  | 28.20  | 164.30 | 112.50 | 12.70 | 655.5 |
| 1971  | 21.60  | 21.60 | 29.20 | 25.40 | 59.70  | 31.80 | 5.10   | 74.90  | 31.80  | 17.00  | 58.90  | 44.50 | 421.5 |
| 1972  | 5.10   | 21.60 | 2.50  | 6.40  | 7.60   | 24.10 | 0.00   | 27.40  | 67.60  | 34.50  | 34.50  | 24.10 | 255.4 |
| 1973  | 12.70  | 31.20 | 7.60  | 49.30 | 48.30  | 33.50 | 13.00  | 126.50 | 42.20  | 2.50   | 117.60 | 59.90 | 544.3 |
| 1974  | 12.70  | 6.40  | 0.00  | 44.50 | 8.60   | 25.40 | 6.40   | 44.50  | 26.70  | 60.50  | 26.70  | 62.20 | 324.6 |
| 1975  | 2.50   | 34.30 | 21.60 | 8.90  | 22.90  | 39.40 | 24.10  | 120.70 | 30.50  | 45.70  | 6.40   | 15.20 | 372.2 |
| 1976  | 3.80   | 95.30 | 11.40 | 23.90 | 59.70  | 14.70 | 77.50  | 151.10 | 22.40  | 34.30  | 45.20  | 29.20 | 568.5 |
| 1977  | 22.60  | 22.90 | 38.10 | 12.70 | 5.60   | 13.00 | 19.10  | 30.50  | 15.80  | 19.10  | 30.50  | 19.10 | 249.0 |
| 1978  | 28.50  | 5.80  | 39.40 | 16.70 | 44.20  | 15.90 | 11.40  | 58.90  | 34.90  | 78.00  | 29.90  | 37.20 | 400.8 |
| AVE : | 38.80  | 28.41 | 20.27 | 29.85 | 36.23  | 30.47 | 44.17  | 62.03  | 41.94  | 45.24  | 63.03  | 33.53 | 474.0 |
| SD :  | 31.99  | 25.90 | 16.58 | 20.59 | 26.04  | 15.51 | 44.25  | 43.17  | 25.54  | 37.57  | 59.95  | 21.16 | 138.6 |

| Appendix A40                                                                                                   |        |        |        |        |        |        |        |        |       |        |        |        |       |
|----------------------------------------------------------------------------------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|-------|--------|--------|--------|-------|
| File : 025414_8.NSP<br>Units : mm<br>Descrip. : Patched monthly rainfall for station 025414 8 for 1924 to 1998 |        |        |        |        |        |        |        |        |       |        |        |        |       |
| Year                                                                                                           | Oct    | Nov    | Dec    | Jan    | Feb    | Mar    | Apr    | May    | Jun   | Jul    | Aug    | Sep    | Total |
| 1924                                                                                                           | 11.00+ | 36.20+ | 2.50+  | 12.90+ | 2.50+  | 27.10+ | 5.60   | 14.30  | 0.00  | 0.00   | 54.60  | 70.80  | 237.5 |
| 1925                                                                                                           | 0.00   | 0.00   | 0.00   | 0.00   | 4.60   | 0.00   | 0.00   | 14.00  | 26.40 | 0.00   | 0.00   | 5.10   | 50.1  |
| 1926                                                                                                           | 44.50  | 0.00   | 0.00   | 0.00   | 3.00   | 0.00   | 42.40  | 4.30   | 0.00  | 17.00  | 26.90  | 0.00   | 138.1 |
| 1927                                                                                                           | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 29.70 | 0.00   | 17.10+ | 26.50+ | 73.3  |
| 1928                                                                                                           | 3.00+  | 29.30+ | 8.10+  | 0.00   | 0.00   | 28.00  | 9.20   | 13.90  | 15.20 | 81.30  | 51.10  | 11.50  | 250.6 |
| 1929                                                                                                           | 0.00   | 0.00   | 23.60  | 27.90  | 107.20 | 55.90  | 21.60  | 21.30  | 14.00 | 22.80  | 78.00  | 35.00  | 407.3 |
| 1930                                                                                                           | 7.60   | 0.00   | 19.30  | 3.30   | 8.10   | 68.80  | 80.80  | 0.00   | 7.10  | 19.60  | 42.70  | 15.50  | 272.8 |
| 1931                                                                                                           | 59.40  | 0.00   | 106.40 | 0.00   | 22.90  | 0.00   | 0.00   | 23.10  | 29.20 | 48.80  | 6.60   | 94.50  | 390.9 |
| 1932                                                                                                           | 3.30   | 23.40  | 0.30   | 0.50   | 31.20  | 9.40   | 3.80   | 23.10  | 17.00 | 16.30  | 73.60  | 3.80   | 205.7 |
| 1933                                                                                                           | 0.00   | 37.50  | 0.00   | 19.80  | 18.10  | 21.40  | 0.00   | 16.20  | 4.10  | 24.30  | 5.30   | 21.10  | 167.8 |
| 1934                                                                                                           | 201.40 | 57.70  | 0.00   | 0.00   | 64.00  | 10.90  | 46.90  | 50.10  | 40.90 | 12.70  | 14.70  | 22.10  | 521.4 |
| 1935                                                                                                           | 0.00   | 50.80  | 7.60   | 4.10   | 0.00   | 11.90  | 2.50   | 29.20  | 0.00  | 23.60  | 17.30  | 36.60  | 183.6 |
| 1936                                                                                                           | 0.00   | 59.00  | 66.60  | 0.00   | 9.90   | 35.10  | 8.10   | 0.00   | 21.90 | 36.50  | 0.00   | 30.50  | 267.6 |
| 1937                                                                                                           | 0.00   | 65.80  | 20.90  | 0.00   | 0.00   | 15.20  | 31.70  | 12.70  | 34.30 | 6.60   | 10.40  | 12.50  | 210.1 |
| 1938                                                                                                           | 9.20   | 84.40  | 25.40  | 0.00   | 41.70  | 76.20  | 16.00  | 0.00   | 3.80  | 38.10  | 55.60  | 15.00  | 365.4 |
| 1939                                                                                                           | 12.70  | 16.00  | 10.50+ | 2.50   | 78.00  | 0.00   | 54.60  | 5.10   | 29.00 | 13.50  | 0.00   | 18.80  | 240.7 |
| 1940                                                                                                           | 0.00   | 52.80  | 0.00   | 13.00  | 0.00   | 0.00   | 62.40  | 35.70  | 50.10 | 22.10  | 3.30   | 14.00  | 253.4 |
| 1941                                                                                                           | 40.60  | 34.80  | 35.60  | 21.60  | 0.00   | 0.00   | 0.00   | 68.50  | 42.10 | 0.00   | 8.10   | 6.60   | 257.9 |
| 1942                                                                                                           | 40.70  | 32.50  | 34.80  | 43.20  | 11.70  | 25.40  | 13.20  | 7.10   | 3.80  | 5.10   | 15.50  | 51.20  | 284.2 |
| 1943                                                                                                           | 6.10   | 57.90  | 11.40  | 2.30   | 0.00   | 12.70  | 11.90  | 109.80 | 19.30 | 32.70  | 37.90  | 44.60  | 346.6 |
| 1944                                                                                                           | 13.20  | 2.50   | 5.10   | 0.00   | 0.00   | 4.80   | 10.10  | 83.30  | 40.70 | 38.70  | 39.10  | 7.80   | 245.3 |
| 1945                                                                                                           | 61.00  | 18.30  | 0.00   | 0.00   | 8.40   | 58.30  | 3.60   | 6.30   | 14.00 | 7.40   | 8.10   | 13.20  | 198.6 |
| 1946                                                                                                           | 12.70  | 0.00   | 0.00   | 0.00   | 0.00   | 53.60  | 16.00  | 21.90  | 22.40 | 66.80  | 0.00   | 76.50  | 269.9 |
| 1947                                                                                                           | 58.20  | 8.90   | 0.00   | 20.60  | 18.00  | 19.40  | 22.60  | 20.40  | 9.40  | 14.20  | 6.80   | 15.20  | 213.7 |
| 1948                                                                                                           | 154.40 | 5.80   | 11.90  | 3.80   | 0.00   | 0.00   | 28.20  | 2.50   | 16.30 | 15.70  | 8.90   | 10.90  | 258.4 |
| 1949                                                                                                           | 0.00   | 105.40 | 0.00   | 0.00   | 0.00   | 13.70  | 10.90  | 38.80  | 0.00  | 82.60  | 31.00  | 24.00  | 306.4 |
| 1950                                                                                                           | 25.10  | 97.60  | 14.20  | 98.00  | 13.20  | 2.50   | 12.70  | 19.80  | 25.90 | 76.90  | 22.10  | 26.70  | 434.7 |
| 1951                                                                                                           | 6.10   | 0.00   | 0.00   | 4.30   | 31.30  | 1.30   | 8.40   | 7.20   | 14.00 | 10.90  | 40.40  | 52.50  | 176.4 |
| 1952                                                                                                           | 5.30   | 56.00  | 18.30  | 0.00   | 6.00   | 0.00   | 48.50  | 13.50  | 18.10 | 66.40  | 19.50  | 61.50  | 313.1 |
| 1953                                                                                                           | 85.50  | 53.00  | 10.00  | 0.00   | 0.00   | 11.20  | 13.50  | 51.00  | 40.00 | 43.50  | 154.00 | 0.00   | 461.7 |
| 1954                                                                                                           | 1.70   | 9.50   | 4.00   | 0.00   | 75.00  | 17.00  | 7.50   | 12.50  | 23.70 | 46.20  | 37.50  | 15.00  | 249.6 |
| 1955                                                                                                           | 21.40  | 14.90  | 0.00   | 21.00  | 0.00   | 23.50  | 0.00   | 46.50  | 19.00 | 7.50   | 25.00  | 20.00  | 198.8 |
| 1956                                                                                                           | 36.50  | 19.00  | 53.00  | 17.00  | 43.50  | 34.00  | 0.00   | 51.00  | 45.00 | 10.50  | 34.00  | 32.00  | 375.5 |
| 1957                                                                                                           | 20.00  | 0.00   | 4.00   | 0.00   | 6.00   | 19.50  | 10.70  | 121.00 | 22.00 | 0.00   | 32.60  | 4.80   | 240.6 |
| 1958                                                                                                           | 30.00  | 19.00  | 0.00   | 39.50  | 42.00  | 8.00   | 51.20  | 34.50  | 5.00  | 91.00  | 49.50  | 21.00  | 390.7 |
| 1959                                                                                                           | 22.50  | 0.00   | 15.00  | 26.00  | 7.50   | 1.00   | 13.50  | 22.00  | 26.50 | 8.50   | 8.00   | 28.50  | 179.0 |
| 1960                                                                                                           | 20.50  | 13.00  | 16.50  | 5.50   | 36.50  | 5.20   | 25.50  | 29.00  | 8.00  | 22.00  | 55.70  | 14.90  | 252.3 |
| 1961                                                                                                           | 4.50   | 26.00  | 3.50   | 25.50  | 32.50  | 8.00   | 26.50  | 5.50   | 26.00 | 6.50   | 144.50 | 0.00   | 309.0 |
| 1962                                                                                                           | 47.50  | 20.50  | 0.00   | 13.50  | 2.50   | 124.50 | 34.20  | 86.00  | 22.00 | 56.00  | 15.00  | 0.00   | 421.7 |
| 1963                                                                                                           | 18.00  | 32.50  | 38.50  | 0.00   | 22.50  | 7.50   | 12.50  | 1.00   | 88.30 | 0.00   | 56.50  | 33.00  | 310.3 |
| 1964                                                                                                           | 21.00  | 38.00  | 10.50  | 0.00   | 21.00  | 9.50   | 42.00  | 54.50  | 9.40  | 17.50  | 7.00   | 0.00   | 230.4 |
| 1965                                                                                                           | 86.00  | 14.50  | 33.50  | 0.00   | 0.00   | 13.00  | 13.50  | 21.50  | 7.00  | 13.00  | 26.00  | 43.50  | 271.5 |
| 1966                                                                                                           | 0.00   | 4.00   | 0.00   | 0.00   | 5.00   | 26.20  | 160.50 | 37.00  | 44.50 | 17.00  | 13.10  | 7.50   | 314.8 |
| 1967                                                                                                           | 11.50  | 21.00  | 1.50   | 0.00   | 0.00   | 3.50   | 14.10  | 44.50  | 57.50 | 5.50   | 45.50  | 17.50  | 222.1 |
| 1968                                                                                                           | 28.00  | 14.00  | 0.00   | 3.00   | 4.50   | 4.00   | 11.00  | 2.50   | 60.00 | 2.00   | 6.00   | 36.50  | 171.5 |
| 1969                                                                                                           | 16.50  | 2.00   | 0.00   | 6.00   | 33.00  | 3.00   | 5.00   | 9.10   | 18.00 | 6.50   | 87.00  | 13.00  | 199.1 |
| 1970                                                                                                           | 18.00  | 0.00   | 3.00   | 11.50  | 9.50   | 23.00  | 20.00  | 34.50  | 17.00 | 56.40  | 66.50  | 3.00   | 262.4 |
| 1971                                                                                                           | 10.00  | 32.50  | 0.00   | 5.00   | 62.50  | 16.00  | 26.50  | 51.00  | 9.50  | 28.00  | 37.70  | 17.00  | 295.7 |
| 1972                                                                                                           | 0.00   | 0.00   | 3.50   | 3.00   | 4.00   | 21.50  | 6.00   | 20.50  | 16.00 | 22.50  | 14.00  | 6.00   | 117.0 |
| 1973                                                                                                           | 4.00   | 25.00  | 23.00  | 11.70  | 31.00  | 9.50   | 0.00   | 74.50  | 23.50 | 2.50   | 133.50 | 12.50  | 350.7 |
| 1974                                                                                                           | 14.00  | 14.00  | 0.00   | 18.50  | 6.50   | 14.50  | 10.00  | 39.00  | 50.00 | 25.00  | 27.50  | 13.00  | 232.0 |
| 1975                                                                                                           | 3.50   | 2.50   | 0.00   | 25.00  | 26.00  | 20.00  | 56.00  | 32.00  | 43.00 | 11.50  | 20.00  | 16.00  | 255.5 |
| 1976                                                                                                           | 67.50  | 42.00  | 20.00  | 12.00  | 46.50  | 29.50  | 42.00  | 164.40 | 24.00 | 15.50  | 15.50  | 20.00  | 498.9 |
| 1977                                                                                                           | 25.50  | 20.00  | 21.70  | 6.50   | 2.20   | 4.50   | 81.00  | 10.50  | 10.00 | 33.20+ | 52.40  | 18.10+ | 285.6 |
| 1978                                                                                                           | 12.00  | 12.00  | 30.00+ | 14.50  | 33.00  | 1.00   | 0.00   | 37.10  | 19.00 | 42.20  | 47.00  | 37.50  | 285.3 |
| 1979                                                                                                           | 26.80+ | 0.00   | 12.30+ | 18.00  | 0.00   | 10.00  | 30.00  | 7.50   | 24.00 | 11.00  | 21.50  | 30.40  | 191.5 |
| 1980                                                                                                           | 7.30   | 50.60+ | 22.10+ | 155.50 | 26.00  | 74.00  | 74.00  | 39.00  | 18.50 | 23.00  | 79.80  | 11.40  | 581.2 |
| 1981                                                                                                           | 12.50  | 29.00  | 23.30+ | 14.00  | 6.60+  | 19.80+ | 136.00 | 0.00   | 31.00 | 49.50  | 14.00  | 24.90+ | 360.6 |
| 1982                                                                                                           | 50.50  | 27.00  | 0.00   | 0.00   | 16.20  | 6.40   | 9.00   | 25.10  | 39.00 | 63.00  | 10.00  | 137.00 | 383.2 |
| 1983                                                                                                           | 11.50  | 26.00  | 0.00   | 5.50   | 2.00   | 25.90  | 4.00   | 23.40  | 13.20 | 35.20  | 6.50   | 7.00   | 160.2 |
| 1984                                                                                                           | 22.20  | 3.00   | 29.80  | 26.00  | 42.00  | 16.50  | 50.50  | 3.50   | 32.10 | 56.00  | 15.00  | 12.50  | 309.1 |
| 1985                                                                                                           | 45.00  | 7.10   | 55.60  | 3.30+  | 25.00  | 32.00  | 8.00   | 16.50  | 20.00 | 29.40  | 68.50  | 16.50  | 326.9 |
| 1986                                                                                                           | 42.00+ | 26.30  | 17.90  | 1.90   | 1.50   | 0.00   | 92.00  | 15.70  | 34.50 | 29.00  | 26.30+ | 24.40  | 311.5 |
| 1987                                                                                                           | 5.50   | 0.00   | 14.00+ | 0.00   | 0.00   | 15.00  | 59.00  | 20.70  | 35.50 | 6.50   | 43.50  | 24.50  | 224.2 |
| 1988                                                                                                           | 29.70  | 0.50   | 25.50  | 2.00   | 8.50+  | 43.00  | 86.50  | 8.00   | 25.60 | 49.50  | 33.00  | 15.00  | 326.8 |
| 1989                                                                                                           | 68.50  | 68.50  | 1.50   | 8.30   | 16.70  | 11.00  | 97.00  | 14.00  | 53.00 | 0.50   | 12.00  | 9.40   | 360.4 |
| 1990                                                                                                           | 10.10  | 13.00  | 22.20  | 30.50  | 6.00   | 4.50   | 10.10  | 20.50  | 7.30  | 37.10  | 3.50   | 8.50   | 173.3 |
| 1991                                                                                                           | 34.50  | 0.00   | 3.20   | 0.00   | 35.00  | 30.70  | 1.80   | 1.50   | 35.00 | 32.40  | 9.20   | 15.50  | 198.8 |
| 1992                                                                                                           | 95.90  | 9.00   | 0.00   | 16.50  | 1.50   | 0.50   | 147.20 | 0.70   | 20.20 | 23.80  | 16.00  | 11.20  | 342.5 |
| 1993                                                                                                           | 0.00   | 0.00   | 84.00  | 0.00   | 1.20   | 9.90   | 16.70  | 0.00   | 10.70 | 40.30  | 25.00  | 34.70  | 222.5 |
| 1994                                                                                                           | 32.90  | 4.00   | 35.50  | 0.00   | 6.00   | 41.00  | 6.00   | 79.10  | 40.50 | 10.90  | 20.00  | 9.60   | 285.5 |
| 1995                                                                                                           | 15.80  | 65.80  | 115.00 | 0.00   | 0.00   | 11.00  | 6.00   | 9.00   | 3.10  | 15.50  | 11.00  | 14.50  | 266.7 |
| 1996                                                                                                           | 108.00 | 59.00  | 21.20  | 0.00   | 0.00   | 33.50  | 0.70   | 39.50  | 20.50 | 30.50  | 6.40   | 0.00   | 319.3 |
| 1997                                                                                                           | 2.00   | 3.50   | 0.20   | 5.00   | 10.00  | 26.00  | 1.70   | 27.00  | 23.30 | 11.00  | 12.90  | 15.00  | 137.6 |
| 1998                                                                                                           | 9.00   | 11.00  | 75.00  | 0.00   | 6.70   | 26.00  | 29.60  | 0.00   | 10.50 | 51.00  | 12.50  | 21.60+ | 252.9 |
| AVE :                                                                                                          | 27.08  | 23.80  | 16.96  | 11.05  | 16.58  | 19.29  | 28.27  | 28.07  | 23.73 | 26.61  | 31.36  | 22.64  | 275.4 |
| SD :                                                                                                           | 35.43  | 25.07  | 24.02  | 22.37  | 21.60  | 21.68  | 34.89  | 30.26  | 16.38 | 22.26  | 31.48  | 22.36  | 97.1  |

| Appendix A41                                                              |         |         |         |         |         |         |         |         |        |        |         |         |        |
|---------------------------------------------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|--------|--------|---------|---------|--------|
| File : 025599_3.NSP                                                       |         |         |         |         |         |         |         |         |        |        |         |         |        |
| Units : mm                                                                |         |         |         |         |         |         |         |         |        |        |         |         |        |
| Descrip. : Patched monthly rainfall for station 025599 3 for 1919 to 1998 |         |         |         |         |         |         |         |         |        |        |         |         |        |
| Year                                                                      | Oct     | Nov     | Dec     | Jan     | Feb     | Mar     | Apr     | May     | Jun    | Jul    | Aug     | Sep     | Total  |
| 1919                                                                      | 86.50+  | 95.50+  | 79.80+  | 16.10   | 151.60  | 91.70   | 29.70   | 111.30  | 89.20  | 146.60 | 50.30   | 23.60   | 971.9  |
| 1920                                                                      | 56.50   | 83.50   | 162.40  | 56.70   | 175.30  | 115.20  | 174.80  | 54.70   | 111.10 | 95.80  | 87.90   | 97.80   | 1271.7 |
| 1921                                                                      | 66.70   | 39.80   | 142.90  | 217.80  | 101.20  | 217.80  | 101.10  | 68.00   | 47.40  | 84.30  | 80.00   | 58.40   | 1225.4 |
| 1922                                                                      | 115.50  | 228.30  | 44.60   | 81.80   | 106.60  | 54.80   | 213.80  | 150.00  | 100.50 | 76.80  | 62.20   | 49.60   | 1284.5 |
| 1923                                                                      | 123.90  | 91.60   | 24.20   | 69.10   | 86.20   | 91.90   | 57.10   | 73.80   | 86.20  | 59.60  | 211.80  | 57.90   | 1033.3 |
| 1924                                                                      | 64.20   | 89.10   | 161.80  | 64.90   | 46.50   | 279.40  | 105.80  | 38.60   | 100.50 | 79.90  | 84.00   | 147.30  | 1262.0 |
| 1925                                                                      | 122.20  | 115.10  | 79.80+  | 148.70  | 81.40   | 115.20  | 110.90  | 35.00   | 36.00  | 142.20 | 91.20   | 76.10   | 1153.8 |
| 1926                                                                      | 160.70  | 128.10  | 14.00   | 55.90   | 142.30  | 115.20  | 92.40   | 125.00  | 40.20  | 39.50  | 111.00  | 50.60   | 1074.9 |
| 1927                                                                      | 104.20  | 89.00   | 88.30   | 91.20   | 62.70   | 196.20  | 52.90+  | 69.30   | 57.50  | 32.40  | 86.40   | 113.60  | 1043.7 |
| 1928                                                                      | 62.90   | 248.90  | 166.90  | 51.50   | 80.50   | 168.60  | 47.00   | 91.80   | 58.40  | 125.30 | 107.70  | 57.70   | 1267.2 |
| 1929                                                                      | 98.70   | 42.70   | 172.70  | 76.00   | 205.10  | 145.00  | 50.50   | 99.10   | 35.80  | 49.20  | 87.60   | 84.50   | 1146.9 |
| 1930                                                                      | 161.40  | 59.20   | 94.80   | 138.90  | 98.80   | 117.30  | 175.80  | 64.30   | 49.20  | 133.80 | 66.30   | 84.50   | 1244.3 |
| 1931                                                                      | 139.80  | 57.40   | 256.00  | 66.00   | 75.50   | 122.00  | 22.70+  | 63.10   | 44.70  | 71.60  | 48.60   | 298.40  | 1265.8 |
| 1932                                                                      | 99.10   | 88.90   | 59.60   | 23.10   | 82.50   | 67.60   | 39.40   | 111.10  | 42.40  | 50.90  | 118.90  | 26.10   | 809.6  |
| 1933                                                                      | 20.30   | 223.70  | 65.10   | 120.10  | 121.60  | 166.00  | 27.40   | 13.00   | 30.20  | 119.10 | 116.50  | 75.10   | 1098.1 |
| 1934                                                                      | 244.00  | 199.90  | 37.20   | 58.20   | 28.90   | 100.90  | 90.90   | 126.00  | 85.50  | 47.60  | 46.50   | 96.60   | 1162.2 |
| 1935                                                                      | 122.30  | 116.70  | 67.40   | 46.20   | 118.60  | 57.80   | 28.40   | 81.00   | 20.60  | 65.80  | 38.60   | 132.60  | 896.0  |
| 1936                                                                      | 89.30   | 325.40  | 97.50   | 82.30   | 50.60   | 182.00  | 49.60   | 16.80   | 59.00  | 66.30  | 34.20   | 84.90   | 1137.9 |
| 1937                                                                      | 29.60   | 97.80   | 216.40  | 133.90  | 28.90   | 114.80  | 85.40   | 36.70   | 43.40  | 59.30  | 59.60   | 82.20   | 988.0  |
| 1938                                                                      | 106.80  | 101.70  | 93.80   | 55.90   | 139.80  | 142.10  | 63.20   | 17.30   | 11.20  | 91.80  | 180.60  | 66.80   | 1071.0 |
| 1939                                                                      | 64.70   | 92.70   | 38.90   | 57.70   | 261.40  | 122.00  | 84.10   | 36.20   | 35.10  | 39.90  | 13.50   | 122.90  | 969.1  |
| 1940                                                                      | 42.40   | 154.70  | 37.30   | 55.50   | 61.30   | 71.60   | 150.60  | 78.10   | 94.30  | 46.50  | 43.90   | 77.20   | 913.4  |
| 1941                                                                      | 126.30  | 67.60   | 45.00   | 167.30  | 47.20   | 88.90   | 84.80   | 97.00   | 46.80  | 27.50  | 49.00   | 76.20   | 923.6  |
| 1942                                                                      | 103.90  | 92.10   | 125.10  | 222.30  | 71.20   | 90.00   | 103.00  | 33.20   | 41.50  | 37.80  | 85.30   | 147.30  | 1152.7 |
| 1943                                                                      | 100.40  | 156.30  | 60.90   | 10.20   | 55.20   | 190.90  | 32.00   | 122.90  | 49.30  | 68.20  | 91.60   | 160.80  | 1098.7 |
| 1944                                                                      | 138.70  | 26.20   | 32.50   | 35.00   | 64.30   | 76.80   | 55.50   | 125.00  | 88.20  | 61.40  | 86.60   | 92.80   | 883.0  |
| 1945                                                                      | 151.80  | 21.10   | 56.90   | 56.90   | 89.10   | 162.10  | 49.70   | 23.90   | 33.80  | 64.00  | 50.80   | 41.70   | 801.8  |
| 1946                                                                      | 77.10   | 99.80   | 20.00   | 49.60   | 117.70  | 207.40  | 145.00  | 75.40   | 56.60  | 88.60  | 9.10    | 92.10   | 1038.4 |
| 1947                                                                      | 90.40   | 145.20  | 45.70   | 91.60   | 36.00   | 129.50  | 158.30  | 34.20   | 37.30  | 40.30  | 25.20   | 68.20   | 901.9  |
| 1948                                                                      | 241.00  | 78.60   | 24.10   | 104.60  | 46.70   | 47.20   | 68.50   | 58.30   | 18.60  | 22.00  | 27.80   | 34.70   | 772.1  |
| 1949                                                                      | 21.30   | 77.10   | 11.50   | 17.30   | 20.10   | 11.10   | 27.40   | 21.40   | 7.80   | 36.50  | 28.00   | 19.10   | 298.6  |
| 1950                                                                      | 67.00   | 70.70   | 34.50   | 125.60+ | 23.40   | 60.20   | 25.40   | 32.00   | 32.80  | 32.60  | 33.60   | 67.10   | 604.9  |
| 1951                                                                      | 20.70   | 1.50    | 18.50   | 76.90   | 34.20   | 35.50   | 31.60   | 19.10   | 9.80   | 16.30  | 26.90   | 73.60   | 364.6  |
| 1952                                                                      | 24.30   | 86.60   | 31.70   | 43.60   | 39.30   | 18.80   | 39.00   | 11.80   | 27.00  | 47.20  | 24.30   | 47.10   | 440.7  |
| 1953                                                                      | 56.20   | 68.50   | 10.30   | 12.40   | 16.20   | 37.80   | 135.20+ | 45.10   | 22.50  | 31.50  | 55.60   | 29.00   | 520.3  |
| 1954                                                                      | 18.60   | 39.10   | 14.80   | 83.50   | 92.10   | 35.40   | 26.50   | 45.10   | 49.00  | 76.50  | 81.00   | 102.00  | 663.6  |
| 1955                                                                      | 64.50   | 56.00   | 34.00   | 82.50   | 72.50   | 108.00  | 99.50   | 132.50  | 37.50  | 65.00  | 65.00   | 39.00   | 856.0  |
| 1956                                                                      | 110.00  | 34.00   | 125.00  | 23.00   | 139.00  | 96.00   | 59.00   | 93.50   | 147.00 | 62.00  | 101.00  | 126.00  | 1115.5 |
| 1957                                                                      | 101.50  | 16.00   | 57.50   | 31.50   | 47.00   | 172.00  | 80.50   | 222.60  | 39.00  | 12.00  | 165.50  | 39.50   | 984.6  |
| 1958                                                                      | 90.50   | 82.00   | 89.00   | 126.90  | 123.50  | 146.50  | 140.00  | 96.50   | 31.00  | 121.50 | 134.50  | 58.50   | 1240.4 |
| 1959                                                                      | 133.90  | 53.50   | 54.00   | 123.50  | 43.00   | 118.50  | 96.70   | 88.40   | 72.50  | 54.00  | 37.50   | 56.50   | 932.0  |
| 1960                                                                      | 49.50   | 123.00  | 121.00  | 137.00  | 40.40   | 106.50  | 89.20   | 98.50   | 44.50  | 73.00  | 115.00  | 98.00   | 1095.6 |
| 1961                                                                      | 122.00  | 83.00   | 39.50   | 51.50   | 99.70   | 126.50  | 110.50  | 47.50   | 39.00  | 54.50  | 288.00  | 20.80   | 1082.5 |
| 1962                                                                      | 141.90  | 166.90+ | 33.30   | 129.50  | 58.50   | 251.60  | 118.70  | 140.60+ | 36.00  | 65.30  | 47.00   | 29.90   | 1219.2 |
| 1963                                                                      | 162.50  | 61.40   | 58.30   | 118.80  | 72.90   | 176.50  | 57.50   | 36.50   | 115.00 | 33.50  | 87.50   | 131.80  | 1112.2 |
| 1964                                                                      | 75.50   | 118.50  | 32.50   | 103.50  | 113.00  | 81.00   | 69.00   | 106.00  | 43.50  | 48.50  | 55.00   | 33.50   | 879.5  |
| 1965                                                                      | 180.40  | 175.00  | 60.00   | 210.70  | 69.80   | 57.50   | 66.00   | 105.00  | 28.00  | 33.20  | 159.50  | 106.70  | 1251.8 |
| 1966                                                                      | 73.90   | 27.50   | 105.50  | 49.60   | 162.30  | 165.00  | 261.40  | 120.00  | 92.10  | 87.00  | 93.90   | 122.70  | 1360.9 |
| 1967                                                                      | 63.90   | 127.60  | 28.50   | 23.30   | 23.00   | 100.50  | 69.30   | 100.50  | 95.50  | 12.70  | 110.70  | 57.30   | 812.8  |
| 1968                                                                      | 47.90   | 180.00  | 31.20   | 57.80   | 124.80  | 100.70  | 53.40   | 44.60   | 97.10  | 58.40  | 58.70   | 56.00   | 910.6  |
| 1969                                                                      | 72.60   | 24.30   | 11.20   | 99.80   | 135.20  | 23.60   | 31.40   | 30.90   | 66.50  | 63.20  | 103.70  | 24.20   | 686.6  |
| 1970                                                                      | 84.90   | 41.80   | 76.80   | 67.40   | 193.50  | 99.80   | 170.60  | 114.40  | 53.90  | 159.90 | 133.30  | 50.00   | 1246.3 |
| 1971                                                                      | 22.00   | 139.00  | 62.50   | 53.50   | 117.20+ | 88.00+  | 51.00   | 120.00  | 31.50  | 51.00  | 129.00  | 65.50   | 930.2  |
| 1972                                                                      | 23.00   | 152.50  | 72.00   | 70.50   | 42.80   | 67.00   | 134.00  | 55.50   | 87.60+ | 45.00  | 58.00+  | 54.50   | 862.4  |
| 1973                                                                      | 62.50   | 86.50   | 54.50   | 171.00  | 167.50  | 169.60  | 55.00   | 174.00  | 48.50  | 5.50   | 186.00  | 59.50   | 1240.1 |
| 1974                                                                      | 54.50   | 35.00   | 16.50   | 82.00   | 83.00   | 101.50  | 42.50   | 68.50   | 49.50  | 84.00  | 105.50  | 104.60  | 827.1  |
| 1975                                                                      | 33.50   | 111.50  | 106.00  | 72.00   | 121.00  | 146.10  | 83.00   | 71.50   | 84.00  | 104.90 | 56.00   | 69.50   | 1059.0 |
| 1976                                                                      | 105.50+ | 121.50  | 62.80   | 28.50   | 268.60  | 79.50   | 69.60   | 167.10+ | 62.80  | 36.50  | 69.20   | 115.00  | 1186.6 |
| 1977                                                                      | 101.50  | 170.60  | 105.10  | 38.00   | 48.80   | 53.90+  | 115.30+ | 63.50   | 35.30+ | 92.90+ | 84.80+  | 73.00   | 982.7  |
| 1978                                                                      | 118.10+ | 37.00   | 154.40+ | 51.70   | 111.80  | 42.30   | 34.20   | 134.80+ | 54.40  | 132.00 | 104.30  | 106.80  | 1081.8 |
| 1979                                                                      | 78.80   | 67.70   | 66.90   | 104.20+ | 60.20   | 26.90   | 59.90   | 29.50   | 76.50+ | 36.30  | 70.90   | 101.60  | 779.4  |
| 1980                                                                      | 126.50  | 185.00  | 92.20   | 250.80  | 130.10  | 122.10+ | 139.20  | 83.80   | 38.20+ | 62.50  | 102.10+ | 68.00   | 1400.5 |
| 1981                                                                      | 63.00   | 39.80   | 119.30  | 66.90   | 91.10   | 123.30  | 321.00  | 26.90+  | 37.70  | 94.80  | 86.30   | 167.80  | 1237.9 |
| 1982                                                                      | 71.60   | 71.20   | 79.30   | 17.90   | 89.20   | 35.30   | 31.40   | 63.60   | 84.50  | 89.40  | 47.80   | 139.00+ | 820.2  |
| 1983                                                                      | 89.10   | 101.60  | 102.20  | 64.50+  | 123.60  | 147.50  | 50.90   | 39.30   | 27.90  | 80.10  | 53.20   | 31.50   | 911.4  |
| 1984                                                                      | 151.50  | 54.70   | 82.70   | 196.60  | 107.40  | 32.90   | 102.80  | 22.40   | 56.30  | 127.10 | 37.30   | 30.90   | 1002.6 |
| 1985                                                                      | 239.10+ | 128.10  | 123.70  | 81.00   | 72.00   | 78.60+  | 62.80   | 22.00   | 32.90  | 37.90  | 257.10+ | 56.50   | 1191.7 |
| 1986                                                                      | 159.70+ | 92.40+  | 59.00   | 41.20   | 34.00   | 78.00+  | 132.00+ | 23.10   | 50.80  | 43.50  | 104.30  | 79.20+  | 897.2  |
| 1987                                                                      | 53.80   | 3.20    | 124.10  | 59.50   | 78.80   | 134.40  | 195.00  | 48.70+  | 54.00  | 110.40 | 59.30   | 40.70   | 961.9  |
| 1988                                                                      | 41.40   | 47.10   | 107.90  | 82.60   | 73.10   | 54.70   | 157.50  | 27.20   | 52.70  | 57.40  | 69.60   | 56.70   | 827.9  |
| 1989                                                                      | 245.10  | 138.60  | 51.80   | 39.50   | 126.00  | 109.00  | 159.00  | 50.80   | 75.50  | 15.00  | 57.00   | 43.50   | 1110.8 |
| 1990                                                                      | 132.00  | 53.00   | 113.00  | 136.10  | 94.70   | 41.10   | 43.50   | 45.50   | 46.50  | 63.90  | 43.10   | 50.50   | 862.9  |
| 1991                                                                      |         |         |         |         |         |         |         |         |        |        |         |         |        |

# **APPENDIX B**

**B1 - B12 : Hydrological Data**



## APPENDIX B 1.1

SUB-CATCHMENT : H1H013  
RIVER : Koekedouw  
PLACE : Ceres

### 1. CATCHMENT

|                          |          | YEAR  |       |       |       |       |       |       | UNITS           |
|--------------------------|----------|-------|-------|-------|-------|-------|-------|-------|-----------------|
|                          |          | 1964  | 1967  | 1976  | 1978  | 1988  | 1990  | 2000  |                 |
| SUB-CATCHMENT AREAS      |          |       |       |       |       |       |       |       |                 |
| upstream farm dams       | High MAP | 0.29  | 0.29  | 0.29  | 0.29  | 0.29  | 0.29  | 0.29  | km <sup>2</sup> |
|                          | Low MAP  | 0.71  | 0.71  | 0.71  | 0.71  | 0.71  | 0.71  | 0.71  | km <sup>2</sup> |
| downstream farm dams     | High MAP | 14.04 | 14.04 | 14.04 | 14.04 | 14.04 | 14.04 | 14.04 | km <sup>2</sup> |
|                          | Low MAP  | 34.67 | 34.67 | 34.67 | 34.67 | 34.67 | 34.67 | 34.67 | km <sup>2</sup> |
| H1H013 inc d/s Ceres Dam | Low MAP  | 3.30  | 3.30  | 3.30  | 3.30  | 3.30  | 3.30  | 3.30  | km <sup>2</sup> |

### 2. LANDUSE

|                                   |  | YEAR |      |      |      |      |      |      | UNITS           |
|-----------------------------------|--|------|------|------|------|------|------|------|-----------------|
|                                   |  | 1964 | 1967 | 1976 | 1978 | 1988 | 1990 | 2000 |                 |
| ALIEN VEGETATION                  |  |      |      |      |      |      |      |      |                 |
| upstream farm dams : tall trees   |  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | km <sup>2</sup> |
| downstream farm dams : tall trees |  | 0.06 | 0.06 | 0.06 | 0.12 | 0.17 | 0.49 | 0.83 | km <sup>2</sup> |
| riparian : tall trees             |  | 0.02 | 0.02 | 0.04 | 0.07 | 0.07 | 0.14 | 0.41 | km <sup>2</sup> |
| Total                             |  | 0.08 | 0.08 | 0.10 | 0.19 | 0.24 | 0.64 | 1.26 | km <sup>2</sup> |
| FARM DAM CAPACITIES               |  | 0.66 | 0.66 | 1.11 | 1.42 | 2.16 | 2.16 | 6.02 | Mm <sup>3</sup> |
| IRRIGATION AREAS                  |  |      |      |      |      |      |      |      |                 |
| farm dams                         |  | 1.49 | 1.49 | 1.78 | 1.96 | 2.43 | 2.43 | 7.72 | km <sup>2</sup> |
| river                             |  | 0.28 | 0.28 | 0.34 | 0.38 | 0.46 | 0.46 | 1.47 | km <sup>2</sup> |
| Total                             |  | 1.77 | 1.77 | 2.12 | 2.34 | 2.89 | 2.89 | 9.19 | km <sup>2</sup> |

### 3. EVAPORATION

|                       | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) | 178  | 232  | 280  | 292  | 240  | 218  | 218  | 82   | 60   | 70   | 85   | 112  | 2067      |
| S-PAN (gross) (in mm) | 164  | 223  | 263  | 274  | 232  | 198  | 124  | 75   | 55   | 55   | 70   | 102  | 1835      |
| LAKE FACTOR           | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)    | 133  | 183  | 218  | 230  | 204  | 174  | 109  | 65   | 47   | 46   | 57   | 83   | 1549      |

**Note : evaporation from BRHS used for this sub-catchment**

### 4. RESERVOIR SIMULATIONS

|                       | COEFFICIENTS |      | START      | DEAD                      | MAX                       |
|-----------------------|--------------|------|------------|---------------------------|---------------------------|
|                       | a            | b    | STOR.<br>% | STOR.<br>M.m <sup>3</sup> | STOR.<br>M.m <sup>3</sup> |
| H1H013 DUMMY FARM DAM | 0.287        | 0.96 | 100        | 0                         | FSC                       |
| CERES DAM             | 0.084        | 0.54 | 100        | 0                         | FSC                       |

Ceres Dam raised in 1998 - capacity increased from 0.302 Mm<sup>3</sup> to 13.654 Mm<sup>3</sup>

### 5. IRRIGATION ROUTINE

|                      | QUANT | CROP FACTORS |     |     |      |      |      |      |     |     |     |     |     |
|----------------------|-------|--------------|-----|-----|------|------|------|------|-----|-----|-----|-----|-----|
|                      | %     | OCT          | NOV | DEC | JAN  | FEB  | MAR  | APR  | MAY | JUN | JUL | AUG | SEP |
| Combined crop factor | 100   | 0.3          | 0.4 | 0.5 | 0.55 | 0.55 | 0.45 | 0.25 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |

### 6. NOTES

Combined crop factor used in the BRHS for :  
crop type 1 : vineyards and fruit trees  
crop type 2 : wheat , lucerne and cash crops

H1H013 sub-catchment modelled using high and low MAP  
high MAP = 2006 mm  
low MAP = 846 mm

# Appendix B1.2

File : H1H013\_1.OBS  
Units : 10^6xm^3/a  
Descrip. : Observed runoff at H1H013 for 1964 to 1990

| Year  | Oct   | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul    | Aug    | Sep   | Total |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|-------|-------|
| 1964  | 1.09+ | 0.69+ | 0.24+ | 0.12+ | 0.09* | 0.75  | 2.15  | 3.51  | 2.34  | 1.50   | 3.01   | 2.46  | 17.9  |
| 1965  | 0.98  | 0.42  | 0.24  | 0.09  | 0.07  | 0.61  | 0.81  | 0.35  | 1.41  | 7.90   | 3.08   | 1.65  | 17.6  |
| 1966  | 0.81  | 0.20  | 0.13  | 0.14  | 0.08  | 0.08  | 0.92  | 0.98  | 10.81 | 3.85   | 0.31   | 3.14* | 21.5  |
| 1967  | 2.70+ | 1.15+ | 0.24+ | 0.13+ | 0.02+ | 0.00+ | 0.28* | 8.86  | 5.93  | 4.83   | 6.72   | 1.63  | 32.5  |
| 1968  | 6.49  | 0.73  | 0.34  | 0.17* | 0.11  | 0.08  | 0.38  | 0.70  | 0.90  | 1.17   | 3.32   | 4.67* | 19.1  |
| 1969  | 4.26* | 1.26  | 0.78  | 0.35  | 0.27  | 0.21  | 0.20* | 1.23  | 5.35  | 5.01   | 7.79   | 6.03  | 32.7  |
| 1970  | 1.51  | 0.53  | 0.37  | 0.18  | 0.17  | 0.21  | 0.23  | 0.32  | 0.56  | 3.57   | 3.49   | 1.58  | 12.7  |
| 1971  | 0.39  | 0.28  | 0.18  | 0.07  | 0.07  | 0.06  | 0.05  | 2.10  | 2.05  | 2.01   | 3.42   | 1.69  | 12.4  |
| 1972  | 0.77  | 0.26  | 0.34  | 0.13  | 0.08  | 0.12  | 0.09  | 0.20  | 0.42  | 9.83   | 3.65   | 2.75  | 18.6  |
| 1973  | 1.68  | 0.58* | 0.24* | 0.11* | 0.09  | 0.09  | 0.09  | 0.39  | 3.31  | 1.11   | 25.27* | 7.17  | 40.1  |
| 1974  | 3.18  | 1.73  | 0.72  | 0.49  | 0.22  | 0.14  | 0.61  | 4.18  | 1.07  | 3.76   | 4.56*  | 2.13+ | 22.8  |
| 1975  | 2.87+ | 0.85+ | 0.23+ | 0.10  | 0.10  | 0.16  | 0.17  | 0.20  | 11.33 | 3.06   | 2.58   | 0.70  | 22.4  |
| 1976  | 0.32  | 6.51  | 3.82  | 1.79  | 0.43  | 0.38  | 0.60  | 8.68  | 11.46 | 14.71  | 11.08  | 4.40  | 64.2  |
| 1977  | 2.13  | 0.88  | 0.61  | 0.20  | 0.16  | 0.17  | 0.59  | 0.99  | 0.22  | 0.12   | 2.00   | 2.59  | 10.7  |
| 1978  | 1.60  | 0.48  | 0.31  | 0.14  | 0.11  | 0.23  | 0.15  | 0.93  | 2.67  | 1.19   | 1.87   | 0.77  | 10.5  |
| 1979  | 4.44  | 0.82  | 0.31  | 0.38  | 0.17  | 0.15  | 0.27  | 1.19  | 2.21  | 0.40   | 1.39   | 0.47  | 12.2  |
| 1980  | 1.32* | 7.37* | 1.70  | 0.88  | 0.26  | 0.24  | 0.29  | 0.26  | 0.27  | 3.11   | 5.28   | 7.75  | 28.7  |
| 1981  | 1.65  | 0.72  | 0.48  | 0.43  | 0.13  | 0.12  | 0.86  | 0.72  | 1.52  | 1.16   | 1.31   | 1.81* | 10.9  |
| 1982  | 2.00  | 0.51  | 0.79  | 0.33  | 0.45  | 0.37  | 0.32  | 3.88  | 7.29  | 12.96  | 4.56   | 2.09  | 35.6  |
| 1983  | 1.05  | 0.25  | 0.23* | 0.14  | 0.11  | 0.37  | 0.63  | 14.07 | 0.43  | 5.26   | 1.29   | 6.83  | 30.7  |
| 1984  | 3.39  | 0.42  | 0.62  | 0.44  | 0.13  | 1.42  | 1.53* | 1.06* | 4.26  | 6.85   | 7.87   | 3.74* | 31.7  |
| 1985  | 1.54  | 0.44  | 0.21  | 0.10  | 0.08  | 0.24  | 1.03  | 1.68  | 1.80  | 4.30   | 11.14  | 3.09  | 25.7  |
| 1986  | 1.04  | 0.55  | 0.30  | 0.34  | 0.16  | 0.14  | 0.16  | 2.62  | 3.56  | 2.93   | 3.30   | 2.61  | 17.7  |
| 1987  | 1.65  | 0.62  | 0.45  | 0.25  | 0.12  | 0.19  | 0.65  | 0.57  | 4.39  | 3.04   | 1.84   | 4.63  | 18.4  |
| 1988  | 1.67  | 0.86  | 0.36  | 0.19  | 0.18  | 1.46  | 0.77  | 1.59  | 1.41  | 3.51   | 4.93   | 9.28  | 26.2  |
| 1989  | 3.04  | 1.44  | 0.54  | 0.23  | 0.13  | 0.09  | 0.83  | 2.99  | 2.35  | 10.64  | 5.32   | 1.13  | 28.7  |
| 1990  | 0.53  | 0.37  | 0.19  | 0.09  | 0.06  | 0.08  | 0.20  | 0.97  | 5.16+ | 13.83+ | 4.14+  | 7.29+ | 32.9  |
| AVE : | 2.00  | 1.15  | 0.55  | 0.30  | 0.15  | 0.30  | 0.55  | 2.42  | 3.50  | 4.87   | 4.98   | 3.48  | 24.3  |
| SD :  | 1.42  | 1.71  | 0.72  | 0.35  | 0.10  | 0.37  | 0.48  | 3.25  | 3.34  | 4.16   | 4.89   | 2.44  | 11.7  |

## Average Rainfall On Catchment H1H013.ra

details of rainfall stations used

042227\_3.pat 1920 to 1998

042326\_X.pat 1920 to 1998

042357\_a.pat 1924 to 1998

042499\_p.pat 1961 to 1981

|          |        | rainfall input as percent m.a.p. |       |       |       |       |       |       |       |        |        |        |        |         |
|----------|--------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|---------|
| no.      | gauges | oct                              | nov   | dec   | jan   | feb   | mar   | apr   | may   | jun    | jul    | aug    | sep    | year    |
| 1920     | 2      | 6.61+                            | 3.18+ | 3.18+ | 4.37  | 7.71  | 2.77  | 7.74  | .47   | 60.80  | 28.18  | 14.79  | 7.57   | 147.37  |
| 1921     | 2      | 3.04                             | 1.68  | 5.93  | 9.67  | 1.59  | 3.16  | 6.07  | 8.35  | 23.47  | 6.66   | 22.18  | .43    | 92.22   |
| 1922     | 2      | 3.06                             | 1.59  | .18   | 5.17  | .12   | .40   | 10.70 | 16.02 | 25.89  | 12.41  | 12.27  | 6.46   | 94.27   |
| 1923     | 2      | 4.79                             | 7.50+ | 1.19  | .53   | .22   | 2.67  | 3.45  | 2.85  | 26.45  | 8.11   | 18.83+ | 8.56   | 85.16   |
| 1924     | 3      | 11.44+                           | 4.94+ | .00+  | 2.09+ | .34+  | .27+  | .46+  | 5.96+ | 45.99  | 21.64+ | 4.95+  | 1.62   | 99.69   |
| 1925     | 3      | 15.72                            | 7.49  | .54   | .00   | 4.06  | .00   | 1.17  | 13.23 | 3.20   | 16.25  | 7.96   | 3.27+  | 72.88   |
| 1926     | 3      | 16.29                            | 4.02  | .00+  | 1.87  | 4.94+ | .00   | 6.53  | 9.51+ | 9.60   | 3.26   | 20.41+ | 4.87   | 81.30   |
| 1927     | 3      | .59                              | 11.46 | 2.84+ | 2.85  | .00   | 3.54  | .84   | .08   | 32.40  | 7.27   | 12.23+ | 9.30   | 83.38   |
| 1928     | 3      | 2.00                             | 2.22  | 1.01  | .00   | .89   | 1.81  | 11.00 | 11.03 | 12.18  | 17.82  | 12.94  | 3.53   | 76.44   |
| 1929     | 3      | 1.90                             | 1.56  | 5.49  | 3.15  | 3.62  | 1.51  | 2.85  | 1.34  | 1.45   | 8.75   | 11.52  | 21.18  | 64.30   |
| 1930     | 3      | 4.92                             | 3.73  | .81   | .00   | 1.77  | .62   | 11.02 | 16.06 | 4.25   | 7.89   | 27.27  | 10.81  | 89.14   |
| 1931     | 3      | 6.57                             | .41   | 2.20  | 2.49  | 19.68 | 1.10  | 1.17  | 15.07 | 14.05  | 14.83  | 7.11   | 9.18   | 93.87   |
| 1932     | 3      | 2.75                             | .57   | 1.71  | 1.87  | 2.83  | 2.65  | .40   | 13.39 | 22.36  | 23.43  | 9.05   | 5.26   | 86.27   |
| 1933     | 3      | 4.41                             | 1.87  | 5.15  | 1.68  | 2.01  | 6.01  | 1.84  | 11.93 | 10.57  | 7.82   | 7.78   | 14.37  | 75.45   |
| 1934     | 3      | 13.79                            | 7.25  | .00   | .80   | 2.26  | 4.60  | 10.46 | 12.00 | 9.32   | 14.11  | 14.33  | 8.74   | 97.66   |
| 1935     | 3      | 1.74                             | 5.49  | .64   | 5.08  | .77   | 3.38  | 1.09  | 12.26 | 4.08   | 11.45  | 16.70  | 14.38  | 77.07   |
| 1936     | 3      | 3.36                             | 2.10  | 11.37 | 1.24  | .14   | 7.25  | 7.72  | 13.38 | 22.01  | 25.31  | 5.98   | 1.27   | 101.13  |
| 1937     | 3      | 4.60                             | .24   | 2.77  | 7.67  | 1.55  | .99   | 12.09 | 19.24 | 8.19   | 7.66   | 11.54  | 11.53  | 88.06   |
| 1938     | 3      | 4.22                             | 2.42  | 2.01  | .74   | 8.47  | .70   | 6.45  | 16.88 | 5.48   | 7.21   | 16.79  | 9.01   | 80.39   |
| 1939     | 3      | .79                              | 3.59  | 4.89  | 1.15  | 6.29  | 2.36  | 12.28 | 6.99  | 15.77  | 7.73   | 4.54   | 7.16   | 73.53   |
| 1940     | 3      | 3.67                             | 7.94  | 1.30  | 8.67  | .91   | .32   | 14.28 | 29.12 | 26.17  | 9.95   | 15.15  | 28.31  | 145.79  |
| 1941     | 3      | 10.89                            | 1.68  | 1.88  | 1.21  | .00   | .40   | 1.83  | 19.80 | 47.94  | 6.57   | 11.25  | 1.58   | 105.01  |
| 1942     | 3      | 6.31                             | .50   | 3.33  | 5.95  | 2.95  | 5.51  | 4.35  | 6.72  | 14.33  | 23.42  | 24.02  | 12.30  | 109.69  |
| 1943     | 3      | 4.99                             | 8.52  | .00   | 2.20  | .00   | 3.77  | 7.72  | 19.86 | 35.15  | 6.10   | 19.33  | 10.01  | 117.65  |
| 1944     | 3      | 5.15                             | 7.49  | 2.66  | .00   | .00   | .37   | 7.68  | 29.55 | 32.80  | 19.04  | 16.90  | 1.30   | 122.95  |
| 1945     | 3      | 4.20                             | 3.18  | 1.41  | .13   | .22   | 3.88  | 6.12  | 6.71  | 4.95   | 6.68   | 10.58  | 23.79  | 71.86   |
| 1946     | 3      | 5.99                             | 1.10  | 1.34  | .00   | .00   | 9.20  | 2.28  | 8.17  | 3.78   | 26.93  | 8.73   | 4.72   | 72.22   |
| 1947     | 3      | 7.67                             | 1.49  | .00   | .48   | 3.24  | 14.41 | 9.50  | 16.06 | 8.95   | 20.38  | 3.55   | 20.89  | 106.61  |
| 1948     | 3      | 7.77                             | 1.83  | 1.25  | .86   | .00   | .61   | 8.66  | 8.18  | 11.42  | 12.70  | 12.78  | 12.88  | 78.93   |
| 1949     | 3      | 11.13                            | 12.23 | 1.92  | .14   | .00   | 1.02  | 22.33 | 2.59  | 5.42   | 28.74  | .14    | 19.53  | 105.17  |
| 1950     | 3      | 6.95                             | 12.43 | 4.20  | 7.29  | .00   | .00   | 11.51 | 8.86  | 32.59  | 14.36  | 11.23  | 9.63   | 119.05  |
| 1951     | 3      | 7.56                             | 11.05 | .33   | .46   | 3.64  | 3.32  | 4.60  | 25.32 | 12.28  | 15.75  | 24.72  | 10.94  | 119.95  |
| 1952     | 3      | 6.31                             | 12.23 | .52   | .13   | .16   | 1.05  | 26.87 | 25.64 | 6.38   | 24.40  | 12.83  | .31+   | 116.82  |
| 1953     | 3      | 2.21+                            | 9.54+ | 5.34+ | 1.52  | 1.22  | 2.89  | 14.19 | 35.00 | 11.77  | 31.36  | 25.11  | 7.71   | 147.86  |
| 1954     | 3      | 5.87                             | 1.20  | 6.92  | .00   | 13.02 | 1.93  | 5.87  | 3.51  | 20.29  | 23.28  | 37.20  | 4.19   | 123.29  |
| 1955     | 3      | 14.40                            | 7.54  | 3.67  | 2.22  | 2.84  | 2.00  | 2.29  | 14.08 | 23.79  | 13.66  | 14.71  | 4.60   | 105.80  |
| 1956     | 3      | 3.35                             | .02   | 2.61  | .39   | 18.55 | 7.67  | 4.98  | 19.81 | 29.19  | 24.43  | 18.30  | 7.53   | 136.83  |
| 1957     | 3      | 21.69                            | .54   | .00   | .78   | 6.71  | .58   | 4.36  | 19.54 | 10.45  | 2.86   | 12.34  | 5.37   | 85.22   |
| 1958     | 3      | 5.73                             | 4.94  | .00   | 1.05  | 3.87  | 2.40  | 15.62 | 41.46 | 4.80   | 2.70   | 17.22  | 4.70   | 104.49  |
| 1959     | 3      | 13.93                            | .11   | 3.66  | .29   | 1.17  | 4.59  | 6.86  | 17.34 | 20.76  | 3.78   | 3.96   | 4.15   | 80.59   |
| 1960     | 3      | 2.56                             | .96   | 2.31  | 5.94  | .50   | 1.62  | 6.18  | 11.07 | 11.30  | 10.33  | 16.02  | 18.54  | 87.33   |
| 1961     | 4      | 2.24+                            | .07+  | .98+  | 1.92  | 5.06  | 8.26  | 9.74  | 6.53  | 46.34  | 16.31  | 30.16  | 5.82   | 133.45  |
| 1962     | 4      | 21.46                            | 5.36  | .27   | 1.35  | .00   | .69   | 1.48  | 1.65  | 13.44  | 16.90  | 34.99  | 3.21   | 100.79  |
| 1963     | 4      | 2.45                             | 8.07  | 5.12  | .04   | 6.51  | 1.13  | 6.31  | 9.35  | 24.27  | 13.14  | 24.00  | 7.53   | 107.93  |
| 1964     | 4      | 3.80                             | 8.16  | .48   | 3.14  | 9.56  | 12.39 | 8.96  | 11.85 | 7.60   | 4.63   | 6.66   | 3.84   | 81.08   |
| 1965     | 4      | 4.65                             | 1.23  | 4.33  | .66   | .60   | 9.44  | 6.75  | 4.30  | 18.14  | 22.04  | 6.13   | 8.61   | 86.88   |
| 1966     | 4      | .34                              | .90   | .63   | 3.42  | .63   | .02   | 11.58 | 7.92  | 35.60  | 11.91  | 9.58   | 7.18   | 89.70   |
| 1967     | 4      | 8.57                             | 7.14  | .36   | 2.63  | 1.28  | .51   | 11.88 | 24.85 | 13.91  | 17.83  | 14.75  | .76    | 104.45  |
| 1968     | 4      | 25.12                            | 2.14  | 6.83  | .99   | 1.10  | 1.13  | 8.34  | 2.75  | 8.03   | 4.46   | 13.07  | 12.49  | 86.44   |
| 1969     | 4      | 15.42                            | 1.54  | .37   | .38   | 1.40  | .21   | .19   | 12.48 | 25.80  | 17.77  | 18.11  | 9.26   | 102.91  |
| 1970     | 4      | 3.43                             | 1.35  | 1.38  | .61   | .22   | 7.48  | .29   | 6.03  | 12.30  | 17.69  | 15.80  | .68    | 67.26   |
| 1971     | 4      | .79                              | .99   | 1.46  | 4.49  | 1.53  | 1.46  | 13.85 | 15.46 | 9.95   | 12.42  | 6.69   | 7.07   | 76.15   |
| 1972     | 4      | 4.43                             | .00   | 6.05  | .04   | .24   | 5.17  | 1.05  | 6.83  | 2.54   | 27.19  | 14.46  | 12.99  | 81.01   |
| 1973     | 4      | 4.40                             | 1.78  | 5.46  | .27   | .68   | 1.59  | 1.97  | 18.68 | 22.28  | 11.22  | 54.05  | 13.75  | 136.13  |
| 1974     | 4      | 12.52                            | 6.79  | 1.42  | 3.84  | 1.65  | 1.44  | 6.97  | 29.08 | 7.03   | 15.80  | 18.53  | 1.48   | 106.55  |
| 1975     | 4      | 11.97                            | 2.37  | .71   | .19   | 2.50  | 2.31  | 10.67 | 5.79  | 36.77  | 16.73  | 7.32   | 3.02   | 100.34  |
| 1976     | 4      | 3.21                             | 23.60 | 13.88 | 3.33  | 3.71  | 1.42  | 9.06  | 35.95 | 27.12  | 30.61  | 19.38  | 9.30   | 180.57  |
| 1977     | 4      | 2.80                             | 2.19  | 5.20  | 1.94  | 1.40  | 5.04  | 7.27  | 5.77  | 2.94   | .30+   | 20.11  | 10.57  | 65.52   |
| 1978     | 4      | 2.15                             | .28   | 5.73  | 3.12  | 8.55  | .35   | 1.92  | 12.38 | 18.66  | 11.22  | 8.84   | 10.79  | 84.00   |
| 1979     | 4      | 10.79                            | .33   | .05   | 4.50  | 2.98  | .59   | 7.26  | 14.67 | 14.85  | 2.76   | 15.87  | 2.24   | 76.89   |
| 1980     | 4      | 5.74                             | 24.04 | 9.75  | 14.36 | 1.26  | 4.19  | 5.21  | 2.38  | 9.80   | 23.75  | 18.69  | 19.53  | 138.69  |
| 1981     | 4      | 3.15                             | 2.61  | .46   | 6.39  | .22   | 6.29  | 18.52 | 6.62  | 13.29  | 10.86  | 6.43+  | .90+   | 75.73   |
| 1982     | 3      | 10.80                            | 2.16  | 4.30  | .00   | 6.65  | 5.06  | 1.86  | 30.11 | 22.92  | 20.15  | 5.94   | 6.70   | 116.64  |
| 1983     | 3      | 1.92                             | 2.41  | .90   | .75   | .12   | 17.25 | 6.68  | 40.03 | 6.23   | 11.05  | 5.77   | 21.98  | 115.09  |
| 1984     | 3      | 13.06                            | .09   | 11.71 | 7.68  | 5.16  | 19.57 | 8.99  | 9.03  | 16.15  | 21.81  | 19.78  | 8.69   | 141.70  |
| 1985     | 3      | 1.47                             | .56   | 2.23  | 1.26  | 2.22  | 7.33  | 5.87  | 5.92  | 19.31  | 15.40  | 24.05  | 8.59   | 94.20   |
| 1986     | 3      | 2.46                             | 2.78  | .00   | 2.72  | 1.42  | 1.43  | 8.62  | 25.49 | 22.26  | 13.55  | 16.97  | 9.47   | 107.16  |
| 1987     | 3      | .34                              | .23   | 4.20  | .06   | .16   | 2.21  | 16.21 | 6.93  | 17.58  | 8.02   | 12.61  | 11.07  | 79.62   |
| 1988     | 3      | 1.59                             | 1.69  | 1.40  | .19   | 4.58  | 15.03 | 11.57 | 9.23  | 19.12  | 14.61  | 20.83  | 17.90  | 117.74  |
| 1989     | 3      | 7.46                             | 5.11  | .31   | 1.49  | 5.19  | 2.29  | 23.70 | 17.86 | 18.82  | 17.50  | 7.89   | .70    | 108.31  |
| 1990     | 3      | .38                              | 3.86  | 4.81  | 1.11  | .60   | 1.65  | 5.59  | 10.73 | 26.00  | 36.14  | 5.13   | 15.83  | 111.84  |
| 1991     | 3      | 6.60                             | 2.80  | .98   | .00   | 5.62  | 6.01  | 12.46 | 10.52 | 29.63  | 18.08  | 12.65  | 5.38   | 110.74  |
| 1992     | 3      | 13.58                            | 4.34  | .73   | 1.04  | 3.85  | .94   | 15.81 | 23.45 | 14.25  | 30.14  | 8.38   | 3.65   | 120.17  |
| 1993     | 3      | .24                              | 1.37  | 3.43  | .13   | .00   | .79   | 12.00 | 8.01  | 39.37  | 11.20  | 3.20   | 16.24  | 95.97   |
| 1994     | 3      | 3.94                             | .63   | 1.28  | .76   | .69   | 2.55  | 1.53  | 16.53 | 12.94  | 20.55  | 14.34  | 2.92   | 78.66   |
| 1995     | 3      | 14.70                            | 1.24  | 10.53 | .47   | 4.63  | 4.55  | 3.83  | 10.85 | 29.53  | 18.07  | 20.25  | 20.44  | 139.10  |
| 1996     | 3      | 4.37                             | 11.69 | 8.39  | 1.21  | .20   | 1.85  | 5.09  | 8.83  | 23.54  | 5.12   | 13.80  | .52    | 84.63   |
| 1997     | 3      | 1.20                             | 8.92  | 4.29  | 8.37  | .00   | .37   | 3.44  | 31.88 | 7.07   | 15.03  | 6.09   | 2.73   | 89.40   |
| 1998     | 3      | 3.64                             | 11.83 | 7.24  | .08+  | 1.48+ | .00+  | 7.31+ | 7.40+ | 18.08+ | 14.28+ | 14.29+ | 10.43+ | 96.06   |
| average  |        | 6.43                             | 4.33  | 2.96  | 2.24  | 2.81  | 3.46  | 7.64  | 13.78 | 18.30  | 14.96  | 14.57  | 8.68   | 100.15  |
| adjusted |        | 6.42                             | 4.33  | 2.96  | 2.24  | 2.80  | 3.45  | 7.62  | 13.76 | 18.27  | 14.93  | 14.54  | 8.67   | 100.001 |

Appendix B1.4

File : AU\_H1R3.USE  
Units : 10^6xm^3  
Descrip. : Upland Alien Demand for 1964 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1965  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1966  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1967  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1968  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1969  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1970  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1971  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1972  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1973  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.0   |
| 1974  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1975  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1976  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.0   |
| 1977  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1978  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1979  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1980  | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.0   |
| 1981  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1984  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1985  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.0   |
| 1986  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1987  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.0   |
| 1989  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.1   |
| 1990  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.05 | 0.02 | 0.02 | 0.1   |
| AVE : | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.0   |
| SD :  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.0   |

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File      : H1R3RIP.DEM
Units     : 10^6xm^3
Descrip.  : Riparian Alien Vegetation Demand for 1964 to 1990
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[illegible]

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File      : GKRQ11.NSI
Units     : 10^6xm^3
Descrip.  : Farm Dam Irrigation in H1R003 sub-catchment for 1964 to 1990
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| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 0.01 | 0.05 | 0.24 | 0.25 | 0.14 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.7   |
| 1965  | 0.01 | 0.11 | 0.18 | 0.28 | 0.23 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.9   |
| 1966  | 0.03 | 0.12 | 0.23 | 0.25 | 0.24 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.0   |
| 1967  | 0.00 | 0.08 | 0.24 | 0.24 | 0.22 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.9   |
| 1968  | 0.00 | 0.11 | 0.22 | 0.25 | 0.22 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.9   |
| 1969  | 0.00 | 0.11 | 0.24 | 0.27 | 0.23 | 0.10 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.0   |
| 1970  | 0.01 | 0.11 | 0.23 | 0.27 | 0.24 | 0.08 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.9   |
| 1971  | 0.02 | 0.11 | 0.22 | 0.24 | 0.22 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.9   |
| 1972  | 0.01 | 0.13 | 0.17 | 0.28 | 0.22 | 0.09 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.9   |
| 1973  | 0.01 | 0.11 | 0.19 | 0.28 | 0.24 | 0.12 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.0   |
| 1974  | 0.00 | 0.08 | 0.24 | 0.26 | 0.23 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.9   |
| 1975  | 0.00 | 0.12 | 0.27 | 0.30 | 0.24 | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.1   |
| 1976  | 0.02 | 0.00 | 0.10 | 0.29 | 0.24 | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.8   |
| 1977  | 0.02 | 0.14 | 0.26 | 0.33 | 0.28 | 0.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.1   |
| 1978  | 0.03 | 0.15 | 0.26 | 0.31 | 0.18 | 0.16 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.1   |
| 1979  | 0.00 | 0.17 | 0.34 | 0.27 | 0.29 | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.2   |
| 1980  | 0.00 | 0.00 | 0.22 | 0.25 | 0.34 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.9   |
| 1981  | 0.02 | 0.15 | 0.35 | 0.29 | 0.34 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.3   |
| 1982  | 0.00 | 0.13 | 0.27 | 0.41 | 0.18 | 0.11 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.1   |
| 1983  | 0.03 | 0.14 | 0.34 | 0.42 | 0.36 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.3   |
| 1984  | 0.00 | 0.19 | 0.20 | 0.30 | 0.26 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.0   |
| 1985  | 0.03 | 0.17 | 0.31 | 0.37 | 0.31 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.3   |
| 1986  | 0.03 | 0.14 | 0.39 | 0.35 | 0.37 | 0.16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.4   |
| 1987  | 0.04 | 0.20 | 0.29 | 0.44 | 0.36 | 0.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.5   |
| 1988  | 0.03 | 0.17 | 0.36 | 0.44 | 0.30 | 0.14 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.4   |
| 1989  | 0.01 | 0.10 | 0.37 | 0.40 | 0.31 | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.4   |
| 1990  | 0.04 | 0.14 | 0.33 | 0.43 | 0.35 | 0.17 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.5   |
| AVE : | 0.01 | 0.12 | 0.26 | 0.31 | 0.26 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.1   |
| SD :  | 0.01 | 0.05 | 0.07 | 0.07 | 0.06 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |

```
File      : GKRQ7.NSI
Units     : 10^6xm^3
Descrip.  : Diffuse Irrigation from river in H1R003 sub-catchment for 1964 to 1990
```

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 0.00 | 0.01 | 0.04 | 0.05 | 0.03 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1965  | 0.00 | 0.02 | 0.03 | 0.01 | 0.04 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1966  | 0.01 | 0.02 | 0.04 | 0.03 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1967  | 0.00 | 0.01 | 0.04 | 0.05 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1968  | 0.00 | 0.02 | 0.04 | 0.05 | 0.04 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1969  | 0.00 | 0.02 | 0.05 | 0.05 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1970  | 0.00 | 0.02 | 0.04 | 0.01 | 0.01 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1971  | 0.00 | 0.02 | 0.04 | 0.05 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1972  | 0.00 | 0.02 | 0.03 | 0.05 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1973  | 0.00 | 0.02 | 0.04 | 0.05 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1974  | 0.00 | 0.02 | 0.05 | 0.05 | 0.04 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1975  | 0.00 | 0.02 | 0.05 | 0.06 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1976  | 0.00 | 0.00 | 0.02 | 0.06 | 0.05 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1977  | 0.00 | 0.03 | 0.05 | 0.06 | 0.05 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1978  | 0.01 | 0.03 | 0.05 | 0.06 | 0.04 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1979  | 0.00 | 0.03 | 0.06 | 0.05 | 0.06 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1980  | 0.00 | 0.00 | 0.04 | 0.05 | 0.07 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1981  | 0.00 | 0.03 | 0.07 | 0.06 | 0.06 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1982  | 0.00 | 0.03 | 0.05 | 0.08 | 0.04 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1983  | 0.01 | 0.03 | 0.07 | 0.08 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1984  | 0.00 | 0.04 | 0.04 | 0.06 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1985  | 0.01 | 0.03 | 0.06 | 0.07 | 0.06 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |
| 1986  | 0.01 | 0.03 | 0.07 | 0.07 | 0.07 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |
| 1987  | 0.01 | 0.04 | 0.06 | 0.08 | 0.07 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |
| 1988  | 0.01 | 0.03 | 0.07 | 0.08 | 0.06 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |
| 1989  | 0.00 | 0.02 | 0.07 | 0.08 | 0.06 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |
| 1990  | 0.01 | 0.03 | 0.06 | 0.08 | 0.07 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |
| AVE : | 0.00 | 0.02 | 0.05 | 0.06 | 0.04 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| SD :  | 0.00 | 0.01 | 0.01 | 0.02 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |

Appendix B1.8

File : GKRQ21.NSI  
Units : 10^6xm^3  
Descrip. : Diffuse Irrigation from river d/s H1R003 for 1964 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1965  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1966  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1967  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1968  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1969  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1970  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.1   |
| 1971  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1972  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1973  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1974  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1975  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1976  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1977  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1978  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1979  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1980  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1981  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1984  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1985  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1986  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1987  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1989  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| AVE : | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.2   |
| SD :  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |



Appendix B1.9

File : KOEKCERS.FLW  
Units : 10<sup>6</sup>m<sup>3</sup>  
Descrip. : Domestic and Irrigation demand from Ceres dam for 1964 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 1.33 | 0.94 | 0.66 | 0.42 | 0.29 | 0.33 | 0.43 | 0.63 | 0.70 | 1.20 | 1.22 | 1.39 | 9.5   |
| 1965  | 1.34 | 0.94 | 0.60 | 0.12 | 0.07 | 0.34 | 0.43 | 0.63 | 0.70 | 1.20 | 1.22 | 1.39 | 9.0   |
| 1966  | 1.34 | 0.95 | 0.24 | 0.09 | 0.02 | 0.01 | 0.43 | 0.63 | 0.71 | 1.21 | 1.23 | 1.39 | 8.3   |
| 1967  | 1.35 | 0.95 | 0.68 | 0.45 | 0.11 | 0.04 | 0.44 | 0.64 | 0.71 | 1.21 | 1.23 | 1.39 | 9.2   |
| 1968  | 1.35 | 0.96 | 0.69 | 0.45 | 0.16 | 0.04 | 0.41 | 0.25 | 0.71 | 1.01 | 1.23 | 1.40 | 8.7   |
| 1969  | 1.36 | 0.97 | 0.69 | 0.11 | 0.03 | 0.02 | 0.02 | 0.65 | 0.71 | 1.21 | 1.23 | 1.40 | 8.4   |
| 1970  | 1.36 | 0.98 | 0.71 | 0.11 | 0.03 | 0.13 | 0.09 | 0.06 | 0.71 | 1.21 | 1.23 | 1.40 | 8.0   |
| 1971  | 1.37 | 0.90 | 0.30 | 0.11 | 0.08 | 0.03 | 0.46 | 0.65 | 0.72 | 1.22 | 1.24 | 1.41 | 8.5   |
| 1972  | 1.37 | 0.99 | 0.61 | 0.19 | 0.07 | 0.11 | 0.11 | 0.20 | 0.27 | 1.22 | 1.24 | 1.41 | 7.8   |
| 1973  | 1.38 | 1.00 | 0.69 | 0.23 | 0.10 | 0.02 | 0.04 | 1.15 | 1.21 | 1.71 | 1.73 | 1.90 | 11.2  |
| 1974  | 1.38 | 1.00 | 0.74 | 0.50 | 0.30 | 0.04 | 0.46 | 1.44 | 1.50 | 2.00 | 2.02 | 2.19 | 13.6  |
| 1975  | 1.38 | 1.01 | 0.74 | 0.19 | 0.08 | 0.04 | 0.47 | 0.66 | 1.72 | 2.17 | 1.89 | 2.06 | 12.4  |
| 1976  | 1.39 | 1.01 | 0.75 | 0.51 | 0.38 | 0.41 | 0.47 | 1.07 | 1.13 | 1.63 | 1.65 | 1.83 | 12.2  |
| 1977  | 1.39 | 1.02 | 0.75 | 0.24 | 0.12 | 0.28 | 0.27 | 0.30 | 0.36 | 0.31 | 3.27 | 2.41 | 10.7  |
| 1978  | 1.38 | 1.01 | 0.40 | 0.28 | 0.38 | 0.42 | 0.17 | 0.67 | 2.04 | 2.54 | 2.12 | 2.30 | 13.7  |
| 1979  | 1.39 | 1.03 | 0.70 | 0.41 | 0.27 | 0.12 | 0.14 | 1.37 | 2.45 | 1.53 | 2.32 | 1.42 | 13.2  |
| 1980  | 1.40 | 1.03 | 0.77 | 0.53 | 0.40 | 0.43 | 0.40 | 0.15 | 0.45 | 2.81 | 2.83 | 2.21 | 13.4  |
| 1981  | 1.40 | 1.04 | 0.77 | 0.43 | 0.23 | 0.30 | 1.05 | 0.88 | 2.02 | 2.52 | 2.21 | 1.43 | 14.3  |
| 1982  | 1.40 | 1.04 | 0.78 | 0.55 | 0.41 | 0.44 | 0.49 | 1.38 | 1.43 | 1.93 | 1.95 | 2.13 | 13.9  |
| 1983  | 1.41 | 1.05 | 0.77 | 0.20 | 0.09 | 0.44 | 0.49 | 1.15 | 1.20 | 1.70 | 1.72 | 1.90 | 12.1  |
| 1984  | 1.41 | 1.05 | 0.79 | 0.60 | 0.45 | 0.48 | 0.51 | 1.15 | 1.19 | 1.69 | 1.71 | 1.90 | 12.9  |
| 1985  | 1.44 | 1.09 | 0.80 | 0.34 | 0.24 | 0.42 | 0.60 | 0.77 | 2.14 | 2.28 | 1.85 | 2.49 | 14.5  |
| 1986  | 1.32 | 0.92 | 0.63 | 0.30 | 0.18 | 0.13 | 0.09 | 1.45 | 1.25 | 1.53 | 2.18 | 2.08 | 12.1  |
| 1987  | 1.55 | 1.01 | 0.59 | 0.26 | 0.14 | 0.14 | 0.56 | 0.53 | 1.85 | 2.27 | 2.15 | 2.10 | 13.2  |
| 1988  | 1.36 | 1.06 | 0.77 | 0.23 | 0.20 | 0.23 | 0.15 | 1.43 | 1.12 | 1.92 | 1.64 | 2.31 | 12.4  |
| 1989  | 1.82 | 1.14 | 0.99 | 0.50 | 0.27 | 0.18 | 0.41 | 1.55 | 1.23 | 1.62 | 2.35 | 2.37 | 14.4  |
| 1990  | 0.93 | 0.84 | 0.57 | 0.45 | 0.15 | 0.12 | 0.07 | 0.66 | 1.41 | 1.74 | 1.87 | 1.56 | 10.4  |
| AVE : | 1.38 | 1.00 | 0.67 | 0.33 | 0.19 | 0.21 | 0.36 | 0.82 | 1.17 | 1.65 | 1.80 | 1.82 | 11.4  |
| SD :  | 0.13 | 0.06 | 0.16 | 0.16 | 0.13 | 0.16 | 0.23 | 0.44 | 0.58 | 0.56 | 0.53 | 0.40 | 2.3   |

Appendix B1.10

File : H1H013.CAL  
Units : 10^6xm^3  
Descrip. : Simulated flow record at H1H013 for 1964 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May   | Jun   | Jul   | Aug   | Sep  | Total |
|-------|------|------|------|------|------|------|------|-------|-------|-------|-------|------|-------|
| 1964  | 1.92 | 0.99 | 0.41 | 0.16 | 0.57 | 1.34 | 0.95 | 1.80  | 1.76  | 1.51  | 1.66  | 1.28 | 14.3  |
| 1965  | 1.06 | 0.36 | 0.21 | 0.05 | 0.01 | 0.34 | 0.14 | 0.43  | 2.92  | 6.89  | 3.84  | 2.64 | 18.9  |
| 1966  | 1.32 | 0.37 | 0.12 | 0.19 | 0.17 | 0.08 | 0.57 | 0.51  | 10.33 | 6.34  | 3.82  | 2.68 | 26.5  |
| 1967  | 2.13 | 1.09 | 0.38 | 0.19 | 0.13 | 0.09 | 0.68 | 5.40  | 4.39  | 6.13  | 6.12  | 2.82 | 29.6  |
| 1968  | 6.80 | 2.08 | 0.66 | 0.23 | 0.19 | 0.10 | 0.11 | 0.13  | 0.53  | 0.71  | 1.97  | 3.09 | 16.6  |
| 1969  | 4.05 | 1.26 | 0.24 | 0.23 | 0.20 | 0.11 | 0.03 | 0.74  | 5.85  | 6.30  | 6.95  | 4.30 | 30.3  |
| 1970  | 1.95 | 0.48 | 0.24 | 0.09 | 0.18 | 0.18 | 0.09 | 0.05  | 1.16  | 3.86  | 5.36  | 2.44 | 16.1  |
| 1971  | 1.07 | 0.33 | 0.06 | 0.02 | 0.04 | 0.03 | 1.13 | 2.48  | 2.24  | 3.54  | 2.79  | 2.14 | 15.9  |
| 1972  | 1.35 | 0.37 | 0.23 | 0.20 | 0.13 | 0.09 | 0.01 | 0.09  | 0.16  | 5.94  | 5.22  | 4.30 | 18.1  |
| 1973  | 2.13 | 0.49 | 0.24 | 0.16 | 0.17 | 0.12 | 0.04 | 2.01  | 4.96  | 3.86  | 21.49 | 9.68 | 45.3  |
| 1974  | 4.47 | 1.71 | 0.57 | 0.29 | 0.07 | 0.11 | 0.12 | 5.67  | 2.17  | 3.39  | 5.85  | 2.27 | 26.7  |
| 1975  | 2.42 | 0.79 | 0.26 | 0.19 | 0.14 | 0.07 | 0.41 | 0.44  | 9.40  | 6.69  | 3.18  | 1.34 | 25.3  |
| 1976  | 1.07 | 4.76 | 3.10 | 0.89 | 0.34 | 0.10 | 0.27 | 9.41  | 10.31 | 13.35 | 9.66  | 4.57 | 57.8  |
| 1977  | 2.07 | 0.49 | 0.30 | 0.31 | 0.20 | 0.04 | 0.04 | 0.23  | 0.30  | 0.25  | 1.55  | 1.62 | 7.4   |
| 1978  | 1.23 | 0.37 | 0.21 | 0.17 | 0.36 | 0.09 | 0.03 | 0.81  | 2.27  | 2.04  | 1.94  | 1.99 | 11.5  |
| 1979  | 2.80 | 0.85 | 0.28 | 0.14 | 0.05 | 0.07 | 0.12 | 0.91  | 1.24  | 1.31  | 2.40  | 1.92 | 12.1  |
| 1980  | 1.10 | 5.11 | 2.29 | 2.25 | 0.82 | 0.21 | 0.10 | 0.01  | 0.62  | 3.95  | 5.44  | 6.60 | 28.5  |
| 1981  | 3.01 | 0.58 | 0.24 | 0.21 | 0.15 | 0.09 | 2.03 | 0.94  | 1.08  | 1.71  | 1.29  | 1.25 | 12.6  |
| 1982  | 1.67 | 0.47 | 0.24 | 0.13 | 0.08 | 0.09 | 0.12 | 5.83  | 6.74  | 6.96  | 3.57  | 1.77 | 27.7  |
| 1983  | 1.23 | 0.37 | 0.23 | 0.02 | 0.08 | 2.10 | 0.63 | 11.18 | 4.14  | 2.52  | 1.81  | 5.91 | 30.2  |
| 1984  | 4.58 | 1.19 | 1.26 | 0.72 | 0.34 | 3.19 | 1.53 | 0.78  | 3.17  | 6.95  | 7.95  | 4.14 | 35.8  |
| 1985  | 1.80 | 0.38 | 0.23 | 0.02 | 0.01 | 0.09 | 0.12 | 0.43  | 1.83  | 3.46  | 7.64  | 3.63 | 19.6  |
| 1986  | 1.90 | 0.53 | 0.31 | 0.14 | 0.10 | 0.03 | 0.26 | 4.44  | 6.40  | 5.09  | 5.21  | 3.61 | 28.0  |
| 1987  | 1.58 | 0.38 | 0.16 | 0.16 | 0.11 | 0.01 | 1.57 | 0.82  | 2.19  | 1.48  | 2.52  | 2.63 | 13.6  |
| 1988  | 1.69 | 0.38 | 0.23 | 0.02 | 0.07 | 1.72 | 1.64 | 0.47  | 4.12  | 4.40  | 7.05  | 6.55 | 28.3  |
| 1989  | 3.14 | 0.93 | 0.25 | 0.09 | 0.14 | 0.08 | 4.24 | 3.42  | 5.16  | 6.10  | 3.12  | 1.16 | 27.8  |
| 1990  | 1.13 | 0.36 | 0.23 | 0.06 | 0.03 | 0.03 | 0.04 | 0.52  | 5.42  | 13.31 | 4.98  | 4.71 | 30.8  |
| AVE : | 2.25 | 1.02 | 0.49 | 0.27 | 0.18 | 0.39 | 0.63 | 2.22  | 3.74  | 4.74  | 4.98  | 3.37 | 24.3  |
| SD :  | 1.36 | 1.21 | 0.68 | 0.44 | 0.18 | 0.77 | 0.93 | 2.95  | 2.97  | 3.25  | 3.99  | 2.01 | 11.0  |

Appendix B1.11

File : H1H13PAT.OBS  
Units : 10^6xm^3  
Descrip. : Patched observed runoff at H1H013 for 1964 to 1990

| Year  | Oct   | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul    | Aug    | Sep   | Total |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|-------|-------|
| 1964  | 1.92+ | 0.99+ | 0.41+ | 0.26+ | 0.09* | 0.75  | 2.15  | 3.51  | 2.34  | 1.50   | 3.01   | 2.46  | 19.4  |
| 1965  | 0.98  | 0.42  | 0.24  | 0.09  | 0.07  | 0.61  | 0.81  | 0.35  | 1.41  | 7.90   | 3.08   | 1.65  | 17.6  |
| 1966  | 0.81  | 0.20  | 0.13  | 0.14  | 0.08  | 0.08  | 0.92  | 0.98  | 10.81 | 3.85   | 0.31   | 3.14* | 21.5  |
| 1967  | 2.70+ | 1.15+ | 0.34+ | 0.14+ | 0.09+ | 0.07+ | 0.28* | 8.86  | 5.93  | 4.83   | 6.72   | 1.63  | 32.7  |
| 1968  | 6.49  | 0.73  | 0.34  | 0.17* | 0.11  | 0.08  | 0.38  | 0.70  | 0.90  | 1.17   | 3.32   | 4.67* | 19.1  |
| 1969  | 4.26* | 1.26  | 0.78  | 0.35  | 0.27  | 0.21  | 0.20* | 1.23  | 5.35  | 5.01   | 7.79   | 6.03  | 32.7  |
| 1970  | 1.51  | 0.53  | 0.37  | 0.18  | 0.17  | 0.21  | 0.23  | 0.32  | 0.56  | 3.57   | 3.49   | 1.58  | 12.7  |
| 1971  | 0.39  | 0.28  | 0.18  | 0.07  | 0.07  | 0.06  | 0.05  | 2.10  | 2.05  | 2.01   | 3.42   | 1.69  | 12.4  |
| 1972  | 0.77  | 0.26  | 0.34  | 0.13  | 0.08  | 0.12  | 0.09  | 0.20  | 0.42  | 9.83   | 3.65   | 2.75  | 18.6  |
| 1973  | 1.68  | 0.58* | 0.24* | 0.11* | 0.09  | 0.09  | 0.09  | 0.39  | 3.31  | 1.11   | 25.27* | 7.17  | 40.1  |
| 1974  | 3.18  | 1.73  | 0.72  | 0.49  | 0.22  | 0.14  | 0.61  | 4.18  | 1.07  | 3.76   | 4.56*  | 2.28+ | 22.9  |
| 1975  | 2.87+ | 0.85+ | 0.24+ | 0.10  | 0.10  | 0.16  | 0.17  | 0.20  | 11.33 | 3.06   | 2.58   | 0.70  | 22.4  |
| 1976  | 0.32  | 6.51  | 3.82  | 1.79  | 0.43  | 0.38  | 0.60  | 8.68  | 11.46 | 14.71  | 11.08  | 4.40  | 64.2  |
| 1977  | 2.13  | 0.88  | 0.61  | 0.20  | 0.16  | 0.17  | 0.59  | 0.99  | 0.22  | 0.12   | 2.00   | 2.59  | 10.7  |
| 1978  | 1.60  | 0.48  | 0.31  | 0.14  | 0.11  | 0.23  | 0.15  | 0.93  | 2.67  | 1.19   | 1.87   | 0.77  | 10.5  |
| 1979  | 4.44  | 0.82  | 0.31  | 0.38  | 0.17  | 0.15  | 0.27  | 1.19  | 2.21  | 0.40   | 1.39   | 0.47  | 12.2  |
| 1980  | 1.32* | 7.37* | 1.70  | 0.88  | 0.26  | 0.24  | 0.29  | 0.26  | 0.27  | 3.11   | 5.28   | 7.75  | 28.7  |
| 1981  | 1.65  | 0.72  | 0.48  | 0.43  | 0.13  | 0.12  | 0.86  | 0.72  | 1.52  | 1.16   | 1.31   | 1.81* | 10.9  |
| 1982  | 2.00  | 0.51  | 0.79  | 0.33  | 0.45  | 0.37  | 0.32  | 3.88  | 7.29  | 12.96  | 4.56   | 2.09  | 35.6  |
| 1983  | 1.05  | 0.25  | 0.23* | 0.14  | 0.11  | 0.37  | 0.63  | 14.07 | 0.43  | 5.26   | 1.29   | 6.83  | 30.7  |
| 1984  | 3.39  | 0.42  | 0.62  | 0.44  | 0.13  | 1.42  | 1.53* | 1.06* | 4.26  | 6.85   | 7.87   | 3.74* | 31.7  |
| 1985  | 1.54  | 0.44  | 0.21  | 0.10  | 0.08  | 0.24  | 1.03  | 1.68  | 1.80  | 4.30   | 11.14  | 3.09  | 25.7  |
| 1986  | 1.04  | 0.55  | 0.30  | 0.34  | 0.16  | 0.14  | 0.16  | 2.62  | 3.56  | 2.93   | 3.30   | 2.61  | 17.7  |
| 1987  | 1.65  | 0.62  | 0.45  | 0.25  | 0.12  | 0.19  | 0.65  | 0.57  | 4.39  | 3.04   | 1.84   | 4.63  | 18.4  |
| 1988  | 1.67  | 0.86  | 0.36  | 0.19  | 0.18  | 1.46  | 0.77  | 1.59  | 1.41  | 3.51   | 4.93   | 9.28  | 26.2  |
| 1989  | 3.04  | 1.44  | 0.54  | 0.23  | 0.13  | 0.09  | 0.83  | 2.99  | 2.35  | 10.64  | 5.32   | 1.13  | 28.7  |
| 1990  | 0.53  | 0.37  | 0.19  | 0.09  | 0.06  | 0.08  | 0.20  | 0.97  | 5.45+ | 13.83+ | 5.01+  | 7.29+ | 34.1  |
| AVE : | 2.03  | 1.16  | 0.56  | 0.30  | 0.15  | 0.30  | 0.55  | 2.42  | 3.51  | 4.87   | 5.01   | 3.49  | 24.4  |
| SD :  | 1.41  | 1.71  | 0.72  | 0.34  | 0.10  | 0.37  | 0.48  | 3.25  | 3.35  | 4.16   | 4.89   | 2.44  | 11.7  |

## Appendix B1.12

File : H1H13S-0.NAT

Units : 10^6xm^3

Descrip. : Incremental Naturalised Flow at H1H013 for 1925 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May   | Jun   | Jul   | Aug   | Sep   | Total |
|-------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| 1925  | 4.06 | 2.14 | 0.99 | 0.55 | 0.35 | 0.19 | 0.12 | 1.45  | 0.75  | 3.13  | 2.67  | 1.81  | 18.2  |
| 1926  | 3.75 | 1.84 | 0.81 | 0.47 | 0.35 | 0.19 | 0.32 | 0.92  | 1.53  | 1.35  | 5.22  | 3.09  | 19.8  |
| 1927  | 1.42 | 1.85 | 0.96 | 0.51 | 0.29 | 0.20 | 0.12 | 0.08  | 8.15  | 3.39  | 3.17  | 3.14  | 23.3  |
| 1928  | 1.82 | 0.99 | 0.60 | 0.35 | 0.18 | 0.10 | 0.92 | 1.48  | 2.52  | 5.54  | 5.42  | 3.00  | 22.9  |
| 1929  | 1.49 | 0.90 | 0.68 | 0.43 | 0.29 | 0.19 | 0.16 | 0.13  | 0.12  | 0.66  | 1.78  | 5.67  | 12.5  |
| 1930  | 2.88 | 1.22 | 0.72 | 0.40 | 0.22 | 0.13 | 0.92 | 2.78  | 1.61  | 1.76  | 8.63  | 5.56  | 26.8  |
| 1931  | 2.79 | 1.33 | 0.72 | 0.43 | 3.42 | 1.15 | 0.33 | 2.15  | 3.09  | 4.61  | 3.42  | 3.05  | 26.5  |
| 1932  | 1.88 | 1.01 | 0.60 | 0.35 | 0.21 | 0.15 | 0.09 | 1.51  | 5.37  | 8.47  | 5.26  | 2.95  | 27.9  |
| 1933  | 1.76 | 1.06 | 0.75 | 0.45 | 0.27 | 0.31 | 0.21 | 1.31  | 1.85  | 2.04  | 2.33  | 4.09  | 16.4  |
| 1934  | 4.26 | 2.28 | 1.04 | 0.56 | 0.31 | 0.24 | 0.95 | 1.85  | 2.12  | 4.10  | 5.24  | 3.80  | 26.7  |
| 1935  | 1.98 | 1.20 | 0.73 | 0.51 | 0.29 | 0.20 | 0.13 | 1.27  | 0.81  | 1.93  | 4.62  | 5.10  | 18.8  |
| 1936  | 2.56 | 1.15 | 1.63 | 0.77 | 0.36 | 0.46 | 0.62 | 2.07  | 6.10  | 9.99  | 5.14  | 2.34  | 33.2  |
| 1937  | 1.40 | 0.90 | 0.57 | 0.63 | 0.33 | 0.19 | 1.21 | 3.99  | 2.71  | 2.45  | 3.63  | 3.89  | 21.9  |
| 1938  | 2.28 | 1.17 | 0.71 | 0.41 | 0.63 | 0.30 | 0.36 | 2.82  | 1.72  | 1.74  | 4.66  | 3.66  | 20.5  |
| 1939  | 1.85 | 1.01 | 0.72 | 0.44 | 0.42 | 0.26 | 1.36 | 1.08  | 3.34  | 2.88  | 2.19  | 2.04  | 17.6  |
| 1940  | 1.50 | 1.36 | 0.80 | 0.88 | 0.45 | 0.23 | 1.75 | 7.91  | 10.08 | 5.91  | 5.94  | 11.01 | 47.8  |
| 1941  | 5.91 | 2.00 | 0.91 | 0.51 | 0.29 | 0.15 | 0.08 | 3.33  | 17.07 | 6.83  | 4.06  | 2.44  | 43.6  |
| 1942  | 1.56 | 0.98 | 0.63 | 0.51 | 0.32 | 0.33 | 0.31 | 0.57  | 2.52  | 7.29  | 9.90  | 6.38  | 31.3  |
| 1943  | 3.02 | 1.89 | 1.00 | 0.55 | 0.30 | 0.20 | 0.46 | 3.84  | 12.31 | 5.62  | 6.72  | 4.82  | 40.7  |
| 1944  | 2.57 | 1.67 | 0.96 | 0.55 | 0.31 | 0.16 | 0.39 | 7.33  | 12.26 | 9.42  | 7.83  | 3.76  | 47.2  |
| 1945  | 1.66 | 1.03 | 0.68 | 0.39 | 0.21 | 0.16 | 0.26 | 0.50  | 0.68  | 1.09  | 2.16  | 7.20  | 16.0  |
| 1946  | 3.59 | 1.31 | 0.71 | 0.40 | 0.21 | 0.61 | 0.29 | 0.63  | 0.65  | 7.05  | 4.37  | 2.36  | 22.2  |
| 1947  | 1.90 | 1.16 | 0.66 | 0.36 | 0.22 | 1.76 | 1.38 | 3.29  | 2.84  | 6.62  | 3.78  | 6.31  | 30.3  |
| 1948  | 3.72 | 1.52 | 0.79 | 0.45 | 0.24 | 0.13 | 0.50 | 0.74  | 1.85  | 3.30  | 4.33  | 4.52  | 22.1  |
| 1949  | 3.69 | 3.08 | 1.36 | 0.66 | 0.36 | 0.19 | 4.18 | 1.46  | 0.79  | 8.08  | 3.63  | 5.14  | 32.6  |
| 1950  | 3.04 | 2.69 | 1.36 | 0.96 | 0.54 | 0.29 | 1.11 | 1.13  | 9.65  | 7.09  | 4.99  | 3.88  | 36.7  |
| 1951  | 2.73 | 2.44 | 1.19 | 0.57 | 0.35 | 0.23 | 0.24 | 5.63  | 3.98  | 5.28  | 9.55  | 6.03  | 38.2  |
| 1952  | 3.03 | 2.74 | 1.28 | 0.60 | 0.32 | 0.17 | 5.84 | 7.89  | 3.66  | 8.13  | 6.50  | 2.99  | 43.2  |
| 1953  | 1.34 | 1.47 | 0.96 | 0.55 | 0.33 | 0.20 | 1.76 | 10.48 | 5.93  | 11.95 | 12.60 | 5.73  | 53.3  |
| 1954  | 2.70 | 1.33 | 0.99 | 0.56 | 1.59 | 0.64 | 0.43 | 0.41  | 4.15  | 7.75  | 15.83 | 6.30  | 42.7  |
| 1955  | 4.18 | 2.35 | 1.13 | 0.67 | 0.41 | 0.24 | 0.18 | 1.77  | 6.15  | 5.48  | 5.71  | 3.34  | 31.6  |
| 1956  | 1.72 | 0.98 | 0.60 | 0.34 | 2.99 | 1.35 | 0.65 | 4.14  | 10.00 | 11.03 | 9.00  | 4.85  | 47.7  |
| 1957  | 6.96 | 2.74 | 0.90 | 0.48 | 0.46 | 0.24 | 0.21 | 3.47  | 2.69  | 1.76  | 2.96  | 2.34  | 25.2  |
| 1958  | 1.68 | 1.19 | 0.71 | 0.40 | 0.26 | 0.17 | 2.13 | 13.45 | 5.23  | 1.91  | 4.51  | 2.92  | 34.6  |
| 1959  | 3.48 | 1.66 | 0.80 | 0.45 | 0.24 | 0.21 | 0.37 | 3.00  | 5.88  | 3.27  | 1.97  | 1.53  | 22.9  |
| 1960  | 1.14 | 0.76 | 0.49 | 0.43 | 0.24 | 0.14 | 0.27 | 1.19  | 2.05  | 2.79  | 5.12  | 6.75  | 21.4  |
| 1961  | 3.09 | 1.17 | 0.65 | 0.36 | 0.29 | 0.57 | 1.05 | 1.04  | 16.03 | 9.53  | 12.56 | 5.76  | 52.1  |
| 1962  | 6.71 | 2.94 | 1.06 | 0.57 | 0.32 | 0.17 | 0.08 | 0.06  | 1.52  | 3.62  | 12.75 | 5.26  | 35.1  |
| 1963  | 1.66 | 1.37 | 0.92 | 0.55 | 0.50 | 0.27 | 0.35 | 0.95  | 6.14  | 5.41  | 8.94  | 4.98  | 32.0  |
| 1964  | 2.29 | 1.64 | 0.92 | 0.63 | 0.39 | 1.05 | 2.60 | 3.93  | 2.74  | 1.88  | 3.31  | 2.83  | 24.2  |
| 1965  | 1.26 | 0.91 | 0.62 | 0.42 | 0.26 | 0.92 | 1.24 | 0.52  | 2.13  | 8.26  | 3.38  | 2.01  | 21.9  |
| 1966  | 1.40 | 0.89 | 0.55 | 0.28 | 0.09 | 0.09 | 1.36 | 1.38  | 11.33 | 4.14  | 1.23  | 3.51  | 26.3  |
| 1967  | 3.06 | 1.80 | 0.89 | 0.49 | 0.26 | 0.15 | 0.73 | 9.36  | 6.34  | 5.13  | 7.03  | 2.00  | 37.2  |
| 1968  | 6.83 | 1.41 | 0.82 | 0.59 | 0.28 | 0.18 | 0.78 | 0.89  | 1.17  | 1.38  | 3.93  | 5.04  | 23.3  |
| 1969  | 4.63 | 1.93 | 1.35 | 0.56 | 0.30 | 0.23 | 0.24 | 1.70  | 5.89  | 5.31  | 8.09  | 6.40  | 36.6  |
| 1970  | 1.91 | 1.20 | 0.80 | 0.47 | 0.19 | 0.42 | 0.34 | 0.56  | 1.01  | 4.06  | 3.80  | 1.97  | 16.7  |
| 1971  | 1.16 | 0.73 | 0.59 | 0.38 | 0.22 | 0.16 | 0.59 | 2.56  | 2.48  | 2.37  | 3.74  | 2.08  | 17.1  |
| 1972  | 1.39 | 1.00 | 0.87 | 0.35 | 0.18 | 0.25 | 0.21 | 0.45  | 0.58  | 10.60 | 3.98  | 3.13  | 23.0  |
| 1973  | 2.09 | 1.27 | 0.81 | 0.45 | 0.18 | 0.12 | 0.14 | 1.42  | 4.34  | 1.93  | 26.07 | 8.05  | 46.9  |
| 1974  | 3.66 | 2.45 | 1.25 | 0.85 | 0.53 | 0.26 | 0.87 | 5.72  | 2.30  | 4.97  | 5.66  | 3.46  | 32.0  |
| 1975  | 3.31 | 1.55 | 0.76 | 0.34 | 0.20 | 0.24 | 0.66 | 0.69  | 13.08 | 4.53  | 3.55  | 2.08  | 31.0  |
| 1976  | 1.35 | 7.38 | 4.43 | 2.17 | 0.73 | 0.68 | 1.10 | 9.70  | 12.37 | 15.43 | 11.81 | 5.20  | 72.3  |
| 1977  | 2.56 | 1.59 | 1.13 | 0.39 | 0.24 | 0.39 | 1.02 | 1.34  | 0.54  | 0.49  | 4.60  | 4.20  | 18.5  |
| 1978  | 2.02 | 1.01 | 0.76 | 0.38 | 0.42 | 0.49 | 0.32 | 1.49  | 4.51  | 3.06  | 3.30  | 2.54  | 20.3  |
| 1979  | 4.89 | 1.53 | 0.78 | 0.71 | 0.40 | 0.26 | 0.53 | 2.43  | 4.47  | 1.82  | 3.13  | 1.64  | 22.6  |
| 1980  | 1.75 | 8.20 | 2.29 | 1.32 | 0.57 | 0.58 | 0.67 | 0.64  | 0.81  | 5.35  | 7.20  | 8.94  | 38.3  |
| 1981  | 2.12 | 1.44 | 0.97 | 0.82 | 0.30 | 0.38 | 1.97 | 1.46  | 3.33  | 3.09  | 2.91  | 2.35  | 21.1  |
| 1982  | 2.44 | 1.24 | 1.29 | 0.64 | 0.82 | 0.63 | 0.45 | 5.54  | 8.62  | 14.36 | 5.61  | 3.22  | 44.9  |
| 1983  | 1.50 | 0.94 | 0.63 | 0.48 | 0.21 | 0.78 | 1.14 | 15.29 | 1.55  | 6.38  | 2.36  | 7.71  | 39.0  |
| 1984  | 3.89 | 1.16 | 1.21 | 0.91 | 0.49 | 1.89 | 2.08 | 2.07  | 5.28  | 7.83  | 8.66  | 4.63  | 40.1  |
| 1985  | 2.04 | 1.15 | 0.66 | 0.46 | 0.28 | 0.54 | 1.31 | 1.82  | 4.06  | 6.03  | 12.50 | 4.63  | 35.5  |
| 1986  | 1.42 | 1.15 | 0.67 | 0.60 | 0.28 | 0.25 | 0.41 | 4.05  | 4.73  | 3.95  | 4.89  | 3.67  | 26.1  |
| 1987  | 2.25 | 1.27 | 0.92 | 0.45 | 0.20 | 0.30 | 1.30 | 0.98  | 6.09  | 4.75  | 3.44  | 5.99  | 27.9  |
| 1988  | 2.07 | 1.52 | 0.74 | 0.54 | 0.36 | 1.71 | 1.03 | 2.90  | 2.42  | 4.92  | 6.00  | 10.57 | 34.8  |
| 1989  | 3.93 | 2.30 | 1.23 | 0.67 | 0.38 | 0.25 | 1.38 | 4.50  | 3.48  | 11.78 | 6.87  | 2.41  | 39.2  |
| 1990  | 1.08 | 0.83 | 0.63 | 0.43 | 0.24 | 0.18 | 0.37 | 1.51  | 6.82  | 15.27 | 6.28  | 7.84  | 41.5  |
| AVE : | 2.68 | 1.69 | 0.94 | 0.56 | 0.43 | 0.40 | 0.86 | 2.94  | 4.67  | 5.44  | 5.95  | 4.36  | 30.9  |
| SD :  | 1.39 | 1.23 | 0.53 | 0.27 | 0.53 | 0.40 | 0.95 | 3.17  | 3.94  | 3.54  | 3.99  | 2.12  | 11.3  |

## Appendix B1.13

File : H1H13CUM.PRS

Units : 10<sup>6</sup>m<sup>3</sup>

Descrip. : Cumulative Present Day (2000) Flow at H1H013 for 1927 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May   | Jun   | Jul   | Aug   | Sep  | Total |
|-------|------|------|------|------|------|------|------|-------|-------|-------|-------|------|-------|
| 1927  | 1.18 | 0.65 | 0.26 | 0.15 | 0.10 | 0.11 | 0.16 | 0.45  | 0.77  | 1.02  | 1.00  | 1.13 | 7.0   |
| 1928  | 1.16 | 0.56 | 0.40 | 0.22 | 0.10 | 0.10 | 0.51 | 0.47  | 0.94  | 4.12  | 3.97  | 1.52 | 14.1  |
| 1929  | 1.06 | 0.60 | 0.49 | 0.16 | 0.10 | 0.11 | 0.19 | 0.45  | 0.54  | 0.94  | 0.95  | 2.63 | 8.2   |
| 1930  | 2.36 | 0.56 | 0.44 | 0.16 | 0.09 | 0.10 | 0.46 | 1.41  | 0.56  | 0.95  | 6.38  | 4.12 | 17.6  |
| 1931  | 2.28 | 0.61 | 0.52 | 0.16 | 3.13 | 0.95 | 0.20 | 0.60  | 1.83  | 3.20  | 2.21  | 1.92 | 17.6  |
| 1932  | 1.37 | 0.51 | 0.41 | 0.16 | 0.10 | 0.11 | 0.17 | 1.05  | 4.08  | 7.00  | 3.79  | 1.62 | 20.4  |
| 1933  | 1.27 | 0.64 | 0.35 | 0.16 | 0.12 | 0.15 | 0.16 | 0.90  | 0.60  | 0.96  | 0.99  | 2.30 | 8.6   |
| 1934  | 3.80 | 1.49 | 0.45 | 0.27 | 0.13 | 0.11 | 0.56 | 0.49  | 0.86  | 2.70  | 3.80  | 2.59 | 17.2  |
| 1935  | 1.47 | 0.61 | 0.37 | 0.16 | 0.11 | 0.11 | 0.16 | 0.91  | 0.54  | 0.95  | 2.54  | 3.69 | 11.6  |
| 1936  | 2.03 | 0.67 | 1.04 | 0.48 | 0.18 | 0.28 | 0.23 | 0.71  | 4.80  | 8.48  | 3.90  | 1.15 | 23.9  |
| 1937  | 1.19 | 0.66 | 0.34 | 0.16 | 0.10 | 0.11 | 0.72 | 2.61  | 1.44  | 1.07  | 2.22  | 2.63 | 13.2  |
| 1938  | 1.78 | 0.64 | 0.35 | 0.16 | 0.39 | 0.13 | 0.21 | 1.31  | 0.55  | 1.91  | 3.24  | 2.35 | 13.0  |
| 1939  | 1.34 | 0.57 | 0.55 | 0.29 | 0.23 | 0.10 | 0.96 | 0.74  | 2.08  | 1.49  | 1.00  | 1.10 | 10.5  |
| 1940  | 1.20 | 0.59 | 0.39 | 0.21 | 0.26 | 0.11 | 1.34 | 6.46  | 8.68  | 4.44  | 4.83  | 9.93 | 38.4  |
| 1941  | 5.41 | 1.20 | 0.41 | 0.22 | 0.12 | 0.10 | 0.17 | 1.76  | 15.56 | 5.33  | 2.67  | 1.25 | 34.2  |
| 1942  | 1.16 | 0.67 | 0.36 | 0.15 | 0.14 | 0.16 | 0.16 | 0.45  | 0.62  | 5.85  | 8.45  | 5.26 | 23.4  |
| 1943  | 2.49 | 1.11 | 0.41 | 0.25 | 0.13 | 0.11 | 0.20 | 2.38  | 10.89 | 4.15  | 5.47  | 3.69 | 31.3  |
| 1944  | 2.05 | 0.90 | 0.38 | 0.25 | 0.14 | 0.11 | 0.16 | 5.69  | 10.83 | 7.90  | 6.69  | 2.56 | 37.7  |
| 1945  | 1.17 | 0.56 | 0.45 | 0.15 | 0.10 | 0.13 | 0.16 | 0.45  | 0.54  | 0.94  | 0.96  | 4.82 | 10.4  |
| 1946  | 3.05 | 0.65 | 0.47 | 0.16 | 0.10 | 0.43 | 0.21 | 0.45  | 0.54  | 4.99  | 2.93  | 1.15 | 15.1  |
| 1947  | 1.23 | 0.66 | 0.31 | 0.15 | 0.14 | 1.58 | 0.97 | 1.91  | 1.57  | 5.18  | 2.34  | 5.17 | 21.2  |
| 1948  | 3.21 | 0.74 | 0.49 | 0.16 | 0.10 | 0.10 | 0.19 | 0.45  | 0.58  | 1.92  | 2.91  | 3.07 | 13.9  |
| 1949  | 3.21 | 2.27 | 0.77 | 0.36 | 0.17 | 0.11 | 3.70 | 0.74  | 0.54  | 6.48  | 2.18  | 4.03 | 24.6  |
| 1950  | 2.52 | 1.89 | 0.76 | 0.66 | 0.35 | 0.12 | 0.71 | 0.45  | 8.03  | 5.61  | 3.88  | 2.76 | 27.7  |
| 1951  | 2.22 | 1.65 | 0.60 | 0.28 | 0.18 | 0.10 | 0.21 | 4.00  | 2.68  | 3.86  | 8.27  | 4.90 | 29.0  |
| 1952  | 2.51 | 1.95 | 0.68 | 0.30 | 0.14 | 0.10 | 5.32 | 6.43  | 2.35  | 6.67  | 5.35  | 1.79 | 33.6  |
| 1953  | 1.11 | 0.64 | 0.43 | 0.26 | 0.15 | 0.11 | 1.32 | 8.99  | 4.59  | 10.42 | 11.61 | 4.58 | 44.2  |
| 1954  | 2.18 | 0.56 | 0.60 | 0.26 | 1.38 | 0.46 | 0.15 | 0.47  | 2.58  | 6.29  | 14.75 | 5.11 | 34.8  |
| 1955  | 3.73 | 1.55 | 0.59 | 0.38 | 0.22 | 0.11 | 0.16 | 1.14  | 4.84  | 4.04  | 4.37  | 2.18 | 23.3  |
| 1956  | 1.22 | 0.51 | 0.53 | 0.16 | 2.74 | 1.16 | 0.24 | 2.75  | 8.61  | 9.67  | 7.99  | 3.69 | 39.3  |
| 1957  | 6.55 | 1.93 | 0.60 | 0.19 | 0.27 | 0.11 | 0.15 | 1.81  | 1.42  | 0.97  | 1.21  | 1.17 | 16.4  |
| 1958  | 1.19 | 0.53 | 0.38 | 0.16 | 0.10 | 0.11 | 1.69 | 11.89 | 3.88  | 0.99  | 2.73  | 1.76 | 25.4  |
| 1959  | 3.03 | 0.88 | 0.42 | 0.16 | 0.09 | 0.11 | 0.20 | 1.55  | 4.58  | 1.85  | 1.00  | 1.11 | 15.0  |
| 1960  | 1.04 | 0.56 | 0.49 | 0.16 | 0.09 | 0.10 | 0.21 | 0.45  | 0.54  | 0.98  | 3.15  | 5.48 | 13.3  |
| 1961  | 2.55 | 0.67 | 0.33 | 0.16 | 0.11 | 0.40 | 0.65 | 0.45  | 14.32 | 8.00  | 11.52 | 4.59 | 43.8  |
| 1962  | 6.29 | 2.13 | 0.53 | 0.28 | 0.14 | 0.11 | 0.16 | 0.45  | 0.83  | 2.25  | 11.19 | 3.72 | 28.1  |
| 1963  | 1.16 | 0.60 | 0.40 | 0.26 | 0.31 | 0.11 | 0.16 | 0.45  | 4.68  | 3.98  | 7.57  | 3.82 | 23.5  |
| 1964  | 1.77 | 0.86 | 0.49 | 0.34 | 0.19 | 0.85 | 2.19 | 2.56  | 1.47  | 0.95  | 2.33  | 2.26 | 16.3  |
| 1965  | 1.19 | 0.66 | 0.24 | 0.15 | 0.11 | 0.34 | 0.79 | 0.45  | 0.54  | 6.80  | 1.94  | 1.06 | 14.3  |
| 1966  | 1.19 | 0.67 | 0.33 | 0.16 | 0.09 | 0.10 | 0.98 | 0.93  | 9.94  | 2.65  | 0.95  | 2.21 | 20.2  |
| 1967  | 2.56 | 1.03 | 0.58 | 0.19 | 0.10 | 0.11 | 0.26 | 7.95  | 5.03  | 3.66  | 5.64  | 1.13 | 28.2  |
| 1968  | 6.43 | 0.60 | 0.48 | 0.29 | 0.10 | 0.11 | 0.39 | 0.99  | 0.90  | 1.37  | 2.31  | 3.04 | 17.0  |
| 1969  | 4.18 | 1.15 | 0.77 | 0.27 | 0.14 | 0.21 | 0.30 | 0.92  | 4.01  | 3.86  | 6.59  | 4.97 | 27.4  |
| 1970  | 1.39 | 0.65 | 0.38 | 0.19 | 0.09 | 0.29 | 0.30 | 0.74  | 0.54  | 2.51  | 2.35  | 1.07 | 10.5  |
| 1971  | 1.22 | 0.66 | 0.32 | 0.16 | 0.09 | 0.11 | 0.16 | 1.19  | 1.21  | 0.97  | 2.32  | 1.07 | 9.5   |
| 1972  | 1.10 | 0.57 | 0.50 | 0.16 | 0.10 | 0.14 | 0.18 | 0.57  | 0.78  | 9.13  | 2.54  | 1.71 | 17.5  |
| 1973  | 1.57 | 0.64 | 0.47 | 0.16 | 0.10 | 0.10 | 0.16 | 0.47  | 3.04  | 0.94  | 24.46 | 6.90 | 39.0  |
| 1974  | 3.18 | 1.65 | 0.66 | 0.56 | 0.35 | 0.11 | 0.60 | 4.15  | 1.00  | 3.56  | 4.28  | 2.27 | 22.4  |
| 1975  | 2.84 | 0.78 | 0.38 | 0.16 | 0.10 | 0.19 | 0.27 | 0.45  | 11.47 | 3.04  | 2.11  | 1.16 | 23.0  |
| 1976  | 1.22 | 6.48 | 3.77 | 1.86 | 0.53 | 0.51 | 0.70 | 8.21  | 11.02 | 14.44 | 10.71 | 4.06 | 63.5  |
| 1977  | 2.04 | 0.82 | 0.56 | 0.16 | 0.10 | 0.22 | 0.66 | 1.23  | 0.54  | 0.94  | 3.20  | 2.75 | 13.2  |
| 1978  | 1.52 | 0.65 | 0.32 | 0.16 | 0.23 | 0.31 | 0.23 | 0.56  | 2.93  | 1.65  | 1.88  | 1.06 | 11.5  |
| 1979  | 4.41 | 0.75 | 0.56 | 0.37 | 0.23 | 0.16 | 0.27 | 0.96  | 3.20  | 0.94  | 1.58  | 1.15 | 14.6  |
| 1980  | 1.26 | 7.44 | 1.67 | 1.00 | 0.37 | 0.39 | 0.31 | 0.68  | 0.54  | 3.94  | 6.15  | 7.84 | 31.6  |
| 1981  | 1.58 | 0.67 | 0.59 | 0.47 | 0.12 | 0.21 | 1.56 | 0.45  | 1.92  | 1.69  | 1.49  | 1.66 | 12.4  |
| 1982  | 1.38 | 0.64 | 0.75 | 0.30 | 0.62 | 0.46 | 0.31 | 3.84  | 7.26  | 12.95 | 4.51  | 2.07 | 35.1  |
| 1983  | 1.19 | 0.67 | 0.33 | 0.24 | 0.09 | 0.31 | 0.73 | 13.76 | 0.54  | 4.98  | 1.06  | 6.62 | 30.5  |
| 1984  | 3.41 | 0.67 | 0.61 | 0.60 | 0.29 | 1.67 | 1.66 | 0.74  | 3.95  | 6.65  | 7.60  | 3.48 | 31.3  |
| 1985  | 1.51 | 0.42 | 0.61 | 0.19 | 0.11 | 0.22 | 1.02 | 1.67  | 1.40  | 4.61  | 11.09 | 3.48 | 26.3  |
| 1986  | 1.18 | 0.63 | 0.38 | 0.30 | 0.10 | 0.18 | 0.15 | 2.64  | 3.38  | 2.49  | 3.52  | 2.54 | 17.5  |
| 1987  | 1.73 | 0.64 | 0.48 | 0.18 | 0.09 | 0.25 | 0.71 | 0.45  | 4.65  | 3.35  | 2.02  | 4.65 | 19.2  |
| 1988  | 1.56 | 0.84 | 0.35 | 0.29 | 0.15 | 1.27 | 0.71 | 1.58  | 1.07  | 3.48  | 4.60  | 9.45 | 25.3  |
| 1989  | 3.40 | 1.51 | 0.64 | 0.37 | 0.20 | 0.10 | 0.94 | 3.09  | 2.15  | 10.31 | 5.68  | 1.21 | 29.6  |
| 1990  | 1.20 | 0.66 | 0.32 | 0.16 | 0.09 | 0.12 | 0.20 | 0.60  | 4.97  | 13.68 | 4.89  | 6.73 | 33.6  |
| AVE : | 2.20 | 1.06 | 0.55 | 0.28 | 0.27 | 0.27 | 0.63 | 2.12  | 3.49  | 4.27  | 4.65  | 3.19 | 23.0  |
| SD :  | 1.36 | 1.16 | 0.46 | 0.25 | 0.52 | 0.35 | 0.85 | 2.82  | 3.71  | 3.36  | 4.04  | 2.06 | 10.9  |

## APPENDIX B2.1

SUB-CATCHMENT : H1H003  
RIVER : Breede  
PLACE : Ceres

### 1 CATCHMENT

|                         |               |          | YEAR   |        |        |        |        |        |        | UNITS           |
|-------------------------|---------------|----------|--------|--------|--------|--------|--------|--------|--------|-----------------|
|                         |               |          | 1964   | 1967   | 1976   | 1978   | 1988   | 1990   | 2000   |                 |
| SUB-CATCHMENT AREAS     |               |          |        |        |        |        |        |        |        |                 |
| Agtertuin sub-catchment |               |          |        |        |        |        |        |        |        |                 |
|                         | u/s farm dams | High MAP | 0.58   | 0.58   | 0.58   | 0.58   | 0.58   | 0.58   | 0.58   | km <sup>2</sup> |
|                         |               | Low MAP  | 1.98   | 1.98   | 1.98   | 1.98   | 1.98   | 1.98   | 1.98   | km <sup>2</sup> |
|                         | d/s farm dams | High MAP | 48.42  | 48.42  | 48.42  | 48.42  | 48.42  | 48.42  | 48.42  | km <sup>2</sup> |
|                         |               | Low MAP  | 97.02  | 97.02  | 97.02  | 97.02  | 97.02  | 97.02  | 97.02  | km <sup>2</sup> |
| H1H003 sub-catchment    |               |          |        |        |        |        |        |        |        |                 |
|                         | u/s farm dams | Low MAP  | 4.41   | 4.41   | 4.41   | 4.41   | 4.41   | 4.41   | 4.41   | km <sup>2</sup> |
|                         |               | Low MAP  | 436.59 | 436.59 | 436.59 | 436.59 | 436.59 | 436.59 | 436.59 | km <sup>2</sup> |

### 2 LANDUSE

|                                   |                            |  | YEAR  |       |       |       |       |       |       | UNITS           |
|-----------------------------------|----------------------------|--|-------|-------|-------|-------|-------|-------|-------|-----------------|
|                                   |                            |  | 1964  | 1967  | 1976  | 1978  | 1988  | 1990  | 2000  |                 |
| ALIEN VEGETATION                  |                            |  |       |       |       |       |       |       |       |                 |
| Agtertuin sub-catchment           |                            |  |       |       |       |       |       |       |       |                 |
|                                   | u/s farm dams : tall trees |  | 0.01  | 0.01  | 0.02  | 0.02  | 0.06  | 0.07  | 0.24  | km <sup>2</sup> |
|                                   | d/s farm dams : tall trees |  | 0.02  | 0.02  | 0.02  | 0.02  | 0.03  | 0.03  | 0.10  | km <sup>2</sup> |
|                                   | riparian tall trees        |  | 0.25  | 0.34  | 0.64  | 0.64  | 2.26  | 2.26  | 4.23  | km <sup>2</sup> |
| H1H003 sub-catchment : tall trees |                            |  | 0.49  | 0.54  | 1.41  | 0.96  | 3.42  | 3.91  | 7.65  | km <sup>2</sup> |
|                                   | riparian tall trees        |  | 0.23  | 0.23  | 0.28  | 0.29  | 0.84  | 0.84  | 1.49  | km <sup>2</sup> |
| Total                             |                            |  | 1.00  | 1.15  | 2.38  | 1.94  | 6.60  | 7.10  | 13.71 | km <sup>2</sup> |
| FARM DAM CAPACITIES               |                            |  |       |       |       |       |       |       |       |                 |
| Agtertuin sub-catchment           |                            |  |       |       |       |       |       |       |       |                 |
|                                   | Rooikloof                  |  | 0.00  | 0.00  | 0.15  | 0.15  | 0.15  | 0.50  | 0.50  | Mm <sup>3</sup> |
|                                   | Ben Etive                  |  | 0.00  | 0.15  | 0.15  | 0.15  | 0.15  | 0.15  | 0.15  | Mm <sup>3</sup> |
|                                   | Farm Dam                   |  | 3.29  | 3.29  | 3.74  | 3.90  | 6.53  | 6.93  | 12.64 | Mm <sup>3</sup> |
| H1H003 sub-catchment              |                            |  | 14.12 | 14.12 | 17.74 | 17.82 | 23.55 | 27.64 | 48.07 | Mm <sup>3</sup> |
| IRRIGATION AREAS                  |                            |  |       |       |       |       |       |       |       |                 |
| AGTERUIN                          | farm dams                  |  | 1.66  | 1.75  | 2.31  | 2.44  | 3.19  | 3.40  | 2.89  | km <sup>2</sup> |
|                                   | rivers                     |  | 16.27 | 16.81 | 19.29 | 19.91 | 22.63 | 23.40 | 19.86 | km <sup>2</sup> |
| H1H003                            | farm dams                  |  | 12.56 | 13.23 | 18.46 | 19.19 | 25.29 | 27.26 | 23.15 | km <sup>2</sup> |
|                                   | rivers                     |  | 1.09  | 1.15  | 1.61  | 1.69  | 2.20  | 2.37  | 2.01  | km <sup>2</sup> |
| Total                             |                            |  | 31.58 | 32.94 | 41.67 | 43.23 | 53.31 | 56.43 | 47.91 | km <sup>2</sup> |

### 3 EVAPORATION

|                       | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) | 211  | 267  | 312  | 323  | 279  | 241  | 155  | 104  | 78   | 82   | 102  | 136  | 2290      |
| S-PAN (gross) (in mm) | 171  | 225  | 269  | 281  | 239  | 201  | 125  | 82   | 60   | 60   | 78   | 106  | 1896      |
| LAKE FACTOR           | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)    | 139  | 185  | 223  | 236  | 210  | 177  | 110  | 71   | 51   | 50   | 63   | 86   | 1600      |

**Note : evaporation from BRHS used for this sub-catchment, average for three sub-catchments**

### 4 RESERVOIR SIMULATIONS

|                    | COEFFICIENTS |       | START      | DEAD                      | MAX                       |
|--------------------|--------------|-------|------------|---------------------------|---------------------------|
|                    | a            | b     | STOR.<br>% | STOR.<br>M.m <sup>3</sup> | STOR.<br>M.m <sup>3</sup> |
| ROOIKLOOF DAM      | 0.362        | 1.018 | 100        | 0                         | FSC                       |
| BEN ETIVE DAM      | 0.391        | 1.018 | 100        | 0                         | FSC                       |
| AGTERTUIN FARM DAM | 0.385        | 1.018 | 100        | 0                         | FSC                       |
| H1H003 FARM DAM    | 0.35         | 1.069 | 100        | 0                         | FSC                       |

### 5 IRRIGATION ROUTINE

|                      | QUANT | CROP FACTORS |     |     |      |      |      |      |     |     |     |     |     |
|----------------------|-------|--------------|-----|-----|------|------|------|------|-----|-----|-----|-----|-----|
|                      | %     | OCT          | NOV | DEC | JAN  | FEB  | MAR  | APR  | MAY | JUN | JUL | AUG | SEP |
| Combined crop factor | 100   | 0.3          | 0.4 | 0.5 | 0.55 | 0.55 | 0.45 | 0.25 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |

### 6. NOTES

Combined crop factor used in the BRHS for :  
 crop type 1 : vineyards and fruit trees  
 crop type 2 : wheat , lucerne and cash crops

H1H003 sub-catchment modelled using high and low MAP areas  
 Agtertuin High MAP = 1148 mm  
 Agtertuin low MAP = 546 mm  
 H1H003 incremental area low MAP = 566 mm

## Appendix B2.2

File : H1H3INC.OBS  
 Units : 10<sup>6</sup>xm<sup>3</sup>/a  
 Descrip. : Incremental observed runoff at H1H003 for 1964 to 1990

| Year  | Oct    | Nov   | Dec   | Jan   | Feb   | Mar   | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Total |
|-------|--------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|-------|
| 1964  | 4.06   | 7.48* | 3.20+ | 1.54+ | 1.75+ | 2.85+ | 1.75+  | 7.44+  | 4.66+  | 4.67+  | 4.08+  | 3.29+  | 46.8  |
| 1965  | 2.94+  | 2.90+ | 1.90+ | 1.19+ | 0.76+ | 2.00+ | 0.33+  | 1.18+  | 8.38+  | 23.57+ | 11.38+ | 10.02+ | 66.6  |
| 1966  | 5.25*  | 0.18  | 0.12  | 0.10  | 0.01  | 0.05  | 1.14   | 3.45   | 66.01* | 11.55+ | 14.06+ | 9.07+  | 111.0 |
| 1967  | 4.90+  | 3.80+ | 1.20+ | 1.53* | 0.86* | 0.16  | 0.72   | 24.43* | 16.82* | 17.87* | 16.52  | 4.74   | 93.5  |
| 1968  | 33.60  | 1.85  | 0.64  | 0.66  | 0.38  | 0.34  | 1.64   | 1.21   | 2.14*  | 2.00*  | 5.67   | 8.73   | 58.9  |
| 1969  | 8.83   | 1.97  | 0.87  | 0.70  | 0.52  | 0.69  | 0.85   | 3.11   | 33.06  | 20.29  | 23.71  | 16.97  | 111.6 |
| 1970  | 4.87   | 2.31  | 1.51  | 0.87  | 0.61  | 0.92  | 1.03   | 1.57   | 1.75   | 17.85  | 12.49  | 4.57   | 50.4  |
| 1971  | 2.20   | 0.94  | 0.52  | 0.44  | 0.36  | 0.47  | 0.58   | 3.64   | 4.91   | 4.86   | 8.60   | 6.10   | 33.6  |
| 1972  | 2.14   | 0.80  | 1.14  | 0.32  | 0.29  | 1.12  | 0.71   | 0.76   | 0.83   | 30.42  | 11.13  | 6.66   | 56.3  |
| 1973  | 3.23   | 0.61  | 0.58  | 0.16  | 0.09  | 0.15  | 0.36   | 1.18   | 33.86  | 6.37   | 171.83 | 23.30  | 241.7 |
| 1974  | 7.26   | 3.94  | 0.94  | 0.32  | 0.19  | 0.32  | 3.03   | 57.70  | 7.33   | 13.68  | 20.22  | 4.40   | 119.3 |
| 1975  | 7.01   | 1.86  | 0.66  | 0.13  | 0.00  | 0.10  | 0.62   | 1.28   | 64.94  | 17.58  | 8.18   | 4.02   | 106.4 |
| 1976  | 2.45   | 29.54 | 9.36  | 3.64  | 1.13  | 0.89  | 3.01   | 87.87  | 56.74  | 132.52 | 105.72 | 15.27  | 448.1 |
| 1977  | 6.13   | 3.44  | 2.39  | 0.45  | 0.37  | 0.57  | 2.03   | 2.98   | 1.51   | 0.94   | 24.15  | 9.40   | 54.4  |
| 1978  | 3.20   | 0.72  | 0.24  | 1.66+ | 0.17  | 0.30  | 0.32   | 1.83   | 18.37  | 6.27   | 6.55   | 15.30* | 54.9  |
| 1979  | 7.87   | 1.22  | 0.14  | 0.45  | 0.10  | 0.07  | 1.23   | 3.75   | 6.16   | 2.30   | 6.41   | 6.70*  | 36.4  |
| 1980  | 1.33   | 6.34  | 3.42  | 14.40 | 1.32  | 0.83  | 0.96   | 1.24   | 1.93   | 12.77  | 24.78  | 28.04* | 97.4  |
| 1981  | 14.52* | 7.29* | 0.28  | 0.40  | 0.17  | 0.33  | 12.53* | 2.48   | 4.00   | 5.01   | 5.17   | 0.00   | 52.2  |
| 1982  | 4.86   | 0.68  | 0.65  | 0.14  | 0.60  | 0.71  | 0.70   | 38.71  | 28.23  | 26.05* | 14.70* | 17.45* | 133.5 |
| 1983  | 3.11   | 0.80  | 2.73+ | 1.61+ | 1.19+ | 8.09+ | 1.18   | 69.99  | 4.34   | 16.87  | 8.56   | 31.64  | 150.1 |
| 1984  | 15.44  | 1.73  | 5.97* | 4.49* | 0.64  | 6.93  | 2.67   | 4.80   | 18.46  | 36.48  | 28.85  | 11.63  | 138.1 |
| 1985  | 4.55   | 6.04* | 0.93  | 0.28  | 0.15  | 0.69  | 2.66   | 6.77   | 9.86   | 14.50  | 30.44  | 11.18  | 88.1  |
| 1986  | 3.09   | 0.95  | 0.10  | 0.12  | 0.11  | 0.12  | 0.77   | 24.41  | 25.01  | 11.43  | 19.30  | 7.33   | 92.7  |
| 1987  | 3.67   | 0.73  | 0.77  | 0.07  | 0.03  | 0.22  | 2.27   | 2.53   | 20.54  | 8.42   | 7.90   | 11.91  | 59.1  |
| 1988  | 3.42   | 1.12  | 0.25  | 0.00  | 0.03  | 1.37  | 2.15   | 2.70   | 7.82   | 11.46  | 22.17* | 35.18* | 87.7  |
| 1989  | 8.11   | 5.06  | 0.89  | 0.30  | 0.50  | 0.61  | 4.07   | 11.89  | 17.36  | 32.38  | 16.01  | 4.03   | 101.2 |
| 1990  | 1.85   | 1.06  | 0.46  | 2.54* | 1.76* | 0.15  | 0.51   | 2.20   | 21.68  | 61.92+ | 22.07  | 26.18  | 142.4 |
| AVE : | 6.29   | 3.53  | 1.55  | 1.43  | 0.52  | 1.15  | 1.85   | 13.74  | 18.03  | 20.37  | 24.10  | 12.34  | 104.9 |
| SD :  | 6.46   | 5.63  | 2.04  | 2.82  | 0.51  | 1.94  | 2.35   | 23.12  | 18.86  | 25.99  | 35.13  | 9.28   | 82.1  |

## Average Rainfall On Catchment H1H003.ra

details of rainfall stations used

042227\_3.pat 1920 to 1998

042326\_X.pat 1920 to 1998

043139\_p.pat 1951 to 1997

043019\_p.pat 1949 to 1976

042582\_2.pat 1951 to 1998

|          |        | rainfall input as percent m.a.p. |       |       |       |        |       |       |       |        |        |        |        | year   |
|----------|--------|----------------------------------|-------|-------|-------|--------|-------|-------|-------|--------|--------|--------|--------|--------|
| no.      | gauges | oct                              | nov   | dec   | jan   | feb    | mar   | apr   | may   | jun    | jul    | aug    | sep    |        |
| 1920     | 2      | 6.61+                            | 3.18+ | 3.18+ | 4.37  | 7.71   | 2.77  | 7.74  | .47   | 60.80  | 28.18  | 14.79  | 7.57   | 147.37 |
| 1921     | 2      | 3.04                             | 1.68  | 5.93  | 9.67  | 1.59   | 3.16  | 6.07  | 8.35  | 23.47  | 6.66   | 22.18  | .43    | 92.22  |
| 1922     | 2      | 3.06                             | 1.59  | .18   | 5.17  | .12    | .40   | 10.70 | 16.02 | 25.89  | 12.41  | 12.27  | 6.46   | 94.27  |
| 1923     | 2      | 4.79                             | 7.50+ | 1.19  | .53   | .22    | 2.67  | 3.45  | 2.85  | 26.45  | 8.11   | 18.83+ | 8.56   | 85.16  |
| 1924     | 2      | 11.18                            | 4.42  | .00   | 2.11  | .19    | .15   | .25   | 5.68  | 49.92  | 19.69  | 4.80   | 1.76   | 100.17 |
| 1925     | 2      | 16.37                            | 8.64  | .81   | .00   | 4.57   | .00   | 1.50  | 14.30 | 3.26   | 18.26  | 7.76   | 3.18   | 78.65  |
| 1926     | 2      | 17.41                            | 4.72  | .00   | 2.03  | 4.48   | .00   | 7.05  | 8.97  | 10.39  | 3.42   | 19.28  | 5.29   | 83.03  |
| 1927     | 2      | .88                              | 11.76 | 2.70  | 3.25  | .00    | 3.63  | .66   | .12   | 33.21  | 8.17   | 12.24  | 9.90   | 86.54  |
| 1928     | 2      | 3.00+                            | 2.51  | 1.10  | .00   | .56    | 1.65  | 11.07 | 11.54 | 13.70  | 18.53  | 13.52  | 3.94   | 81.12  |
| 1929     | 2      | 2.34                             | 1.56  | 6.48  | 3.12  | 5.18   | 1.71  | 2.69  | 1.45  | 1.66   | 9.59   | 10.35  | 23.14  | 69.27  |
| 1930     | 2      | 5.45                             | 4.24  | .77   | .00   | 1.76   | .93   | 11.46 | 17.61 | 4.47   | 8.60   | 26.99  | 11.58  | 93.84  |
| 1931     | 2      | 6.87                             | .39   | 2.66  | 2.62  | 21.10  | .98   | 1.02  | 15.07 | 15.55  | 15.65  | 7.66   | 9.87   | 99.44  |
| 1932     | 2      | 3.07                             | .70   | 1.79  | 1.91  | 3.02   | 2.81  | .31   | 16.16 | 25.07  | 26.09  | 9.90   | 6.04   | 96.87  |
| 1933     | 2      | 4.22                             | 2.12  | 4.68  | 1.64  | 2.07   | 6.66  | 1.52  | 13.82 | 12.14  | 8.14   | 7.42   | 16.01  | 80.42  |
| 1934     | 2      | 15.36                            | 8.09+ | .00+  | .80   | 1.87   | 5.19  | 10.71 | 13.25 | 11.51  | 14.30  | 15.24  | 8.87   | 105.18 |
| 1935     | 2      | 1.83                             | 6.15  | .70   | 5.46  | .78    | 3.85  | 1.37  | 16.33 | 4.78   | 13.12  | 18.00  | 16.39  | 88.78  |
| 1936     | 2      | 3.67                             | 2.26  | 12.28 | 1.35  | .22    | 9.01  | 9.02  | 13.54 | 23.67  | 26.49  | 6.14   | 1.41   | 109.06 |
| 1937     | 2      | 5.34                             | .36   | 2.91  | 6.95  | 1.57   | .82   | 13.36 | 19.56 | 8.12   | 8.22   | 12.54  | 12.39  | 92.14  |
| 1938     | 2      | 4.43                             | 2.85  | 3.01  | .00   | 7.53   | .77   | 6.19  | 17.69 | 5.91   | 7.45   | 16.95  | 9.12   | 81.91  |
| 1939     | 2      | 1.18                             | 3.60  | 4.68  | 1.41  | 6.87   | 2.21  | 12.31 | 7.07  | 16.95  | 7.65   | 4.17   | 7.75   | 75.84  |
| 1940     | 2      | 4.00                             | 7.28  | 1.45  | 10.17 | .87    | .49   | 16.40 | 31.49 | 26.51  | 7.41   | 15.41  | 28.06  | 149.55 |
| 1941     | 2      | 11.52                            | 1.71  | 2.02  | 1.20  | .00    | .51   | 1.67  | 20.67 | 47.88  | 6.92   | 10.92  | 1.62   | 106.63 |
| 1942     | 2      | 6.52                             | .39   | 3.70  | 6.75  | 3.46   | 5.59  | 3.59  | 6.98  | 14.87  | 25.11  | 24.89  | 11.94  | 113.78 |
| 1943     | 2      | 5.47                             | 8.67  | .00   | 1.42  | .00    | 3.81  | 7.81  | 22.05 | 37.55  | 4.17   | 19.96  | 10.75  | 121.66 |
| 1944     | 2      | 5.08                             | 7.61  | 2.59  | .00   | .00    | .40   | 9.00  | 31.86 | 33.32  | 20.50  | 17.69  | 1.55   | 129.61 |
| 1945     | 2      | 4.45                             | 3.49  | 1.35  | .19   | .33    | 3.93  | 5.82  | 7.10  | 5.64   | 6.73   | 10.69  | 25.69  | 75.42  |
| 1946     | 2      | 6.11                             | 1.27  | 1.58  | .00   | .00    | 9.94  | 2.17  | 9.09  | 3.93   | 28.15  | 9.12   | 5.52   | 76.88  |
| 1947     | 2      | 8.14                             | 1.74  | .00   | .65   | 3.73   | 15.65 | 10.82 | 17.04 | 10.40  | 21.26  | 3.67   | 21.59  | 114.68 |
| 1948     | 2      | 7.81                             | 2.06  | 1.31  | 1.00  | .00    | .58   | 9.44  | 8.43  | 11.40  | 13.57  | 12.83  | 14.95  | 83.37  |
| 1949     | 3      | 9.99+                            | 9.77+ | 2.10+ | .08   | .00    | 1.53  | 21.68 | 2.06  | 5.52   | 28.96  | .14    | 21.86  | 103.70 |
| 1950     | 3      | 8.19                             | 10.60 | 3.06  | 5.36  | .00    | .00   | 12.05 | 5.94  | 27.86  | 9.39   | 10.73  | 7.43   | 100.60 |
| 1951     | 5      | 6.29                             | 8.74  | .72   | .82   | 1.97   | 2.86  | 3.82  | 23.72 | 10.92  | 18.06  | 22.86  | 8.67   | 109.45 |
| 1952     | 5      | 4.16                             | 13.49 | 1.42  | .15   | 1.07   | .49   | 25.76 | 19.76 | 6.12   | 26.44  | 12.05  | .22    | 111.13 |
| 1953     | 5      | 8.40                             | 5.30  | 5.44  | 1.02  | .56    | 2.59  | 15.99 | 34.93 | 10.51  | 34.63  | 19.25  | 6.38   | 145.01 |
| 1954     | 5      | 5.50                             | 2.68  | 5.10  | .04+  | 12.28+ | 2.52+ | 5.04+ | 2.93+ | 21.11+ | 26.14+ | 35.63+ | 3.81+  | 122.77 |
| 1955     | 5      | 13.72+                           | 6.52+ | 2.02+ | 1.34  | 2.49   | 1.52  | 1.50  | 12.73 | 20.03  | 17.79  | 12.03  | 2.37   | 94.06  |
| 1956     | 5      | 1.82                             | .15   | 2.12  | .28   | 12.93  | 4.37  | 3.23  | 25.97 | 30.43  | 24.74  | 18.34  | 6.57   | 130.95 |
| 1957     | 5      | 14.52                            | .71   | .94   | .70   | 5.04   | .75   | 5.01  | 15.26 | 9.61   | 1.55   | 12.26  | 4.99   | 71.31  |
| 1958     | 5      | 4.61                             | 2.32  | .98   | .75   | 3.55   | 4.19  | 16.66 | 37.34 | 3.84   | 1.84   | 18.50  | 8.08   | 102.67 |
| 1959     | 5      | 9.26                             | .00   | 2.55  | .10   | .80    | 5.68  | 5.54  | 16.56 | 21.76  | 2.43   | 4.84   | 3.42   | 72.95  |
| 1960     | 5      | 2.17                             | .51   | 3.48  | 4.97+ | 1.09+  | 3.71+ | 8.12+ | 9.04+ | 15.40+ | 12.35+ | 15.26+ | 17.95+ | 94.05  |
| 1961     | 5      | 2.25+                            | .05+  | .59+  | 1.77  | 3.32   | 6.70  | 8.58  | 6.09  | 36.76  | 12.53  | 28.38  | 6.18   | 113.20 |
| 1962     | 5      | 22.33                            | 7.27  | .25   | 2.31  | .36    | .55   | 2.02  | 2.73  | 16.22  | 17.69  | 35.49  | 2.70   | 109.92 |
| 1963     | 5      | 5.26                             | 6.50  | 6.28  | .03   | 4.19   | 1.25  | 6.68  | 7.57  | 23.45  | 11.69  | 18.73  | 8.02   | 99.64  |
| 1964     | 5      | 6.48                             | 8.67  | .31   | 3.01  | 8.07   | 10.95 | 8.89  | 12.51 | 6.20   | 4.69   | 8.39   | 4.14   | 82.32  |
| 1965     | 5      | 6.39                             | 1.04  | 3.97  | .13   | .35    | 10.97 | 4.63  | 5.47  | 14.82+ | 19.69  | 8.07   | 7.19   | 82.73  |
| 1966     | 5      | .19                              | 1.04  | .70   | 1.05  | .88    | .01   | 15.23 | 9.47  | 30.92  | 9.71   | 9.14   | 5.98   | 84.33  |
| 1967     | 5      | 9.25                             | 6.89  | .00   | 1.27  | .81    | .06   | 9.76  | 24.48 | 15.76  | 17.05  | 13.40  | .92    | 99.64  |
| 1968     | 5      | 21.99                            | 2.77  | 1.97  | 1.66  | 1.57   | .62   | 9.49  | 1.41  | 6.39   | 3.46   | 9.79   | 10.17  | 71.30  |
| 1969     | 5      | 14.47                            | .70   | .34   | .14   | 1.18   | .06   | .24   | 10.45 | 22.67  | 17.36  | 18.20  | 8.33   | 94.15  |
| 1970     | 5      | 3.66                             | .58   | 2.00  | .32   | .50    | 4.41  | 2.23  | 2.97  | 10.24  | 16.52  | 16.58  | 4.44   | 64.45  |
| 1971     | 5      | 1.60                             | 1.90  | .94   | 2.84  | 1.16   | 1.70  | 12.28 | 12.93 | 10.45  | 7.18   | 9.28   | 9.89   | 72.17  |
| 1972     | 5      | 2.64                             | .00   | 6.22  | .00   | .19    | 5.52  | .37   | 5.76  | 3.39   | 28.13  | 14.86  | 10.33  | 77.42  |
| 1973     | 5      | 4.00                             | 1.41  | 5.26  | .35   | 1.28   | 1.79  | 1.12  | 18.61 | 25.63  | 11.46  | 51.05  | 11.20  | 133.16 |
| 1974     | 5      | 11.15                            | 7.86  | 1.20  | 2.74  | 1.30   | 1.49  | 10.92 | 31.43 | 6.44   | 12.15  | 17.56  | 1.02   | 105.27 |
| 1975     | 5      | 11.80                            | 1.65  | .62   | .66   | 1.87   | 3.07  | 10.78 | 5.31  | 38.24  | 16.01  | 8.91   | 2.53   | 101.46 |
| 1976     | 5      | 4.27                             | 24.54 | 12.46 | 1.73  | 6.51   | 2.57  | 15.05 | 35.72 | 30.94  | 33.03  | 22.90  | 6.87   | 196.59 |
| 1977     | 4      | 2.60                             | 2.99  | 5.45  | 2.46  | 1.03   | 4.45  | 6.90  | 3.22  | 3.03   | .99    | 21.97  | 11.07  | 66.16  |
| 1978     | 4      | 2.96                             | .83   | 5.00+ | 2.43  | 7.72   | 1.23  | 1.04  | 11.53 | 20.16  | 12.23  | 6.85   | 10.14  | 82.12  |
| 1979     | 4      | 8.85                             | .70   | .05   | 4.40  | 2.61   | .44   | 5.96+ | 13.53 | 13.55  | 2.47   | 14.61  | 2.41   | 69.58  |
| 1980     | 4      | 6.02                             | 24.92 | 8.02  | 17.99 | .78    | 4.95+ | 4.64+ | 2.03  | 7.63+  | 21.80  | 21.18  | 17.52  | 137.49 |
| 1981     | 4      | 3.92                             | 1.89  | .04   | 7.18  | .15    | 8.71  | 18.40 | 5.86  | 11.61  | 8.86   | 4.38+  | .83    | 71.84  |
| 1982     | 4      | 10.33                            | 2.33  | 3.76  | .15   | 7.10   | 4.93  | 1.64  | 30.05 | 24.88  | 20.99  | 6.35   | 6.29   | 118.81 |
| 1983     | 4      | 2.11                             | 2.04  | 1.59  | .85   | .58    | 14.09 | 6.91  | 37.77 | 5.05   | 9.99   | 5.52   | 23.25  | 109.74 |
| 1984     | 4      | 12.79                            | .11   | 11.42 | 8.08  | 4.09   | 18.31 | 9.84  | 9.18  | 17.11  | 22.13  | 15.96  | 9.37   | 138.40 |
| 1985     | 4      | 1.49                             | 1.47  | 5.62  | 1.67  | 2.04   | 8.43  | 5.28  | 5.63  | 18.38  | 14.39  | 24.09  | 8.33   | 96.81  |
| 1986     | 4      | 2.48                             | 2.50  | .00   | 2.86  | .66    | .90   | 8.08  | 21.04 | 19.58  | 12.36  | 14.39  | 8.84+  | 93.68  |
| 1987     | 4      | .51+                             | .07   | 3.94  | .35   | .36    | 5.43  | 15.58 | 5.82  | 17.68  | 8.28   | 14.16  | 10.76  | 82.95  |
| 1988     | 4      | 2.02                             | 1.45  | 2.63  | 1.33  | 3.60   | 15.94 | 11.46 | 7.81  | 17.83  | 13.31  | 20.14  | 18.83  | 116.34 |
| 1989     | 4      | 6.80                             | 6.48  | .86   | 1.62  | 4.28   | 2.36  | 18.54 | 19.46 | 18.06  | 18.17  | 7.21   | .61    | 104.45 |
| 1990     | 4      | .70                              | 4.09  | 4.49  | 2.22  | .49    | 2.22  | 10.98 | 22.53 | 34.58  | 6.35   | 14.97  | 108.89 |        |
| 1991     | 4      | 7.10                             | 2.05  | .72   | .00   | 4.51   | 4.20  | 12.76 | 11.62 | 24.65  | 17.31  | 13.75  | 5.06+  | 103.75 |
| 1992     | 4      | 13.78                            | 4.22  | .37   | .64   | 3.31   | 1.40  | 16.32 | 20.11 | 14.78  | 30.70  | 7.30   | 2.01   | 114.95 |
| 1993     | 4      | .27                              | 1.80  | 2.72  | .25   | .00    | .82   | 10.45 | 7.42  | 37.00  | 10.23  | 2.94   | 14.33  | 88.22  |
| 1994     | 4      | 4.02                             | .64   | 3.18  | 4.00  | 1.52   | 4.07  | 1.91  | 17.49 | 11.73  | 19.66  | 14.94  | 2.77   | 85.94  |
| 1995     | 4      | 14.64+                           | 2.17  | 8.80  | .21   | 3.89   | 4.54  | 4.55  | 8.15  | 23.32  | 18.87  | 18.55  | 18.64  | 126.34 |
| 1996     | 4      | 7.50                             | 10.87 | 8.84  | 2.49  | .10    | 2.16  | 7.16  | 7.63  | 24.92+ | 5.71   | 10.73+ | .91    | 89.03  |
| 1997     | 4      | 1.02                             | 9.77  | 3.69  | 6.72  | .00    | .57   | 2.95  | 28.09 | 9.70   | 14.73  | 7.05   | 4.24   | 88.53  |
| 1998     | 3      | 3.32                             | 12.16 | 4.51  | .00   | 1.68   | .00   | 7.32  | 4.74  | 18.41+ | 14.82+ | 14.12+ | 10.53+ | 91.61  |
| average  |        | 6.47                             | 4.33  | 2.88  | 2.24  | 2.60   | 3.57  | 7.73  | 13.45 | 18.12  | 14.91  | 14.32  | 8.67   | 99.30  |
| adjusted |        | 6.51                             | 4.36  | 2.90  | 2.26  | 2.62   | 3.60  | 7.79  | 13.55 | 18.25  | 15.01  | 14.42  | 8.73   | 100.00 |



```
File      : AGTER_AU.USE
Units     : 10^6xm^3
Descrip.  : Upland Alien Demand in Agtertuin sub-catchment for 1964 to 1990
```

[illegible]

Appendix B2.5

File : AGLP\_RIP.DEM  
Units : 10^6xm^3  
Descrip. : Riparian Alien Demand in Agtertuin sub-catchment for 1964 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1965  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1966  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1967  | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1968  | 0.02 | 0.02 | 0.02 | 0.03 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1969  | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1970  | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1971  | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1972  | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1973  | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1974  | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1975  | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1976  | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1977  | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1978  | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1979  | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1980  | 0.03 | 0.04 | 0.05 | 0.05 | 0.05 | 0.04 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.02 | 0.4   |
| 1981  | 0.04 | 0.05 | 0.07 | 0.07 | 0.06 | 0.05 | 0.03 | 0.02 | 0.02 | 0.01 | 0.02 | 0.03 | 0.5   |
| 1982  | 0.05 | 0.07 | 0.08 | 0.09 | 0.08 | 0.07 | 0.04 | 0.03 | 0.02 | 0.02 | 0.02 | 0.03 | 0.6   |
| 1983  | 0.06 | 0.08 | 0.10 | 0.11 | 0.09 | 0.08 | 0.05 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.7   |
| 1984  | 0.06 | 0.08 | 0.10 | 0.11 | 0.10 | 0.08 | 0.05 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.7   |
| 1985  | 0.06 | 0.09 | 0.10 | 0.11 | 0.10 | 0.08 | 0.05 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.7   |
| 1986  | 0.07 | 0.09 | 0.10 | 0.11 | 0.10 | 0.08 | 0.05 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.7   |
| 1987  | 0.07 | 0.09 | 0.11 | 0.11 | 0.10 | 0.08 | 0.05 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.8   |
| 1988  | 0.07 | 0.09 | 0.11 | 0.11 | 0.10 | 0.09 | 0.06 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.8   |
| 1989  | 0.07 | 0.09 | 0.11 | 0.12 | 0.10 | 0.09 | 0.06 | 0.03 | 0.03 | 0.02 | 0.03 | 0.04 | 0.8   |
| 1990  | 0.07 | 0.09 | 0.11 | 0.12 | 0.11 | 0.09 | 0.06 | 0.04 | 0.03 | 0.02 | 0.03 | 0.04 | 0.8   |
| AVE : | 0.03 | 0.05 | 0.05 | 0.06 | 0.05 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 | 0.02 | 0.02 | 0.4   |
| SD :  | 0.02 | 0.03 | 0.04 | 0.04 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.3   |

```
File      : AU_PIT14.USE
Units     : 10^6xm^3
Descrip.  : Upland Alien Demand in Ben Etive sub-catchment for 1964 to 1990
```

[illegible]

```
File      : AU_PIT16.USE
Units     : 10^6xm^3
Descrip.  : Upland Alien Demand in Rooikloof sub-catchment for 1964 to 1990
```

[illegible]

```
File      : H14_RIP.DEM
Units     : 10^6xm^3
Descrip.  : Riparian Alien Demand in Ben Etive sub-catchment for 1964 to 1990
```

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1965  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1966  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1967  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1968  | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1969  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1970  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1971  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1972  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1973  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1974  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1975  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1976  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1977  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1978  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1979  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1980  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1981  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1982  | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1983  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1984  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1985  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1986  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1987  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1988  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1989  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1990  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| AVE : | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| SD :  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |

Appendix B2.9

File : H16\_RIP.DEM  
Units : 10^6xm^3  
Descrip. : Riparian Alien Demand in Rooikloof sub-catchment for 1964 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1965  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1966  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1967  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1968  | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1969  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1970  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1971  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1972  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1973  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1974  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1975  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1976  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1977  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1978  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1979  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1980  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1981  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1982  | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1983  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1984  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1985  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1986  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1987  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1988  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1989  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1990  | 0.01 | 0.02 | 0.02 | 0.03 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| AVE : | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| SD :  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |

Appendix B2.10

File : AU\_H1H3.USE  
Units : 10^6xm^3  
Descrip. : Upland Alien Demand in H1H003 sub-catchment for 1964 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1965  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.0   |
| 1966  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1967  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1968  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.0   |
| 1969  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.02 | 0.01 | 0.1   |
| 1970  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.0   |
| 1971  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1972  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.01 | 0.0   |
| 1973  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.01 | 0.07 | 0.02 | 0.1   |
| 1974  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1975  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.02 | 0.01 | 0.01 | 0.1   |
| 1976  | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.04 | 0.04 | 0.05 | 0.03 | 0.01 | 0.2   |
| 1977  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.0   |
| 1978  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1979  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1980  | 0.01 | 0.03 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.04 | 0.04 | 0.2   |
| 1981  | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.1   |
| 1982  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 0.06 | 0.06 | 0.04 | 0.02 | 0.3   |
| 1983  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.12 | 0.02 | 0.02 | 0.02 | 0.06 | 0.3   |
| 1984  | 0.04 | 0.01 | 0.01 | 0.01 | 0.00 | 0.02 | 0.01 | 0.01 | 0.04 | 0.07 | 0.06 | 0.04 | 0.3   |
| 1985  | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.04 | 0.04 | 0.09 | 0.05 | 0.3   |
| 1986  | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.04 | 0.06 | 0.05 | 0.06 | 0.04 | 0.3   |
| 1987  | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.04 | 0.04 | 0.05 | 0.04 | 0.2   |
| 1988  | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.02 | 0.02 | 0.02 | 0.05 | 0.06 | 0.09 | 0.09 | 0.4   |
| 1989  | 0.04 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.06 | 0.08 | 0.10 | 0.06 | 0.03 | 0.4   |
| 1990  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.08 | 0.24 | 0.08 | 0.07 | 0.5   |
| AVE : | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.03 | 0.03 | 0.03 | 0.02 | 0.2   |
| SD :  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.03 | 0.02 | 0.05 | 0.03 | 0.02 | 0.1   |

Appendix B2.11

File : H1H3RIP.DEM  
Units : 10^6xm^3  
Descrip. : Riparian Alien Demand in H1H003 sub-catchment for 1964 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1965  | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1966  | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1967  | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1968  | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1969  | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1970  | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1971  | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.1   |
| 1972  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.1   |
| 1973  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1974  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1975  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1976  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1977  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1978  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1979  | 0.02 | 0.02 | 0.03 | 0.03 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1980  | 0.02 | 0.02 | 0.03 | 0.03 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1981  | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1982  | 0.02 | 0.03 | 0.03 | 0.04 | 0.03 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.3   |
| 1983  | 0.02 | 0.03 | 0.04 | 0.04 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.3   |
| 1984  | 0.03 | 0.03 | 0.04 | 0.04 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.3   |
| 1985  | 0.03 | 0.04 | 0.04 | 0.05 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.3   |
| 1986  | 0.03 | 0.04 | 0.05 | 0.05 | 0.04 | 0.04 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.3   |
| 1987  | 0.03 | 0.04 | 0.05 | 0.05 | 0.05 | 0.04 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.02 | 0.4   |
| 1988  | 0.03 | 0.04 | 0.05 | 0.06 | 0.05 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.02 | 0.4   |
| 1989  | 0.03 | 0.05 | 0.06 | 0.06 | 0.05 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 | 0.02 | 0.02 | 0.4   |
| 1990  | 0.04 | 0.05 | 0.06 | 0.06 | 0.05 | 0.05 | 0.03 | 0.02 | 0.01 | 0.01 | 0.02 | 0.02 | 0.4   |
| AVE : | 0.02 | 0.02 | 0.03 | 0.03 | 0.03 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| SD :  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.1   |



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File      : CERRQ19.NSI
Units     : 10^6xm^3
Descrip.  : Diffuse Irrigation from rivers in H1H003 sub-catchment for 1964 to 1990
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| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 0.01 | 0.05 | 0.17 | 0.18 | 0.14 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.6   |
| 1965  | 0.01 | 0.08 | 0.16 | 0.20 | 0.09 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.6   |
| 1966  | 0.02 | 0.08 | 0.18 | 0.20 | 0.10 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.6   |
| 1967  | 0.01 | 0.06 | 0.18 | 0.20 | 0.18 | 0.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.7   |
| 1968  | 0.00 | 0.08 | 0.18 | 0.21 | 0.19 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.8   |
| 1969  | 0.00 | 0.09 | 0.20 | 0.23 | 0.09 | 0.04 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.7   |
| 1970  | 0.01 | 0.09 | 0.20 | 0.24 | 0.15 | 0.08 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.8   |
| 1971  | 0.02 | 0.09 | 0.21 | 0.22 | 0.16 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.8   |
| 1972  | 0.02 | 0.10 | 0.18 | 0.26 | 0.12 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.8   |
| 1973  | 0.02 | 0.09 | 0.21 | 0.26 | 0.18 | 0.09 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.9   |
| 1974  | 0.00 | 0.08 | 0.23 | 0.26 | 0.23 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.9   |
| 1975  | 0.00 | 0.10 | 0.25 | 0.28 | 0.16 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.9   |
| 1976  | 0.02 | 0.01 | 0.15 | 0.27 | 0.22 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.8   |
| 1977  | 0.02 | 0.11 | 0.25 | 0.28 | 0.22 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.0   |
| 1978  | 0.02 | 0.12 | 0.23 | 0.29 | 0.23 | 0.12 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.0   |
| 1979  | 0.01 | 0.12 | 0.28 | 0.28 | 0.23 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.0   |
| 1980  | 0.02 | 0.02 | 0.24 | 0.23 | 0.26 | 0.12 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.9   |
| 1981  | 0.02 | 0.11 | 0.29 | 0.29 | 0.29 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.1   |
| 1982  | 0.01 | 0.12 | 0.27 | 0.30 | 0.24 | 0.11 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.1   |
| 1983  | 0.02 | 0.13 | 0.29 | 0.33 | 0.26 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.1   |
| 1984  | 0.00 | 0.14 | 0.23 | 0.29 | 0.27 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.0   |
| 1985  | 0.03 | 0.14 | 0.30 | 0.34 | 0.19 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.1   |
| 1986  | 0.03 | 0.13 | 0.33 | 0.35 | 0.16 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.1   |
| 1987  | 0.03 | 0.15 | 0.30 | 0.38 | 0.13 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.1   |
| 1988  | 0.03 | 0.15 | 0.32 | 0.32 | 0.15 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.0   |
| 1989  | 0.03 | 0.13 | 0.36 | 0.38 | 0.31 | 0.14 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.4   |
| 1990  | 0.03 | 0.14 | 0.34 | 0.38 | 0.35 | 0.16 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.4   |
| AVE : | 0.02 | 0.10 | 0.24 | 0.28 | 0.20 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.9   |
| SD :  | 0.01 | 0.04 | 0.06 | 0.06 | 0.07 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |

Appendix B2.13

File : CERRQ9.NSI  
Units : 10^6xm^3  
Descrip. : Farm Dam Irrigation in H1H003 sub-catchment for 1964 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 0.13 | 0.62 | 1.99 | 2.07 | 1.60 | 0.59 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 7.0   |
| 1965  | 0.15 | 0.88 | 1.79 | 2.30 | 1.98 | 0.60 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 7.7   |
| 1966  | 0.21 | 0.89 | 2.03 | 2.25 | 2.03 | 0.95 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 8.4   |
| 1967  | 0.08 | 0.70 | 2.08 | 2.27 | 2.05 | 0.95 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 8.2   |
| 1968  | 0.00 | 0.88 | 2.06 | 2.43 | 2.14 | 1.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 8.5   |
| 1969  | 0.00 | 1.00 | 2.28 | 2.62 | 2.23 | 1.04 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 9.3   |
| 1970  | 0.17 | 1.03 | 2.28 | 2.70 | 2.34 | 0.92 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 9.5   |
| 1971  | 0.24 | 1.05 | 2.39 | 2.54 | 2.41 | 1.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 9.7   |
| 1972  | 0.21 | 1.15 | 2.10 | 2.96 | 2.56 | 0.99 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10.1  |
| 1973  | 0.19 | 1.09 | 2.40 | 2.99 | 2.55 | 1.18 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10.5  |
| 1974  | 0.05 | 0.93 | 2.65 | 2.94 | 2.64 | 1.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 10.4  |
| 1975  | 0.04 | 1.17 | 2.82 | 3.22 | 2.71 | 1.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 11.2  |
| 1976  | 0.23 | 0.15 | 1.68 | 3.15 | 2.58 | 1.22 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 9.0   |
| 1977  | 0.25 | 1.22 | 2.85 | 3.23 | 2.94 | 1.17 | 0.05 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 11.7  |
| 1978  | 0.27 | 1.33 | 2.65 | 3.28 | 2.64 | 1.36 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 11.6  |
| 1979  | 0.14 | 1.40 | 3.20 | 3.27 | 2.97 | 1.43 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 12.5  |
| 1980  | 0.19 | 0.20 | 2.71 | 2.66 | 3.05 | 1.35 | 0.09 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 10.3  |
| 1981  | 0.26 | 1.23 | 3.35 | 3.34 | 3.31 | 1.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 12.7  |
| 1982  | 0.15 | 1.43 | 3.12 | 3.87 | 2.81 | 1.27 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 12.8  |
| 1983  | 0.29 | 1.44 | 3.39 | 3.79 | 3.19 | 1.03 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 13.2  |
| 1984  | 0.04 | 1.58 | 2.65 | 3.35 | 3.14 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 11.3  |
| 1985  | 0.36 | 1.63 | 3.41 | 3.94 | 3.59 | 1.04 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 14.0  |
| 1986  | 0.36 | 1.48 | 3.80 | 4.00 | 3.70 | 1.73 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 15.1  |
| 1987  | 0.37 | 1.71 | 3.49 | 4.37 | 3.79 | 1.30 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 15.0  |
| 1988  | 0.36 | 1.74 | 3.69 | 4.60 | 3.69 | 0.73 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 14.8  |
| 1989  | 0.37 | 1.51 | 4.17 | 4.41 | 3.55 | 1.62 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 15.6  |
| 1990  | 0.36 | 1.58 | 3.86 | 4.42 | 3.97 | 1.82 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 16.1  |
| AVE : | 0.20 | 1.15 | 2.77 | 3.22 | 2.82 | 1.13 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 11.3  |
| SD :  | 0.12 | 0.41 | 0.70 | 0.74 | 0.63 | 0.32 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 2.6   |

## Appendix B2.14

File : WARMTOT.FLW  
Units : 10^6xm^3  
Descrip. : Irrigation abstraction from Ben Etive Damg for 1925 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1925  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1926  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1927  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1928  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1929  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1930  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1931  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1932  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1933  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1934  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1935  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1936  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1937  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1938  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1939  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1940  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1941  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1942  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1943  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1944  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1945  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1946  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1947  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1948  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1949  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1950  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1951  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1952  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1953  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1954  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1955  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1956  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1957  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1958  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1959  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1960  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1961  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1962  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1963  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1964  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.22 | 0.85 | 0.54 | 0.48 | 0.55 | 0.27 | 2.9   |
| 1965  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.11 | 0.15 | 0.55 | 1.46 | 0.94 | 0.63 | 3.8   |
| 1966  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.51 | 1.22 | 0.71 | 0.69 | 0.38 | 3.5   |
| 1967  | 0.53 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.72 | 1.28 | 1.14 | 1.11 | 0.46 | 6.2   |
| 1968  | 1.40 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 0.15 | 0.18 | 0.47 | 0.46 | 2.7   |
| 1969  | 0.91 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.20 | 1.68 | 1.56 | 1.63 | 0.96 | 6.9   |
| 1970  | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.32 | 1.23 | 1.54 | 0.69 | 4.4   |
| 1971  | 0.35 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.02 | 0.52 | 0.66 | 0.52 | 0.72 | 0.93 | 3.7   |
| 1972  | 0.09 | 0.01 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.07 | 0.17 | 1.66 | 1.22 | 0.95 | 4.2   |
| 1973  | 0.19 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.27 | 1.50 | 0.85 | 1.95 | 1.05 | 5.8   |
| 1974  | 0.82 | 0.26 | 0.03 | 0.00 | 0.00 | 0.00 | 0.15 | 1.94 | 0.67 | 0.80 | 1.44 | 0.52 | 6.6   |
| 1975  | 0.84 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 | 0.14 | 1.95 | 1.17 | 0.93 | 0.52 | 5.7   |
| 1976  | 0.09 | 0.37 | 0.24 | 0.01 | 0.00 | 0.00 | 0.65 | 1.37 | 1.91 | 0.75 | 0.06 | 0.41 | 5.9   |
| 1977  | 0.47 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.04 | 0.20 | 0.22 | 0.06 | 1.56 | 0.50 | 3.1   |
| 1978  | 0.31 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.29 | 1.39 | 1.01 | 0.87 | 0.83 | 4.7   |
| 1979  | 0.55 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 | 0.50 | 0.72 | 0.44 | 0.95 | 0.50 | 3.8   |
| 1980  | 0.00 | 0.21 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.10 | 0.25 | 1.61 | 1.68 | 1.37 | 5.3   |
| 1981  | 0.70 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 1.33 | 0.40 | 0.70 | 0.75 | 0.59 | 0.31 | 4.8   |
| 1982  | 0.21 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.06 | 1.40 | 1.68 | 1.96 | 0.88 | 0.72 | 6.9   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 1.94 | 0.61 | 0.72 | 0.65 | 1.03 | 5.0   |
| 1984  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 0.57 | 1.18 | 1.86 | 0.88 | 1.03 | 5.6   |
| 1985  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 0.17 | 1.18 | 0.79 | 1.91 | 0.85 | 5.0   |
| 1986  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 1.40 | 1.18 | 1.09 | 0.88 | 0.95 | 5.6   |
| 1987  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.55 | 0.37 | 1.18 | 0.64 | 0.88 | 0.85 | 4.5   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0.42 | 1.18 | 0.94 | 1.69 | 1.03 | 6.0   |
| 1989  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 1.40 | 1.18 | 1.86 | 0.88 | 0.70 | 6.1   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 | 0.49 | 1.93 | 1.86 | 0.88 | 1.03 | 6.2   |
| AVE : | 0.12 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.07 | 0.26 | 0.41 | 0.43 | 0.43 | 0.30 | 2.0   |
| SD :  | 0.28 | 0.06 | 0.03 | 0.00 | 0.00 | 0.00 | 0.21 | 0.50 | 0.61 | 0.62 | 0.60 | 0.41 | 2.6   |

Appendix B2.15

File : R00IT0T.FLW  
Units : 10^6xm^3  
Descrip. : Irrigation abstraction from Rooikloof Dam for 1964 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1965  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1966  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1967  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1968  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1969  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1970  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1971  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.19 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 2.7   |
| 1972  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 | 0.09 | 0.13 | 0.93 | 0.93 | 0.93 | 3.1   |
| 1973  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.73 | 0.51 | 0.51 | 0.51 | 0.51 | 2.8   |
| 1974  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.22 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 2.8   |
| 1975  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.22 | 0.23 | 0.79 | 0.51 | 0.51 | 0.51 | 2.8   |
| 1976  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.22 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 2.8   |
| 1977  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.15 | 0.23 | 0.28 | 0.23 | 1.25 | 0.63 | 2.8   |
| 1978  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 | 0.66 | 0.51 | 0.51 | 0.51 | 0.51 | 2.8   |
| 1979  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 | 0.63 | 0.56 | 0.51 | 0.51 | 0.51 | 2.8   |
| 1980  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.15 | 0.14 | 0.33 | 1.03 | 0.93 | 0.51 | 3.1   |
| 1981  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.22 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 2.8   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.09 | 0.64 | 0.51 | 0.51 | 0.51 | 0.51 | 2.8   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.22 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 2.8   |
| 1984  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.22 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 2.8   |
| 1985  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.12 | 0.16 | 0.63 | 0.63 | 0.63 | 0.63 | 2.8   |
| 1986  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.22 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 2.8   |
| 1987  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.22 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 2.8   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.22 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 2.8   |
| 1989  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.30 | 0.59 | 0.59 | 0.59 | 0.59 | 0.59 | 3.3   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 0.53 | 0.81 | 0.65 | 0.59 | 0.59 | 3.2   |
| AVE : | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.12 | 0.34 | 0.38 | 0.41 | 0.45 | 0.41 | 2.1   |
| SD :  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.10 | 0.26 | 0.26 | 0.29 | 0.32 | 0.26 | 1.3   |

```
File      : AGTRQ27.NSI
Units     : 10^6xm^3
Descrip.  : Diffuse Irrigation from rivers in Agtertuin sub-catchment for 1964 to 1990
```

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 0.00 | 0.01 | 0.05 | 0.05 | 0.04 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1965  | 0.00 | 0.02 | 0.04 | 0.06 | 0.05 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1966  | 0.00 | 0.02 | 0.05 | 0.05 | 0.05 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1967  | 0.00 | 0.01 | 0.05 | 0.05 | 0.05 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1968  | 0.00 | 0.02 | 0.05 | 0.06 | 0.05 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1969  | 0.00 | 0.02 | 0.05 | 0.06 | 0.05 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1970  | 0.00 | 0.02 | 0.05 | 0.06 | 0.05 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1971  | 0.00 | 0.02 | 0.05 | 0.06 | 0.06 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1972  | 0.00 | 0.03 | 0.04 | 0.07 | 0.06 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1973  | 0.00 | 0.03 | 0.05 | 0.07 | 0.05 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1974  | 0.00 | 0.01 | 0.06 | 0.06 | 0.06 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1975  | 0.00 | 0.03 | 0.07 | 0.07 | 0.06 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |
| 1976  | 0.00 | 0.00 | 0.04 | 0.07 | 0.04 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1977  | 0.01 | 0.02 | 0.05 | 0.06 | 0.07 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1978  | 0.01 | 0.03 | 0.05 | 0.08 | 0.05 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |
| 1979  | 0.00 | 0.03 | 0.07 | 0.07 | 0.07 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |
| 1980  | 0.00 | 0.00 | 0.06 | 0.01 | 0.07 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1981  | 0.00 | 0.03 | 0.08 | 0.08 | 0.08 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |
| 1982  | 0.00 | 0.03 | 0.07 | 0.09 | 0.05 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |
| 1983  | 0.01 | 0.04 | 0.08 | 0.09 | 0.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |
| 1984  | 0.00 | 0.04 | 0.05 | 0.06 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1985  | 0.00 | 0.03 | 0.06 | 0.10 | 0.08 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |
| 1986  | 0.01 | 0.03 | 0.09 | 0.09 | 0.08 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |
| 1987  | 0.01 | 0.04 | 0.07 | 0.10 | 0.09 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |
| 1988  | 0.01 | 0.04 | 0.08 | 0.10 | 0.08 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |
| 1989  | 0.01 | 0.03 | 0.09 | 0.10 | 0.08 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |
| 1990  | 0.01 | 0.03 | 0.08 | 0.09 | 0.09 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |
| AVE : | 0.00 | 0.02 | 0.06 | 0.07 | 0.06 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| SD :  | 0.00 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |

Appendix B2.17

File : AGTRQ20.NSI  
Units : 10^6xm^3  
Descrip. : Farm Dam Irrigation in Agtertuin sub-catchment for 1964 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 0.01 | 0.06 | 0.25 | 0.25 | 0.19 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.8   |
| 1965  | 0.01 | 0.10 | 0.20 | 0.29 | 0.25 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.9   |
| 1966  | 0.03 | 0.11 | 0.26 | 0.28 | 0.25 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.1   |
| 1967  | 0.00 | 0.06 | 0.27 | 0.29 | 0.26 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.0   |
| 1968  | 0.00 | 0.09 | 0.26 | 0.31 | 0.25 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.0   |
| 1969  | 0.00 | 0.13 | 0.29 | 0.32 | 0.26 | 0.13 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.1   |
| 1970  | 0.01 | 0.11 | 0.27 | 0.33 | 0.28 | 0.09 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.1   |
| 1971  | 0.02 | 0.13 | 0.27 | 0.30 | 0.29 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.1   |
| 1972  | 0.02 | 0.14 | 0.23 | 0.36 | 0.30 | 0.08 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.1   |
| 1973  | 0.01 | 0.13 | 0.26 | 0.36 | 0.27 | 0.12 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.2   |
| 1974  | 0.00 | 0.08 | 0.32 | 0.32 | 0.32 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.2   |
| 1975  | 0.00 | 0.14 | 0.34 | 0.34 | 0.31 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.2   |
| 1976  | 0.02 | 0.00 | 0.21 | 0.39 | 0.23 | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.0   |
| 1977  | 0.03 | 0.12 | 0.28 | 0.32 | 0.35 | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.2   |
| 1978  | 0.03 | 0.14 | 0.28 | 0.40 | 0.25 | 0.14 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.3   |
| 1979  | 0.02 | 0.17 | 0.38 | 0.38 | 0.37 | 0.15 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.5   |
| 1980  | 0.02 | 0.00 | 0.34 | 0.06 | 0.34 | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.9   |
| 1981  | 0.02 | 0.17 | 0.40 | 0.40 | 0.39 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.5   |
| 1982  | 0.00 | 0.17 | 0.37 | 0.45 | 0.28 | 0.13 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.4   |
| 1983  | 0.03 | 0.19 | 0.42 | 0.48 | 0.41 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.5   |
| 1984  | 0.00 | 0.19 | 0.28 | 0.33 | 0.37 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.2   |
| 1985  | 0.02 | 0.17 | 0.30 | 0.50 | 0.42 | 0.10 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.5   |
| 1986  | 0.03 | 0.14 | 0.46 | 0.47 | 0.44 | 0.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.7   |
| 1987  | 0.04 | 0.21 | 0.38 | 0.53 | 0.46 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.7   |
| 1988  | 0.04 | 0.20 | 0.41 | 0.50 | 0.42 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.6   |
| 1989  | 0.03 | 0.17 | 0.49 | 0.53 | 0.40 | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.8   |
| 1990  | 0.03 | 0.18 | 0.44 | 0.49 | 0.48 | 0.18 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.8   |
| AVE : | 0.02 | 0.13 | 0.32 | 0.37 | 0.33 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.3   |
| SD :  | 0.01 | 0.06 | 0.08 | 0.10 | 0.08 | 0.05 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |

Appendix B2.18

File : AGTRQ23.NSI  
Units : 10^6xm^3  
Descrip. : Rietvlei Irrigation Board Abstraction for 1964 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1965  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1966  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.19 | 0.19 | 0.19 | 0.19 | 0.19 | 1.0   |
| 1967  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.19 | 0.19 | 0.19 | 0.19 | 0.19 | 1.0   |
| 1968  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.19 | 0.19 | 0.19 | 0.19 | 0.19 | 1.0   |
| 1969  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.27 | 0.19 | 0.19 | 0.19 | 0.19 | 1.0   |
| 1970  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.14 | 0.24 | 0.20 | 0.19 | 0.19 | 1.0   |
| 1971  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.19 | 0.19 | 0.19 | 0.19 | 0.19 | 1.0   |
| 1972  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.00 | 0.06 | 0.80 | 0.21 | 0.19 | 1.3   |
| 1973  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.25 | 0.19 | 0.19 | 0.19 | 0.19 | 1.0   |
| 1974  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.19 | 0.19 | 0.19 | 0.19 | 0.19 | 1.0   |
| 1975  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.19 | 0.19 | 0.19 | 0.19 | 0.19 | 1.0   |
| 1976  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.19 | 0.19 | 0.19 | 0.19 | 0.19 | 1.0   |
| 1977  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.19 | 0.19 | 0.19 | 0.19 | 0.19 | 1.0   |
| 1978  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.19 | 0.19 | 0.19 | 0.19 | 0.19 | 1.0   |
| 1979  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.27 | 0.19 | 0.19 | 0.19 | 0.19 | 1.0   |
| 1980  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.19 | 0.19 | 0.19 | 0.19 | 0.19 | 1.0   |
| 1981  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.19 | 0.19 | 0.19 | 0.19 | 0.19 | 1.0   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 0.20 | 0.19 | 0.19 | 0.19 | 0.19 | 1.0   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.19 | 0.19 | 0.19 | 0.19 | 0.19 | 1.0   |
| 1984  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.19 | 0.19 | 0.19 | 0.19 | 0.19 | 1.0   |
| 1985  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.12 | 0.26 | 0.19 | 0.19 | 0.19 | 1.0   |
| 1986  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.19 | 0.19 | 0.19 | 0.19 | 0.19 | 1.0   |
| 1987  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.19 | 0.19 | 0.19 | 0.19 | 0.19 | 1.0   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.19 | 0.19 | 0.19 | 0.19 | 0.19 | 1.0   |
| 1989  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.19 | 0.19 | 0.19 | 0.19 | 0.19 | 1.0   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.26 | 0.19 | 0.19 | 0.19 | 0.19 | 1.0   |
| AVE : | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 0.18 | 0.18 | 0.20 | 0.18 | 0.18 | 1.0   |
| SD :  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.07 | 0.06 | 0.13 | 0.05 | 0.05 | 0.3   |

Appendix B2.19

File : H1H3-INC.CAL  
Units : 10^6xm^3  
Descrip. : Incremental simulated flow record at H1H003 for 1964 to 1990

| Year  | Oct   | Nov   | Dec  | Jan   | Feb  | Mar   | Apr   | May   | Jun   | Jul   | Aug    | Sep   | Total |
|-------|-------|-------|------|-------|------|-------|-------|-------|-------|-------|--------|-------|-------|
| 1964  | 6.14  | 4.57  | 1.34 | 0.85  | 1.89 | 3.91  | 3.29  | 7.35  | 5.08  | 4.03  | 4.74   | 2.89  | 46.1  |
| 1965  | 1.62  | 1.44  | 0.96 | 0.91  | 0.76 | 3.16  | 1.11  | 1.26  | 8.55  | 22.11 | 12.86  | 8.11  | 62.8  |
| 1966  | 1.77  | 1.01  | 0.80 | 0.86  | 0.77 | 0.35  | 7.06  | 4.49  | 46.25 | 16.11 | 12.72  | 7.36  | 99.6  |
| 1967  | 4.90  | 3.80  | 1.20 | 0.87  | 0.77 | 0.35  | 1.96  | 24.88 | 17.13 | 23.98 | 20.54  | 7.99  | 108.4 |
| 1968  | 21.62 | 4.31  | 1.17 | 0.94  | 0.81 | 0.37  | 1.81  | 0.24  | 0.56  | 0.94  | 2.76   | 5.12  | 40.7  |
| 1969  | 9.36  | 2.99  | 0.92 | 0.98  | 0.82 | 0.37  | 0.03  | 1.58  | 21.13 | 21.11 | 27.42  | 15.46 | 102.2 |
| 1970  | 5.45  | 1.73  | 0.91 | 1.02  | 0.87 | 0.49  | 0.07  | 0.00  | 1.64  | 12.12 | 18.67  | 8.81  | 51.8  |
| 1971  | 2.14  | 1.22  | 0.92 | 0.97  | 0.91 | 0.38  | 3.68  | 6.60  | 6.96  | 6.67  | 7.66   | 9.27  | 47.4  |
| 1972  | 3.15  | 1.27  | 1.35 | 1.14  | 0.95 | 0.67  | 0.05  | 0.28  | 0.56  | 31.60 | 17.09  | 13.74 | 71.9  |
| 1973  | 5.80  | 1.86  | 1.36 | 1.16  | 0.95 | 0.42  | 0.03  | 10.65 | 31.37 | 16.72 | 120.88 | 26.20 | 217.4 |
| 1974  | 13.82 | 5.71  | 1.67 | 1.15  | 1.00 | 0.42  | 2.35  | 42.62 | 8.77  | 11.84 | 23.89  | 11.33 | 124.6 |
| 1975  | 7.69  | 2.60  | 1.12 | 1.20  | 1.02 | 0.46  | 2.44  | 1.33  | 63.31 | 22.99 | 16.51  | 10.12 | 130.8 |
| 1976  | 2.87  | 25.29 | 7.11 | 1.80  | 1.65 | 0.71  | 6.63  | 57.91 | 55.22 | 75.25 | 53.55  | 22.00 | 310.0 |
| 1977  | 6.36  | 2.04  | 1.63 | 1.27  | 1.12 | 0.61  | 0.68  | 0.11  | 0.06  | 0.00  | 16.58  | 8.88  | 39.4  |
| 1978  | 4.14  | 1.50  | 1.30 | 1.29  | 1.92 | 0.68  | 0.03  | 2.35  | 16.42 | 13.59 | 11.08  | 12.98 | 67.3  |
| 1979  | 7.29  | 2.46  | 1.24 | 1.29  | 1.16 | 0.52  | 0.26  | 4.83  | 8.40  | 5.06  | 11.03  | 6.22  | 49.8  |
| 1980  | 2.86  | 26.64 | 4.49 | 12.50 | 1.82 | 0.91  | 0.21  | 0.07  | 0.34  | 19.13 | 30.41  | 29.51 | 128.9 |
| 1981  | 9.12  | 2.45  | 1.27 | 1.80  | 1.24 | 1.89  | 11.83 | 3.85  | 6.43  | 7.69  | 5.61   | 3.26  | 56.4  |
| 1982  | 3.76  | 1.93  | 1.31 | 1.40  | 1.58 | 0.99  | 0.02  | 35.98 | 33.28 | 34.83 | 16.87  | 12.03 | 144.0 |
| 1983  | 3.45  | 1.39  | 1.24 | 1.36  | 1.13 | 5.90  | 1.77  | 61.66 | 8.72  | 9.07  | 7.00   | 28.78 | 131.5 |
| 1984  | 14.54 | 3.77  | 4.47 | 2.85  | 1.51 | 12.09 | 4.50  | 4.50  | 14.16 | 31.01 | 26.27  | 18.52 | 138.2 |
| 1985  | 5.63  | 1.62  | 1.59 | 1.44  | 1.28 | 1.73  | 0.51  | 0.61  | 12.21 | 14.48 | 36.25  | 16.44 | 93.8  |
| 1986  | 4.76  | 1.84  | 1.39 | 1.43  | 1.32 | 0.57  | 0.52  | 16.15 | 20.97 | 17.25 | 18.79  | 14.14 | 99.1  |
| 1987  | 3.58  | 1.26  | 1.30 | 1.57  | 1.34 | 0.66  | 7.07  | 2.50  | 13.08 | 9.31  | 13.71  | 13.99 | 69.4  |
| 1988  | 4.11  | 1.65  | 1.34 | 1.63  | 1.33 | 8.32  | 4.92  | 3.69  | 14.55 | 15.41 | 27.57  | 30.14 | 114.7 |
| 1989  | 10.53 | 4.48  | 1.76 | 1.58  | 1.31 | 0.57  | 11.47 | 17.02 | 20.65 | 27.13 | 14.10  | 5.74  | 116.3 |
| 1990  | 0.62  | 1.16  | 1.53 | 1.59  | 1.41 | 0.60  | 0.03  | 2.15  | 20.92 | 64.83 | 16.45  | 16.82 | 128.1 |
| AVE : | 6.19  | 4.15  | 1.73 | 1.74  | 1.21 | 1.78  | 2.75  | 11.65 | 16.92 | 19.79 | 21.89  | 13.55 | 103.3 |
| SD :  | 4.64  | 6.41  | 1.39 | 2.19  | 0.35 | 2.80  | 3.42  | 17.65 | 16.44 | 17.18 | 22.53  | 7.91  | 58.7  |



## Appendix B2.20

File : H1H3PAT.OBS  
 Units : 10^6xm^3/a  
 Descrip. : Incremental patched observed runoff at H1H003 for 1964 to 1990

| Year  | Oct    | Nov   | Dec   | Jan   | Feb   | Mar   | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Total |
|-------|--------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|-------|
| 1964  | 4.06   | 7.48* | 3.20+ | 1.54+ | 1.89+ | 3.91+ | 3.29+  | 7.44+  | 5.07+  | 4.67+  | 4.73+  | 3.29+  | 50.6  |
| 1965  | 2.94+  | 2.90+ | 1.90+ | 1.19+ | 0.76+ | 2.00+ | 0.33+  | 1.18+  | 8.55+  | 23.57+ | 11.38+ | 10.02+ | 66.7  |
| 1966  | 5.25*  | 0.18  | 0.12  | 0.10  | 0.01  | 0.05  | 1.14   | 3.45   | 66.01* | 16.11+ | 12.72+ | 7.36+  | 112.5 |
| 1967  | 4.90+  | 3.80+ | 1.20+ | 1.53* | 0.86* | 0.35  | 1.96   | 24.88* | 17.13* | 23.98* | 16.52  | 7.99   | 105.1 |
| 1968  | 33.60  | 1.85  | 0.64  | 0.66  | 0.38  | 0.34  | 1.64   | 1.21   | 2.14*  | 2.00*  | 5.67   | 8.73   | 58.9  |
| 1969  | 8.83   | 1.97  | 0.87  | 0.70  | 0.52  | 0.69  | 0.85   | 3.11   | 33.06  | 20.29  | 23.71  | 16.97  | 111.6 |
| 1970  | 4.87   | 2.31  | 1.51  | 0.87  | 0.61  | 0.92  | 1.03   | 1.57   | 1.75   | 17.85  | 12.49  | 4.57   | 50.4  |
| 1971  | 2.20   | 0.94  | 0.52  | 0.44  | 0.36  | 0.47  | 0.58   | 3.64   | 4.91   | 4.86   | 8.60   | 6.10   | 33.6  |
| 1972  | 2.14   | 0.80  | 1.14  | 0.32  | 0.29  | 1.12  | 0.71   | 0.76   | 0.83   | 31.60  | 11.13  | 6.66   | 57.5  |
| 1973  | 3.23   | 0.61  | 0.58  | 0.16  | 0.09  | 0.15  | 0.36   | 1.18   | 33.86  | 6.37   | 171.83 | 23.30  | 241.7 |
| 1974  | 7.26   | 3.94  | 0.94  | 0.32  | 0.19  | 0.32  | 3.03   | 57.70  | 7.33   | 13.68  | 20.22  | 4.40   | 119.3 |
| 1975  | 7.01   | 1.86  | 0.66  | 0.13  | 0.00  | 0.10  | 0.62   | 1.28   | 64.94  | 17.58  | 8.18   | 4.02   | 106.4 |
| 1976  | 2.45   | 29.54 | 9.36  | 3.64  | 1.13  | 0.89  | 3.01   | 87.87  | 56.74  | 132.52 | 105.72 | 15.27  | 448.1 |
| 1977  | 6.13   | 3.44  | 2.39  | 0.45  | 0.37  | 0.57  | 2.03   | 2.98   | 1.51   | 0.94   | 24.15  | 9.40   | 54.4  |
| 1978  | 3.20   | 0.72  | 0.24  | 1.66+ | 0.17  | 0.30  | 0.32   | 1.83   | 18.37  | 6.27   | 6.55   | 15.30* | 54.9  |
| 1979  | 7.87   | 1.22  | 0.14  | 0.45  | 0.10  | 0.07  | 1.23   | 3.75   | 6.16   | 2.30   | 6.41   | 6.70*  | 36.4  |
| 1980  | 1.33   | 6.34  | 3.42  | 14.40 | 1.32  | 0.83  | 0.96   | 1.24   | 1.93   | 12.77  | 30.41  | 29.51* | 104.5 |
| 1981  | 14.52* | 7.29* | 0.28  | 0.40  | 0.17  | 0.33  | 12.53* | 2.48   | 4.00   | 5.01   | 5.17   | 0.00   | 52.2  |
| 1982  | 4.86   | 0.68  | 0.65  | 0.14  | 0.60  | 0.71  | 0.70   | 38.71  | 28.23  | 34.83* | 16.87* | 17.45* | 144.4 |
| 1983  | 3.11   | 0.80  | 2.73+ | 1.61+ | 1.19+ | 8.09+ | 1.18   | 69.99  | 4.34   | 16.87  | 8.56   | 31.64  | 150.1 |
| 1984  | 15.44  | 1.73  | 5.97* | 4.49* | 0.64  | 6.93  | 2.67   | 4.80   | 18.46  | 36.48  | 28.85  | 11.63  | 138.1 |
| 1985  | 4.55   | 6.04* | 0.93  | 0.28  | 0.15  | 0.69  | 2.66   | 6.77   | 9.86   | 14.50  | 36.25  | 11.18  | 93.9  |
| 1986  | 3.09   | 0.95  | 0.10  | 0.12  | 0.11  | 0.12  | 0.77   | 24.41  | 25.01  | 11.43  | 19.30  | 7.33   | 92.7  |
| 1987  | 3.67   | 0.73  | 0.77  | 0.07  | 0.03  | 0.22  | 2.27   | 2.53   | 20.54  | 8.42   | 7.90   | 11.91  | 59.1  |
| 1988  | 3.42   | 1.12  | 0.25  | 0.00  | 0.03  | 1.37  | 2.15   | 2.70   | 7.82   | 11.46  | 27.56* | 35.18* | 93.1  |
| 1989  | 8.11   | 5.06  | 0.89  | 0.30  | 0.50  | 0.61  | 4.07   | 17.02  | 20.65  | 32.38  | 16.01  | 4.03   | 109.6 |
| 1990  | 1.85   | 1.06  | 0.46  | 2.54* | 1.76* | 0.15  | 0.51   | 2.20   | 21.68  | 64.83+ | 22.07  | 26.18  | 145.3 |
| AVE : | 6.29   | 3.53  | 1.55  | 1.43  | 0.53  | 1.20  | 1.95   | 13.95  | 18.18  | 21.24  | 24.78  | 12.45  | 107.1 |
| SD :  | 6.46   | 5.63  | 2.04  | 2.82  | 0.53  | 1.99  | 2.36   | 23.14  | 18.86  | 26.27  | 35.19  | 9.33   | 82.0  |

## Appendix B2.21

File : H1H3S-0.NAT  
Units : 10<sup>6</sup>xm<sup>3</sup>  
Descrip. : Incremental Naturalised flow record at H1H003 for 1925 to 1990

| Year  | Oct   | Nov   | Dec  | Jan   | Feb   | Mar  | Apr   | May   | Jun    | Jul    | Aug    | Sep   | Total |
|-------|-------|-------|------|-------|-------|------|-------|-------|--------|--------|--------|-------|-------|
| 1925  | 17.49 | 6.41  | 1.03 | 0.07  | 0.32  | 0.08 | 0.05  | 6.91  | 3.45   | 17.75  | 11.96  | 7.21  | 72.7  |
| 1926  | 15.50 | 3.86  | 0.53 | 0.10  | 0.35  | 0.11 | 1.11  | 3.37  | 7.03   | 5.88   | 21.34  | 10.34 | 69.5  |
| 1927  | 3.88  | 5.04  | 0.98 | 0.31  | 0.06  | 0.20 | 0.13  | 0.06  | 48.50  | 11.28  | 15.26  | 13.37 | 99.1  |
| 1928  | 5.95  | 1.51  | 0.25 | 0.02  | 0.00  | 0.03 | 3.42  | 6.52  | 12.78  | 25.87  | 23.23  | 12.21 | 91.8  |
| 1929  | 4.51  | 1.04  | 0.99 | 0.36  | 0.58  | 0.24 | 0.26  | 0.29  | 0.36   | 3.38   | 7.14   | 29.91 | 49.1  |
| 1930  | 9.11  | 2.70  | 0.45 | 0.04  | 0.03  | 0.03 | 3.68  | 14.46 | 7.30   | 8.62   | 42.32  | 19.82 | 108.6 |
| 1931  | 9.85  | 2.26  | 0.35 | 0.17  | 16.49 | 1.31 | 0.32  | 8.25  | 14.60  | 21.27  | 15.52  | 13.10 | 103.5 |
| 1932  | 5.89  | 1.25  | 0.20 | 0.08  | 0.16  | 0.20 | 0.11  | 9.27  | 33.35  | 48.07  | 23.88  | 13.72 | 136.2 |
| 1933  | 5.99  | 1.57  | 0.65 | 0.19  | 0.11  | 0.92 | 0.45  | 6.94  | 9.93   | 10.37  | 10.06  | 18.04 | 65.2  |
| 1934  | 17.26 | 6.18  | 0.92 | 0.06  | 0.05  | 0.50 | 3.68  | 8.84  | 11.35  | 18.34  | 23.55  | 15.50 | 106.2 |
| 1935  | 6.12  | 2.28  | 0.45 | 0.53  | 0.14  | 0.27 | 0.20  | 9.84  | 4.91   | 11.67  | 23.80  | 24.53 | 84.7  |
| 1936  | 9.28  | 2.09  | 4.60 | 0.57  | 0.06  | 1.84 | 3.08  | 9.15  | 32.44  | 50.88  | 20.89  | 9.34  | 144.2 |
| 1937  | 4.17  | 1.11  | 0.26 | 0.99  | 0.24  | 0.06 | 5.54  | 18.58 | 10.79  | 11.12  | 15.52  | 16.16 | 84.5  |
| 1938  | 7.42  | 1.97  | 0.48 | 0.07  | 1.10  | 0.27 | 0.94  | 13.13 | 6.99   | 7.91   | 19.71  | 13.60 | 73.6  |
| 1939  | 5.42  | 1.40  | 0.69 | 0.17  | 0.94  | 0.36 | 4.87  | 3.96  | 15.91  | 11.84  | 8.77   | 7.52  | 61.9  |
| 1940  | 4.18  | 2.57  | 0.56 | 2.55  | 0.38  | 0.06 | 9.22  | 48.77 | 46.81  | 21.10  | 24.55  | 52.06 | 212.8 |
| 1941  | 18.38 | 4.23  | 0.55 | 0.10  | 0.01  | 0.00 | 0.04  | 16.73 | 103.81 | 19.49  | 17.60  | 9.13  | 190.1 |
| 1942  | 4.70  | 1.29  | 0.37 | 0.97  | 0.44  | 0.79 | 0.73  | 2.05  | 10.96  | 38.00  | 47.98  | 24.21 | 132.5 |
| 1943  | 10.32 | 4.77  | 0.79 | 0.07  | 0.01  | 0.20 | 1.66  | 21.94 | 74.47  | 18.10  | 30.14  | 18.91 | 181.4 |
| 1944  | 8.55  | 3.80  | 0.87 | 0.11  | 0.00  | 0.00 | 1.90  | 46.90 | 63.79  | 42.47  | 37.13  | 15.13 | 220.7 |
| 1945  | 5.42  | 1.72  | 0.33 | 0.04  | 0.00  | 0.22 | 0.92  | 2.30  | 3.21   | 4.84   | 9.06   | 37.46 | 65.5  |
| 1946  | 10.53 | 2.43  | 0.32 | 0.04  | 0.00  | 2.29 | 0.79  | 3.09  | 2.94   | 39.86  | 16.00  | 10.26 | 88.6  |
| 1947  | 6.83  | 1.97  | 0.22 | 0.01  | 0.18  | 8.04 | 5.71  | 15.73 | 12.95  | 32.26  | 15.07  | 29.77 | 128.7 |
| 1948  | 11.52 | 2.89  | 0.39 | 0.06  | 0.01  | 0.00 | 2.17  | 3.52  | 8.22   | 14.97  | 17.95  | 20.80 | 82.5  |
| 1949  | 12.32 | 6.37  | 1.20 | 0.12  | 0.00  | 0.01 | 18.21 | 3.59  | 3.38   | 42.94  | 10.94  | 27.02 | 126.1 |
| 1950  | 10.51 | 6.49  | 1.32 | 0.72  | 0.14  | 0.01 | 4.09  | 2.83  | 38.54  | 16.19  | 16.40  | 11.85 | 109.1 |
| 1951  | 6.61  | 4.13  | 0.75 | 0.07  | 0.06  | 0.16 | 0.41  | 24.14 | 12.06  | 25.04  | 41.30  | 19.39 | 134.1 |
| 1952  | 8.01  | 8.16  | 1.23 | 0.10  | 0.01  | 0.01 | 27.19 | 22.08 | 11.36  | 42.72  | 23.82  | 10.73 | 155.4 |
| 1953  | 5.90  | 2.56  | 1.12 | 0.22  | 0.04  | 0.11 | 8.84  | 59.17 | 17.23  | 71.78  | 40.61  | 18.78 | 226.4 |
| 1954  | 8.03  | 2.18  | 0.84 | 0.15  | 4.06  | 0.77 | 0.93  | 0.99  | 19.93  | 42.02  | 80.39  | 19.33 | 179.6 |
| 1955  | 14.48 | 4.92  | 0.90 | 0.14  | 0.11  | 0.09 | 0.10  | 5.27  | 20.86  | 25.91  | 21.63  | 11.00 | 105.4 |
| 1956  | 3.72  | 0.74  | 0.15 | 0.02  | 4.62  | 1.12 | 0.76  | 29.98 | 53.02  | 50.44  | 39.39  | 18.89 | 202.9 |
| 1957  | 16.18 | 3.59  | 0.36 | 0.05  | 0.41  | 0.14 | 0.56  | 9.08  | 8.37   | 6.03   | 10.29  | 7.24  | 62.3  |
| 1958  | 3.96  | 1.23  | 0.21 | 0.04  | 0.18  | 0.39 | 10.21 | 67.40 | 12.57  | 7.13   | 20.28  | 12.19 | 135.8 |
| 1959  | 8.73  | 2.17  | 0.32 | 0.05  | 0.01  | 0.56 | 1.93  | 11.55 | 27.92  | 12.15  | 7.84   | 5.03  | 77.4  |
| 1960  | 2.29  | 0.53  | 0.26 | 0.49  | 0.14  | 0.26 | 1.87  | 4.04  | 13.49  | 15.83  | 22.34  | 27.31 | 88.9  |
| 1961  | 9.20  | 1.62  | 0.15 | 0.05  | 0.17  | 1.00 | 2.58  | 2.93  | 64.74  | 21.55  | 55.07  | 18.56 | 177.6 |
| 1962  | 29.85 | 6.96  | 1.00 | 0.15  | 0.04  | 0.01 | 0.06  | 0.24  | 10.24  | 19.82  | 73.14  | 16.28 | 157.8 |
| 1963  | 6.35  | 2.87  | 1.47 | 0.23  | 0.28  | 0.14 | 1.06  | 2.59  | 27.25  | 17.28  | 29.43  | 16.22 | 105.2 |
| 1964  | 6.09  | 7.36  | 2.62 | 0.88  | 1.31  | 2.74 | 2.26  | 8.64  | 6.68   | 7.04   | 7.19   | 6.21  | 59.0  |
| 1965  | 5.37  | 2.66  | 1.38 | 0.36  | 0.01  | 1.87 | 0.66  | 1.91  | 10.85  | 27.22  | 14.77  | 13.19 | 80.3  |
| 1966  | 7.75  | 0.00  | 0.00 | 0.00  | 0.00  | 0.00 | 1.64  | 4.82  | 69.86  | 19.39  | 16.51  | 10.87 | 130.8 |
| 1967  | 7.87  | 3.65  | 0.60 | 0.72  | 0.10  | 0.00 | 2.42  | 27.73 | 20.32  | 21.80  | 20.77  | 11.46 | 117.4 |
| 1968  | 36.97 | 1.78  | 0.10 | 0.00  | 0.00  | 0.00 | 2.39  | 2.38  | 4.11   | 4.01   | 9.55   | 12.77 | 74.1  |
| 1969  | 12.25 | 1.86  | 0.23 | 0.00  | 0.00  | 0.32 | 0.82  | 4.91  | 38.41  | 25.08  | 29.59  | 20.08 | 133.6 |
| 1970  | 6.64  | 2.13  | 0.86 | 0.00  | 0.00  | 0.73 | 1.37  | 2.30  | 4.71   | 22.66  | 17.94  | 8.35  | 67.7  |
| 1971  | 4.34  | 0.72  | 0.00 | 0.00  | 0.00  | 0.15 | 1.84  | 6.65  | 9.39   | 9.50   | 13.58  | 9.79  | 56.0  |
| 1972  | 4.16  | 0.59  | 0.64 | 0.00  | 0.00  | 0.96 | 1.01  | 1.54  | 1.84   | 41.64  | 17.98  | 11.40 | 81.8  |
| 1973  | 4.70  | 0.45  | 0.00 | 0.00  | 0.00  | 0.00 | 0.52  | 5.48  | 39.85  | 11.38  | 178.13 | 24.82 | 265.3 |
| 1974  | 8.63  | 4.06  | 0.26 | 0.00  | 0.00  | 0.00 | 4.50  | 63.65 | 11.67  | 18.58  | 24.27  | 5.38  | 141.0 |
| 1975  | 8.35  | 1.70  | 0.00 | 0.00  | 0.00  | 0.00 | 2.16  | 3.22  | 73.28  | 23.40  | 12.30  | 5.04  | 129.5 |
| 1976  | 3.75  | 30.36 | 9.27 | 2.79  | 0.47  | 0.62 | 5.11  | 93.22 | 63.52  | 137.14 | 106.04 | 16.43 | 468.7 |
| 1977  | 7.39  | 3.23  | 1.68 | 0.00  | 0.00  | 0.32 | 3.11  | 4.79  | 3.53   | 2.78   | 32.50  | 14.33 | 73.7  |
| 1978  | 4.76  | 0.47  | 0.00 | 0.61  | 0.00  | 0.00 | 0.71  | 4.91  | 25.01  | 11.36  | 10.48  | 16.17 | 74.5  |
| 1979  | 9.20  | 0.98  | 0.00 | 0.00  | 0.00  | 0.00 | 1.83  | 7.44  | 10.38  | 6.14   | 12.22  | 9.95  | 58.1  |
| 1980  | 2.71  | 6.92  | 2.79 | 13.90 | 0.54  | 0.56 | 1.92  | 2.37  | 4.72   | 20.77  | 35.40  | 31.05 | 123.6 |
| 1981  | 15.94 | 7.13  | 0.00 | 0.00  | 0.00  | 0.18 | 15.60 | 5.26  | 8.71   | 9.76   | 9.42   | 2.22  | 74.2  |
| 1982  | 6.41  | 0.47  | 0.00 | 0.00  | 0.00  | 0.51 | 1.35  | 44.87 | 34.82  | 41.24  | 21.89  | 18.61 | 170.2 |
| 1983  | 4.45  | 0.59  | 1.73 | 0.30  | 0.07  | 8.10 | 2.65  | 76.85 | 8.73   | 21.69  | 13.02  | 36.32 | 174.5 |
| 1984  | 16.76 | 1.50  | 5.43 | 3.76  | 0.00  | 7.11 | 4.45  | 8.05  | 24.51  | 42.92  | 34.19  | 13.19 | 161.9 |
| 1985  | 5.81  | 5.80  | 0.16 | 0.00  | 0.00  | 0.63 | 3.85  | 8.68  | 16.22  | 19.93  | 44.12  | 14.87 | 120.1 |
| 1986  | 5.37  | 0.77  | 0.00 | 0.00  | 0.00  | 0.00 | 2.53  | 29.35 | 30.93  | 16.93  | 25.98  | 10.67 | 122.5 |
| 1987  | 5.93  | 0.45  | 0.00 | 0.00  | 0.00  | 0.08 | 4.86  | 5.39  | 26.59  | 13.23  | 14.73  | 15.13 | 86.4  |
| 1988  | 5.68  | 0.82  | 0.00 | 0.00  | 0.00  | 1.48 | 4.51  | 5.80  | 13.67  | 17.01  | 29.84  | 38.71 | 117.5 |
| 1989  | 10.31 | 4.88  | 0.00 | 0.00  | 0.00  | 0.27 | 6.13  | 22.35 | 26.79  | 38.85  | 22.47  | 8.39  | 140.4 |
| 1990  | 4.03  | 0.85  | 0.00 | 1.18  | 0.40  | 0.00 | 1.25  | 5.83  | 29.44  | 72.63  | 28.69  | 32.66 | 177.0 |
| AVE : | 8.73  | 3.23  | 0.85 | 0.53  | 0.53  | 0.75 | 3.19  | 14.92 | 22.82  | 24.49  | 27.19  | 16.67 | 123.9 |
| SD :  | 5.94  | 3.99  | 1.43 | 1.80  | 2.14  | 1.65 | 4.51  | 19.97 | 21.77  | 20.98  | 25.75  | 9.28  | 64.7  |

## Appendix B2.22

File : H1H3CUM.PRS  
Units : 10<sup>6</sup>x<sup>3</sup>  
Descrip. : Cumulative Present Day (2000) Flow at H1H003 for 1927 to 1990

| Year  | Oct   | Nov   | Dec   | Jan   | Feb   | Mar  | Apr   | May   | Jun    | Jul    | Aug    | Sep   | Total |
|-------|-------|-------|-------|-------|-------|------|-------|-------|--------|--------|--------|-------|-------|
| 1927  | 3.60  | 6.60  | 2.94  | 0.94  | 0.11  | 0.15 | 0.27  | 0.47  | 39.50  | 6.59   | 9.60   | 7.73  | 78.5  |
| 1928  | 5.59  | 3.23  | 3.02  | 1.60  | 0.10  | 0.10 | 2.47  | 3.33  | 8.13   | 23.04  | 20.13  | 7.81  | 78.6  |
| 1929  | 3.73  | 2.97  | 3.19  | 1.87  | 0.22  | 0.16 | 0.42  | 0.57  | 0.54   | 1.05   | 1.78   | 21.57 | 38.1  |
| 1930  | 8.75  | 4.34  | 3.09  | 1.17  | 0.10  | 0.11 | 2.64  | 11.52 | 3.72   | 4.87   | 40.82  | 17.49 | 98.6  |
| 1931  | 10.00 | 4.11  | 3.12  | 1.88  | 18.34 | 1.48 | 0.43  | 4.65  | 10.63  | 18.23  | 11.23  | 9.02  | 93.1  |
| 1932  | 5.92  | 2.65  | 2.88  | 1.71  | 0.13  | 0.15 | 0.24  | 6.16  | 29.47  | 46.49  | 20.81  | 9.18  | 125.8 |
| 1933  | 5.68  | 3.56  | 2.94  | 1.96  | 0.14  | 0.31 | 0.31  | 3.79  | 5.28   | 6.29   | 4.87   | 13.13 | 48.3  |
| 1934  | 19.44 | 8.92  | 3.01  | 1.64  | 0.14  | 0.21 | 2.84  | 5.40  | 7.09   | 14.74  | 20.13  | 11.17 | 94.7  |
| 1935  | 6.05  | 4.17  | 2.93  | 1.88  | 0.14  | 0.16 | 0.26  | 5.98  | 2.58   | 6.44   | 19.12  | 20.74 | 70.4  |
| 1936  | 9.78  | 4.21  | 6.93  | 1.96  | 0.19  | 1.24 | 1.96  | 5.65  | 29.30  | 50.72  | 18.20  | 5.17  | 135.3 |
| 1937  | 3.88  | 3.25  | 2.84  | 2.21  | 0.15  | 0.12 | 4.57  | 16.67 | 7.34   | 7.18   | 10.89  | 12.21 | 71.3  |
| 1938  | 7.68  | 3.87  | 2.85  | 1.52  | 0.60  | 0.19 | 0.56  | 9.98  | 3.37   | 5.34   | 15.57  | 9.45  | 61.0  |
| 1939  | 4.79  | 3.09  | 3.32  | 2.00  | 0.43  | 0.18 | 4.36  | 1.82  | 11.92  | 8.23   | 4.11   | 2.81  | 47.1  |
| 1940  | 3.88  | 4.19  | 2.98  | 2.50  | 0.34  | 0.12 | 8.82  | 50.37 | 46.97  | 19.84  | 22.20  | 54.05 | 216.3 |
| 1941  | 22.24 | 6.76  | 2.99  | 2.84  | 0.13  | 0.10 | 0.27  | 13.60 | 109.80 | 19.21  | 13.59  | 5.19  | 196.7 |
| 1942  | 4.18  | 3.40  | 2.86  | 1.95  | 0.24  | 0.31 | 0.45  | 0.82  | 5.56   | 35.38  | 48.77  | 22.44 | 126.4 |
| 1943  | 11.21 | 7.20  | 3.09  | 2.40  | 0.13  | 0.15 | 0.72  | 19.71 | 76.33  | 16.77  | 28.22  | 15.90 | 181.8 |
| 1944  | 9.19  | 5.99  | 3.04  | 2.35  | 0.14  | 0.11 | 0.92  | 47.57 | 65.78  | 42.17  | 36.46  | 12.02 | 225.7 |
| 1945  | 5.03  | 3.41  | 3.14  | 2.33  | 0.10  | 0.18 | 0.38  | 0.61  | 1.42   | 1.56   | 4.12   | 33.03 | 55.3  |
| 1946  | 11.83 | 4.42  | 2.98  | 1.19  | 0.10  | 1.79 | 0.45  | 0.74  | 0.88   | 35.58  | 12.35  | 5.92  | 78.2  |
| 1947  | 6.26  | 3.95  | 2.77  | 1.10  | 0.18  | 8.66 | 5.18  | 13.43 | 9.23   | 29.93  | 11.24  | 26.87 | 118.8 |
| 1948  | 13.23 | 4.70  | 3.24  | 2.29  | 0.10  | 0.10 | 1.20  | 1.08  | 4.15   | 11.40  | 14.00  | 16.36 | 71.9  |
| 1949  | 13.91 | 9.73  | 3.56  | 1.99  | 0.17  | 0.11 | 20.16 | 1.74  | 0.94   | 40.16  | 7.55   | 23.68 | 123.7 |
| 1950  | 11.59 | 9.54  | 3.46  | 2.04  | 0.38  | 0.12 | 3.31  | 1.08  | 38.10  | 16.31  | 13.65  | 8.16  | 107.7 |
| 1951  | 7.15  | 7.18  | 3.24  | 2.01  | 0.19  | 0.14 | 0.37  | 23.20 | 9.62   | 22.18  | 42.05  | 17.89 | 135.2 |
| 1952  | 8.79  | 11.42 | 3.40  | 2.17  | 0.14  | 0.10 | 30.65 | 24.10 | 8.87   | 40.84  | 22.32  | 6.85  | 159.7 |
| 1953  | 5.15  | 4.51  | 3.17  | 2.21  | 0.16  | 0.13 | 8.58  | 63.17 | 16.10  | 73.18  | 44.82  | 17.00 | 238.2 |
| 1954  | 8.34  | 3.77  | 3.55  | 2.91  | 4.38  | 0.61 | 0.42  | 0.95  | 14.45  | 40.01  | 87.25  | 18.14 | 184.8 |
| 1955  | 16.26 | 7.43  | 3.35  | 2.72  | 0.24  | 0.13 | 0.26  | 3.53  | 18.40  | 22.52  | 19.10  | 7.55  | 101.5 |
| 1956  | 3.38  | 2.56  | 3.02  | 1.92  | 6.01  | 1.51 | 0.56  | 27.97 | 52.98  | 51.63  | 40.00  | 16.39 | 207.9 |
| 1957  | 20.96 | 6.38  | 3.44  | 2.82  | 0.52  | 0.14 | 0.32  | 6.30  | 5.15   | 2.94   | 5.32   | 3.48  | 57.8  |
| 1958  | 3.39  | 2.82  | 2.80  | 1.17  | 0.13  | 0.19 | 10.01 | 74.07 | 11.64  | 3.96   | 15.35  | 8.29  | 133.8 |
| 1959  | 10.07 | 4.36  | 2.87  | 1.56  | 0.09  | 0.22 | 0.51  | 8.91  | 25.12  | 9.14   | 3.33   | 2.45  | 68.6  |
| 1960  | 1.87  | 2.63  | 2.98  | 1.71  | 0.12  | 0.16 | 0.82  | 1.88  | 7.72   | 11.01  | 18.30  | 25.52 | 74.7  |
| 1961  | 10.42 | 3.65  | 2.80  | 1.14  | 0.14  | 0.59 | 2.01  | 1.18  | 69.79  | 23.57  | 58.82  | 17.01 | 191.1 |
| 1962  | 33.70 | 10.44 | 3.40  | 2.66  | 0.15  | 0.11 | 0.26  | 0.48  | 4.30   | 14.17  | 76.23  | 14.21 | 160.1 |
| 1963  | 5.82  | 4.72  | 3.18  | 1.65  | 0.37  | 0.13 | 0.45  | 0.77  | 23.72  | 15.89  | 29.68  | 13.79 | 100.2 |
| 1964  | 6.09  | 9.59  | 4.78  | 2.53  | 0.40  | 2.78 | 3.08  | 7.07  | 3.56   | 3.68   | 3.87   | 3.62  | 51.1  |
| 1965  | 5.03  | 4.45  | 3.57  | 0.93  | 0.11  | 1.17 | 1.10  | 0.90  | 5.67   | 26.78  | 10.11  | 7.51  | 67.3  |
| 1966  | 7.48  | 3.23  | 2.87  | 1.26  | 0.09  | 0.10 | 1.37  | 2.18  | 70.73  | 16.40  | 11.01  | 7.36  | 124.1 |
| 1967  | 7.96  | 5.80  | 3.41  | 3.03  | 0.10  | 0.11 | 1.52  | 31.25 | 18.74  | 18.72  | 19.31  | 7.34  | 117.3 |
| 1968  | 41.23 | 3.49  | 2.98  | 2.19  | 0.11  | 0.11 | 1.49  | 2.32  | 2.54   | 2.80   | 5.79   | 8.83  | 73.9  |
| 1969  | 11.80 | 3.22  | 3.42  | 1.27  | 0.16  | 0.46 | 1.08  | 2.30  | 34.74  | 22.03  | 28.79  | 18.56 | 127.8 |
| 1970  | 6.39  | 4.22  | 3.35  | 2.04  | 0.09  | 0.70 | 1.32  | 2.32  | 1.26   | 18.33  | 12.35  | 2.97  | 55.3  |
| 1971  | 4.19  | 3.08  | 2.82  | 0.84  | 0.11  | 0.13 | 0.64  | 3.76  | 5.48   | 5.53   | 9.65   | 4.20  | 40.4  |
| 1972  | 3.39  | 2.74  | 3.21  | 1.65  | 0.10  | 0.58 | 0.88  | 1.24  | 1.60   | 39.66  | 13.31  | 5.79  | 74.2  |
| 1973  | 3.99  | 3.06  | 3.21  | 1.57  | 0.11  | 0.12 | 0.51  | 1.57  | 34.82  | 6.62   | 193.52 | 24.73 | 273.8 |
| 1974  | 9.69  | 7.08  | 3.63  | 3.23  | 0.43  | 0.12 | 3.67  | 62.94 | 7.79   | 16.42  | 21.29  | 3.33  | 139.6 |
| 1975  | 9.42  | 3.84  | 2.88  | 1.49  | 0.11  | 0.22 | 0.96  | 1.52  | 75.18  | 19.81  | 7.74   | 2.46  | 125.6 |
| 1976  | 3.53  | 37.50 | 14.28 | 5.31  | 0.74  | 0.68 | 4.36  | 96.37 | 65.75  | 142.60 | 108.58 | 14.10 | 493.8 |
| 1977  | 7.91  | 5.52  | 3.84  | 2.68  | 0.11  | 0.29 | 2.60  | 4.06  | 1.95   | 1.78   | 25.50  | 11.12 | 67.4  |
| 1978  | 4.94  | 2.93  | 2.83  | 0.73  | 0.44  | 0.39 | 0.57  | 1.65  | 20.30  | 7.16   | 5.97   | 10.86 | 58.8  |
| 1979  | 11.71 | 2.86  | 3.09  | 2.75  | 0.27  | 0.17 | 1.41  | 4.15  | 7.98   | 2.72   | 6.85   | 6.15  | 50.1  |
| 1980  | 2.24  | 15.05 | 5.74  | 15.15 | 0.57  | 0.53 | 1.33  | 1.93  | 2.01   | 16.30  | 33.71  | 31.79 | 126.3 |
| 1981  | 16.07 | 8.20  | 3.01  | 2.63  | 0.16  | 0.37 | 15.72 | 2.51  | 5.48   | 6.23   | 5.18   | 2.80  | 68.3  |
| 1982  | 6.09  | 2.82  | 3.24  | 1.37  | 0.82  | 0.60 | 1.12  | 43.70 | 33.98  | 46.31  | 19.81  | 14.82 | 174.7 |
| 1983  | 4.13  | 3.17  | 4.16  | 2.12  | 0.11  | 7.33 | 2.07  | 85.30 | 4.46   | 21.44  | 8.22   | 35.02 | 177.5 |
| 1984  | 18.41 | 3.57  | 7.42  | 4.98  | 0.45  | 7.82 | 4.64  | 5.10  | 21.16  | 41.66  | 34.43  | 10.34 | 160.0 |
| 1985  | 5.74  | 6.64  | 3.33  | 2.54  | 0.60  | 0.37 | 3.81  | 8.41  | 10.91  | 18.84  | 47.79  | 11.78 | 120.8 |
| 1986  | 5.05  | 3.00  | 2.90  | 1.71  | 0.11  | 0.18 | 1.54  | 27.32 | 27.13  | 13.30  | 22.45  | 7.13  | 111.8 |
| 1987  | 5.90  | 2.99  | 2.97  | 1.85  | 0.09  | 0.35 | 3.84  | 2.79  | 24.60  | 11.47  | 9.84   | 13.50 | 80.2  |
| 1988  | 5.80  | 3.12  | 2.85  | 1.52  | 0.19  | 1.81 | 3.77  | 4.03  | 8.02   | 14.58  | 27.08  | 40.59 | 113.4 |
| 1989  | 11.85 | 7.81  | 3.16  | 2.84  | 0.27  | 0.14 | 5.43  | 21.10 | 21.91  | 41.47  | 21.53  | 4.19  | 141.7 |
| 1990  | 4.23  | 3.08  | 2.83  | 2.77  | 0.40  | 0.13 | 0.81  | 2.86  | 26.19  | 77.31  | 26.90  | 32.46 | 180.0 |
| AVE : | 8.95  | 5.50  | 3.50  | 2.27  | 0.67  | 0.75 | 2.95  | 13.97 | 20.78  | 22.79  | 25.20  | 13.80 | 121.1 |
| SD :  | 6.93  | 4.80  | 1.61  | 1.83  | 2.42  | 1.69 | 4.99  | 21.88 | 23.56  | 22.80  | 29.31  | 10.25 | 72.1  |

## APPENDIX B 3.1

SUB-CATCHMENT : H1H006  
RIVER : Breede  
PLACE : Witbrug

### 1 CATCHMENT

|                     |          | YEAR  |       |       |       | UNITS           |
|---------------------|----------|-------|-------|-------|-------|-----------------|
|                     |          | 1964  | 1985  | 1990  | 2000  |                 |
| SUB-CATCHMENT AREAS |          |       |       |       |       |                 |
| Witels              | High MAP | 50.90 | 50.90 | 50.90 | 50.90 | km <sup>2</sup> |
| H1H006              | High MAP | 45.10 | 45.10 | 45.10 | 45.10 | km <sup>2</sup> |

### 2 LANDUSE

|                     |             | YEAR           |      |      |       | UNITS           |
|---------------------|-------------|----------------|------|------|-------|-----------------|
|                     |             | 1964           | 1985 | 1990 | 2000  |                 |
| ALIEN VEGETATION    |             |                |      |      |       |                 |
| Witels              | tall trees  | 0.015          | 0.03 | 0.08 | 0.12  | km <sup>2</sup> |
| H1H006              | tall trees  | 0.158          | 0.45 | 1.04 | 1.62  | km <sup>2</sup> |
|                     | tall shrubs | 0.133          | 0.38 | 0.87 | 1.36  | km <sup>2</sup> |
|                     | riparian    | 0.94           | 2.74 | 6.23 | 9.72  | km <sup>2</sup> |
| Total               |             | 1.246          | 3.6  | 8.22 | 12.82 | km <sup>2</sup> |
| FARM DAM CAPACITIES |             | not applicable |      |      |       | Mm <sup>3</sup> |
| IRRIGATION AREAS    |             | not applicable |      |      |       | km <sup>2</sup> |
| Total               |             |                |      |      |       |                 |

### 3 EVAPORATION

|                       | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) | 203  | 267  | 310  | 322  | 277  | 240  | 160  | 107  | 86   | 86   | 102  | 136  | 2296      |
| S-PAN (gross) (in mm) | 164  | 223  | 263  | 274  | 232  | 198  | 124  | 75   | 55   | 55   | 70   | 102  | 1835      |
| LAKE FACTOR           | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)    | 133  | 183  | 218  | 230  | 204  | 174  | 109  | 65   | 47   | 46   | 57   | 83   | 1549      |

**Note : evaporation from BRHS used for this sub-catchment**

### 4 RESERVOIR SIMULATIONS

not applicable

### 5. IRRIGATION ROUTINE

not applicable

### 6. NOTES

H1H006 incremental sub-catchment modelled using two different MAPs

Witels : MAP = 2244 mm  
H1H006 : MAP = 2500 mm

## Appendix B3.2

File : H1H6INC.OBS

Units : 10<sup>6</sup>m<sup>3</sup>

Descrip. : Incremental observed flow record at H1H006 for 1964 to 1990

| Year  | Oct    | Nov    | Dec   | Jan   | Feb   | Mar   | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Total |
|-------|--------|--------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|-------|
| 1964  | 7.82   | 4.63   | 0.00  | 0.00  | 0.07  | 0.57  | 7.31   | 13.63  | 9.21   | 8.41   | 22.43  | 6.82   | 80.9  |
| 1965  | 4.33   | 0.00   | 0.00  | 0.00  | 0.00  | 3.02  | 5.16   | 3.39   | 9.62+  | 36.56+ | 7.43   | 0.04   | 69.6  |
| 1966  | 0.50   | 0.03   | 0.00  | 0.00  | 0.00  | 0.00  | 5.01   | 9.13   | 34.38+ | 1.52   | 12.62  | 3.12   | 66.3  |
| 1967  | 9.92   | 3.31   | 0.52  | 0.00  | 0.00  | 0.00  | 2.78   | 40.41+ | 19.56  | 16.77  | 16.34  | 2.71   | 112.3 |
| 1968  | 19.14* | 4.93   | 2.42  | 1.25  | 0.00  | 0.00  | 4.69   | 5.20   | 5.05   | 7.39   | 13.17  | 15.32  | 78.6  |
| 1969  | 13.26  | 4.94   | 3.18  | 1.95  | 1.36  | 1.90  | 2.25   | 9.86   | 12.19  | 18.95  | 22.79  | 17.84  | 110.5 |
| 1970  | 7.61   | 4.01   | 3.66  | 2.38  | 0.68  | 2.37  | 2.38   | 4.86   | 9.41   | 31.12+ | 17.67  | 6.65   | 92.8  |
| 1971  | 3.80   | 2.40   | 0.00  | 0.00  | 0.00  | 0.00  | 0.00   | 13.85  | 12.49  | 7.72   | 12.90  | 9.60   | 62.8  |
| 1972  | 5.00   | 1.91   | 2.23  | 0.00  | 0.00  | 2.21  | 0.00   | 2.67   | 3.75   | 40.46+ | 19.53  | 12.54  | 90.3  |
| 1973  | 7.25   | 3.65   | 2.69  | 0.00  | 0.00  | 0.00  | 0.00   | 4.81   | 0.23   | 10.38  | 93.42* | 15.90  | 138.3 |
| 1974  | 10.15  | 7.69   | 4.50  | 2.93  | 0.29  | 0.32  | 8.41   | 0.00   | 10.24  | 19.22  | 18.98  | 6.34   | 89.1  |
| 1975  | 10.49  | 4.74   | 2.35  | 0.00  | 0.00  | 0.00  | 0.32   | 4.50   | 52.10+ | 22.91+ | 8.26   | 6.79   | 112.5 |
| 1976  | 5.25   | 31.21+ | 11.66 | 7.38  | 3.19  | 3.14  | 6.42   | 45.01+ | 57.88+ | 52.84+ | 45.94+ | 11.54  | 281.5 |
| 1977  | 7.40   | 2.42   | 4.79  | 1.68  | 1.02  | 1.15  | 5.93   | 6.15*  | 5.35   | 4.20   | 0.52   | 18.12  | 58.7  |
| 1978  | 6.40   | 2.92   | 0.51  | 0.00  | 0.17  | 0.80  | 1.07   | 9.78   | 29.28+ | 9.62   | 16.18  | 12.46+ | 89.2  |
| 1979  | 16.41  | 3.76   | 0.51  | 2.12  | 0.15  | 0.00  | 4.55   | 13.00  | 12.50  | 7.31   | 13.92  | 2.70   | 76.9  |
| 1980  | 5.15   | 16.12  | 9.06  | 0.00  | 2.24  | 1.75  | 2.40   | 3.72   | 6.84   | 24.09  | 13.22  | 17.59+ | 102.2 |
| 1981  | 0.00   | 2.73*  | 0.00* | 0.00* | 0.00* | 0.00* | 22.81* | 6.08*  | 11.55* | 11.93* | 8.31*  | 4.35*  | 67.8  |
| 1982  | 6.08*  | 2.11*  | 0.15* | 0.00* | 0.93* | 1.41  | 0.47   | 2.48   | 91.37+ | 51.34+ | 4.22   | 3.60   | 164.2 |
| 1983  | 4.37   | 3.35   | 0.00  | 0.00  | 0.00  | 0.00  | 2.40   | 71.40* | 8.97   | 33.44+ | 13.40  | 45.25+ | 182.6 |
| 1984  | 14.32  | 3.37   | 0.71  | 1.95  | 1.42  | 14.01 | 7.03   | 10.41  | 29.84+ | 47.14+ | 45.86+ | 10.52  | 186.6 |
| 1985  | 4.76   | 0.00   | 1.24  | 0.17  | 0.00  | 2.08  | 7.09   | 17.49  | 23.69  | 27.01  | 42.19+ | 11.96  | 137.7 |
| 1986  | 4.19   | 2.35   | 0.14  | 0.56  | 0.00  | 0.00  | 1.06   | 26.20+ | 25.08+ | 16.83  | 28.03  | 11.44  | 115.9 |
| 1987  | 4.67   | 2.26   | 2.46  | 0.00  | 0.00  | 0.00  | 7.85   | 8.92   | 18.84+ | 14.97  | 12.51  | 18.64  | 91.1  |
| 1988  | 5.05   | 2.74   | 0.61  | 0.00  | 0.72  | 7.24  | 5.63   | 12.99  | 18.43  | 22.17  | 37.13  | 55.66+ | 168.4 |
| 1989  | 9.90   | 6.34   | 2.54  | 0.81  | 1.01  | 0.53  | 11.66+ | 17.82+ | 16.22+ | 55.61+ | 18.72  | 5.26   | 146.4 |
| 1990  | 2.87   | 2.08   | 1.02  | 0.00  | 0.00  | 0.31  | 0.91   | 11.14  | 27.81+ | 40.81+ | 12.35+ | 18.40  | 117.7 |
| AVE : | 7.26   | 4.67   | 2.11  | 0.86  | 0.49  | 1.59  | 4.65   | 13.89  | 20.81  | 23.73  | 21.41  | 13.01  | 114.5 |
| SD :  | 4.53   | 6.12   | 2.81  | 1.60  | 0.80  | 2.95  | 4.78   | 15.66  | 19.72  | 16.06  | 18.64  | 12.23  | 49.8  |

## Average Rainfall On Catchment H1H006.ra

details of rainfall stations used

042357\_a.pat 1924 to 1998

042326\_X.pat 1920 to 1998

042415\_9.pat 1920 to 1961

|          |        | rainfall input as percent m.a.p. |        |       |       |       |        |        |        |        |        |        |        |         |
|----------|--------|----------------------------------|--------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|---------|
| no.      | gauges | oct                              | nov    | dec   | jan   | feb   | mar    | apr    | may    | jun    | jul    | aug    | sep    | year    |
| 1920     | 2      | 6.08+                            | 3.04+  | 3.04+ | 5.92  | 8.16  | 3.08   | 7.42   | .99    | 63.75  | 26.60  | 14.52  | 5.91   | 148.51  |
| 1921     | 2      | 3.34                             | 1.91+  | 4.24  | 9.31+ | 1.12+ | 3.99+  | 5.58+  | 8.40+  | 23.56  | 5.79   | 20.66  | 1.34   | 89.24   |
| 1922     | 2      | 2.66                             | 1.47   | .55   | 3.36+ | .09   | 1.63   | 8.93   | 15.42+ | 29.01  | 12.28  | 11.00  | 7.79+  | 94.17   |
| 1923     | 2      | 5.82                             | 7.72   | 1.77  | .68+  | .39   | 3.15   | 3.19   | 3.62   | 26.14  | 7.03   | 20.20  | 8.76   | 88.46   |
| 1924     | 3      | 11.56                            | 6.11   | .00   | 1.88  | .50   | .35    | .90+   | 6.85   | 44.44  | 22.94  | 5.56   | 2.19   | 103.29  |
| 1925     | 3      | 15.15+                           | 7.38   | .54   | .07   | 4.55  | .00    | .81    | 14.91  | 3.67   | 14.26  | 8.92   | 3.39   | 73.66   |
| 1926     | 3      | 15.17                            | 3.85   | .00   | 2.12  | 5.95  | .02    | 7.89   | 11.17  | 8.98   | 3.40   | 22.43  | 4.07   | 85.04   |
| 1927     | 3      | .75                              | 11.17  | 3.03  | 3.05  | .00   | 3.81   | 1.08   | .20    | 32.79  | 6.89   | 12.56  | 10.73  | 86.07   |
| 1928     | 3      | .67                              | 1.78   | 1.07  | .00   | 1.05  | 2.23   | 12.41  | 12.07  | 10.61  | 16.80  | 13.63  | 3.14   | 75.46   |
| 1929     | 3      | 1.91                             | 1.67   | 5.39  | 3.77  | 3.16  | 1.28   | 3.82   | 1.29   | 1.59   | 10.32  | 13.90  | 20.58  | 68.68   |
| 1930     | 3      | 4.36                             | 3.66   | .95   | .02   | 2.34  | .02    | 11.46  | 15.45  | 4.01   | 7.92   | 29.07  | 10.82  | 90.07   |
| 1931     | 3      | 7.39                             | .59    | 2.31  | 3.35  | 20.81 | 1.54   | 1.84   | 16.76  | 13.73  | 13.97  | 7.19   | 8.34   | 97.81   |
| 1932     | 3      | 2.32                             | .52    | 1.81  | 2.05  | 3.38  | 2.33   | .63    | 10.86  | 22.90  | 21.26  | 10.08  | 4.63   | 82.77   |
| 1933     | 3      | 5.04                             | 1.51   | 4.26  | 1.51  | 2.10  | 5.70   | 2.12   | 11.80  | 10.46  | 8.73   | 9.79   | 12.88  | 75.92   |
| 1934     | 3      | 12.08                            | 7.02   | .00   | .68   | 2.52  | 4.86   | 9.84   | 12.11  | 7.64   | 16.38  | 13.93  | 10.16  | 97.23   |
| 1935     | 3      | 2.19                             | 5.76   | .79   | 4.83  | 1.15  | 2.88   | 1.03   | 11.06  | 3.80   | 10.88  | 15.92  | 11.57  | 71.86   |
| 1936     | 3      | 2.73                             | 1.85   | 10.68 | 1.34  | .03   | 6.53   | 7.81   | 13.56  | 21.30  | 25.12  | 6.09   | 1.73   | 98.76   |
| 1937     | 3      | 4.22                             | .51    | 2.61  | 10.05 | 1.49  | 1.05   | 10.77  | 20.44  | 8.41   | 7.31   | 10.89  | 11.98  | 89.72   |
| 1938     | 3      | 3.94                             | 2.41   | 1.78  | .74   | 10.17 | 1.08   | 7.18   | 16.91  | 4.03   | 7.93   | 17.67  | 8.06   | 81.91   |
| 1939     | 3      | .80                              | 3.47   | 5.12  | 1.30  | 5.74+ | 3.45   | 10.87  | 7.17   | 15.58  | 8.39   | 5.79   | 6.41+  | 74.10   |
| 1940     | 3      | 3.98                             | 8.46+  | 1.15  | 7.15  | 1.29  | .15    | 14.46+ | 29.19+ | 26.03+ | 5.32+  | 16.20  | 26.72  | 140.10  |
| 1941     | 3      | 10.78                            | 1.40+  | 1.64+ | 1.14  | .00+  | .43    | 2.37+  | 20.70+ | 47.84  | 6.45   | 11.93  | 1.82   | 106.51  |
| 1942     | 3      | 5.70+                            | .34    | 3.90+ | 5.55  | 1.94  | 5.03+  | 6.12   | 6.36   | 14.81  | 21.50  | 22.02  | 12.50+ | 105.76  |
| 1943     | 3      | 4.50+                            | 8.23+  | .00+  | 1.95+ | .00   | 3.35   | 8.28   | 17.27  | 38.14  | 8.23   | 17.55  | 9.50   | 116.97  |
| 1944     | 3      | 4.98                             | 6.30   | 2.26  | .00   | .00   | .41    | 7.58   | 25.60  | 32.29  | 18.54  | 14.95  | 1.55   | 114.44  |
| 1945     | 3      | 3.00                             | 2.68   | 1.93  | .00   | .31   | 3.31   | 6.15   | 6.90   | 4.57   | 8.20   | 10.93  | 22.63  | 70.61   |
| 1946     | 3      | 5.89                             | 1.07   | 1.26  | .00   | .00   | 8.18   | 2.81   | 6.75   | 4.64   | 26.61  | 9.59   | 4.25   | 71.04   |
| 1947     | 3      | 6.69                             | 1.11   | .00   | .21   | 2.71  | 13.09  | 9.64   | 16.74  | 8.93   | 19.44  | 4.19   | 18.97  | 101.72  |
| 1948     | 3      | 7.52                             | 1.60   | 1.39  | 1.01  | .00   | .47    | 8.37   | 8.79   | 11.47  | 13.52  | 14.15  | 12.32  | 80.61   |
| 1949     | 3      | 10.70                            | 9.24   | 1.92  | .14   | .00   | .75    | 20.52  | 2.31   | 4.91   | 28.82  | .37    | 16.31  | 95.99   |
| 1950     | 3      | 5.87                             | 11.48  | 4.15  | 7.98  | .00   | .00    | 12.62  | 9.03   | 30.51  | 14.48  | 9.68   | 9.55+  | 115.33  |
| 1951     | 3      | 7.29                             | 11.09  | .33   | .39   | 4.09  | 3.50   | 4.96   | 21.88  | 10.55  | 13.23  | 25.74  | 11.19  | 114.24  |
| 1952     | 3      | 6.29                             | 11.27  | .29+  | .13   | .29   | 1.07   | 25.94  | 25.23  | 6.62   | 24.05  | 12.04  | .15    | 113.37  |
| 1953     | 3      | 1.28                             | 8.36   | 4.73+ | 1.26  | 1.35  | 2.99   | 13.96  | 28.22  | 11.42  | 29.20  | 21.03  | 7.91   | 131.70  |
| 1954     | 3      | 5.15                             | 1.31   | 5.67  | .00   | 11.57 | 1.45   | 6.29   | 3.84   | 18.81  | 22.74  | 37.12  | 3.61   | 117.56  |
| 1955     | 3      | 11.87                            | 10.30  | 2.71  | 1.84  | 2.92  | 2.44   | 2.48   | 13.18  | 24.00  | 15.30  | 15.17  | 4.28   | 106.49  |
| 1956     | 3      | 3.67                             | .02    | .90   | .55   | 19.37 | 7.78   | 3.97   | 29.90  | 29.43  | 26.99  | 17.53  | 7.90   | 148.00  |
| 1957     | 3      | 19.48                            | .80    | .00   | .75   | 6.86  | 1.16   | 3.97   | 20.86  | 10.70  | 3.17   | 16.01  | 5.27   | 89.02   |
| 1958     | 3      | 6.16                             | 5.46   | .00   | .86   | 3.75  | 1.83   | 15.54  | 46.80  | 4.12   | 3.06   | 15.94  | 3.97   | 107.50  |
| 1959     | 3      | 13.86                            | .11    | 3.14  | .58   | 1.46  | 3.77   | 7.42   | 20.01  | 22.70  | 3.39   | 3.67   | 4.05   | 84.14   |
| 1960     | 3      | 2.24                             | 1.58   | 2.00  | 6.79  | .82   | 2.01   | 6.02   | 13.06  | 12.70  | 9.53   | 15.96  | 18.38  | 91.08   |
| 1961     | 3      | 2.29                             | .00+   | 1.36+ | 2.29+ | 5.75+ | 7.30+  | 8.49+  | 5.53+  | 48.08+ | 14.13+ | 27.65+ | 5.81+  | 128.68  |
| 1962     | 2      | 18.44                            | 4.64   | .16   | 2.26  | .00   | .57    | 1.83   | 2.35   | 12.79  | 16.89  | 33.75  | 2.39   | 96.07   |
| 1963     | 2      | 2.01                             | 7.53   | 5.90+ | .00   | 9.34  | .87    | 8.32   | 10.38  | 26.49  | 12.75  | 27.06  | 4.79   | 115.44  |
| 1964     | 2      | 5.07                             | 10.72  | .96   | 3.29  | 8.17  | 15.29  | 9.72   | 9.47   | 8.12   | 4.82   | 7.05   | 3.39   | 86.05   |
| 1965     | 2      | 5.09                             | 1.23   | 5.16  | .04   | .41   | 9.55   | 7.43   | 3.31   | 16.25  | 24.89  | 6.94   | 10.31  | 90.61   |
| 1966     | 2      | .37                              | .62    | 1.14  | 3.40  | .84   | .04    | 10.77  | 8.09   | 34.04  | 10.63  | 7.46   | 6.64   | 84.04   |
| 1967     | 2      | 8.27                             | 7.84   | .36   | 2.13  | .88   | .00    | 13.28  | 26.96  | 18.17  | 18.93  | 14.63  | .75    | 112.22  |
| 1968     | 2      | 23.62                            | 2.72   | 11.80 | .78   | 1.66  | 1.02   | 8.51   | 3.25   | 7.41   | 4.51   | 12.73  | 11.63  | 89.65   |
| 1969     | 2      | 13.10                            | 1.73   | .74   | .60   | 2.09  | .42    | .30    | 15.47  | 24.68  | 16.52  | 18.87  | 8.66   | 103.17  |
| 1970     | 2      | 4.37                             | 2.71   | 2.27  | .62   | .45   | 8.91   | .26    | 6.00   | 17.03  | 14.69  | 17.87  | 1.35   | 76.53   |
| 1971     | 2      | 1.25                             | 1.07   | 1.42  | 1.58  | 2.14  | .82    | 15.35  | 14.46  | 7.90   | 8.59   | 8.11   | 7.38   | 70.06   |
| 1972     | 2      | 5.16                             | .00    | 4.77  | .09   | .00   | 5.58   | .82    | 6.49   | 2.62   | 29.60  | 14.35  | 11.82  | 81.31   |
| 1973     | 2      | 4.29                             | 1.12   | 4.71  | .09   | .24   | .90    | .00    | 16.88  | 23.75  | 10.98  | 53.15  | 12.92  | 129.04  |
| 1974     | 2      | 12.39                            | 9.73   | .88   | 3.60  | 1.74  | 1.19   | 8.57   | 29.92  | 6.79   | 14.49  | 16.14  | 1.70   | 107.14  |
| 1975     | 2      | 12.47                            | 2.97   | .82   | .00   | 3.05  | 2.83   | 7.61   | 5.22   | 38.45  | 16.66  | 6.72   | 3.10   | 99.90   |
| 1976     | 2      | 1.98                             | 26.18  | 12.52 | 3.79  | 4.37  | 1.45   | 12.34  | 36.36  | 28.09  | 28.96  | 21.04  | 6.69   | 183.78  |
| 1977     | 2      | 2.67                             | 2.61   | 6.83  | .99   | 1.53  | 6.13   | 6.72   | 6.59+  | 2.59   | .21    | 22.49  | 10.18+ | 69.54   |
| 1978     | 2      | 1.74                             | .18    | 2.77  | 2.90+ | 10.37 | .26    | 1.50   | 11.16  | 20.13  | 10.64  | 9.67   | 11.85  | 83.17   |
| 1979     | 2      | 11.65                            | .34    | .00   | 4.70  | 2.04  | .22    | 9.25   | 13.92  | 14.55  | 2.86   | 16.76  | 2.31   | 78.59   |
| 1980     | 2      | 4.93                             | 22.43  | 12.42 | 16.24 | .00   | 4.40   | 4.85   | 2.26   | 11.01  | 23.50  | 18.74  | 17.42  | 138.20  |
| 1981     | 2      | 3.16                             | 2.15   | .92   | 6.46  | .32   | 4.87   | 18.09  | 7.42   | 10.78  | 11.46  | 6.55   | .57    | 72.76   |
| 1982     | 2      | 11.50                            | 2.31   | 4.04  | .00   | 5.15  | 4.19   | 2.03   | 28.40  | 22.81  | 23.62  | 6.10   | 6.37   | 116.51  |
| 1983     | 2      | .39                              | 1.90   | .70   | .53   | .08   | 16.16  | 5.80   | 41.32  | 8.23   | 10.62  | 6.59   | 21.26  | 113.59  |
| 1984     | 2      | 13.24                            | .13    | 10.96 | 6.57  | 3.26  | 20.79+ | 8.16+  | 9.45   | 17.73  | 21.36+ | 21.10+ | 8.24   | 140.99  |
| 1985     | 2      | 1.74                             | .58    | 1.31  | 1.51  | 2.14  | 8.19   | 6.85   | 6.96+  | 19.48+ | 14.61  | 25.27+ | 8.70+  | 97.34   |
| 1986     | 2      | 2.30                             | 2.77   | .00   | 3.54  | 1.16  | 1.48   | 8.38   | 26.13+ | 21.96  | 14.32+ | 18.18  | 9.38   | 109.62  |
| 1987     | 2      | .41                              | .34    | 4.52  | .09   | .25+  | 1.83   | 14.41+ | 8.45   | 20.23+ | 8.22+  | 13.05+ | 11.22+ | 83.01   |
| 1988     | 2      | 1.37+                            | 1.45   | 1.51  | .29   | 4.40+ | 14.46  | 10.03  | 9.10   | 18.61  | 15.08  | 21.11  | 19.06  | 116.46  |
| 1989     | 2      | 6.91                             | 6.08   | .35   | 1.01  | 5.08  | 2.79   | 25.43  | 16.46  | 19.42+ | 18.44+ | 7.34+  | .84    | 110.17  |
| 1990     | 2      | .46                              | 3.47   | 4.88  | .97   | .90   | 1.94   | 5.53   | 12.06  | 24.46  | 34.52  | 5.56   | 17.75  | 112.52  |
| 1991     | 2      | 6.18                             | 2.84   | .78   | .00   | 4.86  | 7.08   | 12.44  | 10.64+ | 32.93  | 17.72  | 11.00  | 5.37   | 111.83  |
| 1992     | 2      | 13.43+                           | 4.19   | .56   | 1.18  | 4.11  | .88    | 19.60  | 24.78  | 13.73  | 32.34  | 8.37   | 4.07   | 127.23  |
| 1993     | 2      | .15                              | 1.14   | 3.85  | .19   | .00   | .96    | 10.62  | 8.02   | 42.30  | 10.01  | 3.56   | 15.96  | 96.77   |
| 1994     | 2      | 3.97                             | .94    | 1.76  | .93+  | .92   | 2.36   | 1.01   | 13.43  | 16.13  | 17.48  | 11.62  | 2.79   | 73.35   |
| 1995     | 2      | 15.48+                           | .89    | 14.20 | .70   | 4.17  | 4.35   | 3.81   | 11.48  | 35.56  | 20.05  | 22.84  | 22.23  | 155.76  |
| 1996     | 2      | 6.56                             | 12.40  | 7.31  | 1.12  | .31   | 1.58   | 3.82   | 8.97   | 35.31+ | 5.11   | 11.83  | .64    | 94.96   |
| 1997     | 2      | 1.11                             | 9.15   | 2.88  | 5.43  | .00   | .56    | 3.82   | 39.75  | 10.60  | 15.55  | 6.36   | 2.91   | 98.11   |
| 1998     | 2      | 3.73                             | 12.27+ | 7.29+ | .12   | 1.96  | .00    | 6.69   | 11.09+ | 18.33+ | 14.63+ | 14.63+ | 8.53+  | 99.29   |
| average  |        | 6.18                             | 4.39   | 2.96  | 2.21  | 2.88  | 3.47   | 7.69   | 14.07  | 18.85  | 14.76  | 14.73  | 8.41   | 100.61  |
| adjusted |        | 6.14                             | 4.36   | 2.95  | 2.19  | 2.86  | 3.45   | 7.64   | 13.99  | 18.73  | 14.67  | 14.64  | 8.36   | 100.001 |

Appendix B3.4

File : AU\_WE.USE  
Units : 10^6xm^3  
Descrip. : Upland alien demand in Witels sub-catchment for 1964 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1965  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.0   |
| 1966  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1967  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.0   |
| 1968  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1969  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1970  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1971  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1972  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.0   |
| 1973  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1974  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.01 | 0.00 | 0.0   |
| 1975  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.0   |
| 1976  | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.1   |
| 1977  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1978  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1979  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1980  | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.0   |
| 1981  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.0   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.0   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.01 | 0.0   |
| 1984  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.1   |
| 1985  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.0   |
| 1986  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1987  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1989  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.1   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.04 | 0.01 | 0.01 | 0.1   |
| AVE : | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.0   |
| SD :  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.0   |

Appendix B3.5

File : AU\_H1H6.USE

Units : 10<sup>6</sup>xm<sup>3</sup>

Descrip. : Upland alien demand (tall trees) in H1H006 sub-catchment for 1964 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1965  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.02 | 0.05 | 0.01 | 0.02 | 0.1   |
| 1966  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.07 | 0.02 | 0.01 | 0.01 | 0.1   |
| 1967  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.05 | 0.04 | 0.05 | 0.04 | 0.01 | 0.2   |
| 1968  | 0.05 | 0.01 | 0.02 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.01 | 0.02 | 0.02 | 0.2   |
| 1969  | 0.03 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.05 | 0.04 | 0.05 | 0.02 | 0.2   |
| 1970  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.04 | 0.04 | 0.05 | 0.01 | 0.2   |
| 1971  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.02 | 0.01 | 0.02 | 0.02 | 0.02 | 0.1   |
| 1972  | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.08 | 0.04 | 0.04 | 0.2   |
| 1973  | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.06 | 0.03 | 0.21 | 0.04 | 0.4   |
| 1974  | 0.04 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.09 | 0.01 | 0.05 | 0.06 | 0.01 | 0.3   |
| 1975  | 0.03 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.13 | 0.06 | 0.02 | 0.01 | 0.3   |
| 1976  | 0.01 | 0.08 | 0.03 | 0.01 | 0.01 | 0.00 | 0.02 | 0.12 | 0.12 | 0.13 | 0.09 | 0.02 | 0.6   |
| 1977  | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.07 | 0.03 | 0.2   |
| 1978  | 0.01 | 0.01 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.02 | 0.06 | 0.04 | 0.04 | 0.04 | 0.2   |
| 1979  | 0.04 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.04 | 0.04 | 0.01 | 0.07 | 0.01 | 0.3   |
| 1980  | 0.01 | 0.08 | 0.03 | 0.05 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.10 | 0.09 | 0.08 | 0.5   |
| 1981  | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.05 | 0.01 | 0.03 | 0.05 | 0.02 | 0.01 | 0.2   |
| 1982  | 0.03 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.00 | 0.11 | 0.10 | 0.13 | 0.03 | 0.02 | 0.5   |
| 1983  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.05 | 0.01 | 0.19 | 0.04 | 0.05 | 0.03 | 0.11 | 0.5   |
| 1984  | 0.06 | 0.01 | 0.02 | 0.01 | 0.01 | 0.08 | 0.02 | 0.02 | 0.09 | 0.12 | 0.12 | 0.04 | 0.6   |
| 1985  | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.08 | 0.08 | 0.15 | 0.04 | 0.4   |
| 1986  | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.14 | 0.13 | 0.10 | 0.13 | 0.06 | 0.6   |
| 1987  | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.06 | 0.02 | 0.13 | 0.06 | 0.10 | 0.08 | 0.5   |
| 1988  | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.08 | 0.04 | 0.04 | 0.16 | 0.15 | 0.21 | 0.19 | 0.9   |
| 1989  | 0.05 | 0.04 | 0.01 | 0.01 | 0.01 | 0.01 | 0.21 | 0.12 | 0.21 | 0.22 | 0.08 | 0.03 | 1.0   |
| 1990  | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.07 | 0.25 | 0.49 | 0.06 | 0.21 | 1.2   |
| AVE : | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.01 | 0.02 | 0.04 | 0.07 | 0.08 | 0.07 | 0.04 | 0.4   |
| SD :  | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.02 | 0.04 | 0.05 | 0.06 | 0.10 | 0.06 | 0.05 | 0.3   |



Appendix B3.6

File : H1H6AUS.USE  
Units : 10^6xm^3  
Descrip. : Upland alien demand (tall shrub) in H1H006 sub-catchment for 1964 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1965  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1966  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1967  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1968  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1969  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1970  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1971  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1972  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.0   |
| 1973  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1974  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1975  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1976  | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.1   |
| 1977  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1978  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1979  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1980  | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.0   |
| 1981  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.0   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.0   |
| 1984  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.0   |
| 1985  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.0   |
| 1986  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.0   |
| 1987  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.01 | 0.0   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1989  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | 0.00 | 0.1   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.03 | 0.00 | 0.01 | 0.1   |
| AVE : | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| SD :  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.0   |

Appendix B3.7

File : H6\_RIP.DEM  
Units : 10<sup>6</sup>m<sup>3</sup>  
Descrip. : Riparian alien demand in H1H006 sub-catchment for 1964 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 0.04 | 0.06 | 0.07 | 0.07 | 0.06 | 0.05 | 0.03 | 0.02 | 0.01 | 0.01 | 0.02 | 0.03 | 0.5   |
| 1965  | 0.04 | 0.06 | 0.07 | 0.08 | 0.07 | 0.06 | 0.04 | 0.02 | 0.02 | 0.02 | 0.02 | 0.03 | 0.5   |
| 1966  | 0.05 | 0.07 | 0.08 | 0.08 | 0.07 | 0.06 | 0.04 | 0.02 | 0.02 | 0.02 | 0.02 | 0.03 | 0.6   |
| 1967  | 0.05 | 0.07 | 0.08 | 0.09 | 0.08 | 0.07 | 0.04 | 0.03 | 0.02 | 0.02 | 0.02 | 0.03 | 0.6   |
| 1968  | 0.06 | 0.08 | 0.09 | 0.10 | 0.08 | 0.07 | 0.05 | 0.03 | 0.02 | 0.02 | 0.02 | 0.03 | 0.7   |
| 1969  | 0.06 | 0.08 | 0.10 | 0.10 | 0.09 | 0.08 | 0.05 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.7   |
| 1970  | 0.06 | 0.09 | 0.10 | 0.11 | 0.10 | 0.08 | 0.05 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.7   |
| 1971  | 0.07 | 0.09 | 0.11 | 0.11 | 0.10 | 0.09 | 0.05 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.8   |
| 1972  | 0.07 | 0.10 | 0.11 | 0.12 | 0.11 | 0.09 | 0.06 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.8   |
| 1973  | 0.07 | 0.10 | 0.12 | 0.13 | 0.11 | 0.10 | 0.06 | 0.04 | 0.03 | 0.03 | 0.03 | 0.05 | 0.9   |
| 1974  | 0.08 | 0.11 | 0.13 | 0.13 | 0.12 | 0.10 | 0.06 | 0.04 | 0.03 | 0.03 | 0.03 | 0.05 | 0.9   |
| 1975  | 0.08 | 0.11 | 0.13 | 0.14 | 0.12 | 0.11 | 0.07 | 0.04 | 0.03 | 0.03 | 0.03 | 0.05 | 0.9   |
| 1976  | 0.08 | 0.12 | 0.14 | 0.15 | 0.13 | 0.11 | 0.07 | 0.04 | 0.03 | 0.03 | 0.04 | 0.05 | 1.0   |
| 1977  | 0.09 | 0.12 | 0.14 | 0.15 | 0.14 | 0.12 | 0.07 | 0.04 | 0.03 | 0.03 | 0.04 | 0.05 | 1.0   |
| 1978  | 0.09 | 0.13 | 0.15 | 0.16 | 0.14 | 0.12 | 0.08 | 0.05 | 0.03 | 0.03 | 0.04 | 0.06 | 1.1   |
| 1979  | 0.10 | 0.13 | 0.16 | 0.17 | 0.15 | 0.13 | 0.08 | 0.05 | 0.03 | 0.03 | 0.04 | 0.06 | 1.1   |
| 1980  | 0.10 | 0.14 | 0.16 | 0.17 | 0.15 | 0.13 | 0.08 | 0.05 | 0.03 | 0.03 | 0.04 | 0.06 | 1.1   |
| 1981  | 0.10 | 0.14 | 0.17 | 0.18 | 0.16 | 0.13 | 0.08 | 0.05 | 0.04 | 0.04 | 0.04 | 0.06 | 1.2   |
| 1982  | 0.11 | 0.15 | 0.17 | 0.18 | 0.16 | 0.14 | 0.09 | 0.05 | 0.04 | 0.04 | 0.05 | 0.07 | 1.3   |
| 1983  | 0.11 | 0.15 | 0.18 | 0.19 | 0.17 | 0.14 | 0.09 | 0.05 | 0.04 | 0.04 | 0.05 | 0.07 | 1.3   |
| 1984  | 0.11 | 0.16 | 0.19 | 0.20 | 0.17 | 0.15 | 0.09 | 0.06 | 0.04 | 0.04 | 0.05 | 0.07 | 1.3   |
| 1985  | 0.12 | 0.16 | 0.19 | 0.20 | 0.18 | 0.15 | 0.10 | 0.06 | 0.04 | 0.04 | 0.05 | 0.07 | 1.4   |
| 1986  | 0.15 | 0.20 | 0.24 | 0.26 | 0.23 | 0.19 | 0.12 | 0.07 | 0.05 | 0.05 | 0.06 | 0.09 | 1.7   |
| 1987  | 0.18 | 0.24 | 0.29 | 0.31 | 0.27 | 0.23 | 0.15 | 0.09 | 0.06 | 0.06 | 0.08 | 0.11 | 2.1   |
| 1988  | 0.21 | 0.29 | 0.34 | 0.36 | 0.32 | 0.27 | 0.17 | 0.10 | 0.07 | 0.07 | 0.09 | 0.13 | 2.4   |
| 1989  | 0.24 | 0.33 | 0.39 | 0.41 | 0.36 | 0.31 | 0.19 | 0.12 | 0.08 | 0.08 | 0.10 | 0.15 | 2.8   |
| 1990  | 0.27 | 0.37 | 0.44 | 0.46 | 0.41 | 0.35 | 0.22 | 0.13 | 0.09 | 0.09 | 0.11 | 0.17 | 3.1   |
| AVE : | 0.10 | 0.14 | 0.17 | 0.18 | 0.16 | 0.13 | 0.08 | 0.05 | 0.04 | 0.04 | 0.04 | 0.06 | 1.2   |
| SD :  | 0.06 | 0.08 | 0.10 | 0.10 | 0.09 | 0.08 | 0.05 | 0.03 | 0.02 | 0.02 | 0.02 | 0.04 | 0.7   |

## Appendix B3.8

File : H1H022.FLW  
 Units : 10<sup>6</sup>m<sup>3</sup>  
 Descrip. : Canal abstraction (H1H022) u/s of H1H006 for 1964 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 1.27 | 1.24 | 2.37 | 2.08 | 2.04 | 2.05 | 1.06 | 1.28 | 1.39 | 1.29 | 1.46 | 2.14 | 19.7  |
| 1965  | 2.91 | 2.79 | 2.67 | 1.80 | 1.16 | 1.75 | 1.28 | 1.37 | 1.08 | 0.72 | 1.36 | 2.07 | 21.0  |
| 1966  | 2.38 | 2.31 | 1.06 | 0.65 | 0.31 | 0.24 | 1.49 | 1.42 | 0.79 | 1.27 | 0.49 | 1.07 | 13.5  |
| 1967  | 2.40 | 2.30 | 2.28 | 2.21 | 1.46 | 0.47 | 1.50 | 0.45 | 0.88 | 1.05 | 0.77 | 1.24 | 17.0  |
| 1968  | 1.45 | 2.12 | 2.43 | 1.91 | 1.01 | 0.71 | 1.64 | 1.34 | 1.43 | 1.48 | 1.54 | 1.95 | 19.0  |
| 1969  | 1.50 | 2.40 | 2.26 | 1.59 | 1.09 | 1.09 | 0.62 | 1.83 | 1.44 | 1.34 | 1.38 | 1.33 | 17.9  |
| 1970  | 1.55 | 2.41 | 2.51 | 1.68 | 1.04 | 2.65 | 1.78 | 2.23 | 0.32 | 0.57 | 0.95 | 1.03 | 18.7  |
| 1971  | 2.34 | 2.44 | 1.85 | 1.52 | 1.06 | 0.92 | 1.99 | 1.55 | 1.45 | 1.07 | 0.98 | 1.62 | 18.8  |
| 1972  | 2.31 | 2.62 | 2.52 | 1.19 | 0.64 | 2.27 | 1.69 | 2.18 | 1.26 | 1.13 | 0.79 | 1.16 | 19.8  |
| 1973  | 1.84 | 2.57 | 2.50 | 1.16 | 0.66 | 0.70 | 0.79 | 1.64 | 0.58 | 1.34 | 1.51 | 0.43 | 15.7  |
| 1974  | 1.14 | 1.33 | 1.98 | 2.35 | 1.23 | 0.93 | 1.66 | 0.72 | 0.92 | 0.96 | 1.20 | 1.35 | 15.8  |
| 1975  | 1.42 | 1.95 | 2.47 | 1.41 | 0.93 | 1.00 | 1.85 | 1.09 | 0.92 | 0.81 | 0.89 | 1.12 | 15.9  |
| 1976  | 1.71 | 2.09 | 0.95 | 2.42 | 1.17 | 2.31 | 2.04 | 1.22 | 0.92 | 0.96 | 0.99 | 1.25 | 18.0  |
| 1977  | 1.69 | 2.15 | 2.28 | 2.17 | 1.82 | 1.90 | 1.65 | 1.33 | 0.92 | 0.96 | 0.99 | 1.25 | 19.1  |
| 1978  | 1.69 | 2.15 | 2.28 | 2.17 | 1.82 | 1.90 | 1.65 | 1.33 | 0.92 | 0.96 | 0.99 | 1.25 | 19.1  |
| 1979  | 1.69 | 2.15 | 2.28 | 2.17 | 1.82 | 1.90 | 1.65 | 1.33 | 0.92 | 0.96 | 0.99 | 1.25 | 19.1  |
| 1980  | 1.69 | 2.15 | 2.28 | 2.17 | 1.82 | 1.90 | 1.65 | 1.33 | 0.92 | 0.96 | 0.99 | 1.25 | 19.1  |
| 1981  | 1.69 | 2.15 | 2.28 | 2.17 | 1.82 | 1.90 | 1.65 | 1.33 | 0.92 | 0.96 | 0.99 | 1.25 | 19.1  |
| 1982  | 1.69 | 2.15 | 2.28 | 2.17 | 1.82 | 1.90 | 1.65 | 1.33 | 0.92 | 0.96 | 0.99 | 1.25 | 19.1  |
| 1983  | 1.69 | 2.15 | 2.28 | 2.17 | 1.82 | 1.90 | 1.65 | 1.33 | 0.92 | 0.96 | 0.99 | 1.25 | 19.1  |
| 1984  | 1.69 | 2.15 | 2.28 | 2.17 | 1.82 | 1.90 | 1.65 | 1.33 | 0.92 | 0.96 | 0.99 | 1.25 | 19.1  |
| 1985  | 1.69 | 2.15 | 2.28 | 2.17 | 1.82 | 1.90 | 1.65 | 1.33 | 0.92 | 0.96 | 0.99 | 1.25 | 19.1  |
| 1986  | 1.69 | 2.15 | 2.28 | 2.17 | 1.82 | 1.90 | 1.65 | 1.33 | 0.92 | 0.96 | 0.99 | 1.25 | 19.1  |
| 1987  | 1.69 | 2.15 | 2.28 | 2.17 | 1.82 | 1.90 | 1.65 | 1.33 | 0.92 | 0.96 | 0.99 | 1.25 | 19.1  |
| 1988  | 1.69 | 2.15 | 2.28 | 2.17 | 1.82 | 1.90 | 1.65 | 1.33 | 0.92 | 0.96 | 0.99 | 1.25 | 19.1  |
| 1989  | 1.69 | 2.15 | 2.28 | 2.17 | 1.82 | 1.90 | 1.65 | 1.33 | 0.92 | 0.96 | 0.99 | 1.25 | 19.1  |
| 1990  | 1.69 | 2.15 | 2.28 | 2.17 | 1.82 | 1.90 | 1.65 | 1.33 | 0.92 | 0.96 | 0.99 | 1.25 | 19.1  |
| AVE : | 1.77 | 2.17 | 2.21 | 1.94 | 1.45 | 1.62 | 1.57 | 1.37 | 0.97 | 1.02 | 1.04 | 1.31 | 18.5  |
| SD :  | 0.38 | 0.32 | 0.38 | 0.43 | 0.48 | 0.61 | 0.31 | 0.35 | 0.25 | 0.19 | 0.23 | 0.33 | 1.6   |

## Appendix B3.9

File : H1H006.CAL  
Units : 10<sup>6</sup>m<sup>3</sup>  
Descrip. : Simulated flow record at H1H006 for 1964 to 1990

| Year  | Oct   | Nov   | Dec   | Jan   | Feb  | Mar   | Apr   | May   | Jun   | Jul   | Aug    | Sep   | Total |
|-------|-------|-------|-------|-------|------|-------|-------|-------|-------|-------|--------|-------|-------|
| 1964  | 4.56  | 8.91  | 0.00  | 0.00  | 1.83 | 13.86 | 6.49  | 7.30  | 9.10  | 5.36  | 8.77   | 3.16  | 69.3  |
| 1965  | 1.82  | 0.00  | 0.00  | 0.00  | 0.00 | 3.17  | 1.88  | 0.49  | 18.06 | 44.66 | 10.53  | 13.19 | 93.8  |
| 1966  | 1.86  | 0.00  | 0.00  | 0.35  | 0.32 | 0.23  | 5.04  | 2.60  | 55.02 | 18.42 | 11.17  | 6.96  | 102.0 |
| 1967  | 5.99  | 4.49  | 0.00  | 0.00  | 0.00 | 0.10  | 9.42  | 38.35 | 27.49 | 35.41 | 26.74  | 3.98  | 152.0 |
| 1968  | 33.52 | 1.82  | 7.84  | 0.00  | 0.00 | 0.02  | 2.19  | 0.00  | 2.64  | 2.12  | 13.15  | 16.09 | 79.4  |
| 1969  | 16.39 | 1.19  | 0.00  | 0.00  | 0.00 | 0.00  | 0.00  | 13.11 | 33.20 | 25.53 | 34.20  | 12.01 | 135.6 |
| 1970  | 3.92  | 0.63  | 0.00  | 0.00  | 0.00 | 1.46  | 0.00  | 0.00  | 19.47 | 19.82 | 32.25  | 4.12  | 81.7  |
| 1971  | 0.72  | 0.00  | 0.00  | 0.00  | 0.00 | 0.00  | 12.77 | 13.11 | 5.23  | 11.19 | 11.40  | 7.74  | 62.2  |
| 1972  | 3.30  | 0.00  | 0.00  | 0.00  | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 43.28 | 22.57  | 17.72 | 86.9  |
| 1973  | 3.55  | 0.08  | 0.00  | 0.00  | 0.03 | 0.00  | 0.00  | 15.96 | 32.17 | 13.61 | 109.42 | 22.49 | 197.3 |
| 1974  | 15.99 | 8.38  | 0.60  | 0.00  | 0.00 | 0.00  | 2.29  | 43.89 | 5.72  | 24.07 | 28.62  | 4.00  | 133.6 |
| 1975  | 12.21 | 1.64  | 0.00  | 0.00  | 0.00 | 0.00  | 0.96  | 0.89  | 62.41 | 31.29 | 10.09  | 4.27  | 123.8 |
| 1976  | 1.84  | 36.02 | 11.33 | 0.00  | 0.43 | 0.00  | 7.99  | 57.36 | 54.93 | 58.98 | 40.67  | 9.24  | 278.8 |
| 1977  | 3.40  | 0.69  | 1.07  | 0.00  | 0.00 | 0.00  | 0.89  | 2.04  | 1.63  | 1.10  | 30.17  | 11.43 | 52.4  |
| 1978  | 2.45  | 0.00  | 0.00  | 0.00  | 4.44 | 0.00  | 0.00  | 6.42  | 25.72 | 15.00 | 14.79  | 17.26 | 86.1  |
| 1979  | 13.40 | 1.23  | 0.00  | 0.00  | 0.00 | 0.00  | 2.90  | 12.00 | 16.26 | 4.36  | 26.70  | 3.93  | 80.8  |
| 1980  | 2.72  | 29.26 | 9.95  | 16.66 | 0.00 | 0.00  | 0.03  | 0.02  | 7.91  | 36.77 | 34.97  | 30.16 | 168.4 |
| 1981  | 3.68  | 0.68  | 0.00  | 0.09  | 0.00 | 0.00  | 19.10 | 3.55  | 10.09 | 18.55 | 8.92   | 3.30  | 68.0  |
| 1982  | 9.51  | 0.77  | 0.00  | 0.00  | 0.00 | 0.00  | 0.00  | 39.53 | 34.21 | 46.43 | 9.58   | 6.34  | 146.4 |
| 1983  | 2.35  | 0.00  | 0.00  | 0.00  | 0.00 | 14.25 | 0.25  | 66.20 | 12.14 | 16.99 | 8.96   | 36.48 | 157.6 |
| 1984  | 17.88 | 1.33  | 6.12  | 1.02  | 0.00 | 24.37 | 3.94  | 6.97  | 28.49 | 40.90 | 40.35  | 11.99 | 183.4 |
| 1985  | 3.07  | 0.06  | 0.00  | 0.00  | 0.00 | 1.37  | 0.95  | 2.44  | 25.43 | 25.87 | 48.53  | 13.00 | 120.7 |
| 1986  | 3.10  | 0.48  | 0.00  | 0.00  | 0.00 | 0.00  | 1.79  | 35.50 | 34.25 | 26.30 | 33.11  | 13.61 | 148.1 |
| 1987  | 2.63  | 0.00  | 0.00  | 0.00  | 0.00 | 0.00  | 11.20 | 3.41  | 26.64 | 12.96 | 21.38  | 16.36 | 94.6  |
| 1988  | 2.68  | 0.00  | 0.00  | 0.00  | 0.00 | 11.18 | 5.15  | 5.85  | 28.54 | 27.46 | 39.26  | 33.97 | 154.1 |
| 1989  | 5.99  | 3.11  | 0.00  | 0.00  | 0.00 | 0.00  | 32.95 | 18.59 | 32.65 | 34.62 | 11.54  | 3.55  | 143.0 |
| 1990  | 0.87  | 0.00  | 0.00  | 0.00  | 0.00 | 0.00  | 0.00  | 7.98  | 34.51 | 69.37 | 8.44   | 29.01 | 150.2 |
| AVE : | 6.64  | 3.73  | 1.37  | 0.67  | 0.26 | 2.59  | 4.75  | 14.95 | 23.85 | 26.31 | 25.79  | 13.16 | 124.1 |
| SD :  | 7.38  | 8.70  | 3.27  | 3.20  | 0.91 | 6.03  | 7.39  | 18.84 | 16.59 | 17.04 | 20.79  | 9.81  | 50.3  |

Appendix B3.10

File : H1H6PAT.OBS  
Units : 10^6xm^3  
Descrip. : Patched incremental observed flow record at H1H006 for 1964 to 1990

| Year  | Oct    | Nov    | Dec   | Jan   | Feb   | Mar   | Apr    | May    | Jun    | Jul    | Aug     | Sep    | Total |
|-------|--------|--------|-------|-------|-------|-------|--------|--------|--------|--------|---------|--------|-------|
| 1964  | 7.82   | 4.63   | 0.00  | 0.00  | 0.07  | 0.57  | 7.31   | 13.63  | 9.21   | 8.41   | 22.43   | 6.82   | 80.9  |
| 1965  | 4.33   | 0.00   | 0.00  | 0.00  | 0.00  | 3.02  | 5.16   | 3.39   | 18.06+ | 44.66+ | 7.43    | 0.04   | 86.1  |
| 1966  | 0.50   | 0.03   | 0.00  | 0.00  | 0.00  | 0.00  | 5.01   | 9.13   | 55.02+ | 1.52   | 12.62   | 3.12   | 86.9  |
| 1967  | 9.92   | 3.31   | 0.52  | 0.00  | 0.00  | 0.00  | 2.78   | 40.41+ | 19.56  | 16.77  | 16.34   | 2.71   | 112.3 |
| 1968  | 33.52* | 4.93   | 2.42  | 1.25  | 0.00  | 0.00  | 4.69   | 5.20   | 5.05   | 7.39   | 13.17   | 15.32  | 92.9  |
| 1969  | 13.26  | 4.94   | 3.18  | 1.95  | 1.36  | 1.90  | 2.25   | 9.86   | 12.19  | 18.95  | 22.79   | 17.84  | 110.5 |
| 1970  | 7.61   | 4.01   | 3.66  | 2.38  | 0.68  | 2.37  | 2.38   | 4.86   | 9.41   | 31.12+ | 17.67   | 6.65   | 92.8  |
| 1971  | 3.80   | 2.40   | 0.00  | 0.00  | 0.00  | 0.00  | 0.00   | 13.85  | 12.49  | 7.72   | 12.90   | 9.60   | 62.8  |
| 1972  | 5.00   | 1.91   | 2.23  | 0.00  | 0.00  | 2.21  | 0.00   | 2.67   | 3.75   | 43.28+ | 19.53   | 12.54  | 93.1  |
| 1973  | 7.25   | 3.65   | 2.69  | 0.00  | 0.00  | 0.00  | 0.00   | 4.81   | 0.23   | 10.38  | 109.42* | 15.90  | 154.3 |
| 1974  | 10.15  | 7.69   | 4.50  | 2.93  | 0.29  | 0.32  | 8.41   | 0.00   | 10.24  | 19.22  | 18.98   | 6.34   | 89.1  |
| 1975  | 10.49  | 4.74   | 2.35  | 0.00  | 0.00  | 0.00  | 0.32   | 4.50   | 62.41+ | 31.29+ | 8.26    | 6.79   | 131.2 |
| 1976  | 5.25   | 36.02+ | 11.66 | 7.38  | 3.19  | 3.14  | 6.42   | 57.36+ | 57.88+ | 58.98+ | 45.94+  | 11.54  | 304.8 |
| 1977  | 7.40   | 2.42   | 4.79  | 1.68  | 1.02  | 1.15  | 5.93   | 6.15*  | 5.35   | 4.20   | 0.52    | 18.12  | 58.7  |
| 1978  | 6.40   | 2.92   | 0.51  | 0.00  | 0.17  | 0.80  | 1.07   | 9.78   | 29.28+ | 9.62   | 16.18   | 17.26+ | 94.0  |
| 1979  | 16.41  | 3.76   | 0.51  | 2.12  | 0.15  | 0.00  | 4.55   | 13.00  | 12.50  | 7.31   | 13.92   | 2.70   | 76.9  |
| 1980  | 5.15   | 16.12  | 9.06  | 0.00  | 2.24  | 1.75  | 2.40   | 3.72   | 6.84   | 24.09  | 13.22   | 30.16+ | 114.8 |
| 1981  | 0.00   | 2.73*  | 0.00* | 0.00* | 0.00* | 0.00* | 22.81* | 6.08*  | 11.55* | 18.55* | 8.92*   | 5.03*  | 75.7  |
| 1982  | 9.51*  | 2.11*  | 0.15* | 0.00* | 0.93* | 1.41  | 0.47   | 2.48   | 91.37+ | 51.34+ | 4.22    | 3.60   | 167.6 |
| 1983  | 4.37   | 3.35   | 0.00  | 0.00  | 0.00  | 0.00  | 2.40   | 71.40* | 8.97   | 33.44+ | 13.40   | 45.25+ | 182.6 |
| 1984  | 14.32  | 3.37   | 0.71  | 1.95  | 1.42  | 14.01 | 7.03   | 10.41  | 29.84+ | 47.14+ | 45.86+  | 10.52  | 186.6 |
| 1985  | 4.76   | 0.00   | 1.24  | 0.17  | 0.00  | 2.08  | 7.09   | 17.49  | 23.69  | 27.01  | 48.53+  | 11.96  | 144.0 |
| 1986  | 4.19   | 2.35   | 0.14  | 0.56  | 0.00  | 0.00  | 1.06   | 35.50+ | 34.25+ | 16.83  | 28.03   | 11.44  | 134.4 |
| 1987  | 4.67   | 2.26   | 2.46  | 0.00  | 0.00  | 0.00  | 7.85   | 8.92   | 26.64+ | 14.97  | 12.51   | 18.64  | 98.9  |
| 1988  | 5.05   | 2.74   | 0.61  | 0.00  | 0.72  | 7.24  | 5.63   | 12.99  | 18.43  | 22.17  | 37.13   | 55.66+ | 168.4 |
| 1989  | 9.90   | 6.34   | 2.54  | 0.81  | 1.01  | 0.53  | 32.95+ | 18.59+ | 32.65+ | 55.61+ | 18.72   | 5.26   | 184.9 |
| 1990  | 2.87   | 2.08   | 1.02  | 0.00  | 0.00  | 0.31  | 0.91   | 11.14  | 34.51+ | 69.37+ | 12.35+  | 18.40  | 153.0 |
| AVE : | 7.92   | 4.85   | 2.11  | 0.86  | 0.49  | 1.59  | 5.44   | 14.72  | 23.76  | 25.98  | 22.26   | 13.67  | 123.6 |
| SD :  | 6.43   | 6.94   | 2.81  | 1.60  | 0.80  | 2.95  | 7.15   | 17.09  | 21.44  | 18.69  | 21.36   | 12.65  | 53.1  |

## Appendix B3.11

File : H1H6S-0.NAT  
Units : 10<sup>6</sup>xm<sup>3</sup>  
Descrip. : Incremental naturalised runoff at H1H006 for 1925 to 1990

| Year  | Oct   | Nov   | Dec   | Jan  | Feb   | Mar   | Apr   | May   | Jun   | Jul   | Aug    | Sep   | Total |
|-------|-------|-------|-------|------|-------|-------|-------|-------|-------|-------|--------|-------|-------|
| 1925  | 16.30 | 4.93  | 1.52  | 0.87 | 1.17  | 0.58  | 0.46  | 14.06 | 1.76  | 15.41 | 11.25  | 5.19  | 73.5  |
| 1926  | 18.90 | 4.09  | 1.50  | 0.92 | 1.82  | 0.69  | 3.21  | 8.61  | 7.53  | 4.86  | 38.78  | 6.08  | 97.0  |
| 1927  | 3.76  | 9.51  | 2.07  | 1.17 | 0.88  | 0.98  | 0.59  | 0.50  | 48.87 | 5.14  | 17.39  | 16.32 | 107.2 |
| 1928  | 4.15  | 1.99  | 1.05  | 0.85 | 0.62  | 0.51  | 9.36  | 10.19 | 10.11 | 30.38 | 24.95  | 5.76  | 99.9  |
| 1929  | 3.81  | 2.01  | 2.05  | 1.31 | 1.09  | 0.81  | 0.96  | 0.66  | 0.67  | 6.84  | 15.17  | 34.70 | 70.1  |
| 1930  | 5.54  | 3.35  | 1.39  | 0.90 | 0.76  | 0.53  | 7.71  | 16.28 | 3.56  | 6.85  | 55.87  | 18.30 | 121.0 |
| 1931  | 7.84  | 3.35  | 1.46  | 1.24 | 26.06 | 1.29  | 0.95  | 18.74 | 15.39 | 24.49 | 11.51  | 11.40 | 123.7 |
| 1932  | 4.64  | 2.22  | 1.14  | 0.96 | 0.92  | 0.67  | 0.52  | 6.99  | 31.58 | 37.42 | 18.07  | 6.24  | 111.4 |
| 1933  | 5.34  | 2.73  | 1.76  | 1.02 | 0.88  | 1.62  | 0.72  | 9.17  | 9.06  | 10.78 | 15.80  | 20.71 | 79.6  |
| 1934  | 16.22 | 6.37  | 2.15  | 1.06 | 0.92  | 1.26  | 5.85  | 10.98 | 6.78  | 28.78 | 25.54  | 15.88 | 121.8 |
| 1935  | 4.86  | 4.02  | 1.62  | 1.64 | 0.93  | 0.88  | 0.63  | 7.45  | 2.04  | 9.58  | 24.91  | 18.59 | 77.2  |
| 1936  | 4.81  | 2.52  | 7.80  | 1.29 | 0.92  | 2.14  | 3.53  | 13.54 | 33.51 | 50.84 | 10.73  | 5.13  | 136.8 |
| 1937  | 4.05  | 2.06  | 1.19  | 6.18 | 0.96  | 0.82  | 7.06  | 26.69 | 8.36  | 11.14 | 18.01  | 19.05 | 105.6 |
| 1938  | 5.43  | 3.01  | 1.40  | 1.00 | 6.12  | 0.80  | 2.83  | 19.67 | 4.08  | 7.39  | 31.37  | 11.96 | 95.1  |
| 1939  | 4.26  | 2.48  | 2.16  | 1.06 | 1.85  | 1.03  | 7.64  | 4.48  | 19.67 | 14.14 | 8.14   | 7.43  | 74.3  |
| 1940  | 5.01  | 6.57  | 1.90  | 3.04 | 0.98  | 0.82  | 13.47 | 43.76 | 47.85 | 9.55  | 29.05  | 50.86 | 212.9 |
| 1941  | 15.55 | 3.95  | 1.72  | 1.18 | 0.89  | 0.64  | 0.52  | 25.26 | 84.33 | 11.42 | 20.05  | 5.13  | 170.6 |
| 1942  | 4.86  | 2.28  | 1.41  | 1.88 | 0.94  | 1.46  | 2.22  | 3.16  | 16.97 | 39.27 | 43.33  | 21.92 | 139.7 |
| 1943  | 5.99  | 6.90  | 2.09  | 1.16 | 0.89  | 0.85  | 3.57  | 20.05 | 69.95 | 15.17 | 32.24  | 15.11 | 174.0 |
| 1944  | 6.04  | 5.09  | 2.15  | 1.12 | 0.86  | 0.62  | 2.67  | 35.51 | 56.15 | 36.36 | 28.21  | 5.50  | 180.3 |
| 1945  | 3.79  | 2.32  | 1.25  | 0.98 | 0.73  | 0.70  | 1.62  | 2.71  | 2.51  | 6.20  | 14.04  | 40.86 | 77.7  |
| 1946  | 6.74  | 3.20  | 1.29  | 0.95 | 0.71  | 3.29  | 0.66  | 2.60  | 2.46  | 40.88 | 16.61  | 5.86  | 85.3  |
| 1947  | 6.27  | 2.84  | 1.13  | 0.85 | 0.73  | 10.68 | 6.07  | 20.47 | 11.72 | 36.40 | 6.86   | 32.85 | 136.9 |
| 1948  | 8.24  | 3.58  | 1.46  | 1.02 | 0.78  | 0.56  | 3.39  | 4.61  | 10.39 | 20.31 | 25.43  | 20.20 | 100.0 |
| 1949  | 13.44 | 8.87  | 2.68  | 1.16 | 0.90  | 0.66  | 24.88 | 1.25  | 2.30  | 44.78 | 4.82   | 21.56 | 127.3 |
| 1950  | 6.17  | 11.44 | 3.02  | 4.34 | 1.10  | 0.82  | 10.07 | 5.82  | 51.02 | 27.87 | 16.72  | 14.25 | 152.6 |
| 1951  | 7.74  | 11.39 | 2.46  | 1.09 | 1.22  | 0.96  | 1.38  | 28.88 | 10.71 | 23.20 | 50.57  | 19.38 | 159.0 |
| 1952  | 7.09  | 11.61 | 2.48  | 1.13 | 0.88  | 0.64  | 35.30 | 36.20 | 7.15  | 46.33 | 22.43  | 4.98  | 176.2 |
| 1953  | 2.88  | 5.22  | 2.34  | 1.11 | 0.91  | 0.83  | 12.59 | 42.10 | 17.20 | 58.63 | 41.45  | 12.67 | 197.9 |
| 1954  | 6.22  | 3.18  | 2.68  | 1.18 | 8.48  | 0.96  | 2.34  | 1.79  | 24.04 | 40.47 | 77.05  | 6.59  | 175.0 |
| 1955  | 13.93 | 10.45 | 2.95  | 1.29 | 1.12  | 0.92  | 0.80  | 11.47 | 34.67 | 27.96 | 28.02  | 6.37  | 140.0 |
| 1956  | 4.76  | 2.30  | 1.10  | 0.88 | 22.79 | 3.71  | 1.93  | 45.45 | 56.32 | 55.62 | 34.35  | 12.33 | 241.5 |
| 1957  | 31.43 | 4.08  | 1.62  | 1.13 | 2.49  | 0.76  | 0.98  | 26.43 | 10.03 | 5.05  | 25.58  | 6.60  | 116.2 |
| 1958  | 6.17  | 4.36  | 1.58  | 0.90 | 0.98  | 0.63  | 15.50 | 79.82 | 6.31  | 5.26  | 25.82  | 5.86  | 153.2 |
| 1959  | 17.25 | 3.26  | 1.46  | 0.94 | 0.77  | 0.85  | 2.75  | 25.38 | 36.18 | 6.02  | 5.47   | 4.94  | 105.3 |
| 1960  | 3.43  | 1.78  | 0.99  | 2.45 | 0.78  | 0.71  | 1.71  | 11.61 | 13.34 | 15.02 | 28.80  | 33.11 | 113.7 |
| 1961  | 5.16  | 2.42  | 1.22  | 1.03 | 1.73  | 2.86  | 4.73  | 3.43  | 89.90 | 27.42 | 55.27  | 8.98  | 204.1 |
| 1962  | 28.95 | 5.11  | 2.03  | 1.20 | 0.91  | 0.67  | 0.51  | 0.44  | 10.30 | 20.35 | 65.13  | 5.53  | 141.1 |
| 1963  | 3.63  | 4.76  | 3.05  | 1.12 | 5.12  | 0.88  | 4.01  | 7.95  | 43.43 | 24.32 | 53.64  | 7.21  | 159.1 |
| 1964  | 9.14  | 5.94  | 0.37  | 0.00 | 2.18  | 2.69  | 8.41  | 14.94 | 10.62 | 9.72  | 23.92  | 9.01  | 96.9  |
| 1965  | 7.29  | 1.04  | 0.32  | 0.00 | 0.00  | 4.84  | 6.49  | 4.78  | 19.18 | 45.46 | 8.82   | 2.16  | 100.4 |
| 1966  | 2.94  | 1.94  | 0.85  | 0.66 | 0.29  | 0.17  | 6.55  | 10.58 | 55.91 | 2.83  | 13.14  | 4.22  | 100.1 |
| 1967  | 12.38 | 5.69  | 2.62  | 0.00 | 0.00  | 0.12  | 4.34  | 40.95 | 20.50 | 17.90 | 17.17  | 3.99  | 125.7 |
| 1968  | 35.09 | 7.14  | 4.96  | 2.79 | 0.68  | 0.36  | 6.39  | 6.45  | 6.51  | 8.90  | 14.75  | 17.32 | 111.3 |
| 1969  | 14.85 | 7.43  | 4.61  | 2.92 | 2.15  | 2.46  | 2.66  | 11.74 | 13.71 | 20.35 | 24.26  | 19.23 | 126.4 |
| 1970  | 9.23  | 6.52  | 5.18  | 3.40 | 1.47  | 5.11  | 3.00  | 6.73  | 9.79  | 31.75 | 18.71  | 7.74  | 108.6 |
| 1971  | 6.22  | 3.97  | 1.02  | 0.49 | 0.40  | 0.00  | 1.92  | 15.46 | 13.97 | 8.83  | 13.93  | 11.28 | 77.5  |
| 1972  | 7.39  | 4.54  | 4.02  | 0.58 | 0.38  | 3.64  | 0.00  | 4.67  | 4.83  | 44.53 | 20.39  | 13.77 | 108.8 |
| 1973  | 9.17  | 6.33  | 4.64  | 0.75 | 0.59  | 0.34  | 0.00  | 6.53  | 0.91  | 11.78 | 111.19 | 16.42 | 168.6 |
| 1974  | 11.41 | 9.15  | 6.61  | 4.43 | 1.38  | 1.19  | 10.14 | 0.00  | 11.20 | 20.27 | 20.28  | 7.75  | 103.8 |
| 1975  | 12.02 | 6.81  | 3.87  | 0.88 | 0.79  | 0.44  | 2.25  | 5.64  | 63.51 | 32.20 | 9.20   | 7.97  | 145.6 |
| 1976  | 7.05  | 38.33 | 12.78 | 9.84 | 4.50  | 4.14  | 8.55  | 58.76 | 58.97 | 60.12 | 47.08  | 12.86 | 323.0 |
| 1977  | 9.19  | 4.70  | 7.22  | 2.94 | 2.02  | 3.11  | 7.66  | 7.53  | 6.31  | 5.20  | 1.63   | 19.45 | 77.0  |
| 1978  | 8.19  | 4.81  | 1.58  | 0.00 | 2.15  | 1.59  | 1.79  | 11.18 | 30.30 | 10.65 | 17.25  | 18.61 | 108.1 |
| 1979  | 18.24 | 6.05  | 1.86  | 3.65 | 1.02  | 0.46  | 6.29  | 14.42 | 13.49 | 8.31  | 15.03  | 4.02  | 92.8  |
| 1980  | 6.95  | 18.51 | 11.53 | 1.66 | 3.99  | 3.19  | 4.14  | 5.11  | 7.81  | 25.20 | 14.36  | 31.57 | 134.0 |
| 1981  | 0.00  | 5.03  | 1.19  | 1.65 | 0.64  | 1.27  | 24.60 | 7.47  | 12.54 | 19.61 | 9.97   | 6.35  | 90.3  |
| 1982  | 11.34 | 4.42  | 2.01  | 0.54 | 2.42  | 2.51  | 1.22  | 3.99  | 92.45 | 52.49 | 5.29   | 4.94  | 183.6 |
| 1983  | 6.18  | 5.37  | 0.00  | 0.00 | 0.00  | 0.00  | 4.15  | 72.99 | 9.97  | 34.50 | 14.47  | 46.70 | 194.3 |
| 1984  | 16.19 | 5.69  | 3.20  | 4.33 | 2.97  | 16.16 | 8.79  | 11.82 | 30.91 | 48.28 | 47.04  | 11.88 | 207.2 |
| 1985  | 6.58  | 0.27  | 2.53  | 1.19 | 0.69  | 4.14  | 8.85  | 18.89 | 24.75 | 28.11 | 49.74  | 13.32 | 159.1 |
| 1986  | 6.05  | 4.71  | 1.51  | 1.81 | 0.54  | 0.49  | 2.84  | 37.06 | 35.37 | 17.96 | 29.23  | 12.85 | 150.4 |
| 1987  | 6.56  | 4.30  | 4.16  | 0.81 | 0.64  | 0.36  | 9.72  | 10.36 | 27.77 | 16.06 | 13.70  | 20.10 | 114.5 |
| 1988  | 6.97  | 5.03  | 1.81  | 0.76 | 1.86  | 0.51  | 7.49  | 14.46 | 19.60 | 23.37 | 38.44  | 57.25 | 186.6 |
| 1989  | 11.89 | 8.86  | 4.68  | 1.96 | 2.59  | 1.44  | 35.02 | 20.18 | 33.88 | 56.90 | 19.91  | 6.69  | 204.0 |
| 1990  | 4.85  | 3.94  | 2.85  | 0.00 | 0.00  | 0.96  | 2.26  | 12.68 | 35.81 | 70.98 | 13.52  | 20.05 | 167.9 |
| AVE : | 9.00  | 5.58  | 2.64  | 1.56 | 2.12  | 1.85  | 5.93  | 16.51 | 24.07 | 24.85 | 25.92  | 14.83 | 134.9 |
| SD :  | 6.57  | 5.11  | 2.30  | 1.57 | 4.24  | 2.63  | 7.23  | 16.64 | 22.74 | 16.98 | 18.94  | 11.67 | 47.3  |

## Appendix B3.12

File : H1H6CUM.PRS  
Units : 10<sup>6</sup>m<sup>3</sup>  
Descrip. : Cumulative Present Day (2000) Flow at H1H006 for 1927 to 1990

| Year  | Oct   | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May    | Jun    | Jul    | Aug    | Sep    | Total |
|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|-------|
| 1927  | 5.22  | 12.93 | 2.94  | 0.94  | 0.11  | 0.15  | 0.27  | 0.47   | 86.86  | 11.09  | 26.07  | 22.60  | 169.7 |
| 1928  | 7.63  | 2.70  | 3.02  | 1.54  | 0.09  | 0.10  | 9.83  | 12.02  | 17.20  | 52.47  | 44.08  | 12.26  | 162.9 |
| 1929  | 5.53  | 2.92  | 3.19  | 1.87  | 0.22  | 0.16  | 0.42  | 0.57   | 0.54   | 6.71   | 14.94  | 54.60  | 91.7  |
| 1930  | 12.25 | 4.76  | 3.09  | 1.17  | 0.10  | 0.11  | 8.38  | 26.26  | 6.33   | 11.05  | 95.31  | 34.33  | 203.1 |
| 1931  | 15.78 | 4.60  | 3.12  | 1.88  | 41.77 | 0.34  | 0.43  | 21.82  | 24.92  | 41.85  | 21.90  | 19.04  | 197.4 |
| 1932  | 8.53  | 2.29  | 2.88  | 1.71  | 0.13  | 0.15  | 0.24  | 11.71  | 59.76  | 82.89  | 37.97  | 14.10  | 222.4 |
| 1933  | 8.98  | 3.22  | 2.94  | 1.96  | 0.12  | 0.27  | 0.31  | 11.49  | 13.31  | 16.36  | 19.78  | 32.34  | 111.1 |
| 1934  | 33.50 | 12.46 | 2.90  | 1.52  | 0.11  | 0.21  | 6.75  | 14.90  | 12.86  | 42.59  | 44.66  | 25.61  | 198.1 |
| 1935  | 8.88  | 5.20  | 2.93  | 1.87  | 0.13  | 0.16  | 0.26  | 11.99  | 3.67   | 15.32  | 43.01  | 37.86  | 131.3 |
| 1936  | 12.56 | 3.66  | 11.51 | 1.64  | 0.10  | 0.93  | 3.58  | 17.68  | 61.49  | 100.37 | 28.10  | 9.00   | 250.6 |
| 1937  | 5.79  | 3.21  | 2.84  | 5.12  | 0.15  | 0.12  | 9.66  | 41.69  | 14.68  | 17.61  | 27.99  | 29.78  | 158.6 |
| 1938  | 11.09 | 3.85  | 2.85  | 1.52  | 4.16  | 0.16  | 0.95  | 28.07  | 6.50   | 12.05  | 45.86  | 20.02  | 137.1 |
| 1939  | 7.04  | 2.66  | 3.32  | 1.87  | 0.30  | 0.18  | 10.02 | 4.90   | 30.43  | 21.63  | 11.44  | 8.90   | 102.7 |
| 1940  | 6.70  | 7.69  | 2.98  | 2.59  | 0.18  | 0.12  | 20.25 | 92.26  | 93.31  | 28.70  | 50.20  | 103.04 | 408.0 |
| 1941  | 35.63 | 7.91  | 2.99  | 2.78  | 0.10  | 0.10  | 0.27  | 37.20  | 192.20 | 29.92  | 32.70  | 9.01   | 350.8 |
| 1942  | 6.93  | 3.21  | 2.86  | 1.95  | 0.19  | 0.26  | 0.45  | 1.55   | 21.41  | 73.60  | 90.88  | 42.84  | 246.1 |
| 1943  | 15.16 | 11.24 | 3.08  | 2.31  | 0.09  | 0.15  | 2.29  | 38.17  | 144.52 | 31.19  | 59.38  | 29.58  | 337.2 |
| 1944  | 13.20 | 8.26  | 3.04  | 2.26  | 0.09  | 0.11  | 1.64  | 81.31  | 120.33 | 77.53  | 63.63  | 16.21  | 387.6 |
| 1945  | 6.80  | 2.76  | 3.14  | 2.33  | 0.10  | 0.15  | 0.37  | 1.84   | 2.97   | 6.84   | 17.28  | 72.16  | 116.7 |
| 1946  | 16.52 | 4.72  | 2.98  | 1.19  | 0.10  | 2.62  | 0.45  | 1.74   | 2.14   | 75.38  | 28.06  | 10.42  | 146.3 |
| 1947  | 10.49 | 3.73  | 2.77  | 1.10  | 0.13  | 16.78 | 9.31  | 32.31  | 19.89  | 65.32  | 17.32  | 58.08  | 237.2 |
| 1948  | 19.39 | 5.48  | 3.24  | 2.29  | 0.10  | 0.10  | 2.68  | 4.26   | 13.49  | 30.89  | 38.42  | 35.07  | 155.4 |
| 1949  | 25.21 | 15.73 | 3.29  | 1.79  | 0.10  | 0.11  | 42.86 | 1.64   | 2.30   | 83.82  | 11.61  | 43.73  | 232.2 |
| 1950  | 15.72 | 18.08 | 3.33  | 3.24  | 0.13  | 0.11  | 11.38 | 5.24   | 87.58  | 43.28  | 29.47  | 20.99  | 238.6 |
| 1951  | 12.82 | 15.66 | 3.06  | 1.89  | 0.11  | 0.14  | 0.37  | 50.39  | 19.27  | 44.51  | 91.31  | 35.80  | 275.3 |
| 1952  | 13.82 | 20.12 | 3.18  | 2.03  | 0.10  | 0.10  | 63.65 | 58.52  | 15.01  | 86.05  | 43.78  | 10.52  | 316.9 |
| 1953  | 5.98  | 6.73  | 3.17  | 2.10  | 0.11  | 0.13  | 19.14 | 103.42 | 32.18  | 130.54 | 85.08  | 28.27  | 416.9 |
| 1954  | 12.52 | 4.15  | 3.55  | 2.81  | 10.43 | 0.26  | 0.61  | 0.95   | 37.27  | 79.41  | 162.68 | 23.41  | 338.1 |
| 1955  | 28.05 | 14.99 | 3.35  | 2.49  | 0.12  | 0.13  | 0.26  | 13.51  | 51.73  | 49.55  | 46.08  | 12.60  | 222.9 |
| 1956  | 6.11  | 2.56  | 3.02  | 1.92  | 26.19 | 2.75  | 0.53  | 71.53  | 107.71 | 106.01 | 73.24  | 27.33  | 428.9 |
| 1957  | 50.06 | 7.64  | 3.44  | 2.79  | 0.52  | 0.14  | 0.32  | 31.06  | 14.14  | 7.36   | 29.88  | 8.71   | 156.1 |
| 1958  | 7.37  | 4.22  | 2.80  | 1.17  | 0.13  | 0.19  | 23.45 | 151.58 | 16.97  | 8.59   | 40.15  | 12.83  | 269.5 |
| 1959  | 25.14 | 4.82  | 2.87  | 1.56  | 0.09  | 0.22  | 1.01  | 32.63  | 59.94  | 14.52  | 8.03   | 5.01   | 155.8 |
| 1960  | 3.09  | 2.63  | 2.98  | 1.71  | 0.12  | 0.16  | 0.57  | 11.98  | 19.98  | 25.27  | 46.06  | 56.99  | 171.5 |
| 1961  | 13.55 | 3.13  | 2.80  | 1.14  | 0.13  | 0.98  | 4.81  | 3.22   | 157.69 | 50.09  | 112.73 | 24.63  | 374.9 |
| 1962  | 60.33 | 12.73 | 3.40  | 2.54  | 0.11  | 0.11  | 0.26  | 0.48   | 13.55  | 33.70  | 139.88 | 18.42  | 285.5 |
| 1963  | 7.45  | 6.65  | 3.09  | 1.55  | 2.98  | 0.13  | 2.32  | 7.17   | 65.71  | 39.34  | 81.97  | 19.65  | 238.0 |
| 1964  | 13.19 | 12.64 | 3.08  | 1.78  | 0.31  | 2.86  | 9.52  | 20.56  | 13.13  | 12.75  | 26.95  | 11.32  | 128.1 |
| 1965  | 10.10 | 2.88  | 2.75  | 0.75  | 0.09  | 3.53  | 5.00  | 3.64   | 22.77  | 71.14  | 18.08  | 7.99   | 148.7 |
| 1966  | 8.10  | 3.23  | 2.87  | 1.26  | 0.09  | 0.10  | 5.54  | 11.37  | 125.08 | 18.44  | 22.17  | 10.23  | 208.5 |
| 1967  | 18.27 | 8.65  | 3.41  | 2.44  | 0.10  | 0.11  | 3.85  | 70.40  | 38.00  | 35.64  | 35.49  | 9.69   | 226.0 |
| 1968  | 73.95 | 7.83  | 3.80  | 2.06  | 0.11  | 0.11  | 5.96  | 7.42   | 8.09   | 11.09  | 19.66  | 24.70  | 164.8 |
| 1969  | 24.50 | 7.85  | 4.58  | 1.75  | 1.22  | 1.90  | 2.24  | 12.52  | 47.15  | 41.50  | 51.98  | 36.38  | 233.6 |
| 1970  | 13.58 | 7.71  | 5.35  | 2.36  | 0.57  | 3.33  | 2.45  | 7.69   | 8.73   | 49.27  | 30.01  | 8.82   | 139.9 |
| 1971  | 8.19  | 3.62  | 2.77  | 0.84  | 0.11  | 0.11  | 0.47  | 17.70  | 18.46  | 13.63  | 22.73  | 13.71  | 102.3 |
| 1972  | 8.48  | 3.88  | 3.48  | 1.65  | 0.10  | 2.20  | 0.27  | 4.55   | 5.51   | 83.09  | 32.71  | 18.10  | 164.0 |
| 1973  | 11.12 | 5.83  | 3.42  | 1.57  | 0.11  | 0.12  | 0.21  | 5.79   | 34.42  | 17.20  | 302.76 | 39.63  | 422.2 |
| 1974  | 18.94 | 13.34 | 6.10  | 4.39  | 0.18  | 0.20  | 11.90 | 61.06  | 17.98  | 35.81  | 40.54  | 8.58   | 219.0 |
| 1975  | 19.30 | 7.85  | 3.06  | 1.49  | 0.11  | 0.14  | 1.30  | 5.77   | 137.00 | 51.06  | 16.10  | 7.31   | 250.5 |
| 1976  | 8.35  | 72.65 | 23.80 | 12.21 | 2.21  | 3.14  | 10.91 | 153.07 | 123.13 | 201.51 | 155.07 | 25.58  | 791.6 |
| 1977  | 15.07 | 7.44  | 7.91  | 2.68  | 0.82  | 1.02  | 8.36  | 10.21  | 7.27   | 6.32   | 26.06  | 29.15  | 122.3 |
| 1978  | 11.11 | 4.17  | 2.83  | 0.46  | 0.31  | 0.33  | 1.07  | 11.38  | 49.36  | 17.04  | 22.33  | 28.26  | 148.7 |
| 1979  | 27.80 | 6.10  | 3.09  | 3.04  | 0.13  | 0.12  | 5.76  | 17.06  | 20.35  | 10.02  | 20.84  | 8.05   | 122.4 |
| 1980  | 6.97  | 30.46 | 14.01 | 13.67 | 1.72  | 1.54  | 3.59  | 5.68   | 8.57   | 40.47  | 46.99  | 61.86  | 235.5 |
| 1981  | 14.05 | 10.44 | 3.01  | 2.36  | 0.13  | 0.27  | 38.19 | 8.36   | 16.97  | 25.04  | 14.32  | 4.28   | 137.4 |
| 1982  | 15.32 | 3.65  | 2.87  | 1.23  | 0.30  | 1.06  | 0.47  | 45.85  | 125.08 | 97.64  | 24.27  | 18.42  | 336.2 |
| 1983  | 8.10  | 4.93  | 2.76  | 1.89  | 0.09  | 4.70  | 4.33  | 156.13 | 13.01  | 55.16  | 21.86  | 80.07  | 353.0 |
| 1984  | 32.44 | 6.16  | 7.40  | 6.35  | 0.50  | 21.25 | 11.49 | 15.47  | 50.80  | 88.86  | 80.33  | 20.81  | 341.9 |
| 1985  | 10.29 | 4.13  | 3.33  | 2.54  | 0.59  | 1.65  | 10.77 | 25.92  | 34.42  | 46.05  | 96.22  | 23.69  | 259.6 |
| 1986  | 8.79  | 4.36  | 2.90  | 1.56  | 0.11  | 0.11  | 2.39  | 62.59  | 61.15  | 30.36  | 50.57  | 18.56  | 243.4 |
| 1987  | 10.43 | 3.92  | 3.52  | 1.83  | 0.09  | 0.20  | 11.52 | 11.48  | 51.12  | 26.79  | 22.56  | 32.14  | 175.6 |
| 1988  | 10.75 | 5.13  | 2.85  | 1.39  | 0.43  | 8.73  | 9.29  | 17.05  | 26.35  | 37.03  | 64.33  | 96.20  | 279.5 |
| 1989  | 21.69 | 13.84 | 3.74  | 2.63  | 0.58  | 0.49  | 38.15 | 39.69  | 54.47  | 97.37  | 40.59  | 9.57   | 322.8 |
| 1990  | 6.78  | 3.75  | 2.83  | 1.92  | 0.11  | 0.16  | 1.11  | 14.07  | 60.65  | 146.85 | 39.60  | 50.93  | 328.8 |
| AVE : | 15.57 | 8.21  | 3.96  | 2.38  | 1.58  | 1.38  | 7.29  | 29.06  | 44.20  | 47.20  | 50.09  | 27.34  | 238.3 |
| SD :  | 12.76 | 9.69  | 3.17  | 2.13  | 6.20  | 3.53  | 11.61 | 36.62  | 44.67  | 38.07  | 46.62  | 21.25  | 114.8 |

## APPENDIX B4.1

SUB-CATCHMENT : H1H007  
RIVER : Wit  
PLACE : Drosterkloof

### 1 CATCHMENT

|                     | YEAR  |       |       |       | UNITS |
|---------------------|-------|-------|-------|-------|-------|
|                     | 1961  | 1980  | 1990  | 2000  |       |
| SUB-CATCHMENT AREAS |       |       |       |       |       |
| H1H011              | 28.00 | 28.00 | 28.00 | 28.00 | km²   |
| H1H007              | 56.00 | 56.00 | 56.00 | 56.00 | km²   |

### 2 LANDUSE

|                     | YEAR           |      |      |       | UNITS |
|---------------------|----------------|------|------|-------|-------|
|                     | 1961           | 1980 | 1990 | 2000  |       |
| ALIEN VEGETATION    |                |      |      |       |       |
| H1H011 tall trees   | 0.04           | 0.07 | 0.14 | 0.34  | km²   |
| H1H007 tall trees   | 0.87           | 1.26 | 2.78 | 6.75  | km²   |
| H1H007 tall shrubs  | 0.69           | 0.99 | 2.18 | 5.30  | km²   |
| Total               | 1.60           | 2.31 | 5.10 | 12.39 | km²   |
| FARM DAM CAPACITIES | not applicable |      |      |       |       |
| IRRIGATION AREAS    | not applicable |      |      |       |       |

### 3 EVAPORATION

|                       | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) | 186  | 256  | 306  | 318  | 268  | 222  | 132  | 77   | 58   | 57   | 76   | 115  | 2071      |
| S-PAN (gross) (in mm) | 139  | 194  | 239  | 249  | 209  | 172  | 95   | 50   | 36   | 34   | 51   | 83   | 1551      |
| LAKE FACTOR           | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)    | 113  | 159  | 198  | 209  | 184  | 151  | 84   | 44   | 31   | 28   | 41   | 67   | 1309      |

**Note : evaporation from BRHS used for this sub-catchment**

### 4 RESERVOIR SIMULATIONS

not applicable

### 5 IRRIGATION ROUTINE

not applicable

### 6. NOTES

Catchment modelled using two different MAPs

H1H011 MAP = 2260 mm

H1H007 MAP = 2080 mm



## Appendix B4.2

File : H1H007.OBS  
 Units : 10<sup>6</sup>m<sup>3</sup>  
 Descrip. : Observed flow record at H1H007 for 1961 to 1990

| Year  | Oct    | Nov    | Dec    | Jan    | Feb   | Mar    | Apr    | May    | Jun    | Jul    | Aug     | Sep    | Total |
|-------|--------|--------|--------|--------|-------|--------|--------|--------|--------|--------|---------|--------|-------|
| 1961  | 2.12+  | 1.10+  | 0.60+  | 0.43+  | 0.89+ | 1.12+  | 2.77+  | 2.80+  | 60.04* | 19.28* | 34.14   | 9.21   | 134.5 |
| 1962  | 21.83* | 4.74   | 0.95   | 0.45   | 0.29  | 0.31   | 0.31   | 1.78   | 9.97   | 25.53* | 43.27*  | 14.11  | 123.5 |
| 1963  | 2.87   | 4.34   | 2.75   | 0.48   | 10.47 | 1.33   | 1.42   | 9.20   | 19.56  | 13.71  | 33.79+  | 8.69+  | 108.6 |
| 1964  | 12.32  | 8.35   | 1.13   | 2.14   | 2.06  | 9.84   | 12.24  | 15.74* | 10.08  | 10.42  | 22.71   | 7.16   | 114.2 |
| 1965  | 5.34   | 1.58   | 1.77   | 0.51   | 0.32  | 8.47   | 5.24   | 4.12   | 24.69* | 41.69* | 14.11   | 11.98  | 119.8 |
| 1966  | 2.48   | 0.67   | 1.13   | 1.35   | 0.20  | 0.28   | 10.71  | 13.13  | 44.21* | 16.13  | 10.44   | 8.52   | 109.3 |
| 1967  | 12.41  | 5.28   | 1.42   | 2.10   | 0.87  | 0.09   | 8.41   | 37.98  | 16.56  | 55.14* | 32.63   | 5.39   | 178.3 |
| 1968  | 16.38  | 1.13   | 1.42   | 5.26   | 1.28  | 0.29   | 5.85   | 3.98   | 15.08  | 13.65  | 23.07   | 16.37  | 103.8 |
| 1969  | 14.18  | 2.02   | 0.54   | 0.32   | 0.30  | 0.34   | 0.29   | 19.23  | 33.78* | 21.60  | 32.72*  | 13.68  | 139.0 |
| 1970  | 4.54   | 2.59   | 3.02   | 0.59   | 0.34  | 0.76   | 1.00   | 3.72   | 9.06   | 24.16  | 26.35   | 5.65   | 81.8  |
| 1971  | 2.80   | 0.74   | 0.66   | 0.84   | 1.37  | 0.29   | 0.50   | 20.70+ | 10.47+ | 8.44   | 12.68   | 13.99  | 73.5  |
| 1972  | 2.91   | 0.71   | 2.81*  | 0.46   | 0.30  | 4.50   | 0.42   | 2.41   | 2.48   | 48.85* | 13.57   | 9.02   | 88.4  |
| 1973  | 5.25   | 1.62   | 7.11   | 0.57   | 0.36  | 0.39   | 0.34   | 6.17   | 26.63  | 9.59   | 100.65* | 10.63  | 169.3 |
| 1974  | 10.97  | 3.29   | 1.02   | 0.83   | 0.49  | 0.46   | 6.27   | 27.85  | 13.66  | 26.44* | 15.84   | 2.54   | 109.7 |
| 1975  | 7.65   | 2.23   | 1.04   | 0.41   | 0.31  | 0.37   | 0.61   | 2.16   | 60.04* | 24.22* | 10.06+  | 8.08+  | 117.2 |
| 1976  | 2.73   | 33.03+ | 11.39+ | 4.20+  | 1.16  | 1.05   | 6.61+  | 64.47+ | 58.37  | 53.93* | 38.69*  | 8.91   | 284.5 |
| 1977  | 5.80   | 1.21   | 4.53   | 0.65   | 0.58  | 0.89   | 8.25*  | 17.96  | 2.47   | 1.61   | 35.81*  | 14.86  | 94.6  |
| 1978  | 5.63   | 3.15   | 1.54   | 1.26   | 1.92  | 2.43   | 2.57   | 16.41* | 25.12* | 11.23  | 16.70   | 7.96   | 95.9  |
| 1979  | 22.08  | 1.99   | 0.60   | 1.88   | 0.76  | 0.40   | 9.44   | 22.63* | 21.36* | 8.65   | 13.23   | 6.03   | 109.1 |
| 1980  | 4.98   | 15.72  | 5.92   | 11.20* | 1.10  | 1.31   | 2.27   | 2.79   | 12.40  | 30.95* | 22.40   | 24.08  | 135.1 |
| 1981  | 2.69   | 1.65   | 1.36   | 2.08   | 0.46  | 0.62+  | 13.63+ | 5.03   | 18.34  | 12.52  | 14.92   | 4.91   | 78.2  |
| 1982  | 9.41   | 3.04   | 6.26   | 0.95+  | 2.50  | 4.28   | 1.58   | 34.72* | 41.19* | 24.67  | 12.19   | 14.75  | 155.5 |
| 1983  | 2.08   | 1.06   | 1.02   | 0.56   | 0.34  | 2.86   | 2.66   | 57.05* | 14.51+ | 12.98+ | 11.21*  | 28.81+ | 135.1 |
| 1984  | 11.19  | 0.96   | 6.37   | 4.71   | 2.12+ | 12.52+ | 8.33+  | 7.10+  | 26.76+ | 39.62+ | 22.72+  | 9.89+  | 152.3 |
| 1985  | 2.77   | 1.50   | 0.57   | 0.82   | 0.32  | 2.79   | 13.99  | 19.30  | 26.42  | 33.78* | 46.05*  | 15.56  | 163.9 |
| 1986  | 1.76   | 1.22   | 0.66   | 5.16   | 0.64  | 0.76+  | 2.88+  | 27.79* | 28.32  | 22.14* | 23.42   | 16.31  | 131.1 |
| 1987  | 3.47   | 1.33   | 6.23   | 0.91   | 0.37  | 0.43   | 10.28  | 19.56* | 18.11* | 23.03  | 18.19   | 19.15  | 121.1 |
| 1988  | 3.94   | 3.17   | 0.73   | 0.39   | 0.91  | 11.33  | 4.31   | 15.39  | 16.75  | 30.16* | 24.72*  | 20.65* | 132.4 |
| 1989  | 5.82   | 4.68   | 0.90   | 0.46   | 1.81  | 0.69   | 21.52* | 16.59  | 23.67* | 47.13* | 18.75*  | 4.40   | 146.4 |
| 1990  | 1.18   | 1.09   | 3.24   | 0.79   | 0.93  | 1.01   | 1.14   | 21.72* | 31.89* | 36.03* | 17.36   | 27.30* | 143.7 |
| AVE : | 6.99   | 3.84   | 2.62   | 1.76   | 1.19  | 2.41   | 5.53   | 17.32  | 24.07  | 24.91  | 25.41   | 12.29  | 128.3 |
| SD :  | 5.76   | 6.27   | 2.66   | 2.31   | 1.87  | 3.48   | 5.26   | 15.48  | 15.56  | 14.36  | 17.45   | 6.67   | 39.8  |

## Average Rainfall On Catchment H1H007.ra

## details of rainfall stations used

022038\_8.pat 1920 to 1998

022368\_4.pat 1932 to 1977

22284a.pat 1970 to 1983

042357\_a.pat 1924 to 1998

| no. gauges                       |   | oct    | nov   | dec   | jan   | feb   | mar   | apr   | may    | jun    | jul    | aug    | sep   | year   |
|----------------------------------|---|--------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|-------|--------|
| rainfall input as percent m.a.p. |   |        |       |       |       |       |       |       |        |        |        |        |       |        |
| 1920                             | 1 | 3.86+  | 3.86+ | 3.86+ | 4.02  | 6.89  | 1.73  | 9.35  | 1.66   | 38.65  | 16.35  | 13.65  | 6.10  | 110.00 |
| 1921                             | 1 | 4.23   | 3.22  | 6.39  | 8.97  | 3.22  | 6.51  | 6.96  | 11.36  | 19.95  | 8.00   | 17.76  | 3.93  | 100.50 |
| 1922                             | 1 | 3.00   | 3.33  | .33   | 2.66  | .34   | 1.19  | 12.50 | 31.10  | 25.19  | 13.58  | 13.37  | 10.07 | 116.66 |
| 1923                             | 1 | 5.25   | 15.13 | 3.96  | 3.13  | .37   | 3.07  | 3.05  | 8.04   | 20.50  | 8.17   | 17.13  | 9.00  | 96.80  |
| 1924                             | 2 | 10.44+ | 7.87+ | .16+  | 2.74+ | .85+  | .67+  | 1.25+ | 8.04+  | 38.82  | 24.28+ | 5.55+  | 2.82  | 103.49 |
| 1925                             | 2 | 12.84  | 6.10  | .75   | .50   | 4.10  | .00   | 1.49  | 15.37  | 3.71   | 13.59  | 8.61   | 4.29+ | 71.36  |
| 1926                             | 2 | 15.77  | 2.42  | .00+  | 1.34  | 6.12+ | .09   | 6.84  | 11.06+ | 10.42  | 5.67   | 19.99+ | 4.04  | 83.76  |
| 1927                             | 2 | .41    | 10.39 | 2.92+ | 2.91  | .00   | 3.68  | 1.81  | .29    | 25.88  | 6.46   | 11.08+ | 9.59  | 75.44  |
| 1928                             | 2 | 1.11   | 1.75  | 2.03  | .00   | 1.02  | 2.56  | 10.39 | 16.08  | 11.05  | 17.54  | 10.72  | 3.79  | 78.04  |
| 1929                             | 2 | 1.81   | 2.21  | 4.26  | 3.11  | 2.05  | 1.99  | 4.16  | .89    | 1.35   | 9.43   | 12.81  | 18.69 | 62.75  |
| 1930                             | 2 | 4.41   | 4.15  | 1.36  | .00   | 3.30  | .00   | 12.33 | 13.51  | 5.14   | 7.57   | 24.10  | 12.55 | 88.42  |
| 1931                             | 2 | 7.34   | .45   | 2.16  | 3.34  | 17.01 | 2.17  | 1.83  | 17.91  | 13.95  | 11.45  | 8.72   | 9.13  | 95.46  |
| 1932                             | 3 | 2.49   | .76   | 2.87  | 2.34  | 3.52  | 1.99  | 1.03  | 10.07  | 27.95  | 19.55  | 8.81   | 3.88  | 85.26  |
| 1933                             | 3 | 7.94   | .87   | 3.33  | .93   | 2.07  | 5.67  | 1.95  | 11.78  | 8.96   | 8.00   | 9.01   | 10.54 | 71.03  |
| 1934                             | 3 | 9.50   | 5.83  | .30   | .56   | 2.47  | 4.07  | 9.33  | 12.26  | 7.53   | 14.55  | 13.43  | 10.07 | 89.88  |
| 1935                             | 3 | 2.07   | 5.28  | .44   | 5.72  | 1.39  | 2.32  | .66   | 9.56   | 4.60   | 12.33  | 15.04  | 10.34 | 69.76  |
| 1936                             | 3 | 2.55   | 3.25  | 9.00  | 1.21  | .02   | 9.40  | 7.40  | 13.85  | 24.18  | 22.13  | 5.63   | 2.33  | 100.95 |
| 1937                             | 3 | 3.32   | .43   | 1.86  | 9.88  | 2.17  | 1.06  | 10.97 | 18.37  | 8.38   | 9.59   | 9.77   | 10.36 | 86.17  |
| 1938                             | 3 | 3.75   | 2.52  | 1.24  | .74   | 6.63  | 1.02  | 7.24  | 15.69  | 5.08   | 8.01   | 16.47  | 8.81  | 77.19  |
| 1939                             | 3 | 1.04   | 4.63  | 3.19  | .53   | 5.01  | 3.38  | 12.08 | 9.72   | 15.47  | 7.09   | 5.99   | 7.53  | 75.65  |
| 1940                             | 3 | 3.24   | 9.30  | 1.08  | 5.92  | 2.07  | .39   | 13.92 | 28.87  | 25.09  | 14.37  | 16.55  | 29.06 | 149.85 |
| 1941                             | 3 | 7.86   | 1.27  | 2.56  | 1.59  | .12   | .18   | 2.18  | 23.03  | 45.08  | 7.01   | 12.75  | 1.90  | 105.53 |
| 1942                             | 3 | 4.68   | .52   | 1.82  | 5.25  | 2.17  | 6.37  | 5.30  | 6.42   | 13.54  | 19.40  | 20.38  | 11.80 | 97.64  |
| 1943                             | 3 | 4.14   | 9.39  | .00   | 3.12  | .01   | 3.12  | 6.47  | 18.14  | 31.55  | 10.81  | 16.85  | 8.44  | 112.04 |
| 1944                             | 3 | 5.74   | 6.58  | 5.08  | .00   | .03   | .81   | 6.51  | 22.13  | 32.00  | 22.50  | 15.71  | 1.19  | 118.28 |
| 1945                             | 3 | 3.09   | 2.68  | 2.34  | .27   | .06   | 3.30  | 9.37  | 9.80   | 5.59   | 9.24   | 14.85  | 19.73 | 80.32  |
| 1946                             | 3 | 8.13   | 1.78  | 1.34  | .00   | .00   | 8.03  | 3.21  | 8.85   | 5.48   | 27.15  | 10.67  | 4.04  | 78.68  |
| 1947                             | 3 | 5.47   | 2.10  | .20   | .46   | 1.67  | 7.97  | 6.44  | 15.98  | 7.89   | 19.48  | 7.77   | 19.24 | 94.67  |
| 1948                             | 3 | 8.92   | 1.34  | 2.29  | .62   | .03   | 1.12  | 9.13  | 8.24   | 11.40  | 14.12  | 14.65  | 9.96  | 81.81  |
| 1949                             | 3 | 8.42   | 9.32  | 2.03  | .21   | .00   | .91   | 16.54 | 1.86   | 7.24   | 27.22  | 1.21   | 14.87 | 89.85  |
| 1950                             | 3 | 3.68   | 10.45 | 3.93  | 4.77  | .08   | .03   | 19.77 | 9.93   | 29.00  | 14.07  | 10.33  | 8.51  | 114.55 |
| 1951                             | 3 | 6.39   | 10.53 | .31   | .39   | 2.91  | 3.02  | 5.09  | 21.55  | 9.14   | 13.46  | 27.06  | 16.57 | 116.43 |
| 1952                             | 3 | 5.90   | 11.80 | .66   | .69   | .53   | 1.46  | 26.63 | 27.72  | 8.32   | 21.66  | 15.85  | 1.05+ | 122.27 |
| 1953                             | 3 | 2.02+  | 6.67+ | 3.35+ | 1.48  | 1.88  | 3.30  | 14.51 | 31.98  | 12.09  | 31.92  | 20.98  | 7.57  | 137.74 |
| 1954                             | 3 | 7.81   | 1.28  | 6.60  | .05   | 9.06  | 1.42  | 5.99  | 4.24   | 18.16  | 25.71  | 34.26  | 4.41  | 118.98 |
| 1955                             | 3 | 12.24  | 6.78  | 3.35  | .74   | 1.91  | 2.76  | 4.42  | 15.42  | 23.94  | 17.27  | 19.19  | 4.09  | 112.13 |
| 1956                             | 3 | 3.83   | .58   | 2.54  | 1.11  | 16.97 | 5.31  | 5.02  | 28.40  | 26.03  | 27.22  | 15.19  | 7.90  | 140.13 |
| 1957                             | 3 | 16.28  | 1.09  | .00   | 1.25  | 8.32  | 1.56  | 4.15  | 19.77  | 10.49  | 2.27   | 10.38  | 5.16  | 80.72  |
| 1958                             | 3 | 6.53   | 5.57  | .00   | 1.47  | 2.97  | 2.66  | 15.90 | 45.83  | 3.45   | 2.31   | 13.94  | 4.32  | 104.92 |
| 1959                             | 3 | 11.41  | .28   | 2.56  | .44   | 1.63  | 4.75  | 7.63  | 17.75  | 22.75  | 3.94   | 3.99   | 3.81  | 80.94  |
| 1960                             | 3 | 3.58   | .57   | 2.45  | 5.79  | 1.42  | 1.21  | 4.41  | 9.33   | 17.55  | 8.43   | 14.73  | 17.71 | 87.21  |
| 1961                             | 3 | 3.37   | .00   | 1.90  | 2.03  | 6.19  | 5.16  | 8.99  | 4.41   | 47.65  | 13.49  | 26.70  | 4.92  | 124.78 |
| 1962                             | 3 | 17.87  | 1.96  | .38   | 3.06  | .49   | .77   | 1.46  | 3.49   | 10.68  | 18.40  | 25.62  | 4.79  | 88.99  |
| 1963                             | 3 | 1.63   | 6.26  | 4.57  | .01   | 12.49 | 1.41  | 5.50  | 7.84   | 21.88  | 13.79  | 18.49  | 4.79  | 98.65  |
| 1964                             | 3 | 5.67   | 10.11 | 1.07  | 3.22  | 6.75  | 14.73 | 8.36  | 12.15  | 7.78   | 7.90   | 7.97   | 3.87  | 89.56  |
| 1965                             | 3 | 6.31   | 1.64  | 5.33  | .23   | .67   | 9.75  | 5.66  | 5.22   | 19.44  | 25.32  | 7.75   | 9.92  | 97.24  |
| 1966                             | 3 | .62    | 1.00  | 1.32  | 2.02  | .26   | 1.73  | 12.12 | 10.69  | 32.89  | 7.47   | 8.41   | 6.58  | 85.10  |
| 1967                             | 3 | 7.87   | 7.66  | .44   | 2.95  | .71   | .13   | 10.36 | 25.13  | 16.41  | 22.48  | 12.68  | 1.64  | 108.45 |
| 1968                             | 3 | 19.38  | 2.37  | 9.72  | 3.47  | 1.12  | 1.46  | 10.45 | 2.57   | 10.62  | 6.03   | 13.00  | 12.78 | 92.99  |
| 1969                             | 3 | 6.87   | 1.16  | .80   | .61   | 2.03  | .43   | 1.15  | 18.92  | 26.55  | 15.29  | 17.46  | 8.08  | 99.34  |
| 1970                             | 4 | 3.16   | 2.84  | 2.92  | .59   | .23   | 5.13  | .59   | 6.61   | 11.40  | 16.18  | 16.68  | 1.39  | 67.69  |
| 1971                             | 4 | 2.63   | 1.04  | 2.25  | 3.92  | 2.47  | 2.11  | 9.52  | 15.72+ | 6.98+  | 7.14   | 7.64   | 6.51  | 67.92  |
| 1972                             | 4 | 2.52   | .00   | 5.14  | .18   | .00   | 5.98  | .91   | 5.55   | 1.95   | 41.84  | 10.89  | 9.74  | 84.69  |
| 1973                             | 4 | 4.62   | 1.39  | 6.06  | .38   | .64   | .94   | .08   | 13.08  | 27.32  | 11.27  | 58.37  | 8.79  | 132.93 |
| 1974                             | 4 | 10.40  | 6.54  | 2.07  | 2.90  | 1.67  | .92   | 11.87 | 30.28  | 6.60   | 16.17  | 13.54  | 2.90  | 105.88 |
| 1975                             | 4 | 9.90   | 2.47  | .49   | .00   | 1.75  | 3.98  | 4.77  | 5.49   | 40.14  | 14.84  | 5.88   | 5.68  | 95.40  |
| 1976                             | 4 | 2.52   | 23.49 | 10.86 | 4.55  | 4.08  | 1.39  | 12.26 | 34.56  | 28.91  | 28.92  | 26.54  | 6.25  | 184.34 |
| 1977                             | 4 | 2.97   | 1.78  | 6.62  | 1.85  | 2.20  | 6.33  | 7.64  | 8.15   | 1.16   | .99    | 22.08  | 10.05 | 71.82  |
| 1978                             | 3 | 2.22   | .68   | 4.22  | 2.77  | 8.03  | .65   | 1.16  | 16.38  | 20.84  | 8.75   | 12.80  | 9.99  | 88.48  |
| 1979                             | 3 | 11.81  | 1.23  | .05   | 5.05  | 1.92  | .15   | 8.09  | 15.48  | 13.08  | 6.66   | 16.22  | 3.31  | 83.04  |
| 1980                             | 3 | 4.18   | 18.84 | 6.78  | 13.27 | .39   | 3.65  | 4.02  | 2.79   | 9.22   | 26.38  | 16.95  | 22.51 | 128.99 |
| 1981                             | 3 | 2.65   | 1.90  | 2.12  | 4.10  | .29   | 2.97  | 14.64 | 8.57   | 12.64  | 11.66  | 8.42   | 1.95  | 71.91  |
| 1982                             | 3 | 9.61   | 2.76  | 4.98  | .48   | 5.30  | 5.84  | 3.31  | 26.68  | 27.04  | 26.04  | 5.48   | 8.42  | 125.95 |
| 1983                             | 3 | .85    | 2.50  | 1.43  | .69   | .14   | 12.27 | 5.24  | 38.64  | 9.97   | 14.22  | 9.07   | 21.19 | 116.21 |
| 1984                             | 2 | 12.84  | .16   | 11.01 | 6.71  | 4.23  | 16.23 | 10.25 | 8.94   | 20.06  | 19.52  | 18.66  | 8.26  | 136.86 |
| 1985                             | 2 | 2.28   | .90   | 1.40  | 2.07  | 2.08  | 7.20  | 9.18  | 8.78   | 20.68  | 17.41  | 21.73  | 8.29  | 102.00 |
| 1986                             | 2 | 1.59   | 2.37  | .75   | 6.50  | 2.01  | 2.83  | 8.19  | 20.46  | 19.10  | 15.98  | 18.34  | 10.98 | 109.11 |
| 1987                             | 2 | 1.96   | 1.03  | 6.16  | .09   | .00   | 2.14  | 13.91 | 9.29   | 15.86  | 11.10  | 15.75  | 9.96  | 87.25  |
| 1988                             | 2 | 2.44   | 1.54  | 2.54  | .79   | 4.85  | 13.89 | 10.77 | 10.89  | 17.24  | 18.23  | 20.58  | 17.06 | 120.83 |
| 1989                             | 2 | 6.69   | 7.55  | .61   | 1.74  | 6.17  | 1.05  | 25.67 | 15.29  | 20.08  | 23.48  | 7.32   | 2.63  | 118.29 |
| 1990                             | 2 | .43    | 3.74  | 6.31  | 1.36  | 1.57  | .98   | 4.51  | 13.22  | 26.42  | 43.79  | 6.70   | 16.37 | 125.39 |
| 1991                             | 2 | 7.09   | 2.64  | 1.42  | .05   | 4.72  | 6.88  | 9.18  | 12.69  | 34.81  | 16.36  | 10.56  | 7.16  | 113.56 |
| 1992                             | 2 | 16.00  | 3.21  | .55   | 1.34  | 4.16  | .64   | 21.92 | 23.98  | 14.15  | 28.45  | 9.42   | 3.81  | 127.64 |
| 1993                             | 2 | .39    | .85   | 3.35  | 1.11  | .29   | 1.17  | 9.42  | 6.59   | 37.63  | 7.24   | 4.16   | 13.08 | 85.29  |
| 1994                             | 2 | 4.15   | 1.21  | 1.95  | 1.16  | 1.05  | 2.15  | 2.23  | 11.92  | 19.31  | 19.17  | 13.10  | 2.20  | 79.61  |
| 1995                             | 2 | 14.80  | .87   | 17.12 | 1.04  | 5.14  | 3.94  | 4.13  | 11.34  | 31.91  | 16.86  | 18.37  | 19.41 | 144.93 |
| 1996                             | 2 | 7.28   | 11.07 | 8.73  | 1.25  | .14   | .80   | 4.36  | 9.96   | 30.10  | 6.27   | 12.79  | 1.14  | 93.89  |
| 1997                             | 2 | 1.24   | 8.98  | 5.19  | 3.29  | .00   | 1.28  | 5.12  | 29.94  | 11.35  | 14.25  | 6.36   | 4.35  | 91.35  |
| 1998                             | 2 | 4.12   | 10.55 | 9.23  | .35+  | .80+  | .23+  | 8.63+ | 12.93+ | 17.55+ | 14.69+ | 13.88+ | 8.54+ | 101.51 |

average 5.89 4.31 3.20 2.25 2.78 3.31 7.73 14.39 18.10 15.40 14.32 8.46 100.14

adjusted 5.88 4.31 3.19 2.24 2.77 3.31 7.72 14.37 18.07 15.38 14.30 8.45 100.001

## Appendix B4.4

File : AU\_PIT11.USE  
Units : 10^6xm^3  
Descrip. : Upland alien demand u/s of H1h011 for 1961 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1961  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.01 | 0.01 | 0.00 | 0.1   |
| 1962  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.0   |
| 1963  | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.0   |
| 1964  | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.1   |
| 1965  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.0   |
| 1966  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1967  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.1   |
| 1968  | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.01 | 0.01 | 0.1   |
| 1969  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1970  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.0   |
| 1971  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1972  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.01 | 0.01 | 0.1   |
| 1973  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.01 | 0.05 | 0.01 | 0.1   |
| 1974  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.1   |
| 1975  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1976  | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.03 | 0.03 | 0.03 | 0.02 | 0.01 | 0.2   |
| 1977  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.0   |
| 1978  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1979  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.1   |
| 1980  | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.01 | 0.02 | 0.1   |
| 1981  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.1   |
| 1982  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.01 | 0.01 | 0.1   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.04 | 0.01 | 0.01 | 0.01 | 0.02 | 0.1   |
| 1984  | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.02 | 0.03 | 0.03 | 0.01 | 0.1   |
| 1985  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.03 | 0.02 | 0.03 | 0.01 | 0.1   |
| 1986  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.03 | 0.03 | 0.02 | 0.03 | 0.01 | 0.1   |
| 1987  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.02 | 0.01 | 0.03 | 0.01 | 0.1   |
| 1988  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.03 | 0.04 | 0.04 | 0.03 | 0.2   |
| 1989  | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 | 0.04 | 0.02 | 0.04 | 0.04 | 0.01 | 0.01 | 0.2   |
| 1990  | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.04 | 0.09 | 0.01 | 0.03 | 0.2   |
| AVE : | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.1   |
| SD :  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.0   |

Appendix B4.5

File : AU\_H1H7.USE  
Units : 10^6xm^3  
Descrip. : Upland alien demand (tall trees) u/s of H1h007 for 1961 to 1990

| Year  | Oct  | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul  | Aug  | Sep  | Total |
|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|-------|
| 1961  | 0.01 | 0.01* | 0.01* | 0.01* | 0.02  | 0.01  | 0.05  | 0.02  | 0.52  | 0.16 | 0.30 | 0.06 | 1.2   |
| 1962  | 0.18 | 0.02  | 0.01* | 0.01* | 0.01* | 0.01* | 0.00* | 0.01* | 0.06  | 0.17 | 0.28 | 0.05 | 0.8   |
| 1963  | 0.03 | 0.03  | 0.01  | 0.01* | 0.08  | 0.01* | 0.01  | 0.04  | 0.22  | 0.15 | 0.21 | 0.05 | 0.9   |
| 1964  | 0.04 | 0.08  | 0.01  | 0.01* | 0.03  | 0.12  | 0.05  | 0.11  | 0.06  | 0.08 | 0.08 | 0.04 | 0.7   |
| 1965  | 0.05 | 0.01  | 0.02  | 0.01* | 0.01* | 0.06  | 0.02  | 0.02  | 0.20  | 0.30 | 0.09 | 0.11 | 0.9   |
| 1966  | 0.03 | 0.01  | 0.01* | 0.01* | 0.01* | 0.01* | 0.08  | 0.08  | 0.37  | 0.09 | 0.09 | 0.06 | 0.9   |
| 1967  | 0.07 | 0.06  | 0.01  | 0.01* | 0.01* | 0.01* | 0.06  | 0.26  | 0.18  | 0.28 | 0.16 | 0.04 | 1.2   |
| 1968  | 0.21 | 0.02  | 0.06  | 0.01  | 0.01* | 0.01* | 0.07  | 0.01* | 0.08  | 0.05 | 0.14 | 0.15 | 0.8   |
| 1969  | 0.06 | 0.02  | 0.01* | 0.01* | 0.01* | 0.01* | 0.00* | 0.18  | 0.30  | 0.18 | 0.23 | 0.09 | 1.1   |
| 1970  | 0.04 | 0.02  | 0.01  | 0.01* | 0.01* | 0.01  | 0.01* | 0.03  | 0.10  | 0.18 | 0.21 | 0.04 | 0.7   |
| 1971  | 0.02 | 0.01  | 0.01* | 0.01  | 0.01* | 0.01* | 0.06  | 0.16  | 0.06  | 0.07 | 0.08 | 0.07 | 0.6   |
| 1972  | 0.04 | 0.01  | 0.02  | 0.01* | 0.01* | 0.02  | 0.01* | 0.02  | 0.01* | 0.54 | 0.13 | 0.11 | 0.9   |
| 1973  | 0.05 | 0.02  | 0.03  | 0.01* | 0.01* | 0.01* | 0.01* | 0.11  | 0.33  | 0.13 | 0.90 | 0.11 | 1.7   |
| 1974  | 0.12 | 0.06  | 0.01  | 0.01  | 0.01* | 0.01* | 0.10  | 0.38  | 0.07  | 0.21 | 0.19 | 0.05 | 1.2   |
| 1975  | 0.11 | 0.02  | 0.01  | 0.01* | 0.01* | 0.01* | 0.01  | 0.02  | 0.55  | 0.22 | 0.08 | 0.07 | 1.1   |
| 1976  | 0.04 | 0.30  | 0.10  | 0.02  | 0.01  | 0.01* | 0.11  | 0.47  | 0.43  | 0.47 | 0.42 | 0.08 | 2.5   |
| 1977  | 0.05 | 0.02  | 0.04  | 0.01  | 0.01* | 0.03  | 0.05  | 0.06  | 0.03  | 0.02 | 0.28 | 0.12 | 0.7   |
| 1978  | 0.04 | 0.01  | 0.01  | 0.01  | 0.05  | 0.01* | 0.01* | 0.18  | 0.27  | 0.11 | 0.18 | 0.13 | 1.0   |
| 1979  | 0.16 | 0.03  | 0.01  | 0.02  | 0.01* | 0.01* | 0.05  | 0.17  | 0.16  | 0.08 | 0.24 | 0.06 | 1.0   |
| 1980  | 0.04 | 0.24  | 0.05  | 0.14  | 0.01  | 0.01  | 0.01  | 0.01  | 0.08  | 0.38 | 0.27 | 0.35 | 1.6   |
| 1981  | 0.06 | 0.02  | 0.01  | 0.01  | 0.01* | 0.01* | 0.17  | 0.08  | 0.18  | 0.18 | 0.13 | 0.06 | 0.9   |
| 1982  | 0.13 | 0.03  | 0.03  | 0.01  | 0.03  | 0.03  | 0.01  | 0.45  | 0.50  | 0.55 | 0.11 | 0.14 | 2.0   |
| 1983  | 0.05 | 0.02  | 0.01  | 0.01  | 0.01* | 0.16  | 0.03  | 0.77  | 0.18  | 0.30 | 0.18 | 0.44 | 2.2   |
| 1984  | 0.27 | 0.04  | 0.15  | 0.06  | 0.03  | 0.28  | 0.15  | 0.13  | 0.43  | 0.47 | 0.45 | 0.17 | 2.6   |
| 1985  | 0.07 | 0.03  | 0.02  | 0.01  | 0.01  | 0.06  | 0.11  | 0.13  | 0.47  | 0.45 | 0.57 | 0.19 | 2.1   |
| 1986  | 0.07 | 0.03  | 0.02  | 0.06  | 0.01  | 0.01  | 0.09  | 0.45  | 0.47  | 0.44 | 0.51 | 0.28 | 2.4   |
| 1987  | 0.08 | 0.03  | 0.06  | 0.02  | 0.01  | 0.01  | 0.25  | 0.14  | 0.38  | 0.28 | 0.46 | 0.25 | 2.0   |
| 1988  | 0.09 | 0.04  | 0.03  | 0.02  | 0.04  | 0.28  | 0.20  | 0.23  | 0.47  | 0.57 | 0.66 | 0.52 | 3.2   |
| 1989  | 0.17 | 0.15  | 0.04  | 0.02  | 0.06  | 0.01  | 0.69  | 0.40  | 0.60  | 0.81 | 0.24 | 0.11 | 3.3   |
| 1990  | 0.06 | 0.04  | 0.08  | 0.02  | 0.02  | 0.01  | 0.03  | 0.30  | 0.82  | 1.65 | 0.24 | 0.54 | 3.8   |
| AVE : | 0.08 | 0.05  | 0.03  | 0.02  | 0.02  | 0.04  | 0.08  | 0.18  | 0.29  | 0.32 | 0.27 | 0.15 | 1.5   |
| SD :  | 0.06 | 0.07  | 0.03  | 0.03  | 0.02  | 0.07  | 0.13  | 0.18  | 0.21  | 0.32 | 0.19 | 0.14 | 0.9   |

## Appendix B4.6

File : AUSPIT7.USE  
Units : 10^6xm^3  
Descrip. : Upland alien demand (tall shrubs) u/s of H1h007 for 1961 to 1990

| Year  | Oct  | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul  | Aug  | Sep  | Total |
|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|-------|
| 1961  | 0.00 | 0.00* | 0.00* | 0.00* | 0.00  | 0.00* | 0.00  | 0.00  | 0.03  | 0.01 | 0.02 | 0.00 | 0.1   |
| 1962  | 0.01 | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.01 | 0.02 | 0.00 | 0.0   |
| 1963  | 0.00 | 0.00  | 0.00  | 0.00* | 0.01  | 0.00* | 0.00  | 0.00  | 0.01  | 0.01 | 0.01 | 0.00 | 0.0   |
| 1964  | 0.00 | 0.01  | 0.00* | 0.00* | 0.00  | 0.01  | 0.00  | 0.01  | 0.00  | 0.01 | 0.01 | 0.00 | 0.1   |
| 1965  | 0.00 | 0.00  | 0.00  | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.01  | 0.02 | 0.01 | 0.01 | 0.1   |
| 1966  | 0.00 | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.01  | 0.02  | 0.01 | 0.01 | 0.00 | 0.1   |
| 1967  | 0.00 | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.02  | 0.01  | 0.02 | 0.01 | 0.00 | 0.1   |
| 1968  | 0.01 | 0.00  | 0.00  | 0.00* | 0.00* | 0.00* | 0.00  | 0.00* | 0.00  | 0.00 | 0.01 | 0.01 | 0.0   |
| 1969  | 0.00 | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.02  | 0.01 | 0.01 | 0.01 | 0.1   |
| 1970  | 0.00 | 0.00  | 0.00* | 0.00* | 0.00* | 0.00  | 0.00* | 0.00  | 0.01  | 0.01 | 0.01 | 0.00 | 0.0   |
| 1971  | 0.00 | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.01  | 0.00  | 0.00 | 0.00 | 0.00 | 0.0   |
| 1972  | 0.00 | 0.00  | 0.00  | 0.00* | 0.00* | 0.00  | 0.00* | 0.00  | 0.00* | 0.03 | 0.01 | 0.01 | 0.1   |
| 1973  | 0.00 | 0.00  | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.02  | 0.01 | 0.06 | 0.01 | 0.1   |
| 1974  | 0.01 | 0.00  | 0.00  | 0.00* | 0.00* | 0.00* | 0.01  | 0.02  | 0.00  | 0.01 | 0.01 | 0.00 | 0.1   |
| 1975  | 0.01 | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.03  | 0.01 | 0.01 | 0.00 | 0.1   |
| 1976  | 0.00 | 0.02  | 0.01  | 0.00  | 0.00  | 0.00* | 0.01  | 0.03  | 0.03  | 0.03 | 0.03 | 0.01 | 0.2   |
| 1977  | 0.00 | 0.00  | 0.00  | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.02 | 0.01 | 0.0   |
| 1978  | 0.00 | 0.00  | 0.00  | 0.00* | 0.00  | 0.00* | 0.00* | 0.01  | 0.02  | 0.01 | 0.01 | 0.01 | 0.1   |
| 1979  | 0.01 | 0.00  | 0.00* | 0.00  | 0.00* | 0.00* | 0.00  | 0.01  | 0.01  | 0.01 | 0.01 | 0.00 | 0.1   |
| 1980  | 0.00 | 0.02  | 0.00  | 0.01  | 0.00* | 0.00  | 0.00  | 0.00* | 0.01  | 0.03 | 0.02 | 0.02 | 0.1   |
| 1981  | 0.00 | 0.00  | 0.00  | 0.00  | 0.00* | 0.00* | 0.01  | 0.01  | 0.01  | 0.01 | 0.01 | 0.00 | 0.1   |
| 1982  | 0.01 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.03  | 0.03  | 0.04 | 0.01 | 0.01 | 0.1   |
| 1983  | 0.00 | 0.00  | 0.00  | 0.00* | 0.00* | 0.01  | 0.00  | 0.05  | 0.01  | 0.02 | 0.01 | 0.03 | 0.1   |
| 1984  | 0.02 | 0.00  | 0.01  | 0.00  | 0.00  | 0.02  | 0.01  | 0.01  | 0.03  | 0.03 | 0.03 | 0.01 | 0.2   |
| 1985  | 0.00 | 0.00  | 0.00  | 0.00  | 0.00* | 0.00  | 0.01  | 0.01  | 0.03  | 0.03 | 0.04 | 0.01 | 0.1   |
| 1986  | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.01  | 0.03  | 0.03  | 0.03 | 0.03 | 0.02 | 0.2   |
| 1987  | 0.01 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00* | 0.02  | 0.01  | 0.02  | 0.02 | 0.03 | 0.02 | 0.1   |
| 1988  | 0.01 | 0.00  | 0.00  | 0.00  | 0.00  | 0.02  | 0.01  | 0.02  | 0.03  | 0.04 | 0.04 | 0.03 | 0.2   |
| 1989  | 0.01 | 0.01  | 0.00  | 0.00  | 0.00  | 0.00  | 0.05  | 0.03  | 0.04  | 0.05 | 0.02 | 0.01 | 0.2   |
| 1990  | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.02  | 0.05  | 0.11 | 0.02 | 0.04 | 0.2   |
| AVE : | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.01  | 0.01  | 0.02  | 0.02 | 0.02 | 0.01 | 0.1   |
| SD :  | 0.01 | 0.01  | 0.00  | 0.00  | 0.00  | 0.01  | 0.01  | 0.01  | 0.01  | 0.02 | 0.01 | 0.01 | 0.1   |

Appendix B4.7

File : GAWIE.FLW  
Units : 10<sup>6</sup>m<sup>3</sup>  
Descrip. : Gawie-se-water abstraction from Wit River for 1961 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1961  | 0.34 | 0.21 | 0.14 | 0.11 | 0.24 | 0.27 | 0.55 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 4.7   |
| 1962  | 0.38 | 0.37 | 0.30 | 0.27 | 0.14 | 0.07 | 0.06 | 0.10 | 0.55 | 0.57 | 0.57 | 0.55 | 3.9   |
| 1963  | 0.38 | 0.37 | 0.30 | 0.22 | 0.24 | 0.27 | 0.55 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 5.1   |
| 1964  | 0.38 | 0.37 | 0.30 | 0.27 | 0.24 | 0.27 | 0.55 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 5.2   |
| 1965  | 0.38 | 0.37 | 0.30 | 0.27 | 0.15 | 0.27 | 0.55 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 5.1   |
| 1966  | 0.38 | 0.37 | 0.26 | 0.15 | 0.08 | 0.06 | 0.55 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 4.7   |
| 1967  | 0.38 | 0.37 | 0.30 | 0.27 | 0.16 | 0.07 | 0.55 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 4.9   |
| 1968  | 0.38 | 0.37 | 0.30 | 0.27 | 0.21 | 0.12 | 0.55 | 0.53 | 0.55 | 0.57 | 0.57 | 0.55 | 5.0   |
| 1969  | 0.38 | 0.37 | 0.30 | 0.18 | 0.09 | 0.05 | 0.04 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 4.2   |
| 1970  | 0.38 | 0.37 | 0.30 | 0.23 | 0.10 | 0.27 | 0.19 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 4.7   |
| 1971  | 0.38 | 0.37 | 0.27 | 0.20 | 0.15 | 0.10 | 0.55 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 4.8   |
| 1972  | 0.38 | 0.37 | 0.30 | 0.24 | 0.09 | 0.27 | 0.20 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 4.7   |
| 1973  | 0.38 | 0.37 | 0.30 | 0.27 | 0.14 | 0.08 | 0.05 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 4.4   |
| 1974  | 0.38 | 0.37 | 0.30 | 0.27 | 0.24 | 0.23 | 0.55 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 5.2   |
| 1975  | 0.38 | 0.37 | 0.30 | 0.17 | 0.12 | 0.09 | 0.55 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 4.8   |
| 1976  | 0.38 | 0.37 | 0.30 | 0.27 | 0.24 | 0.27 | 0.55 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 5.2   |
| 1977  | 0.38 | 0.37 | 0.30 | 0.27 | 0.21 | 0.27 | 0.55 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 5.2   |
| 1978  | 0.38 | 0.37 | 0.30 | 0.27 | 0.24 | 0.27 | 0.30 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 4.9   |
| 1979  | 0.38 | 0.37 | 0.30 | 0.27 | 0.24 | 0.21 | 0.55 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 5.1   |
| 1980  | 0.38 | 0.37 | 0.30 | 0.27 | 0.24 | 0.27 | 0.55 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 5.2   |
| 1981  | 0.38 | 0.37 | 0.30 | 0.27 | 0.17 | 0.26 | 0.55 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 5.1   |
| 1982  | 0.38 | 0.37 | 0.30 | 0.27 | 0.24 | 0.27 | 0.27 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 4.9   |
| 1983  | 0.38 | 0.37 | 0.26 | 0.12 | 0.05 | 0.27 | 0.55 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 4.8   |
| 1984  | 0.38 | 0.37 | 0.30 | 0.27 | 0.24 | 0.27 | 0.55 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 5.2   |
| 1985  | 0.38 | 0.37 | 0.30 | 0.23 | 0.15 | 0.27 | 0.55 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 5.1   |
| 1986  | 0.38 | 0.37 | 0.30 | 0.27 | 0.24 | 0.23 | 0.55 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 5.2   |
| 1987  | 0.38 | 0.37 | 0.30 | 0.27 | 0.13 | 0.16 | 0.55 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 5.0   |
| 1988  | 0.38 | 0.37 | 0.30 | 0.21 | 0.22 | 0.27 | 0.55 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 5.1   |
| 1989  | 0.38 | 0.37 | 0.30 | 0.27 | 0.24 | 0.16 | 0.55 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 5.1   |
| 1990  | 0.38 | 0.37 | 0.30 | 0.27 | 0.16 | 0.10 | 0.31 | 0.57 | 0.55 | 0.57 | 0.57 | 0.55 | 4.7   |
| AVE : | 0.38 | 0.36 | 0.29 | 0.24 | 0.18 | 0.20 | 0.45 | 0.55 | 0.55 | 0.57 | 0.57 | 0.55 | 4.9   |
| SD :  | 0.01 | 0.03 | 0.03 | 0.05 | 0.06 | 0.09 | 0.18 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |

## Appendix B4.8

File : H1H007.CAL  
Units : 10^6xm^3  
Descrip. : Simulated flow record at H1H007 for 1925 to 1990

| Year  | Oct   | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul   | Aug   | Sep   | Total |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1925  | 14.07 | 4.36  | 1.28  | 0.98  | 1.33  | 0.56  | 0.46  | 16.12 | 2.06  | 16.11 | 10.29 | 5.59  | 73.2  |
| 1926  | 20.50 | 2.70  | 1.13  | 0.90  | 2.70  | 0.58  | 3.34  | 10.33 | 11.35 | 6.50  | 28.90 | 6.28  | 95.2  |
| 1927  | 2.91  | 9.56  | 1.48  | 1.29  | 0.85  | 1.08  | 0.59  | 0.49  | 32.80 | 5.74  | 13.79 | 12.16 | 82.7  |
| 1928  | 3.51  | 1.39  | 1.12  | 0.82  | 0.59  | 0.56  | 8.25  | 18.41 | 12.91 | 25.23 | 16.13 | 5.78  | 94.7  |
| 1929  | 3.12  | 1.49  | 1.82  | 1.25  | 0.89  | 0.73  | 1.21  | 0.62  | 0.67  | 7.70  | 14.92 | 25.74 | 60.2  |
| 1930  | 5.23  | 3.02  | 1.20  | 0.93  | 1.00  | 0.52  | 11.22 | 14.20 | 4.43  | 8.20  | 35.69 | 18.28 | 103.9 |
| 1931  | 8.66  | 2.29  | 1.22  | 1.25  | 18.82 | 0.94  | 0.89  | 20.87 | 17.02 | 15.15 | 12.22 | 11.96 | 111.3 |
| 1932  | 4.21  | 1.62  | 1.30  | 1.00  | 1.08  | 0.67  | 0.53  | 7.99  | 37.84 | 28.62 | 13.09 | 5.75  | 103.7 |
| 1933  | 8.30  | 2.06  | 1.45  | 0.94  | 0.78  | 2.19  | 0.65  | 11.12 | 8.63  | 9.03  | 11.56 | 14.08 | 70.8  |
| 1934  | 11.62 | 5.01  | 1.35  | 0.97  | 0.84  | 1.14  | 6.94  | 12.87 | 7.65  | 19.93 | 20.41 | 13.61 | 102.3 |
| 1935  | 4.18  | 3.45  | 1.23  | 2.63  | 0.84  | 0.77  | 0.54  | 7.15  | 2.46  | 14.19 | 20.43 | 13.82 | 71.7  |
| 1936  | 4.26  | 2.21  | 7.01  | 1.12  | 0.88  | 6.93  | 4.50  | 15.62 | 34.12 | 35.54 | 8.48  | 4.94  | 125.6 |
| 1937  | 3.30  | 1.46  | 1.11  | 7.82  | 0.87  | 0.69  | 9.34  | 22.17 | 9.05  | 12.28 | 13.76 | 13.87 | 95.7  |
| 1938  | 4.94  | 2.22  | 1.15  | 0.91  | 3.24  | 0.62  | 3.90  | 17.77 | 4.66  | 8.98  | 23.40 | 11.78 | 83.6  |
| 1939  | 3.80  | 2.66  | 1.48  | 1.02  | 1.88  | 1.02  | 11.37 | 9.18  | 20.07 | 9.09  | 8.01  | 9.33  | 78.9  |
| 1940  | 4.31  | 8.66  | 1.35  | 2.87  | 0.98  | 0.74  | 13.85 | 38.68 | 36.28 | 23.51 | 25.52 | 44.85 | 201.6 |
| 1941  | 10.13 | 2.75  | 1.38  | 1.05  | 0.76  | 0.53  | 0.47  | 27.78 | 66.74 | 10.53 | 18.40 | 4.77  | 145.3 |
| 1942  | 3.99  | 1.54  | 1.10  | 2.11  | 0.80  | 2.92  | 2.27  | 4.27  | 16.35 | 27.75 | 32.18 | 16.70 | 112.0 |
| 1943  | 5.36  | 9.20  | 1.42  | 1.28  | 0.78  | 0.83  | 2.91  | 21.41 | 45.48 | 17.27 | 25.63 | 11.26 | 142.8 |
| 1944  | 6.59  | 5.55  | 2.84  | 1.14  | 0.87  | 0.61  | 2.89  | 27.14 | 45.91 | 36.47 | 24.82 | 4.81  | 159.6 |
| 1945  | 2.96  | 1.68  | 1.27  | 0.93  | 0.66  | 0.77  | 6.69  | 8.47  | 4.76  | 10.68 | 20.82 | 29.26 | 89.0  |
| 1946  | 9.96  | 2.67  | 1.18  | 0.92  | 0.65  | 4.74  | 0.80  | 6.71  | 4.17  | 38.61 | 16.32 | 5.91  | 92.6  |
| 1947  | 5.35  | 2.10  | 1.12  | 0.86  | 0.64  | 4.65  | 3.16  | 18.62 | 8.37  | 28.06 | 11.36 | 27.78 | 112.1 |
| 1948  | 11.21 | 2.63  | 1.27  | 0.96  | 0.70  | 0.49  | 6.21  | 5.78  | 12.41 | 18.73 | 21.78 | 13.34 | 95.5  |
| 1949  | 10.00 | 9.56  | 1.61  | 1.06  | 0.78  | 0.55  | 17.56 | 0.74  | 4.97  | 37.93 | 4.86  | 18.95 | 108.6 |
| 1950  | 4.24  | 10.37 | 2.05  | 2.09  | 0.99  | 0.75  | 22.64 | 8.89  | 40.86 | 21.90 | 15.09 | 11.03 | 140.9 |
| 1951  | 7.17  | 11.20 | 1.48  | 1.00  | 0.94  | 0.81  | 1.72  | 26.57 | 10.02 | 18.35 | 42.71 | 25.07 | 147.0 |
| 1952  | 7.08  | 13.30 | 1.54  | 1.05  | 0.76  | 0.56  | 33.10 | 37.19 | 10.02 | 33.19 | 24.82 | 4.72  | 167.3 |
| 1953  | 2.47  | 4.28  | 1.58  | 1.09  | 0.88  | 0.95  | 14.83 | 43.93 | 16.13 | 51.83 | 33.82 | 10.32 | 182.1 |
| 1954  | 9.21  | 2.51  | 3.83  | 1.11  | 6.58  | 0.83  | 2.69  | 1.97  | 22.63 | 37.55 | 56.42 | 7.09  | 152.4 |
| 1955  | 15.48 | 6.10  | 1.95  | 1.14  | 0.94  | 0.84  | 1.35  | 16.86 | 32.52 | 26.02 | 29.80 | 6.33  | 139.3 |
| 1956  | 4.26  | 1.68  | 1.24  | 0.89  | 18.39 | 2.15  | 2.34  | 38.26 | 38.32 | 45.01 | 24.36 | 10.54 | 187.4 |
| 1957  | 22.26 | 2.81  | 1.20  | 0.94  | 5.34  | 0.68  | 1.24  | 23.60 | 11.77 | 4.32  | 12.25 | 6.03  | 92.4  |
| 1958  | 6.42  | 4.17  | 1.24  | 0.96  | 0.92  | 0.72  | 16.84 | 66.93 | 5.50  | 4.23  | 17.78 | 5.54  | 131.3 |
| 1959  | 13.40 | 2.06  | 1.24  | 0.88  | 0.68  | 1.42  | 4.42  | 21.10 | 31.48 | 6.49  | 5.65  | 4.64  | 93.5  |
| 1960  | 3.39  | 1.43  | 1.15  | 2.55  | 0.76  | 0.62  | 1.26  | 7.20  | 21.78 | 10.10 | 21.21 | 25.54 | 97.0  |
| 1961  | 4.64  | 1.55  | 0.97  | 0.79  | 2.50  | 1.62  | 6.35  | 2.34  | 71.68 | 21.47 | 41.66 | 6.95  | 162.5 |
| 1962  | 24.17 | 2.62  | 0.93  | 0.94  | 0.59  | 0.45  | 0.34  | 0.61  | 8.66  | 22.89 | 37.28 | 6.43  | 105.9 |
| 1963  | 3.06  | 3.70  | 1.83  | 0.84  | 11.58 | 0.54  | 1.73  | 5.13  | 28.85 | 19.24 | 28.03 | 6.36  | 110.9 |
| 1964  | 5.57  | 9.96  | 1.16  | 1.08  | 3.33  | 15.28 | 6.18  | 13.32 | 8.32  | 9.49  | 10.14 | 5.20  | 89.0  |
| 1965  | 5.80  | 1.72  | 2.24  | 0.76  | 0.64  | 7.09  | 1.92  | 2.42  | 24.78 | 37.76 | 11.43 | 12.61 | 109.2 |
| 1966  | 3.28  | 1.03  | 0.82  | 0.72  | 0.51  | 0.40  | 10.24 | 9.18  | 46.53 | 10.84 | 10.73 | 7.73  | 102.0 |
| 1967  | 8.42  | 6.61  | 1.11  | 0.96  | 0.63  | 0.51  | 7.60  | 31.55 | 21.09 | 34.12 | 19.17 | 4.26  | 136.0 |
| 1968  | 25.08 | 2.29  | 7.89  | 1.29  | 0.83  | 0.69  | 8.02  | 0.74  | 9.83  | 5.36  | 16.55 | 16.93 | 95.5  |
| 1969  | 7.54  | 1.96  | 0.81  | 0.69  | 0.60  | 0.40  | 0.30  | 20.71 | 34.85 | 20.76 | 26.21 | 10.07 | 124.9 |
| 1970  | 4.14  | 1.80  | 1.07  | 0.74  | 0.62  | 1.45  | 0.30  | 2.55  | 10.70 | 20.50 | 23.68 | 4.16  | 71.7  |
| 1971  | 2.32  | 0.93  | 0.84  | 1.14  | 0.66  | 0.55  | 6.53  | 17.40 | 6.38  | 7.76  | 9.12  | 7.53  | 61.2  |
| 1972  | 3.48  | 1.12  | 1.95  | 0.64  | 0.56  | 2.08  | 0.29  | 1.53  | 0.60  | 59.86 | 14.41 | 12.25 | 98.8  |
| 1973  | 5.07  | 1.67  | 2.85  | 0.75  | 0.64  | 0.48  | 0.34  | 11.62 | 35.36 | 13.69 | 96.95 | 11.87 | 181.3 |
| 1974  | 12.74 | 5.52  | 1.27  | 1.05  | 0.69  | 0.46  | 10.05 | 40.12 | 6.78  | 22.54 | 20.00 | 4.80  | 126.0 |
| 1975  | 10.58 | 2.10  | 0.87  | 0.73  | 0.55  | 0.93  | 0.89  | 2.03  | 57.59 | 22.43 | 7.62  | 6.64  | 113.0 |
| 1976  | 3.37  | 30.08 | 10.41 | 1.92  | 1.52  | 0.77  | 11.13 | 47.75 | 43.93 | 47.79 | 42.66 | 8.48  | 249.8 |
| 1977  | 4.25  | 1.64  | 3.56  | 0.92  | 0.79  | 2.70  | 4.36  | 6.26  | 2.11  | 1.39  | 28.22 | 11.64 | 67.8  |
| 1978  | 3.28  | 1.10  | 1.43  | 0.83  | 4.82  | 0.49  | 0.43  | 17.22 | 26.31 | 10.17 | 17.82 | 12.76 | 96.7  |
| 1979  | 14.83 | 2.20  | 0.81  | 1.75  | 0.54  | 0.38  | 4.28  | 16.46 | 15.11 | 7.35  | 22.86 | 5.04  | 91.6  |
| 1980  | 3.76  | 23.03 | 4.44  | 13.38 | 0.93  | 1.11  | 0.91  | 0.75  | 7.51  | 36.49 | 25.64 | 33.35 | 151.3 |
| 1981  | 4.51  | 1.65  | 0.95  | 1.30  | 0.60  | 0.56  | 14.37 | 6.48  | 14.59 | 14.91 | 11.12 | 4.12  | 75.2  |
| 1982  | 9.65  | 2.01  | 2.02  | 0.80  | 1.91  | 2.26  | 0.93  | 34.34 | 38.44 | 42.14 | 7.87  | 10.25 | 152.6 |
| 1983  | 3.25  | 1.26  | 0.91  | 0.77  | 0.58  | 10.74 | 1.43  | 53.75 | 12.16 | 20.91 | 12.37 | 30.33 | 148.5 |
| 1984  | 16.89 | 2.21  | 9.62  | 3.57  | 1.54  | 17.63 | 9.15  | 8.46  | 27.26 | 30.15 | 28.70 | 10.56 | 165.7 |
| 1985  | 3.93  | 1.32  | 0.86  | 0.72  | 0.58  | 3.44  | 6.36  | 7.14  | 27.40 | 25.89 | 33.32 | 10.61 | 121.6 |
| 1986  | 3.63  | 1.42  | 0.84  | 3.02  | 0.62  | 0.63  | 4.69  | 24.68 | 25.33 | 23.86 | 27.58 | 14.56 | 130.9 |
| 1987  | 3.84  | 1.25  | 2.88  | 0.72  | 0.62  | 0.44  | 12.93 | 7.08  | 19.21 | 14.01 | 23.02 | 12.75 | 98.8  |
| 1988  | 3.89  | 1.34  | 0.94  | 0.69  | 1.45  | 13.39 | 9.26  | 10.98 | 22.57 | 27.32 | 31.43 | 24.57 | 147.8 |
| 1989  | 7.57  | 6.58  | 1.17  | 0.82  | 2.62  | 0.57  | 31.11 | 17.50 | 27.06 | 36.50 | 10.49 | 4.48  | 146.5 |
| 1990  | 2.05  | 1.37  | 3.07  | 0.79  | 0.69  | 0.53  | 0.97  | 12.42 | 34.95 | 70.26 | 9.66  | 22.45 | 159.2 |
| AVE : | 7.31  | 4.16  | 1.95  | 1.45  | 1.91  | 2.04  | 6.01  | 16.20 | 21.34 | 22.25 | 21.85 | 12.23 | 118.7 |
| SD :  | 5.38  | 4.97  | 1.91  | 1.80  | 3.43  | 3.47  | 6.90  | 14.17 | 16.33 | 14.31 | 14.00 | 8.36  | 37.4  |

Appendix B4.9

File : H1H7PAT.OBS

Units : 10^6xm^3

Descrip. : Patched observed flow record at H1H007 for 1961 to 1990

| Year  | Oct    | Nov    | Dec    | Jan    | Feb   | Mar    | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Total |
|-------|--------|--------|--------|--------|-------|--------|--------|--------|--------|--------|--------|--------|-------|
| 1961  | 4.41+  | 1.56+  | 1.01+  | 0.80+  | 2.46+ | 1.55+  | 6.17+  | 2.19+  | 71.32* | 21.35* | 34.14  | 9.21   | 156.2 |
| 1962  | 23.95* | 4.74   | 0.95   | 0.45   | 0.29  | 0.31   | 0.31   | 1.78   | 9.97   | 22.89* | 38.35* | 14.11  | 118.1 |
| 1963  | 2.87   | 4.34   | 2.75   | 0.48   | 10.47 | 1.33   | 1.42   | 9.20   | 19.56  | 13.71  | 28.21+ | 6.00+  | 100.3 |
| 1964  | 12.32  | 8.35   | 1.13   | 2.14   | 2.06  | 9.84   | 12.24  | 15.74* | 10.08  | 10.42  | 22.71  | 7.16   | 114.2 |
| 1965  | 5.34   | 1.58   | 1.77   | 0.51   | 0.32  | 8.47   | 5.24   | 4.12   | 24.69* | 41.69* | 14.11  | 11.98  | 119.8 |
| 1966  | 2.48   | 0.67   | 1.13   | 1.35   | 0.20  | 0.28   | 10.71  | 13.13  | 46.54* | 16.13  | 10.44  | 8.52   | 111.6 |
| 1967  | 12.41  | 5.28   | 1.42   | 2.10   | 0.87  | 0.09   | 8.41   | 37.98  | 16.56  | 55.14* | 32.63  | 5.39   | 178.3 |
| 1968  | 16.38  | 1.13   | 1.42   | 5.26   | 1.28  | 0.29   | 5.85   | 3.98   | 15.08  | 13.65  | 23.07  | 16.37  | 103.8 |
| 1969  | 14.18  | 2.02   | 0.54   | 0.32   | 0.30  | 0.34   | 0.29   | 19.23  | 34.60* | 21.60  | 32.72* | 13.68  | 139.8 |
| 1970  | 4.54   | 2.59   | 3.02   | 0.59   | 0.34  | 0.76   | 1.00   | 3.72   | 9.06   | 24.16  | 26.42  | 5.65   | 81.9  |
| 1971  | 2.80   | 0.74   | 0.66   | 0.84   | 1.37  | 0.29   | 0.50   | 17.31+ | 10.47+ | 8.44   | 12.68  | 13.99  | 70.1  |
| 1972  | 2.91   | 0.71   | 2.81*  | 0.46   | 0.30  | 4.50   | 0.42   | 2.41   | 2.48   | 60.23* | 13.57  | 9.02   | 99.8  |
| 1973  | 5.25   | 1.62   | 7.11   | 0.57   | 0.36  | 0.39   | 0.34   | 6.17   | 26.63  | 9.59   | 98.57* | 10.63  | 167.2 |
| 1974  | 10.97  | 3.29   | 1.02   | 0.83   | 0.49  | 0.46   | 6.27   | 27.85  | 13.66  | 26.44* | 15.84  | 2.54   | 109.7 |
| 1975  | 7.65   | 2.23   | 1.04   | 0.41   | 0.31  | 0.37   | 0.61   | 2.16   | 57.33* | 24.22* | 7.41+  | 6.28+  | 110.0 |
| 1976  | 2.73   | 30.27+ | 11.39+ | 6.41+  | 1.16  | 1.05   | 11.09+ | 48.06+ | 44.66  | 48.37* | 43.23* | 8.91   | 257.3 |
| 1977  | 5.80   | 1.21   | 4.53   | 0.65   | 0.58  | 0.89   | 8.19*  | 17.96  | 2.47   | 1.61   | 28.38* | 14.86  | 87.1  |
| 1978  | 5.63   | 3.15   | 1.54   | 1.26   | 1.92  | 2.43   | 2.57   | 17.25* | 26.05* | 11.23  | 16.70  | 7.96   | 97.7  |
| 1979  | 22.08  | 1.99   | 0.60   | 1.88   | 0.76  | 0.40   | 9.44   | 22.63* | 14.79* | 8.65   | 13.23  | 6.03   | 102.5 |
| 1980  | 4.98   | 15.72  | 5.92   | 13.37* | 1.10  | 1.31   | 2.27   | 2.79   | 12.40  | 36.79* | 22.40  | 24.08  | 143.1 |
| 1981  | 2.69   | 1.65   | 1.36   | 2.08   | 0.46  | 0.56+  | 14.41+ | 5.03   | 18.34  | 12.52  | 14.92  | 4.91   | 78.9  |
| 1982  | 9.41   | 3.04   | 6.26   | 0.95+  | 2.50  | 4.28   | 1.58   | 34.72* | 41.19* | 24.67  | 12.19  | 14.75  | 155.5 |
| 1983  | 2.08   | 1.06   | 1.02   | 0.56   | 0.34  | 2.86   | 2.66   | 54.40* | 12.34+ | 21.13+ | 12.62* | 30.94+ | 142.0 |
| 1984  | 11.19  | 0.96   | 6.37   | 4.71   | 2.12  | 10.80+ | 9.06+  | 8.35+  | 27.07+ | 31.37+ | 29.31+ | 10.43+ | 151.7 |
| 1985  | 2.77   | 1.50   | 0.57   | 0.82   | 0.32  | 2.79   | 13.99  | 19.30  | 26.42  | 33.78* | 36.05* | 15.56  | 153.9 |
| 1986  | 1.76   | 1.22   | 0.66   | 5.16   | 0.64  | 1.39+  | 4.61+  | 27.79* | 28.32  | 24.53* | 23.42  | 16.31  | 135.8 |
| 1987  | 3.47   | 1.33   | 6.23   | 0.91   | 0.37  | 0.43   | 10.28  | 19.56* | 18.95* | 23.03  | 18.19  | 19.15  | 121.9 |
| 1988  | 3.94   | 3.17   | 0.73   | 0.39   | 0.91  | 11.33  | 4.31   | 15.39  | 16.75  | 30.16* | 32.28* | 25.26* | 144.6 |
| 1989  | 5.82   | 4.68   | 0.90   | 0.46   | 1.81  | 0.69   | 31.79* | 16.59  | 26.88* | 47.13* | 18.75* | 4.40   | 159.9 |
| 1990  | 1.18   | 1.09   | 3.24   | 0.79   | 0.93  | 1.01   | 1.14   | 21.72* | 34.67* | 72.95* | 17.36  | 27.30* | 183.4 |
| AVE : | 7.13   | 3.76   | 2.64   | 1.92   | 1.24  | 2.38   | 6.24   | 16.62  | 23.98  | 26.59  | 25.00  | 12.38  | 129.9 |
| SD :  | 5.91   | 5.82   | 2.65   | 2.72   | 1.88  | 3.31   | 6.58   | 13.69  | 15.88  | 16.86  | 16.75  | 7.21   | 38.5  |



## Appendix B4.10

File : H1H7S-0.NAT

Units : 10<sup>6</sup>m<sup>3</sup>

Descrip. : Incremental naturalised observed flow record at H1H007 for 1925 to 1990

| Year  | Oct   | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul   | Aug    | Sep   | Total |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|-------|
| 1925  | 14.07 | 4.36  | 1.28  | 0.98  | 1.33  | 0.56  | 0.46  | 16.12 | 2.06  | 16.11 | 10.29  | 5.59  | 73.2  |
| 1926  | 20.51 | 2.70  | 1.13  | 0.90  | 2.70  | 0.58  | 3.34  | 10.33 | 11.35 | 6.50  | 28.91  | 6.28  | 95.2  |
| 1927  | 2.91  | 9.57  | 1.48  | 1.29  | 0.85  | 1.08  | 0.59  | 0.49  | 32.83 | 5.74  | 13.80  | 12.17 | 82.8  |
| 1928  | 3.51  | 1.39  | 1.12  | 0.82  | 0.59  | 0.56  | 8.26  | 18.44 | 12.93 | 25.26 | 16.15  | 5.79  | 94.8  |
| 1929  | 3.13  | 1.50  | 1.82  | 1.25  | 0.89  | 0.73  | 1.21  | 0.62  | 0.67  | 7.71  | 14.95  | 25.79 | 60.3  |
| 1930  | 5.24  | 3.03  | 1.20  | 0.94  | 1.00  | 0.52  | 11.25 | 14.23 | 4.44  | 8.22  | 35.77  | 18.32 | 104.2 |
| 1931  | 8.68  | 2.29  | 1.22  | 1.25  | 18.88 | 0.94  | 0.89  | 20.93 | 17.07 | 15.20 | 12.25  | 12.00 | 111.6 |
| 1932  | 4.23  | 1.62  | 1.30  | 1.00  | 1.09  | 0.67  | 0.53  | 8.02  | 37.98 | 28.73 | 13.13  | 5.77  | 104.1 |
| 1933  | 8.33  | 2.06  | 1.46  | 0.95  | 0.79  | 2.19  | 0.65  | 11.17 | 8.66  | 9.07  | 11.60  | 14.14 | 71.1  |
| 1934  | 11.67 | 5.03  | 1.36  | 0.98  | 0.84  | 1.15  | 6.96  | 12.93 | 7.68  | 20.02 | 20.51  | 13.68 | 102.8 |
| 1935  | 4.20  | 3.47  | 1.23  | 2.65  | 0.85  | 0.77  | 0.55  | 7.18  | 2.48  | 14.26 | 20.53  | 13.88 | 72.1  |
| 1936  | 4.29  | 2.22  | 7.05  | 1.13  | 0.89  | 6.96  | 4.52  | 15.71 | 34.30 | 35.73 | 8.53   | 4.96  | 126.3 |
| 1937  | 3.32  | 1.46  | 1.12  | 7.86  | 0.87  | 0.69  | 9.39  | 22.30 | 9.10  | 12.35 | 13.84  | 13.95 | 96.3  |
| 1938  | 4.97  | 2.23  | 1.16  | 0.92  | 3.26  | 0.63  | 3.92  | 17.88 | 4.70  | 9.03  | 23.55  | 11.85 | 84.1  |
| 1939  | 3.82  | 2.69  | 1.49  | 1.02  | 1.89  | 1.03  | 11.44 | 9.25  | 20.21 | 9.15  | 8.06   | 9.39  | 79.4  |
| 1940  | 4.35  | 8.72  | 1.36  | 2.90  | 0.99  | 0.75  | 13.96 | 38.97 | 36.55 | 23.68 | 25.71  | 45.18 | 203.1 |
| 1941  | 10.21 | 2.77  | 1.39  | 1.06  | 0.77  | 0.54  | 0.47  | 27.99 | 67.27 | 10.62 | 18.55  | 4.82  | 146.5 |
| 1942  | 4.02  | 1.56  | 1.11  | 2.13  | 0.81  | 2.95  | 2.29  | 4.30  | 16.50 | 27.97 | 32.45  | 16.84 | 112.9 |
| 1943  | 5.41  | 9.28  | 1.43  | 1.29  | 0.79  | 0.84  | 2.95  | 21.60 | 45.88 | 17.42 | 25.86  | 11.36 | 144.1 |
| 1944  | 6.65  | 5.59  | 2.87  | 1.15  | 0.88  | 0.62  | 2.91  | 27.39 | 46.34 | 36.81 | 25.05  | 4.86  | 161.1 |
| 1945  | 2.99  | 1.70  | 1.28  | 0.94  | 0.67  | 0.78  | 6.75  | 8.55  | 4.81  | 10.78 | 21.02  | 29.55 | 89.8  |
| 1946  | 10.07 | 2.69  | 1.19  | 0.93  | 0.65  | 4.78  | 0.81  | 6.77  | 4.22  | 39.01 | 16.49  | 5.97  | 93.6  |
| 1947  | 5.42  | 2.14  | 1.13  | 0.86  | 0.65  | 4.71  | 3.20  | 18.82 | 8.46  | 28.37 | 11.49  | 28.09 | 113.3 |
| 1948  | 11.34 | 2.66  | 1.28  | 0.97  | 0.71  | 0.50  | 6.27  | 5.84  | 12.55 | 18.94 | 22.03  | 13.49 | 96.6  |
| 1949  | 10.12 | 9.67  | 1.63  | 1.07  | 0.79  | 0.56  | 17.76 | 0.74  | 5.02  | 38.37 | 4.91   | 19.18 | 109.8 |
| 1950  | 4.29  | 10.51 | 2.07  | 2.12  | 1.00  | 0.75  | 22.92 | 8.99  | 41.37 | 22.17 | 15.28  | 11.17 | 142.6 |
| 1951  | 7.27  | 11.35 | 1.50  | 1.02  | 0.96  | 0.82  | 1.75  | 26.92 | 10.16 | 18.59 | 43.25  | 25.40 | 149.0 |
| 1952  | 7.18  | 13.47 | 1.56  | 1.06  | 0.77  | 0.56  | 33.54 | 37.69 | 10.16 | 33.64 | 25.15  | 4.78  | 169.6 |
| 1953  | 2.52  | 4.34  | 1.60  | 1.11  | 0.89  | 0.96  | 15.04 | 44.53 | 16.34 | 52.55 | 34.29  | 10.46 | 184.6 |
| 1954  | 9.34  | 2.56  | 3.88  | 1.13  | 6.67  | 0.84  | 2.73  | 2.00  | 22.95 | 38.09 | 57.24  | 7.19  | 154.6 |
| 1955  | 15.71 | 6.19  | 1.99  | 1.16  | 0.96  | 0.86  | 1.36  | 17.11 | 33.00 | 26.41 | 30.24  | 6.44  | 141.4 |
| 1956  | 4.33  | 1.71  | 1.27  | 0.90  | 18.67 | 2.18  | 2.37  | 38.84 | 38.90 | 45.70 | 24.74  | 10.70 | 190.3 |
| 1957  | 22.61 | 2.86  | 1.22  | 0.95  | 5.42  | 0.69  | 1.26  | 23.97 | 11.96 | 4.39  | 12.44  | 6.13  | 93.9  |
| 1958  | 6.51  | 4.23  | 1.26  | 0.98  | 0.94  | 0.73  | 17.12 | 68.03 | 5.59  | 4.30  | 18.07  | 5.64  | 133.4 |
| 1959  | 13.62 | 2.09  | 1.26  | 0.89  | 0.69  | 1.44  | 4.50  | 21.45 | 32.02 | 6.60  | 5.74   | 4.72  | 95.0  |
| 1960  | 3.44  | 1.46  | 1.17  | 2.59  | 0.78  | 0.63  | 1.28  | 7.33  | 22.15 | 10.27 | 21.58  | 25.97 | 98.7  |
| 1961  | 4.76  | 1.78  | 1.16  | 0.92  | 2.72  | 1.83  | 6.77  | 2.78  | 72.45 | 22.10 | 35.04  | 9.82  | 162.1 |
| 1962  | 24.53 | 5.13  | 1.26  | 0.73  | 0.44  | 0.39  | 0.37  | 1.89  | 10.59 | 23.65 | 39.23  | 14.71 | 122.9 |
| 1963  | 3.28  | 4.74  | 3.06  | 0.71  | 10.81 | 1.61  | 1.98  | 9.81  | 20.35 | 14.45 | 29.01  | 6.60  | 106.4 |
| 1964  | 12.74 | 8.82  | 1.44  | 2.42  | 2.33  | 10.25 | 12.84 | 16.44 | 10.70 | 11.09 | 23.38  | 7.75  | 120.2 |
| 1965  | 5.77  | 1.96  | 2.09  | 0.79  | 0.48  | 8.80  | 5.81  | 4.71  | 25.46 | 42.59 | 14.79  | 12.66 | 125.9 |
| 1966  | 2.89  | 1.05  | 1.40  | 1.51  | 0.29  | 0.35  | 11.36 | 13.80 | 47.50 | 16.81 | 11.12  | 9.14  | 117.2 |
| 1967  | 12.87 | 5.71  | 1.73  | 2.38  | 1.04  | 0.17  | 9.03  | 38.84 | 17.31 | 56.02 | 33.38  | 5.98  | 184.5 |
| 1968  | 16.99 | 1.52  | 1.79  | 5.54  | 1.50  | 0.42  | 6.48  | 4.42  | 15.72 | 14.27 | 23.80  | 17.09 | 109.5 |
| 1969  | 14.63 | 2.41  | 0.85  | 0.51  | 0.40  | 0.40  | 0.33  | 20.00 | 35.48 | 22.37 | 33.54  | 14.34 | 145.3 |
| 1970  | 4.96  | 2.98  | 3.33  | 0.83  | 0.45  | 1.04  | 1.17  | 4.32  | 9.73  | 24.93 | 27.22  | 6.24  | 87.2  |
| 1971  | 3.20  | 1.12  | 0.94  | 1.05  | 1.53  | 0.40  | 1.12  | 18.06 | 11.09 | 9.09  | 13.34  | 14.62 | 75.6  |
| 1972  | 3.33  | 1.09  | 3.13  | 0.71  | 0.40  | 4.79  | 0.59  | 3.00  | 2.86  | 61.40 | 14.29  | 9.70  | 105.3 |
| 1973  | 5.68  | 2.01  | 7.44  | 0.85  | 0.51  | 0.48  | 0.40  | 6.87  | 27.55 | 10.31 | 100.15 | 11.31 | 173.6 |
| 1974  | 11.49 | 3.72  | 1.33  | 1.11  | 0.74  | 0.70  | 6.94  | 28.84 | 14.29 | 27.24 | 16.62  | 3.14  | 116.2 |
| 1975  | 8.16  | 2.62  | 1.35  | 0.59  | 0.44  | 0.47  | 1.17  | 2.75  | 58.50 | 25.03 | 8.08   | 6.91  | 116.1 |
| 1976  | 3.15  | 30.97 | 11.81 | 6.70  | 1.41  | 1.33  | 11.77 | 49.16 | 45.70 | 49.47 | 44.27  | 9.56  | 265.3 |
| 1977  | 6.23  | 1.60  | 4.87  | 0.93  | 0.80  | 1.19  | 8.79  | 18.60 | 3.05  | 2.20  | 29.26  | 15.55 | 93.1  |
| 1978  | 6.05  | 3.53  | 1.85  | 1.54  | 2.21  | 2.70  | 2.81  | 18.02 | 26.90 | 11.93 | 17.47  | 8.66  | 103.7 |
| 1979  | 22.64 | 2.39  | 0.91  | 2.17  | 1.01  | 0.61  | 10.04 | 23.39 | 15.52 | 9.32  | 14.06  | 6.64  | 108.7 |
| 1980  | 5.40  | 16.36 | 6.27  | 13.80 | 1.35  | 1.59  | 2.80  | 3.24  | 13.05 | 37.79 | 23.27  | 25.02 | 149.9 |
| 1981  | 3.13  | 2.04  | 1.67  | 2.36  | 0.64  | 0.83  | 15.15 | 5.70  | 19.09 | 13.29 | 15.64  | 5.52  | 85.1  |
| 1982  | 9.94  | 3.44  | 6.59  | 1.23  | 2.77  | 4.58  | 1.86  | 35.80 | 42.30 | 25.86 | 12.89  | 15.46 | 162.7 |
| 1983  | 2.51  | 1.45  | 1.29  | 0.69  | 0.40  | 3.31  | 3.24  | 55.83 | 13.09 | 22.03 | 13.39  | 31.98 | 149.2 |
| 1984  | 11.87 | 1.37  | 6.84  | 5.04  | 2.39  | 11.38 | 9.78  | 9.07  | 28.10 | 32.47 | 30.39  | 11.17 | 159.9 |
| 1985  | 3.23  | 1.90  | 0.89  | 1.06  | 0.48  | 3.13  | 14.67 | 20.02 | 27.50 | 34.85 | 37.26  | 16.32 | 161.3 |
| 1986  | 2.22  | 1.62  | 0.98  | 5.49  | 0.89  | 1.63  | 5.27  | 28.87 | 29.40 | 25.59 | 24.56  | 17.17 | 143.7 |
| 1987  | 3.95  | 1.73  | 6.59  | 1.20  | 0.51  | 0.60  | 11.11 | 20.29 | 19.92 | 23.91 | 19.28  | 19.98 | 129.1 |
| 1988  | 4.43  | 3.58  | 1.06  | 0.62  | 1.17  | 11.91 | 5.08  | 16.22 | 17.83 | 31.38 | 33.59  | 26.39 | 153.3 |
| 1989  | 6.39  | 5.22  | 1.24  | 0.75  | 2.12  | 0.86  | 33.12 | 17.61 | 28.11 | 48.60 | 19.59  | 5.08  | 168.7 |
| 1990  | 1.62  | 1.50  | 3.63  | 1.08  | 1.11  | 1.12  | 1.48  | 22.62 | 36.13 | 75.37 | 18.20  | 28.46 | 192.3 |
| AVE : | 7.55  | 4.22  | 2.24  | 1.76  | 1.90  | 1.90  | 6.49  | 17.64 | 21.88 | 23.68 | 23.02  | 13.10 | 125.4 |
| SD :  | 5.37  | 4.63  | 2.06  | 2.09  | 3.40  | 2.60  | 7.11  | 14.03 | 16.19 | 15.29 | 14.07  | 8.30  | 38.6  |

## Appendix B4.11

File : H1H7CUM.PRS  
Units : 10<sup>6</sup>m<sup>3</sup>  
Descrip. : Cumulative Present Day (2000) Flow at H1H007 for 1927 to 1990

| Year  | Oct   | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul   | Aug   | Sep   | Total |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1927  | 2.38  | 8.72  | 1.10  | 0.98  | 0.65  | 0.77  | 0.36  | 0.31  | 30.62 | 4.87  | 12.53 | 11.01 | 74.3  |
| 1928  | 2.95  | 0.95  | 0.75  | 0.62  | 0.51  | 0.48  | 7.30  | 16.94 | 11.72 | 23.42 | 14.76 | 4.94  | 85.3  |
| 1929  | 2.58  | 1.05  | 1.43  | 0.94  | 0.69  | 0.49  | 0.68  | 0.37  | 0.40  | 6.76  | 13.63 | 23.94 | 53.0  |
| 1930  | 4.60  | 2.51  | 0.83  | 0.65  | 0.79  | 0.39  | 10.14 | 12.94 | 3.67  | 7.24  | 33.39 | 16.84 | 94.0  |
| 1931  | 7.86  | 1.79  | 0.85  | 0.94  | 17.77 | 0.62  | 0.53  | 19.30 | 15.66 | 13.86 | 11.06 | 10.84 | 101.1 |
| 1932  | 3.64  | 1.16  | 0.93  | 0.70  | 0.88  | 0.49  | 0.40  | 7.05  | 35.50 | 26.70 | 11.88 | 4.92  | 94.3  |
| 1933  | 7.54  | 1.58  | 1.09  | 0.69  | 0.64  | 1.81  | 0.39  | 10.04 | 7.68  | 8.04  | 10.45 | 12.87 | 62.8  |
| 1934  | 10.70 | 4.41  | 0.99  | 0.68  | 0.69  | 0.87  | 6.06  | 11.70 | 6.74  | 18.43 | 18.90 | 12.43 | 92.6  |
| 1935  | 3.61  | 2.92  | 0.86  | 2.27  | 0.65  | 0.45  | 0.33  | 6.25  | 1.80  | 12.97 | 18.92 | 12.62 | 63.7  |
| 1936  | 3.69  | 1.73  | 6.40  | 0.82  | 0.69  | 6.34  | 3.75  | 14.34 | 32.00 | 33.35 | 7.53  | 4.16  | 114.8 |
| 1937  | 2.77  | 1.01  | 0.75  | 7.23  | 0.67  | 0.51  | 8.37  | 20.60 | 8.09  | 11.15 | 12.57 | 12.69 | 86.4  |
| 1938  | 4.34  | 1.74  | 0.79  | 0.67  | 2.94  | 0.45  | 3.18  | 16.40 | 3.92  | 8.01  | 21.78 | 10.70 | 74.9  |
| 1939  | 3.24  | 2.18  | 1.11  | 0.72  | 1.64  | 0.70  | 10.32 | 8.22  | 18.64 | 8.11  | 7.08  | 8.36  | 70.3  |
| 1940  | 3.75  | 7.91  | 0.99  | 2.51  | 0.78  | 0.50  | 12.70 | 36.41 | 34.14 | 21.90 | 23.83 | 42.33 | 187.8 |
| 1941  | 9.32  | 2.25  | 1.02  | 0.76  | 0.62  | 0.46  | 0.39  | 26.00 | 63.29 | 9.52  | 17.04 | 4.03  | 134.7 |
| 1942  | 3.44  | 1.11  | 0.74  | 1.78  | 0.61  | 2.53  | 1.62  | 3.52  | 15.12 | 25.98 | 30.23 | 15.44 | 102.1 |
| 1943  | 4.75  | 8.44  | 1.06  | 0.98  | 0.64  | 0.69  | 2.30  | 19.94 | 42.98 | 15.96 | 23.97 | 10.23 | 131.9 |
| 1944  | 5.93  | 4.94  | 2.42  | 0.84  | 0.68  | 0.54  | 2.21  | 25.43 | 43.42 | 34.36 | 23.21 | 4.06  | 148.0 |
| 1945  | 2.46  | 1.24  | 0.91  | 0.74  | 0.59  | 0.63  | 5.86  | 7.56  | 4.02  | 9.66  | 19.39 | 27.48 | 80.5  |
| 1946  | 9.18  | 2.18  | 0.82  | 0.68  | 0.57  | 4.28  | 0.47  | 5.86  | 3.46  | 36.46 | 15.09 | 5.11  | 84.2  |
| 1947  | 4.76  | 1.65  | 0.76  | 0.66  | 0.57  | 4.21  | 2.49  | 17.30 | 7.49  | 26.37 | 10.34 | 26.11 | 102.7 |
| 1948  | 10.38 | 2.15  | 0.91  | 0.67  | 0.57  | 0.42  | 5.40  | 4.97  | 11.36 | 17.41 | 20.34 | 12.24 | 86.8  |
| 1949  | 9.23  | 8.82  | 1.24  | 0.76  | 0.64  | 0.48  | 16.31 | 0.43  | 4.23  | 35.85 | 4.09  | 17.66 | 99.7  |
| 1950  | 3.69  | 9.61  | 1.66  | 1.77  | 0.79  | 0.60  | 21.20 | 7.97  | 38.71 | 20.48 | 13.94 | 10.05 | 130.5 |
| 1951  | 6.52  | 10.41 | 1.12  | 0.72  | 0.75  | 0.57  | 1.21  | 24.98 | 9.09  | 17.08 | 40.47 | 23.56 | 136.5 |
| 1952  | 6.43  | 12.41 | 1.18  | 0.76  | 0.62  | 0.48  | 31.28 | 35.21 | 9.10  | 31.35 | 23.30 | 3.99  | 156.1 |
| 1953  | 2.00  | 3.76  | 1.21  | 0.80  | 0.69  | 0.81  | 13.73 | 41.69 | 14.96 | 49.30 | 31.97 | 9.38  | 170.3 |
| 1954  | 8.49  | 2.05  | 3.39  | 0.82  | 6.18  | 0.52  | 2.04  | 1.32  | 21.23 | 35.59 | 53.74 | 6.27  | 141.6 |
| 1955  | 14.53 | 5.50  | 1.58  | 0.85  | 0.75  | 0.71  | 1.09  | 15.67 | 30.77 | 24.49 | 28.12 | 5.55  | 129.6 |
| 1956  | 3.73  | 1.24  | 0.90  | 0.70  | 17.57 | 1.80  | 1.69  | 36.28 | 36.38 | 42.78 | 22.91 | 9.60  | 175.6 |
| 1957  | 21.07 | 2.34  | 0.85  | 0.74  | 5.00  | 0.46  | 0.89  | 22.19 | 10.81 | 3.60  | 11.24 | 5.26  | 84.5  |
| 1958  | 5.80  | 3.65  | 0.89  | 0.72  | 0.74  | 0.54  | 15.70 | 64.00 | 4.75  | 3.51  | 16.58 | 4.80  | 121.7 |
| 1959  | 12.54 | 1.60  | 0.89  | 0.69  | 0.61  | 1.22  | 3.73  | 19.80 | 29.85 | 5.69  | 4.88  | 3.93  | 85.4  |
| 1960  | 2.88  | 1.02  | 0.80  | 2.21  | 0.58  | 0.50  | 1.01  | 6.40  | 20.48 | 9.18  | 19.93 | 24.11 | 89.1  |
| 1961  | 4.13  | 1.31  | 0.80  | 0.72  | 2.43  | 1.46  | 5.88  | 2.06  | 68.19 | 20.39 | 32.29 | 8.88  | 148.5 |
| 1962  | 22.90 | 4.60  | 0.89  | 0.42  | 0.29  | 0.31  | 0.35  | 1.81  | 9.58  | 21.88 | 36.72 | 13.80 | 113.6 |
| 1963  | 2.72  | 4.17  | 2.65  | 0.49  | 10.07 | 1.29  | 1.46  | 8.95  | 18.29 | 12.87 | 26.98 | 5.69  | 95.6  |
| 1964  | 12.05 | 7.92  | 1.06  | 2.11  | 2.00  | 9.18  | 11.95 | 15.16 | 9.70  | 10.01 | 22.26 | 6.90  | 110.3 |
| 1965  | 5.07  | 1.47  | 1.66  | 0.49  | 0.33  | 8.16  | 5.13  | 3.99  | 23.62 | 40.06 | 13.60 | 11.43 | 115.0 |
| 1966  | 2.32  | 0.61  | 1.13  | 1.36  | 0.21  | 0.32  | 10.26 | 12.74 | 44.53 | 15.66 | 9.97  | 8.17  | 107.3 |
| 1967  | 12.04 | 4.98  | 1.36  | 2.07  | 0.89  | 0.09  | 8.08  | 36.62 | 15.66 | 53.67 | 31.79 | 5.18  | 172.4 |
| 1968  | 15.32 | 1.01  | 1.08  | 5.22  | 1.29  | 0.27  | 5.50  | 3.92  | 14.64 | 13.39 | 22.35 | 15.64 | 99.6  |
| 1969  | 13.85 | 1.91  | 0.48  | 0.31  | 0.31  | 0.37  | 0.31  | 18.35 | 33.12 | 20.72 | 31.58 | 13.24 | 134.6 |
| 1970  | 4.35  | 2.49  | 2.96  | 0.57  | 0.36  | 0.68  | 0.99  | 3.62  | 8.61  | 23.28 | 25.41 | 5.45  | 78.8  |
| 1971  | 2.68  | 0.68  | 0.67  | 0.83  | 1.38  | 0.32  | 0.21  | 16.57 | 10.18 | 8.10  | 12.28 | 13.66 | 67.6  |
| 1972  | 2.75  | 0.64  | 2.71  | 0.46  | 0.32  | 4.39  | 0.41  | 2.32  | 2.44  | 57.74 | 12.96 | 8.48  | 95.6  |
| 1973  | 5.02  | 1.53  | 6.98  | 0.55  | 0.36  | 0.40  | 0.38  | 5.68  | 25.15 | 9.01  | 94.55 | 10.12 | 159.7 |
| 1974  | 10.43 | 3.04  | 0.94  | 0.80  | 0.54  | 0.51  | 5.85  | 26.17 | 13.37 | 25.48 | 15.00 | 2.31  | 104.4 |
| 1975  | 7.22  | 2.11  | 0.98  | 0.39  | 0.36  | 0.36  | 0.70  | 2.11  | 54.96 | 23.28 | 7.09  | 5.99  | 105.6 |
| 1976  | 2.57  | 29.03 | 10.96 | 6.34  | 1.16  | 1.00  | 10.63 | 46.10 | 42.86 | 46.39 | 41.46 | 8.54  | 247.0 |
| 1977  | 5.61  | 1.12  | 4.37  | 0.62  | 0.59  | 0.77  | 8.00  | 17.69 | 2.36  | 1.52  | 27.21 | 14.38 | 84.2  |
| 1978  | 5.48  | 3.08  | 1.45  | 1.23  | 1.82  | 2.39  | 2.58  | 16.54 | 24.97 | 10.81 | 15.96 | 7.42  | 93.7  |
| 1979  | 21.48 | 1.88  | 0.54  | 1.82  | 0.81  | 0.43  | 9.25  | 21.94 | 14.17 | 8.35  | 12.29 | 5.80  | 98.8  |
| 1980  | 4.81  | 14.79 | 5.74  | 12.86 | 1.13  | 1.25  | 2.21  | 2.72  | 12.10 | 35.31 | 21.35 | 22.71 | 137.0 |
| 1981  | 2.50  | 1.56  | 1.30  | 2.04  | 0.49  | 0.58  | 13.84 | 4.77  | 17.77 | 11.92 | 14.47 | 4.73  | 76.0  |
| 1982  | 9.05  | 2.94  | 6.16  | 0.92  | 2.51  | 4.18  | 1.58  | 33.43 | 39.74 | 23.08 | 11.88 | 14.35 | 149.8 |
| 1983  | 1.94  | 0.99  | 1.02  | 0.54  | 0.37  | 2.48  | 2.58  | 52.45 | 11.87 | 20.35 | 12.14 | 29.83 | 136.6 |
| 1984  | 10.59 | 0.86  | 6.04  | 4.60  | 2.14  | 10.19 | 8.74  | 8.04  | 26.11 | 30.31 | 28.29 | 10.04 | 146.0 |
| 1985  | 2.62  | 1.43  | 0.52  | 0.80  | 0.33  | 2.68  | 13.77 | 19.06 | 25.51 | 32.91 | 34.92 | 15.19 | 149.7 |
| 1986  | 1.63  | 1.15  | 0.61  | 5.08  | 0.69  | 1.43  | 4.47  | 27.00 | 27.51 | 23.76 | 22.53 | 15.84 | 131.7 |
| 1987  | 3.34  | 1.27  | 6.12  | 0.90  | 0.36  | 0.47  | 9.86  | 19.33 | 18.35 | 22.59 | 17.48 | 18.73 | 118.8 |
| 1988  | 3.82  | 3.11  | 0.69  | 0.42  | 0.93  | 10.93 | 4.03  | 15.06 | 16.08 | 29.36 | 31.34 | 24.53 | 140.3 |
| 1989  | 5.60  | 4.49  | 0.86  | 0.44  | 1.82  | 0.71  | 30.92 | 16.10 | 26.13 | 46.11 | 18.44 | 4.26  | 155.9 |
| 1990  | 1.10  | 1.03  | 3.16  | 0.77  | 0.96  | 1.04  | 1.21  | 21.37 | 33.73 | 71.10 | 17.09 | 26.70 | 179.3 |
| AVE : | 6.50  | 3.64  | 1.86  | 1.49  | 1.67  | 1.66  | 5.88  | 16.39 | 20.68 | 22.33 | 21.42 | 12.12 | 115.6 |
| SD :  | 4.90  | 4.45  | 2.01  | 2.02  | 3.27  | 2.41  | 6.73  | 13.46 | 15.35 | 14.62 | 13.48 | 7.91  | 36.5  |

## APPENDIX B5.1

SUB-CATCHMENT : H1H018  
RIVER : Molenaars  
PLACE : Hawequas Forest Reserve

### 1 CATCHMENT

|                     | YEAR |      |      |      | UNITS |
|---------------------|------|------|------|------|-------|
|                     | 1968 | 1984 | 1990 | 2000 |       |
| SUB-CATCHMENT AREAS |      |      |      |      |       |
| H1H017 inc          | 61.0 | 61.0 | 61.0 | 61.0 | km²   |
| H1H018 inc          | 52.0 | 52.0 | 52.0 | 52.0 | km²   |

### 2 LANDUSE

|                     | YEAR           |      |       |       | UNITS |
|---------------------|----------------|------|-------|-------|-------|
|                     | 1968           | 1984 | 1990  | 2000  |       |
| ALIEN VEGETATION    |                |      |       |       |       |
| H1H017 tall trees   | 0.18           | 0.51 | 3.21  | 5.01  | km²   |
| tall shrubs         | 0.14           | 0.4  | 2.52  | 3.94  | km²   |
| riparian            | 0.14           | 0.39 | 2.48  | 3.88  | km²   |
| H1H018 tall trees   | 0.38           | 0.38 | 2.05  | 3.25  | km²   |
| tall shrubs         | 0.3            | 0.3  | 1.61  | 2.55  | km²   |
| riparian            | 0.99           | 2.74 | 5.35  | 8.46  | km²   |
| Total               | 2.13           | 4.72 | 17.22 | 27.09 | km²   |
| FARM DAM CAPACITIES | not applicable |      |       |       |       |
| IRRIGATION AREAS    |                |      |       |       |       |
| H1H018              | 1.11           | 1.11 | 1.11  | 0.1   | km²   |
| Total               | 1.11           | 1.11 | 1.11  | 0.1   | km²   |

### 3 EVAPORATION

|                              | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) H1H017 | 169  | 218  | 259  | 256  | 221  | 185  | 127  | 88   | 73   | 73   | 88   | 116  | 1872      |
| S-PAN (gross) (in mm)        | 132  | 178  | 216  | 213  | 180  | 147  | 93   | 57   | 43   | 43   | 57   | 83   | 1442      |
| LAKE FACTOR                  | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)           | 107  | 146  | 179  | 179  | 158  | 129  | 82   | 50   | 37   | 36   | 46   | 67   | 1215.9    |
| A-PAN (gross) (in mm) H1H018 | 177  | 247  | 299  | 310  | 262  | 218  | 126  | 72   | 52   | 53   | 71   | 110  | 1997      |
| S-PAN (gross) (in mm)        | 136  | 190  | 230  | 238  | 202  | 168  | 97   | 55   | 40   | 41   | 55   | 85   | 1537      |
| LAKE FACTOR                  | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)           | 110  | 156  | 191  | 200  | 178  | 148  | 85   | 48   | 34   | 34   | 45   | 69   | 1297      |

**Note : evaporation from BRHS used for this sub-catchment**

### 4 RESERVOIR SIMULATIONS

not applicable

### 5 IRRIGATION ROUTINE

|                      | QUANT<br>% | CROP FACTORS |      |      |      |      |      |      |      |      |      |      |      |
|----------------------|------------|--------------|------|------|------|------|------|------|------|------|------|------|------|
|                      |            | OCT          | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  |
| Combined crop factor | 100        | 0.30         | 0.38 | 0.44 | 0.46 | 0.46 | 0.39 | 0.25 | 0.18 | 0.18 | 0.18 | 0.18 | 0.22 |

### 6. NOTES

Combined crop factor used in the BRHS for :  
crop type 1 : vineyards and fruit trees  
crop type 2 : wheat, lucerne and cash crops

Catchment modelled using two different MAPs

H1H017 MAP = 1950 mm  
H1H018 MAP = 1940 mm

Appendix B5.2

File : H1H018.OBS  
Units : 10^6xm^3  
Descrip. : Observed flow record at H1H018 for 1968 to 1990

| Year  | Oct    | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May    | Jun    | Jul    | Aug    | Sep    | Total |
|-------|--------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|-------|
| 1968  | 22.49+ | 4.88+ | 2.86+ | 2.29+ | 1.89* | 1.53  | 5.12  | 3.83   | 10.63  | 13.37  | 21.41  | 24.83  | 115.1 |
| 1969  | 16.62  | 3.68  | 2.17  | 1.64  | 1.40  | 1.36  | 1.27  | 19.35  | 34.40  | 33.43  | 35.43  | 17.03  | 167.8 |
| 1970  | 7.20   | 3.70  | 3.64  | 2.10  | 1.34  | 1.73  | 1.75  | 4.54   | 6.87   | 29.80  | 26.30  | 7.82   | 96.8  |
| 1971  | 3.60   | 2.09  | 1.83  | 1.85  | 1.61  | 1.19  | 1.42  | 14.95  | 13.06  | 7.99   | 14.94  | 13.95  | 78.5  |
| 1972  | 4.08   | 1.91  | 2.47  | 1.36  | 0.99  | 2.30  | 1.04  | 2.03   | 2.50   | 59.10  | 18.49  | 12.99  | 109.3 |
| 1973  | 9.07   | 3.00  | 6.72  | 1.22  | 0.64  | 1.03  | 0.90  | 3.75   | 35.44  | 12.40  | 103.11 | 17.67  | 194.9 |
| 1974  | 14.72  | 6.83  | 2.89  | 2.24  | 1.38  | 1.26  | 8.08  | 40.66  | 17.38  | 36.41  | 23.45  | 5.93   | 161.2 |
| 1975  | 12.44  | 4.64  | 2.75  | 1.59  | 1.20  | 1.34  | 1.30  | 2.52   | 59.63* | 33.39  | 13.64  | 8.23   | 142.7 |
| 1976  | 5.48   | 25.10 | 16.65 | 7.81  | 2.73  | 2.54  | 8.59  | 53.75  | 63.93  | 55.50  | 58.77  | 15.56  | 316.4 |
| 1977  | 8.09   | 3.03  | 4.45  | 1.94  | 1.58  | 1.61  | 6.10  | 13.73  | 3.52   | 2.74   | 32.02  | 17.27  | 96.1  |
| 1978  | 7.95   | 4.67  | 2.48  | 2.08  | 1.87  | 2.60  | 2.01  | 16.20  | 28.85  | 17.07  | 21.85  | 17.15  | 124.8 |
| 1979  | 22.19  | 4.72  | 2.13  | 2.24  | 1.41* | 1.56* | 6.21  | 18.26  | 15.08  | 12.62  | 14.52  | 7.21   | 108.2 |
| 1980  | 6.92   | 16.12 | 14.49 | 11.21 | 4.13  | 3.86  | 4.44  | 4.44   | 8.89   | 35.78  | 25.07  | 36.01  | 171.4 |
| 1981  | 6.13   | 4.89  | 3.30  | 2.13* | 1.42* | 1.43  | 5.22  | 16.03  | 22.74  | 14.94  | 15.50  | 6.21   | 99.9  |
| 1982  | 7.85*  | 5.00  | 5.65  | 2.53  | 4.13  | 5.09* | 2.28+ | 31.28* | 47.26  | 46.41  | 16.84  | 20.82  | 195.1 |
| 1983  | 5.72   | 3.09  | 2.52  | 1.72  | 1.32  | 2.52  | 3.62  | 60.32  | 22.49  | 28.37  | 15.69  | 41.23  | 188.6 |
| 1984  | 16.32  | 3.29  | 7.09  | 5.45  | 2.21  | 16.13 | 8.49  | 10.42  | 26.28  | 40.37  | 29.18  | 16.08  | 181.3 |
| 1985  | 5.30   | 2.83  | 2.11  | 1.77* | 1.07* | 2.69  | 9.16  | 16.96  | 33.73  | 36.31  | 39.85  | 17.93  | 169.7 |
| 1986  | 4.49   | 3.29  | 1.83  | 2.58  | 1.39  | 1.75  | 2.43  | 33.89  | 30.06  | 29.14  | 36.88  | 18.55  | 166.3 |
| 1987  | 6.09   | 2.65  | 5.85  | 1.81  | 1.21  | 1.30  | 9.26  | 19.34  | 17.27  | 24.30  | 33.03  | 21.24  | 143.4 |
| 1988  | 5.91   | 2.09  | 1.68  | 1.44  | 1.34  | 9.57  | 5.81  | 15.62  | 18.06  | 28.71  | 16.26  | 27.91  | 134.4 |
| 1989  | 9.79   | 4.45  | 2.26  | 1.61  | 2.55  | 1.66  | 17.94 | 18.77  | 23.97  | 48.32  | 23.15  | 6.41   | 160.9 |
| 1990  | 3.06   | 3.25  | 3.30  | 1.78  | 1.44  | 1.69  | 1.94  | 21.22+ | 51.19+ | 58.41+ | 15.38+ | 33.94+ | 196.6 |
| AVE : | 9.20   | 5.18  | 4.40  | 2.71  | 1.75  | 2.95  | 4.97  | 19.21  | 25.79  | 30.65  | 28.29  | 17.91  | 153.0 |
| SD :  | 5.62   | 5.19  | 3.87  | 2.35  | 0.89  | 3.41  | 4.04  | 15.60  | 17.03  | 16.09  | 19.56  | 9.70   | 50.8  |

## Average Rainfall On Catchment ouplaas.r

## details of rainfall stations used

022038\_8.pat 1920 to 1998

22284a.pat 1970 to 1983

022113\_2.pat 1920 to 1998

022504\_x.pat 1932 to 1994

|          |        | rainfall input as percent m.a.p. |        |        |       |       |       |        |        |        |        |        |        |         |  |
|----------|--------|----------------------------------|--------|--------|-------|-------|-------|--------|--------|--------|--------|--------|--------|---------|--|
| no.      | gauges | oct                              | nov    | dec    | jan   | feb   | mar   | apr    | may    | jun    | jul    | aug    | sep    | year    |  |
| 1920     | 2      | 6.01                             | 3.18   | 3.94   | 4.51  | 5.30  | 2.44  | 7.42   | 1.37   | 42.22  | 16.84  | 13.77  | 6.30   | 113.29  |  |
| 1921     | 2      | 3.58                             | 2.58   | 6.02   | 9.16  | 2.43  | 6.68  | 5.70   | 10.29  | 24.15  | 7.39   | 17.23  | 5.26   | 100.48  |  |
| 1922     | 2      | 2.73                             | 3.09   | 1.17   | 2.66  | .20   | 1.34  | 10.90  | 27.47  | 27.21  | 14.67  | 12.42  | 9.25   | 113.10  |  |
| 1923     | 2      | 5.15                             | 16.62  | 2.39   | 2.32  | .18   | 3.69  | 3.01   | 10.22  | 19.85  | 8.11   | 16.20  | 8.64   | 96.40   |  |
| 1924     | 2      | 8.65                             | 9.65   | .24    | 4.10  | .53   | .42   | 2.51   | 10.23  | 41.31  | 20.70  | 8.01   | 3.48   | 109.84  |  |
| 1925     | 2      | 10.11                            | 6.75+  | 1.93   | 1.07  | 4.87  | .23   | 2.99   | 20.04  | 6.43   | 15.68  | 11.07  | 5.20   | 86.38   |  |
| 1926     | 2      | 17.49                            | 2.62   | .00    | .79   | 6.71  | .21   | 7.54   | 12.16  | 10.57  | 9.53   | 16.42  | 4.91   | 88.95   |  |
| 1927     | 2      | .72                              | 9.49   | 4.12   | 3.57  | .00   | 4.50  | 2.95   | .59    | 27.81  | 10.74  | 10.40  | 11.70  | 86.58   |  |
| 1928     | 2      | 2.12                             | 2.15   | 3.28   | .00   | .68   | 2.00  | 10.15  | 17.80  | 10.59  | 18.09  | 10.82  | 4.35   | 82.04   |  |
| 1929     | 2      | 2.99                             | 2.81   | 4.75   | 3.12  | 3.30  | 4.93  | 4.42   | .33    | 2.08   | 13.36  | 13.17  | 21.57  | 76.84   |  |
| 1930     | 2      | 5.06                             | 6.25   | 1.97   | .00   | 4.18  | .38+  | 12.24  | 9.62   | 5.18   | 8.31   | 16.61  | 12.29  | 82.07   |  |
| 1931     | 2      | 9.72                             | .24    | 2.07   | 2.91  | 11.92 | 2.06  | 1.63   | 19.34  | 14.31  | 10.08  | 9.46   | 8.94   | 92.68   |  |
| 1932     | 3      | 3.18                             | 1.26   | 2.70   | 1.70  | 1.92  | 1.33  | 1.81   | 12.35  | 28.75  | 19.91  | 11.60  | 3.91   | 90.40   |  |
| 1933     | 3      | 6.60                             | 1.09   | 2.83   | .44   | 2.98  | 4.55  | 1.16   | 14.57  | 10.17+ | 8.60   | 8.03   | 10.69  | 71.73   |  |
| 1934     | 3      | 8.55                             | 5.98+  | .57    | .80   | 2.73  | 3.93  | 10.31  | 14.59  | 9.33   | 13.49  | 9.82   | 8.86   | 88.94   |  |
| 1935     | 3      | 1.54                             | 6.82   | 1.00   | 6.87  | 1.51  | 2.60  | .79    | 10.35  | 7.42   | 12.97  | 14.59  | 9.04   | 75.52   |  |
| 1936     | 3      | 2.23                             | 4.79   | 9.84   | 1.55  | .22   | 7.97  | 9.28   | 14.74  | 28.94  | 20.49  | 5.26   | 4.77   | 110.07  |  |
| 1937     | 3      | 3.16                             | 2.92   | .27    | 5.04  | 1.73  | 1.44  | 12.49  | 13.64  | 7.19   | 9.93   | 9.34   | 13.55  | 80.70   |  |
| 1938     | 3      | 3.20                             | 5.00   | 1.31   | .41*  | 6.91  | 2.27+ | 7.75   | 18.25  | 5.09   | 6.77   | 14.42+ | 6.48   | 77.84   |  |
| 1939     | 3      | 1.49                             | 5.13   | 4.32+  | .36   | 7.58  | 3.67  | 12.32  | 11.22  | 17.95  | 9.62   | 6.01   | 9.01   | 88.69   |  |
| 1940     | 3      | 4.42                             | 10.41  | 1.44   | 8.00  | 1.63  | 1.02  | 20.48  | 27.82  | 23.39  | 16.29  | 15.55  | 27.07  | 157.51  |  |
| 1941     | 3      | 8.02                             | 1.39   | 4.43   | 1.11  | .24   | .33   | 2.44   | 20.89  | 38.69  | 7.17   | 17.67  | 2.47   | 104.84  |  |
| 1942     | 3      | 4.82+                            | .28    | .77    | 5.40  | 1.72  | 6.65  | 3.76   | 3.38   | 15.26  | 13.53  | 18.52  | 8.27   | 82.36   |  |
| 1943     | 3      | 4.75                             | 6.90   | .58    | 1.55  | .50   | 2.30  | 4.83   | 16.51  | 31.46  | 13.04  | 16.06  | 9.87   | 108.36  |  |
| 1944     | 3      | 6.77                             | 5.07   | 5.20   | .00   | .03   | .46   | 7.90   | 23.83  | 32.61  | 31.01  | 16.43  | 1.20   | 130.52  |  |
| 1945     | 3      | 5.27                             | 3.35   | 1.63   | .58   | 1.29  | 3.87  | 6.20   | 10.86  | 5.61   | 10.12  | 11.38  | 17.25  | 77.41   |  |
| 1946     | 3      | 9.52                             | 1.99   | 1.07   | .00   | .00   | 8.51  | 3.15   | 11.97  | 6.72   | 25.04  | 11.54  | 2.45   | 81.95   |  |
| 1947     | 3      | 7.13                             | 2.76   | .36+   | .39   | 1.10  | 4.51  | 3.03   | 13.61  | 9.10   | 15.46  | 6.90   | 18.20  | 82.55   |  |
| 1948     | 3      | 10.10                            | 1.06   | 2.20   | .60   | .03   | .69   | 8.34   | 7.62   | 10.16  | 13.05  | 13.26  | 10.70  | 77.80   |  |
| 1949     | 3      | 7.36                             | 7.47   | 1.03   | .22   | .00   | .63   | 14.60  | 1.64   | 6.67   | 30.69  | 1.98   | 17.71  | 90.01   |  |
| 1950     | 3      | 3.64                             | 9.98   | 3.38   | 4.72  | .17   | .43   | 18.95  | 7.08   | 29.48  | 11.87  | 7.15   | 10.64* | 107.50  |  |
| 1951     | 3      | 3.59                             | 8.57+  | .00    | .03   | 1.08+ | 2.83+ | 6.27   | 15.52  | 9.80   | 13.99  | 24.84  | 19.27* | 105.80  |  |
| 1952     | 3      | 3.97                             | 14.95  | .46    | .50   | .40   | 1.89  | 24.78  | 20.28  | 7.15   | 18.56  | 14.10  | 1.00   | 108.05  |  |
| 1953     | 3      | 4.64                             | 7.00+  | 1.60   | 1.17  | 1.93  | 4.30  | 10.48  | 30.07  | 15.24  | 33.85  | 19.65  | 4.08   | 134.02  |  |
| 1954     | 3      | 6.80                             | 1.92   | 5.10   | .05   | 15.38 | 1.36  | 5.38   | 4.11   | 15.73  | 22.61  | 31.98  | 4.03   | 114.46  |  |
| 1955     | 3      | 11.99                            | 8.25   | 1.90   | 1.28  | 1.08  | 2.91  | 6.05   | 15.31  | 25.17  | 16.35  | 20.29  | 7.23   | 117.82  |  |
| 1956     | 3      | 5.53                             | .38    | 4.78   | .99   | 10.70 | 4.08  | 7.37   | 34.64  | 25.65  | 24.72  | 16.33  | 7.37   | 142.54  |  |
| 1957     | 3      | 16.70                            | .75    | .00    | 1.29  | 7.31  | 3.78  | 4.63   | 19.74  | 10.87  | 2.19   | 12.37  | 4.34   | 83.95   |  |
| 1958     | 3      | 6.81                             | 6.17   | .11    | 3.04  | 1.97  | 2.66  | 17.86  | 37.97  | 2.92   | 4.22   | 13.95  | 4.69   | 102.37  |  |
| 1959     | 3      | 9.78                             | .21    | 1.95   | 2.02  | .92   | 4.98  | 5.01   | 12.16  | 21.72  | 4.17   | 3.68   | 4.97   | 71.56   |  |
| 1960     | 3      | 4.91                             | .66    | 2.38   | 4.99  | 1.37  | 1.68  | 5.17   | 9.70   | 16.30  | 10.78  | 14.81  | 17.16  | 89.93   |  |
| 1961     | 3      | 3.92                             | .01    | 1.95   | 1.94  | 4.75  | 4.97  | 11.26  | 4.59   | 41.98  | 12.01  | 27.24  | 5.34   | 119.96  |  |
| 1962     | 3      | 18.64                            | 3.87   | .72    | 4.95  | .48   | .76   | 3.04   | 5.20   | 8.73   | 21.25  | 23.37  | 4.80   | 95.82   |  |
| 1963     | 3      | 2.27                             | 5.28   | 5.49   | .36   | 10.39 | .71   | 4.40   | 9.54   | 21.57  | 14.17  | 13.65  | 6.18   | 94.00   |  |
| 1964     | 3      | 6.04                             | 9.03   | 1.13   | 4.81  | 5.62  | 13.12 | 8.76   | 18.44  | 8.57   | 8.06   | 10.16  | 5.76   | 99.50   |  |
| 1965     | 3      | 5.49                             | 2.41   | 7.20   | .89   | .99   | 12.12 | 4.95   | 6.42   | 16.72  | 19.41  | 10.24  | 7.72   | 94.58   |  |
| 1966     | 3      | .61                              | 2.06   | 1.29   | 1.37  | .13   | 1.32  | 14.55  | 9.47   | 24.15  | 6.54   | 7.38   | 6.29   | 75.16   |  |
| 1967     | 3      | 7.46                             | 6.49   | .25    | 4.03  | 1.70  | .22   | 13.27  | 18.37  | 16.71  | 19.80  | 11.71  | 1.87   | 101.89  |  |
| 1968     | 3      | 15.34                            | 2.83   | 2.50   | 4.57  | 1.83  | 1.49  | 7.68   | 1.74   | 12.24  | 9.19   | 12.16  | 11.73  | 83.29   |  |
| 1969     | 3      | 9.82                             | .62    | .30    | .72   | 3.17  | .29   | .43    | 17.41  | 22.51  | 15.59  | 15.68  | 7.96   | 94.49   |  |
| 1970     | 4      | 5.01                             | 2.38   | 2.78   | .38   | .14   | 3.74  | 1.24   | 7.13   | 8.70   | 17.67  | 16.09  | 1.79   | 67.07   |  |
| 1971     | 4      | 1.77                             | .80    | 2.82   | 3.76  | 2.07  | 1.96  | 10.86+ | 15.50  | 9.13   | 7.06   | 7.92   | 5.40   | 69.04   |  |
| 1972     | 4      | 2.82                             | .10    | 4.48   | .29   | .03   | 4.74  | 1.53   | 5.55   | 2.11   | 38.21  | 10.44  | 8.88   | 79.18   |  |
| 1973     | 4      | 3.78                             | 1.54   | 7.05   | .80   | .75   | .83   | .19    | 13.83  | 24.70  | 10.87  | 56.48  | 9.74   | 130.57  |  |
| 1974     | 4      | 10.77                            | 4.53   | 1.52   | 2.51  | 1.60  | .81   | 8.38   | 27.84  | 9.83   | 19.25  | 12.27  | 3.33   | 102.64  |  |
| 1975     | 4      | 7.65                             | 3.38   | .36    | .00   | .83   | 3.86  | 4.37   | 6.23   | 36.56  | 16.48  | 7.35   | 5.90   | 92.99   |  |
| 1976     | 4      | 3.45                             | 18.68* | 8.53   | 4.37  | 5.35  | 1.99  | 15.19  | 32.29  | 30.15  | 32.25  | 28.92  | 7.09   | 188.25  |  |
| 1977     | 4      | 3.20                             | 2.81   | 3.90   | 2.69  | 1.69  | 5.84  | 6.01   | 6.17   | 2.10   | 3.22   | 23.04  | 7.99   | 68.66   |  |
| 1978     | 4      | 5.55                             | .63    | 5.48   | 2.84  | 8.04  | .66   | 2.13   | 17.06  | 20.50  | 9.78   | 13.82  | 12.25  | 98.73   |  |
| 1979     | 4      | 11.64                            | 1.22   | .22    | 4.66  | 3.00  | 1.41  | 7.09   | 15.80  | 14.27  | 7.06   | 14.60  | 4.82   | 85.79   |  |
| 1980     | 4      | 5.68                             | 14.63  | 6.70*  | 14.92 | 1.26  | 4.89  | 5.49   | 2.95   | 8.42   | 26.18  | 15.50  | 20.28  | 126.90  |  |
| 1981     | 4      | 3.86                             | 2.28   | 2.01   | 2.93  | .24   | 1.75  | 13.40  | 8.53   | 12.23  | 13.90  | 8.24   | 3.08   | 72.44   |  |
| 1982     | 4      | 7.30                             | 2.88   | 5.40   | .83   | 6.50  | 6.50  | 3.22   | 24.60  | 26.90  | 23.73  | 6.08   | 13.46  | 127.41  |  |
| 1983     | 4      | 1.59                             | 1.85   | 1.79   | 1.38  | .35   | 8.61  | 6.78   | 37.76  | 9.97   | 15.94  | 8.42   | 21.23  | 115.68  |  |
| 1984     | 3      | 13.69                            | .32    | 11.07+ | 6.39  | 5.77  | 14.53 | 10.55  | 6.27   | 23.17  | 24.68  | 15.42  | 8.97   | 140.82  |  |
| 1985     | 3      | 5.17                             | 1.73   | 2.54   | 1.69  | 2.34  | 9.12  | 7.19   | 6.46   | 23.94  | 16.88  | 25.60  | 6.86   | 109.53  |  |
| 1986     | 3      | 1.88                             | 3.29   | .98    | 6.00  | 2.15  | 2.59  | 7.82   | 19.02  | 18.19  | 14.04  | 19.04  | 11.37  | 106.37  |  |
| 1987     | 3      | 2.71                             | 1.46   | 5.99   | .87+  | .94*  | 3.31+ | 9.68+  | 10.84  | 12.18  | 12.11  | 17.15  | 8.99   | 86.24   |  |
| 1988     | 3      | 3.33                             | 1.62   | 2.25   | .73   | 3.98  | 15.43 | 10.67  | 12.63  | 14.18  | 18.30  | 16.03  | 10.67  | 109.82  |  |
| 1989     | 3      | 7.61                             | 6.19   | .34    | 2.13  | 4.88  | 1.65  | 17.57+ | 13.46+ | 20.65+ | 23.64  | 10.44  | 3.53   | 112.09  |  |
| 1990     | 3      | .78                              | 4.81   | 5.23   | 1.30  | 1.22  | .59   | 4.59   | 15.01  | 25.60+ | 41.39  | 7.73   | 14.45+ | 122.69  |  |
| 1991     | 3      | 7.03                             | 2.00   | 1.18   | .13   | 4.24+ | 4.65+ | 8.16   | 12.15+ | 35.58+ | 15.36  | 12.33+ | 7.79   | 110.61  |  |
| 1992     | 3      | 15.80+                           | 2.09   | .23    | 1.43  | 4.48+ | .61   | 24.92+ | 17.88+ | 15.48+ | 32.19+ | 10.09  | 3.85   | 129.06  |  |
| 1993     | 3      | .51                              | 1.11   | 3.70   | 1.14  | .57+  | .98   | 8.59   | 6.11   | 39.62+ | 8.48+  | 4.90   | 11.97  | 87.68   |  |
| 1994     | 3      | 3.40                             | 1.02   | 3.99+  | 1.70  | 1.14  | 2.96  | 3.16   | 12.05  | 18.99  | 19.98+ | 14.46+ | 3.50+  | 86.36   |  |
| 1995     | 2      | 10.54                            | 1.47   | 16.85  | 1.22  | 5.23  | 3.83  | 4.78   | 9.33   | 24.28  | 12.10  | 17.24  | 16.44  | 123.31  |  |
| 1996     | 2      | 7.41                             | 8.43   | 8.88   | 1.36  | .06   | .97   | 4.76   | 9.70   | 29.53  | 7.11   | 13.87  | 1.33   | 93.40   |  |
| 1997     | 2      | 1.76                             | 8.53   | 6.11   | 2.15  | .00   | 2.23  | 6.08   | 21.10  | 12.50  | 14.76  | 6.99   | 5.67   | 87.88   |  |
| 1998     | 2      | 3.09                             | 8.09   | 6.65   | .23   | .06   | .23   | 9.57   | 11.25  | 17.59  | 14.75  | 13.94  | 7.89   | 93.33   |  |
| average  |        | 6.07                             | 4.31   | 3.10   | 2.33  | 2.69  | 3.33  | 7.68   | 13.79  | 18.06  | 15.66  | 14.04  | 8.54   | 99.58   |  |
| adjusted |        | 6.09                             | 4.33   | 3.11   | 2.34  | 2.70  | 3.34  | 7.71   | 13.85  | 18.13  | 15.73  | 14.10  | 8.57   | 100.001 |  |

Appendix B5.4

File : AU\_H1H17.USE

Units : 10<sup>6</sup>xm<sup>3</sup>

Descrip. : Upland alien demand (tall trees) in H1H017 sub-catchment for 1968 to 1990

| Year  | Oct  | Nov  | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul  | Aug  | Sep  | Total |
|-------|------|------|-------|-------|-------|-------|-------|-------|-------|------|------|------|-------|
| 1968  | 0.02 | 0.01 | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.00* | 0.01  | 0.01 | 0.02 | 0.02 | 0.1   |
| 1969  | 0.01 | 0.01 | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.02  | 0.04  | 0.03 | 0.03 | 0.01 | 0.2   |
| 1970  | 0.01 | 0.01 | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.01  | 0.03 | 0.04 | 0.01 | 0.1   |
| 1971  | 0.01 | 0.01 | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.02  | 0.02  | 0.01 | 0.02 | 0.01 | 0.1   |
| 1972  | 0.01 | 0.01 | 0.01  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.09 | 0.02 | 0.02 | 0.2   |
| 1973  | 0.01 | 0.01 | 0.01  | 0.01  | 0.00* | 0.00* | 0.00* | 0.02  | 0.05  | 0.03 | 0.16 | 0.02 | 0.3   |
| 1974  | 0.02 | 0.01 | 0.01  | 0.01  | 0.00* | 0.00* | 0.01  | 0.06  | 0.02  | 0.06 | 0.04 | 0.01 | 0.3   |
| 1975  | 0.01 | 0.01 | 0.01  | 0.01  | 0.00* | 0.00* | 0.00* | 0.01  | 0.10  | 0.05 | 0.02 | 0.02 | 0.2   |
| 1976  | 0.01 | 0.05 | 0.01  | 0.01  | 0.01  | 0.01  | 0.03  | 0.10  | 0.11  | 0.12 | 0.11 | 0.02 | 0.6   |
| 1977  | 0.01 | 0.01 | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01 | 0.06 | 0.02 | 0.2   |
| 1978  | 0.02 | 0.01 | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.04  | 0.06  | 0.04 | 0.05 | 0.04 | 0.3   |
| 1979  | 0.04 | 0.01 | 0.01  | 0.01  | 0.01  | 0.01  | 0.00* | 0.01  | 0.04  | 0.05 | 0.02 | 0.05 | 0.3   |
| 1980  | 0.02 | 0.04 | 0.01  | 0.04  | 0.01  | 0.01  | 0.01  | 0.01  | 0.02  | 0.10 | 0.06 | 0.08 | 0.4   |
| 1981  | 0.02 | 0.01 | 0.01  | 0.01  | 0.01  | 0.01  | 0.00* | 0.03  | 0.02  | 0.04 | 0.06 | 0.03 | 0.3   |
| 1982  | 0.02 | 0.01 | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.09  | 0.12  | 0.11 | 0.03 | 0.05 | 0.5   |
| 1983  | 0.02 | 0.01 | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.16  | 0.05  | 0.08 | 0.04 | 0.09 | 0.5   |
| 1984  | 0.06 | 0.01 | 0.02  | 0.01  | 0.01  | 0.04  | 0.03  | 0.02  | 0.11  | 0.13 | 0.08 | 0.04 | 0.6   |
| 1985  | 0.04 | 0.01 | 0.01  | 0.01  | 0.01  | 0.02  | 0.02  | 0.03  | 0.19  | 0.16 | 0.24 | 0.06 | 0.8   |
| 1986  | 0.04 | 0.02 | 0.02  | 0.02  | 0.01  | 0.01  | 0.03  | 0.19  | 0.22  | 0.19 | 0.26 | 0.13 | 1.1   |
| 1987  | 0.06 | 0.02 | 0.03  | 0.02  | 0.01  | 0.01  | 0.06  | 0.10  | 0.16  | 0.21 | 0.30 | 0.14 | 1.1   |
| 1988  | 0.08 | 0.04 | 0.03  | 0.02  | 0.02  | 0.19  | 0.12  | 0.20  | 0.28  | 0.40 | 0.36 | 0.21 | 2.0   |
| 1989  | 0.15 | 0.09 | 0.04  | 0.03  | 0.03  | 0.02  | 0.29  | 0.24  | 0.52  | 0.65 | 0.28 | 0.12 | 2.5   |
| 1990  | 0.06 | 0.05 | 0.05  | 0.04  | 0.03  | 0.02  | 0.02  | 0.26  | 0.69  | 1.39 | 0.25 | 0.40 | 3.3   |
| AVE : | 0.03 | 0.02 | 0.01  | 0.01  | 0.01  | 0.02  | 0.03  | 0.07  | 0.13  | 0.17 | 0.11 | 0.07 | 0.7   |
| SD :  | 0.03 | 0.02 | 0.01  | 0.01  | 0.01  | 0.04  | 0.06  | 0.08  | 0.17  | 0.30 | 0.11 | 0.09 | 0.8   |

Appendix B5.5

File : AU\_H1H17.USE

Units : 10^6xm^3

Descrip. : Upland alien demand (tall shrubs) in H1H017 sub-catchment for 1968 to 1990

| Year  | Oct  | Nov  | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul  | Aug  | Sep  | Total |
|-------|------|------|-------|-------|-------|-------|-------|-------|-------|------|------|------|-------|
| 1968  | 0.02 | 0.01 | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.00* | 0.01  | 0.01 | 0.02 | 0.02 | 0.1   |
| 1969  | 0.01 | 0.01 | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.02  | 0.04  | 0.03 | 0.03 | 0.01 | 0.2   |
| 1970  | 0.01 | 0.01 | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.01  | 0.03 | 0.04 | 0.01 | 0.1   |
| 1971  | 0.01 | 0.01 | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.02  | 0.02  | 0.01 | 0.02 | 0.01 | 0.1   |
| 1972  | 0.01 | 0.01 | 0.01  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.09 | 0.02 | 0.02 | 0.2   |
| 1973  | 0.01 | 0.01 | 0.01  | 0.01  | 0.00* | 0.00* | 0.00* | 0.02  | 0.05  | 0.03 | 0.16 | 0.02 | 0.3   |
| 1974  | 0.02 | 0.01 | 0.01  | 0.01  | 0.00* | 0.00* | 0.01  | 0.06  | 0.02  | 0.06 | 0.04 | 0.01 | 0.3   |
| 1975  | 0.01 | 0.01 | 0.01  | 0.01  | 0.00* | 0.00* | 0.00* | 0.01  | 0.10  | 0.05 | 0.02 | 0.02 | 0.2   |
| 1976  | 0.01 | 0.05 | 0.01  | 0.01  | 0.01  | 0.01  | 0.03  | 0.10  | 0.11  | 0.12 | 0.11 | 0.02 | 0.6   |
| 1977  | 0.01 | 0.01 | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01 | 0.06 | 0.02 | 0.2   |
| 1978  | 0.02 | 0.01 | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.04  | 0.06  | 0.04 | 0.05 | 0.04 | 0.3   |
| 1979  | 0.04 | 0.01 | 0.01  | 0.01  | 0.01  | 0.01  | 0.00* | 0.01  | 0.04  | 0.05 | 0.02 | 0.05 | 0.3   |
| 1980  | 0.02 | 0.04 | 0.01  | 0.04  | 0.01  | 0.01  | 0.01  | 0.01  | 0.02  | 0.10 | 0.06 | 0.08 | 0.4   |
| 1981  | 0.02 | 0.01 | 0.01  | 0.01  | 0.01  | 0.00* | 0.03  | 0.02  | 0.04  | 0.06 | 0.03 | 0.02 | 0.3   |
| 1982  | 0.02 | 0.01 | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.09  | 0.12  | 0.11 | 0.03 | 0.05 | 0.5   |
| 1983  | 0.02 | 0.01 | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.16  | 0.05  | 0.08 | 0.04 | 0.09 | 0.5   |
| 1984  | 0.06 | 0.01 | 0.02  | 0.01  | 0.01  | 0.04  | 0.03  | 0.02  | 0.11  | 0.13 | 0.08 | 0.04 | 0.6   |
| 1985  | 0.04 | 0.01 | 0.01  | 0.01  | 0.01  | 0.02  | 0.02  | 0.03  | 0.19  | 0.16 | 0.24 | 0.06 | 0.8   |
| 1986  | 0.04 | 0.02 | 0.02  | 0.02  | 0.01  | 0.01  | 0.03  | 0.19  | 0.22  | 0.19 | 0.26 | 0.13 | 1.1   |
| 1987  | 0.06 | 0.02 | 0.03  | 0.02  | 0.01  | 0.01  | 0.06  | 0.10  | 0.16  | 0.21 | 0.30 | 0.14 | 1.1   |
| 1988  | 0.08 | 0.04 | 0.03  | 0.02  | 0.02  | 0.19  | 0.12  | 0.20  | 0.28  | 0.40 | 0.36 | 0.21 | 2.0   |
| 1989  | 0.15 | 0.09 | 0.04  | 0.03  | 0.03  | 0.02  | 0.29  | 0.24  | 0.52  | 0.65 | 0.28 | 0.12 | 2.5   |
| 1990  | 0.06 | 0.05 | 0.05  | 0.04  | 0.03  | 0.02  | 0.02  | 0.26  | 0.69  | 1.39 | 0.25 | 0.40 | 3.3   |
| AVE : | 0.03 | 0.02 | 0.01  | 0.01  | 0.01  | 0.02  | 0.03  | 0.07  | 0.13  | 0.17 | 0.11 | 0.07 | 0.7   |
| SD :  | 0.03 | 0.02 | 0.01  | 0.01  | 0.01  | 0.04  | 0.06  | 0.08  | 0.17  | 0.30 | 0.11 | 0.09 | 0.8   |

Appendix B5.6

File : H17\_RIP.DEM

Units : 10<sup>6</sup>xm<sup>3</sup>

Descrip. : Riparian alien demand in H1H017 incremental sub-catchment for 1968 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1968  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1969  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1970  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1971  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1972  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1973  | 0.01 | 0.01 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1974  | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1975  | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1976  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.1   |
| 1977  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.1   |
| 1978  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1979  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1980  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1981  | 0.02 | 0.02 | 0.03 | 0.03 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1982  | 0.02 | 0.02 | 0.03 | 0.03 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1983  | 0.02 | 0.02 | 0.03 | 0.03 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1984  | 0.02 | 0.02 | 0.03 | 0.03 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1985  | 0.03 | 0.04 | 0.05 | 0.05 | 0.05 | 0.04 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.02 | 0.4   |
| 1986  | 0.05 | 0.07 | 0.08 | 0.08 | 0.07 | 0.06 | 0.04 | 0.02 | 0.02 | 0.02 | 0.02 | 0.03 | 0.6   |
| 1987  | 0.06 | 0.09 | 0.11 | 0.11 | 0.09 | 0.08 | 0.05 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.7   |
| 1988  | 0.08 | 0.11 | 0.13 | 0.13 | 0.12 | 0.09 | 0.06 | 0.04 | 0.03 | 0.03 | 0.03 | 0.05 | 0.9   |
| 1989  | 0.09 | 0.13 | 0.16 | 0.16 | 0.14 | 0.11 | 0.07 | 0.04 | 0.03 | 0.03 | 0.04 | 0.06 | 1.1   |
| 1990  | 0.11 | 0.15 | 0.18 | 0.18 | 0.16 | 0.13 | 0.08 | 0.05 | 0.04 | 0.04 | 0.05 | 0.07 | 1.2   |
| AVE : | 0.03 | 0.04 | 0.05 | 0.05 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.3   |
| SD :  | 0.03 | 0.04 | 0.05 | 0.05 | 0.04 | 0.04 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.3   |



Appendix B5.7

File : AU\_H1H18.USE

Units : 10<sup>6</sup>xm<sup>3</sup>

Descrip. : Upland alien demand (tall trees) in H1H018 sub-catchment for 1968 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb   | Mar   | Apr   | May   | Jun   | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|-------|-------|-------|-------|-------|------|------|------|-------|
| 1968  | 0.04 | 0.01 | 0.01 | 0.01 | 0.01  | 0.00* | 0.01  | 0.00* | 0.02  | 0.02 | 0.04 | 0.04 | 0.2   |
| 1969  | 0.03 | 0.01 | 0.01 | 0.01 | 0.00* | 0.00* | 0.00* | 0.04  | 0.06  | 0.05 | 0.05 | 0.02 | 0.3   |
| 1970  | 0.02 | 0.01 | 0.01 | 0.01 | 0.00* | 0.00* | 0.00* | 0.01  | 0.01  | 0.05 | 0.06 | 0.01 | 0.2   |
| 1971  | 0.01 | 0.01 | 0.01 | 0.01 | 0.00* | 0.00* | 0.01  | 0.04  | 0.02  | 0.02 | 0.02 | 0.02 | 0.2   |
| 1972  | 0.01 | 0.01 | 0.01 | 0.01 | 0.00* | 0.00* | 0.00* | 0.01  | 0.00* | 0.12 | 0.04 | 0.02 | 0.2   |
| 1973  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01  | 0.00* | 0.00* | 0.02  | 0.07  | 0.04 | 0.22 | 0.04 | 0.4   |
| 1974  | 0.03 | 0.01 | 0.01 | 0.01 | 0.01  | 0.00* | 0.01  | 0.08  | 0.03  | 0.07 | 0.04 | 0.02 | 0.3   |
| 1975  | 0.02 | 0.01 | 0.01 | 0.01 | 0.00* | 0.00* | 0.00* | 0.01  | 0.12  | 0.06 | 0.02 | 0.02 | 0.3   |
| 1976  | 0.01 | 0.05 | 0.01 | 0.01 | 0.01  | 0.01  | 0.03  | 0.11  | 0.12  | 0.13 | 0.11 | 0.02 | 0.6   |
| 1977  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01 | 0.07 | 0.02 | 0.2   |
| 1978  | 0.02 | 0.01 | 0.01 | 0.01 | 0.01  | 0.01  | 0.00* | 0.04  | 0.06  | 0.04 | 0.05 | 0.04 | 0.3   |
| 1979  | 0.04 | 0.01 | 0.01 | 0.01 | 0.01  | 0.01  | 0.00* | 0.01  | 0.04  | 0.04 | 0.02 | 0.05 | 0.3   |
| 1980  | 0.01 | 0.04 | 0.01 | 0.03 | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.09 | 0.06 | 0.07 | 0.4   |
| 1981  | 0.02 | 0.01 | 0.01 | 0.01 | 0.01  | 0.01  | 0.00* | 0.03  | 0.02  | 0.05 | 0.07 | 0.04 | 0.3   |
| 1982  | 0.02 | 0.01 | 0.01 | 0.01 | 0.01  | 0.01  | 0.01  | 0.13  | 0.18  | 0.17 | 0.05 | 0.08 | 0.7   |
| 1983  | 0.03 | 0.01 | 0.01 | 0.01 | 0.01  | 0.02  | 0.01  | 0.29  | 0.08  | 0.13 | 0.06 | 0.17 | 0.8   |
| 1984  | 0.11 | 0.02 | 0.05 | 0.02 | 0.02  | 0.08  | 0.06  | 0.04  | 0.21  | 0.26 | 0.16 | 0.08 | 1.1   |
| 1985  | 0.05 | 0.02 | 0.02 | 0.01 | 0.01  | 0.03  | 0.02  | 0.04  | 0.24  | 0.21 | 0.31 | 0.08 | 1.0   |
| 1986  | 0.04 | 0.02 | 0.02 | 0.02 | 0.01  | 0.01  | 0.02  | 0.18  | 0.22  | 0.18 | 0.25 | 0.13 | 1.1   |
| 1987  | 0.05 | 0.02 | 0.03 | 0.02 | 0.01  | 0.01  | 0.05  | 0.08  | 0.13  | 0.17 | 0.25 | 0.12 | 0.9   |
| 1988  | 0.06 | 0.02 | 0.02 | 0.02 | 0.01  | 0.13  | 0.08  | 0.15  | 0.21  | 0.30 | 0.26 | 0.15 | 1.4   |
| 1989  | 0.11 | 0.06 | 0.03 | 0.02 | 0.02  | 0.01  | 0.19  | 0.16  | 0.35  | 0.45 | 0.19 | 0.08 | 1.7   |
| 1990  | 0.04 | 0.04 | 0.03 | 0.02 | 0.02  | 0.01  | 0.01  | 0.16  | 0.43  | 0.89 | 0.16 | 0.25 | 2.1   |
| AVE : | 0.03 | 0.02 | 0.02 | 0.01 | 0.01  | 0.02  | 0.02  | 0.07  | 0.12  | 0.15 | 0.11 | 0.07 | 0.7   |
| SD :  | 0.03 | 0.01 | 0.01 | 0.01 | 0.01  | 0.03  | 0.04  | 0.07  | 0.12  | 0.19 | 0.09 | 0.06 | 0.5   |

## Appendix B5.8

File : USH1H18.USE

Units : 10^6xm^3

Descrip. : Upland alien demand (tall shrubs) in H1H018 sub-catchment for 1968 to 1990

| Year  | Oct  | Nov  | Dec  | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|-------|-------|-------|-------|-------|-------|------|------|------|-------|
| 1968  | 0.00 | 0.00 | 0.00 | 0.00  | 0.00* | 0.00* | 0.00  | 0.00* | 0.00  | 0.00 | 0.00 | 0.00 | 0.0   |
| 1969  | 0.00 | 0.00 | 0.00 | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00 | 0.00 | 0.00 | 0.0   |
| 1970  | 0.00 | 0.00 | 0.00 | 0.00  | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00 | 0.00 | 0.00 | 0.0   |
| 1971  | 0.00 | 0.00 | 0.00 | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00 | 0.00 | 0.00 | 0.0   |
| 1972  | 0.00 | 0.00 | 0.00 | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.01 | 0.00 | 0.00 | 0.0   |
| 1973  | 0.00 | 0.00 | 0.00 | 0.00  | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00 | 0.01 | 0.00 | 0.0   |
| 1974  | 0.00 | 0.00 | 0.00 | 0.00  | 0.00* | 0.00* | 0.00  | 0.01  | 0.00  | 0.00 | 0.00 | 0.00 | 0.0   |
| 1975  | 0.00 | 0.00 | 0.00 | 0.00  | 0.00* | 0.00* | 0.00* | 0.00  | 0.01  | 0.00 | 0.00 | 0.00 | 0.0   |
| 1976  | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.01  | 0.01  | 0.01 | 0.01 | 0.00 | 0.0   |
| 1977  | 0.00 | 0.00 | 0.00 | 0.00  | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.00 | 0.00 | 0.0   |
| 1978  | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00* | 0.00* | 0.00  | 0.00  | 0.00 | 0.00 | 0.00 | 0.0   |
| 1979  | 0.00 | 0.00 | 0.00 | 0.00  | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00 | 0.00 | 0.00 | 0.0   |
| 1980  | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.01 | 0.00 | 0.00 | 0.0   |
| 1981  | 0.00 | 0.00 | 0.00 | 0.00  | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00 | 0.00 | 0.00 | 0.0   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.01  | 0.01  | 0.01 | 0.00 | 0.00 | 0.0   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.02  | 0.01  | 0.01 | 0.00 | 0.01 | 0.1   |
| 1984  | 0.01 | 0.00 | 0.00 | 0.00  | 0.00  | 0.01  | 0.00  | 0.00  | 0.01  | 0.02 | 0.01 | 0.01 | 0.1   |
| 1985  | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.02  | 0.01 | 0.02 | 0.01 | 0.1   |
| 1986  | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.01  | 0.01  | 0.01 | 0.02 | 0.01 | 0.1   |
| 1987  | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.01  | 0.01  | 0.01 | 0.02 | 0.01 | 0.1   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.01  | 0.01  | 0.01  | 0.01  | 0.02 | 0.02 | 0.01 | 0.1   |
| 1989  | 0.01 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  | 0.01  | 0.01  | 0.02  | 0.03 | 0.01 | 0.01 | 0.1   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.01  | 0.03  | 0.06 | 0.01 | 0.02 | 0.1   |
| AVE : | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.01  | 0.01 | 0.01 | 0.00 | 0.0   |
| SD :  | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.01  | 0.01  | 0.01 | 0.01 | 0.01 | 0.0   |

Appendix B5.9

File : H18\_RIP.DEM

Units : 10<sup>6</sup>m<sup>3</sup>

Descrip. : Riparian alien demand in H1H018 incremental sub-catchment for 1968 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1968  | 0.04 | 0.06 | 0.07 | 0.08 | 0.07 | 0.06 | 0.03 | 0.02 | 0.01 | 0.01 | 0.02 | 0.03 | 0.5   |
| 1969  | 0.04 | 0.06 | 0.07 | 0.08 | 0.07 | 0.06 | 0.03 | 0.02 | 0.01 | 0.01 | 0.02 | 0.03 | 0.5   |
| 1970  | 0.04 | 0.06 | 0.07 | 0.08 | 0.07 | 0.06 | 0.03 | 0.02 | 0.01 | 0.01 | 0.02 | 0.03 | 0.5   |
| 1971  | 0.04 | 0.06 | 0.07 | 0.08 | 0.07 | 0.06 | 0.03 | 0.02 | 0.01 | 0.01 | 0.02 | 0.03 | 0.5   |
| 1972  | 0.04 | 0.06 | 0.07 | 0.08 | 0.07 | 0.06 | 0.03 | 0.02 | 0.01 | 0.01 | 0.02 | 0.03 | 0.5   |
| 1973  | 0.04 | 0.06 | 0.07 | 0.08 | 0.07 | 0.06 | 0.03 | 0.02 | 0.01 | 0.01 | 0.02 | 0.03 | 0.5   |
| 1974  | 0.04 | 0.06 | 0.07 | 0.08 | 0.07 | 0.06 | 0.03 | 0.02 | 0.01 | 0.01 | 0.02 | 0.03 | 0.5   |
| 1975  | 0.04 | 0.06 | 0.07 | 0.08 | 0.07 | 0.06 | 0.03 | 0.02 | 0.01 | 0.01 | 0.02 | 0.03 | 0.5   |
| 1976  | 0.04 | 0.06 | 0.07 | 0.08 | 0.07 | 0.06 | 0.03 | 0.02 | 0.01 | 0.01 | 0.02 | 0.03 | 0.5   |
| 1977  | 0.04 | 0.06 | 0.07 | 0.08 | 0.07 | 0.06 | 0.03 | 0.02 | 0.01 | 0.01 | 0.02 | 0.03 | 0.5   |
| 1978  | 0.04 | 0.06 | 0.07 | 0.08 | 0.07 | 0.06 | 0.03 | 0.02 | 0.01 | 0.01 | 0.02 | 0.03 | 0.5   |
| 1979  | 0.04 | 0.06 | 0.07 | 0.08 | 0.07 | 0.06 | 0.03 | 0.02 | 0.01 | 0.01 | 0.02 | 0.03 | 0.5   |
| 1980  | 0.04 | 0.06 | 0.07 | 0.08 | 0.07 | 0.06 | 0.03 | 0.02 | 0.01 | 0.01 | 0.02 | 0.03 | 0.5   |
| 1981  | 0.04 | 0.06 | 0.07 | 0.08 | 0.07 | 0.06 | 0.03 | 0.02 | 0.01 | 0.01 | 0.02 | 0.03 | 0.5   |
| 1982  | 0.04 | 0.06 | 0.07 | 0.08 | 0.07 | 0.06 | 0.03 | 0.02 | 0.01 | 0.01 | 0.02 | 0.03 | 0.5   |
| 1983  | 0.04 | 0.06 | 0.07 | 0.08 | 0.07 | 0.06 | 0.03 | 0.02 | 0.01 | 0.01 | 0.02 | 0.03 | 0.5   |
| 1984  | 0.04 | 0.06 | 0.07 | 0.08 | 0.07 | 0.06 | 0.03 | 0.02 | 0.01 | 0.01 | 0.02 | 0.03 | 0.5   |
| 1985  | 0.07 | 0.10 | 0.13 | 0.13 | 0.12 | 0.10 | 0.06 | 0.03 | 0.02 | 0.02 | 0.03 | 0.05 | 0.9   |
| 1986  | 0.10 | 0.15 | 0.18 | 0.19 | 0.17 | 0.14 | 0.08 | 0.05 | 0.03 | 0.03 | 0.04 | 0.06 | 1.2   |
| 1987  | 0.13 | 0.19 | 0.23 | 0.24 | 0.22 | 0.18 | 0.10 | 0.06 | 0.04 | 0.04 | 0.05 | 0.08 | 1.6   |
| 1988  | 0.17 | 0.23 | 0.29 | 0.30 | 0.27 | 0.22 | 0.13 | 0.07 | 0.05 | 0.05 | 0.07 | 0.10 | 1.9   |
| 1989  | 0.20 | 0.28 | 0.34 | 0.36 | 0.32 | 0.26 | 0.15 | 0.09 | 0.06 | 0.06 | 0.08 | 0.12 | 2.3   |
| 1990  | 0.23 | 0.32 | 0.39 | 0.41 | 0.37 | 0.30 | 0.18 | 0.10 | 0.07 | 0.07 | 0.09 | 0.14 | 2.7   |
| AVE : | 0.07 | 0.10 | 0.12 | 0.13 | 0.12 | 0.10 | 0.05 | 0.03 | 0.02 | 0.02 | 0.03 | 0.05 | 0.8   |
| SD :  | 0.06 | 0.08 | 0.10 | 0.10 | 0.09 | 0.07 | 0.04 | 0.02 | 0.02 | 0.02 | 0.02 | 0.03 | 0.7   |

Appendix B5.10

File : IRRDEM7.FLW  
Units : 10<sup>6</sup>m<sup>3</sup>  
Descrip. : Irrigation from rivers in H1H018 sub-catchment for 1968 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1968  | 0.00 | 0.12 | 0.15 | 0.16 | 0.16 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.7   |
| 1969  | 0.00 | 0.13 | 0.19 | 0.20 | 0.14 | 0.12 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.8   |
| 1970  | 0.04 | 0.10 | 0.16 | 0.20 | 0.17 | 0.09 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.8   |
| 1971  | 0.04 | 0.12 | 0.16 | 0.16 | 0.14 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.7   |
| 1972  | 0.05 | 0.14 | 0.15 | 0.20 | 0.17 | 0.09 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.8   |
| 1973  | 0.03 | 0.11 | 0.14 | 0.19 | 0.16 | 0.10 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.8   |
| 1974  | 0.00 | 0.08 | 0.17 | 0.18 | 0.16 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.7   |
| 1975  | 0.00 | 0.11 | 0.19 | 0.20 | 0.16 | 0.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.7   |
| 1976  | 0.05 | 0.00 | 0.07 | 0.17 | 0.13 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.5   |
| 1977  | 0.05 | 0.10 | 0.15 | 0.19 | 0.15 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.7   |
| 1978  | 0.04 | 0.12 | 0.13 | 0.18 | 0.08 | 0.12 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.7   |
| 1979  | 0.00 | 0.13 | 0.19 | 0.16 | 0.16 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.8   |
| 1980  | 0.03 | 0.00 | 0.12 | 0.07 | 0.17 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.5   |
| 1981  | 0.05 | 0.11 | 0.16 | 0.17 | 0.17 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.8   |
| 1982  | 0.00 | 0.10 | 0.13 | 0.20 | 0.12 | 0.07 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.6   |
| 1983  | 0.07 | 0.12 | 0.17 | 0.19 | 0.17 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.8   |
| 1984  | 0.00 | 0.13 | 0.09 | 0.16 | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.5   |
| 1985  | 0.02 | 0.12 | 0.16 | 0.19 | 0.16 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.7   |
| 1986  | 0.06 | 0.10 | 0.18 | 0.16 | 0.16 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.8   |
| 1987  | 0.06 | 0.12 | 0.12 | 0.21 | 0.17 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.8   |
| 1988  | 0.05 | 0.12 | 0.15 | 0.20 | 0.14 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.7   |
| 1989  | 0.04 | 0.09 | 0.19 | 0.18 | 0.12 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.7   |
| 1990  | 0.06 | 0.10 | 0.15 | 0.19 | 0.16 | 0.11 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.8   |
| AVE : | 0.03 | 0.10 | 0.15 | 0.18 | 0.15 | 0.08 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.7   |
| SD :  | 0.02 | 0.04 | 0.03 | 0.03 | 0.02 | 0.03 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |

## Appendix B5.11

File : H1H18.CAL  
Units : 10^6xm^3  
Descrip. : Simulated flow record at H1H018 for 1925 to 1990

| Year  | Oct   | Nov   | Dec  | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul   | Aug    | Sep   | Total |
|-------|-------|-------|------|-------|-------|-------|-------|-------|-------|-------|--------|-------|-------|
| 1925  | 9.61  | 6.06  | 2.81 | 2.20  | 2.20  | 1.35  | 1.20  | 24.91 | 7.27  | 23.88 | 18.90  | 9.42  | 109.8 |
| 1926  | 25.94 | 4.99  | 2.48 | 1.89  | 2.79  | 1.23  | 3.21  | 11.79 | 13.68 | 15.32 | 29.24  | 9.62  | 122.2 |
| 1927  | 4.43  | 7.41  | 3.04 | 2.57  | 1.89  | 1.85  | 1.39  | 1.22  | 40.21 | 14.48 | 16.78  | 17.88 | 113.2 |
| 1928  | 6.32  | 2.77  | 2.44 | 1.78  | 1.28  | 0.94  | 5.86  | 22.77 | 14.34 | 33.05 | 18.94  | 8.89  | 119.4 |
| 1929  | 5.04  | 2.91  | 2.92 | 2.19  | 1.85  | 2.01  | 1.94  | 1.65  | 1.66  | 13.65 | 18.18  | 38.11 | 92.1  |
| 1930  | 8.71  | 5.69  | 2.69 | 2.10  | 1.87  | 1.19  | 9.40  | 8.51  | 6.98  | 10.66 | 27.96  | 19.94 | 105.7 |
| 1931  | 13.69 | 4.18  | 2.45 | 1.97  | 9.20  | 1.75  | 1.67  | 24.24 | 20.00 | 17.32 | 15.28  | 13.59 | 125.3 |
| 1932  | 6.77  | 2.91  | 2.39 | 1.79  | 1.35  | 1.00  | 0.80  | 9.71  | 45.88 | 38.02 | 20.61  | 8.55  | 139.8 |
| 1933  | 7.40  | 3.26  | 2.48 | 1.83  | 1.45  | 1.50  | 1.03  | 14.36 | 11.45 | 12.53 | 12.76  | 15.78 | 85.8  |
| 1934  | 11.73 | 6.37  | 2.66 | 2.03  | 1.56  | 1.43  | 6.89  | 17.79 | 13.11 | 23.67 | 16.43  | 13.59 | 117.3 |
| 1935  | 5.97  | 4.90  | 2.60 | 3.63  | 1.86  | 1.58  | 1.22  | 6.83  | 6.50  | 17.94 | 25.95  | 13.96 | 92.9  |
| 1936  | 6.33  | 3.62  | 7.52 | 2.51  | 1.98  | 3.88  | 6.53  | 18.92 | 52.86 | 40.27 | 11.17  | 8.26  | 163.9 |
| 1937  | 5.05  | 3.00  | 2.38 | 2.39  | 1.46  | 1.15  | 9.90  | 15.58 | 9.93  | 14.58 | 14.90  | 21.65 | 102.0 |
| 1938  | 7.12  | 4.12  | 2.56 | 1.99  | 3.01  | 1.42  | 3.88  | 24.16 | 8.21  | 9.43  | 22.65  | 10.83 | 99.4  |
| 1939  | 5.19  | 3.49  | 2.90 | 2.13  | 3.68  | 1.83  | 11.06 | 12.90 | 29.86 | 17.09 | 10.90  | 12.78 | 113.8 |
| 1940  | 7.31  | 10.22 | 2.95 | 4.79  | 2.14  | 1.72  | 25.30 | 44.32 | 43.91 | 30.93 | 28.60  | 50.16 | 252.4 |
| 1941  | 12.65 | 4.51  | 3.13 | 2.24  | 1.65  | 1.15  | 0.88  | 25.63 | 67.71 | 13.79 | 31.34  | 7.85  | 172.5 |
| 1942  | 5.28  | 2.78  | 2.13 | 2.32  | 1.34  | 2.52  | 1.61  | 1.93  | 18.24 | 20.86 | 33.84  | 13.34 | 106.2 |
| 1943  | 7.85  | 6.08  | 2.73 | 2.12  | 1.51  | 1.12  | 1.41  | 18.65 | 53.80 | 24.89 | 28.91  | 15.38 | 164.5 |
| 1944  | 9.96  | 5.39  | 3.50 | 2.41  | 1.78  | 1.23  | 3.23  | 33.30 | 58.76 | 61.69 | 31.88  | 7.59  | 220.7 |
| 1945  | 5.31  | 3.27  | 2.60 | 1.96  | 1.40  | 1.28  | 2.14  | 9.36  | 6.91  | 13.29 | 18.48  | 29.30 | 95.3  |
| 1946  | 13.62 | 4.57  | 2.50 | 1.90  | 1.31  | 3.82  | 1.28  | 10.82 | 7.77  | 43.22 | 21.15  | 7.62  | 119.6 |
| 1947  | 7.21  | 3.48  | 2.46 | 1.83  | 1.28  | 1.35  | 1.01  | 12.91 | 10.18 | 25.34 | 11.82  | 30.26 | 109.1 |
| 1948  | 14.46 | 4.35  | 2.49 | 1.90  | 1.34  | 0.92  | 3.42  | 4.52  | 11.04 | 20.37 | 22.97  | 16.35 | 104.1 |
| 1949  | 10.42 | 7.52  | 2.83 | 2.15  | 1.52  | 1.03  | 13.11 | 1.42  | 4.45  | 50.37 | 8.74   | 26.28 | 129.8 |
| 1950  | 7.14  | 9.29  | 3.06 | 2.91  | 2.01  | 1.48  | 21.85 | 5.85  | 49.19 | 22.44 | 12.20  | 15.87 | 153.3 |
| 1951  | 7.32  | 7.49  | 2.76 | 2.06  | 1.44  | 1.12  | 2.05  | 17.41 | 12.39 | 23.80 | 46.21  | 35.20 | 159.3 |
| 1952  | 8.16  | 18.41 | 3.21 | 2.27  | 1.60  | 1.14  | 32.71 | 29.40 | 11.17 | 32.98 | 25.52  | 7.06  | 173.6 |
| 1953  | 4.53  | 5.17  | 2.67 | 2.11  | 1.57  | 1.54  | 7.17  | 47.79 | 27.10 | 65.21 | 38.81  | 9.61  | 213.3 |
| 1954  | 8.14  | 3.65  | 3.27 | 2.18  | 15.37 | 1.80  | 2.52  | 2.61  | 19.89 | 40.15 | 61.90  | 10.26 | 171.7 |
| 1955  | 15.59 | 8.96  | 3.10 | 2.36  | 1.74  | 1.37  | 2.13  | 17.18 | 42.06 | 30.81 | 37.48  | 12.32 | 175.1 |
| 1956  | 8.23  | 3.38  | 2.93 | 1.96  | 7.22  | 2.04  | 4.52  | 56.90 | 49.23 | 48.40 | 30.99  | 12.53 | 228.3 |
| 1957  | 25.82 | 4.89  | 2.59 | 1.92  | 3.21  | 1.63  | 1.98  | 26.14 | 15.08 | 7.90  | 16.51  | 8.43  | 116.1 |
| 1958  | 7.59  | 5.46  | 2.60 | 2.15  | 1.56  | 1.26  | 20.07 | 63.82 | 9.29  | 6.94  | 19.65  | 9.01  | 149.4 |
| 1959  | 11.55 | 3.66  | 2.33 | 1.79  | 1.29  | 1.55  | 1.63  | 11.38 | 34.24 | 9.65  | 7.05   | 6.25  | 92.4  |
| 1960  | 5.27  | 2.74  | 2.22 | 2.26  | 1.42  | 1.14  | 1.61  | 6.88  | 22.61 | 18.11 | 25.86  | 29.51 | 119.6 |
| 1961  | 7.85  | 3.15  | 2.29 | 1.72  | 1.78  | 1.76  | 9.01  | 4.61  | 74.28 | 23.30 | 51.12  | 11.02 | 191.9 |
| 1962  | 28.78 | 5.97  | 2.73 | 2.72  | 1.72  | 1.27  | 1.09  | 1.60  | 6.33  | 32.79 | 43.70  | 9.81  | 138.5 |
| 1963  | 4.99  | 3.64  | 3.34 | 2.24  | 6.98  | 1.74  | 1.98  | 7.14  | 33.15 | 25.76 | 24.11  | 10.66 | 125.7 |
| 1964  | 8.02  | 8.67  | 2.92 | 2.80  | 2.77  | 12.22 | 7.85  | 27.43 | 13.53 | 13.00 | 16.53  | 9.98  | 125.7 |
| 1965  | 7.25  | 3.36  | 4.41 | 2.28  | 1.77  | 9.26  | 2.76  | 4.95  | 23.74 | 35.31 | 18.03  | 12.19 | 125.3 |
| 1966  | 5.33  | 2.72  | 2.21 | 1.64  | 1.14  | 0.81  | 12.96 | 7.99  | 39.39 | 12.03 | 11.83  | 9.83  | 107.9 |
| 1967  | 9.05  | 6.12  | 2.63 | 2.35  | 1.63  | 1.22  | 11.00 | 24.24 | 27.19 | 36.65 | 20.94  | 7.41  | 150.4 |
| 1968  | 20.05 | 4.40  | 2.47 | 2.37  | 1.57  | 1.23  | 3.36  | 1.49  | 12.05 | 11.90 | 19.54  | 18.20 | 98.6  |
| 1969  | 13.66 | 4.01  | 2.12 | 1.47  | 1.18  | 0.75  | 0.61  | 18.53 | 33.40 | 27.81 | 28.12  | 12.60 | 144.3 |
| 1970  | 7.71  | 3.24  | 2.36 | 1.68  | 1.16  | 1.07  | 0.75  | 2.69  | 6.75  | 26.54 | 29.06  | 7.27  | 90.3  |
| 1971  | 3.29  | 2.28  | 1.84 | 1.51  | 1.06  | 0.87  | 7.21  | 18.91 | 12.56 | 11.59 | 12.37  | 9.17  | 82.6  |
| 1972  | 5.05  | 2.42  | 2.29 | 1.39  | 0.96  | 1.20  | 0.74  | 1.69  | 1.34  | 62.48 | 18.76  | 13.32 | 111.6 |
| 1973  | 6.92  | 2.80  | 3.83 | 1.84  | 1.39  | 0.99  | 0.73  | 11.78 | 37.07 | 18.40 | 113.09 | 17.33 | 216.2 |
| 1974  | 15.40 | 5.93  | 2.59 | 2.04  | 1.46  | 1.06  | 3.77  | 41.67 | 14.36 | 35.07 | 21.97  | 8.25  | 153.6 |
| 1975  | 8.23  | 3.83  | 2.29 | 1.63  | 1.09  | 1.05  | 1.20  | 2.77  | 60.43 | 32.07 | 12.62  | 9.81  | 137.0 |
| 1976  | 5.72  | 24.60 | 7.17 | 2.95  | 3.01  | 2.11  | 16.21 | 53.53 | 58.91 | 64.46 | 57.73  | 13.34 | 309.8 |
| 1977  | 7.05  | 3.25  | 2.78 | 2.05  | 1.51  | 2.17  | 2.68  | 4.27  | 3.61  | 3.52  | 34.99  | 12.23 | 80.1  |
| 1978  | 8.00  | 3.07  | 2.92 | 1.88  | 4.03  | 1.50  | 1.44  | 19.40 | 31.41 | 17.47 | 23.84  | 19.54 | 134.5 |
| 1979  | 16.75 | 4.42  | 2.23 | 2.13  | 1.41  | 1.07  | 2.80  | 18.42 | 20.66 | 12.00 | 25.07  | 9.30  | 116.3 |
| 1980  | 6.94  | 17.56 | 5.24 | 16.24 | 2.54  | 2.70  | 3.07  | 2.56  | 7.33  | 44.03 | 29.06  | 36.20 | 173.5 |
| 1981  | 8.11  | 3.29  | 2.38 | 1.86  | 1.25  | 0.93  | 11.25 | 7.02  | 16.07 | 24.37 | 13.24  | 7.68  | 97.4  |
| 1982  | 7.48  | 3.41  | 3.07 | 1.93  | 2.81  | 2.93  | 2.00  | 35.65 | 48.07 | 46.35 | 12.15  | 20.70 | 186.5 |
| 1983  | 6.36  | 2.73  | 2.11 | 1.48  | 1.01  | 3.79  | 3.23  | 62.11 | 17.98 | 28.71 | 14.01  | 37.13 | 180.6 |
| 1984  | 21.01 | 4.57  | 8.90 | 3.71  | 3.25  | 15.48 | 11.13 | 8.11  | 38.34 | 47.78 | 28.97  | 14.41 | 205.7 |
| 1985  | 8.44  | 3.39  | 2.33 | 1.68  | 1.24  | 4.64  | 4.19  | 5.59  | 38.06 | 31.99 | 48.04  | 12.27 | 161.9 |
| 1986  | 5.76  | 2.79  | 2.04 | 2.49  | 1.28  | 1.13  | 3.59  | 24.99 | 29.73 | 25.26 | 34.73  | 18.36 | 152.2 |
| 1987  | 6.67  | 2.62  | 2.99 | 1.53  | 1.11  | 0.98  | 5.49  | 10.15 | 16.46 | 20.99 | 30.45  | 13.94 | 113.4 |
| 1988  | 6.70  | 2.56  | 1.86 | 1.18  | 1.09  | 14.71 | 9.34  | 15.93 | 23.04 | 33.03 | 29.09  | 16.55 | 155.1 |
| 1989  | 10.42 | 5.95  | 2.15 | 1.50  | 1.58  | 0.92  | 19.13 | 15.88 | 34.81 | 44.17 | 18.61  | 8.10  | 163.2 |
| 1990  | 3.48  | 2.62  | 2.36 | 1.33  | 0.93  | 0.62  | 1.06  | 14.85 | 39.70 | 80.61 | 14.53  | 22.78 | 184.9 |
| AVE : | 9.29  | 5.16  | 2.93 | 2.34  | 2.22  | 2.25  | 5.75  | 17.27 | 25.40 | 27.92 | 25.71  | 15.34 | 141.6 |
| SD :  | 5.33  | 3.83  | 1.22 | 1.83  | 2.19  | 2.90  | 6.54  | 15.27 | 18.15 | 16.15 | 15.91  | 9.01  | 44.7  |

Appendix B5.12

File : H1H18PAT.OBS

Units : 10^6xm^3

Descrip. : Patched observed flow record at H1H018 for 1968 to 1990

| Year  | Oct    | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May    | Jun    | Jul    | Aug    | Sep    | Total |
|-------|--------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|-------|
| 1968  | 22.49+ | 4.88+ | 2.86+ | 2.37+ | 1.89* | 1.53  | 5.12  | 3.83   | 10.63  | 13.37  | 21.41  | 24.83  | 115.2 |
| 1969  | 16.62  | 3.68  | 2.17  | 1.64  | 1.40  | 1.36  | 1.27  | 19.35  | 34.40  | 33.43  | 35.43  | 17.03  | 167.8 |
| 1970  | 7.20   | 3.70  | 3.64  | 2.10  | 1.34  | 1.73  | 1.75  | 4.54   | 6.87   | 29.80  | 26.30  | 7.82   | 96.8  |
| 1971  | 3.60   | 2.09  | 1.83  | 1.85  | 1.61  | 1.19  | 1.42  | 14.95  | 13.06  | 7.99   | 14.94  | 13.95  | 78.5  |
| 1972  | 4.08   | 1.91  | 2.47  | 1.36  | 0.99  | 2.30  | 1.04  | 2.03   | 2.50   | 59.10  | 18.49  | 12.99  | 109.3 |
| 1973  | 9.07   | 3.00  | 6.72  | 1.22  | 0.64  | 1.03  | 0.90  | 3.75   | 35.44  | 12.40  | 103.11 | 17.67  | 194.9 |
| 1974  | 14.72  | 6.83  | 2.89  | 2.24  | 1.38  | 1.26  | 8.08  | 40.66  | 17.38  | 36.41  | 23.45  | 5.93   | 161.2 |
| 1975  | 12.44  | 4.64  | 2.75  | 1.59  | 1.20  | 1.34  | 1.30  | 2.52   | 60.43* | 33.39  | 13.64  | 8.23   | 143.5 |
| 1976  | 5.48   | 25.10 | 16.65 | 7.81  | 2.73  | 2.54  | 8.59  | 53.75  | 63.93  | 55.50  | 58.77  | 15.56  | 316.4 |
| 1977  | 8.09   | 3.03  | 4.45  | 1.94  | 1.58  | 1.61  | 6.10  | 13.73  | 3.52   | 2.74   | 32.02  | 17.27  | 96.1  |
| 1978  | 7.95   | 4.67  | 2.48  | 2.08  | 1.87  | 2.60  | 2.01  | 16.20  | 28.85  | 17.07  | 21.85  | 17.15  | 124.8 |
| 1979  | 22.19  | 4.72  | 2.13  | 2.24  | 1.41* | 1.56* | 6.21  | 18.26  | 15.08  | 12.62  | 14.52  | 7.21   | 108.2 |
| 1980  | 6.92   | 16.12 | 14.49 | 11.21 | 4.13  | 3.86  | 4.44  | 4.44   | 8.89   | 35.78  | 25.07  | 36.01  | 171.4 |
| 1981  | 6.13   | 4.89  | 3.30  | 2.13* | 1.42* | 1.43  | 5.22  | 16.03  | 22.74  | 14.94  | 15.50  | 6.21   | 99.9  |
| 1982  | 7.85*  | 5.00  | 5.65  | 2.53  | 4.13  | 5.09* | 2.28+ | 35.65* | 47.26  | 46.41  | 16.84  | 20.82  | 199.5 |
| 1983  | 5.72   | 3.09  | 2.52  | 1.72  | 1.32  | 2.52  | 3.62  | 60.32  | 22.49  | 28.37  | 15.69  | 41.23  | 188.6 |
| 1984  | 16.32  | 3.29  | 7.09  | 5.45  | 2.21  | 16.13 | 8.49  | 10.42  | 26.28  | 40.37  | 29.18  | 16.08  | 181.3 |
| 1985  | 5.30   | 2.83  | 2.11  | 1.77* | 1.24* | 2.69  | 9.16  | 16.96  | 33.73  | 36.31  | 39.85  | 17.93  | 169.9 |
| 1986  | 4.49   | 3.29  | 1.83  | 2.58  | 1.39  | 1.75  | 2.43  | 33.89  | 30.06  | 29.14  | 36.88  | 18.55  | 166.3 |
| 1987  | 6.09   | 2.65  | 5.85  | 1.81  | 1.21  | 1.30  | 9.26  | 19.34  | 17.27  | 24.30  | 33.03  | 21.24  | 143.4 |
| 1988  | 5.91   | 2.09  | 1.68  | 1.44  | 1.34  | 9.57  | 5.81  | 15.62  | 18.06  | 28.71  | 16.26  | 27.91  | 134.4 |
| 1989  | 9.79   | 4.45  | 2.26  | 1.61  | 2.55  | 1.66  | 17.94 | 18.77  | 23.97  | 48.32  | 23.15  | 6.41   | 160.9 |
| 1990  | 3.06   | 3.25  | 3.30  | 1.78  | 1.44  | 1.69  | 1.94  | 21.22+ | 51.19+ | 80.61+ | 15.38+ | 33.94+ | 218.8 |
| AVE : | 9.20   | 5.18  | 4.40  | 2.72  | 1.76  | 2.95  | 4.97  | 19.40  | 25.83  | 31.61  | 28.29  | 17.91  | 154.2 |
| SD :  | 5.62   | 5.19  | 3.87  | 2.35  | 0.88  | 3.41  | 4.04  | 15.78  | 17.10  | 18.34  | 19.56  | 9.70   | 52.0  |

## Appendix B5.13

File : H1H18S-0.NAT  
Units : 10<sup>6</sup>mm<sup>3</sup>  
Descrip. : Incremental naturalised runoff at H1H018 for 1925 to 1990

| Year  | Oct   | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul   | Aug    | Sep   | Total |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|-------|
| 1925  | 9.61  | 6.06  | 2.81  | 2.20  | 2.20  | 1.35  | 1.20  | 24.91 | 7.27  | 23.88 | 18.90  | 9.42  | 109.8 |
| 1926  | 25.94 | 4.99  | 2.48  | 1.89  | 2.79  | 1.23  | 3.21  | 11.79 | 13.70 | 15.32 | 29.25  | 9.62  | 122.2 |
| 1927  | 4.43  | 7.41  | 3.04  | 2.57  | 1.89  | 1.85  | 1.39  | 1.22  | 40.23 | 14.48 | 16.78  | 17.89 | 113.2 |
| 1928  | 6.32  | 2.77  | 2.44  | 1.79  | 1.28  | 0.94  | 5.86  | 22.79 | 14.36 | 33.07 | 18.96  | 8.89  | 119.5 |
| 1929  | 5.05  | 2.91  | 2.92  | 2.20  | 1.86  | 2.03  | 1.94  | 1.65  | 1.66  | 13.67 | 18.20  | 38.14 | 92.2  |
| 1930  | 8.73  | 5.70  | 2.69  | 2.10  | 1.88  | 1.19  | 9.41  | 8.52  | 6.99  | 10.68 | 27.99  | 19.96 | 105.8 |
| 1931  | 13.70 | 4.18  | 2.45  | 1.98  | 9.21  | 1.75  | 1.67  | 24.27 | 20.02 | 17.35 | 15.30  | 13.62 | 125.5 |
| 1932  | 6.77  | 2.91  | 2.39  | 1.79  | 1.36  | 1.00  | 0.80  | 9.72  | 45.94 | 38.08 | 20.64  | 8.56  | 140.0 |
| 1933  | 7.42  | 3.26  | 2.48  | 1.83  | 1.45  | 1.52  | 1.04  | 14.38 | 11.47 | 12.55 | 12.79  | 15.81 | 86.0  |
| 1934  | 11.76 | 6.37  | 2.66  | 2.03  | 1.56  | 1.43  | 6.90  | 17.82 | 13.14 | 23.73 | 16.46  | 13.61 | 117.5 |
| 1935  | 5.99  | 4.92  | 2.60  | 3.64  | 1.86  | 1.59  | 1.22  | 6.83  | 6.50  | 17.97 | 26.00  | 13.99 | 93.1  |
| 1936  | 6.35  | 3.63  | 7.53  | 2.51  | 1.99  | 3.88  | 6.55  | 18.96 | 52.97 | 40.36 | 11.20  | 8.27  | 164.2 |
| 1937  | 5.07  | 3.00  | 2.39  | 2.40  | 1.47  | 1.15  | 9.93  | 15.61 | 9.95  | 14.62 | 14.94  | 21.70 | 102.2 |
| 1938  | 7.14  | 4.13  | 2.56  | 2.00  | 3.02  | 1.42  | 3.90  | 24.23 | 8.23  | 9.45  | 22.72  | 10.86 | 99.7  |
| 1939  | 5.20  | 3.51  | 2.90  | 2.13  | 3.69  | 1.83  | 11.09 | 12.93 | 29.95 | 17.15 | 10.93  | 12.82 | 114.1 |
| 1940  | 7.33  | 10.25 | 2.97  | 4.81  | 2.15  | 1.73  | 25.38 | 44.46 | 44.05 | 31.01 | 28.70  | 50.32 | 253.2 |
| 1941  | 12.69 | 4.52  | 3.14  | 2.24  | 1.65  | 1.15  | 0.88  | 25.71 | 67.94 | 13.85 | 31.45  | 7.88  | 173.1 |
| 1942  | 5.31  | 2.78  | 2.15  | 2.32  | 1.34  | 2.52  | 1.62  | 1.94  | 18.31 | 20.93 | 33.96  | 13.38 | 106.6 |
| 1943  | 7.88  | 6.10  | 2.73  | 2.12  | 1.51  | 1.14  | 1.41  | 18.72 | 54.00 | 24.99 | 29.01  | 15.44 | 165.1 |
| 1944  | 10.00 | 5.41  | 3.52  | 2.42  | 1.79  | 1.23  | 3.24  | 33.43 | 58.99 | 61.94 | 32.01  | 7.62  | 221.6 |
| 1945  | 5.33  | 3.28  | 2.61  | 1.97  | 1.40  | 1.29  | 2.15  | 9.40  | 6.94  | 13.34 | 18.56  | 29.42 | 95.7  |
| 1946  | 13.68 | 4.59  | 2.52  | 1.91  | 1.33  | 3.83  | 1.30  | 10.86 | 7.80  | 43.40 | 21.24  | 7.65  | 120.1 |
| 1947  | 7.24  | 3.49  | 2.47  | 1.84  | 1.28  | 1.35  | 1.01  | 12.97 | 10.22 | 25.46 | 11.88  | 30.40 | 109.6 |
| 1948  | 14.54 | 4.37  | 2.50  | 1.90  | 1.35  | 0.93  | 3.44  | 4.54  | 11.08 | 20.46 | 23.08  | 16.43 | 104.6 |
| 1949  | 10.48 | 7.56  | 2.84  | 2.16  | 1.53  | 1.04  | 13.18 | 1.43  | 4.48  | 50.62 | 8.78   | 26.41 | 130.5 |
| 1950  | 7.17  | 9.35  | 3.07  | 2.93  | 2.02  | 1.50  | 21.95 | 5.88  | 49.44 | 22.55 | 12.26  | 15.96 | 154.1 |
| 1951  | 7.36  | 7.54  | 2.78  | 2.07  | 1.46  | 1.13  | 2.06  | 17.50 | 12.45 | 23.93 | 46.46  | 35.39 | 160.1 |
| 1952  | 8.21  | 18.52 | 3.24  | 2.27  | 1.62  | 1.15  | 32.88 | 29.56 | 11.23 | 33.17 | 25.67  | 7.10  | 174.6 |
| 1953  | 4.56  | 5.20  | 2.69  | 2.12  | 1.58  | 1.55  | 7.21  | 48.07 | 27.26 | 65.60 | 39.03  | 9.67  | 214.5 |
| 1954  | 8.20  | 3.67  | 3.29  | 2.19  | 15.47 | 1.81  | 2.54  | 2.63  | 20.01 | 40.38 | 62.28  | 10.32 | 172.8 |
| 1955  | 15.69 | 9.02  | 3.13  | 2.38  | 1.75  | 1.39  | 2.14  | 17.28 | 42.32 | 31.00 | 37.71  | 12.39 | 176.2 |
| 1956  | 8.27  | 3.41  | 2.94  | 1.97  | 7.27  | 2.05  | 4.55  | 57.27 | 49.54 | 48.71 | 31.19  | 12.61 | 229.8 |
| 1957  | 25.99 | 4.93  | 2.60  | 1.92  | 3.24  | 1.64  | 1.99  | 26.32 | 15.18 | 7.96  | 16.62  | 8.48  | 116.9 |
| 1958  | 7.64  | 5.50  | 2.62  | 2.16  | 1.56  | 1.28  | 20.20 | 64.25 | 9.35  | 6.99  | 19.78  | 9.07  | 150.4 |
| 1959  | 11.63 | 3.69  | 2.35  | 1.81  | 1.30  | 1.56  | 1.64  | 11.46 | 34.48 | 9.73  | 7.09   | 6.29  | 93.0  |
| 1960  | 5.31  | 2.76  | 2.24  | 2.28  | 1.43  | 1.14  | 1.62  | 6.92  | 22.77 | 18.24 | 26.05  | 29.72 | 120.5 |
| 1961  | 7.91  | 3.17  | 2.32  | 1.73  | 1.79  | 1.77  | 9.08  | 4.64  | 74.83 | 23.48 | 51.50  | 11.10 | 193.3 |
| 1962  | 28.99 | 6.01  | 2.75  | 2.75  | 1.72  | 1.29  | 1.09  | 1.61  | 6.38  | 33.05 | 44.04  | 9.88  | 139.6 |
| 1963  | 5.03  | 3.66  | 3.37  | 2.26  | 7.03  | 1.76  | 2.00  | 7.20  | 33.41 | 25.96 | 24.30  | 10.74 | 126.7 |
| 1964  | 8.08  | 8.73  | 2.94  | 2.82  | 2.79  | 12.32 | 7.91  | 27.65 | 13.64 | 13.11 | 16.66  | 10.05 | 126.7 |
| 1965  | 7.31  | 3.39  | 4.44  | 2.30  | 1.78  | 9.35  | 2.79  | 4.99  | 23.94 | 35.60 | 18.18  | 12.30 | 126.4 |
| 1966  | 5.38  | 2.75  | 2.22  | 1.65  | 1.16  | 0.82  | 13.08 | 8.06  | 39.72 | 12.13 | 11.93  | 9.92  | 108.8 |
| 1967  | 9.12  | 6.18  | 2.66  | 2.38  | 1.65  | 1.22  | 11.10 | 24.45 | 27.43 | 36.97 | 21.12  | 7.48  | 151.8 |
| 1968  | 22.60 | 5.07  | 3.08  | 2.52  | 2.11  | 1.69  | 5.17  | 3.85  | 10.67 | 13.41 | 21.49  | 24.92 | 116.6 |
| 1969  | 16.71 | 3.87  | 2.42  | 1.91  | 1.60  | 1.53  | 1.34  | 19.43 | 34.51 | 33.52 | 35.53  | 17.09 | 169.5 |
| 1970  | 7.32  | 3.88  | 3.86  | 2.37  | 1.56  | 1.87  | 1.81  | 4.58  | 6.90  | 29.89 | 26.42  | 7.88  | 98.3  |
| 1971  | 3.70  | 2.28  | 2.05  | 2.08  | 1.81  | 1.34  | 1.48  | 15.03 | 13.11 | 8.03  | 15.00  | 14.02 | 79.9  |
| 1972  | 4.19  | 2.11  | 2.69  | 1.63  | 1.21  | 2.44  | 1.10  | 2.06  | 2.51  | 59.34 | 18.57  | 13.07 | 110.9 |
| 1973  | 9.16  | 3.18  | 6.94  | 1.50  | 0.86  | 1.18  | 0.97  | 3.81  | 35.57 | 12.48 | 103.53 | 17.77 | 197.0 |
| 1974  | 14.82 | 6.99  | 3.14  | 2.51  | 1.61  | 1.42  | 8.14  | 40.83 | 17.44 | 36.55 | 23.55  | 6.00  | 163.0 |
| 1975  | 12.52 | 4.82  | 3.01  | 1.88  | 1.42  | 1.48  | 1.34  | 2.57  | 59.88 | 33.51 | 13.70  | 8.31  | 144.4 |
| 1976  | 5.59  | 25.28 | 16.82 | 8.07  | 2.95  | 2.72  | 8.69  | 54.01 | 64.19 | 55.78 | 59.04  | 15.64 | 318.8 |
| 1977  | 8.20  | 3.21  | 4.68  | 2.21  | 1.81  | 1.75  | 6.16  | 13.78 | 3.55  | 2.77  | 32.18  | 17.35 | 97.7  |
| 1978  | 8.07  | 4.87  | 2.70  | 2.35  | 2.05  | 2.80  | 2.08  | 16.31 | 28.98 | 17.16 | 21.98  | 17.27 | 126.6 |
| 1979  | 22.32 | 4.93  | 2.40  | 2.49  | 1.65  | 1.74  | 6.27  | 18.37 | 15.18 | 12.67 | 14.65  | 7.29  | 110.0 |
| 1980  | 7.03  | 16.28 | 14.70 | 11.43 | 4.38  | 4.02  | 4.50  | 4.49  | 8.93  | 36.00 | 25.22  | 36.21 | 173.2 |
| 1981  | 6.27  | 5.08  | 3.55  | 2.40  | 1.67  | 1.59  | 5.32  | 16.10 | 22.85 | 15.09 | 15.60  | 6.29  | 101.8 |
| 1982  | 7.95  | 5.18  | 5.88  | 2.82  | 4.34  | 5.25  | 2.35  | 31.55 | 47.60 | 46.73 | 16.95  | 20.99 | 197.6 |
| 1983  | 5.88  | 3.29  | 2.78  | 2.01  | 1.57  | 2.66  | 3.68  | 60.83 | 22.65 | 28.61 | 15.82  | 41.55 | 191.3 |
| 1984  | 16.56 | 3.51  | 7.33  | 5.72  | 2.44  | 16.34 | 8.62  | 10.51 | 26.64 | 40.81 | 29.46  | 16.25 | 184.2 |
| 1985  | 5.51  | 3.10  | 2.45  | 2.13  | 1.39  | 2.93  | 9.28  | 17.08 | 34.22 | 36.73 | 40.48  | 18.15 | 173.4 |
| 1986  | 4.77  | 3.63  | 2.28  | 3.02  | 1.78  | 2.05  | 2.60  | 34.35 | 30.57 | 29.58 | 37.49  | 18.92 | 171.0 |
| 1987  | 6.43  | 3.07  | 6.35  | 2.37  | 1.68  | 1.65  | 9.52  | 19.63 | 17.64 | 24.76 | 33.70  | 21.64 | 148.5 |
| 1988  | 6.35  | 2.59  | 2.28  | 2.08  | 1.88  | 10.22 | 6.22  | 16.10 | 18.66 | 29.54 | 17.02  | 28.44 | 141.4 |
| 1989  | 10.39 | 5.10  | 2.98  | 2.33  | 3.15  | 2.14  | 18.67 | 19.33 | 24.98 | 49.58 | 23.77  | 6.81  | 169.2 |
| 1990  | 3.55  | 3.89  | 4.08  | 2.58  | 2.15  | 2.24  | 2.23  | 21.82 | 52.50 | 60.95 | 15.96  | 34.85 | 206.8 |
| AVE : | 9.42  | 5.31  | 3.51  | 2.53  | 2.37  | 2.40  | 5.80  | 18.05 | 25.44 | 27.43 | 25.59  | 16.26 | 144.1 |
| SD :  | 5.57  | 3.78  | 2.49  | 1.47  | 2.18  | 2.68  | 6.33  | 15.04 | 18.34 | 15.10 | 15.03  | 9.71  | 45.0  |

## Appendix B5.14

File : H1H18CUM.PRS

Units : 10<sup>6</sup>m<sup>3</sup>

Descrip. : Cumulative Present Day (2000) Flow at H1H018 for 1927 to 1990

| Year  | Oct   | Nov   | Dec   | Jan  | Feb   | Mar   | Apr   | May   | Jun   | Jul   | Aug   | Sep   | Total |
|-------|-------|-------|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1927  | 3.70  | 6.34  | 2.00  | 1.51 | 0.94  | 1.06  | 0.90  | 0.93  | 38.25 | 13.68 | 15.80 | 16.75 | 101.8 |
| 1928  | 5.51  | 1.91  | 1.43  | 0.75 | 0.35  | 0.19  | 5.18  | 21.52 | 13.56 | 31.40 | 17.88 | 8.17  | 107.8 |
| 1929  | 4.31  | 2.04  | 1.88  | 1.15 | 0.92  | 1.22  | 1.43  | 1.33  | 1.41  | 12.90 | 17.16 | 36.11 | 81.8  |
| 1930  | 7.61  | 4.70  | 1.66  | 1.04 | 0.94  | 0.44  | 8.56  | 7.91  | 6.51  | 10.04 | 26.51 | 18.74 | 94.8  |
| 1931  | 12.56 | 3.25  | 1.44  | 0.92 | 7.94  | 0.96  | 1.17  | 22.94 | 18.96 | 16.40 | 14.38 | 12.68 | 113.6 |
| 1932  | 5.94  | 2.04  | 1.38  | 0.75 | 0.43  | 0.25  | 0.35  | 9.04  | 43.70 | 36.19 | 19.49 | 7.85  | 127.4 |
| 1933  | 6.57  | 2.38  | 1.47  | 0.79 | 0.52  | 0.74  | 0.58  | 13.51 | 10.79 | 11.82 | 11.99 | 14.78 | 75.9  |
| 1934  | 10.71 | 5.33  | 1.63  | 0.97 | 0.63  | 0.65  | 6.18  | 16.77 | 12.39 | 22.49 | 15.49 | 12.67 | 105.9 |
| 1935  | 5.19  | 3.95  | 1.58  | 2.53 | 0.92  | 0.81  | 0.75  | 6.29  | 6.04  | 16.99 | 24.60 | 13.05 | 82.7  |
| 1936  | 5.54  | 2.73  | 6.28  | 1.46 | 1.03  | 3.00  | 5.83  | 17.86 | 50.39 | 38.36 | 10.47 | 7.57  | 150.5 |
| 1937  | 4.32  | 2.12  | 1.38  | 1.35 | 0.54  | 0.40  | 9.07  | 14.66 | 9.34  | 13.79 | 14.04 | 20.39 | 91.4  |
| 1938  | 6.29  | 3.20  | 1.55  | 0.94 | 2.03  | 0.64  | 3.31  | 22.90 | 7.69  | 8.85  | 21.47 | 10.05 | 88.9  |
| 1939  | 4.44  | 2.61  | 1.86  | 1.08 | 2.67  | 1.04  | 10.18 | 12.11 | 28.43 | 16.20 | 10.22 | 11.92 | 102.7 |
| 1940  | 6.48  | 9.04  | 1.93  | 3.63 | 1.20  | 0.94  | 23.82 | 42.20 | 41.87 | 29.44 | 27.18 | 47.70 | 235.4 |
| 1941  | 11.60 | 3.57  | 2.09  | 1.19 | 0.71  | 0.40  | 0.43  | 24.31 | 64.69 | 13.07 | 29.80 | 7.20  | 159.1 |
| 1942  | 4.54  | 1.92  | 1.14  | 1.27 | 0.41  | 1.72  | 1.13  | 1.61  | 17.32 | 19.83 | 32.20 | 12.46 | 95.5  |
| 1943  | 7.00  | 5.08  | 1.70  | 1.06 | 0.58  | 0.39  | 0.92  | 17.64 | 51.37 | 23.69 | 27.46 | 14.41 | 151.3 |
| 1944  | 9.02  | 4.42  | 2.45  | 1.37 | 0.85  | 0.47  | 2.68  | 31.67 | 56.14 | 58.96 | 30.34 | 6.95  | 205.3 |
| 1945  | 4.56  | 2.39  | 1.59  | 0.91 | 0.47  | 0.51  | 1.64  | 8.74  | 6.46  | 12.59 | 17.50 | 27.76 | 85.1  |
| 1946  | 12.54 | 3.64  | 1.51  | 0.86 | 0.40  | 2.96  | 0.81  | 10.13 | 7.29  | 41.26 | 20.06 | 6.98  | 108.4 |
| 1947  | 6.39  | 2.59  | 1.46  | 0.80 | 0.35  | 0.57  | 0.55  | 12.15 | 9.59  | 24.14 | 11.12 | 28.70 | 98.4  |
| 1948  | 13.35 | 3.43  | 1.49  | 0.85 | 0.42  | 0.18  | 2.87  | 4.10  | 10.41 | 19.37 | 21.81 | 15.36 | 93.6  |
| 1949  | 9.47  | 6.48  | 1.80  | 1.11 | 0.60  | 0.29  | 12.17 | 1.12  | 4.11  | 48.16 | 8.16  | 24.90 | 118.4 |
| 1950  | 6.32  | 8.18  | 2.02  | 1.85 | 1.06  | 0.72  | 20.54 | 5.37  | 47.03 | 21.36 | 11.48 | 14.90 | 140.8 |
| 1951  | 6.51  | 6.46  | 1.75  | 1.01 | 0.53  | 0.38  | 1.54  | 16.47 | 11.73 | 22.68 | 44.14 | 33.46 | 146.6 |
| 1952  | 7.32  | 16.93 | 2.18  | 1.22 | 0.69  | 0.40  | 30.96 | 27.99 | 10.56 | 31.49 | 24.28 | 6.45  | 160.5 |
| 1953  | 3.83  | 4.22  | 1.66  | 1.06 | 0.65  | 0.77  | 6.47  | 45.66 | 25.86 | 62.45 | 37.04 | 8.91  | 198.6 |
| 1954  | 7.31  | 2.77  | 2.23  | 1.14 | 13.91 | 1.02  | 2.02  | 2.29  | 18.95 | 38.38 | 59.21 | 9.52  | 158.7 |
| 1955  | 14.45 | 7.86  | 2.08  | 1.33 | 0.81  | 0.61  | 1.63  | 16.26 | 40.23 | 29.43 | 35.78 | 11.51 | 162.0 |
| 1956  | 7.37  | 2.51  | 1.90  | 0.91 | 6.09  | 1.24  | 3.94  | 54.43 | 47.13 | 46.33 | 29.55 | 11.72 | 213.1 |
| 1957  | 24.29 | 3.96  | 1.58  | 0.87 | 2.24  | 0.86  | 1.48  | 24.89 | 14.33 | 7.45  | 15.64 | 7.78  | 105.4 |
| 1958  | 6.77  | 4.50  | 1.60  | 1.11 | 0.63  | 0.50  | 18.87 | 61.08 | 8.76  | 6.51  | 18.66 | 8.34  | 137.3 |
| 1959  | 10.59 | 2.78  | 1.34  | 0.77 | 0.37  | 0.78  | 1.15  | 10.71 | 32.77 | 9.14  | 6.55  | 5.68  | 82.6  |
| 1960  | 4.54  | 1.90  | 1.23  | 1.23 | 0.50  | 0.39  | 1.13  | 6.37  | 21.57 | 17.26 | 24.64 | 28.05 | 108.8 |
| 1961  | 7.04  | 2.29  | 1.31  | 0.69 | 0.85  | 0.98  | 8.25  | 4.20  | 71.27 | 22.26 | 48.93 | 10.27 | 178.3 |
| 1962  | 27.15 | 4.99  | 1.72  | 1.68 | 0.78  | 0.51  | 0.63  | 1.30  | 5.92  | 31.39 | 41.81 | 9.11  | 127.0 |
| 1963  | 4.28  | 2.75  | 2.30  | 1.21 | 5.85  | 0.97  | 1.48  | 6.64  | 31.72 | 24.62 | 22.97 | 9.93  | 114.7 |
| 1964  | 7.20  | 7.58  | 1.90  | 1.74 | 1.81  | 11.05 | 7.14  | 26.15 | 12.85 | 12.36 | 15.68 | 9.27  | 114.7 |
| 1965  | 6.46  | 2.49  | 3.32  | 1.25 | 0.84  | 8.22  | 2.25  | 4.53  | 22.68 | 33.81 | 17.14 | 11.42 | 114.4 |
| 1966  | 4.61  | 1.89  | 1.21  | 0.62 | 0.26  | 0.08  | 12.08 | 7.47  | 37.76 | 11.42 | 11.17 | 9.15  | 97.7  |
| 1967  | 8.18  | 5.16  | 1.63  | 1.33 | 0.72  | 0.46  | 10.19 | 23.10 | 26.02 | 35.13 | 19.93 | 6.83  | 138.7 |
| 1968  | 21.16 | 4.12  | 2.04  | 1.46 | 1.17  | 0.90  | 4.61  | 3.54  | 9.96  | 12.71 | 20.38 | 23.77 | 105.8 |
| 1969  | 15.57 | 2.94  | 1.40  | 0.86 | 0.67  | 0.78  | 0.90  | 18.35 | 32.83 | 32.08 | 34.03 | 16.20 | 156.6 |
| 1970  | 6.45  | 2.97  | 2.84  | 1.30 | 0.63  | 1.11  | 1.36  | 4.23  | 6.43  | 28.53 | 24.88 | 7.23  | 88.0  |
| 1971  | 3.02  | 1.43  | 1.03  | 1.04 | 0.88  | 0.59  | 0.74  | 13.94 | 12.38 | 7.35  | 14.22 | 13.28 | 69.9  |
| 1972  | 3.43  | 1.26  | 1.68  | 0.59 | 0.30  | 1.66  | 0.65  | 1.74  | 2.27  | 56.34 | 17.50 | 12.15 | 99.6  |
| 1973  | 8.32  | 2.31  | 5.85  | 0.43 | -0.07 | 0.43  | 0.52  | 3.04  | 33.71 | 11.48 | 98.14 | 16.65 | 180.8 |
| 1974  | 13.59 | 5.96  | 2.09  | 1.45 | 0.67  | 0.65  | 7.56  | 38.70 | 16.62 | 34.78 | 22.33 | 5.30  | 149.7 |
| 1975  | 11.62 | 3.90  | 2.00  | 0.82 | 0.49  | 0.73  | 0.86  | 2.21  | 56.96 | 31.89 | 12.91 | 7.54  | 131.9 |
| 1976  | 4.80  | 23.40 | 15.57 | 6.97 | 1.95  | 1.91  | 7.53  | 51.32 | 61.32 | 52.66 | 56.17 | 14.72 | 298.3 |
| 1977  | 7.35  | 2.31  | 3.63  | 1.16 | 0.87  | 0.95  | 5.63  | 13.35 | 3.23  | 2.45  | 30.36 | 16.48 | 87.8  |
| 1978  | 7.19  | 3.98  | 1.65  | 1.30 | 1.01  | 2.01  | 1.59  | 15.20 | 27.38 | 16.20 | 20.67 | 16.05 | 114.2 |
| 1979  | 21.03 | 3.98  | 1.39  | 1.44 | 0.72  | 0.95  | 5.73  | 17.29 | 14.08 | 11.97 | 13.27 | 6.53  | 98.4  |
| 1980  | 6.18  | 14.74 | 13.52 | 9.72 | 3.40  | 3.19  | 3.95  | 4.15  | 8.44  | 33.80 | 23.67 | 34.23 | 159.0 |
| 1981  | 5.37  | 4.18  | 2.53  | 1.35 | 0.74  | 0.84  | 4.39  | 15.54 | 21.95 | 13.80 | 14.78 | 5.63  | 91.1  |
| 1982  | 7.08  | 4.28  | 4.82  | 1.77 | 3.35  | 4.41  | 1.83  | 29.68 | 45.23 | 44.44 | 16.17 | 19.71 | 182.8 |
| 1983  | 5.06  | 2.42  | 1.77  | 0.96 | 0.65  | 1.78  | 3.12  | 57.73 | 21.67 | 27.13 | 14.95 | 39.52 | 176.8 |
| 1984  | 15.06 | 2.54  | 6.00  | 4.59 | 1.43  | 14.91 | 7.70  | 9.91  | 24.71 | 38.44 | 27.91 | 15.25 | 168.4 |
| 1985  | 4.59  | 2.20  | 1.42  | 1.07 | 0.46  | 1.99  | 8.67  | 16.59 | 32.31 | 35.10 | 38.04 | 17.26 | 159.7 |
| 1986  | 3.97  | 2.75  | 1.26  | 1.94 | 0.84  | 1.26  | 2.02  | 32.96 | 29.03 | 28.25 | 35.65 | 17.74 | 157.7 |
| 1987  | 5.60  | 2.19  | 5.28  | 1.31 | 0.75  | 0.87  | 8.85  | 18.92 | 16.71 | 23.63 | 32.07 | 20.67 | 136.8 |
| 1988  | 5.50  | 1.71  | 1.26  | 1.03 | 0.94  | 8.81  | 5.36  | 15.11 | 17.41 | 27.83 | 15.45 | 27.33 | 127.7 |
| 1989  | 9.36  | 4.04  | 1.94  | 1.28 | 2.20  | 1.36  | 17.36 | 18.34 | 23.19 | 47.34 | 22.68 | 6.11  | 155.2 |
| 1990  | 2.85  | 3.00  | 3.02  | 1.53 | 1.22  | 1.49  | 1.74  | 20.88 | 50.47 | 57.00 | 15.04 | 33.44 | 191.7 |
| AVE : | 8.22  | 4.33  | 2.49  | 1.48 | 1.40  | 1.61  | 5.23  | 17.02 | 24.56 | 26.22 | 24.23 | 15.44 | 132.2 |
| SD :  | 5.03  | 3.66  | 2.48  | 1.42 | 2.12  | 2.59  | 6.10  | 14.54 | 17.60 | 14.52 | 14.51 | 9.39  | 43.3  |



## APPENDIX B 6.1

SUB-CATCHMENT : Lower Wit River

RIVER : Wit

PLACE : U/s Breede confluence

### 1 CATCHMENT

|                                        | YEAR  |       |       |       |       | UNITS           |
|----------------------------------------|-------|-------|-------|-------|-------|-----------------|
|                                        | 1980  | 1981  | 1988  | 1990  | 2000  |                 |
| SUB-CATCHMENT AREAS<br>Lower Wit River | 36.00 | 36.00 | 36.00 | 36.00 | 36.00 | km <sup>2</sup> |

### 2 LANDUSE

|                       | YEAR           |      |      |      |       | UNITS           |
|-----------------------|----------------|------|------|------|-------|-----------------|
|                       | 1980           | 1981 | 1988 | 1990 | 2000  |                 |
| ALIEN VEGETATION      |                |      |      |      |       |                 |
| Upland : Tall Trees   | 1.10           | 1.12 | 2.27 | 2.43 | 5.89  | km <sup>2</sup> |
| Upland : shrubs       | 0.87           | 0.88 | 1.79 | 1.91 | 4.63  | km <sup>2</sup> |
| riparian : tall trees | 0.61           | 0.62 | 1.26 | 1.34 | 3.26  | km <sup>2</sup> |
| Total                 | 2.57           | 2.62 | 5.32 | 5.67 | 13.78 | km <sup>2</sup> |
| FARM DAM CAPACITIES   | Not applicable |      |      |      |       | Mm <sup>3</sup> |
| IRRIGATION AREAS      |                |      |      |      |       |                 |
| river                 | 0.27           | 0.27 | 0.27 | 0.27 | 0.14  | km <sup>2</sup> |
| Total                 | 0.27           | 0.27 | 0.27 | 0.27 | 0.14  | km <sup>2</sup> |

### 3 EVAPORATION

|                       | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE  |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|
|                       |      |      |      |      |      |      |      |      |      |      |      |      | mm   |
| A-PAN (gross) (in mm) | 186  | 256  | 306  | 318  | 268  | 222  | 132  | 77   | 58   | 57   | 76   | 115  | 2071 |
| S-PAN (gross) (in mm) | 143  | 197  | 235  | 245  | 205  | 171  | 102  | 59   | 45   | 44   | 58   | 88   | 1592 |
| LAKE FACTOR           | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |      |
| FREE WATER (in mm)    | 116  | 162  | 195  | 206  | 180  | 150  | 90   | 51   | 38   | 37   | 47   | 71   | 1343 |

**Note : BRHS evaporation used for this sub-catchment**

### 4 RESERVOIR SIMULATIONS

Not Applicable

### 5 IRRIGATION ROUTINE

|                      | QUANT<br>% | CROP FACTORS |     |     |      |      |      |      |     |     |     |     |     |
|----------------------|------------|--------------|-----|-----|------|------|------|------|-----|-----|-----|-----|-----|
|                      |            | OCT          | NOV | DEC | JAN  | FEB  | MAR  | APR  | MAY | JUN | JUL | AUG | SEP |
| Combined crop factor | 100        | 0.3          | 0.4 | 0.5 | 0.55 | 0.55 | 0.45 | 0.25 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |

### 5 NOTES

Combined crop factor used in the BRHS for :

crop type 1 : vineyards and fruit trees

crop type 2 : wheat , lucerne and cash crops

Modelled as a single rainfall area

MAP = 990 mm

## APPENDIX B 6.1

SUB-CATCHMENT : H1H012  
RIVER : Holsloot  
PLACE : Daschbosch River

### 1 CATCHMENT

|                               | YEAR  |       |       |       |       |       | UNITS |
|-------------------------------|-------|-------|-------|-------|-------|-------|-------|
|                               | 1980  | 1981  | 1984  | 1988  | 1990  | 2000  |       |
| SUB-CATCHMENT AREAS<br>H1H012 | 91.00 | 91.00 | 91.00 | 91.00 | 91.00 | 91.00 | km²   |

### 2 LANDUSE

|                     | YEAR           |      |      |      |      |       | UNITS |
|---------------------|----------------|------|------|------|------|-------|-------|
|                     | 1980           | 1981 | 1984 | 1988 | 1990 | 2000  |       |
| ALIEN VEGETATION    |                |      |      |      |      |       |       |
| Upland : Tall Trees | 0.73           | 0.73 | 0.73 | 2.02 | 4.60 | 7.18  | km²   |
| Upland : shrubs     | 0.57           | 0.57 | 0.57 | 1.59 | 3.62 | 5.64  | km²   |
| Total               | 1.30           | 1.30 | 1.30 | 3.61 | 8.22 | 12.82 | km²   |
| FARM DAM CAPACITIES | Not applicable |      |      |      |      |       | Mm³   |
| IRRIGATION AREAS    | not applicable |      |      |      |      |       | km²   |
| Total               |                |      |      |      |      |       |       |

### 3 EVAPORATION

|                       | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) | 173  | 237  | 284  | 285  | 242  | 200  | 125  | 77   | 56   | 59   | 75   | 111  | 1924      |
| S-PAN (gross) (in mm) | 129  | 171  | 205  | 196  | 166  | 135  | 92   | 61   | 46   | 48   | 60   | 84   | 1393      |
| LAKE FACTOR           | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)    | 222  | 211  | 210  | 215  | 185  | 187  | 146  | 123  | 98   | 111  | 145  | 187  | 2040      |

**Note : BRHS evaporation used for this sub-catchment**

### 4 RESERVOIR SIMULATIONS

|                | COEFFICIENTS                     |   | START | DEAD  | MAX   |
|----------------|----------------------------------|---|-------|-------|-------|
|                | a                                | b | STOR. | STOR. | STOR. |
|                |                                  |   | %     | M.m³  | M.m³  |
| DUMMY FARM DAM | Not Applicable<br>Not Applicable |   |       |       |       |

### 5 IRRIGATION ROUTINE

|                      | QUANT          | CROP FACTORS |     |     |     |     |     |     |     |     |     |     |     |
|----------------------|----------------|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                      | %              | OCT          | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
| Combined crop factor | Not applicable |              |     |     |     |     |     |     |     |     |     |     |     |

### 5 NOTES

Combined crop factor used in the BRHS for :  
Not applicable

Modelled as a single rainfall area  
MAP = 1101 mm

## APPENDIX B 6.1

SUB-CATCHMENT : H1R002  
RIVER : Smalblaar  
PLACE : Stettynskloof Dam

### 1 CATCHMENT

|                               | YEAR  |       |       |       |       | UNITS           |
|-------------------------------|-------|-------|-------|-------|-------|-----------------|
|                               | 1980  | 1981  | 1988  | 1990  | 2000  |                 |
| SUB-CATCHMENT AREAS<br>H1R002 | 54.20 | 54.20 | 51.39 | 46.78 | 46.78 | km <sup>2</sup> |

### 2 LANDUSE

|                                       | YEAR           |       |       |       |       | UNITS           |
|---------------------------------------|----------------|-------|-------|-------|-------|-----------------|
|                                       | 1980           | 1981  | 1988  | 1990  | 2000  |                 |
| ALIEN VEGETATION                      |                |       |       |       |       |                 |
| Upland : Tall Trees (u/s of farm dam) | 0.73           | 0.73  | 2.02  | 4.60  | 7.18  | km <sup>2</sup> |
| Upland : shrubs (u/s of farm dam)     | 0.57           | 0.57  | 1.59  | 3.62  | 5.64  | km <sup>2</sup> |
| riparian : tall trees                 | 0.00           | 0.00  | 0.00  | 0.00  | 0.00  | km <sup>2</sup> |
| Total                                 | 1.30           | 1.30  | 3.61  | 8.22  | 12.82 | km <sup>2</sup> |
| FARM DAM CAPACITIES                   | Not applicable |       |       |       |       | Mm <sup>3</sup> |
| STETTYSKLOOF DAM                      | 15.39          | 15.39 | 15.39 | 15.39 | 15.39 | Mm <sup>3</sup> |
| IRRIGATION AREAS                      | Not applicable |       |       |       |       | km <sup>2</sup> |
| Total                                 |                |       |       |       |       |                 |

### 3 EVAPORATION

|                       | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) | 173  | 237  | 284  | 285  | 242  | 200  | 125  | 77   | 56   | 59   | 75   | 111  | 1924      |
| S-PAN (gross) (in mm) | 129  | 171  | 205  | 196  | 166  | 135  | 92   | 61   | 46   | 48   | 60   | 84   | 1393      |
| LAKE FACTOR           | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)    | 222  | 211  | 210  | 215  | 185  | 187  | 146  | 123  | 98   | 111  | 145  | 187  | 2040      |

**Note : BRHS evaporation used for this sub-catchment**

### 4 RESERVOIR SIMULATIONS

|                  | COEFFICIENTS |       | START      | DEAD                      | MAX                       |
|------------------|--------------|-------|------------|---------------------------|---------------------------|
|                  | a            | b     | STOR.<br>% | STOR.<br>M.m <sup>3</sup> | STOR.<br>M.m <sup>3</sup> |
| STETTYSKLOOF DAM | 0.224        | 0.548 | 100        | 0                         | FSC                       |

### 5 IRRIGATION ROUTINE

|                      | QUANT<br>%     | CROP FACTORS |     |     |     |     |     |     |     |     |     |     |     |
|----------------------|----------------|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                      |                | OCT          | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
| Combined crop factor | Not applicable |              |     |     |     |     |     |     |     |     |     |     |     |

### 5 NOTES

Combined crop factor used in the BRHS for :  
Not applicable

Modelled as a single rainfall area  
MAP = 1730 mm

## APPENDIX B 6.1

SUB-CATCHMENT : H1H008  
RIVER : Holsloot  
PLACE : Rawsonville

### 1 CATCHMENT

|                               | YEAR  |       |       |       |       | UNITS           |
|-------------------------------|-------|-------|-------|-------|-------|-----------------|
|                               | 1980  | 1981  | 1988  | 1990  | 2000  |                 |
| SUB-CATCHMENT AREAS<br>H1H008 | 63.70 | 63.70 | 63.70 | 63.70 | 63.70 | km <sup>2</sup> |

### 2 LANDUSE

|                       | YEAR           |      |      |      |       | UNITS           |
|-----------------------|----------------|------|------|------|-------|-----------------|
|                       | 1980           | 1981 | 1988 | 1990 | 2000  |                 |
| ALIEN VEGETATION      |                |      |      |      |       |                 |
| Upland : Tall Trees   | 0.78           | 0.78 | 0.78 | 1.74 | 3.37  | km <sup>2</sup> |
| Upland : shrubs       | 0.61           | 0.61 | 0.61 | 1.36 | 2.65  | km <sup>2</sup> |
| riparian : tall trees | 1.32           | 1.32 | 1.32 | 2.95 | 5.75  |                 |
| Total                 | 2.71           | 2.71 | 2.71 | 6.05 | 11.77 | km <sup>2</sup> |
| FARM DAM CAPACITIES   | Not applicable |      |      |      |       | Mm <sup>3</sup> |
| IRRIGATION AREAS      |                |      |      |      |       |                 |
| river                 | 0.38           | 0.41 | 0.57 | 0.57 | 3.82  | km <sup>2</sup> |
| river                 |                |      |      |      |       |                 |
| Total                 | 0.38           | 0.41 | 0.57 | 0.57 | 3.82  | km <sup>2</sup> |

### 3 EVAPORATION

|                       | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) | 173  | 237  | 284  | 285  | 242  | 200  | 125  | 77   | 56   | 59   | 75   | 111  | 1924      |
| S-PAN (gross) (in mm) | 129  | 171  | 205  | 196  | 166  | 135  | 92   | 61   | 46   | 48   | 60   | 84   | 1393      |
| LAKE FACTOR           | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)    | 222  | 211  | 210  | 215  | 185  | 187  | 146  | 123  | 98   | 111  | 145  | 187  | 2040      |

Note : BRHS evaporation used for this sub-catchment

### 4 RESERVOIR SIMULATIONS

|                | COEFFICIENTS   |   | START      | DEAD                      | MAX                       |
|----------------|----------------|---|------------|---------------------------|---------------------------|
|                | a              | b | STOR.<br>% | STOR.<br>M.m <sup>3</sup> | STOR.<br>M.m <sup>3</sup> |
| DUMMY FARM DAM | Not applicable |   |            |                           |                           |
| CERES DAM      | Not applicable |   |            |                           |                           |

### 5 IRRIGATION ROUTINE

|                      | QUANT<br>% | CROP FACTORS |     |     |      |      |      |      |     |     |     |     |     |
|----------------------|------------|--------------|-----|-----|------|------|------|------|-----|-----|-----|-----|-----|
|                      |            | OCT          | NOV | DEC | JAN  | FEB  | MAR  | APR  | MAY | JUN | JUL | AUG | SEP |
| Combined crop factor | 100        | 0.3          | 0.4 | 0.5 | 0.55 | 0.55 | 0.45 | 0.25 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |

### 5 NOTES

Combined crop factor used in the BRHS for :  
crop type 1 : vineyards and fruit trees  
crop type 2 : wheat , lucerne and cash crops

Modelled as a single rainfall area  
MAP = 1510 mm

## APPENDIX B 6.1

SUB-CATCHMENT : Wolseley  
RIVER : Breede  
PLACE : Wolseley

### 1 CATCHMENT

|                                   | YEAR   |        |        |        |        | UNITS           |
|-----------------------------------|--------|--------|--------|--------|--------|-----------------|
|                                   | 1980   | 1981   | 1988   | 1990   | 2000   |                 |
| SUB-CATCHMENT AREAS<br>Wolseley   | 227.00 | 227.00 | 227.00 | 227.00 | 227.00 | km <sup>2</sup> |
| 10% of area upstream of farm dams |        |        |        |        |        |                 |

### 2 LANDUSE

|                       | YEAR  |       |       |       |       | UNITS           |
|-----------------------|-------|-------|-------|-------|-------|-----------------|
|                       | 1980  | 1981  | 1988  | 1990  | 2000  |                 |
| ALIEN VEGETATION      |       |       |       |       |       |                 |
| Upland : Tall Trees   | 1.03  | 1.03  | 3.31  | 4.08  | 8.00  | km <sup>2</sup> |
| Upland : shrubs       | 0.81  | 0.81  | 2.60  | 3.20  | 6.29  | km <sup>2</sup> |
| riparian : tall trees | 0.40  | 0.40  | 1.28  | 1.58  | 3.09  | km <sup>2</sup> |
| Total                 | 2.24  | 2.24  | 7.19  | 8.86  | 17.38 | km <sup>2</sup> |
| FARM DAM CAPACITIES   | 2.84  | 2.89  | 3.26  | 3.36  | 5.63  | Mm <sup>3</sup> |
| IRRIGATION AREAS      |       |       |       |       |       |                 |
| farm dams             | 4.29  | 4.44  | 5.50  | 5.80  | 3.37  | km <sup>2</sup> |
| river                 | 12.88 | 13.33 | 16.50 | 17.40 | 10.12 | km <sup>2</sup> |
| Total                 | 17.17 | 17.77 | 21.99 | 23.20 | 13.49 | km <sup>2</sup> |

### 3 EVAPORATION

|                       | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) | 200  | 271  | 323  | 335  | 285  | 242  | 149  | 87   | 64   | 63   | 83   | 124  | 2226      |
| S-PAN (gross) (in mm) | 156  | 213  | 255  | 266  | 224  | 189  | 115  | 66   | 49   | 48   | 64   | 96   | 1741      |
| LAKE FACTOR           | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)    | 222  | 211  | 210  | 215  | 185  | 187  | 146  | 123  | 98   | 111  | 145  | 187  | 2040      |

Note : BRHS evaporation used for this sub-catchment

### 4 RESERVOIR SIMULATIONS

|                | COEFFICIENTS |   | START      | DEAD                      | MAX                       |
|----------------|--------------|---|------------|---------------------------|---------------------------|
|                | a            | b | STOR.<br>% | STOR.<br>M.m <sup>3</sup> | STOR.<br>M.m <sup>3</sup> |
| DUMMY FARM DAM | 0.287        | 1 | 100        | 0                         | FSC                       |

### 5 IRRIGATION ROUTINE

|                      | QUANT<br>% | CROP FACTORS |     |     |      |      |      |      |     |     |     |     |     |
|----------------------|------------|--------------|-----|-----|------|------|------|------|-----|-----|-----|-----|-----|
|                      |            | OCT          | NOV | DEC | JAN  | FEB  | MAR  | APR  | MAY | JUN | JUL | AUG | SEP |
| Combined crop factor | 100        | 0.3          | 0.4 | 0.5 | 0.55 | 0.55 | 0.45 | 0.25 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |

### 5 NOTES

Combined crop factor used in the BRHS for :  
crop type 1 : vineyards and fruit trees  
crop type 2 : wheat , lucerne and cash crops

Modelled as a single rainfall area  
MAP = 767 mm

## APPENDIX B 6.1

SUB-CATCHMENT : Slanghoek  
RIVER : Slanghoek  
PLACE : Breede confluence

### 1 CATCHMENT

|                     | YEAR                              |       |       |       |       |       | UNITS |
|---------------------|-----------------------------------|-------|-------|-------|-------|-------|-------|
|                     | 1980                              | 1981  | 1988  | 1987  | 1990  | 2000  |       |
| SUB-CATCHMENT AREAS |                                   |       |       |       |       |       |       |
| Slanghoek River     | 66.00                             | 66.00 | 66.00 | 66.00 | 66.00 | 66.00 | km²   |
|                     | 20% of area upstream of farm dams |       |       |       |       |       |       |

### 2 LANDUSE

|                                       | YEAR |      |      |      |      |       | UNITS |
|---------------------------------------|------|------|------|------|------|-------|-------|
|                                       | 1980 | 1981 | 1988 | 1987 | 1990 | 2000  |       |
| ALIEN VEGETATION                      |      |      |      |      |      |       |       |
| Upland : Tall Trees (u/s of farm dam) | 0.34 | 0.34 | 0.75 |      | 1.05 | 1.76  | km²   |
| Upland : shrubs (d/s of farm dam)     | 0.26 | 0.26 | 0.59 |      | 0.82 | 1.38  | km²   |
| riparian : tall trees                 | 0.22 | 0.22 | 0.48 |      | 0.68 | 1.14  | km²   |
| Total                                 | 0.82 | 0.82 | 1.82 |      | 2.55 | 4.28  | km²   |
| FARM DAM CAPACITIES                   | 1.16 | 1.16 | 1.16 |      | 1.16 | 3.34  | Mm³   |
| IRRIGATION AREAS                      |      |      |      |      |      |       |       |
| farm dams                             | 2.30 |      |      | 3.26 | 3.26 | 5.31  | km²   |
| river                                 | 3.45 |      |      | 4.89 | 4.89 | 6.97  | km²   |
| Total                                 | 5.75 |      |      | 8.15 | 8.15 | 12.28 | km²   |

### 3 EVAPORATION

|                       | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) | 181  | 252  | 311  | 324  | 272  | 224  | 124  | 65   | 47   | 44   | 66   | 108  | 2018      |
| S-PAN (gross) (in mm) | 139  | 194  | 239  | 249  | 209  | 172  | 95   | 50   | 36   | 34   | 51   | 83   | 1551      |
| LAKE FACTOR           | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)    | 222  | 211  | 210  | 215  | 185  | 187  | 146  | 123  | 98   | 111  | 145  | 187  | 2040      |

Note : BRHS evaporation used for this sub-catchment

### 4 RESERVOIR SIMULATIONS

|                | COEFFICIENTS |       | START      | DEAD          | MAX           |
|----------------|--------------|-------|------------|---------------|---------------|
|                | a            | b     | STOR.<br>% | STOR.<br>M.m³ | STOR.<br>M.m³ |
| DUMMY FARM DAM | 0.322        | 0.929 | 100        | 0             | FSC           |

### 5 IRRIGATION ROUTINE

|                      | QUANT<br>% | CROP FACTORS |     |     |      |      |      |      |     |     |     |     |     |
|----------------------|------------|--------------|-----|-----|------|------|------|------|-----|-----|-----|-----|-----|
|                      |            | OCT          | NOV | DEC | JAN  | FEB  | MAR  | APR  | MAY | JUN | JUL | AUG | SEP |
| Combined crop factor | 100        | 0.3          | 0.4 | 0.5 | 0.55 | 0.55 | 0.45 | 0.25 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |

### 5 NOTES

Combined crop factor used in the BRHS for :  
crop type 1 : vineyards and fruit trees  
crop type 2 : wheat , lucerne and cash crops

Modelled as a single rainfall area  
MAP = 1028 mm

## APPENDIX B 6.1

SUB-CATCHMENT : Rawsonville  
RIVER : Breede River  
PLACE : Rawsonville

### 1 CATCHMENT

|                                    | 1980   | 1981   | YEAR<br>1988 | 1990   | 2000   | UNITS           |
|------------------------------------|--------|--------|--------------|--------|--------|-----------------|
| SUB-CATCHMENT AREAS<br>Rawsonville | 392.00 | 392.00 | 392.00       | 392.00 | 392.00 | km <sup>2</sup> |
| 10% of area upstream of farm dams  |        |        |              |        |        |                 |

### 2 LANDUSE

|                                       | 1980  | 1981  | YEAR<br>1988 | 1990  | 2000  | UNITS           |
|---------------------------------------|-------|-------|--------------|-------|-------|-----------------|
| ALIEN VEGETATION                      |       |       |              |       |       |                 |
| Upland : Tall Trees (u/s of farm dam) | 1.09  | 1.09  | 1.91         | 2.34  | 3.66  | km <sup>2</sup> |
| Upland : shrubs (u/s of farm dam)     | 0.86  | 0.86  | 1.50         | 1.84  | 2.87  | km <sup>2</sup> |
| riparian : tall trees                 | 4.18  | 4.18  | 7.31         | 9.00  | 14.05 | km <sup>2</sup> |
| Total                                 | 6.13  | 6.13  | 10.72        | 13.18 | 20.58 | km <sup>2</sup> |
| FARM DAM CAPACITIES                   |       | 5.63  | 7.33         | 7.33  | 12.07 | Mm <sup>3</sup> |
| IRRIGATION AREAS                      |       |       |              |       |       |                 |
| farm dams                             | 9.33  | 9.47  | 10.47        | 10.76 | 12.95 | km <sup>2</sup> |
| river                                 | 27.98 | 28.42 | 31.41        | 32.29 | 38.87 | km <sup>2</sup> |
| Total                                 | 37.31 | 37.89 | 41.88        | 43.05 | 51.82 | km <sup>2</sup> |

### 3 EVAPORATION

|                       | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) | 192  | 246  | 290  | 301  | 243  | 222  | 140  | 85   | 64   | 68   | 90   | 124  | 2065      |
| S-PAN (gross) (in mm) | 156  | 213  | 255  | 266  | 224  | 189  | 115  | 66   | 49   | 48   | 64   | 96   | 1741      |
| LAKE FACTOR           | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)    | 222  | 211  | 210  | 215  | 185  | 187  | 146  | 123  | 98   | 111  | 145  | 187  | 2040      |

**Note : BRHS evaporation used for this sub-catchment**

### 4 RESERVOIR SIMULATIONS

|                | COEFFICIENTS |   | START      | DEAD                      | MAX                       |
|----------------|--------------|---|------------|---------------------------|---------------------------|
|                | a            | b | STOR.<br>% | STOR.<br>M.m <sup>3</sup> | STOR.<br>M.m <sup>3</sup> |
| DUMMY FARM DAM | 0.3324       | 1 | 100        | 0                         | FSC                       |

### 5 IRRIGATION ROUTINE

|                      | QUANT<br>% | CROP FACTORS |      |      |      |      |      |      |      |      |      |      |      |
|----------------------|------------|--------------|------|------|------|------|------|------|------|------|------|------|------|
|                      |            | OCT          | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  |
| Combined crop factor | 100        | 0.3          | 0.39 | 0.48 | 0.52 | 0.52 | 0.43 | 0.25 | 0.19 | 0.19 | 0.19 | 0.19 | 0.21 |

### 5 NOTES

Combined crop factor used in the BRHS for :  
crop type 1 : vineyards and fruit trees  
crop type 2 : wheat , lucerne and cash crops

Modelled as a single rainfall area  
MAP = 715 mm

## APPENDIX B 6.1

SUB-CATCHMENT : Ouplaas  
RIVER : Molenaars  
PLACE : Ouplaas Dam site

### 1 CATCHMENT

|                                | YEAR  |       |       |       |       | UNITS           |
|--------------------------------|-------|-------|-------|-------|-------|-----------------|
|                                | 1980  | 1981  | 1988  | 1990  | 2000  |                 |
| SUB-CATCHMENT AREAS<br>Ouplaas | 38.30 | 38.30 | 38.30 | 38.30 | 38.30 | km <sup>2</sup> |

### 2 LANDUSE

|                     | YEAR           |      |      |      |      | UNITS           |
|---------------------|----------------|------|------|------|------|-----------------|
|                     | 1980           | 1981 | 1988 | 1990 | 2000 |                 |
| ALIEN VEGETATION    |                |      |      |      |      |                 |
| Upland : Tall Trees | 2.05           | 2.05 | 3.18 | 3.18 | 4.76 | km <sup>2</sup> |
| Upland : shrubs     | 1.61           | 1.61 | 2.50 | 2.50 | 3.74 | km <sup>2</sup> |
| Total               | 3.66           | 3.66 | 5.68 | 5.68 | 8.50 | km <sup>2</sup> |
| FARM DAM CAPACITIES | Not applicable |      |      |      |      | Mm <sup>3</sup> |
| IRRIGATION AREAS    | Not applicable |      |      |      |      | km <sup>2</sup> |
| Total               |                |      |      |      |      |                 |

### 3 EVAPORATION

|                       | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) | 177  | 247  | 299  | 310  | 262  | 218  | 126  | 72   | 52   | 53   | 71   | 110  | 1997      |
| S-PAN (gross) (in mm) | 132  | 178  | 216  | 213  | 180  | 147  | 93   | 57   | 43   | 43   | 57   | 83   | 1442      |
| LAKE FACTOR           | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)    | 222  | 211  | 210  | 215  | 185  | 187  | 146  | 123  | 98   | 111  | 145  | 187  | 2040      |

**Note : BRHS evaporation used for this sub-catchment**

### 4 RESERVOIR SIMULATIONS

|                | COEFFICIENTS   |   | START      | DEAD                      | MAX                       |
|----------------|----------------|---|------------|---------------------------|---------------------------|
|                | a              | b | STOR.<br>% | STOR.<br>M.m <sup>3</sup> | STOR.<br>M.m <sup>3</sup> |
| DUMMY FARM DAM | Not applicable |   |            |                           |                           |

### 5 IRRIGATION ROUTINE

|                      | QUANT<br>%     | CROP FACTORS |     |     |     |     |     |     |     |     |     |     |     |
|----------------------|----------------|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                      |                | OCT          | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
| Combined crop factor | Not applicable |              |     |     |     |     |     |     |     |     |     |     |     |

### 5 NOTES

Combined crop factor used in the BRHS for :  
crop type 1 : Not applicable  
crop type 2 : Not applicable

Modelled as a single rainfall area  
MAP = 1577 mm



## APPENDIX B 6.1

SUB-CATCHMENT : Lower Hex  
RIVER : Hex River  
PLACE : Breede confluence

### 1 CATCHMENT

|                                        | YEAR   |        |        |        |        | UNITS |
|----------------------------------------|--------|--------|--------|--------|--------|-------|
|                                        | 1980   | 1981   | 1988   | 1990   | 2000   |       |
| SUB-CATCHMENT AREAS<br>Lower Hex River | 131.90 | 131.90 | 131.90 | 131.90 | 131.90 | km²   |

### 2 LANDUSE

|                     | YEAR           |      |      |      |      | UNITS |
|---------------------|----------------|------|------|------|------|-------|
|                     | 1980           | 1981 | 1988 | 1990 | 2000 |       |
| ALIEN VEGETATION    | not applicable |      |      |      |      | km²   |
| Total               |                |      |      |      |      | km²   |
| FARM DAM CAPACITIES | Not applicable |      |      |      |      | Mm³   |
| IRRIGATION AREAS    |                |      |      |      |      |       |
| farm dams           | 2.35           | 2.42 | 2.91 | 2.98 | 4.41 | km²   |
| river               | 1.01           | 1.06 | 1.25 | 1.28 | 1.89 | km²   |
| Total               | 3.36           | 3.48 | 4.16 | 4.26 | 6.30 | km²   |

### 3 EVAPORATION

|                       | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) | 192  | 246  | 290  | 301  | 243  | 222  | 140  | 85   | 64   | 68   | 90   | 124  | 2065      |
| S-PAN (gross) (in mm) | 154  | 196  | 245  | 257  | 215  | 191  | 120  | 74   | 49   | 49   | 65   | 97   | 1712      |
| LAKE FACTOR           | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)    | 222  | 211  | 210  | 215  | 185  | 187  | 146  | 123  | 98   | 111  | 145  | 187  | 2040      |

**Note : BRHS evaporation used for this sub-catchment**

### 4 RESERVOIR SIMULATIONS

|                | COEFFICIENTS |   | START      | DEAD          | MAX           |
|----------------|--------------|---|------------|---------------|---------------|
|                | a            | b | STOR.<br>% | STOR.<br>M.m³ | STOR.<br>M.m³ |
| DUMMY FARM DAM | 0.29         | 1 | 100        | 0             | FSC           |

### 5 IRRIGATION ROUTINE

|                      | QUANT<br>% | CROP FACTORS |      |      |      |      |      |      |      |      |      |      |      |
|----------------------|------------|--------------|------|------|------|------|------|------|------|------|------|------|------|
|                      |            | OCT          | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  |
| Combined crop factor | 100        | 0.3          | 0.38 | 0.44 | 0.48 | 0.48 | 0.39 | 0.25 | 0.18 | 0.18 | 0.18 | 0.18 | 0.22 |

### 5 NOTES

Combined crop factor used in the BRHS for :  
crop type 1 : vineyards and fruit trees  
crop type 2 : wheat , lucerne and cash crops

Modelled as a single rainfall area  
MAP = 463 mm

## APPENDIX B 6.1

SUB-CATCHMENT : H402

RIVER :

PLACE : Moordkuil Dam

### 1 CATCHMENT

|                             | YEAR   |        |        |        |        | UNITS           |
|-----------------------------|--------|--------|--------|--------|--------|-----------------|
|                             | 1980   | 1981   | 1988   | 1990   | 2000   |                 |
| SUB-CATCHMENT AREAS<br>H402 | 178.60 | 178.60 | 178.60 | 178.60 | 178.60 | km <sup>2</sup> |

### 2 LANDUSE

|                                         | YEAR         |              |              |              |               | UNITS                              |
|-----------------------------------------|--------------|--------------|--------------|--------------|---------------|------------------------------------|
|                                         | 1980         | 1981         | 1988         | 1990         | 2000          |                                    |
| ALIEN VEGETATION<br>Upland : Tall Trees | 2.40         | 2.48         | 3.04         | 3.20         | 3.20          | km <sup>2</sup>                    |
| Total                                   | 2.40         | 2.48         | 3.04         | 3.20         | 3.20          | km <sup>2</sup>                    |
| FARM DAM CAPACITIES<br>MOORDKUIL DAM    | 4.21<br>1.37 | 4.24<br>1.37 | 5.11<br>1.37 | 5.11<br>1.37 | 11.45<br>1.37 | Mm <sup>3</sup><br>Mm <sup>3</sup> |
| IRRIGATION AREAS<br>farm dams           | 4.50         | 0.71         | 6.83         | 6.83         | 8.53          | km <sup>2</sup>                    |
| river                                   | 1.50         | 1.58         | 2.28         | 2.28         | 2.85          | km <sup>2</sup>                    |
| Total                                   | 6.00         | 2.29         | 9.11         | 9.11         | 11.38         | km <sup>2</sup>                    |

### 3 EVAPORATION

|                       | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) | 187  | 234  | 276  | 296  | 236  | 205  | 138  | 96   | 71   | 73   | 96   | 128  | 2036      |
| S-PAN (gross) (in mm) | 148  | 188  | 227  | 243  | 198  | 168  | 112  | 77   | 55   | 56   | 76   | 99   | 1647      |
| LAKE FACTOR           | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)    | 222  | 211  | 210  | 215  | 185  | 187  | 146  | 123  | 98   | 111  | 145  | 187  | 2040      |

Note : BRHS evaporation used for this sub-catchment

### 4 RESERVOIR SIMULATIONS

|                | COEFFICIENTS |   | START      | DEAD                      | MAX                       |
|----------------|--------------|---|------------|---------------------------|---------------------------|
|                | a            | b | STOR.<br>% | STOR.<br>M.m <sup>3</sup> | STOR.<br>M.m <sup>3</sup> |
| DUMMY FARM DAM | 0.33         | 1 | 100        | 0                         | FSC                       |
| MOORDKUIL DAM  | 0.845        | 1 | 100        | 0                         | FSC                       |

### 5 IRRIGATION ROUTINE

|                      | QUANT<br>% | CROP FACTORS |      |      |      |      |      |      |      |      |      |      |      |
|----------------------|------------|--------------|------|------|------|------|------|------|------|------|------|------|------|
|                      |            | OCT          | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  |
| Combined crop factor | 100        | 0.3          | 0.38 | 0.44 | 0.48 | 0.48 | 0.39 | 0.25 | 0.18 | 0.18 | 0.18 | 0.18 | 0.22 |

### 5 NOTES

Combined crop factor used in the BRHS for :

crop type 1 : vineyards and fruit trees

crop type 2 : wheat , lucerne and cash crops

Modelled as a single rainfall area

MAP = 621 mm

## APPENDIX B 6.1

SUB-CATCHMENT : H405  
RIVER : Nonna / Nuy  
PLACE : Doornrivier

### 1 CATCHMENT

|                             | YEAR   |        |        |        |        | UNITS           |
|-----------------------------|--------|--------|--------|--------|--------|-----------------|
|                             | 1980   | 1981   | 1988   | 1990   | 2000   |                 |
| SUB-CATCHMENT AREAS<br>H405 | 229.40 | 229.40 | 229.40 | 229.40 | 229.40 | km <sup>2</sup> |

### 2 LANDUSE

|                               | YEAR           |       |       |       |       | UNITS           |
|-------------------------------|----------------|-------|-------|-------|-------|-----------------|
|                               | 1980           | 1981  | 1988  | 1990  | 2000  |                 |
| ALIEN VEGETATION              | not applicable |       |       |       |       |                 |
| Total                         |                |       |       |       |       | km <sup>2</sup> |
| FARM DAM CAPACITIES           | 14.10          | 14.10 | 14.10 | 14.10 | 10.90 | Mm <sup>3</sup> |
| IRRIGATION AREAS<br>farm dams | 33.02          | 33.18 | 34.32 | 34.65 | 19.03 | km <sup>2</sup> |
| river                         |                |       |       |       |       | km <sup>2</sup> |
| Total                         | 33.02          | 33.18 | 34.32 | 34.65 | 19.03 |                 |

### 3 EVAPORATION

|                       | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) | 192  | 238  | 279  | 295  | 237  | 207  | 137  | 93   | 71   | 75   | 97   | 132  | 2053      |
| S-PAN (gross) (in mm) | 151  | 191  | 229  | 243  | 199  | 170  | 111  | 75   | 55   | 58   | 74   | 103  | 1659      |
| LAKE FACTOR           | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)    | 222  | 211  | 210  | 215  | 185  | 187  | 146  | 123  | 98   | 111  | 145  | 187  | 2040      |

**Note : BRHS evaporation used for this sub-catchment**

### 4 RESERVOIR SIMULATIONS

|                | COEFFICIENTS |   | START      | DEAD                      | MAX                       |
|----------------|--------------|---|------------|---------------------------|---------------------------|
|                | a            | b | STOR.<br>% | STOR.<br>M.m <sup>3</sup> | STOR.<br>M.m <sup>3</sup> |
| DUMMY FARM DAM | 0.27         | 1 | 100        | 0                         | FSC                       |

### 5 IRRIGATION ROUTINE

|                      | QUANT<br>% | CROP FACTORS |      |      |      |      |      |      |      |      |      |      |      |
|----------------------|------------|--------------|------|------|------|------|------|------|------|------|------|------|------|
|                      |            | OCT          | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  |
| Combined crop factor | 100        | 0.3          | 0.38 | 0.44 | 0.48 | 0.48 | 0.39 | 0.25 | 0.18 | 0.18 | 0.18 | 0.18 | 0.22 |

### 5 NOTES

Combined crop factor used in the BRHS for :  
crop type 1 : vineyards and fruit trees  
crop type 2 : wheat , lucerne and cash crops

Modelled as a single rainfall area  
MAP = 398 mm

## APPENDIX B 6.1

SUB-CATCHMENT : H4H017 incremental (H406)

RIVER : Breede

PLACE : Le Chasseur

### 1 CATCHMENT

|                             | YEAR   |        |        |        |        | UNITS |
|-----------------------------|--------|--------|--------|--------|--------|-------|
|                             | 1980   | 1981   | 1988   | 1990   | 2000   |       |
| SUB-CATCHMENT AREAS<br>H506 | 615.70 | 615.70 | 615.70 | 615.70 | 615.70 | km²   |

### 2 LANDUSE

|                                                           | YEAR  |       |       |       |       | UNITS |
|-----------------------------------------------------------|-------|-------|-------|-------|-------|-------|
|                                                           | 1980  | 1981  | 1988  | 1990  | 2000  |       |
| ALIEN VEGETATION<br>Upland : Tall Trees (u/s of farm dam) | 15.38 | 15.89 | 19.47 | 20.50 | 20.50 | km²   |
| Total                                                     | 15.38 | 15.89 | 19.47 | 20.50 | 20.50 | km²   |
| FARM DAM CAPACITIES                                       | 10.97 | 11.00 | 11.18 | 11.18 | 26.43 | Mm³   |
| IRRIGATION AREAS<br>farm dams                             | 5.83  | 5.97  | 6.83  | 6.83  | 6.83  | km²   |
| Total                                                     | 5.83  | 5.97  | 6.83  | 6.83  | 6.83  | km²   |

### 3 EVAPORATION

|                       | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) | 187  | 234  | 276  | 296  | 236  | 205  | 138  | 96   | 71   | 73   | 96   | 128  | 2036      |
| S-PAN (gross) (in mm) | 148  | 188  | 227  | 243  | 198  | 168  | 112  | 77   | 55   | 56   | 73   | 99   | 1644      |
| LAKE FACTOR           | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)    | 222  | 211  | 210  | 215  | 185  | 187  | 146  | 123  | 98   | 111  | 145  | 187  | 2040      |

Note : BRHS evaporation used for this sub-catchment

### 4 RESERVOIR SIMULATIONS

|                | COEFFICIENTS |   | START      | DEAD          | MAX           |
|----------------|--------------|---|------------|---------------|---------------|
|                | a            | b | STOR.<br>% | STOR.<br>M.m³ | STOR.<br>M.m³ |
| DUMMY FARM DAM | 0.29         | 1 | 100        | 0             | FSC           |

### 5 IRRIGATION ROUTINE

|                      | QUANT<br>% | CROP FACTORS |      |      |      |      |      |      |      |      |      |      |      |
|----------------------|------------|--------------|------|------|------|------|------|------|------|------|------|------|------|
|                      |            | OCT          | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  |
| Combined crop factor | 100        | 0.3          | 0.38 | 0.44 | 0.48 | 0.48 | 0.39 | 0.25 | 0.18 | 0.18 | 0.18 | 0.18 | 0.22 |

### 5 NOTES

Combined crop factor used in the BRHS for :

crop type 1 : vineyards and fruit trees

crop type 2 : wheat , lucerne and cash crops

Modelled as a single rainfall area

MAP = 447 mm

## APPENDIX B 6.1

SUB-CATCHMENT : H1H020

RIVER : Hartbees

PLACE : Brandwachtsberg

### 1 CATCHMENT

|                     | YEAR  |       |       |       |       | UNITS           |
|---------------------|-------|-------|-------|-------|-------|-----------------|
|                     | 1980  | 1981  | 1988  | 1990  | 2000  |                 |
| SUB-CATCHMENT AREAS |       |       |       |       |       |                 |
| Brandwacht Dam      | 13.00 | 13.00 | 13.00 | 13.00 | 13.00 | km <sup>2</sup> |

### 2 LANDUSE

|                       | YEAR           |      |      |      |      | UNITS           |
|-----------------------|----------------|------|------|------|------|-----------------|
|                       | 1980           | 1981 | 1988 | 1990 | 2000 |                 |
| ALIEN VEGETATION      |                |      |      |      |      |                 |
| riparian : tall trees | 0.59           | 0.59 | 0.59 | 1.32 | 2.56 |                 |
| Total                 | 0.59           | 0.59 | 0.59 | 1.32 | 2.56 | km <sup>2</sup> |
| FARM DAM CAPACITIES   | not applicable |      |      |      |      | Mm <sup>3</sup> |
| IRRIGATION AREAS      | not applicable |      |      |      |      | km <sup>2</sup> |
| Total                 |                |      |      |      |      |                 |

### 3 EVAPORATION

|                       | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE  |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|
|                       |      |      |      |      |      |      |      |      |      |      |      |      | mm   |
| A-PAN (gross) (in mm) | 192  | 246  | 290  | 301  | 243  | 222  | 140  | 85   | 64   | 68   | 90   | 124  | 2065 |
| S-PAN (gross) (in mm) | 154  | 196  | 245  | 257  | 215  | 191  | 120  | 74   | 49   | 49   | 65   | 97   | 1712 |
| LAKE FACTOR           | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |      |
| FREE WATER (in mm)    | 222  | 211  | 210  | 215  | 185  | 187  | 146  | 123  | 98   | 111  | 145  | 187  | 2040 |

**Note : BRHS evaporation used for this sub-catchment**

### 4 RESERVOIR SIMULATIONS

|                | COEFFICIENTS |   | START | DEAD             | MAX              |
|----------------|--------------|---|-------|------------------|------------------|
|                | a            | b | STOR. | STOR.            | STOR.            |
|                |              |   | %     | M.m <sup>3</sup> | M.m <sup>3</sup> |
| DUMMY FARM DAM | 0            | 0 | 100   | 0                | FSC              |

### 5 IRRIGATION ROUTINE

|                      | CROP FACTORS |     |     |     |      |      |      |      |     |     |     |     |     |
|----------------------|--------------|-----|-----|-----|------|------|------|------|-----|-----|-----|-----|-----|
|                      | QUANT<br>%   | OCT | NOV | DEC | JAN  | FEB  | MAR  | APR  | MAY | JUN | JUL | AUG | SEP |
| Combined crop factor | 100          | 0.3 | 0.4 | 0.5 | 0.55 | 0.55 | 0.45 | 0.25 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |

### 5 NOTES

Combined crop factor used in the BRHS for :

crop type 1 : vineyards and fruit trees

crop type 2 : wheat , lucerne and cash crops

Modelled as a single rainfall area

MAP = 1493 mm

## APPENDIX B 6.1

SUB-CATCHMENT : H1H009  
RIVER : Holsloot  
PLACE : Boontjiesrivier

### 1 CATCHMENT

|                               | YEAR  |       |       |       |       | UNITS           |
|-------------------------------|-------|-------|-------|-------|-------|-----------------|
|                               | 1980  | 1981  | 1988  | 1990  | 2000  |                 |
| SUB-CATCHMENT AREAS<br>H1H009 | 47.00 | 47.00 | 47.00 | 47.00 | 47.00 | km <sup>2</sup> |

### 2 LANDUSE

|                           | YEAR           |      |      |      |      | UNITS           |
|---------------------------|----------------|------|------|------|------|-----------------|
|                           | 1980           | 1981 | 1988 | 1990 | 2000 |                 |
| ALIEN VEGETATION          |                |      |      |      |      |                 |
| Upland : Tall Trees       | 0.29           | 0.29 | 0.64 | 0.89 | 1.50 | km <sup>2</sup> |
| Upland : shrubs           | 0.22           | 0.22 | 0.50 | 0.71 | 1.18 | km <sup>2</sup> |
| Total                     | 0.51           | 0.51 | 1.14 | 1.60 | 2.68 | km <sup>2</sup> |
| FARM DAM CAPACITIES       | Not applicable |      |      |      |      | Mm <sup>3</sup> |
| IRRIGATION AREAS<br>river | 0.69           | 0.70 | 0.75 | 0.75 | 3.51 | km <sup>2</sup> |
| Total                     | 0.69           | 0.70 | 0.75 | 0.75 | 3.51 | km <sup>2</sup> |

### 3 EVAPORATION

|                       | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) | 166  | 199  | 219  | 241  | 204  | 165  | 112  | 78   | 62   | 61   | 89   | 111  | 1707      |
| S-PAN (gross) (in mm) | 126  | 156  | 188  | 164  | 138  | 106  | 86   | 62   | 48   | 49   | 62   | 81   | 1266      |
| LAKE FACTOR           | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)    | 222  | 211  | 210  | 215  | 185  | 187  | 146  | 123  | 98   | 111  | 145  | 187  | 2040      |

**Note : BRHS evaporation used for this sub-catchment**

### 4 RESERVOIR SIMULATIONS

|                | COEFFICIENTS   |   | START      | DEAD                      | MAX                       |
|----------------|----------------|---|------------|---------------------------|---------------------------|
|                | a              | b | STOR.<br>% | STOR.<br>M.m <sup>3</sup> | STOR.<br>M.m <sup>3</sup> |
| DUMMY FARM DAM | Not Applicable |   |            |                           |                           |

### 5 IRRIGATION ROUTINE

|                      | QUANT<br>% | CROP FACTORS |     |     |      |      |      |      |     |     |     |     |     |
|----------------------|------------|--------------|-----|-----|------|------|------|------|-----|-----|-----|-----|-----|
|                      |            | OCT          | NOV | DEC | JAN  | FEB  | MAR  | APR  | MAY | JUN | JUL | AUG | SEP |
| Combined crop factor | 100        | 0.3          | 0.4 | 0.5 | 0.55 | 0.55 | 0.45 | 0.25 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |

### 5 NOTES

Combined crop factor used in the BRHS for :  
crop type 1 : vineyards and fruit trees  
crop type 2 : wheat , lucerne and cash crops

Modelled as a single rainfall area  
MAP = 1124 mm

## APPENDIX B 6.1

SUB-CATCHMENT : H1R001

RIVER :

PLACE : Brandvlei Dam

### 1 CATCHMENT

|                               | YEAR  |       |       |       |       | UNITS           |
|-------------------------------|-------|-------|-------|-------|-------|-----------------|
|                               | 1980  | 1981  | 1988  | 1990  | 2000  |                 |
| SUB-CATCHMENT AREAS<br>H1R001 | 40.14 | 40.14 | 40.14 | 39.93 | 39.93 | km <sup>2</sup> |

### 2 LANDUSE

|                                                      | YEAR   |        |        |        |        | UNITS           |
|------------------------------------------------------|--------|--------|--------|--------|--------|-----------------|
|                                                      | 1980   | 1981   | 1988   | 1990   | 2000   |                 |
| ALIEN VEGETATION<br>Upland : Tall Trees (u/s of GBD) | 0.16   | 0.16   | 0.16   | 0.37   | 0.71   | km <sup>2</sup> |
| Total                                                | 0.16   | 0.16   | 0.16   | 0.37   | 0.71   | km <sup>2</sup> |
| FARM DAM CAPACITIES                                  |        |        |        |        |        |                 |
| Brandvlei Dam                                        | 342.00 | 342.00 | 342.00 | 342.00 | 342.00 | Mm <sup>3</sup> |
| Dummy Dam                                            | 1.22   | 1.22   | 1.24   | 1.24   | 1.24   | Mm <sup>3</sup> |
| IRRIGATION AREAS                                     |        |        |        |        |        |                 |
| farm dams                                            | 9.33   | 9.47   | 10.33  | 10.33  | 3.30   | km <sup>2</sup> |
| canal from GBD                                       | 48.32  | 49.45  | 56.22  | 56.22  | 54.22  | km <sup>2</sup> |
| Total                                                | 57.65  | 58.92  | 66.55  | 66.55  | 57.52  | km <sup>2</sup> |

### 3 EVAPORATION

|                       | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) | 192  | 246  | 290  | 301  | 243  | 222  | 140  | 85   | 64   | 68   | 90   | 124  | 2065      |
| S-PAN (gross) (in mm) | 154  | 196  | 245  | 257  | 215  | 191  | 120  | 74   | 49   | 49   | 65   | 97   | 1712      |
| LAKE FACTOR           | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)    | 222  | 211  | 210  | 215  | 185  | 187  | 146  | 123  | 98   | 111  | 145  | 187  | 2040      |

**Note : BRHS evaporation used for this sub-catchment**

### 4 RESERVOIR SIMULATIONS

|                | COEFFICIENTS |   | START      | DEAD                      | MAX                       |
|----------------|--------------|---|------------|---------------------------|---------------------------|
|                | a            | b | STOR.<br>% | STOR.<br>M.m <sup>3</sup> | STOR.<br>M.m <sup>3</sup> |
| DUMMY FARM DAM | 0.29         | 1 | 100        | 0                         | FSC                       |
| BRANDVLEI DAM  | 0.09         | 1 | 100        | 0                         | FSC                       |

### 5 IRRIGATION ROUTINE

|                      | QUANT | CROP FACTORS |      |      |      |      |      |      |      |      |      |      |      |
|----------------------|-------|--------------|------|------|------|------|------|------|------|------|------|------|------|
|                      | %     | OCT          | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  |
| Combined crop factor | 100   | 0.3          | 0.38 | 0.44 | 0.48 | 0.48 | 0.39 | 0.25 | 0.18 | 0.18 | 0.18 | 0.18 | 0.22 |

### 5 NOTES

Combined crop factor used in the BRHS for :

crop type 1 : vineyards and fruit trees

crop type 2 : wheat , lucerne and cash crops

Modelled as a single rainfall area

MAP = 471 mm

## APPENDIX B 6.1

SUB-CATCHMENT : H4R004

RIVER :

PLACE : Kwaggaskloof Dam

### 1 CATCHMENT

|                               | YEAR  |       |       |       |       | UNITS           |
|-------------------------------|-------|-------|-------|-------|-------|-----------------|
|                               | 1980  | 1981  | 1988  | 1990  | 2000  |                 |
| SUB-CATCHMENT AREAS<br>H4R004 | 48.10 | 48.10 | 48.10 | 48.10 | 48.10 | km <sup>2</sup> |

### 2 LANDUSE

|                                                      | YEAR          |      |      |      |      | UNITS           |
|------------------------------------------------------|---------------|------|------|------|------|-----------------|
|                                                      | 1980          | 1981 | 1988 | 1990 | 2000 |                 |
| ALIEN VEGETATION<br>Upland : Tall Trees (u/s of GBD) | 0.01          | 0.01 | 0.01 | 0.02 | 0.04 | km <sup>2</sup> |
| Total                                                | 0.01          | 0.01 | 0.01 | 0.02 | 0.04 | km <sup>2</sup> |
| FARM DAM CAPACITIES                                  | As for H1R001 |      |      |      |      | Mm <sup>3</sup> |
| IRRIGATION AREAS<br>farm dams                        | As for H1R001 |      |      |      |      | km <sup>2</sup> |
| Total                                                |               |      |      |      |      |                 |

### 3 EVAPORATION

|                       | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) | 192  | 246  | 290  | 301  | 243  | 222  | 140  | 85   | 64   | 68   | 90   | 124  | 2065      |
| S-PAN (gross) (in mm) | 154  | 196  | 245  | 257  | 215  | 191  | 120  | 74   | 49   | 49   | 65   | 97   | 1712      |
| LAKE FACTOR           | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)    | 222  | 211  | 210  | 215  | 185  | 187  | 146  | 123  | 98   | 111  | 145  | 187  | 2040      |

**Note : BRHS evaporation used for this sub-catchment**

### 4 RESERVOIR SIMULATIONS

|                | COEFFICIENTS  |   | START | DEAD             | MAX              |
|----------------|---------------|---|-------|------------------|------------------|
|                | a             | b | STOR. | STOR.            | STOR.            |
|                |               |   | %     | M.m <sup>3</sup> | M.m <sup>3</sup> |
| DUMMY FARM DAM | As for H1R001 |   |       |                  |                  |
| BRANDVLEI DAM  | As for H1R001 |   |       |                  |                  |

### 5 IRRIGATION ROUTINE

|                      | QUANT<br>% | CROP FACTORS |      |      |      |      |      |      |      |      |      |      |      |
|----------------------|------------|--------------|------|------|------|------|------|------|------|------|------|------|------|
|                      |            | OCT          | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  |
| Combined crop factor | 100        | 0.3          | 0.38 | 0.44 | 0.48 | 0.48 | 0.39 | 0.25 | 0.18 | 0.18 | 0.18 | 0.18 | 0.22 |

### 5 NOTES

Combined crop factor used in the BRHS for :

crop type 1 : vineyards and fruit trees

crop type 2 : wheat , lucerne and cash crops

Modelled as a single rainfall area

MAP = 458 mm



Appendix B6.2

File : H4H17INC.OBS

Units : 10^6xm^3

Descrip. : Incremental observed flow record at H4H017 for 1981 to 1988

| Year  | Oct   | Nov    | Dec   | Jan   | Feb    | Mar    | Apr   | May    | Jun    | Jul    | Aug    | Sep    | Total |
|-------|-------|--------|-------|-------|--------|--------|-------|--------|--------|--------|--------|--------|-------|
| 1981  | 20.04 | 4.71   | 15.74 | 11.91 | 10.90  | 7.27   | 0.00  | 25.89  | 27.47  | 15.72  | 37.63  | 3.33   | 180.6 |
| 1982  | 24.31 | 15.55  | 17.15 | 13.81 | 8.85   | 11.79  | 5.76  | 36.13  | 94.96  | 189.81 | 54.54  | 50.90  | 523.6 |
| 1983  | 13.34 | 12.76  | 14.88 | 13.67 | 13.06* | 59.02* | 4.40  | 118.44 | 5.63   | 140.12 | 42.71  | 110.99 | 549.0 |
| 1984  | 83.61 | 39.75* | 12.15 | 8.06  | 7.30   | 38.12  | 15.47 | 19.98  | 108.78 | 93.44  | 100.73 | 27.36  | 554.8 |
| 1985  | 16.90 | 17.52  | 19.34 | 14.00 | 11.80  | 8.41   | 7.74  | 10.38  | 33.85  | 98.69  | 166.25 | 80.34  | 485.2 |
| 1986  | 17.00 | 14.20  | 14.01 | 10.67 | 12.64  | 11.12  | 2.50  | 32.86  | 68.21  | 71.43  | 126.96 | 72.73  | 454.3 |
| 1987  | 26.18 | 13.55  | 12.11 | 13.73 | 13.87  | 9.86   | 9.50  | 17.31  | 25.62  | 32.39  | 0.80   | 92.75  | 267.7 |
| 1988  | 21.39 | 11.30  | 13.36 | 14.96 | 10.38  | 0.00   | 18.49 | 25.61  | 28.73  | 48.62  | 85.61  | 120.60 | 399.1 |
| AVE : | 27.85 | 16.17  | 14.84 | 12.60 | 11.10  | 18.20  | 7.98  | 35.83  | 49.16  | 86.28  | 76.91  | 69.87  | 426.8 |
| SD :  | 22.91 | 10.25  | 2.51  | 2.27  | 2.22   | 19.89  | 6.33  | 34.39  | 37.01  | 57.75  | 53.63  | 40.53  | 137.1 |

## Average Rainfall On Catchment H1H007.ra

details of rainfall stations used

022038\_8.pat 1920 to 1998

022368\_4.pat 1932 to 1977

22284a.pat 1970 to 1983

042357\_a.pat 1924 to 1998

| no. gauges |   | rainfall input as percent m.a.p. |       |       |       |       |       |       |        |        |        |        |       | year   |
|------------|---|----------------------------------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|-------|--------|
|            |   | oct                              | nov   | dec   | jan   | feb   | mar   | apr   | may    | jun    | jul    | aug    | sep   |        |
| 1920       | 1 | 3.86+                            | 3.86+ | 3.86+ | 4.02  | 6.89  | 1.73  | 9.35  | 1.66   | 38.65  | 16.35  | 13.65  | 6.10  | 110.00 |
| 1921       | 1 | 4.23                             | 3.22  | 6.39  | 8.97  | 3.22  | 6.51  | 6.96  | 11.36  | 19.95  | 8.00   | 17.76  | 3.93  | 100.50 |
| 1922       | 1 | 3.00                             | 3.33  | .33   | 2.66  | .34   | 1.19  | 12.50 | 31.10  | 25.19  | 13.58  | 13.37  | 10.07 | 116.66 |
| 1923       | 1 | 5.25                             | 15.13 | 3.96  | 3.13  | .37   | 3.07  | 3.05  | 8.04   | 20.50  | 8.17   | 17.13  | 9.00  | 96.80  |
| 1924       | 2 | 10.44+                           | 7.87+ | .16+  | 2.74+ | .85+  | .67+  | 1.25+ | 8.04+  | 38.82  | 24.28+ | 5.55+  | 2.82  | 103.49 |
| 1925       | 2 | 12.84                            | 6.10  | .75   | .50   | 4.10  | .00   | 1.49  | 15.37  | 3.71   | 13.59  | 8.61   | 4.29+ | 71.36  |
| 1926       | 2 | 15.77                            | 2.42  | .00+  | 1.34  | 6.12+ | .09   | 6.84  | 11.06+ | 10.42  | 5.67   | 19.99+ | 4.04  | 83.76  |
| 1927       | 2 | .41                              | 10.39 | 2.92+ | 2.91  | .00   | 3.68  | 1.81  | .29    | 25.88  | 6.46   | 11.08+ | 9.59  | 75.44  |
| 1928       | 2 | 1.11                             | 1.75  | 2.03  | .00   | 1.02  | 2.56  | 10.39 | 16.08  | 11.05  | 17.54  | 10.72  | 3.79  | 78.04  |
| 1929       | 2 | 1.81                             | 2.21  | 4.26  | 3.11  | 2.05  | 1.99  | 4.16  | .89    | 1.35   | 9.43   | 12.81  | 18.69 | 62.75  |
| 1930       | 2 | 4.41                             | 4.15  | 1.36  | .00   | 3.30  | .00   | 12.33 | 13.51  | 5.14   | 7.57   | 24.10  | 12.55 | 88.42  |
| 1931       | 2 | 7.34                             | .45   | 2.16  | 3.34  | 17.01 | 2.17  | 1.83  | 17.91  | 13.95  | 11.45  | 8.72   | 9.13  | 95.46  |
| 1932       | 3 | 2.49                             | .76   | 2.87  | 2.34  | 3.52  | 1.99  | 1.03  | 10.07  | 27.95  | 19.55  | 8.81   | 3.88  | 85.26  |
| 1933       | 3 | 7.94                             | .87   | 3.33  | .93   | 2.07  | 5.67  | 1.95  | 11.78  | 8.96   | 8.00   | 9.01   | 10.54 | 71.03  |
| 1934       | 3 | 9.50                             | 5.83  | .30   | .56   | 2.47  | 4.07  | 9.33  | 12.26  | 7.53   | 14.55  | 13.43  | 10.07 | 89.88  |
| 1935       | 3 | 2.07                             | 5.28  | .44   | 5.72  | 1.39  | 2.32  | .66   | 9.56   | 4.60   | 12.33  | 15.04  | 10.34 | 69.76  |
| 1936       | 3 | 2.55                             | 3.25  | 9.00  | 1.21  | .02   | 9.40  | 7.40  | 13.85  | 24.18  | 22.13  | 5.63   | 2.33  | 100.95 |
| 1937       | 3 | 3.32                             | .43   | 1.86  | 9.88  | 2.17  | 1.06  | 10.97 | 18.37  | 8.38   | 9.59   | 9.77   | 10.36 | 86.17  |
| 1938       | 3 | 3.75                             | 2.52  | 1.24  | .74   | 6.63  | 1.02  | 7.24  | 15.69  | 5.08   | 8.01   | 16.47  | 8.81  | 77.19  |
| 1939       | 3 | 1.04                             | 4.63  | 3.19  | .53   | 5.01  | 3.38  | 12.08 | 9.72   | 15.47  | 7.09   | 5.99   | 7.53  | 75.65  |
| 1940       | 3 | 3.24                             | 9.30  | 1.08  | 5.92  | 2.07  | .39   | 13.92 | 28.87  | 25.09  | 14.37  | 16.55  | 29.06 | 149.85 |
| 1941       | 3 | 7.86                             | 1.27  | 2.56  | 1.59  | .12   | .18   | 2.18  | 23.03  | 45.08  | 7.01   | 12.75  | 1.90  | 105.53 |
| 1942       | 3 | 4.68                             | .52   | 1.82  | 5.25  | 2.17  | 6.37  | 5.30  | 6.42   | 13.54  | 19.40  | 20.38  | 11.80 | 97.64  |
| 1943       | 3 | 4.14                             | 9.39  | .00   | 3.12  | .01   | 3.12  | 6.47  | 18.14  | 31.55  | 10.81  | 16.85  | 8.44  | 112.04 |
| 1944       | 3 | 5.74                             | 6.58  | 5.08  | .00   | .03   | .81   | 6.51  | 22.13  | 32.00  | 22.50  | 15.71  | 1.19  | 118.28 |
| 1945       | 3 | 3.09                             | 2.68  | 2.34  | .27   | .06   | 3.30  | 9.37  | 9.80   | 5.59   | 9.24   | 14.85  | 19.73 | 80.32  |
| 1946       | 3 | 8.13                             | 1.78  | 1.34  | .00   | .00   | 8.03  | 3.21  | 8.85   | 5.48   | 27.15  | 10.67  | 4.04  | 78.68  |
| 1947       | 3 | 5.47                             | 2.10  | .20   | .46   | 1.67  | 7.97  | 6.44  | 15.98  | 7.89   | 19.48  | 7.77   | 19.24 | 94.67  |
| 1948       | 3 | 8.92                             | 1.34  | 2.29  | .62   | .03   | 1.12  | 9.13  | 8.24   | 11.40  | 14.12  | 14.65  | 9.96  | 81.81  |
| 1949       | 3 | 8.42                             | 9.32  | 2.03  | .21   | .00   | .91   | 16.54 | 1.86   | 7.24   | 27.22  | 1.21   | 14.87 | 89.85  |
| 1950       | 3 | 3.68                             | 10.45 | 3.93  | 4.77  | .08   | .03   | 19.77 | 9.93   | 29.00  | 14.07  | 10.33  | 8.51  | 114.55 |
| 1951       | 3 | 6.39                             | 10.53 | .31   | .39   | 2.91  | 3.02  | 5.09  | 21.55  | 9.14   | 13.46  | 27.06  | 16.57 | 116.43 |
| 1952       | 3 | 5.90                             | 11.80 | .66   | .69   | .53   | 1.46  | 26.63 | 27.72  | 8.32   | 21.66  | 15.85  | 1.05+ | 122.27 |
| 1953       | 3 | 2.02+                            | 6.67+ | 3.35+ | 1.48  | 1.88  | 3.30  | 14.51 | 31.98  | 12.09  | 31.92  | 20.98  | 7.57  | 137.74 |
| 1954       | 3 | 7.81                             | 1.28  | 6.60  | .05   | 9.06  | 1.42  | 5.99  | 4.24   | 18.16  | 25.71  | 34.26  | 4.41  | 118.98 |
| 1955       | 3 | 12.24                            | 6.78  | 3.35  | .74   | 1.91  | 2.76  | 4.42  | 15.42  | 23.94  | 17.27  | 19.19  | 4.09  | 112.13 |
| 1956       | 3 | 3.83                             | .58   | 2.54  | 1.11  | 16.97 | 5.31  | 5.02  | 28.40  | 26.03  | 27.22  | 15.19  | 7.90  | 140.13 |
| 1957       | 3 | 16.28                            | 1.09  | .00   | 1.25  | 8.32  | 1.56  | 4.15  | 19.77  | 10.49  | 2.27   | 10.38  | 5.16  | 80.72  |
| 1958       | 3 | 6.53                             | 5.57  | .00   | 1.47  | 2.97  | 2.66  | 15.90 | 45.83  | 3.45   | 2.31   | 13.94  | 4.32  | 104.92 |
| 1959       | 3 | 11.41                            | .28   | 2.56  | .44   | 1.63  | 4.75  | 7.63  | 17.75  | 22.75  | 3.94   | 3.99   | 3.81  | 80.94  |
| 1960       | 3 | 3.58                             | .57   | 2.45  | 5.79  | 1.42  | 1.21  | 4.41  | 9.33   | 17.55  | 8.43   | 14.73  | 17.71 | 87.21  |
| 1961       | 3 | 3.37                             | .00   | 1.90  | 2.03  | 6.19  | 5.16  | 8.99  | 4.41   | 47.65  | 13.49  | 26.70  | 4.92  | 124.78 |
| 1962       | 3 | 17.87                            | 1.96  | .38   | 3.06  | .49   | .77   | 1.46  | 3.49   | 10.68  | 18.40  | 25.62  | 4.79  | 88.99  |
| 1963       | 3 | 1.63                             | 6.26  | 4.57  | .01   | 12.49 | 1.41  | 5.50  | 7.84   | 21.88  | 13.79  | 18.49  | 4.79  | 98.65  |
| 1964       | 3 | 5.67                             | 10.11 | 1.07  | 3.22  | 6.75  | 14.73 | 8.36  | 12.15  | 7.78   | 7.90   | 7.97   | 3.87  | 89.56  |
| 1965       | 3 | 6.31                             | 1.64  | 5.33  | .23   | .67   | 9.75  | 5.66  | 5.22   | 19.44  | 25.32  | 7.75   | 9.92  | 97.24  |
| 1966       | 3 | .62                              | 1.00  | 1.32  | 2.02  | .26   | 1.73  | 12.12 | 10.69  | 32.89  | 7.47   | 8.41   | 6.58  | 85.10  |
| 1967       | 3 | 7.87                             | 7.66  | .44   | 2.95  | .71   | .13   | 10.36 | 25.13  | 16.41  | 22.48  | 12.68  | 1.64  | 108.45 |
| 1968       | 3 | 19.38                            | 2.37  | 9.72  | 3.47  | 1.12  | 1.46  | 10.45 | 2.57   | 10.62  | 6.03   | 13.00  | 12.78 | 92.99  |
| 1969       | 3 | 6.87                             | 1.16  | .80   | .61   | 2.03  | .43   | 1.15  | 18.92  | 26.55  | 15.29  | 17.46  | 8.08  | 99.34  |
| 1970       | 4 | 3.16                             | 2.84  | 2.92  | .59   | .23   | 5.13  | .59   | 6.61   | 11.40  | 16.18  | 16.68  | 1.39  | 67.69  |
| 1971       | 4 | 2.63                             | 1.04  | 2.25  | 3.92  | 2.47  | 2.11  | 9.52  | 15.72+ | 6.98+  | 7.14   | 7.64   | 6.51  | 67.92  |
| 1972       | 4 | 2.52                             | .00   | 5.14  | .18   | .00   | 5.98  | .91   | 5.55   | 1.95   | 41.84  | 10.89  | 9.74  | 84.69  |
| 1973       | 4 | 4.62                             | 1.39  | 6.06  | .38   | .64   | .94   | .08   | 13.08  | 27.32  | 11.27  | 58.37  | 8.79  | 132.93 |
| 1974       | 4 | 10.40                            | 6.54  | 2.07  | 2.90  | 1.67  | .92   | 11.87 | 30.28  | 6.60   | 16.17  | 13.54  | 2.90  | 105.88 |
| 1975       | 4 | 9.90                             | 2.47  | .49   | .00   | 1.75  | 3.98  | 4.77  | 5.49   | 40.14  | 14.84  | 5.88   | 5.68  | 95.40  |
| 1976       | 4 | 2.52                             | 23.49 | 10.86 | 4.55  | 4.08  | 1.39  | 12.26 | 34.56  | 28.91  | 28.92  | 26.54  | 6.25  | 184.34 |
| 1977       | 4 | 2.97                             | 1.78  | 6.62  | 1.85  | 2.20  | 6.33  | 7.64  | 8.15   | 1.16   | .99    | 22.08  | 10.05 | 71.82  |
| 1978       | 3 | 2.22                             | .68   | 4.22  | 2.77  | 8.03  | .65   | 1.16  | 16.38  | 20.84  | 8.75   | 12.80  | 9.99  | 88.48  |
| 1979       | 3 | 11.81                            | 1.23  | .05   | 5.05  | 1.92  | .15   | 8.09  | 15.48  | 13.08  | 6.66   | 16.22  | 3.31  | 83.04  |
| 1980       | 3 | 4.18                             | 18.84 | 6.78  | 13.27 | .39   | 3.65  | 4.02  | 2.79   | 9.22   | 26.38  | 16.95  | 22.51 | 128.99 |
| 1981       | 3 | 2.65                             | 1.90  | 2.12  | 4.10  | .29   | 2.97  | 14.64 | 8.57   | 12.64  | 11.66  | 8.42   | 1.95  | 71.91  |
| 1982       | 3 | 9.61                             | 2.76  | 4.98  | .48   | 5.30  | 5.84  | 3.31  | 26.68  | 27.04  | 26.04  | 5.48   | 8.42  | 125.95 |
| 1983       | 3 | .85                              | 2.50  | 1.43  | .69   | .14   | 12.27 | 5.24  | 38.64  | 9.97   | 14.22  | 9.07   | 21.19 | 116.21 |
| 1984       | 2 | 12.84                            | .16   | 11.01 | 6.71  | 4.23  | 16.23 | 10.25 | 8.94   | 20.06  | 19.52  | 18.66  | 8.26  | 136.86 |
| 1985       | 2 | 2.28                             | .90   | 1.40  | 2.07  | 2.08  | 7.20  | 9.18  | 8.78   | 20.68  | 17.41  | 21.73  | 8.29  | 102.00 |
| 1986       | 2 | 1.59                             | 2.37  | .75   | 6.50  | 2.01  | 2.83  | 8.19  | 20.46  | 19.10  | 15.98  | 18.34  | 10.98 | 109.11 |
| 1987       | 2 | 1.96                             | 1.03  | 6.16  | .09   | .00   | 2.14  | 13.91 | 9.29   | 15.86  | 11.10  | 15.75  | 9.96  | 87.25  |
| 1988       | 2 | 2.44                             | 1.54  | 2.54  | .79   | 4.85  | 13.89 | 10.77 | 10.89  | 17.24  | 18.23  | 20.58  | 17.06 | 120.83 |
| 1989       | 2 | 6.69                             | 7.55  | .61   | 1.74  | 6.17  | 1.05  | 25.67 | 15.29  | 20.08  | 23.48  | 7.32   | 2.63  | 118.29 |
| 1990       | 2 | .43                              | 3.74  | 6.31  | 1.36  | 1.57  | .98   | 4.51  | 13.22  | 26.42  | 43.79  | 6.70   | 16.37 | 125.39 |
| 1991       | 2 | 7.09                             | 2.64  | 1.42  | .05   | 4.72  | 6.88  | 9.18  | 12.69  | 34.81  | 16.36  | 10.56  | 7.16  | 113.56 |
| 1992       | 2 | 16.00                            | 3.21  | .55   | 1.34  | 4.16  | .64   | 21.92 | 23.98  | 14.15  | 28.45  | 9.42   | 3.81  | 127.64 |
| 1993       | 2 | .39                              | .85   | 3.35  | 1.11  | .29   | 1.17  | 9.42  | 6.59   | 37.63  | 7.24   | 4.16   | 13.08 | 85.29  |
| 1994       | 2 | 4.15                             | 1.21  | 1.95  | 1.16  | 1.05  | 2.15  | 2.23  | 11.92  | 19.31  | 19.17  | 13.10  | 2.20  | 79.61  |
| 1995       | 2 | 14.80                            | .87   | 17.12 | 1.04  | 5.14  | 3.94  | 4.13  | 11.34  | 31.91  | 16.86  | 18.37  | 19.41 | 144.93 |
| 1996       | 2 | 7.28                             | 11.07 | 8.73  | 1.25  | .14   | .80   | 4.36  | 9.96   | 30.10  | 6.27   | 12.79  | 1.14  | 93.89  |
| 1997       | 2 | 1.24                             | 8.98  | 5.19  | 3.29  | .00   | 1.28  | 5.12  | 29.94  | 11.35  | 14.25  | 6.36   | 4.35  | 91.35  |
| 1998       | 2 | 4.12                             | 10.55 | 9.23  | .35+  | .80+  | .23+  | 8.63+ | 12.93+ | 17.55+ | 14.69+ | 13.88+ | 8.54+ | 101.51 |

average 5.89 4.31 3.20 2.25 2.78 3.31 7.73 14.39 18.10 15.40 14.32 8.46 100.14

adjusted 5.88 4.31 3.19 2.24 2.77 3.31 7.72 14.37 18.07 15.38 14.30 8.45 100.001

## Average Rainfall On Catchment wolve.ran

## details of rainfall stations used

22789a.pat 1943 to 1988

022792.pat 1936 to 1979

022521\_9.pat 1920 to 1976

022803.pat 1925 to 1998

|          |        | rainfall input as percent m.a.p. |        |        |       |        |       |       |        |        |        |        |        | year    |
|----------|--------|----------------------------------|--------|--------|-------|--------|-------|-------|--------|--------|--------|--------|--------|---------|
| no.      | gauges | oct                              | nov    | dec    | jan   | feb    | mar   | apr   | may    | jun    | jul    | aug    | sep    |         |
| 1920     | 1      | 2.94+                            | 2.94+  | 2.94+  | 2.56  | 5.52   | .00   | 4.67  | .00    | 110.93 | 16.16  | 13.18  | .64    | 162.49  |
| 1921     | 1      | 3.26+                            | 1.49   | .00    | .00   | .00    | 5.27+ | 2.78  | 10.34+ | 29.82  | 9.57   | 19.72  | 2.12   | 84.37   |
| 1922     | 1      | 1.27                             | .00    | .00    | .00   | .00    | .00   | .64   | 13.82  | 26.14  | 8.15   | .00    | 7.23   | 57.24   |
| 1923     | 1      | 4.17+                            | 12.85+ | 3.03+  | .00   | .00    | 1.07  | .85   | .00    | 19.14  | 6.17   | 18.07  | 3.18   | 68.51   |
| 1924     | 1      | 3.40                             | 4.05   | .00    | .00   | .00    | .00   | .00   | 3.40   | 64.38  | 16.79  | .00    | .00    | 92.02   |
| 1925     | 2      | 7.32+                            | 3.27+  | 1.72+  | .00   | 3.74   | .00   | .31   | 11.43  | 1.72   | 16.34  | 8.55   | 2.35   | 56.76   |
| 1926     | 2      | 18.33                            | 4.02   | .00    | .00   | 1.62   | .00   | 8.72  | 7.66   | 17.14  | 2.85   | 21.26  | 2.12   | 83.72   |
| 1927     | 2      | .00                              | 7.97   | 1.72+  | 2.23  | .00    | 3.63  | .00   | .00    | 26.51  | 11.34+ | 7.85+  | 11.00+ | 72.26   |
| 1928     | 2      | .00+                             | 6.05+  | 1.56   | .00   | .00    | 7.89  | 15.80 | 7.11   | 14.08  | 21.21  | 15.68  | .00    | 89.38   |
| 1929     | 2      | .31                              | .00+   | 3.48+  | 6.17+ | 11.65+ | 1.64+ | .00+  | 3.13+  | 2.89+  | 3.25+  | 15.41+ | 14.73+ | 62.66   |
| 1930     | 2      | 2.78+                            | 3.26+  | .45+   | .00   | .88    | .37   | 17.36 | 13.63  | 2.06   | 14.66  | 21.91  | 11.94  | 89.31   |
| 1931     | 2      | 14.64                            | .51    | 2.93   | 1.64  | 14.73  | .54   | .74   | 12.15  | 12.68  | 16.05  | 6.52   | 12.44  | 95.54   |
| 1932     | 2      | 1.27                             | .00    | 3.13   | .96   | 1.27   | 3.91  | 2.50  | 10.44  | 29.23  | 23.38  | 12.52  | 3.70   | 92.32   |
| 1933     | 2      | 3.06                             | 2.35   | 3.05   | 2.66  | 4.62   | 1.97  | .19   | 8.10+  | 12.37+ | 10.23+ | 18.08+ | 13.04  | 79.73   |
| 1934     | 2      | 13.03                            | 1.96   | .00    | .00   | .62    | .85   | 12.84 | 16.81  | 13.00  | 11.15  | 10.46  | 7.33   | 88.06   |
| 1935     | 2      | .61                              | 7.32   | .00    | 3.93  | .00    | .00   | 3.02  | 11.40  | 6.34   | 18.34  | 14.33  | 10.54  | 75.82   |
| 1936     | 3      | 2.08                             | 14.70  | 12.26  | .07   | .95    | 7.52  | 7.75  | 12.29  | 16.67  | 16.90  | 2.18   | 4.34   | 97.70   |
| 1937     | 3      | .70                              | .11    | 1.52   | 4.58  | .74    | 1.45  | 8.21  | 11.77  | 8.22   | 5.79   | 9.91   | 6.45   | 59.44   |
| 1938     | 3      | 2.20                             | 3.11   | 3.44   | 4.10  | 9.15   | 3.29  | 7.29  | 14.79  | 3.94   | 10.27  | 20.66  | 7.61   | 89.85   |
| 1939     | 3      | 2.52+                            | 2.96   | 2.19   | .14   | 4.48   | .37   | 10.72 | 9.53   | 14.97  | 5.79+  | 3.75+  | 1.57   | 58.98   |
| 1940     | 3      | 1.34                             | 11.88  | .15    | 3.34  | 2.10   | .00+  | 12.31 | 34.84  | 34.73  | 14.24  | 11.69  | 23.77  | 150.39  |
| 1941     | 3      | 7.26                             | 3.81   | 1.13   | 4.76  | .37    | .00   | .84   | 19.14  | 37.70  | 2.47   | 7.19   | 1.42   | 86.09   |
| 1942     | 3      | 3.92                             | .27    | 8.37   | 7.08  | .23    | 10.15 | 7.06  | 2.99   | 13.13  | 18.14  | 14.32  | 13.21  | 98.84   |
| 1943     | 4      | 2.27                             | 9.54   | .75+   | .51   | .00    | 2.79  | 3.14  | 10.07  | 23.08  | 10.47  | 19.51+ | 10.08+ | 92.21   |
| 1944     | 4      | 9.67+                            | 3.27+  | 1.31+  | .00+  | .00+   | .24+  | 7.25  | 29.41  | 28.53  | 31.88  | 20.86  | 3.49   | 135.93  |
| 1945     | 4      | 13.84                            | 1.75   | 1.17   | .00   | .80    | 3.40  | 4.71  | 3.86   | 6.67   | 7.76   | 10.81  | 25.19  | 79.96   |
| 1946     | 4      | 4.84                             | .00    | 1.62   | .00   | .00    | 11.67 | 3.31  | 8.44   | 5.83   | 24.72  | 8.83   | 2.88   | 72.15   |
| 1947     | 4      | 2.73                             | 2.13   | 1.47   | 2.80  | 1.62   | 16.04 | 4.83  | 15.71  | 9.00   | 16.64  | 3.30   | 24.18  | 100.46  |
| 1948     | 4      | 14.03                            | .21    | 2.04   | .03   | .00    | .62   | 11.24 | 7.97   | 10.12  | 13.55  | 15.59  | 10.22  | 85.60   |
| 1949     | 4      | 7.10                             | 24.70  | .48    | .33   | .08    | .46   | 11.57 | 3.14   | 2.98   | 30.51  | .65    | 18.58  | 100.57  |
| 1950     | 4      | 9.95                             | 14.54  | 3.67   | 13.72 | .00    | .17   | 13.67 | 4.68   | 25.28  | 16.18  | 7.76   | 12.43  | 122.04  |
| 1951     | 4      | 5.54                             | 6.09   | .09    | .20   | 5.12   | .37   | 2.70  | 23.56  | 15.07  | 20.52  | 24.32  | 21.04  | 124.62  |
| 1952     | 4      | 4.68                             | 20.06  | 2.62   | .08   | 5.70   | .08   | 31.31 | 16.58  | 4.36   | 18.61  | 6.82   | 2.77   | 113.65  |
| 1953     | 4      | 7.52                             | 6.55   | 2.11   | .34   | 2.37   | 9.21  | 6.89  | 37.21  | 19.86  | 31.93  | 23.88  | 4.95   | 152.82  |
| 1954     | 4      | 5.49                             | 1.33   | 3.08   | .00   | 28.51  | 3.23  | 4.29  | 3.05   | 18.58  | 27.23  | 34.11  | 1.99   | 130.90  |
| 1955     | 4      | 8.55                             | 6.81   | .65    | 2.42  | 3.71   | .65   | .45   | 18.61  | 28.73  | 12.62  | 13.49  | 2.71   | 99.41   |
| 1956     | 4      | 5.93                             | .00    | 6.91   | .06   | 13.41  | 10.25 | 1.26  | 31.93  | 33.43  | 25.42  | 20.94  | 7.11   | 156.65  |
| 1957     | 4      | 7.65                             | .19    | .00    | .10   | 4.76   | 8.49  | 8.22  | 19.04  | 9.03   | .54    | 18.15  | 3.20   | 79.38   |
| 1958     | 4      | 10.11                            | 5.57   | .38    | 2.53  | 8.12   | 2.30  | 16.72 | 34.43  | 2.78   | 5.17   | 14.58  | 3.73   | 106.44  |
| 1959     | 4      | 19.00                            | .00    | 1.47   | .59   | .08    | 1.92  | 2.84  | 12.48  | 17.14  | 7.44   | .54    | 5.49   | 69.00   |
| 1960     | 4      | .65                              | 1.00   | 3.92   | 3.89  | .36    | 4.22  | 5.58  | 6.73   | 9.09   | 7.19   | 11.79  | 21.38  | 75.78   |
| 1961     | 4      | 3.31                             | .00    | .38    | 5.85  | 4.11   | 3.37  | 9.20  | 4.58   | 45.12  | 12.69  | 42.39  | 2.52   | 133.52  |
| 1962     | 4      | 26.74                            | 5.59   | .00    | 4.39  | 1.05   | .15   | .34   | 10.82  | 9.53   | 13.52  | 23.81  | 1.75   | 97.70   |
| 1963     | 4      | 4.60                             | 3.33   | 3.03   | .56   | 6.32   | 3.12  | 3.78  | 10.04  | 28.32  | 8.27   | 17.31  | 5.08   | 93.75   |
| 1964     | 4      | 5.55                             | 17.51  | .00    | .24   | 4.81   | 12.56 | 4.19  | 17.15  | 6.04   | 5.91   | 5.57   | 2.31   | 81.83   |
| 1965     | 4      | 6.44                             | 4.04   | 4.00   | .08   | .00    | 6.44  | 4.28  | 3.77   | 18.21  | 10.05  | 16.26  | 7.77   | 81.35   |
| 1966     | 4      | .44                              | .06    | .00    | .42   | .49    | .73   | 15.91 | 9.96   | 23.42  | 7.72   | 7.14   | 2.08   | 68.35   |
| 1967     | 4      | 3.52                             | 8.60   | .00    | 1.25  | .03    | 1.20  | 7.08  | 15.09  | 23.38  | 15.95  | 15.50  | 2.21   | 93.80   |
| 1968     | 4      | 14.08                            | 4.93   | .27    | .36   | 1.44   | .57   | 14.24 | .47    | 9.26   | 3.49   | 7.10   | 12.69  | 68.91   |
| 1969     | 4      | 14.59                            | .39    | .00    | .00   | 6.55   | .00   | .11   | 7.24   | 16.39  | 19.82  | 16.55  | 4.43   | 86.08   |
| 1970     | 4      | 7.17                             | 1.08   | 3.66   | .13   | .26    | 8.39  | 3.09  | 8.79   | 9.88   | 24.66  | 18.78  | .23    | 86.11   |
| 1971     | 4      | 1.54                             | .58    | 2.27   | 3.90  | .82    | 1.75  | 10.16 | 13.84  | 6.39   | 7.03   | 4.47   | 10.50  | 63.25   |
| 1972     | 4      | 1.47                             | .00    | 2.27   | .13   | 1.83   | .72   | 1.18  | 1.31   | 4.08   | 27.82  | 11.58  | 7.98   | 60.37   |
| 1973     | 4      | 2.14                             | .40    | 2.46   | .16   | 4.77   | 2.43  | .00   | 12.93  | 17.69  | 8.08   | 78.46  | 5.57   | 135.09  |
| 1974     | 4      | 11.63                            | 2.55   | .62    | 2.46  | .98    | .54   | 7.49  | 30.37  | 7.60   | 15.12  | 18.44  | 3.27   | 101.08  |
| 1975     | 4      | 7.72                             | 1.77   | .04    | 2.17  | 4.85   | 12.77 | 9.44  | 6.13   | 36.45  | 13.39  | 7.22   | 4.21   | 106.17  |
| 1976     | 4      | 6.67                             | 22.53  | 7.58   | 2.60  | 7.33   | .37   | 27.11 | 40.62  | 24.86  | 28.72  | 33.39  | 3.73   | 205.53  |
| 1977     | 3      | .61                              | 7.81   | 11.26  | .87+  | .87    | 6.47  | 7.17  | 1.88   | 3.08   | 5.25   | 25.43  | 5.56+  | 76.25   |
| 1978     | 3      | 2.89                             | 3.35   | 11.24+ | 3.28+ | 14.61  | .00   | 1.07  | 10.32  | 23.12  | 13.48  | 9.30+  | 8.23+  | 100.91  |
| 1979     | 3      | 3.82+                            | .00    | .10    | 3.10  | .27    | .66   | 7.16  | 13.60  | 13.11  | 5.29+  | 14.37  | 6.06   | 67.53   |
| 1980     | 2      | 5.23                             | 20.31+ | 6.47   | 66.28 | 8.59   | 8.02  | 9.27  | 3.32   | 3.11   | 24.90  | 19.81  | 15.15  | 190.46  |
| 1981     | 2      | 13.73+                           | 1.23   | .56    | 2.34  | .63    | 2.94  | 51.14 | 3.75   | 15.00  | 9.06   | 8.27   | 1.63   | 110.28  |
| 1982     | 2      | 5.72+                            | 1.85   | 1.98   | .46   | 4.62   | 6.42  | 3.06  | 26.04  | 28.77  | 22.19+ | 4.34   | 15.93  | 121.38  |
| 1983     | 2      | .53                              | .00    | .00    | 3.44  | .00    | 22.69 | 6.55  | 39.73  | 1.91   | 7.78   | 3.15   | 28.36  | 114.15  |
| 1984     | 2      | 15.36                            | .00    | 8.20   | 9.20  | 6.17   | 10.34 | 7.18  | 5.24   | 12.99+ | 35.53  | 11.47  | 5.56   | 127.23  |
| 1985     | 2      | 22.87                            | 1.05   | 7.01   | .00   | 3.01   | 5.26  | 7.30  | 1.04   | 21.22+ | 11.04  | 29.95  | 11.11  | 120.86  |
| 1986     | 2      | 7.90                             | 5.34   | .00    | .27   | 1.25   | .19   | 18.01 | 18.28  | 18.29+ | 9.99   | 20.81  | 7.50   | 107.84  |
| 1987     | 2      | .00                              | .00    | 1.18   | .00   | .00    | 1.87  | 11.87 | 4.97   | 13.52  | 3.17   | 21.40  | 4.49   | 62.47   |
| 1988     | 2      | 3.33                             | .00    | 1.05   | .53   | 5.43   | 12.37 | 31.44 | 4.03   | 22.13  | 9.50   | 20.57  | 21.79  | 132.16  |
| 1989     | 1      | 8.60                             | 3.07   | .00    | 1.47  | 7.99   | 1.43  | 28.05 | 16.09  | 25.60  | 13.47  | 3.07   | .00    | 108.86  |
| 1990     | 1      | 2.66                             | 1.43   | 5.24   | 4.30  | .00    | 9.75  | 6.35  | 12.29  | 18.55  | 32.85  | 3.07   | 12.70  | 109.18  |
| 1991     | 1      | 6.14                             | .00    | .00    | .00   | 2.95   | 1.43  | 15.36 | 10.85  | 21.50  | 21.13  | 9.91   | 3.89   | 93.17   |
| 1992     | 1      | 16.67                            | .82    | .00    | .00   | 5.53   | .00   | 87.93 | 12.90  | 13.92  | 35.06  | 8.68   | 1.84   | 183.35  |
| 1993     | 1      | .00                              | .00    | 6.55   | .61   | .00    | 6.39  | 18.63 | 12.37  | 43.41  | 11.06  | 5.12   | 8.40   | 112.54  |
| 1994     | 1      | 4.91                             | .00    | 11.06  | 19.86 | 1.72   | 7.58  | 1.64  | 27.11  | 11.47  | 7.37   | 18.63  | 1.43   | 112.79  |
| 1995     | 1      | 14.74                            | 6.55   | 40.95  | 1.56  | 4.30   | 5.73  | 1.88  | 11.47  | 32.15  | 24.16  | 13.51  | 10.03  | 167.05  |
| 1996     | 1      | 15.97                            | 14.13  | 5.94   | .00   | .00    | 2.05  | 10.24 | 28.26  | 28.67  | 6.96   | 9.62   | .00    | 121.84  |
| 1997     | 1      | 3.48                             | 14.33  | .00    | 17.20 | .00    | 5.53  | 8.81  | 32.03  | 3.07   | 6.55   | 3.07   | .00    | 94.07   |
| 1998     | 1      | .00                              | 4.42+  | 15.56  | .00   | .00    | .00   | 5.53  | 11.88  | 14.87+ | 14.01+ | 14.87+ | 6.88+  | 88.01   |
| average  |        | 6.44                             | 4.53   | 3.14   | 2.93  | 3.18   | 3.78  | 9.21  | 12.94  | 18.52  | 14.43  | 14.32  | 7.53   | 100.94  |
| adjusted |        | 6.38                             | 4.49   | 3.11   | 2.90  | 3.15   | 3.74  | 9.13  | 12.82  | 18.35  | 14.29  | 14.19  | 7.46   | 100.001 |

## Average Rainfall On Catchment slang.ran

## details of rainfall stations used

022368\_4.pat 1932 to 1977

022521\_9.pat 1920 to 1976

022038\_8.pat 1920 to 1998

22284a.pat 1970 to 1983

|          |        | rainfall input as percent m.a.p. |       |       |       |       |       |        |       |        |        |        |       |         |  |
|----------|--------|----------------------------------|-------|-------|-------|-------|-------|--------|-------|--------|--------|--------|-------|---------|--|
| no.      | gauges | oct                              | nov   | dec   | jan   | feb   | mar   | apr    | may   | jun    | jul    | aug    | sep   | year    |  |
| 1920     | 2      | 3.40+                            | 3.40+ | 3.40+ | 3.29  | 6.20  | .86   | 7.01   | .83   | 74.79  | 16.25  | 13.41  | 3.37  | 136.24  |  |
| 1921     | 2      | 3.75                             | 2.36  | 3.20  | 4.49  | 1.61  | 5.89  | 4.87   | 10.85 | 24.89  | 8.79   | 18.74  | 3.03  | 92.44   |  |
| 1922     | 2      | 2.14                             | 1.66  | .16   | 1.33  | .17   | .60   | 6.57   | 22.46 | 25.67  | 10.86  | 6.69   | 8.65  | 86.95   |  |
| 1923     | 2      | 4.71                             | 13.99 | 3.49  | 1.57  | .18   | 2.07  | 1.95   | 4.02  | 19.82  | 7.17   | 17.60  | 6.09  | 82.66   |  |
| 1924     | 2      | 6.16                             | 6.90  | .16   | 1.72  | .53   | .42   | .81    | 6.49  | 51.95  | 19.90  | 2.93   | 2.15  | 100.12  |  |
| 1925     | 2      | 9.46                             | 4.57  | .75   | .50   | 5.35  | .00   | 1.23   | 16.62 | 2.17   | 12.04  | 8.25   | 2.57  | 63.52   |  |
| 1926     | 2      | 17.35                            | 1.32  | .00   | .56   | 3.72  | .09   | 5.69   | 11.49 | 14.90  | 6.44   | 18.87  | 4.15  | 84.59   |  |
| 1927     | 2      | .41                              | 10.80 | 1.36  | 1.89  | .00   | 3.82  | 1.22   | .29   | 28.74  | 12.56  | 9.13   | 11.93 | 82.14   |  |
| 1928     | 2      | 1.11                             | 1.78  | 1.61  | .00   | .25   | 2.76  | 14.31  | 12.98 | 13.81  | 18.68  | 12.69  | 2.43  | 82.42   |  |
| 1929     | 2      | 1.30                             | 1.44  | 4.63  | 2.24  | 3.50  | 1.64  | 2.59   | .33   | 1.79   | 6.96   | 11.31  | 19.63 | 57.36   |  |
| 1930     | 2      | 3.97                             | 4.39  | .92   | .00   | 3.08  | .00   | 14.38  | 19.78 | 4.62   | 9.44   | 22.94  | 17.04 | 100.58  |  |
| 1931     | 2      | 8.08                             | .24   | 2.58  | 3.29  | 13.80 | 2.03  | 1.84   | 16.75 | 15.22  | 15.16  | 11.45  | 8.31  | 98.74   |  |
| 1932     | 3      | 2.64                             | .66   | 3.73  | 2.38  | 3.56  | 1.98  | 1.22   | 10.83 | 34.11  | 21.86  | 8.38   | 4.68  | 96.04   |  |
| 1933     | 3      | 7.96                             | .73   | 1.80  | .75   | 2.02  | 5.41  | 1.24   | 12.13 | 10.70  | 7.30   | 9.94   | 10.43 | 70.42   |  |
| 1934     | 3      | 9.85                             | 4.57  | .30   | .29   | 1.87  | 3.49  | 8.60   | 13.61 | 10.82  | 13.64  | 13.04  | 10.16 | 90.23   |  |
| 1935     | 3      | 1.55                             | 6.86  | .26   | 5.28  | 1.14  | 1.51  | 1.04   | 11.42 | 6.20   | 17.31  | 15.95  | 9.64  | 78.17   |  |
| 1936     | 3      | 2.03                             | 4.43  | 10.60 | .94   | .02   | 11.98 | 10.59  | 15.29 | 30.08  | 21.41  | 4.95   | 2.71  | 115.03  |  |
| 1937     | 3      | 2.92                             | .43   | 1.45  | 11.23 | 2.30  | 1.10  | 10.47  | 18.68 | 9.22   | 10.25  | 12.11  | 9.93  | 90.11   |  |
| 1938     | 3      | 3.05                             | 3.50  | 2.09  | .00   | 5.32  | 2.03  | 8.17   | 16.12 | 5.31   | 9.51   | 15.66  | 9.41  | 80.19   |  |
| 1939     | 3      | 1.04                             | 6.40  | 2.82  | .46   | 4.72  | 2.79  | 16.65  | 11.12 | 16.98  | 6.92   | 7.08   | 6.74  | 83.71   |  |
| 1940     | 3      | 2.88                             | 9.90  | .76   | 5.16  | 2.24  | .39   | 14.61  | 41.49 | 28.05  | 16.79  | 18.26  | 35.74 | 176.27  |  |
| 1941     | 3      | 8.18                             | .73   | 3.16  | 3.60  | .12   | .12   | 2.17   | 24.24 | 52.72  | 7.16   | 13.08  | 1.78  | 117.05  |  |
| 1942     | 3      | 3.92                             | .28   | 3.44  | 5.03  | 1.52  | 8.63  | 4.76   | 7.05  | 15.59  | 21.52  | 21.59  | 11.49 | 104.82  |  |
| 1943     | 3      | 4.00                             | 9.63  | .00   | 2.50  | .01   | 3.36  | 5.79   | 16.88 | 34.04  | 14.20  | 18.14  | 8.07  | 116.63  |  |
| 1944     | 3      | 5.65                             | 5.65  | 5.15  | .00   | .03   | .70   | 7.17   | 20.79 | 38.00  | 31.78  | 18.21  | .92   | 134.05  |  |
| 1945     | 3      | 3.84                             | 2.53  | 3.39  | .27   | .76   | 3.03  | 9.39   | 10.66 | 6.61   | 10.24  | 19.11  | 20.68 | 90.52   |  |
| 1946     | 3      | 8.27                             | 1.52  | 1.81  | .00   | .00   | 7.91  | 3.30   | 8.58  | 7.05   | 29.28  | 12.60  | 4.10  | 84.43   |  |
| 1947     | 3      | 5.17                             | 2.66  | .20   | .63   | 1.34  | 7.77  | 6.29   | 15.83 | 12.23  | 20.21  | 9.67   | 22.50 | 104.49  |  |
| 1948     | 3      | 8.51                             | 1.16  | 2.05  | .43   | .03   | .90   | 9.02   | 8.57  | 12.62  | 15.26  | 16.53  | 11.81 | 86.89   |  |
| 1949     | 3      | 8.44                             | 9.97  | 2.07  | .17   | .00   | .72   | 14.41  | 1.08  | 7.33   | 27.81  | 1.54   | 15.98 | 89.50   |  |
| 1950     | 3      | 2.26                             | 10.98 | 3.87  | 5.26  | .08   | .03   | 23.85+ | 9.51  | 30.51  | 13.94  | 10.29  | 9.31  | 119.91  |  |
| 1951     | 3      | 5.97                             | 10.08 | .08   | .42   | 2.47  | 2.42  | 4.02   | 21.98 | 8.07   | 14.19  | 26.21  | 18.74 | 114.66  |  |
| 1952     | 3      | 6.74                             | 11.82 | 1.89  | .72   | .53   | 1.20  | 28.00  | 27.94 | 7.43   | 19.01  | 15.36  | 1.45  | 122.09  |  |
| 1953     | 3      | 2.47                             | 5.14  | 2.63  | 1.25  | 1.54  | 3.87  | 14.23  | 38.89 | 12.77  | 33.76  | 21.48  | 7.00  | 145.03  |  |
| 1954     | 3      | 9.11                             | 1.32  | 5.99  | .05   | 9.44  | 1.19  | 4.16   | 3.04  | 17.85  | 25.05  | 37.05  | 3.34  | 117.60  |  |
| 1955     | 3      | 11.30                            | 7.73  | 1.56  | .55   | 1.41  | 2.44  | 4.09   | 15.64 | 23.83  | 17.03  | 19.89  | 3.89  | 109.38  |  |
| 1956     | 3      | 3.85                             | .56   | 3.66  | 1.05  | 16.44 | 4.27  | 4.09   | 27.66 | 24.19  | 32.29  | 16.11  | 6.31  | 140.49  |  |
| 1957     | 3      | 13.84                            | 1.05  | .00   | 1.20  | 7.95  | 1.65  | 4.15   | 16.95 | 9.80   | 2.08   | 11.12  | 4.50  | 74.30   |  |
| 1958     | 3      | 8.05                             | 7.20  | .00   | 1.43  | 2.96  | 2.45  | 15.30  | 45.46 | 3.17   | 2.03   | 12.25  | 4.04  | 104.34  |  |
| 1959     | 3      | 9.18                             | .17   | 2.51  | .33   | 1.15+ | 4.38  | 6.90   | 15.48 | 22.63  | 4.21   | 3.28   | 5.34  | 75.56   |  |
| 1960     | 3      | 3.45                             | .65   | 3.42  | 3.81  | 1.65  | 1.85  | 3.84   | 9.50  | 19.17  | 7.06   | 13.95  | 16.86 | 85.21   |  |
| 1961     | 3      | 3.04                             | .00   | 1.93  | 2.95  | 4.94  | 3.26  | 8.54   | 3.37  | 45.48  | 11.40  | 25.52  | 4.01  | 114.44  |  |
| 1962     | 3      | 17.98                            | 1.76  | .27   | 3.41  | .49   | .65   | .88    | 4.20  | 9.43   | 17.51  | 22.44  | 5.83  | 84.85   |  |
| 1963     | 3      | 1.61                             | 4.28  | 3.13  | .01   | 14.80 | .83   | 3.60   | 5.97  | 21.13  | 11.74  | 14.73  | 4.38  | 86.19   |  |
| 1964     | 3      | 4.89                             | 8.64  | .82   | 2.02  | 5.28  | 12.34 | 6.57   | 11.95 | 7.60   | 7.72   | 8.53   | 4.20  | 80.55   |  |
| 1965     | 3      | 5.56                             | 1.52  | 4.95  | .21   | .55   | 9.18  | 5.12   | 5.34  | 21.03  | 21.76  | 8.77   | 9.58  | 93.57   |  |
| 1966     | 3      | .56                              | .81   | 1.10  | .97   | .03   | 1.70  | 10.44  | 9.80  | 29.29  | 6.87   | 8.07   | 6.03  | 75.68   |  |
| 1967     | 3      | 6.30                             | 7.31  | .20   | 2.43  | .39   | 1.41  | 9.10   | 24.04 | 14.57  | 22.64  | 12.58  | 1.57  | 102.54  |  |
| 1968     | 3      | 17.34                            | 2.33  | 3.09  | 3.47  | .54   | .99   | 11.57  | 2.02  | 10.39  | 6.06   | 12.93  | 13.26 | 83.99   |  |
| 1969     | 3      | 5.93                             | .44   | .50   | .34   | 2.32  | .26   | 1.02   | 17.68 | 23.80  | 15.27  | 16.27  | 6.01  | 89.84   |  |
| 1970     | 4      | 2.72+                            | 2.73+ | 2.70+ | .48   | .14   | 3.76  | .45    | 6.77  | 7.82   | 16.22  | 16.11  | .92   | 60.83   |  |
| 1971     | 4      | 2.76                             | .85   | 1.79  | 4.52  | 1.82  | 1.93  | 7.20   | 15.85 | 6.87   | 6.69   | 6.84   | 6.70  | 63.82   |  |
| 1972     | 4      | 2.40                             | .00   | 5.19  | .14   | .08   | 4.79  | .92    | 4.88  | 1.44   | 44.11  | 11.49  | 8.81  | 84.25   |  |
| 1973     | 4      | 5.20                             | 1.06  | 5.89  | .42   | .59   | .71   | .08    | 10.92 | 26.91  | 10.98  | 60.76  | 6.77  | 130.30  |  |
| 1974     | 4      | 9.22                             | 4.47  | 2.05  | 2.02  | 2.16  | 1.07  | 14.45  | 31.31 | 6.78   | 16.91  | 13.24  | 3.77  | 107.45  |  |
| 1975     | 4      | 8.88                             | 2.51  | .29   | .25   | 1.53  | 4.93  | 7.17   | 5.63  | 37.24  | 15.96  | 4.77   | 5.74  | 94.91   |  |
| 1976     | 4      | 1.97                             | 23.10 | 8.26  | 5.44  | 3.74  | 1.13  | 16.23  | 34.60 | 33.50  | 29.03  | 31.85  | 4.88  | 193.75  |  |
| 1977     | 3      | 3.05                             | 1.38  | 6.49  | 2.11  | 2.59  | 6.34  | 8.24   | 7.82  | .95    | 1.23   | 21.61  | 9.46  | 71.28   |  |
| 1978     | 2      | 2.32                             | .84   | 4.48  | 2.23  | 7.67  | .71   | 1.04   | 19.17 | 21.53  | 8.46   | 14.51  | 9.90  | 92.88   |  |
| 1979     | 2      | 11.71                            | 1.63  | .07   | 4.77  | 2.00  | .00   | 6.79   | 15.90 | 11.91  | 8.37   | 14.61  | 3.38  | 81.13   |  |
| 1980     | 2      | 3.89                             | 16.39 | 5.57  | 12.94 | .58   | 3.37  | 3.62   | 2.74  | 8.31   | 27.47  | 16.27  | 24.35 | 125.51  |  |
| 1981     | 2      | 2.40                             | 1.66  | 2.25  | 2.82  | .31   | 2.04  | 12.10  | 9.57  | 13.13  | 11.29  | 8.90   | 2.36  | 68.83   |  |
| 1982     | 2      | 8.45                             | 2.92  | 5.32  | .72   | 4.93  | 6.66  | 3.63   | 25.26 | 28.42  | 27.01  | 4.98   | 9.54  | 127.84  |  |
| 1983     | 2      | .89                              | 2.74  | 1.80  | .77   | .21   | 10.01 | 4.85   | 37.13 | 11.67  | 15.09  | 10.49  | 20.54 | 116.17  |  |
| 1984     | 1      | 10.71                            | .07   | 10.77 | 5.44  | 5.30  | 11.33 | 11.29  | 7.53  | 22.41  | 21.52  | 13.83  | 7.92  | 128.13  |  |
| 1985     | 1      | 1.85                             | 1.18  | 1.48  | 2.82  | 1.98  | 7.20  | 10.48  | 8.36  | 22.82  | 18.52  | 18.84  | 7.73  | 103.24  |  |
| 1986     | 1      | .81                              | 2.29  | 1.51  | 9.33  | 2.40  | 4.09  | 7.36   | 14.89 | 14.04  | 16.69  | 16.78  | 11.62 | 101.80  |  |
| 1987     | 1      | 3.56                             | 1.53  | 7.85  | .00   | .00   | 2.10  | 13.06  | 10.15 | 12.78  | 14.15  | 16.61  | 9.85  | 91.64   |  |
| 1988     | 1      | 2.95                             | 1.79  | 3.14  | 1.23  | 5.24  | 13.23 | 8.84   | 12.85 | 13.54  | 20.13  | 18.46  | 14.41 | 115.82  |  |
| 1989     | 1      | 5.67                             | 8.97  | .52   | 2.69  | 6.35  | .00   | 23.55  | 14.50 | 21.31  | 25.24  | 8.51   | 4.22  | 121.54  |  |
| 1990     | 1      | .25                              | 4.32  | 7.79  | 1.31  | 2.36  | .56   | 3.67   | 15.52 | 24.61  | 52.43  | 8.13   | 14.05 | 135.02  |  |
| 1991     | 1      | 6.20                             | 1.95  | 2.14  | .10   | 4.61  | 5.44  | 6.17   | 14.88 | 36.16  | 14.75  | 11.23  | 9.51  | 113.13  |  |
| 1992     | 1      | 16.53                            | 1.99  | .41   | 1.40  | 3.79  | .85   | 23.20  | 22.20 | 15.13  | 23.33  | 10.49  | 3.42  | 122.73  |  |
| 1993     | 1      | .60                              | .92   | 2.84  | 1.96  | .59   | 1.21  | 9.94   | 5.32  | 35.50  | 5.72   | 4.85   | 11.11 | 80.56   |  |
| 1994     | 1      | 4.24                             | 1.38  | 2.03  | 1.11  | 1.13  | 1.56  | 3.41   | 10.65 | 20.21  | 20.30  | 14.71  | 1.85  | 82.57   |  |
| 1995     | 1      | 10.90                            | .93   | 17.59 | 1.31  | 5.76  | 3.41  | 4.68   | 9.82  | 23.97  | 11.63  | 15.36  | 16.27 | 121.63  |  |
| 1996     | 1      | 7.77                             | 8.87  | 9.39  | 1.74  | .09   | .33   | 4.69   | 9.98  | 29.14  | 7.82   | 13.35+ | 1.57  | 94.74   |  |
| 1997     | 1      | 1.68                             | 9.22  | 7.14  | .79   | .00   | 2.03  | 6.27   | 21.25 | 12.38  | 14.47  | 7.40   | 6.18+ | 88.81   |  |
| 1998     | 1      | 4.52                             | 8.75  | 7.11  | .46   | .00   | .46   | 10.82  | 11.30 | 17.22+ | 14.81+ | 13.20+ | 8.46+ | 97.13   |  |
| average  |        | 5.51                             | 4.11  | 3.07  | 2.07  | 2.64  | 3.06  | 7.61   | 14.18 | 19.19  | 15.93  | 14.37  | 8.44  | 100.18  |  |
| adjusted |        | 5.50                             | 4.10  | 3.07  | 2.06  | 2.63  | 3.05  | 7.59   | 14.16 | 19.16  | 15.90  | 14.34  | 8.43  | 100.001 |  |

## Average Rainfall On Catchment rawson.ra

## details of rainfall stations used

022504\_x.pat 1932 to 1994

22264p.pat 1959 to 1975

022521\_9.pat 1920 to 1976

022792.pat 1936 to 1979

022803.pat 1925 to 1998

|          |        | rainfall input as percent m.a.p. |        |       |       |        |       |       |        |        |        |        |        | year    |
|----------|--------|----------------------------------|--------|-------|-------|--------|-------|-------|--------|--------|--------|--------|--------|---------|
| no.      | gauges | oct                              | nov    | dec   | jan   | feb    | mar   | apr   | may    | jun    | jul    | aug    | sep    |         |
| 1920     | 1      | 2.94+                            | 2.94+  | 2.94+ | 2.56  | 5.52   | .00   | 4.67  | .00    | 110.93 | 16.16  | 13.18  | .64    | 162.49  |
| 1921     | 1      | 3.26+                            | 1.49   | .00   | .00   | .00    | 5.27+ | 2.78  | 10.34+ | 29.82  | 9.57   | 19.72  | 2.12   | 84.37   |
| 1922     | 1      | 1.27                             | .00    | .00   | .00   | .00    | .00   | .64   | 13.82  | 26.14  | 8.15   | .00    | 7.23   | 57.24   |
| 1923     | 1      | 4.17+                            | 12.85+ | 3.03+ | .00   | .00    | 1.07  | .85   | .00    | 19.14  | 6.17   | 18.07  | 3.18   | 68.51   |
| 1924     | 1      | 3.40                             | 4.05   | .00   | .00   | .00    | .00   | .00   | 3.40   | 64.38  | 16.79  | .00    | .00    | 92.02   |
| 1925     | 2      | 7.32+                            | 3.27+  | 1.72+ | .00   | 3.74   | .00   | .31   | 11.43  | 1.72   | 16.34  | 8.55   | 2.35   | 56.76   |
| 1926     | 2      | 18.33                            | 4.02   | .00   | .00   | 1.62   | .00   | 8.72  | 7.66   | 17.14  | 2.85   | 21.26  | 2.12   | 83.72   |
| 1927     | 2      | .00                              | 7.97   | 1.72+ | 2.23  | .00    | 3.63  | .00   | .00    | 26.51  | 11.34+ | 7.85+  | 11.00+ | 72.26   |
| 1928     | 2      | .00+                             | 6.05+  | 1.56  | .00   | .00    | 7.89  | 15.80 | 7.11   | 14.08  | 21.21  | 15.68  | .00    | 89.38   |
| 1929     | 2      | .31                              | .00+   | 3.48+ | 6.17+ | 11.65+ | 1.64+ | .00+  | 3.13+  | 2.89+  | 3.25+  | 15.41+ | 14.73+ | 62.66   |
| 1930     | 2      | 2.78+                            | 3.26+  | .45+  | .00   | .88    | .37   | 17.36 | 13.63  | 2.06   | 14.66  | 21.91  | 11.94  | 89.31   |
| 1931     | 2      | 14.64                            | .51    | 2.93  | 1.64  | 14.73  | .54   | .74   | 12.15  | 12.68  | 16.05  | 6.52   | 12.44  | 95.54   |
| 1932     | 3      | 2.46                             | .74    | 3.13  | 1.03  | 1.26   | 2.86  | 2.46  | 12.44  | 32.19  | 26.38  | 13.37  | 4.57   | 102.90  |
| 1933     | 3      | 3.51                             | 2.16   | 4.18  | 1.95  | 4.60   | 1.64  | .13   | 9.64+  | 14.25+ | 9.71+  | 15.85+ | 14.11  | 81.71   |
| 1934     | 3      | 12.92                            | 3.38   | .00   | .35   | 1.40   | 1.72  | 11.54 | 16.80  | 13.33  | 11.44  | 9.63   | 7.93   | 90.42   |
| 1935     | 3      | .46                              | 8.43   | .44   | 4.33  | .13    | .58   | 2.27  | 11.53  | 7.59   | 19.20  | 16.00  | 8.58   | 79.54   |
| 1936     | 4      | 1.89                             | 13.54  | 12.91 | .05   | .83    | 6.32  | 8.28  | 13.33  | 20.43  | 18.34  | 2.33   | 4.49   | 102.74  |
| 1937     | 4      | .52                              | 1.75   | 1.14  | 4.75  | .55    | 1.55  | 8.03  | 12.01  | 7.74   | 6.27   | 10.02  | 8.42   | 62.76   |
| 1938     | 4      | 2.09                             | 2.95   | 2.58  | 3.38  | 8.78   | 3.46  | 6.88  | 14.57  | 4.05   | 7.97   | 18.22  | 7.05   | 81.97   |
| 1939     | 4      | 1.89+                            | 3.22   | 2.23  | .10   | 4.97   | .72   | 12.13 | 8.64   | 15.49  | 7.13+  | 3.33+  | 2.71   | 62.55   |
| 1940     | 4      | 1.43                             | 11.70  | .11   | 4.51  | 1.58   | .00+  | 12.96 | 35.61  | 32.40  | 15.16  | 12.25  | 25.75  | 153.45  |
| 1941     | 4      | 7.85                             | 2.90   | 1.72  | 3.57  | .28    | .00   | 1.01  | 17.65  | 39.14  | 2.92   | 9.19   | 1.07   | 87.29   |
| 1942     | 4      | 3.97                             | .20    | 6.28  | 6.61  | .17    | 9.35  | 5.29  | 2.24   | 16.40  | 16.71  | 15.50  | 11.09  | 93.81   |
| 1943     | 4      | 2.46                             | 8.25   | .95+  | .51   | .37    | 2.46  | 2.22  | 9.62   | 22.22  | 7.99   | 15.22+ | 10.06+ | 82.32   |
| 1944     | 4      | 8.28+                            | 3.77+  | 1.75+ | .00+  | .00+   | .24+  | 7.72  | 25.31  | 31.30  | 33.61  | 20.95  | 3.09   | 136.03  |
| 1945     | 4      | 10.18                            | 2.24   | 1.17  | .00   | .80    | 2.87  | 3.37  | 5.28   | 5.18   | 8.65   | 12.69  | 22.03  | 74.44   |
| 1946     | 4      | 4.37                             | .00    | .78   | .00   | .00    | 10.74 | 1.87  | 8.65   | 6.41   | 26.17  | 9.13   | 2.33   | 70.44   |
| 1947     | 4      | 3.88                             | 2.50   | 1.61  | 1.59  | 1.31   | 14.87 | 3.11  | 12.64  | 10.48  | 15.65  | 2.85   | 24.88  | 95.37   |
| 1948     | 4      | 13.27                            | .21    | .56   | .03   | .00    | .62   | 9.15  | 8.12   | 10.83  | 13.60  | 14.53  | 11.98  | 82.91   |
| 1949     | 4      | 8.12                             | 15.85  | .48   | .37   | .08    | .25   | 12.36 | 2.11   | 3.38   | 30.77  | .65    | 18.64  | 93.06   |
| 1950     | 4      | 8.43                             | 12.30  | 2.98  | 11.24 | .00    | .48   | 15.43 | 4.55   | 27.85  | 14.71  | 5.35   | 12.57  | 115.90  |
| 1951     | 4      | 5.54                             | 7.36   | .09   | .20   | 3.27   | .64   | 2.57  | 22.10  | 11.55  | 18.55  | 23.53  | 18.47  | 113.88  |
| 1952     | 4      | 3.98                             | 19.87  | 2.62  | .08   | 1.82   | .08   | 29.42 | 17.64  | 4.39   | 19.29  | 8.31   | 1.29   | 108.77  |
| 1953     | 4      | 6.60                             | 7.06   | 2.11  | .34   | 1.41   | 6.38  | 6.03  | 37.30  | 17.64  | 36.14  | 22.31  | 5.97   | 149.30  |
| 1954     | 4      | 5.68                             | 1.42   | 3.28  | .00   | 26.87  | .16   | 4.62  | 3.33   | 19.23  | 25.77  | 38.84  | 2.38   | 131.59  |
| 1955     | 4      | 10.69                            | 7.99   | 1.08  | 2.52  | 2.52   | 1.00  | .83   | 17.97  | 26.95  | 13.18  | 15.57  | 4.60   | 104.89  |
| 1956     | 4      | 5.41                             | .00    | 5.81  | .06   | 13.33  | 7.38  | 3.25  | 31.20  | 36.36  | 27.67  | 21.15  | 6.40   | 158.02  |
| 1957     | 4      | 11.59                            | .19    | .00   | .10   | 4.90   | 5.27  | 6.04  | 19.96  | 10.95  | .88    | 21.46  | 3.02   | 84.36   |
| 1958     | 4      | 11.13                            | 6.30   | .47   | 3.11  | 5.70   | 2.31  | 17.80 | 39.66  | 2.49   | 5.83   | 16.31  | 4.35   | 115.47  |
| 1959     | 5      | 14.81                            | .26    | 2.08  | 1.69  | .32    | 2.90  | 3.35  | 12.72  | 21.56  | 5.96   | 1.85   | 6.34   | 73.83   |
| 1960     | 5      | 2.79                             | .68    | 3.99  | 5.26  | 1.30   | 3.67  | 5.13  | 8.26   | 10.84  | 9.58   | 11.92  | 18.95  | 82.38   |
| 1961     | 5      | 3.12                             | .02    | 1.07  | 4.66  | 3.68   | 3.64  | 9.76  | 4.37   | 44.17  | 12.32  | 37.59  | 3.35   | 127.76  |
| 1962     | 5      | 25.37                            | 5.71   | .42   | 3.80  | 1.03   | .57   | 1.71  | 9.38   | 9.76   | 19.74  | 24.05  | 2.76   | 104.29  |
| 1963     | 5      | 3.48                             | 3.02   | 4.46  | .26   | 7.93   | 1.41  | 5.41  | 8.32   | 26.05  | 10.41  | 15.91  | 6.07   | 92.73   |
| 1964     | 5      | 4.97                             | 13.86  | .06   | 2.34  | 5.46   | 12.46 | 6.08  | 12.77  | 7.41   | 8.86   | 7.64   | 3.67   | 85.58   |
| 1965     | 5      | 5.65                             | 3.56   | 6.45  | .44   | .44    | 8.58  | 4.66  | 4.34   | 19.50  | 13.17  | 15.08  | 7.84   | 89.70   |
| 1966     | 5      | .51                              | .37    | .68   | .65   | .25    | .83   | 16.30 | 10.21  | 25.06  | 8.36   | 7.73   | 3.49   | 74.44   |
| 1967     | 5      | 5.41                             | 7.36   | 2.21  | 2.28  | .92    | 1.07  | 8.52  | 18.19  | 23.31  | 18.29  | 15.75  | 1.65   | 104.96  |
| 1968     | 5      | 15.76                            | 4.10   | 1.15  | 1.41  | 1.86   | .89   | 10.87 | .97    | 10.13  | 6.53   | 10.08  | 14.34  | 78.10   |
| 1969     | 5      | 14.02                            | .65    | .05   | .36   | 5.97   | .12   | .17   | 11.06  | 17.76  | 19.05  | 17.06  | 5.70   | 91.97   |
| 1970     | 5      | 6.32                             | 1.86   | 3.36  | .37   | .21    | 6.10  | 2.74  | 9.54   | 8.74   | 22.09  | 18.37  | .90    | 80.61   |
| 1971     | 5      | 1.19                             | .96    | 2.29  | 4.39  | 1.77   | 1.53  | 11.59 | 16.11  | 8.77   | 7.69   | 7.50   | 9.20   | 72.99   |
| 1972     | 5      | 2.02                             | .09    | 2.88  | .42   | 1.10   | 1.65  | 1.48  | 3.41   | 4.08   | 29.06  | 11.07  | 9.03   | 66.29   |
| 1973     | 5      | 2.66                             | .78    | 4.03  | .62   | 3.80   | 2.02  | .23   | 13.57  | 20.72  | 10.66  | 68.08  | 7.64   | 134.80  |
| 1974     | 5      | 12.40                            | 3.88   | 1.05  | 1.92  | 1.34   | .93   | 8.65  | 31.17  | 9.31   | 16.48  | 16.12  | 3.37   | 106.62  |
| 1975     | 5      | 7.57                             | 2.10   | .05   | .20   | 3.37   | 9.98  | 7.75  | 6.55   | 37.44  | 16.67  | 8.41   | 4.91   | 105.01  |
| 1976     | 4      | 5.82                             | 19.94  | 9.63  | 3.61  | 6.46   | .48   | 19.48 | 43.95  | 27.01  | 29.05  | 35.22  | 4.08   | 204.74  |
| 1977     | 3      | 1.12                             | 6.11   | 9.57  | 1.72+ | .89    | 6.93  | 6.34  | 2.70   | 3.07   | 4.66   | 27.73  | 7.44+  | 78.28   |
| 1978     | 3      | 4.37                             | 1.27   | 9.43+ | 3.16+ | 12.76  | .00   | 1.59  | 11.69  | 19.82  | 14.42  | 12.30+ | 11.61+ | 102.42  |
| 1979     | 3      | 5.48+                            | .55    | .25   | 4.49  | .61    | .50   | 6.74  | 13.60  | 14.60  | 6.80+  | 14.06  | 6.03   | 73.72   |
| 1980     | 2      | 5.12                             | 16.98+ | 7.62  | 50.58 | 6.61   | 6.30  | 10.51 | 2.56   | 4.86   | 25.06  | 19.72  | 18.40  | 174.31  |
| 1981     | 2      | 7.67+                            | 2.42   | 1.50  | 1.96  | .17    | 1.54  | 36.78 | 3.68   | 13.23  | 10.71  | 7.81   | 2.38   | 89.85   |
| 1982     | 2      | 5.36+                            | 2.28   | 2.25  | .68   | 6.85   | 6.39  | 4.56  | 29.20  | 25.26  | 25.47+ | 5.30   | 20.11  | 133.70  |
| 1983     | 2      | 1.28                             | .21    | .24   | 2.36  | .50    | 10.66 | 7.71  | 40.23  | 6.43   | 11.76  | 5.03   | 23.81  | 110.23  |
| 1984     | 2      | 18.01                            | .37    | 9.12  | 9.33  | 7.83   | 15.99 | 7.48  | 5.66   | 16.70+ | 31.49  | 16.13  | 7.39   | 145.52  |
| 1985     | 2      | 11.71                            | 2.01   | 6.29  | .20   | 3.57   | 9.03  | 6.88  | 2.92   | 22.21+ | 13.85  | 30.33  | 8.66   | 117.66  |
| 1986     | 2      | 6.04                             | 4.55   | .25   | .44   | 1.03   | .48   | 10.81 | 19.27  | 17.27+ | 9.49   | 21.20  | 8.36   | 99.18   |
| 1987     | 2      | .60                              | .11    | 2.84  | .05   | .00    | 2.81  | 7.63  | 6.48   | 14.67  | 5.82   | 19.54  | 5.87   | 66.41   |
| 1988     | 2      | 2.67                             | 1.01   | .86   | .21   | 1.32   | 17.38 | 21.78 | 7.21   | 20.32  | 15.64  | 18.15  | 15.02  | 121.56  |
| 1989     | 2      | 10.13                            | 2.69   | .07   | 1.37  | 5.95   | 2.90  | 17.66 | 14.57  | 22.52  | 16.93  | 8.48   | 1.09   | 104.35  |
| 1990     | 2      | 2.21                             | 4.00   | 3.85  | 3.23  | .17    | 5.12  | 6.13  | 14.36  | 22.90  | 34.01  | 4.94   | 14.43  | 115.35  |
| 1991     | 2      | 7.89                             | .99    | .52   | .14   | 3.57   | 3.17  | 13.98 | 9.80   | 27.01  | 18.83  | 12.72  | 4.45   | 103.06  |
| 1992     | 2      | 17.45                            | 1.06   | .03   | .90   | 5.92   | .14   | 58.96 | 11.44  | 14.48  | 42.76  | 8.26   | 3.37   | 164.76  |
| 1993     | 2      | .00                              | .78    | 6.05  | .42   | .44    | 3.54  | 12.62 | 9.95   | 44.50  | 12.20  | 5.20   | 11.42  | 107.12  |
| 1994     | 2      | 4.31                             | .19    | 9.67  | 11.35 | 1.76   | 6.03  | 2.17  | 20.23  | 13.71  | 13.84  | 16.61  | 3.85   | 103.72  |
| 1995     | 1      | 14.74                            | 6.55   | 40.95 | 1.56  | 4.30   | 5.73  | 1.88  | 11.47  | 32.15  | 24.16  | 13.51  | 10.03  | 167.05  |
| 1996     | 1      | 15.97                            | 14.13  | 5.94  | .00   | .00    | 2.05  | 10.24 | 28.26  | 28.67  | 6.96   | 9.62   | .00    | 121.84  |
| 1997     | 1      | 3.48                             | 14.33  | .00   | 17.20 | .00    | 5.53  | 8.81  | 32.03  | 3.07   | 6.55   | 3.07   | .00    | 94.07   |
| 1998     | 1      | .00                              | 4.42+  | 15.56 | .00   | .00    | .00   | 5.53  | 11.88  | 14.87+ | 14.01+ | 14.87+ | 6.88+  | 88.01   |
| average  |        | 6.28                             | 4.42   | 3.25  | 2.65  | 2.99   | 3.49  | 8.09  | 13.12  | 19.13  | 15.34  | 14.52  | 7.84   | 101.13  |
| adjusted |        | 6.21                             | 4.37   | 3.22  | 2.62  | 2.96   | 3.45  | 8.00  | 12.98  | 18.92  | 15.17  | 14.35  | 7.75   | 100.001 |

## Average Rainfall On Catchment ouplaas.r

## details of rainfall stations used

022038\_8.pat 1920 to 1998

22284a.pat 1970 to 1983

022113\_2.pat 1920 to 1998

022504\_x.pat 1932 to 1994

|          |        | rainfall input as percent m.a.p. |        |        |       |       |       |        |        |        |        |        |        |         |  |
|----------|--------|----------------------------------|--------|--------|-------|-------|-------|--------|--------|--------|--------|--------|--------|---------|--|
| no.      | gauges | oct                              | nov    | dec    | jan   | feb   | mar   | apr    | may    | jun    | jul    | aug    | sep    | year    |  |
| 1920     | 2      | 6.01                             | 3.18   | 3.94   | 4.51  | 5.30  | 2.44  | 7.42   | 1.37   | 42.22  | 16.84  | 13.77  | 6.30   | 113.29  |  |
| 1921     | 2      | 3.58                             | 2.58   | 6.02   | 9.16  | 2.43  | 6.68  | 5.70   | 10.29  | 24.15  | 7.39   | 17.23  | 5.26   | 100.48  |  |
| 1922     | 2      | 2.73                             | 3.09   | 1.17   | 2.66  | .20   | 1.34  | 10.90  | 27.47  | 27.21  | 14.67  | 12.42  | 9.25   | 113.10  |  |
| 1923     | 2      | 5.15                             | 16.62  | 2.39   | 2.32  | .18   | 3.69  | 3.01   | 10.22  | 19.85  | 8.11   | 16.20  | 8.64   | 96.40   |  |
| 1924     | 2      | 8.65                             | 9.65   | .24    | 4.10  | .53   | .42   | 2.51   | 10.23  | 41.31  | 20.70  | 8.01   | 3.48   | 109.84  |  |
| 1925     | 2      | 10.11                            | 6.75+  | 1.93   | 1.07  | 4.87  | .23   | 2.99   | 20.04  | 6.43   | 15.68  | 11.07  | 5.20   | 86.38   |  |
| 1926     | 2      | 17.49                            | 2.62   | .00    | .79   | 6.71  | .21   | 7.54   | 12.16  | 10.57  | 9.53   | 16.42  | 4.91   | 88.95   |  |
| 1927     | 2      | .72                              | 9.49   | 4.12   | 3.57  | .00   | 4.50  | 2.95   | .59    | 27.81  | 10.74  | 10.40  | 11.70  | 86.58   |  |
| 1928     | 2      | 2.12                             | 2.15   | 3.28   | .00   | .68   | 2.00  | 10.15  | 17.80  | 10.59  | 18.09  | 10.82  | 4.35   | 82.04   |  |
| 1929     | 2      | 2.99                             | 2.81   | 4.75   | 3.12  | 3.30  | 4.93  | 4.42   | .33    | 2.08   | 13.36  | 13.17  | 21.57  | 76.84   |  |
| 1930     | 2      | 5.06                             | 6.25   | 1.97   | .00   | 4.18  | .38+  | 12.24  | 9.62   | 5.18   | 8.31   | 16.61  | 12.29  | 82.07   |  |
| 1931     | 2      | 9.72                             | .24    | 2.07   | 2.91  | 11.92 | 2.06  | 1.63   | 19.34  | 14.31  | 10.08  | 9.46   | 8.94   | 92.68   |  |
| 1932     | 3      | 3.18                             | 1.26   | 2.70   | 1.70  | 1.92  | 1.33  | 1.81   | 12.35  | 28.75  | 19.91  | 11.60  | 3.91   | 90.40   |  |
| 1933     | 3      | 6.60                             | 1.09   | 2.83   | .44   | 2.98  | 4.55  | 1.16   | 14.57  | 10.17+ | 8.60   | 8.03   | 10.69  | 71.73   |  |
| 1934     | 3      | 8.55                             | 5.98+  | .57    | .80   | 2.73  | 3.93  | 10.31  | 14.59  | 9.33   | 13.49  | 9.82   | 8.86   | 88.94   |  |
| 1935     | 3      | 1.54                             | 6.82   | 1.00   | 6.87  | 1.51  | 2.60  | .79    | 10.35  | 7.42   | 12.97  | 14.59  | 9.04   | 75.52   |  |
| 1936     | 3      | 2.23                             | 4.79   | 9.84   | 1.55  | .22   | 7.97  | 9.28   | 14.74  | 28.94  | 20.49  | 5.26   | 4.77   | 110.07  |  |
| 1937     | 3      | 3.16                             | 2.92   | .27    | 5.04  | 1.73  | 1.44  | 12.49  | 13.64  | 7.19   | 9.93   | 9.34   | 13.55  | 80.70   |  |
| 1938     | 3      | 3.20                             | 5.00   | 1.31   | .41*  | 6.91  | 2.27+ | 7.75   | 18.25  | 5.09   | 6.77   | 14.42+ | 6.48   | 77.84   |  |
| 1939     | 3      | 1.49                             | 5.13   | 4.32+  | .36   | 7.58  | 3.67  | 12.32  | 11.22  | 17.95  | 9.62   | 6.01   | 9.01   | 88.69   |  |
| 1940     | 3      | 4.42                             | 10.41  | 1.44   | 8.00  | 1.63  | 1.02  | 20.48  | 27.82  | 23.39  | 16.29  | 15.55  | 27.07  | 157.51  |  |
| 1941     | 3      | 8.02                             | 1.39   | 4.43   | 1.11  | .24   | .33   | 2.44   | 20.89  | 38.69  | 7.17   | 17.67  | 2.47   | 104.84  |  |
| 1942     | 3      | 4.82+                            | .28    | .77    | 5.40  | 1.72  | 6.65  | 3.76   | 3.38   | 15.26  | 13.53  | 18.52  | 8.27   | 82.36   |  |
| 1943     | 3      | 4.75                             | 6.90   | .58    | 1.55  | .50   | 2.30  | 4.83   | 16.51  | 31.46  | 13.04  | 16.06  | 9.87   | 108.36  |  |
| 1944     | 3      | 6.77                             | 5.07   | 5.20   | .00   | .03   | .46   | 7.90   | 23.83  | 32.61  | 31.01  | 16.43  | 1.20   | 130.52  |  |
| 1945     | 3      | 5.27                             | 3.35   | 1.63   | .58   | 1.29  | 3.87  | 6.20   | 10.86  | 5.61   | 10.12  | 11.38  | 17.25  | 77.41   |  |
| 1946     | 3      | 9.52                             | 1.99   | 1.07   | .00   | .00   | 8.51  | 3.15   | 11.97  | 6.72   | 25.04  | 11.54  | 2.45   | 81.95   |  |
| 1947     | 3      | 7.13                             | 2.76   | .36+   | .39   | 1.10  | 4.51  | 3.03   | 13.61  | 9.10   | 15.46  | 6.90   | 18.20  | 82.55   |  |
| 1948     | 3      | 10.10                            | 1.06   | 2.20   | .60   | .03   | .69   | 8.34   | 7.62   | 10.16  | 13.05  | 13.26  | 10.70  | 77.80   |  |
| 1949     | 3      | 7.36                             | 7.47   | 1.03   | .22   | .00   | .63   | 14.60  | 1.64   | 6.67   | 30.69  | 1.98   | 17.71  | 90.01   |  |
| 1950     | 3      | 3.64                             | 9.98   | 3.38   | 4.72  | .17   | .43   | 18.95  | 7.08   | 29.48  | 11.87  | 7.15   | 10.64* | 107.50  |  |
| 1951     | 3      | 3.59                             | 8.57+  | .00    | .03   | 1.08+ | 2.83+ | 6.27   | 15.52  | 9.80   | 13.99  | 24.84  | 19.27* | 105.80  |  |
| 1952     | 3      | 3.97                             | 14.95  | .46    | .50   | .40   | 1.89  | 24.78  | 20.28  | 7.15   | 18.56  | 14.10  | 1.00   | 108.05  |  |
| 1953     | 3      | 4.64                             | 7.00+  | 1.60   | 1.17  | 1.93  | 4.30  | 10.48  | 30.07  | 15.24  | 33.85  | 19.65  | 4.08   | 134.02  |  |
| 1954     | 3      | 6.80                             | 1.92   | 5.10   | .05   | 15.38 | 1.36  | 5.38   | 4.11   | 15.73  | 22.61  | 31.98  | 4.03   | 114.46  |  |
| 1955     | 3      | 11.99                            | 8.25   | 1.90   | 1.28  | 1.08  | 2.91  | 6.05   | 15.31  | 25.17  | 16.35  | 20.29  | 7.23   | 117.82  |  |
| 1956     | 3      | 5.53                             | .38    | 4.78   | .99   | 10.70 | 4.08  | 7.37   | 34.64  | 25.65  | 24.72  | 16.33  | 7.37   | 142.54  |  |
| 1957     | 3      | 16.70                            | .75    | .00    | 1.29  | 7.31  | 3.78  | 4.63   | 19.74  | 10.87  | 2.19   | 12.37  | 4.34   | 83.95   |  |
| 1958     | 3      | 6.81                             | 6.17   | .11    | 3.04  | 1.97  | 2.66  | 17.86  | 37.97  | 2.92   | 4.22   | 13.95  | 4.69   | 102.37  |  |
| 1959     | 3      | 9.78                             | .21    | 1.95   | 2.02  | .92   | 4.98  | 5.01   | 12.16  | 21.72  | 4.17   | 3.68   | 4.97   | 71.56   |  |
| 1960     | 3      | 4.91                             | .66    | 2.38   | 4.99  | 1.37  | 1.68  | 5.17   | 9.70   | 16.30  | 10.78  | 14.81  | 17.16  | 89.93   |  |
| 1961     | 3      | 3.92                             | .01    | 1.95   | 1.94  | 4.75  | 4.97  | 11.26  | 4.59   | 41.98  | 12.01  | 27.24  | 5.34   | 119.96  |  |
| 1962     | 3      | 18.64                            | 3.87   | .72    | 4.95  | .48   | .76   | 3.04   | 5.20   | 8.73   | 21.25  | 23.37  | 4.80   | 95.82   |  |
| 1963     | 3      | 2.27                             | 5.28   | 5.49   | .36   | 10.39 | .71   | 4.40   | 9.54   | 21.57  | 14.17  | 13.65  | 6.18   | 94.00   |  |
| 1964     | 3      | 6.04                             | 9.03   | 1.13   | 4.81  | 5.62  | 13.12 | 8.76   | 18.44  | 8.57   | 8.06   | 10.16  | 5.76   | 99.50   |  |
| 1965     | 3      | 5.49                             | 2.41   | 7.20   | .89   | .99   | 12.12 | 4.95   | 6.42   | 16.72  | 19.41  | 10.24  | 7.72   | 94.58   |  |
| 1966     | 3      | .61                              | 2.06   | 1.29   | 1.37  | .13   | 1.32  | 14.55  | 9.47   | 24.15  | 6.54   | 7.38   | 6.29   | 75.16   |  |
| 1967     | 3      | 7.46                             | 6.49   | .25    | 4.03  | 1.70  | .22   | 13.27  | 18.37  | 16.71  | 19.80  | 11.71  | 1.87   | 101.89  |  |
| 1968     | 3      | 15.34                            | 2.83   | 2.50   | 4.57  | 1.83  | 1.49  | 7.68   | 1.74   | 12.24  | 9.19   | 12.16  | 11.73  | 83.29   |  |
| 1969     | 3      | 9.82                             | .62    | .30    | .72   | 3.17  | .29   | .43    | 17.41  | 22.51  | 15.59  | 15.68  | 7.96   | 94.49   |  |
| 1970     | 4      | 5.01                             | 2.38   | 2.78   | .38   | .14   | 3.74  | 1.24   | 7.13   | 8.70   | 17.67  | 16.09  | 1.79   | 67.07   |  |
| 1971     | 4      | 1.77                             | .80    | 2.82   | 3.76  | 2.07  | 1.96  | 10.86+ | 15.50  | 9.13   | 7.06   | 7.92   | 5.40   | 69.04   |  |
| 1972     | 4      | 2.82                             | .10    | 4.48   | .29   | .03   | 4.74  | 1.53   | 5.55   | 2.11   | 38.21  | 10.44  | 8.88   | 79.18   |  |
| 1973     | 4      | 3.78                             | 1.54   | 7.05   | .80   | .75   | .83   | .19    | 13.83  | 24.70  | 10.87  | 56.48  | 9.74   | 130.57  |  |
| 1974     | 4      | 10.77                            | 4.53   | 1.52   | 2.51  | 1.60  | .81   | 8.38   | 27.84  | 9.83   | 19.25  | 12.27  | 3.33   | 102.64  |  |
| 1975     | 4      | 7.65                             | 3.38   | .36    | .00   | .83   | 3.86  | 4.37   | 6.23   | 36.56  | 16.48  | 7.35   | 5.90   | 92.99   |  |
| 1976     | 4      | 3.45                             | 18.68* | 8.53   | 4.37  | 5.35  | 1.99  | 15.19  | 32.29  | 30.15  | 32.25  | 28.92  | 7.09   | 188.25  |  |
| 1977     | 4      | 3.20                             | 2.81   | 3.90   | 2.69  | 1.69  | 5.84  | 6.01   | 6.17   | 2.10   | 3.22   | 23.04  | 7.99   | 68.66   |  |
| 1978     | 4      | 5.55                             | .63    | 5.48   | 2.84  | 8.04  | .66   | 2.13   | 17.06  | 20.50  | 9.78   | 13.82  | 12.25  | 98.73   |  |
| 1979     | 4      | 11.64                            | 1.22   | .22    | 4.66  | 3.00  | 1.41  | 7.09   | 15.80  | 14.27  | 7.06   | 14.60  | 4.82   | 85.79   |  |
| 1980     | 4      | 5.68                             | 14.63  | 6.70*  | 14.92 | 1.26  | 4.89  | 5.49   | 2.95   | 8.42   | 26.18  | 15.50  | 20.28  | 126.90  |  |
| 1981     | 4      | 3.86                             | 2.28   | 2.01   | 2.93  | .24   | 1.75  | 13.40  | 8.53   | 12.23  | 13.90  | 8.24   | 3.08   | 72.44   |  |
| 1982     | 4      | 7.30                             | 2.88   | 5.40   | .83   | 6.50  | 6.50  | 3.22   | 24.60  | 26.90  | 23.73  | 6.08   | 13.46  | 127.41  |  |
| 1983     | 4      | 1.59                             | 1.85   | 1.79   | 1.38  | .35   | 8.61  | 6.78   | 37.76  | 9.97   | 15.94  | 8.42   | 21.23  | 115.68  |  |
| 1984     | 3      | 13.69                            | .32    | 11.07+ | 6.39  | 5.77  | 14.53 | 10.55  | 6.27   | 23.17  | 24.68  | 15.42  | 8.97   | 140.82  |  |
| 1985     | 3      | 5.17                             | 1.73   | 2.54   | 1.69  | 2.34  | 9.12  | 7.19   | 6.46   | 23.94  | 16.88  | 25.60  | 6.86   | 109.53  |  |
| 1986     | 3      | 1.88                             | 3.29   | .98    | 6.00  | 2.15  | 2.59  | 7.82   | 19.02  | 18.19  | 14.04  | 19.04  | 11.37  | 106.37  |  |
| 1987     | 3      | 2.71                             | 1.46   | 5.99   | .87+  | .94*  | 3.31+ | 9.68+  | 10.84  | 12.18  | 12.11  | 17.15  | 8.99   | 86.24   |  |
| 1988     | 3      | 3.33                             | 1.62   | 2.25   | .73   | 3.98  | 15.43 | 10.67  | 12.63  | 14.18  | 18.30  | 16.03  | 10.67  | 109.82  |  |
| 1989     | 3      | 7.61                             | 6.19   | .34    | 2.13  | 4.88  | 1.65  | 17.57+ | 13.46+ | 20.65+ | 23.64  | 10.44  | 3.53   | 112.09  |  |
| 1990     | 3      | .78                              | 4.81   | 5.23   | 1.30  | 1.22  | .59   | 4.59   | 15.01  | 25.60+ | 41.39  | 7.73   | 14.45+ | 122.69  |  |
| 1991     | 3      | 7.03                             | 2.00   | 1.18   | .13   | 4.24+ | 4.65+ | 8.16   | 12.15+ | 35.58+ | 15.36  | 12.33+ | 7.79   | 110.61  |  |
| 1992     | 3      | 15.80+                           | 2.09   | .23    | 1.43  | 4.48+ | .61   | 24.92+ | 17.88+ | 15.48+ | 32.19+ | 10.09  | 3.85   | 129.06  |  |
| 1993     | 3      | .51                              | 1.11   | 3.70   | 1.14  | .57+  | .98   | 8.59   | 6.11   | 39.62+ | 8.48+  | 4.90   | 11.97  | 87.68   |  |
| 1994     | 3      | 3.40                             | 1.02   | 3.99+  | 1.70  | 1.14  | 2.96  | 3.16   | 12.05  | 18.99  | 19.98+ | 14.46+ | 3.50+  | 86.36   |  |
| 1995     | 2      | 10.54                            | 1.47   | 16.85  | 1.22  | 5.23  | 3.83  | 4.78   | 9.33   | 24.28  | 12.10  | 17.24  | 16.44  | 123.31  |  |
| 1996     | 2      | 7.41                             | 8.43   | 8.88   | 1.36  | .06   | .97   | 4.76   | 9.70   | 29.53  | 7.11   | 13.87  | 1.33   | 93.40   |  |
| 1997     | 2      | 1.76                             | 8.53   | 6.11   | 2.15  | .00   | 2.23  | 6.08   | 21.10  | 12.50  | 14.76  | 6.99   | 5.67   | 87.88   |  |
| 1998     | 2      | 3.09                             | 8.09   | 6.65   | .23   | .06   | .23   | 9.57   | 11.25  | 17.59  | 14.75  | 13.94  | 7.89   | 93.33   |  |
| average  |        | 6.07                             | 4.31   | 3.10   | 2.33  | 2.69  | 3.33  | 7.68   | 13.79  | 18.06  | 15.66  | 14.04  | 8.54   | 99.58   |  |
| adjusted |        | 6.09                             | 4.33   | 3.11   | 2.34  | 2.70  | 3.34  | 7.71   | 13.85  | 18.13  | 15.73  | 14.10  | 8.57   | 100.001 |  |

## Average Rainfall On Catchment stettyn.r

## details of rainfall stations used

022113\_2.pat 1920 to 1998

22264p.pat 1959 to 1975

022504\_x.pat 1932 to 1994

022475\_4.pat 1982 to 1998

|          |        | rainfall input as percent m.a.p. |        |       |       |       |       |        |        |        |        |        |        | year    |
|----------|--------|----------------------------------|--------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|---------|
| no.      | gauges | oct                              | nov    | dec   | jan   | feb   | mar   | apr    | may    | jun    | jul    | aug    | sep    |         |
| 1920     | 1      | 8.15                             | 2.49   | 4.01  | 5.01  | 3.71  | 3.15  | 5.49   | 1.08   | 45.78  | 17.33  | 13.89  | 6.50   | 116.58  |
| 1921     | 1      | 2.93                             | 1.94   | 5.65  | 9.36  | 1.63  | 6.85  | 4.43   | 9.22   | 28.36  | 6.78   | 16.69  | 6.60   | 100.45  |
| 1922     | 1      | 2.45                             | 2.84   | 2.00  | 2.66  | .06   | 1.48  | 9.30   | 23.85  | 29.23  | 15.75  | 11.47  | 8.43   | 109.54  |
| 1923     | 1      | 5.05                             | 18.10  | .83   | 1.52  | .00   | 4.31  | 2.96   | 12.41  | 19.21  | 8.06   | 15.27  | 8.27   | 96.00   |
| 1924     | 1      | 8.38                             | 9.54   | .16   | 4.78  | .00   | .00   | 3.40   | 10.89  | 43.11  | 18.38  | 10.16  | 2.65   | 111.45  |
| 1925     | 1      | 8.94                             | 6.48+  | 2.35  | 1.14  | 4.57  | .46   | 3.51   | 20.44  | 8.52   | 16.42  | 13.29  | 5.27   | 91.38   |
| 1926     | 1      | 17.48                            | 3.03   | .00   | .46   | 7.04  | .26   | 6.88   | 12.81  | 8.34   | 10.64  | 15.54  | 5.76   | 88.23   |
| 1927     | 1      | .61                              | 9.05   | 5.52  | 3.37  | .00   | 4.97  | 3.46   | .61    | 34.62  | 14.01  | 10.83  | 12.30  | 99.33   |
| 1928     | 1      | 2.00                             | 2.44   | 3.33  | .00   | .86   | 1.02  | 10.39  | 13.45  | 8.21   | 17.52  | 11.99  | 3.84   | 75.07   |
| 1929     | 1      | 3.39                             | 2.73   | 4.50  | 3.24  | 3.00  | 7.00  | 3.67   | .00    | 2.50   | 14.93  | 14.56  | 23.01  | 82.54   |
| 1930     | 1      | 5.16                             | 6.90   | 2.10  | .00   | 3.55  | .75+  | 9.96   | 5.19   | 3.89   | 7.95   | 12.83  | 8.75   | 67.03   |
| 1931     | 1      | 10.72                            | .00    | 1.12  | 1.36  | 6.67  | 1.14  | 1.08   | 17.91  | 11.79  | 10.46  | 7.48   | 7.41   | 77.14   |
| 1932     | 2      | 3.42                             | 1.16   | 2.37  | 1.17  | 1.59  | .86   | 1.69   | 12.96  | 28.24  | 21.54  | 12.46  | 4.15   | 91.61   |
| 1933     | 2      | 4.77                             | 1.07   | 3.21  | .53   | 3.13  | 2.19  | .49    | 13.51  | 11.84+ | 8.07   | 8.21   | 11.32  | 68.36   |
| 1934     | 2      | 9.56                             | 4.70+  | .43   | 1.00  | 3.13  | 3.66  | 9.82   | 14.84  | 10.50  | 12.08  | 7.45   | 7.52   | 84.69   |
| 1935     | 2      | .64                              | 7.05   | 1.12  | 6.28  | 1.32  | 1.84  | .71    | 9.64   | 8.13   | 14.43  | 16.31  | 7.48   | 74.94   |
| 1936     | 2      | 1.81                             | 5.84   | 11.18 | 1.43  | .32   | 4.36  | 9.92   | 15.62  | 31.18  | 21.22  | 4.37   | 5.07   | 112.33  |
| 1937     | 2      | 2.29                             | 3.80   | .11   | 5.41  | 1.10  | 1.61  | 9.59   | 12.74  | 6.46   | 9.49   | 9.58   | 14.01  | 76.18   |
| 1938     | 2      | 2.81                             | 5.84   | .93   | .61*  | 7.75  | 2.76+ | 7.60   | 19.35  | 4.32   | 5.01   | 13.49+ | 5.71   | 76.17   |
| 1939     | 2      | 1.00                             | 5.07   | 4.88+ | .34   | 8.27  | 3.27  | 13.28  | 9.69   | 18.38  | 10.95  | 5.98   | 7.51   | 88.62   |
| 1940     | 2      | 4.28                             | 11.18  | 1.03  | 8.12  | .73   | .94   | 20.45  | 29.22  | 22.54  | 18.19  | 14.43  | 29.18  | 160.29  |
| 1941     | 2      | 9.10                             | .99    | 3.93  | .98   | .20   | .31   | 2.37   | 17.18  | 41.53  | 6.49   | 17.99  | 1.61   | 102.67  |
| 1942     | 2      | 4.48+                            | .00    | .63   | 4.10  | .70   | 6.57  | 3.16   | 2.22   | 17.70  | 12.16  | 18.93  | 6.02   | 76.65   |
| 1943     | 2      | 5.08                             | 6.81   | .87   | .93   | .73   | 2.74  | 3.85   | 14.33  | 32.70  | 13.79  | 16.07  | 10.23  | 108.14  |
| 1944     | 2      | 5.46                             | 4.24   | 4.36  | .00   | .00   | .20   | 7.52   | 23.26  | 34.79  | 36.03  | 18.24  | .76    | 134.85  |
| 1945     | 2      | 5.55                             | 3.40   | 1.57  | .50   | 1.85  | 3.34  | 3.63   | 9.20   | 3.68   | 9.05   | 11.18  | 17.53  | 70.49   |
| 1946     | 2      | 8.75                             | 1.21   | .54   | .00   | .00   | 8.17  | 2.67   | 12.31  | 6.10   | 27.89  | 11.41  | 1.32   | 80.36   |
| 1947     | 2      | 8.82                             | 2.62   | .27+  | .14   | .77   | 3.69  | 1.57   | 14.17  | 9.13   | 13.53  | 5.09   | 21.38  | 81.18   |
| 1948     | 2      | 9.74                             | .71    | 1.26  | .44   | .00   | .43   | 6.31   | 7.10   | 9.79   | 11.87  | 12.48  | 11.72  | 71.85   |
| 1949     | 2      | 7.00                             | 7.35   | .62   | .11   | .00   | .13   | 13.23  | 1.22   | 5.43   | 31.41  | 1.63   | 19.25  | 87.37   |
| 1950     | 2      | 3.46                             | 10.27  | 2.68  | 5.26  | .14   | .64   | 16.16  | 5.09   | 31.14  | 10.83  | 5.21   | 12.57* | 103.44  |
| 1951     | 2      | 2.89                             | 8.36+  | .00   | .00   | .90+  | 2.61+ | 5.94   | 15.94  | 9.98   | 13.93  | 24.14  | 18.90* | 103.58  |
| 1952     | 2      | 3.09                             | 15.44  | .19   | .38   | .15   | 1.28  | 23.96  | 17.66  | 6.18   | 17.86  | 11.02  | .88    | 98.10   |
| 1953     | 2      | 6.12                             | 7.31+  | .75   | .67   | 1.13  | 4.34  | 8.47   | 28.62  | 17.43  | 37.10  | 19.87  | 3.85   | 135.67  |
| 1954     | 2      | 6.42                             | 2.34   | 4.98  | .00   | 18.24 | .76   | 5.04   | 3.43   | 14.97  | 21.59  | 35.16  | 4.19   | 117.12  |
| 1955     | 2      | 13.47                            | 9.06   | 1.83  | 1.80  | .99   | 2.59  | 5.76   | 15.02  | 26.53  | 16.54  | 21.49  | 9.33   | 124.41  |
| 1956     | 2      | 6.40                             | .27    | 5.41  | .36   | 9.91  | 4.11  | 7.69   | 37.06  | 30.16  | 26.05  | 18.21  | 6.98   | 152.62  |
| 1957     | 2      | 16.87                            | .33    | .00   | .70   | 5.42  | 4.02  | 4.13   | 19.81  | 10.43  | 1.96   | 18.55  | 3.34   | 85.58   |
| 1958     | 2      | 6.92                             | 5.17   | .17   | 2.80  | 1.68  | 2.67  | 17.07  | 34.21  | 2.69   | 5.17   | 15.43  | 4.00   | 97.98   |
| 1959     | 3      | 9.97                             | .48    | 2.02  | 2.57  | .68   | 4.21  | 4.08   | 11.21  | 22.97  | 4.39   | 3.35   | 5.36   | 71.29   |
| 1960     | 3      | 5.38                             | .70    | 2.88  | 5.19  | 2.10  | 1.80  | 5.34   | 8.85   | 13.42  | 11.00  | 13.86  | 16.52  | 87.05   |
| 1961     | 3      | 4.37                             | .03    | 2.33  | 1.87  | 3.77  | 5.95  | 10.77  | 4.51   | 38.78  | 11.98  | 28.95  | 5.79   | 119.11  |
| 1962     | 3      | 20.04                            | 4.12   | .75   | 5.57  | .31   | .94   | 3.49   | 6.08   | 9.21   | 23.51  | 22.60  | 3.71   | 100.32  |
| 1963     | 3      | 2.72                             | 3.66   | 5.46  | .53   | 8.24  | .41   | 7.01   | 9.32   | 21.99  | 13.17  | 14.27  | 6.15   | 92.93   |
| 1964     | 3      | 5.11                             | 8.29   | .57   | 6.05  | 6.02  | 12.10 | 9.85   | 21.13  | 9.32   | 11.75  | 10.36  | 5.66   | 106.11  |
| 1965     | 3      | 5.63                             | 3.37   | 8.45  | .92   | 1.14  | 13.08 | 4.96   | 7.09   | 17.19  | 17.61  | 13.33  | 7.57   | 100.43  |
| 1966     | 3      | .58                              | 1.45   | 2.13  | 1.28  | .20   | 1.09  | 16.23  | 10.28  | 23.44  | 8.55   | 6.91   | 6.28   | 78.44   |
| 1967     | 3      | 7.46                             | 6.54   | 3.73  | 4.18  | 2.11  | .18   | 10.89  | 18.36  | 20.03  | 17.98  | 12.85  | 2.23   | 106.54  |
| 1968     | 3      | 16.79                            | 2.93   | 2.77  | 4.28  | 2.70  | 1.66  | 7.60   | 1.46   | 12.85  | 11.33  | 12.61  | 13.52  | 90.49   |
| 1969     | 3      | 12.36                            | .97    | .13   | 1.05  | 3.61  | .27   | .38    | 17.23  | 21.77  | 17.35  | 18.43  | 8.41   | 101.96  |
| 1970     | 3      | 6.20                             | 3.38   | 3.45  | .50   | .35   | 3.55  | 2.04   | 9.05   | 11.67  | 18.58  | 16.83  | 2.43   | 78.03   |
| 1971     | 3      | 1.84                             | 1.49   | 3.70  | 3.92  | 3.55  | 2.03  | 12.45+ | 13.69  | 11.18  | 6.75   | 10.17  | 6.43   | 77.20   |
| 1972     | 3      | 2.29                             | .15    | 3.30  | .58   | .89   | 3.59  | 2.39   | 6.64   | 3.84   | 24.84  | 10.46  | 9.10   | 68.06   |
| 1973     | 3      | 3.47                             | 1.84   | 6.58  | 1.26  | .64   | 1.38  | .46    | 16.01  | 23.24  | 12.23  | 45.17  | 11.97  | 124.26  |
| 1974     | 3      | 11.64                            | 5.99   | 1.65  | 2.62  | 1.48  | 1.28  | 6.35   | 27.65  | 12.23  | 21.37  | 13.50  | 3.07   | 108.82  |
| 1975     | 3      | 7.40                             | 3.58   | .21   | .00   | .82   | 4.24  | 5.15   | 5.36   | 35.12  | 21.32  | 9.57   | 6.25   | 99.00   |
| 1976     | 2      | 3.66                             | 16.79* | 8.88  | 3.64  | 6.33  | 2.10  | 17.37  | 39.53  | 32.99  | 36.17  | 26.34  | 7.82   | 201.61  |
| 1977     | 2      | 3.36                             | 3.54   | 3.16  | 3.17  | 1.10  | 5.36  | 3.90   | 5.50   | 2.77   | 4.59   | 25.34  | 6.80   | 68.57   |
| 1978     | 2      | 8.77                             | .43    | 6.48  | 3.44  | 8.40  | .61   | 3.23   | 14.94  | 19.48  | 11.09  | 13.12  | 14.59  | 104.57  |
| 1979     | 2      | 11.58                            | .82    | .38   | 4.55  | 3.99  | 2.82  | 7.38   | 15.70  | 16.64  | 5.75   | 14.59  | 6.25   | 90.44   |
| 1980     | 2      | 7.46                             | 12.87  | 7.83* | 16.91 | 1.94  | 6.41  | 7.36   | 3.15   | 8.52   | 24.89  | 14.73  | 16.22  | 128.30  |
| 1981     | 2      | 5.33                             | 2.89   | 1.78  | 3.04  | .17   | 1.45  | 14.70  | 7.48   | 11.32  | 16.51  | 7.58   | 3.79   | 76.05   |
| 1982     | 3      | 5.82+                            | 2.63+  | 4.40+ | .79+  | 6.77+ | 5.80+ | 2.85+  | 22.71+ | 25.99  | 21.63  | 7.23   | 16.66  | 123.27  |
| 1983     | 3      | 2.07                             | .75    | 1.41  | 1.64  | .50   | 6.01  | 8.63   | 38.28  | 8.95   | 16.38  | 6.37   | 23.64  | 114.63  |
| 1984     | 3      | 14.89                            | .53    | 10.24 | 6.53  | 5.52  | 15.90 | 9.39   | 5.12   | 21.41  | 24.46  | 15.61  | 8.98   | 138.57  |
| 1985     | 3      | 6.22                             | 2.21   | 3.11  | .88   | 2.32  | 9.41  | 5.15   | 5.22   | 23.82+ | 15.04  | 26.86  | 5.98   | 106.22  |
| 1986     | 3      | 2.28                             | 4.33   | .70   | 3.12  | 1.54  | 1.49  | 7.26   | 20.52  | 19.20  | 11.63  | 18.97  | 9.94   | 101.00  |
| 1987     | 3      | 1.84                             | 1.04   | 4.47  | .90   | .98   | 3.11  | 10.89  | 10.13  | 12.36  | 10.38  | 17.25  | 8.64   | 81.97   |
| 1988     | 3      | 3.43                             | 1.53   | 1.58  | .49   | 2.93  | 15.70 | 10.71  | 11.96  | 13.79  | 16.96+ | 15.97  | 11.38  | 106.43  |
| 1989     | 3      | 8.47                             | 3.82   | .23   | 1.66  | 3.63  | 2.02  | 14.32  | 13.43  | 20.01  | 22.08  | 11.84  | 2.82   | 104.33  |
| 1990     | 3      | 1.14                             | 5.31   | 3.39  | 1.37  | .54   | .57   | 5.33   | 14.95  | 25.30  | 35.70  | 7.55   | 15.53  | 116.66  |
| 1991     | 3      | 6.90                             | 2.14   | .61   | .14   | 3.37  | 3.72  | 8.94+  | 10.48+ | 34.87+ | 16.38  | 13.42  | 6.32   | 107.28  |
| 1992     | 3      | 15.25                            | 1.72   | .14   | 1.47  | 4.12  | .39   | 26.85  | 14.25  | 14.75  | 37.64+ | 8.45   | 3.83   | 128.86  |
| 1993     | 3      | .31                              | 1.11   | 4.07  | .81   | .63   | .58   | 6.87   | 5.06   | 42.23  | 10.41  | 4.72   | 11.92  | 88.71   |
| 1994     | 3      | 2.97                             | .70    | 5.14  | 2.10  | 1.08  | 3.44  | 2.64   | 11.94  | 16.77  | 20.07  | 13.87  | 4.20   | 84.92   |
| 1995     | 2      | 11.61                            | 2.37   | 11.65 | .75   | 3.72  | 3.88  | 3.72   | 8.47   | 32.57  | 16.45  | 18.80  | 17.52  | 131.50  |
| 1996     | 2      | 9.78                             | 9.59   | 6.72  | .95   | .42   | 1.33  | 5.31   | 9.29   | 29.98  | 5.65   | 9.46   | .55    | 89.01   |
| 1997     | 2      | 2.04                             | 10.18  | 4.03  | 3.43  | .33   | 2.78  | 5.03   | 21.47  | 9.28   | 12.88  | 6.83+  | 3.59   | 81.86   |
| 1998     | 2      | 1.54                             | 6.58   | 4.81  | .33   | .06   | .00   | 6.10   | 10.81+ | 19.05+ | 15.25+ | 13.63+ | 7.93+  | 86.08   |
| average  |        | 6.27                             | 4.30   | 2.94  | 2.30  | 2.53  | 3.22  | 7.34   | 13.39  | 18.55  | 15.87  | 14.05  | 8.61   | 99.38   |
| adjusted |        | 6.31                             | 4.33   | 2.96  | 2.31  | 2.55  | 3.24  | 7.39   | 13.47  | 18.67  | 15.97  | 14.14  | 8.66   | 100.001 |

## Average Rainfall On Catchment GBD.ran

details of rainfall stations used

022792.pat 1936 to 1979

22789A.pat 1943 to 1988

23039P.pat 1927 to 1977

022521\_9.pat 1920 to 1976

022803.pat 1925 to 1998

|          |        | rainfall input as percent m.a.p. |        |        |       |        |       |       |        |        |        |        |        | year    |
|----------|--------|----------------------------------|--------|--------|-------|--------|-------|-------|--------|--------|--------|--------|--------|---------|
| no.      | gauges | oct                              | nov    | dec    | jan   | feb    | mar   | apr   | may    | jun    | jul    | aug    | sep    |         |
| 1920     | 1      | 2.94+                            | 2.94+  | 2.94+  | 2.56  | 5.52   | .00   | 4.67  | .00    | 110.93 | 16.16  | 13.18  | .64    | 162.49  |
| 1921     | 1      | 3.26+                            | 1.49   | .00    | .00   | .00    | 5.27+ | 2.78  | 10.34+ | 29.82  | 9.57   | 19.72  | 2.12   | 84.37   |
| 1922     | 1      | 1.27                             | .00    | .00    | .00   | .00    | .00   | .64   | 13.82  | 26.14  | 8.15   | .00    | 7.23   | 57.24   |
| 1923     | 1      | 4.17+                            | 12.85+ | 3.03+  | .00   | .00    | 1.07  | .85   | .00    | 19.14  | 6.17   | 18.07  | 3.18   | 68.51   |
| 1924     | 1      | 3.40                             | 4.05   | .00    | .00   | .00    | .00   | .00   | 3.40   | 64.38  | 16.79  | .00    | .00    | 92.02   |
| 1925     | 2      | 7.32+                            | 3.27+  | 1.72+  | .00   | 3.74   | .00   | .31   | 11.43  | 1.72   | 16.34  | 8.55   | 2.35   | 56.76   |
| 1926     | 2      | 18.33                            | 4.02   | .00    | .00   | 1.62   | .00   | 8.72  | 7.66   | 17.14  | 2.85   | 21.26  | 2.12   | 83.72   |
| 1927     | 3      | .00                              | 7.41   | 2.39+  | 1.49  | .00    | 7.25  | .76   | .00    | 24.65  | 8.19+  | 7.39+  | 11.67+ | 71.19   |
| 1928     | 3      | .00+                             | 9.63+  | 4.91   | .00   | .00    | 8.70  | 13.39 | 9.32   | 11.08  | 21.58  | 13.15  | 2.15   | 93.90   |
| 1929     | 3      | 1.43                             | .00+   | 3.28+  | 8.31+ | 15.57+ | 2.35+ | .00+  | 3.18+  | 2.88+  | 2.55+  | 16.62+ | 14.70+ | 70.88   |
| 1930     | 3      | 2.56+                            | 3.68+  | .55+   | 1.26  | .59    | 1.30  | 23.00 | 10.31  | 1.38   | 16.84  | 20.23  | 8.29   | 89.98   |
| 1931     | 3      | 14.83                            | 3.07   | 2.81   | 1.09  | 20.79  | .36   | .50   | 13.26  | 12.70  | 12.80  | 4.34   | 16.53  | 103.07  |
| 1932     | 3      | 2.35                             | 1.47   | 3.59   | .64   | .85    | 6.31  | 2.81  | 10.75  | 24.91  | 22.65  | 14.43  | 2.88   | 93.64   |
| 1933     | 3      | 2.04                             | 3.83   | 3.72   | 4.93  | 4.09   | 3.33  | .62   | 6.74+  | 11.95+ | 11.32+ | 20.04+ | 13.82  | 86.44   |
| 1934     | 3      | 15.95                            | 5.67   | .00    | .50   | .41    | .57   | 10.16 | 17.80  | 14.42  | 11.55  | 8.91   | 7.95   | 93.90   |
| 1935     | 3      | .41                              | 5.97   | .00    | 4.09  | .00    | .00   | 5.12  | 8.90   | 5.83   | 16.80  | 15.77  | 11.56  | 74.46   |
| 1936     | 4      | 2.15                             | 17.01  | 11.97  | .05   | 2.29   | 11.22 | 6.69  | 11.16  | 17.22  | 19.98  | 1.63   | 6.41   | 107.80  |
| 1937     | 4      | 1.32                             | .50    | 3.31   | 3.43  | .55    | 2.72  | 9.43  | 10.34  | 8.66   | 5.67   | 9.73   | 6.29   | 61.94   |
| 1938     | 4      | 3.86                             | 3.56   | 4.63   | 3.07  | 12.63  | 4.92  | 7.20  | 13.11  | 3.61   | 9.65   | 22.39  | 6.52   | 95.17   |
| 1939     | 4      | 2.61+                            | 2.22   | 1.64   | .10   | 5.88   | 3.43  | 9.14  | 7.62   | 14.41  | 6.23+  | 3.60+  | 2.94   | 59.83   |
| 1940     | 4      | 1.57                             | 12.25  | .11    | 5.25  | 1.58   | .00+  | 15.41 | 33.41  | 31.47  | 14.14  | 12.26  | 22.11  | 149.56  |
| 1941     | 4      | 9.82                             | 3.08   | .85    | 3.92  | .72    | .00   | 1.69  | 22.01  | 36.25  | 2.30   | 7.82   | 2.17   | 90.63   |
| 1942     | 4      | 4.92                             | .20    | 10.55  | 9.05  | .93    | 12.87 | 10.93 | 2.81   | 12.05  | 17.27  | 15.43  | 16.39  | 113.41  |
| 1943     | 5      | 2.27                             | 10.61  | .78+   | .40   | .00    | 3.54  | 3.60  | 10.22  | 24.52  | 8.38   | 20.32+ | 10.21+ | 94.84   |
| 1944     | 5      | 8.64+                            | 3.18+  | 1.05+  | .00+  | .00+   | .19+  | 6.51  | 29.75  | 26.03  | 29.58  | 19.64  | 3.83   | 128.39  |
| 1945     | 5      | 15.68                            | 2.03   | .93    | .00   | .64    | 4.01  | 4.57  | 3.47   | 6.79   | 6.85   | 8.85   | 27.21  | 81.03   |
| 1946     | 5      | 4.73                             | .00    | 1.98   | .00   | .00    | 11.86 | 4.71  | 9.17   | 4.91   | 23.05  | 8.38   | 2.83   | 71.62   |
| 1947     | 5      | 3.27                             | 2.46   | 1.18   | 3.55  | 1.30   | 14.92 | 5.93  | 14.18  | 9.14   | 15.13  | 2.79   | 22.32  | 96.17   |
| 1948     | 5      | 14.53                            | .57    | 2.48   | .02   | .00    | .50   | 12.01 | 7.71   | 8.93   | 13.00  | 15.19  | 9.53   | 84.48   |
| 1949     | 5      | 6.09                             | 28.01  | .38    | .26   | .06    | .60   | 10.87 | 3.77   | 2.68   | 29.25  | .52    | 18.35  | 100.84  |
| 1950     | 5      | 10.18                            | 17.80  | 2.94   | 16.11 | .00    | .14   | 12.15 | 4.04   | 24.51  | 14.98  | 7.60   | 13.27  | 123.72  |
| 1951     | 5      | 4.76                             | 6.93   | .07    | .16   | 6.92   | .30   | 2.87  | 23.10  | 16.69  | 20.39  | 24.09  | 20.05  | 126.33  |
| 1952     | 5      | 3.97                             | 20.03  | 2.70   | .06   | 6.37   | .06   | 31.20 | 15.21  | 4.98   | 18.01  | 6.16   | 3.47   | 112.23  |
| 1953     | 5      | 8.31                             | 6.47   | 3.46   | .27   | 2.91   | 10.44 | 6.29  | 35.46  | 19.26  | 31.93  | 24.17  | 4.66   | 153.64  |
| 1954     | 5      | 5.30                             | 1.59   | 2.76   | .00   | 28.69  | 3.72  | 4.32  | 2.87   | 18.49  | 26.04  | 31.59  | 2.63   | 127.99  |
| 1955     | 5      | 7.97                             | 5.45   | .94    | 1.94  | 4.75   | .52   | .36   | 17.91  | 28.48  | 12.26  | 12.76  | 2.17   | 95.52   |
| 1956     | 5      | 6.48                             | .00    | 7.42   | .05   | 12.77  | 11.60 | 1.01  | 32.45  | 33.45  | 23.46  | 19.98  | 8.78   | 157.45  |
| 1957     | 5      | 7.03                             | .15    | .00    | .08   | 4.37   | 8.71  | 8.44  | 18.69  | 8.30   | .43    | 16.66  | 3.20   | 76.05   |
| 1958     | 5      | 9.45                             | 4.96   | .31    | 2.03  | 9.15   | 2.92  | 16.88 | 32.03  | 2.73   | 5.72   | 14.34  | 3.36   | 103.88  |
| 1959     | 5      | 20.21                            | .00    | 1.18   | .48   | .07    | 1.72  | 2.63  | 12.47  | 16.13  | 8.57   | .44    | 6.96   | 70.85   |
| 1960     | 5      | .52                              | 1.63   | 3.99   | 3.81  | .28    | 4.44  | 5.88  | 6.09   | 8.63   | 6.68   | 10.40  | 23.27  | 75.62   |
| 1961     | 5      | 4.62                             | .00    | .30    | 6.45  | 4.52   | 3.58  | 9.61  | 5.35   | 42.87  | 12.07  | 42.78  | 2.39   | 134.53  |
| 1962     | 5      | 25.27                            | 5.64   | .00    | 4.95  | .84    | .37   | .27   | 10.67  | 9.95   | 12.23  | 22.91  | 1.53   | 94.62   |
| 1963     | 5      | 5.19                             | 5.69   | 4.57   | .45   | 5.31   | 2.49  | 5.46  | 10.78  | 28.80  | 7.62   | 17.11  | 6.22   | 99.69   |
| 1964     | 5      | 5.40                             | 19.40  | .00    | .19   | 4.60   | 12.57 | 4.86  | 15.71  | 5.94   | 6.77   | 6.29   | 2.53   | 84.27   |
| 1965     | 5      | 6.97                             | 4.59   | 4.27   | .07   | .00    | 6.99  | 4.38  | 4.18   | 17.80  | 9.12   | 17.26  | 8.97   | 84.59   |
| 1966     | 5      | .35                              | .05    | .00    | .33   | .39    | .68   | 17.29 | 10.24  | 22.37  | 7.15   | 7.40   | 2.17   | 68.42   |
| 1967     | 5      | 3.50                             | 9.12   | .00    | 1.23  | .03    | 1.16  | 7.35  | 12.72  | 23.32  | 14.07  | 14.54  | 3.17   | 90.21   |
| 1968     | 5      | 14.19                            | 5.41   | .22    | .69   | 1.86   | .46   | 15.25 | .38    | 9.98   | 2.97   | 6.44   | 11.32  | 69.15   |
| 1969     | 5      | 13.72                            | .56    | .00    | .00   | 6.00   | .00   | .08   | 7.00   | 14.60  | 19.72  | 16.27  | 4.67   | 82.63   |
| 1970     | 5      | 7.75                             | .86    | 3.11   | .10   | .46    | 8.85  | 3.18  | 9.35   | 9.19   | 28.19  | 20.01  | .36    | 91.42   |
| 1971     | 5      | 2.22                             | 1.10   | 2.42   | 3.88  | .95    | 3.82  | 8.13  | 13.13  | 5.11   | 6.83   | 3.98   | 11.88  | 63.46   |
| 1972     | 5      | 1.18                             | .00    | 2.39   | .10   | 2.92   | 1.01  | .94   | 1.70   | 4.24   | 26.28  | 10.12  | 6.66   | 57.55   |
| 1973     | 5      | 1.96                             | .88    | 2.54   | .13   | 5.88   | 3.08  | .00   | 15.43  | 17.98  | 7.21   | 77.56  | 6.18   | 138.83  |
| 1974     | 5      | 10.94                            | 2.24   | .49    | 2.07  | .79    | .83   | 6.39  | 28.26  | 8.66   | 15.08  | 19.12  | 2.61   | 97.48   |
| 1975     | 5      | 7.37                             | 1.41   | .03    | 6.90  | 5.07   | 12.00 | 10.13 | 4.90   | 35.61  | 12.70  | 6.67   | 3.77   | 106.57  |
| 1976     | 5      | 8.22                             | 23.39  | 6.76   | 2.08  | 8.05   | .30   | 31.12 | 37.16  | 23.56  | 28.73  | 30.38  | 3.68   | 203.41  |
| 1977     | 4      | .46                              | 5.86   | 15.14  | .99+  | .66    | 6.15  | 7.04  | 1.65   | 2.89   | 5.05   | 24.39  | 5.07+  | 75.36   |
| 1978     | 3      | 2.89                             | 3.35   | 11.24+ | 3.28+ | 14.61  | .00   | 1.07  | 10.32  | 23.12  | 13.48  | 9.30+  | 8.23+  | 100.91  |
| 1979     | 3      | 3.82+                            | .00    | .10    | 3.10  | .27    | .66   | 7.16  | 13.60  | 13.11  | 5.29+  | 14.37  | 6.06   | 67.53   |
| 1980     | 2      | 5.23                             | 20.31+ | 6.47   | 66.28 | 8.59   | 8.02  | 9.27  | 3.32   | 3.11   | 24.90  | 19.81  | 15.15  | 190.46  |
| 1981     | 2      | 13.73+                           | 1.23   | .56    | 2.34  | .63    | 2.94  | 51.14 | 3.75   | 15.00  | 9.06   | 8.27   | 1.63   | 110.28  |
| 1982     | 2      | 5.72+                            | 1.85   | 1.98   | .46   | 4.62   | 6.42  | 3.06  | 26.04  | 28.77  | 22.19+ | 4.34   | 15.93  | 121.38  |
| 1983     | 2      | .53                              | .00    | .00    | 3.44  | .00    | 22.69 | 6.55  | 39.73  | 1.91   | 7.78   | 3.15   | 28.36  | 114.15  |
| 1984     | 2      | 15.36                            | .00    | 8.20   | 9.20  | 6.17   | 10.34 | 7.18  | 5.24   | 12.99+ | 35.53  | 11.47  | 5.56   | 127.23  |
| 1985     | 2      | 22.87                            | 1.05   | 7.01   | .00   | 3.01   | 5.26  | 7.30  | 1.04   | 21.22+ | 11.04  | 29.95  | 11.11  | 120.86  |
| 1986     | 2      | 7.90                             | 5.34   | .00    | .27   | 1.25   | .19   | 18.01 | 18.28  | 18.29+ | 9.99   | 20.81  | 7.50   | 107.84  |
| 1987     | 2      | .00                              | .00    | 1.18   | .00   | .00    | 1.87  | 11.87 | 4.97   | 13.52  | 3.17   | 21.40  | 4.49   | 62.47   |
| 1988     | 2      | 3.33                             | .00    | 1.05   | .53   | 5.43   | 12.37 | 31.44 | 4.03   | 22.13  | 9.50   | 20.57  | 21.79  | 132.16  |
| 1989     | 1      | 8.60                             | 3.07   | .00    | 1.47  | 7.99   | 1.43  | 28.05 | 16.09  | 25.60  | 13.47  | 3.07   | .00    | 108.86  |
| 1990     | 1      | 2.66                             | 1.43   | 5.24   | 4.30  | .00    | 9.75  | 6.35  | 12.29  | 18.55  | 32.85  | 3.07   | 12.70  | 109.18  |
| 1991     | 1      | 6.14                             | .00    | .00    | .00   | 2.95   | 1.43  | 15.36 | 10.85  | 21.50  | 21.13  | 9.91   | 3.89   | 93.17   |
| 1992     | 1      | 16.67                            | .82    | .00    | .00   | 5.53   | .00   | 87.93 | 12.90  | 13.92  | 35.06  | 8.68   | 1.84   | 183.35  |
| 1993     | 1      | .00                              | .00    | 6.55   | .61   | .00    | 6.39  | 18.63 | 12.37  | 43.41  | 11.06  | 5.12   | 8.40   | 112.54  |
| 1994     | 1      | 4.91                             | .00    | 11.06  | 19.86 | 1.72   | 7.58  | 1.64  | 27.11  | 11.47  | 7.37   | 18.63  | 1.43   | 112.79  |
| 1995     | 1      | 14.74                            | 6.55   | 40.95  | 1.56  | 4.30   | 5.73  | 1.88  | 11.47  | 32.15  | 24.16  | 13.51  | 10.03  | 167.05  |
| 1996     | 1      | 15.97                            | 14.13  | 5.94   | .00   | .00    | 2.05  | 10.24 | 28.26  | 28.67  | 6.96   | 9.62   | .00    | 121.84  |
| 1997     | 1      | 3.48                             | 14.33  | .00    | 17.20 | .00    | 5.53  | 8.81  | 32.03  | 3.07   | 6.55   | 3.07   | .00    | 94.07   |
| 1998     | 1      | .00                              | 4.42+  | 15.56  | .00   | .00    | .00   | 5.53  | 11.88  | 14.87+ | 14.01+ | 14.87+ | 6.88+  | 88.01   |
| average  |        | 6.58                             | 4.86   | 3.31   | 3.08  | 3.44   | 4.14  | 9.43  | 12.66  | 18.19  | 14.12  | 14.11  | 7.73   | 101.64  |
| adjusted |        | 6.47                             | 4.78   | 3.26   | 3.03  | 3.38   | 4.07  | 9.28  | 12.46  | 17.89  | 13.89  | 13.88  | 7.60   | 100.001 |



Appendix B6.10

File : AU\_WIT.USE  
Units : 10^6xm^3  
Descrip. : Upland alien demand (tall trees) in Low Wit subcatchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 | 0.08 | 0.10 | 0.2   |
| 1981  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.02 | 0.00 | 0.1   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.14 | 0.16 | 0.01 | 0.01 | 0.3   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.12 | 0.05 | 0.08 | 0.04 | 0.12 | 0.4   |
| 1984  | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.08 | 0.14 | 0.13 | 0.02 | 0.4   |
| 1985  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.14 | 0.17 | 0.02 | 0.4   |
| 1986  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.11 | 0.13 | 0.15 | 0.05 | 0.5   |
| 1987  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.09 | 0.13 | 0.04 | 0.3   |
| 1988  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.18 | 0.21 | 0.13 | 0.6   |
| 1989  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.20 | 0.26 | 0.05 | 0.01 | 0.6   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.10 | 0.56 | 0.04 | 0.13 | 0.8   |
| AVE : | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.07 | 0.17 | 0.09 | 0.06 | 0.4   |
| SD :  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.04 | 0.06 | 0.14 | 0.07 | 0.05 | 0.2   |

Appendix B6.11

File : AUS\_WIT.USE  
Units : 10^6xm^3  
Descrip. : Upland alien demand (tall shrubs) in Low wit subcatchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.0   |
| 1981  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.0   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.01 | 0.0   |
| 1984  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.0   |
| 1985  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.0   |
| 1986  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.0   |
| 1987  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.0   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.0   |
| 1989  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.00 | 0.00 | 0.0   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.04 | 0.00 | 0.01 | 0.1   |
| AVE : | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.0   |
| SD :  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.0   |

[illegible][illegible]

Appendix B6.13

File : AU\_WOLS.USE  
Units : 10^6xm^3  
Descrip. : Upland alien demand (tall trees) in Wolseley subcatchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.00 | 0.00 | 0.00 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.05 | 0.03 | 0.2   |
| 1981  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 | 0.01 | 0.02 | 0.01 | 0.00 | 0.1   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.06 | 0.10 | 0.00 | 0.03 | 0.2   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.07 | 0.01 | 0.01 | 0.01 | 0.11 | 0.2   |
| 1984  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.13 | 0.05 | 0.01 | 0.2   |
| 1985  | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.17 | 0.03 | 0.3   |
| 1986  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.05 | 0.16 | 0.01 | 0.3   |
| 1987  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.0   |
| 1988  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.01 | 0.08 | 0.06 | 0.20 | 0.18 | 0.6   |
| 1989  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.22 | 0.13 | 0.01 | 0.01 | 0.4   |
| 1990  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.36 | 0.01 | 0.02 | 0.4   |
| AVE : | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.04 | 0.08 | 0.06 | 0.04 | 0.3   |
| SD :  | 0.01 | 0.00 | 0.00 | 0.03 | 0.00 | 0.00 | 0.02 | 0.02 | 0.07 | 0.11 | 0.08 | 0.06 | 0.2   |

Appendix B6.14

File : AUS\_WOL.USE  
Units : 10^6xm^3  
Descrip. : Upland alien demand (tall shrubs) in Wolseley subcatchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1981  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.0   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.0   |
| 1984  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.0   |
| 1985  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1986  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1987  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.0   |
| 1989  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.0   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.0   |
| AVE : | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| SD :  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.0   |

[illegible]Units :  $10^6 \text{ m}^3$ 

Descript. : Riparian alien demand (tall trees) in Wolseley subcatchment for 1980 to 1990

[illegible]

Appendix B6.16

File : AU\_SLG.USE  
Units : 10^6xm^3  
Descrip. : Upland alien demand (tall trees) in Slanghoek subcatchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.02 | 0.04 | 0.1   |
| 1981  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.0   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.05 | 0.06 | 0.01 | 0.01 | 0.1   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.02 | 0.04 | 0.02 | 0.04 | 0.2   |
| 1984  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.06 | 0.03 | 0.01 | 0.2   |
| 1985  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.05 | 0.05 | 0.01 | 0.1   |
| 1986  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.05 | 0.05 | 0.02 | 0.1   |
| 1987  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.05 | 0.02 | 0.1   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.08 | 0.06 | 0.04 | 0.2   |
| 1989  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.09 | 0.12 | 0.03 | 0.00 | 0.3   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 | 0.32 | 0.03 | 0.05 | 0.5   |
| AVE : | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.03 | 0.08 | 0.03 | 0.02 | 0.2   |
| SD :  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.03 | 0.09 | 0.02 | 0.02 | 0.1   |

Appendix B6.17

File : AUS\_SLG.USE  
Units : 10<sup>6</sup>xm<sup>3</sup>  
Descrip. : Upland alien demand (tall shrubs) in Slanghoek subcatchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1981  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1984  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1985  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1986  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1987  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1989  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.0   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.0   |
| AVE : | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| SD :  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.0   |



Appendix B6.18

File : H1H19RIP.DEM  
Units : 10^6xm^3  
Descrip. : Riparian alien demand (tall trees) in Slanghoek subcatchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1981  | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1982  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1983  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1984  | 0.01 | 0.02 | 0.03 | 0.03 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1985  | 0.02 | 0.02 | 0.03 | 0.03 | 0.03 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1986  | 0.02 | 0.02 | 0.03 | 0.03 | 0.03 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1987  | 0.02 | 0.03 | 0.03 | 0.04 | 0.03 | 0.03 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1988  | 0.02 | 0.03 | 0.04 | 0.04 | 0.03 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.3   |
| 1989  | 0.02 | 0.04 | 0.04 | 0.05 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.3   |
| 1990  | 0.03 | 0.04 | 0.05 | 0.05 | 0.05 | 0.04 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.3   |
| AVE : | 0.02 | 0.02 | 0.03 | 0.03 | 0.03 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| SD :  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.00 | 0.1   |

Appendix B6.19

File : AU\_PITOU.USE  
Units : 10^6xm^3  
Descrip. : Upland alien demand (tall trees) in Ouplaas subcatchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.00 | 0.02 | 0.01 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.43 | 0.24 | 0.30 | 1.0   |
| 1981  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.16 | 0.21 | 0.11 | 0.01 | 0.5   |
| 1982  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.23 | 0.49 | 0.44 | 0.08 | 0.18 | 1.4   |
| 1983  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.58 | 0.16 | 0.29 | 0.13 | 0.36 | 1.5   |
| 1984  | 0.18 | 0.01 | 0.01 | 0.00 | 0.00 | 0.02 | 0.08 | 0.05 | 0.46 | 0.53 | 0.29 | 0.12 | 1.8   |
| 1985  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.45 | 0.36 | 0.57 | 0.09 | 1.5   |
| 1986  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.17 | 0.40 | 0.31 | 0.42 | 0.21 | 1.5   |
| 1987  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.24 | 0.26 | 0.39 | 0.15 | 1.1   |
| 1988  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.04 | 0.03 | 0.24 | 0.32 | 0.46 | 0.38 | 0.20 | 1.7   |
| 1989  | 0.05 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 | 0.22 | 0.51 | 0.63 | 0.23 | 0.01 | 1.7   |
| 1990  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.60 | 1.16 | 0.15 | 0.29 | 2.2   |
| AVE : | 0.03 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.14 | 0.35 | 0.46 | 0.27 | 0.17 | 1.5   |
| SD :  | 0.05 | 0.01 | 0.00 | 0.01 | 0.00 | 0.01 | 0.03 | 0.18 | 0.18 | 0.26 | 0.15 | 0.11 | 0.5   |

Appendix B6.20

File : AUS\_PITO.USE  
Units : 10^6xm^3  
Descrip. : Upland alien demand (tall shrubs) in Ouplaas subcatchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.02 | 0.02 | 0.1   |
| 1981  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.0   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.03 | 0.03 | 0.00 | 0.01 | 0.1   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.01 | 0.02 | 0.01 | 0.02 | 0.1   |
| 1984  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.02 | 0.01 | 0.1   |
| 1985  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.02 | 0.04 | 0.01 | 0.1   |
| 1986  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.03 | 0.02 | 0.03 | 0.01 | 0.1   |
| 1987  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.02 | 0.03 | 0.01 | 0.1   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.02 | 0.03 | 0.03 | 0.01 | 0.1   |
| 1989  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.03 | 0.04 | 0.02 | 0.00 | 0.1   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.08 | 0.01 | 0.02 | 0.2   |
| AVE : | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.03 | 0.02 | 0.01 | 0.1   |
| SD :  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.0   |

Appendix B6.21

File : AU\_H1H8.USE

Units : 10^6xm^3

Descrip. : Upland alien demand (tall trees) in H1H008 subcatchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.00 | 0.01 | 0.00 | 0.22 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.15 | 0.11 | 0.10 | 0.6   |
| 1981  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.11 | 0.01 | 0.06 | 0.05 | 0.04 | 0.00 | 0.3   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.11 | 0.15 | 0.16 | 0.02 | 0.11 | 0.6   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.21 | 0.03 | 0.06 | 0.02 | 0.13 | 0.5   |
| 1984  | 0.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.01 | 0.09 | 0.20 | 0.09 | 0.02 | 0.5   |
| 1985  | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.09 | 0.08 | 0.19 | 0.04 | 0.4   |
| 1986  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.09 | 0.05 | 0.12 | 0.04 | 0.3   |
| 1987  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.02 | 0.11 | 0.02 | 0.2   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.07 | 0.02 | 0.11 | 0.09 | 0.10 | 0.08 | 0.5   |
| 1989  | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.10 | 0.21 | 0.16 | 0.06 | 0.00 | 0.6   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.30 | 0.49 | 0.04 | 0.15 | 1.0   |
| AVE : | 0.02 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.02 | 0.05 | 0.11 | 0.14 | 0.08 | 0.06 | 0.5   |
| SD :  | 0.03 | 0.00 | 0.00 | 0.07 | 0.00 | 0.01 | 0.04 | 0.07 | 0.09 | 0.13 | 0.05 | 0.05 | 0.2   |

Appendix B6.22

File : AUS\_H1H8.USE  
Units : 10^6xm^3  
Descrip. : Upland alien demand (tall shrubs) in H1H008 subcatchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.0   |
| 1981  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.0   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.0   |
| 1984  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.0   |
| 1985  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1986  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1987  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.0   |
| 1989  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.0   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.03 | 0.00 | 0.01 | 0.1   |
| AVE : | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.0   |
| SD :  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.0   |

Appendix B6.23

File : H1H08RIP.DEM  
Units : 10^6xm^3  
Descrip. : Riparian alien demand (tall trees) in H1H08 subcatchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.06 | 0.08 | 0.10 | 0.09 | 0.08 | 0.07 | 0.05 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.7   |
| 1981  | 0.06 | 0.08 | 0.10 | 0.09 | 0.08 | 0.07 | 0.05 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.7   |
| 1982  | 0.06 | 0.08 | 0.10 | 0.09 | 0.08 | 0.07 | 0.05 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.7   |
| 1983  | 0.06 | 0.08 | 0.10 | 0.09 | 0.08 | 0.07 | 0.05 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.7   |
| 1984  | 0.06 | 0.08 | 0.10 | 0.09 | 0.08 | 0.07 | 0.05 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.7   |
| 1985  | 0.06 | 0.08 | 0.10 | 0.09 | 0.08 | 0.07 | 0.05 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.7   |
| 1986  | 0.06 | 0.08 | 0.10 | 0.09 | 0.08 | 0.07 | 0.05 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.7   |
| 1987  | 0.06 | 0.08 | 0.10 | 0.09 | 0.08 | 0.07 | 0.05 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.7   |
| 1988  | 0.06 | 0.08 | 0.10 | 0.09 | 0.08 | 0.07 | 0.05 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.7   |
| 1989  | 0.10 | 0.13 | 0.15 | 0.15 | 0.13 | 0.11 | 0.07 | 0.05 | 0.04 | 0.04 | 0.04 | 0.06 | 1.1   |
| 1990  | 0.13 | 0.18 | 0.21 | 0.21 | 0.18 | 0.15 | 0.10 | 0.07 | 0.05 | 0.05 | 0.06 | 0.09 | 1.5   |
| AVE : | 0.07 | 0.09 | 0.11 | 0.11 | 0.09 | 0.08 | 0.06 | 0.04 | 0.02 | 0.02 | 0.03 | 0.05 | 0.8   |
| SD :  | 0.02 | 0.03 | 0.04 | 0.04 | 0.03 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.3   |

Appendix B6.24

File : AU\_RAWS.USE  
Units : 10^6xm^3  
Descrip. : Upland alien demand (tall trees) in Rawsonville subcatchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.04 | 0.04 | 0.1   |
| 1981  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.04 | 0.10 | 0.00 | 0.04 | 0.2   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.02 | 0.00 | 0.06 | 0.1   |
| 1984  | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.06 | 0.00 | 0.2   |
| 1985  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.12 | 0.01 | 0.1   |
| 1986  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.08 | 0.01 | 0.1   |
| 1987  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.0   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.07 | 0.09 | 0.04 | 0.2   |
| 1989  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.10 | 0.02 | 0.01 | 0.2   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.21 | 0.01 | 0.04 | 0.3   |
| AVE : | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.05 | 0.04 | 0.02 | 0.1   |
| SD :  | 0.01 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.07 | 0.04 | 0.02 | 0.1   |

Appendix B6.25

File : AUS\_RAWS.USE

Units : 10<sup>6</sup>xm<sup>3</sup>

Descrip. : Upland alien demand (tall shrubs) in Rawsonville subcatchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1981  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.0   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1984  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.0   |
| 1985  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1986  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1987  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1989  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.0   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.0   |
| AVE : | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| SD :  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.0   |



Appendix B6.26

File : RAW5\_RIP.DEM  
Units : 10^6xm^3  
Descrip. : Riparian alien demand (tall trees) in Rawsonville subcatchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.18 | 0.25 | 0.30 | 0.32 | 0.28 | 0.24 | 0.14 | 0.08 | 0.06 | 0.06 | 0.07 | 0.11 | 2.1   |
| 1981  | 0.18 | 0.25 | 0.30 | 0.32 | 0.28 | 0.24 | 0.14 | 0.08 | 0.06 | 0.06 | 0.07 | 0.11 | 2.1   |
| 1982  | 0.20 | 0.28 | 0.33 | 0.35 | 0.31 | 0.26 | 0.16 | 0.09 | 0.07 | 0.06 | 0.08 | 0.12 | 2.3   |
| 1983  | 0.22 | 0.30 | 0.37 | 0.39 | 0.34 | 0.29 | 0.17 | 0.10 | 0.07 | 0.07 | 0.09 | 0.13 | 2.5   |
| 1984  | 0.24 | 0.33 | 0.40 | 0.42 | 0.37 | 0.31 | 0.19 | 0.11 | 0.08 | 0.07 | 0.10 | 0.15 | 2.8   |
| 1985  | 0.26 | 0.35 | 0.43 | 0.45 | 0.40 | 0.34 | 0.21 | 0.12 | 0.08 | 0.08 | 0.11 | 0.16 | 3.0   |
| 1986  | 0.28 | 0.38 | 0.46 | 0.49 | 0.43 | 0.36 | 0.22 | 0.13 | 0.09 | 0.09 | 0.11 | 0.17 | 3.2   |
| 1987  | 0.30 | 0.41 | 0.49 | 0.52 | 0.46 | 0.39 | 0.24 | 0.13 | 0.10 | 0.09 | 0.12 | 0.18 | 3.4   |
| 1988  | 0.31 | 0.43 | 0.53 | 0.56 | 0.49 | 0.41 | 0.25 | 0.14 | 0.10 | 0.10 | 0.13 | 0.19 | 3.6   |
| 1989  | 0.35 | 0.48 | 0.59 | 0.62 | 0.55 | 0.46 | 0.28 | 0.16 | 0.12 | 0.11 | 0.14 | 0.22 | 4.1   |
| 1990  | 0.39 | 0.53 | 0.65 | 0.68 | 0.60 | 0.51 | 0.31 | 0.18 | 0.13 | 0.12 | 0.16 | 0.24 | 4.5   |
| AVE : | 0.26 | 0.36 | 0.44 | 0.47 | 0.41 | 0.35 | 0.21 | 0.12 | 0.09 | 0.08 | 0.11 | 0.16 | 3.1   |
| SD :  | 0.07 | 0.09 | 0.12 | 0.12 | 0.11 | 0.09 | 0.06 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.8   |

Appendix B6.27

File : H1H20RIP.DEM  
Units : 10^6xm^3  
Descrip. : Riparian alien demand (tall trees) in H1H020 subcatchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.03 | 0.03 | 0.04 | 0.04 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.3   |
| 1981  | 0.03 | 0.03 | 0.04 | 0.04 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.3   |
| 1982  | 0.03 | 0.03 | 0.04 | 0.04 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.3   |
| 1983  | 0.03 | 0.03 | 0.04 | 0.04 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.3   |
| 1984  | 0.03 | 0.03 | 0.04 | 0.04 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.3   |
| 1985  | 0.03 | 0.03 | 0.04 | 0.04 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.3   |
| 1986  | 0.03 | 0.03 | 0.04 | 0.04 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.3   |
| 1987  | 0.03 | 0.03 | 0.04 | 0.04 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.3   |
| 1988  | 0.03 | 0.03 | 0.04 | 0.04 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.3   |
| 1989  | 0.04 | 0.05 | 0.07 | 0.07 | 0.06 | 0.06 | 0.03 | 0.02 | 0.01 | 0.01 | 0.02 | 0.03 | 0.5   |
| 1990  | 0.06 | 0.07 | 0.09 | 0.10 | 0.09 | 0.08 | 0.05 | 0.03 | 0.02 | 0.02 | 0.02 | 0.04 | 0.7   |
| AVE : | 0.03 | 0.04 | 0.05 | 0.05 | 0.05 | 0.04 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.3   |
| SD :  | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |

Appendix B6.28

File : AU\_STET.USE  
Units : 10^6xm^3  
Descrip. : Upland alien demand (tall trees) in Stettynskloof subcatchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.00 | 0.01 | 0.00 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.16 | 0.09 | 0.09 | 0.4   |
| 1981  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.06 | 0.11 | 0.04 | 0.00 | 0.2   |
| 1982  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.11 | 0.22 | 0.18 | 0.05 | 0.11 | 0.7   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.32 | 0.07 | 0.15 | 0.05 | 0.21 | 0.8   |
| 1984  | 0.13 | 0.00 | 0.01 | 0.00 | 0.00 | 0.04 | 0.05 | 0.02 | 0.23 | 0.29 | 0.16 | 0.07 | 1.0   |
| 1985  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.26 | 0.19 | 0.36 | 0.04 | 0.9   |
| 1986  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.13 | 0.28 | 0.16 | 0.26 | 0.11 | 0.9   |
| 1987  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.03 | 0.17 | 0.15 | 0.26 | 0.10 | 0.7   |
| 1988  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.05 | 0.16 | 0.22 | 0.30 | 0.27 | 0.16 | 1.2   |
| 1989  | 0.11 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.24 | 0.57 | 0.67 | 0.31 | 0.01 | 2.0   |
| 1990  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 1.03 | 1.56 | 0.24 | 0.53 | 3.4   |
| AVE : | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.10 | 0.28 | 0.36 | 0.19 | 0.13 | 1.1   |
| SD :  | 0.05 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.02 | 0.11 | 0.29 | 0.43 | 0.12 | 0.15 | 0.9   |

Appendix B6.29

File : AUS\_STET.USE  
 Units : 10^6xm^3  
 Descrip. : Upland alien demand (tall shrubs) in Stettynskloof subcatchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.0   |
| 1981  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.0   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.0   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.01 | 0.00 | 0.01 | 0.0   |
| 1984  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.02 | 0.01 | 0.00 | 0.1   |
| 1985  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.02 | 0.00 | 0.1   |
| 1986  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.01 | 0.02 | 0.01 | 0.1   |
| 1987  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.02 | 0.01 | 0.1   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.02 | 0.02 | 0.01 | 0.1   |
| 1989  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.04 | 0.04 | 0.02 | 0.00 | 0.1   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.07 | 0.10 | 0.02 | 0.03 | 0.2   |
| AVE : | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.02 | 0.01 | 0.01 | 0.1   |
| SD :  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.03 | 0.01 | 0.01 | 0.1   |

Appendix B6.30

File : AU\_H1H12.USE

Units : 10^6xm^3

Descrip. : Upland alien demand (tall trees) in H1H012 subcatchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.00 | 0.01 | 0.00 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.07 | 0.07 | 0.06 | 0.3   |
| 1981  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.00 | 0.03 | 0.04 | 0.02 | 0.00 | 0.1   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.10 | 0.10 | 0.01 | 0.06 | 0.3   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.10 | 0.01 | 0.04 | 0.01 | 0.08 | 0.2   |
| 1984  | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.13 | 0.06 | 0.01 | 0.3   |
| 1985  | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.07 | 0.17 | 0.02 | 0.3   |
| 1986  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.09 | 0.05 | 0.14 | 0.03 | 0.3   |
| 1987  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.15 | 0.01 | 0.2   |
| 1988  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.04 | 0.02 | 0.19 | 0.15 | 0.18 | 0.12 | 0.7   |
| 1989  | 0.04 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.04 | 0.37 | 0.28 | 0.09 | 0.01 | 0.9   |
| 1990  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.33 | 0.90 | 0.05 | 0.24 | 1.5   |
| AVE : | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 | 0.02 | 0.11 | 0.17 | 0.09 | 0.06 | 0.5   |
| SD :  | 0.02 | 0.00 | 0.00 | 0.04 | 0.00 | 0.00 | 0.02 | 0.03 | 0.13 | 0.25 | 0.06 | 0.07 | 0.4   |

Appendix B6.31

File : AUS\_H12.USE  
Units : 10^6xm^3  
Descrip. : Upland alien demand (tall shrubs) in H1H012 subcatchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1981  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.0   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.0   |
| 1984  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.0   |
| 1985  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1986  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1987  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.0   |
| 1989  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.02 | 0.01 | 0.00 | 0.1   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.06 | 0.00 | 0.02 | 0.1   |
| AVE : | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.0   |
| SD :  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.01 | 0.01 | 0.0   |

Appendix B6.32

File : AU\_H9.USE  
Units : 10^6xm^3  
Descrip. : Upland alien demand (tall trees) in H1H009 subcatchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.02 | 0.1   |
| 1981  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.1   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.05 | 0.05 | 0.01 | 0.03 | 0.2   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 0.01 | 0.02 | 0.00 | 0.05 | 0.1   |
| 1984  | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.08 | 0.04 | 0.01 | 0.2   |
| 1985  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.04 | 0.08 | 0.01 | 0.2   |
| 1986  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.04 | 0.02 | 0.06 | 0.01 | 0.1   |
| 1987  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 | 0.01 | 0.1   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.06 | 0.05 | 0.06 | 0.04 | 0.2   |
| 1989  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.09 | 0.06 | 0.02 | 0.00 | 0.2   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.07 | 0.18 | 0.01 | 0.05 | 0.3   |
| AVE : | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.03 | 0.05 | 0.03 | 0.02 | 0.2   |
| SD :  | 0.01 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.01 | 0.02 | 0.03 | 0.05 | 0.03 | 0.02 | 0.1   |

[illegible]Units :  $10^6 \text{ m}^3$ 

Descrip. : Upland a

Units : 10<sup>6</sup> x m<sup>3</sup>  
 Descrip. : Upland alien demand (tall shrubs) in H1H009 subcatchment for 1980 to 1990

[illegible]



[illegible]Units :  $10^6 \text{ m}^3$ 

Descript. : Upland alien demand (tall trees) in H1R001 subcatchment for 1980 to 1990

[illegible]

[illegible]Units :  $10^6 \text{ m}^3$ 

Descript. : Upland alien demand (tall trees) in H4R004 subcatchment for 1980 to 1990

[illegible]

Appendix B6.36

File : AU\_H406.USE

Units : 10^6xm^3

Descrip. : Upland alien demand (tall trees) in H4H017 subcatchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.01 | 0.01 | 0.01 | 0.12 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.02 | 0.2   |
| 1981  | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1982  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.02 | 0.02 | 0.1   |
| 1983  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.01 | 0.01 | 0.01 | 0.02 | 0.1   |
| 1984  | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.02 | 0.02 | 0.1   |
| 1985  | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.03 | 0.02 | 0.1   |
| 1986  | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.1   |
| 1987  | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1988  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.02 | 0.02 | 0.1   |
| 1989  | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.02 | 0.03 | 0.03 | 0.02 | 0.2   |
| 1990  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.08 | 0.04 | 0.03 | 0.2   |
| AVE : | 0.02 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.1   |
| SD :  | 0.01 | 0.00 | 0.00 | 0.04 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.1   |

Appendix B6.37

File : AU\_H402.USE

Units : 10^6xm^3

Descrip. : Upland alien demand (tall trees) in H4R001 subcatchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.04 | 0.05 | 0.1   |
| 1981  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.13 | 0.01 | 0.01 | 0.2   |
| 1983  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.01 | 0.01 | 0.02 | 0.1   |
| 1984  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.10 | 0.10 | 0.01 | 0.2   |
| 1985  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.01 | 0.1   |
| 1986  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.04 | 0.01 | 0.1   |
| 1987  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.05 | 0.1   |
| 1989  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.01 | 0.01 | 0.1   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.11 | 0.01 | 0.01 | 0.1   |
| AVE : | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.03 | 0.02 | 0.1   |
| SD :  | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.05 | 0.03 | 0.02 | 0.1   |

[illegible][illegible]

Appendix B6.39

File : WOLRQ6.NSI  
Units : 10^6xm^3  
Descrip. : Farm dam irrigation in Wolseley sub-catchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.06 | 0.12 | 0.48 | 0.54 | 0.61 | 0.25 | 0.03 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 2.1   |
| 1981  | 0.08 | 0.37 | 0.63 | 0.68 | 0.62 | 0.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 2.7   |
| 1982  | 0.02 | 0.36 | 0.59 | 0.76 | 0.57 | 0.28 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.6   |
| 1983  | 0.11 | 0.38 | 0.68 | 0.78 | 0.66 | 0.18 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.8   |
| 1984  | 0.03 | 0.42 | 0.55 | 0.71 | 0.63 | 0.14 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.5   |
| 1985  | 0.09 | 0.42 | 0.68 | 0.81 | 0.66 | 0.28 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.9   |
| 1986  | 0.10 | 0.38 | 0.75 | 0.80 | 0.71 | 0.33 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.1   |
| 1987  | 0.12 | 0.45 | 0.72 | 0.88 | 0.75 | 0.36 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.3   |
| 1988  | 0.11 | 0.45 | 0.77 | 0.90 | 0.72 | 0.23 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.2   |
| 1989  | 0.06 | 0.40 | 0.81 | 0.91 | 0.71 | 0.37 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 3.3   |
| 1990  | 0.13 | 0.44 | 0.74 | 0.93 | 0.81 | 0.39 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.5   |
| AVE : | 0.08 | 0.38 | 0.67 | 0.79 | 0.68 | 0.28 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.9   |
| SD :  | 0.04 | 0.09 | 0.10 | 0.12 | 0.07 | 0.08 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.4   |

Appendix B6.40

File : WOLRQ10.NSI  
Units : 10<sup>6</sup>m<sup>3</sup>  
Descrip. : Diffuse irrigation from rivers in Wolseley sub-catchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.15 | 0.17 | 1.35 | 1.48 | 1.82 | 0.73 | 0.06 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 5.8   |
| 1981  | 0.23 | 1.09 | 1.89 | 1.49 | 0.56 | 0.83 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 6.1   |
| 1982  | 0.01 | 1.05 | 1.71 | 1.05 | 1.65 | 0.79 | 0.14 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.4   |
| 1983  | 0.34 | 1.14 | 2.02 | 0.90 | 0.38 | 0.42 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.3   |
| 1984  | 0.03 | 1.26 | 1.54 | 2.05 | 1.85 | 0.26 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 7.0   |
| 1985  | 0.26 | 1.25 | 1.99 | 1.05 | 0.52 | 0.77 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.8   |
| 1986  | 0.27 | 1.10 | 2.00 | 2.37 | 0.82 | 0.58 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 7.1   |
| 1987  | 0.36 | 1.34 | 2.10 | 0.95 | 0.37 | 0.46 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.6   |
| 1988  | 0.31 | 1.32 | 1.88 | 0.64 | 0.78 | 0.57 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.5   |
| 1989  | 0.14 | 1.14 | 2.43 | 0.98 | 0.87 | 1.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 | 6.7   |
| 1990  | 0.37 | 1.27 | 2.15 | 2.52 | 1.29 | 1.04 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 8.7   |
| AVE : | 0.22 | 1.10 | 1.91 | 1.41 | 0.99 | 0.69 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 6.4   |
| SD :  | 0.13 | 0.32 | 0.30 | 0.64 | 0.57 | 0.26 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 1.0   |

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File      : SLGRQ9.NSI
Units     : 10^6xm^3
Descrip.  : Farm dam-irrigation in Slanghoek sub-catchment for 1980 to 1990
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| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.01 | 0.00 | 0.16 | 0.00 | 0.28 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.6   |
| 1981  | 0.00 | 0.15 | 0.36 | 0.39 | 0.08 | 0.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.1   |
| 1982  | 0.00 | 0.15 | 0.34 | 0.46 | 0.09 | 0.07 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.1   |
| 1983  | 0.03 | 0.17 | 0.42 | 0.46 | 0.16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.2   |
| 1984  | 0.00 | 0.19 | 0.32 | 0.28 | 0.39 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.2   |
| 1985  | 0.00 | 0.18 | 0.31 | 0.52 | 0.30 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.4   |
| 1986  | 0.02 | 0.12 | 0.49 | 0.53 | 0.27 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.5   |
| 1987  | 0.04 | 0.21 | 0.42 | 0.58 | 0.16 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.5   |
| 1988  | 0.03 | 0.21 | 0.43 | 0.54 | 0.06 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.4   |
| 1989  | 0.00 | 0.16 | 0.50 | 0.57 | 0.15 | 0.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.6   |
| 1990  | 0.03 | 0.17 | 0.44 | 0.46 | 0.28 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.4   |
| AVE : | 0.01 | 0.16 | 0.38 | 0.44 | 0.20 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.3   |
| SD :  | 0.02 | 0.06 | 0.10 | 0.17 | 0.11 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |



[illegible][illegible]

Appendix B6.43

File : RAWRQ10.NSI  
Units : 10^6xm^3  
Descrip. : Farm dam-irrigation in Rawsonville sub-catchment for 1981 to 1988

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1981  | 0.08 | 0.70 | 1.15 | 1.22 | 1.01 | 0.48 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 4.7   |
| 1982  | 0.09 | 0.69 | 1.07 | 1.35 | 0.92 | 0.43 | 0.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.6   |
| 1983  | 0.20 | 0.74 | 1.22 | 1.32 | 1.11 | 0.09 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.7   |
| 1984  | 0.00 | 0.76 | 0.98 | 0.92 | 1.04 | 0.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.9   |
| 1985  | 0.00 | 0.73 | 0.95 | 1.39 | 1.10 | 0.48 | 0.04 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 4.7   |
| 1986  | 0.16 | 0.56 | 1.28 | 1.39 | 1.04 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.0   |
| 1987  | 0.23 | 0.79 | 1.13 | 1.45 | 1.17 | 0.39 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.2   |
| 1988  | 0.19 | 0.80 | 1.17 | 1.39 | 1.02 | 0.42 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.0   |
| AVE : | 0.12 | 0.72 | 1.12 | 1.30 | 1.05 | 0.39 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.7   |
| SD :  | 0.09 | 0.08 | 0.11 | 0.17 | 0.08 | 0.16 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.4   |

Appendix B6.44

File : RAWRQ13.NSI

Units : 10<sup>6</sup>m<sup>3</sup>

Descrip. : Diffuse irrigation from rivers in Rawsonville sub-catchment for 1981 to 1988

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1981  | 0.25 | 2.09 | 3.45 | 3.16 | 1.71 | 1.44 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 12.2  |
| 1982  | 0.26 | 2.08 | 3.22 | 3.99 | 2.76 | 1.29 | 0.25 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 13.9  |
| 1983  | 0.61 | 2.21 | 3.65 | 2.19 | 1.14 | 0.27 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10.1  |
| 1984  | 0.00 | 2.28 | 2.95 | 2.74 | 3.13 | 0.62 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 11.7  |
| 1985  | 0.00 | 2.20 | 2.84 | 3.49 | 1.88 | 1.45 | 0.13 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 12.0  |
| 1986  | 0.48 | 1.68 | 3.83 | 4.18 | 2.22 | 1.74 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 14.1  |
| 1987  | 0.70 | 2.38 | 3.39 | 3.31 | 1.36 | 1.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 12.3  |
| 1988  | 0.56 | 2.39 | 3.52 | 2.68 | 1.93 | 1.25 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 12.3  |
| AVE : | 0.36 | 2.16 | 3.36 | 3.22 | 2.02 | 1.15 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 12.3  |
| SD :  | 0.27 | 0.23 | 0.34 | 0.67 | 0.67 | 0.48 | 0.09 | 0.01 | 0.00 | 0.00 | 0.00 | 0.02 | 1.2   |

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File      : OUPRQ8.NSI
Units     : 10^6xm^3
Descrip.  : Diffuse irrigation from rivers in H1H008 sub-catchment for 1980 to 1990
```

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.00 | 0.00 | 0.03 | 0.00 | 0.05 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1981  | 0.00 | 0.02 | 0.04 | 0.05 | 0.05 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1982  | 0.00 | 0.02 | 0.04 | 0.06 | 0.04 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1983  | 0.01 | 0.03 | 0.06 | 0.07 | 0.06 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1984  | 0.00 | 0.03 | 0.04 | 0.04 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1985  | 0.00 | 0.03 | 0.05 | 0.07 | 0.06 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1986  | 0.01 | 0.02 | 0.07 | 0.08 | 0.07 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |
| 1987  | 0.01 | 0.04 | 0.05 | 0.08 | 0.07 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |
| 1988  | 0.01 | 0.03 | 0.06 | 0.08 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1989  | 0.00 | 0.03 | 0.07 | 0.08 | 0.04 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |
| 1990  | 0.01 | 0.02 | 0.06 | 0.08 | 0.07 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |
| AVE : | 0.00 | 0.02 | 0.05 | 0.06 | 0.06 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| SD :  | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |

[illegible][illegible]

Appendix B6.47

File : HEXRQ7.NSI  
Units : 10^6xm^3  
Descrip. : Farm dam irrigation Low Hex sub-catchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.05 | 0.02 | 0.17 | 0.02 | 0.13 | 0.07 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.5   |
| 1981  | 0.03 | 0.18 | 0.19 | 0.21 | 0.17 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.9   |
| 1982  | 0.06 | 0.18 | 0.19 | 0.22 | 0.16 | 0.07 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.9   |
| 1983  | 0.07 | 0.19 | 0.20 | 0.22 | 0.19 | 0.01 | 0.02 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.9   |
| 1984  | 0.02 | 0.20 | 0.17 | 0.15 | 0.18 | 0.06 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.8   |
| 1985  | 0.00 | 0.19 | 0.18 | 0.24 | 0.19 | 0.08 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.9   |
| 1986  | 0.06 | 0.16 | 0.22 | 0.24 | 0.18 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 1.0   |
| 1987  | 0.09 | 0.21 | 0.22 | 0.26 | 0.21 | 0.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 1.1   |
| 1988  | 0.07 | 0.21 | 0.22 | 0.25 | 0.18 | 0.09 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.1   |
| 1989  | 0.03 | 0.20 | 0.23 | 0.26 | 0.08 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.03 | 0.9   |
| 1990  | 0.08 | 0.20 | 0.22 | 0.22 | 0.22 | 0.09 | 0.03 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 1.1   |
| AVE : | 0.05 | 0.18 | 0.20 | 0.21 | 0.17 | 0.07 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.9   |
| SD :  | 0.03 | 0.05 | 0.02 | 0.07 | 0.04 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.2   |

Appendix B6.48

File : HEXRQ11.NSI

Units : 10^6xm^3

Descrip. : Diffuse irrigation from rivers in Low Hex sub-catchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.02 | 0.01 | 0.07 | 0.01 | 0.05 | 0.03 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.2   |
| 1981  | 0.01 | 0.08 | 0.08 | 0.09 | 0.07 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.4   |
| 1982  | 0.02 | 0.08 | 0.08 | 0.09 | 0.07 | 0.03 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.4   |
| 1983  | 0.03 | 0.08 | 0.09 | 0.09 | 0.08 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.4   |
| 1984  | 0.01 | 0.08 | 0.07 | 0.07 | 0.08 | 0.03 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.4   |
| 1985  | 0.00 | 0.08 | 0.08 | 0.10 | 0.08 | 0.03 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.4   |
| 1986  | 0.03 | 0.07 | 0.09 | 0.10 | 0.08 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.4   |
| 1987  | 0.04 | 0.09 | 0.09 | 0.11 | 0.09 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.5   |
| 1988  | 0.03 | 0.09 | 0.09 | 0.11 | 0.08 | 0.04 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.5   |
| 1989  | 0.01 | 0.08 | 0.10 | 0.11 | 0.03 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.4   |
| 1990  | 0.03 | 0.08 | 0.09 | 0.10 | 0.09 | 0.04 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.4   |
| AVE : | 0.02 | 0.07 | 0.08 | 0.09 | 0.07 | 0.03 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.4   |
| SD :  | 0.01 | 0.02 | 0.01 | 0.03 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |

Appendix B6.49

File : BRAND.WTH  
Units : 10^6xm^3'pp"  
Descrip. : Irrigation releases-from Gretaer Brandvlei Dam for 1980 to 1990

| Year  | Oct   | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul   | Aug   | Sep   | Total |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1980  | 16.35 | 18.81 | 19.43 | 19.43 | 17.70 | 16.46 | 13.80 | 12.65 | 13.72 | 14.17 | 14.17 | 13.72 | 190.4 |
| 1981  | 16.73 | 19.23 | 19.87 | 21.34 | 19.59 | 18.66 | 13.81 | 12.65 | 13.72 | 14.17 | 14.17 | 14.08 | 198.0 |
| 1982  | 16.73 | 19.23 | 19.88 | 21.47 | 19.75 | 18.30 | 14.42 | 12.65 | 13.72 | 14.53 | 14.53 | 14.08 | 199.3 |
| 1983  | 16.74 | 19.23 | 19.89 | 20.73 | 20.06 | 17.38 | 14.41 | 12.65 | 13.72 | 14.53 | 14.53 | 14.08 | 198.0 |
| 1984  | 16.73 | 19.23 | 20.33 | 21.87 | 19.67 | 18.21 | 13.91 | 12.75 | 13.72 | 14.53 | 14.53 | 14.09 | 199.6 |
| 1985  | 16.71 | 19.20 | 19.86 | 20.84 | 19.97 | 17.39 | 14.31 | 13.05 | 13.92 | 14.53 | 14.53 | 14.08 | 198.4 |
| 1986  | 16.72 | 19.22 | 19.90 | 22.58 | 20.48 | 17.91 | 13.81 | 12.65 | 13.72 | 14.76 | 14.76 | 14.31 | 200.8 |
| 1987  | 16.92 | 19.42 | 21.04 | 23.29 | 20.81 | 17.75 | 13.82 | 12.67 | 13.72 | 14.69 | 14.69 | 14.25 | 203.1 |
| 1988  | 16.89 | 19.40 | 21.75 | 23.18 | 20.38 | 17.64 | 13.81 | 12.68 | 13.72 | 14.51 | 14.51 | 14.06 | 202.5 |
| 1989  | 16.70 | 19.19 | 19.87 | 22.76 | 20.15 | 17.80 | 14.64 | 13.48 | 14.55 | 14.51 | 14.51 | 14.07 | 202.2 |
| 1990  | 16.71 | 19.21 | 21.65 | 22.67 | 20.71 | 17.91 | 14.65 | 13.48 | 14.55 | 14.51 | 14.51 | 14.08 | 204.6 |
| AVE : | 16.72 | 19.22 | 20.32 | 21.83 | 19.93 | 17.76 | 14.13 | 12.85 | 13.89 | 14.50 | 14.49 | 14.08 | 199.7 |
| SD :  | 0.14  | 0.16  | 0.79  | 1.20  | 0.85  | 0.58  | 0.36  | 0.33  | 0.33  | 0.18  | 0.18  | 0.15  | 3.8   |



Appendix B6.50

File : 406RQ35.NSI  
Units : 10^6xm^3  
Descrip. : Bossieveld irrigation from farm dams for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.21 | 0.02 | 1.00 | 0.00 | 0.54 | 0.46 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.2   |
| 1981  | 0.11 | 0.63 | 1.16 | 1.31 | 1.07 | 0.49 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.11 | 4.9   |
| 1982  | 0.27 | 0.64 | 1.17 | 1.31 | 1.01 | 0.50 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.0   |
| 1983  | 0.32 | 0.67 | 1.21 | 1.30 | 1.11 | 0.11 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.8   |
| 1984  | 0.03 | 0.68 | 1.00 | 0.95 | 0.98 | 0.37 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 4.1   |
| 1985  | 0.01 | 0.63 | 1.05 | 1.42 | 1.07 | 0.45 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.6   |
| 1986  | 0.22 | 0.57 | 1.27 | 1.45 | 1.06 | 0.64 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.2   |
| 1987  | 0.37 | 0.71 | 1.25 | 1.47 | 1.17 | 0.59 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 5.6   |
| 1988  | 0.29 | 0.71 | 1.28 | 1.45 | 1.03 | 0.47 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.2   |
| 1989  | 0.16 | 0.63 | 1.28 | 1.44 | 0.57 | 0.61 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.13 | 4.8   |
| 1990  | 0.29 | 0.65 | 1.17 | 1.28 | 1.13 | 0.53 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.1   |
| AVE : | 0.21 | 0.59 | 1.17 | 1.22 | 0.98 | 0.47 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 4.7   |
| SD :  | 0.12 | 0.19 | 0.11 | 0.43 | 0.22 | 0.14 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 | 0.9   |

Appendix B6.51

File : 406RQ38.NSI

Units : 10^6xm^3

Descrip. : Diffuse irrigation from rivers in H4H017 sub-catchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 1.11 | 0.12 | 5.18 | 0.00 | 2.78 | 2.39 | 0.08 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 11.7  |
| 1981  | 0.59 | 3.31 | 6.08 | 6.43 | 5.57 | 2.53 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.58 | 25.1  |
| 1982  | 1.41 | 3.38 | 6.18 | 6.43 | 5.32 | 2.61 | 0.59 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 25.9  |
| 1983  | 1.69 | 3.54 | 6.42 | 6.43 | 5.85 | 0.57 | 0.57 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 25.1  |
| 1984  | 0.14 | 3.62 | 5.31 | 5.05 | 5.23 | 1.97 | 0.29 | 0.00 | 0.00 | 0.00 | 0.00 | 0.10 | 21.7  |
| 1985  | 0.05 | 3.41 | 5.65 | 6.43 | 5.76 | 2.44 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 23.8  |
| 1986  | 1.19 | 3.10 | 6.43 | 6.43 | 5.73 | 3.44 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 26.3  |
| 1987  | 1.99 | 3.85 | 6.43 | 6.43 | 5.85 | 3.20 | 0.09 | 0.00 | 0.00 | 0.01 | 0.00 | 0.34 | 28.2  |
| 1988  | 1.59 | 3.85 | 6.43 | 6.43 | 5.61 | 2.58 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 26.5  |
| 1989  | 0.85 | 3.44 | 6.43 | 6.43 | 3.09 | 3.30 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.71 | 24.3  |
| 1990  | 1.60 | 3.55 | 6.38 | 6.43 | 5.85 | 2.88 | 0.51 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 27.2  |
| AVE : | 1.11 | 3.20 | 6.08 | 5.72 | 5.15 | 2.54 | 0.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.16 | 24.2  |
| SD :  | 0.64 | 1.04 | 0.48 | 1.94 | 1.12 | 0.79 | 0.25 | 0.01 | 0.00 | 0.00 | 0.01 | 0.26 | 4.5   |

[illegible]Units :  $10^6 \text{ m}^3$ 

Descrip. : Farm dam

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.06 | 0.00 | 0.36 | 0.00 | 0.38 | 0.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.0   |
| 1981  | 0.06 | 0.25 | 0.60 | 0.69 | 0.60 | 0.24 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 2.5   |
| 1982  | 0.07 | 0.27 | 0.64 | 0.78 | 0.50 | 0.18 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.5   |
| 1983  | 0.12 | 0.32 | 0.71 | 0.78 | 0.66 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.6   |
| 1984  | 0.00 | 0.33 | 0.47 | 0.64 | 0.49 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.0   |
| 1985  | 0.00 | 0.30 | 0.60 | 0.93 | 0.64 | 0.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.7   |
| 1986  | 0.04 | 0.26 | 0.83 | 0.96 | 0.72 | 0.34 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.2   |
| 1987  | 0.15 | 0.38 | 0.81 | 1.02 | 0.81 | 0.34 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.5   |
| 1988  | 0.11 | 0.38 | 0.41 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.9   |
| 1989  | 0.01 | 0.32 | 0.92 | 1.02 | 0.52 | 0.36 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 3.2   |
| 1990  | 0.12 | 0.35 | 0.84 | 0.97 | 0.84 | 0.30 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.4   |
| AVE : | 0.07 | 0.29 | 0.65 | 0.71 | 0.56 | 0.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.5   |
| SD :  | 0.05 | 0.10 | 0.19 | 0.37 | 0.23 | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.9   |

Appendix B6.53

File : 405RQ35.NSI  
Units : 10^6xm^3  
Descrip. : Farm dam irrigation in H4H020 sub-catchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 1.00 | 0.31 | 3.49 | 0.01 | 1.42 | 1.59 | 0.16 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 8.0   |
| 1981  | 0.54 | 2.38 | 3.87 | 4.20 | 3.44 | 1.13 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.57 | 16.1  |
| 1982  | 1.14 | 2.41 | 3.86 | 4.14 | 3.34 | 0.62 | 0.48 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 16.0  |
| 1983  | 1.30 | 2.45 | 3.93 | 4.12 | 3.06 | 0.51 | 0.61 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 16.0  |
| 1984  | 0.42 | 2.46 | 3.27 | 3.18 | 3.13 | 1.40 | 0.33 | 0.00 | 0.00 | 0.00 | 0.00 | 0.25 | 14.4  |
| 1985  | 0.37 | 1.92 | 3.46 | 4.38 | 3.27 | 1.57 | 0.28 | 0.01 | 0.00 | 0.00 | 0.00 | 0.21 | 15.5  |
| 1986  | 1.06 | 2.10 | 3.97 | 4.41 | 3.43 | 1.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 16.6  |
| 1987  | 1.44 | 2.49 | 3.99 | 4.43 | 3.56 | 0.58 | 0.58 | 0.02 | 0.00 | 0.01 | 0.00 | 0.49 | 17.6  |
| 1988  | 1.22 | 2.50 | 3.87 | 3.10 | 0.80 | 0.63 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.27 | 12.4  |
| 1989  | 1.25 | 2.42 | 4.04 | 4.03 | 2.45 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.39 | 14.7  |
| 1990  | 1.20 | 2.47 | 4.06 | 4.14 | 1.28 | 0.11 | 0.18 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 13.4  |
| AVE : | 0.99 | 2.17 | 3.80 | 3.65 | 2.65 | 0.89 | 0.24 | 0.01 | 0.00 | 0.00 | 0.00 | 0.20 | 14.6  |
| SD :  | 0.37 | 0.64 | 0.27 | 1.29 | 1.01 | 0.58 | 0.24 | 0.01 | 0.00 | 0.00 | 0.01 | 0.21 | 2.6   |

Appendix B6.54

File : 406RQ28.NSI  
Units : 10^6xm^3  
Descrip. : Farm dam irrigation in H4H017 sub-catchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.13 | 0.01 | 0.63 | 0.00 | 0.34 | 0.29 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.4   |
| 1981  | 0.07 | 0.40 | 0.73 | 0.83 | 0.67 | 0.31 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.07 | 3.1   |
| 1982  | 0.17 | 0.41 | 0.75 | 0.83 | 0.64 | 0.32 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.2   |
| 1983  | 0.20 | 0.43 | 0.78 | 0.84 | 0.71 | 0.07 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.1   |
| 1984  | 0.02 | 0.44 | 0.64 | 0.61 | 0.63 | 0.24 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 2.6   |
| 1985  | 0.01 | 0.41 | 0.68 | 0.93 | 0.70 | 0.30 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.0   |
| 1986  | 0.14 | 0.38 | 0.83 | 0.95 | 0.70 | 0.42 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.4   |
| 1987  | 0.24 | 0.47 | 0.82 | 0.97 | 0.77 | 0.39 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 3.7   |
| 1988  | 0.19 | 0.47 | 0.85 | 0.96 | 0.68 | 0.31 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.5   |
| 1989  | 0.10 | 0.42 | 0.85 | 0.95 | 0.38 | 0.40 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.09 | 3.2   |
| 1990  | 0.19 | 0.43 | 0.77 | 0.85 | 0.75 | 0.35 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.4   |
| AVE : | 0.13 | 0.39 | 0.76 | 0.79 | 0.63 | 0.31 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 3.1   |
| SD :  | 0.08 | 0.13 | 0.08 | 0.28 | 0.14 | 0.10 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.6   |



Appendix B6.56

File : STTRQ20.NSI  
Units : 10^6xm^3  
Descrip. : Worcester urban demand supplied from Stettynskloof for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.67 | 0.61 | 0.68 | 0.75 | 0.59 | 0.70 | 0.61 | 0.52 | 0.53 | 0.56 | 0.56 | 0.57 | 7.3   |
| 1981  | 0.72 | 0.74 | 0.89 | 0.92 | 0.83 | 0.87 | 0.68 | 0.50 | 0.50 | 0.50 | 0.42 | 0.46 | 8.0   |
| 1982  | 0.63 | 0.77 | 0.81 | 0.84 | 0.76 | 0.68 | 0.60 | 0.49 | 0.44 | 0.34 | 0.46 | 0.43 | 7.3   |
| 1983  | 0.63 | 0.75 | 0.92 | 0.98 | 1.01 | 0.77 | 0.56 | 0.47 | 0.54 | 0.55 | 0.52 | 0.40 | 8.1   |
| 1984  | 0.56 | 0.75 | 0.73 | 0.75 | 0.92 | 0.75 | 0.68 | 0.68 | 0.61 | 0.42 | 0.37 | 0.45 | 7.7   |
| 1985  | 0.55 | 0.69 | 0.64 | 0.79 | 0.92 | 0.65 | 0.54 | 0.53 | 0.30 | 0.33 | 0.26 | 0.37 | 6.6   |
| 1986  | 0.51 | 0.82 | 1.06 | 1.20 | 0.98 | 1.10 | 0.73 | 0.86 | 0.68 | 0.63 | 0.57 | 0.57 | 9.7   |
| 1987  | 0.99 | 1.08 | 1.20 | 1.10 | 0.98 | 0.82 | 0.48 | 0.48 | 0.48 | 0.44 | 0.68 | 0.65 | 9.4   |
| 1988  | 0.90 | 0.95 | 0.97 | 0.90 | 0.92 | 0.73 | 0.62 | 0.53 | 0.46 | 0.47 | 0.56 | 0.71 | 8.7   |
| 1989  | 0.81 | 0.93 | 0.91 | 0.96 | 0.92 | 0.73 | 0.62 | 0.53 | 0.46 | 0.47 | 0.56 | 0.71 | 8.6   |
| 1990  | 0.81 | 0.93 | 0.91 | 0.96 | 0.92 | 0.73 | 0.62 | 0.53 | 0.46 | 0.47 | 0.56 | 0.71 | 8.6   |
| AVE : | 0.71 | 0.82 | 0.88 | 0.92 | 0.89 | 0.78 | 0.61 | 0.56 | 0.50 | 0.47 | 0.50 | 0.55 | 8.2   |
| SD :  | 0.15 | 0.14 | 0.16 | 0.14 | 0.12 | 0.12 | 0.07 | 0.12 | 0.10 | 0.09 | 0.12 | 0.13 | 0.9   |

Appendix B6.57

File : KEERSPIL.NSI  
Units : 10^6xm^3  
Descrip. : Keerom Dam spills for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.00 | 0.00 | 0.00 | 2.30 | 0.82 | 0.00 | 0.00 | 0.00 | 0.00 | 0.53 | 0.90 | 0.91 | 5.5   |
| 1981  | 0.92 | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 | 1.05 | 1.44 | 0.50 | 0.56 | 0.51 | 0.39 | 5.5   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.25 | 0.3   |
| 1983  | 0.31 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.4   |
| 1984  | 0.15 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.2   |
| 1985  | 0.36 | 0.14 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.5   |
| 1986  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1987  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1989  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| AVE : | 0.16 | 0.03 | 0.00 | 0.21 | 0.07 | 0.00 | 0.10 | 0.13 | 0.05 | 0.10 | 0.13 | 0.14 | 1.1   |
| SD :  | 0.29 | 0.05 | 0.01 | 0.69 | 0.25 | 0.00 | 0.32 | 0.43 | 0.15 | 0.22 | 0.30 | 0.29 | 2.2   |



Appendix B6.58

File : OVER.NSI  
Units : 10^6xm^3  
Descrip. : Hex River transfer to Nuy River catchment for 1980 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1980  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.90 | 0.94 | 0.94 | 0.94 | 0.00 | 3.7   |
| 1981  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.94 | 0.94 | 0.94 | 0.94 | 0.00 | 3.8   |
| 1982  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.94 | 0.94 | 0.94 | 0.94 | 0.00 | 3.8   |
| 1983  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.94 | 0.94 | 0.94 | 0.94 | 0.00 | 3.8   |
| 1984  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.94 | 0.94 | 0.94 | 0.94 | 0.00 | 3.8   |
| 1985  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.94 | 0.94 | 0.94 | 0.00 | 2.8   |
| 1986  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.94 | 0.94 | 0.94 | 0.94 | 0.00 | 3.8   |
| 1987  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.94 | 0.94 | 0.94 | 0.94 | 0.00 | 3.8   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.94 | 0.94 | 0.94 | 0.94 | 0.00 | 3.8   |
| 1989  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.94 | 0.94 | 0.94 | 0.94 | 0.00 | 3.8   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.94 | 0.94 | 0.94 | 0.94 | 0.00 | 3.8   |
| AVE : | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.85 | 0.94 | 0.94 | 0.94 | 0.00 | 3.7   |
| SD :  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.3   |

Appendix B6.59

File : H4H017.CAL  
Units : 10^6xm^3  
Descrip. : Incremental simulated flow record at H4H017 for 1981 to 1988

| Year  | Oct   | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May    | Jun    | Jul    | Aug    | Sep    | Total |
|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|-------|
| 1981  | 24.94 | 17.61 | 14.56 | 15.71 | 13.63 | 12.51 | 81.28 | 12.65  | 29.53  | 34.97  | 24.59  | 14.76  | 296.7 |
| 1982  | 24.05 | 17.12 | 17.51 | 15.98 | 15.87 | 16.76 | 12.80 | 19.70  | 165.37 | 184.17 | 18.75  | 99.72  | 607.8 |
| 1983  | 21.71 | 15.08 | 14.67 | 14.82 | 14.62 | 15.37 | 14.80 | 122.34 | 24.64  | 67.63  | 21.31  | 111.83 | 458.8 |
| 1984  | 85.25 | 16.36 | 20.02 | 19.50 | 14.18 | 33.53 | 25.28 | 11.32  | 49.88  | 165.27 | 115.13 | 30.95  | 586.7 |
| 1985  | 40.74 | 16.05 | 14.43 | 15.26 | 14.61 | 13.46 | 20.40 | 23.64  | 52.13  | 55.51  | 162.77 | 54.71  | 483.7 |
| 1986  | 20.96 | 16.06 | 14.56 | 16.96 | 14.45 | 12.19 | 12.44 | 18.92  | 62.47  | 58.97  | 99.57  | 58.73  | 406.3 |
| 1987  | 22.00 | 14.38 | 18.80 | 17.39 | 14.94 | 11.93 | 19.44 | 14.11  | 16.33  | 30.47  | 41.02  | 21.14  | 241.9 |
| 1988  | 21.18 | 13.71 | 16.10 | 17.15 | 14.76 | 23.68 | 38.61 | 17.61  | 65.37  | 88.99  | 108.18 | 71.16  | 496.5 |
| AVE : | 32.60 | 15.80 | 16.33 | 16.60 | 14.63 | 17.43 | 28.13 | 30.03  | 58.21  | 85.75  | 73.91  | 57.88  | 447.3 |
| SD :  | 22.26 | 1.33  | 2.20  | 1.49  | 0.64  | 7.57  | 23.11 | 37.52  | 46.85  | 58.08  | 54.45  | 35.42  | 128.5 |

Appendix B6.60

File : H4H17PAT.OBS  
Units : 10^6xm^3  
Descrip. : Patched incremental observed flow record at H4H017 for 1981 to 1988

| Year  | Oct   | Nov    | Dec   | Jan   | Feb    | Mar    | Apr   | May    | Jun    | Jul    | Aug    | Sep    | Total |
|-------|-------|--------|-------|-------|--------|--------|-------|--------|--------|--------|--------|--------|-------|
| 1981  | 20.04 | 4.71   | 15.74 | 11.91 | 10.90  | 7.27   | 0.00  | 25.89  | 27.47  | 15.72  | 37.63  | 3.33   | 180.6 |
| 1982  | 24.31 | 15.55  | 17.15 | 13.81 | 8.85   | 11.79  | 5.76  | 36.13  | 94.96  | 189.81 | 54.54  | 50.90  | 523.6 |
| 1983  | 13.34 | 12.76  | 14.88 | 13.67 | 14.62* | 59.02* | 4.40  | 118.44 | 5.63   | 140.12 | 42.71  | 110.99 | 550.6 |
| 1984  | 83.61 | 39.75* | 12.15 | 8.06  | 7.30   | 38.12  | 15.47 | 19.98  | 108.78 | 93.44  | 100.73 | 27.36  | 554.8 |
| 1985  | 16.90 | 17.52  | 19.34 | 14.00 | 11.80  | 8.41   | 7.74  | 10.38  | 33.85  | 98.69  | 166.25 | 80.34  | 485.2 |
| 1986  | 17.00 | 14.20  | 14.01 | 10.67 | 12.64  | 11.12  | 2.50  | 32.86  | 68.21  | 71.43  | 126.96 | 72.73  | 454.3 |
| 1987  | 26.18 | 13.55  | 12.11 | 13.73 | 13.87  | 9.86   | 9.50  | 17.31  | 25.62  | 32.39  | 0.80   | 92.75  | 267.7 |
| 1988  | 21.39 | 11.30  | 13.36 | 14.96 | 10.38  | 0.00   | 18.49 | 25.61  | 28.73  | 48.62  | 85.61  | 120.60 | 399.1 |
| AVE : | 27.85 | 16.17  | 14.84 | 12.60 | 11.30  | 18.20  | 7.98  | 35.83  | 49.16  | 86.28  | 76.91  | 69.87  | 427.0 |
| SD :  | 22.91 | 10.25  | 2.51  | 2.27  | 2.47   | 19.89  | 6.33  | 34.39  | 37.01  | 57.75  | 53.63  | 40.53  | 137.3 |

## Appendix B6.61

File : H4H17S-0.NAT

Units : 10<sup>6</sup>xm<sup>3</sup>

Descrip. : Incremental naturalised flow record at H4H017 for 1925 to 1990

| Year  | Oct    | Nov   | Dec  | Jan    | Feb   | Mar   | Apr   | May    | Jun    | Jul    | Aug    | Sep    | Total  |
|-------|--------|-------|------|--------|-------|-------|-------|--------|--------|--------|--------|--------|--------|
| 1925  | 2.46   | 1.43  | 0.54 | 0.13   | 0.10  | 0.08  | 0.04  | 8.19   | 9.06   | 29.66  | 28.40  | 5.77   | 85.9   |
| 1926  | 45.66  | 2.55  | 0.81 | 0.17   | 0.13  | 0.03  | 0.39  | 2.28   | 20.36  | 15.38  | 80.82  | 7.27   | 175.9  |
| 1927  | 2.62   | 1.80  | 0.82 | 0.30   | 0.11  | 0.14  | 0.15  | 0.09   | 49.12  | 39.89  | 30.86  | 35.69  | 161.6  |
| 1928  | 3.20   | 1.65  | 0.81 | 0.24   | 0.05  | 0.19  | 3.22  | 8.96   | 32.02  | 101.87 | 96.81  | 5.38   | 254.4  |
| 1929  | 2.90   | 1.24  | 0.44 | 0.30   | 1.90  | 0.69  | 0.39  | 0.32   | 0.42   | 4.62   | 23.35  | 55.13  | 91.7   |
| 1930  | 3.48   | 1.62  | 0.59 | 0.15   | 0.06  | 0.04  | 5.76  | 7.82   | 3.70   | 35.49  | 111.93 | 52.98  | 223.6  |
| 1931  | 29.66  | 2.92  | 0.95 | 0.30   | 2.58  | 0.59  | 0.29  | 6.61   | 25.72  | 56.66  | 25.91  | 31.27  | 183.5  |
| 1932  | 3.81   | 1.64  | 0.55 | 0.19   | 0.08  | 0.09  | 0.11  | 2.12   | 104.90 | 189.88 | 84.56  | 6.74   | 394.7  |
| 1933  | 3.95   | 1.75  | 0.69 | 0.28   | 0.15  | 0.15  | 0.10  | 1.89   | 12.71  | 21.63  | 45.17  | 46.29  | 134.8  |
| 1934  | 24.09  | 3.31  | 1.02 | 0.23   | 0.07  | 0.06  | 1.17  | 16.24  | 34.53  | 47.22  | 40.72  | 21.68  | 190.3  |
| 1935  | 3.33   | 1.85  | 0.71 | 0.30   | 0.15  | 0.06  | 0.06  | 1.19   | 1.27   | 45.18  | 64.58  | 25.39  | 144.1  |
| 1936  | 3.64   | 3.74  | 3.58 | 0.93   | 0.27  | 0.39  | 1.02  | 15.04  | 101.25 | 111.92 | 10.69  | 6.19   | 258.7  |
| 1937  | 3.16   | 1.34  | 0.43 | 0.23   | 0.12  | 0.07  | 0.83  | 7.13   | 11.65  | 22.94  | 32.74  | 29.82  | 110.5  |
| 1938  | 2.67   | 1.41  | 0.57 | 0.25   | 0.65  | 0.46  | 0.67  | 18.10  | 6.40   | 14.40  | 71.45  | 17.03  | 134.1  |
| 1939  | 3.26   | 1.49  | 0.57 | 0.18   | 0.25  | 0.15  | 2.35  | 8.70   | 45.38  | 29.72  | 10.70  | 9.54   | 112.3  |
| 1940  | 2.00   | 3.65  | 0.85 | 0.45   | 0.23  | 0.09  | 7.10  | 124.20 | 243.36 | 127.44 | 91.83  | 197.16 | 798.4  |
| 1941  | 14.19  | 3.29  | 1.04 | 0.34   | 0.14  | 0.05  | 0.01  | 10.81  | 211.26 | 18.55  | 49.77  | 4.79   | 314.2  |
| 1942  | 3.16   | 1.44  | 0.64 | 0.56   | 0.29  | 1.11  | 0.83  | 0.91   | 15.16  | 63.79  | 86.01  | 41.13  | 215.0  |
| 1943  | 4.92   | 2.87  | 1.13 | 0.26   | 0.07  | 0.06  | 0.13  | 3.01   | 86.27  | 44.41  | 82.68  | 31.67  | 257.5  |
| 1944  | 7.23   | 2.55  | 0.88 | 0.24   | 0.06  | 0.00  | 0.26  | 38.50  | 194.61 | 308.60 | 169.73 | 6.61   | 729.3  |
| 1945  | 8.91   | 3.02  | 0.88 | 0.21   | 0.06  | 0.07  | 0.16  | 0.70   | 0.84   | 9.23   | 34.83  | 84.86  | 143.8  |
| 1946  | 9.40   | 1.82  | 0.51 | 0.12   | 0.00  | 0.64  | 0.37  | 1.62   | 4.63   | 100.77 | 41.34  | 4.14   | 165.4  |
| 1947  | 4.17   | 1.46  | 0.48 | 0.14   | 0.06  | 2.01  | 0.64  | 4.64   | 18.00  | 67.39  | 14.32  | 126.60 | 239.9  |
| 1948  | 28.11  | 2.84  | 0.78 | 0.20   | 0.01  | 0.00  | 0.43  | 0.84   | 5.25   | 41.16  | 58.99  | 39.74  | 178.4  |
| 1949  | 8.12   | 15.79 | 1.81 | 0.39   | 0.08  | 0.00  | 2.38  | 0.68   | 0.81   | 106.83 | 4.29   | 63.54  | 204.7  |
| 1950  | 7.59   | 6.80  | 1.77 | 1.52   | 0.61  | 0.18  | 6.70  | 1.92   | 114.66 | 80.13  | 22.25  | 44.41  | 288.5  |
| 1951  | 4.33   | 2.74  | 0.95 | 0.21   | 0.11  | 0.10  | 0.17  | 14.41  | 27.01  | 84.57  | 189.27 | 127.85 | 451.7  |
| 1952  | 5.57   | 26.00 | 2.07 | 0.53   | 0.17  | 0.09  | 38.78 | 68.64  | 15.65  | 109.37 | 47.90  | 4.57   | 319.3  |
| 1953  | 3.35   | 2.25  | 0.94 | 0.27   | 0.11  | 0.21  | 0.88  | 116.63 | 106.18 | 315.60 | 209.65 | 13.03  | 769.1  |
| 1954  | 6.17   | 2.39  | 0.80 | 0.25   | 25.20 | 1.36  | 0.86  | 0.88   | 25.92  | 136.91 | 330.19 | 7.96   | 538.9  |
| 1955  | 18.86  | 3.62  | 1.12 | 0.33   | 0.16  | 0.11  | 0.12  | 7.69   | 96.99  | 89.48  | 112.45 | 13.63  | 344.6  |
| 1956  | 4.72   | 1.83  | 0.71 | 0.27   | 2.04  | 0.79  | 0.84  | 100.04 | 266.12 | 252.79 | 188.83 | 18.34  | 837.3  |
| 1957  | 35.54  | 2.81  | 0.71 | 0.15   | 0.14  | 0.23  | 0.44  | 22.05  | 31.62  | 3.35   | 67.32  | 5.06   | 169.4  |
| 1958  | 10.59  | 2.37  | 0.83 | 0.23   | 0.24  | 0.22  | 7.65  | 182.74 | 5.86   | 12.44  | 83.52  | 6.58   | 313.3  |
| 1959  | 27.65  | 2.84  | 0.78 | 0.22   | 0.08  | 0.06  | 0.11  | 2.33   | 64.18  | 16.18  | 4.26   | 5.57   | 124.3  |
| 1960  | 2.33   | 1.10  | 0.44 | 0.27   | 0.15  | 0.12  | 0.24  | 0.91   | 15.57  | 25.93  | 50.11  | 73.92  | 171.1  |
| 1961  | 4.32   | 1.86  | 0.47 | 0.21   | 0.19  | 0.21  | 1.17  | 0.94   | 211.90 | 89.55  | 393.14 | 10.68  | 714.6  |
| 1962  | 104.47 | 4.37  | 1.39 | 0.42   | 0.17  | 0.07  | 0.97  | 0.45   | 1.42   | 58.24  | 133.74 | 6.20   | 311.0  |
| 1963  | 3.15   | 1.70  | 0.80 | 0.29   | 0.65  | 0.25  | 0.32  | 1.09   | 68.79  | 50.64  | 97.92  | 12.54  | 238.1  |
| 1964  | 4.36   | 7.09  | 1.61 | 0.43   | 0.28  | 2.32  | 3.83  | 30.25  | 17.98  | 30.70  | 28.20  | 6.10   | 133.2  |
| 1965  | 2.74   | 1.61  | 0.90 | 0.34   | 0.09  | 1.23  | 0.48  | 0.76   | 33.17  | 72.41  | 54.11  | 21.68  | 189.5  |
| 1966  | 3.61   | 1.38  | 0.36 | 0.10   | 0.01  | 0.00  | 5.11  | 5.54   | 97.63  | 32.66  | 25.80  | 8.11   | 180.3  |
| 1967  | 5.61   | 2.13  | 0.91 | 0.28   | 0.11  | 0.07  | 0.97  | 22.04  | 84.87  | 125.51 | 104.24 | 4.86   | 351.6  |
| 1968  | 35.07  | 2.78  | 0.95 | 0.30   | 0.13  | 0.08  | 1.11  | 0.70   | 3.52   | 15.05  | 26.24  | 46.35  | 132.3  |
| 1969  | 28.24  | 1.95  | 0.51 | 0.12   | 0.10  | 0.08  | 0.04  | 4.21   | 43.48  | 78.23  | 103.41 | 15.03  | 275.4  |
| 1970  | 4.63   | 2.01  | 0.70 | 0.19   | 0.05  | 0.12  | 0.19  | 0.87   | 4.58   | 66.49  | 110.88 | 5.97   | 196.7  |
| 1971  | 3.41   | 1.41  | 0.46 | 0.22   | 0.15  | 0.11  | 1.61  | 16.48  | 22.47  | 20.39  | 23.42  | 16.99  | 107.1  |
| 1972  | 2.72   | 1.12  | 0.36 | 0.14   | 0.05  | 0.03  | 0.05  | 0.15   | 0.26   | 86.33  | 43.25  | 24.29  | 158.8  |
| 1973  | 3.03   | 1.35  | 0.54 | 0.19   | 0.09  | 0.10  | 0.09  | 3.64   | 53.94  | 46.26  | 726.25 | 29.47  | 865.0  |
| 1974  | 25.97  | 3.37  | 1.02 | 0.29   | 0.13  | 0.06  | 0.50  | 73.32  | 35.82  | 94.44  | 105.34 | 4.96   | 345.2  |
| 1975  | 6.44   | 1.96  | 0.58 | 0.25   | 0.17  | 0.55  | 0.72  | 1.04   | 160.71 | 130.77 | 33.59  | 9.32   | 346.1  |
| 1976  | 3.99   | 32.03 | 2.67 | 0.97   | 0.57  | 0.37  | 16.16 | 227.35 | 227.95 | 312.49 | 346.71 | 14.00  | 1185.3 |
| 1977  | 4.37   | 2.08  | 1.43 | 0.60   | 0.19  | 0.24  | 0.41  | 0.60   | 0.67   | 0.91   | 76.22  | 21.19  | 108.9  |
| 1978  | 5.87   | 1.45  | 0.94 | 0.46   | 1.52  | 0.52  | 0.27  | 4.77   | 58.37  | 52.43  | 61.90  | 43.46  | 232.0  |
| 1979  | 14.59  | 1.99  | 0.54 | 0.17   | 0.12  | 0.08  | 0.29  | 8.58   | 39.14  | 23.25  | 58.75  | 11.15  | 158.6  |
| 1980  | 5.68   | 19.24 | 2.36 | 170.18 | 3.19  | 1.78  | 2.87  | 1.66   | 4.59   | 98.14  | 126.16 | 115.25 | 551.1  |
| 1981  | 4.22   | 0.00  | 3.48 | 0.00   | 0.00  | 0.00  | 0.00  | 18.36  | 35.28  | 36.99  | 44.21  | 0.00   | 142.5  |
| 1982  | 4.29   | 1.32  | 1.47 | 0.00   | 0.00  | 0.00  | 0.00  | 73.37  | 87.22  | 223.09 | 58.06  | 46.87  | 495.7  |
| 1983  | 0.00   | 0.66  | 2.04 | 0.41   | 0.00  | 45.71 | 0.00  | 157.08 | 30.22  | 144.05 | 43.97  | 153.03 | 577.2  |
| 1984  | 57.44  | 28.25 | 0.00 | 0.00   | 0.00  | 13.00 | 0.00  | 14.16  | 127.85 | 132.34 | 103.88 | 21.66  | 498.6  |
| 1985  | 1.75   | 6.02  | 7.32 | 0.64   | 0.00  | 0.00  | 0.00  | 0.00   | 40.28  | 111.02 | 213.18 | 55.80  | 436.0  |
| 1986  | 2.31   | 2.12  | 1.82 | 0.00   | 0.00  | 0.00  | 0.00  | 37.24  | 72.49  | 70.81  | 174.97 | 48.84  | 410.6  |
| 1987  | 9.61   | 2.32  | 0.00 | 0.00   | 0.18  | 0.00  | 0.00  | 7.92   | 30.71  | 30.54  | 67.83  | 90.89  | 240.0  |
| 1988  | 3.56   | 0.23  | 0.00 | 0.00   | 0.00  | 0.00  | 6.47  | 28.34  | 39.28  | 66.88  | 107.84 | 140.80 | 393.4  |
| 1989  | 15.71  | 2.95  | 0.88 | 0.22   | 0.31  | 0.27  | 10.93 | 28.85  | 118.60 | 140.81 | 40.38  | 5.04   | 365.0  |
| 1990  | 3.00   | 1.44  | 0.62 | 0.28   | 0.11  | 0.10  | 0.26  | 4.17   | 85.15  | 302.97 | 23.31  | 63.78  | 485.2  |
| AVE : | 11.04  | 3.96  | 1.07 | 2.86   | 0.69  | 1.18  | 2.11  | 23.98  | 58.28  | 83.72  | 94.77  | 35.33  | 319.0  |
| SD :  | 16.39  | 6.21  | 1.05 | 20.91  | 3.12  | 5.80  | 5.41  | 45.64  | 65.71  | 77.52  | 110.89 | 41.23  | 224.8  |

## Appendix B6.62

File : H4H17CUM.PRS

Units : 10^6x^3

Descrip. : Cumulative Present Day (2000) Flow at H4H017 for 1927 to 1990

| Year  | Oct    | Nov    | Dec   | Jan    | Feb   | Mar   | Apr    | May    | Jun    | Jul    | Aug     | Sep    | Total  |
|-------|--------|--------|-------|--------|-------|-------|--------|--------|--------|--------|---------|--------|--------|
| 1927  | 26.17  | 35.82  | 21.56 | 19.47  | 13.80 | 3.64  | 2.87   | 1.55   | 144.75 | 35.14  | 55.68   | 56.09  | 416.5  |
| 1928  | 32.24  | 24.16  | 23.37 | 20.48  | 15.82 | 13.52 | 30.91  | 38.50  | 44.09  | 140.39 | 133.54  | 36.01  | 553.0  |
| 1929  | 28.99  | 21.41  | 22.27 | 21.14  | 28.90 | 18.68 | 12.17  | 11.53  | 12.40  | 23.05  | 45.68   | 106.06 | 352.3  |
| 1930  | 42.86  | 23.76  | 21.02 | 18.70  | 2.38  | 1.46  | 48.09  | 58.08  | 26.12  | 57.26  | 220.13  | 95.52  | 615.4  |
| 1931  | 84.02  | 26.47  | 22.77 | 21.06  | 92.50 | 21.26 | 11.55  | 52.52  | 56.91  | 83.52  | 55.90   | 62.59  | 591.1  |
| 1932  | 40.33  | 21.64  | 21.43 | 19.77  | 16.36 | 13.51 | 10.53  | 26.50  | 144.25 | 253.64 | 128.86  | 44.63  | 741.5  |
| 1933  | 39.32  | 22.29  | 21.88 | 20.60  | 16.31 | 15.08 | 10.40  | 29.58  | 30.96  | 36.61  | 64.56   | 82.65  | 390.2  |
| 1934  | 109.89 | 42.88  | 23.71 | 20.15  | 16.27 | 13.87 | 24.54  | 38.71  | 38.39  | 91.72  | 95.97   | 60.84  | 576.9  |
| 1935  | 33.99  | 24.20  | 20.87 | 21.58  | 16.15 | 13.21 | 10.20  | 26.49  | 14.87  | 43.01  | 98.62   | 78.77  | 402.0  |
| 1936  | 43.41  | 35.28  | 38.58 | 21.91  | 16.90 | 28.27 | 22.46  | 42.27  | 151.57 | 233.30 | 69.94   | 34.84  | 738.7  |
| 1937  | 30.84  | 21.89  | 21.36 | 27.61  | 16.21 | 13.41 | 34.34  | 72.53  | 35.07  | 45.79  | 61.20   | 61.58  | 441.8  |
| 1938  | 37.51  | 22.76  | 21.07 | 19.77  | 28.70 | 17.66 | 15.58  | 54.31  | 22.63  | 33.08  | 118.68  | 57.77  | 449.5  |
| 1939  | 33.23  | 22.09  | 21.33 | 15.93  | 4.63  | 3.17  | 31.47  | 13.96  | 67.36  | 46.36  | 34.03   | 31.10  | 324.7  |
| 1940  | 29.80  | 35.02  | 18.34 | 8.29   | 3.13  | 1.73  | 65.06  | 207.93 | 334.54 | 161.96 | 157.64  | 349.73 | 1373.2 |
| 1941  | 95.36  | 31.72  | 23.26 | 21.82  | 16.61 | 13.25 | 10.16  | 89.42  | 450.99 | 74.73  | 84.12   | 31.06  | 942.5  |
| 1942  | 31.28  | 21.74  | 24.14 | 24.46  | 17.34 | 21.63 | 21.74  | 20.66  | 50.78  | 134.89 | 191.25  | 132.85 | 692.8  |
| 1943  | 58.09  | 38.00  | 23.63 | 21.48  | 16.23 | 13.58 | 13.00  | 66.97  | 244.94 | 81.37  | 147.67  | 71.44  | 796.4  |
| 1944  | 50.54  | 29.93  | 23.37 | 20.95  | 16.22 | 13.17 | 14.05  | 137.23 | 318.23 | 458.95 | 303.72  | 45.34  | 1431.7 |
| 1945  | 48.66  | 27.97  | 22.78 | 21.07  | 16.34 | 13.60 | 15.84  | 17.91  | 16.26  | 26.91  | 56.17   | 160.31 | 443.8  |
| 1946  | 68.66  | 23.49  | 20.78 | 19.09  | 16.01 | 20.02 | 11.64  | 17.96  | 17.78  | 156.14 | 69.18   | 31.18  | 471.9  |
| 1947  | 37.01  | 21.90  | 20.61 | 18.93  | 16.08 | 30.13 | 19.80  | 59.30  | 40.25  | 124.79 | 47.66   | 164.19 | 600.7  |
| 1948  | 85.79  | 26.72  | 22.24 | 20.31  | 15.74 | 12.74 | 17.38  | 18.84  | 36.18  | 64.96  | 94.19   | 75.32  | 490.4  |
| 1949  | 75.05  | 67.05  | 27.45 | 20.86  | 16.41 | 13.10 | 71.65  | 4.08   | 7.64   | 179.45 | 35.70   | 98.30  | 616.7  |
| 1950  | 50.86  | 55.09  | 25.95 | 24.64  | 12.91 | 2.28  | 54.80  | 13.27  | 187.19 | 115.21 | 67.99   | 60.84  | 671.0  |
| 1951  | 44.04  | 41.53  | 22.03 | 20.08  | 16.63 | 13.46 | 11.32  | 91.32  | 47.80  | 121.50 | 297.88  | 162.39 | 890.0  |
| 1952  | 48.72  | 88.44  | 27.05 | 21.74  | 16.74 | 13.27 | 181.21 | 133.37 | 44.54  | 194.65 | 106.45  | 33.21  | 909.4  |
| 1953  | 31.35  | 27.32  | 22.88 | 20.92  | 16.34 | 14.02 | 47.79  | 219.50 | 128.83 | 533.96 | 396.75  | 72.56  | 1532.2 |
| 1954  | 49.22  | 24.08  | 25.56 | 21.83  | 63.13 | 19.02 | 13.94  | 12.94  | 73.37  | 210.63 | 574.82  | 63.46  | 1152.0 |
| 1955  | 89.54  | 40.31  | 23.01 | 21.71  | 16.80 | 13.71 | 10.98  | 37.91  | 126.03 | 139.15 | 204.50  | 40.12  | 763.8  |
| 1956  | 34.44  | 20.77  | 21.82 | 20.68  | 57.49 | 17.04 | 12.83  | 170.26 | 430.69 | 485.63 | 345.31  | 82.32  | 1699.3 |
| 1957  | 144.24 | 27.64  | 22.83 | 21.48  | 21.52 | 13.62 | 10.77  | 65.12  | 38.36  | 22.85  | 64.80   | 28.14  | 481.4  |
| 1958  | 41.42  | 23.59  | 21.20 | 19.37  | 16.42 | 13.26 | 71.75  | 368.35 | 48.81  | 28.92  | 112.16  | 37.88  | 803.1  |
| 1959  | 90.53  | 25.34  | 21.85 | 20.11  | 16.09 | 14.10 | 14.18  | 61.78  | 121.47 | 37.10  | 26.96   | 23.16  | 472.7  |
| 1960  | 26.34  | 19.06  | 20.47 | 17.11  | 2.38  | 1.89  | 3.85   | 19.48  | 43.34  | 50.48  | 95.39   | 135.16 | 435.0  |
| 1961  | 49.07  | 22.90  | 20.96 | 19.35  | 17.98 | 8.85  | 17.05  | 6.01   | 413.36 | 151.01 | 516.30  | 77.94  | 1320.8 |
| 1962  | 242.34 | 41.68  | 24.14 | 21.74  | 16.58 | 13.24 | 10.29  | 11.32  | 35.88  | 81.33  | 286.83  | 63.01  | 848.4  |
| 1963  | 34.74  | 27.60  | 24.51 | 20.22  | 27.37 | 14.32 | 13.93  | 25.39  | 124.23 | 87.25  | 184.08  | 46.85  | 630.5  |
| 1964  | 53.83  | 42.35  | 25.00 | 23.09  | 18.62 | 31.14 | 36.42  | 48.13  | 36.58  | 38.91  | 67.83   | 33.67  | 455.6  |
| 1965  | 36.66  | 22.45  | 22.59 | 18.80  | 12.77 | 15.98 | 11.75  | 8.03   | 59.67  | 153.51 | 63.34   | 43.59  | 469.1  |
| 1966  | 31.84  | 20.38  | 21.07 | 19.70  | 15.13 | 12.58 | 42.60  | 35.34  | 228.06 | 64.77  | 57.51   | 35.99  | 585.0  |
| 1967  | 60.74  | 29.16  | 22.45 | 22.62  | 16.47 | 12.72 | 27.77  | 124.02 | 97.92  | 181.93 | 152.18  | 35.34  | 783.3  |
| 1968  | 163.54 | 27.43  | 23.53 | 25.27  | 16.85 | 12.95 | 23.67  | 23.46  | 30.12  | 34.70  | 56.01   | 68.27  | 505.8  |
| 1969  | 94.49  | 24.20  | 20.77 | 18.29  | 15.41 | 2.27  | 3.59   | 36.79  | 106.02 | 114.78 | 168.83  | 77.48  | 682.9  |
| 1970  | 44.37  | 26.30  | 25.45 | 20.03  | 15.71 | 14.55 | 13.39  | 21.22  | 28.81  | 106.98 | 134.63  | 37.78  | 489.2  |
| 1971  | 29.57  | 20.32  | 20.82 | 19.25  | 16.53 | 12.75 | 10.19  | 39.89  | 41.22  | 31.54  | 52.97   | 49.34  | 344.4  |
| 1972  | 31.67  | 7.60   | 8.67  | 4.20   | 1.78  | 7.59  | 2.50   | 7.05   | 8.58   | 194.47 | 79.01   | 48.41  | 401.5  |
| 1973  | 45.68  | 23.65  | 30.30 | 19.42  | 7.58  | 1.62  | 2.09   | 12.44  | 96.22  | 55.42  | 1173.62 | 128.50 | 1596.5 |
| 1974  | 88.33  | 34.09  | 26.19 | 22.57  | 16.72 | 13.46 | 30.70  | 134.90 | 60.99  | 121.11 | 145.45  | 33.28  | 727.8  |
| 1975  | 59.11  | 25.66  | 21.41 | 19.72  | 15.99 | 13.44 | 12.68  | 17.05  | 319.10 | 182.27 | 55.14   | 31.79  | 773.4  |
| 1976  | 32.40  | 175.68 | 63.43 | 40.67  | 18.71 | 15.87 | 52.94  | 405.41 | 422.00 | 667.16 | 671.21  | 85.17  | 2650.6 |
| 1977  | 47.96  | 25.92  | 31.42 | 22.07  | 16.64 | 14.20 | 27.91  | 45.51  | 18.95  | 15.94  | 81.23   | 68.36  | 416.1  |
| 1978  | 40.42  | 23.58  | 21.50 | 19.40  | 5.95  | 4.52  | 4.69   | 34.20  | 103.03 | 57.13  | 78.60   | 62.69  | 455.7  |
| 1979  | 100.38 | 23.32  | 20.93 | 22.15  | 16.31 | 12.94 | 27.65  | 48.19  | 37.60  | 34.47  | 52.09   | 27.03  | 423.1  |
| 1980  | 34.27  | 111.13 | 41.59 | 187.88 | 12.44 | 5.15  | 11.47  | 10.57  | 22.49  | 117.55 | 162.86  | 184.89 | 902.3  |
| 1981  | 43.74  | 28.34  | 22.30 | 22.61  | 16.33 | 13.78 | 69.76  | 51.83  | 56.35  | 41.58  | 70.58   | 23.52  | 460.7  |
| 1982  | 48.03  | 23.46  | 27.89 | 4.96   | 5.34  | 7.07  | 4.25   | 131.50 | 221.83 | 370.65 | 119.27  | 98.34  | 1062.6 |
| 1983  | 29.45  | 21.41  | 22.72 | 20.29  | 15.79 | 63.17 | 16.55  | 351.50 | 71.34  | 199.70 | 90.61   | 325.79 | 1228.3 |
| 1984  | 143.96 | 50.20  | 34.26 | 29.89  | 19.78 | 65.89 | 34.50  | 45.53  | 162.82 | 235.37 | 276.93  | 77.67  | 1176.8 |
| 1985  | 36.40  | 28.36  | 27.60 | 22.00  | 17.08 | 17.07 | 40.46  | 63.66  | 66.01  | 163.89 | 347.31  | 118.83 | 948.7  |
| 1986  | 31.86  | 21.75  | 21.51 | 24.83  | 16.04 | 14.11 | 18.68  | 129.40 | 131.79 | 117.93 | 255.17  | 100.92 | 884.0  |
| 1987  | 42.62  | 21.08  | 28.80 | 20.55  | 15.73 | 13.96 | 39.64  | 56.54  | 94.01  | 76.72  | 86.11   | 159.80 | 655.6  |
| 1988  | 37.52  | 22.37  | 20.55 | 19.45  | 16.67 | 34.36 | 34.75  | 53.34  | 51.10  | 103.01 | 172.82  | 302.94 | 868.9  |
| 1989  | 80.27  | 33.39  | 22.23 | 21.15  | 17.69 | 13.64 | 104.37 | 75.48  | 143.47 | 292.73 | 127.03  | 30.85  | 962.3  |
| 1990  | 26.75  | 19.68  | 22.27 | 19.45  | 15.48 | 13.55 | 12.79  | 49.40  | 150.39 | 522.59 | 111.26  | 184.09 | 1147.7 |
| AVE : | 57.12  | 32.61  | 24.21 | 23.23  | 17.95 | 15.03 | 26.84  | 68.80  | 109.96 | 142.87 | 165.00  | 83.90  | 767.5  |
| SD :  | 38.34  | 24.08  | 6.73  | 21.42  | 13.38 | 11.17 | 28.22  | 83.62  | 113.16 | 137.46 | 182.80  | 68.56  | 410.7  |

## APPENDIX B 7.1

SUB-CATCHMENT : H6H005  
RIVER : Bavians  
PLACE : Genadendal

### 1 CATCHMENT

|                     | YEAR  |       |       |       |       |       | UNITS           |
|---------------------|-------|-------|-------|-------|-------|-------|-----------------|
|                     | 1960  | 1975  | 1976  | 1982  | 1999  | 2000  |                 |
| SUB-CATCHMENT AREAS | 24.50 | 24.50 | 24.50 | 24.50 | 24.50 | 24.50 | km <sup>2</sup> |

### 2 LANDUSE

|                     | YEAR           |      |       |       |       |       | UNITS           |
|---------------------|----------------|------|-------|-------|-------|-------|-----------------|
|                     | 1964           | 1975 | 1976  | 1982  | 1999  | 2000  |                 |
| ALIEN VEGETATION    |                |      |       |       |       |       |                 |
| tall trees upland   | 2.76           | 5.26 | 9.02  | 10.91 | 11.07 | 10.72 | km <sup>2</sup> |
| tall trees riparian | 2.16           | 4.13 | 7.09  | 8.57  | 8.70  | 8.42  | km <sup>2</sup> |
| Total               | 4.92           | 9.39 | 16.11 | 19.48 | 19.77 | 19.14 | km <sup>2</sup> |
| FARM DAM CAPACITIES | not applicable |      |       |       |       |       | Mm <sup>3</sup> |
| IRRIGATION AREAS    | not applicable |      |       |       |       |       | km <sup>2</sup> |
| Total               |                |      |       |       |       |       |                 |

### 3 EVAPORATION

|                       | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) | 121  | 142  | 208  | 215  | 150  | 140  | 140  | 74   | 60   | 70   | 76   | 95   | 1491      |
| S-PAN (gross) (in mm) | 90   | 108  | 167  | 173  | 116  | 107  | 107  | 49   | 37   | 46   | 51   | 67   | 1118      |
| LAKE FACTOR           | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)    | 73   | 89   | 139  | 145  | 102  | 94   | 94   | 43   | 31   | 38   | 41   | 54   | 944       |

**Note : evaporation from CCWR database used for this sub-catchment**

### 4 RESERVOIR SIMULATIONS

not applicable

### 5. IRRIGATION ROUTINE

not applicable

### 6. NOTES

catchment MAP = 1005 mm

## Appendix B7.2

File : H6H5.OBS  
Units : 10^6xm^3  
Descrip. : Observed flow record at H6H005 for 1963 to 1997

| Year | Oct     | Nov     | Dec     | Jan     | Feb     | Mar     | Apr     | May     | Jun     | Jul     | Aug     | Sep     | Total    |
|------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|
| 1963 | 0.75    | 0.70    | 0.23    | 0.17    | 0.20    | 0.90    | 0.52    | 0.28    | 1.46    | 0.64    | 1.32    | 1.34    | 8.5      |
| 1964 | 0.94    | 0.90    | 0.31    | 0.19    | 0.18    | 0.24    | 0.22    | 0.34    | 0.52    | 2.01    | 0.74    | 0.56    | 7.2      |
| 1965 | 1.72    | 3.12    | 0.63    | 0.44    | 0.21    | 0.14    | 0.15    | 0.15    | 0.16    | 0.28    | 1.25    | 0.98    | 9.2      |
| 1966 | 0.20    | 0.11    | 0.11    | 0.09    | 0.10    | 0.18    | 1.10    | 1.42    | 1.71    | 0.74    | 0.33    | 0.11*   | 6.2      |
| 1967 | -999.00 | -999.00 | 0.08*   | 0.10    | 0.09    | 0.24    | 0.18    | 0.84    | 1.26    | 0.85    | 1.05    | 1.04    | -1992.3  |
| 1968 | 0.82    | 0.83    | 0.40    | 0.16*   | 0.58*   | 0.68    | 1.71    | 1.62    | 2.41    | 2.83    | 0.76*   | 0.00    | 12.8     |
| 1969 | 0.00    | 0.00    | 0.00    | 0.00    | 0.00    | 0.00    | 0.00*   | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -4995.0  |
| 1970 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | 2.08*   | 9.03    | 12.20   | 11.30   | 8.68    | -6949.7  |
| 1971 | 8.13    | 9.63    | 7.44*   | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -8965.8  |
| 1972 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -11988.0 |
| 1973 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -11988.0 |
| 1974 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | 0.10*   | 0.31    | 0.60*   | 1.17    | 0.59    | -6990.2  |
| 1975 | 0.10*   | 0.26    | 0.15*   | 0.08    | 0.07    | 0.12    | 0.17    | 0.57    | 1.59    | 1.36    | 0.97    | 0.39    | 5.8      |
| 1976 | 1.19*   | 1.51*   | 0.33    | 0.14    | 0.20    | 0.17    | 0.36    | 1.21    | 1.12    | 1.91    | 2.29    | 0.74    | 11.2     |
| 1977 | 0.38    | 0.51    | 1.03    | 0.41    | 0.13    | 0.13    | 0.21    | 0.18    | 0.16    | 0.30    | 1.12    | 1.03    | 5.6      |
| 1978 | 1.08    | 0.33    | 1.25    | 0.24    | 0.16    | 0.32    | 0.23    | 0.85    | 0.99    | 0.85    | 0.82    | 1.10    | 8.2      |
| 1979 | 0.51    | 0.22    | 0.11    | 0.14    | 0.13    | 0.10    | 0.13    | 0.15    | 0.42    | 0.36    | 0.47    | 0.59    | 3.3      |
| 1980 | 0.38    | 0.30    | 0.75    | -999.00 | 0.82*   | 0.56    | 1.06    | 1.53    | 1.85    | 4.06    | 5.34    | 6.33    | -976.0   |
| 1981 | 4.69    | 3.94    | 4.19    | 4.00    | 1.53*   | 0.04*   | -999.00 | 0.71    | 0.47    | 0.80    | 0.37    | 1.48    | -976.8   |
| 1982 | 0.30    | 0.19    | 0.15    | 0.13    | 0.13    | 0.16    | 0.13    | 0.86    | 1.15    | 2.06    | 0.74    | 1.36    | 7.4      |
| 1983 | 0.96    | 0.22    | 0.15    | 0.14    | 0.16    | 0.21    | 0.16    | 0.82    | 0.37    | 0.44    | 0.43    | 1.14    | 5.2      |
| 1984 | 1.08    | 0.60    | 0.32    | 0.44    | 0.82    | 0.37    | 0.24    | 0.18    | 0.46    | -999.00 | 0.97    | 0.24    | -993.3   |
| 1985 | -999.00 | 1.54    | 1.00    | 0.25    | 0.17    | 0.18    | 0.19    | 0.15    | 0.30    | 0.46    | -999.00 | 1.14    | -1992.6  |
| 1986 | 0.79    | 0.43    | 0.17    | 0.11    | 0.08    | 0.10    | 0.36    | 0.22    | 0.56    | 0.59    | 0.76    | 0.73    | 4.9      |
| 1987 | 0.50    | 0.06    | 0.06    | 0.05    | 0.05    | 0.08    | 0.36    | 0.14    | 0.77    | 0.38    | 0.56    | 0.96    | 4.0      |
| 1988 | 0.63    | 0.11    | 0.07    | 0.05    | 0.05    | 0.16    | -999.00 | 0.39    | 1.19    | 0.92    | 1.31    | 1.55    | -992.6   |
| 1989 | 1.71    | -999.00 | 0.32    | 0.14    | 0.24    | 0.21    | 0.65    | 1.32    | 1.39    | 1.84    | 0.51    | 0.51    | -990.2   |
| 1990 | 0.43    | 0.20    | 0.16    | 0.09    | 0.09    | 0.06    | 0.07    | 0.11    | 0.58    | -999.00 | 0.94    | 0.66    | -995.6   |
| 1991 | -999.00 | 0.95    | 0.17    | 0.09*   | 0.06    | 0.04    | 0.19    | 0.23    | 0.86    | -999.00 | 0.55    | 0.39    | -1994.5  |
| 1992 | 1.41    | 0.38    | 0.04    | 0.03    | 0.01    | 0.03    | -999.00 | 0.48    | 1.13    | 1.94    | 1.05    | 0.33    | -992.2   |
| 1993 | 0.09    | 0.11    | 0.24    | 0.06    | 0.08*   | 0.03*   | 0.10    | 0.15    | -999.00 | 1.22    | 1.57    | 0.64    | -994.7   |
| 1994 | 0.41    | 0.06    | 0.14    | 0.15*   | -999.00 | -999.00 | 0.58*   | 0.87    | 0.71    | 0.44    | 0.79    | 0.10    | -1993.8  |
| 1995 | 0.13    | 0.29    | 1.52    | 0.17    | 0.03    | 0.04    | 0.01    | 0.02    | 0.61    | 1.28    | 0.56    | 0.43    | 5.1      |
| 1996 | 2.55    | 2.45    | 0.39    | 0.14    | 0.06    | 0.06    | 0.10    | 0.74    | 0.81*   | 0.58    | 0.80    | 0.45    | 9.1      |
| 1997 | 0.15    | 0.20    | 0.06    | 0.31    | 0.09    | 0.11    | 0.86    | 1.39    | 0.23    | 0.26    | 0.17    | 0.08    | 3.9      |
| AVE  | -198.89 | -170.40 | -113.54 | -171.01 | -171.07 | -171.10 | -228.06 | -113.60 | -141.73 | -198.59 | -141.54 | -113.15 | -1932.7  |
| SD   | 405.90  | 382.40  | 322.71  | 382.12  | 382.09  | 382.08  | 425.78  | 322.69  | 355.09  | 406.05  | 355.17  | 322.86  | 3355.9   |

## Average Rainfall On Catchment H6H005.ra

details of rainfall stations used

007183\_7.pat 1968 to 1998

022539\_X.pat 1924 to 1998

|          |        | rainfall input as percent m.a.p. |       |        |       |       |       |        |       |        |        |       |        |         |
|----------|--------|----------------------------------|-------|--------|-------|-------|-------|--------|-------|--------|--------|-------|--------|---------|
| no.      | gauges | oct                              | nov   | dec    | jan   | feb   | mar   | apr    | may   | jun    | jul    | aug   | sep    | year    |
| 1924     | 1      | 6.01                             | 6.62  | .00    | 4.38  | 1.74  | .00   | 1.26   | 2.83  | 40.25  | 13.16  | 6.54  | 5.28   | 88.07   |
| 1925     | 1      | 7.75                             | 7.13  | .00    | .93   | 2.83  | 1.37  | 1.50   | 12.18 | 10.12  | 17.89  | 9.80  | 6.07   | 77.58   |
| 1926     | 1      | 13.91                            | 3.58  | .00    | .66   | .58   | 1.18  | 5.68   | 9.34  | 13.72  | 3.49   | 20.49 | 3.72   | 76.34   |
| 1927     | 1      | .82                              | 11.46 | 4.40   | 4.67  | .00   | 3.68  | .00    | .90   | 26.27  | 12.41  | 15.14 | 13.59  | 93.31   |
| 1928     | 1      | .61                              | 6.79  | 4.40   | .00   | 1.26  | 1.74  | 8.17   | 8.12  | 7.91   | 20.40  | 16.29 | 2.56   | 78.25   |
| 1929     | 1      | 1.71                             | 5.08  | 3.92   | 3.90  | 6.28  | 5.24  | 1.87   | 2.45  | 7.03   | 3.61   | 21.61 | 22.96  | 85.67   |
| 1930     | 1      | 1.45                             | 5.92  | 1.29   | 3.34  | 3.90  | 1.21  | 21.41  | 5.52  | 2.93   | 12.42  | 17.79 | 10.84  | 88.02   |
| 1931     | 1      | 19.49                            | .00   | 2.56   | 6.33  | 9.50  | 3.09  | .00    | 9.86  | 9.42   | 15.79  | 2.53  | 18.03  | 96.59   |
| 1932     | 1      | 6.31                             | 6.00  | 4.83   | 2.11  | 1.63  | 2.70  | 2.48   | 11.17 | 28.47  | 25.27  | 10.93 | 5.24   | 107.16  |
| 1933     | 1      | 1.18                             | 2.37  | 3.69   | .21   | 2.99  | 1.55  | .98    | 9.91  | 17.38  | 8.92   | 9.64  | 12.21  | 71.03   |
| 1934     | 1      | 9.94                             | 3.57  | .00    | .77   | 3.37# | 2.93  | 11.67  | 16.98 | 10.28  | 8.30   | 4.84  | 4.64   | 77.28   |
| 1935     | 1      | 1.60                             | 10.81 | .45    | 6.79  | 1.07  | 4.01  | 1.34   | 11.94 | 7.02   | 23.66  | 19.07 | 10.06  | 97.82   |
| 1936     | 1      | 4.62                             | 17.11 | 12.76  | 1.50  | 1.76  | 5.32  | 4.88   | 9.54  | 25.53  | 21.81  | 2.03  | 9.03   | 115.89  |
| 1937     | 1      | 3.01                             | 2.77  | 1.26   | 2.03  | 1.47  | 5.16  | 11.51  | 8.63  | 5.96   | 6.81   | 12.61 | 14.60  | 75.82   |
| 1938     | 1      | 5.85                             | 2.37  | 3.33   | .24   | 4.96  | 7.88  | 7.21   | 11.49 | 3.90+  | 6.55   | 15.78 | 4.38   | 73.94   |
| 1939     | 1      | .53                              | 2.24  | 1.68   | .21   | 8.89  | 4.14  | 21.28  | 7.10  | 21.34  | 9.30   | 3.01  | 4.73   | 84.44   |
| 1940     | 1      | 3.82                             | 13.56 | 1.68   | 7.56  | 1.49  | .77   | 17.78  | 20.13 | 27.69  | 16.87  | 19.57 | 25.98  | 156.88  |
| 1941     | 1      | 10.12                            | 3.09  | 4.76   | 3.34  | 1.95  | 4.06  | 2.93   | 17.92 | 42.51  | 4.43   | 13.96 | 3.85   | 112.91  |
| 1942     | 1      | 5.07                             | .00   | 7.93   | 10.70 | 5.47  | 8.65  | 3.53   | 8.70  | 20.96+ | 19.47  | 20.64 | 10.52  | 121.63  |
| 1943     | 1      | 5.80                             | 7.51  | 1.93   | .00   | .32   | 3.21  | 3.82   | 10.95 | 32.09  | 3.72   | 17.30 | 12.95  | 99.61   |
| 1944     | 1      | 3.92                             | 2.41  | 2.40   | .00   | .00   | .56   | 7.51   | 24.75 | 24.73  | 38.70  | 22.43 | 1.95   | 129.36  |
| 1945     | 1      | 13.32                            | 2.85  | .24    | .66   | 2.96  | 5.04  | 1.87   | 6.86  | 4.24   | 8.39   | 5.84  | 20.13  | 72.37   |
| 1946     | 1      | 4.40                             | .00   | 1.45   | .00   | .00   | 8.86  | 2.85   | 8.76  | 3.93   | 22.72  | 8.33  | 7.02   | 68.31   |
| 1947     | 1      | 2.57                             | 3.74  | 1.42   | 1.90  | 1.10  | 10.23 | 6.38   | 13.16 | 6.73   | 16.83  | 3.60  | 25.96  | 93.63   |
| 1948     | 1      | 7.75                             | .82   | 2.03   | .90   | .29   | .00   | 11.09  | 8.28  | 8.65   | 10.09  | 15.16 | 12.97  | 78.01   |
| 1949     | 1      | 7.71                             | 13.83 | 1.87   | 1.79  | .00   | .42   | 13.03  | 2.27  | 4.12   | 34.74  | 2.80  | 21.23  | 103.80  |
| 1950     | 1      | 7.18                             | 14.32 | 4.70   | 8.39  | .00   | 1.42  | 9.94   | 5.45  | 32.74  | 12.98  | 10.54 | 18.83  | 126.50  |
| 1951     | 1      | 5.60                             | 12.87 | .56    | .00   | 1.37  | .85   | 3.64   | 24.24 | 6.62   | 15.76  | 24.46 | 16.45  | 112.42  |
| 1952     | 1      | 8.74                             | 17.95 | 3.90   | .40+  | 1.36+ | .56   | 26.99  | 17.04 | 5.84   | 19.33  | 11.88 | 2.77   | 116.75  |
| 1953     | 1      | 6.46                             | 8.46  | 2.00   | .67   | 3.10  | 6.55  | 7.13   | 29.96 | 17.67  | 40.49  | 31.06 | 8.31   | 161.87  |
| 1954     | 1      | 5.47                             | 1.84  | 3.95   | .64   | 29.59 | .88   | 6.25   | 5.44  | 18.93  | 17.83  | 36.05 | 4.96   | 131.81  |
| 1955     | 1      | 16.83                            | 7.67  | 1.04   | 4.96  | 3.63  | 1.60  | 1.97   | 13.67 | 22.14  | 10.31  | 11.99 | 3.68   | 99.49   |
| 1956     | 1      | 6.68                             | 1.87  | 5.92   | .00   | 7.47  | 4.92  | 2.88   | 34.37 | 31.57  | 23.42  | 20.81 | 6.79   | 146.71  |
| 1957     | 1      | 10.60                            | .00   | .00    | .00   | 5.36  | 5.92  | 3.60   | 18.38 | 13.11  | 1.04   | 22.33 | 3.60   | 83.93   |
| 1958     | 1      | 6.73                             | 1.60  | .00    | 5.12  | 2.88  | 3.52  | 19.06  | 29.37 | 3.87   | 6.23   | 18.82 | 4.56   | 101.74  |
| 1959     | 1      | 10.47                            | .64   | 2.08   | 3.20  | .48   | 2.64  | 3.20   | 9.40  | 17.67  | 6.55   | 1.60  | 9.56   | 67.48   |
| 1960     | 1      | 2.32                             | 2.40  | 1.84   | 6.03  | 1.60  | 3.36  | 4.72   | 7.91  | 10.15  | 8.27   | 8.55  | 21.73  | 78.86   |
| 1961     | 1      | 4.67                             | .00   | .00    | 4.32  | 1.28  | 4.24  | 13.09  | 4.72  | 32.29  | 12.23  | 48.66 | 3.95   | 129.44  |
| 1962     | 1      | 25.05                            | 10.23 | 1.97   | 1.84  | .64   | 1.12  | 1.89   | 5.12  | 8.70   | 13.25  | 25.66 | 1.04   | 96.50   |
| 1963     | 1      | 4.08                             | 3.60  | 3.76   | 1.95  | 4.96  | 2.72  | 6.47   | 5.44  | 28.46  | 13.76  | 18.72 | 7.43   | 101.34  |
| 1964     | 1      | 2.80                             | 7.27  | .00    | 1.12  | 4.24  | 7.51  | 9.03   | 12.39 | 8.63   | 8.01   | 10.55 | 4.88   | 76.43   |
| 1965     | 1      | 12.71                            | 6.31  | 9.21   | .00   | .32   | 6.04  | 4.12   | 5.87  | 22.94  | 14.23  | 12.31 | 7.99   | 102.06  |
| 1966     | 1      | 2.80                             | .56   | .00    | .00   | .00   | .00   | 7.67   | 11.03 | 18.06  | 11.75  | 10.95 | 2.80   | 65.63   |
| 1967     | 1      | 6.23                             | 6.68  | 1.28   | .88   | 2.24  | .37   | 5.88   | 14.04 | 19.73  | 15.14  | 11.41 | 3.79   | 87.67   |
| 1968     | 2      | 10.07                            | 7.02  | 1.33   | 4.11  | 5.18  | 2.80  | 10.68  | 1.18  | 10.00  | 5.95   | 6.79  | 7.79   | 72.88   |
| 1969     | 2      | 9.76                             | 2.24  | 1.46   | 3.30  | 8.27  | 1.60  | .60    | 6.26  | 12.72  | 14.27  | 17.33 | 3.97   | 81.79   |
| 1970     | 2      | 8.30                             | 1.74  | 5.28   | 1.49  | 5.88  | 5.58  | 8.35   | 11.43 | 11.47  | 21.56  | 17.25 | 3.17   | 101.50  |
| 1971     | 2      | 4.90                             | 7.41# | 8.31   | 6.18  | 5.86  | 2.89  | 11.23  | 12.44 | 11.99  | 7.28   | 11.57 | 7.12   | 97.17   |
| 1972     | 2      | 2.70                             | 2.94  | .88    | .86   | .64   | 1.32  | 3.35   | 3.31  | 2.53   | 12.64  | 6.80  | 5.60   | 43.56   |
| 1973     | 2      | 1.44                             | 3.31  | 2.62   | 5.21  | 6.85  | 5.26  | .81    | 12.53 | 8.63   | 5.04   | 44.86 | 9.81   | 106.36  |
| 1974     | 2      | 5.57                             | 2.29  | .53    | 8.70  | 2.84  | .94   | 3.87   | 18.19 | 5.52   | 12.41  | 15.92 | 4.69   | 81.48   |
| 1975     | 2      | 6.06                             | 5.09  | 3.79   | .09   | 3.42  | 10.24 | 6.39   | 7.70  | 26.07  | 12.26  | 6.99  | 6.19   | 94.28   |
| 1976     | 2      | 9.33                             | 17.89 | 5.56   | 1.97  | 7.89  | 8.01  | 12.09+ | 23.12 | 14.25  | 22.28  | 21.57 | 5.50   | 149.47  |
| 1977     | 2      | 1.94                             | 7.64  | 9.84   | 7.74  | 2.02  | 4.40  | 5.61   | 3.39  | 4.96   | 6.71   | 18.37 | 7.33   | 79.93   |
| 1978     | 2      | 5.58                             | 3.65  | 7.70   | 4.98  | 12.04 | .64   | .27    | 11.40 | 15.76  | 12.30  | 8.97  | 9.01*  | 92.29   |
| 1979     | 2      | 8.79                             | 1.09  | 1.70   | 4.58  | 1.85  | .49   | 4.08   | 11.04 | 11.64  | 4.47   | 8.57  | 6.08+  | 64.37   |
| 1980     | 2      | 10.51                            | 15.16 | 8.87   | 30.55 | 7.92  | 7.44  | 11.49  | 2.91  | 5.13   | 19.72  | 18.11 | 16.79  | 154.61  |
| 1981     | 2      | 6.77                             | 2.16  | 4.98   | 1.44  | 2.56  | 5.93  | 22.43  | 2.56  | 15.36  | 7.08   | 10.02 | 6.32   | 87.59   |
| 1982     | 2      | 4.43                             | 1.91  | 3.50   | 2.72  | 8.04  | 4.38  | 2.52   | 18.15 | 19.51  | 19.14  | 6.62  | 11.41  | 102.33  |
| 1983     | 2      | 3.78*                            | 2.34  | .83    | 4.18  | 4.30  | 7.53  | 7.29   | 26.64 | 4.26*  | 13.75* | 3.84  | 16.37* | 95.12   |
| 1984     | 2      | 16.51                            | 3.63  | 10.01* | 10.57 | 10.10 | 10.64 | 9.73   | 2.07  | 11.69  | 24.45  | 10.81 | 3.48   | 123.70  |
| 1985     | 2      | 24.27                            | 5.52  | 12.06  | 3.19  | 7.45  | 8.61  | 6.61   | 2.57  | 11.90  | 8.96   | 25.62 | 5.80   | 122.55  |
| 1986     | 2      | 8.33                             | 6.15  | 1.13   | 1.60  | 4.44  | 3.85  | 15.86  | 14.51 | 10.69  | 5.48   | 16.47 | 10.20  | 98.72   |
| 1987     | 2      | 2.66                             | .81   | 3.57   | .39+  | 1.91+ | 6.55+ | 9.00+  | 5.76  | 10.97  | 6.45   | 14.99 | 6.62   | 69.68   |
| 1988     | 2      | 5.56                             | 2.07  | 3.19   | 2.91  | 2.24  | 12.29 | 24.15  | 4.30  | 11.71  | 12.41  | 12.24 | 8.73   | 101.80  |
| 1989     | 2      | 16.48                            | 8.90  | 2.06   | 3.40  | 8.14  | 3.72  | 11.69  | 12.75 | 17.51  | 8.02   | 10.42 | 3.80   | 106.90  |
| 1990     | 2      | 6.62                             | 6.15  | 4.38   | 4.42  | 3.40  | 3.21  | 5.12   | 10.11 | 17.66  | 26.83  | 3.98  | 9.41   | 101.29  |
| 1991     | 2      | 17.06                            | 2.13  | 7.43   | 2.82  | 4.74  | 3.12  | 9.60   | 10.37 | 19.24  | 15.37  | 10.81 | 5.53   | 108.23  |
| 1992     | 2      | 18.30                            | 4.53  | .13    | 2.03  | 7.72  | 2.67  | 33.00  | 8.10  | 11.80  | 31.23  | 8.43  | 4.30   | 132.24  |
| 1993     | 2      | .79                              | 5.51  | 14.71  | 3.38  | 7.54  | 2.69  | 9.43   | 8.12  | 27.83  | 9.76   | 9.32  | 9.43   | 108.52  |
| 1994     | 2      | 7.46                             | .35   | 15.72  | 5.23  | 3.33  | 8.68  | 11.52  | 16.65 | 10.19  | 13.19  | 12.14 | 2.98   | 107.44  |
| 1995     | 2      | 12.44                            | 13.27 | 17.92  | 3.39  | 5.00  | 6.73  | 2.61   | 7.47  | 22.99  | 21.13  | 10.57 | 10.73  | 134.24  |
| 1996     | 2      | 18.98                            | 15.96 | 4.40   | 1.75  | 2.80  | 3.91  | 6.38   | 16.54 | 20.61  | 4.89   | 10.49 | 1.41   | 108.13  |
| 1997     | 2      | 6.66                             | 10.20 | 2.88   | 7.72  | 5.49  | 6.96  | 10.61  | 21.04 | 5.93   | 8.58   | 7.60  | 2.20   | 95.86   |
| 1998     | 2      | 2.70                             | 15.17 | 27.14  | 5.09  | 1.95  | 5.17  | 7.80   | 19.61 | 8.18   | 6.64   | 13.55 | 7.74+  | 120.76  |
| average  |        | 7.46                             | 5.73  | 4.09   | 3.34  | 3.98  | 4.07  | 7.92   | 11.28 | 15.08  | 13.82  | 14.07 | 8.57   | 99.40   |
| adjusted |        | 7.50                             | 5.77  | 4.11   | 3.36  | 4.00  | 4.10  | 7.96   | 11.34 | 15.17  | 13.91  | 14.15 | 8.63   | 100.001 |



Appendix B7.4

File : H6H5-US1.MON

Units : 10<sup>6</sup>xm<sup>3</sup>

Descrip. : Upland alien demand (tall trees) in H6H005 sub-catchment for 1972 to 1997

| Year  | Oct   | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul  | Aug  | Sep   | Total |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|-------|-------|
| 1972  | 0.08  | 0.06  | 0.04* | 0.02* | 0.01* | 0.01* | 0.01* | 0.01* | 0.01* | 0.07 | 0.05 | 0.04* | 0.4   |
| 1973  | 0.04* | 0.03* | 0.02* | 0.01* | 0.02* | 0.02* | 0.01* | 0.07  | 0.06  | 0.05 | 0.79 | 0.35  | 1.5   |
| 1974  | 0.09  | 0.07  | 0.04  | 0.04  | 0.03* | 0.01* | 0.01* | 0.19  | 0.09  | 0.10 | 0.21 | 0.12  | 1.0   |
| 1975  | 0.07  | 0.07  | 0.05  | 0.03* | 0.01* | 0.04  | 0.04* | 0.04* | 0.41  | 0.24 | 0.11 | 0.09  | 1.2   |
| 1976  | 0.17  | 0.46  | 0.23  | 0.08  | 0.07  | 0.07  | 0.15  | 0.62  | 0.46  | 0.70 | 0.91 | 0.40  | 4.3   |
| 1977  | 0.18  | 0.15  | 0.15  | 0.11  | 0.07  | 0.05  | 0.04  | 0.04  | 0.05  | 0.07 | 0.42 | 0.23  | 1.6   |
| 1978  | 0.13  | 0.11  | 0.09  | 0.06  | 0.15  | 0.08  | 0.04* | 0.11  | 0.32  | 0.28 | 0.20 | 0.20  | 1.8   |
| 1979  | 0.21  | 0.15  | 0.09  | 0.05  | 0.04* | 0.02* | 0.02* | 0.09  | 0.16  | 0.11 | 0.12 | 0.12  | 1.2   |
| 1980  | 0.19  | 0.38  | 0.23  | 1.03  | 0.42  | 0.11  | 0.19  | 0.13  | 0.09  | 0.54 | 0.66 | 0.62  | 4.6   |
| 1981  | 0.33  | 0.18  | 0.12  | 0.07  | 0.04  | 0.04* | 0.60  | 0.25  | 0.32  | 0.19 | 0.19 | 0.18  | 2.5   |
| 1982  | 0.15  | 0.12  | 0.08  | 0.05  | 0.05  | 0.05  | 0.04* | 0.42  | 0.65  | 0.71 | 0.33 | 0.29  | 2.9   |
| 1983  | 0.22  | 0.15  | 0.09  | 0.05  | 0.04* | 0.05  | 0.06  | 0.85  | 0.36  | 0.30 | 0.20 | 0.46  | 2.8   |
| 1984  | 0.58  | 0.28  | 0.19  | 0.19  | 0.17  | 0.18  | 0.17  | 0.11  | 0.21  | 0.87 | 0.50 | 0.23  | 3.7   |
| 1985  | 0.88  | 0.42  | 0.26  | 0.14  | 0.09  | 0.10  | 0.09  | 0.07  | 0.19  | 0.18 | 0.91 | 0.44  | 3.8   |
| 1986  | 0.21  | 0.18  | 0.11  | 0.06  | 0.04  | 0.04* | 0.31  | 0.36  | 0.25  | 0.16 | 0.46 | 0.36  | 2.5   |
| 1987  | 0.21  | 0.14  | 0.09  | 0.05  | 0.03* | 0.03* | 0.07  | 0.06  | 0.15  | 0.13 | 0.36 | 0.24  | 1.6   |
| 1988  | 0.16  | 0.13  | 0.08  | 0.05  | 0.04* | 0.15  | 0.76  | 0.30  | 0.19  | 0.30 | 0.34 | 0.28  | 2.8   |
| 1989  | 0.54  | 0.35  | 0.17  | 0.09  | 0.08  | 0.06  | 0.15  | 0.25  | 0.52  | 0.30 | 0.27 | 0.22  | 3.0   |
| 1990  | 0.19  | 0.16  | 0.11  | 0.07  | 0.05  | 0.04  | 0.04* | 0.10  | 0.45  | 1.05 | 0.44 | 0.22  | 2.9   |
| 1991  | 0.54  | 0.28  | 0.13  | 0.08  | 0.05  | 0.04  | 0.09  | 0.13  | 0.55  | 0.54 | 0.36 | 0.24  | 3.0   |
| 1992  | 0.60  | 0.33  | 0.13  | 0.07  | 0.06  | 0.05  | 1.14  | 0.46  | 0.22  | 1.21 | 0.58 | 0.23  | 5.1   |
| 1993  | 0.17  | 0.13  | 0.32  | 0.15  | 0.07  | 0.06  | 0.09  | 0.10  | 0.95  | 0.48 | 0.25 | 0.27  | 3.0   |
| 1994  | 0.24  | 0.17  | 0.38  | 0.18  | 0.07  | 0.08  | 0.17  | 0.44  | 0.30  | 0.36 | 0.39 | 0.27  | 3.1   |
| 1995  | 0.34  | 0.40  | 0.60  | 0.25  | 0.09  | 0.07  | 0.06  | 0.07  | 0.70  | 0.87 | 0.44 | 0.32  | 4.2   |
| 1996  | 0.69  | 0.66  | 0.28  | 0.11  | 0.06  | 0.05  | 0.05  | 0.36  | 0.70  | 0.31 | 0.23 | 0.18  | 3.7   |
| 1997  | 0.15  | 0.19  | 0.13  | 0.09  | 0.07  | 0.07  | 0.13  | 0.63  | 0.30  | 0.17 | 0.19 | 0.17  | 2.3   |
| AVE : | 0.28  | 0.22  | 0.16  | 0.12  | 0.07  | 0.06  | 0.17  | 0.24  | 0.33  | 0.40 | 0.38 | 0.26  | 2.7   |
| SD :  | 0.22  | 0.15  | 0.13  | 0.19  | 0.08  | 0.04  | 0.26  | 0.22  | 0.24  | 0.32 | 0.23 | 0.13  | 1.2   |

## Appendix B7.5

File : H6H5-US2.MON

Units : 10^6xm^3

Descrip. : Upland alien demand (tall shrubs) in H6H005 sub-catchment for 1972 to 1997

| Year  | Oct   | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul  | Aug  | Sep   | Total |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|-------|-------|
| 1972  | 0.00  | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00 | 0.00 | 0.00* | 0.0   |
| 1973  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00 | 0.04 | 0.02  | 0.1   |
| 1974  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00* | 0.00* | 0.00* | 0.01  | 0.00  | 0.01 | 0.01 | 0.01  | 0.0   |
| 1975  | 0.00  | 0.00  | 0.00  | 0.00* | 0.00* | 0.00  | 0.00* | 0.00* | 0.02  | 0.01 | 0.01 | 0.00  | 0.0   |
| 1976  | 0.01  | 0.03  | 0.01  | 0.00  | 0.00  | 0.00  | 0.01  | 0.04  | 0.03  | 0.04 | 0.05 | 0.02  | 0.2   |
| 1977  | 0.01  | 0.01  | 0.01  | 0.01  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.02 | 0.01  | 0.1   |
| 1978  | 0.01  | 0.01  | 0.01  | 0.00  | 0.01  | 0.00  | 0.00* | 0.01  | 0.02  | 0.02 | 0.01 | 0.01  | 0.1   |
| 1979  | 0.01  | 0.01  | 0.00  | 0.00  | 0.00* | 0.00* | 0.00* | 0.00  | 0.01  | 0.01 | 0.01 | 0.01  | 0.1   |
| 1980  | 0.01  | 0.02  | 0.01  | 0.06  | 0.02  | 0.01  | 0.01  | 0.01  | 0.01  | 0.03 | 0.04 | 0.04  | 0.3   |
| 1981  | 0.02  | 0.01  | 0.01  | 0.00  | 0.00  | 0.00* | 0.03  | 0.01  | 0.02  | 0.01 | 0.01 | 0.01  | 0.1   |
| 1982  | 0.01  | 0.01  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00* | 0.02  | 0.04  | 0.04 | 0.02 | 0.02  | 0.2   |
| 1983  | 0.01  | 0.01  | 0.00  | 0.00  | 0.00* | 0.00  | 0.00  | 0.05  | 0.02  | 0.02 | 0.01 | 0.03  | 0.2   |
| 1984  | 0.03  | 0.02  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.05 | 0.03 | 0.01  | 0.2   |
| 1985  | 0.05  | 0.02  | 0.02  | 0.01  | 0.00  | 0.01  | 0.01  | 0.00  | 0.01  | 0.01 | 0.05 | 0.03  | 0.2   |
| 1986  | 0.01  | 0.01  | 0.01  | 0.00  | 0.00* | 0.00* | 0.02  | 0.02  | 0.01  | 0.01 | 0.03 | 0.02  | 0.1   |
| 1987  | 0.01  | 0.01  | 0.00  | 0.00  | 0.00* | 0.00* | 0.00  | 0.00  | 0.01  | 0.01 | 0.02 | 0.01  | 0.1   |
| 1988  | 0.01  | 0.01  | 0.00  | 0.00  | 0.00* | 0.01  | 0.04  | 0.02  | 0.01  | 0.02 | 0.02 | 0.02  | 0.2   |
| 1989  | 0.03  | 0.02  | 0.01  | 0.00  | 0.00  | 0.00  | 0.01  | 0.01  | 0.03  | 0.02 | 0.02 | 0.01  | 0.2   |
| 1990  | 0.01  | 0.01  | 0.01  | 0.00  | 0.00  | 0.00* | 0.00* | 0.01  | 0.03  | 0.06 | 0.02 | 0.01  | 0.2   |
| 1991  | 0.03  | 0.02  | 0.01  | 0.00  | 0.00  | 0.00  | 0.00  | 0.01  | 0.03  | 0.03 | 0.02 | 0.01  | 0.2   |
| 1992  | 0.03  | 0.02  | 0.01  | 0.00  | 0.00  | 0.00  | 0.07  | 0.03  | 0.01  | 0.07 | 0.03 | 0.01  | 0.3   |
| 1993  | 0.01  | 0.01  | 0.02  | 0.01  | 0.00  | 0.00  | 0.01  | 0.01  | 0.06  | 0.03 | 0.01 | 0.02  | 0.2   |
| 1994  | 0.01  | 0.01  | 0.02  | 0.01  | 0.00  | 0.00  | 0.01  | 0.03  | 0.02  | 0.02 | 0.02 | 0.02  | 0.2   |
| 1995  | 0.02  | 0.02  | 0.03  | 0.01  | 0.00  | 0.00  | 0.00  | 0.00  | 0.04  | 0.05 | 0.03 | 0.02  | 0.2   |
| 1996  | 0.04  | 0.04  | 0.02  | 0.01  | 0.00  | 0.00  | 0.00  | 0.02  | 0.04  | 0.02 | 0.01 | 0.01  | 0.2   |
| 1997  | 0.01  | 0.01  | 0.01  | 0.00  | 0.00  | 0.00  | 0.01  | 0.04  | 0.02  | 0.01 | 0.01 | 0.01  | 0.1   |
| AVE : | 0.02  | 0.01  | 0.01  | 0.01  | 0.00  | 0.00  | 0.01  | 0.01  | 0.02  | 0.02 | 0.02 | 0.02  | 0.1   |
| SD :  | 0.01  | 0.01  | 0.01  | 0.01  | 0.00  | 0.00  | 0.02  | 0.01  | 0.01  | 0.02 | 0.01 | 0.01  | 0.1   |

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File      : GENAD.MON
Units     : 10^6xm^3
Descrip.  : Genadendal domestic abstraction for 1972 to 1997
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[illegible]

Appendix B7.7

File : H6H005.SIM  
Units : 10^6xm^3  
Descrip. : Simulated flow record at H6H005 for 1960 to 1998

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1960  | 0.18 | 0.15 | 0.10 | 0.08 | 0.06 | 0.05 | 0.05 | 0.12 | 0.32 | 0.36 | 0.43 | 2.17 | 4.1   |
| 1961  | 1.06 | 0.36 | 0.19 | 0.10 | 0.07 | 0.06 | 0.51 | 0.26 | 3.40 | 1.77 | 6.25 | 2.54 | 16.6  |
| 1962  | 2.83 | 1.55 | 0.55 | 0.24 | 0.13 | 0.07 | 0.05 | 0.06 | 0.16 | 0.68 | 2.72 | 1.13 | 10.2  |
| 1963  | 0.32 | 0.26 | 0.17 | 0.10 | 0.08 | 0.07 | 0.08 | 0.10 | 2.79 | 1.72 | 1.88 | 1.02 | 8.6   |
| 1964  | 0.55 | 0.45 | 0.28 | 0.13 | 0.08 | 0.12 | 0.21 | 0.56 | 0.47 | 0.45 | 0.68 | 0.56 | 4.6   |
| 1965  | 0.91 | 0.64 | 0.49 | 0.26 | 0.12 | 0.09 | 0.08 | 0.11 | 1.99 | 1.48 | 0.99 | 0.73 | 7.9   |
| 1966  | 0.52 | 0.36 | 0.18 | 0.08 | 0.04 | 0.02 | 0.06 | 0.28 | 1.33 | 0.95 | 0.73 | 0.52 | 5.1   |
| 1967  | 0.43 | 0.39 | 0.24 | 0.13 | 0.06 | 0.04 | 0.05 | 0.63 | 1.68 | 1.47 | 0.97 | 0.61 | 6.7   |
| 1968  | 0.65 | 0.55 | 0.32 | 0.16 | 0.12 | 0.10 | 0.30 | 0.17 | 0.30 | 0.28 | 0.30 | 0.39 | 3.6   |
| 1969  | 0.52 | 0.39 | 0.20 | 0.11 | 0.14 | 0.11 | 0.06 | 0.07 | 0.49 | 0.93 | 1.55 | 0.77 | 5.3   |
| 1970  | 0.51 | 0.39 | 0.24 | 0.13 | 0.10 | 0.10 | 0.16 | 0.45 | 0.61 | 2.06 | 2.06 | 0.94 | 7.8   |
| 1971  | 0.52 | 0.47 | 0.41 | 0.28 | 0.18 | 0.14 | 0.39 | 0.65 | 0.74 | 0.56 | 0.80 | 0.69 | 5.8   |
| 1972  | 0.52 | 0.38 | 0.20 | 0.10 | 0.05 | 0.03 | 0.03 | 0.03 | 0.04 | 0.43 | 0.30 | 0.20 | 2.3   |
| 1973  | 0.18 | 0.14 | 0.10 | 0.08 | 0.09 | 0.09 | 0.08 | 0.45 | 0.36 | 0.26 | 5.04 | 2.19 | 9.1   |
| 1974  | 0.57 | 0.41 | 0.23 | 0.21 | 0.13 | 0.08 | 0.05 | 1.17 | 0.52 | 0.59 | 1.25 | 0.69 | 5.9   |
| 1975  | 0.43 | 0.36 | 0.24 | 0.13 | 0.07 | 0.22 | 0.16 | 0.17 | 2.38 | 1.42 | 0.60 | 0.53 | 6.8   |
| 1976  | 0.55 | 1.35 | 0.65 | 0.21 | 0.17 | 0.19 | 0.45 | 1.83 | 1.33 | 2.06 | 2.69 | 1.16 | 12.6  |
| 1977  | 0.49 | 0.41 | 0.41 | 0.30 | 0.16 | 0.11 | 0.10 | 0.10 | 0.11 | 0.16 | 1.17 | 0.65 | 4.2   |
| 1978  | 0.31 | 0.24 | 0.21 | 0.13 | 0.36 | 0.18 | 0.05 | 0.26 | 0.82 | 0.73 | 0.52 | 0.50 | 4.3   |
| 1979  | 0.51 | 0.36 | 0.19 | 0.09 | 0.04 | 0.02 | 0.02 | 0.22 | 0.38 | 0.24 | 0.27 | 0.27 | 2.6   |
| 1980  | 0.43 | 0.90 | 0.53 | 2.51 | 1.01 | 0.24 | 0.42 | 0.27 | 0.20 | 1.32 | 1.60 | 1.51 | 11.0  |
| 1981  | 0.77 | 0.40 | 0.24 | 0.12 | 0.06 | 0.04 | 1.42 | 0.55 | 0.71 | 0.44 | 0.42 | 0.39 | 5.6   |
| 1982  | 0.32 | 0.23 | 0.14 | 0.06 | 0.09 | 0.06 | 0.03 | 0.93 | 1.45 | 1.59 | 0.70 | 0.62 | 6.2   |
| 1983  | 0.47 | 0.29 | 0.16 | 0.07 | 0.03 | 0.07 | 0.10 | 1.91 | 0.77 | 0.63 | 0.43 | 0.99 | 5.9   |
| 1984  | 1.31 | 0.60 | 0.39 | 0.39 | 0.34 | 0.37 | 0.36 | 0.23 | 0.43 | 1.93 | 1.11 | 0.51 | 8.0   |
| 1985  | 1.96 | 0.92 | 0.56 | 0.29 | 0.16 | 0.19 | 0.16 | 0.14 | 0.39 | 0.38 | 2.02 | 0.97 | 8.2   |
| 1986  | 0.46 | 0.37 | 0.23 | 0.10 | 0.05 | 0.03 | 0.66 | 0.79 | 0.53 | 0.33 | 1.01 | 0.77 | 5.4   |
| 1987  | 0.45 | 0.27 | 0.16 | 0.06 | 0.02 | 0.02 | 0.11 | 0.10 | 0.29 | 0.25 | 0.78 | 0.51 | 3.0   |
| 1988  | 0.32 | 0.24 | 0.15 | 0.06 | 0.02 | 0.29 | 1.68 | 0.62 | 0.40 | 0.61 | 0.73 | 0.59 | 5.7   |
| 1989  | 1.16 | 0.74 | 0.33 | 0.15 | 0.13 | 0.09 | 0.30 | 0.52 | 1.12 | 0.64 | 0.55 | 0.46 | 6.2   |
| 1990  | 0.38 | 0.32 | 0.22 | 0.12 | 0.06 | 0.03 | 0.02 | 0.18 | 0.97 | 2.32 | 0.94 | 0.45 | 6.0   |
| 1991  | 1.16 | 0.59 | 0.26 | 0.14 | 0.08 | 0.05 | 0.15 | 0.26 | 1.20 | 1.19 | 0.76 | 0.51 | 6.3   |
| 1992  | 1.33 | 0.68 | 0.23 | 0.10 | 0.09 | 0.05 | 2.52 | 0.99 | 0.45 | 2.67 | 1.25 | 0.47 | 10.8  |
| 1993  | 0.36 | 0.25 | 0.68 | 0.30 | 0.13 | 0.09 | 0.16 | 0.18 | 2.10 | 1.05 | 0.51 | 0.54 | 6.3   |
| 1994  | 0.50 | 0.34 | 0.82 | 0.36 | 0.10 | 0.14 | 0.33 | 0.92 | 0.61 | 0.74 | 0.83 | 0.54 | 6.2   |
| 1995  | 0.70 | 0.86 | 1.31 | 0.51 | 0.14 | 0.13 | 0.09 | 0.13 | 1.55 | 1.91 | 0.92 | 0.66 | 8.9   |
| 1996  | 1.50 | 1.42 | 0.58 | 0.19 | 0.09 | 0.05 | 0.06 | 0.76 | 1.53 | 0.64 | 0.45 | 0.36 | 7.6   |
| 1997  | 0.29 | 0.39 | 0.23 | 0.15 | 0.10 | 0.10 | 0.26 | 1.37 | 0.62 | 0.35 | 0.39 | 0.34 | 4.6   |
| 1998  | 0.26 | 0.76 | 2.23 | 0.79 | 0.10 | 0.07 | 0.10 | 1.14 | 0.58 | 0.30 | 0.69 | 0.54 | 7.5   |
| AVE : | 0.69 | 0.52 | 0.39 | 0.24 | 0.13 | 0.10 | 0.30 | 0.50 | 0.93 | 0.97 | 1.21 | 0.77 | 6.8   |
| SD :  | 0.53 | 0.33 | 0.38 | 0.40 | 0.16 | 0.08 | 0.50 | 0.48 | 0.78 | 0.69 | 1.22 | 0.52 | 2.8   |

Appendix B7.8

File : H6H5PAT.OBS

Units : 10^6xm^3

Descrip. : Patched observed flow record at H6H005 for 1963 to 1997

| Year  | Oct   | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul   | Aug   | Sep   | Total |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1963  | 0.75  | 0.70  | 0.23  | 0.17  | 0.20  | 0.90  | 0.52  | 0.28  | 1.46  | 0.64  | 1.32  | 1.34  | 8.5   |
| 1964  | 0.94  | 0.90  | 0.31  | 0.19  | 0.18  | 0.24  | 0.22  | 0.34  | 0.52  | 2.01  | 0.74  | 0.56  | 7.2   |
| 1965  | 1.72  | 3.12  | 0.63  | 0.44  | 0.21  | 0.14  | 0.15  | 0.15  | 0.16  | 0.28  | 1.25  | 0.98  | 9.2   |
| 1966  | 0.20  | 0.11  | 0.11  | 0.09  | 0.10  | 0.18  | 1.10  | 1.42  | 1.71  | 0.74  | 0.33  | 0.52* | 6.6   |
| 1967  | 0.43# | 0.39# | 0.24* | 0.10  | 0.09  | 0.24  | 0.18  | 0.84  | 1.26  | 0.85  | 1.05  | 1.04  | 6.7   |
| 1968  | 0.16  | 0.83  | 0.40  | 0.16* | 0.58* | 0.68  | 1.71  | 1.62  | 2.41  | 2.83  | 0.76* | 0.00  | 12.2  |
| 1969  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.06* | 0.07# | 0.49# | 0.93# | 1.55# | 0.77# | 3.9   |
| 1970  | 0.51# | 0.39# | 0.24# | 0.13# | 0.10# | 0.10# | 0.16# | 2.08* | 9.03  | 12.20 | 11.30 | 8.68  | 44.9  |
| 1971  | 8.13  | 9.63  | 7.44* | 0.28# | 0.18# | 0.14# | 0.39# | 0.65# | 0.74# | 0.56# | 0.80# | 0.69# | 29.6  |
| 1972  | 0.52# | 0.38# | 0.20# | 0.10# | 0.05# | 0.03# | 0.03# | 0.03# | 0.04# | 0.43# | 0.30# | 0.20# | 2.3   |
| 1973  | 0.18# | 0.14# | 0.10# | 0.08# | 0.09# | 0.09# | 0.08# | 0.45# | 0.36# | 0.26# | 5.04# | 2.19# | 9.1   |
| 1974  | 0.57# | 0.41# | 0.23# | 0.21# | 0.13# | 0.08# | 0.05# | 1.17* | 0.31  | 0.60* | 1.17  | 0.59  | 5.5   |
| 1975  | 0.43* | 0.26  | 0.24* | 0.08  | 0.07  | 0.12  | 0.17  | 0.57  | 1.59  | 1.36  | 0.97  | 0.39  | 6.3   |
| 1976  | 1.19* | 1.51* | 0.33  | 0.14  | 0.20  | 0.17  | 0.36  | 1.21  | 1.12  | 1.91  | 2.29  | 0.74  | 11.2  |
| 1977  | 0.38  | 0.51  | 1.03  | 0.41  | 0.13  | 0.13  | 0.21  | 0.18  | 0.16  | 0.30  | 1.12  | 1.03  | 5.6   |
| 1978  | 1.08  | 0.33  | 1.25  | 0.24  | 0.16  | 0.32  | 0.23  | 0.85  | 0.99  | 0.85  | 0.82  | 1.10  | 8.2   |
| 1979  | 0.51  | 0.22  | 0.11  | 0.14  | 0.13  | 0.10  | 0.13  | 0.15  | 0.42  | 0.36  | 0.47  | 0.59  | 3.3   |
| 1980  | 0.38  | 0.30  | 0.75  | 2.51# | 1.01* | 0.56  | 1.06  | 1.53  | 1.85  | 4.06  | 5.34  | 6.33  | 25.7  |
| 1981  | 4.69  | 3.94  | 4.19  | 4.00  | 1.53* | 0.04* | 1.42# | 0.71  | 0.47  | 0.80  | 0.37  | 1.48  | 23.6  |
| 1982  | 0.30  | 0.19  | 0.15  | 0.13  | 0.13  | 0.16  | 0.13  | 0.86  | 1.15  | 2.06  | 0.74  | 1.36  | 7.4   |
| 1983  | 0.96  | 0.22  | 0.15  | 0.14  | 0.16  | 0.21  | 0.16  | 0.82  | 0.37  | 0.44  | 0.43  | 1.14  | 5.2   |
| 1984  | 1.08  | 0.60  | 0.32  | 0.44  | 0.82  | 0.37  | 0.24  | 0.18  | 0.46  | 1.93# | 0.97  | 0.24  | 7.7   |
| 1985  | 1.96# | 1.54  | 1.00  | 0.25  | 0.17  | 0.18  | 0.19  | 0.15  | 0.30  | 0.46  | 2.02# | 1.14  | 9.4   |
| 1986  | 0.79  | 0.43  | 0.17  | 0.11  | 0.08  | 0.10  | 0.36  | 0.22  | 0.56  | 0.59  | 0.76  | 0.73  | 4.9   |
| 1987  | 0.50  | 0.06  | 0.06  | 0.05  | 0.05  | 0.08  | 0.36  | 0.14  | 0.77  | 0.38  | 0.56  | 0.96  | 4.0   |
| 1988  | 0.63  | 0.11  | 0.07  | 0.05  | 0.05  | 0.16  | 1.68# | 0.39  | 1.19  | 0.92  | 1.31  | 1.55  | 8.1   |
| 1989  | 1.71  | 0.74# | 0.32  | 0.14  | 0.24  | 0.21  | 0.65  | 1.32  | 1.39  | 1.84  | 0.51  | 0.51  | 9.6   |
| 1990  | 0.43  | 0.20  | 0.16  | 0.09  | 0.09  | 0.06  | 0.07  | 0.11  | 0.58  | 2.32# | 0.94  | 0.66  | 5.7   |
| 1991  | 1.16# | 0.95  | 0.17  | 0.14* | 0.06  | 0.04  | 0.19  | 0.23  | 0.86  | 1.19# | 0.55  | 0.39  | 5.9   |
| 1992  | 1.41  | 0.38  | 0.04  | 0.03  | 0.01  | 0.03  | 2.52# | 0.48  | 1.13  | 1.94  | 1.05  | 0.33  | 9.4   |
| 1993  | 0.09  | 0.11  | 0.24  | 0.06  | 0.13* | 0.09* | 0.10  | 0.15  | 2.10# | 1.22  | 1.57  | 0.64  | 6.5   |
| 1994  | 0.41  | 0.06  | 0.14  | 0.36* | 0.10# | 0.14# | 0.58* | 0.87  | 0.71  | 0.44  | 0.79  | 0.10  | 4.7   |
| 1995  | 0.13  | 0.29  | 1.52  | 0.17  | 0.03  | 0.04  | 0.01  | 0.02  | 0.61  | 1.28  | 0.56  | 0.43  | 5.1   |
| 1996  | 2.55  | 2.45  | 0.39  | 0.14  | 0.06  | 0.06  | 0.10  | 0.74  | 1.53* | 0.58  | 0.80  | 0.45  | 9.9   |
| 1997  | 0.15  | 0.20  | 0.06  | 0.31  | 0.09  | 0.11  | 0.86  | 1.39  | 0.23  | 0.26  | 0.17  | 0.08  | 3.9   |
| AVE : | 1.06  | 0.93  | 0.66  | 0.35  | 0.21  | 0.18  | 0.47  | 0.64  | 1.11  | 1.42  | 1.45  | 1.14  | 9.6   |
| SD :  | 1.52  | 1.75  | 1.39  | 0.76  | 0.31  | 0.19  | 0.58  | 0.54  | 1.50  | 2.06  | 2.04  | 1.68  | 8.6   |

## Appendix B7.9

File : H6H5-S-0.NAT  
Units : 10<sup>6</sup>xm<sup>3</sup>  
Descrip. : Incremental naturalised flow record at H6H005 for 1924 to 1997

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul   | Aug   | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|-------|-------|------|-------|
| 1924  | 0.27 | 0.28 | 0.20 | 0.12 | 0.08 | 0.05 | 0.04 | 0.03 | 4.84 | 2.32  | 0.55  | 0.42 | 9.2   |
| 1925  | 0.47 | 0.46 | 0.30 | 0.15 | 0.08 | 0.06 | 0.05 | 0.45 | 0.46 | 1.57  | 1.00  | 0.59 | 5.6   |
| 1926  | 1.17 | 0.72 | 0.34 | 0.16 | 0.08 | 0.05 | 0.06 | 0.22 | 0.80 | 0.46  | 1.98  | 0.97 | 7.0   |
| 1927  | 0.38 | 0.62 | 0.38 | 0.20 | 0.12 | 0.09 | 0.07 | 0.05 | 2.63 | 1.46  | 1.28  | 1.33 | 8.6   |
| 1928  | 0.70 | 0.44 | 0.31 | 0.18 | 0.09 | 0.06 | 0.14 | 0.21 | 0.27 | 1.95  | 1.98  | 0.87 | 7.2   |
| 1929  | 0.46 | 0.35 | 0.25 | 0.17 | 0.15 | 0.14 | 0.12 | 0.10 | 0.16 | 0.18  | 2.05  | 3.03 | 7.2   |
| 1930  | 1.13 | 0.39 | 0.26 | 0.15 | 0.10 | 0.08 | 1.87 | 0.76 | 0.20 | 0.66  | 1.73  | 1.18 | 8.5   |
| 1931  | 2.20 | 1.06 | 0.35 | 0.23 | 0.32 | 0.22 | 0.14 | 0.29 | 0.40 | 1.27  | 0.72  | 1.71 | 8.9   |
| 1932  | 0.96 | 0.50 | 0.37 | 0.22 | 0.13 | 0.09 | 0.07 | 0.37 | 3.20 | 3.76  | 1.64  | 0.75 | 12.1  |
| 1933  | 0.56 | 0.39 | 0.25 | 0.14 | 0.08 | 0.06 | 0.05 | 0.23 | 1.34 | 0.76  | 0.58  | 0.95 | 5.4   |
| 1934  | 0.89 | 0.59 | 0.34 | 0.17 | 0.09 | 0.08 | 0.42 | 1.36 | 0.86 | 0.57  | 0.52  | 0.49 | 6.4   |
| 1935  | 0.42 | 0.59 | 0.35 | 0.20 | 0.13 | 0.10 | 0.08 | 0.45 | 0.33 | 2.44  | 2.59  | 1.27 | 9.0   |
| 1936  | 0.69 | 1.67 | 1.33 | 0.51 | 0.21 | 0.15 | 0.14 | 0.31 | 2.77 | 3.14  | 1.19  | 0.67 | 12.8  |
| 1937  | 0.56 | 0.41 | 0.25 | 0.14 | 0.08 | 0.07 | 0.40 | 0.36 | 0.29 | 0.34  | 0.85  | 1.39 | 5.1   |
| 1938  | 0.84 | 0.49 | 0.32 | 0.17 | 0.11 | 0.17 | 0.20 | 0.52 | 0.38 | 0.34  | 1.30  | 0.79 | 5.6   |
| 1939  | 0.42 | 0.30 | 0.19 | 0.10 | 0.18 | 0.13 | 1.89 | 0.83 | 2.10 | 1.19  | 0.57  | 0.49 | 8.4   |
| 1940  | 0.43 | 0.96 | 0.51 | 0.26 | 0.17 | 0.10 | 1.30 | 2.17 | 3.68 | 2.56  | 2.60  | 4.37 | 19.1  |
| 1941  | 2.07 | 0.80 | 0.49 | 0.28 | 0.17 | 0.12 | 0.11 | 1.36 | 5.81 | 2.16  | 1.16  | 0.79 | 15.3  |
| 1942  | 0.54 | 0.40 | 0.33 | 0.47 | 0.29 | 0.30 | 0.23 | 0.31 | 2.06 | 2.54  | 2.84  | 1.60 | 11.9  |
| 1943  | 0.89 | 0.73 | 0.48 | 0.24 | 0.12 | 0.07 | 0.07 | 0.35 | 3.78 | 1.50  | 1.55  | 1.42 | 11.2  |
| 1944  | 0.75 | 0.47 | 0.29 | 0.15 | 0.08 | 0.04 | 0.09 | 2.43 | 3.32 | 5.75  | 4.16  | 1.41 | 18.9  |
| 1945  | 1.22 | 0.77 | 0.37 | 0.18 | 0.10 | 0.09 | 0.08 | 0.12 | 0.14 | 0.26  | 0.29  | 1.92 | 5.5   |
| 1946  | 0.94 | 0.33 | 0.20 | 0.10 | 0.05 | 0.15 | 0.10 | 0.19 | 0.18 | 2.21  | 1.10  | 0.50 | 6.1   |
| 1947  | 0.44 | 0.34 | 0.22 | 0.12 | 0.07 | 0.26 | 0.19 | 0.68 | 0.46 | 1.44  | 0.82  | 3.04 | 8.1   |
| 1948  | 1.50 | 0.53 | 0.31 | 0.16 | 0.08 | 0.05 | 0.32 | 0.27 | 0.31 | 0.51  | 1.29  | 1.33 | 6.7   |
| 1949  | 0.86 | 1.24 | 0.67 | 0.26 | 0.14 | 0.08 | 0.56 | 0.28 | 0.14 | 4.11  | 1.62  | 2.15 | 12.1  |
| 1950  | 1.10 | 1.17 | 0.64 | 0.37 | 0.23 | 0.13 | 0.28 | 0.22 | 3.83 | 2.11  | 0.97  | 2.16 | 13.2  |
| 1951  | 1.21 | 1.14 | 0.64 | 0.25 | 0.12 | 0.07 | 0.06 | 2.32 | 0.96 | 1.20  | 3.04  | 2.40 | 13.4  |
| 1952  | 1.16 | 1.97 | 0.97 | 0.31 | 0.16 | 0.10 | 2.77 | 2.17 | 0.69 | 1.88  | 1.42  | 0.74 | 14.3  |
| 1953  | 0.58 | 0.58 | 0.39 | 0.20 | 0.11 | 0.12 | 0.16 | 3.35 | 2.59 | 5.78  | 6.09  | 2.22 | 22.2  |
| 1954  | 0.87 | 0.62 | 0.39 | 0.21 | 3.24 | 1.20 | 0.17 | 0.18 | 1.63 | 2.08  | 5.12  | 2.12 | 17.8  |
| 1955  | 1.80 | 1.10 | 0.50 | 0.28 | 0.18 | 0.13 | 0.10 | 0.69 | 2.32 | 1.23  | 0.97  | 0.71 | 10.0  |
| 1956  | 0.57 | 0.45 | 0.31 | 0.18 | 0.17 | 0.14 | 0.12 | 3.99 | 5.00 | 3.79  | 3.16  | 1.45 | 19.3  |
| 1957  | 1.06 | 0.73 | 0.37 | 0.17 | 0.11 | 0.11 | 0.11 | 1.44 | 1.20 | 0.51  | 2.33  | 1.11 | 9.3   |
| 1958  | 0.48 | 0.38 | 0.23 | 0.13 | 0.09 | 0.08 | 1.51 | 3.73 | 1.34 | 0.39  | 1.84  | 1.00 | 11.2  |
| 1959  | 0.76 | 0.54 | 0.29 | 0.16 | 0.10 | 0.07 | 0.06 | 0.21 | 1.40 | 0.71  | 0.34  | 0.48 | 5.1   |
| 1960  | 0.40 | 0.28 | 0.18 | 0.13 | 0.09 | 0.07 | 0.08 | 0.16 | 0.38 | 0.42  | 0.50  | 2.36 | 5.1   |
| 1961  | 1.18 | 0.44 | 0.25 | 0.13 | 0.08 | 0.07 | 0.59 | 0.32 | 3.75 | 1.97  | 6.85  | 2.80 | 18.4  |
| 1962  | 3.13 | 1.73 | 0.62 | 0.30 | 0.15 | 0.09 | 0.07 | 0.07 | 0.21 | 0.76  | 3.00  | 1.27 | 11.4  |
| 1963  | 0.81 | 0.76 | 0.28 | 0.20 | 0.23 | 0.94 | 0.56 | 0.32 | 1.76 | 0.84  | 1.55  | 1.47 | 9.7   |
| 1964  | 1.03 | 0.98 | 0.38 | 0.23 | 0.21 | 0.28 | 0.27 | 0.43 | 0.60 | 2.08  | 0.83  | 0.65 | 8.0   |
| 1965  | 1.84 | 3.22 | 0.70 | 0.51 | 0.24 | 0.17 | 0.19 | 0.18 | 0.42 | 0.48  | 1.40  | 1.08 | 10.4  |
| 1966  | 0.29 | 0.18 | 0.17 | 0.12 | 0.14 | 0.20 | 1.14 | 1.49 | 1.90 | 0.88  | 0.44  | 0.61 | 7.5   |
| 1967  | 0.50 | 0.46 | 0.31 | 0.15 | 0.13 | 0.28 | 0.22 | 0.95 | 1.50 | 1.06  | 1.20  | 1.14 | 7.9   |
| 1968  | 0.28 | 0.93 | 0.47 | 0.22 | 0.63 | 0.71 | 1.77 | 1.67 | 2.47 | 2.90  | 0.83  | 0.08 | 13.0  |
| 1969  | 0.10 | 0.08 | 0.07 | 0.05 | 0.05 | 0.04 | 0.10 | 0.11 | 0.59 | 1.09  | 1.79  | 0.91 | 4.9   |
| 1970  | 0.60 | 0.46 | 0.31 | 0.18 | 0.13 | 0.13 | 0.22 | 2.17 | 9.15 | 12.52 | 11.63 | 8.85 | 46.3  |
| 1971  | 8.24 | 9.73 | 0.09 | 0.34 | 0.25 | 0.20 | 0.47 | 0.76 | 0.89 | 0.68  | 0.95  | 0.82 | 23.4  |
| 1972  | 0.62 | 0.46 | 0.27 | 0.14 | 0.09 | 0.07 | 0.07 | 0.07 | 0.08 | 0.53  | 0.37  | 0.27 | 3.0   |
| 1973  | 0.25 | 0.20 | 0.14 | 0.11 | 0.13 | 0.13 | 0.11 | 0.55 | 0.44 | 0.33  | 5.90  | 2.59 | 10.9  |
| 1974  | 0.69 | 0.51 | 0.30 | 0.28 | 0.18 | 0.11 | 0.09 | 1.39 | 0.42 | 0.74  | 1.42  | 0.74 | 6.9   |
| 1975  | 0.53 | 0.36 | 0.32 | 0.14 | 0.10 | 0.18 | 0.23 | 0.64 | 2.04 | 1.64  | 1.11  | 0.50 | 7.8   |
| 1976  | 1.40 | 0.52 | 0.60 | 0.24 | 0.30 | 0.27 | 0.55 | 1.90 | 1.64 | 2.67  | 3.28  | 1.19 | 14.5  |
| 1977  | 0.59 | 0.69 | 1.22 | 0.55 | 0.22 | 0.20 | 0.28 | 0.24 | 0.23 | 0.40  | 1.58  | 1.30 | 7.5   |
| 1978  | 1.26 | 0.49 | 1.39 | 0.34 | 0.36 | 0.44 | 0.31 | 1.01 | 1.36 | 1.19  | 1.07  | 1.35 | 10.6  |
| 1979  | 0.77 | 0.42 | 0.24 | 0.23 | 0.21 | 0.16 | 0.19 | 0.28 | 0.62 | 0.51  | 0.64  | 0.76 | 5.0   |
| 1980  | 0.62 | 0.73 | 1.02 | 3.64 | 1.49 | 0.72 | 1.30 | 1.71 | 1.99 | 4.67  | 6.08  | 7.03 | 31.0  |
| 1981  | 5.08 | 4.17 | 4.36 | 4.11 | 0.08 | 0.12 | 2.09 | 1.00 | 0.84 | 1.04  | 0.61  | 1.71 | 25.2  |
| 1982  | 0.49 | 0.36 | 0.27 | 0.22 | 0.22 | 0.25 | 0.21 | 1.33 | 1.88 | 2.85  | 1.12  | 1.71 | 10.9  |
| 1983  | 1.23 | 0.42 | 0.27 | 0.23 | 0.23 | 0.30 | 0.26 | 1.75 | 0.79 | 0.80  | 0.67  | 1.67 | 8.6   |
| 1984  | 1.73 | 0.94 | 0.56 | 0.68 | 1.04 | 0.60 | 0.46 | 0.34 | 0.72 | 2.89  | 1.54  | 0.52 | 12.0  |
| 1985  | 2.93 | 2.02 | 1.32 | 0.43 | 0.30 | 0.32 | 0.33 | 0.26 | 0.54 | 0.69  | 3.02  | 1.65 | 13.8  |
| 1986  | 1.04 | 0.66 | 0.33 | 0.21 | 0.15 | 0.17 | 0.73 | 0.64 | 0.85 | 0.80  | 1.28  | 1.15 | 8.0   |
| 1987  | 0.76 | 0.25 | 0.19 | 0.13 | 0.11 | 0.15 | 0.47 | 0.23 | 0.97 | 0.55  | 0.98  | 1.25 | 6.0   |
| 1988  | 0.85 | 0.30 | 0.20 | 0.15 | 0.14 | 0.37 | 2.53 | 0.77 | 1.44 | 1.29  | 1.72  | 1.90 | 11.7  |
| 1989  | 2.33 | 1.16 | 0.55 | 0.28 | 0.37 | 0.32 | 0.86 | 1.63 | 1.99 | 2.21  | 0.85  | 0.80 | 13.4  |
| 1990  | 0.69 | 0.42 | 0.33 | 0.21 | 0.19 | 0.15 | 0.16 | 0.27 | 1.11 | 3.48  | 1.45  | 0.94 | 9.4   |
| 1991  | 1.78 | 1.30 | 0.36 | 0.27 | 0.16 | 0.13 | 0.33 | 0.42 | 1.50 | 1.81  | 0.98  | 0.69 | 9.7   |
| 1992  | 2.09 | 0.78 | 0.23 | 0.15 | 0.12 | 0.13 | 3.78 | 1.02 | 1.41 | 3.27  | 1.71  | 0.63 | 15.3  |
| 1993  | 0.32 | 0.30 | 0.63 | 0.27 | 0.25 | 0.20 | 0.25 | 0.32 | 3.16 | 1.78  | 1.88  | 0.98 | 10.3  |
| 1994  | 0.71 | 0.29 | 0.59 | 0.60 | 0.22 | 0.27 | 0.81 | 1.39 | 1.08 | 0.87  | 1.25  | 0.44 | 8.5   |
| 1995  | 0.54 | 0.76 | 2.20 | 0.48 | 0.17 | 0.16 | 0.12 | 0.14 | 1.40 | 2.25  | 1.08  | 0.82 | 10.1  |
| 1996  | 3.33 | 3.20 | 0.74 | 0.32 | 0.17 | 0.16 | 0.20 | 1.17 | 2.32 | 0.96  | 1.09  | 0.69 | 14.4  |
| 1997  | 0.36 | 0.45 | 0.25 | 0.45 | 0.21 | 0.23 | 1.06 | 2.11 | 0.60 | 0.49  | 0.42  | 0.31 | 6.9   |
| AVE : | 1.12 | 0.89 | 0.50 | 0.34 | 0.23 | 0.20 | 0.51 | 0.87 | 1.58 | 1.78  | 1.86  | 1.42 | 11.3  |
| SD :  | 1.17 | 1.25 | 0.57 | 0.61 | 0.41 | 0.20 | 0.72 | 0.88 | 1.55 | 1.78  | 1.82  | 1.34 | 6.6   |

## Appendix B7.10

File : H6H5CUM.PRS  
Units : 10<sup>6</sup>m<sup>3</sup>  
Descrip. : Cumulative Present Day (2000) Flow at H6H005 for 1927 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1927  | 0.21 | 0.37 | 0.21 | 0.08 | 0.02 | 0.02 | 0.01 | 0.01 | 1.75 | 0.95 | 0.82 | 0.86 | 5.3   |
| 1928  | 0.43 | 0.25 | 0.17 | 0.06 | 0.02 | 0.01 | 0.04 | 0.08 | 0.14 | 1.28 | 1.30 | 0.55 | 4.3   |
| 1929  | 0.26 | 0.19 | 0.12 | 0.06 | 0.04 | 0.04 | 0.02 | 0.02 | 0.05 | 0.06 | 1.35 | 2.03 | 4.2   |
| 1930  | 0.72 | 0.21 | 0.13 | 0.04 | 0.02 | 0.02 | 1.23 | 0.47 | 0.08 | 0.40 | 1.13 | 0.75 | 5.2   |
| 1931  | 1.44 | 0.67 | 0.18 | 0.11 | 0.16 | 0.10 | 0.04 | 0.15 | 0.22 | 0.82 | 0.44 | 1.11 | 5.4   |
| 1932  | 0.60 | 0.29 | 0.20 | 0.10 | 0.03 | 0.02 | 0.01 | 0.20 | 2.13 | 2.51 | 1.06 | 0.46 | 7.6   |
| 1933  | 0.33 | 0.21 | 0.12 | 0.04 | 0.02 | 0.01 | 0.01 | 0.11 | 0.87 | 0.47 | 0.34 | 0.60 | 3.1   |
| 1934  | 0.56 | 0.35 | 0.18 | 0.06 | 0.02 | 0.02 | 0.23 | 0.88 | 0.54 | 0.34 | 0.30 | 0.28 | 3.7   |
| 1935  | 0.23 | 0.35 | 0.18 | 0.08 | 0.03 | 0.02 | 0.02 | 0.25 | 0.17 | 1.61 | 1.72 | 0.82 | 5.5   |
| 1936  | 0.42 | 1.09 | 0.86 | 0.30 | 0.08 | 0.04 | 0.04 | 0.16 | 1.83 | 2.09 | 0.76 | 0.41 | 8.1   |
| 1937  | 0.33 | 0.23 | 0.12 | 0.04 | 0.02 | 0.01 | 0.22 | 0.19 | 0.15 | 0.18 | 0.53 | 0.90 | 2.9   |
| 1938  | 0.53 | 0.28 | 0.17 | 0.06 | 0.02 | 0.06 | 0.08 | 0.30 | 0.21 | 0.19 | 0.84 | 0.49 | 3.2   |
| 1939  | 0.23 | 0.16 | 0.07 | 0.02 | 0.06 | 0.03 | 1.24 | 0.52 | 1.39 | 0.76 | 0.34 | 0.28 | 5.1   |
| 1940  | 0.24 | 0.60 | 0.30 | 0.13 | 0.06 | 0.02 | 0.84 | 1.42 | 2.46 | 1.70 | 1.72 | 2.93 | 12.4  |
| 1941  | 1.36 | 0.50 | 0.28 | 0.15 | 0.06 | 0.02 | 0.02 | 0.88 | 3.90 | 1.42 | 0.74 | 0.49 | 9.8   |
| 1942  | 0.32 | 0.22 | 0.17 | 0.27 | 0.14 | 0.15 | 0.11 | 0.16 | 1.35 | 1.68 | 1.88 | 1.04 | 7.5   |
| 1943  | 0.56 | 0.45 | 0.28 | 0.12 | 0.02 | 0.01 | 0.01 | 0.18 | 2.53 | 0.97 | 1.00 | 0.92 | 7.1   |
| 1944  | 0.46 | 0.27 | 0.15 | 0.04 | 0.02 | 0.01 | 0.02 | 1.61 | 2.21 | 3.86 | 2.78 | 0.91 | 12.3  |
| 1945  | 0.78 | 0.48 | 0.20 | 0.06 | 0.02 | 0.02 | 0.02 | 0.02 | 0.04 | 0.13 | 0.15 | 1.26 | 3.2   |
| 1946  | 0.60 | 0.18 | 0.08 | 0.02 | 0.01 | 0.04 | 0.02 | 0.07 | 0.06 | 1.47 | 0.71 | 0.29 | 3.5   |
| 1947  | 0.25 | 0.18 | 0.10 | 0.02 | 0.01 | 0.13 | 0.07 | 0.41 | 0.26 | 0.94 | 0.51 | 2.02 | 4.9   |
| 1948  | 0.98 | 0.31 | 0.16 | 0.05 | 0.02 | 0.01 | 0.16 | 0.14 | 0.16 | 0.30 | 0.83 | 0.86 | 4.0   |
| 1949  | 0.54 | 0.80 | 0.41 | 0.13 | 0.04 | 0.02 | 0.33 | 0.15 | 0.04 | 2.75 | 1.05 | 1.41 | 7.7   |
| 1950  | 0.70 | 0.75 | 0.39 | 0.20 | 0.11 | 0.03 | 0.15 | 0.10 | 2.55 | 1.38 | 0.61 | 1.42 | 8.4   |
| 1951  | 0.77 | 0.73 | 0.39 | 0.12 | 0.02 | 0.01 | 0.01 | 1.53 | 0.60 | 0.77 | 2.02 | 1.58 | 8.6   |
| 1952  | 0.74 | 1.29 | 0.61 | 0.16 | 0.05 | 0.02 | 1.83 | 1.42 | 0.42 | 1.23 | 0.92 | 0.46 | 9.1   |
| 1953  | 0.34 | 0.34 | 0.21 | 0.08 | 0.02 | 0.02 | 0.05 | 2.23 | 1.72 | 3.88 | 4.10 | 1.46 | 14.4  |
| 1954  | 0.55 | 0.37 | 0.21 | 0.08 | 2.16 | 0.77 | 0.06 | 0.06 | 1.06 | 1.37 | 3.44 | 1.39 | 11.5  |
| 1955  | 1.18 | 0.70 | 0.29 | 0.15 | 0.06 | 0.03 | 0.02 | 0.42 | 1.53 | 0.79 | 0.61 | 0.44 | 6.2   |
| 1956  | 0.34 | 0.25 | 0.16 | 0.06 | 0.06 | 0.04 | 0.02 | 2.66 | 3.36 | 2.53 | 2.11 | 0.94 | 12.5  |
| 1957  | 0.67 | 0.45 | 0.20 | 0.06 | 0.02 | 0.02 | 0.02 | 0.94 | 0.77 | 0.30 | 1.54 | 0.70 | 5.7   |
| 1958  | 0.28 | 0.21 | 0.11 | 0.03 | 0.02 | 0.02 | 0.97 | 2.49 | 0.87 | 0.21 | 1.20 | 0.63 | 7.0   |
| 1959  | 0.47 | 0.32 | 0.15 | 0.05 | 0.02 | 0.01 | 0.01 | 0.08 | 0.91 | 0.44 | 0.19 | 0.28 | 2.9   |
| 1960  | 0.22 | 0.15 | 0.06 | 0.03 | 0.02 | 0.01 | 0.02 | 0.05 | 0.21 | 0.23 | 0.29 | 1.57 | 2.8   |
| 1961  | 0.75 | 0.25 | 0.12 | 0.03 | 0.02 | 0.01 | 0.35 | 0.16 | 2.51 | 1.29 | 4.61 | 1.85 | 11.9  |
| 1962  | 2.09 | 1.13 | 0.37 | 0.16 | 0.04 | 0.02 | 0.01 | 0.01 | 0.08 | 0.47 | 1.99 | 0.82 | 7.2   |
| 1963  | 0.50 | 0.46 | 0.15 | 0.07 | 0.11 | 0.59 | 0.32 | 0.16 | 1.15 | 0.53 | 0.99 | 0.95 | 6.0   |
| 1964  | 0.65 | 0.60 | 0.21 | 0.11 | 0.10 | 0.15 | 0.14 | 0.24 | 0.36 | 1.36 | 0.52 | 0.39 | 4.8   |
| 1965  | 1.20 | 2.14 | 0.43 | 0.30 | 0.12 | 0.05 | 0.07 | 0.06 | 0.23 | 0.27 | 0.90 | 0.68 | 6.5   |
| 1966  | 0.15 | 0.06 | 0.06 | 0.02 | 0.04 | 0.07 | 0.72 | 0.97 | 1.25 | 0.56 | 0.25 | 0.37 | 4.5   |
| 1967  | 0.29 | 0.26 | 0.16 | 0.04 | 0.03 | 0.14 | 0.10 | 0.59 | 0.98 | 0.67 | 0.77 | 0.72 | 4.8   |
| 1968  | 0.15 | 0.57 | 0.27 | 0.10 | 0.38 | 0.43 | 1.15 | 1.08 | 1.63 | 1.92 | 0.52 | 0.02 | 8.2   |
| 1969  | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.35 | 0.69 | 1.17 | 0.58 | 2.9   |
| 1970  | 0.36 | 0.26 | 0.16 | 0.06 | 0.03 | 0.03 | 0.10 | 1.42 | 6.16 | 8.46 | 7.85 | 5.96 | 30.9  |
| 1971  | 5.55 | 6.56 | 0.02 | 0.18 | 0.12 | 0.08 | 0.27 | 0.47 | 0.55 | 0.41 | 0.59 | 0.51 | 15.3  |
| 1972  | 0.37 | 0.26 | 0.14 | 0.04 | 0.02 | 0.01 | 0.01 | 0.01 | 0.02 | 0.31 | 0.21 | 0.14 | 1.5   |
| 1973  | 0.12 | 0.08 | 0.04 | 0.02 | 0.03 | 0.03 | 0.02 | 0.32 | 0.25 | 0.17 | 3.98 | 1.72 | 6.8   |
| 1974  | 0.42 | 0.30 | 0.16 | 0.15 | 0.06 | 0.02 | 0.02 | 0.90 | 0.23 | 0.46 | 0.91 | 0.46 | 4.1   |
| 1975  | 0.31 | 0.19 | 0.16 | 0.04 | 0.02 | 0.06 | 0.11 | 0.39 | 1.34 | 1.06 | 0.70 | 0.29 | 4.7   |
| 1976  | 0.90 | 0.29 | 0.35 | 0.12 | 0.15 | 0.14 | 0.31 | 1.25 | 1.06 | 1.76 | 2.17 | 0.76 | 9.3   |
| 1977  | 0.35 | 0.42 | 0.77 | 0.32 | 0.10 | 0.07 | 0.15 | 0.12 | 0.11 | 0.22 | 1.02 | 0.83 | 4.5   |
| 1978  | 0.81 | 0.28 | 0.90 | 0.18 | 0.19 | 0.25 | 0.16 | 0.63 | 0.88 | 0.76 | 0.68 | 0.87 | 6.6   |
| 1979  | 0.48 | 0.23 | 0.12 | 0.11 | 0.08 | 0.05 | 0.07 | 0.15 | 0.37 | 0.30 | 0.39 | 0.47 | 2.8   |
| 1980  | 0.37 | 0.45 | 0.64 | 2.43 | 0.96 | 0.44 | 0.84 | 1.11 | 1.31 | 3.13 | 4.08 | 4.73 | 20.5  |
| 1981  | 3.40 | 2.79 | 2.91 | 2.75 | 0.02 | 0.02 | 1.37 | 0.63 | 0.53 | 0.66 | 0.37 | 1.11 | 16.5  |
| 1982  | 0.28 | 0.19 | 0.14 | 0.10 | 0.09 | 0.13 | 0.09 | 0.86 | 1.23 | 1.89 | 0.71 | 1.11 | 6.8   |
| 1983  | 0.79 | 0.23 | 0.14 | 0.11 | 0.11 | 0.14 | 0.13 | 1.14 | 0.49 | 0.50 | 0.41 | 1.09 | 5.3   |
| 1984  | 1.13 | 0.58 | 0.33 | 0.41 | 0.66 | 0.36 | 0.26 | 0.18 | 0.43 | 1.92 | 0.99 | 0.30 | 7.5   |
| 1985  | 1.94 | 1.32 | 0.85 | 0.24 | 0.15 | 0.16 | 0.17 | 0.13 | 0.32 | 0.42 | 2.01 | 1.07 | 8.8   |
| 1986  | 0.66 | 0.39 | 0.16 | 0.09 | 0.04 | 0.05 | 0.45 | 0.39 | 0.53 | 0.50 | 0.82 | 0.73 | 4.8   |
| 1987  | 0.47 | 0.12 | 0.07 | 0.03 | 0.02 | 0.04 | 0.27 | 0.11 | 0.61 | 0.32 | 0.63 | 0.81 | 3.5   |
| 1988  | 0.53 | 0.16 | 0.08 | 0.04 | 0.04 | 0.20 | 1.68 | 0.47 | 0.93 | 0.83 | 1.12 | 1.25 | 7.3   |
| 1989  | 1.53 | 0.74 | 0.32 | 0.15 | 0.20 | 0.16 | 0.54 | 1.06 | 1.31 | 1.45 | 0.53 | 0.49 | 8.5   |
| 1990  | 0.41 | 0.23 | 0.17 | 0.10 | 0.07 | 0.04 | 0.05 | 0.14 | 0.70 | 2.32 | 0.94 | 0.58 | 5.7   |
| AVE : | 0.71 | 0.56 | 0.28 | 0.18 | 0.12 | 0.09 | 0.28 | 0.55 | 1.01 | 1.18 | 1.28 | 1.00 | 7.2   |
| SD :  | 0.82 | 0.89 | 0.39 | 0.44 | 0.30 | 0.14 | 0.43 | 0.62 | 1.08 | 1.28 | 1.31 | 0.95 | 4.7   |

## APPENDIX B8.1

SUB-CATCHMENT : H6H009  
RIVER : Riviersonderend  
PLACE : Reenen

### 1 CATCHMENT

|                     | YEAR    |         |         |         |         |         | UNITS |
|---------------------|---------|---------|---------|---------|---------|---------|-------|
|                     | 1964    | 1973    | 1980    | 1987    | 1997    | 2000    |       |
| SUB-CATCHMENT AREAS |         |         |         |         |         |         |       |
| u/s farm dams       | 104.25  | 104.35  | 104.35  | 113.66  | 196.98  | 196.98  | km²   |
| d/s farm dams       | 1381.86 | 1381.76 | 1381.76 | 1372.45 | 1289.13 | 1289.13 | km²   |
| Total               | 1486.11 | 1486.11 | 1486.11 | 1486.11 | 1486.11 | 1486.11 |       |

### 2 LANDUSE

|                             | YEAR  |       |       |       |       |       | UNITS |
|-----------------------------|-------|-------|-------|-------|-------|-------|-------|
|                             | 1964  | 1973  | 1980  | 1987  | 1997  | 2000  |       |
| ALIEN VEGETATION            |       |       |       |       |       |       |       |
| u/s farm dams : tall trees  | 0.09  | 0.33  | 0.97  | 0.92  | 2.76  | 2.79  | km²   |
| u/s farm dams : tall shrubs | 0.07  | 0.26  | 0.76  | 0.72  | 2.17  | 2.19  | km²   |
| riparian                    | 0.06  | 0.16  | 0.21  | 0.05  | 0.02  | 0.01  | km²   |
| d/s farm dams : tall trees  | 1.05  | 3.73  | 11.20 | 10.56 | 31.72 | 32.08 | km²   |
| d/s farm dams : tall shrubs | 0.92  | 2.93  | 8.80  | 8.30  | 24.92 | 25.21 | km²   |
| riparian                    | 0.65  | 1.78  | 2.39  | 0.58  | 0.18  | 0.03  | km²   |
| Total                       | 2.84  | 9.19  | 24.33 | 21.13 | 61.77 | 62.31 | km²   |
| FORESTRY                    |       |       |       |       |       |       |       |
| u/s farm dams               | 8.00  | 8.10  | 20.07 | 18.70 | 16.00 | 15.02 | km²   |
| FARM DAM CAPACITIES         |       |       |       |       |       |       |       |
|                             | 7.70  | 7.70  | 7.70  | 11.50 | 16.60 | 16.60 | Mm³   |
| IRRIGATION AREAS            |       |       |       |       |       |       |       |
|                             | 25.06 | 30.53 | 34.37 | 41.01 | 50.00 | 50.46 | km²   |

### 3 EVAPORATION

|                       | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) | 169  | 209  | 271  | 282  | 221  | 189  | 189  | 80   | 62   | 69   | 83   | 113  | 1937      |
| S-PAN (gross) (in mm) | 132  | 167  | 222  | 231  | 178  | 150  | 150  | 54   | 38   | 44   | 57   | 83   | 1506      |
| LAKE FACTOR           | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)    | 107  | 137  | 184  | 194  | 157  | 132  | 132  | 47   | 32   | 37   | 46   | 67   | 1272      |

**Note : evaporation from CCWR database used for this sub-catchment**

### 4 RESERVOIR SIMULATIONS

|                 | COEFFICIENTS |     | START      | DEAD          | MAX           |
|-----------------|--------------|-----|------------|---------------|---------------|
|                 | a            | b   | STOR.<br>% | STOR.<br>M.m³ | STOR.<br>M.m³ |
| H6H009 farm dam | 0.4          | 0.7 | 100        | 0             | FSC           |

### 5 IRRIGATION ROUTINE

|             | QUANT<br>% | CROP FACTORS |      |      |      |      |      |      |      |      |      |      |      |
|-------------|------------|--------------|------|------|------|------|------|------|------|------|------|------|------|
|             |            | OCT          | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  |
| crop type 1 | 41.8       | 0.40         | 0.45 | 0.50 | 0.50 | 0.50 | 0.40 | 0.20 | 0.20 | 0.20 | 0.20 | 0.25 | 0.30 |
| crop type 2 | 58.2       | 0.70         | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.70 | 0.60 | 0.50 | 0.50 | 0.50 | 0.60 |

### 6. NOTES

Combined crop factor used for calculating irrigation demands  
crop type 1 : vineyards and fruit trees  
crop type 2 : wheat , lucerne and cash crops

Historical crop composition :

|                 |      |      |      |      |      |
|-----------------|------|------|------|------|------|
|                 | 1964 | 1973 | 1980 | 1987 | 1997 |
| crop type 1 (%) | 8.1  | 20   | 26.2 | 31.8 | 41.8 |
| crop type 2 (%) | 91.9 | 80   | 73.8 | 68.2 | 58.2 |

Catchment MAP = 495 mm



## Appendix B8.2

File : H6H009.NS  
 Units : 10^6xm^3  
 Descrip. : Observed flow record at H6H009 for 1964 to 1997

| Year  | Oct    | Nov   | Dec   | Jan    | Feb    | Mar   | Apr   | May    | Jun    | Jul    | Aug    | Sep    | Total  |
|-------|--------|-------|-------|--------|--------|-------|-------|--------|--------|--------|--------|--------|--------|
| 1964  | 29.90  | 35.10 | 2.79  | 0.06   | 1.22   | 2.12  | 16.20 | 22.60  | 45.60  | 58.60  | 60.10  | 24.50* | 298.8  |
| 1965  | 38.60  | 80.70 | 7.12  | 13.90  | 5.71   | 0.27  | 15.50 | 9.08   | 19.60  | 107.00 | 84.60  | 67.10  | 449.2  |
| 1966  | 20.60  | 2.05  | 0.01  | 0.00   | 0.16   | 3.29  | 28.80 | 52.00  | 125.00 | 45.50  | 58.30  | 38.80  | 374.5  |
| 1967  | 32.60  | 11.00 | 3.99  | 0.00   | 0.00   | 0.72  | 2.46  | 56.40  | 82.40  | 61.20  | 73.70  | 34.00  | 358.5  |
| 1968  | 47.10  | 17.80 | 0.93  | 0.00   | 0.00   | 0.01  | 5.51  | 6.64   | 15.20  | 27.20  | 35.00  | 46.40  | 201.8  |
| 1969  | 41.10  | 5.73  | 0.06  | 0.00   | 2.98   | 0.29  | 0.00  | 0.14   | 52.00  | 55.70  | 75.30  | 48.60  | 281.9  |
| 1970  | 24.20  | 2.63  | 1.61  | 0.03   | 0.89   | 1.72  | 3.73* | 10.90  | 14.50  | 113.00 | 105.00 | 36.20  | 314.4  |
| 1971  | 8.74   | 18.70 | 11.70 | 0.47   | 1.75   | 1.42  | 0.28  | 30.70  | 42.50  | 18.60  | 54.00  | 31.60  | 220.5  |
| 1972  | 8.45   | 7.36  | 0.22  | 0.00   | 0.00   | 0.00  | 1.99  | 0.41   | 0.96   | 59.40  | 63.60  | 29.90  | 172.3  |
| 1973  | 15.30  | 2.83  | 1.74  | 2.67   | 10.90  | 4.44  | 2.76  | 10.50  | 47.60  | 25.20  | 297.00 | 86.30  | 507.2  |
| 1974  | 37.60  | 18.00 | 2.04  | 0.00   | 0.25   | 0.55  | 0.11  | 46.20  | 52.20  | 73.20  | 77.40  | 49.00  | 356.5  |
| 1975  | 19.30  | 7.91  | 4.48  | 0.46   | 0.00   | 3.81  | 0.85  | 10.50  | 145.00 | 107.00 | 67.30  | 18.90* | 385.5  |
| 1976  | 50.80  | 68.10 | 31.80 | 15.80* | 11.70* | 12.90 | 33.10 | 132.00 | 212.00 | 179.00 | 221.00 | 45.10  | 1013.3 |
| 1977  | 22.90  | 13.20 | 11.00 | 19.00  | 1.11   | 1.66  | 8.17  | 16.10  | 12.10  | 20.00  | 64.40  | 55.40  | 245.0  |
| 1978  | 45.90  | 16.60 | 26.20 | 3.99   | 0.24   | 7.90  | 1.19  | 12.60  | 43.80  | 38.20  | 53.50  | 40.30  | 290.4  |
| 1979  | 54.40  | 13.60 | 1.62  | 4.94   | 13.20  | 2.18  | 4.34  | 9.63   | 14.70  | 46.60  | 20.40  | 22.40  | 208.0  |
| 1980  | 13.80  | 3.56  | 41.60 | 78.10  | 78.70  | 9.41  | 18.80 | 25.10  | 17.70  | 45.50  | 103.00 | 108.00 | 543.3  |
| 1981  | 55.60  | 4.57  | 6.34  | 2.35   | 2.21   | 6.38  | 53.40 | 17.90  | 21.20* | 29.10  | 36.30  | 67.30  | 302.7  |
| 1982  | 20.90  | 3.10  | 1.58  | 0.34   | 1.57   | 1.29  | 1.30  | 11.30  | 40.80  | 150.00 | 81.80  | 62.10  | 376.1  |
| 1983  | 32.90  | 6.63  | 2.38  | 2.15   | 6.49   | 7.69  | 1.18  | 93.50  | 39.20  | 64.00  | 25.90  | 69.00  | 351.0  |
| 1984  | 36.60  | 11.70 | 3.32  | 5.58   | 9.46   | 34.70 | 18.10 | 15.30  | 59.60  | 119.00 | 84.20  | 15.70  | 413.3  |
| 1985  | 34.10  | 61.40 | 22.10 | 3.68   | 2.14   | 2.49  | 3.74* | 0.13*  | 21.80  | 57.60  | 223.00 | 88.50  | 520.7  |
| 1986  | 21.10  | 8.75  | 3.49  | 2.16   | 1.71   | 1.81  | 9.82  | 13.10  | 34.90  | 42.90  | 75.80  | 42.40  | 257.9  |
| 1987  | 22.00  | 1.81  | 3.02  | 1.28   | 1.63   | 5.47  | 13.40 | 2.09   | 12.20  | 50.00  | 17.60  | 34.40  | 164.9  |
| 1988  | 15.30  | 1.51  | 2.09  | 1.81   | 0.98   | 4.16  | 50.80 | 9.61   | 26.20  | 62.20  | 61.80  | 108.00 | 344.5  |
| 1989  | 30.00  | 38.80 | 5.22  | 2.32   | 7.27   | 6.11  | 6.59  | 16.20  | 62.50  | 96.70  | 95.50  | 10.00  | 377.2  |
| 1990  | 9.31   | 3.46  | 5.09  | 2.15   | 4.99   | 2.94  | 2.08  | 3.48   | 6.88   | 19.90  | 14.90  | 8.55   | 83.7   |
| 1991  | 31.20  | 32.90 | 3.41  | 3.70   | 1.88   | 2.23  | 4.25  | 5.07   | 11.50  | 65.50  | 80.40  | 64.30  | 306.3  |
| 1992  | 64.40  | 41.00 | 2.07  | 1.48   | 3.87   | 5.37  | 42.70 | 12.00  | 37.20  | 118.00 | 82.40  | 20.90  | 431.4  |
| 1993  | 5.65   | 6.46  | 11.20 | 5.47   | 12.20  | 10.00 | 8.09  | 4.71   | 12.60  | 34.30  | 68.70  | 27.30  | 206.7  |
| 1994  | 23.30  | 2.51  | 10.60 | 9.42   | 1.87   | 7.05  | 20.90 | 20.50  | 13.40  | 9.25   | 18.10  | 7.64   | 144.5  |
| 1995  | 13.80  | 16.10 | 46.20 | 10.80  | 4.27   | 4.11* | 3.54  | 3.84   | 8.01   | 51.10  | 56.40  | 65.10  | 283.3  |
| 1996  | 106.00 | 95.50 | 18.00 | 3.37   | 4.08   | 5.76  | 7.92  | 14.20  | 14.30  | 29.60  | 53.40  | 38.10  | 390.2  |
| 1997  | 7.65   | 6.80  | 3.16  | 7.70   | 7.98   | 10.70 | 17.70 | 30.80  | 9.06   | 8.47   | 19.20  | 13.40  | 142.6  |
| AVE : | 30.62  | 19.64 | 8.77  | 6.03   | 5.98   | 5.03  | 12.04 | 21.33  | 40.42  | 61.43  | 76.74  | 44.86  | 332.9  |
| SD :  | 20.19  | 24.00 | 11.71 | 13.61  | 13.43  | 6.22  | 14.39 | 27.40  | 43.95  | 40.60  | 60.13  | 26.66  | 164.1  |

## Average Rainfall On Catchment H6H009.ra

## details of rainfall stations used

007008\_a.pat            1972 to 1998

007183\_7.pat            1968 to 1998

007698\_a.pat            1931 to 1974

008136\_a.pat            1923 to 1998

008367\_2.pat            1930 to 1998

022539\_x.pat            1924 to 1998

|          |        | rainfall input as percent m.a.p. |       |        |       |       |       |        |       |        |        |       |        | year    |
|----------|--------|----------------------------------|-------|--------|-------|-------|-------|--------|-------|--------|--------|-------|--------|---------|
| no.      | gauges | oct                              | nov   | dec    | jan   | feb   | mar   | apr    | may   | jun    | jul    | aug   | sep    |         |
| 1923     | 1      | 10.06+                           | 7.57+ | 5.66+  | 4.92+ | 3.11  | 2.38  | 4.41   | 5.09  | 10.43  | 3.67   | 10.65 | 6.10   | 74.05   |
| 1924     | 2      | 5.05                             | 10.86 | .44    | 4.59  | 1.31  | 5.37  | 4.05   | 3.43  | 31.13  | 10.73  | 5.33  | 7.67   | 89.97   |
| 1925     | 2      | 6.06                             | 4.56  | .00    | .99   | 1.41  | 2.57  | 4.27   | 8.89  | 7.31   | 19.38  | 10.64 | 6.77   | 72.85   |
| 1926     | 2      | 15.21                            | 5.94  | .87    | .67   | 2.00  | 3.82  | 3.49   | 8.66  | 8.72   | 3.97   | 13.98 | 4.02   | 71.35   |
| 1927     | 2      | 2.64                             | 6.53  | 3.42   | 2.33  | 1.40  | 6.93  | .00    | .45   | 14.93  | 6.20   | 9.69  | 11.37  | 65.89   |
| 1928     | 2      | .30                              | 6.20  | 2.20   | .65   | 4.50  | 8.17  | 6.24   | 7.05  | 7.40   | 13.90  | 11.45 | 4.14   | 72.20   |
| 1929     | 2      | 3.85                             | 4.34  | 11.99  | 4.31  | 8.21  | 9.66  | 4.11   | 5.36  | 4.93   | 3.42   | 18.56 | 15.91  | 94.65   |
| 1930     | 3      | 12.96                            | 7.07  | 1.48   | 7.32  | 3.17  | 7.25  | 25.79  | 2.84  | 3.06   | 21.85  | 13.93 | 9.33   | 116.05  |
| 1931     | 4      | 21.00                            | 3.73  | 13.83  | 3.63  | 8.87  | 1.82  | .99    | 7.92  | 10.87  | 11.46  | 2.68  | 21.63  | 108.43  |
| 1932     | 4      | 6.52                             | 9.45  | 3.71   | 1.30  | 2.79  | 7.71  | 2.83   | 11.49 | 16.01  | 12.00  | 13.41 | 2.29   | 89.50   |
| 1933     | 4      | 2.37                             | 8.58  | 3.21   | 7.87  | 7.17  | 4.46  | 3.14   | 5.57  | 5.90   | 14.39  | 14.97 | 10.19  | 87.83   |
| 1934     | 4      | 13.13                            | 9.32  | .09    | .83   | 1.95# | 3.87  | 12.50  | 18.01 | 9.86   | 6.63   | 4.26  | 7.36   | 87.82   |
| 1935     | 4      | 2.99                             | 10.66 | 3.54   | 3.90  | 2.36  | 4.51  | 2.32   | 10.93 | 5.70   | 16.50  | 9.53  | 11.87  | 84.79   |
| 1936     | 4      | 6.79                             | 23.38 | 10.72  | 1.29  | 1.47  | 6.98  | 5.04   | 3.72  | 12.67  | 15.71  | 1.42  | 11.60  | 100.79  |
| 1937     | 4      | 4.08                             | 5.40  | 10.45  | 3.39  | 1.61  | 14.63 | 11.98  | 12.71 | 7.16   | 9.19   | 10.53 | 12.82  | 103.95  |
| 1938     | 4      | 8.37                             | 4.76  | 3.24   | 3.52  | 14.96 | 11.77 | 7.43   | 3.70  | 1.71+  | 8.13   | 20.50 | 4.23   | 92.33   |
| 1939     | 4      | 4.16                             | 2.05  | 4.49   | 1.09  | 13.35 | 9.04  | 15.13  | 6.72  | 13.24  | 5.11   | 1.79  | 7.78   | 83.94   |
| 1940     | 4      | 3.99                             | 16.04 | 1.14   | 6.13  | 1.58  | 1.43  | 17.85  | 13.51 | 17.30  | 10.33  | 14.58 | 12.33  | 116.22  |
| 1941     | 4      | 14.76                            | 2.37  | 2.59   | 6.45  | 1.82  | 7.69  | 2.98   | 18.80 | 19.25  | 3.44   | 7.29  | 4.75   | 92.18   |
| 1942     | 4      | 15.26                            | 1.89  | 13.44  | 17.12 | 6.99  | 8.51  | 8.36   | 4.90  | 10.86+ | 8.42   | 10.11 | 11.71  | 117.57  |
| 1943     | 4      | 5.13                             | 18.29 | 1.72   | .49   | .84   | 3.84  | 3.72   | 11.94 | 18.98  | 3.25   | 15.12 | 18.63  | 101.95  |
| 1944     | 4      | 6.85                             | 1.33  | 1.29   | .00   | .52   | 1.73  | 6.86   | 23.57 | 17.18  | 16.28  | 14.29 | 3.62   | 93.51   |
| 1945     | 4      | 28.10                            | 1.58  | .64    | .79   | 3.64  | 16.14 | 3.08   | 4.52  | 5.49   | 7.19   | 3.67  | 9.83   | 84.68   |
| 1946     | 4      | 6.12                             | 1.17  | .74    | .23   | 2.13  | 17.66 | 8.57   | 7.60  | 6.24   | 16.52  | 3.97  | 9.93   | 80.87   |
| 1947     | 4      | 8.30                             | 8.53  | 1.31   | 2.92  | 1.42  | 8.98  | 7.25   | 5.99  | 7.14   | 12.55  | 1.82  | 12.25  | 78.45   |
| 1948     | 4      | 28.32                            | 2.14  | 2.06   | 3.53  | 1.02  | .30   | 13.32  | 9.21  | 4.34   | 8.59   | 8.33  | 6.02   | 87.16   |
| 1949     | 4      | 2.35                             | 32.44 | .64    | .60   | .65   | .78   | 9.57   | 4.54  | 1.95   | 18.07  | 4.09  | 10.63  | 86.31   |
| 1950     | 4      | 13.36                            | 19.20 | 5.38   | 16.39 | .78   | 4.78  | 8.59   | 3.89  | 18.82  | 10.46  | 8.93  | 18.98  | 129.58  |
| 1951     | 4      | 4.88                             | 4.45  | .59    | 1.38  | 6.97  | 3.62  | 4.04   | 9.98  | 7.54   | 9.10   | 19.82 | 17.42  | 89.78   |
| 1952     | 4      | 7.04                             | 26.71 | 2.23   | 1.64+ | 2.41+ | .67   | 17.30  | 7.72  | 8.32   | 14.20  | 6.45  | 7.29   | 101.97  |
| 1953     | 4      | 8.10                             | 9.66  | 1.69   | .62   | 3.86  | 6.87  | 8.29   | 27.04 | 12.48  | 21.36  | 22.75 | 3.69   | 126.40  |
| 1954     | 4      | 2.89                             | 4.93  | 2.28   | 4.35  | 24.16 | .85   | 4.64   | 4.80  | 14.18  | 18.17  | 21.80 | 5.52   | 108.58  |
| 1955     | 4      | 10.97                            | 3.46  | 1.11   | 5.06  | 3.32  | 7.02  | 3.06   | 16.63 | 13.62  | 13.90  | 9.90  | 3.79   | 91.83   |
| 1956     | 4      | 8.88                             | 2.42  | 9.24   | .00   | 9.53  | 11.25 | 3.16   | 25.58 | 27.65  | 16.28  | 18.44 | 13.01  | 145.43  |
| 1957     | 4      | 23.04                            | .00   | .67    | .00   | 3.67  | 12.43 | 9.25   | 28.39 | 11.21  | .78    | 19.64 | 2.80   | 111.86  |
| 1958     | 4      | 8.13                             | 3.31  | 1.71   | 10.10 | 7.14  | 8.08  | 20.69  | 18.17 | 3.44   | 19.40  | 19.37 | 5.29   | 124.82  |
| 1959     | 4      | 14.11                            | 1.76  | 1.86   | 4.35  | 1.72  | 6.90  | 2.98   | 9.45  | 14.30  | 9.09   | 2.93  | 6.20   | 75.65   |
| 1960     | 4      | 3.06                             | 5.81  | 8.07   | 10.95 | .80   | 6.15  | 9.24   | 14.50 | 5.82   | 9.08   | 10.33 | 14.95  | 98.76   |
| 1961     | 4      | 7.13                             | .14   | .85    | 7.86  | 6.53  | 10.83 | 11.95  | 4.60  | 17.80  | 6.83   | 46.90 | 2.49   | 123.89  |
| 1962     | 4      | 20.47                            | 22.93 | .49    | 4.95  | 3.60  | 6.49  | 7.53   | 6.07  | 5.98   | 13.04  | 10.35 | 1.18   | 103.06  |
| 1963     | 4      | 10.87                            | 9.62  | 9.17   | 3.59  | 5.99  | 16.65 | 5.97   | 4.55  | 19.17  | 8.33   | 14.48 | 7.78   | 116.18  |
| 1964     | 4      | 6.31                             | 14.22 | .92    | 1.56  | 8.30  | 9.42  | 7.29   | 13.65 | 6.65   | 14.45  | 7.44  | 2.17   | 92.38   |
| 1965     | 4      | 17.58                            | 13.20 | 6.76   | 4.38  | 1.49  | 4.42  | 7.11   | 8.23  | 8.06   | 6.74   | 29.69 | 10.48  | 118.15  |
| 1966     | 4      | 1.82                             | 2.17  | .82    | .85   | 2.35  | 4.45  | 29.81  | 13.91 | 15.03  | 8.07   | 10.63 | 8.91   | 98.81   |
| 1967     | 4      | 6.95                             | 9.06  | 2.14   | 1.22  | 1.46  | 3.28  | 4.29   | 9.96  | 14.61  | 5.44   | 10.97 | 5.29   | 74.64   |
| 1968     | 5      | 7.49                             | 7.93  | 1.20   | 4.08  | 6.33  | 2.21  | 13.19  | 1.77  | 10.88  | 6.54   | 5.40  | 3.89   | 70.90   |
| 1969     | 5      | 7.08                             | 1.52  | 1.07   | 2.48  | 12.00 | 1.05  | .33    | 5.28  | 9.92   | 10.34  | 16.13 | 2.74   | 69.96   |
| 1970     | 5      | 8.13                             | 1.40  | 4.51   | .77   | 6.25  | 8.26  | 9.50   | 10.87 | 9.01   | 21.81  | 19.37 | 3.78   | 103.66  |
| 1971     | 5      | 4.18                             | 8.82# | 7.50   | 4.73  | 6.25  | 3.39  | 13.69  | 11.67 | 11.49  | 7.43   | 14.38 | 8.07   | 101.62  |
| 1972     | 6      | 2.07                             | 5.11  | 2.17   | 1.07  | .88   | 2.60  | 3.56   | 5.50  | 5.55   | 9.33   | 7.48  | 5.76   | 51.07   |
| 1973     | 6      | 1.31                             | 4.43  | 2.20   | 5.26  | 11.64 | 5.52  | 1.36   | 17.61 | 5.64   | 2.54   | 34.78 | 10.06  | 102.33  |
| 1974     | 6      | 8.33                             | 3.84  | .34    | 8.06  | 1.53  | 2.78  | 3.68   | 13.66 | 7.13   | 12.02  | 15.69 | 7.35   | 84.41   |
| 1975     | 5      | 5.49                             | 4.65  | 2.04   | .49   | 3.22  | 12.10 | 10.30  | 8.82  | 26.27  | 11.93  | 8.68  | 7.36   | 101.35  |
| 1976     | 5      | 11.87                            | 13.79 | 5.90   | 1.67  | 11.53 | 6.93  | 15.88+ | 20.62 | 11.74  | 17.96  | 14.96 | 5.95   | 138.80  |
| 1977     | 5      | 1.70                             | 9.29  | 8.15   | 5.42  | 3.57  | 4.59  | 9.05   | 3.58  | 4.94   | 13.63  | 17.03 | 6.55   | 87.50   |
| 1978     | 5      | 6.02                             | 4.09  | 8.48   | 6.57  | 18.53 | .38   | .20    | 14.33 | 11.45  | 12.55  | 10.82 | 8.78*  | 102.19  |
| 1979     | 5      | 8.45                             | .89   | 3.20   | 6.37  | 2.20  | 2.02  | 5.22   | 8.82  | 11.87  | 3.16   | 8.60  | 6.78+  | 67.58   |
| 1980     | 5      | 9.72                             | 16.85 | 8.22   | 27.45 | 11.47 | 11.46 | 13.53  | 5.68  | 5.39   | 18.03  | 17.33 | 13.49  | 158.61  |
| 1981     | 5      | 6.33                             | 3.57  | 5.67   | 3.13  | 2.20  | 6.03  | 29.13  | 2.37  | 14.59  | 6.66   | 8.03  | 8.46   | 96.17   |
| 1982     | 5      | 5.32                             | 2.25  | 3.56   | 1.91  | 7.45  | 3.34  | 5.33   | 18.44 | 18.46  | 16.54  | 5.95  | 11.68  | 100.23  |
| 1983     | 5      | 3.92*                            | 3.71  | 1.83   | 3.04  | 5.18  | 8.39  | 6.63   | 19.72 | 3.93*  | 10.21* | 2.72  | 12.05* | 81.33   |
| 1984     | 5      | 13.66                            | 4.03  | 10.49* | 11.14 | 10.92 | 9.71  | 10.84  | 2.11  | 10.46  | 25.61  | 7.19  | 3.14   | 119.31  |
| 1985     | 5      | 21.51                            | 7.55  | 8.85   | 1.85  | 6.39  | 8.13  | 7.05   | 2.32  | 8.71   | 8.24   | 32.01 | 7.10   | 119.72  |
| 1986     | 5      | 9.40                             | 6.18  | 1.32   | 1.13  | 3.01  | 3.05  | 16.71  | 10.97 | 10.78  | 5.93   | 13.58 | 12.70  | 94.76   |
| 1987     | 5      | 2.54                             | .68   | 4.03   | .20+  | 2.65+ | 5.42+ | 9.98+  | 5.99  | 10.47  | 5.47   | 12.98 | 7.22   | 67.62   |
| 1988     | 5      | 4.99                             | 2.08  | 5.76   | 2.39  | 2.31  | 14.54 | 25.82  | 4.46  | 12.93  | 13.19  | 12.86 | 8.86   | 110.20  |
| 1989     | 5      | 18.58                            | 7.01  | 1.18   | 2.72  | 9.16  | 7.44  | 19.79  | 12.27 | 16.86  | 5.63   | 7.33  | 3.84   | 111.80  |
| 1990     | 5      | 5.63                             | 4.99  | 5.51   | 6.04  | 2.73  | 2.87  | 4.67   | 8.44  | 14.75  | 21.68  | 2.87  | 6.64   | 86.80   |
| 1991     | 5      | 18.88                            | 3.59  | 5.94   | 1.86  | 3.42  | 4.82  | 10.26  | 10.88 | 13.90  | 14.19  | 9.01  | 7.21   | 103.96  |
| 1992     | 5      | 22.32                            | 5.35  | .71    | 1.36  | 8.21  | 2.95  | 35.04  | 10.70 | 11.95  | 23.19  | 8.35  | 4.58   | 134.71  |
| 1993     | 5      | 1.26                             | 3.73  | 12.34  | 4.20  | 6.60  | 6.98  | 13.94  | 9.37  | 23.29  | 8.67   | 10.26 | 6.46   | 107.09  |
| 1994     | 5      | 7.82                             | .33   | 19.00  | 4.54  | 3.80  | 12.83 | 9.50   | 17.25 | 7.98   | 10.57  | 11.77 | 3.67   | 109.05  |
| 1995     | 5      | 12.31                            | 11.91 | 24.26  | 2.94  | 4.91  | 7.08  | 2.29   | 7.61  | 14.12  | 18.95  | 6.36  | 8.90   | 121.64  |
| 1996     | 5      | 24.10                            | 16.43 | 5.43   | 1.67  | 1.79  | 4.79  | 10.82  | 17.72 | 14.43  | 9.61   | 11.50 | 1.43   | 119.73  |
| 1997     | 5      | 8.06                             | 10.90 | 2.59   | 11.23 | 4.89  | 9.81  | 14.56  | 21.93 | 5.47   | 8.06   | 6.47  | 2.48   | 106.45  |
| 1998     | 5      | 2.08                             | 21.52 | 27.91  | 4.26  | 3.56  | 4.74  | 10.64  | 16.21 | 5.64   | 7.33   | 11.16 | 7.60+  | 122.64  |
| average  |        | 9.09                             | 7.47  | 4.77   | 4.08  | 4.99  | 6.43  | 9.25   | 10.28 | 11.24  | 11.30  | 12.08 | 7.98   | 98.95   |
| adjusted |        | 9.19                             | 7.55  | 4.82   | 4.12  | 5.04  | 6.49  | 9.35   | 10.39 | 11.36  | 11.42  | 12.21 | 8.07   | 100.001 |

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File      : VEG-US-T.DEM
Units     : 10^6xm^3
Descrip.  : Upland alien demand (tall shrub) u/s of farm dams for 1964 to 1997
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| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1965  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1966  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1967  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1968  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1969  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1970  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.0   |
| 1971  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1972  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1973  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.0   |
| 1974  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.0   |
| 1975  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.0   |
| 1976  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1977  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.0   |
| 1978  | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1979  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1980  | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1981  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1982  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1983  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1984  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.01 | 0.1   |
| 1985  | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.02 | 0.1   |
| 1986  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1987  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.0   |
| 1988  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1989  | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1990  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.01 | 0.01 | 0.1   |
| 1991  | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1992  | 0.04 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.07 | 0.03 | 0.01 | 0.04 | 0.02 | 0.01 | 0.3   |
| 1993  | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.04 | 0.02 | 0.01 | 0.01 | 0.1   |
| 1994  | 0.01 | 0.01 | 0.02 | 0.01 | 0.00 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.02 | 0.01 | 0.1   |
| 1995  | 0.01 | 0.01 | 0.05 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.03 | 0.02 | 0.01 | 0.2   |
| 1996  | 0.06 | 0.04 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.2   |
| 1997  | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.05 | 0.02 | 0.01 | 0.01 | 0.01 | 0.2   |
| AVE : | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| SD :  | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |

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File      : VEG-US-S.DEM
Units     : 10^6xm^3
Descrip.  : Upland alien demand (tall shrub) u/s of farm dams for 1964 to 1997
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[illegible]

Appendix B8.6

File : VEG-US-R.DEM  
Units : 10^6xm^3  
Descrip. : Riparian alien demand (tall trees) u/s of farm dams for 1964 to 1997

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1965  | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1966  | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1967  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1968  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1969  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1970  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1971  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1972  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1973  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1974  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1975  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1976  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1977  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1978  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1979  | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1980  | 0.01 | 0.01 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1981  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1982  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1983  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1984  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1985  | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1986  | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1987  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1989  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1991  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1992  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1993  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1994  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1995  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1996  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1997  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| AVE : | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| SD :  | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |

Appendix B8.7

File : FOR-US.DEM  
Units : 10^6xm^3  
Descrip. : Afforestation demand u/s of farm dams for 1964 to 1997

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 0.03 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.03 | 0.03 | 0.03 | 0.3   |
| 1965  | 0.06 | 0.04 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.19 | 0.09 | 0.5   |
| 1966  | 0.03 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.17 | 0.08 | 0.04 | 0.04 | 0.04 | 0.04 | 0.5   |
| 1967  | 0.03 | 0.03 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.03 | 0.02 | 0.03 | 0.03 | 0.2   |
| 1968  | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.1   |
| 1969  | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.04 | 0.03 | 0.1   |
| 1970  | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.02 | 0.10 | 0.12 | 0.07 | 0.4   |
| 1971  | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.03 | 0.05 | 0.04 | 0.3   |
| 1972  | 0.03 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1973  | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.04 | 0.02 | 0.01 | 0.25 | 0.11 | 0.5   |
| 1974  | 0.04 | 0.03 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.02 | 0.01 | 0.03 | 0.06 | 0.05 | 0.3   |
| 1975  | 0.04 | 0.03 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.21 | 0.11 | 0.06 | 0.06 | 0.6   |
| 1976  | 0.07 | 0.07 | 0.04 | 0.01 | 0.01 | 0.01 | 0.05 | 0.14 | 0.09 | 0.13 | 0.14 | 0.11 | 0.9   |
| 1977  | 0.07 | 0.04 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.04 | 0.11 | 0.07 | 0.4   |
| 1978  | 0.05 | 0.04 | 0.02 | 0.01 | 0.10 | 0.04 | 0.01 | 0.04 | 0.04 | 0.06 | 0.07 | 0.08 | 0.6   |
| 1979  | 0.07 | 0.04 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.03 | 0.03 | 0.04 | 0.04 | 0.3   |
| 1980  | 0.05 | 0.12 | 0.06 | 0.38 | 0.15 | 0.04 | 0.06 | 0.04 | 0.04 | 0.15 | 0.21 | 0.18 | 1.5   |
| 1981  | 0.12 | 0.07 | 0.03 | 0.01 | 0.01 | 0.01 | 0.40 | 0.15 | 0.07 | 0.06 | 0.06 | 0.07 | 1.1   |
| 1982  | 0.06 | 0.04 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.12 | 0.18 | 0.18 | 0.13 | 0.11 | 0.9   |
| 1983  | 0.09 | 0.05 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.15 | 0.08 | 0.05 | 0.05 | 0.07 | 0.6   |
| 1984  | 0.09 | 0.06 | 0.04 | 0.03 | 0.03 | 0.02 | 0.03 | 0.02 | 0.03 | 0.34 | 0.18 | 0.07 | 0.9   |
| 1985  | 0.24 | 0.11 | 0.04 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.03 | 0.51 | 0.23 | 1.2   |
| 1986  | 0.07 | 0.05 | 0.02 | 0.01 | 0.01 | 0.00 | 0.07 | 0.05 | 0.04 | 0.05 | 0.09 | 0.11 | 0.6   |
| 1987  | 0.08 | 0.04 | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.03 | 0.04 | 0.07 | 0.07 | 0.4   |
| 1988  | 0.05 | 0.03 | 0.01 | 0.01 | 0.01 | 0.04 | 0.31 | 0.12 | 0.06 | 0.09 | 0.11 | 0.11 | 0.9   |
| 1989  | 0.20 | 0.11 | 0.04 | 0.01 | 0.01 | 0.01 | 0.14 | 0.08 | 0.13 | 0.10 | 0.08 | 0.07 | 1.0   |
| 1990  | 0.05 | 0.04 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.05 | 0.23 | 0.12 | 0.06 | 0.6   |
| 1991  | 0.16 | 0.08 | 0.03 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.06 | 0.10 | 0.10 | 0.09 | 0.7   |
| 1992  | 0.26 | 0.12 | 0.03 | 0.01 | 0.01 | 0.01 | 0.50 | 0.19 | 0.06 | 0.28 | 0.17 | 0.09 | 1.7   |
| 1993  | 0.06 | 0.03 | 0.03 | 0.01 | 0.01 | 0.01 | 0.04 | 0.03 | 0.24 | 0.14 | 0.09 | 0.08 | 0.8   |
| 1994  | 0.07 | 0.04 | 0.12 | 0.05 | 0.01 | 0.02 | 0.02 | 0.09 | 0.07 | 0.07 | 0.09 | 0.08 | 0.7   |
| 1995  | 0.07 | 0.07 | 0.26 | 0.09 | 0.01 | 0.01 | 0.01 | 0.01 | 0.04 | 0.15 | 0.10 | 0.07 | 0.9   |
| 1996  | 0.28 | 0.19 | 0.06 | 0.02 | 0.01 | 0.01 | 0.01 | 0.09 | 0.09 | 0.07 | 0.09 | 0.08 | 1.0   |
| 1997  | 0.06 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 | 0.04 | 0.19 | 0.10 | 0.06 | 0.06 | 0.05 | 0.7   |
| AVE : | 0.08 | 0.05 | 0.03 | 0.03 | 0.02 | 0.01 | 0.06 | 0.05 | 0.06 | 0.08 | 0.11 | 0.08 | 0.6   |
| SD :  | 0.07 | 0.04 | 0.05 | 0.06 | 0.03 | 0.01 | 0.12 | 0.06 | 0.06 | 0.08 | 0.09 | 0.04 | 0.4   |

## Appendix B8.8

File : VEG-DS-T.DEM  
Units : 10^6xm^3  
Descrip. : Upland alien demand (tall trees) d/s of farm dams for 1964 to 1997

| Year  | Oct  | Nov  | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul  | Aug  | Sep  | Total |
|-------|------|------|-------|-------|-------|-------|-------|-------|-------|------|------|------|-------|
| 1964  | 0.01 | 0.01 | 0.01  | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.01  | 0.01 | 0.01 | 0.01 | 0.1   |
| 1965  | 0.01 | 0.01 | 0.01  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.01 | 0.04 | 0.02 | 0.1   |
| 1966  | 0.01 | 0.01 | 0.00* | 0.00* | 0.00* | 0.00* | 0.05  | 0.02  | 0.01  | 0.01 | 0.01 | 0.01 | 0.1   |
| 1967  | 0.01 | 0.01 | 0.01  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.01 | 0.01 | 0.01 | 0.1   |
| 1968  | 0.01 | 0.01 | 0.01  | 0.00* | 0.00* | 0.00* | 0.01  | 0.00* | 0.01  | 0.01 | 0.01 | 0.01 | 0.1   |
| 1969  | 0.01 | 0.01 | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.01 | 0.02 | 0.01 | 0.1   |
| 1970  | 0.01 | 0.01 | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.01  | 0.05 | 0.06 | 0.03 | 0.2   |
| 1971  | 0.02 | 0.01 | 0.01  | 0.01  | 0.00* | 0.00* | 0.01  | 0.01  | 0.01  | 0.01 | 0.02 | 0.02 | 0.1   |
| 1972  | 0.02 | 0.01 | 0.01  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.01 | 0.01 | 0.01 | 0.1   |
| 1973  | 0.01 | 0.01 | 0.00* | 0.00* | 0.01  | 0.01  | 0.00* | 0.02  | 0.01  | 0.01 | 0.15 | 0.06 | 0.3   |
| 1974  | 0.02 | 0.02 | 0.01  | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.01  | 0.02 | 0.04 | 0.04 | 0.2   |
| 1975  | 0.03 | 0.02 | 0.01  | 0.00* | 0.00* | 0.01  | 0.01  | 0.01  | 0.14  | 0.08 | 0.04 | 0.04 | 0.4   |
| 1976  | 0.05 | 0.05 | 0.02  | 0.01  | 0.01  | 0.01  | 0.04  | 0.10  | 0.06  | 0.09 | 0.10 | 0.07 | 0.6   |
| 1977  | 0.05 | 0.03 | 0.02  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.03 | 0.08 | 0.05 | 0.3   |
| 1978  | 0.04 | 0.02 | 0.01  | 0.01  | 0.07  | 0.03  | 0.01  | 0.02  | 0.03  | 0.05 | 0.05 | 0.06 | 0.4   |
| 1979  | 0.05 | 0.04 | 0.01  | 0.01  | 0.01  | 0.00* | 0.00* | 0.01  | 0.02  | 0.02 | 0.03 | 0.04 | 0.2   |
| 1980  | 0.04 | 0.09 | 0.05  | 0.28  | 0.11  | 0.03  | 0.04  | 0.03  | 0.03  | 0.12 | 0.16 | 0.13 | 1.1   |
| 1981  | 0.09 | 0.05 | 0.02  | 0.01  | 0.01  | 0.00* | 0.30  | 0.11  | 0.05  | 0.05 | 0.05 | 0.05 | 0.8   |
| 1982  | 0.05 | 0.03 | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.09  | 0.13  | 0.13 | 0.09 | 0.09 | 0.7   |
| 1983  | 0.06 | 0.04 | 0.02  | 0.01  | 0.00* | 0.01  | 0.01  | 0.11  | 0.06  | 0.04 | 0.04 | 0.05 | 0.5   |
| 1984  | 0.07 | 0.05 | 0.02  | 0.02  | 0.02  | 0.02  | 0.02  | 0.02  | 0.02  | 0.26 | 0.13 | 0.06 | 0.7   |
| 1985  | 0.18 | 0.09 | 0.03  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.02 | 0.38 | 0.17 | 0.9   |
| 1986  | 0.05 | 0.04 | 0.02  | 0.01  | 0.00* | 0.00* | 0.05  | 0.04  | 0.04  | 0.04 | 0.07 | 0.08 | 0.4   |
| 1987  | 0.06 | 0.03 | 0.01  | 0.01  | 0.00* | 0.00* | 0.01  | 0.01  | 0.02  | 0.02 | 0.05 | 0.05 | 0.3   |
| 1988  | 0.05 | 0.03 | 0.01  | 0.01  | 0.00* | 0.04  | 0.28  | 0.11  | 0.05  | 0.08 | 0.11 | 0.10 | 0.9   |
| 1989  | 0.21 | 0.12 | 0.04  | 0.01  | 0.01  | 0.01  | 0.15  | 0.09  | 0.13  | 0.11 | 0.09 | 0.08 | 1.1   |
| 1990  | 0.06 | 0.04 | 0.02  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.07  | 0.29 | 0.16 | 0.08 | 0.8   |
| 1991  | 0.23 | 0.12 | 0.04  | 0.01  | 0.01  | 0.01  | 0.01  | 0.03  | 0.09  | 0.14 | 0.13 | 0.12 | 0.9   |
| 1992  | 0.42 | 0.20 | 0.05  | 0.01  | 0.01  | 0.01  | 0.81  | 0.31  | 0.09  | 0.45 | 0.27 | 0.15 | 2.8   |
| 1993  | 0.11 | 0.06 | 0.05  | 0.03  | 0.01  | 0.01  | 0.06  | 0.06  | 0.44  | 0.25 | 0.16 | 0.15 | 1.4   |
| 1994  | 0.13 | 0.08 | 0.25  | 0.09  | 0.02  | 0.05  | 0.04  | 0.19  | 0.13  | 0.13 | 0.18 | 0.16 | 1.5   |
| 1995  | 0.16 | 0.15 | 0.57  | 0.21  | 0.02  | 0.02  | 0.01  | 0.02  | 0.10  | 0.33 | 0.22 | 0.16 | 2.0   |
| 1996  | 0.67 | 0.46 | 0.14  | 0.04  | 0.01  | 0.01  | 0.02  | 0.22  | 0.22  | 0.18 | 0.22 | 0.19 | 2.4   |
| 1997  | 0.14 | 0.12 | 0.06  | 0.05  | 0.03  | 0.03  | 0.11  | 0.52  | 0.26  | 0.15 | 0.16 | 0.14 | 1.8   |
| AVE : | 0.09 | 0.06 | 0.05  | 0.03  | 0.01  | 0.01  | 0.06  | 0.07  | 0.07  | 0.09 | 0.10 | 0.07 | 0.7   |
| SD :  | 0.13 | 0.08 | 0.10  | 0.06  | 0.02  | 0.01  | 0.15  | 0.11  | 0.09  | 0.11 | 0.09 | 0.05 | 0.7   |





Appendix B8.10

File : VEG-DS-R.DEM  
Units : 10^6xm^3  
Descrip. : Riparian alien demand (tall trees) d/s of farm dams for 1964 to 1997

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1964  | 0.03 | 0.03 | 0.05 | 0.05 | 0.04 | 0.03 | 0.03 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.3   |
| 1965  | 0.03 | 0.04 | 0.06 | 0.06 | 0.05 | 0.04 | 0.04 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.4   |
| 1966  | 0.04 | 0.05 | 0.07 | 0.07 | 0.06 | 0.05 | 0.05 | 0.02 | 0.01 | 0.01 | 0.02 | 0.02 | 0.5   |
| 1967  | 0.04 | 0.06 | 0.07 | 0.08 | 0.06 | 0.05 | 0.05 | 0.02 | 0.01 | 0.01 | 0.02 | 0.03 | 0.5   |
| 1968  | 0.05 | 0.06 | 0.08 | 0.09 | 0.07 | 0.06 | 0.06 | 0.02 | 0.01 | 0.02 | 0.02 | 0.03 | 0.6   |
| 1969  | 0.05 | 0.07 | 0.09 | 0.10 | 0.08 | 0.07 | 0.07 | 0.02 | 0.02 | 0.02 | 0.02 | 0.03 | 0.6   |
| 1970  | 0.06 | 0.08 | 0.10 | 0.11 | 0.09 | 0.07 | 0.07 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.7   |
| 1971  | 0.06 | 0.08 | 0.11 | 0.12 | 0.09 | 0.08 | 0.08 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.8   |
| 1972  | 0.07 | 0.09 | 0.12 | 0.13 | 0.10 | 0.09 | 0.09 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.8   |
| 1973  | 0.07 | 0.10 | 0.13 | 0.14 | 0.11 | 0.09 | 0.09 | 0.03 | 0.02 | 0.03 | 0.03 | 0.05 | 0.9   |
| 1974  | 0.08 | 0.10 | 0.14 | 0.14 | 0.11 | 0.10 | 0.10 | 0.03 | 0.02 | 0.03 | 0.03 | 0.05 | 0.9   |
| 1975  | 0.08 | 0.11 | 0.14 | 0.15 | 0.12 | 0.10 | 0.10 | 0.04 | 0.02 | 0.03 | 0.04 | 0.05 | 1.0   |
| 1976  | 0.09 | 0.11 | 0.15 | 0.16 | 0.13 | 0.11 | 0.11 | 0.04 | 0.03 | 0.03 | 0.04 | 0.05 | 1.0   |
| 1977  | 0.09 | 0.11 | 0.15 | 0.16 | 0.13 | 0.11 | 0.11 | 0.04 | 0.03 | 0.03 | 0.04 | 0.06 | 1.1   |
| 1978  | 0.09 | 0.12 | 0.16 | 0.17 | 0.14 | 0.11 | 0.11 | 0.04 | 0.03 | 0.03 | 0.04 | 0.06 | 1.1   |
| 1979  | 0.10 | 0.12 | 0.17 | 0.18 | 0.14 | 0.12 | 0.12 | 0.04 | 0.03 | 0.03 | 0.04 | 0.06 | 1.2   |
| 1980  | 0.10 | 0.13 | 0.17 | 0.18 | 0.15 | 0.12 | 0.12 | 0.04 | 0.03 | 0.03 | 0.04 | 0.06 | 1.2   |
| 1981  | 0.09 | 0.11 | 0.15 | 0.16 | 0.13 | 0.11 | 0.11 | 0.04 | 0.03 | 0.03 | 0.04 | 0.06 | 1.1   |
| 1982  | 0.08 | 0.10 | 0.14 | 0.14 | 0.12 | 0.10 | 0.10 | 0.03 | 0.02 | 0.03 | 0.03 | 0.05 | 0.9   |
| 1983  | 0.07 | 0.09 | 0.12 | 0.12 | 0.10 | 0.08 | 0.08 | 0.03 | 0.02 | 0.02 | 0.03 | 0.04 | 0.8   |
| 1984  | 0.06 | 0.07 | 0.10 | 0.10 | 0.08 | 0.07 | 0.07 | 0.03 | 0.02 | 0.02 | 0.02 | 0.04 | 0.7   |
| 1985  | 0.05 | 0.06 | 0.08 | 0.08 | 0.07 | 0.06 | 0.06 | 0.02 | 0.01 | 0.02 | 0.02 | 0.03 | 0.6   |
| 1986  | 0.04 | 0.05 | 0.06 | 0.06 | 0.05 | 0.04 | 0.04 | 0.02 | 0.01 | 0.01 | 0.02 | 0.02 | 0.4   |
| 1987  | 0.02 | 0.03 | 0.04 | 0.04 | 0.04 | 0.03 | 0.03 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.3   |
| 1988  | 0.02 | 0.03 | 0.04 | 0.04 | 0.03 | 0.03 | 0.03 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.3   |
| 1989  | 0.02 | 0.03 | 0.04 | 0.04 | 0.03 | 0.03 | 0.03 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.3   |
| 1990  | 0.02 | 0.02 | 0.03 | 0.04 | 0.03 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1991  | 0.02 | 0.02 | 0.03 | 0.03 | 0.03 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1992  | 0.02 | 0.02 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1993  | 0.01 | 0.02 | 0.02 | 0.03 | 0.02 | 0.02 | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1994  | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |
| 1995  | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1996  | 0.01 | 0.01 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1997  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| AVE : | 0.05 | 0.06 | 0.09 | 0.09 | 0.07 | 0.06 | 0.06 | 0.02 | 0.01 | 0.02 | 0.02 | 0.03 | 0.6   |
| SD :  | 0.03 | 0.04 | 0.05 | 0.05 | 0.04 | 0.04 | 0.04 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.4   |

Appendix B8.11

File : H6H9IRR.DEM

Units : 10<sup>6</sup>xm<sup>3</sup>

Descrip. : Diffuse irrigation from rivers in H6H009 sub-catchment for 1964 to 1997

| Year  | Oct  | Nov   | Dec   | Jan   | Feb   | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|-------|-------|-------|-------|------|------|------|------|------|------|------|-------|
| 1964  | 3.69 | 5.88  | 8.41  | 8.80  | 6.92  | 5.89 | 4.72 | 1.37 | 0.00 | 0.84 | 0.18 | 2.07 | 48.8  |
| 1965  | 4.29 | 5.68  | 8.84  | 9.02  | 7.17  | 5.91 | 4.88 | 1.57 | 0.00 | 0.00 | 0.91 | 1.96 | 50.2  |
| 1966  | 4.29 | 6.48  | 9.06  | 9.39  | 7.33  | 6.17 | 4.97 | 1.05 | 0.23 | 0.00 | 0.19 | 2.10 | 51.2  |
| 1967  | 3.40 | 6.48  | 9.24  | 9.62  | 7.47  | 6.25 | 5.17 | 1.09 | 0.03 | 0.85 | 0.00 | 2.44 | 52.1  |
| 1968  | 4.87 | 6.56  | 9.33  | 9.76  | 7.67  | 6.26 | 5.67 | 2.01 | 0.00 | 0.55 | 0.33 | 1.68 | 54.7  |
| 1969  | 5.24 | 6.75  | 9.59  | 10.06 | 7.70  | 6.34 | 5.09 | 1.32 | 0.23 | 0.00 | 0.08 | 2.54 | 54.9  |
| 1970  | 4.94 | 7.11  | 9.35  | 10.10 | 7.69  | 6.41 | 5.45 | 1.53 | 0.61 | 1.00 | 0.00 | 1.25 | 55.4  |
| 1971  | 3.97 | 6.93  | 10.04 | 10.18 | 8.10  | 6.66 | 3.08 | 1.86 | 0.92 | 0.00 | 0.00 | 2.04 | 53.8  |
| 1972  | 3.08 | 7.48  | 9.65  | 10.57 | 7.99  | 7.06 | 6.05 | 1.30 | 0.00 | 0.00 | 1.51 | 0.65 | 55.3  |
| 1973  | 4.53 | 6.36  | 9.63  | 10.14 | 7.86  | 6.33 | 5.32 | 0.80 | 0.00 | 0.00 | 0.00 | 2.73 | 53.7  |
| 1974  | 5.11 | 6.58  | 9.82  | 10.00 | 7.79  | 6.60 | 5.38 | 1.43 | 0.44 | 0.00 | 0.00 | 1.83 | 55.0  |
| 1975  | 3.88 | 6.61  | 10.15 | 10.52 | 8.18  | 6.75 | 4.32 | 0.14 | 0.00 | 0.49 | 1.17 | 2.21 | 54.4  |
| 1976  | 5.21 | 6.56  | 10.15 | 10.55 | 8.30  | 6.83 | 5.67 | 0.90 | 0.48 | 0.00 | 0.36 | 1.68 | 56.7  |
| 1977  | 4.82 | 5.05  | 9.96  | 10.87 | 8.49  | 6.82 | 5.42 | 1.75 | 0.00 | 0.00 | 1.72 | 1.75 | 56.6  |
| 1978  | 5.25 | 7.46  | 10.14 | 10.94 | 8.63  | 6.54 | 4.62 | 0.73 | 0.27 | 0.12 | 0.22 | 1.62 | 56.5  |
| 1979  | 4.77 | 7.67  | 10.69 | 11.11 | 8.07  | 6.80 | 5.29 | 1.81 | 1.18 | 0.29 | 0.00 | 2.77 | 60.4  |
| 1980  | 5.41 | 8.15  | 10.79 | 11.42 | 8.29  | 7.06 | 4.35 | 1.44 | 0.00 | 0.77 | 1.74 | 2.34 | 61.8  |
| 1981  | 5.34 | 6.13  | 10.83 | 11.01 | 8.80  | 7.31 | 3.83 | 0.63 | 0.00 | 0.00 | 0.00 | 1.66 | 55.5  |
| 1982  | 3.99 | 8.18  | 11.04 | 11.28 | 9.02  | 7.17 | 5.91 | 0.07 | 0.00 | 1.03 | 0.73 | 2.75 | 61.2  |
| 1983  | 4.03 | 8.46  | 10.72 | 10.97 | 8.96  | 7.31 | 5.31 | 1.69 | 0.00 | 0.24 | 0.30 | 1.83 | 59.8  |
| 1984  | 5.60 | 6.30  | 11.67 | 12.22 | 9.55  | 7.76 | 6.11 | 0.87 | 0.00 | 1.12 | 0.00 | 1.02 | 62.2  |
| 1985  | 5.49 | 8.98  | 11.99 | 12.55 | 9.81  | 8.08 | 5.80 | 0.00 | 0.00 | 0.00 | 0.00 | 3.13 | 65.8  |
| 1986  | 2.40 | 9.16  | 12.32 | 12.81 | 9.85  | 7.40 | 6.52 | 1.87 | 0.59 | 0.47 | 1.52 | 2.26 | 67.2  |
| 1987  | 5.87 | 9.44  | 12.60 | 13.15 | 10.18 | 7.48 | 5.81 | 1.47 | 0.47 | 0.00 | 1.49 | 2.30 | 70.3  |
| 1988  | 5.65 | 8.47  | 12.84 | 13.26 | 10.45 | 8.20 | 6.15 | 1.73 | 0.32 | 0.00 | 2.00 | 1.98 | 71.1  |
| 1989  | 2.35 | 9.30  | 12.59 | 13.01 | 10.31 | 8.55 | 4.91 | 1.23 | 0.78 | 0.23 | 0.62 | 2.88 | 66.7  |
| 1990  | 6.60 | 4.54  | 12.95 | 13.48 | 10.55 | 8.70 | 5.63 | 1.90 | 1.30 | 0.00 | 1.47 | 2.19 | 69.3  |
| 1991  | 4.90 | 6.85  | 12.90 | 12.70 | 10.76 | 8.61 | 5.91 | 2.05 | 0.00 | 0.00 | 0.53 | 1.06 | 66.3  |
| 1992  | 6.44 | 9.49  | 13.48 | 13.98 | 10.55 | 8.86 | 6.80 | 1.21 | 0.25 | 0.15 | 0.00 | 1.28 | 72.5  |
| 1993  | 6.19 | 5.82  | 13.63 | 14.24 | 11.08 | 9.24 | 4.72 | 1.52 | 0.12 | 0.00 | 1.01 | 2.90 | 70.5  |
| 1994  | 6.13 | 8.95  | 13.94 | 14.58 | 11.19 | 8.98 | 6.32 | 0.00 | 0.00 | 0.00 | 0.00 | 3.59 | 73.7  |
| 1995  | 7.18 | 9.97  | 14.16 | 14.59 | 9.94  | 9.59 | 7.10 | 2.05 | 0.00 | 0.00 | 0.00 | 3.33 | 77.9  |
| 1996  | 5.83 | 10.43 | 14.51 | 14.81 | 11.65 | 9.31 | 7.52 | 0.38 | 0.00 | 0.00 | 0.40 | 3.71 | 78.6  |
| 1997  | 6.33 | 10.81 | 14.17 | 15.46 | 11.40 | 9.17 | 7.64 | 0.00 | 0.00 | 0.00 | 0.00 | 2.06 | 77.0  |
| AVE : | 4.91 | 7.50  | 11.21 | 11.68 | 9.05  | 7.42 | 5.51 | 1.20 | 0.24 | 0.24 | 0.54 | 2.16 | 61.7  |
| SD :  | 1.15 | 1.57  | 1.80  | 1.85  | 1.38  | 1.11 | 0.97 | 0.64 | 0.36 | 0.36 | 0.65 | 0.72 | 8.6   |

Appendix B8.12

File : H6H9FDAM.DEM  
Units : 10^6xm^3  
Descrip. : Irrigation from farm dams in H6H009 sub-catchment for 1964 to 1997

| Year  | Oct  | Nov  | Dec   | Jan   | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|-------|-------|------|------|------|------|------|------|------|------|-------|
| 1964  | 3.69 | 5.88 | 8.41  | 8.80  | 6.92 | 5.89 | 4.72 | 1.37 | 0.00 | 0.84 | 0.18 | 2.07 | 48.8  |
| 1965  | 4.29 | 5.68 | 8.84  | 9.02  | 7.17 | 5.91 | 4.88 | 1.57 | 0.00 | 0.00 | 0.91 | 1.96 | 50.2  |
| 1966  | 4.29 | 6.48 | 9.06  | 9.39  | 7.33 | 6.17 | 4.97 | 1.05 | 0.23 | 0.00 | 0.19 | 2.10 | 51.2  |
| 1967  | 0.00 | 0.00 | 8.36  | 9.61  | 7.44 | 6.19 | 4.49 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 36.1  |
| 1968  | 0.00 | 4.47 | 8.92  | 9.64  | 6.95 | 5.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 35.2  |
| 1969  | 0.00 | 6.63 | 9.49  | 9.98  | 7.64 | 6.28 | 5.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 45.1  |
| 1970  | 0.00 | 4.31 | 8.96  | 10.10 | 7.69 | 6.41 | 5.43 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 42.9  |
| 1971  | 0.00 | 4.10 | 9.91  | 10.12 | 7.94 | 6.66 | 3.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 41.8  |
| 1972  | 0.00 | 6.63 | 9.65  | 10.57 | 7.99 | 7.06 | 5.94 | 1.26 | 0.00 | 0.00 | 0.00 | 0.00 | 49.1  |
| 1973  | 0.00 | 6.11 | 5.54  | 9.94  | 7.86 | 6.15 | 4.82 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 40.4  |
| 1974  | 0.00 | 0.00 | 8.67  | 9.85  | 7.74 | 6.56 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 32.8  |
| 1975  | 0.00 | 2.33 | 8.49  | 10.30 | 8.13 | 6.72 | 4.32 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 40.3  |
| 1976  | 0.00 | 0.00 | 0.00  | 0.00  | 3.42 | 2.38 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.8   |
| 1977  | 0.00 | 3.09 | 5.77  | 9.13  | 7.94 | 6.21 | 0.70 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 32.8  |
| 1978  | 0.00 | 0.00 | 7.04  | 9.18  | 8.25 | 3.88 | 3.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 31.5  |
| 1979  | 0.00 | 1.98 | 8.92  | 3.12  | 0.06 | 6.72 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 20.8  |
| 1980  | 0.00 | 5.57 | 0.00  | 0.00  | 0.00 | 5.37 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10.9  |
| 1981  | 0.00 | 3.45 | 8.27  | 7.71  | 7.24 | 5.92 | 3.42 | 0.47 | 0.00 | 0.00 | 0.00 | 0.00 | 36.5  |
| 1982  | 0.00 | 7.08 | 7.49  | 8.15  | 6.13 | 6.23 | 2.64 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 37.7  |
| 1983  | 0.00 | 7.90 | 6.32  | 6.57  | 6.50 | 6.90 | 4.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 38.4  |
| 1984  | 0.00 | 5.76 | 10.05 | 7.90  | 7.46 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 31.2  |
| 1985  | 0.00 | 0.00 | 11.17 | 10.52 | 6.36 | 4.54 | 4.84 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 37.4  |
| 1986  | 2.07 | 7.72 | 8.72  | 8.26  | 5.91 | 4.25 | 5.23 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 42.2  |
| 1987  | 0.00 | 6.69 | 8.12  | 8.16  | 5.98 | 5.12 | 5.04 | 1.36 | 0.00 | 0.00 | 0.13 | 0.00 | 40.6  |
| 1988  | 0.47 | 5.77 | 8.64  | 7.92  | 6.06 | 4.55 | 4.36 | 1.55 | 0.00 | 0.00 | 0.00 | 0.00 | 39.3  |
| 1989  | 1.77 | 8.07 | 8.81  | 8.76  | 6.95 | 7.32 | 2.98 | 0.00 | 0.00 | 0.00 | 0.00 | 2.50 | 47.2  |
| 1990  | 6.23 | 0.44 | 9.05  | 9.39  | 6.84 | 5.02 | 2.01 | 0.00 | 1.18 | 0.00 | 1.03 | 0.00 | 41.2  |
| 1991  | 0.00 | 1.89 | 9.33  | 8.96  | 6.81 | 4.63 | 2.59 | 1.93 | 0.00 | 0.00 | 0.00 | 0.00 | 36.1  |
| 1992  | 0.00 | 0.00 | 9.27  | 8.89  | 5.69 | 4.97 | 3.79 | 0.93 | 0.00 | 0.00 | 0.00 | 0.00 | 33.5  |
| 1993  | 4.55 | 1.64 | 9.93  | 10.90 | 8.74 | 5.49 | 3.25 | 1.38 | 0.00 | 0.00 | 0.00 | 0.00 | 45.9  |
| 1994  | 0.00 | 5.68 | 9.78  | 11.10 | 6.85 | 5.78 | 5.22 | 0.00 | 0.00 | 0.00 | 0.00 | 2.61 | 47.0  |
| 1995  | 0.00 | 3.83 | 13.15 | 10.75 | 6.27 | 6.52 | 3.49 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 44.0  |
| 1996  | 0.00 | 0.00 | 6.53  | 11.25 | 7.00 | 5.03 | 4.64 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 34.5  |
| 1997  | 3.51 | 8.33 | 8.82  | 10.81 | 6.92 | 4.83 | 6.14 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 49.4  |
| AVE : | 0.91 | 4.04 | 8.22  | 8.67  | 6.59 | 5.50 | 3.39 | 0.38 | 0.04 | 0.02 | 0.07 | 0.33 | 38.2  |
| SD :  | 1.76 | 2.84 | 2.54  | 2.68  | 1.93 | 1.42 | 1.95 | 0.63 | 0.20 | 0.14 | 0.23 | 0.81 | 10.1  |

Appendix B8.13

File : UP-INFL0.OBS  
Units : 10^6xm^3  
Descrip. : Spills/releases from Theewaterskloof Dam for 1967 to 1997

| Year  | Oct    | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May    | Jun    | Jul    | Aug    | Sep    | Total |
|-------|--------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|-------|
| 1967  | 15.36* | 6.68* | 0.88  | 0.01  | 0.03  | 0.06  | 0.67  | 51.52  | 50.90  | 48.13  | 47.76  | 17.66  | 239.6 |
| 1968  | 36.27  | 2.09  | 0.41  | 0.12  | 0.72^ | 1.05^ | 5.74^ | 3.94^  | 15.11^ | 9.09   | 32.33^ | 34.50^ | 141.4 |
| 1969  | 31.56^ | 0.12  | 0.10  | 0.07  | 0.06  | 0.06  | 0.06  | 14.76  | 45.97  | 50.89  | 56.88  | 35.01* | 235.5 |
| 1970  | 13.11  | 2.79  | 0.39  | 0.00  | 0.00  | 0.00  | 0.01  | 10.44  | 7.87   | 66.27  | 51.41  | 16.40* | 168.7 |
| 1971  | 5.13   | 2.83  | 0.13  | 0.06  | 0.16  | 0.00  | 0.00  | 31.50  | 27.35  | 11.27  | 30.76  | 20.71* | 129.9 |
| 1972  | 3.29   | 0.86  | 0.01  | 0.00  | 0.00  | 0.00  | 0.12  | 0.05   | 3.68^  | 64.50  | 49.83  | 27.85^ | 150.2 |
| 1973  | 10.97  | 0.26  | 4.09  | 0.20* | 0.00* | 0.18^ | 0.50^ | 12.36^ | 43.75  | 19.69  | 186.10 | 45.16* | 323.2 |
| 1974  | 23.50  | 7.64  | 1.15  | 0.15  | 0.05  | 0.05  | 8.79  | 54.70  | 39.20  | 59.40  | 63.40  | 14.60  | 272.6 |
| 1975  | 16.50  | 4.28  | 1.66  | 0.22  | 0.06  | 0.03  | 0.01  | 1.58   | 105.00 | 86.90  | 30.80  | 17.40  | 264.4 |
| 1976  | 13.50  | 52.00 | 25.70 | 19.30 | 4.88  | 4.45  | 25.60 | 82.10  | 155.00 | 125.00 | 154.00 | 24.90  | 686.4 |
| 1977  | 8.80   | 1.96  | 4.19  | 1.74  | 0.56  | 0.61  | 4.72  | 18.60  | 6.17   | 10.70  | 43.80  | 33.00  | 134.9 |
| 1978  | 23.10  | 9.67  | 3.10  | 1.76  | 0.37  | 2.67  | 1.43  | 7.66   | 42.80  | 31.20  | 30.80  | 24.00  | 178.6 |
| 1979  | 41.50  | 5.69  | 1.77  | 7.99  | 8.01  | 0.08  | 7.90  | 18.30  | 10.30  | 34.60  | 19.20  | 9.53   | 164.9 |
| 1980  | 5.67   | 2.58  | 36.00 | 32.20 | 34.10 | 1.69  | 6.20  | 11.60  | 5.53   | 35.10  | 72.70  | 66.70  | 310.1 |
| 1981  | 30.40  | 2.68  | 2.56  | 3.30  | 1.56  | 1.39  | 0.41  | 0.17   | 15.90  | 12.10  | 30.20  | 22.00  | 122.7 |
| 1982  | 14.10  | 1.10  | 3.55  | 3.13  | 2.89  | 0.93  | 3.27  | 12.90  | 35.20  | 102.00 | 55.30  | 40.00  | 274.4 |
| 1983  | 13.20  | 0.56  | 4.40  | 4.40  | 2.46  | 0.40  | 1.15  | 90.10  | 21.10  | 59.20  | 18.80  | 55.50  | 271.3 |
| 1984  | 27.30  | 0.54  | 1.62  | 4.32  | 2.09  | 35.00 | 20.30 | 14.80  | 61.20  | 65.60  | 62.80  | 14.00  | 309.6 |
| 1985  | 10.70  | 9.93  | 0.82  | 2.03  | 3.45  | 3.54  | 0.95  | 0.85   | 28.10  | 58.70  | 70.60  | 31.70  | 221.4 |
| 1986  | 0.33   | 1.44  | 3.60  | 4.55  | 3.94  | 3.15  | 1.29  | 12.00  | 39.30  | 35.60  | 50.00  | 30.50  | 185.7 |
| 1987  | 9.98   | 2.75  | 4.48  | 4.99  | 4.20  | 2.36  | 0.78  | 0.11   | 5.06   | 50.70  | 1.36   | 23.00  | 109.8 |
| 1988  | 5.18   | 2.70  | 4.20  | 5.34  | 4.39  | 3.65  | 1.79  | 0.18   | 3.04   | 46.10  | 52.10  | 63.80  | 192.5 |
| 1989  | 0.58   | 1.23  | 3.78  | 4.25  | 3.36  | 1.23  | 1.93  | 1.82   | 57.00  | 77.60  | 68.80  | 0.38   | 222.0 |
| 1990  | 0.37   | 4.10  | 3.90  | 4.09  | 3.71  | 3.68  | 3.62  | 2.68   | 0.12   | 0.32   | 0.44   | 6.27   | 33.3  |
| 1991  | 10.50  | 4.96  | 3.57  | 3.74  | 3.95  | 3.98  | 3.32  | 0.12   | 4.40   | 63.30  | 70.90  | 44.50  | 217.2 |
| 1992  | 47.40  | 15.00 | 4.21  | 5.09  | 4.86  | 3.89  | 3.01  | 0.28   | 28.60  | 85.80  | 41.20  | 9.74   | 249.1 |
| 1993  | 1.64   | 4.18  | 3.70  | 3.34  | 2.34  | 3.75  | 1.47  | 0.15   | 0.52   | 10.90  | 28.50  | 15.90  | 76.4  |
| 1994  | 9.09   | 3.27  | 4.16  | 3.48  | 4.34  | 3.20  | 1.10  | 0.30   | 0.22   | 0.25   | 0.40   | 0.98   | 30.8  |
| 1995  | 16.70  | 6.14  | 1.01  | 3.84  | 3.67  | 3.07  | 3.61  | 3.86   | 0.60   | 40.20  | 51.60  | 63.70  | 198.0 |
| 1996  | 58.80  | 39.20 | 7.98  | 3.56  | 4.65  | 4.28  | 2.88  | 0.41   | 1.54   | 18.20  | 38.20  | 24.30  | 204.0 |
| 1997  | 2.82   | 2.48  | 5.35  | 4.65  | 4.48  | 4.34  | 1.50  | 0.60   | 0.24   | 4.19   | 12.90  | 10.40  | 54.0  |
| AVE : | 16.37  | 6.51  | 4.60  | 4.26  | 3.53  | 2.99  | 3.68  | 14.85  | 27.77  | 44.63  | 49.16  | 27.23  | 205.6 |
| SD :  | 14.62  | 11.06 | 7.37  | 6.33  | 6.04  | 6.16  | 5.67  | 23.51  | 33.91  | 31.50  | 38.55  | 17.90  | 119.3 |

```
File      : RUEN-E.DEM
Units    : 10^6xm^3
Descrip.  : Ruensveld-East demand for 1974 to 1997
```

[illegible]

```
File      : RUEN-W.DEM
Units    : 10^6xm^3
Descrip.  : Ruensveld-West demand for 1974 to 1997
```

[illegible]

## Appendix B8.16

File : H6H9SIM.CUM

Units : 10^6xm^3

Descrip. : Simulated flow record at H6H009 for 1963 to 1997

| Year  | Oct    | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May    | Jun    | Jul    | Aug    | Sep    | Total |
|-------|--------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|-------|
| 1963  | 0.00   | 0.35  | 0.19  | 0.17  | 0.20  | 0.90  | 0.42  | 0.14   | 0.00   | 0.00   | 0.00   | 0.00   | 2.4   |
| 1964  | 0.00   | 7.42  | 5.56  | 1.89  | 1.12  | 1.95  | 1.76  | 3.81   | 0.00   | 0.00   | 0.00   | 0.00   | 23.5  |
| 1965  | 0.00   | 10.24 | 6.37  | 3.25  | 1.30  | 0.75  | 0.76  | 0.94   | 0.00   | 0.00   | 0.00   | 0.00   | 23.6  |
| 1966  | 0.00   | 3.06  | 1.85  | 0.68  | 0.28  | 0.39  | 54.06 | 15.83  | 0.00   | 0.00   | 0.00   | 0.00   | 76.2  |
| 1967  | 24.04  | 12.21 | 6.23  | 1.72  | 0.53  | 0.50  | 0.60  | 51.91  | 55.92  | 57.34  | 59.43  | 27.74  | 298.2 |
| 1968  | 41.90  | 5.23  | 4.93  | 1.36  | 1.47  | 1.57  | 6.35  | 4.68   | 18.11  | 17.35  | 39.70  | 39.91  | 182.6 |
| 1969  | 33.42  | 3.50  | 1.99  | 0.46  | 2.59  | 1.52  | 0.47  | 14.05  | 45.80  | 52.34  | 77.21  | 47.67  | 281.0 |
| 1970  | 18.76  | 4.56  | 3.81  | 0.93  | 0.53  | 1.00  | 1.77  | 12.40  | 18.69  | 120.86 | 113.06 | 50.78  | 347.2 |
| 1971  | 24.09  | 15.76 | 5.83  | 2.48  | 1.46  | 1.09  | 5.06  | 33.64  | 33.22  | 23.07  | 51.36  | 38.07  | 235.1 |
| 1972  | 13.98  | 5.32  | 3.73  | 0.96  | 0.25  | 0.11  | 0.17  | 0.35   | 3.68   | 64.50  | 51.41  | 33.72  | 178.2 |
| 1973  | 12.62  | 3.04  | 2.92  | 0.70  | 2.58  | 2.04  | 1.11  | 21.32  | 53.63  | 25.44  | 293.29 | 89.89  | 508.6 |
| 1974  | 33.18  | 11.28 | 5.07  | 1.52  | 0.84  | 0.48  | 5.05  | 56.85  | 40.32  | 68.87  | 85.69  | 31.28  | 340.4 |
| 1975  | 26.10  | 6.78  | 5.05  | 0.99  | 0.32  | 2.83  | 2.82  | 3.55   | 161.77 | 121.03 | 48.84  | 33.06  | 413.1 |
| 1976  | 27.45  | 64.03 | 26.79 | 14.09 | 5.16  | 4.09  | 30.54 | 115.80 | 177.81 | 160.94 | 191.94 | 50.49  | 869.1 |
| 1977  | 21.76  | 8.05  | 7.24  | 4.02  | 1.43  | 1.06  | 2.47  | 18.20  | 6.15   | 15.59  | 67.32  | 49.59  | 202.9 |
| 1978  | 30.99  | 10.89 | 6.25  | 2.93  | 19.40 | 8.74  | 1.40  | 10.79  | 47.99  | 44.18  | 46.78  | 39.57  | 269.9 |
| 1979  | 52.01  | 8.16  | 4.96  | 3.28  | 2.73  | 0.45  | 4.27  | 17.63  | 9.39   | 39.80  | 26.58  | 15.89  | 185.2 |
| 1980  | 10.30  | 16.52 | 38.24 | 88.53 | 53.71 | 8.22  | 10.77 | 16.37  | 13.65  | 64.21  | 111.62 | 100.25 | 532.4 |
| 1981  | 49.95  | 12.52 | 9.51  | 6.85  | 1.00  | 0.88  | 58.69 | 25.55  | 27.57  | 23.23  | 40.97  | 33.66  | 290.4 |
| 1982  | 20.60  | 4.89  | 4.13  | 1.69  | 1.38  | 0.99  | 1.49  | 24.77  | 67.07  | 134.33 | 76.89  | 58.82  | 397.0 |
| 1983  | 25.52  | 6.08  | 5.25  | 2.24  | 1.27  | 1.23  | 1.52  | 106.25 | 34.88  | 68.12  | 28.21  | 67.04  | 347.6 |
| 1984  | 39.60  | 6.59  | 7.41  | 6.13  | 5.49  | 33.22 | 19.45 | 16.06  | 61.17  | 126.02 | 94.40  | 26.55  | 442.1 |
| 1985  | 50.53  | 24.79 | 8.43  | 3.46  | 2.17  | 2.36  | 1.76  | 1.72   | 28.08  | 58.67  | 161.16 | 70.08  | 413.2 |
| 1986  | 11.30  | 6.56  | 6.16  | 2.40  | 1.43  | 1.16  | 10.85 | 14.55  | 41.07  | 45.45  | 65.89  | 49.25  | 256.1 |
| 1987  | 19.83  | 5.71  | 5.22  | 2.28  | 1.37  | 0.98  | 1.70  | 1.35   | 4.67   | 51.05  | 12.68  | 34.09  | 140.9 |
| 1988  | 10.37  | 4.75  | 5.17  | 2.60  | 1.59  | 7.52  | 43.95 | 19.36  | 14.11  | 63.22  | 72.88  | 83.67  | 329.2 |
| 1989  | 36.18  | 14.38 | 8.02  | 4.23  | 2.37  | 2.01  | 20.57 | 9.15   | 81.14  | 97.53  | 83.79  | 11.86  | 371.2 |
| 1990  | 5.04   | 6.77  | 5.66  | 3.67  | 1.85  | 1.52  | 1.41  | 1.90   | 0.32   | 42.70  | 23.37  | 16.93  | 111.2 |
| 1991  | 38.35  | 16.11 | 6.71  | 3.95  | 1.71  | 1.57  | 2.42  | 2.43   | 4.35   | 81.82  | 88.95  | 60.32  | 308.7 |
| 1992  | 93.19  | 31.30 | 7.28  | 4.12  | 2.04  | 1.77  | 81.98 | 36.69  | 40.17  | 140.89 | 74.24  | 26.80  | 540.5 |
| 1993  | 8.19   | 5.70  | 7.75  | 5.04  | 1.98  | 2.28  | 5.88  | 3.15   | 37.07  | 38.59  | 46.44  | 30.83  | 192.9 |
| 1994  | 17.57  | 5.71  | 20.61 | 12.29 | 2.56  | 5.13  | 3.87  | 8.79   | 9.43   | 13.36  | 18.60  | 14.20  | 132.1 |
| 1995  | 26.04  | 11.88 | 43.25 | 20.45 | 4.30  | 2.21  | 1.87  | 2.93   | 0.54   | 66.51  | 71.93  | 75.65  | 327.6 |
| 1996  | 113.21 | 71.88 | 12.28 | 6.66  | 2.48  | 1.65  | 2.45  | 8.63   | 16.73  | 34.23  | 57.01  | 37.76  | 365.0 |
| 1997  | 8.97   | 6.87  | 7.08  | 6.21  | 3.16  | 3.27  | 7.99  | 25.62  | 20.77  | 15.87  | 25.41  | 19.67  | 150.9 |
| AVE : | 27.00  | 12.54 | 8.77  | 6.41  | 3.83  | 3.07  | 11.36 | 20.21  | 33.58  | 56.49  | 65.92  | 39.00  | 288.2 |
| SD :  | 24.11  | 15.19 | 9.35  | 14.88 | 9.26  | 5.66  | 19.36 | 26.56  | 40.50  | 43.52  | 58.20  | 25.64  | 173.2 |

Appendix B8.17

File : H6H9PAT.OBS

Units : 10^6xm^3

Descrip. : Patched observed flow record at H6H009 for 1964 to 1997

| Year  | Oct    | Nov   | Dec   | Jan    | Feb    | Mar   | Apr   | May    | Jun    | Jul    | Aug    | Sep    | Total  |
|-------|--------|-------|-------|--------|--------|-------|-------|--------|--------|--------|--------|--------|--------|
| 1964  | 29.90  | 35.10 | 2.79  | 0.06   | 1.22   | 2.12  | 16.20 | 22.60  | 45.60  | 58.60  | 60.10  | 24.50* | 298.8  |
| 1965  | 38.60  | 80.70 | 7.12  | 13.90  | 5.71   | 0.27  | 15.50 | 9.08   | 19.60  | 107.00 | 84.60  | 67.10  | 449.2  |
| 1966  | 20.60  | 2.05  | 0.01  | 0.00   | 0.16   | 3.29  | 28.80 | 52.00  | 125.00 | 45.50  | 58.30  | 38.80  | 374.5  |
| 1967  | 32.60  | 11.00 | 3.99  | 0.00   | 0.00   | 0.72  | 2.46  | 56.40  | 82.40  | 61.20  | 73.70  | 34.00  | 358.5  |
| 1968  | 47.10  | 17.80 | 0.93  | 0.00   | 0.00   | 0.01  | 5.51  | 6.64   | 15.20  | 27.20  | 35.00  | 46.40  | 201.8  |
| 1969  | 41.10  | 5.73  | 0.06  | 0.00   | 2.98   | 0.29  | 0.00  | 0.14   | 52.00  | 55.70  | 75.30  | 48.60  | 281.9  |
| 1970  | 24.20  | 2.63  | 1.61  | 0.03   | 0.89   | 1.72  | 3.73* | 10.90  | 14.50  | 113.00 | 105.00 | 36.20  | 314.4  |
| 1971  | 8.74   | 18.70 | 11.70 | 0.47   | 1.75   | 1.42  | 0.28  | 30.70  | 42.50  | 18.60  | 54.00  | 31.60  | 220.5  |
| 1972  | 8.45   | 7.36  | 0.22  | 0.00   | 0.00   | 0.00  | 1.99  | 0.41   | 0.96   | 59.40  | 63.60  | 29.90  | 172.3  |
| 1973  | 15.30  | 2.83  | 1.74  | 2.67   | 10.90  | 4.44  | 2.76  | 10.50  | 47.60  | 25.20  | 297.00 | 86.30  | 507.2  |
| 1974  | 37.60  | 18.00 | 2.04  | 0.00   | 0.25   | 0.55  | 0.11  | 46.20  | 52.20  | 73.20  | 77.40  | 49.00  | 356.5  |
| 1975  | 19.30  | 7.91  | 4.48  | 0.46   | 0.00   | 3.81  | 0.85  | 10.50  | 145.00 | 107.00 | 67.30  | 34.10* | 400.7  |
| 1976  | 50.80  | 68.10 | 31.80 | 15.80* | 11.70* | 12.90 | 33.10 | 132.00 | 212.00 | 179.00 | 221.00 | 45.10  | 1013.3 |
| 1977  | 22.90  | 13.20 | 11.00 | 19.00  | 1.11   | 1.66  | 8.17  | 16.10  | 12.10  | 20.00  | 64.40  | 55.40  | 245.0  |
| 1978  | 45.90  | 16.60 | 26.20 | 3.99   | 0.24   | 7.90  | 1.19  | 12.60  | 43.80  | 38.20  | 53.50  | 40.30  | 290.4  |
| 1979  | 54.40  | 13.60 | 1.62  | 4.94   | 13.20  | 2.18  | 4.34  | 9.63   | 14.70  | 46.60  | 20.40  | 22.40  | 208.0  |
| 1980  | 13.80  | 3.56  | 41.60 | 78.10  | 78.70  | 9.41  | 18.80 | 25.10  | 17.70  | 45.50  | 103.00 | 108.00 | 543.3  |
| 1981  | 55.60  | 4.57  | 6.34  | 2.35   | 2.21   | 6.38  | 53.40 | 17.90  | 28.28* | 29.10  | 36.30  | 67.30  | 309.7  |
| 1982  | 20.90  | 3.10  | 1.58  | 0.34   | 1.57   | 1.29  | 1.30  | 11.30  | 40.80  | 150.00 | 81.80  | 62.10  | 376.1  |
| 1983  | 32.90  | 6.63  | 2.38  | 2.15   | 6.49   | 7.69  | 1.18  | 93.50  | 39.20  | 64.00  | 25.90  | 69.00  | 351.0  |
| 1984  | 36.60  | 11.70 | 3.32  | 5.58   | 9.46   | 34.70 | 18.10 | 15.30  | 59.60  | 119.00 | 84.20  | 15.70  | 413.3  |
| 1985  | 34.10  | 61.40 | 22.10 | 3.68   | 2.14   | 2.49  | 3.74* | 2.36*  | 21.80  | 57.60  | 223.00 | 88.50  | 522.9  |
| 1986  | 21.10  | 8.75  | 3.49  | 2.16   | 1.71   | 1.81  | 9.82  | 13.10  | 34.90  | 42.90  | 75.80  | 42.40  | 257.9  |
| 1987  | 22.00  | 1.81  | 3.02  | 1.28   | 1.63   | 5.47  | 13.40 | 2.09   | 12.20  | 50.00  | 17.60  | 34.40  | 164.9  |
| 1988  | 15.30  | 1.51  | 2.09  | 1.81   | 0.98   | 4.16  | 50.80 | 9.61   | 26.20  | 62.20  | 61.80  | 108.00 | 344.5  |
| 1989  | 30.00  | 38.80 | 5.22  | 2.32   | 7.27   | 6.11  | 6.59  | 16.20  | 62.50  | 96.70  | 95.50  | 10.00  | 377.2  |
| 1990  | 9.31   | 3.46  | 5.09  | 2.15   | 4.99   | 2.94  | 2.08  | 3.48   | 6.88   | 19.90  | 14.90  | 8.55   | 83.7   |
| 1991  | 31.20  | 32.90 | 3.41  | 3.70   | 1.88   | 2.23  | 4.25  | 5.07   | 11.50  | 65.50  | 80.40  | 64.30  | 306.3  |
| 1992  | 64.40  | 41.00 | 2.07  | 1.48   | 3.87   | 5.37  | 42.70 | 12.00  | 37.20  | 118.00 | 82.40  | 20.90  | 431.4  |
| 1993  | 5.65   | 6.46  | 11.20 | 5.47   | 12.20  | 10.00 | 8.09  | 4.71   | 12.60  | 34.30  | 68.70  | 27.30  | 206.7  |
| 1994  | 23.30  | 2.51  | 10.60 | 9.42   | 1.87   | 7.05  | 20.90 | 20.50  | 13.40  | 9.25   | 18.10  | 7.64   | 144.5  |
| 1995  | 13.80  | 16.10 | 46.20 | 10.80  | 4.27   | 4.11* | 3.54  | 3.84   | 8.01   | 51.10  | 56.40  | 65.10  | 283.3  |
| 1996  | 106.00 | 95.50 | 18.00 | 3.37   | 4.08   | 5.76  | 7.92  | 14.20  | 14.30  | 29.60  | 53.40  | 38.10  | 390.2  |
| 1997  | 7.65   | 6.80  | 3.16  | 7.70   | 7.98   | 10.70 | 17.70 | 30.80  | 9.06   | 8.47   | 19.20  | 13.40  | 142.6  |
| AVE : | 30.62  | 19.64 | 8.77  | 6.03   | 5.98   | 5.03  | 12.04 | 21.40  | 40.63  | 61.43  | 76.74  | 45.31  | 333.6  |
| SD :  | 20.19  | 24.00 | 11.71 | 13.61  | 13.43  | 6.22  | 14.39 | 27.35  | 43.87  | 40.60  | 60.13  | 26.33  | 164.3  |



## Appendix B8.18

File : H6H9IS-0.NAT

Units : 10<sup>6</sup>xm<sup>3</sup>

Descrip. : Incremental naturalised flow record at H6H009 for 1927 to 1993

| Year  | Oct   | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul   | Aug    | Sep   | Total |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|-------|
| 1927  | 6.67  | 4.25  | 2.32  | 0.99  | 0.40  | 0.47  | 0.48  | 0.29  | 7.99  | 5.68  | 6.21   | 10.07 | 45.8  |
| 1928  | 8.23  | 4.69  | 2.28  | 0.82  | 0.38  | 0.78  | 1.18  | 1.85  | 3.30  | 11.12 | 14.08  | 12.70 | 61.4  |
| 1929  | 9.23  | 5.44  | 5.41  | 2.85  | 1.65  | 2.40  | 2.15  | 2.03  | 2.69  | 3.38  | 24.13  | 26.26 | 87.6  |
| 1930  | 19.92 | 11.89 | 5.20  | 2.08  | 1.13  | 1.07  | 53.38 | 20.69 | 3.86  | 38.81 | 27.69  | 17.44 | 203.2 |
| 1931  | 44.97 | 21.68 | 11.37 | 5.00  | 2.27  | 1.56  | 0.84  | 1.05  | 3.86  | 8.10  | 8.69   | 41.55 | 150.9 |
| 1932  | 21.65 | 8.90  | 4.76  | 1.75  | 0.63  | 0.73  | 0.85  | 3.21  | 15.09 | 15.44 | 19.87  | 16.85 | 109.7 |
| 1933  | 10.55 | 6.47  | 3.43  | 1.81  | 1.45  | 1.33  | 1.06  | 1.19  | 2.03  | 10.23 | 18.41  | 16.55 | 74.5  |
| 1934  | 17.95 | 12.90 | 5.76  | 1.69  | 0.48  | 0.34  | 3.56  | 20.56 | 13.57 | 10.69 | 10.97  | 10.40 | 108.9 |
| 1935  | 8.30  | 6.84  | 3.85  | 1.59  | 0.71  | 0.54  | 0.51  | 2.31  | 3.12  | 16.91 | 14.34  | 15.21 | 74.2  |
| 1936  | 13.26 | 50.05 | 21.85 | 4.05  | 1.26  | 0.82  | 1.00  | 1.21  | 5.53  | 16.75 | 12.50  | 11.62 | 139.9 |
| 1937  | 9.66  | 5.96  | 4.45  | 2.36  | 0.94  | 7.34  | 6.73  | 8.55  | 8.83  | 10.73 | 14.30  | 19.28 | 99.1  |
| 1938  | 16.46 | 10.12 | 4.54  | 1.67  | 8.39  | 6.89  | 3.98  | 3.23  | 3.07  | 3.93  | 33.87  | 18.98 | 115.1 |
| 1939  | 8.32  | 4.75  | 2.16  | 0.86  | 4.70  | 3.40  | 10.51 | 7.10  | 11.03 | 11.46 | 9.88   | 8.88  | 83.1  |
| 1940  | 7.44  | 15.90 | 7.25  | 1.81  | 0.85  | 0.44  | 16.65 | 12.92 | 23.65 | 19.52 | 25.17  | 26.23 | 157.8 |
| 1941  | 28.33 | 16.12 | 5.75  | 2.09  | 1.01  | 0.94  | 0.98  | 21.47 | 34.49 | 17.78 | 11.41  | 10.72 | 151.1 |
| 1942  | 18.02 | 10.35 | 8.49  | 18.11 | 7.72  | 3.05  | 3.85  | 3.18  | 5.88  | 8.29  | 11.46  | 15.31 | 112.9 |
| 1943  | 12.89 | 26.85 | 11.50 | 2.04  | 0.53  | 0.30  | 0.38  | 3.24  | 25.32 | 14.64 | 17.91  | 36.36 | 152.0 |
| 1944  | 21.99 | 9.52  | 3.59  | 0.98  | 0.25  | 0.11  | 0.31  | 42.46 | 33.47 | 28.32 | 28.85  | 21.81 | 191.7 |
| 1945  | 79.62 | 32.89 | 4.96  | 1.32  | 0.46  | 11.08 | 5.09  | 1.78  | 2.38  | 3.78  | 4.84   | 6.41  | 154.6 |
| 1946  | 6.50  | 4.22  | 1.69  | 0.47  | 0.16  | 15.70 | 7.21  | 3.27  | 4.60  | 19.10 | 14.64  | 12.04 | 89.6  |
| 1947  | 11.18 | 8.44  | 4.26  | 1.49  | 0.54  | 0.91  | 1.34  | 1.93  | 3.17  | 8.64  | 8.71   | 10.98 | 61.6  |
| 1948  | 75.23 | 30.46 | 4.18  | 1.39  | 0.55  | 0.23  | 4.37  | 3.79  | 3.86  | 5.55  | 7.84   | 8.78  | 146.2 |
| 1949  | 7.03  | 88.83 | 31.82 | 1.55  | 0.40  | 0.15  | 0.85  | 1.23  | 1.50  | 19.85 | 11.64  | 8.64  | 173.5 |
| 1950  | 13.44 | 31.86 | 13.68 | 14.77 | 6.08  | 1.42  | 1.59  | 1.94  | 23.45 | 16.06 | 12.85  | 35.64 | 172.8 |
| 1951  | 21.68 | 9.22  | 3.76  | 1.12  | 0.62  | 0.70  | 0.70  | 2.02  | 3.48  | 5.98  | 33.63  | 37.75 | 120.7 |
| 1952  | 20.89 | 68.30 | 26.01 | 2.72  | 0.85  | 0.38  | 14.62 | 7.32  | 4.94  | 13.78 | 13.61  | 12.24 | 185.7 |
| 1953  | 10.85 | 8.67  | 4.53  | 1.48  | 0.52  | 0.65  | 1.29  | 60.51 | 29.87 | 45.90 | 69.40  | 35.63 | 269.3 |
| 1954  | 15.91 | 8.41  | 3.60  | 1.38  | 45.00 | 16.44 | 1.40  | 1.39  | 8.47  | 26.86 | 53.43  | 29.03 | 211.3 |
| 1955  | 16.78 | 10.51 | 4.27  | 1.48  | 0.76  | 0.83  | 0.90  | 13.56 | 14.10 | 17.76 | 18.34  | 15.91 | 115.2 |
| 1956  | 12.60 | 7.80  | 4.31  | 1.88  | 1.48  | 3.28  | 2.48  | 53.54 | 85.84 | 47.46 | 45.53  | 36.77 | 303.0 |
| 1957  | 65.38 | 29.53 | 6.24  | 1.54  | 0.48  | 3.45  | 3.16  | 68.21 | 32.04 | 11.63 | 35.45  | 21.39 | 278.5 |
| 1958  | 11.25 | 7.06  | 3.07  | 2.16  | 1.71  | 1.83  | 30.20 | 32.40 | 15.07 | 34.32 | 48.12  | 28.31 | 215.5 |
| 1959  | 23.11 | 13.35 | 4.75  | 1.57  | 0.67  | 0.65  | 0.74  | 1.75  | 9.62  | 10.12 | 9.56   | 8.76  | 84.7  |
| 1960  | 6.89  | 4.44  | 2.84  | 3.32  | 1.85  | 1.01  | 1.70  | 9.28  | 7.95  | 8.56  | 12.02  | 21.61 | 81.5  |
| 1961  | 16.73 | 8.62  | 3.12  | 1.28  | 1.11  | 2.70  | 5.09  | 4.30  | 21.67 | 15.32 | 167.28 | 68.41 | 315.6 |
| 1962  | 42.13 | 60.51 | 20.80 | 2.99  | 1.21  | 1.01  | 1.37  | 2.00  | 3.07  | 9.00  | 11.53  | 10.28 | 165.9 |
| 1963  | 9.53  | 7.90  | 5.35  | 2.65  | 1.37  | 13.54 | 6.69  | 2.90  | 25.97 | 16.64 | 19.69  | 18.05 | 130.3 |
| 1964  | 13.55 | 15.27 | 7.31  | 1.91  | 1.07  | 1.88  | 2.17  | 7.85  | 7.67  | 15.65 | 15.38  | 12.39 | 102.1 |
| 1965  | 25.65 | 18.74 | 7.96  | 3.09  | 1.23  | 0.70  | 0.90  | 1.88  | 3.66  | 5.61  | 79.36  | 38.34 | 187.1 |
| 1966  | 12.55 | 6.53  | 2.44  | 0.71  | 0.25  | 0.28  | 71.59 | 32.56 | 18.03 | 16.37 | 17.56  | 17.98 | 196.9 |
| 1967  | 23.37 | 9.06  | 5.09  | 1.70  | 0.52  | 0.31  | 2.26  | 6.22  | 36.66 | 12.93 | 24.95  | 17.27 | 140.3 |
| 1968  | 14.51 | 19.48 | 3.54  | 1.33  | 0.83  | 0.73  | 3.94  | 5.08  | 1.41  | 15.74 | 2.24   | 13.30 | 82.1  |
| 1969  | 13.66 | 6.21  | 1.68  | 0.57  | 2.81  | 1.67  | 0.11  | 0.00  | 8.42  | 8.60  | 17.02  | 14.87 | 75.6  |
| 1970  | 14.51 | 3.75  | 2.57  | 0.96  | 0.56  | 1.04  | 4.06  | 2.98  | 2.39  | 35.46 | 42.51  | 12.28 | 123.1 |
| 1971  | 0.00  | 11.71 | 5.00  | 2.46  | 1.42  | 1.09  | 1.17  | 4.01  | 18.82 | 6.83  | 22.54  | 11.87 | 86.9  |
| 1972  | 7.25  | 9.16  | 3.11  | 1.06  | 0.33  | 0.19  | 2.06  | 0.63  | 0.00  | 0.00  | 17.43  | 2.46  | 43.7  |
| 1973  | 7.81  | 2.88  | 1.51  | 0.76  | 2.75  | 2.13  | 2.89  | 6.07  | 3.55  | 5.35  | 106.31 | 41.25 | 183.3 |
| 1974  | 17.61 | 15.24 | 3.55  | 1.51  | 0.87  | 0.53  | 0.00  | 0.00  | 17.06 | 13.27 | 12.97  | 35.38 | 118.0 |
| 1975  | 5.57  | 8.68  | 3.35  | 1.08  | 0.39  | 2.99  | 1.45  | 10.86 | 44.09 | 19.33 | 36.57  | 18.18 | 152.5 |
| 1976  | 40.33 | 21.38 | 8.85  | 2.95  | 3.24  | 2.51  | 14.72 | 52.40 | 56.46 | 52.38 | 65.31  | 21.05 | 341.6 |
| 1977  | 17.76 | 14.86 | 5.47  | 2.75  | 1.38  | 0.95  | 7.21  | 0.00  | 8.31  | 13.27 | 21.03  | 22.95 | 116.0 |
| 1978  | 26.01 | 12.60 | 3.84  | 2.19  | 20.47 | 8.35  | 0.98  | 8.93  | 3.86  | 6.41  | 22.24  | 16.70 | 132.6 |
| 1979  | 16.35 | 13.87 | 3.39  | 1.42  | 0.81  | 0.49  | 0.56  | 0.00  | 10.76 | 12.99 | 0.86   | 14.58 | 76.1  |
| 1980  | 12.15 | 7.27  | 10.16 | 63.42 | 25.47 | 6.50  | 17.62 | 15.80 | 10.46 | 7.26  | 26.72  | 37.15 | 240.0 |
| 1981  | 25.55 | 3.01  | 4.84  | 1.93  | 0.80  | 0.65  | 63.55 | 17.89 | 12.10 | 16.39 | 5.93   | 45.32 | 197.9 |
| 1982  | 10.43 | 4.29  | 2.64  | 0.98  | 0.71  | 0.77  | 0.64  | 6.67  | 4.82  | 47.10 | 26.63  | 23.11 | 128.8 |
| 1983  | 22.74 | 9.03  | 3.47  | 1.19  | 0.66  | 1.09  | 1.13  | 13.52 | 17.95 | 4.68  | 7.12   | 13.94 | 96.5  |
| 1984  | 13.31 | 15.43 | 5.87  | 4.83  | 4.52  | 4.10  | 3.56  | 3.30  | 3.99  | 53.02 | 20.83  | 2.53  | 135.3 |
| 1985  | 26.63 | 57.20 | 6.38  | 2.80  | 1.30  | 1.46  | 3.76  | 2.47  | 0.00  | 3.92  | 152.00 | 58.58 | 316.5 |
| 1986  | 22.63 | 11.07 | 4.11  | 1.30  | 0.46  | 0.35  | 11.80 | 7.01  | 1.98  | 7.23  | 26.40  | 13.13 | 107.5 |
| 1987  | 16.88 | 3.36  | 2.80  | 0.95  | 0.35  | 0.38  | 13.25 | 2.86  | 12.15 | 5.22  | 16.91  | 12.42 | 87.5  |
| 1988  | 14.56 | 2.46  | 2.66  | 1.17  | 0.54  | 6.97  | 63.14 | 12.13 | 22.38 | 15.42 | 10.18  | 44.46 | 196.1 |
| 1989  | 30.48 | 44.34 | 6.43  | 2.03  | 1.44  | 1.65  | 12.04 | 22.75 | 5.03  | 17.74 | 26.91  | 11.57 | 182.4 |
| 1990  | 14.30 | 2.96  | 3.24  | 1.67  | 0.95  | 0.62  | 1.27  | 2.95  | 16.76 | 20.47 | 15.02  | 3.52  | 83.7  |
| 1991  | 24.22 | 32.66 | 4.73  | 1.84  | 0.76  | 0.61  | 3.69  | 6.72  | 18.52 | 2.34  | 9.67   | 20.57 | 126.3 |
| 1992  | 21.75 | 33.46 | 5.53  | 1.61  | 0.94  | 0.90  | 57.78 | 12.71 | 7.88  | 31.24 | 40.70  | 12.23 | 226.7 |
| 1993  | 9.55  | 6.98  | 5.94  | 3.04  | 1.44  | 1.43  | 9.27  | 7.72  | 23.33 | 22.67 | 39.73  | 13.35 | 144.5 |
| AVE : | 18.99 | 16.37 | 6.04  | 3.20  | 2.68  | 2.41  | 8.61  | 10.50 | 13.53 | 16.16 | 27.42  | 20.68 | 146.6 |
| SD :  | 14.67 | 16.91 | 5.49  | 7.93  | 6.63  | 3.54  | 16.24 | 14.93 | 14.63 | 12.38 | 29.95  | 13.16 | 68.0  |

## Appendix B8.19

File : H6H9CUM.PRS  
Units : 10<sup>6</sup>x<sup>3</sup>  
Descrip. : Cumulative Present Day (2000) Flow at H6H009 for 1927 to 1990

| Year  | Oct   | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul    | Aug    | Sep   | Total |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|-------|-------|
| 1927  | 1.37  | 4.24  | 4.12  | 1.92  | 1.34  | 1.40  | 1.09  | 0.40  | 0.43  | 0.25   | 6.06   | 8.92  | 31.6  |
| 1928  | 3.80  | 4.21  | 5.11  | 2.48  | 1.32  | 1.67  | 1.64  | 1.33  | 0.43  | 0.43   | 13.71  | 11.30 | 47.4  |
| 1929  | 4.81  | 4.79  | 7.22  | 4.33  | 2.47  | 3.13  | 2.37  | 1.17  | 0.22  | 0.43   | 15.64  | 26.11 | 72.7  |
| 1930  | 17.10 | 7.49  | 7.07  | 4.52  | 1.98  | 1.93  | 39.09 | 16.48 | 4.22  | 38.35  | 28.77  | 15.73 | 182.7 |
| 1931  | 40.78 | 16.62 | 11.27 | 7.90  | 3.17  | 2.45  | 1.39  | 0.92  | 0.43  | 0.14   | 5.06   | 40.88 | 131.0 |
| 1932  | 16.56 | 6.24  | 6.80  | 3.93  | 1.55  | 1.63  | 1.38  | 1.82  | 1.98  | 18.14  | 20.95  | 14.77 | 95.8  |
| 1933  | 5.85  | 5.25  | 5.65  | 3.59  | 2.26  | 2.16  | 1.53  | 0.97  | 0.15  | 0.27   | 14.83  | 16.22 | 58.7  |
| 1934  | 14.71 | 7.94  | 7.48  | 4.44  | 1.41  | 1.29  | 3.42  | 9.75  | 8.39  | 11.24  | 11.42  | 9.04  | 90.5  |
| 1935  | 5.87  | 5.50  | 5.95  | 3.54  | 1.62  | 0.49  | 0.39  | 1.43  | 0.43  | 6.33   | 14.87  | 15.66 | 62.1  |
| 1936  | 9.02  | 45.52 | 18.97 | 7.30  | 2.89  | 1.56  | 0.78  | 0.82  | 0.43  | 10.40  | 13.33  | 9.48  | 120.5 |
| 1937  | 4.79  | 4.85  | 6.51  | 4.11  | 1.82  | 7.47  | 6.00  | 4.15  | 0.11  | 7.45   | 14.98  | 18.56 | 80.8  |
| 1938  | 13.18 | 6.62  | 6.66  | 4.04  | 8.42  | 6.14  | 3.08  | 2.33  | 0.43  | 0.12   | 26.07  | 17.36 | 94.4  |
| 1939  | 3.47  | 4.20  | 4.71  | 0.77  | 4.21  | 3.03  | 9.73  | 3.52  | 0.12  | 12.15  | 10.03  | 7.90  | 63.9  |
| 1940  | 3.12  | 13.35 | 8.42  | 4.93  | 0.80  | 0.40  | 13.62 | 6.71  | 18.07 | 21.30  | 25.32  | 27.59 | 143.6 |
| 1941  | 24.51 | 10.83 | 7.39  | 5.09  | 1.92  | 1.82  | 1.48  | 9.93  | 33.76 | 19.11  | 46.84  | 13.34 | 176.0 |
| 1942  | 13.95 | 6.89  | 9.30  | 19.02 | 7.93  | 3.82  | 3.12  | 1.93  | 0.32  | 0.45   | 13.55  | 13.99 | 94.3  |
| 1943  | 8.45  | 21.07 | 11.42 | 5.31  | 1.46  | 1.25  | 1.02  | 1.83  | 12.57 | 15.13  | 48.27  | 61.66 | 189.4 |
| 1944  | 19.55 | 6.05  | 5.98  | 3.54  | 1.21  | 1.07  | 0.98  | 26.99 | 35.59 | 166.68 | 115.33 | 22.47 | 405.4 |
| 1945  | 75.83 | 26.82 | 6.93  | 4.10  | 1.39  | 10.79 | 4.59  | 1.64  | 0.43  | 0.27   | 0.18   | 0.80  | 133.8 |
| 1946  | 3.03  | 4.38  | 4.40  | 1.83  | 1.12  | 14.91 | 6.19  | 1.87  | 0.43  | 9.47   | 15.18  | 11.02 | 73.8  |
| 1947  | 6.64  | 5.44  | 6.39  | 4.00  | 1.46  | 1.90  | 1.79  | 1.28  | 0.43  | 0.28   | 6.17   | 12.46 | 48.3  |
| 1948  | 70.65 | 24.13 | 6.39  | 4.08  | 1.47  | 1.18  | 4.17  | 2.61  | 0.43  | 0.43   | 4.17   | 7.24  | 127.0 |
| 1949  | 5.85  | 82.30 | 25.48 | 5.00  | 2.60  | 1.12  | 1.65  | 0.79  | 0.14  | 6.66   | 11.68  | 8.56  | 151.8 |
| 1950  | 9.51  | 26.17 | 13.07 | 16.37 | 6.87  | 2.25  | 2.05  | 1.21  | 9.18  | 17.59  | 12.54  | 35.16 | 152.0 |
| 1951  | 17.82 | 6.49  | 6.28  | 3.47  | 1.54  | 1.60  | 1.26  | 2.02  | 0.20  | 0.43   | 29.35  | 37.69 | 108.1 |
| 1952  | 19.72 | 62.65 | 21.64 | 5.99  | 2.73  | 1.32  | 12.65 | 4.12  | 0.17  | 10.77  | 14.23  | 10.58 | 166.6 |
| 1953  | 6.03  | 7.14  | 6.68  | 4.20  | 1.45  | 1.57  | 1.74  | 44.48 | 30.57 | 49.48  | 128.87 | 48.78 | 331.0 |
| 1954  | 12.61 | 5.48  | 5.96  | 4.04  | 42.97 | 16.30 | 1.83  | 1.05  | 0.43  | 20.98  | 115.33 | 39.70 | 266.7 |
| 1955  | 32.37 | 7.21  | 6.57  | 3.83  | 1.70  | 1.73  | 1.42  | 6.26  | 6.63  | 18.60  | 19.02  | 15.47 | 120.8 |
| 1956  | 8.39  | 5.31  | 6.46  | 4.57  | 2.33  | 3.91  | 2.62  | 38.46 | 88.11 | 123.23 | 105.90 | 46.96 | 436.3 |
| 1957  | 85.01 | 24.48 | 7.81  | 4.37  | 1.41  | 4.05  | 3.13  | 52.09 | 32.66 | 12.03  | 36.85  | 19.40 | 283.3 |
| 1958  | 6.43  | 5.47  | 5.57  | 3.77  | 2.50  | 2.61  | 23.00 | 22.94 | 16.02 | 34.43  | 48.92  | 26.40 | 198.1 |
| 1959  | 19.42 | 8.28  | 6.77  | 4.14  | 1.58  | 1.56  | 1.29  | 1.46  | 0.43  | 5.56   | 9.63   | 6.67  | 66.8  |
| 1960  | 2.85  | 4.44  | 5.25  | 4.47  | 2.63  | 1.88  | 2.02  | 4.91  | 0.43  | 5.61   | 12.51  | 21.91 | 68.9  |
| 1961  | 14.99 | 6.38  | 5.64  | 2.95  | 1.97  | 3.38  | 4.88  | 2.84  | 10.06 | 15.41  | 169.46 | 66.50 | 304.5 |
| 1962  | 39.39 | 54.98 | 17.89 | 6.09  | 2.78  | 1.88  | 1.77  | 1.67  | 0.21  | 0.43   | 10.23  | 8.83  | 146.2 |
| 1963  | 6.52  | 6.10  | 7.17  | 4.45  | 2.29  | 13.54 | 6.06  | 1.59  | 11.96 | 17.18  | 19.51  | 16.80 | 113.2 |
| 1964  | 9.04  | 10.34 | 8.44  | 4.93  | 2.02  | 2.78  | 2.48  | 3.95  | 0.11  | 12.80  | 15.79  | 11.74 | 84.4  |
| 1965  | 22.17 | 14.48 | 9.19  | 6.13  | 2.17  | 1.64  | 1.46  | 1.29  | 0.43  | 0.11   | 72.45  | 35.93 | 167.5 |
| 1966  | 9.88  | 4.36  | 5.13  | 3.07  | 1.23  | 1.29  | 52.77 | 32.69 | 19.15 | 17.04  | 17.71  | 15.48 | 179.8 |
| 1967  | 19.38 | 6.14  | 6.87  | 4.12  | 1.45  | 1.39  | 1.78  | 3.40  | 23.60 | 13.53  | 25.67  | 15.99 | 123.3 |
| 1968  | 9.95  | 15.49 | 6.05  | 4.03  | 2.08  | 2.04  | 4.69  | 3.12  | 0.14  | 7.55   | 2.57   | 10.61 | 68.3  |
| 1969  | 10.50 | 4.64  | 4.46  | 2.52  | 2.49  | 1.48  | 0.09  | 0.24  | 0.32  | 1.23   | 18.37  | 13.82 | 60.2  |
| 1970  | 9.55  | 4.21  | 5.30  | 2.13  | 1.49  | 1.92  | 3.15  | 2.15  | 0.43  | 37.17  | 49.92  | 16.47 | 133.9 |
| 1971  | 1.51  | 12.85 | 6.82  | 5.25  | 1.36  | 1.04  | 1.10  | 2.21  | 5.18  | 7.02   | 23.04  | 10.18 | 77.6  |
| 1972  | 3.15  | 6.26  | 5.64  | 2.23  | 0.30  | 0.17  | 1.57  | 0.36  | 0.00  | 0.13   | 0.57   | 0.83  | 21.2  |
| 1973  | 2.91  | 3.77  | 4.47  | 1.69  | 2.46  | 1.90  | 2.20  | 3.19  | 0.43  | 0.43   | 103.09 | 39.86 | 166.4 |
| 1974  | 13.52 | 9.25  | 5.90  | 4.30  | 1.80  | 1.45  | 0.74  | 0.68  | 1.21  | 13.97  | 14.14  | 32.95 | 99.9  |
| 1975  | 1.64  | 5.97  | 5.71  | 3.16  | 1.33  | 3.68  | 1.92  | 5.06  | 34.72 | 20.18  | 36.96  | 16.52 | 136.8 |
| 1976  | 35.48 | 15.90 | 9.71  | 5.91  | 3.98  | 3.33  | 11.95 | 36.44 | 65.22 | 177.73 | 219.91 | 31.85 | 617.4 |
| 1977  | 12.58 | 9.50  | 7.75  | 5.73  | 2.29  | 1.88  | 6.31  | 0.82  | 0.12  | 4.40   | 22.18  | 21.99 | 95.5  |
| 1978  | 22.13 | 7.92  | 6.76  | 4.72  | 19.28 | 8.60  | 1.60  | 4.53  | 0.20  | 0.87   | 22.92  | 15.56 | 115.1 |
| 1979  | 11.99 | 8.41  | 5.81  | 4.09  | 1.76  | 1.44  | 1.20  | 0.32  | 0.43  | 7.74   | 1.29   | 13.06 | 57.5  |
| 1980  | 8.64  | 5.28  | 10.77 | 60.12 | 25.29 | 7.74  | 13.80 | 8.23  | 8.54  | 10.81  | 30.80  | 39.33 | 229.4 |
| 1981  | 23.38 | 4.84  | 8.91  | 6.62  | 1.69  | 1.57  | 45.90 | 17.33 | 12.48 | 17.13  | 6.59   | 43.72 | 190.2 |
| 1982  | 6.03  | 4.32  | 5.19  | 2.47  | 1.69  | 1.77  | 1.28  | 3.74  | 0.43  | 42.08  | 27.05  | 22.31 | 118.4 |
| 1983  | 18.89 | 6.50  | 5.86  | 3.12  | 1.67  | 2.08  | 1.68  | 6.64  | 9.66  | 4.71   | 7.34   | 50.14 | 118.3 |
| 1984  | 36.75 | 11.82 | 7.56  | 7.61  | 5.81  | 4.96  | 3.64  | 1.90  | 0.13  | 55.82  | 80.34  | 16.70 | 233.0 |
| 1985  | 23.82 | 51.72 | 8.35  | 5.82  | 2.26  | 2.42  | 3.43  | 1.67  | 0.43  | 0.12   | 223.99 | 84.30 | 408.3 |
| 1986  | 18.31 | 7.40  | 6.31  | 3.60  | 1.41  | 1.33  | 9.98  | 4.02  | 0.43  | 0.43   | 36.43  | 36.38 | 126.0 |
| 1987  | 12.20 | 3.90  | 5.37  | 2.13  | 1.30  | 1.34  | 10.77 | 2.20  | 0.19  | 3.93   | 16.36  | 11.93 | 71.6  |
| 1988  | 11.34 | 3.52  | 5.12  | 2.37  | 1.48  | 7.33  | 45.89 | 11.52 | 23.37 | 16.45  | 11.02  | 65.19 | 204.6 |
| 1989  | 37.20 | 39.08 | 7.91  | 5.05  | 2.44  | 2.60  | 10.14 | 10.80 | 2.61  | 19.02  | 38.04  | 12.40 | 187.3 |
| 1990  | 10.40 | 3.67  | 5.76  | 2.94  | 1.88  | 1.55  | 1.72  | 1.56  | 2.67  | 70.57  | 57.44  | 69.90 | 230.1 |
| AVE : | 16.50 | 13.08 | 7.71  | 5.44  | 3.52  | 3.14  | 6.55  | 7.12  | 8.43  | 19.38  | 37.45  | 24.17 | 152.5 |
| SD :  | 16.77 | 15.62 | 3.95  | 7.48  | 6.32  | 3.33  | 11.13 | 11.32 | 16.00 | 34.12  | 47.98  | 18.03 | 107.4 |

# APPENDIX B9.1

SUB-CATCHMENT : H7H006  
RIVER : Breede  
PLACE : Swellendam

## 1 CATCHMENT

|                      | YEAR    |         |         |         |         |         | UNITS |
|----------------------|---------|---------|---------|---------|---------|---------|-------|
|                      | 1970    | 1973    | 1980    | 1987    | 1990    |         |       |
| SUB-CATCHMENT AREAS  |         |         |         |         |         |         |       |
| 50 u/s farm dams     | 66.19   | 66.19   | 66.19   | 66.19   | 66.19   | 66.19   | km²   |
| d/s farm dams        | 595.72  | 595.71  | 595.71  | 595.71  | 595.71  | 595.71  | km²   |
| 661 u/s farm dams    | 0.50    | 0.50    | 0.50    | 0.50    | 0.78    | 0.78    | km²   |
| d/s farm dams        | 224.41  | 224.40  | 224.40  | 224.40  | 224.12  | 224.12  | km²   |
| H7H006 u/s farm dams | 5.15    | 3.28    | 3.54    | 9.53    | 12.11   | 12.11   | km²   |
| d/s farm dams        | 221.81  | 221.70  | 221.44  | 215.45  | 212.87  | 212.87  | km²   |
|                      | 1113.78 | 1111.78 | 1111.78 | 1111.78 | 1111.78 | 1111.78 | km²   |

## 2 LANDUSE

|                                   | YEAR  |       |       |       |       |       | UNITS |
|-----------------------------------|-------|-------|-------|-------|-------|-------|-------|
|                                   | 1970  | 1973  | 1980  | 1987  | 1990  | 2000  |       |
| ALIEN VEGETATION                  |       |       |       |       |       |       |       |
| H7H006 d/s farm dams : tall trees | 0.16  | 0.16  | 0.21  | 0.25  | 0.25  | 0.41  | km²   |
| riparian                          | 1.72  | 1.80  | 2.10  | 2.62  | 2.86  | 3.72  | km²   |
| Total                             | 1.88  | 1.96  | 2.31  | 2.87  | 3.11  | 4.13  | km²   |
| FORESTRY                          |       |       |       |       |       |       |       |
| 661 d/s farm dams                 | 0.45  | 0.47  | 0.52  | 0.55  | 0.45  | 0.16  | km²   |
| h7h006 U/s farm dams              | 0.22  | 0.22  | 0.24  | 0.24  | 0.23  | 0.13  | km²   |
| Total                             | 0.67  | 0.69  | 0.76  | 0.79  | 0.68  | 0.29  | km²   |
| FARM DAM CAPACITIES               |       |       |       |       |       |       |       |
| 50                                | 5.24  | 5.29  | 6.24  | 6.61  | 6.98  | 9.37  | km²   |
| 661                               | 0.14  | 0.14  | 0.14  | 0.21  | 0.30  | 0.30  | km²   |
| h7h006                            | 0.64  | 0.71  | 0.87  | 1.80  | 1.87  | 3.09  | km²   |
| IRRIGATION AREAS                  |       |       |       |       |       |       |       |
| 50                                | 15.86 | 16.02 | 17.93 | 18.06 | 21.68 | 21.47 | km²   |
| 661                               | 2.79  | 2.84  | 2.84  | 6.61  | 5.26  | 5.26  | km²   |
| h7h006                            | 4.11  | 4.22  | 3.15  | 5.41  | 5.17  | 4.43  | km²   |
| Total                             | 22.76 | 23.08 | 23.92 | 30.08 | 32.11 | 31.16 | km²   |

## 3 EVAPORATION

|                              | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) 50     | 188  | 234  | 293  | 305  | 241  | 205  | 205  | 89   | 68   | 70   | 89   | 122  | 2109      |
| S-PAN (gross) (in mm) 50     | 149  | 189  | 242  | 252  | 196  | 164  | 164  | 62   | 43   | 45   | 62   | 91   | 1659      |
| LAKE FACTOR                  | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)           | 121  | 155  | 201  | 212  | 172  | 144  | 144  | 54   | 37   | 37   | 50   | 74   | 1401      |
| A-PAN (gross) (in mm) 661    | 180  | 221  | 283  | 296  | 234  | 195  | 195  | 85   | 70   | 70   | 90   | 118  | 2037      |
| S-PAN (gross) (in mm) 661    | 142  | 178  | 233  | 244  | 189  | 155  | 155  | 58   | 45   | 45   | 63   | 87   | 1594      |
| LAKE FACTOR                  | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)           | 115  | 146  | 193  | 205  | 166  | 136  | 136  | 50   | 38   | 37   | 51   | 70   | 1346      |
| A-PAN (gross) (in mm) H7H006 | 173  | 210  | 271  | 285  | 221  | 183  | 183  | 85   | 69   | 70   | 88   | 116  | 1954      |
| S-PAN (gross) (in mm) H7H006 | 136  | 168  | 222  | 234  | 178  | 145  | 145  | 58   | 45   | 45   | 61   | 86   | 1523      |
| LAKE FACTOR                  | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)           | 110  | 138  | 184  | 197  | 157  | 128  | 128  | 50   | 38   | 37   | 49   | 70   | 1286      |

## 4 RESERVOIR SIMULATIONS

|        | COEFFICIENTS |     | START      | DEAD          | MAX           |
|--------|--------------|-----|------------|---------------|---------------|
|        | a            | b   | STOR.<br>% | STOR.<br>M.m³ | STOR.<br>M.m³ |
| 50     | 0.4          | 0.7 | 100        | 0             | FSC           |
| 661    | 0.4          | 0.7 | 100        | 0             | FSC           |
| h7h006 | 0.4          | 0.7 | 100        | 0             | FSC           |

| 5 IRRIGATION ROUTINE                                         |  |              |      |      |      |      |      |     |     |     |     |      |     |
|--------------------------------------------------------------|--|--------------|------|------|------|------|------|-----|-----|-----|-----|------|-----|
|                                                              |  | CROP FACTORS |      |      |      |      |      |     |     |     |     |      |     |
|                                                              |  | OCT          | NOV  | DEC  | JAN  | FEB  | MAR  | APR | MAY | JUN | JUL | AUG  | SEP |
| Orchards & vineyards                                         |  | 0.4          | 0.45 | 0.5  | 0.5  | 0.5  | 0.4  | 0.2 | 0.2 | 0.2 | 0.2 | 0.25 | 0.3 |
| Patures & cash crops                                         |  | 0.7          | 0.8  | 0.8  | 0.8  | 0.8  | 0.8  | 0.7 | 0.6 | 0.5 | 0.5 | 0.5  | 0.6 |
| 6. NOTES                                                     |  |              |      |      |      |      |      |     |     |     |     |      |     |
| Combined crop factor used for calculating irrigation demands |  |              |      |      |      |      |      |     |     |     |     |      |     |
| crop type 1 : vineyards and fruit trees                      |  |              |      |      |      |      |      |     |     |     |     |      |     |
| crop type 2 : wheat , lucerne and cash crops                 |  |              |      |      |      |      |      |     |     |     |     |      |     |
| Historical crop composition :                                |  |              |      |      |      |      |      |     |     |     |     |      |     |
| 60 crop type 1 (%)                                           |  |              | 78.1 | 78.3 | 72.1 | 74.9 | 73.1 |     |     |     |     |      |     |
| crop type 2 (%)                                              |  |              | 21.9 | 21.7 | 27.9 | 25.1 | 26.9 |     |     |     |     |      |     |
| 661 crop type 1 (%)                                          |  |              | 19.4 | 20.8 | 24.6 | 19.5 | 10.5 |     |     |     |     |      |     |
| crop type 2 (%)                                              |  |              | 80.0 | 79.2 | 75.4 | 80.5 | 89.5 |     |     |     |     |      |     |
| H7H006 crop type 1 (%)                                       |  |              | 36.9 | 40.0 | 61.6 | 56.6 | 54.5 |     |     |     |     |      |     |
| crop type 2 (%)                                              |  |              | 63.1 | 60.0 | 38.4 | 43.4 | 45.5 |     |     |     |     |      |     |
| Catchment modelled using three different MAPs                |  |              |      |      |      |      |      |     |     |     |     |      |     |
| 50 MAP = 404 mm                                              |  |              |      |      |      |      |      |     |     |     |     |      |     |
| 661 MAP = 358 mm                                             |  |              |      |      |      |      |      |     |     |     |     |      |     |
| H7H006 inc MAP = 507 mm                                      |  |              |      |      |      |      |      |     |     |     |     |      |     |

## Appendix B9.2

File : H7H006.NS  
 Units : 10^6xm^3  
 Descrip. : Observed flow record at H7H006 for 1970 to 1993

| Year  | Oct    | Nov    | Dec    | Jan     | Feb    | Mar   | Apr    | May     | Jun     | Jul    | Aug     | Sep    | Total  |
|-------|--------|--------|--------|---------|--------|-------|--------|---------|---------|--------|---------|--------|--------|
| 1970  | 64.20  | 9.92   | 5.49   | 1.35    | 3.36   | 7.76  | 36.20  | 15.70   | 21.00   | 287.00 | 264.00  | 89.20  | 805.2  |
| 1971  | 14.70  | 24.30  | 12.30  | 1.50    | 2.45   | 2.52  | 1.15   | 76.10   | 44.60   | 39.00  | 120.00  | 81.50  | 420.1  |
| 1972  | 20.90  | 9.50   | 2.92   | 0.51    | 0.43   | 2.16  | 4.11   | 2.27    | 4.18    | 188.00 | 176.00  | 87.00  | 498.0  |
| 1973  | 54.10  | 5.40   | 12.00  | 3.73    | 16.40  | 8.06  | 4.30   | 16.90   | 171.00  | 60.60  | -999.00 | 312.00 | -334.5 |
| 1974  | 109.00 | 52.10  | 12.20  | 3.58    | 3.40   | 2.86  | 10.80  | 194.00  | 145.00  | 242.00 | 259.00  | 100.00 | 1133.9 |
| 1975  | 78.40  | 18.30  | 10.70  | 4.39    | 2.92   | 9.70  | 4.98   | 20.80   | 420.00  | 306.00 | 160.00  | 61.70  | 1097.9 |
| 1976  | 83.00  | 213.00 | 101.00 | 65.80   | 27.90  | 25.50 | 78.40  | 409.00  | 701.00  | 698.00 | -999.00 | 182.00 | 1585.6 |
| 1977  | 72.40  | 29.80  | 36.10  | 27.10   | 5.81   | 4.63  | 17.60* | 56.50   | 26.00   | 22.90  | 123.00  | 161.00 | 582.8  |
| 1978  | 83.80  | 35.90  | 39.20  | 8.07    | 1.60   | 17.60 | 4.41   | 32.70   | 215.00  | 101.00 | 168.00  | 99.00  | 806.3  |
| 1979  | 181.00 | 39.40  | 12.80  | 13.30   | 13.80  | 5.74  | 18.40  | 66.90   | 61.20   | 108.00 | 73.80   | 49.40  | 643.7  |
| 1980  | 26.50  | 92.10  | 116.00 | -999.00 | 146.00 | 31.10 | 41.60  | 59.60   | 48.50   | 206.00 | 314.00  | 426.00 | 508.4  |
| 1981  | 101.00 | 14.50* | 18.00  | 10.20   | 7.02   | 11.30 | 108.00 | 85.70   | 96.10   | 104.00 | 106.00  | 100.00 | 761.8  |
| 1982  | 71.10  | 20.50  | 16.90  | 7.84    | 6.21   | 11.40 | 5.54   | 132.00  | 346.00  | 534.00 | 186.00  | 196.00 | 1533.5 |
| 1983  | 70.60  | 24.80  | 11.40  | 7.60    | 7.95   | 17.40 | 7.11   | -999.00 | 79.00   | 291.00 | 107.00  | 319.00 | -56.1  |
| 1984  | 174.00 | 28.70  | 22.10  | 20.80   | 17.90  | 95.90 | 47.30  | 58.30   | 270.00  | 382.00 | 333.00  | 45.30* | 1495.3 |
| 1985  | 73.60  | 114.00 | 50.80  | 10.50   | 5.57   | 9.01  | 35.30  | 59.80   | 122.00  | 239.00 | 513.00  | 243.00 | 1475.6 |
| 1986  | 55.00  | 23.80  | 8.05   | 5.87    | 3.50   | 3.02  | 17.90  | 145.00  | 196.00  | 172.00 | 298.00  | 150.00 | 1078.1 |
| 1987  | 59.20  | 10.90  | 12.00  | 2.50    | 2.78   | 7.16  | 38.60  | 48.90   | 122.00  | 130.00 | 54.40   | 208.00 | 696.4  |
| 1988  | 49.80  | 10.30  | 5.00   | 3.22    | 2.12   | 17.00 | 93.50  | 74.10   | 107.00  | 193.00 | 252.00  | 432.00 | 1239.0 |
| 1989  | 110.00 | 77.50  | 13.30  | 3.20    | 12.60  | 12.60 | 40.60  | 164.00  | 146.00  | 485.00 | 313.00  | 49.00  | 1426.8 |
| 1990  | 22.30  | 9.52   | 9.80   | 5.16    | 8.02   | 7.04  | 5.49   | 62.60   | 223.00  | 286.00 | 262.00  | 276.00 | 1176.9 |
| 1991  | 115.00 | 75.80  | 8.70   | 4.59    | 3.35   | 6.09  | 25.60  | 65.50   | 460.00  | 359.00 | 215.00  | 181.00 | 1519.6 |
| 1992  | 239.00 | 104.00 | 7.49   | 5.38    | 6.33   | 8.43  | 185.00 | 142.00  | 196.00  | 774.00 | 319.00  | 69.60  | 2056.2 |
| 1993  | 27.50  | 12.80  | 19.20  | 9.30    | 15.80  | 15.60 | 15.90  | 11.80*  | 397.00* | 267.00 | 141.00  | 73.80  | 1006.7 |
| AVE : | 81.50  | 44.03  | 23.48  | -32.23  | 13.47  | 14.15 | 35.32  | 41.72   | 192.40  | 269.77 | 114.97  | 166.31 | 964.9  |
| SD :  | 54.20  | 48.27  | 28.62  | 206.36  | 28.99  | 18.84 | 43.08  | 237.40  | 168.30  | 193.84 | 358.44  | 115.63 | 552.1  |

## Average Rainfall On Catchment H661.ran

details of rainfall stations used

008136\_a.pat 1923 to 1998

008367\_2.pat 1930 to 1998

|          |        | rainfall input as percent m.a.p. |       |       |       |        |        |       |        |        |        |        |        |         |
|----------|--------|----------------------------------|-------|-------|-------|--------|--------|-------|--------|--------|--------|--------|--------|---------|
| no.      | gauges | oct                              | nov   | dec   | jan   | feb    | mar    | apr   | may    | jun    | jul    | aug    | sep    | year    |
| 1923     | 1      | 10.06+                           | 7.57+ | 5.66+ | 4.92+ | 3.11   | 2.38   | 4.41  | 5.09   | 10.43  | 3.67   | 10.65  | 6.10   | 74.05   |
| 1924     | 1      | 4.09                             | 15.11 | .88   | 4.80  | .88    | 10.75  | 6.83  | 4.04   | 22.01  | 8.30   | 4.11   | 10.06  | 91.87   |
| 1925     | 1      | 4.36                             | 1.98  | .00   | 1.05  | .00    | 3.77   | 7.03  | 5.61   | 4.51   | 20.86  | 11.48  | 7.47   | 68.12   |
| 1926     | 1      | 16.50                            | 8.30+ | 1.74+ | .69   | 3.43   | 6.46   | 1.30  | 7.98   | 3.72   | 4.46+  | 7.47   | 4.31+  | 66.36   |
| 1927     | 1      | 4.46+                            | 1.59+ | 2.45+ | .00   | 2.79   | 10.19  | .00   | .00    | 3.60   | .00    | 4.24   | 9.16   | 38.47   |
| 1928     | 1      | .00                              | 5.61  | .00   | 1.30+ | 7.74+  | 14.59+ | 4.31  | 5.97   | 6.88   | 7.39   | 6.61   | 5.73   | 66.14   |
| 1929     | 1      | 6.00                             | 3.60  | 20.05 | 4.73  | 10.14  | 14.08  | 6.34  | 8.28   | 2.82   | 3.23   | 15.50  | 8.86   | 103.62  |
| 1930     | 2      | 18.71+                           | 7.64+ | 1.58+ | 9.31+ | 2.80+  | 10.27  | 27.98 | 1.51   | 3.13   | 26.56  | 12.00  | 8.57+  | 130.06  |
| 1931     | 2      | 20.46                            | 5.05  | 16.97 | 2.06  | 9.06   | 1.47   | 1.64  | 6.94   | 11.46  | 10.23  | 2.99   | 20.81  | 109.14  |
| 1932     | 2      | 5.31                             | 10.03 | 2.93  | 1.07  | 2.38   | 10.85  | 2.92  | 12.66  | 10.55  | 7.61   | 13.42  | 1.80   | 81.55   |
| 1933     | 2      | 1.70                             | 12.71 | 3.37  | 10.84 | 6.73   | 5.09   | 1.82  | 4.25   | 2.25   | 15.69  | 15.82  | 9.85   | 90.12   |
| 1934     | 2      | 15.40                            | 12.42 | .18   | .54   | 1.07   | 2.92   | 12.15 | 18.39  | 9.45   | 5.58   | 3.60   | 8.92   | 90.62   |
| 1935     | 2      | 3.69                             | 10.64 | 4.53  | 3.14  | 1.72   | 6.52   | 1.99  | 9.68   | 4.59   | 15.30  | 5.62   | 11.96  | 79.38   |
| 1936     | 2      | 7.82                             | 28.20 | 10.63 | 1.27  | .40    | 7.27   | 5.35  | 1.57   | 6.90   | 13.62  | .23+   | 12.13  | 95.39   |
| 1937     | 2      | 5.00                             | 5.05  | 14.11 | 3.48  | 1.94   | 16.82  | 11.10 | 13.60  | 8.39   | 10.32  | 8.32   | 10.15+ | 108.27  |
| 1938     | 2      | 8.24                             | 6.09  | 1.64  | 5.65  | 17.95  | 14.57  | 7.43  | .12    | 1.06   | 8.06   | 22.61  | 3.61   | 97.05   |
| 1939     | 2      | 5.40                             | 1.77  | 4.08  | 1.45  | 13.71  | 12.38  | 13.92 | 7.61   | 10.35  | 3.16   | 1.16   | 6.89   | 81.88   |
| 1940     | 2      | 2.69                             | 18.26 | 1.27  | 7.26  | .24    | 1.80   | 16.37 | 9.02   | 13.68  | 8.73   | 14.28  | 6.97   | 100.57  |
| 1941     | 2      | 17.33                            | .97   | 1.85+ | 7.63  | .93    | 7.86   | 3.09  | 19.82  | 11.32  | 1.96   | 4.71   | 3.74   | 81.22   |
| 1942     | 2      | 14.40                            | 2.67  | 15.14 | 17.38 | 7.60   | 6.86   | 7.21  | 4.76   | 6.82   | 3.78   | 6.22   | 11.91  | 104.74  |
| 1943     | 2      | 3.32                             | 25.49 | 2.10  | .53   | .71    | 3.86   | 3.44  | 13.65  | 13.70  | 4.03   | 13.82  | 19.81  | 104.43  |
| 1944     | 2      | 7.99                             | 1.08  | .93   | .00   | .47    | 2.03   | 6.12  | 21.02  | 14.58  | 7.33   | 11.11  | 4.73   | 77.38   |
| 1945     | 2      | 33.46                            | 1.05  | .47   | .65   | 3.78   | 20.39  | 3.22  | 2.96   | 5.45   | 5.86   | 2.99   | 5.02+  | 85.30   |
| 1946     | 2      | 6.08                             | 1.91  | .18   | .00   | 2.48   | 21.46  | 6.30  | 6.57   | 6.16   | 13.15  | 2.48   | 12.79  | 79.58   |
| 1947     | 2      | 10.11                            | 10.85 | 1.07  | 3.98  | 1.03   | 6.41   | 8.08  | 2.36   | 6.76   | 10.74  | .83    | 6.07   | 68.29   |
| 1948     | 2      | 32.07                            | 3.41+ | 2.39  | 4.24  | 1.26   | .60    | 14.90 | 9.77   | 3.04   | 8.30   | 6.22   | 3.51   | 89.72   |
| 1949     | 2      | .53                              | 38.86 | .34   | .31   | .50    | .93    | 8.74  | 4.82   | 1.16   | 11.97  | 5.46   | 7.15   | 80.76   |
| 1950     | 2      | 11.94                            | 20.99 | 7.11  | 19.91 | 1.39   | 4.00   | 7.66  | 3.16   | 14.56+ | 10.41  | 8.17   | 15.79+ | 125.08  |
| 1951     | 2      | 4.25                             | 2.16  | .89   | 2.75  | 10.12  | 3.01   | 3.39  | 4.77   | 8.03   | 7.06   | 19.68  | 17.45  | 83.55   |
| 1952     | 2      | 7.79                             | 28.00 | 2.51  | 2.31  | 2.71   | .45    | 12.64 | 4.48   | 10.19  | 13.40  | 5.73+  | 7.45   | 97.67   |
| 1953     | 2      | 9.24                             | 8.65  | 2.38  | .91   | 3.86   | 6.68   | 7.90+ | 26.32  | 11.85  | 14.06  | 21.51  | 2.14   | 115.50  |
| 1954     | 2      | 2.03                             | 5.37  | 2.59  | 6.22  | 22.11  | .89    | 5.31  | 3.91   | 13.36  | 19.13  | 17.01  | 5.92   | 103.85  |
| 1955     | 2      | 8.50                             | 2.54  | .86   | 5.31  | 2.37   | 9.70   | 3.94  | 17.45  | 9.85   | 13.32  | 9.43   | 4.03   | 87.30   |
| 1956     | 2      | 11.40                            | .37   | 8.14  | .00   | 10.16  | 14.20  | 2.78  | 23.90  | 26.51  | 12.74  | 17.99  | 16.16  | 144.36  |
| 1957     | 2      | 30.56                            | .00   | .43   | .00   | 3.20   | 12.02  | 11.07 | 32.72  | 11.12  | .49    | 17.00  | 2.30   | 120.91  |
| 1958     | 2      | 7.46                             | 2.79  | 1.84  | 9.22  | 7.67   | 7.61   | 21.82 | 14.97  | 3.27   | 26.90  | 19.43  | 5.71   | 128.69  |
| 1959     | 2      | 15.83                            | 3.20  | .31   | 2.84  | 2.61   | 6.89   | 3.33  | 10.26+ | 13.66  | 9.77   | 2.84   | 4.43   | 75.97   |
| 1960     | 2      | 3.64                             | 7.30  | 9.82  | 11.37 | .81    | 6.44   | 8.74  | 16.61  | 3.79   | 9.17   | 10.56+ | 11.98  | 100.22  |
| 1961     | 2      | 7.93                             | .10   | 1.46  | 10.05 | 8.94   | 13.74  | 10.07 | 4.44   | 12.32  | 4.35   | 54.20  | 1.87   | 129.45  |
| 1962     | 2      | 22.35                            | 32.44 | .00   | 6.09  | 4.96   | 10.15  | 8.50  | 7.12   | 4.66   | 14.96  | 5.20   | 1.56   | 117.98  |
| 1963     | 2      | 13.12                            | 12.44 | 9.22  | 3.55  | 7.97   | 21.32  | 6.46  | 4.46   | 15.87  | 6.88   | 13.00  | 8.00+  | 122.28  |
| 1964     | 2      | 7.34                             | 15.95 | 1.28  | 1.74  | 9.36+  | 11.30  | 6.83  | 13.81  | 6.15   | 17.40  | 6.49   | 1.73   | 99.38   |
| 1965     | 2      | 16.48                            | 15.67 | 5.31  | 4.19  | 1.98   | 4.38   | 7.57  | 10.04  | 2.60   | 4.21   | 30.73  | 12.51  | 115.67  |
| 1966     | 2      | 2.12                             | 2.74  | 1.53  | .43   | 2.57   | 6.31   | 40.15 | 16.55  | 13.75  | 7.14   | 8.76   | 11.63  | 113.69  |
| 1967     | 2      | 8.22                             | 10.16 | 1.59  | 1.57  | 1.38   | 3.81   | 4.43  | 7.88   | 13.04  | 1.78   | 10.52  | 6.03   | 70.41   |
| 1968     | 2      | 6.61                             | 7.77  | .92   | 4.11  | 6.73   | .93    | 15.74 | 2.44   | 11.47  | 6.39   | 4.91   | .90    | 68.94   |
| 1969     | 2      | 4.65                             | .98   | .37   | .08   | 14.12  | .00    | .00   | 4.21   | 7.82   | 7.08   | 14.98  | 2.12   | 56.40   |
| 1970     | 2      | 7.24                             | .97   | 3.11  | .21   | 4.51   | 8.52   | 11.01 | 9.33   | 6.29   | 24.37  | 20.68  | 4.66   | 100.89  |
| 1971     | 2      | 4.15                             | 10.05 | 7.84  | 3.43  | 6.85   | 4.20   | 16.15 | 11.24  | 13.91  | 6.80   | 17.42  | 8.89   | 110.94  |
| 1972     | 2      | .95                              | 5.78  | 2.96  | 1.70  | .69    | 2.43   | 1.79  | 7.35   | 6.98   | 5.63   | 7.78   | 4.47   | 48.49   |
| 1973     | 2      | 1.16                             | 3.82  | 1.27  | 3.60  | 17.49  | 5.09   | .86   | 23.11  | 4.37   | .00    | 27.56  | 8.32   | 96.64   |
| 1974     | 2      | 9.11                             | 6.23  | .26   | 9.48  | 1.08   | 4.83   | 3.68  | 11.04  | 10.78  | 11.69  | 15.79  | 9.78   | 93.75   |
| 1975     | 2      | 5.41                             | 5.19  | .82   | 1.13  | 2.31   | 15.61  | 15.22 | 9.14   | 26.37  | 11.75  | 9.00   | 6.40   | 108.34  |
| 1976     | 2      | 14.87                            | 10.48 | 5.76  | .65   | 16.16  | 6.18   | 22.93 | 20.22  | 9.62   | 13.88  | 9.85   | 6.19   | 136.79  |
| 1977     | 2      | 1.31                             | 11.13 | 6.40  | 3.69  | 5.36   | 5.30   | 12.65 | 4.12   | 5.34   | 21.66  | 16.06  | 3.72   | 96.74   |
| 1978     | 2      | 5.73                             | 5.09  | 10.67 | 8.81  | 25.69  | .15    | .23   | 16.96  | 7.49   | 12.77  | 14.38  | 8.93   | 116.90  |
| 1979     | 2      | 7.67                             | .69   | 4.89  | 8.90  | 3.05   | 3.12   | 5.78  | 6.22   | 11.04  | 1.55   | 7.79   | 8.38   | 69.08   |
| 1980     | 2      | 10.23                            | 20.09 | 8.58+ | 29.67 | 15.56+ | 14.64  | 13.06 | 9.35   | 5.12   | 14.94  | 16.93  | 11.33  | 169.51  |
| 1981     | 2      | 7.22                             | 4.77  | 7.20  | 5.16  | 2.38   | 7.76+  | 38.61 | 2.23+  | 15.02  | 6.96+  | 6.23+  | 12.34  | 115.87  |
| 1982     | 2      | 6.41                             | 2.22  | 3.13  | .88   | 6.18   | 2.59   | 8.88  | 13.62  | 18.86  | 14.89+ | 4.71   | 10.74  | 93.11   |
| 1983     | 2      | 4.88                             | 5.19  | 1.94  | 2.01  | 6.69   | 10.23  | 6.38  | 14.16  | 4.24   | 8.23   | 1.81   | 8.96   | 74.71   |
| 1984     | 2      | 10.15                            | 5.21  | 9.25  | 13.93 | 11.63  | 9.14   | 10.50 | 2.31   | 9.69   | 27.69  | 3.24   | 3.06   | 115.79  |
| 1985     | 2      | 22.00                            | 10.38 | 7.19  | 1.16  | 4.80   | 7.46   | 5.98  | 1.93   | 5.25   | 7.58   | 35.94  | 7.46   | 117.13  |
| 1986     | 2      | 11.71                            | 6.07  | 1.90  | .09   | 1.31   | 2.11   | 19.44 | 6.70   | 10.37  | 6.23   | 10.07  | 16.59  | 92.59   |
| 1987     | 2      | 2.07                             | .37   | 4.54  | .00   | 3.90   | 5.93+  | 11.47 | 5.06   | 8.41   | 3.75   | 8.72   | 6.86   | 61.09   |
| 1988     | 2      | 4.61                             | 1.80  | 10.41 | 2.05  | 3.21   | 15.16  | 24.97 | 3.66   | 12.44  | 11.30  | 12.19  | 6.52   | 108.33  |
| 1989     | 2      | 23.18                            | 5.20  | .59   | 1.42  | 10.30  | 13.08  | 30.22 | 12.34  | 15.90  | 3.27   | 4.41   | 3.48   | 123.40  |
| 1990     | 2      | 4.94                             | 3.85  | 7.64  | 9.07  | 2.93   | 1.80   | 3.55  | 6.12   | 12.06  | 14.53  | 1.68   | 2.81   | 70.96   |
| 1991     | 2      | 22.94                            | 5.43  | 5.05  | 1.32  | 2.76   | 7.40   | 8.85  | 10.71  | 9.81   | 13.86  | 6.56   | 7.98   | 102.67  |
| 1992     | 2      | 29.89+                           | 7.52  | 1.43  | .58   | 8.65   | 3.83   | 32.08 | 13.97  | 10.50  | 14.66  | 7.58   | 6.04   | 136.72  |
| 1993     | 2      | 1.50                             | 2.79  | 11.47 | 6.29  | 6.22   | 10.08  | 19.47 | 9.86   | 16.92  | 7.73   | 11.81  | 3.56   | 107.71  |
| 1994     | 2      | 8.42                             | .20   | 25.01 | 5.18  | 5.29   | 18.94  | 9.33  | 17.18  | 4.35   | 7.31   | 8.24   | 4.78   | 114.21  |
| 1995     | 2      | 13.05                            | 13.66 | 29.10 | 2.98  | 4.51   | 8.19   | 1.46  | 8.02   | 7.05   | 19.02  | 1.98   | 7.51   | 116.54  |
| 1996     | 2      | 31.71                            | 18.66 | 4.53  | 1.43  | .89    | 6.66   | 14.76 | 15.39  | 8.58   | 15.67  | 12.57  | 1.29   | 132.16  |
| 1997     | 2      | 10.18+                           | 9.93  | 2.48  | 16.39 | 5.32   | 14.56  | 20.69 | 19.92  | 4.11   | 7.31   | 3.88   | 2.60   | 117.37  |
| 1998     | 2      | 1.18                             | 29.16 | 32.76 | 4.69  | 5.89   | 6.68+  | 12.15 | 16.94  | 2.60   | 6.91+  | 8.17+  | 7.36+  | 134.48  |
| average  |        | 9.87                             | 8.41  | 5.17  | 4.43  | 5.55   | 7.74   | 10.06 | 9.81   | 9.24   | 10.11  | 10.86  | 7.48   | 98.74   |
| adjusted |        | 10.00                            | 8.52  | 5.24  | 4.49  | 5.62   | 7.84   | 10.19 | 9.94   | 9.36   | 10.24  | 11.00  | 7.58   | 100.001 |

## AVERAGE RAINFALL ON SUB-CATCHMENT 50

| DETAILS OF RAINFALL STATIONS USED |          |         |                  |       |          |       |           |       |       |       |       |       |       |        |
|-----------------------------------|----------|---------|------------------|-------|----------|-------|-----------|-------|-------|-------|-------|-------|-------|--------|
| SECTION                           | POSITION | MAP(mm) | PERIOD OF RECORD |       | LATITUDE |       | LONGITUDE |       |       |       |       |       |       |        |
| 23                                | 895      | 281     | 1947 TO 1981     |       | 33.55    |       | 19.60     |       |       |       |       |       |       |        |
| 24                                | 57       | 235     | 1958 TO 1978     |       | 33.57    |       | 20.02     |       |       |       |       |       |       |        |
| 24                                | 146      | 269     | 1925 TO 1990     |       | 33.56    |       | 20.05     |       |       |       |       |       |       |        |
| 24                                | 324      | 465     | 1970 TO 1984     |       | 33.54    |       | 20.11     |       |       |       |       |       |       |        |
| 24                                | 447      | 477     | 1953 TO 1980     |       | 33.57    |       | 20.15     |       |       |       |       |       |       |        |
| 8                                 | 367      | 318     | 1931 TO 1990     |       | 34.07    |       | 20.13     |       |       |       |       |       |       |        |
| RAINFALL INPUT AS PERCENT M.A.P.  |          |         |                  |       |          |       |           |       |       |       |       |       |       |        |
| NO.                               | GAUGES   | OCT     | NOV              | DEC   | JAN      | FEB   | MAR       | APR   | MAY   | JUN   | JUL   | AUG   | SEP   | YEAR   |
| 1925                              | 1        | 4.91    | 3.49             | .85   | .00      | 1.71  | 1.78      | 4.16  | 7.51  | 6.91  | 17.06 | 6.91  | 7.47  | 62.76  |
| 1926                              | 1        | 15.09   | 12.04            | .00   | 3.68     | 6.24  | 4.35      | 17.84 | 11.33 | 9.33  | 1.82  | 14.20 | 3.20  | 99.11  |
| 1927                              | 1        | .00     | 4.05             | 5.76  | 2.82     | 1.11  | 36.71     | 2.82  | 2.38  | .48   | 5.61  | 8.25  | 13.01 | 83.02  |
| 1928                              | 1        | 1.52    | 25.75            | 6.69  | .56      | .00   | 9.10      | 4.24  | 8.44  | 4.42  | 21.37 | 17.06 | 2.56  | 101.71 |
| 1929                              | 1        | 2.97    | 4.91             | 5.17  | 4.72     | 26.98 | 12.08     | 3.57  | 6.80  | 2.27  | 2.27  | 18.25 | 8.99  | 98.96  |
| 1930                              | 1        | 4.53    | 9.07             | .00   | .00      | 4.61  | 5.20      | 26.16 | .00   | .00   | 18.51 | 12.63 | 4.42  | 85.14  |
| 1931                              | 2        | 20.30   | 7.24             | 7.71  | 3.20     | 7.53  | .00       | .31   | 5.34  | 14.31 | 7.29  | 1.19  | 25.69 | 100.11 |
| 1932                              | 2        | 2.10    | 9.56             | 1.96  | .00      | .88   | 6.56      | .57   | 10.80 | 10.10 | 9.29  | 17.24 | .28   | 69.34  |
| 1933                              | 2        | .00     | 8.33             | .00   | 6.09     | 4.04  | 7.57      | .36   | 4.59  | .80   | 13.33 | 14.26 | 9.73  | 69.11  |
| 1934                              | 2        | 17.17   | 9.58             | .00   | .00      | 2.94  | 3.02      | 11.81 | 17.04 | 8.15  | 3.13  | 6.25  | 7.87  | 86.94  |
| 1935                              | 2        | 1.68    | 9.94             | 1.92  | 2.07     | 1.03  | 8.38      | 1.41  | 8.53  | 3.30  | 12.70 | 5.34  | 10.16 | 66.48  |
| 1936                              | 2        | 4.40    | 26.86            | 10.39 | 1.23     | .00   | 9.39      | 4.55  | .72   | 6.54  | 17.27 | .00   | 12.53 | 93.89  |
| 1937                              | 2        | 7.44    | 1.23             | 11.22 | 1.12     | .52   | 11.05     | 19.00 | 12.93 | 8.00  | 11.77 | 5.59  | 9.50  | 99.38  |
| 1938                              | 2        | 5.77    | 3.97             | 3.55  | 4.15     | 19.62 | 13.50     | 7.44  | 1.35  | .83   | 10.11 | 29.41 | 2.61  | 102.31 |
| 1939                              | 2        | 2.03    | .88              | 3.31  | 2.81     | 8.02  | 19.01     | 14.96 | 7.11  | 11.23 | 1.22  | .70   | 7.50  | 78.79  |
| 1940                              | 2        | 5.79    | 14.65            | 1.12  | 2.90     | .00   | 1.14      | 20.75 | 16.61 | 13.99 | 14.18 | 12.40 | 6.07  | 109.61 |
| 1941                              | 2        | 13.06   | 1.60             | .93   | 8.52     | .71   | 2.07      | 3.39  | 21.75 | 15.16 | 4.96  | 3.91  | 5.49  | 81.55  |
| 1942                              | 2        | 12.22   | 4.55             | 17.74 | 19.28    | 10.28 | 12.29     | 12.23 | 5.94  | 6.31  | 4.20  | 8.54  | 18.36 | 131.94 |
| 1943                              | 2        | 3.82    | 25.76            | 2.75  | .00      | .00   | 5.76      | 4.95  | 14.84 | 17.05 | 6.28  | 14.02 | 18.49 | 113.71 |
| 1944                              | 2        | 7.53    | 1.53             | .00   | .00      | .00   | 1.25      | 6.13  | 18.95 | 17.67 | 16.38 | 11.45 | 3.93  | 84.81  |
| 1945                              | 2        | 31.54   | 3.59             | .37   | .37      | 3.00  | 20.96     | 2.99  | 3.39  | 3.93  | 5.49  | 3.16  | 7.77  | 86.57  |
| 1946                              | 2        | 6.67    | 2.75             | 1.13  | .00      | 1.79  | 20.50     | 5.77  | 6.54  | 4.76  | 15.07 | .99   | 9.48  | 75.45  |
| 1947                              | 3        | 7.56    | 9.17             | 3.19  | 4.75     | 2.30  | 7.24      | 7.84  | 5.48  | 7.41  | 10.32 | .90   | 10.57 | 76.75  |
| 1948                              | 3        | 28.10   | 1.06             | 5.17  | 1.42     | .65   | .26       | 15.22 | 7.33  | 4.46  | 10.01 | 6.92  | 3.82  | 84.42  |
| 1949                              | 3        | .92     | 42.98            | .00   | .00      | .35   | .51       | 10.59 | 6.14  | 1.91  | 14.95 | 7.20  | 9.82  | 95.36  |
| 1950                              | 3        | 10.07   | 17.68            | 5.91  | 23.40    | .31   | 4.41      | 10.28 | 2.79  | 13.96 | 10.43 | 5.57  | 15.57 | 120.38 |
| 1951                              | 3        | 2.53    | 2.54             | .38   | 1.97     | 8.84  | 1.69      | 4.99  | 6.64  | 10.74 | 11.38 | 19.11 | 15.88 | 86.68  |
| 1952                              | 3        | 7.22    | 26.25            | 4.61  | 1.56     | 1.88  | .71       | 16.22 | 4.71  | 12.74 | 14.43 | 13.96 | 8.89  | 113.20 |
| 1953                              | 4        | 12.10   | 9.22             | 3.40  | 2.81     | 3.17  | 8.39      | 12.68 | 25.52 | 16.95 | 17.89 | 17.12 | 3.84  | 133.08 |
| 1954                              | 4        | 2.11    | 3.46             | 1.03  | 5.64     | 34.18 | 3.17      | 3.81  | 6.13  | 11.25 | 16.74 | 15.57 | 6.92  | 110.03 |
| 1955                              | 4        | 4.47    | .79              | 1.05  | 5.42     | 6.68  | 7.46      | 2.91  | 14.79 | 10.32 | 7.41  | 9.18  | 5.22  | 75.70  |
| 1956                              | 4        | 13.63   | .47              | 10.31 | .69      | 10.99 | 6.70      | 2.07  | 26.81 | 21.20 | 10.11 | 18.34 | 13.65 | 134.97 |
| 1957                              | 4        | 21.06   | .00              | 1.20  | .17      | 4.20  | 7.77      | 9.64  | 35.84 | 8.58  | .63   | 14.10 | 2.94  | 106.14 |
| 1958                              | 5        | 11.79   | 4.37             | 1.87  | 8.79     | 8.07  | 8.66      | 26.00 | 19.43 | 1.80  | 22.78 | 14.95 | 4.45  | 132.96 |
| 1959                              | 5        | 15.00   | 1.52             | 1.21  | 1.97     | 2.13  | 6.29      | 1.94  | 6.17  | 11.29 | 9.48  | 4.46  | 5.56  | 67.02  |
| 1960                              | 5        | 2.46    | 5.83             | 8.75  | 9.56     | 1.67  | 5.34      | 14.28 | 16.02 | 2.09  | 6.90  | 10.42 | 11.69 | 95.00  |
| 1961                              | 5        | 8.81    | 1.15             | .11   | 11.75    | 2.11  | 10.33     | 11.73 | 5.27  | 15.52 | 3.80  | 57.62 | 1.99  | 130.20 |
| 1962                              | 5        | 22.89   | 25.94            | .26   | 5.10     | 2.04  | 8.62      | 5.63  | 18.14 | 8.79  | 13.66 | 5.19  | .31   | 116.59 |
| 1963                              | 5        | 11.72   | 14.29            | 12.40 | 6.70     | 8.93  | 5.30      | 10.60 | 3.52  | 23.34 | 4.39  | 16.30 | 12.68 | 130.17 |
| 1964                              | 5        | 10.47   | 17.56            | .91   | 1.28     | 10.01 | 7.50      | 8.62  | 13.42 | 5.31  | 14.08 | 9.97  | .62   | 99.74  |
| 1965                              | 5        | 13.18   | 10.06            | 5.91  | 1.67     | 1.83  | 5.42      | 7.22  | 10.15 | 3.21  | 4.57  | 27.72 | 11.61 | 102.56 |
| 1966                              | 5        | 1.16    | .80              | .54   | 1.08     | 2.44  | 5.47      | 37.07 | 14.19 | 11.68 | 5.46  | 8.53  | 5.59  | 94.00  |
| 1967                              | 5        | 6.74    | 10.16            | 5.02  | 1.59     | 2.19  | 2.38      | 4.82  | 6.29  | 18.90 | 3.25  | 12.14 | 6.10  | 79.57  |
| 1968                              | 5        | 6.78    | 12.90            | .10   | 5.93     | 6.09  | 1.48      | 22.93 | 1.24  | 13.56 | 5.54  | 4.37  | 2.75  | 83.66  |
| 1969                              | 5        | 6.08    | 1.53             | .00   | 1.61     | 7.65  | .76       | .14   | 6.83  | 9.51  | 8.13  | 18.56 | 2.00  | 62.81  |
| 1970                              | 6        | 7.61    | 1.11             | 4.79  | 1.24     | 5.26  | 10.42     | 19.87 | 11.13 | 6.21  | 28.16 | 26.89 | 2.94  | 125.63 |
| 1971                              | 6        | 2.92    | 13.57            | 4.30  | 5.49     | 6.32  | 9.00      | 8.66  | 13.80 | 7.92  | 7.02  | 11.33 | 11.25 | 101.57 |
| 1972                              | 6        | 1.38    | 3.21             | 2.84  | 1.65     | .62   | 2.07      | 2.59  | 7.80  | 8.76  | 6.63  | 10.84 | 6.85  | 55.24  |
| 1973                              | 6        | 1.21    | 6.50             | 2.23  | 5.09     | 15.47 | 7.22      | 1.26  | 25.45 | 5.72  | .94   | 32.18 | 10.38 | 113.66 |
| 1974                              | 6        | 6.89    | 7.39             | .00   | 7.00     | 5.17  | 3.27      | 3.23  | 13.25 | 9.92  | 13.71 | 12.99 | 8.32  | 91.13  |
| 1975                              | 6        | 3.58    | 5.06             | 1.97  | .90      | 3.94  | 13.96     | 12.42 | 14.99 | 23.57 | 9.08  | 7.18  | 6.16  | 102.82 |
| 1976                              | 6        | 12.09   | 15.29            | 2.88  | 1.93     | 14.73 | 5.31      | 33.84 | 26.76 | 7.30  | 15.97 | 9.64  | 6.45  | 152.19 |
| 1977                              | 6        | 1.57    | 7.21             | 6.72  | 1.52     | 1.95  | 3.76      | 10.10 | 3.80  | 3.82  | 8.49  | 14.32 | 4.56  | 67.82  |
| 1978                              | 6        | 4.42    | 4.69             | 8.83  | 5.20     | 17.62 | 1.31      | 1.72  | 14.18 | 11.77 | 12.90 | 11.62 | 9.14  | 103.39 |
| 1979                              | 5        | 7.07    | 1.14             | 2.92  | 7.30     | 2.14  | 3.88      | 5.35  | 8.51  | 12.53 | 2.35  | 8.70  | 8.18  | 70.07  |
| 1980                              | 5        | 8.43    | 20.46            | 6.83  | 23.33    | 15.36 | 16.06     | 14.37 | 11.07 | 4.74  | 16.83 | 23.37 | 12.04 | 172.90 |
| 1981                              | 4        | 8.12    | 3.74             | 6.02  | 8.61     | 2.45  | 5.26      | 40.30 | 2.81  | 11.47 | 10.97 | 5.04  | 9.34  | 114.12 |
| 1982                              | 3        | 6.70    | 2.29             | 2.82  | .91      | 5.21  | 1.64      | 6.17  | 13.73 | 16.81 | 13.06 | 5.50  | 17.75 | 92.59  |
| 1983                              | 3        | 4.40    | 7.52             | 3.02  | 4.55     | 4.11  | 11.11     | 9.37  | 13.59 | 4.68  | 7.19  | 2.33  | 12.10 | 83.95  |
| 1984                              | 3        | 10.64   | 3.17             | 10.25 | 12.34    | 10.73 | 7.22      | 9.49  | 4.83  | 10.32 | 21.92 | 6.93  | 5.89  | 113.73 |
| 1985                              | 2        | 23.79   | 13.22            | 9.17  | 1.50     | 6.96  | 7.30      | 7.71  | 1.85  | 6.26  | 7.39  | 32.39 | 8.02  | 125.56 |
| 1986                              | 2        | 12.27   | 5.63             | .71   | 1.47     | 1.11  | 2.09      | 24.29 | 10.58 | 13.10 | 9.31  | 12.79 | 17.62 | 110.98 |
| 1987                              | 2        | 1.24    | .69              | 6.06  | .26      | 1.06  | 6.19      | 10.15 | 5.74  | 10.59 | 4.12  | 11.30 | 5.24  | 62.64  |
| 1988                              | 2        | 5.14    | 1.40             | 9.25  | 2.00     | 4.81  | 10.70     | 15.57 | 6.69  | 10.62 | 11.17 | 12.15 | 11.07 | 100.56 |
| 1989                              | 2        | 18.39   | 5.30             | .00   | 1.32     | 12.71 | 6.82      | 32.66 | 11.84 | 17.27 | 4.78  | 4.55  | 3.19  | 118.81 |
| 1990                              | 2        | 4.96    | 3.50             | 8.26  | 8.35     | .79   | 5.85      | 6.12  | 6.32  | 12.81 | 17.06 | 2.36  | 6.66  | 83.03  |
| AVERAGE                           |          | 8.34    | 8.23             | 3.88  | 4.10     | 5.58  | 7.09      | 10.57 | 10.37 | 9.49  | 10.22 | 12.04 | 8.19  | 98.09  |
| ADJUSTED                          |          | 8.50    | 8.39             | 3.95  | 4.18     | 5.69  | 7.23      | 10.78 | 10.57 | 9.67  | 10.42 | 12.27 | 8.35  | 100.00 |
| STD. DEV.                         |          | 6.84    | 8.33             | 3.80  | 4.94     | 6.43  | 5.97      | 9.16  | 7.20  | 5.55  | 5.90  | 9.34  | 4.95  | 12.61  |

## Average Rainfall On Catchment H7H006.ra

details of rainfall stations used

008782\_0.pat 1926 to 1998

008367\_2.pat 1930 to 1998

008751\_7.pat 1929 to 1998

|          |        | rainfall input as percent m.a.p. |        |        |       |       |       |       |        |       |       |        |       |         |
|----------|--------|----------------------------------|--------|--------|-------|-------|-------|-------|--------|-------|-------|--------|-------|---------|
| no.      | gauges | oct                              | nov    | dec    | jan   | feb   | mar   | apr   | may    | jun   | jul   | aug    | sep   | year    |
| 1926     | 1      | 12.79                            | 10.07  | 1.94   | 3.65  | 13.58 | 10.23 | 6.58  | 12.31  | 5.27  | 2.77  | 8.99   | 3.17  | 91.35   |
| 1927     | 1      | 4.45                             | 1.85   | 2.67   | 6.31  | 2.44  | 13.26 | 4.53  | 4.02   | 8.75  | 3.65  | 7.79   | 14.98 | 74.70   |
| 1928     | 1      | 3.79                             | 20.80  | 11.87  | 3.10  | 9.38  | 17.78 | 2.41  | 10.40  | 6.11  | 12.08 | 10.03  | 6.77  | 114.52  |
| 1929     | 2      | 7.73+                            | 5.29+  | 15.00+ | 5.70  | 14.10 | 12.83 | 6.31  | 7.90   | 3.04  | 2.69  | 10.93  | 6.47  | 97.99   |
| 1930     | 3      | 16.70                            | 8.24   | 3.27   | 13.47 | 7.00  | 10.45 | 20.39 | 2.45   | 4.45  | 17.31 | 6.94   | 8.68  | 119.34  |
| 1931     | 3      | 11.74                            | 5.98   | 27.11  | 3.12  | 7.48  | 5.01  | .69   | 4.98   | 8.86  | 7.22  | 3.75   | 25.32 | 111.26  |
| 1932     | 3      | 8.22                             | 10.90+ | 4.47   | .54   | 4.20  | 7.19  | 1.68  | 10.85  | 8.02  | 5.90  | 12.19+ | 1.53  | 75.69   |
| 1933     | 3      | 2.08                             | 15.74  | 3.27   | 11.40 | 11.57 | 10.32 | 1.64  | 1.92   | 1.20  | 13.77 | 14.50  | 8.08  | 95.48   |
| 1934     | 3      | 22.19                            | 12.47  | 2.23+  | 1.77  | 3.13  | 5.55  | 9.88  | 13.41  | 9.05  | 4.08  | 3.97   | 9.66  | 97.41   |
| 1935     | 3      | 5.96                             | 13.66  | 5.59   | 3.81  | 7.36  | 5.84  | 1.19  | 12.11  | 3.49  | 11.78 | 5.47   | 14.78 | 91.04   |
| 1936     | 3      | 8.44                             | 32.47  | 9.55   | 3.72  | 3.55  | 15.72 | 3.76  | .64    | 5.41  | 9.56  | 2.14   | 9.83  | 104.79  |
| 1937     | 3      | 5.76                             | 6.61   | 11.74+ | 7.68  | 2.69  | 12.35 | 14.14 | 9.20   | 5.56  | 7.51  | 7.04+  | 9.28+ | 99.56   |
| 1938     | 3      | 9.04                             | 7.71   | 5.76   | 7.05+ | 17.14 | 14.96 | 6.46  | .79    | .60   | 7.88  | 23.62  | 5.60  | 106.61  |
| 1939     | 3      | 5.12                             | 4.23   | 3.59   | 4.65  | 21.62 | 13.75 | 9.09  | 4.11   | 6.80  | 2.98  | 2.06   | 12.75 | 90.75   |
| 1940     | 3      | 4.55                             | 15.65  | 3.10   | 3.58  | 5.62  | 3.77  | 16.47 | 9.52   | 13.10 | 7.20  | 10.79  | 5.57  | 98.92   |
| 1941     | 3      | 16.15                            | 4.62   | 3.16   | 13.57 | 2.96  | 6.66  | 7.14  | 16.25+ | 8.13  | 5.86  | 4.05   | 5.08  | 93.63   |
| 1942     | 3      | 11.61                            | 4.45   | 13.15  | 19.54 | 9.78  | 8.80  | 9.88  | 3.57   | 3.80+ | 3.04  | 7.10   | 15.20 | 109.92  |
| 1943     | 3      | 6.91                             | 25.46  | 2.63   | 2.30  | 2.19  | 12.31 | 4.99  | 10.61  | 11.25 | 4.66  | 10.63  | 17.70 | 111.63  |
| 1944     | 3      | 11.47                            | 2.52   | .96    | .78   | 3.71  | 4.05  | 5.88  | 13.29  | 10.86 | 10.58 | 11.19  | 7.04  | 82.34   |
| 1945     | 3      | 23.02                            | 2.39   | 2.89   | 4.94  | 6.46  | 24.22 | 5.17  | 2.98   | 3.92  | 5.59  | 4.53   | 4.43  | 90.53   |
| 1946     | 3      | 5.09                             | 3.62   | .76    | 2.13  | 6.83  | 19.96 | 6.67  | 7.13   | 5.91  | 11.32 | 1.19   | 13.45 | 84.06   |
| 1947     | 3      | 7.53                             | 14.14  | 2.22   | 8.02  | 3.58  | 9.74  | 9.07  | 2.94   | 4.81  | 7.58  | 1.12   | 7.10  | 77.85   |
| 1948     | 3      | 26.68                            | 5.02   | 2.33   | 6.27  | 2.91  | 1.86  | 10.25 | 6.78   | 1.85  | 5.88  | 6.24   | 6.03+ | 82.10   |
| 1949     | 3      | 6.04                             | 27.28  | 1.06   | 3.24  | 1.46  | 1.16  | 8.81  | 5.76   | .71   | 10.64 | 6.88   | 4.79  | 77.82   |
| 1950     | 3      | 15.30                            | 17.62  | 6.56   | 18.27 | 2.04  | 11.82 | 8.12  | 3.41   | 10.71 | 7.41  | 6.44   | 12.02 | 119.69  |
| 1951     | 3      | 4.14                             | 1.44   | 1.72   | 8.53  | 6.50  | 3.97  | 3.66  | 4.13   | 4.52  | 6.36  | 14.37  | 16.88 | 76.23   |
| 1952     | 3      | 8.36                             | 23.87  | 5.42   | 5.26  | 7.19+ | 1.86  | 9.66  | 2.95   | 7.80  | 12.43 | 5.43   | 9.61  | 99.85   |
| 1953     | 3      | 11.57                            | 10.90  | 3.06   | 1.58  | 3.37  | 7.22  | 12.50 | 17.66  | 8.69  | 9.67  | 19.37  | 6.10  | 111.69  |
| 1954     | 3      | 2.92                             | 9.18   | 1.99   | 15.48 | 23.95 | 2.98  | 4.10  | 4.10   | 9.11  | 12.49 | 12.15  | 7.69  | 106.15  |
| 1955     | 3      | 5.04                             | 1.43   | 1.87   | 7.00  | 5.23  | 10.81 | 7.05  | 14.41  | 6.70  | 7.00  | 7.24   | 4.13  | 77.91   |
| 1956     | 3      | 13.34                            | .85    | 8.39   | 1.53  | 10.80 | 7.58  | 3.00  | 17.63  | 17.06 | 9.29  | 16.86  | 12.98 | 119.31  |
| 1957     | 3      | 23.17                            | .16    | 2.12   | 1.01  | 4.57  | 17.22 | 7.29  | 31.28  | 8.51  | .67   | 17.36  | 2.33  | 115.67  |
| 1958     | 3      | 8.60+                            | 4.29   | 5.26   | 10.89 | 10.19 | 11.01 | 17.40 | 11.51  | 2.88  | 18.14 | 20.16  | 3.98  | 124.31  |
| 1959     | 3      | 15.19                            | 3.39   | 2.12   | 4.66  | 2.43  | 11.13 | 5.40  | 7.08   | 9.39  | 8.43  | 2.96   | 5.92  | 78.10   |
| 1960     | 3      | 4.47                             | 9.09   | 12.28  | 11.54 | 3.85  | 6.38  | 8.46  | 14.61  | 1.89  | 8.42  | 8.55   | 11.63 | 101.17  |
| 1961     | 3      | 10.93                            | 2.87   | 2.33   | 6.49  | 7.62  | 14.55 | 13.89 | 4.01   | 7.24  | 4.65  | 53.91  | 1.90  | 130.39  |
| 1962     | 3      | 18.57                            | 24.99  | 1.26   | 9.31  | 4.52  | 16.85 | 9.85  | 13.14  | 3.77  | 10.11 | 3.58   | 1.31  | 117.26  |
| 1963     | 3      | 14.30                            | 8.79   | 5.85   | 11.41 | 8.78  | 15.95 | 4.54  | 2.72   | 15.19 | 4.75  | 8.97   | 10.17 | 111.43  |
| 1964     | 3      | 10.33                            | 11.57  | .50    | 5.11  | 6.92  | 9.86  | 5.45  | 11.47  | 5.22  | 11.98 | 6.85   | .99   | 86.26   |
| 1965     | 3      | 18.47                            | 16.73  | 5.88   | 11.55 | 3.47  | 4.19  | 8.96  | 10.42  | 3.14  | 3.62  | 25.29  | 10.88 | 122.61  |
| 1966     | 3      | 1.36                             | 2.01   | 3.99   | 3.56  | 9.06  | 10.01 | 31.36 | 12.84  | 9.94  | 7.07  | 9.10   | 13.72 | 114.02  |
| 1967     | 3      | 5.62                             | 9.98   | 1.89   | 2.02  | 1.30  | 6.48  | 5.88  | 8.36   | 10.06 | .95   | 10.83  | 4.96  | 68.35   |
| 1968     | 3      | 4.64                             | 12.99  | 1.51   | 4.93  | 10.23 | 3.61  | 9.42  | 2.37   | 9.26  | 6.49  | 5.09   | 2.65  | 73.20   |
| 1969     | 3      | 4.70                             | 2.44   | .46    | 6.88  | 10.12 | 1.40  | .89   | 3.17   | 5.43  | 7.79  | 11.69  | 1.39  | 56.37   |
| 1970     | 3      | 7.60                             | .93    | 4.40   | 2.67  | 11.52 | 9.73  | 15.82 | 12.65  | 5.38  | 18.79 | 16.98  | 3.05  | 109.54  |
| 1971     | 3      | 5.55                             | 12.13  | 5.76   | 6.61+ | 10.37 | 6.51  | 10.24 | 10.76  | 9.12  | 5.28+ | 13.95  | 7.55  | 103.82  |
| 1972     | 3      | .85                              | 10.34  | 5.25   | 3.05  | 4.01+ | 2.35+ | 6.72+ | 5.96   | 8.89  | 5.63  | 6.94   | 5.21  | 65.22   |
| 1973     | 3      | 3.71                             | 7.22   | .37+   | 7.45  | 20.41 | 7.11+ | 2.87  | 18.91+ | 4.55  | .09   | 21.76+ | 7.35  | 101.80  |
| 1974     | 3      | 5.88+                            | 4.90   | .11    | 10.02 | 2.74  | 7.48  | 2.30  | 10.41  | 12.45 | 9.43  | 10.71  | 10.35 | 86.78   |
| 1975     | 3      | 4.88                             | 9.54   | 5.74   | 3.15  | 6.80  | 13.91 | 10.96 | 8.22   | 17.04 | 10.08 | 6.83   | 7.73  | 104.88  |
| 1976     | 3      | 12.92                            | 11.28  | 5.82   | 1.46  | 22.46 | 6.08  | 13.97 | 20.01  | 8.04  | 9.03  | 8.44   | 8.66  | 128.17  |
| 1977     | 3      | 4.49                             | 11.62  | 5.63   | 5.66  | 3.80  | 4.55  | 12.38 | 6.18   | 3.84  | 14.08 | 12.97  | 5.62  | 90.83   |
| 1978     | 3      | 9.19                             | 5.57   | 13.26  | 6.82  | 19.51 | 1.55  | 1.42+ | 15.97  | 5.27  | 10.82 | 11.50  | 9.06  | 109.93  |
| 1979     | 3      | 6.32                             | 2.66   | 7.74   | 9.39  | 6.78  | 3.92  | 6.72  | 4.90   | 9.54  | 2.69  | 7.29   | 9.60  | 77.55   |
| 1980     | 3      | 11.93                            | 15.71  | 9.95   | 26.02 | 10.81 | 14.16 | 11.98 | 9.75   | 3.81+ | 12.77 | 14.58  | 9.73  | 151.20  |
| 1981     | 3      | 6.15                             | 3.21   | 9.77   | 5.33  | 4.15  | 15.93 | 36.42 | 1.67   | 12.91 | 7.75  | 7.89   | 15.11 | 126.29  |
| 1982     | 3      | 6.09                             | 3.18   | 4.51   | 1.28  | 7.39  | 1.93  | 4.68  | 8.78   | 11.93 | 12.94 | 4.04   | 13.62 | 80.38   |
| 1983     | 3      | 7.13                             | 13.35+ | 4.30   | 3.92  | 7.96  | 13.19 | 6.58  | 8.34   | 3.44  | 6.99  | 1.31   | 5.22  | 81.74   |
| 1984     | 3      | 8.69                             | 3.99+  | 8.12   | 14.76 | 12.46 | 5.52  | 11.35 | 2.07   | 7.45  | 20.61 | 2.67   | 2.94  | 100.64  |
| 1985     | 3      | 24.88                            | 12.17  | 6.33   | 5.32  | 6.92  | 7.98  | 7.09  | 2.03   | 4.09  | 4.83  | 35.33  | 5.16  | 122.14  |
| 1986     | 3      | 15.40                            | 6.80   | 2.63   | 2.66  | 3.49  | 4.11  | 14.63 | 6.25   | 6.96  | 6.22  | 9.36   | 13.01 | 91.54   |
| 1987     | 3      | 2.80                             | .21    | 7.62   | 2.05  | 4.44  | 9.97  | 13.74 | 5.29   | 7.68  | 4.98  | 7.53   | 5.23  | 71.56   |
| 1988     | 3      | 4.15                             | 3.24   | 10.01  | 4.03  | 5.57  | 11.26 | 26.58 | 2.65   | 7.37  | 8.93  | 10.67  | 4.54  | 98.98   |
| 1989     | 3      | 23.63                            | 10.10  | 4.81   | 3.34  | 11.01 | 7.61  | 23.12 | 9.84   | 13.14 | 1.52  | 5.21   | 3.89  | 117.24  |
| 1990     | 3      | 10.31                            | 7.55   | 8.71   | 7.99  | 6.84  | 3.20  | 4.63  | 6.23   | 8.19  | 11.45 | 2.49   | 3.15  | 80.73   |
| 1991     | 3      | 26.20                            | 2.19   | 9.62   | 5.66  | 6.58  | 5.93  | 5.48  | 8.96   | 11.10 | 11.17 | 3.63   | 7.70  | 104.22  |
| 1992     | 3      | 19.46                            | 9.47   | .93    | 7.76  | 7.98  | 5.26  | 21.23 | 10.99  | 6.37  | 11.06 | 6.19   | 6.53  | 113.21  |
| 1993     | 3      | 1.78                             | 5.15   | 12.78  | 6.19  | 10.75 | 12.73 | 13.31 | 6.40   | 9.65  | 5.41  | 13.26  | 3.59  | 101.01  |
| 1994     | 3      | 8.66                             | .95    | 24.33  | 9.42  | 8.08  | 15.56 | 13.26 | 13.75  | 3.58  | 6.80  | 6.69   | 4.64  | 115.71  |
| 1995     | 3      | 11.52                            | 15.07  | 25.01  | 6.25  | 4.06  | 9.72  | 1.95  | 7.64   | 3.71  | 12.26 | 1.12   | 6.37  | 104.68  |
| 1996     | 3      | 24.27                            | 21.52  | 3.24   | 2.18  | 6.31  | 7.72  | 11.55 | 13.87  | 8.36  | 11.45 | 11.71  | 3.38  | 125.54  |
| 1997     | 3      | 9.93                             | 8.28   | 5.07   | 12.36 | 5.94+ | 15.77 | 19.52 | 11.90  | 2.24  | 4.74  | 4.18   | 3.39  | 103.33  |
| 1998     | 3      | 2.34                             | 27.93  | 23.48  | 8.69  | 7.29  | 11.26 | 12.41 | 12.06  | 2.69  | 5.27  | 7.48   | 7.59+ | 128.48  |
| average  |        | 10.01                            | 9.34   | 6.17   | 6.56  | 7.66  | 9.10  | 9.49  | 8.68   | 7.07  | 8.11  | 9.89   | 7.72  | 99.81   |
| adjusted |        | 10.03                            | 9.36   | 6.18   | 6.57  | 7.68  | 9.12  | 9.51  | 8.70   | 7.08  | 8.13  | 9.91   | 7.73  | 100.001 |



```
File      : 661-PITF.DEM
Units     : 10^6xm^3
Descrip.  : Afforestation demand d/s farm dams in 661 sub-catchment for 1970 to 1990
```

[illegible]

```
File      : H7H6FOR.DEM
Units     : 10^6xm^3
Descrip.  : Afforestation demand d/s farm dams in H7H006 sub-catchment for 1970 to 1990
```

[illegible]

```
File      : VEG-DS-T.DEM
Units     : 10^6xm^3
Descrip.  : Upland alien demand (tall trees) in H7H006 sub-catchment for 1970 to 1990
```

[illegible]

Appendix B9.9

File : VEG-DS-R.DEM

Units : 10<sup>6</sup>m<sup>3</sup>

Descrip. : Riparian alien demand (tall trees) in H7H006 sub-catchment for 1970 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1970  | 0.08 | 0.09 | 0.12 | 0.13 | 0.10 | 0.08 | 0.08 | 0.03 | 0.03 | 0.03 | 0.03 | 0.05 | 0.8   |
| 1971  | 0.08 | 0.10 | 0.12 | 0.14 | 0.11 | 0.08 | 0.08 | 0.03 | 0.03 | 0.03 | 0.03 | 0.05 | 0.9   |
| 1972  | 0.08 | 0.10 | 0.13 | 0.14 | 0.11 | 0.08 | 0.08 | 0.04 | 0.03 | 0.03 | 0.03 | 0.05 | 0.9   |
| 1973  | 0.08 | 0.10 | 0.13 | 0.14 | 0.11 | 0.09 | 0.09 | 0.04 | 0.03 | 0.03 | 0.04 | 0.05 | 0.9   |
| 1974  | 0.08 | 0.10 | 0.13 | 0.14 | 0.11 | 0.09 | 0.09 | 0.04 | 0.03 | 0.03 | 0.04 | 0.05 | 0.9   |
| 1975  | 0.08 | 0.10 | 0.13 | 0.15 | 0.12 | 0.09 | 0.09 | 0.04 | 0.03 | 0.03 | 0.04 | 0.05 | 1.0   |
| 1976  | 0.08 | 0.11 | 0.14 | 0.15 | 0.12 | 0.09 | 0.09 | 0.04 | 0.03 | 0.03 | 0.04 | 0.05 | 1.0   |
| 1977  | 0.09 | 0.11 | 0.14 | 0.15 | 0.12 | 0.09 | 0.09 | 0.04 | 0.03 | 0.03 | 0.04 | 0.05 | 1.0   |
| 1978  | 0.09 | 0.11 | 0.14 | 0.16 | 0.12 | 0.10 | 0.10 | 0.04 | 0.03 | 0.03 | 0.04 | 0.05 | 1.0   |
| 1979  | 0.09 | 0.11 | 0.15 | 0.16 | 0.13 | 0.10 | 0.10 | 0.04 | 0.03 | 0.03 | 0.04 | 0.06 | 1.0   |
| 1980  | 0.09 | 0.11 | 0.15 | 0.16 | 0.13 | 0.10 | 0.10 | 0.04 | 0.03 | 0.03 | 0.04 | 0.06 | 1.0   |
| 1981  | 0.10 | 0.12 | 0.15 | 0.17 | 0.13 | 0.10 | 0.10 | 0.04 | 0.03 | 0.03 | 0.04 | 0.06 | 1.1   |
| 1982  | 0.10 | 0.12 | 0.16 | 0.18 | 0.14 | 0.11 | 0.11 | 0.04 | 0.03 | 0.03 | 0.04 | 0.06 | 1.1   |
| 1983  | 0.10 | 0.13 | 0.16 | 0.18 | 0.14 | 0.11 | 0.11 | 0.05 | 0.04 | 0.03 | 0.05 | 0.06 | 1.2   |
| 1984  | 0.10 | 0.13 | 0.17 | 0.19 | 0.15 | 0.11 | 0.11 | 0.05 | 0.04 | 0.04 | 0.05 | 0.06 | 1.2   |
| 1985  | 0.11 | 0.14 | 0.18 | 0.19 | 0.15 | 0.12 | 0.12 | 0.05 | 0.04 | 0.04 | 0.05 | 0.07 | 1.3   |
| 1986  | 0.11 | 0.14 | 0.18 | 0.20 | 0.16 | 0.12 | 0.12 | 0.05 | 0.04 | 0.04 | 0.05 | 0.07 | 1.3   |
| 1987  | 0.11 | 0.14 | 0.19 | 0.21 | 0.16 | 0.12 | 0.12 | 0.05 | 0.04 | 0.04 | 0.05 | 0.07 | 1.3   |
| 1988  | 0.12 | 0.15 | 0.19 | 0.21 | 0.17 | 0.13 | 0.13 | 0.05 | 0.04 | 0.04 | 0.05 | 0.07 | 1.4   |
| 1989  | 0.12 | 0.15 | 0.20 | 0.22 | 0.17 | 0.13 | 0.13 | 0.06 | 0.04 | 0.04 | 0.05 | 0.07 | 1.4   |
| 1990  | 0.13 | 0.16 | 0.20 | 0.22 | 0.17 | 0.14 | 0.14 | 0.06 | 0.04 | 0.04 | 0.06 | 0.08 | 1.4   |
| AVE : | 0.10 | 0.12 | 0.16 | 0.17 | 0.13 | 0.10 | 0.10 | 0.04 | 0.03 | 0.03 | 0.04 | 0.06 | 1.1   |
| SD :  | 0.02 | 0.02 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.2   |

Appendix B9.10

File : H661IRR.DEM  
Units : 10<sup>6</sup>m<sup>3</sup>  
Descrip. : Irrigation from farm dams in sub-catchment 661 for 1970 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1970  | 0.44 | 0.67 | 0.92 | 0.97 | 0.77 | 0.63 | 0.50 | 0.16 | 0.03 | 0.10 | 0.07 | 0.24 | 5.5   |
| 1971  | 0.49 | 0.61 | 0.94 | 0.97 | 0.78 | 0.60 | 0.49 | 0.17 | 0.00 | 0.05 | 0.14 | 0.21 | 5.5   |
| 1972  | 0.49 | 0.72 | 0.95 | 0.99 | 0.78 | 0.63 | 0.49 | 0.16 | 0.09 | 0.00 | 0.06 | 0.23 | 5.6   |
| 1973  | 0.39 | 0.67 | 0.94 | 0.99 | 0.77 | 0.62 | 0.53 | 0.14 | 0.10 | 0.09 | 0.10 | 0.26 | 5.6   |
| 1974  | 0.49 | 0.72 | 0.94 | 0.99 | 0.77 | 0.61 | 0.54 | 0.20 | 0.10 | 0.14 | 0.14 | 0.22 | 5.9   |
| 1975  | 0.52 | 0.69 | 0.95 | 0.99 | 0.76 | 0.59 | 0.51 | 0.15 | 0.07 | 0.06 | 0.11 | 0.24 | 5.6   |
| 1976  | 0.47 | 0.70 | 0.88 | 0.98 | 0.75 | 0.59 | 0.49 | 0.14 | 0.11 | 0.11 | 0.02 | 0.22 | 5.5   |
| 1977  | 0.37 | 0.67 | 0.94 | 0.96 | 0.77 | 0.61 | 0.32 | 0.19 | 0.11 | 0.00 | 0.06 | 0.22 | 5.2   |
| 1978  | 0.36 | 0.69 | 0.89 | 0.98 | 0.75 | 0.63 | 0.53 | 0.15 | 0.02 | 0.04 | 0.15 | 0.13 | 5.3   |
| 1979  | 0.48 | 0.65 | 0.94 | 0.99 | 0.78 | 0.60 | 0.52 | 0.11 | 0.03 | 0.06 | 0.04 | 0.28 | 5.5   |
| 1980  | 0.51 | 0.63 | 0.94 | 0.96 | 0.76 | 0.62 | 0.52 | 0.17 | 0.12 | 0.00 | 0.02 | 0.21 | 5.5   |
| 1981  | 0.46 | 0.73 | 1.10 | 1.15 | 0.90 | 0.73 | 0.50 | 0.08 | 0.05 | 0.09 | 0.17 | 0.25 | 6.2   |
| 1982  | 0.66 | 0.87 | 1.25 | 1.32 | 1.05 | 0.83 | 0.69 | 0.17 | 0.12 | 0.00 | 0.16 | 0.26 | 7.4   |
| 1983  | 0.70 | 0.77 | 1.40 | 1.51 | 1.20 | 0.94 | 0.75 | 0.29 | 0.10 | 0.01 | 0.28 | 0.29 | 8.2   |
| 1984  | 0.83 | 1.18 | 1.55 | 1.68 | 1.33 | 1.00 | 0.76 | 0.17 | 0.09 | 0.06 | 0.15 | 0.36 | 9.2   |
| 1985  | 0.86 | 1.30 | 1.79 | 1.85 | 1.38 | 1.12 | 0.90 | 0.38 | 0.24 | 0.10 | 0.00 | 0.49 | 10.4  |
| 1986  | 1.00 | 1.49 | 1.95 | 2.06 | 1.54 | 1.24 | 0.88 | 0.29 | 0.07 | 0.22 | 0.36 | 0.49 | 11.6  |
| 1987  | 1.14 | 1.33 | 2.14 | 2.20 | 1.78 | 1.43 | 0.91 | 0.29 | 0.01 | 0.11 | 0.08 | 0.53 | 11.9  |
| 1988  | 0.81 | 1.53 | 1.99 | 2.04 | 1.65 | 1.29 | 1.07 | 0.12 | 0.05 | 0.25 | 0.28 | 0.55 | 11.6  |
| 1989  | 0.83 | 1.44 | 1.82 | 1.90 | 1.54 | 1.25 | 0.98 | 0.34 | 0.14 | 0.20 | 0.23 | 0.40 | 11.1  |
| 1990  | 0.93 | 0.99 | 1.76 | 1.85 | 1.46 | 1.17 | 0.96 | 0.19 | 0.01 | 0.18 | 0.07 | 0.25 | 9.8   |
| AVE : | 0.63 | 0.91 | 1.28 | 1.35 | 1.06 | 0.85 | 0.66 | 0.19 | 0.08 | 0.09 | 0.13 | 0.30 | 7.5   |
| SD :  | 0.23 | 0.32 | 0.44 | 0.46 | 0.36 | 0.29 | 0.21 | 0.08 | 0.06 | 0.07 | 0.09 | 0.12 | 2.5   |

Appendix B9.11

File : H50IRR.DEM  
Units : 10^6xm^3  
Descrip. : Irrigation from farm dams in sub-catchment 50 for 1970 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1970  | 1.66 | 2.47 | 3.48 | 3.63 | 2.84 | 2.12 | 1.26 | 0.26 | 0.08 | 0.00 | 0.18 | 0.65 | 18.6  |
| 1971  | 1.24 | 2.13 | 3.50 | 3.59 | 2.78 | 2.08 | 0.70 | 0.18 | 0.04 | 0.30 | 0.03 | 0.83 | 17.4  |
| 1972  | 1.87 | 2.47 | 3.42 | 3.61 | 2.87 | 1.55 | 1.32 | 0.47 | 0.37 | 0.11 | 0.12 | 0.43 | 18.6  |
| 1973  | 1.81 | 1.57 | 3.41 | 3.65 | 2.90 | 2.01 | 1.26 | 0.22 | 0.14 | 0.00 | 0.00 | 0.86 | 17.8  |
| 1974  | 1.78 | 2.48 | 3.49 | 3.65 | 2.49 | 1.99 | 1.31 | 0.30 | 0.27 | 0.28 | 0.00 | 0.60 | 18.6  |
| 1975  | 1.74 | 2.34 | 3.64 | 3.79 | 2.92 | 2.15 | 0.54 | 0.59 | 0.41 | 0.00 | 0.05 | 0.81 | 19.0  |
| 1976  | 1.08 | 2.46 | 3.56 | 3.80 | 2.91 | 2.27 | 1.50 | 0.37 | 0.00 | 0.09 | 0.54 | 0.13 | 18.7  |
| 1977  | 1.91 | 2.39 | 3.72 | 3.91 | 3.08 | 2.19 | 1.51 | 0.19 | 0.03 | 0.05 | 0.00 | 1.02 | 20.0  |
| 1978  | 2.03 | 2.49 | 3.82 | 3.87 | 3.07 | 2.21 | 1.54 | 0.41 | 0.38 | 0.00 | 0.03 | 0.61 | 20.5  |
| 1979  | 1.28 | 2.47 | 3.88 | 4.04 | 3.14 | 2.33 | 1.04 | 0.12 | 0.07 | 0.25 | 0.25 | 0.70 | 19.6  |
| 1980  | 2.02 | 2.49 | 3.90 | 4.06 | 3.22 | 2.26 | 1.54 | 0.24 | 0.23 | 0.00 | 0.31 | 0.61 | 20.9  |
| 1981  | 2.03 | 1.89 | 3.99 | 4.33 | 3.44 | 2.44 | 1.60 | 0.68 | 0.13 | 0.00 | 0.71 | 0.57 | 21.8  |
| 1982  | 1.89 | 3.11 | 3.98 | 4.34 | 3.44 | 2.41 | 0.92 | 0.23 | 0.10 | 0.01 | 0.34 | 0.72 | 21.5  |
| 1983  | 1.97 | 2.98 | 4.13 | 4.29 | 3.08 | 2.37 | 1.47 | 0.65 | 0.44 | 0.05 | 0.00 | 1.05 | 22.5  |
| 1984  | 2.15 | 3.13 | 4.14 | 4.32 | 3.30 | 2.26 | 1.11 | 0.38 | 0.02 | 0.43 | 0.67 | 0.81 | 22.7  |
| 1985  | 1.98 | 2.48 | 4.18 | 4.32 | 3.46 | 2.61 | 0.85 | 0.17 | 0.00 | 0.00 | 0.08 | 0.88 | 21.0  |
| 1986  | 1.63 | 3.10 | 4.19 | 4.22 | 3.45 | 2.59 | 1.67 | 0.08 | 0.00 | 0.18 | 0.45 | 0.91 | 22.5  |
| 1987  | 1.67 | 2.97 | 3.87 | 4.02 | 3.27 | 2.40 | 1.25 | 0.44 | 0.14 | 0.23 | 0.17 | 0.30 | 20.7  |
| 1988  | 2.21 | 2.08 | 4.44 | 4.68 | 3.70 | 2.69 | 1.70 | 0.21 | 0.00 | 0.15 | 0.04 | 0.32 | 22.2  |
| 1989  | 2.08 | 3.42 | 4.65 | 4.84 | 3.83 | 2.86 | 1.64 | 0.13 | 0.00 | 0.00 | 0.10 | 1.08 | 24.6  |
| 1990  | 0.84 | 3.51 | 4.92 | 5.12 | 3.98 | 2.58 | 1.92 | 0.63 | 0.26 | 0.18 | 0.58 | 0.92 | 25.4  |
| AVE : | 1.76 | 2.59 | 3.92 | 4.10 | 3.20 | 2.30 | 1.32 | 0.33 | 0.15 | 0.11 | 0.22 | 0.70 | 20.7  |
| SD :  | 0.37 | 0.49 | 0.41 | 0.42 | 0.37 | 0.29 | 0.35 | 0.19 | 0.15 | 0.13 | 0.24 | 0.26 | 2.2   |

Appendix B9.12

File : H7H6IRR.DEM  
Units : 10<sup>6</sup>m<sup>3</sup>  
Descrip. : Irrigation from farm dams in sub-catchment 70 for 1970 to 1990

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1970  | 0.45 | 0.74 | 1.17 | 1.22 | 0.88 | 0.70 | 0.52 | 0.09 | 0.07 | 0.12 | 0.05 | 0.31 | 6.3   |
| 1971  | 0.58 | 0.87 | 1.17 | 1.21 | 0.95 | 0.69 | 0.55 | 0.19 | 0.02 | 0.10 | 0.07 | 0.14 | 6.5   |
| 1972  | 0.60 | 0.58 | 1.13 | 1.24 | 0.92 | 0.66 | 0.59 | 0.11 | 0.06 | 0.00 | 0.04 | 0.26 | 6.2   |
| 1973  | 0.53 | 0.81 | 1.09 | 1.21 | 0.88 | 0.68 | 0.51 | 0.13 | 0.11 | 0.12 | 0.02 | 0.26 | 6.3   |
| 1974  | 0.37 | 0.74 | 1.12 | 1.12 | 0.89 | 0.67 | 0.31 | 0.20 | 0.08 | 0.00 | 0.08 | 0.22 | 5.8   |
| 1975  | 0.43 | 0.74 | 0.94 | 1.14 | 0.85 | 0.68 | 0.56 | 0.16 | 0.01 | 0.04 | 0.14 | 0.02 | 5.7   |
| 1976  | 0.46 | 0.65 | 1.03 | 1.11 | 0.84 | 0.64 | 0.52 | 0.09 | 0.02 | 0.05 | 0.00 | 0.30 | 5.7   |
| 1977  | 0.53 | 0.56 | 0.99 | 1.00 | 0.76 | 0.60 | 0.50 | 0.19 | 0.13 | 0.00 | 0.00 | 0.20 | 5.5   |
| 1978  | 0.24 | 0.57 | 0.96 | 1.01 | 0.77 | 0.60 | 0.38 | 0.06 | 0.01 | 0.07 | 0.12 | 0.17 | 5.0   |
| 1979  | 0.43 | 0.53 | 0.90 | 0.96 | 0.72 | 0.57 | 0.47 | 0.07 | 0.08 | 0.00 | 0.09 | 0.11 | 4.9   |
| 1980  | 0.39 | 0.29 | 0.84 | 0.91 | 0.70 | 0.50 | 0.41 | 0.18 | 0.05 | 0.00 | 0.14 | 0.15 | 4.6   |
| 1981  | 0.37 | 0.52 | 0.75 | 0.81 | 0.64 | 0.44 | 0.21 | 0.06 | 0.03 | 0.02 | 0.04 | 0.13 | 4.0   |
| 1982  | 0.36 | 0.56 | 0.85 | 0.89 | 0.63 | 0.47 | 0.32 | 0.16 | 0.11 | 0.02 | 0.00 | 0.19 | 4.5   |
| 1983  | 0.44 | 0.65 | 0.93 | 0.98 | 0.66 | 0.52 | 0.32 | 0.13 | 0.03 | 0.07 | 0.14 | 0.11 | 5.0   |
| 1984  | 0.49 | 0.53 | 1.01 | 1.06 | 0.81 | 0.62 | 0.24 | 0.08 | 0.00 | 0.03 | 0.02 | 0.22 | 5.1   |
| 1985  | 0.34 | 0.75 | 1.08 | 1.07 | 0.88 | 0.64 | 0.40 | 0.03 | 0.02 | 0.04 | 0.12 | 0.24 | 5.6   |
| 1986  | 0.44 | 0.80 | 1.09 | 1.10 | 0.89 | 0.67 | 0.38 | 0.16 | 0.07 | 0.09 | 0.06 | 0.10 | 5.9   |
| 1987  | 0.55 | 0.47 | 1.23 | 1.30 | 1.00 | 0.69 | 0.49 | 0.08 | 0.00 | 0.06 | 0.02 | 0.09 | 6.0   |
| 1988  | 0.46 | 0.87 | 1.23 | 1.29 | 0.98 | 0.74 | 0.47 | 0.06 | 0.00 | 0.00 | 0.02 | 0.24 | 6.3   |
| 1989  | 0.28 | 0.92 | 1.28 | 1.33 | 1.01 | 0.63 | 0.52 | 0.20 | 0.08 | 0.06 | 0.13 | 0.30 | 6.7   |
| 1990  | 0.60 | 0.89 | 1.27 | 1.33 | 0.99 | 0.65 | 0.48 | 0.12 | 0.05 | 0.00 | 0.21 | 0.13 | 6.7   |
| AVE : | 0.44 | 0.67 | 1.05 | 1.11 | 0.84 | 0.62 | 0.44 | 0.12 | 0.05 | 0.04 | 0.07 | 0.19 | 5.6   |
| SD :  | 0.10 | 0.16 | 0.15 | 0.15 | 0.12 | 0.08 | 0.11 | 0.05 | 0.04 | 0.04 | 0.06 | 0.08 | 0.8   |

```
File      : ANGORA.RET
Units     : 10^6xm^3
Descrip.  : Angora canal return flows for 1970 to 1990
```

[illegible]



```
File      : BOESMAN.RET
Units     : 10^6xm^3
Descrip.  : Boesmans canal return flows for 1970 to 1990
```

[illegible]

```
File      : JACKMOON.RET
Units     : 10^6xm^3
Descrip.  : Jack Moon canal return flows for 1970 to 1990
```

[illegible]

```
File      : WENTZEL.RET
Units     : 10^6xm^3
Descrip.  : Wentzel canal return flows for 1970 to 1990
```

[illegible]

Appendix B9.17

File : H7H6CUM.SIM  
Units : 10^6xm^3  
Descrip. : Cumulative simulated flow record at H7H006 for 1970 to 1990

| Year  | Oct    | Nov    | Dec    | Jan    | Feb    | Mar    | Apr    | May    | Jun    | Jul    | Aug     | Sep    | Total  |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|--------|--------|
| 1970  | 58.43  | 8.42   | 5.25   | 3.02   | 3.40   | 5.72   | 17.77  | 19.59  | 24.36  | 328.82 | 290.96  | 96.83  | 862.6  |
| 1971  | 17.06  | 26.05  | 15.41  | 2.78   | 3.92   | 2.89   | 2.29   | 83.47  | 100.79 | 38.09  | 130.43  | 86.15  | 509.3  |
| 1972  | 20.17  | 10.30  | 4.61   | 1.73   | 1.79   | 2.72   | 2.69   | 3.11   | 3.20   | 275.79 | 187.36  | 96.16  | 609.6  |
| 1973  | 55.80  | 4.73   | 11.88  | 6.14   | 23.78  | 10.57  | 3.65   | 34.02  | 200.54 | 61.90  | 1992.35 | 335.89 | 2741.2 |
| 1974  | 124.91 | 48.35  | 10.25  | 6.23   | 3.71   | 3.78   | 12.78  | 212.56 | 131.43 | 250.99 | 284.22  | 105.45 | 1194.7 |
| 1975  | 85.06  | 18.31  | 10.65  | 5.78   | 3.88   | 12.84  | 7.00   | 18.14  | 463.76 | 347.73 | 161.32  | 76.20  | 1210.7 |
| 1976  | 80.41  | 234.18 | 99.48  | 71.98  | 36.48  | 26.15  | 96.10  | 484.13 | 848.16 | 746.04 | 967.13  | 183.84 | 3874.1 |
| 1977  | 76.58  | 30.64  | 33.88  | 27.97  | 6.59   | 4.64   | 27.45  | 59.65  | 25.42  | 29.14  | 135.76  | 167.14 | 624.9  |
| 1978  | 88.46  | 34.30  | 39.16  | 13.76  | 15.52  | 18.38  | 3.61   | 34.69  | 233.11 | 108.45 | 181.79  | 103.35 | 874.6  |
| 1979  | 196.01 | 34.63  | 12.88  | 17.84  | 17.53  | 6.73   | 17.25  | 70.19  | 75.13  | 103.26 | 82.43   | 48.09  | 682.0  |
| 1980  | 26.90  | 116.95 | 127.42 | 438.38 | 147.84 | 36.31  | 38.87  | 42.76  | 51.02  | 221.13 | 326.57  | 443.12 | 2017.3 |
| 1981  | 105.02 | 18.57  | 19.34  | 11.85  | 7.11   | 13.07  | 158.94 | 100.82 | 104.89 | 106.71 | 117.45  | 99.56  | 863.3  |
| 1982  | 74.27  | 19.51  | 17.65  | 9.42   | 8.04   | 10.31  | 4.28   | 149.13 | 352.53 | 513.22 | 184.71  | 205.49 | 1548.6 |
| 1983  | 70.94  | 22.88  | 11.05  | 9.55   | 9.13   | 72.61  | 7.74   | 500.98 | 73.48  | 290.11 | 108.46  | 329.19 | 1506.1 |
| 1984  | 180.02 | 25.33  | 20.27  | 26.16  | 19.39  | 104.98 | 45.87  | 59.93  | 265.94 | 414.51 | 349.39  | 83.75  | 1595.5 |
| 1985  | 98.22  | 111.68 | 43.37  | 11.85  | 7.35   | 8.82   | 28.51  | 64.75  | 135.85 | 240.11 | 651.04  | 250.83 | 1652.4 |
| 1986  | 51.76  | 20.41  | 8.65   | 8.65   | 4.69   | 3.25   | 28.61  | 176.20 | 218.33 | 189.00 | 327.59  | 171.15 | 1208.3 |
| 1987  | 57.27  | 8.11   | 12.17  | 5.83   | 4.43   | 7.08   | 38.04  | 50.32  | 125.27 | 141.22 | 63.42   | 211.20 | 724.4  |
| 1988  | 43.60  | 7.58   | 6.45   | 5.89   | 3.47   | 18.03  | 96.58  | 80.05  | 117.39 | 196.51 | 281.01  | 447.88 | 1304.4 |
| 1989  | 123.79 | 72.97  | 12.14  | 5.13   | 14.93  | 11.59  | 82.59  | 163.41 | 169.06 | 514.06 | 326.36  | 44.64  | 1540.7 |
| 1990  | 18.35  | 8.05   | 10.67  | 6.57   | 7.02   | 5.66   | 4.25   | 62.36  | 246.96 | 311.88 | 278.94  | 301.16 | 1261.9 |
| AVE : | 78.72  | 42.00  | 25.36  | 33.17  | 16.67  | 18.39  | 34.52  | 117.63 | 188.89 | 258.51 | 353.75  | 185.10 | 1352.7 |
| SD :  | 48.16  | 54.15  | 31.42  | 94.08  | 31.25  | 25.35  | 41.25  | 136.22 | 188.85 | 179.30 | 428.11  | 123.49 | 787.3  |

Appendix B9.18

File : H7H6PAT.OBS

Units : 10^6xm^3

Descrip. : Patched observed flow record at H7H006 for 1970 to 1990

| Year  | Oct    | Nov    | Dec    | Jan     | Feb    | Mar   | Apr    | May     | Jun    | Jul    | Aug      | Sep    | Total  |
|-------|--------|--------|--------|---------|--------|-------|--------|---------|--------|--------|----------|--------|--------|
| 1970  | 64.20  | 9.92   | 5.49   | 1.35    | 3.36   | 7.76  | 36.20  | 15.70   | 21.00  | 287.00 | 264.00   | 89.20  | 805.2  |
| 1971  | 14.70  | 24.30  | 12.30  | 1.50    | 2.45   | 2.52  | 1.15   | 76.10   | 44.60  | 39.00  | 120.00   | 81.50  | 420.1  |
| 1972  | 20.90  | 9.50   | 2.92   | 0.51    | 0.43   | 2.16  | 4.11   | 2.27    | 4.18   | 188.00 | 176.00   | 87.00  | 498.0  |
| 1973  | 54.10  | 5.40   | 12.00  | 3.73    | 16.40  | 8.06  | 4.30   | 16.90   | 171.00 | 60.60  | 1992.00# | 312.00 | 2656.5 |
| 1974  | 109.00 | 52.10  | 12.20  | 3.58    | 3.40   | 2.86  | 10.80  | 194.00  | 145.00 | 242.00 | 259.00   | 100.00 | 1133.9 |
| 1975  | 78.40  | 18.30  | 10.70  | 4.39    | 2.92   | 9.70  | 4.98   | 20.80   | 420.00 | 306.00 | 160.00   | 61.70  | 1097.9 |
| 1976  | 83.00  | 213.00 | 101.00 | 65.80   | 27.90  | 25.50 | 78.40  | 409.00  | 701.00 | 698.00 | 967.00#  | 182.00 | 3551.6 |
| 1977  | 72.40  | 29.80  | 36.10  | 27.10   | 5.81   | 4.63  | 28.95* | 56.50   | 26.00  | 22.90  | 123.00   | 161.00 | 594.2  |
| 1978  | 83.80  | 35.90  | 39.20  | 8.07    | 1.60   | 17.60 | 4.41   | 32.70   | 215.00 | 101.00 | 168.00   | 99.00  | 806.3  |
| 1979  | 181.00 | 39.40  | 12.80  | 13.30   | 13.80  | 5.74  | 18.40  | 66.90   | 61.20  | 108.00 | 73.80    | 49.40  | 643.7  |
| 1980  | 26.50  | 92.10  | 116.00 | 433.81# | 146.00 | 31.10 | 41.60  | 59.60   | 48.50  | 206.00 | 314.00   | 426.00 | 1941.2 |
| 1981  | 101.00 | 17.82  | 18.00  | 10.20   | 7.02   | 11.30 | 108.00 | 85.70   | 96.10  | 104.00 | 106.00   | 100.00 | 765.1  |
| 1982  | 71.10  | 20.50  | 16.90  | 7.84    | 6.21   | 11.40 | 5.54   | 132.00  | 346.00 | 534.00 | 186.00   | 196.00 | 1533.5 |
| 1983  | 70.60  | 24.80  | 11.40  | 7.60    | 7.95   | 17.40 | 7.11   | 507.00# | 79.00  | 291.00 | 107.00   | 319.00 | 1449.9 |
| 1984  | 174.00 | 28.70  | 22.10  | 20.80   | 17.90  | 95.90 | 47.30  | 58.30   | 270.00 | 382.00 | 333.00   | 83.44* | 1533.4 |
| 1985  | 73.60  | 114.00 | 50.80  | 10.50   | 5.57   | 9.01  | 35.30  | 59.80   | 122.00 | 239.00 | 513.00   | 243.00 | 1475.6 |
| 1986  | 55.00  | 23.80  | 8.05   | 5.87    | 3.50   | 3.02  | 17.90  | 145.00  | 196.00 | 172.00 | 298.00   | 150.00 | 1078.1 |
| 1987  | 59.20  | 10.90  | 12.00  | 2.50    | 2.78   | 7.16  | 38.60  | 48.90   | 122.00 | 130.00 | 54.40    | 208.00 | 696.4  |
| 1988  | 49.80  | 10.30  | 5.00   | 3.22    | 2.12   | 17.00 | 93.50  | 74.10   | 107.00 | 193.00 | 252.00   | 432.00 | 1239.0 |
| 1989  | 110.00 | 77.50  | 13.30  | 3.20    | 12.60  | 12.60 | 40.60  | 164.00  | 146.00 | 485.00 | 313.00   | 49.00  | 1426.8 |
| 1990  | 22.30  | 9.52   | 9.80   | 5.16    | 8.02   | 7.04  | 5.49   | 62.60   | 223.00 | 286.00 | 262.00   | 276.00 | 1176.9 |
| AVE : | 74.98  | 41.31  | 25.15  | 30.48   | 14.18  | 14.74 | 30.13  | 108.95  | 169.74 | 241.64 | 335.30   | 176.44 | 1263.0 |
| SD :  | 43.49  | 48.81  | 30.24  | 93.51   | 30.95  | 20.07 | 30.79  | 127.13  | 162.36 | 171.08 | 427.24   | 118.21 | 744.7  |

## Appendix B9.19

File : H7H6IS-0.NAT  
Units : 10<sup>6</sup>xm<sup>3</sup>  
Descrip. : Incremental naturalised flow record at H7H006 for 1927 to 1990

| Year  | Oct   | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul   | Aug    | Sep   | Total |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|-------|
| 1927  | 0.87  | 0.41  | 0.20  | 0.15  | 0.06  | 36.88 | 12.46 | 0.19  | 0.46  | 0.39  | 0.81   | 4.64  | 57.5  |
| 1928  | 2.03  | 22.78 | 8.82  | 0.53  | 0.46  | 4.86  | 1.72  | 1.03  | 0.73  | 11.40 | 9.96   | 3.47  | 67.8  |
| 1929  | 1.49  | 0.81  | 4.30  | 1.55  | 20.50 | 9.97  | 1.38  | 0.69  | 0.53  | 0.45  | 7.71   | 3.91  | 53.3  |
| 1930  | 5.75  | 2.92  | 0.60  | 1.69  | 0.71  | 0.84  | 28.10 | 9.61  | 0.39  | 14.41 | 7.63   | 2.48  | 75.1  |
| 1931  | 12.61 | 5.00  | 12.21 | 4.12  | 0.48  | 0.24  | 0.07  | 0.12  | 3.02  | 1.87  | 0.88   | 28.41 | 69.0  |
| 1932  | 10.51 | 2.09  | 0.82  | 0.13  | 0.04  | 0.38  | 0.17  | 1.81  | 1.85  | 1.53  | 7.49   | 3.48  | 30.3  |
| 1933  | 0.93  | 3.58  | 1.30  | 1.10  | 1.29  | 1.12  | 0.37  | 0.10  | 0.11  | 4.30  | 7.04   | 3.69  | 24.9  |
| 1934  | 13.75 | 7.08  | 1.21  | 0.16  | 0.03  | 0.06  | 1.87  | 8.10  | 3.83  | 1.32  | 1.21   | 1.86  | 40.5  |
| 1935  | 1.26  | 2.88  | 1.13  | 0.15  | 0.18  | 0.40  | 0.17  | 1.46  | 0.71  | 3.50  | 1.93   | 4.00  | 17.8  |
| 1936  | 2.35  | 38.83 | 14.46 | 0.70  | 0.10  | 3.03  | 1.12  | 0.13  | 0.26  | 5.93  | 2.52   | 2.86  | 72.3  |
| 1937  | 1.72  | 0.70  | 2.54  | 1.07  | 0.13  | 2.88  | 9.64  | 5.69  | 2.01  | 2.81  | 2.37   | 2.78  | 34.3  |
| 1938  | 2.26  | 1.25  | 0.50  | 0.28  | 11.98 | 8.76  | 2.14  | 0.41  | 0.25  | 1.10  | 34.26  | 12.38 | 75.6  |
| 1939  | 1.04  | 0.52  | 0.19  | 0.09  | 7.05  | 10.95 | 6.70  | 1.86  | 1.94  | 1.38  | 0.89   | 2.17  | 34.8  |
| 1940  | 1.24  | 6.88  | 2.46  | 0.16  | 0.10  | 0.05  | 12.63 | 9.08  | 6.34  | 5.42  | 5.67   | 3.47  | 53.5  |
| 1941  | 7.61  | 3.15  | 0.49  | 1.95  | 0.69  | 0.18  | 0.23  | 14.93 | 8.91  | 2.37  | 1.33   | 1.22  | 43.1  |
| 1942  | 3.66  | 1.64  | 7.53  | 15.53 | 5.68  | 2.27  | 2.62  | 1.07  | 0.64  | 0.69  | 1.20   | 9.59  | 52.1  |
| 1943  | 4.11  | 30.48 | 10.40 | 0.19  | 0.05  | 1.11  | 0.47  | 3.87  | 7.50  | 3.13  | 4.79   | 14.61 | 80.7  |
| 1944  | 7.02  | 1.63  | 0.42  | 0.08  | 0.02  | 0.02  | 0.14  | 10.18 | 10.31 | 8.10  | 5.67   | 3.12  | 46.7  |
| 1945  | 43.76 | 15.35 | 0.56  | 0.15  | 0.11  | 19.34 | 6.66  | 0.22  | 0.25  | 0.43  | 0.49   | 0.70  | 88.0  |
| 1946  | 0.69  | 0.38  | 0.14  | 0.03  | 0.10  | 15.95 | 5.63  | 0.55  | 0.56  | 4.72  | 2.36   | 3.30  | 34.4  |
| 1947  | 2.24  | 3.24  | 1.19  | 0.35  | 0.14  | 0.63  | 0.86  | 0.41  | 0.49  | 1.56  | 1.06   | 1.57  | 13.7  |
| 1948  | 38.88 | 13.44 | 0.41  | 0.18  | 0.07  | 0.01  | 4.06  | 1.88  | 0.50  | 1.21  | 1.21   | 1.01  | 62.9  |
| 1949  | 0.74  | 67.92 | 22.85 | 0.14  | 0.02  | 0.01  | 1.95  | 0.56  | 0.23  | 3.94  | 2.16   | 1.59  | 101.2 |
| 1950  | 4.31  | 12.76 | 4.35  | 18.77 | 6.36  | 1.05  | 1.30  | 0.50  | 3.64  | 2.87  | 1.70   | 6.44  | 64.1  |
| 1951  | 3.06  | 0.76  | 0.24  | 0.31  | 0.64  | 0.25  | 0.08  | 0.20  | 1.06  | 1.86  | 11.69  | 13.01 | 33.2  |
| 1952  | 4.93  | 31.91 | 10.97 | 0.34  | 0.22  | 0.08  | 4.48  | 1.69  | 2.18  | 5.38  | 5.01   | 3.37  | 70.6  |
| 1953  | 4.12  | 3.04  | 0.94  | 0.18  | 0.06  | 0.44  | 2.86  | 25.28 | 14.07 | 9.98  | 16.86  | 7.32  | 85.1  |
| 1954  | 2.27  | 1.39  | 0.50  | 2.57  | 42.47 | 14.09 | 0.20  | 0.22  | 1.95  | 8.18  | 9.16   | 4.15  | 87.2  |
| 1955  | 1.89  | 0.89  | 0.28  | 0.21  | 0.21  | 1.01  | 0.54  | 5.85  | 3.34  | 1.99  | 2.27   | 1.75  | 20.2  |
| 1956  | 4.88  | 2.03  | 1.25  | 0.43  | 1.64  | 1.37  | 0.39  | 25.30 | 26.36 | 8.85  | 13.37  | 10.83 | 96.7  |
| 1957  | 27.78 | 9.78  | 0.69  | 0.14  | 0.06  | 3.87  | 2.20  | 55.49 | 20.08 | 1.59  | 8.12   | 3.85  | 133.7 |
| 1958  | 2.68  | 1.29  | 0.38  | 1.18  | 1.22  | 1.44  | 23.35 | 16.81 | 3.96  | 21.75 | 18.96  | 6.13  | 99.2  |
| 1959  | 8.13  | 3.36  | 0.52  | 0.13  | 0.05  | 0.83  | 0.37  | 0.42  | 2.11  | 2.08  | 1.28   | 1.07  | 20.4  |
| 1960  | 0.80  | 0.85  | 1.84  | 2.15  | 0.63  | 0.19  | 2.76  | 7.67  | 4.17  | 1.28  | 2.36   | 4.04  | 27.4  |
| 1961  | 3.29  | 1.29  | 0.33  | 1.35  | 0.73  | 3.19  | 4.07  | 1.35  | 4.17  | 2.17  | 122.03 | 42.28 | 186.3 |
| 1962  | 20.56 | 40.76 | 11.87 | 0.66  | 0.24  | 3.68  | 1.90  | 7.48  | 3.37  | 4.32  | 2.63   | 1.38  | 98.9  |
| 1963  | 4.25  | 4.78  | 2.95  | 1.64  | 1.12  | 5.28  | 2.60  | 0.53  | 16.06 | 6.25  | 5.90   | 5.38  | 56.7  |
| 1964  | 3.74  | 8.32  | 2.86  | 0.22  | 0.80  | 1.15  | 0.78  | 3.50  | 1.73  | 5.26  | 3.69   | 1.79  | 33.8  |
| 1965  | 7.96  | 7.62  | 2.14  | 1.09  | 0.38  | 0.10  | 0.54  | 1.61  | 0.82  | 0.51  | 36.13  | 15.27 | 74.2  |
| 1966  | 2.06  | 0.67  | 0.22  | 0.06  | 0.35  | 0.67  | 61.18 | 25.25 | 4.63  | 2.54  | 2.70   | 4.11  | 104.4 |
| 1967  | 2.49  | 2.31  | 0.91  | 0.17  | 0.04  | 0.09  | 0.13  | 0.45  | 7.74  | 3.14  | 2.96   | 1.92  | 22.4  |
| 1968  | 1.16  | 3.61  | 1.33  | 0.18  | 0.67  | 0.27  | 13.12 | 4.58  | 2.84  | 1.68  | 1.01   | 0.87  | 31.3  |
| 1969  | 0.70  | 0.39  | 0.13  | 0.12  | 1.19  | 0.44  | 0.04  | 0.14  | 0.67  | 0.95  | 8.46   | 3.61  | 16.8  |
| 1970  | 9.96  | 5.58  | 4.79  | 2.15  | 3.13  | 5.27  | 30.93 | 2.54  | 0.00  | 0.00  | 8.92   | 4.04  | 77.3  |
| 1971  | 1.25  | 4.96  | 2.73  | 2.78  | 1.53  | 2.06  | 1.41  | 0.00  | 0.00  | 2.93  | 0.00   | 0.63  | 20.3  |
| 1972  | 4.93  | 3.50  | 2.93  | 2.04  | 0.98  | 0.70  | 2.60  | 0.08  | 2.36  | 0.00  | 0.00   | 0.00  | 20.1  |
| 1973  | 1.28  | 3.17  | 4.47  | 2.12  | 4.90  | 2.82  | 1.95  | 6.66  | 0.00  | 0.00  | 39.57  | 0.00  | 66.9  |
| 1974  | 0.00  | 7.88  | 6.57  | 2.46  | 2.00  | 0.88  | 0.00  | 0.00  | 16.97 | 0.00  | 0.00   | 0.00  | 36.8  |
| 1975  | 0.00  | 4.17  | 4.98  | 2.90  | 1.51  | 3.21  | 3.01  | 7.82  | 0.00  | 0.00  | 1.90   | 0.00  | 29.5  |
| 1976  | 8.98  | 0.00  | 7.88  | 0.00  | 5.01  | 4.92  | 19.23 | 0.00  | 0.00  | 0.00  | 5.44   | 1.61  | 53.1  |
| 1977  | 0.12  | 4.18  | 7.67  | 4.09  | 2.44  | 1.83  | 5.31  | 0.00  | 0.95  | 0.00  | 0.00   | 0.00  | 26.6  |
| 1978  | 0.00  | 5.44  | 6.84  | 0.00  | 3.00  | 5.89  | 2.33  | 4.52  | 0.00  | 0.00  | 0.00   | 0.00  | 28.0  |
| 1979  | 0.00  | 8.76  | 5.09  | 1.06  | 0.00  | 0.98  | 2.61  | 0.00  | 0.00  | 6.33  | 0.00   | 3.94  | 28.8  |
| 1980  | 4.56  | 0.00  | 0.00  | 28.89 | 16.10 | 4.88  | 10.76 | 20.46 | 0.00  | 0.00  | 7.63   | 0.00  | 93.3  |
| 1981  | 1.90  | 3.00  | 4.48  | 4.23  | 2.98  | 2.97  | 21.47 | 9.31  | 0.00  | 0.42  | 0.00   | 5.75  | 56.5  |
| 1982  | 1.72  | 5.63  | 4.34  | 3.71  | 1.52  | 3.11  | 2.44  | 0.00  | 1.67  | 27.87 | 4.81   | 0.30  | 57.1  |
| 1983  | 6.31  | 8.25  | 6.33  | 3.06  | 1.57  | 0.00  | 2.58  | 9.95  | 7.57  | 2.08  | 0.00   | 0.00  | 47.7  |
| 1984  | 0.00  | 8.20  | 8.01  | 4.09  | 5.38  | 0.00  | 4.45  | 0.00  | 5.41  | 0.00  | 0.00   | 2.34  | 37.9  |
| 1985  | 3.73  | 17.58 | 14.61 | 4.28  | 2.04  | 2.81  | 8.37  | 0.00  | 0.00  | 0.00  | 0.00   | 12.78 | 66.2  |
| 1986  | 10.60 | 9.57  | 4.90  | 1.90  | 1.60  | 1.88  | 8.95  | 0.00  | 0.00  | 0.00  | 0.00   | 0.00  | 39.4  |
| 1987  | 8.25  | 7.26  | 4.97  | 1.65  | 1.16  | 2.57  | 4.70  | 0.21  | 0.00  | 0.00  | 0.00   | 0.00  | 30.8  |
| 1988  | 9.83  | 5.72  | 5.08  | 2.59  | 1.72  | 3.35  | 16.77 | 0.48  | 0.00  | 0.00  | 0.00   | 0.00  | 45.5  |
| 1989  | 7.63  | 16.17 | 7.55  | 3.35  | 3.14  | 4.82  | 2.40  | 17.23 | 0.00  | 0.00  | 0.00   | 7.19  | 69.5  |
| 1990  | 6.58  | 6.66  | 5.92  | 4.24  | 4.57  | 3.59  | 3.11  | 1.28  | 0.00  | 0.00  | 0.00   | 0.00  | 36.0  |
| AVE : | 5.71  | 7.91  | 4.06  | 2.25  | 2.74  | 3.41  | 5.91  | 5.29  | 3.29  | 3.35  | 7.11   | 4.59  | 55.6  |
| SD :  | 8.13  | 11.65 | 4.48  | 4.59  | 6.24  | 5.76  | 9.85  | 9.21  | 5.27  | 4.99  | 16.73  | 6.83  | 31.5  |

## Appendix B9.20

File : H7H6CUM.PRS  
 Units : 10^6x^3  
 Descrip. : Cumulative Present Day (2000) Flow at H7H006 for 1927 to 1990

| Year  | Oct    | Nov    | Dec   | Jan    | Feb    | Mar   | Apr    | May    | Jun    | Jul    | Aug     | Sep    | Total  |
|-------|--------|--------|-------|--------|--------|-------|--------|--------|--------|--------|---------|--------|--------|
| 1927  | 14.73  | 24.04  | 9.23  | 5.56   | 3.61   | 37.14 | 9.49   | 2.22   | 135.44 | 29.22  | 55.72   | 64.40  | 390.8  |
| 1928  | 25.13  | 42.79  | 20.39 | 8.03   | 4.10   | 11.61 | 21.48  | 30.51  | 37.90  | 152.68 | 153.93  | 45.27  | 553.8  |
| 1929  | 23.46  | 10.88  | 17.22 | 13.21  | 41.93  | 21.12 | 6.28   | 3.76   | 1.89   | 13.57  | 71.17   | 132.80 | 357.3  |
| 1930  | 54.01  | 17.73  | 11.60 | 9.62   | 4.70   | 4.58  | 113.19 | 82.27  | 22.79  | 106.26 | 253.56  | 107.81 | 788.1  |
| 1931  | 128.12 | 33.34  | 33.65 | 18.91  | 83.00  | 11.97 | 3.70   | 37.77  | 53.14  | 78.97  | 54.44   | 196.59 | 733.6  |
| 1932  | 79.61  | 13.76  | 11.85 | 8.18   | 3.79   | 3.94  | 3.42   | 15.04  | 142.78 | 268.92 | 160.00  | 57.93  | 769.2  |
| 1933  | 33.46  | 14.97  | 11.65 | 10.11  | 5.82   | 6.37  | 3.56   | 14.69  | 23.29  | 35.77  | 85.16   | 97.55  | 342.4  |
| 1934  | 144.06 | 52.80  | 15.46 | 9.24   | 3.98   | 3.67  | 18.18  | 50.74  | 46.68  | 98.29  | 101.91  | 64.36  | 609.4  |
| 1935  | 28.72  | 17.42  | 11.22 | 9.74   | 4.06   | 2.78  | 2.08   | 13.84  | 8.13   | 46.32  | 110.85  | 93.69  | 348.8  |
| 1936  | 42.06  | 127.24 | 57.50 | 15.11  | 5.62   | 20.95 | 11.91  | 29.76  | 144.65 | 246.21 | 79.37   | 44.67  | 825.1  |
| 1937  | 26.07  | 11.37  | 15.15 | 18.23  | 4.27   | 12.98 | 34.97  | 75.80  | 30.08  | 49.43  | 71.78   | 75.36  | 425.5  |
| 1938  | 40.95  | 14.80  | 11.30 | 8.09   | 39.26  | 21.98 | 9.49   | 42.72  | 15.19  | 27.51  | 186.55  | 84.18  | 502.0  |
| 1939  | 24.19  | 9.57   | 9.33  | 4.32   | 13.06  | 15.10 | 33.34  | 10.69  | 62.56  | 53.12  | 37.41   | 33.34  | 306.0  |
| 1940  | 21.26  | 43.53  | 12.85 | 8.62   | 3.09   | 2.21  | 78.40  | 230.42 | 359.41 | 183.87 | 184.37  | 375.40 | 1503.4 |
| 1941  | 117.75 | 29.69  | 13.46 | 13.27  | 4.93   | 3.92  | 2.95   | 105.21 | 493.76 | 91.28  | 125.54  | 37.83  | 1039.6 |
| 1942  | 37.16  | 13.09  | 25.13 | 50.02  | 18.00  | 16.02 | 15.48  | 11.59  | 44.60  | 129.18 | 200.03  | 156.10 | 716.4  |
| 1943  | 60.39  | 77.32  | 26.16 | 11.23  | 3.81   | 4.14  | 5.59   | 77.01  | 268.24 | 93.87  | 196.78  | 152.21 | 976.7  |
| 1944  | 68.28  | 20.84  | 12.04 | 8.91   | 3.52   | 2.98  | 5.50   | 239.21 | 395.99 | 640.84 | 438.40  | 71.71  | 1908.2 |
| 1945  | 182.94 | 59.57  | 12.91 | 10.14  | 3.81   | 38.59 | 16.08  | 7.85   | 8.03   | 20.56  | 49.38   | 154.96 | 564.8  |
| 1946  | 60.02  | 11.19  | 8.86  | 5.32   | 3.46   | 50.03 | 14.82  | 8.76   | 8.88   | 174.77 | 82.90   | 37.88  | 466.9  |
| 1947  | 35.56  | 14.46  | 11.22 | 7.86   | 3.84   | 21.87 | 10.85  | 47.66  | 33.73  | 120.23 | 47.29   | 171.88 | 526.4  |
| 1948  | 206.81 | 54.16  | 11.90 | 9.03   | 3.80   | 3.07  | 13.64  | 10.48  | 29.16  | 60.38  | 93.02   | 75.51  | 570.9  |
| 1949  | 72.04  | 248.00 | 66.32 | 10.49  | 5.25   | 3.06  | 56.48  | 2.66   | 1.77   | 193.65 | 45.74   | 101.34 | 806.8  |
| 1950  | 52.46  | 82.36  | 24.48 | 50.96  | 15.28  | 5.18  | 41.06  | 7.56   | 194.24 | 132.99 | 76.75   | 97.66  | 781.0  |
| 1951  | 53.58  | 32.62  | 11.06 | 7.59   | 4.54   | 3.73  | 3.71   | 77.94  | 42.03  | 118.58 | 336.86  | 209.26 | 901.5  |
| 1952  | 60.97  | 186.64 | 42.97 | 12.62  | 5.41   | 3.32  | 190.02 | 135.84 | 40.33  | 205.99 | 119.26  | 39.93  | 1043.3 |
| 1953  | 30.40  | 22.43  | 12.61 | 9.28   | 3.79   | 4.54  | 34.39  | 310.43 | 178.84 | 628.73 | 587.72  | 138.77 | 1961.9 |
| 1954  | 51.99  | 14.29  | 14.14 | 13.21  | 165.30 | 46.97 | 6.15   | 3.65   | 67.54  | 239.15 | 706.97  | 110.86 | 1440.2 |
| 1955  | 112.80 | 32.23  | 12.52 | 10.58  | 4.27   | 4.94  | 3.94   | 38.96  | 133.46 | 154.77 | 221.00  | 49.72  | 779.2  |
| 1956  | 39.63  | 11.62  | 14.51 | 10.79  | 47.80  | 10.95 | 6.26   | 248.30 | 560.00 | 622.57 | 479.86  | 145.85 | 2198.2 |
| 1957  | 251.73 | 46.29  | 13.61 | 10.78  | 8.23   | 9.63  | 6.83   | 201.77 | 102.02 | 29.77  | 121.61  | 48.84  | 851.1  |
| 1958  | 39.76  | 13.59  | 10.34 | 9.57   | 6.57   | 5.83  | 108.96 | 410.97 | 63.27  | 88.48  | 180.62  | 63.27  | 1001.2 |
| 1959  | 108.59 | 20.73  | 11.95 | 8.74   | 3.82   | 4.37  | 5.63   | 48.86  | 117.31 | 38.51  | 30.86   | 23.06  | 422.4  |
| 1960  | 17.03  | 8.55   | 10.78 | 9.82   | 5.54   | 3.94  | 4.88   | 17.39  | 39.24  | 50.63  | 103.96  | 158.18 | 429.9  |
| 1961  | 56.17  | 13.57  | 10.06 | 9.13   | 5.91   | 8.33  | 13.68  | 5.36   | 424.12 | 165.59 | 926.26  | 236.11 | 1874.3 |
| 1962  | 305.30 | 128.01 | 34.95 | 13.74  | 5.35   | 7.24  | 5.06   | 21.77  | 37.99  | 81.52  | 294.81  | 65.60  | 1001.4 |
| 1963  | 33.82  | 24.35  | 16.68 | 11.02  | 15.89  | 20.88 | 11.83  | 12.82  | 167.34 | 112.05 | 208.37  | 64.10  | 699.1  |
| 1964  | 54.38  | 59.63  | 20.24 | 13.04  | 6.58   | 23.82 | 24.53  | 49.17  | 31.89  | 51.05  | 81.37   | 38.82  | 454.5  |
| 1965  | 65.66  | 31.86  | 16.09 | 10.83  | 4.78   | 5.86  | 4.84   | 3.38   | 45.66  | 147.15 | 177.53  | 91.94  | 605.6  |
| 1966  | 31.28  | 8.46   | 9.70  | 6.98   | 3.81   | 3.82  | 165.91 | 101.78 | 248.48 | 78.96  | 72.53   | 47.97  | 779.7  |
| 1967  | 69.51  | 22.00  | 12.78 | 11.37  | 3.77   | 3.37  | 15.18  | 117.41 | 131.79 | 195.21 | 175.97  | 45.90  | 804.3  |
| 1968  | 162.66 | 31.75  | 13.01 | 13.97  | 5.02   | 4.21  | 28.70  | 23.72  | 26.32  | 36.64  | 52.67   | 71.30  | 470.0  |
| 1969  | 93.26  | 12.80  | 9.16  | 6.07   | 5.86   | 3.84  | 1.06   | 21.43  | 100.96 | 111.58 | 198.12  | 89.51  | 653.7  |
| 1970  | 42.86  | 14.53  | 13.27 | 6.31   | 4.55   | 6.01  | 16.20  | 18.16  | 24.21  | 179.20 | 236.45  | 63.17  | 624.9  |
| 1971  | 20.57  | 21.16  | 12.07 | 9.35   | 4.33   | 3.59  | 5.40   | 33.37  | 42.61  | 33.48  | 76.24   | 56.97  | 319.2  |
| 1972  | 23.87  | 7.93   | 8.35  | 5.22   | 2.54   | 2.91  | 2.59   | 2.39   | 1.71   | 184.63 | 75.28   | 43.35  | 360.8  |
| 1973  | 36.00  | 11.45  | 16.40 | 5.97   | 14.10  | 7.29  | 3.33   | 33.38  | 101.12 | 49.28  | 1452.99 | 250.08 | 1981.4 |
| 1974  | 100.34 | 29.87  | 14.88 | 13.09  | 4.28   | 3.53  | 17.37  | 133.14 | 63.61  | 134.93 | 163.30  | 63.78  | 742.1  |
| 1975  | 50.09  | 16.83  | 10.76 | 7.31   | 3.67   | 10.04 | 9.33   | 13.20  | 396.33 | 219.72 | 90.76   | 43.94  | 872.0  |
| 1976  | 62.22  | 187.79 | 55.66 | 32.49  | 20.27  | 11.33 | 101.44 | 508.77 | 502.54 | 868.46 | 934.39  | 131.77 | 3417.1 |
| 1977  | 52.92  | 21.74  | 21.62 | 13.40  | 4.56   | 4.28  | 21.27  | 36.85  | 11.52  | 18.14  | 108.22  | 86.77  | 401.3  |
| 1978  | 51.47  | 16.00  | 13.74 | 9.84   | 35.06  | 15.13 | 2.58   | 31.02  | 100.67 | 56.64  | 100.77  | 74.89  | 507.8  |
| 1979  | 101.88 | 16.18  | 10.38 | 11.10  | 4.22   | 3.46  | 15.28  | 37.43  | 33.74  | 36.46  | 48.09   | 34.27  | 352.5  |
| 1980  | 32.59  | 121.01 | 38.51 | 300.10 | 52.43  | 16.98 | 23.68  | 14.46  | 22.50  | 134.58 | 238.39  | 246.64 | 1241.9 |
| 1981  | 60.88  | 18.31  | 15.00 | 14.56  | 4.07   | 6.01  | 273.77 | 124.40 | 67.81  | 56.61  | 73.01   | 65.39  | 779.8  |
| 1982  | 44.85  | 12.35  | 15.57 | 6.31   | 4.15   | 3.75  | 2.06   | 124.41 | 228.59 | 418.00 | 143.81  | 160.12 | 1164.0 |
| 1983  | 53.49  | 15.34  | 12.38 | 8.19   | 4.20   | 56.84 | 9.41   | 351.44 | 76.22  | 198.81 | 91.59   | 372.35 | 1250.3 |
| 1984  | 171.52 | 46.97  | 23.45 | 27.58  | 14.93  | 60.77 | 24.67  | 38.23  | 158.01 | 328.52 | 366.96  | 88.73  | 1350.3 |
| 1985  | 86.77  | 79.66  | 19.78 | 13.10  | 5.00   | 8.28  | 27.83  | 56.12  | 59.43  | 157.88 | 644.57  | 223.86 | 1382.3 |
| 1986  | 44.34  | 15.58  | 11.15 | 12.96  | 3.63   | 3.23  | 43.80  | 140.29 | 129.29 | 114.76 | 295.21  | 142.90 | 957.2  |
| 1987  | 46.63  | 9.12   | 16.27 | 7.42   | 3.63   | 3.79  | 37.06  | 52.17  | 88.42  | 74.41  | 100.35  | 165.99 | 605.3  |
| 1988  | 37.05  | 9.03   | 10.24 | 6.71   | 3.83   | 32.55 | 94.85  | 68.87  | 71.73  | 116.94 | 183.30  | 364.85 | 999.9  |
| 1989  | 124.44 | 64.02  | 13.35 | 10.81  | 8.17   | 5.86  | 147.00 | 100.93 | 152.74 | 311.87 | 160.90  | 37.03  | 1137.1 |
| 1990  | 25.91  | 8.14   | 11.89 | 7.61   | 4.44   | 3.56  | 4.94   | 35.46  | 150.29 | 606.90 | 169.17  | 247.58 | 1275.9 |
| AVE : | 70.13  | 39.21  | 17.54 | 16.45  | 12.57  | 12.09 | 32.15  | 77.56  | 118.81 | 164.14 | 215.50  | 113.03 | 889.2  |
| SD :  | 57.00  | 47.31  | 11.83 | 36.98  | 24.10  | 13.70 | 51.00  | 103.24 | 133.38 | 172.57 | 249.83  | 83.42  | 553.8  |

## APPENDIX B10.1

SUB-CATCHMENT : H7R001  
RIVER : Buffeljags  
PLACE : Buffeljags Dam

### 1 CATCHMENT

|                           | YEAR   |        |        |        |        |        | UNITS |
|---------------------------|--------|--------|--------|--------|--------|--------|-------|
|                           | 1968   | 1973   | 1980   | 1987   | 1998   | 2000   |       |
| SUB-CATCHMENT AREAS       |        |        |        |        |        |        |       |
| u/s farm dams    low MAP  | 32.27  | 32.96  | 33.93  | 164.04 | 375.08 | 375.08 | km²   |
| d/s farm dams    low MAP  | 485.73 | 485.04 | 484.07 | 353.96 | 142.92 | 142.92 | km²   |
| d/s farm dams    high MAP | 101.00 | 101.00 | 101.00 | 101.00 | 101.00 | 101.00 | km²   |
| Total                     | 619.00 | 619.00 | 619.00 | 619.00 | 619.00 | 619.00 | km²   |

### 2 LANDUSE

|                            | YEAR  |       |       |       |       |       | UNITS |
|----------------------------|-------|-------|-------|-------|-------|-------|-------|
|                            | 1968  | 1973  | 1980  | 1987  | 1998  | 2000  |       |
| ALIEN VEGETATION           |       |       |       |       |       |       |       |
| u/s farm dams : tall trees | 1.94  | 2.20  | 8.46  | 1.03  | 1.50  | 1.39  | km²   |
| riparian : tall trees      | 2.11  | 2.33  | 5.07  | 3.72  | 5.02  | 5.33  | km²   |
| Total                      | 4.05  | 4.53  | 13.53 | 4.75  | 6.52  | 6.72  | km²   |
| FORESTRY                   | 1.50  | 1.96  | 8.56  | 8.44  | 8.29  | 8.29  | km²   |
| FARM DAM CAPACITIES        | 5.09  | 5.33  | 5.61  | 9.53  | 10.69 | 10.69 | Mm³   |
| IRRIGATION AREAS           |       |       |       |       |       |       |       |
| farm dams                  | 19.73 | 19.68 | 13.54 | 17.15 | 16.49 | 16.49 | km²   |
| Total                      | 19.73 | 19.68 | 13.54 | 17.15 | 16.49 | 16.49 | km²   |

### 3 EVAPORATION

|                       | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) | 173  | 201  | 259  | 277  | 198  | 175  | 175  | 89   | 70   | 71   | 89   | 118  | 1895      |
| S-PAN (gross) (in mm) | 136  | 161  | 212  | 228  | 158  | 138  | 138  | 62   | 45   | 46   | 62   | 87   | 1473      |
| LAKE FACTOR           | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)    | 110  | 132  | 176  | 192  | 139  | 121  | 121  | 54   | 38   | 38   | 50   | 70   | 1243      |

**Note : evaporation from CCWR database used for this sub-catchment**

### 4 RESERVOIR SIMULATIONS

|          | COEFFICIENTS |     | START      | DEAD          | MAX           |
|----------|--------------|-----|------------|---------------|---------------|
|          | a            | b   | STOR.<br>% | STOR.<br>M.m³ | STOR.<br>M.m³ |
| Farm Dam | 0.4          | 0.7 | 100        | 0             | FSC           |

### 5 IRRIGATION ROUTINE

|                      | QUANT<br>% | CROP FACTORS |      |     |     |     |     |     |     |     |     |      |     |
|----------------------|------------|--------------|------|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|
|                      |            | OCT          | NOV  | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG  | SEP |
| Orchards & vineyards | 42.7       | 0.4          | 0.45 | 0.5 | 0.5 | 0.5 | 0.4 | 0.2 | 0.2 | 0.2 | 0.2 | 0.25 | 0.3 |
| Patures & cash crops | 57.3       | 0.7          | 0.8  | 0.8 | 0.8 | 0.8 | 0.8 | 0.7 | 0.6 | 0.5 | 0.5 | 0.5  | 0.6 |

### 6. NOTES

Combined crop factor used for calculation of irrigation demand :  
crop type 1 : vineyards and fruit trees  
crop type 2 : wheat , lucerne and cash crops

Catchment modelled using two different MAPs  
High MAP = 973 mm  
Low MAP = 526 mm



Appendix B10.2

File : H7R1-INF.OBS

Units : 10<sup>6</sup>m<sup>3</sup>

Descrip. : Buffeljags Dam calculated (dam balance) inflow record for 1970 to 1999

| Year  | Oct   | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul   | Aug   | Sep   | Total |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1970  | 0.00  | 0.58  | 1.87  | 0.02  | 14.32 | 10.41 | 34.19 | 8.84  | 4.69  | 28.00 | 24.27 | 8.20  | 135.4 |
| 1971  | 2.32  | 17.02 | 5.47  | 0.67  | 7.25  | 5.03  | 1.24  | 14.73 | 3.87  | 2.15  | 14.32 | 7.51  | 81.6  |
| 1972  | 1.39  | 13.05 | 1.88  | 1.86  | 2.43  | 2.14  | 18.48 | 3.07  | 2.05  | 4.64  | 4.54  | 3.14  | 58.7  |
| 1973  | 1.38  | 7.57  | 3.42  | 10.60 | 22.98 | 5.84  | 6.05  | 9.71  | 3.80  | 3.30  | 27.78 | 7.66  | 110.1 |
| 1974  | 2.40  | 1.79  | 0.43  | 2.28  | 2.31  | 5.54  | 1.07  | 2.09  | 3.86  | 6.64  | 5.26  | 23.69 | 57.4  |
| 1975  | 1.59  | 7.44  | 9.24  | 3.46  | 8.93  | 13.98 | 3.79  | 10.08 | 7.71  | 9.63  | 7.04  | 5.80  | 88.7  |
| 1976  | 23.95 | 21.44 | 1.40  | 0.93  | 17.34 | 6.83  | 5.54  | 45.07 | 5.11  | 4.94  | 8.66  | 13.01 | 154.2 |
| 1977  | 12.85 | 19.94 | 11.02 | 6.95  | 0.92  | 1.28  | 6.16  | 2.93  | 2.18  | 2.22  | 9.77  | 8.20  | 84.4  |
| 1978  | 19.18 | 5.17  | 10.39 | 3.60  | 1.33  | 5.39  | 0.94  | 10.69 | 4.75  | 16.91 | 12.73 | 22.00 | 113.1 |
| 1979  | 7.16  | 4.87  | 3.72  | 10.04 | 5.23  | 1.93  | 1.67  | 1.04  | 2.98  | 1.77  | 4.77  | 8.05  | 53.2  |
| 1980  | 13.30 | 6.95  | 18.80 | 63.26 | 21.08 | 17.34 | 19.70 | 24.49 | 10.77 | 9.58  | 35.44 | 20.26 | 261.0 |
| 1981  | 6.30  | 3.78  | 12.82 | 3.10  | 6.53  | 17.06 | 58.93 | 5.96  | 3.87  | 15.57 | 2.80  | 33.04 | 169.8 |
| 1982  | 3.80  | 4.35  | 2.86  | 0.63  | 1.15  | 2.30  | 1.04  | 3.38  | 4.85  | 20.23 | 4.97  | 31.08 | 80.6  |
| 1983  | 10.72 | 10.64 | 3.63  | 3.25  | 13.22 | 16.63 | 2.78  | 2.99  | 2.46  | 3.88  | 2.97  | 2.88  | 76.1  |
| 1984  | 5.40  | 5.82  | 5.02  | 11.77 | 7.30  | 2.73  | 4.31  | 0.99  | 1.75  | 10.85 | 2.84  | 1.05  | 59.8  |
| 1985  | 38.21 | 25.11 | 33.47 | 9.36  | 4.28  | 2.13  | 2.77  | 2.03  | 1.15  | 1.51  | 45.95 | 11.13 | 177.1 |
| 1986  | 23.57 | 13.68 | 4.85  | 1.74  | 1.06  | 2.86  | 12.69 | 1.47  | 2.91  | 3.12  | 4.71  | 11.98 | 84.6  |
| 1987  | 8.01  | 1.13  | 5.91  | 0.71  | 2.63  | 9.49  | 15.98 | 2.41  | 8.64  | 5.28  | 9.94  | 6.99  | 77.1  |
| 1988  | 5.27  | 3.28  | 8.55  | 3.47  | 2.71  | 4.63  | 27.96 | 4.27  | 4.68  | 6.32  | 7.36  | 4.95  | 83.4  |
| 1989  | 29.15 | 43.50 | 4.73  | 1.17  | 10.68 | 8.48  | 13.04 | 9.17  | 7.96  | 4.78  | 3.81  | 8.61  | 145.1 |
| 1990  | 15.65 | 3.12  | 6.04  | 8.75  | 10.24 | 2.30  | 0.98  | 1.86  | 3.51  | 6.76  | 5.16  | 1.63  | 66.0  |
| 1991  | 37.99 | 7.37  | 4.45  | 6.51  | 7.30  | 5.29  | 2.25  | 3.95  | 13.62 | 9.87  | 5.28  | 6.58  | 110.5 |
| 1992  | 35.56 | 10.86 | 1.14  | 1.71  | 1.52  | 3.25  | 34.88 | 13.78 | 7.13  | 6.25  | 7.25  | 8.31  | 131.6 |
| 1993  | 4.09  | 8.44  | 12.81 | 9.11  | 20.91 | 13.69 | 5.18  | 2.41  | 3.26  | 6.52  | 26.65 | 9.09  | 122.2 |
| 1994  | 8.88  | 1.21  | 15.63 | 20.99 | 4.10  | 16.02 | 32.38 | 12.68 | 5.31  | 2.55  | 2.87  | 2.08  | 124.7 |
| 1995  | 3.85  | 20.56 | 45.86 | 10.64 | 3.66  | 10.09 | 1.93  | 1.03  | 0.97  | 4.16  | 1.93  | 2.77  | 107.5 |
| 1996  | 36.86 | 61.70 | 4.25  | 3.74  | 6.88  | 7.71  | 6.77  | 14.81 | 3.06  | 15.86 | 18.28 | 5.95  | 185.9 |
| 1997  | 4.52  | 7.21  | 6.03  | 5.89  | 6.92  | 27.25 | 42.49 | 8.41  | 3.30  | 2.94  | 2.85  | 3.17  | 121.0 |
| 1998  | 3.46  | 30.91 | 33.76 | 6.86  | 14.26 | 18.15 | 14.52 | 4.52  | 2.00  | 2.05  | 2.76  | 4.28  | 137.5 |
| 1999  | 13.22 | 3.50  | 0.77  | 10.85 | 9.86  | 51.75 | 10.07 | 3.55  | 2.80  | 1.33  | 0.99  | 0.00  | 108.7 |
| AVE : | 12.67 | 12.40 | 9.34  | 7.46  | 7.98  | 9.92  | 12.99 | 7.75  | 4.50  | 7.32  | 10.47 | 9.44  | 112.2 |
| SD :  | 12.21 | 13.55 | 10.77 | 11.54 | 6.39  | 10.18 | 14.74 | 8.96  | 2.87  | 6.33  | 11.02 | 8.44  | 46.0  |

## APPENDIX B10.3 PERCENTAGE RAINFALL FILES USED FOR CALIBRATION OF H7R001

Average Rainfall On Catchment H7R001.ra

details of rainfall stations used

025599\_3.nsp 1919 to 1998

025414\_8.nsp 1924 to 1998

008751\_7.nsp 1929 to 1998

009365\_5.nsp 1943 to 1998

|      |        | rainfall input as percent m.a.p. |        |        |        |       |        |        |        |        |        |        |        |        |
|------|--------|----------------------------------|--------|--------|--------|-------|--------|--------|--------|--------|--------|--------|--------|--------|
| no.  | gauges | oct                              | nov    | dec    | jan    | feb   | mar    | apr    | may    | jun    | jul    | aug    | sep    | year   |
| 1919 | 1      | 8.58+                            | 9.47+  | 7.92+  | 1.60   | 15.04 | 9.10   | 2.95   | 11.04  | 8.85   | 14.54  | 4.99   | 2.34   | 96.42  |
| 1920 | 1      | 5.61                             | 8.28   | 16.11  | 5.62   | 17.39 | 11.43  | 17.34  | 5.43   | 11.02  | 9.50   | 8.72   | 9.70   | 126.16 |
| 1921 | 1      | 6.62                             | 3.95   | 14.18  | 21.61  | 10.04 | 21.61  | 10.03  | 6.75   | 4.70   | 8.36   | 7.94   | 5.79   | 121.57 |
| 1922 | 1      | 11.46                            | 22.65  | 4.42   | 8.11   | 10.58 | 5.44   | 21.21  | 14.88  | 9.97   | 7.62   | 6.17   | 4.92   | 127.43 |
| 1923 | 1      | 12.29                            | 9.09   | 2.40   | 6.86   | 8.55  | 9.12   | 5.66   | 7.32   | 8.55   | 5.91   | 21.01  | 5.74   | 102.51 |
| 1924 | 2      | 5.18+                            | 10.99+ | 8.48+  | 5.56+  | 2.76+ | 18.78+ | 6.26   | 4.51   | 4.99   | 3.96   | 14.08  | 20.16  | 105.71 |
| 1925 | 2      | 6.06                             | 5.71   | 3.96   | 7.38   | 4.87  | 5.71   | 5.50   | 4.28   | 6.58   | 7.05   | 4.52   | 4.70   | 66.33  |
| 1926 | 2      | 16.05                            | 6.35   | .69    | 2.77   | 7.60  | 5.71   | 12.28  | 6.98   | 1.99   | 5.05   | 10.39  | 2.51   | 78.39  |
| 1927 | 2      | 5.17                             | 4.41   | 4.38   | 4.52   | 3.11  | 9.73   | 2.62   | 3.44   | 8.24   | 1.61   | 7.39+  | 10.45+ | 65.08  |
| 1928 | 2      | 3.66+                            | 17.66+ | 9.75+  | 2.55   | 3.99  | 13.45  | 4.00   | 7.08   | 5.66   | 20.97  | 14.62  | 4.95   | 108.35 |
| 1929 | 3      | 5.89+                            | 3.36+  | 13.74+ | 7.61   | 23.90 | 15.23  | 6.17   | 8.29   | 3.77   | 5.21   | 15.55  | 8.69   | 117.41 |
| 1930 | 3      | 11.65                            | 4.42   | 6.96   | 10.56  | 7.16  | 16.08  | 20.31  | 3.12   | 4.17   | 10.94  | 9.05   | 7.42   | 111.83 |
| 1931 | 3      | 14.71                            | 3.95   | 33.25  | 3.70   | 7.57  | 6.73   | .93    | 6.08   | 7.16   | 9.90   | 3.65   | 30.71  | 128.34 |
| 1932 | 3      | 6.88                             | 10.19+ | 3.82   | 1.12   | 8.48  | 5.10   | 2.40   | 9.19   | 4.91   | 4.88   | 16.66+ | 1.91   | 75.55  |
| 1933 | 3      | 1.69                             | 16.26  | 4.05   | 9.86   | 12.05 | 11.71  | 1.56   | 2.79   | 2.21   | 10.54  | 9.00   | 7.28   | 89.02  |
| 1934 | 3      | 39.62                            | 18.23  | 2.62+  | 2.83   | 10.28 | 6.60   | 11.02  | 13.83  | 10.39  | 4.22   | 4.43   | 8.71   | 132.76 |
| 1935 | 3      | 6.18                             | 14.30  | 5.63   | 3.17   | 7.24  | 4.12   | 1.49   | 10.10  | 1.67   | 7.96   | 4.68   | 13.99  | 80.55  |
| 1936 | 3      | 5.33                             | 29.93  | 13.88  | 4.46   | 4.50  | 16.65  | 3.63   | .63    | 6.06   | 8.60   | 2.11   | 9.24   | 105.02 |
| 1937 | 3      | 2.63                             | 14.08  | 14.20+ | 7.96   | 2.10  | 9.44   | 11.41  | 4.33   | 6.74   | 4.82   | 5.48+  | 7.25+  | 90.44  |
| 1938 | 3      | 8.06                             | 16.45  | 8.90   | 4.32+  | 14.86 | 18.50  | 5.22   | .90    | 1.01   | 9.93   | 19.64  | 6.31   | 114.10 |
| 1939 | 3      | 5.83                             | 7.02   | 3.89   | 4.26   | 28.03 | 7.91   | 11.35  | 2.20   | 5.87   | 3.94   | 1.33   | 11.49  | 93.10  |
| 1940 | 3      | 3.38                             | 15.95  | 2.45   | 4.69   | 4.80  | 3.98   | 17.49  | 8.82   | 12.57  | 5.90   | 4.08   | 5.95   | 90.06  |
| 1941 | 3      | 14.75                            | 8.26   | 7.08   | 13.59  | 3.07  | 5.64   | 5.51   | 15.31+ | 8.07   | 2.88   | 3.69   | 4.86   | 92.73  |
| 1942 | 3      | 11.68                            | 8.24   | 12.11  | 19.41  | 7.04  | 8.82   | 8.59   | 1.96   | 3.05+  | 2.41   | 6.79   | 15.59  | 105.70 |
| 1943 | 4      | 6.40+                            | 18.46+ | 4.22+  | 1.74   | 2.67  | 12.67  | 4.51   | 20.25  | 7.29   | 7.79+  | 10.42  | 14.83+ | 111.25 |
| 1944 | 4      | 9.72                             | 2.86   | 1.71   | 1.23   | 3.71  | 4.33   | 4.96   | 17.52+ | 10.47+ | 9.10+  | 11.44  | 8.17   | 85.23  |
| 1945 | 4      | 17.84                            | 4.32+  | 3.26+  | 3.20   | 5.95  | 20.41+ | 4.18   | 2.68   | 4.31   | 5.60   | 4.75   | 4.99   | 81.49  |
| 1946 | 4      | 5.63                             | 4.46+  | .88    | 2.27+  | 6.57  | 19.11  | 8.23   | 8.20   | 6.43   | 14.21  | .48    | 17.38  | 93.85  |
| 1947 | 4      | 11.05                            | 10.85  | 2.57   | 8.59   | 4.27  | 10.47+ | 11.17+ | 3.71   | 4.13   | 5.04+  | 2.09+  | 6.71   | 80.64  |
| 1948 | 4      | 33.24                            | 4.93   | 2.99   | 5.77+  | 3.05  | 2.15   | 8.19   | 4.57   | 2.83+  | 4.51   | 4.38   | 5.14   | 81.74  |
| 1949 | 4      | 3.93                             | 22.56  | .74    | 2.63   | 1.11  | 3.07   | 6.04+  | 6.52   | .69    | 13.50  | 6.68   | 4.63   | 72.08  |
| 1950 | 4      | 11.69                            | 18.93+ | 5.14   | 19.54+ | 2.56  | 8.85   | 5.50   | 6.12   | 8.36   | 12.68+ | 6.41+  | 10.72  | 116.49 |
| 1951 | 4      | 3.06                             | .90    | 1.90   | 7.18   | 6.06+ | 3.41+  | 4.47   | 3.18   | 3.61   | 4.54   | 9.82   | 15.85  | 63.97  |
| 1952 | 4      | 5.06                             | 15.57  | 5.77   | 4.34+  | 5.04  | 1.12   | 10.78  | 3.10   | 6.21   | 14.92  | 5.75   | 12.59  | 90.24  |
| 1953 | 4      | 16.59                            | 12.83+ | 2.87   | 1.53   | 2.47  | 6.46   | 11.78+ | 13.85  | 7.06+  | 8.61   | 24.49  | 3.71   | 112.25 |
| 1954 | 4      | 2.46                             | 7.20   | 1.89+  | 11.06  | 19.85 | 3.98   | 3.55   | 4.59   | 6.84   | 11.86  | 10.08  | 7.90+  | 91.27  |
| 1955 | 4      | 8.27+                            | 4.20   | 1.86   | 5.89   | 4.27  | 10.64  | 6.88   | 15.03  | 6.48   | 5.37   | 8.00   | 4.57   | 81.48  |
| 1956 | 4      | 13.58                            | 3.72   | 12.33  | 3.47   | 13.19 | 9.07   | 3.91   | 14.13  | 14.84  | 5.93   | 14.21  | 11.61  | 120.00 |
| 1957 | 4      | 11.23                            | .73    | 4.46   | 1.25   | 4.10  | 14.29  | 7.26   | 31.82  | 5.77   | 1.05   | 15.93  | 2.82   | 100.71 |
| 1958 | 4      | 9.29                             | 6.39   | 5.72   | 12.06+ | 13.48 | 11.06  | 18.31  | 10.74  | 2.86   | 18.71  | 17.49  | 6.29   | 132.41 |
| 1959 | 4      | 13.45                            | 2.93   | 4.41   | 8.34   | 3.87  | 10.10  | 6.27   | 9.91   | 8.76   | 5.51   | 3.50   | 7.97+  | 85.00  |
| 1960 | 4      | 5.33                             | 9.77   | 10.71  | 11.01  | 5.93  | 6.81   | 9.28   | 10.84  | 3.74   | 7.71   | 14.77  | 8.67   | 104.58 |
| 1961 | 4      | 8.93                             | 6.69   | 3.26   | 6.31   | 9.89  | 10.30  | 12.14  | 3.73   | 6.86   | 4.71   | 40.68  | 2.08   | 115.58 |
| 1962 | 4      | 16.26                            | 13.90  | 2.19   | 8.77   | 3.59  | 29.48  | 11.46  | 18.93  | 5.12   | 10.86  | 4.72   | 1.57   | 126.85 |
| 1963 | 4      | 12.38                            | 7.44   | 6.84   | 11.13  | 5.34  | 12.32  | 4.76   | 2.75   | 17.48  | 2.64   | 11.22  | 12.41  | 106.73 |
| 1964 | 4      | 7.03                             | 12.69  | 2.37   | 5.74+  | 8.53  | 7.03   | 9.29   | 14.27  | 3.80   | 7.12   | 4.95   | 1.98   | 84.79  |
| 1965 | 4      | 20.66                            | 15.11  | 7.87   | 12.83  | 3.33  | 4.46   | 6.70   | 10.24  | 3.04   | 3.97   | 18.10  | 12.47  | 118.78 |
| 1966 | 4      | 2.64                             | 2.28   | 5.97   | 3.33   | 10.44 | 13.49  | 38.33  | 13.21  | 10.75  | 7.51   | 8.62   | 9.63   | 126.20 |
| 1967 | 4      | 5.12                             | 9.66   | 1.91   | 1.25   | 1.35  | 6.25   | 6.73   | 13.79  | 13.53  | 1.47   | 12.52  | 6.21   | 79.79  |
| 1968 | 4      | 6.11                             | 12.62  | 1.95   | 3.72   | 7.64  | 5.38   | 5.66   | 2.70   | 12.95  | 4.84   | 5.18   | 7.03   | 75.78  |
| 1969 | 4      | 5.66                             | 2.34   | .83    | 8.30   | 12.45 | 1.62   | 1.80   | 2.75   | 5.77   | 6.35   | 15.92  | 2.71   | 66.51  |
| 1970 | 4      | 7.86                             | 2.10   | 4.97   | 3.84   | 13.45 | 10.46  | 15.41  | 11.88+ | 5.81   | 19.31+ | 16.71  | 3.19   | 115.00 |
| 1971 | 4      | 3.83                             | 14.32  | 3.67   | 4.31   | 14.52 | 7.73   | 8.90   | 13.03  | 3.60   | 6.53   | 12.99  | 6.67   | 100.10 |
| 1972 | 4      | 1.46                             | 9.60   | 4.90   | 4.04   | 3.17  | 5.89   | 8.19   | 6.18   | 8.26   | 5.51   | 5.94   | 5.06   | 68.20  |
| 1973 | 4      | 4.11                             | 8.64   | 6.26   | 10.32  | 16.59 | 8.71   | 2.84   | 18.41  | 4.88   | .67    | 26.06  | 5.66   | 113.16 |
| 1974 | 4      | 5.32                             | 4.60   | .49    | 7.89   | 3.68  | 7.16   | 4.05   | 10.69  | 9.57   | 9.17   | 9.93   | 9.69   | 82.24  |
| 1975 | 4      | 2.99                             | 7.89   | 5.85   | 6.08   | 10.41 | 11.51  | 11.91  | 8.96   | 12.11  | 7.64   | 6.12   | 6.81   | 98.28  |
| 1976 | 4      | 14.99                            | 13.55  | 6.26   | 2.84   | 21.40 | 7.98   | 10.60  | 29.93  | 7.49   | 5.02   | 6.69   | 9.46   | 136.20 |
| 1977 | 4      | 8.06                             | 11.73  | 7.98   | 3.86   | 2.65  | 3.32   | 16.34  | 5.91   | 3.89   | 10.15  | 11.65  | 7.83   | 93.37  |
| 1978 | 4      | 9.26                             | 4.36   | 12.47  | 4.84   | 14.76 | 2.01   | 2.03   | 13.56  | 5.39   | 12.04  | 12.09  | 10.64+ | 103.43 |
| 1979 | 4      | 7.88                             | 3.84   | 7.14   | 10.35  | 5.12  | 3.33   | 7.51   | 3.50   | 8.51   | 3.14   | 7.92   | 9.92   | 78.15  |
| 1980 | 4      | 9.08                             | 16.31  | 9.38   | 34.66  | 10.37 | 16.28  | 19.20  | 10.89  | 5.27   | 8.42   | 17.52+ | 6.07   | 163.45 |
| 1981 | 4      | 5.48                             | 5.31   | 11.26  | 4.93   | 7.59  | 13.98  | 36.12  | 1.32   | 8.44   | 10.77  | 7.69   | 15.22  | 128.10 |
| 1982 | 4      | 9.23                             | 5.98   | 4.38   | 1.32   | 8.00  | 2.23   | 4.14   | 7.80   | 10.32  | 14.09  | 3.93   | 23.84  | 95.26  |
| 1983 | 4      | 6.36                             | 11.07  | 5.20   | 4.28   | 8.48  | 13.80  | 4.18   | 5.97   | 3.19   | 8.64   | 2.73   | 3.02   | 76.92  |
| 1984 | 4      | 10.33                            | 3.79   | 8.92   | 15.01  | 11.50 | 4.59   | 14.44  | 1.48   | 8.35   | 17.05  | 3.75   | 2.93   | 102.15 |
| 1985 | 4      | 21.42                            | 10.41  | 13.59  | 5.04   | 7.69  | 8.59   | 5.08   | 3.26   | 4.84   | 6.05   | 31.06  | 6.08   | 123.13 |
| 1986 | 4      | 15.85                            | 8.25   | 5.00   | 3.06   | 3.31  | 4.57   | 20.13  | 4.28   | 7.06   | 6.28   | 9.85   | 9.18   | 96.82  |
| 1987 | 4      | 3.46                             | .21    | 8.75   | 2.69   | 4.94  | 10.60  | 17.78  | 6.44   | 8.47   | 6.27   | 9.00   | 6.53   | 85.14  |
| 1988 | 4      | 6.35                             | 2.93   | 8.77   | 4.50   | 5.66  | 11.15  | 24.00  | 2.90   | 7.39   | 9.74   | 9.03   | 5.24   | 97.67  |
| 1989 | 4      | 23.75                            | 15.65  | 4.76   | 4.62   | 10.47 | 7.19   | 22.41  | 7.27   | 12.28  | .98    | 5.32   | 4.06   | 118.76 |
| 1990 | 4      | 10.12                            | 6.77   | 8.87   | 10.26  | 7.96  | 3.81   | 4.19   | 6.11   | 5.45   | 8.84   | 2.77   | 4.58   | 79.72  |
| 1991 | 4      | 24.54                            | 1.67+  | 7.70   | 5.66   | 10.17 | 7.11   | 4.10   | 6.13   | 10.76  | 9.36   | 3.42   | 7.16   | 97.77  |
| 1992 | 4      | 25.26                            | 7.68   | 1.24   | 6.81   | 6.20  | 3.48   | 31.02  | 8.43   | 5.06   | 8.05   | 6.55   | 6.68   | 116.46 |
| 1993 | 4      | 2.65                             | 5.43   | 18.53  | 5.46   | 10.34 | 12.34  | 9.16   | 3.10   | 5.26   | 7.60   | 12.07  | 6.69   | 98.61  |
| 1994 | 4      | 9.81                             | 2.04   | 18.68  | 8.13   | 8.47  | 13.24  | 10.75  | 15.10  | 7.90   | 4.65   | 5.91   | 5.38   | 110.07 |
| 1995 | 4      | 5.83                             | 18.77  | 27.05  | 5.98   | 3.28  | 8.76   | 2.55   | 3.65   | 1.71   | 8.83   | 2.31   | 6.58   | 95.31  |
| 1996 | 4      | 23.62                            | 23.03  | 6.15   | 2.24   | 6.87  | 11.28  | 5.75   | 14.79  | 7.65   | 9.69   | 10.69  | 3.37   | 1      |

## Appendix B10.4

File : H7R1-T.DEM

Units : 10<sup>6</sup>xm<sup>3</sup>

Descrip. : Upland alien demand (tall trees) in H7R001 sub-catchment for 1968 to 1998

| Year  | Oct  | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul   | Aug   | Sep   | Total |
|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1968  | 0.01 | 0.01  | 0.01  | 0.01  | 0.01  | 0.00* | 0.00* | 0.00* | 0.01  | 0.01  | 0.01  | 0.01  | 0.1   |
| 1969  | 0.01 | 0.01  | 0.00* | 0.01  | 0.01  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.01  | 0.1   |
| 1970  | 0.01 | 0.01  | 0.00* | 0.00* | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.02  | 0.03  | 0.01  | 0.1   |
| 1971  | 0.01 | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.1   |
| 1972  | 0.01 | 0.01  | 0.01  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.01  | 0.01  | 0.01  | 0.1   |
| 1973  | 0.01 | 0.01  | 0.01  | 0.01  | 0.02  | 0.01  | 0.00* | 0.02  | 0.01  | 0.01  | 0.04  | 0.02  | 0.2   |
| 1974  | 0.01 | 0.01  | 0.01  | 0.01  | 0.00* | 0.01  | 0.00* | 0.01  | 0.01  | 0.01  | 0.01  | 0.02  | 0.1   |
| 1975  | 0.01 | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.02  | 0.01  | 0.02  | 0.02  | 0.01  | 0.01  | 0.2   |
| 1976  | 0.04 | 0.04  | 0.02  | 0.01  | 0.06  | 0.02  | 0.01  | 0.11  | 0.05  | 0.01  | 0.02  | 0.02  | 0.4   |
| 1977  | 0.02 | 0.03  | 0.02  | 0.01  | 0.01  | 0.01  | 0.04  | 0.02  | 0.01  | 0.02  | 0.02  | 0.02  | 0.2   |
| 1978  | 0.02 | 0.02  | 0.03  | 0.02  | 0.04  | 0.02  | 0.01  | 0.03  | 0.01  | 0.02  | 0.04  | 0.04  | 0.3   |
| 1979  | 0.03 | 0.02  | 0.02  | 0.02  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.02  | 0.2   |
| 1980  | 0.02 | 0.07  | 0.04  | 0.23  | 0.10  | 0.06  | 0.10  | 0.05  | 0.02  | 0.03  | 0.09  | 0.05  | 0.9   |
| 1981  | 0.03 | 0.02  | 0.03  | 0.02  | 0.01  | 0.04  | 0.22  | 0.08  | 0.02  | 0.03  | 0.02  | 0.06  | 0.6   |
| 1982  | 0.04 | 0.02  | 0.02  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.02  | 0.04  | 0.02  | 0.11  | 0.3   |
| 1983  | 0.05 | 0.02  | 0.02  | 0.01  | 0.01  | 0.02  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.2   |
| 1984  | 0.01 | 0.01  | 0.01  | 0.02  | 0.02  | 0.01  | 0.02  | 0.01  | 0.01  | 0.04  | 0.02  | 0.01  | 0.2   |
| 1985  | 0.04 | 0.02  | 0.02  | 0.01  | 0.01  | 0.01  | 0.01  | 0.00* | 0.00* | 0.01  | 0.08  | 0.03  | 0.2   |
| 1986  | 0.02 | 0.01  | 0.01  | 0.01  | 0.00* | 0.00* | 0.02  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.1   |
| 1987  | 0.01 | 0.01  | 0.01  | 0.00* | 0.00* | 0.00* | 0.01  | 0.01  | 0.00* | 0.00* | 0.01  | 0.01  | 0.1   |
| 1988  | 0.01 | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.02  | 0.01  | 0.00* | 0.01  | 0.01  | 0.01  | 0.1   |
| 1989  | 0.02 | 0.02  | 0.01  | 0.00* | 0.01  | 0.00* | 0.02  | 0.01  | 0.01  | 0.01  | 0.00* | 0.00* | 0.1   |
| 1990  | 0.01 | 0.01  | 0.01  | 0.01  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.0   |
| 1991  | 0.02 | 0.01  | 0.00* | 0.00* | 0.01  | 0.00* | 0.00* | 0.00* | 0.01  | 0.01  | 0.01  | 0.01  | 0.1   |
| 1992  | 0.03 | 0.01  | 0.01  | 0.00* | 0.00* | 0.00* | 0.04  | 0.01  | 0.00* | 0.01  | 0.01  | 0.01  | 0.1   |
| 1993  | 0.01 | 0.01  | 0.02  | 0.01  | 0.01  | 0.01  | 0.01  | 0.00* | 0.00* | 0.01  | 0.01  | 0.01  | 0.1   |
| 1994  | 0.01 | 0.01  | 0.02  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.1   |
| 1995  | 0.01 | 0.02  | 0.04  | 0.02  | 0.00* | 0.01  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.1   |
| 1996  | 0.03 | 0.04  | 0.01  | 0.00* | 0.00* | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.2   |
| 1997  | 0.01 | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.1   |
| 1998  | 0.01 | 0.02  | 0.02  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.00* | 0.01  | 0.01  | 0.01  | 0.1   |
| AVE : | 0.02 | 0.02  | 0.01  | 0.02  | 0.01  | 0.01  | 0.02  | 0.02  | 0.01  | 0.01  | 0.02  | 0.02  | 0.2   |
| SD :  | 0.01 | 0.01  | 0.01  | 0.04  | 0.02  | 0.01  | 0.04  | 0.02  | 0.01  | 0.01  | 0.02  | 0.02  | 0.2   |

## Appendix B10.5

File : H7R1-S.DEM

Units : 10^6xm^3

Descrip. : Upland alien demand (tall shrubs) in H7R001 sub-catchment for 1968 to 1998

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1968  | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.1   |
| 1969  | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.0   |
| 1970  | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.01 | 0.1   |
| 1971  | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1972  | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.1   |
| 1973  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.02 | 0.01 | 0.00 | 0.03 | 0.01 | 0.1   |
| 1974  | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1975  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1976  | 0.03 | 0.03 | 0.01 | 0.01 | 0.05 | 0.02 | 0.01 | 0.09 | 0.04 | 0.01 | 0.01 | 0.02 | 0.3   |
| 1977  | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.03 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.2   |
| 1978  | 0.02 | 0.01 | 0.02 | 0.01 | 0.03 | 0.01 | 0.01 | 0.02 | 0.01 | 0.02 | 0.03 | 0.03 | 0.2   |
| 1979  | 0.02 | 0.02 | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.2   |
| 1980  | 0.02 | 0.05 | 0.03 | 0.19 | 0.08 | 0.05 | 0.08 | 0.04 | 0.02 | 0.02 | 0.07 | 0.04 | 0.7   |
| 1981  | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.03 | 0.18 | 0.06 | 0.01 | 0.02 | 0.02 | 0.05 | 0.5   |
| 1982  | 0.04 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.03 | 0.02 | 0.08 | 0.3   |
| 1983  | 0.04 | 0.02 | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1984  | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.01 | 0.02 | 0.01 | 0.01 | 0.03 | 0.01 | 0.01 | 0.2   |
| 1985  | 0.04 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.06 | 0.02 | 0.2   |
| 1986  | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.1   |
| 1987  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1989  | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1990  | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1991  | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.1   |
| 1992  | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.1   |
| 1993  | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.1   |
| 1994  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1995  | 0.01 | 0.02 | 0.04 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1996  | 0.02 | 0.03 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1997  | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1998  | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.1   |
| AVE : | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| SD :  | 0.01 | 0.01 | 0.01 | 0.03 | 0.02 | 0.01 | 0.03 | 0.02 | 0.01 | 0.01 | 0.02 | 0.02 | 0.1   |

Appendix B10.6

File : H7R1-R.DEM  
Units : 10^6xm^3  
Descrip. : Riparian alien demand (tall trees) in H7R001 sub-catchment for 1968 to 1998

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1968  | 0.09 | 0.11 | 0.15 | 0.16 | 0.12 | 0.10 | 0.10 | 0.05 | 0.03 | 0.03 | 0.04 | 0.06 | 1.0   |
| 1969  | 0.09 | 0.11 | 0.15 | 0.16 | 0.12 | 0.10 | 0.10 | 0.05 | 0.03 | 0.03 | 0.04 | 0.06 | 1.0   |
| 1970  | 0.09 | 0.11 | 0.15 | 0.16 | 0.12 | 0.10 | 0.10 | 0.05 | 0.03 | 0.03 | 0.04 | 0.06 | 1.0   |
| 1971  | 0.10 | 0.12 | 0.15 | 0.17 | 0.12 | 0.11 | 0.11 | 0.05 | 0.03 | 0.03 | 0.04 | 0.06 | 1.1   |
| 1972  | 0.10 | 0.12 | 0.15 | 0.17 | 0.12 | 0.11 | 0.11 | 0.05 | 0.03 | 0.03 | 0.04 | 0.06 | 1.1   |
| 1973  | 0.10 | 0.12 | 0.16 | 0.18 | 0.13 | 0.11 | 0.11 | 0.05 | 0.04 | 0.04 | 0.05 | 0.07 | 1.2   |
| 1974  | 0.11 | 0.14 | 0.18 | 0.20 | 0.14 | 0.12 | 0.12 | 0.06 | 0.04 | 0.04 | 0.05 | 0.07 | 1.3   |
| 1975  | 0.12 | 0.14 | 0.19 | 0.21 | 0.15 | 0.13 | 0.13 | 0.06 | 0.04 | 0.04 | 0.05 | 0.08 | 1.3   |
| 1976  | 0.12 | 0.14 | 0.19 | 0.21 | 0.15 | 0.13 | 0.13 | 0.06 | 0.04 | 0.04 | 0.05 | 0.08 | 1.3   |
| 1977  | 0.12 | 0.14 | 0.19 | 0.21 | 0.15 | 0.13 | 0.13 | 0.06 | 0.04 | 0.04 | 0.05 | 0.08 | 1.3   |
| 1978  | 0.11 | 0.13 | 0.17 | 0.19 | 0.14 | 0.12 | 0.12 | 0.05 | 0.04 | 0.04 | 0.05 | 0.07 | 1.2   |
| 1979  | 0.14 | 0.17 | 0.23 | 0.25 | 0.18 | 0.16 | 0.16 | 0.07 | 0.05 | 0.05 | 0.07 | 0.09 | 1.6   |
| 1980  | 0.22 | 0.27 | 0.36 | 0.39 | 0.28 | 0.25 | 0.25 | 0.11 | 0.08 | 0.08 | 0.10 | 0.14 | 2.5   |
| 1981  | 0.37 | 0.45 | 0.60 | 0.65 | 0.47 | 0.41 | 0.41 | 0.18 | 0.13 | 0.13 | 0.17 | 0.24 | 4.2   |
| 1982  | 0.37 | 0.45 | 0.60 | 0.65 | 0.47 | 0.41 | 0.41 | 0.18 | 0.13 | 0.13 | 0.17 | 0.24 | 4.2   |
| 1983  | 0.34 | 0.41 | 0.54 | 0.59 | 0.43 | 0.37 | 0.37 | 0.17 | 0.12 | 0.12 | 0.15 | 0.22 | 3.8   |
| 1984  | 0.34 | 0.40 | 0.54 | 0.58 | 0.42 | 0.37 | 0.37 | 0.16 | 0.12 | 0.12 | 0.15 | 0.22 | 3.8   |
| 1985  | 0.32 | 0.38 | 0.50 | 0.55 | 0.40 | 0.35 | 0.35 | 0.15 | 0.11 | 0.11 | 0.14 | 0.20 | 3.6   |
| 1986  | 0.23 | 0.28 | 0.37 | 0.40 | 0.29 | 0.26 | 0.26 | 0.11 | 0.08 | 0.08 | 0.11 | 0.15 | 2.6   |
| 1987  | 0.16 | 0.20 | 0.26 | 0.29 | 0.21 | 0.18 | 0.18 | 0.08 | 0.06 | 0.06 | 0.08 | 0.11 | 1.9   |
| 1988  | 0.12 | 0.14 | 0.18 | 0.20 | 0.15 | 0.13 | 0.13 | 0.06 | 0.04 | 0.04 | 0.05 | 0.07 | 1.3   |
| 1989  | 0.12 | 0.14 | 0.19 | 0.21 | 0.15 | 0.13 | 0.13 | 0.06 | 0.04 | 0.04 | 0.05 | 0.08 | 1.3   |
| 1990  | 0.09 | 0.10 | 0.14 | 0.15 | 0.11 | 0.09 | 0.09 | 0.04 | 0.03 | 0.03 | 0.04 | 0.05 | 1.0   |
| 1991  | 0.08 | 0.10 | 0.13 | 0.14 | 0.10 | 0.09 | 0.09 | 0.04 | 0.03 | 0.03 | 0.04 | 0.05 | 0.9   |
| 1992  | 0.13 | 0.16 | 0.21 | 0.23 | 0.17 | 0.14 | 0.14 | 0.06 | 0.05 | 0.05 | 0.06 | 0.08 | 1.5   |
| 1993  | 0.14 | 0.16 | 0.22 | 0.24 | 0.17 | 0.15 | 0.15 | 0.07 | 0.05 | 0.05 | 0.06 | 0.09 | 1.5   |
| 1994  | 0.23 | 0.28 | 0.37 | 0.41 | 0.30 | 0.26 | 0.26 | 0.11 | 0.08 | 0.08 | 0.11 | 0.15 | 2.6   |
| 1995  | 0.26 | 0.32 | 0.42 | 0.46 | 0.33 | 0.29 | 0.29 | 0.13 | 0.09 | 0.09 | 0.12 | 0.17 | 3.0   |
| 1996  | 0.25 | 0.31 | 0.41 | 0.44 | 0.32 | 0.28 | 0.28 | 0.12 | 0.09 | 0.09 | 0.12 | 0.16 | 2.9   |
| 1997  | 0.22 | 0.26 | 0.35 | 0.38 | 0.28 | 0.24 | 0.24 | 0.11 | 0.08 | 0.08 | 0.10 | 0.14 | 2.5   |
| 1998  | 0.22 | 0.27 | 0.36 | 0.39 | 0.28 | 0.25 | 0.25 | 0.11 | 0.08 | 0.08 | 0.10 | 0.14 | 2.5   |
| AVE : | 0.18 | 0.21 | 0.28 | 0.31 | 0.22 | 0.20 | 0.20 | 0.09 | 0.06 | 0.06 | 0.08 | 0.11 | 2.0   |
| SD :  | 0.09 | 0.11 | 0.15 | 0.16 | 0.12 | 0.10 | 0.10 | 0.04 | 0.03 | 0.03 | 0.04 | 0.06 | 1.1   |

Appendix B10.7

File : H7R1-FOR.DEM  
Units : 10^6xm^3  
Descrip. : Afforestation demand upstream of farm dams in H7R001 sub-catchment for 1968 to 1996

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1968  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1969  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.1   |
| 1970  | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.03 | 0.03 | 0.01 | 0.2   |
| 1971  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1972  | 0.01 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1973  | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.05 | 0.02 | 0.2   |
| 1974  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.1   |
| 1975  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.2   |
| 1976  | 0.04 | 0.05 | 0.02 | 0.01 | 0.08 | 0.04 | 0.02 | 0.15 | 0.06 | 0.02 | 0.02 | 0.03 | 0.5   |
| 1977  | 0.03 | 0.04 | 0.03 | 0.01 | 0.01 | 0.01 | 0.05 | 0.02 | 0.01 | 0.02 | 0.04 | 0.03 | 0.3   |
| 1978  | 0.03 | 0.02 | 0.04 | 0.02 | 0.05 | 0.02 | 0.01 | 0.04 | 0.02 | 0.04 | 0.05 | 0.05 | 0.4   |
| 1979  | 0.04 | 0.03 | 0.02 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.03 | 0.2   |
| 1980  | 0.04 | 0.09 | 0.06 | 0.32 | 0.13 | 0.09 | 0.14 | 0.07 | 0.03 | 0.04 | 0.12 | 0.07 | 1.2   |
| 1981  | 0.04 | 0.03 | 0.04 | 0.03 | 0.02 | 0.06 | 0.34 | 0.12 | 0.03 | 0.04 | 0.04 | 0.09 | 0.9   |
| 1982  | 0.07 | 0.04 | 0.03 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.03 | 0.07 | 0.04 | 0.19 | 0.5   |
| 1983  | 0.09 | 0.05 | 0.03 | 0.02 | 0.02 | 0.05 | 0.03 | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.4   |
| 1984  | 0.03 | 0.02 | 0.02 | 0.07 | 0.05 | 0.02 | 0.06 | 0.03 | 0.02 | 0.09 | 0.05 | 0.03 | 0.5   |
| 1985  | 0.15 | 0.08 | 0.07 | 0.03 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.26 | 0.11 | 0.8   |
| 1986  | 0.09 | 0.06 | 0.03 | 0.02 | 0.01 | 0.01 | 0.12 | 0.04 | 0.02 | 0.02 | 0.04 | 0.04 | 0.5   |
| 1987  | 0.03 | 0.02 | 0.03 | 0.01 | 0.01 | 0.03 | 0.10 | 0.04 | 0.03 | 0.03 | 0.04 | 0.04 | 0.4   |
| 1988  | 0.04 | 0.03 | 0.03 | 0.02 | 0.01 | 0.03 | 0.18 | 0.07 | 0.02 | 0.04 | 0.04 | 0.04 | 0.6   |
| 1989  | 0.18 | 0.14 | 0.05 | 0.02 | 0.03 | 0.02 | 0.15 | 0.07 | 0.05 | 0.03 | 0.03 | 0.03 | 0.8   |
| 1990  | 0.04 | 0.03 | 0.03 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.3   |
| 1991  | 0.18 | 0.07 | 0.02 | 0.01 | 0.03 | 0.02 | 0.01 | 0.01 | 0.03 | 0.04 | 0.03 | 0.03 | 0.5   |
| 1992  | 0.20 | 0.09 | 0.02 | 0.02 | 0.01 | 0.01 | 0.25 | 0.10 | 0.02 | 0.03 | 0.03 | 0.03 | 0.8   |
| 1993  | 0.03 | 0.02 | 0.11 | 0.04 | 0.03 | 0.04 | 0.03 | 0.01 | 0.01 | 0.02 | 0.05 | 0.04 | 0.4   |
| 1994  | 0.04 | 0.03 | 0.11 | 0.05 | 0.02 | 0.05 | 0.04 | 0.07 | 0.04 | 0.03 | 0.03 | 0.03 | 0.5   |
| 1995  | 0.03 | 0.11 | 0.25 | 0.08 | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.6   |
| 1996  | 0.17 | 0.21 | 0.07 | 0.01 | 0.01 | 0.03 | 0.02 | 0.06 | 0.04 | 0.04 | 0.06 | 0.04 | 0.8   |
| AVE : | 0.06 | 0.05 | 0.04 | 0.03 | 0.02 | 0.02 | 0.06 | 0.04 | 0.02 | 0.03 | 0.04 | 0.04 | 0.4   |
| SD :  | 0.06 | 0.05 | 0.05 | 0.06 | 0.03 | 0.02 | 0.08 | 0.04 | 0.01 | 0.02 | 0.05 | 0.04 | 0.3   |

Appendix B10.8

File : H7R1IRR.DEM

Units : 10<sup>6</sup>m<sup>3</sup>

Descrip. : Irrigation demand from farm dams in H7R001 sub-catchment for 1968 to 1998

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1968  | 1.96 | 2.72 | 4.34 | 4.84 | 3.06 | 2.57 | 1.89 | 0.32 | 0.03 | 0.00 | 0.40 | 1.26 | 23.4  |
| 1969  | 2.17 | 2.80 | 4.10 | 4.72 | 2.99 | 2.50 | 1.00 | 0.56 | 0.00 | 0.01 | 0.16 | 0.73 | 21.8  |
| 1970  | 2.10 | 3.11 | 4.15 | 4.26 | 3.20 | 2.21 | 1.38 | 0.47 | 0.23 | 0.06 | 0.20 | 1.01 | 22.4  |
| 1971  | 1.75 | 1.77 | 4.43 | 4.64 | 3.18 | 2.67 | 0.87 | 0.19 | 0.00 | 0.10 | 0.28 | 1.08 | 21.0  |
| 1972  | 1.69 | 2.74 | 4.49 | 4.68 | 3.24 | 2.57 | 1.69 | 0.45 | 0.05 | 0.18 | 0.00 | 1.02 | 22.8  |
| 1973  | 2.20 | 2.60 | 4.31 | 4.71 | 3.40 | 2.28 | 1.64 | 0.63 | 0.22 | 0.27 | 0.00 | 0.23 | 22.5  |
| 1974  | 2.04 | 2.85 | 4.24 | 4.45 | 3.19 | 2.54 | 1.62 | 0.61 | 0.13 | 0.12 | 0.42 | 1.04 | 23.3  |
| 1975  | 1.29 | 2.67 | 4.13 | 4.36 | 2.97 | 2.42 | 1.10 | 0.41 | 0.41 | 0.20 | 0.08 | 1.14 | 21.2  |
| 1976  | 1.90 | 2.66 | 3.84 | 4.11 | 2.94 | 2.21 | 1.65 | 0.61 | 0.05 | 0.44 | 0.19 | 0.59 | 21.2  |
| 1977  | 1.89 | 1.74 | 3.51 | 3.94 | 2.77 | 2.00 | 1.48 | 0.37 | 0.15 | 0.00 | 0.00 | 0.88 | 18.8  |
| 1978  | 1.67 | 2.45 | 3.23 | 3.62 | 2.17 | 1.85 | 1.28 | 0.32 | 0.21 | 0.16 | 0.00 | 0.63 | 17.6  |
| 1979  | 1.27 | 2.25 | 3.19 | 3.35 | 2.40 | 1.73 | 0.66 | 0.53 | 0.19 | 0.00 | 0.11 | 0.66 | 16.3  |
| 1980  | 1.04 | 2.14 | 2.48 | 3.28 | 2.25 | 1.81 | 1.39 | 0.35 | 0.08 | 0.00 | 0.36 | 0.00 | 15.2  |
| 1981  | 1.46 | 1.86 | 3.16 | 3.44 | 2.30 | 1.88 | 1.31 | 0.25 | 0.14 | 0.15 | 0.00 | 0.90 | 16.9  |
| 1982  | 1.79 | 1.60 | 3.27 | 3.37 | 2.30 | 1.81 | 1.41 | 0.53 | 0.31 | 0.00 | 0.10 | 0.65 | 17.1  |
| 1983  | 0.16 | 1.55 | 3.41 | 3.65 | 2.42 | 1.99 | 0.93 | 0.16 | 0.00 | 0.18 | 0.33 | 0.59 | 15.4  |
| 1984  | 1.66 | 1.83 | 3.46 | 3.77 | 2.58 | 2.11 | 1.51 | 0.25 | 0.37 | 0.06 | 0.32 | 0.32 | 18.2  |
| 1985  | 1.76 | 0.96 | 3.38 | 3.86 | 2.73 | 1.88 | 1.43 | 0.72 | 0.12 | 0.04 | 0.55 | 0.60 | 18.0  |
| 1986  | 1.99 | 1.97 | 3.48 | 3.90 | 2.88 | 2.12 | 1.00 | 0.51 | 0.10 | 0.18 | 0.27 | 0.74 | 19.1  |
| 1987  | 1.70 | 1.88 | 3.72 | 4.11 | 2.64 | 1.95 | 1.42 | 0.74 | 0.47 | 0.00 | 0.00 | 0.82 | 19.5  |
| 1988  | 1.84 | 2.47 | 3.83 | 4.10 | 2.30 | 2.22 | 1.03 | 0.66 | 0.14 | 0.22 | 0.65 | 0.49 | 19.9  |
| 1989  | 2.02 | 1.95 | 3.88 | 4.10 | 2.90 | 2.35 | 0.87 | 0.34 | 0.00 | 0.16 | 0.42 | 0.87 | 19.9  |
| 1990  | 1.30 | 2.42 | 3.76 | 3.87 | 2.93 | 2.30 | 1.47 | 0.15 | 0.06 | 0.33 | 0.46 | 0.93 | 20.0  |
| 1991  | 1.49 | 2.41 | 3.62 | 3.71 | 2.82 | 2.21 | 1.28 | 0.70 | 0.30 | 0.36 | 0.22 | 0.34 | 19.5  |
| 1992  | 1.81 | 1.77 | 3.80 | 4.13 | 2.92 | 2.11 | 1.52 | 0.00 | 0.09 | 0.08 | 0.07 | 0.36 | 18.7  |
| 1993  | 1.60 | 2.72 | 3.85 | 4.13 | 2.88 | 2.31 | 1.49 | 0.08 | 0.00 | 0.02 | 0.03 | 0.72 | 19.8  |
| 1994  | 1.10 | 2.62 | 3.79 | 4.07 | 2.82 | 1.91 | 1.53 | 0.65 | 0.21 | 0.17 | 0.36 | 0.91 | 20.1  |
| 1995  | 1.84 | 2.60 | 3.84 | 4.07 | 2.79 | 1.93 | 1.28 | 0.35 | 0.13 | 0.00 | 0.72 | 0.28 | 19.8  |
| 1996  | 1.50 | 2.21 | 3.78 | 3.91 | 2.84 | 2.13 | 1.10 | 0.58 | 0.22 | 0.19 | 0.58 | 0.80 | 19.8  |
| 1997  | 0.37 | 2.56 | 3.76 | 3.96 | 2.86 | 2.33 | 1.27 | 0.52 | 0.31 | 0.21 | 0.39 | 0.89 | 19.4  |
| 1998  | 1.92 | 1.49 | 3.80 | 4.02 | 2.89 | 2.30 | 1.40 | 0.41 | 0.49 | 0.00 | 0.22 | 0.92 | 19.9  |
| AVE : | 1.62 | 2.24 | 3.74 | 4.04 | 2.79 | 2.17 | 1.32 | 0.43 | 0.17 | 0.12 | 0.25 | 0.72 | 19.6  |
| SD :  | 0.47 | 0.50 | 0.44 | 0.42 | 0.32 | 0.26 | 0.28 | 0.20 | 0.14 | 0.12 | 0.21 | 0.30 | 2.1   |

Appendix B10.9

File : H7R1.SIM  
Units : 10^6xm^3  
Descrip. : Simulated inflow record to Buffeljags Dam for 1968 to 1998

| Year  | Oct   | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul   | Aug   | Sep   | Total |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1968  | 7.43  | 13.96 | 6.76  | 2.96  | 4.01  | 2.83  | 2.33  | 1.59  | 10.35 | 5.82  | 4.12  | 5.68  | 67.8  |
| 1969  | 5.17  | 3.48  | 2.24  | 4.14  | 10.10 | 3.83  | 0.97  | 0.87  | 1.71  | 2.68  | 16.99 | 8.28  | 60.5  |
| 1970  | 5.84  | 3.82  | 2.83  | 1.98  | 10.98 | 9.61  | 16.76 | 14.18 | 7.00  | 27.49 | 31.87 | 14.01 | 146.4 |
| 1971  | 6.60  | 15.99 | 7.55  | 2.96  | 13.60 | 7.71  | 5.74  | 12.30 | 6.15  | 5.04  | 14.24 | 10.22 | 108.1 |
| 1972  | 5.46  | 7.95  | 4.85  | 2.58  | 1.69  | 2.05  | 3.86  | 3.22  | 4.93  | 4.60  | 4.94  | 5.07  | 51.2  |
| 1973  | 4.22  | 6.26  | 4.67  | 7.26  | 19.08 | 10.14 | 2.97  | 21.60 | 9.71  | 3.24  | 40.34 | 17.62 | 147.1 |
| 1974  | 5.97  | 4.56  | 2.83  | 4.08  | 2.24  | 2.80  | 1.82  | 6.67  | 7.83  | 8.53  | 11.18 | 12.34 | 70.9  |
| 1975  | 7.23  | 6.78  | 4.99  | 3.71  | 7.16  | 9.89  | 11.26 | 8.30  | 12.39 | 10.03 | 8.04  | 8.16  | 98.0  |
| 1976  | 18.99 | 19.47 | 8.75  | 3.52  | 28.50 | 13.10 | 8.09  | 50.18 | 21.57 | 6.75  | 7.50  | 10.59 | 197.0 |
| 1977  | 10.01 | 12.93 | 8.65  | 3.93  | 2.13  | 1.50  | 16.29 | 7.43  | 2.45  | 7.42  | 12.53 | 10.08 | 95.4  |
| 1978  | 9.91  | 6.21  | 11.66 | 5.79  | 14.21 | 5.74  | 1.37  | 11.10 | 5.71  | 10.41 | 14.80 | 14.49 | 111.4 |
| 1979  | 10.39 | 5.90  | 5.33  | 8.03  | 4.19  | 1.84  | 3.25  | 2.10  | 4.51  | 3.17  | 5.15  | 8.88  | 62.7  |
| 1980  | 9.01  | 20.25 | 12.16 | 60.67 | 26.36 | 19.16 | 29.04 | 16.33 | 6.97  | 8.26  | 25.60 | 14.48 | 248.3 |
| 1981  | 7.38  | 5.51  | 9.40  | 4.67  | 3.78  | 12.46 | 63.44 | 21.80 | 5.57  | 10.10 | 8.95  | 19.79 | 172.9 |
| 1982  | 14.11 | 7.30  | 4.75  | 2.36  | 3.69  | 1.72  | 0.94  | 3.09  | 6.89  | 14.91 | 7.89  | 35.59 | 103.2 |
| 1983  | 16.43 | 10.72 | 6.50  | 3.37  | 4.40  | 12.06 | 4.95  | 2.60  | 2.11  | 5.07  | 3.69  | 2.79  | 74.7  |
| 1984  | 7.27  | 3.96  | 4.82  | 14.00 | 11.34 | 3.75  | 12.20 | 5.10  | 4.41  | 18.79 | 9.18  | 4.07  | 98.9  |
| 1985  | 26.95 | 16.79 | 14.01 | 6.54  | 4.39  | 5.11  | 2.88  | 1.71  | 1.92  | 2.83  | 45.80 | 22.16 | 151.1 |
| 1986  | 18.22 | 10.91 | 5.11  | 3.21  | 2.19  | 1.37  | 21.02 | 8.23  | 3.35  | 4.04  | 7.69  | 8.88  | 94.2  |
| 1987  | 5.64  | 3.46  | 5.63  | 3.10  | 1.51  | 5.77  | 18.02 | 7.96  | 5.40  | 5.16  | 7.52  | 6.89  | 76.1  |
| 1988  | 6.11  | 4.30  | 6.03  | 3.84  | 2.19  | 6.73  | 28.84 | 10.57 | 4.57  | 8.52  | 9.66  | 7.10  | 98.5  |
| 1989  | 37.20 | 29.10 | 8.22  | 3.74  | 6.71  | 4.83  | 24.21 | 13.54 | 12.38 | 6.89  | 4.81  | 4.07  | 155.7 |
| 1990  | 7.72  | 5.68  | 6.12  | 7.46  | 5.39  | 2.63  | 1.73  | 2.02  | 2.15  | 4.80  | 3.44  | 3.01  | 52.2  |
| 1991  | 29.79 | 12.92 | 4.49  | 3.52  | 5.78  | 4.19  | 2.04  | 2.22  | 6.25  | 7.12  | 4.36  | 4.81  | 87.5  |
| 1992  | 38.05 | 17.65 | 3.83  | 3.72  | 3.09  | 1.82  | 41.04 | 21.61 | 4.45  | 6.58  | 6.97  | 6.87  | 155.7 |
| 1993  | 3.82  | 3.51  | 19.07 | 7.48  | 5.76  | 8.68  | 6.25  | 2.87  | 3.05  | 5.22  | 12.45 | 8.43  | 86.6  |
| 1994  | 8.98  | 4.17  | 20.27 | 8.61  | 4.53  | 9.47  | 9.51  | 17.34 | 10.73 | 6.21  | 6.36  | 5.77  | 111.9 |
| 1995  | 4.36  | 23.35 | 48.09 | 14.00 | 2.17  | 3.65  | 1.81  | 0.98  | 0.78  | 3.18  | 2.00  | 2.52  | 106.9 |
| 1996  | 34.29 | 43.45 | 11.41 | 2.32  | 2.57  | 5.84  | 3.01  | 10.57 | 9.12  | 9.52  | 13.15 | 7.73  | 153.0 |
| 1997  | 5.59  | 4.00  | 2.87  | 3.62  | 3.37  | 9.43  | 15.14 | 8.79  | 4.37  | 4.78  | 4.56  | 3.83  | 70.3  |
| 1998  | 2.34  | 16.62 | 21.75 | 6.78  | 4.24  | 8.13  | 10.74 | 5.35  | 2.68  | 6.19  | 5.58  | 6.48  | 96.9  |
| AVE : | 12.27 | 11.32 | 9.22  | 6.90  | 7.14  | 6.38  | 11.98 | 9.75  | 6.18  | 7.53  | 11.66 | 9.70  | 110.0 |
| SD :  | 10.30 | 9.06  | 8.81  | 10.42 | 6.87  | 4.26  | 13.88 | 9.86  | 4.24  | 5.09  | 10.55 | 6.89  | 45.5  |



## Appendix B10.10

File : H7R1S-0.NAT

Units : 10<sup>6</sup>xm<sup>3</sup>

Descrip. : Incremental naturalised inflow record at Buffelsjags Dam for 1927 to 1998

| Year  | Oct   | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul   | Aug   | Sep   | Total |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1927  | 6.56  | 5.57  | 4.23  | 3.12  | 2.01  | 5.67  | 2.70  | 1.32  | 4.02  | 2.57  | 4.16  | 8.89  | 50.8  |
| 1928  | 5.41  | 21.98 | 13.57 | 4.01  | 2.08  | 11.47 | 5.04  | 3.34  | 3.38  | 29.93 | 27.25 | 11.74 | 139.2 |
| 1929  | 7.12  | 5.12  | 14.08 | 8.35  | 36.24 | 26.86 | 8.22  | 5.96  | 4.28  | 4.22  | 18.77 | 13.51 | 152.7 |
| 1930  | 14.00 | 7.92  | 5.73  | 8.84  | 5.83  | 17.77 | 32.10 | 11.17 | 3.37  | 9.56  | 10.39 | 8.90  | 135.6 |
| 1931  | 19.04 | 9.63  | 60.01 | 22.09 | 4.63  | 4.12  | 2.10  | 2.43  | 3.64  | 7.57  | 5.21  | 54.51 | 195.0 |
| 1932  | 23.55 | 10.38 | 5.79  | 2.80  | 4.76  | 3.02  | 1.46  | 4.86  | 3.32  | 2.93  | 19.99 | 9.62  | 92.5  |
| 1933  | 3.77  | 18.65 | 8.10  | 6.64  | 10.81 | 11.40 | 4.26  | 1.77  | 1.52  | 6.96  | 7.81  | 6.78  | 88.5  |
| 1934  | 76.80 | 49.08 | 11.25 | 3.31  | 7.21  | 4.82  | 8.21  | 14.99 | 12.49 | 7.00  | 5.86  | 8.76  | 209.8 |
| 1935  | 7.46  | 16.61 | 8.52  | 3.25  | 3.87  | 2.45  | 1.32  | 5.89  | 2.91  | 4.20  | 3.72  | 14.51 | 74.7  |
| 1936  | 8.35  | 52.08 | 30.47 | 7.13  | 2.86  | 18.34 | 7.46  | 1.70  | 2.51  | 5.26  | 3.47  | 6.71  | 146.3 |
| 1937  | 4.38  | 14.06 | 17.77 | 8.63  | 2.74  | 5.48  | 9.42  | 4.38  | 3.91  | 4.01  | 4.56  | 6.18  | 85.5  |
| 1938  | 7.38  | 20.84 | 12.24 | 4.33  | 14.95 | 26.79 | 9.81  | 2.44  | 1.85  | 6.31  | 27.47 | 13.14 | 147.6 |
| 1939  | 5.97  | 6.06  | 4.03  | 2.73  | 45.05 | 18.57 | 9.36  | 4.42  | 3.33  | 3.24  | 2.83  | 9.61  | 115.2 |
| 1940  | 5.43  | 17.88 | 7.64  | 2.46  | 2.07  | 1.54  | 19.36 | 11.01 | 12.58 | 8.43  | 5.97  | 6.47  | 100.8 |
| 1941  | 18.01 | 11.73 | 6.60  | 13.86 | 5.90  | 2.69  | 2.57  | 15.49 | 9.74  | 4.59  | 4.18  | 4.48  | 99.8  |
| 1942  | 11.04 | 8.74  | 11.84 | 27.86 | 11.62 | 6.03  | 6.29  | 3.16  | 2.14  | 2.02  | 3.60  | 17.46 | 111.8 |
| 1943  | 9.60  | 24.61 | 10.50 | 2.63  | 1.74  | 9.86  | 4.51  | 26.26 | 12.77 | 7.17  | 11.97 | 21.99 | 143.6 |
| 1944  | 15.91 | 7.28  | 4.11  | 2.64  | 1.90  | 1.59  | 1.60  | 19.57 | 13.63 | 9.71  | 14.57 | 12.45 | 105.0 |
| 1945  | 27.19 | 12.70 | 4.65  | 3.14  | 3.01  | 26.83 | 10.34 | 1.88  | 2.04  | 2.87  | 3.19  | 3.57  | 101.4 |
| 1946  | 3.96  | 3.32  | 2.21  | 1.45  | 2.35  | 23.28 | 11.36 | 5.57  | 5.02  | 16.30 | 8.78  | 23.17 | 106.8 |
| 1947  | 17.62 | 13.11 | 6.26  | 6.09  | 3.54  | 7.08  | 9.73  | 4.30  | 2.61  | 3.26  | 2.99  | 4.38  | 81.0  |
| 1948  | 59.73 | 22.92 | 3.39  | 3.14  | 1.97  | 1.17  | 3.54  | 2.30  | 1.46  | 1.97  | 2.43  | 3.07  | 107.1 |
| 1949  | 2.89  | 32.58 | 12.28 | 1.76  | 1.12  | 0.86  | 1.68  | 2.42  | 1.43  | 11.56 | 7.39  | 4.43  | 80.4  |
| 1950  | 11.01 | 27.78 | 11.38 | 25.94 | 9.95  | 5.15  | 3.52  | 3.04  | 5.37  | 13.21 | 9.26  | 12.17 | 137.8 |
| 1951  | 7.66  | 4.38  | 3.01  | 3.78  | 3.09  | 1.70  | 1.48  | 1.23  | 1.27  | 1.77  | 6.54  | 19.51 | 55.4  |
| 1952  | 9.62  | 18.31 | 9.08  | 3.34  | 2.62  | 1.56  | 6.77  | 3.16  | 2.59  | 15.56 | 9.04  | 14.06 | 95.7  |
| 1953  | 25.14 | 20.06 | 7.66  | 3.23  | 2.11  | 2.70  | 8.81  | 14.87 | 8.25  | 8.18  | 43.03 | 19.60 | 163.6 |
| 1954  | 6.07  | 6.26  | 3.92  | 8.40  | 27.50 | 10.01 | 2.00  | 2.03  | 3.35  | 10.39 | 11.59 | 9.59  | 101.1 |
| 1955  | 9.21  | 6.06  | 3.68  | 3.39  | 2.34  | 6.94  | 4.79  | 15.41 | 8.63  | 5.24  | 7.68  | 6.56  | 79.9  |
| 1956  | 15.54 | 8.14  | 11.71 | 5.58  | 11.61 | 8.57  | 3.30  | 13.34 | 19.68 | 10.24 | 18.83 | 19.28 | 145.8 |
| 1957  | 16.50 | 7.97  | 4.49  | 2.83  | 2.04  | 12.96 | 7.10  | 55.10 | 21.98 | 4.51  | 19.57 | 10.05 | 165.1 |
| 1958  | 8.61  | 6.73  | 4.69  | 10.44 | 14.71 | 11.58 | 24.57 | 15.60 | 5.95  | 26.18 | 33.28 | 16.09 | 178.4 |
| 1959  | 17.86 | 9.22  | 4.65  | 5.85  | 3.27  | 6.49  | 4.35  | 6.80  | 7.49  | 5.79  | 4.95  | 7.14  | 83.9  |
| 1960  | 6.00  | 8.52  | 10.31 | 10.56 | 5.22  | 3.73  | 6.08  | 9.21  | 5.02  | 5.91  | 18.45 | 13.81 | 102.8 |
| 1961  | 10.74 | 7.97  | 4.69  | 4.10  | 6.96  | 8.35  | 11.43 | 5.12  | 4.33  | 4.27  | 79.05 | 30.62 | 177.6 |
| 1962  | 21.13 | 21.16 | 7.90  | 6.29  | 3.44  | 48.53 | 24.31 | 26.69 | 12.00 | 11.79 | 8.91  | 5.96  | 198.1 |
| 1963  | 13.11 | 9.08  | 5.79  | 9.43  | 4.95  | 10.13 | 5.03  | 2.03  | 20.26 | 9.01  | 10.19 | 15.60 | 114.6 |
| 1964  | 10.02 | 14.32 | 6.98  | 3.79  | 5.33  | 4.38  | 6.95  | 14.99 | 7.16  | 5.72  | 5.72  | 4.65  | 89.1  |
| 1965  | 29.68 | 25.85 | 10.53 | 12.73 | 5.51  | 2.28  | 3.07  | 7.06  | 3.83  | 2.81  | 23.09 | 20.05 | 146.5 |
| 1966  | 8.07  | 4.20  | 4.02  | 2.59  | 6.78  | 13.26 | 73.52 | 35.84 | 14.50 | 11.37 | 12.12 | 13.64 | 199.9 |
| 1967  | 9.03  | 9.98  | 5.58  | 2.80  | 1.77  | 2.33  | 2.81  | 12.37 | 16.30 | 7.17  | 13.14 | 9.35  | 92.6  |
| 1968  | 6.81  | 13.59 | 6.60  | 2.84  | 4.04  | 2.88  | 2.42  | 1.63  | 10.71 | 6.07  | 4.21  | 5.84  | 67.6  |
| 1969  | 5.43  | 3.71  | 2.47  | 4.42  | 10.49 | 4.04  | 1.10  | 0.95  | 1.79  | 2.80  | 17.66 | 8.50  | 63.4  |
| 1970  | 0.24  | 0.83  | 2.12  | 0.24  | 14.76 | 10.78 | 34.78 | 9.30  | 4.94  | 29.20 | 25.65 | 8.65  | 141.5 |
| 1971  | 2.31  | 17.57 | 5.89  | 0.97  | 7.78  | 5.38  | 1.52  | 15.18 | 4.15  | 2.38  | 14.84 | 7.71  | 85.7  |
| 1972  | 1.68  | 13.43 | 2.21  | 2.12  | 2.60  | 2.30  | 18.69 | 3.21  | 2.24  | 4.79  | 4.79  | 3.31  | 61.4  |
| 1973  | 1.65  | 7.89  | 3.74  | 11.00 | 23.70 | 6.26  | 6.25  | 10.52 | 4.19  | 3.43  | 29.71 | 8.48  | 116.8 |
| 1974  | 2.27  | 1.95  | 0.74  | 2.62  | 2.52  | 5.75  | 1.25  | 2.34  | 4.15  | 6.97  | 5.64  | 24.09 | 60.3  |
| 1975  | 1.98  | 7.83  | 9.62  | 3.81  | 9.30  | 14.40 | 4.25  | 10.38 | 8.12  | 10.03 | 7.43  | 6.06  | 93.2  |
| 1976  | 24.73 | 22.25 | 1.91  | 1.30  | 18.56 | 7.42  | 5.91  | 47.46 | 6.18  | 5.17  | 9.01  | 13.40 | 163.3 |
| 1977  | 12.94 | 20.40 | 11.53 | 7.32  | 1.17  | 1.49  | 6.86  | 3.24  | 2.32  | 2.56  | 10.32 | 8.49  | 88.6  |
| 1978  | 19.60 | 5.54  | 10.97 | 4.01  | 1.97  | 5.72  | 1.13  | 11.12 | 4.98  | 17.34 | 13.42 | 22.55 | 118.4 |
| 1979  | 7.53  | 5.31  | 4.17  | 10.57 | 5.56  | 2.18  | 1.94  | 1.19  | 3.17  | 1.96  | 5.02  | 8.38  | 57.0  |
| 1980  | 13.82 | 7.99  | 19.63 | 66.31 | 22.46 | 18.31 | 21.10 | 25.26 | 11.15 | 10.05 | 36.72 | 21.15 | 274.0 |
| 1981  | 6.75  | 4.36  | 13.91 | 4.03  | 7.21  | 18.13 | 64.18 | 7.88  | 4.33  | 16.31 | 3.57  | 34.47 | 185.1 |
| 1982  | 4.84  | 5.10  | 3.12  | 1.34  | 1.89  | 2.87  | 1.55  | 3.76  | 5.44  | 21.68 | 5.89  | 34.96 | 92.4  |
| 1983  | 12.85 | 11.87 | 4.08  | 3.53  | 14.05 | 18.02 | 3.61  | 3.44  | 2.85  | 4.49  | 3.48  | 3.35  | 85.6  |
| 1984  | 6.30  | 6.67  | 6.07  | 13.83 | 8.88  | 3.52  | 5.99  | 1.85  | 2.36  | 13.74 | 4.33  | 1.95  | 75.5  |
| 1985  | 43.21 | 27.14 | 35.41 | 10.02 | 4.69  | 2.77  | 3.37  | 2.41  | 1.55  | 2.06  | 54.70 | 12.01 | 199.3 |
| 1986  | 26.02 | 15.61 | 5.38  | 1.81  | 1.04  | 3.36  | 17.30 | 3.24  | 3.60  | 3.90  | 6.15  | 13.62 | 101.0 |
| 1987  | 8.99  | 1.77  | 6.35  | 0.77  | 3.13  | 10.50 | 20.02 | 4.14  | 9.67  | 6.48  | 11.70 | 8.51  | 92.0  |
| 1988  | 6.47  | 3.99  | 9.12  | 3.57  | 3.29  | 5.87  | 36.46 | 7.22  | 4.85  | 6.54  | 7.97  | 5.53  | 100.9 |
| 1989  | 31.08 | 45.36 | 6.48  | 1.44  | 11.80 | 9.20  | 21.18 | 10.07 | 8.07  | 5.04  | 4.25  | 9.46  | 163.5 |
| 1990  | 16.99 | 4.32  | 6.90  | 9.89  | 11.00 | 2.51  | 1.19  | 2.44  | 4.14  | 7.99  | 6.14  | 2.50  | 76.0  |
| 1991  | 46.82 | 9.61  | 5.04  | 6.70  | 8.35  | 6.00  | 2.65  | 4.50  | 15.51 | 12.04 | 6.93  | 8.46  | 132.6 |
| 1992  | 39.87 | 12.65 | 2.00  | 2.23  | 2.00  | 3.48  | 45.71 | 13.98 | 7.29  | 6.39  | 7.44  | 8.78  | 151.8 |
| 1993  | 5.75  | 9.58  | 17.53 | 11.70 | 22.45 | 16.62 | 7.37  | 3.14  | 3.34  | 6.61  | 26.77 | 9.85  | 140.7 |
| 1994  | 10.21 | 3.13  | 19.76 | 24.68 | 5.58  | 19.17 | 33.98 | 13.31 | 5.61  | 2.83  | 3.34  | 3.05  | 144.7 |
| 1995  | 5.80  | 23.05 | 49.56 | 14.59 | 4.49  | 11.59 | 2.84  | 1.66  | 1.51  | 5.68  | 2.90  | 3.91  | 127.6 |
| 1996  | 38.53 | 63.97 | 7.88  | 4.55  | 7.79  | 10.36 | 8.40  | 19.07 | 3.37  | 16.12 | 18.90 | 6.88  | 205.8 |
| 1997  | 5.32  | 9.60  | 7.39  | 7.25  | 8.21  | 32.78 | 46.03 | 8.96  | 3.66  | 3.22  | 3.31  | 4.10  | 139.8 |
| 1998  | 5.14  | 32.72 | 37.19 | 10.60 | 16.22 | 20.96 | 15.96 | 5.01  | 2.50  | 2.15  | 3.08  | 5.19  | 156.7 |
| AVE : | 14.14 | 14.27 | 9.86  | 7.30  | 7.84  | 9.49  | 11.34 | 9.14  | 6.11  | 7.87  | 12.59 | 11.74 | 121.7 |
| SD :  | 13.78 | 12.16 | 10.33 | 9.13  | 8.15  | 8.73  | 14.42 | 10.12 | 4.83  | 6.12  | 13.02 | 8.86  | 45.0  |

## Appendix B10.11

File : H7R1CUM.PRS  
 Units : 10<sup>6</sup>x<sup>3</sup>  
 Descrip. : Cumulative Present Day (2000) Flow at H7R001 for 1927 to 1990

| Year  | Oct   | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul   | Aug   | Sep   | Total |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1927  | 3.15  | 2.79  | 2.51  | 2.16  | 1.37  | 3.81  | 1.76  | 0.71  | 2.50  | 1.44  | 2.51  | 5.64  | 30.3  |
| 1928  | 3.31  | 16.63 | 10.30 | 2.84  | 1.45  | 7.14  | 2.92  | 2.06  | 3.09  | 29.82 | 26.95 | 10.97 | 117.5 |
| 1929  | 5.36  | 2.80  | 10.62 | 5.34  | 33.25 | 24.97 | 6.86  | 5.50  | 3.99  | 4.05  | 18.50 | 12.60 | 133.8 |
| 1930  | 12.49 | 6.25  | 3.57  | 5.81  | 3.85  | 13.24 | 31.08 | 10.79 | 3.23  | 9.40  | 10.05 | 7.96  | 117.7 |
| 1931  | 17.58 | 7.35  | 56.43 | 18.25 | 3.05  | 2.74  | 1.28  | 1.46  | 2.24  | 6.78  | 5.01  | 53.57 | 175.7 |
| 1932  | 21.64 | 8.26  | 3.60  | 1.94  | 3.27  | 2.02  | 0.91  | 3.12  | 2.01  | 1.70  | 16.10 | 9.15  | 73.7  |
| 1933  | 2.00  | 16.26 | 4.99  | 4.61  | 7.04  | 8.45  | 2.68  | 1.17  | 1.29  | 6.79  | 7.37  | 5.84  | 68.5  |
| 1934  | 75.39 | 46.57 | 7.63  | 2.13  | 4.69  | 3.19  | 5.07  | 13.40 | 12.09 | 6.70  | 5.60  | 7.72  | 190.2 |
| 1935  | 5.65  | 14.20 | 5.22  | 2.22  | 2.68  | 1.69  | 0.91  | 3.78  | 1.69  | 2.63  | 2.13  | 12.08 | 54.9  |
| 1936  | 6.45  | 50.18 | 27.02 | 4.56  | 1.93  | 13.44 | 5.81  | 1.18  | 2.29  | 5.15  | 3.27  | 5.79  | 127.1 |
| 1937  | 2.65  | 11.53 | 14.49 | 5.69  | 1.83  | 3.66  | 5.98  | 3.65  | 3.62  | 3.74  | 4.38  | 5.42  | 66.7  |
| 1938  | 5.88  | 18.42 | 8.80  | 2.96  | 10.14 | 24.86 | 8.74  | 1.75  | 1.53  | 6.22  | 27.23 | 12.28 | 128.8 |
| 1939  | 4.59  | 3.65  | 2.47  | 2.04  | 37.91 | 16.39 | 7.65  | 3.87  | 3.14  | 3.10  | 2.28  | 9.40  | 96.5  |
| 1940  | 3.67  | 15.74 | 4.78  | 1.97  | 1.59  | 1.22  | 11.01 | 9.62  | 12.35 | 8.14  | 5.76  | 5.39  | 81.2  |
| 1941  | 16.08 | 9.80  | 4.18  | 9.20  | 3.67  | 1.77  | 1.68  | 12.65 | 9.34  | 4.42  | 3.88  | 3.64  | 80.3  |
| 1942  | 10.52 | 6.93  | 8.36  | 24.11 | 9.05  | 3.98  | 4.96  | 2.80  | 2.00  | 1.72  | 3.17  | 16.75 | 94.3  |
| 1943  | 7.82  | 22.64 | 6.98  | 1.92  | 1.28  | 6.30  | 2.87  | 22.10 | 12.31 | 7.00  | 11.54 | 21.46 | 124.2 |
| 1944  | 14.10 | 5.93  | 2.31  | 1.77  | 1.33  | 1.08  | 1.08  | 11.04 | 12.43 | 9.56  | 13.98 | 11.70 | 86.3  |
| 1945  | 25.28 | 10.63 | 2.61  | 2.02  | 2.06  | 19.27 | 9.01  | 1.27  | 1.84  | 2.61  | 2.80  | 2.74  | 82.1  |
| 1946  | 2.48  | 2.06  | 1.76  | 1.57  | 1.84  | 13.03 | 8.99  | 4.83  | 4.55  | 16.21 | 8.52  | 22.33 | 88.2  |
| 1947  | 15.84 | 10.79 | 3.77  | 4.03  | 2.22  | 4.64  | 6.06  | 2.88  | 2.37  | 2.97  | 2.31  | 3.76  | 61.6  |
| 1948  | 57.80 | 20.87 | 2.33  | 2.36  | 1.52  | 1.01  | 2.24  | 1.42  | 0.78  | 1.12  | 1.43  | 1.87  | 94.7  |
| 1949  | 1.74  | 23.87 | 8.74  | 1.59  | 1.13  | 0.91  | 1.20  | 1.50  | 0.80  | 6.95  | 4.43  | 2.56  | 55.4  |
| 1950  | 9.54  | 25.53 | 7.99  | 22.51 | 7.29  | 3.42  | 2.18  | 1.97  | 5.04  | 12.86 | 8.91  | 11.69 | 118.9 |
| 1951  | 5.86  | 2.50  | 1.92  | 2.75  | 2.26  | 1.23  | 1.01  | 0.63  | 0.71  | 1.02  | 4.09  | 13.45 | 37.4  |
| 1952  | 7.99  | 15.82 | 5.58  | 2.37  | 1.87  | 1.16  | 4.36  | 1.84  | 1.49  | 11.99 | 8.83  | 13.31 | 76.6  |
| 1953  | 23.91 | 17.61 | 4.51  | 2.04  | 1.38  | 1.76  | 5.56  | 10.25 | 7.96  | 7.94  | 42.55 | 18.55 | 144.0 |
| 1954  | 4.23  | 3.81  | 2.51  | 5.63  | 21.82 | 8.06  | 1.13  | 1.14  | 3.06  | 10.30 | 10.90 | 9.13  | 81.7  |
| 1955  | 7.67  | 3.87  | 2.29  | 2.38  | 1.70  | 4.60  | 3.01  | 9.09  | 8.34  | 4.96  | 7.08  | 5.68  | 60.7  |
| 1956  | 14.87 | 5.67  | 8.24  | 3.69  | 7.29  | 6.24  | 1.99  | 12.70 | 19.34 | 9.93  | 18.39 | 18.34 | 126.7 |
| 1957  | 14.65 | 6.26  | 2.62  | 1.89  | 1.43  | 7.90  | 4.34  | 52.23 | 21.37 | 4.32  | 19.27 | 9.05  | 145.3 |
| 1958  | 7.11  | 4.93  | 3.04  | 6.73  | 10.55 | 9.52  | 23.05 | 15.10 | 5.73  | 26.07 | 32.90 | 15.36 | 160.1 |
| 1959  | 15.97 | 6.56  | 2.71  | 3.87  | 2.19  | 4.31  | 2.78  | 4.31  | 4.69  | 5.20  | 4.67  | 6.65  | 63.9  |
| 1960  | 4.17  | 6.60  | 6.88  | 7.01  | 3.50  | 2.58  | 3.85  | 7.43  | 4.76  | 5.80  | 18.11 | 13.21 | 83.9  |
| 1961  | 9.46  | 5.89  | 2.85  | 2.79  | 4.67  | 5.48  | 7.01  | 4.34  | 4.14  | 4.10  | 78.76 | 29.42 | 158.9 |
| 1962  | 19.22 | 18.84 | 4.70  | 4.11  | 2.20  | 43.38 | 22.63 | 26.14 | 11.75 | 11.68 | 8.64  | 5.10  | 178.4 |
| 1963  | 11.47 | 6.62  | 3.74  | 6.24  | 3.31  | 6.41  | 3.06  | 1.06  | 20.02 | 8.69  | 9.92  | 14.68 | 95.2  |
| 1964  | 8.59  | 11.87 | 4.18  | 2.55  | 3.54  | 2.95  | 3.92  | 10.96 | 6.99  | 5.49  | 5.52  | 3.97  | 70.5  |
| 1965  | 28.17 | 23.22 | 7.05  | 8.97  | 3.51  | 1.49  | 1.94  | 4.74  | 3.56  | 2.32  | 22.94 | 19.02 | 126.9 |
| 1966  | 6.39  | 2.26  | 2.63  | 1.90  | 4.54  | 8.26  | 69.81 | 35.34 | 14.15 | 11.22 | 11.94 | 12.76 | 181.2 |
| 1967  | 7.57  | 7.48  | 3.37  | 1.85  | 1.25  | 1.63  | 1.84  | 7.39  | 12.94 | 6.85  | 12.66 | 8.53  | 73.4  |
| 1968  | 5.00  | 11.41 | 4.02  | 1.94  | 2.79  | 2.01  | 1.51  | 0.92  | 6.51  | 3.73  | 4.03  | 5.08  | 49.0  |
| 1969  | 3.79  | 2.23  | 1.81  | 3.29  | 6.83  | 2.66  | 0.65  | 0.56  | 1.07  | 1.74  | 12.36 | 7.39  | 44.4  |
| 1970  | 4.78  | 2.35  | 2.20  | 1.79  | 7.27  | 6.32  | 13.61 | 14.45 | 6.99  | 28.58 | 32.75 | 13.29 | 134.4 |
| 1971  | 5.06  | 14.26 | 4.74  | 2.15  | 8.78  | 6.03  | 4.47  | 12.14 | 6.27  | 4.88  | 14.59 | 9.82  | 93.2  |
| 1972  | 3.98  | 6.28  | 3.37  | 2.06  | 1.37  | 1.62  | 2.66  | 2.05  | 3.25  | 2.85  | 3.03  | 3.06  | 35.6  |
| 1973  | 2.66  | 4.63  | 3.45  | 5.26  | 14.18 | 8.40  | 1.92  | 21.78 | 9.74  | 3.02  | 42.07 | 17.76 | 134.9 |
| 1974  | 3.90  | 2.74  | 2.07  | 3.21  | 1.80  | 2.12  | 1.02  | 4.33  | 5.08  | 6.09  | 11.30 | 12.01 | 55.7  |
| 1975  | 5.76  | 4.96  | 3.43  | 2.84  | 5.04  | 6.67  | 7.65  | 8.28  | 12.70 | 9.98  | 8.23  | 7.53  | 83.1  |
| 1976  | 18.04 | 18.21 | 5.71  | 2.47  | 24.79 | 11.51 | 6.96  | 51.86 | 22.42 | 6.69  | 7.41  | 10.16 | 186.2 |
| 1977  | 8.32  | 10.88 | 5.71  | 2.80  | 1.53  | 1.21  | 9.82  | 6.99  | 2.34  | 7.55  | 12.92 | 9.32  | 79.4  |
| 1978  | 8.66  | 4.01  | 8.82  | 4.05  | 10.80 | 3.95  | 0.76  | 10.83 | 5.69  | 10.75 | 15.34 | 14.04 | 97.7  |
| 1979  | 8.88  | 4.32  | 3.58  | 5.67  | 2.95  | 1.41  | 2.24  | 1.29  | 2.97  | 1.95  | 4.10  | 8.39  | 47.7  |
| 1980  | 7.58  | 19.08 | 9.51  | 59.89 | 24.98 | 18.02 | 29.02 | 16.58 | 7.17  | 8.46  | 26.52 | 14.39 | 241.2 |
| 1981  | 5.95  | 3.81  | 7.09  | 3.68  | 2.96  | 8.88  | 66.94 | 23.32 | 5.80  | 10.35 | 9.54  | 20.33 | 168.6 |
| 1982  | 13.34 | 5.58  | 2.99  | 2.00  | 3.02  | 1.58  | 0.94  | 2.16  | 4.68  | 12.18 | 8.51  | 38.73 | 95.7  |
| 1983  | 16.59 | 9.69  | 4.23  | 2.40  | 3.48  | 8.27  | 3.80  | 2.61  | 2.37  | 5.52  | 3.83  | 2.39  | 65.2  |
| 1984  | 6.85  | 2.97  | 4.12  | 10.48 | 10.58 | 2.97  | 12.07 | 5.71  | 4.86  | 21.44 | 10.29 | 4.21  | 96.5  |
| 1985  | 30.30 | 16.68 | 12.55 | 4.58  | 3.21  | 3.85  | 2.03  | 1.20  | 1.35  | 2.20  | 54.33 | 22.13 | 154.4 |
| 1986  | 19.09 | 10.37 | 3.43  | 2.19  | 1.44  | 1.36  | 16.89 | 9.63  | 3.77  | 4.71  | 8.97  | 9.85  | 91.7  |
| 1987  | 4.90  | 2.27  | 4.01  | 2.30  | 1.52  | 4.56  | 13.96 | 9.03  | 6.29  | 6.01  | 8.99  | 7.68  | 71.5  |
| 1988  | 5.66  | 3.08  | 4.28  | 2.60  | 1.96  | 5.19  | 32.62 | 13.05 | 4.51  | 8.60  | 10.09 | 6.77  | 98.4  |
| 1989  | 37.33 | 28.50 | 6.57  | 2.55  | 5.06  | 3.60  | 29.64 | 13.67 | 12.31 | 6.95  | 4.93  | 4.39  | 155.5 |
| 1990  | 7.46  | 4.51  | 4.68  | 5.88  | 4.19  | 1.98  | 1.25  | 1.59  | 1.64  | 3.77  | 2.78  | 3.54  | 43.3  |
| AVE : | 11.91 | 10.97 | 6.14  | 5.26  | 5.83  | 6.46  | 8.70  | 8.80  | 6.21  | 7.45  | 13.00 | 11.42 | 102.1 |
| SD :  | 12.51 | 9.62  | 7.48  | 8.19  | 7.46  | 7.21  | 13.36 | 10.58 | 5.27  | 6.02  | 13.61 | 8.66  | 45.1  |

## APPENDIX B11.1

SUB-CATCHMENT : IFR Site 4  
RIVER : Breede  
PLACE : IFR site 4 (Swellendam)

### 1 CATCHMENT

|                       | YEAR   |        |        |        |        | UNITS           |
|-----------------------|--------|--------|--------|--------|--------|-----------------|
|                       | 1968   | 1980   | 1987   | 1999   | 2000   |                 |
| SUB-CATCHMENT AREAS   |        |        |        |        |        |                 |
| u/s farm dams low MAP | 56.20  | 56.20  | 56.20  | 56.20  | 56.20  | km <sup>2</sup> |
| d/s farm dams low MAP | 365.10 | 365.10 | 365.10 | 365.10 | 365.10 | km <sup>2</sup> |
| Total                 | 421.30 | 421.30 | 421.30 | 421.30 | 421.30 | km <sup>2</sup> |

### 2 LANDUSE

|                             | YEAR  |       |       |       |       | UNITS           |
|-----------------------------|-------|-------|-------|-------|-------|-----------------|
|                             | 1968  | 1980  | 1987  | 1999  | 2000  |                 |
| ALIEN VEGETATION            |       |       |       |       |       |                 |
| u/s farm dams : tall trees  | 0.25  | 0.45  | 0.67  | 2.00  | 2.00  | km <sup>2</sup> |
| u/s farm dams : tall shrubs | 0.32  | 0.58  | 0.85  | 1.57  | 1.57  |                 |
| riparian                    | 1.45  | 1.84  | 2.38  | 3.31  | 3.31  | km <sup>2</sup> |
| Total                       | 2.02  | 2.87  | 3.90  | 6.88  | 6.88  | km <sup>2</sup> |
| FARM DAM CAPACITIES         | 3.59  | 3.73  | 7.93  | 9.92  | 9.92  | Mm <sup>3</sup> |
| IRRIGATION AREAS            |       |       |       |       |       |                 |
| farm dams                   | 21.89 | 19.21 | 25.91 | 28.62 | 28.62 | km <sup>2</sup> |
| Total                       | 21.89 | 19.21 | 25.91 | 28.62 | 28.62 | km <sup>2</sup> |

### 3 EVAPORATION

|                       | OCT    | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|-----------------------|--------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) | 174    | 210  | 265  | 287  | 219  | 175  | 175  | 84   | 70   | 70   | 87   | 113  | 1929      |
| S-PAN (gross) (in mm) | 137    | 169  | 217  | 236  | 176  | 137  | 137  | 58   | 45   | 45   | 61   | 84   | 1502      |
| LAKE FACTOR           | 0.81   | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)    | 110.97 | 139  | 180  | 198  | 155  | 121  | 121  | 50   | 38   | 37   | 49   | 68   | 1267      |

**Note : evaporation from CCWR database used for this sub-catchment**

### 4 RESERVOIR SIMULATIONS

|          | COEFFICIENTS |     | START      | DEAD                      | MAX                       |
|----------|--------------|-----|------------|---------------------------|---------------------------|
|          | a            | b   | STOR.<br>% | STOR.<br>M.m <sup>3</sup> | STOR.<br>M.m <sup>3</sup> |
| Farm Dam | 0.4          | 0.7 | 100        | 0                         | FSC                       |

### 5 IRRIGATION ROUTINE

|                      | QUANT | CROP FACTORS |      |     |     |     |     |     |     |     |     |      |     |
|----------------------|-------|--------------|------|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|
|                      | %     | OCT          | NOV  | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG  | SEP |
| Orchards & vineyards | 33    | 0.4          | 0.45 | 0.5 | 0.5 | 0.5 | 0.4 | 0.2 | 0.2 | 0.2 | 0.2 | 0.25 | 0.3 |
| Patures & cash crops | 67    | 0.7          | 0.8  | 0.8 | 0.8 | 0.8 | 0.8 | 0.7 | 0.6 | 0.5 | 0.5 | 0.5  | 0.6 |

### 6. NOTES

Combined crop factor used for calculation of irrigation demands  
crop type 1 : vineyards and fruit trees  
crop type 2 : wheat , lucerne and cash crops

Catchment MAP = 411 mm

APPENDIX B11.2 PERCENTAGE RAINFALL FILES USED FOR SIMULATION OF IFR Site 4

Average Rainfall On Catchment lowbree.r

details of rainfall stations used

008683\_p.nsp 1926 to 1977  
008713\_a.nsp 1978 to 1998  
008876\_9.nsp 1926 to 1964  
009365\_5.nsp 1943 to 1998  
009430\_2.nsp 1935 to 1988  
009458\_a.nsp 1972 to 1995

|          |        | rainfall input as percent m.a.p. |        |        |       |       |       |        |        |       |        |       |        |         |
|----------|--------|----------------------------------|--------|--------|-------|-------|-------|--------|--------|-------|--------|-------|--------|---------|
| no.      | gauges | oct                              | nov    | dec    | jan   | feb   | mar   | apr    | may    | jun   | jul    | aug   | sep    | year    |
| 1926     | 2      | 16.35                            | 10.12  | 1.35   | 1.32  | 12.03 | 6.30  | 7.12   | 7.49   | 6.01  | 1.96   | 13.91 | 1.26   | 85.22   |
| 1927     | 2      | 3.35                             | 4.62   | 2.79   | 3.08  | .76   | 13.09 | 2.11   | 1.14   | 4.25  | 3.52   | 6.93  | 10.99  | 56.62   |
| 1928     | 2      | 2.62                             | 29.12  | 8.95   | .00   | 7.37  | 7.71  | 2.65   | 8.28   | 4.40  | 19.39  | 10.31 | 4.69   | 105.49  |
| 1929     | 2      | 6.91                             | 1.35   | 6.72   | 3.69  | 18.23 | 11.72 | 7.22   | 7.81   | 4.49  | 3.48   | 13.86 | 6.85   | 92.34   |
| 1930     | 2      | 8.73                             | 6.04   | .93    | 4.19  | 3.24  | 10.08 | 25.06  | 1.33   | 1.74  | 23.99  | 7.19  | 5.87+  | 98.39   |
| 1931     | 2      | 21.57                            | 5.28   | 15.92  | 5.15  | 11.80 | 2.30  | 3.02   | 6.84   | 8.71  | 10.19  | 2.25  | 37.00  | 130.04  |
| 1932     | 2      | 4.50                             | 11.00  | 4.22   | .96   | 4.55  | 8.21  | 4.72   | 8.21   | 7.74  | 5.23   | 13.78 | 1.57+  | 74.71   |
| 1933     | 2      | 3.38                             | 8.36   | 2.41   | 12.51 | 4.32  | 8.08  | 1.84+  | 3.70   | 3.36  | 15.94  | 17.05 | 8.69   | 89.65   |
| 1934     | 2      | 19.71                            | 11.24  | .48    | 2.45  | 8.55  | 2.84  | 9.48   | 16.68  | 9.42  | 4.45   | 4.34  | 9.75   | 99.39   |
| 1935     | 3      | 4.66+                            | 12.35+ | 6.04+  | 2.21+ | 3.41+ | 2.77+ | 2.54+  | 12.09+ | 3.80+ | 12.89+ | 5.30+ | 12.81+ | 80.85   |
| 1936     | 3      | 8.31+                            | 32.02  | 14.22  | .90   | 2.78  | 8.03  | 2.94   | .44    | 4.56  | 9.57   | 1.58  | 9.41   | 94.75   |
| 1937     | 3      | 4.73                             | 9.20   | 11.06  | 3.56  | .57   | 14.07 | 11.78  | 9.23   | 7.20  | 9.51   | 8.16  | 8.44   | 97.52   |
| 1938     | 3      | 6.90                             | 11.87  | 5.32   | 2.80  | 16.32 | 17.62 | 8.41   | 2.55   | 1.85+ | 11.12  | 22.67 | 5.50   | 112.95  |
| 1939     | 3      | 3.00                             | 4.52   | 2.61   | 4.96  | 20.28 | 5.19  | 11.55  | 4.50   | 7.28  | 2.85   | 1.19  | 6.09   | 74.03   |
| 1940     | 3      | 5.74                             | 17.05  | .99    | 10.76 | 1.84  | 1.65  | 19.69  | 11.32  | 14.68 | 10.53  | 9.51  | 8.15   | 111.90  |
| 1941     | 3      | 16.11                            | 5.35   | 4.80   | 8.92  | 1.82  | 5.48  | 4.01   | 11.22  | 9.40  | 3.08   | 5.79  | 4.52   | 80.48   |
| 1942     | 3      | 10.81                            | 1.77   | 17.35  | 25.97 | 4.71  | 8.34  | 8.69   | 5.17   | 5.06  | 6.04   | 8.48  | 16.24  | 118.63  |
| 1943     | 4      | 4.53                             | 20.79  | 2.20   | 1.16  | 2.01  | 8.26  | 7.10   | 18.53  | 13.51 | 6.08   | 11.93 | 17.55  | 113.66  |
| 1944     | 4      | 8.87                             | 3.16   | .92    | .50   | 1.37  | 1.66  | 5.66   | 18.80  | 13.54 | 8.91   | 13.05 | 8.82   | 85.26   |
| 1945     | 4      | 22.61                            | 7.13   | 1.36   | 1.51  | 4.72  | 24.33 | 3.27   | 4.19   | 4.68  | 6.46   | 3.67  | 5.58   | 89.52   |
| 1946     | 4      | 5.62                             | 3.15   | .09    | .85   | 4.39+ | 19.99 | 5.09   | 8.17   | 5.67  | 15.17  | 1.20  | 12.13  | 81.53   |
| 1947     | 4      | 6.58                             | 9.85   | 1.45   | 3.71  | 3.70  | 12.23 | 11.56  | 2.83   | 6.85  | 9.90   | 1.47  | 8.35   | 78.47   |
| 1948     | 4      | 35.32                            | 4.79   | 2.91   | 4.76  | 1.72  | .98   | 15.69  | 8.82   | 1.61  | 6.33   | 5.95  | 3.98   | 92.85   |
| 1949     | 4      | 1.22                             | 33.12  | .35    | 1.28  | 1.71  | 2.48  | 11.76+ | 4.86   | 1.11  | 11.32  | 7.04  | 4.90   | 81.16   |
| 1950     | 4      | 12.46                            | 17.85  | 3.86   | 20.19 | .00   | 9.39  | 7.98   | 6.78   | 14.32 | 12.99  | 7.38  | 14.61  | 127.79  |
| 1951     | 4      | 5.43                             | 1.12   | 1.99   | 5.03  | 5.75  | 3.66  | 5.06   | 4.88   | 6.62  | 6.59   | 18.26 | 27.26  | 91.65   |
| 1952     | 4      | 7.53                             | 22.39  | 4.82   | 3.66  | 3.15  | .48   | 11.67  | 5.13   | 9.77  | 20.99  | 6.40  | 14.65  | 110.64  |
| 1953     | 4      | 15.53                            | 14.11  | 2.40   | .81   | 3.24  | 5.70  | 11.68  | 25.61  | 7.35  | 12.68  | 27.63 | 2.15   | 128.90  |
| 1954     | 4      | 1.89                             | 8.62   | 1.84   | 9.92  | 21.36 | .59   | 4.58   | 3.27   | 10.11 | 14.66  | 14.09 | 9.94   | 100.89  |
| 1955     | 4      | 12.88                            | 2.71   | 1.01   | 1.43  | 2.45  | 13.30 | 5.34   | 17.86  | 10.51 | 9.20   | 13.76 | 4.20+  | 94.64   |
| 1956     | 4      | 13.02                            | 2.01   | 6.88   | 1.87  | 12.44 | 10.64 | 3.92   | 20.06  | 23.96 | 9.93   | 19.81 | 10.95  | 135.50  |
| 1957     | 4      | 12.03                            | .21    | 1.63   | .00   | 3.63  | 13.32 | 9.03   | 30.85  | 5.47  | .54    | 15.55 | 2.18   | 94.44   |
| 1958     | 4      | 6.29                             | 4.54   | 5.16+  | 9.74  | 10.15 | 9.31  | 25.68  | 14.01  | 1.92  | 26.31  | 20.14 | 6.07   | 139.32  |
| 1959     | 4      | 23.10                            | 2.60   | 2.93   | 8.62  | 2.93  | 9.23  | 3.11   | 10.48  | 12.34 | 6.91   | 2.86  | 9.17   | 94.28   |
| 1960     | 4      | 2.90                             | 5.94   | 13.16  | 13.86 | 2.14  | 7.80  | 8.14   | 16.43  | 4.38  | 8.57   | 14.99 | 8.85   | 107.14  |
| 1961     | 4      | 7.92                             | 1.71   | 1.43+  | 8.23+ | 6.27  | 18.10 | 11.75  | 4.58   | 9.86  | 5.18   | 45.98 | 1.06   | 122.06  |
| 1962     | 4      | 17.46                            | 9.69   | 1.40   | 4.80  | 2.10  | 14.17 | 8.57   | 11.34  | 5.25  | 10.97  | 5.86  | .68    | 92.29   |
| 1963     | 4      | 10.38                            | 7.20   | 7.47   | 11.24 | 9.49  | 19.24 | 5.17   | 3.59   | 18.56 | 3.82   | 9.80  | 11.97  | 117.94  |
| 1964     | 4      | 7.53                             | 14.92  | 1.27   | 3.62  | 7.60  | 8.24  | 7.41   | 17.49  | 3.82  | 13.55  | 5.41  | 1.59   | 92.45   |
| 1965     | 3      | 20.20                            | 17.22  | 5.21   | 4.83  | .41   | 6.48  | 7.01   | 12.30  | 1.95  | 3.08   | 27.72 | 12.45  | 118.87  |
| 1966     | 3      | 1.64                             | 3.44   | 1.59   | 1.61  | 8.61  | 12.36 | 46.17  | 17.56  | 11.63 | 9.20   | 9.20  | 11.86  | 134.87  |
| 1967     | 3      | 4.57                             | 7.37   | 1.52   | 1.08  | 3.22  | 6.33  | 5.90   | 12.18  | 13.95 | 1.21   | 12.09 | 3.38   | 72.81   |
| 1968     | 3      | 5.77                             | 10.09  | 1.00   | 1.88  | 4.22  | 2.81  | 7.60   | 2.75   | 15.02 | 4.76   | 5.11  | 5.42   | 66.43   |
| 1969     | 3      | 5.00                             | 1.28   | 1.17   | 8.53  | 9.41  | .54   | .25    | 4.28   | 6.03  | 9.49   | 12.06 | 2.77   | 60.80   |
| 1970     | 3      | 6.39                             | 1.56   | 4.25   | 1.75  | 12.65 | 14.04 | 21.36  | 10.61  | 9.32  | 28.21  | 18.41 | 2.13   | 130.69  |
| 1971     | 3      | 4.22                             | 17.26  | 2.26   | 2.39  | 8.95  | 5.89  | 14.64  | 9.69   | 4.45  | 7.73   | 13.55 | 10.73  | 101.75  |
| 1972     | 4      | 1.04+                            | 6.90+  | 2.84+  | 2.55  | .48   | 3.72  | 5.78   | 7.23   | 8.67  | 5.32   | 7.53  | 5.67   | 57.73   |
| 1973     | 4      | 2.51                             | 4.86   | 9.56   | 6.11  | 20.97 | 6.15  | 1.35   | 16.57  | 3.28  | 1.31   | 25.73 | 7.53   | 105.93  |
| 1974     | 4      | 6.58                             | 3.88   | .67    | 4.96  | 2.71  | 2.96  | 4.12   | 11.54  | 5.76  | 10.04  | 13.58 | 13.91  | 80.71   |
| 1975     | 4      | 3.61                             | 5.90   | 1.42   | 2.44  | 8.15  | 12.30 | 15.87  | 7.30   | 19.22 | 11.20  | 8.12  | 5.23   | 100.77  |
| 1976     | 4      | 14.40                            | 11.33  | 3.65   | 1.70  | 15.32 | 6.74  | 15.21  | 25.88  | 11.09 | 8.45   | 7.30  | 9.21   | 130.28  |
| 1977     | 4      | 5.68                             | 11.64  | 8.61   | 5.78  | 4.14  | 3.19  | 11.55  | 5.35   | 4.05  | 10.16  | 11.13 | 10.72  | 91.98   |
| 1978     | 4      | 7.56                             | 5.22   | 8.43   | 5.99  | 25.23 | .74   | 1.40   | 10.34  | 6.78  | 10.16  | 11.46 | 8.16   | 101.47  |
| 1979     | 4      | 8.87                             | 1.31   | 6.16   | 11.51 | 3.53  | 3.47  | 4.97   | 4.23   | 11.85 | 1.73   | 7.53  | 9.32   | 74.49   |
| 1980     | 4      | 8.89                             | 19.00  | 8.00   | 28.96 | 7.63  | 13.40 | 29.85  | 9.52   | 6.35  | 11.87  | 17.87 | 6.57   | 167.91  |
| 1981     | 4      | 4.59                             | 6.58   | 10.14  | 2.46  | 5.82  | 12.63 | 34.33  | 1.02   | 11.71 | 7.72   | 8.56  | 14.70  | 120.27  |
| 1982     | 4      | 5.01                             | 4.04   | 3.72   | 1.34  | 11.07 | 2.43  | 6.52   | 10.33  | 13.09 | 13.56  | 5.29  | 15.80  | 92.19   |
| 1983     | 4      | 4.84                             | 8.91   | 3.97   | 2.21  | 7.79  | 11.55 | 4.73   | 10.15  | 3.81  | 7.77   | 1.33  | 5.02   | 72.07   |
| 1984     | 4      | 9.43                             | 4.38+  | 6.02   | 13.05 | 9.60  | 5.04  | 16.63  | 2.20   | 11.10 | 25.07  | 3.18  | 1.78   | 107.48  |
| 1985     | 4      | 20.44                            | 9.26   | 10.54  | 3.51  | 5.73  | 6.71  | 5.01   | 2.07   | 5.09  | 6.92   | 40.45 | 7.24   | 122.95  |
| 1986     | 4      | 12.11                            | 7.35   | 1.92   | 1.48  | 2.48  | 3.01  | 22.85  | 6.03   | 7.95  | 4.78   | 11.35 | 10.65  | 91.95   |
| 1987     | 4      | 1.21                             | .00    | 6.31   | .35   | 3.29  | 7.83  | 11.44  | 5.49   | 9.16  | 4.64   | 9.15  | 8.32   | 67.17   |
| 1988     | 4      | 4.12                             | 1.94   | 4.84   | 2.69  | 3.26  | 13.64 | 20.84  | 2.81   | 11.51 | 8.33   | 8.95  | 5.00   | 87.93   |
| 1989     | 3      | 22.71                            | 8.48   | 3.18   | 4.04  | 7.43  | 3.72  | 24.10  | 10.10  | 14.48 | 2.93   | 5.61  | 3.61   | 110.39  |
| 1990     | 3      | 7.13                             | 6.23   | 6.22   | 6.33  | 6.08  | 3.42  | 2.09   | 7.58   | 8.52  | 6.91   | 2.57  | 5.56   | 68.63   |
| 1991     | 3      | 21.63                            | 3.04   | 3.68   | 2.78  | 5.97  | 7.00  | 5.61   | 11.42  | 11.26 | 9.97   | 4.11  | 9.16   | 95.63   |
| 1992     | 3      | 25.61                            | 7.42   | .41    | 5.28  | 9.14  | 3.72  | 27.32  | 14.07  | 7.49  | 9.68   | 6.27  | 7.50   | 123.93  |
| 1993     | 3      | 1.50                             | 4.35   | 14.49  | 5.00  | 9.75  | 8.53  | 13.35  | 6.22   | 9.97  | 6.31   | 12.16 | 2.47   | 94.10   |
| 1994     | 3      | 8.38                             | 1.88   | 22.87  | 7.00  | 8.23  | 14.16 | 13.69  | 15.89  | 5.98  | 7.18   | 7.92  | 7.81   | 120.98  |
| 1995     | 3      | 5.58                             | 13.99  | 17.52+ | 3.96+ | 3.55+ | 8.12+ | 1.66+  | 4.10+  | 3.00+ | 13.96+ | 2.20+ | 7.37+  | 85.01   |
| 1996     | 2      | 24.40                            | 19.74  | 7.30   | 2.74  | 6.30  | 10.39 | 8.55   | 17.78  | 10.73 | 9.78   | 11.67 | 2.85   | 132.26  |
| 1997     | 2      | 11.40                            | 9.41   | 1.19   | 11.82 | 5.18  | 14.98 | 26.28  | 12.65  | 5.21  | 8.39   | 4.15  | 3.00   | 113.67  |
| 1998     | 2      | 1.44                             | 17.29  | 10.35  | 6.78  | 10.34 | 6.17  | 13.20  | 8.50   | 2.80  | 5.92   | 6.76  | 7.31+  | 96.86   |
| average  |        | 9.41                             | 8.79   | 5.12   | 5.28  | 6.73  | 8.09  | 10.59  | 9.48   | 8.05  | 9.24   | 10.75 | 8.15   | 99.68   |
| adjusted |        | 9.44                             | 8.82   | 5.13   | 5.29  | 6.76  | 8.12  | 10.63  | 9.51   | 8.07  | 9.27   | 10.78 | 8.17   | 100.001 |

## Appendix B11.3

File : AT.DEM  
Units : 10^6xm^3  
Descrip. : Upland alien demand (tall trees) in IFR Site 4 sub-catchment for 1927 to 1998

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1927  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1928  | 0.00 | 0.04 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.1   |
| 1929  | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1930  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.01 | 0.00 | 0.02 | 0.01 | 0.00 | 0.1   |
| 1931  | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 0.1   |
| 1932  | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1933  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.0   |
| 1934  | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1935  | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.0   |
| 1936  | 0.00 | 0.05 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1937  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1938  | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.1   |
| 1939  | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1940  | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1941  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1942  | 0.00 | 0.00 | 0.01 | 0.04 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1943  | 0.01 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.1   |
| 1944  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1945  | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1946  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1947  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1948  | 0.06 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1949  | 0.00 | 0.05 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1950  | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1951  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.04 | 0.1   |
| 1952  | 0.01 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.01 | 0.1   |
| 1953  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.01 | 0.01 | 0.04 | 0.02 | 0.1   |
| 1954  | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1955  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.1   |
| 1956  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.03 | 0.01 | 0.02 | 0.01 | 0.1   |
| 1957  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.05 | 0.02 | 0.00 | 0.01 | 0.01 | 0.1   |
| 1958  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.02 | 0.00 | 0.04 | 0.03 | 0.01 | 0.1   |
| 1959  | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1960  | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.1   |
| 1961  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.09 | 0.04 | 0.2   |
| 1962  | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1963  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.1   |
| 1964  | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.0   |
| 1965  | 0.02 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.02 | 0.1   |
| 1966  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.09 | 0.04 | 0.01 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1967  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1968  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1969  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1970  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.01 | 0.00 | 0.04 | 0.03 | 0.01 | 0.1   |
| 1971  | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.1   |
| 1972  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1973  | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.01 | 0.01 | 0.00 | 0.03 | 0.01 | 0.1   |
| 1974  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.0   |
| 1975  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.1   |
| 1976  | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.04 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1977  | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.0   |
| 1978  | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.1   |
| 1979  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1980  | 0.00 | 0.01 | 0.01 | 0.04 | 0.01 | 0.01 | 0.05 | 0.02 | 0.00 | 0.01 | 0.01 | 0.01 | 0.2   |
| 1981  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 0.02 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1982  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1983  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1984  | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.03 | 0.01 | 0.00 | 0.1   |
| 1985  | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.03 | 0.1   |
| 1986  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.1   |
| 1987  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1988  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1989  | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.1   |
| 1990  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1991  | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.0   |
| 1992  | 0.03 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1993  | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.0   |
| 1994  | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1995  | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.0   |
| 1996  | 0.03 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.1   |
| 1997  | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.04 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.1   |
| 1998  | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |
| AVE : | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.1   |
| SD :  | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | 0.0   |

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File      : AS.DEM
Units     : 10^6xm^3
Descrip.  : Upland alien demand (tall shrubs) in IFR Site 4 sub-catchment for 1927 to 1998
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[illegible]

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File      : 58-RIP.DEM
Units     : 10^6xm^3
Descrip.  : Riparian alien demand (tall trees) in IFR Site 4 sub-catchment for 1927 to 1998
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[illegible]

## Appendix B11.6

File : 58IRR.DEM  
Units : 10^6xm^3  
Descrip. : Irrigation from farm dams in IFR Site 4 sub-catchment for 1927 to 1998

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1927  | 4.21 | 5.79 | 7.85 | 8.50 | 6.54 | 4.61 | 3.97 | 1.64 | 0.72 | 0.81 | 0.74 | 1.51 | 46.9  |
| 1928  | 4.27 | 3.70 | 7.64 | 8.61 | 6.32 | 4.80 | 3.92 | 1.03 | 0.70 | 0.00 | 0.43 | 2.05 | 43.5  |
| 1929  | 3.91 | 6.07 | 7.72 | 8.48 | 5.95 | 4.66 | 3.53 | 1.07 | 0.69 | 0.81 | 0.11 | 1.87 | 44.9  |
| 1930  | 3.75 | 5.67 | 7.92 | 8.46 | 6.46 | 4.72 | 2.19 | 1.62 | 1.02 | 0.00 | 0.71 | 1.95 | 44.5  |
| 1931  | 2.66 | 5.74 | 7.40 | 8.43 | 6.17 | 4.98 | 3.89 | 1.15 | 0.31 | 0.17 | 1.30 | 0.00 | 42.2  |
| 1932  | 4.11 | 5.25 | 7.80 | 8.57 | 6.41 | 4.78 | 3.74 | 1.03 | 0.39 | 0.61 | 0.12 | 2.32 | 45.2  |
| 1933  | 4.21 | 5.47 | 7.86 | 8.18 | 6.42 | 4.79 | 3.99 | 1.42 | 0.83 | 0.00 | 0.00 | 1.71 | 44.9  |
| 1934  | 2.81 | 5.23 | 7.93 | 8.52 | 6.28 | 4.96 | 3.34 | 0.50 | 0.24 | 0.70 | 1.05 | 1.62 | 43.2  |
| 1935  | 4.10 | 5.13 | 7.74 | 8.53 | 6.45 | 4.97 | 3.93 | 0.79 | 0.77 | 0.00 | 0.94 | 1.36 | 44.7  |
| 1936  | 3.79 | 3.46 | 7.46 | 8.58 | 6.47 | 4.79 | 3.90 | 1.69 | 0.68 | 0.23 | 1.38 | 1.65 | 44.1  |
| 1937  | 4.09 | 5.40 | 7.57 | 8.49 | 6.55 | 4.58 | 3.14 | 0.97 | 0.44 | 0.23 | 0.62 | 1.73 | 43.8  |
| 1938  | 3.91 | 5.17 | 7.77 | 8.51 | 6.01 | 4.46 | 3.43 | 1.51 | 1.01 | 0.09 | 0.00 | 1.98 | 43.9  |
| 1939  | 4.24 | 5.80 | 7.86 | 8.44 | 5.88 | 4.88 | 3.16 | 1.35 | 0.43 | 0.89 | 1.43 | 1.93 | 46.3  |
| 1940  | 4.01 | 4.73 | 7.91 | 8.24 | 6.51 | 5.00 | 2.53 | 0.84 | 0.00 | 0.14 | 0.50 | 1.76 | 42.2  |
| 1941  | 3.12 | 5.73 | 7.78 | 8.30 | 6.51 | 4.87 | 3.81 | 0.84 | 0.24 | 0.86 | 0.88 | 2.07 | 45.0  |
| 1942  | 3.58 | 6.04 | 7.36 | 7.72 | 6.41 | 4.78 | 3.41 | 1.29 | 0.63 | 0.54 | 0.59 | 1.07 | 43.4  |
| 1943  | 4.11 | 4.41 | 7.87 | 8.57 | 6.50 | 4.78 | 3.54 | 0.38 | 0.00 | 0.54 | 0.28 | 0.98 | 42.0  |
| 1944  | 3.74 | 5.92 | 7.92 | 8.59 | 6.52 | 5.00 | 3.67 | 0.36 | 0.00 | 0.29 | 0.18 | 1.70 | 43.9  |
| 1945  | 2.57 | 5.58 | 7.90 | 8.56 | 6.41 | 4.23 | 3.87 | 1.38 | 0.67 | 0.51 | 1.13 | 1.98 | 44.8  |
| 1946  | 4.02 | 5.92 | 7.94 | 8.58 | 6.42 | 4.38 | 3.71 | 1.03 | 0.58 | 0.00 | 1.43 | 1.42 | 45.4  |
| 1947  | 3.94 | 5.35 | 7.90 | 8.48 | 6.44 | 4.64 | 3.16 | 1.49 | 0.47 | 0.20 | 1.40 | 1.74 | 45.2  |
| 1948  | 1.52 | 5.78 | 7.85 | 8.45 | 6.51 | 5.03 | 2.81 | 0.99 | 1.04 | 0.52 | 0.86 | 2.11 | 43.5  |
| 1949  | 4.39 | 3.36 | 7.94 | 8.56 | 6.51 | 4.98 | 3.14 | 1.32 | 1.10 | 0.08 | 0.73 | 2.03 | 44.1  |
| 1950  | 3.43 | 4.66 | 7.82 | 7.92 | 6.57 | 4.74 | 3.47 | 1.15 | 0.00 | 0.00 | 0.69 | 1.20 | 41.7  |
| 1951  | 4.03 | 6.09 | 7.88 | 8.44 | 6.37 | 4.94 | 3.72 | 1.32 | 0.49 | 0.49 | 0.00 | 0.36 | 44.1  |
| 1952  | 3.85 | 4.28 | 7.78 | 8.48 | 6.46 | 5.04 | 3.15 | 1.30 | 0.21 | 0.00 | 0.81 | 1.20 | 42.6  |
| 1953  | 3.17 | 4.98 | 7.87 | 8.58 | 6.46 | 4.87 | 3.15 | 0.00 | 0.43 | 0.00 | 0.00 | 2.27 | 41.8  |
| 1954  | 4.33 | 5.45 | 7.89 | 8.27 | 5.84 | 5.04 | 3.76 | 1.45 | 0.18 | 0.00 | 0.09 | 1.60 | 43.9  |
| 1955  | 3.40 | 5.96 | 7.91 | 8.56 | 6.49 | 4.61 | 3.69 | 0.42 | 0.15 | 0.26 | 0.12 | 2.09 | 43.7  |
| 1956  | 3.39 | 6.01 | 7.71 | 8.54 | 6.14 | 4.70 | 3.81 | 0.28 | 0.00 | 0.20 | 0.00 | 1.52 | 42.3  |
| 1957  | 3.47 | 6.17 | 7.89 | 8.61 | 6.44 | 4.61 | 3.38 | 0.00 | 0.59 | 1.16 | 0.00 | 2.26 | 44.6  |
| 1958  | 3.96 | 5.80 | 7.77 | 8.27 | 6.22 | 4.74 | 2.15 | 0.67 | 1.00 | 0.00 | 0.00 | 1.93 | 42.5  |
| 1959  | 2.53 | 5.96 | 7.85 | 8.31 | 6.47 | 4.75 | 3.88 | 0.89 | 0.00 | 0.47 | 1.23 | 1.67 | 44.0  |
| 1960  | 4.25 | 5.68 | 7.50 | 8.13 | 6.50 | 4.79 | 3.45 | 0.51 | 0.70 | 0.32 | 0.01 | 1.70 | 43.5  |
| 1961  | 3.82 | 6.04 | 7.90 | 8.33 | 6.35 | 4.44 | 3.15 | 1.34 | 0.20 | 0.62 | 0.00 | 2.36 | 44.6  |
| 1962  | 3.01 | 5.36 | 7.90 | 8.44 | 6.50 | 4.58 | 3.42 | 0.83 | 0.61 | 0.11 | 0.87 | 2.39 | 44.0  |
| 1963  | 3.61 | 5.57 | 7.69 | 8.22 | 6.25 | 4.40 | 3.71 | 1.43 | 0.00 | 0.77 | 0.47 | 1.43 | 43.6  |
| 1964  | 3.85 | 4.91 | 7.90 | 8.48 | 6.31 | 4.78 | 3.51 | 0.45 | 0.77 | 0.00 | 0.93 | 2.32 | 44.2  |
| 1965  | 2.77 | 4.72 | 7.77 | 8.44 | 6.55 | 4.84 | 3.55 | 0.77 | 0.99 | 0.86 | 0.00 | 1.39 | 42.7  |
| 1966  | 4.36 | 5.89 | 7.89 | 8.55 | 6.27 | 4.64 | 0.85 | 0.44 | 0.05 | 0.26 | 0.52 | 1.44 | 41.2  |
| 1967  | 4.11 | 5.56 | 7.90 | 8.57 | 6.46 | 4.85 | 3.64 | 0.78 | 0.00 | 1.08 | 0.27 | 2.16 | 45.4  |
| 1968  | 4.00 | 5.32 | 7.91 | 8.54 | 6.42 | 4.96 | 3.50 | 1.50 | 0.00 | 0.66 | 0.96 | 1.99 | 45.8  |
| 1969  | 4.07 | 6.08 | 7.91 | 8.32 | 6.25 | 5.04 | 4.13 | 1.37 | 0.54 | 0.24 | 0.27 | 2.22 | 46.4  |
| 1970  | 3.95 | 6.05 | 7.80 | 8.55 | 6.14 | 4.58 | 2.42 | 0.88 | 0.25 | 0.00 | 0.00 | 2.27 | 42.9  |
| 1971  | 4.14 | 4.71 | 7.87 | 8.53 | 6.26 | 4.86 | 2.90 | 0.94 | 0.70 | 0.39 | 0.14 | 1.54 | 43.0  |
| 1972  | 4.41 | 5.60 | 7.85 | 8.52 | 6.55 | 4.93 | 3.65 | 1.11 | 0.31 | 0.61 | 0.67 | 1.97 | 46.2  |
| 1973  | 4.28 | 5.77 | 7.62 | 8.40 | 5.85 | 4.85 | 4.03 | 0.50 | 0.84 | 1.07 | 0.00 | 1.81 | 45.0  |
| 1974  | 3.94 | 5.86 | 7.93 | 8.44 | 6.48 | 4.96 | 3.80 | 0.82 | 0.57 | 0.19 | 0.14 | 1.26 | 44.4  |
| 1975  | 4.19 | 5.68 | 7.90 | 8.52 | 6.29 | 4.64 | 2.79 | 1.11 | 0.00 | 0.09 | 0.62 | 2.01 | 43.8  |
| 1976  | 3.27 | 5.22 | 7.82 | 8.55 | 6.04 | 4.83 | 2.85 | 0.00 | 0.10 | 0.33 | 0.70 | 1.67 | 41.4  |
| 1977  | 4.01 | 5.19 | 7.65 | 8.41 | 6.43 | 4.95 | 3.16 | 1.28 | 0.74 | 0.18 | 0.35 | 1.54 | 43.9  |
| 1978  | 3.85 | 5.74 | 7.66 | 8.40 | 5.71 | 5.04 | 4.03 | 0.90 | 0.48 | 0.18 | 0.32 | 1.76 | 44.1  |
| 1979  | 3.74 | 6.07 | 7.74 | 8.21 | 6.45 | 4.94 | 3.72 | 1.37 | 0.03 | 1.02 | 0.67 | 1.66 | 45.6  |
| 1980  | 3.74 | 4.57 | 7.68 | 7.62 | 6.31 | 4.60 | 1.88 | 0.95 | 0.52 | 0.03 | 0.00 | 1.89 | 39.8  |
| 1981  | 4.11 | 5.63 | 7.60 | 8.52 | 6.37 | 4.63 | 1.60 | 1.65 | 0.04 | 0.39 | 0.58 | 1.20 | 42.3  |
| 1982  | 4.07 | 5.84 | 7.82 | 8.56 | 6.19 | 4.98 | 3.59 | 0.90 | 0.00 | 0.00 | 0.94 | 1.10 | 44.0  |
| 1983  | 4.08 | 5.43 | 7.81 | 8.53 | 6.30 | 4.67 | 3.74 | 0.91 | 0.77 | 0.39 | 1.41 | 2.02 | 46.1  |
| 1984  | 3.69 | 5.81 | 7.74 | 8.16 | 6.24 | 4.89 | 2.73 | 1.54 | 0.09 | 0.00 | 1.19 | 2.30 | 44.4  |
| 1985  | 2.75 | 5.40 | 7.59 | 8.49 | 6.37 | 4.83 | 3.72 | 1.56 | 0.63 | 0.47 | 0.00 | 1.83 | 43.6  |
| 1986  | 3.46 | 5.56 | 7.88 | 8.56 | 6.48 | 4.96 | 2.33 | 1.22 | 0.37 | 0.66 | 0.33 | 1.54 | 43.4  |
| 1987  | 4.39 | 6.19 | 7.73 | 8.60 | 6.46 | 4.79 | 3.17 | 1.26 | 0.27 | 0.67 | 0.53 | 1.74 | 45.8  |
| 1988  | 4.14 | 6.02 | 7.78 | 8.52 | 6.46 | 4.60 | 2.45 | 1.49 | 0.06 | 0.34 | 0.55 | 2.02 | 44.4  |
| 1989  | 2.56 | 5.46 | 7.84 | 8.47 | 6.32 | 4.93 | 2.25 | 0.91 | 0.00 | 0.88 | 0.90 | 2.14 | 42.7  |
| 1990  | 3.89 | 5.65 | 7.74 | 8.39 | 6.36 | 4.94 | 3.97 | 1.09 | 0.32 | 0.47 | 1.26 | 1.98 | 46.1  |
| 1991  | 2.65 | 5.93 | 7.82 | 8.51 | 6.36 | 4.82 | 3.67 | 0.83 | 0.08 | 0.19 | 1.08 | 1.67 | 43.6  |
| 1992  | 2.31 | 5.55 | 7.93 | 8.43 | 6.26 | 4.93 | 2.04 | 0.66 | 0.41 | 0.22 | 0.82 | 1.81 | 41.4  |
| 1993  | 4.37 | 5.82 | 7.45 | 8.44 | 6.24 | 4.77 | 3.01 | 1.20 | 0.19 | 0.52 | 0.26 | 2.24 | 44.5  |
| 1994  | 3.78 | 6.03 | 7.17 | 8.37 | 6.29 | 4.58 | 2.98 | 0.55 | 0.55 | 0.44 | 0.64 | 1.78 | 43.1  |
| 1995  | 4.02 | 4.99 | 7.35 | 8.47 | 6.45 | 4.78 | 4.00 | 1.38 | 0.87 | 0.00 | 1.31 | 1.82 | 45.5  |
| 1996  | 2.42 | 4.50 | 7.70 | 8.51 | 6.35 | 4.71 | 3.42 | 0.43 | 0.13 | 0.21 | 0.30 | 2.21 | 40.9  |
| 1997  | 3.52 | 5.38 | 7.91 | 8.20 | 6.39 | 4.55 | 2.11 | 0.75 | 0.62 | 0.33 | 1.08 | 2.19 | 43.0  |
| 1998  | 4.37 | 4.71 | 7.60 | 8.38 | 6.21 | 4.85 | 3.02 | 1.01 | 0.89 | 0.55 | 0.77 | 1.83 | 44.2  |
| AVE : | 3.70 | 5.44 | 7.77 | 8.43 | 6.34 | 4.78 | 3.28 | 1.00 | 0.43 | 0.37 | 0.58 | 1.76 | 43.9  |
| SD :  | 0.61 | 0.62 | 0.16 | 0.19 | 0.18 | 0.18 | 0.66 | 0.42 | 0.33 | 0.32 | 0.46 | 0.43 | 1.4   |



## Appendix B11.7

File : H7R1-CUR.SPL  
Units : 10^6xm^3  
Descrip. : Current-day spills/releases from Buffeljags Dam for 1927 to 1990

| Year  | Oct   | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul   | Aug   | Sep   | Total |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1927  | 0.00  | 0.67  | 0.87  | 0.37  | 0.00  | 2.63  | 0.49  | 0.00  | 1.42  | 1.02  | 1.24  | 5.01  | 13.7  |
| 1928  | 1.88  | 15.44 | 8.70  | 1.03  | 0.04  | 6.04  | 1.65  | 1.10  | 2.27  | 29.53 | 25.72 | 10.31 | 103.7 |
| 1929  | 3.95  | 1.51  | 9.05  | 3.57  | 31.97 | 23.88 | 5.60  | 4.54  | 3.15  | 3.66  | 17.28 | 11.96 | 120.1 |
| 1930  | 11.12 | 4.97  | 1.95  | 4.06  | 2.46  | 12.15 | 29.92 | 9.80  | 2.40  | 9.04  | 8.79  | 7.31  | 164.0 |
| 1931  | 16.23 | 6.06  | 54.99 | 16.45 | 1.66  | 1.59  | 0.00  | 0.49  | 1.43  | 6.42  | 3.71  | 53.08 | 162.1 |
| 1932  | 20.24 | 7.02  | 1.96  | 0.12  | 1.89  | 0.86  | 0.00  | 1.81  | 1.19  | 1.30  | 14.89 | 8.46  | 59.7  |
| 1933  | 0.56  | 15.06 | 3.35  | 2.85  | 5.68  | 7.33  | 1.39  | 0.17  | 0.45  | 6.43  | 6.11  | 5.19  | 54.6  |
| 1934  | 74.20 | 45.38 | 5.98  | 0.33  | 3.33  | 2.04  | 3.85  | 12.48 | 11.30 | 6.30  | 4.30  | 7.08  | 176.6 |
| 1935  | 4.24  | 12.98 | 3.59  | 0.42  | 1.29  | 0.53  | 0.00  | 2.46  | 0.85  | 2.25  | 0.84  | 11.48 | 40.9  |
| 1936  | 5.04  | 49.08 | 25.44 | 2.76  | 0.53  | 12.36 | 4.54  | 0.18  | 1.47  | 4.78  | 1.96  | 5.16  | 113.3 |
| 1937  | 1.22  | 10.32 | 12.92 | 3.92  | 0.41  | 2.53  | 4.76  | 2.68  | 2.80  | 3.35  | 3.09  | 4.77  | 52.8  |
| 1938  | 4.49  | 17.23 | 7.20  | 1.16  | 8.80  | 23.78 | 7.48  | 0.75  | 0.68  | 5.86  | 26.04 | 11.62 | 115.1 |
| 1939  | 3.18  | 2.39  | 0.84  | 0.24  | 36.66 | 15.25 | 6.44  | 2.87  | 2.32  | 2.70  | 0.97  | 8.78  | 82.6  |
| 1940  | 2.25  | 14.54 | 3.13  | 0.17  | 0.18  | 0.06  | 9.84  | 8.67  | 11.57 | 7.75  | 4.46  | 4.73  | 67.4  |
| 1941  | 14.73 | 8.55  | 2.56  | 7.47  | 2.25  | 0.62  | 0.43  | 11.74 | 8.54  | 4.01  | 2.58  | 2.97  | 66.4  |
| 1942  | 9.15  | 5.67  | 6.78  | 22.42 | 7.66  | 2.85  | 3.73  | 1.80  | 1.16  | 1.30  | 1.89  | 16.15 | 80.6  |
| 1943  | 6.42  | 21.45 | 5.34  | 0.11  | 0.00  | 5.06  | 1.60  | 21.23 | 11.50 | 6.62  | 10.29 | 20.86 | 110.5 |
| 1944  | 12.71 | 4.64  | 0.66  | 0.00  | 0.00  | 0.00  | 0.00  | 9.76  | 11.64 | 9.19  | 12.73 | 11.06 | 72.4  |
| 1945  | 23.95 | 9.35  | 0.97  | 0.22  | 0.66  | 18.21 | 7.74  | 0.28  | 1.01  | 2.22  | 1.51  | 2.07  | 68.2  |
| 1946  | 1.07  | 0.78  | 0.10  | 0.00  | 0.21  | 11.96 | 7.75  | 3.88  | 3.73  | 15.88 | 7.20  | 21.74 | 74.3  |
| 1947  | 14.46 | 9.56  | 2.12  | 2.26  | 0.81  | 3.51  | 4.84  | 1.90  | 1.54  | 2.57  | 1.00  | 3.10  | 47.7  |
| 1948  | 56.57 | 19.60 | 0.69  | 0.58  | 0.10  | 0.00  | 0.83  | 0.44  | 0.00  | 0.66  | 0.14  | 1.21  | 80.8  |
| 1949  | 0.31  | 22.71 | 7.08  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 6.28  | 3.15  | 1.89  | 41.4  |
| 1950  | 8.17  | 24.35 | 6.36  | 20.81 | 5.87  | 2.29  | 0.92  | 1.00  | 4.24  | 12.51 | 7.63  | 11.06 | 105.2 |
| 1951  | 4.43  | 1.20  | 0.27  | 0.97  | 0.86  | 0.05  | 0.00  | 0.00  | 0.00  | 0.00  | 2.73  | 12.85 | 23.4  |
| 1952  | 6.58  | 14.61 | 3.96  | 0.58  | 0.46  | 0.00  | 3.12  | 0.85  | 0.67  | 11.66 | 7.54  | 12.69 | 62.7  |
| 1953  | 22.57 | 16.38 | 2.87  | 0.23  | 0.00  | 0.56  | 4.34  | 9.33  | 7.15  | 7.57  | 41.39 | 17.88 | 130.3 |
| 1954  | 2.80  | 2.55  | 0.86  | 3.88  | 20.52 | 6.89  | 0.00  | 0.01  | 2.25  | 9.95  | 9.64  | 8.48  | 67.8  |
| 1955  | 6.28  | 2.59  | 0.64  | 0.60  | 0.30  | 3.48  | 1.76  | 8.18  | 7.52  | 4.57  | 5.81  | 5.01  | 46.7  |
| 1956  | 13.51 | 4.38  | 6.66  | 1.88  | 5.94  | 5.11  | 0.72  | 11.79 | 18.58 | 9.54  | 17.16 | 17.72 | 113.0 |
| 1957  | 13.28 | 4.96  | 0.99  | 0.07  | 0.02  | 6.81  | 3.09  | 51.43 | 20.55 | 3.90  | 18.05 | 8.37  | 131.5 |
| 1958  | 5.73  | 3.66  | 1.42  | 4.99  | 9.21  | 8.40  | 21.87 | 14.16 | 4.89  | 25.77 | 31.69 | 14.70 | 146.5 |
| 1959  | 14.61 | 5.27  | 1.08  | 2.10  | 0.78  | 3.19  | 1.53  | 3.37  | 3.89  | 4.81  | 3.37  | 6.00  | 50.0  |
| 1960  | 2.76  | 5.35  | 5.29  | 5.26  | 2.10  | 1.43  | 2.62  | 6.50  | 3.93  | 5.42  | 16.88 | 12.57 | 70.1  |
| 1961  | 8.07  | 4.62  | 1.21  | 1.01  | 3.29  | 4.36  | 5.80  | 3.35  | 3.33  | 3.70  | 77.71 | 28.74 | 145.2 |
| 1962  | 17.88 | 17.63 | 3.05  | 2.34  | 0.79  | 42.38 | 21.41 | 25.26 | 10.92 | 11.32 | 7.35  | 4.41  | 164.7 |
| 1963  | 10.10 | 5.36  | 2.12  | 4.49  | 1.90  | 5.30  | 1.79  | 0.07  | 19.28 | 8.28  | 8.67  | 14.06 | 81.4  |
| 1964  | 7.18  | 10.64 | 2.53  | 0.76  | 2.16  | 1.80  | 2.69  | 10.05 | 6.16  | 5.11  | 4.23  | 3.29  | 56.6  |
| 1965  | 26.86 | 22.01 | 5.44  | 7.23  | 2.10  | 0.32  | 0.69  | 3.80  | 2.72  | 1.92  | 21.74 | 18.40 | 113.2 |
| 1966  | 4.96  | 0.96  | 1.01  | 0.10  | 3.17  | 7.16  | 68.78 | 34.42 | 13.36 | 10.84 | 10.67 | 12.13 | 167.6 |
| 1967  | 6.15  | 6.23  | 1.72  | 0.03  | 0.00  | 0.30  | 0.60  | 6.48  | 12.17 | 6.43  | 11.43 | 7.87  | 59.4  |
| 1968  | 3.59  | 10.19 | 2.37  | 0.15  | 1.41  | 0.85  | 0.25  | 0.00  | 5.66  | 3.33  | 2.74  | 4.43  | 35.0  |
| 1969  | 2.38  | 0.94  | 0.15  | 1.52  | 5.48  | 1.48  | 0.00  | 0.00  | 0.00  | 0.55  | 11.14 | 6.71  | 30.4  |
| 1970  | 3.39  | 1.06  | 0.57  | 0.00  | 5.91  | 5.20  | 12.42 | 13.52 | 6.17  | 28.28 | 31.54 | 12.61 | 120.7 |
| 1971  | 3.64  | 13.04 | 3.10  | 0.36  | 7.44  | 4.88  | 3.23  | 11.22 | 5.44  | 4.49  | 13.35 | 9.17  | 79.4  |
| 1972  | 2.54  | 5.04  | 1.74  | 0.26  | 0.00  | 0.42  | 1.42  | 1.09  | 2.44  | 2.46  | 1.75  | 2.39  | 21.6  |
| 1973  | 1.23  | 3.38  | 1.83  | 3.51  | 12.85 | 7.27  | 0.64  | 20.90 | 8.92  | 2.59  | 40.92 | 17.10 | 121.1 |
| 1974  | 2.48  | 1.47  | 0.41  | 1.44  | 0.38  | 0.97  | 0.00  | 3.15  | 4.29  | 5.73  | 10.05 | 11.37 | 41.7  |
| 1975  | 4.33  | 3.70  | 1.81  | 1.06  | 3.67  | 5.55  | 6.43  | 7.33  | 11.92 | 9.60  | 6.95  | 6.87  | 69.2  |
| 1976  | 16.69 | 16.99 | 4.09  | 0.66  | 23.50 | 10.37 | 5.74  | 51.05 | 21.61 | 6.29  | 6.13  | 9.53  | 172.7 |
| 1977  | 6.93  | 9.65  | 4.10  | 1.00  | 0.12  | 0.04  | 8.64  | 6.02  | 1.51  | 7.19  | 11.67 | 8.67  | 65.5  |
| 1978  | 7.27  | 2.73  | 7.23  | 2.26  | 9.46  | 2.77  | 0.00  | 9.39  | 4.87  | 10.40 | 14.10 | 13.42 | 83.9  |
| 1979  | 7.48  | 3.03  | 1.97  | 3.91  | 1.55  | 0.23  | 0.99  | 0.31  | 2.17  | 1.55  | 2.83  | 7.76  | 33.8  |
| 1980  | 6.19  | 17.89 | 7.90  | 58.30 | 23.61 | 16.93 | 27.85 | 15.64 | 6.35  | 8.09  | 25.32 | 13.73 | 227.8 |
| 1981  | 4.53  | 2.54  | 5.50  | 1.89  | 1.57  | 7.78  | 65.89 | 22.32 | 5.00  | 9.99  | 8.27  | 19.74 | 155.0 |
| 1982  | 11.95 | 4.31  | 1.36  | 0.19  | 1.63  | 0.40  | 0.00  | 0.88  | 3.89  | 11.85 | 7.22  | 38.20 | 81.9  |
| 1983  | 15.18 | 8.46  | 2.60  | 0.60  | 2.10  | 7.17  | 2.53  | 1.64  | 1.53  | 5.15  | 2.52  | 1.71  | 51.2  |
| 1984  | 5.47  | 1.68  | 2.51  | 8.76  | 9.22  | 1.81  | 10.87 | 4.71  | 4.06  | 21.12 | 8.99  | 3.53  | 82.7  |
| 1985  | 28.99 | 15.45 | 10.97 | 2.79  | 1.82  | 2.72  | 0.77  | 0.21  | 0.52  | 1.81  | 53.21 | 21.47 | 140.7 |
| 1986  | 17.75 | 9.11  | 1.80  | 0.39  | 0.03  | 0.20  | 15.73 | 8.65  | 2.96  | 4.32  | 7.71  | 9.21  | 77.9  |
| 1987  | 3.47  | 0.97  | 2.41  | 0.49  | 0.12  | 3.44  | 12.78 | 8.06  | 5.49  | 5.63  | 7.73  | 7.02  | 57.6  |
| 1988  | 4.26  | 1.79  | 2.67  | 0.81  | 0.56  | 4.08  | 31.48 | 12.06 | 3.70  | 8.24  | 8.83  | 6.10  | 84.6  |
| 1989  | 36.03 | 27.30 | 4.94  | 0.76  | 3.69  | 2.45  | 28.49 | 12.71 | 11.53 | 6.53  | 3.65  | 3.71  | 141.8 |
| 1990  | 6.08  | 3.25  | 3.07  | 4.13  | 2.81  | 0.81  | 0.00  | 0.60  | 0.82  | 3.40  | 1.47  | 2.87  | 29.3  |
| AVE : | 10.50 | 9.71  | 4.51  | 3.49  | 4.45  | 5.33  | 7.51  | 7.82  | 5.39  | 7.05  | 11.74 | 10.77 | 88.3  |
| SD :  | 12.57 | 9.67  | 7.51  | 8.22  | 7.49  | 7.24  | 13.37 | 10.62 | 5.29  | 6.07  | 13.66 | 8.69  | 45.3  |

## Appendix B11.8

File : 58CUMCUR.SIM

Units : 10^6xm^3

Descrip. : Simulated Current-day flows at IFR-Site 4 for 1927 to 1998

| Year  | Oct    | Nov    | Dec   | Jan    | Feb    | Mar   | Apr    | May    | Jun    | Jul    | Aug     | Sep    | Total  |
|-------|--------|--------|-------|--------|--------|-------|--------|--------|--------|--------|---------|--------|--------|
| 1927  | 6.72   | 21.00  | 9.52  | 5.26   | 2.84   | 33.36 | 8.92   | 0.26   | 128.65 | 29.56  | 56.42   | 68.80  | 371.3  |
| 1928  | 23.61  | 69.83  | 28.24 | 8.83   | 3.78   | 14.81 | 19.20  | 21.76  | 39.67  | 187.21 | 181.74  | 54.46  | 653.1  |
| 1929  | 24.48  | 11.15  | 22.44 | 14.53  | 62.91  | 43.04 | 10.38  | 6.43   | 4.66   | 16.73  | 90.03   | 144.07 | 450.9  |
| 1930  | 62.48  | 19.41  | 12.29 | 11.85  | 5.83   | 14.21 | 141.66 | 94.16  | 24.41  | 124.65 | 265.25  | 113.97 | 890.2  |
| 1931  | 149.19 | 37.03  | 84.78 | 30.36  | 78.62  | 11.91 | 3.62   | 31.60  | 54.59  | 85.91  | 57.42   | 273.60 | 898.6  |
| 1932  | 104.56 | 18.15  | 12.64 | 7.43   | 4.60   | 4.01  | 2.79   | 6.27   | 143.90 | 269.93 | 176.46  | 65.18  | 815.9  |
| 1933  | 30.58  | 25.57  | 13.45 | 12.26  | 9.74   | 11.49 | 4.08   | 3.78   | 23.03  | 44.68  | 95.44   | 103.01 | 377.1  |
| 1934  | 221.49 | 96.42  | 18.84 | 8.98   | 6.11   | 4.71  | 18.37  | 57.03  | 59.26  | 104.48 | 105.69  | 70.77  | 772.2  |
| 1935  | 29.86  | 27.07  | 13.52 | 9.27   | 4.32   | 2.64  | 1.59   | 6.53   | 8.63   | 49.80  | 111.52  | 105.41 | 370.2  |
| 1936  | 44.73  | 191.66 | 84.25 | 16.23  | 5.90   | 27.57 | 13.85  | 19.87  | 145.52 | 251.15 | 80.31   | 48.80  | 929.8  |
| 1937  | 23.96  | 18.55  | 24.28 | 19.34  | 4.20   | 14.00 | 33.17  | 73.58  | 32.91  | 53.27  | 75.07   | 79.41  | 451.7  |
| 1938  | 42.63  | 28.64  | 16.45 | 8.64   | 41.28  | 40.83 | 15.37  | 42.34  | 15.10  | 34.04  | 220.94  | 97.26  | 603.5  |
| 1939  | 24.12  | 10.75  | 9.55  | 3.64   | 44.59  | 26.44 | 35.17  | 12.71  | 64.75  | 55.29  | 37.31   | 40.62  | 364.9  |
| 1940  | 20.18  | 57.14  | 14.92 | 8.53   | 2.70   | 1.76  | 81.15  | 240.78 | 373.27 | 193.14 | 189.63  | 379.67 | 1562.9 |
| 1941  | 133.03 | 34.61  | 14.32 | 18.21  | 6.06   | 3.70  | 2.72   | 106.95 | 502.71 | 94.87  | 127.62  | 39.25  | 1084.1 |
| 1942  | 43.94  | 16.30  | 29.08 | 75.44  | 24.29  | 16.09 | 16.15  | 11.27  | 45.35  | 130.21 | 201.84  | 174.31 | 784.3  |
| 1943  | 64.50  | 101.20 | 28.07 | 10.58  | 3.38   | 7.71  | 6.01   | 92.16  | 282.67 | 100.99 | 208.27  | 176.72 | 1082.2 |
| 1944  | 79.92  | 21.83  | 11.64 | 7.88   | 2.77   | 2.35  | 4.49   | 243.01 | 410.55 | 650.88 | 452.81  | 82.66  | 1970.8 |
| 1945  | 213.17 | 67.29  | 12.67 | 9.34   | 3.58   | 52.78 | 23.56  | 7.00   | 8.53   | 22.51  | 50.08   | 155.50 | 626.0  |
| 1946  | 57.75  | 10.68  | 8.49  | 4.22   | 2.89   | 53.96 | 20.77  | 11.98  | 12.32  | 192.93 | 89.90   | 59.62  | 525.5  |
| 1947  | 47.31  | 20.60  | 12.21 | 8.99   | 3.72   | 21.68 | 13.76  | 39.69  | 35.03  | 123.23 | 47.47   | 173.90 | 547.6  |
| 1948  | 284.08 | 76.27  | 11.54 | 8.66   | 3.09   | 2.43  | 13.54  | 1.95   | 28.46  | 60.79  | 92.64   | 75.10  | 658.6  |
| 1949  | 68.65  | 287.03 | 72.87 | 9.88   | 4.79   | 2.42  | 46.17  | 0.24   | 0.85   | 200.60 | 48.73   | 101.74 | 844.0  |
| 1950  | 58.82  | 106.81 | 26.98 | 68.80  | 19.33  | 7.00  | 34.34  | 7.22   | 200.28 | 147.56 | 84.86   | 110.17 | 872.2  |
| 1951  | 55.77  | 28.86  | 10.49 | 7.72   | 4.38   | 3.04  | 2.99   | 66.95  | 41.70  | 118.33 | 343.75  | 236.25 | 920.2  |
| 1952  | 69.16  | 205.55 | 42.89 | 12.09  | 5.47   | 2.65  | 181.26 | 135.83 | 41.25  | 224.24 | 128.72  | 54.00  | 1103.1 |
| 1953  | 53.67  | 37.30  | 14.30 | 8.75   | 3.00   | 4.16  | 31.98  | 325.81 | 189.66 | 637.89 | 643.42  | 160.01 | 2109.9 |
| 1954  | 51.66  | 14.78  | 13.50 | 14.90  | 177.66 | 51.64 | 5.57   | 0.22   | 69.54  | 251.21 | 719.08  | 119.49 | 1489.2 |
| 1955  | 117.98 | 30.41  | 12.00 | 9.97   | 3.65   | 7.83  | 4.99   | 40.51  | 142.80 | 160.02 | 228.85  | 54.11  | 813.1  |
| 1956  | 51.93  | 14.39  | 18.42 | 11.08  | 44.68  | 14.24 | 6.37   | 256.43 | 589.83 | 636.09 | 503.35  | 165.80 | 2312.6 |
| 1957  | 264.12 | 46.75  | 13.18 | 9.77   | 6.74   | 14.57 | 8.72   | 260.06 | 127.96 | 33.05  | 142.25  | 56.43  | 983.6  |
| 1958  | 42.43  | 14.97  | 10.82 | 12.58  | 13.48  | 12.17 | 130.10 | 429.92 | 68.18  | 126.45 | 222.53  | 79.27  | 1162.9 |
| 1959  | 130.20 | 24.20  | 11.96 | 9.88   | 3.75   | 6.42  | 5.97   | 42.07  | 122.40 | 43.60  | 33.55   | 28.22  | 462.2  |
| 1960  | 16.46  | 12.25  | 15.00 | 14.32  | 6.63   | 4.49  | 6.34   | 16.33  | 43.68  | 56.30  | 123.29  | 170.82 | 485.9  |
| 1961  | 61.72  | 15.89  | 10.45 | 8.67   | 7.62   | 13.39 | 17.53  | 0.20   | 427.15 | 169.19 | 1038.27 | 274.65 | 2044.7 |
| 1962  | 324.48 | 142.86 | 31.99 | 14.36  | 5.69   | 41.52 | 22.24  | 45.01  | 48.81  | 93.65  | 302.06  | 68.31  | 1141.0 |
| 1963  | 41.49  | 25.28  | 16.53 | 14.30  | 15.28  | 25.03 | 12.68  | 3.67   | 190.95 | 121.38 | 217.42  | 78.39  | 762.4  |
| 1964  | 59.10  | 68.27  | 20.16 | 12.53  | 7.31   | 21.46 | 22.47  | 54.77  | 38.73  | 57.85  | 85.76   | 40.55  | 489.0  |
| 1965  | 95.91  | 55.12  | 19.48 | 15.97  | 5.87   | 5.08  | 4.58   | 0.08   | 45.42  | 148.46 | 212.69  | 114.92 | 723.6  |
| 1966  | 33.21  | 8.73   | 9.92  | 5.71   | 5.82   | 9.82  | 258.07 | 150.81 | 264.27 | 90.96  | 84.09   | 60.75  | 982.2  |
| 1967  | 73.17  | 23.95  | 13.11 | 10.22  | 2.98   | 2.97  | 13.15  | 114.21 | 145.88 | 201.51 | 188.36  | 52.58  | 842.1  |
| 1968  | 163.10 | 37.90  | 13.83 | 12.53  | 5.22   | 4.10  | 23.79  | 14.91  | 33.96  | 40.22  | 54.82   | 74.27  | 478.6  |
| 1969  | 92.30  | 12.14  | 8.82  | 6.28   | 9.61   | 4.41  | 0.75   | 10.36  | 100.51 | 112.30 | 210.12  | 94.83  | 662.4  |
| 1970  | 43.06  | 13.63  | 12.45 | 5.32   | 9.34   | 10.67 | 28.16  | 29.39  | 31.04  | 222.08 | 277.76  | 76.38  | 759.3  |
| 1971  | 21.43  | 33.74  | 14.40 | 8.93   | 9.89   | 7.07  | 8.46   | 34.93  | 47.78  | 38.05  | 91.23   | 66.37  | 382.3  |
| 1972  | 23.21  | 11.58  | 9.51  | 4.49   | 1.94   | 2.65  | 3.24   | 0.15   | 0.01   | 183.57 | 76.76   | 44.34  | 361.5  |
| 1973  | 33.70  | 12.96  | 16.15 | 8.37   | 26.81  | 13.98 | 3.26   | 46.70  | 110.38 | 51.12  | 1505.14 | 269.82 | 2098.4 |
| 1974  | 99.91  | 26.49  | 13.67 | 12.86  | 3.73   | 3.63  | 14.45  | 126.36 | 67.74  | 141.08 | 175.02  | 76.49  | 761.4  |
| 1975  | 51.80  | 17.66  | 11.51 | 7.27   | 6.10   | 13.67 | 14.91  | 11.92  | 413.30 | 232.05 | 98.36   | 49.94  | 928.5  |
| 1976  | 78.36  | 201.91 | 53.35 | 28.03  | 38.27  | 18.73 | 100.26 | 571.82 | 528.88 | 875.60 | 940.89  | 140.97 | 3583.1 |
| 1977  | 57.12  | 27.99  | 22.35 | 13.08  | 4.06   | 3.50  | 24.91  | 35.21  | 12.48  | 25.75  | 120.60  | 95.26  | 442.3  |
| 1978  | 56.12  | 16.23  | 18.32 | 10.80  | 43.80  | 17.63 | 2.75   | 32.32  | 105.41 | 67.52  | 115.75  | 87.67  | 574.3  |
| 1979  | 106.84 | 16.69  | 11.30 | 13.28  | 4.86   | 2.98  | 13.54  | 26.71  | 36.71  | 37.51  | 50.59   | 41.14  | 362.2  |
| 1980  | 36.11  | 139.70 | 41.51 | 366.45 | 75.56  | 31.32 | 65.91  | 35.07  | 28.98  | 144.02 | 268.41  | 260.97 | 1494.0 |
| 1981  | 62.60  | 17.98  | 18.12 | 14.62  | 4.59   | 12.21 | 349.23 | 152.28 | 73.75  | 67.00  | 81.51   | 86.54  | 940.4  |
| 1982  | 54.42  | 14.60  | 14.98 | 5.71   | 5.11   | 3.50  | 1.64   | 115.11 | 233.94 | 431.95 | 151.25  | 200.35 | 1232.6 |
| 1983  | 66.52  | 20.42  | 13.50 | 7.95   | 5.20   | 52.52 | 10.36  | 349.76 | 77.33  | 203.95 | 93.14   | 372.49 | 1273.1 |
| 1984  | 174.24 | 43.82  | 22.17 | 31.26  | 20.89  | 53.47 | 35.92  | 42.62  | 162.75 | 360.55 | 378.96  | 90.79  | 1417.4 |
| 1985  | 119.43 | 92.92  | 26.45 | 14.34  | 6.11   | 9.17  | 23.52  | 47.14  | 59.43  | 159.42 | 725.55  | 253.41 | 1536.9 |
| 1986  | 60.43  | 21.23  | 11.85 | 11.68  | 2.88   | 2.73  | 55.50  | 150.62 | 132.26 | 118.83 | 303.61  | 151.96 | 1023.6 |
| 1987  | 46.83  | 9.29   | 16.34 | 6.65   | 2.95   | 6.02  | 40.87  | 56.53  | 94.08  | 79.77  | 108.18  | 172.12 | 639.6  |
| 1988  | 38.08  | 9.84   | 11.72 | 6.15   | 3.51   | 31.00 | 123.88 | 81.78  | 76.28  | 125.66 | 192.45  | 369.81 | 1070.1 |
| 1989  | 166.52 | 89.77  | 16.18 | 10.55  | 9.86   | 6.87  | 172.82 | 116.46 | 166.43 | 318.71 | 164.29  | 39.31  | 1277.8 |
| 1990  | 28.99  | 10.28  | 13.40 | 9.95   | 5.96   | 3.55  | 4.01   | 25.35  | 151.09 | 610.17 | 169.76  | 248.94 | 1281.5 |
| 1991  | 4.64   | 2.76   | 0.71  | 0.00   | 0.00   | 0.00  | 0.00   | 0.08   | 0.00   | 0.00   | 0.16    | 0.24   | 8.6    |
| 1992  | 0.32   | 3.86   | 0.92  | 0.00   | 0.03   | 0.00  | 9.08   | 0.06   | 0.03   | 0.00   | 0.10    | 0.27   | 14.7   |
| 1993  | 0.73   | 0.65   | 1.11  | 0.23   | 0.10   | 0.13  | 0.88   | 0.06   | 0.00   | 0.05   | 0.00    | 0.36   | 4.3    |
| 1994  | 0.03   | 0.07   | 5.84  | 1.87   | 0.00   | 1.09  | 1.35   | 0.04   | 0.06   | 0.04   | 0.07    | 0.27   | 10.7   |
| 1995  | 0.50   | 1.21   | 2.85  | 0.70   | 0.00   | 0.00  | 0.00   | 0.00   | 0.00   | 0.00   | 0.20    | 0.16   | 5.6    |
| 1996  | 0.34   | 6.69   | 2.36  | 0.00   | 0.00   | 0.22  | 0.16   | 0.02   | 0.00   | 0.00   | 0.00    | 0.35   | 10.1   |
| 1997  | 0.56   | 1.31   | 0.00  | 0.36   | 0.04   | 1.31  | 8.80   | 0.08   | 0.07   | 0.02   | 0.16    | 0.35   | 13.1   |
| 1998  | 0.73   | 2.45   | 1.03  | 0.00   | 0.20   | 0.04  | 0.80   | 0.08   | 0.01   | 0.01   | 0.02    | 0.01   | 5.4    |
| AVE : | 70.71  | 42.53  | 18.11 | 16.66  | 13.58  | 13.60 | 34.10  | 72.16  | 110.94 | 153.36 | 204.44  | 110.76 | 861.0  |
| SD :  | 67.37  | 54.50  | 16.16 | 43.48  | 25.79  | 15.00 | 60.90  | 108.69 | 135.96 | 172.81 | 257.66  | 90.86  | 624.0  |

## Appendix B11.9

File : 58INCSIM.NAT

Units : 10<sup>6</sup>m<sup>3</sup>

Descrip. : Incremental natural simulated flow record for IFR Site 4 sub-catchment for 1927 to 1990

| Year  | Oct   | Nov   | Dec  | Jan   | Feb   | Mar  | Apr   | May   | Jun   | Jul   | Aug   | Sep   | Total |
|-------|-------|-------|------|-------|-------|------|-------|-------|-------|-------|-------|-------|-------|
| 1927  | 0.61  | 0.37  | 0.15 | 0.05  | 0.01  | 1.13 | 0.42  | 0.05  | 0.05  | 0.07  | 0.18  | 0.77  | 3.9   |
| 1928  | 0.41  | 14.88 | 5.31 | 0.17  | 0.13  | 0.19 | 0.09  | 0.23  | 0.17  | 4.99  | 2.53  | 0.74  | 29.8  |
| 1929  | 0.55  | 0.30  | 0.17 | 0.07  | 3.89  | 2.12 | 0.47  | 0.33  | 0.27  | 0.26  | 1.75  | 1.01  | 11.2  |
| 1930  | 0.69  | 0.42  | 0.15 | 0.05  | 0.02  | 0.41 | 10.41 | 3.58  | 0.17  | 9.31  | 3.61  | 0.62  | 29.4  |
| 1931  | 7.23  | 2.70  | 2.62 | 0.93  | 0.82  | 0.32 | 0.06  | 0.12  | 0.34  | 0.72  | 0.48  | 23.95 | 40.3  |
| 1932  | 8.39  | 0.94  | 0.39 | 0.07  | 0.03  | 0.18 | 0.10  | 0.23  | 0.32  | 0.30  | 1.75  | 0.89  | 13.6  |
| 1933  | 0.32  | 0.37  | 0.16 | 0.97  | 0.37  | 0.19 | 0.10  | 0.05  | 0.06  | 2.50  | 4.22  | 1.84  | 11.2  |
| 1934  | 5.76  | 2.86  | 0.49 | 0.08  | 0.22  | 0.10 | 0.34  | 3.03  | 1.55  | 0.55  | 0.47  | 0.81  | 16.3  |
| 1935  | 0.55  | 1.20  | 0.51 | 0.09  | 0.03  | 0.02 | 0.01  | 0.85  | 0.39  | 1.27  | 0.72  | 1.50  | 7.1   |
| 1936  | 1.00  | 18.41 | 7.86 | 0.68  | 0.06  | 0.17 | 0.09  | 0.03  | 0.05  | 0.40  | 0.25  | 0.47  | 29.5  |
| 1937  | 0.31  | 0.42  | 0.78 | 0.26  | 0.03  | 1.51 | 1.33  | 0.69  | 0.46  | 0.74  | 0.81  | 0.85  | 8.2   |
| 1938  | 0.68  | 1.18  | 0.48 | 0.09  | 2.63  | 4.40 | 1.52  | 0.25  | 0.16  | 0.79  | 8.36  | 3.26  | 23.8  |
| 1939  | 0.53  | 0.29  | 0.11 | 0.05  | 5.54  | 1.94 | 0.79  | 0.38  | 0.29  | 0.29  | 0.24  | 0.25  | 10.7  |
| 1940  | 0.24  | 3.23  | 1.14 | 0.57  | 0.21  | 0.02 | 5.02  | 2.46  | 2.32  | 1.70  | 1.31  | 1.15  | 19.4  |
| 1941  | 3.35  | 1.44  | 0.27 | 0.32  | 0.13  | 0.06 | 0.05  | 0.66  | 0.66  | 0.38  | 0.33  | 0.33  | 8.0   |
| 1942  | 0.81  | 0.39  | 3.35 | 12.37 | 3.85  | 0.27 | 0.37  | 0.22  | 0.18  | 0.26  | 0.50  | 3.05  | 25.6  |
| 1943  | 1.37  | 6.33  | 2.22 | 0.08  | 0.02  | 0.18 | 0.17  | 4.22  | 2.97  | 1.02  | 1.52  | 4.55  | 24.7  |
| 1944  | 2.27  | 0.64  | 0.21 | 0.05  | 0.01  | 0.00 | 0.03  | 4.34  | 2.96  | 1.15  | 1.91  | 1.45  | 15.0  |
| 1945  | 8.59  | 3.30  | 0.32 | 0.08  | 0.03  | 9.46 | 3.25  | 0.11  | 0.13  | 0.22  | 0.24  | 0.25  | 26.0  |
| 1946  | 0.24  | 0.15  | 0.06 | 0.01  | 0.01  | 5.28 | 1.86  | 0.29  | 0.26  | 2.31  | 1.12  | 1.31  | 12.9  |
| 1947  | 0.79  | 0.70  | 0.29 | 0.06  | 0.02  | 0.88 | 1.06  | 0.37  | 0.23  | 0.65  | 0.46  | 0.50  | 6.0   |
| 1948  | 22.10 | 7.63  | 0.19 | 0.07  | 0.02  | 0.01 | 2.25  | 1.07  | 0.25  | 0.25  | 0.31  | 0.30  | 34.5  |
| 1949  | 0.21  | 19.31 | 6.51 | 0.05  | 0.01  | 0.01 | 0.74  | 0.32  | 0.09  | 0.77  | 0.55  | 0.35  | 28.9  |
| 1950  | 1.25  | 4.21  | 1.43 | 5.53  | 1.89  | 0.34 | 0.31  | 0.23  | 1.84  | 2.10  | 1.17  | 2.56  | 22.9  |
| 1951  | 1.36  | 0.42  | 0.14 | 0.06  | 0.06  | 0.03 | 0.05  | 0.06  | 0.15  | 0.23  | 4.20  | 14.51 | 21.3  |
| 1952  | 5.06  | 8.07  | 2.83 | 0.14  | 0.05  | 0.02 | 0.72  | 0.32  | 0.49  | 6.58  | 2.71  | 2.49  | 29.5  |
| 1953  | 3.54  | 2.88  | 0.84 | 0.10  | 0.02  | 0.05 | 0.76  | 11.19 | 4.09  | 1.63  | 14.30 | 5.44  | 44.8  |
| 1954  | 0.73  | 0.56  | 0.23 | 0.42  | 6.64  | 2.26 | 0.08  | 0.06  | 0.49  | 2.14  | 2.62  | 1.62  | 17.9  |
| 1955  | 1.93  | 0.85  | 0.18 | 0.05  | 0.01  | 1.21 | 0.47  | 3.71  | 2.00  | 0.96  | 2.22  | 1.29  | 14.9  |
| 1956  | 1.81  | 0.81  | 0.25 | 0.09  | 0.94  | 0.87 | 0.26  | 5.46  | 11.23 | 4.20  | 6.37  | 3.62  | 35.9  |
| 1957  | 2.22  | 0.96  | 0.24 | 0.06  | 0.01  | 1.22 | 0.72  | 16.90 | 5.98  | 0.45  | 2.65  | 1.28  | 32.7  |
| 1958  | 0.47  | 0.27  | 0.14 | 0.39  | 0.56  | 0.49 | 11.10 | 5.42  | 0.94  | 12.16 | 10.27 | 3.06  | 45.3  |
| 1959  | 9.26  | 3.45  | 0.29 | 0.29  | 0.11  | 0.31 | 0.15  | 0.54  | 1.25  | 0.74  | 0.46  | 0.69  | 17.5  |
| 1960  | 0.46  | 0.25  | 1.28 | 1.88  | 0.55  | 0.18 | 0.26  | 2.85  | 1.19  | 0.58  | 2.53  | 1.62  | 13.6  |
| 1961  | 0.89  | 0.45  | 0.14 | 0.21  | 0.13  | 3.83 | 2.14  | 0.46  | 0.63  | 0.50  | 34.20 | 11.98 | 55.6  |
| 1962  | 3.98  | 1.95  | 0.37 | 0.09  | 0.03  | 1.55 | 0.78  | 0.86  | 0.49  | 0.94  | 0.73  | 0.47  | 12.2  |
| 1963  | 0.79  | 0.49  | 0.28 | 0.72  | 0.57  | 4.85 | 1.74  | 0.16  | 4.33  | 1.79  | 0.86  | 1.54  | 18.1  |
| 1964  | 0.98  | 2.34  | 0.86 | 0.08  | 0.14  | 0.24 | 0.22  | 3.51  | 1.42  | 1.72  | 1.03  | 0.54  | 13.1  |
| 1965  | 5.88  | 5.42  | 1.37 | 0.14  | 0.05  | 0.07 | 0.13  | 0.98  | 0.47  | 0.19  | 13.42 | 5.87  | 34.0  |
| 1966  | 0.86  | 0.29  | 0.10 | 0.03  | 0.21  | 1.00 | 34.25 | 15.04 | 2.52  | 1.44  | 1.43  | 1.97  | 59.1  |
| 1967  | 1.18  | 0.62  | 0.24 | 0.06  | 0.02  | 0.06 | 0.08  | 0.93  | 1.96  | 0.86  | 1.27  | 0.77  | 8.1   |
| 1968  | 0.42  | 0.66  | 0.26 | 0.05  | 0.02  | 0.01 | 0.13  | 0.08  | 2.00  | 0.88  | 0.32  | 0.34  | 5.2   |
| 1969  | 0.29  | 0.16  | 0.06 | 0.21  | 0.38  | 0.14 | 0.02  | 0.02  | 0.08  | 0.42  | 1.17  | 0.62  | 3.6   |
| 1970  | 0.33  | 0.18  | 0.08 | 0.02  | 0.98  | 1.87 | 7.13  | 2.96  | 0.93  | 14.54 | 9.83  | 2.67  | 41.5  |
| 1971  | 0.90  | 3.70  | 1.34 | 0.09  | 0.26  | 0.15 | 1.82  | 1.09  | 0.39  | 0.47  | 1.83  | 1.63  | 13.7  |
| 1972  | 0.74  | 0.38  | 0.16 | 0.05  | 0.01  | 0.01 | 0.05  | 0.14  | 0.34  | 0.29  | 0.39  | 0.39  | 2.9   |
| 1973  | 0.29  | 0.17  | 0.40 | 0.19  | 6.17  | 2.19 | 0.10  | 2.83  | 1.13  | 0.24  | 11.23 | 4.29  | 29.2  |
| 1974  | 0.60  | 0.33  | 0.13 | 0.05  | 0.02  | 0.01 | 0.02  | 0.72  | 0.39  | 0.63  | 1.86  | 2.51  | 7.3   |
| 1975  | 1.12  | 0.40  | 0.16 | 0.05  | 0.17  | 0.97 | 2.74  | 1.10  | 5.04  | 2.86  | 1.28  | 0.95  | 16.8  |
| 1976  | 2.37  | 1.74  | 0.50 | 0.09  | 2.09  | 0.81 | 2.14  | 12.02 | 4.86  | 1.19  | 1.06  | 1.20  | 30.1  |
| 1977  | 0.85  | 1.18  | 0.69 | 0.21  | 0.07  | 0.03 | 0.72  | 0.34  | 0.15  | 0.62  | 1.10  | 1.23  | 7.2   |
| 1978  | 0.81  | 0.40  | 0.35 | 0.17  | 10.46 | 3.55 | 0.06  | 0.49  | 0.34  | 0.68  | 1.25  | 0.95  | 19.5  |
| 1979  | 0.81  | 0.41  | 0.17 | 0.74  | 0.28  | 0.05 | 0.05  | 0.06  | 0.86  | 0.45  | 0.34  | 0.62  | 4.8   |
| 1980  | 0.66  | 4.82  | 1.86 | 14.68 | 5.07  | 1.42 | 16.12 | 5.85  | 0.63  | 1.42  | 4.75  | 2.33  | 59.6  |
| 1981  | 0.85  | 0.50  | 0.63 | 0.23  | 0.07  | 1.03 | 20.99 | 7.07  | 1.01  | 0.79  | 0.80  | 2.51  | 36.5  |
| 1982  | 1.27  | 0.40  | 0.16 | 0.05  | 0.59  | 0.23 | 0.09  | 0.53  | 1.50  | 2.14  | 1.12  | 3.05  | 11.1  |
| 1983  | 1.50  | 0.67  | 0.29 | 0.07  | 0.15  | 0.77 | 0.32  | 0.52  | 0.32  | 0.38  | 0.33  | 0.27  | 5.6   |
| 1984  | 0.54  | 0.30  | 0.14 | 1.18  | 0.75  | 0.20 | 2.87  | 1.09  | 0.80  | 10.87 | 4.12  | 0.61  | 23.5  |
| 1985  | 6.14  | 2.58  | 0.82 | 0.27  | 0.08  | 0.11 | 0.08  | 0.06  | 0.08  | 0.19  | 27.70 | 9.77  | 47.9  |
| 1986  | 1.44  | 0.79  | 0.23 | 0.06  | 0.01  | 0.01 | 7.93  | 2.80  | 0.38  | 0.37  | 1.04  | 1.26  | 16.3  |
| 1987  | 0.64  | 0.23  | 0.13 | 0.05  | 0.01  | 0.14 | 0.74  | 0.34  | 0.45  | 0.38  | 0.62  | 0.70  | 4.4   |
| 1988  | 0.46  | 0.23  | 0.10 | 0.03  | 0.02  | 1.34 | 6.53  | 2.21  | 0.95  | 0.82  | 0.87  | 0.70  | 14.3  |
| 1989  | 8.35  | 3.28  | 0.32 | 0.09  | 0.14  | 0.07 | 9.23  | 3.66  | 2.19  | 1.13  | 0.60  | 0.51  | 29.6  |
| 1990  | 0.47  | 0.32  | 0.18 | 0.12  | 0.09  | 0.05 | 0.03  | 0.15  | 0.32  | 0.33  | 0.29  | 0.27  | 2.6   |
| AVE : | 2.21  | 2.27  | 0.85 | 0.72  | 0.91  | 0.98 | 2.57  | 2.17  | 1.26  | 1.75  | 3.28  | 2.36  | 21.3  |
| SD :  | 3.45  | 3.89  | 1.47 | 2.44  | 1.97  | 1.63 | 5.65  | 3.51  | 1.84  | 2.88  | 5.97  | 3.79  | 14.3  |

## Appendix B11.10

File : IFR4CUM.PRS  
Units : 10^6x^3  
Descrip. : Cumulative Present Day (2000) Flow at IFR4 Site for 1927 to 1990

| Year  | Oct    | Nov    | Dec   | Jan    | Feb    | Mar   | Apr    | May    | Jun    | Jul    | Aug     | Sep    | Total  |
|-------|--------|--------|-------|--------|--------|-------|--------|--------|--------|--------|---------|--------|--------|
| 1927  | 6.72   | 21.00  | 9.52  | 5.26   | 2.84   | 33.36 | 8.92   | 0.26   | 128.65 | 29.56  | 56.42   | 68.80  | 371.3  |
| 1928  | 23.61  | 69.83  | 28.24 | 8.83   | 3.78   | 14.81 | 19.20  | 21.76  | 39.67  | 187.21 | 181.74  | 54.46  | 653.1  |
| 1929  | 24.48  | 11.15  | 22.44 | 14.53  | 62.91  | 43.04 | 10.38  | 6.43   | 4.66   | 16.73  | 90.03   | 144.07 | 450.9  |
| 1930  | 62.48  | 19.41  | 12.29 | 11.85  | 5.83   | 14.21 | 141.66 | 94.16  | 24.41  | 124.65 | 265.25  | 113.97 | 890.2  |
| 1931  | 149.19 | 37.03  | 84.78 | 30.36  | 78.62  | 11.91 | 3.62   | 31.60  | 54.59  | 85.91  | 57.42   | 273.60 | 898.6  |
| 1932  | 104.56 | 18.15  | 12.64 | 7.43   | 4.60   | 4.01  | 2.79   | 6.27   | 143.90 | 269.93 | 176.46  | 65.18  | 815.9  |
| 1933  | 30.58  | 25.57  | 13.45 | 12.26  | 9.74   | 11.49 | 4.08   | 3.78   | 23.03  | 44.68  | 95.44   | 103.01 | 377.1  |
| 1934  | 221.49 | 96.42  | 18.84 | 8.98   | 6.11   | 4.71  | 18.37  | 57.03  | 59.26  | 104.48 | 105.69  | 70.77  | 772.2  |
| 1935  | 29.86  | 27.07  | 13.52 | 9.27   | 4.32   | 2.64  | 1.59   | 6.53   | 8.63   | 49.80  | 111.52  | 105.41 | 370.2  |
| 1936  | 44.73  | 191.66 | 84.25 | 16.23  | 5.90   | 27.57 | 13.85  | 19.87  | 145.52 | 251.15 | 80.31   | 48.80  | 929.8  |
| 1937  | 23.96  | 18.55  | 24.28 | 19.34  | 4.20   | 14.00 | 33.17  | 73.58  | 32.91  | 53.27  | 75.07   | 79.41  | 451.7  |
| 1938  | 42.63  | 28.64  | 16.45 | 8.64   | 41.28  | 40.83 | 15.37  | 42.34  | 15.10  | 34.04  | 220.94  | 97.26  | 603.5  |
| 1939  | 24.12  | 10.75  | 9.55  | 3.64   | 44.59  | 26.44 | 35.17  | 12.71  | 64.75  | 55.29  | 37.31   | 40.62  | 364.9  |
| 1940  | 20.18  | 57.14  | 14.92 | 8.53   | 2.70   | 1.76  | 81.15  | 240.78 | 373.27 | 193.14 | 189.63  | 379.67 | 1562.9 |
| 1941  | 133.03 | 34.61  | 14.32 | 18.21  | 6.06   | 3.70  | 2.72   | 106.95 | 502.71 | 94.87  | 127.62  | 39.25  | 1084.1 |
| 1942  | 43.94  | 16.30  | 29.08 | 75.44  | 24.29  | 16.09 | 16.15  | 11.27  | 45.35  | 130.21 | 201.84  | 174.31 | 784.3  |
| 1943  | 64.50  | 101.20 | 28.07 | 10.58  | 3.38   | 7.71  | 6.01   | 92.16  | 282.67 | 100.99 | 208.27  | 176.72 | 1082.2 |
| 1944  | 79.92  | 21.83  | 11.64 | 7.88   | 2.77   | 2.35  | 4.49   | 243.01 | 410.55 | 650.88 | 452.81  | 82.66  | 1970.8 |
| 1945  | 213.17 | 67.29  | 12.67 | 9.34   | 3.58   | 52.78 | 23.56  | 7.00   | 8.53   | 22.51  | 50.08   | 155.50 | 626.0  |
| 1946  | 57.75  | 10.68  | 8.49  | 4.22   | 2.89   | 53.96 | 20.77  | 11.98  | 12.32  | 192.93 | 89.90   | 59.62  | 525.5  |
| 1947  | 47.31  | 20.60  | 12.21 | 8.99   | 3.72   | 21.68 | 13.76  | 39.69  | 35.03  | 123.23 | 47.47   | 173.90 | 547.6  |
| 1948  | 284.08 | 76.27  | 11.54 | 8.66   | 3.09   | 2.43  | 13.54  | 1.95   | 28.46  | 60.79  | 92.64   | 75.10  | 658.6  |
| 1949  | 68.65  | 287.03 | 72.87 | 9.88   | 4.79   | 2.42  | 46.17  | 0.24   | 0.85   | 200.60 | 48.73   | 101.74 | 844.0  |
| 1950  | 58.82  | 106.81 | 26.98 | 68.80  | 19.33  | 7.00  | 34.34  | 7.22   | 200.28 | 147.56 | 84.86   | 110.17 | 872.2  |
| 1951  | 55.77  | 28.86  | 10.49 | 7.72   | 4.38   | 3.04  | 2.99   | 66.95  | 41.70  | 118.33 | 343.75  | 236.25 | 920.2  |
| 1952  | 69.16  | 205.55 | 42.89 | 12.09  | 5.47   | 2.65  | 181.26 | 135.83 | 41.25  | 224.24 | 128.72  | 54.00  | 1103.1 |
| 1953  | 53.67  | 37.30  | 14.30 | 8.75   | 3.00   | 4.16  | 31.98  | 325.81 | 189.66 | 637.89 | 643.42  | 160.01 | 2109.9 |
| 1954  | 51.66  | 14.78  | 13.50 | 14.90  | 177.66 | 51.64 | 5.57   | 0.22   | 69.54  | 251.21 | 719.08  | 119.49 | 1489.2 |
| 1955  | 117.98 | 30.41  | 12.00 | 9.97   | 3.65   | 7.83  | 4.99   | 40.51  | 142.80 | 160.02 | 228.85  | 54.11  | 813.1  |
| 1956  | 51.93  | 14.39  | 18.42 | 11.08  | 44.68  | 14.24 | 6.37   | 256.43 | 589.83 | 636.09 | 503.35  | 165.80 | 2312.6 |
| 1957  | 264.12 | 46.75  | 13.18 | 9.77   | 6.74   | 14.57 | 8.72   | 260.06 | 127.96 | 33.05  | 142.25  | 56.43  | 983.6  |
| 1958  | 42.43  | 14.97  | 10.82 | 12.58  | 13.48  | 12.17 | 130.10 | 429.92 | 68.18  | 126.45 | 222.53  | 79.27  | 1162.9 |
| 1959  | 130.20 | 24.20  | 11.96 | 9.88   | 3.75   | 6.42  | 5.97   | 42.07  | 122.40 | 43.60  | 33.55   | 28.22  | 462.2  |
| 1960  | 16.46  | 12.25  | 15.00 | 14.32  | 6.63   | 4.49  | 6.34   | 16.33  | 43.68  | 56.30  | 123.29  | 170.82 | 485.9  |
| 1961  | 61.72  | 15.89  | 10.45 | 8.67   | 7.62   | 13.39 | 17.53  | 0.20   | 427.15 | 169.19 | 1038.27 | 274.65 | 2044.7 |
| 1962  | 324.48 | 142.86 | 31.99 | 14.36  | 5.69   | 41.52 | 22.24  | 45.01  | 48.81  | 93.65  | 302.06  | 68.31  | 1141.0 |
| 1963  | 41.49  | 25.28  | 16.53 | 14.30  | 15.28  | 25.03 | 12.68  | 3.67   | 190.95 | 121.38 | 217.42  | 78.39  | 762.4  |
| 1964  | 59.10  | 68.27  | 20.16 | 12.53  | 7.31   | 21.46 | 22.47  | 54.77  | 38.73  | 57.85  | 85.76   | 40.55  | 489.0  |
| 1965  | 95.91  | 55.12  | 19.48 | 15.97  | 5.87   | 5.08  | 4.58   | 0.08   | 45.42  | 148.46 | 212.69  | 114.92 | 723.6  |
| 1966  | 33.21  | 8.73   | 9.92  | 5.71   | 5.82   | 9.82  | 258.07 | 150.81 | 264.27 | 90.96  | 84.09   | 60.75  | 982.2  |
| 1967  | 73.17  | 23.95  | 13.11 | 10.22  | 2.98   | 2.97  | 13.15  | 114.21 | 145.88 | 201.51 | 188.36  | 52.58  | 842.1  |
| 1968  | 163.10 | 37.90  | 13.83 | 12.53  | 5.22   | 4.10  | 23.79  | 14.91  | 33.96  | 40.22  | 54.82   | 74.27  | 478.6  |
| 1969  | 92.30  | 12.14  | 8.82  | 6.28   | 9.61   | 4.41  | 0.75   | 10.36  | 100.51 | 112.30 | 210.12  | 94.83  | 662.4  |
| 1970  | 43.06  | 13.63  | 12.45 | 5.32   | 9.34   | 10.67 | 28.16  | 29.39  | 31.04  | 222.08 | 277.76  | 76.38  | 759.3  |
| 1971  | 21.43  | 33.74  | 14.40 | 8.93   | 9.89   | 7.07  | 8.46   | 34.93  | 47.78  | 38.05  | 91.23   | 66.37  | 382.3  |
| 1972  | 23.21  | 11.58  | 9.51  | 4.49   | 1.94   | 2.65  | 3.24   | 0.15   | 0.01   | 183.57 | 76.76   | 44.34  | 361.5  |
| 1973  | 33.70  | 12.96  | 16.15 | 8.37   | 26.81  | 13.98 | 3.26   | 46.70  | 110.38 | 51.12  | 1505.14 | 269.82 | 2098.4 |
| 1974  | 99.91  | 26.49  | 13.67 | 12.86  | 3.73   | 3.63  | 14.45  | 126.36 | 67.74  | 141.08 | 175.02  | 76.49  | 761.4  |
| 1975  | 51.80  | 17.66  | 11.51 | 7.27   | 6.10   | 13.67 | 14.91  | 11.92  | 413.30 | 232.05 | 98.36   | 49.94  | 928.5  |
| 1976  | 78.36  | 201.91 | 53.35 | 28.03  | 38.27  | 18.73 | 100.26 | 571.82 | 528.88 | 875.60 | 940.89  | 140.97 | 3583.1 |
| 1977  | 57.12  | 27.99  | 22.35 | 13.08  | 4.06   | 3.50  | 24.91  | 35.21  | 12.48  | 25.75  | 120.60  | 95.26  | 442.3  |
| 1978  | 56.12  | 16.23  | 18.32 | 10.80  | 43.80  | 17.63 | 2.75   | 32.32  | 105.41 | 67.52  | 115.75  | 87.67  | 574.3  |
| 1979  | 106.84 | 16.69  | 11.30 | 13.28  | 4.86   | 2.98  | 13.54  | 26.71  | 36.71  | 37.51  | 50.59   | 41.14  | 362.2  |
| 1980  | 36.11  | 139.70 | 41.51 | 366.45 | 75.56  | 31.32 | 65.91  | 35.07  | 28.98  | 144.02 | 268.41  | 260.97 | 1494.0 |
| 1981  | 62.60  | 17.98  | 18.12 | 14.62  | 4.59   | 12.21 | 349.23 | 152.28 | 73.75  | 67.00  | 81.51   | 86.54  | 940.4  |
| 1982  | 54.42  | 14.60  | 14.98 | 5.71   | 5.11   | 3.50  | 1.64   | 115.11 | 233.94 | 431.95 | 151.25  | 200.35 | 1232.6 |
| 1983  | 66.52  | 20.42  | 13.50 | 7.95   | 5.20   | 52.52 | 10.36  | 349.76 | 77.33  | 203.95 | 93.14   | 372.49 | 1273.1 |
| 1984  | 174.24 | 43.82  | 22.17 | 31.26  | 20.89  | 53.47 | 35.92  | 42.62  | 162.75 | 360.55 | 378.96  | 90.79  | 1417.4 |
| 1985  | 119.43 | 92.92  | 26.45 | 14.34  | 6.11   | 9.17  | 23.52  | 47.14  | 59.43  | 159.42 | 725.55  | 253.41 | 1536.9 |
| 1986  | 60.43  | 21.23  | 11.85 | 11.68  | 2.88   | 2.73  | 55.50  | 150.62 | 132.26 | 118.83 | 303.61  | 151.96 | 1023.6 |
| 1987  | 46.83  | 9.29   | 16.34 | 6.65   | 2.95   | 6.02  | 40.87  | 56.53  | 94.08  | 79.77  | 108.18  | 172.12 | 639.6  |
| 1988  | 38.08  | 9.84   | 11.72 | 6.15   | 3.51   | 31.00 | 123.88 | 81.78  | 76.28  | 125.66 | 192.45  | 369.81 | 1070.1 |
| 1989  | 166.52 | 89.77  | 16.18 | 10.55  | 9.86   | 6.87  | 172.82 | 116.46 | 166.43 | 318.71 | 164.29  | 39.31  | 1277.8 |
| 1990  | 28.99  | 10.28  | 13.40 | 9.95   | 5.96   | 3.55  | 4.01   | 25.35  | 151.09 | 610.17 | 169.76  | 248.94 | 1281.5 |
| AVE : | 79.43  | 47.55  | 20.14 | 18.70  | 15.27  | 15.26 | 38.03  | 81.17  | 124.81 | 172.52 | 229.98  | 124.57 | 967.4  |
| SD :  | 66.49  | 55.83  | 16.00 | 45.75  | 26.89  | 15.11 | 63.54  | 112.12 | 138.11 | 174.06 | 262.40  | 86.95  | 578.9  |

## APPENDIX B12.1

SUB-CATCHMENT : Estuary  
RIVER : Breede  
PLACE : Breede River Estuary

### 1 CATCHMENT

|                     | YEAR    |         |         |         |         | UNITS           |
|---------------------|---------|---------|---------|---------|---------|-----------------|
|                     | 1968    | 1980    | 1987    | 1999    | 2000    |                 |
| SUB-CATCHMENT AREAS |         |         |         |         |         |                 |
| u/s farm dams       | 30.66   | 30.66   | 30.66   | 30.66   | 30.66   | km <sup>2</sup> |
| d/s farm dams       | 1612.30 | 1612.30 | 1612.30 | 1612.30 | 1612.30 | km <sup>2</sup> |

### 2 LANDUSE

|                             | YEAR  |       |       |       |       | UNITS           |
|-----------------------------|-------|-------|-------|-------|-------|-----------------|
|                             | 1968  | 1980  | 1987  | 1999  | 2000  |                 |
| ALIEN VEGETATION            |       |       |       |       |       |                 |
| u/s farm dams : tall trees  | 1.61  | 2.93  | 4.29  | 12.91 | 12.91 | km <sup>2</sup> |
| u/s farm dams : tall shrubs | 2.05  | 3.72  | 5.46  | 10.14 | 10.14 |                 |
| riparian                    | 9.34  | 11.87 | 15.34 | 21.34 | 21.34 | km <sup>2</sup> |
| Total                       | 13.00 | 18.52 | 25.09 | 44.39 | 44.39 | km <sup>2</sup> |
| FARM DAM CAPACITIES         | 1.69  | 1.76  | 3.73  | 4.66  | 4.66  | Mm <sup>3</sup> |
| IRRIGATION AREAS            |       |       |       |       |       |                 |
| farm dams                   | 2.82  | 2.48  | 3.34  | 3.69  | 3.69  | km <sup>2</sup> |
| Total                       | 2.82  | 2.48  | 3.34  | 3.69  | 3.69  | km <sup>2</sup> |

### 3 EVAPORATION

|                       | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  | JUN  | JUL  | AUG  | SEP  | MAE<br>mm |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|
| A-PAN (gross) (in mm) | 174  | 210  | 265  | 287  | 219  | 175  | 175  | 84   | 70   | 70   | 87   | 113  | 1929      |
| S-PAN (gross) (in mm) | 137  | 169  | 217  | 236  | 176  | 137  | 137  | 58   | 45   | 45   | 61   | 84   | 1502      |
| LAKE FACTOR           | 0.81 | 0.82 | 0.83 | 0.84 | 0.88 | 0.88 | 0.88 | 0.87 | 0.85 | 0.83 | 0.81 | 0.81 |           |
| FREE WATER (in mm)    | 111  | 139  | 180  | 198  | 155  | 121  | 121  | 50   | 38   | 37   | 49   | 68   | 1267      |

### 4 RESERVOIR SIMULATIONS

|          | COEFFICIENTS |     | START      | DEAD                      | MAX                       |
|----------|--------------|-----|------------|---------------------------|---------------------------|
|          | a            | b   | STOR.<br>% | STOR.<br>M.m <sup>3</sup> | STOR.<br>M.m <sup>3</sup> |
| Farm Dam | 0.4          | 0.7 | 100        | 0                         | FSC                       |

### 5 IRRIGATION ROUTINE

|                      | CROP FACTORS |     |      |     |     |     |     |     |     |     |     |      |     |
|----------------------|--------------|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|
|                      | QUANT        |     |      |     |     |     |     |     |     |     |     |      |     |
|                      | %            | OCT | NOV  | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG  | SEP |
| Orchards & vineyards | 33           | 0.4 | 0.45 | 0.5 | 0.5 | 0.5 | 0.4 | 0.2 | 0.2 | 0.2 | 0.2 | 0.25 | 0.3 |
| Patures & cash crops | 67           | 0.7 | 0.8  | 0.8 | 0.8 | 0.8 | 0.8 | 0.7 | 0.6 | 0.5 | 0.5 | 0.5  | 0.6 |

### 6. NOTES

Combined crop factor used for calculation of irrigation demand  
crop type 1 : vineyards and fruit trees  
crop type 2 : wheat , lucerne and cash crops

Catchment MAP = 411 mm

## APPENDIX B12.2 PERCENTAGE RAINFALL FILES USED FOR SIMULATION OF Estuary

Average Rainfall On Catchment lowbree.r

details of rainfall stations used

008683\_p.nsp 1926 to 1977

008713\_a.nsp 1978 to 1998

008876\_9.nsp 1926 to 1964

009365\_5.nsp 1943 to 1998

009430\_2.nsp 1935 to 1988

009458\_a.nsp 1972 to 1995

|          |        | rainfall input as percent m.a.p. |        |        |       |       |       |        |        |       |        |       |        |         |  |
|----------|--------|----------------------------------|--------|--------|-------|-------|-------|--------|--------|-------|--------|-------|--------|---------|--|
| no.      | gauges | oct                              | nov    | dec    | jan   | feb   | mar   | apr    | may    | jun   | jul    | aug   | sep    | year    |  |
| 1926     | 2      | 16.35                            | 10.12  | 1.35   | 1.32  | 12.03 | 6.30  | 7.12   | 7.49   | 6.01  | 1.96   | 13.91 | 1.26   | 85.22   |  |
| 1927     | 2      | 3.35                             | 4.62   | 2.79   | 3.08  | .76   | 13.09 | 2.11   | 1.14   | 4.25  | 3.52   | 6.93  | 10.99  | 56.62   |  |
| 1928     | 2      | 2.62                             | 29.12  | 8.95   | .00   | 7.37  | 7.71  | 2.65   | 8.28   | 4.40  | 19.39  | 10.31 | 4.69   | 105.49  |  |
| 1929     | 2      | 6.91                             | 1.35   | 6.72   | 3.69  | 18.23 | 11.72 | 7.22   | 7.81   | 4.49  | 3.48   | 13.86 | 6.85   | 92.34   |  |
| 1930     | 2      | 8.73                             | 6.04   | .93    | 4.19  | 3.24  | 10.08 | 25.06  | 1.33   | 1.74  | 23.99  | 7.19  | 5.87+  | 98.39   |  |
| 1931     | 2      | 21.57                            | 5.28   | 15.92  | 5.15  | 11.80 | 2.30  | 3.02   | 6.84   | 8.71  | 10.19  | 2.25  | 37.00  | 130.04  |  |
| 1932     | 2      | 4.50                             | 11.00  | 4.22   | .96   | 4.55  | 8.21  | 4.72   | 8.21   | 7.74  | 5.23   | 13.78 | 1.57+  | 74.71   |  |
| 1933     | 2      | 3.38                             | 8.36   | 2.41   | 12.51 | 4.32  | 8.08  | 1.84+  | 3.70   | 3.36  | 15.94  | 17.05 | 8.69   | 89.65   |  |
| 1934     | 2      | 19.71                            | 11.24  | .48    | 2.45  | 8.55  | 2.84  | 9.48   | 16.68  | 9.42  | 4.45   | 4.34  | 9.75   | 99.39   |  |
| 1935     | 3      | 4.66+                            | 12.35+ | 6.04+  | 2.21+ | 3.41+ | 2.77+ | 2.54+  | 12.09+ | 3.80+ | 12.89+ | 5.30+ | 12.81+ | 80.85   |  |
| 1936     | 3      | 8.31+                            | 32.02  | 14.22  | .90   | 2.78  | 8.03  | 2.94   | .44    | 4.56  | 9.57   | 1.58  | 9.41   | 94.75   |  |
| 1937     | 3      | 4.73                             | 9.20   | 11.06  | 3.56  | .57   | 14.07 | 11.78  | 9.23   | 7.20  | 9.51   | 8.16  | 8.44   | 97.52   |  |
| 1938     | 3      | 6.90                             | 11.87  | 5.32   | 2.80  | 16.32 | 17.62 | 8.41   | 2.55   | 1.85+ | 11.12  | 22.67 | 5.50   | 112.95  |  |
| 1939     | 3      | 3.00                             | 4.52   | 2.61   | 4.96  | 20.28 | 5.19  | 11.55  | 4.50   | 7.28  | 2.85   | 1.19  | 6.09   | 74.03   |  |
| 1940     | 3      | 5.74                             | 17.05  | .99    | 10.76 | 1.84  | 1.65  | 19.69  | 11.32  | 14.68 | 10.53  | 9.51  | 8.15   | 111.90  |  |
| 1941     | 3      | 16.11                            | 5.35   | 4.80   | 8.92  | 1.82  | 5.48  | 4.01   | 11.22  | 9.40  | 3.08   | 5.79  | 4.52   | 80.48   |  |
| 1942     | 3      | 10.81                            | 1.77   | 17.35  | 25.97 | 4.71  | 8.34  | 8.69   | 5.17   | 5.06  | 6.04   | 8.48  | 16.24  | 118.63  |  |
| 1943     | 4      | 4.53                             | 20.79  | 2.20   | 1.16  | 2.01  | 8.26  | 7.10   | 18.53  | 13.51 | 6.08   | 11.93 | 17.55  | 113.66  |  |
| 1944     | 4      | 8.87                             | 3.16   | .92    | .50   | 1.37  | 1.66  | 5.66   | 18.80  | 13.54 | 8.91   | 13.05 | 8.82   | 85.26   |  |
| 1945     | 4      | 22.61                            | 7.13   | 1.36   | 1.51  | 4.72  | 24.33 | 3.27   | 4.19   | 4.68  | 6.46   | 3.67  | 5.58   | 89.52   |  |
| 1946     | 4      | 5.62                             | 3.15   | .09    | .85   | 4.39+ | 19.99 | 5.09   | 8.17   | 5.67  | 15.17  | 1.20  | 12.13  | 81.53   |  |
| 1947     | 4      | 6.58                             | 9.85   | 1.45   | 3.71  | 3.70  | 12.23 | 11.56  | 2.83   | 6.85  | 9.90   | 1.47  | 8.35   | 78.47   |  |
| 1948     | 4      | 35.32                            | 4.79   | 2.91   | 4.76  | 1.72  | .98   | 15.69  | 8.82   | 1.61  | 6.33   | 5.95  | 3.98   | 92.85   |  |
| 1949     | 4      | 1.22                             | 33.12  | .35    | 1.28  | 1.71  | 2.48  | 11.76+ | 4.86   | 1.11  | 11.32  | 7.04  | 4.90   | 81.16   |  |
| 1950     | 4      | 12.46                            | 17.85  | 3.86   | 20.19 | .00   | 9.39  | 7.98   | 6.78   | 14.32 | 12.99  | 7.38  | 14.61  | 127.79  |  |
| 1951     | 4      | 5.43                             | 1.12   | 1.99   | 5.03  | 5.75  | 3.66  | 5.06   | 4.88   | 6.62  | 6.59   | 18.26 | 27.26  | 91.65   |  |
| 1952     | 4      | 7.53                             | 22.39  | 4.82   | 3.66  | 3.15  | .48   | 11.67  | 5.13   | 9.77  | 20.99  | 6.40  | 14.65  | 110.64  |  |
| 1953     | 4      | 15.53                            | 14.11  | 2.40   | .81   | 3.24  | 5.70  | 11.68  | 25.61  | 7.35  | 12.68  | 27.63 | 2.15   | 128.90  |  |
| 1954     | 4      | 1.89                             | 8.62   | 1.84   | 9.92  | 21.36 | .59   | 4.58   | 3.27   | 10.11 | 14.66  | 14.09 | 9.94   | 100.89  |  |
| 1955     | 4      | 12.88                            | 2.71   | 1.01   | 1.43  | 2.45  | 13.30 | 5.34   | 17.86  | 10.51 | 9.20   | 13.76 | 4.20+  | 94.64   |  |
| 1956     | 4      | 13.02                            | 2.01   | 6.88   | 1.87  | 12.44 | 10.64 | 3.92   | 20.06  | 23.96 | 9.93   | 19.81 | 10.95  | 135.50  |  |
| 1957     | 4      | 12.03                            | .21    | 1.63   | .00   | 3.63  | 13.32 | 9.03   | 30.85  | 5.47  | .54    | 15.55 | 2.18   | 94.44   |  |
| 1958     | 4      | 6.29                             | 4.54   | 5.16+  | 9.74  | 10.15 | 9.31  | 25.68  | 14.01  | 1.92  | 26.31  | 20.14 | 6.07   | 139.32  |  |
| 1959     | 4      | 23.10                            | 2.60   | 2.93   | 8.62  | 2.93  | 9.23  | 3.11   | 10.48  | 12.34 | 6.91   | 2.86  | 9.17   | 94.28   |  |
| 1960     | 4      | 2.90                             | 5.94   | 13.16  | 13.86 | 2.14  | 7.80  | 8.14   | 16.43  | 4.38  | 8.57   | 14.99 | 8.85   | 107.14  |  |
| 1961     | 4      | 7.92                             | 1.71   | 1.43+  | 8.23+ | 6.27  | 18.10 | 11.75  | 4.58   | 9.86  | 5.18   | 45.98 | 1.06   | 122.06  |  |
| 1962     | 4      | 17.46                            | 9.69   | 1.40   | 4.80  | 2.10  | 14.17 | 8.57   | 11.34  | 5.25  | 10.97  | 5.86  | .68    | 92.29   |  |
| 1963     | 4      | 10.38                            | 7.20   | 7.47   | 11.24 | 9.49  | 19.24 | 5.17   | 3.59   | 18.56 | 3.82   | 9.80  | 11.97  | 117.94  |  |
| 1964     | 4      | 7.53                             | 14.92  | 1.27   | 3.62  | 7.60  | 8.24  | 7.41   | 17.49  | 3.82  | 13.55  | 5.41  | 1.59   | 92.45   |  |
| 1965     | 3      | 20.20                            | 17.22  | 5.21   | 4.83  | .41   | 6.48  | 7.01   | 12.30  | 1.95  | 3.08   | 27.72 | 12.45  | 118.87  |  |
| 1966     | 3      | 1.64                             | 3.44   | 1.59   | 1.61  | 8.61  | 12.36 | 46.17  | 17.56  | 11.63 | 9.20   | 9.20  | 11.86  | 134.87  |  |
| 1967     | 3      | 4.57                             | 7.37   | 1.52   | 1.08  | 3.22  | 6.33  | 5.90   | 12.18  | 13.95 | 1.21   | 12.09 | 3.38   | 72.81   |  |
| 1968     | 3      | 5.77                             | 10.09  | 1.00   | 1.88  | 4.22  | 2.81  | 7.60   | 2.75   | 15.02 | 4.76   | 5.11  | 5.42   | 66.43   |  |
| 1969     | 3      | 5.00                             | 1.28   | 1.17   | 8.53  | 9.41  | .54   | .25    | 4.28   | 6.03  | 9.49   | 12.06 | 2.77   | 60.80   |  |
| 1970     | 3      | 6.39                             | 1.56   | 4.25   | 1.75  | 12.65 | 14.04 | 21.36  | 10.61  | 9.32  | 28.21  | 18.41 | 2.13   | 130.69  |  |
| 1971     | 3      | 4.22                             | 17.26  | 2.26   | 2.39  | 8.95  | 5.89  | 14.64  | 9.69   | 4.45  | 7.73   | 13.55 | 10.73  | 101.75  |  |
| 1972     | 4      | 1.04+                            | 6.90+  | 2.84+  | 2.55  | .48   | 3.72  | 5.78   | 7.23   | 8.67  | 5.32   | 7.53  | 5.67   | 57.73   |  |
| 1973     | 4      | 2.51                             | 4.86   | 9.56   | 6.11  | 20.97 | 6.15  | 1.35   | 16.57  | 3.28  | 1.31   | 25.73 | 7.53   | 105.93  |  |
| 1974     | 4      | 6.58                             | 3.88   | .67    | 4.96  | 2.71  | 2.96  | 4.12   | 11.54  | 5.76  | 10.04  | 13.58 | 13.91  | 80.71   |  |
| 1975     | 4      | 3.61                             | 5.90   | 1.42   | 2.44  | 8.15  | 12.30 | 15.87  | 7.30   | 19.22 | 11.20  | 8.12  | 5.23   | 100.77  |  |
| 1976     | 4      | 14.40                            | 11.33  | 3.65   | 1.70  | 15.32 | 6.74  | 15.21  | 25.88  | 11.09 | 8.45   | 7.30  | 9.21   | 130.28  |  |
| 1977     | 4      | 5.68                             | 11.64  | 8.61   | 5.78  | 4.14  | 3.19  | 11.55  | 5.35   | 4.05  | 10.16  | 11.13 | 10.72  | 91.98   |  |
| 1978     | 4      | 7.56                             | 5.22   | 8.43   | 5.99  | 25.23 | .74   | 1.40   | 10.34  | 6.78  | 10.16  | 11.46 | 8.16   | 101.47  |  |
| 1979     | 4      | 8.87                             | 1.31   | 6.16   | 11.51 | 3.53  | 3.47  | 4.97   | 4.23   | 11.85 | 1.73   | 7.53  | 9.32   | 74.49   |  |
| 1980     | 4      | 8.89                             | 19.00  | 8.00   | 28.96 | 7.63  | 13.40 | 29.85  | 9.52   | 6.35  | 11.87  | 17.87 | 6.57   | 167.91  |  |
| 1981     | 4      | 4.59                             | 6.58   | 10.14  | 2.46  | 5.82  | 12.63 | 34.33  | 1.02   | 11.71 | 7.72   | 8.56  | 14.70  | 120.27  |  |
| 1982     | 4      | 5.01                             | 4.04   | 3.72   | 1.34  | 11.07 | 2.43  | 6.52   | 10.33  | 13.09 | 13.56  | 5.29  | 15.80  | 92.19   |  |
| 1983     | 4      | 4.84                             | 8.91   | 3.97   | 2.21  | 7.79  | 11.55 | 4.73   | 10.15  | 3.81  | 7.77   | 1.33  | 5.02   | 72.07   |  |
| 1984     | 4      | 9.43                             | 4.38+  | 6.02   | 13.05 | 9.60  | 5.04  | 16.63  | 2.20   | 11.10 | 25.07  | 3.18  | 1.78   | 107.48  |  |
| 1985     | 4      | 20.44                            | 9.26   | 10.54  | 3.51  | 5.73  | 6.71  | 5.01   | 2.07   | 5.09  | 6.92   | 40.45 | 7.24   | 122.95  |  |
| 1986     | 4      | 12.11                            | 7.35   | 1.92   | 1.48  | 2.48  | 3.01  | 22.85  | 6.03   | 7.95  | 4.78   | 11.35 | 10.65  | 91.95   |  |
| 1987     | 4      | 1.21                             | .00    | 6.31   | .35   | 3.29  | 7.83  | 11.44  | 5.49   | 9.16  | 4.64   | 9.15  | 8.32   | 67.17   |  |
| 1988     | 4      | 4.12                             | 1.94   | 4.84   | 2.69  | 3.26  | 13.64 | 20.84  | 2.81   | 11.51 | 8.33   | 8.95  | 5.00   | 87.93   |  |
| 1989     | 3      | 22.71                            | 8.48   | 3.18   | 4.04  | 7.43  | 3.72  | 24.10  | 10.10  | 14.48 | 2.93   | 5.61  | 3.61   | 110.39  |  |
| 1990     | 3      | 7.13                             | 6.23   | 6.22   | 6.33  | 6.08  | 3.42  | 2.09   | 7.58   | 8.52  | 6.91   | 2.57  | 5.56   | 68.63   |  |
| 1991     | 3      | 21.63                            | 3.04   | 3.68   | 2.78  | 5.97  | 7.00  | 5.61   | 11.42  | 11.26 | 9.97   | 4.11  | 9.16   | 95.63   |  |
| 1992     | 3      | 25.61                            | 7.42   | .41    | 5.28  | 9.14  | 3.72  | 27.32  | 14.07  | 7.49  | 9.68   | 6.27  | 7.50   | 123.93  |  |
| 1993     | 3      | 1.50                             | 4.35   | 14.49  | 5.00  | 9.75  | 8.53  | 13.35  | 6.22   | 9.97  | 6.31   | 12.16 | 2.47   | 94.10   |  |
| 1994     | 3      | 8.38                             | 1.88   | 22.87  | 7.00  | 8.23  | 14.16 | 13.69  | 15.89  | 5.98  | 7.18   | 7.92  | 7.81   | 120.98  |  |
| 1995     | 3      | 5.58                             | 13.99  | 17.52+ | 3.96+ | 3.55+ | 8.12+ | 1.66+  | 4.10+  | 3.00+ | 13.96+ | 2.20+ | 7.37+  | 85.01   |  |
| 1996     | 2      | 24.40                            | 19.74  | 7.30   | 2.74  | 6.30  | 10.39 | 8.55   | 17.78  | 10.73 | 9.78   | 11.67 | 2.85   | 132.26  |  |
| 1997     | 2      | 11.40                            | 9.41   | 1.19   | 11.82 | 5.18  | 14.98 | 26.28  | 12.65  | 5.21  | 8.39   | 4.15  | 3.00   | 113.67  |  |
| 1998     | 2      | 1.44                             | 17.29  | 10.35  | 6.78  | 10.34 | 6.17  | 13.20  | 8.50   | 2.80  | 5.92   | 6.76  | 7.31+  | 96.86   |  |
| average  |        | 9.41                             | 8.79   | 5.12   | 5.28  | 6.73  | 8.09  | 10.59  | 9.48   | 8.05  | 9.24   | 10.75 | 8.15   | 99.68   |  |
| adjusted |        | 9.44                             | 8.82   | 5.13   | 5.29  | 6.76  | 8.12  | 10.63  | 9.51   | 8.07  | 9.27   | 10.78 | 8.17   | 100.001 |  |

## Appendix B12.3

File : AT.DEM  
Units : 10<sup>6</sup>xm<sup>3</sup>  
Descrip. : Upland alien demand (tall trees) in Estuary sub-catchment for 1927 to 1998

| Year  | Oct  | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul   | Aug  | Sep  | Total |
|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|-------|
| 1927  | 0.01 | 0.01  | 0.00* | 0.00* | 0.00* | 0.02  | 0.01  | 0.00* | 0.00* | 0.00* | 0.01 | 0.01 | 0.1   |
| 1928  | 0.01 | 0.27  | 0.09  | 0.01  | 0.00* | 0.01  | 0.00* | 0.01  | 0.01  | 0.09  | 0.05 | 0.01 | 0.6   |
| 1929  | 0.01 | 0.01  | 0.01  | 0.00* | 0.07  | 0.04  | 0.01  | 0.01  | 0.01  | 0.01  | 0.03 | 0.02 | 0.2   |
| 1930  | 0.01 | 0.01  | 0.00* | 0.00* | 0.00* | 0.01  | 0.19  | 0.06  | 0.01  | 0.17  | 0.06 | 0.01 | 0.5   |
| 1931  | 0.13 | 0.05  | 0.05  | 0.02  | 0.02  | 0.01  | 0.00* | 0.00* | 0.01  | 0.01  | 0.01 | 0.01 | 0.43  |
| 1932  | 0.15 | 0.02  | 0.01  | 0.00* | 0.00* | 0.01  | 0.00* | 0.01  | 0.01  | 0.01  | 0.03 | 0.02 | 0.3   |
| 1933  | 0.01 | 0.01  | 0.00* | 0.02  | 0.01  | 0.01  | 0.00* | 0.00* | 0.00* | 0.05  | 0.08 | 0.04 | 0.2   |
| 1934  | 0.11 | 0.05  | 0.01  | 0.00* | 0.01  | 0.00* | 0.01  | 0.05  | 0.03  | 0.01  | 0.01 | 0.02 | 0.3   |
| 1935  | 0.01 | 0.02  | 0.01  | 0.00* | 0.00* | 0.00* | 0.00* | 0.02  | 0.01  | 0.02  | 0.01 | 0.03 | 0.1   |
| 1936  | 0.02 | 0.33  | 0.14  | 0.01  | 0.00* | 0.01  | 0.00* | 0.00* | 0.00* | 0.01  | 0.01 | 0.01 | 0.5   |
| 1937  | 0.01 | 0.01  | 0.01  | 0.01  | 0.00* | 0.03  | 0.02  | 0.01  | 0.01  | 0.01  | 0.02 | 0.02 | 0.2   |
| 1938  | 0.01 | 0.02  | 0.01  | 0.00* | 0.05  | 0.08  | 0.03  | 0.01  | 0.01  | 0.01  | 0.15 | 0.06 | 0.4   |
| 1939  | 0.01 | 0.01  | 0.00* | 0.00* | 0.10  | 0.04  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01 | 0.01 | 0.2   |
| 1940  | 0.01 | 0.06  | 0.02  | 0.01  | 0.01  | 0.00* | 0.09  | 0.05  | 0.04  | 0.03  | 0.02 | 0.02 | 0.4   |
| 1941  | 0.06 | 0.02  | 0.01  | 0.01  | 0.00* | 0.00* | 0.00* | 0.01  | 0.01  | 0.01  | 0.01 | 0.01 | 0.2   |
| 1942  | 0.02 | 0.01  | 0.06  | 0.22  | 0.07  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01 | 0.05 | 0.5   |
| 1943  | 0.02 | 0.11  | 0.04  | 0.00* | 0.00* | 0.01  | 0.01  | 0.08  | 0.05  | 0.02  | 0.03 | 0.08 | 0.5   |
| 1944  | 0.04 | 0.01  | 0.01  | 0.00* | 0.00* | 0.00* | 0.00* | 0.08  | 0.05  | 0.02  | 0.04 | 0.02 | 0.3   |
| 1945  | 0.15 | 0.06  | 0.01  | 0.00* | 0.00* | 0.17  | 0.06  | 0.00* | 0.00* | 0.01  | 0.01 | 0.01 | 0.5   |
| 1946  | 0.01 | 0.00* | 0.00* | 0.00* | 0.00* | 0.09  | 0.04  | 0.01  | 0.01  | 0.04  | 0.02 | 0.02 | 0.2   |
| 1947  | 0.01 | 0.01  | 0.01  | 0.00* | 0.00* | 0.02  | 0.02  | 0.01  | 0.01  | 0.01  | 0.01 | 0.01 | 0.1   |
| 1948  | 0.40 | 0.13  | 0.01  | 0.00* | 0.00* | 0.00* | 0.04  | 0.02  | 0.01  | 0.01  | 0.01 | 0.01 | 0.6   |
| 1949  | 0.01 | 0.35  | 0.12  | 0.00* | 0.00* | 0.00* | 0.01  | 0.01  | 0.00* | 0.01  | 0.01 | 0.01 | 0.5   |
| 1950  | 0.02 | 0.08  | 0.02  | 0.10  | 0.04  | 0.01  | 0.01  | 0.01  | 0.04  | 0.04  | 0.02 | 0.05 | 0.4   |
| 1951  | 0.02 | 0.01  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.08 | 0.26 | 0.4   |
| 1952  | 0.09 | 0.15  | 0.05  | 0.00* | 0.00* | 0.00* | 0.01  | 0.01  | 0.01  | 0.12  | 0.05 | 0.05 | 0.5   |
| 1953  | 0.06 | 0.05  | 0.02  | 0.00* | 0.00* | 0.00* | 0.01  | 0.01  | 0.01  | 0.08  | 0.03 | 0.26 | 0.8   |
| 1954  | 0.01 | 0.01  | 0.01  | 0.01  | 0.12  | 0.04  | 0.00* | 0.00* | 0.01  | 0.04  | 0.05 | 0.03 | 0.3   |
| 1955  | 0.04 | 0.02  | 0.01  | 0.00* | 0.00* | 0.02  | 0.01  | 0.06  | 0.04  | 0.02  | 0.04 | 0.02 | 0.3   |
| 1956  | 0.04 | 0.01  | 0.01  | 0.00* | 0.02  | 0.02  | 0.01  | 0.10  | 0.20  | 0.08  | 0.12 | 0.06 | 0.7   |
| 1957  | 0.04 | 0.02  | 0.01  | 0.00* | 0.00* | 0.02  | 0.01  | 0.31  | 0.11  | 0.01  | 0.05 | 0.02 | 0.6   |
| 1958  | 0.01 | 0.01  | 0.00* | 0.01  | 0.01  | 0.01  | 0.20  | 0.10  | 0.02  | 0.22  | 0.18 | 0.05 | 0.8   |
| 1959  | 0.16 | 0.06  | 0.01  | 0.01  | 0.00* | 0.01  | 0.00* | 0.01  | 0.02  | 0.01  | 0.01 | 0.01 | 0.3   |
| 1960  | 0.01 | 0.01  | 0.02  | 0.04  | 0.01  | 0.01  | 0.01  | 0.05  | 0.02  | 0.01  | 0.05 | 0.03 | 0.3   |
| 1961  | 0.02 | 0.01  | 0.00* | 0.01  | 0.00* | 0.07  | 0.04  | 0.01  | 0.01  | 0.01  | 0.62 | 0.22 | 1.0   |
| 1962  | 0.07 | 0.04  | 0.01  | 0.00* | 0.00* | 0.03  | 0.01  | 0.02  | 0.01  | 0.02  | 0.01 | 0.01 | 0.2   |
| 1963  | 0.01 | 0.01  | 0.01  | 0.01  | 0.01  | 0.09  | 0.03  | 0.01  | 0.08  | 0.03  | 0.02 | 0.03 | 0.3   |
| 1964  | 0.02 | 0.04  | 0.02  | 0.00* | 0.00* | 0.01  | 0.01  | 0.06  | 0.02  | 0.03  | 0.02 | 0.01 | 0.2   |
| 1965  | 0.11 | 0.10  | 0.02  | 0.00* | 0.00* | 0.00* | 0.00* | 0.02  | 0.01  | 0.01  | 0.24 | 0.11 | 0.6   |
| 1966  | 0.02 | 0.01  | 0.00* | 0.00* | 0.01  | 0.02  | 0.62  | 0.27  | 0.05  | 0.02  | 0.02 | 0.04 | 1.1   |
| 1967  | 0.02 | 0.01  | 0.01  | 0.00* | 0.00* | 0.00* | 0.02  | 0.04  | 0.04  | 0.02  | 0.02 | 0.01 | 0.2   |
| 1968  | 0.01 | 0.01  | 0.01  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.04  | 0.02  | 0.01 | 0.01 | 0.1   |
| 1969  | 0.01 | 0.00* | 0.00* | 0.01  | 0.01  | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.02 | 0.01 | 0.1   |
| 1970  | 0.01 | 0.01  | 0.00* | 0.00* | 0.02  | 0.04  | 0.05  | 0.02  | 0.26  | 0.18  | 0.05 | 0.08 | 0.8   |
| 1971  | 0.02 | 0.06  | 0.02  | 0.00* | 0.01  | 0.00* | 0.04  | 0.02  | 0.01  | 0.01  | 0.04 | 0.03 | 0.3   |
| 1972  | 0.01 | 0.01  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.01  | 0.01 | 0.01 | 0.1   |
| 1973  | 0.01 | 0.01  | 0.01  | 0.01  | 0.11  | 0.04  | 0.00* | 0.05  | 0.02  | 0.01  | 0.20 | 0.08 | 0.6   |
| 1974  | 0.01 | 0.01  | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.01  | 0.01  | 0.01  | 0.04 | 0.05 | 0.1   |
| 1975  | 0.02 | 0.01  | 0.00* | 0.00* | 0.01  | 0.02  | 0.05  | 0.02  | 0.09  | 0.05  | 0.02 | 0.02 | 0.3   |
| 1976  | 0.04 | 0.03  | 0.01  | 0.00* | 0.04  | 0.02  | 0.04  | 0.22  | 0.09  | 0.02  | 0.02 | 0.02 | 0.6   |
| 1977  | 0.02 | 0.02  | 0.01  | 0.01  | 0.00* | 0.00* | 0.01  | 0.01  | 0.00* | 0.01  | 0.02 | 0.02 | 0.1   |
| 1978  | 0.01 | 0.01  | 0.01  | 0.01  | 0.19  | 0.06  | 0.00* | 0.01  | 0.01  | 0.01  | 0.02 | 0.02 | 0.4   |
| 1979  | 0.02 | 0.01  | 0.01  | 0.01  | 0.01  | 0.00* | 0.00* | 0.00* | 0.02  | 0.01  | 0.01 | 0.01 | 0.1   |
| 1980  | 0.01 | 0.09  | 0.04  | 0.26  | 0.09  | 0.02  | 0.29  | 0.11  | 0.01  | 0.02  | 0.09 | 0.04 | 1.1   |
| 1981  | 0.02 | 0.01  | 0.01  | 0.01  | 0.00* | 0.02  | 0.38  | 0.13  | 0.02  | 0.01  | 0.01 | 0.05 | 0.7   |
| 1982  | 0.02 | 0.01  | 0.00* | 0.00* | 0.01  | 0.01  | 0.00* | 0.01  | 0.03  | 0.04  | 0.02 | 0.05 | 0.2   |
| 1983  | 0.03 | 0.01  | 0.01  | 0.00* | 0.00* | 0.01  | 0.01  | 0.01  | 0.01  | 0.01  | 0.01 | 0.01 | 0.1   |
| 1984  | 0.01 | 0.01  | 0.00* | 0.02  | 0.01  | 0.01  | 0.05  | 0.02  | 0.01  | 0.19  | 0.08 | 0.01 | 0.4   |
| 1985  | 0.11 | 0.05  | 0.02  | 0.01  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.50 | 0.18 | 0.9   |
| 1986  | 0.02 | 0.01  | 0.01  | 0.00* | 0.00* | 0.00* | 0.14  | 0.05  | 0.01  | 0.01  | 0.02 | 0.02 | 0.3   |
| 1987  | 0.01 | 0.01  | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.01  | 0.01  | 0.01  | 0.01 | 0.01 | 0.1   |
| 1988  | 0.01 | 0.01  | 0.00* | 0.00* | 0.00* | 0.02  | 0.12  | 0.04  | 0.02  | 0.02  | 0.02 | 0.01 | 0.3   |
| 1989  | 0.15 | 0.06  | 0.01  | 0.00* | 0.00* | 0.00* | 0.16  | 0.06  | 0.04  | 0.02  | 0.01 | 0.01 | 0.5   |
| 1990  | 0.01 | 0.01  | 0.01  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.01  | 0.01 | 0.01 | 0.1   |
| 1991  | 0.13 | 0.05  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.02  | 0.02  | 0.01 | 0.01 | 0.3   |
| 1992  | 0.21 | 0.08  | 0.01  | 0.00* | 0.01  | 0.00* | 0.23  | 0.11  | 0.02  | 0.02  | 0.02 | 0.02 | 0.7   |
| 1993  | 0.01 | 0.01  | 0.03  | 0.01  | 0.01  | 0.01  | 0.02  | 0.01  | 0.01  | 0.01  | 0.02 | 0.02 | 0.2   |
| 1994  | 0.01 | 0.01  | 0.15  | 0.05  | 0.01  | 0.03  | 0.04  | 0.05  | 0.02  | 0.01  | 0.02 | 0.02 | 0.4   |
| 1995  | 0.01 | 0.04  | 0.08  | 0.02  | 0.00* | 0.01  | 0.00* | 0.00* | 0.00* | 0.03  | 0.01 | 0.01 | 0.2   |
| 1996  | 0.18 | 0.15  | 0.04  | 0.00* | 0.00* | 0.01  | 0.01  | 0.07  | 0.04  | 0.02  | 0.03 | 0.02 | 0.6   |
| 1997  | 0.02 | 0.02  | 0.01  | 0.02  | 0.01  | 0.04  | 0.22  | 0.09  | 0.02  | 0.01  | 0.01 | 0.01 | 0.5   |
| 1998  | 0.01 | 0.06  | 0.03  | 0.01  | 0.01  | 0.01  | 0.02  | 0.01  | 0.01  | 0.01  | 0.01 | 0.01 | 0.2   |
| AVE : | 0.04 | 0.04  | 0.02  | 0.01  | 0.02  | 0.02  | 0.05  | 0.04  | 0.02  | 0.03  | 0.06 | 0.04 | 0.4   |
| SD :  | 0.06 | 0.07  | 0.03  | 0.04  | 0.03  | 0.03  | 0.10  | 0.06  | 0.03  | 0.05  | 0.10 | 0.06 | 0.3   |

## Appendix B12.4

File : AS.DEM  
Units : 10^6xm^3  
Descrip. : Upland alien demand (tall shrubs) in Estuary sub-catchment for 1927 to 1998

| Year  | Oct  | Nov   | Dec   | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul   | Aug   | Sep  | Total |
|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|
| 1927  | 0.00 | 0.00  | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00 | 0.0   |
| 1928  | 0.00 | 0.02  | 0.01  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.00* | 0.01  | 0.00  | 0.00 | 0.0   |
| 1929  | 0.00 | 0.00  | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1930  | 0.00 | 0.00  | 0.00* | 0.00* | 0.00* | 0.00  | 0.01  | 0.00  | 0.00* | 0.01  | 0.00  | 0.00 | 0.0   |
| 1931  | 0.01 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.03 | 0.0   |
| 1932  | 0.01 | 0.00  | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1933  | 0.00 | 0.00  | 0.00* | 0.00  | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00 | 0.0   |
| 1934  | 0.01 | 0.00  | 0.00  | 0.00* | 0.00  | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1935  | 0.00 | 0.00  | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1936  | 0.00 | 0.02  | 0.01  | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00 | 0.0   |
| 1937  | 0.00 | 0.00  | 0.00  | 0.00  | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1938  | 0.00 | 0.00  | 0.00  | 0.00* | 0.00  | 0.01  | 0.00  | 0.00  | 0.00* | 0.00  | 0.01  | 0.00 | 0.0   |
| 1939  | 0.00 | 0.00  | 0.00* | 0.00* | 0.01  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1940  | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00* | 0.01  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1941  | 0.00 | 0.00  | 0.00  | 0.00  | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1942  | 0.00 | 0.00  | 0.00  | 0.01  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00* | 0.00  | 0.00  | 0.00 | 0.0   |
| 1943  | 0.00 | 0.01  | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.01 | 0.0   |
| 1944  | 0.00 | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1945  | 0.01 | 0.00  | 0.00  | 0.00* | 0.00* | 0.01  | 0.00  | 0.00* | 0.00* | 0.00  | 0.00  | 0.00 | 0.0   |
| 1946  | 0.00 | 0.00* | 0.00* | 0.00* | 0.00* | 0.01  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1947  | 0.00 | 0.00  | 0.00  | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1948  | 0.03 | 0.01  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1949  | 0.00 | 0.02  | 0.01  | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00* | 0.00  | 0.00  | 0.00 | 0.0   |
| 1950  | 0.00 | 0.00  | 0.00  | 0.01  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1951  | 0.00 | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.02 | 0.0   |
| 1952  | 0.01 | 0.01  | 0.00  | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.01  | 0.00  | 0.00 | 0.0   |
| 1953  | 0.00 | 0.00  | 0.00  | 0.00* | 0.00* | 0.00* | 0.00  | 0.01  | 0.00  | 0.00  | 0.02  | 0.01 | 0.0   |
| 1954  | 0.00 | 0.00  | 0.00  | 0.00  | 0.01  | 0.00  | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1955  | 0.00 | 0.00  | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1956  | 0.00 | 0.00  | 0.00  | 0.00* | 0.00* | 0.00  | 0.00  | 0.01  | 0.01  | 0.00  | 0.01  | 0.00 | 0.0   |
| 1957  | 0.00 | 0.00  | 0.00  | 0.00* | 0.00* | 0.00  | 0.00  | 0.02  | 0.01  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1958  | 0.00 | 0.00  | 0.00* | 0.00  | 0.00  | 0.00  | 0.01  | 0.00  | 0.00  | 0.01  | 0.01  | 0.00 | 0.0   |
| 1959  | 0.01 | 0.00  | 0.00  | 0.00  | 0.00* | 0.00  | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1960  | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1961  | 0.00 | 0.00  | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.04  | 0.01 | 0.1   |
| 1962  | 0.00 | 0.00  | 0.00  | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1963  | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.01  | 0.00  | 0.00* | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1964  | 0.00 | 0.00  | 0.00  | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1965  | 0.01 | 0.01  | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00* | 0.02  | 0.01 | 0.1   |
| 1966  | 0.00 | 0.00  | 0.00* | 0.00* | 0.00  | 0.00  | 0.04  | 0.02  | 0.00  | 0.00  | 0.00  | 0.00 | 0.1   |
| 1967  | 0.00 | 0.00  | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1968  | 0.00 | 0.00  | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1969  | 0.00 | 0.00* | 0.00* | 0.00  | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00 | 0.0   |
| 1970  | 0.00 | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.01  | 0.00  | 0.00  | 0.02  | 0.01  | 0.00 | 0.0   |
| 1971  | 0.00 | 0.00  | 0.00  | 0.00* | 0.00  | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1972  | 0.00 | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1973  | 0.00 | 0.00* | 0.00  | 0.00* | 0.01  | 0.00  | 0.00* | 0.00  | 0.00  | 0.00  | 0.01  | 0.00 | 0.0   |
| 1974  | 0.00 | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1975  | 0.00 | 0.00  | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.01  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1976  | 0.00 | 0.00  | 0.00  | 0.00* | 0.00  | 0.00  | 0.00  | 0.01  | 0.01  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1977  | 0.00 | 0.00  | 0.00  | 0.00  | 0.00* | 0.00* | 0.00  | 0.00  | 0.00* | 0.00  | 0.00  | 0.00 | 0.0   |
| 1978  | 0.00 | 0.00  | 0.00  | 0.00* | 0.01  | 0.00  | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1979  | 0.00 | 0.00  | 0.00* | 0.00  | 0.00  | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1980  | 0.00 | 0.01  | 0.00  | 0.02  | 0.01  | 0.00  | 0.02  | 0.01  | 0.00  | 0.00  | 0.01  | 0.00 | 0.1   |
| 1981  | 0.00 | 0.00  | 0.00  | 0.00  | 0.00* | 0.00  | 0.03  | 0.01  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1982  | 0.00 | 0.00  | 0.00* | 0.00* | 0.00  | 0.00  | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1983  | 0.00 | 0.00  | 0.00  | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1984  | 0.00 | 0.00  | 0.00* | 0.00  | 0.00  | 0.00* | 0.00  | 0.00  | 0.00  | 0.01  | 0.00  | 0.00 | 0.0   |
| 1985  | 0.01 | 0.00  | 0.00  | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.03  | 0.01 | 0.1   |
| 1986  | 0.00 | 0.00  | 0.00  | 0.00* | 0.00* | 0.00* | 0.01  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1987  | 0.00 | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1988  | 0.00 | 0.00  | 0.00* | 0.00* | 0.00* | 0.00  | 0.01  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1989  | 0.01 | 0.00  | 0.00  | 0.00* | 0.00* | 0.00* | 0.01  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1990  | 0.00 | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1991  | 0.01 | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1992  | 0.01 | 0.00  | 0.00  | 0.00* | 0.00  | 0.00* | 0.02  | 0.01  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1993  | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1994  | 0.00 | 0.00  | 0.01  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1995  | 0.00 | 0.00  | 0.00  | 0.00  | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.00  | 0.00  | 0.00 | 0.0   |
| 1996  | 0.01 | 0.01  | 0.00  | 0.00* | 0.00* | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1997  | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.01  | 0.01  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| 1998  | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| AVE : | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00 | 0.0   |
| SD :  | 0.01 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.01  | 0.00  | 0.00  | 0.00  | 0.01  | 0.00 | 0.0   |



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File      : 590-RIP.DEM
Units     : 10^6xm^3
Descrip.  : Riparian alien demand (tall trees) in Estuary sub-catchment for 1927 to 1990
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| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1927  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1928  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1929  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1930  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1931  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1932  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1933  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1934  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1935  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1936  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1937  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1938  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1939  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1940  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1941  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1942  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1943  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1944  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1945  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1946  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1947  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1948  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1949  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1950  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1951  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1952  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1953  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1954  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1955  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1956  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1957  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1958  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1959  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1960  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1961  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1962  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1963  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1964  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1965  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1966  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1967  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1968  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1969  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1970  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1971  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1972  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1973  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1974  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1975  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1976  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1977  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1978  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1979  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1980  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1981  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1982  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1983  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1984  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1985  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1986  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1987  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1988  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1989  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| 1990  | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| AVE : | 0.93 | 1.17 | 1.52 | 1.67 | 1.30 | 1.01 | 1.01 | 0.42 | 0.32 | 0.31 | 0.42 | 0.57 | 10.7  |
| SD :  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0   |

## Appendix B12.6

File : 590IRR.DEM  
Units : 10^6xm^3  
Descrip. : Irrigation from farm dams in Estuary sub-catchment for 1927 to 1998

| Year  | Oct  | Nov  | Dec  | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Total |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1927  | 0.56 | 0.77 | 1.05 | 1.14 | 0.88 | 0.62 | 0.53 | 0.22 | 0.10 | 0.11 | 0.10 | 0.20 | 6.3   |
| 1928  | 0.57 | 0.49 | 1.02 | 1.15 | 0.85 | 0.64 | 0.52 | 0.14 | 0.09 | 0.00 | 0.06 | 0.27 | 5.8   |
| 1929  | 0.52 | 0.81 | 1.03 | 1.13 | 0.80 | 0.62 | 0.47 | 0.14 | 0.09 | 0.11 | 0.02 | 0.25 | 6.0   |
| 1930  | 0.50 | 0.76 | 1.06 | 1.13 | 0.86 | 0.63 | 0.29 | 0.22 | 0.14 | 0.00 | 0.10 | 0.26 | 5.9   |
| 1931  | 0.36 | 0.77 | 0.99 | 1.13 | 0.82 | 0.67 | 0.52 | 0.15 | 0.04 | 0.02 | 0.17 | 0.00 | 5.6   |
| 1932  | 0.55 | 0.70 | 1.04 | 1.15 | 0.86 | 0.64 | 0.50 | 0.14 | 0.05 | 0.08 | 0.02 | 0.31 | 6.0   |
| 1933  | 0.56 | 0.73 | 1.05 | 1.09 | 0.86 | 0.64 | 0.53 | 0.19 | 0.11 | 0.00 | 0.00 | 0.23 | 6.0   |
| 1934  | 0.38 | 0.70 | 1.06 | 1.14 | 0.84 | 0.66 | 0.45 | 0.07 | 0.03 | 0.09 | 0.14 | 0.22 | 5.8   |
| 1935  | 0.55 | 0.69 | 1.03 | 1.14 | 0.86 | 0.66 | 0.52 | 0.11 | 0.10 | 0.00 | 0.13 | 0.18 | 6.0   |
| 1936  | 0.51 | 0.46 | 1.00 | 1.15 | 0.87 | 0.64 | 0.52 | 0.23 | 0.09 | 0.03 | 0.18 | 0.22 | 5.9   |
| 1937  | 0.55 | 0.72 | 1.01 | 1.14 | 0.88 | 0.61 | 0.42 | 0.13 | 0.06 | 0.03 | 0.08 | 0.23 | 5.9   |
| 1938  | 0.52 | 0.69 | 1.04 | 1.14 | 0.80 | 0.60 | 0.46 | 0.20 | 0.13 | 0.01 | 0.00 | 0.26 | 5.9   |
| 1939  | 0.57 | 0.77 | 1.05 | 1.13 | 0.79 | 0.65 | 0.42 | 0.18 | 0.06 | 0.12 | 0.19 | 0.26 | 6.2   |
| 1940  | 0.54 | 0.63 | 1.06 | 1.10 | 0.87 | 0.67 | 0.34 | 0.11 | 0.00 | 0.02 | 0.07 | 0.23 | 5.6   |
| 1941  | 0.42 | 0.77 | 1.04 | 1.11 | 0.87 | 0.65 | 0.51 | 0.11 | 0.03 | 0.12 | 0.12 | 0.28 | 6.0   |
| 1942  | 0.48 | 0.81 | 0.98 | 1.03 | 0.86 | 0.64 | 0.45 | 0.17 | 0.08 | 0.07 | 0.08 | 0.14 | 5.8   |
| 1943  | 0.55 | 0.59 | 1.05 | 1.15 | 0.87 | 0.64 | 0.47 | 0.05 | 0.00 | 0.07 | 0.04 | 0.13 | 5.6   |
| 1944  | 0.50 | 0.79 | 1.06 | 1.15 | 0.87 | 0.67 | 0.49 | 0.05 | 0.00 | 0.04 | 0.03 | 0.23 | 5.9   |
| 1945  | 0.34 | 0.75 | 1.06 | 1.14 | 0.86 | 0.57 | 0.52 | 0.18 | 0.09 | 0.07 | 0.15 | 0.26 | 6.0   |
| 1946  | 0.54 | 0.79 | 1.06 | 1.15 | 0.86 | 0.59 | 0.50 | 0.14 | 0.08 | 0.00 | 0.19 | 0.19 | 6.1   |
| 1947  | 0.53 | 0.72 | 1.06 | 1.13 | 0.86 | 0.62 | 0.42 | 0.20 | 0.06 | 0.03 | 0.19 | 0.23 | 6.0   |
| 1948  | 0.20 | 0.77 | 1.05 | 1.13 | 0.87 | 0.67 | 0.38 | 0.13 | 0.14 | 0.07 | 0.12 | 0.28 | 5.8   |
| 1949  | 0.59 | 0.45 | 1.06 | 1.15 | 0.87 | 0.66 | 0.42 | 0.18 | 0.15 | 0.01 | 0.10 | 0.27 | 5.9   |
| 1950  | 0.46 | 0.62 | 1.05 | 1.06 | 0.88 | 0.63 | 0.46 | 0.15 | 0.00 | 0.00 | 0.09 | 0.16 | 5.6   |
| 1951  | 0.54 | 0.81 | 1.05 | 1.13 | 0.85 | 0.66 | 0.50 | 0.18 | 0.07 | 0.07 | 0.00 | 0.05 | 5.9   |
| 1952  | 0.52 | 0.57 | 1.04 | 1.13 | 0.86 | 0.67 | 0.42 | 0.17 | 0.03 | 0.00 | 0.11 | 0.16 | 5.7   |
| 1953  | 0.42 | 0.67 | 1.05 | 1.15 | 0.86 | 0.65 | 0.42 | 0.00 | 0.06 | 0.00 | 0.00 | 0.30 | 5.6   |
| 1954  | 0.58 | 0.73 | 1.05 | 1.11 | 0.78 | 0.67 | 0.50 | 0.19 | 0.02 | 0.00 | 0.01 | 0.21 | 5.9   |
| 1955  | 0.45 | 0.80 | 1.06 | 1.14 | 0.87 | 0.62 | 0.49 | 0.06 | 0.02 | 0.04 | 0.02 | 0.28 | 5.8   |
| 1956  | 0.45 | 0.80 | 1.03 | 1.14 | 0.82 | 0.63 | 0.51 | 0.04 | 0.00 | 0.03 | 0.00 | 0.20 | 5.7   |
| 1957  | 0.46 | 0.82 | 1.06 | 1.15 | 0.86 | 0.62 | 0.45 | 0.00 | 0.08 | 0.16 | 0.00 | 0.30 | 6.0   |
| 1958  | 0.53 | 0.77 | 1.04 | 1.11 | 0.83 | 0.63 | 0.29 | 0.09 | 0.13 | 0.00 | 0.00 | 0.26 | 5.7   |
| 1959  | 0.34 | 0.80 | 1.05 | 1.11 | 0.86 | 0.63 | 0.52 | 0.12 | 0.00 | 0.06 | 0.16 | 0.22 | 5.9   |
| 1960  | 0.57 | 0.76 | 1.00 | 1.09 | 0.87 | 0.64 | 0.46 | 0.07 | 0.09 | 0.04 | 0.00 | 0.23 | 5.8   |
| 1961  | 0.51 | 0.81 | 1.06 | 1.11 | 0.85 | 0.59 | 0.42 | 0.18 | 0.03 | 0.08 | 0.00 | 0.32 | 6.0   |
| 1962  | 0.40 | 0.72 | 1.06 | 1.13 | 0.87 | 0.61 | 0.46 | 0.11 | 0.08 | 0.01 | 0.12 | 0.32 | 5.9   |
| 1963  | 0.48 | 0.74 | 1.03 | 1.10 | 0.84 | 0.59 | 0.49 | 0.19 | 0.00 | 0.10 | 0.06 | 0.19 | 5.8   |
| 1964  | 0.52 | 0.66 | 1.06 | 1.13 | 0.84 | 0.64 | 0.47 | 0.06 | 0.10 | 0.00 | 0.12 | 0.31 | 5.9   |
| 1965  | 0.37 | 0.63 | 1.04 | 1.13 | 0.88 | 0.65 | 0.47 | 0.10 | 0.13 | 0.12 | 0.00 | 0.19 | 5.7   |
| 1966  | 0.58 | 0.79 | 1.06 | 1.14 | 0.84 | 0.62 | 0.11 | 0.06 | 0.01 | 0.04 | 0.07 | 0.19 | 5.5   |
| 1967  | 0.55 | 0.74 | 1.06 | 1.15 | 0.86 | 0.65 | 0.49 | 0.10 | 0.00 | 0.14 | 0.04 | 0.29 | 6.1   |
| 1968  | 0.53 | 0.71 | 1.06 | 1.14 | 0.86 | 0.66 | 0.47 | 0.20 | 0.00 | 0.09 | 0.13 | 0.27 | 6.1   |
| 1969  | 0.54 | 0.81 | 1.06 | 1.11 | 0.84 | 0.67 | 0.55 | 0.18 | 0.07 | 0.03 | 0.04 | 0.30 | 6.2   |
| 1970  | 0.53 | 0.81 | 1.04 | 1.14 | 0.82 | 0.61 | 0.32 | 0.12 | 0.03 | 0.00 | 0.00 | 0.30 | 5.7   |
| 1971  | 0.55 | 0.63 | 1.05 | 1.14 | 0.84 | 0.65 | 0.39 | 0.13 | 0.09 | 0.05 | 0.02 | 0.20 | 5.7   |
| 1972  | 0.59 | 0.75 | 1.05 | 1.14 | 0.88 | 0.66 | 0.49 | 0.15 | 0.04 | 0.08 | 0.09 | 0.26 | 6.2   |
| 1973  | 0.57 | 0.77 | 1.02 | 1.12 | 0.78 | 0.65 | 0.54 | 0.07 | 0.11 | 0.14 | 0.00 | 0.24 | 6.0   |
| 1974  | 0.53 | 0.78 | 1.06 | 1.13 | 0.87 | 0.66 | 0.51 | 0.11 | 0.08 | 0.03 | 0.02 | 0.17 | 5.9   |
| 1975  | 0.56 | 0.76 | 1.06 | 1.14 | 0.84 | 0.62 | 0.37 | 0.15 | 0.00 | 0.01 | 0.08 | 0.27 | 5.9   |
| 1976  | 0.44 | 0.70 | 1.05 | 1.14 | 0.81 | 0.65 | 0.38 | 0.00 | 0.01 | 0.04 | 0.09 | 0.22 | 5.5   |
| 1977  | 0.54 | 0.69 | 1.02 | 1.12 | 0.86 | 0.66 | 0.42 | 0.17 | 0.10 | 0.02 | 0.05 | 0.20 | 5.9   |
| 1978  | 0.52 | 0.77 | 1.02 | 1.12 | 0.76 | 0.67 | 0.54 | 0.12 | 0.06 | 0.02 | 0.04 | 0.23 | 5.9   |
| 1979  | 0.50 | 0.81 | 1.03 | 1.10 | 0.86 | 0.66 | 0.50 | 0.18 | 0.00 | 0.14 | 0.09 | 0.22 | 6.1   |
| 1980  | 0.50 | 0.61 | 1.03 | 1.02 | 0.84 | 0.61 | 0.25 | 0.13 | 0.07 | 0.00 | 0.00 | 0.25 | 5.3   |
| 1981  | 0.55 | 0.75 | 1.02 | 1.14 | 0.85 | 0.62 | 0.21 | 0.22 | 0.01 | 0.05 | 0.08 | 0.16 | 5.7   |
| 1982  | 0.54 | 0.78 | 1.05 | 1.15 | 0.83 | 0.67 | 0.48 | 0.12 | 0.00 | 0.00 | 0.13 | 0.15 | 5.9   |
| 1983  | 0.55 | 0.73 | 1.05 | 1.14 | 0.84 | 0.62 | 0.50 | 0.12 | 0.10 | 0.05 | 0.19 | 0.27 | 6.2   |
| 1984  | 0.49 | 0.78 | 1.03 | 1.09 | 0.83 | 0.65 | 0.36 | 0.21 | 0.01 | 0.00 | 0.16 | 0.31 | 5.9   |
| 1985  | 0.37 | 0.72 | 1.01 | 1.14 | 0.85 | 0.65 | 0.50 | 0.21 | 0.08 | 0.06 | 0.00 | 0.24 | 5.8   |
| 1986  | 0.46 | 0.74 | 1.05 | 1.14 | 0.87 | 0.66 | 0.31 | 0.16 | 0.05 | 0.09 | 0.05 | 0.21 | 5.8   |
| 1987  | 0.59 | 0.83 | 1.03 | 1.15 | 0.86 | 0.64 | 0.42 | 0.17 | 0.04 | 0.09 | 0.07 | 0.23 | 6.1   |
| 1988  | 0.55 | 0.81 | 1.04 | 1.14 | 0.86 | 0.61 | 0.33 | 0.20 | 0.01 | 0.05 | 0.07 | 0.27 | 5.9   |
| 1989  | 0.34 | 0.73 | 1.05 | 1.13 | 0.84 | 0.66 | 0.30 | 0.12 | 0.00 | 0.12 | 0.12 | 0.29 | 5.7   |
| 1990  | 0.52 | 0.76 | 1.03 | 1.12 | 0.85 | 0.66 | 0.53 | 0.14 | 0.04 | 0.06 | 0.17 | 0.26 | 6.2   |
| 1991  | 0.35 | 0.79 | 1.05 | 1.14 | 0.85 | 0.65 | 0.49 | 0.11 | 0.01 | 0.03 | 0.14 | 0.22 | 5.8   |
| 1992  | 0.31 | 0.74 | 1.06 | 1.13 | 0.84 | 0.66 | 0.27 | 0.09 | 0.06 | 0.03 | 0.11 | 0.24 | 5.5   |
| 1993  | 0.58 | 0.78 | 1.00 | 1.13 | 0.83 | 0.64 | 0.40 | 0.16 | 0.03 | 0.07 | 0.04 | 0.30 | 6.0   |
| 1994  | 0.51 | 0.81 | 0.96 | 1.12 | 0.84 | 0.61 | 0.40 | 0.07 | 0.07 | 0.06 | 0.09 | 0.24 | 5.8   |
| 1995  | 0.54 | 0.67 | 0.98 | 1.13 | 0.86 | 0.64 | 0.53 | 0.18 | 0.12 | 0.00 | 0.17 | 0.24 | 6.1   |
| 1996  | 0.32 | 0.60 | 1.03 | 1.14 | 0.85 | 0.63 | 0.46 | 0.06 | 0.02 | 0.03 | 0.04 | 0.30 | 5.5   |
| 1997  | 0.47 | 0.72 | 1.06 | 1.10 | 0.85 | 0.61 | 0.28 | 0.10 | 0.08 | 0.05 | 0.14 | 0.29 | 5.8   |
| 1998  | 0.59 | 0.63 | 1.01 | 1.12 | 0.83 | 0.65 | 0.40 | 0.14 | 0.12 | 0.07 | 0.10 | 0.24 | 5.9   |
| AVE : | 0.49 | 0.73 | 1.04 | 1.13 | 0.85 | 0.64 | 0.44 | 0.13 | 0.06 | 0.05 | 0.08 | 0.24 | 5.9   |
| SD :  | 0.08 | 0.08 | 0.02 | 0.02 | 0.02 | 0.02 | 0.09 | 0.06 | 0.04 | 0.04 | 0.06 | 0.06 | 0.2   |

## Appendix B12.7

File : 590CUMCU.SIM  
Units : 10^6xm^3  
Descrip. : Simulated flow record for Estuary sub-catchment for 1927 to 1998

| Year  | Oct    | Nov    | Dec    | Jan    | Feb    | Mar   | Apr    | May    | Jun    | Jul    | Aug     | Sep    | Total  |
|-------|--------|--------|--------|--------|--------|-------|--------|--------|--------|--------|---------|--------|--------|
| 1927  | 5.29   | 20.47  | 7.47   | 2.91   | 1.20   | 35.38 | 8.96   | 0.00   | 128.42 | 29.41  | 56.57   | 71.03  | 367.1  |
| 1928  | 23.66  | 125.91 | 46.31  | 6.62   | 2.28   | 13.74 | 17.98  | 22.10  | 39.92  | 206.32 | 191.05  | 56.53  | 752.4  |
| 1929  | 25.17  | 10.30  | 20.53  | 11.96  | 75.93  | 49.64 | 10.71  | 7.15   | 5.30   | 17.32  | 96.36   | 147.16 | 477.5  |
| 1930  | 63.72  | 19.09  | 10.25  | 9.20   | 3.73   | 14.19 | 180.75 | 107.40 | 24.60  | 160.57 | 278.73  | 115.53 | 987.8  |
| 1931  | 175.97 | 45.54  | 92.45  | 31.18  | 79.74  | 11.48 | 2.26   | 31.49  | 55.58  | 88.40  | 58.66   | 366.09 | 1038.8 |
| 1932  | 135.59 | 19.94  | 11.55  | 4.85   | 2.64   | 2.97  | 1.66   | 6.63   | 144.78 | 270.68 | 182.77  | 67.76  | 851.8  |
| 1933  | 30.30  | 25.08  | 11.45  | 13.32  | 8.99   | 10.61 | 2.89   | 3.35   | 22.81  | 54.11  | 111.40  | 109.34 | 403.6  |
| 1934  | 242.56 | 105.67 | 18.14  | 6.45   | 4.83   | 3.42  | 18.23  | 68.33  | 64.93  | 106.24 | 106.96  | 73.16  | 818.9  |
| 1935  | 30.49  | 29.86  | 12.94  | 6.76   | 2.42   | 1.29  | 0.42   | 8.58   | 9.71   | 54.45  | 113.79  | 110.46 | 381.2  |
| 1936  | 47.15  | 261.52 | 112.22 | 16.02  | 3.92   | 26.59 | 12.62  | 19.35  | 145.26 | 252.37 | 80.68   | 49.83  | 1027.5 |
| 1937  | 23.65  | 18.31  | 24.77  | 17.54  | 2.33   | 18.04 | 36.86  | 75.75  | 34.31  | 55.85  | 77.74   | 81.93  | 467.1  |
| 1938  | 43.80  | 31.34  | 15.76  | 6.16   | 49.41  | 56.34 | 19.75  | 42.68  | 15.27  | 36.82  | 253.01  | 109.03 | 679.4  |
| 1939  | 24.64  | 9.88   | 7.38   | 1.62   | 63.41  | 32.30 | 36.83  | 13.59  | 65.50  | 55.94  | 37.60   | 40.74  | 389.4  |
| 1940  | 19.62  | 67.87  | 16.76  | 7.97   | 1.68   | 0.60  | 98.52  | 249.79 | 381.98 | 199.38 | 194.23  | 383.35 | 1621.8 |
| 1941  | 144.68 | 38.19  | 12.82  | 16.70  | 4.36   | 2.24  | 1.40   | 108.96 | 504.97 | 95.89  | 128.36  | 39.66  | 1098.2 |
| 1942  | 45.71  | 15.82  | 39.60  | 120.78 | 37.10  | 15.50 | 16.07  | 11.51  | 45.65  | 130.84 | 203.30  | 185.48 | 867.4  |
| 1943  | 68.26  | 124.03 | 34.07  | 8.04   | 1.64   | 6.39  | 5.16   | 108.08 | 293.93 | 104.59 | 213.66  | 193.67 | 1161.5 |
| 1944  | 87.31  | 22.36  | 9.82   | 5.19   | 1.12   | 1.02  | 2.77   | 258.88 | 421.75 | 655.03 | 459.75  | 87.47  | 2012.5 |
| 1945  | 245.27 | 78.15  | 11.29  | 6.79   | 1.83   | 87.68 | 34.60  | 6.81   | 8.61   | 23.00  | 50.42   | 155.64 | 710.1  |
| 1946  | 57.22  | 9.29   | 6.09   | 1.98   | 1.22   | 71.87 | 26.42  | 12.53  | 12.95  | 201.61 | 93.61   | 63.96  | 558.7  |
| 1947  | 48.94  | 21.46  | 10.71  | 6.38   | 1.92   | 23.24 | 16.42  | 40.47  | 35.56  | 125.44 | 48.63   | 175.08 | 554.2  |
| 1948  | 368.77 | 103.89 | 9.70   | 6.11   | 1.43   | 1.10  | 20.13  | 5.58   | 28.95  | 61.37  | 93.27   | 75.37  | 775.7  |
| 1949  | 67.92  | 360.41 | 95.55  | 7.21   | 2.75   | 1.09  | 47.22  | 0.90   | 0.75   | 203.27 | 50.32   | 102.25 | 939.6  |
| 1950  | 62.28  | 121.35 | 29.90  | 87.53  | 24.44  | 6.69  | 34.02  | 7.52   | 207.09 | 155.41 | 88.85   | 119.38 | 944.5  |
| 1951  | 59.50  | 28.48  | 8.43   | 5.09   | 2.54   | 1.68  | 1.62   | 66.31  | 41.86  | 118.84 | 359.65  | 292.03 | 986.0  |
| 1952  | 87.35  | 235.14 | 51.33  | 9.79   | 3.46   | 1.31  | 182.37 | 136.47 | 42.83  | 249.57 | 138.69  | 62.93  | 1201.2 |
| 1953  | 66.06  | 46.66  | 14.99  | 6.30   | 1.35   | 2.58  | 33.17  | 368.88 | 205.14 | 643.90 | 698.54  | 180.20 | 2267.8 |
| 1954  | 52.97  | 15.08  | 11.78  | 13.77  | 201.42 | 58.69 | 4.32   | 0.00   | 71.12  | 259.20 | 728.80  | 124.99 | 1542.1 |
| 1955  | 124.08 | 31.71  | 10.11  | 7.30   | 1.83   | 10.62 | 5.29   | 54.50  | 150.21 | 163.42 | 236.99  | 58.27  | 854.3  |
| 1956  | 57.54  | 15.56  | 16.85  | 8.57   | 46.27  | 16.00 | 5.86   | 277.19 | 633.19 | 652.05 | 527.65  | 179.10 | 2435.8 |
| 1957  | 271.30 | 48.48  | 11.49  | 7.09   | 4.62   | 17.72 | 10.93  | 325.31 | 150.75 | 34.31  | 152.10  | 60.49  | 1093.7 |
| 1958  | 42.78  | 14.07  | 8.76   | 11.33  | 13.57  | 12.48 | 171.91 | 450.42 | 71.37  | 173.37 | 262.00  | 90.32  | 1322.4 |
| 1959  | 164.91 | 35.61  | 10.48  | 8.19   | 2.22   | 5.78  | 4.96   | 43.63  | 126.94 | 46.12  | 34.72   | 30.11  | 513.7  |
| 1960  | 16.70  | 11.29  | 17.45  | 18.87  | 6.57   | 3.54  | 5.88   | 26.94  | 47.87  | 58.23  | 132.67  | 176.27 | 522.3  |
| 1961  | 63.74  | 15.61  | 8.39   | 6.65   | 5.97   | 26.70 | 24.38  | 1.37   | 429.27 | 170.78 | 1170.73 | 320.21 | 2243.8 |
| 1962  | 338.59 | 148.54 | 30.81  | 11.88  | 3.62   | 45.95 | 23.81  | 47.83  | 50.34  | 97.01  | 304.35  | 69.23  | 1172.0 |
| 1963  | 43.16  | 25.28  | 15.07  | 14.36  | 15.41  | 42.28 | 17.85  | 3.67   | 207.48 | 127.89 | 220.28  | 83.59  | 816.3  |
| 1964  | 61.47  | 75.54  | 20.89  | 10.03  | 5.72   | 20.77 | 21.84  | 67.93  | 43.76  | 64.22  | 89.22   | 41.74  | 523.1  |
| 1965  | 117.44 | 74.31  | 22.20  | 13.66  | 3.83   | 3.70  | 3.56   | 3.43   | 46.76  | 148.76 | 264.39  | 136.94 | 839.0  |
| 1966  | 35.01  | 7.89   | 7.71   | 3.22   | 4.27   | 12.11 | 389.93 | 208.72 | 273.73 | 96.15  | 89.10   | 67.61  | 1195.5 |
| 1967  | 76.25  | 24.43  | 11.45  | 7.58   | 1.31   | 1.68  | 117.32 | 153.17 | 204.37 | 192.83 | 54.71   | 856.4  | 856.4  |
| 1968  | 163.24 | 38.60  | 12.26  | 9.85   | 3.11   | 2.47  | 22.78  | 14.60  | 41.43  | 43.25  | 55.53   | 74.74  | 481.9  |
| 1969  | 91.93  | 10.75  | 6.43   | 4.29   | 8.97   | 3.23  | 0.00   | 9.29   | 100.39 | 113.59 | 214.21  | 96.35  | 659.4  |
| 1970  | 42.89  | 12.35  | 10.16  | 2.90   | 10.77  | 16.34 | 54.51  | 40.39  | 34.31  | 278.26 | 315.47  | 85.88  | 904.2  |
| 1971  | 23.44  | 46.31  | 16.99  | 6.45   | 8.80   | 6.00  | 14.07  | 38.61  | 48.88  | 39.49  | 97.86   | 71.89  | 418.8  |
| 1972  | 24.58  | 11.14  | 7.52   | 2.30   | 0.47   | 1.27  | 1.81   | 0.00   | 0.21   | 184.30 | 77.78   | 45.02  | 356.4  |
| 1973  | 33.26  | 11.64  | 15.15  | 6.31   | 48.76  | 20.82 | 2.09   | 57.27  | 114.33 | 51.59  | 1548.40 | 285.62 | 2195.2 |
| 1974  | 100.76 | 25.80  | 11.51  | 10.22  | 1.92   | 2.07  | 12.61  | 128.67 | 68.85  | 143.23 | 181.79  | 85.51  | 772.9  |
| 1975  | 54.60  | 17.28  | 9.51   | 4.59   | 4.62   | 15.85 | 24.19  | 15.61  | 432.57 | 242.85 | 102.83  | 52.80  | 977.3  |
| 1976  | 86.20  | 206.78 | 52.73  | 25.55  | 44.28  | 20.28 | 113.14 | 618.12 | 547.41 | 879.87 | 944.50  | 144.84 | 3683.7 |
| 1977  | 58.93  | 30.72  | 22.47  | 11.09  | 2.33   | 2.03  | 26.00  | 35.92  | 12.62  | 27.81  | 124.40  | 99.29  | 453.6  |
| 1978  | 57.82  | 15.84  | 17.13  | 8.66   | 82.36  | 29.74 | 1.49   | 33.61  | 106.37 | 69.85  | 120.11  | 90.56  | 633.6  |
| 1979  | 108.58 | 16.27  | 9.39   | 13.41  | 3.77   | 1.63  | 11.99  | 26.30  | 39.73  | 38.77  | 51.39   | 42.77  | 364.0  |
| 1980  | 37.25  | 156.66 | 46.16  | 420.82 | 93.13  | 35.18 | 127.22 | 57.21  | 31.06  | 149.16 | 286.46  | 269.17 | 1709.5 |
| 1981  | 64.40  | 18.02  | 18.05  | 12.67  | 2.75   | 14.56 | 429.49 | 179.08 | 77.35  | 69.73  | 84.12   | 95.59  | 1065.8 |
| 1982  | 57.86  | 14.18  | 13.00  | 3.28   | 5.07   | 2.72  | 0.68   | 116.43 | 239.40 | 439.94 | 155.01  | 211.51 | 1259.1 |
| 1983  | 70.78  | 21.15  | 12.02  | 5.39   | 3.64   | 53.92 | 10.06  | 351.25 | 78.16  | 205.05 | 93.80   | 372.70 | 1277.9 |
| 1984  | 174.91 | 42.99  | 20.13  | 33.09  | 21.72  | 52.56 | 45.71  | 46.19  | 165.54 | 402.49 | 394.35  | 92.27  | 1492.0 |
| 1985  | 141.96 | 101.06 | 27.13  | 12.60  | 4.26   | 7.96  | 22.30  | 46.73  | 59.33  | 159.78 | 832.76  | 290.49 | 1706.4 |
| 1986  | 64.57  | 22.39  | 10.13  | 9.05   | 1.23   | 1.34  | 84.25  | 160.92 | 133.35 | 119.84 | 307.21  | 156.05 | 1070.3 |
| 1987  | 47.81  | 8.17   | 14.24  | 4.02   | 1.27   | 4.43  | 42.31  | 57.29  | 95.47  | 80.81  | 110.11  | 174.05 | 640.0  |
| 1988  | 38.35  | 8.73   | 9.52   | 3.59   | 1.73   | 34.14 | 147.91 | 89.70  | 79.65  | 128.53 | 195.34  | 371.69 | 1108.9 |
| 1989  | 197.71 | 100.58 | 14.82  | 8.06   | 8.24   | 5.48  | 207.39 | 130.14 | 174.64 | 322.62 | 166.05  | 40.45  | 1376.2 |
| 1990  | 29.34  | 9.60   | 11.55  | 7.59   | 4.15   | 2.11  | 2.49   | 25.34  | 151.99 | 611.09 | 170.25  | 249.16 | 1274.7 |
| 1991  | 31.54  | 11.74  | 1.20   | 0.37   | 0.33   | 0.48  | 0.39   | 0.02   | 2.69   | 3.89   | 2.62    | 3.16   | 58.4   |
| 1992  | 44.57  | 19.47  | 1.78   | 0.48   | 1.08   | 0.54  | 54.83  | 23.07  | 4.01   | 3.68   | 3.31    | 3.21   | 160.0  |
| 1993  | 2.29   | 1.50   | 6.49   | 2.38   | 1.47   | 1.37  | 4.98   | 1.51   | 2.58   | 2.21   | 5.41    | 3.43   | 35.6   |
| 1994  | 2.01   | 1.24   | 35.51  | 11.71  | 0.97   | 6.20  | 8.73   | 12.01  | 5.02   | 2.61   | 3.17    | 3.36   | 92.5   |
| 1995  | 2.41   | 7.68   | 17.80  | 4.64   | 0.39   | 0.72  | 0.40   | 0.04   | 0.02   | 3.86   | 2.78    | 1.30   | 42.0   |
| 1996  | 38.29  | 39.52  | 9.36   | 0.71   | 0.44   | 1.84  | 1.52   | 12.11  | 8.10   | 4.44   | 6.43    | 4.24   | 127.0  |
| 1997  | 5.18   | 4.33   | 1.17   | 3.01   | 1.18   | 7.07  | 55.38  | 20.09  | 3.27   | 2.96   | 2.71    | 2.16   | 108.5  |
| 1998  | 1.50   | 15.09  | 6.53   | 1.19   | 1.92   | 0.96  | 4.57   | 1.63   | 1.07   | 1.11   | 1.48    | 1.68   | 38.7   |
| AVE : | 78.69  | 49.82  | 19.63  | 16.99  | 14.99  | 15.73 | 43.14  | 80.09  | 115.34 | 159.43 | 215.70  | 118.47 | 928.0  |
| SD :  | 75.18  | 65.65  | 20.24  | 51.23  | 31.10  | 19.10 | 78.58  | 117.18 | 140.58 | 175.09 | 272.28  | 97.63  | 645.8  |

## Appendix B12.8

File : 590INSIM.NAT

Units : 10<sup>6</sup>m<sup>3</sup>

Descrip. : Incremental natural simulated flow record for Estuary sub-catchment for 1927 to 1990

| Year  | Oct   | Nov   | Dec   | Jan   | Feb   | Mar   | Apr    | May   | Jun   | Jul   | Aug    | Sep   | Total |
|-------|-------|-------|-------|-------|-------|-------|--------|-------|-------|-------|--------|-------|-------|
| 1927  | 2.38  | 1.44  | 0.56  | 0.18  | 0.06  | 4.42  | 1.64   | 0.16  | 0.19  | 0.28  | 0.70   | 3.02  | 15.0  |
| 1928  | 1.60  | 58.00 | 20.72 | 0.67  | 0.49  | 0.74  | 0.36   | 0.91  | 0.69  | 19.48 | 9.85   | 2.95  | 116.5 |
| 1929  | 2.18  | 1.17  | 0.67  | 0.27  | 15.15 | 8.25  | 1.86   | 1.29  | 1.08  | 1.03  | 6.80   | 3.94  | 43.7  |
| 1930  | 2.70  | 1.64  | 0.58  | 0.18  | 0.08  | 1.62  | 40.58  | 13.95 | 0.67  | 36.35 | 14.07  | 2.42  | 114.8 |
| 1931  | 28.19 | 10.51 | 10.22 | 3.66  | 3.25  | 1.27  | 0.21   | 0.47  | 1.36  | 2.83  | 1.87   | 93.44 | 157.3 |
| 1932  | 32.70 | 3.69  | 1.52  | 0.28  | 0.11  | 0.72  | 0.41   | 0.93  | 1.27  | 1.16  | 6.78   | 3.51  | 53.1  |
| 1933  | 1.26  | 1.43  | 0.61  | 3.84  | 1.43  | 0.77  | 0.40   | 0.19  | 0.23  | 9.77  | 16.45  | 7.17  | 43.6  |
| 1934  | 22.48 | 11.17 | 1.93  | 0.32  | 0.87  | 0.39  | 1.35   | 11.81 | 6.05  | 2.18  | 1.86   | 3.20  | 63.6  |
| 1935  | 2.15  | 4.67  | 2.01  | 0.35  | 0.11  | 0.07  | 0.06   | 3.35  | 1.52  | 4.97  | 2.84   | 5.83  | 27.9  |
| 1936  | 3.90  | 71.79 | 30.63 | 2.67  | 0.21  | 0.68  | 0.35   | 0.14  | 0.17  | 1.57  | 1.01   | 1.84  | 115.0 |
| 1937  | 1.21  | 1.67  | 3.04  | 1.05  | 0.12  | 5.88  | 5.16   | 2.72  | 1.80  | 2.93  | 3.20   | 3.35  | 32.1  |
| 1938  | 2.66  | 4.58  | 1.90  | 0.36  | 10.25 | 17.16 | 5.90   | 0.99  | 0.65  | 3.11  | 32.61  | 12.69 | 92.9  |
| 1939  | 2.07  | 1.11  | 0.44  | 0.19  | 21.57 | 7.57  | 3.12   | 1.50  | 1.15  | 1.11  | 0.94   | 0.98  | 41.8  |
| 1940  | 0.94  | 12.59 | 4.48  | 2.23  | 0.84  | 0.09  | 19.59  | 9.59  | 9.05  | 6.60  | 5.12   | 4.51  | 75.6  |
| 1941  | 13.06 | 5.56  | 1.09  | 1.28  | 0.49  | 0.20  | 0.17   | 2.63  | 2.62  | 1.47  | 1.32   | 1.28  | 31.2  |
| 1942  | 3.21  | 1.53  | 13.06 | 48.22 | 15.05 | 1.07  | 1.43   | 0.86  | 0.73  | 1.04  | 1.98   | 11.92 | 100.1 |
| 1943  | 5.29  | 24.69 | 8.65  | 0.32  | 0.08  | 0.70  | 0.68   | 16.44 | 11.62 | 4.02  | 5.89   | 17.73 | 96.1  |
| 1944  | 8.88  | 2.52  | 0.80  | 0.18  | 0.04  | 0.02  | 0.12   | 16.92 | 11.56 | 4.52  | 7.43   | 5.63  | 58.6  |
| 1945  | 33.51 | 12.85 | 1.25  | 0.31  | 0.12  | 36.89 | 12.67  | 0.43  | 0.50  | 0.89  | 0.95   | 1.01  | 101.4 |
| 1946  | 0.97  | 0.59  | 0.22  | 0.06  | 0.04  | 20.55 | 7.23   | 1.12  | 1.05  | 9.01  | 4.37   | 5.12  | 50.3  |
| 1947  | 3.12  | 2.77  | 1.12  | 0.22  | 0.09  | 3.47  | 4.14   | 1.43  | 0.93  | 2.55  | 1.80   | 2.00  | 23.6  |
| 1948  | 86.20 | 29.72 | 0.77  | 0.28  | 0.11  | 0.05  | 8.77   | 4.20  | 0.98  | 0.98  | 1.20   | 1.15  | 134.4 |
| 1949  | 0.83  | 75.32 | 25.43 | 0.19  | 0.05  | 0.03  | 2.92   | 1.27  | 0.38  | 3.00  | 2.14   | 1.39  | 113.0 |
| 1950  | 4.88  | 16.40 | 5.53  | 21.54 | 7.36  | 1.33  | 1.20   | 0.89  | 7.15  | 8.19  | 4.54   | 9.99  | 89.0  |
| 1951  | 5.25  | 1.65  | 0.54  | 0.20  | 0.21  | 0.15  | 0.17   | 0.23  | 0.56  | 0.91  | 16.38  | 56.63 | 82.9  |
| 1952  | 19.76 | 31.47 | 11.07 | 0.53  | 0.17  | 0.08  | 2.85   | 1.26  | 1.93  | 25.72 | 10.57  | 9.71  | 115.1 |
| 1953  | 13.81 | 11.24 | 3.31  | 0.41  | 0.10  | 0.17  | 2.99   | 43.64 | 15.95 | 6.34  | 55.76  | 21.20 | 174.9 |
| 1954  | 2.86  | 2.22  | 0.91  | 1.66  | 25.93 | 8.79  | 0.30   | 0.24  | 1.94  | 8.32  | 10.21  | 6.32  | 69.7  |
| 1955  | 7.53  | 3.32  | 0.74  | 0.18  | 0.05  | 4.73  | 1.85   | 14.49 | 7.79  | 3.76  | 8.62   | 5.05  | 58.1  |
| 1956  | 7.04  | 3.18  | 1.01  | 0.35  | 3.71  | 3.40  | 1.05   | 21.29 | 43.83 | 16.37 | 24.83  | 14.13 | 140.2 |
| 1957  | 8.62  | 3.78  | 0.93  | 0.20  | 0.06  | 4.77  | 2.81   | 65.92 | 23.32 | 1.75  | 10.32  | 4.98  | 127.5 |
| 1958  | 1.84  | 1.08  | 0.52  | 1.55  | 2.22  | 1.95  | 43.29  | 21.10 | 3.68  | 47.39 | 40.05  | 11.95 | 176.6 |
| 1959  | 36.13 | 13.46 | 1.13  | 1.12  | 0.44  | 1.21  | 0.56   | 2.11  | 4.87  | 2.91  | 1.80   | 2.70  | 68.4  |
| 1960  | 1.78  | 0.99  | 4.98  | 7.34  | 2.14  | 0.70  | 1.04   | 11.12 | 4.64  | 2.29  | 9.85   | 6.28  | 53.2  |
| 1961  | 3.50  | 1.73  | 0.55  | 0.79  | 0.50  | 14.95 | 8.34   | 1.79  | 2.47  | 2.00  | 133.39 | 46.71 | 216.7 |
| 1962  | 15.51 | 7.61  | 1.44  | 0.35  | 0.12  | 6.05  | 3.07   | 3.37  | 1.95  | 3.70  | 2.86   | 1.86  | 47.9  |
| 1963  | 3.10  | 1.94  | 1.11  | 2.84  | 2.27  | 18.90 | 6.74   | 0.64  | 16.89 | 6.96  | 3.37   | 6.00  | 70.8  |
| 1964  | 3.86  | 9.13  | 3.36  | 0.33  | 0.55  | 0.96  | 0.89   | 13.67 | 5.48  | 6.70  | 4.05   | 2.11  | 51.1  |
| 1965  | 22.94 | 21.09 | 5.32  | 0.52  | 0.16  | 0.28  | 0.49   | 3.88  | 1.82  | 0.75  | 52.32  | 22.90 | 132.5 |
| 1966  | 3.36  | 1.15  | 0.41  | 0.11  | 0.83  | 3.92  | 133.56 | 58.65 | 9.83  | 5.55  | 5.53   | 7.67  | 230.6 |
| 1967  | 4.61  | 2.42  | 0.96  | 0.22  | 0.07  | 0.23  | 0.30   | 3.65  | 7.64  | 3.36  | 4.95   | 3.02  | 31.4  |
| 1968  | 1.64  | 2.60  | 1.05  | 0.17  | 0.07  | 0.06  | 0.51   | 0.32  | 7.81  | 3.46  | 1.28   | 1.34  | 20.3  |
| 1969  | 1.14  | 0.62  | 0.22  | 0.82  | 1.50  | 0.53  | 0.08   | 0.08  | 0.29  | 1.64  | 4.57   | 2.42  | 13.9  |
| 1970  | 1.32  | 0.74  | 0.30  | 0.11  | 3.88  | 7.31  | 27.81  | 11.59 | 3.64  | 56.69 | 38.30  | 10.45 | 162.1 |
| 1971  | 3.55  | 14.43 | 5.22  | 0.37  | 1.05  | 0.60  | 7.06   | 4.24  | 1.53  | 1.82  | 7.12   | 6.33  | 53.3  |
| 1972  | 2.93  | 1.50  | 0.61  | 0.18  | 0.05  | 0.04  | 0.16   | 0.53  | 1.35  | 1.14  | 1.55   | 1.54  | 11.6  |
| 1973  | 1.11  | 0.65  | 1.56  | 0.77  | 24.10 | 8.54  | 0.42   | 11.09 | 4.42  | 0.95  | 43.84  | 16.70 | 114.2 |
| 1974  | 2.34  | 1.29  | 0.47  | 0.18  | 0.08  | 0.06  | 0.08   | 2.84  | 1.52  | 2.49  | 7.26   | 9.81  | 28.4  |
| 1975  | 4.35  | 1.57  | 0.61  | 0.17  | 0.67  | 3.81  | 10.72  | 4.28  | 19.65 | 11.17 | 5.00   | 3.74  | 65.7  |
| 1976  | 9.24  | 6.77  | 1.98  | 0.37  | 8.12  | 3.22  | 8.32   | 46.89 | 18.96 | 4.65  | 4.16   | 4.70  | 117.4 |
| 1977  | 3.32  | 4.62  | 2.69  | 0.84  | 0.26  | 0.14  | 2.82   | 1.33  | 0.57  | 2.41  | 4.29   | 4.83  | 28.1  |
| 1978  | 3.18  | 1.57  | 1.38  | 0.68  | 40.75 | 13.88 | 0.24   | 1.93  | 1.37  | 2.68  | 4.85   | 3.72  | 76.2  |
| 1979  | 3.21  | 1.60  | 0.67  | 2.91  | 1.10  | 0.16  | 0.17   | 0.20  | 3.36  | 1.73  | 1.33   | 2.44  | 18.9  |
| 1980  | 2.60  | 18.83 | 7.25  | 57.28 | 19.82 | 5.48  | 62.85  | 22.80 | 2.49  | 5.47  | 18.56  | 9.08  | 232.5 |
| 1981  | 3.33  | 1.99  | 2.48  | 0.91  | 0.27  | 4.03  | 81.85  | 27.61 | 3.94  | 3.11  | 3.13   | 9.83  | 142.5 |
| 1982  | 4.96  | 1.57  | 0.61  | 0.19  | 2.32  | 0.92  | 0.36   | 2.07  | 5.80  | 8.33  | 4.34   | 11.92 | 43.4  |
| 1983  | 5.80  | 2.65  | 1.12  | 0.29  | 0.59  | 3.02  | 1.25   | 2.04  | 1.27  | 1.48  | 1.30   | 1.08  | 21.9  |
| 1984  | 2.12  | 1.16  | 0.53  | 4.60  | 2.96  | 0.78  | 11.21  | 4.24  | 3.13  | 42.38 | 16.08  | 2.40  | 91.6  |
| 1985  | 23.94 | 10.09 | 3.23  | 1.10  | 0.31  | 0.44  | 0.33   | 0.23  | 0.32  | 0.75  | 108.04 | 38.10 | 186.9 |
| 1986  | 5.56  | 3.09  | 0.90  | 0.22  | 0.06  | 0.05  | 30.92  | 10.94 | 1.47  | 1.43  | 4.10   | 4.90  | 63.6  |
| 1987  | 2.54  | 0.92  | 0.47  | 0.17  | 0.05  | 0.55  | 2.91   | 1.37  | 1.75  | 1.46  | 2.45   | 2.75  | 17.4  |
| 1988  | 1.80  | 0.90  | 0.38  | 0.14  | 0.07  | 5.23  | 25.49  | 8.60  | 3.71  | 3.25  | 3.42   | 2.75  | 55.7  |
| 1989  | 32.60 | 12.78 | 1.24  | 0.34  | 0.53  | 0.29  | 36.04  | 14.28 | 8.55  | 4.38  | 2.34   | 2.03  | 115.4 |
| 1990  | 1.84  | 1.27  | 0.73  | 0.46  | 0.35  | 0.19  | 0.12   | 0.56  | 1.27  | 1.31  | 1.12   | 1.09  | 10.3  |
| AVE : | 8.63  | 8.88  | 3.30  | 2.83  | 3.54  | 3.82  | 10.04  | 8.46  | 4.94  | 6.84  | 12.80  | 9.21  | 83.3  |
| SD :  | 13.46 | 15.16 | 5.74  | 9.52  | 7.70  | 6.36  | 22.02  | 13.71 | 7.18  | 11.22 | 23.27  | 14.78 | 56.0  |

## Appendix B12.9

File : ESTCUM.PRS  
Units : 10<sup>6</sup>m<sup>3</sup>  
Descrip. : Cumulative Present Day (2000) Flow at Estuary for 1927 to 1990

| Year  | Oct    | Nov    | Dec    | Jan    | Feb    | Mar   | Apr    | May    | Jun    | Jul    | Aug     | Sep    | Total  |
|-------|--------|--------|--------|--------|--------|-------|--------|--------|--------|--------|---------|--------|--------|
| 1927  | 5.29   | 20.47  | 7.47   | 2.91   | 1.20   | 35.38 | 8.96   | 0.00   | 128.42 | 29.41  | 56.57   | 71.03  | 367.1  |
| 1928  | 23.66  | 125.91 | 46.31  | 6.62   | 2.28   | 13.74 | 17.98  | 22.10  | 39.92  | 206.32 | 191.05  | 56.53  | 752.4  |
| 1929  | 25.17  | 10.30  | 20.53  | 11.96  | 75.93  | 49.64 | 10.71  | 7.15   | 5.30   | 17.32  | 96.36   | 147.16 | 477.5  |
| 1930  | 63.72  | 19.09  | 10.25  | 9.20   | 3.73   | 14.19 | 180.75 | 107.40 | 24.60  | 160.57 | 278.73  | 115.53 | 987.8  |
| 1931  | 175.97 | 45.54  | 92.45  | 31.18  | 79.74  | 11.48 | 2.26   | 31.49  | 55.58  | 88.40  | 58.66   | 366.09 | 1038.8 |
| 1932  | 135.59 | 19.94  | 11.55  | 4.85   | 2.64   | 2.97  | 1.66   | 6.63   | 144.78 | 270.68 | 182.77  | 67.76  | 851.8  |
| 1933  | 30.30  | 25.08  | 11.45  | 13.32  | 8.99   | 10.61 | 2.89   | 3.35   | 22.81  | 54.11  | 111.40  | 109.34 | 403.6  |
| 1934  | 242.56 | 105.67 | 18.14  | 6.45   | 4.83   | 3.42  | 18.23  | 68.33  | 64.93  | 106.24 | 106.96  | 73.16  | 818.9  |
| 1935  | 30.49  | 29.86  | 12.94  | 6.76   | 2.42   | 1.29  | 0.42   | 8.58   | 9.71   | 54.45  | 113.79  | 110.46 | 381.2  |
| 1936  | 47.15  | 261.52 | 112.22 | 16.02  | 3.92   | 26.59 | 12.62  | 19.35  | 145.26 | 252.37 | 80.68   | 49.83  | 1027.5 |
| 1937  | 23.65  | 18.31  | 24.77  | 17.54  | 2.33   | 18.04 | 36.86  | 75.75  | 34.31  | 55.85  | 77.74   | 81.93  | 467.1  |
| 1938  | 43.80  | 31.34  | 15.76  | 6.16   | 49.41  | 56.34 | 19.75  | 42.68  | 15.27  | 36.82  | 253.01  | 109.03 | 679.4  |
| 1939  | 24.64  | 9.88   | 7.38   | 1.62   | 63.41  | 32.30 | 36.83  | 13.59  | 65.50  | 55.94  | 37.60   | 40.74  | 389.4  |
| 1940  | 19.62  | 67.87  | 16.76  | 7.97   | 1.68   | 0.60  | 98.52  | 249.79 | 381.98 | 199.38 | 194.23  | 383.35 | 1621.8 |
| 1941  | 144.68 | 38.19  | 12.82  | 16.70  | 4.36   | 2.24  | 1.40   | 108.96 | 504.97 | 95.89  | 128.36  | 39.66  | 1098.2 |
| 1942  | 45.71  | 15.82  | 39.60  | 120.78 | 37.10  | 15.50 | 16.07  | 11.51  | 45.65  | 130.84 | 203.30  | 185.48 | 867.4  |
| 1943  | 68.26  | 124.03 | 34.07  | 8.04   | 1.64   | 6.39  | 5.16   | 108.08 | 293.93 | 104.59 | 213.66  | 193.67 | 1161.5 |
| 1944  | 87.31  | 22.36  | 9.82   | 5.19   | 1.12   | 1.02  | 2.77   | 258.88 | 421.75 | 655.03 | 459.75  | 87.47  | 2012.5 |
| 1945  | 245.27 | 78.15  | 11.29  | 6.79   | 1.83   | 87.68 | 34.60  | 6.81   | 8.61   | 23.00  | 50.42   | 155.64 | 710.1  |
| 1946  | 57.22  | 9.29   | 6.09   | 1.98   | 1.22   | 71.87 | 26.42  | 12.53  | 12.95  | 201.61 | 93.61   | 63.96  | 558.7  |
| 1947  | 48.94  | 21.46  | 10.71  | 6.38   | 1.92   | 23.24 | 16.42  | 40.47  | 35.56  | 125.44 | 48.63   | 175.08 | 554.2  |
| 1948  | 368.77 | 103.89 | 9.70   | 6.11   | 1.43   | 1.10  | 20.13  | 5.58   | 28.95  | 61.37  | 93.27   | 75.37  | 775.7  |
| 1949  | 67.92  | 360.41 | 95.55  | 7.21   | 2.75   | 1.09  | 47.22  | 0.90   | 0.75   | 203.27 | 50.32   | 102.25 | 939.6  |
| 1950  | 62.28  | 121.35 | 29.90  | 87.53  | 24.44  | 6.69  | 34.02  | 7.52   | 207.09 | 155.41 | 88.85   | 119.38 | 944.5  |
| 1951  | 59.50  | 28.48  | 8.43   | 5.09   | 2.54   | 1.68  | 1.62   | 66.31  | 41.86  | 118.84 | 359.65  | 292.03 | 986.0  |
| 1952  | 87.35  | 235.14 | 51.33  | 9.79   | 3.46   | 1.31  | 182.37 | 136.47 | 42.83  | 249.57 | 138.69  | 62.93  | 1201.2 |
| 1953  | 66.06  | 46.66  | 14.99  | 6.30   | 1.35   | 2.58  | 33.17  | 368.88 | 205.14 | 643.90 | 698.54  | 180.20 | 2267.8 |
| 1954  | 52.97  | 15.08  | 11.78  | 13.77  | 201.42 | 58.69 | 4.32   | 0.00   | 71.12  | 259.20 | 728.80  | 124.99 | 1542.1 |
| 1955  | 124.08 | 31.71  | 10.11  | 7.30   | 1.83   | 10.62 | 5.29   | 54.50  | 150.21 | 163.42 | 236.99  | 58.27  | 854.3  |
| 1956  | 57.54  | 15.56  | 16.85  | 8.57   | 46.27  | 16.00 | 5.86   | 277.19 | 633.19 | 652.05 | 527.65  | 179.10 | 2435.8 |
| 1957  | 271.30 | 48.48  | 11.49  | 7.09   | 4.62   | 17.72 | 10.93  | 325.31 | 150.75 | 34.31  | 152.10  | 60.49  | 1093.7 |
| 1958  | 42.78  | 14.07  | 8.76   | 11.33  | 13.57  | 12.48 | 171.91 | 450.42 | 71.37  | 173.37 | 262.00  | 90.32  | 1322.4 |
| 1959  | 164.91 | 35.61  | 10.48  | 8.19   | 2.22   | 5.78  | 4.96   | 43.63  | 126.94 | 46.12  | 34.72   | 30.11  | 513.7  |
| 1960  | 16.70  | 11.29  | 17.45  | 18.87  | 6.57   | 3.54  | 5.88   | 26.94  | 47.87  | 58.23  | 132.67  | 176.27 | 522.3  |
| 1961  | 63.74  | 15.61  | 8.39   | 6.65   | 5.97   | 26.70 | 24.38  | 1.37   | 429.27 | 170.78 | 1170.73 | 320.21 | 2243.8 |
| 1962  | 338.59 | 148.54 | 30.81  | 11.88  | 3.62   | 45.95 | 23.81  | 47.83  | 50.34  | 97.01  | 304.35  | 69.23  | 1172.0 |
| 1963  | 43.16  | 25.28  | 15.07  | 14.36  | 15.41  | 42.28 | 17.85  | 3.67   | 207.48 | 127.89 | 220.28  | 83.59  | 816.3  |
| 1964  | 61.47  | 75.54  | 20.89  | 10.03  | 5.72   | 20.77 | 21.84  | 67.93  | 43.76  | 64.22  | 89.22   | 41.74  | 523.1  |
| 1965  | 117.44 | 74.31  | 22.20  | 13.66  | 3.83   | 3.70  | 3.56   | 3.43   | 46.76  | 148.76 | 264.39  | 136.94 | 839.0  |
| 1966  | 35.01  | 7.89   | 7.71   | 3.22   | 4.27   | 12.11 | 389.93 | 208.72 | 273.73 | 96.15  | 89.10   | 67.61  | 1195.5 |
| 1967  | 76.25  | 24.43  | 11.45  | 7.58   | 1.31   | 1.68  | 11.35  | 117.32 | 153.17 | 204.37 | 192.83  | 54.71  | 856.4  |
| 1968  | 163.24 | 38.60  | 12.26  | 9.85   | 3.11   | 2.47  | 22.78  | 14.60  | 41.43  | 43.25  | 55.53   | 74.74  | 481.9  |
| 1969  | 91.93  | 10.75  | 6.43   | 4.29   | 8.97   | 3.23  | 0.00   | 9.29   | 100.39 | 113.59 | 214.21  | 96.35  | 659.4  |
| 1970  | 42.89  | 12.35  | 10.16  | 2.90   | 10.77  | 16.34 | 54.51  | 40.39  | 34.31  | 278.26 | 315.47  | 85.88  | 904.2  |
| 1971  | 23.44  | 46.31  | 16.99  | 6.45   | 8.80   | 6.00  | 14.07  | 38.61  | 48.88  | 39.49  | 97.86   | 71.89  | 418.8  |
| 1972  | 24.58  | 11.14  | 7.52   | 2.30   | 0.47   | 1.27  | 1.81   | 0.00   | 0.21   | 184.30 | 77.78   | 45.02  | 356.4  |
| 1973  | 33.26  | 11.64  | 15.15  | 6.31   | 48.76  | 20.82 | 2.09   | 57.27  | 114.33 | 51.59  | 1548.40 | 285.62 | 2195.2 |
| 1974  | 100.76 | 25.80  | 11.51  | 10.22  | 1.92   | 2.07  | 12.61  | 128.67 | 68.85  | 143.23 | 181.79  | 85.51  | 772.9  |
| 1975  | 54.60  | 17.28  | 9.51   | 4.59   | 4.62   | 15.85 | 24.19  | 15.61  | 432.57 | 242.85 | 102.83  | 52.80  | 977.3  |
| 1976  | 86.20  | 206.78 | 52.73  | 25.55  | 44.28  | 20.28 | 113.14 | 618.12 | 547.41 | 879.87 | 944.50  | 144.84 | 3683.7 |
| 1977  | 58.93  | 30.72  | 22.47  | 11.09  | 2.33   | 2.03  | 26.00  | 35.92  | 12.62  | 27.81  | 124.40  | 99.29  | 453.6  |
| 1978  | 57.82  | 15.84  | 17.13  | 8.66   | 82.36  | 29.74 | 1.49   | 33.61  | 106.37 | 69.85  | 120.11  | 90.56  | 633.6  |
| 1979  | 108.58 | 16.27  | 9.39   | 13.41  | 3.77   | 1.63  | 11.99  | 26.30  | 39.73  | 38.77  | 51.39   | 42.77  | 364.0  |
| 1980  | 37.25  | 156.66 | 46.16  | 420.82 | 93.13  | 35.18 | 127.22 | 57.21  | 31.06  | 149.16 | 286.46  | 269.17 | 1709.5 |
| 1981  | 64.40  | 18.02  | 18.05  | 12.67  | 2.75   | 14.56 | 429.49 | 179.08 | 77.35  | 69.73  | 84.12   | 95.59  | 1065.8 |
| 1982  | 57.86  | 14.18  | 13.00  | 3.28   | 5.07   | 2.72  | 0.68   | 116.43 | 239.40 | 439.94 | 155.01  | 211.51 | 1259.1 |
| 1983  | 70.78  | 21.15  | 12.02  | 5.39   | 3.64   | 53.92 | 10.06  | 351.25 | 78.16  | 205.05 | 93.80   | 372.70 | 1277.9 |
| 1984  | 174.91 | 42.99  | 20.13  | 33.09  | 21.72  | 52.56 | 45.71  | 46.19  | 165.54 | 402.49 | 394.35  | 92.27  | 1492.0 |
| 1985  | 141.96 | 101.06 | 27.13  | 12.60  | 4.26   | 7.96  | 22.30  | 46.73  | 59.33  | 159.78 | 832.76  | 290.49 | 1706.4 |
| 1986  | 64.57  | 22.39  | 10.13  | 9.05   | 1.23   | 1.34  | 84.25  | 160.92 | 133.35 | 119.84 | 307.21  | 156.05 | 1070.3 |
| 1987  | 47.81  | 8.17   | 14.24  | 4.02   | 1.27   | 4.43  | 42.31  | 57.29  | 95.47  | 80.81  | 110.11  | 174.05 | 640.0  |
| 1988  | 38.35  | 8.73   | 9.52   | 3.59   | 1.73   | 34.14 | 147.91 | 89.70  | 79.65  | 128.53 | 195.34  | 371.69 | 1108.9 |
| 1989  | 197.71 | 100.58 | 14.82  | 8.06   | 8.24   | 5.48  | 207.39 | 130.14 | 174.64 | 322.62 | 166.05  | 40.45  | 1376.2 |
| 1990  | 29.34  | 9.60   | 11.55  | 7.59   | 4.15   | 2.11  | 2.49   | 25.34  | 151.99 | 611.09 | 170.25  | 249.16 | 1274.7 |
| AVE : | 86.53  | 54.47  | 20.84  | 18.73  | 16.74  | 17.39 | 46.49  | 89.00  | 129.33 | 178.98 | 242.22  | 132.92 | 1033.7 |
| SD :  | 75.95  | 68.12  | 20.81  | 54.12  | 32.59  | 19.62 | 82.42  | 121.41 | 143.11 | 176.23 | 277.70  | 93.98  | 606.4  |

# **APPENDIX C**

**Investigation into the need to update or  
improve available hydrological modelling**

## INVESTIGATION INTO THE NEED TO UPDATE OR IMPROVE AVAILABLE HYDROLOGICAL MODELLING

### 1. INTRODUCTION

The river systems in the Breede River basin have been the subject of a number of hydrological investigations, the most comprehensive being the Breede River Hydrological Study (BRHS) which was carried out by the Department of Water Affairs and Forestry, and completed in 1995. The BRHS investigation spanned the upper and middle parts of the Breede River basin comprised of hydrological catchments H1 to H5 (Refer to Figure C-1). Long term naturalised and present day flow sequences were generated at points where river flow measurements were available, and also at a number of points of interest. These flow sequences spanned hydrological years 1925 to 1990.

During the Inception Phase of the Breede River Basin Study (BRBS), the BRHS hydrology was reviewed to determine whether:

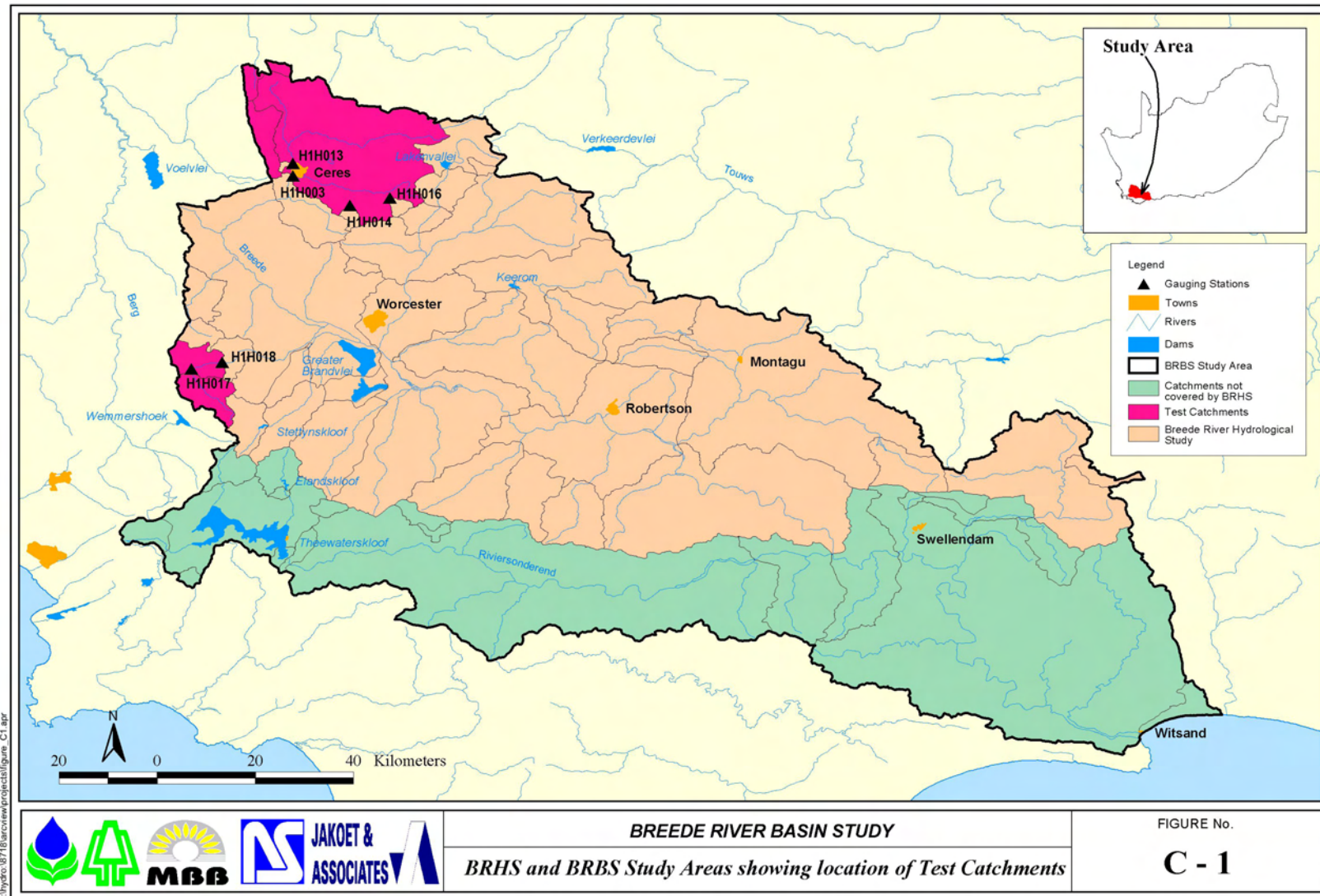
- C the hydrological data which has become available in the intervening years to September 1999 should be used to extend the previous hydrology, and
- C whether there is a need to revisit the previous hydrological calibrations to ensure that the methodology which was employed is compatible with the purposes for which the hydrology will be used in the BRBS.

### 2. REVIEW PROCEDURE

#### 2.1 The Need for Extension of BRHS Flow Sequences

The benefit of extending the hydrology completed for the BRHS may be outweighed by the cost implications associated with such an exercise. Generally speaking, the longer the length of the flow sequences that are used as the basis for hydrological systems analysis, the wider the range of climatic conditions that the system is subjected to, leading to an improvement in the confidence with which predictions are made.

It follows that, if a sequence is extended with a number of years of hydrological data representing climatic conditions which are not reflected in the original sequence, estimates of firm yield, and of the reliability associated with a given yield are likely to change. However, if a sequence is extended with data representing conditions already contained within the original sequence, it is likely that, while the reliability associated with a given yield may change, *the estimate of firm yield is not likely to change*. If the latter proves to be true for the BRHS hydrology, a strong case can be made for not extending the previous hydrology, based on the standpoint that yield assessments of conceptualised schemes will be done at a pre-feasibility level of investigation only.





The following procedure was adopted to enable an informed recommendation on the need for extension:

- C The Molenaars River catchment gauged at station H1H018 and the Ceres basin gauged at station H1H003 were selected as test catchments representing significantly different levels of catchment development and rainfall regimes. The Molenaars catchment is mountainous, relatively pristine, and experiences high rainfall. A high degree of catchment development has taken place in the Ceres Basin, and rainfall in this area is relatively lower compared to the Molenaars catchment.
- C BRHS landuse and water demand information were used in conjunction with extended catchment rainfall sequences (1925 to 1998) to re-calibrate the Pitman model for the two test catchments. The calibrated models were then used to generate 74 year long naturalised and present day flow sequences for the period 1925 to 1998.
- C The latter parts of the 74 year sequences were lopped off to provide 66 year sequences for the period 1925 to 1990 (as for the BRHS).
- C the "short" and "long" present day sequences were used to carry out monthly reservoir simulations. The resultant yield-storage curves were used to compare the yield characteristics of the 66 year and 74 year sequences, and is shown in Figures C.2 (Ceres Basin), and C.3 (Molenaars catchment).

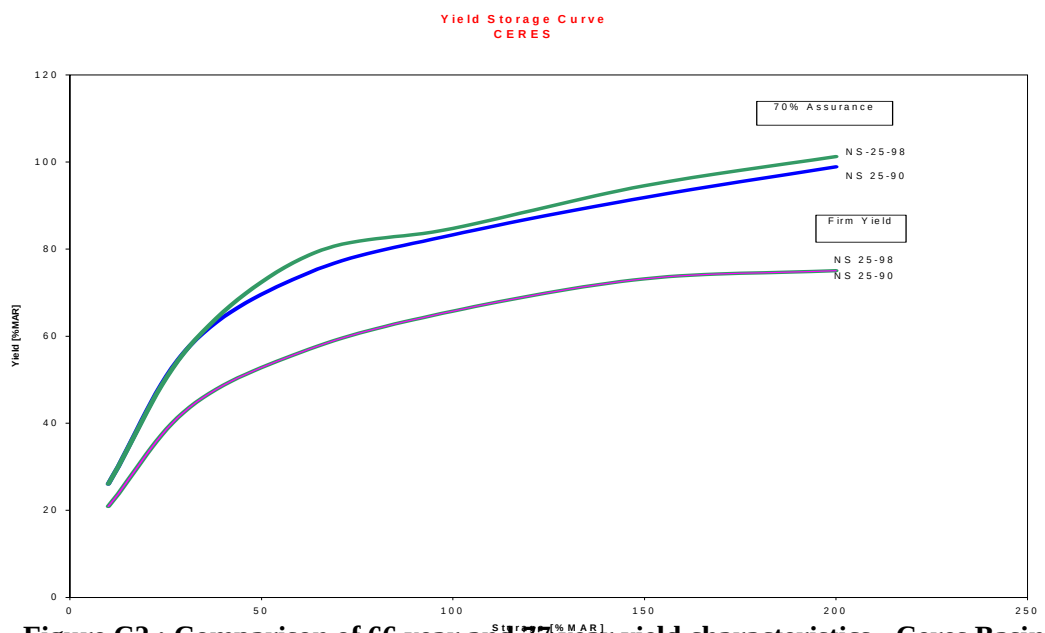


**Figure C2 : Comparison of 66 year and 77 year yield characteristics - Ceres Basin**

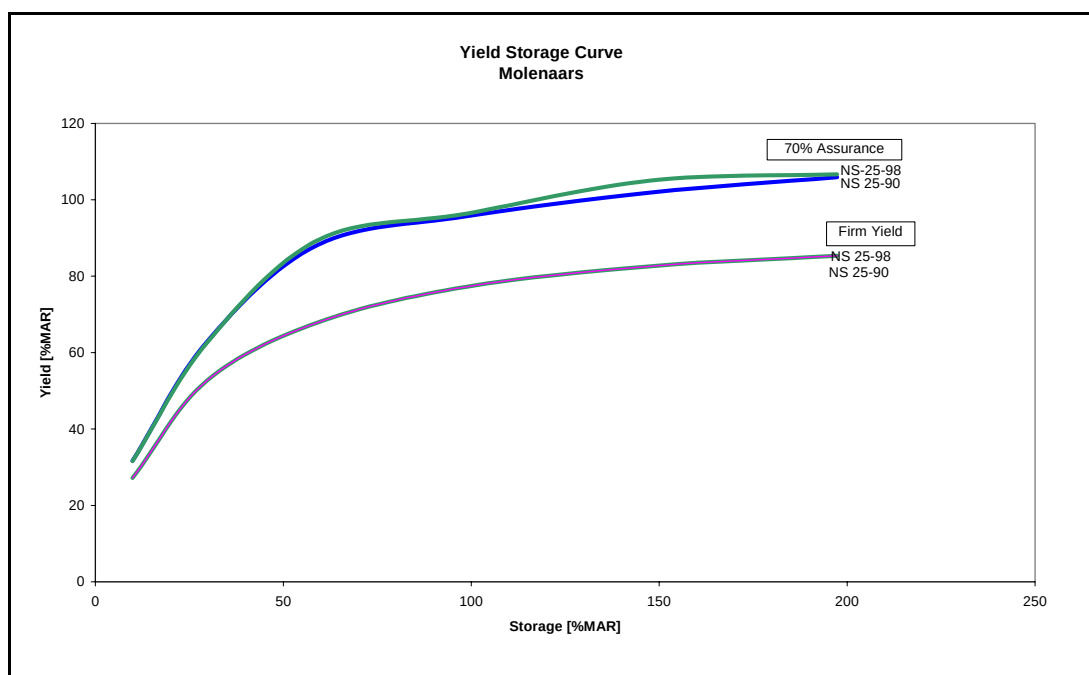


**Figure C.3 : Comparison of 66 and 77 year yield characteristics - Molenaars catchment**

It is immediately apparent from the above figures that the firm yield curves for the 66 year and 77 year sequences are identical. This is due to the fact that the critical drought sequence is contained within the 1925 to 1990 period. For both the Ceres and Molenaars catchment, the extended sequences have produced slightly less conservative estimates of yields associated with a 70% exceedence probability. (Note that the yields were derived by means of a historical analysis).

## 2.2 The Need for Re-calibration of BRHS Hydrology

Upper Breede catchments (the H1 secondary catchment in particular), encompass the major water producing areas within the basin. The H1 secondary catchment is also a potential future source for water exports to the Greater Cape Town Metropolitan Area. The confidence with which yield assessments of export schemes will be made, will depend to a large extent on the quality of hydrological modelling carried out for these catchments.

The scarcity of rainfall stations in the mountain ranges present significant problems to the hydrological modelling process. The need to revisit the previous hydrological calibrations was therefore assessed by comparing the yield characteristics of the 66 year sequences prepared for this review with the BRHS sequences covering the same time period. It must be stressed that the sequences that were prepared for this review are based on a completely independent catchment rainfall generation exercise. This affords the opportunity to assess the sensitivity of the calibrations to rainfall station selection in especially the data sparse Molenaars catchment.

BRHS calibrations were assessed by comparing the yield characteristics of the flow sequences prepared for the previous studies with the "short" 66 year sequences generated for the review. It must be borne in mind that the availability of 8 additional years of rainfall data strengthens the basis on

which rainfall station groupings are made, as more stations (which may previously have been discarded due to insufficient record length) become available for selection.

Comparisons of yield characteristics of the BRHS and review sequences are shown in Figures C.4 and C.5 below.

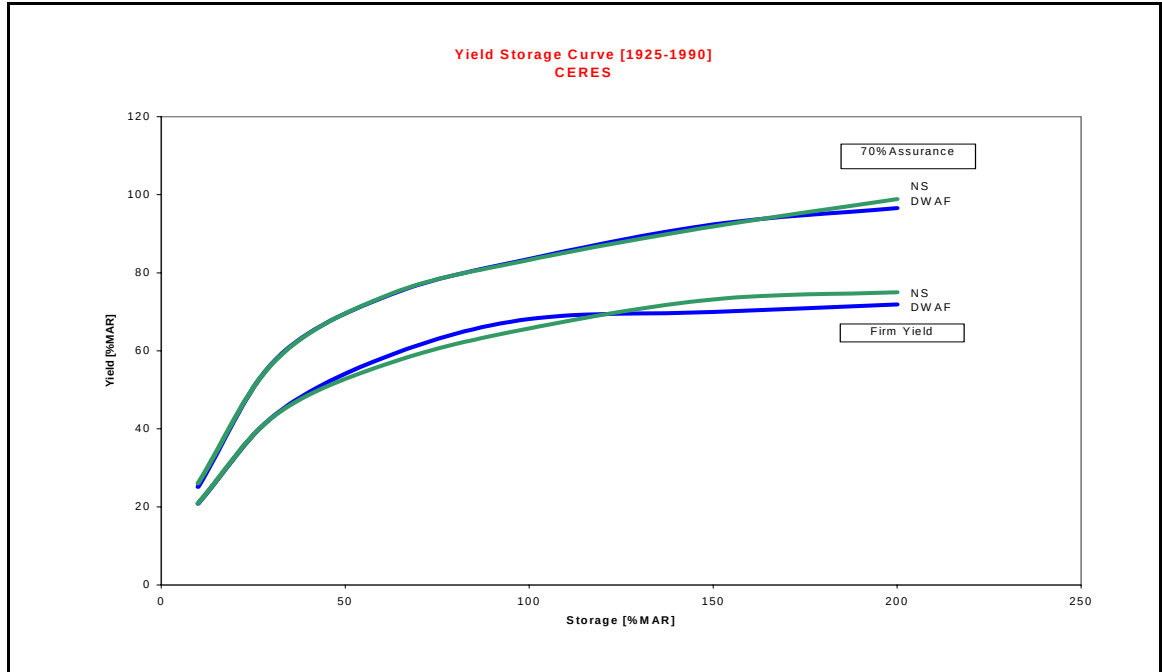


**Figure C.4 : Comparison of yield characteristics of BRHS and Review Sequences - Ceres Basin**

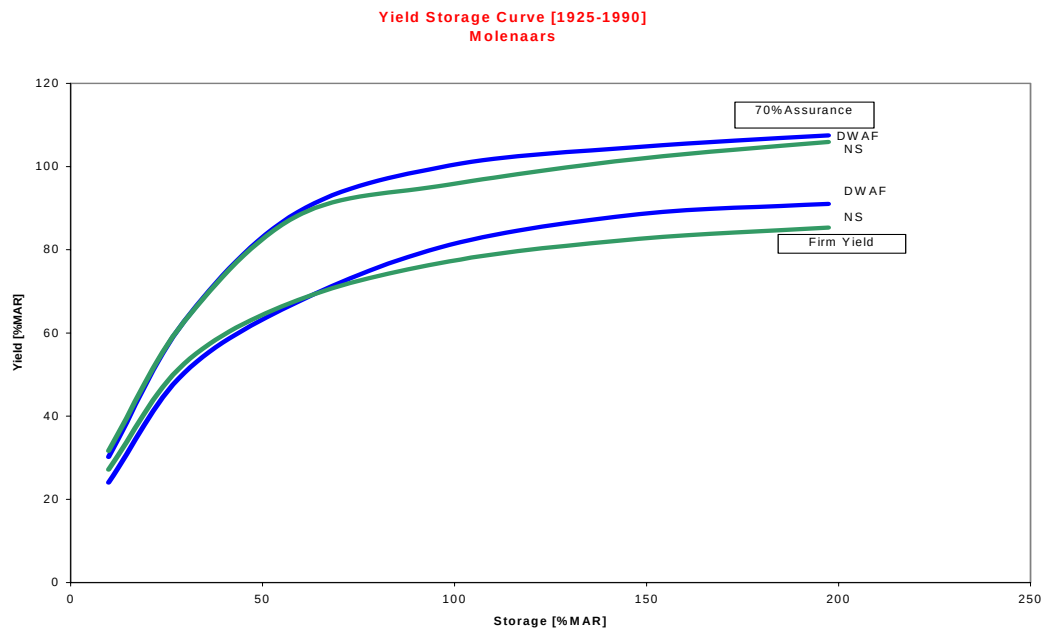


**Figure C.5 : Comparison of Yield Characteristics of BRHS and Review Sequences -Molenaars**

Significant differences in the yield-storage curves are shown for both the Ceres and the Molenaars catchments. As the BRHS land-use and water demand information were used for the review calibrations, the differences are partly ascribed to the disparate catchment rainfall sequences,

underlining the sensitivity of the modelling process to rainfall station selection and grouping. However, a visual comparison of the simulated historical sequences brought consistent, and large differences in the simulation of low flows to light. This is of concern due to the implications for water quality modelling that is planned for the Middle Breede River reaches (and for yield assessments, of course).

Figure C.6 overleaf shows comparisons of low flows for the simulated review sequence at H1H003 ("H1H003.NSI"), and the simulated BRHS sequence ("CERRQ18.NSI"). Figure C.7 shows comparisons of low flows for the simulated review sequence at H1H018 ("H1H018.NSI"), and the simulated BRHS sequence ("OUPRQ3.NSI"). Major discrepancies of up to 1 million m<sup>3</sup>/month can be observed in the low flows simulated for the Molenaars (H1H018) catchment. As identical observed flow sequences (based on the same rating curves) were used for the BRHS and the review, the differences are ascribed to software limitations in the WRS90 model which was used for the BRHS calibrations. Visual comparisons of observed and simulated flow sequences generated by the model can only be shown for the full range of flows, whereas the SHELL software used for the review allows for zooming and panning to inspect low flow simulation.

### **3. RECOMMENDATIONS**

#### **3.1 Need for Extension**

Based on the comments in Section 2.1 above, and due to the fact that extension of flow sequences can not be selectively carried out (extension of sequences in H1 will require extensions in secondary catchments H2 to H5), it is not recommended to extend the BRHS hydrology for use in the Breede River Basin Study.

#### **3.2 Need for Re-calibration**

The discrepancies that were observed between low flows and yield characteristics of the BRHS and review flow sequences have significant implications for the water quality assessments that are to be carried out for the Middle Breede River reaches, and also for the yield and viability assessments of development options. It is therefore recommended that the hydrological calibrations for the H1 secondary catchment are revisited. *Local* contributions of low flows in the H4 secondary catchment are dominated by irrigation return flows and flows entering the upstream end of the catchment. Re-calibration of hydrology in H4, and by implication, H5 is therefore not considered necessary.

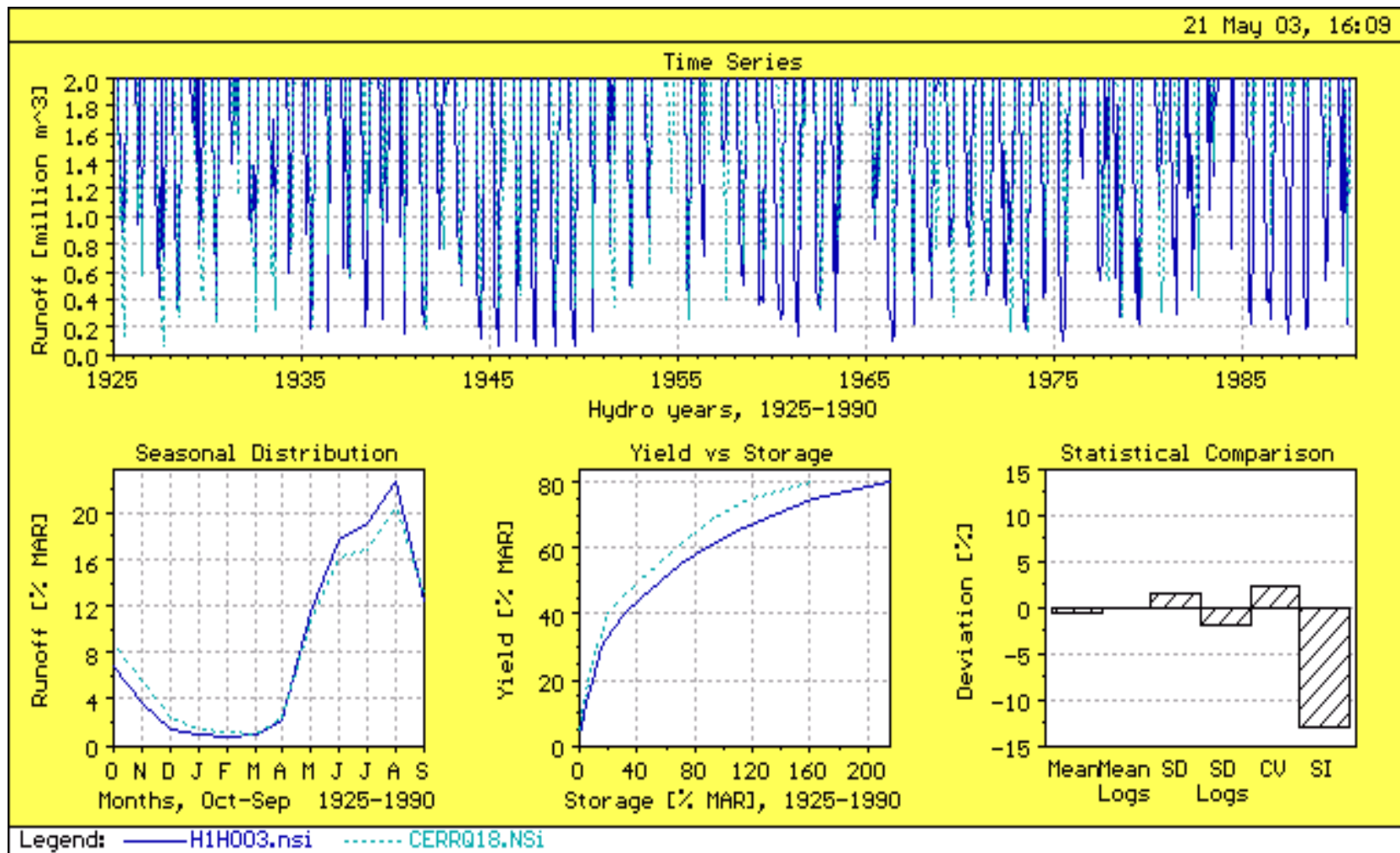


Figure C.6 : Comparison of simulated low flows for the Molenaars Catchment (H1H018)

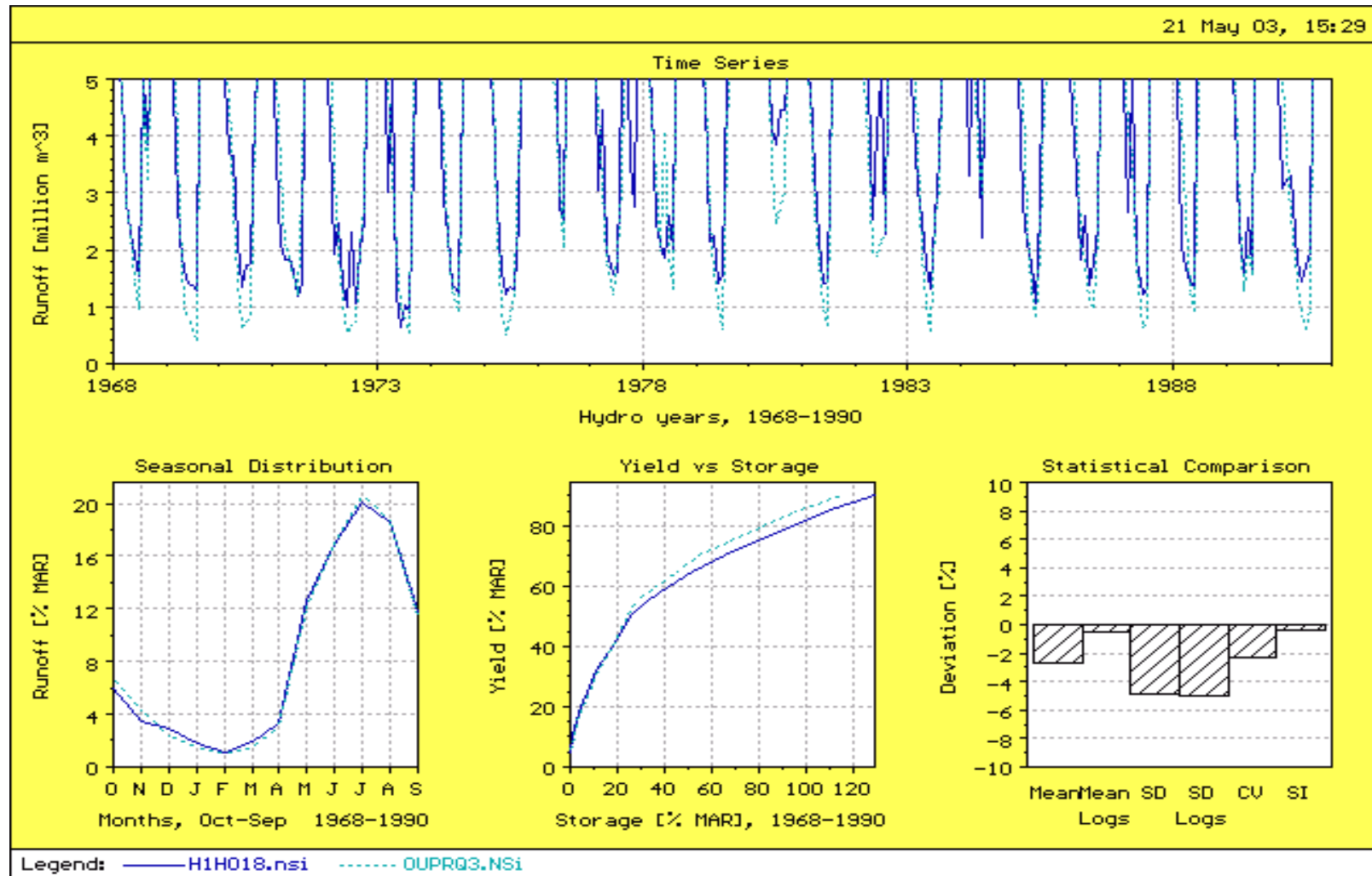


Figure C.7 : Comparison of simulated low flows for the Ceres Basin (H1H003)