Swakopmund - Municipality:

17 Jan'00

CENTRAL NAMIB AREA
GROUNDWATER POTENTIAL

SUMMARY

CURRENT STATUS OF EXISTING SOURCES
(Omdel & Kuiseb)

Sustainable yield: 8.9 - 12.4 Mm^3/a

Recommended Abstraction (1999): 12.9 Mm^3/a

Average Abstraction - past 5 years (1994-1998): 12.07 Mm^3/a

FURTHER GROUNDWATER DEVELOPMENT OPTIONS

Adjacent dune area (south of Kuiseb): 0.94 Mm^3/a (BGR)

Dorop North: 1.0 Mm^3/a (DWA - RSA Report 1992)

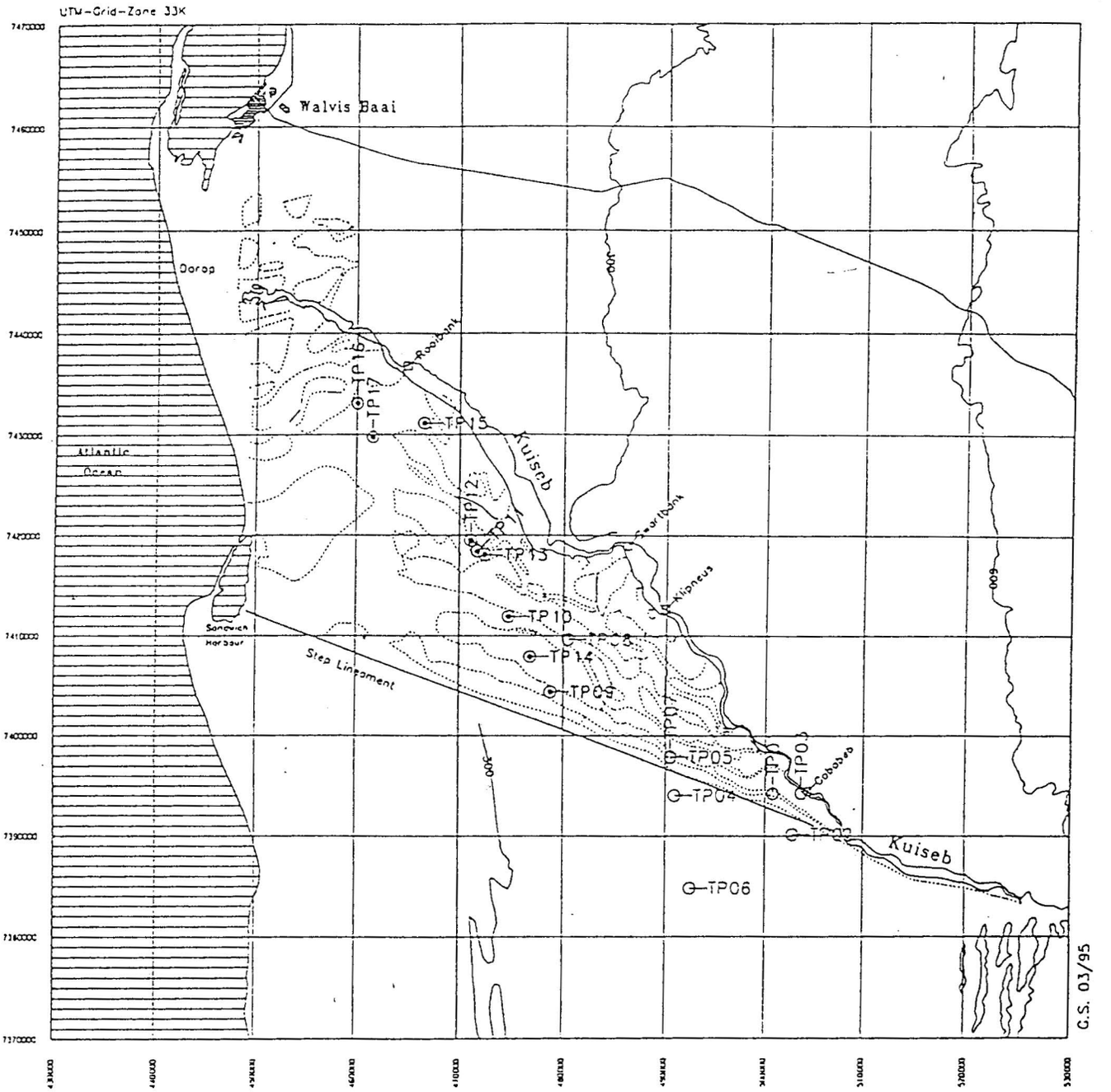
Sandwich Harbour Area: Unknown ? (Depends on Kuiseb River)

9989

HOW MUCH WATER CAN SAFELY BE ABSTRACTED?

SOURCE	SUSTAINABLE YIELD Mm^3/a	SUSTAINABLE YIELD Mm^3/a (With Artificial Recharge)
Kuiseb Aquifers	4.200	4.200
⇒ Dorop South & Rooibank B	1.000	-
⇒ Rooibank A	1.200	-
⇒ Swartbank	2.000	-
Omdel Aquifer	4.700	8.200
⇒ Aquifer (Without Recharge)	4.700	4.700
⇒ Aquifer (With Recharge – Omdel Dam)	-	3.500
TOTAL	8.900	12.400

Fig.2 Project Exploration Wells



Definitions :

Land Surface in [m] a.s.l.

Boundary of Paleo Channel (after Lenz 11/94)

TP05 Exploration Well

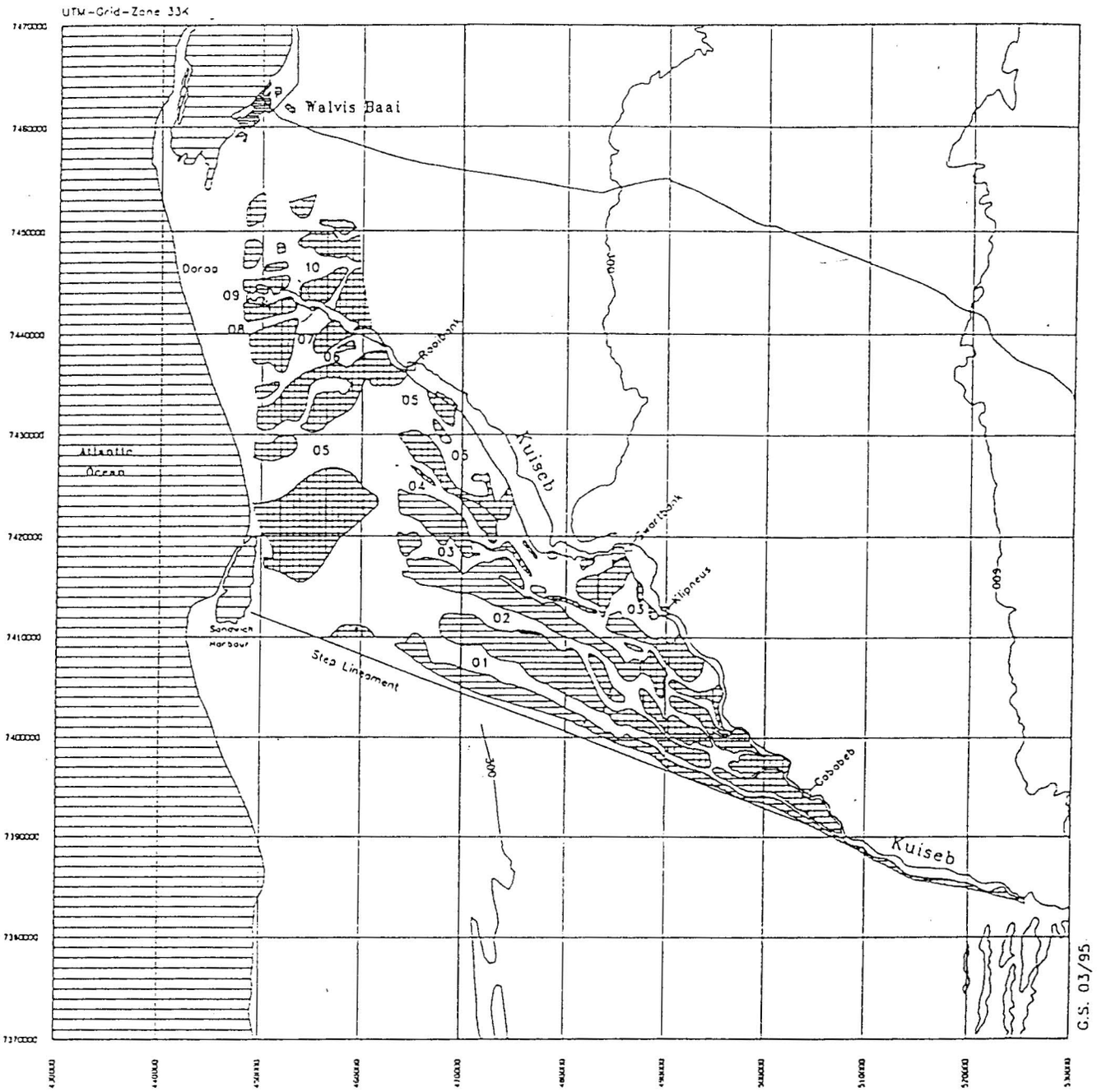
TP09 Exploration Well / Aquifer Test

BGR-Hannover DWA-Windhoek

Groundwater Exploration : Kuiseb Dune Area

Project Exploration Wells

Fig.1 Geological Features



Definitions :

Land Surface in [m] a.s.l.

Basement

Tsondab Sandstone

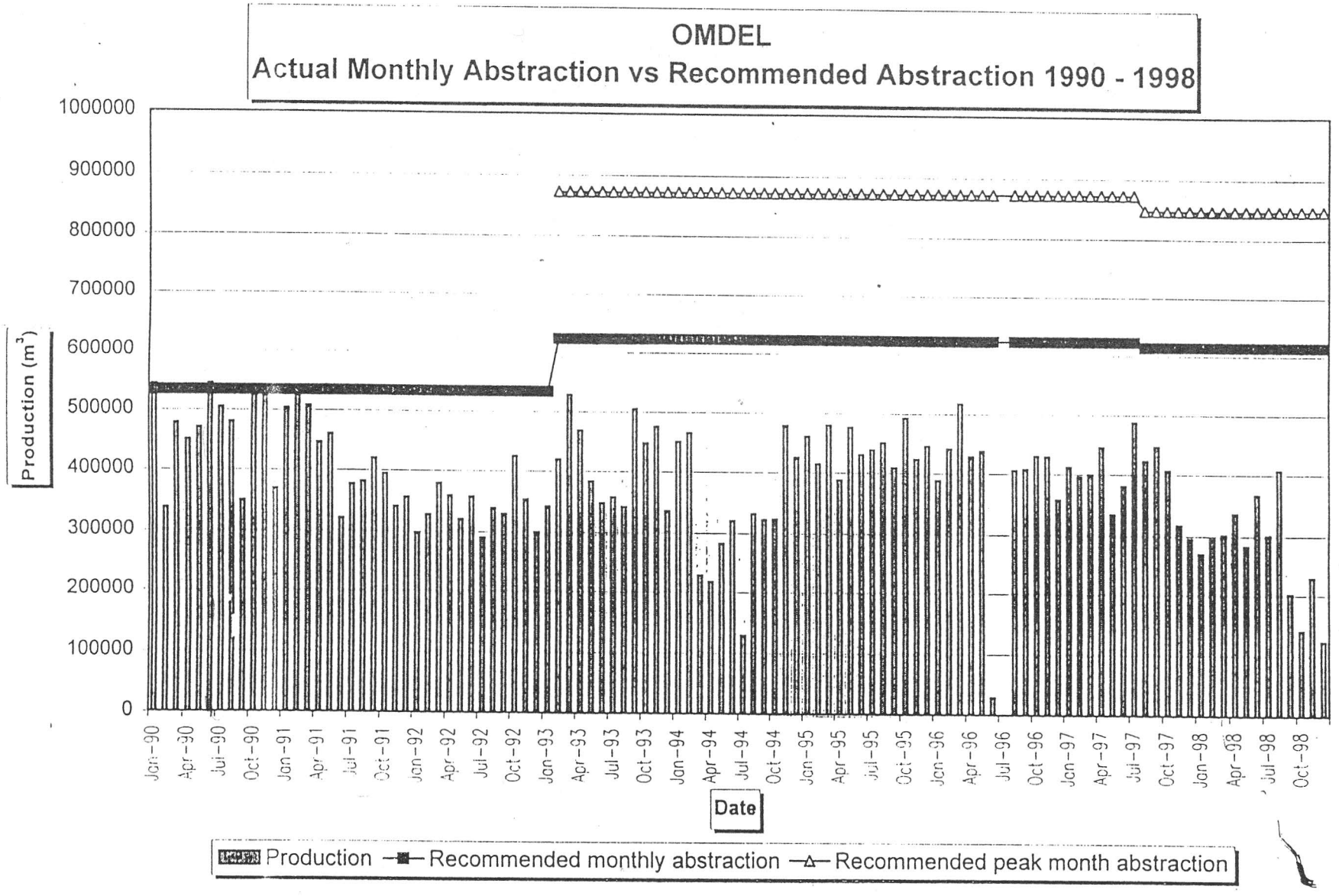
03 Paleo Channel

BGR-Hannover DWA-Windhoek

Groundwater Exploration : Kuiseb Dune Area

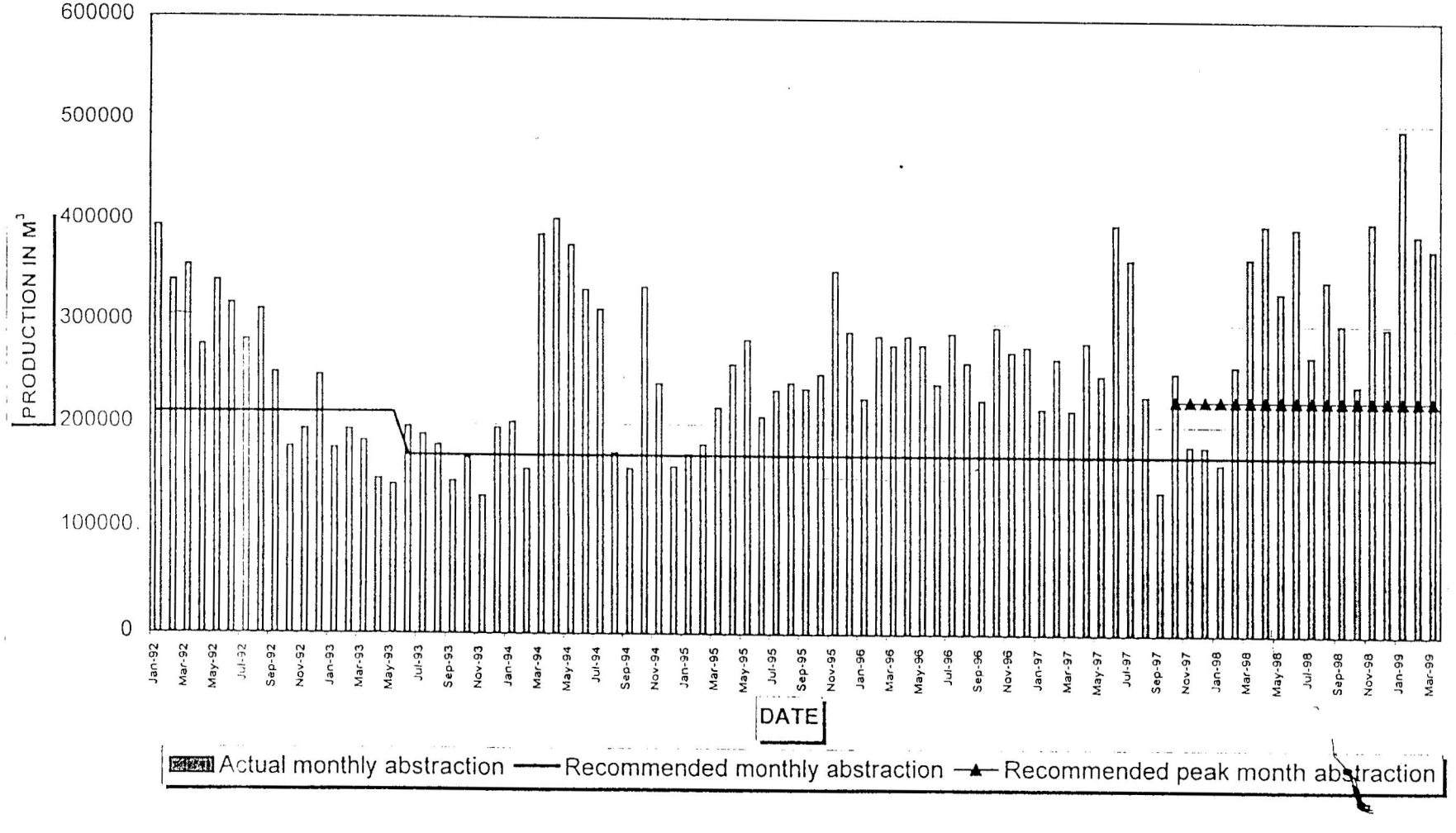
Geological Features (after Lenz 11/94)

Source	Actual Annual Abstraction in Mm^3											
	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Kuiseb Aquifers	*9.900*	*9.756*	*8.298*	*8.240*	*8.000*	*7.830*	*6.720*	*8.250*	*6.723*	*6.812*	*6.806*	*7.348*
- Dorop South						0.300	1.380	1.400	1.285	1.156	0.680	1.021
- Rooibank A	2.600	2.775	2.921	2.930	2.800	2.780	1.870	2.230	1.446	1.275	1.506	1.490
- Rooibank B	1.100	1.136	1.150	1.090	1.300	1.560	1.450	1.320	1.072	1.164	1.654	1.072
- Swartbank	6.200	5.845	4.227	4.220	3.900	3.460	2.020	3.210	2.920	3.217	2.966	3.765
Omdel Aquifer	*6.990*	*6.156*	*6.268*	*5.289*	*4.796*	*3.819*	*5.120*	*3.797*	*5.048*	*4.861*	*5.210*	*5.543*
TOTAL	16.890	15.912	16.024	13.529	12.796	11.649	11.84	12.047	11.771	11.637	12.016	12.891


OMDEL
Actual Monthly Abstraction vs Recommended Abstraction 1990 - 1998
Production (m³)
1000000
900000
800000
700000
600000
500000
400000
300000
200000
100000
0
Jan-90
Apr-90
Jul-90
Oct-90
Jan-91
Apr-91
Jul-91
Oct-91
Jan-92
Apr-92
Jul-92
Oct-92
Jan-93
Apr-93
Jul-93
Oct-93
Jan-94
Apr-94
Jul-94
Oct-94
Jan-95
Apr-95
Jul-95
Oct-95
Jan-96
Apr-96
Jul-96
Oct-96
Jan-97
Apr-97
Jul-97
Oct-97
Jan-98
Apr-98
Jul-98
Oct-98
Date
Production
Recommended monthly abstraction
Recommended peak month abstraction

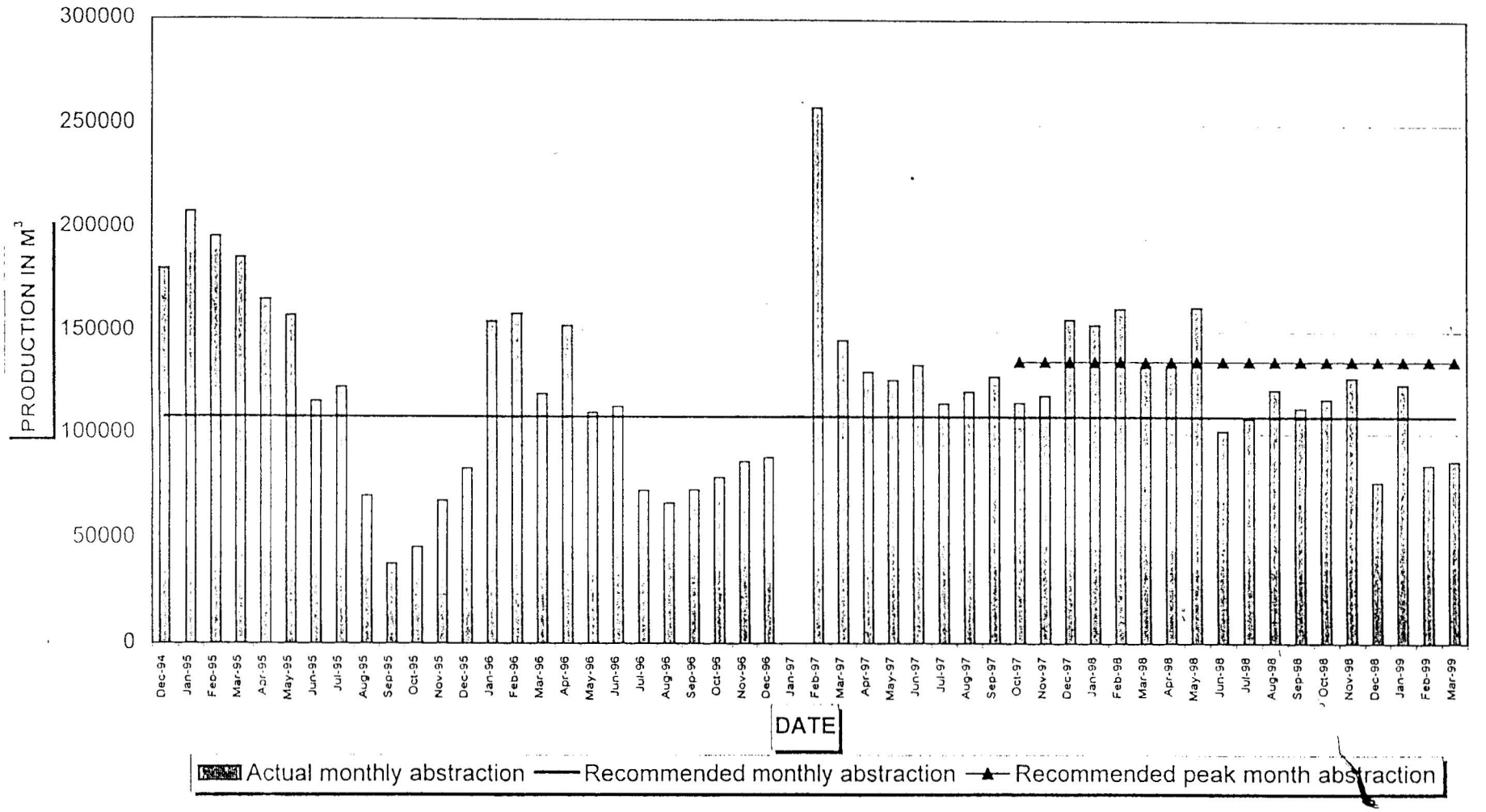
SWARTBANK

Actual Monthly Abstraction vs Recommended Abstraction 1992 - 1999



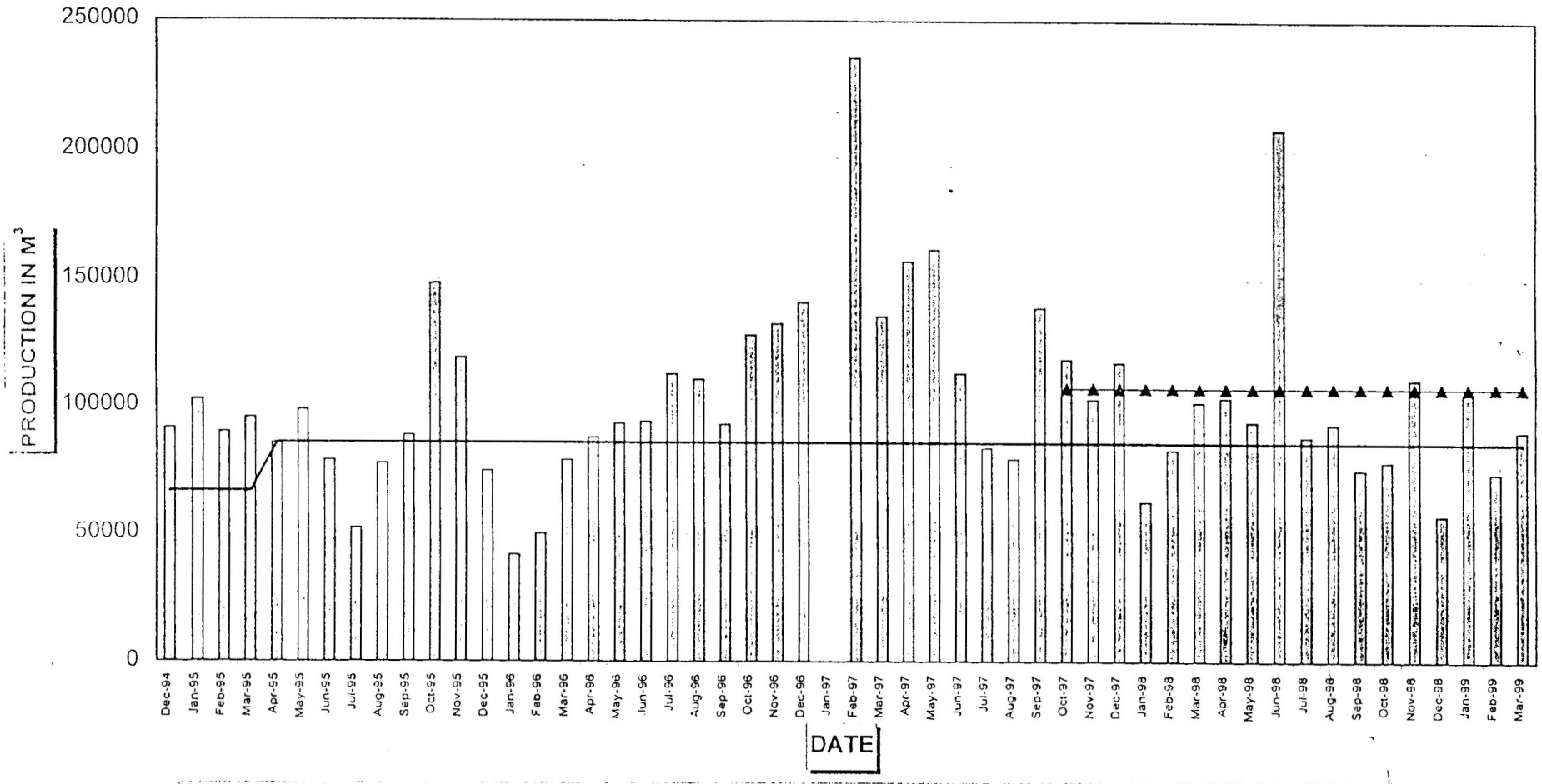
ROOIBANK A

Actual Monthly Abstraction vs Recommended Abstraction 1994 - 1999



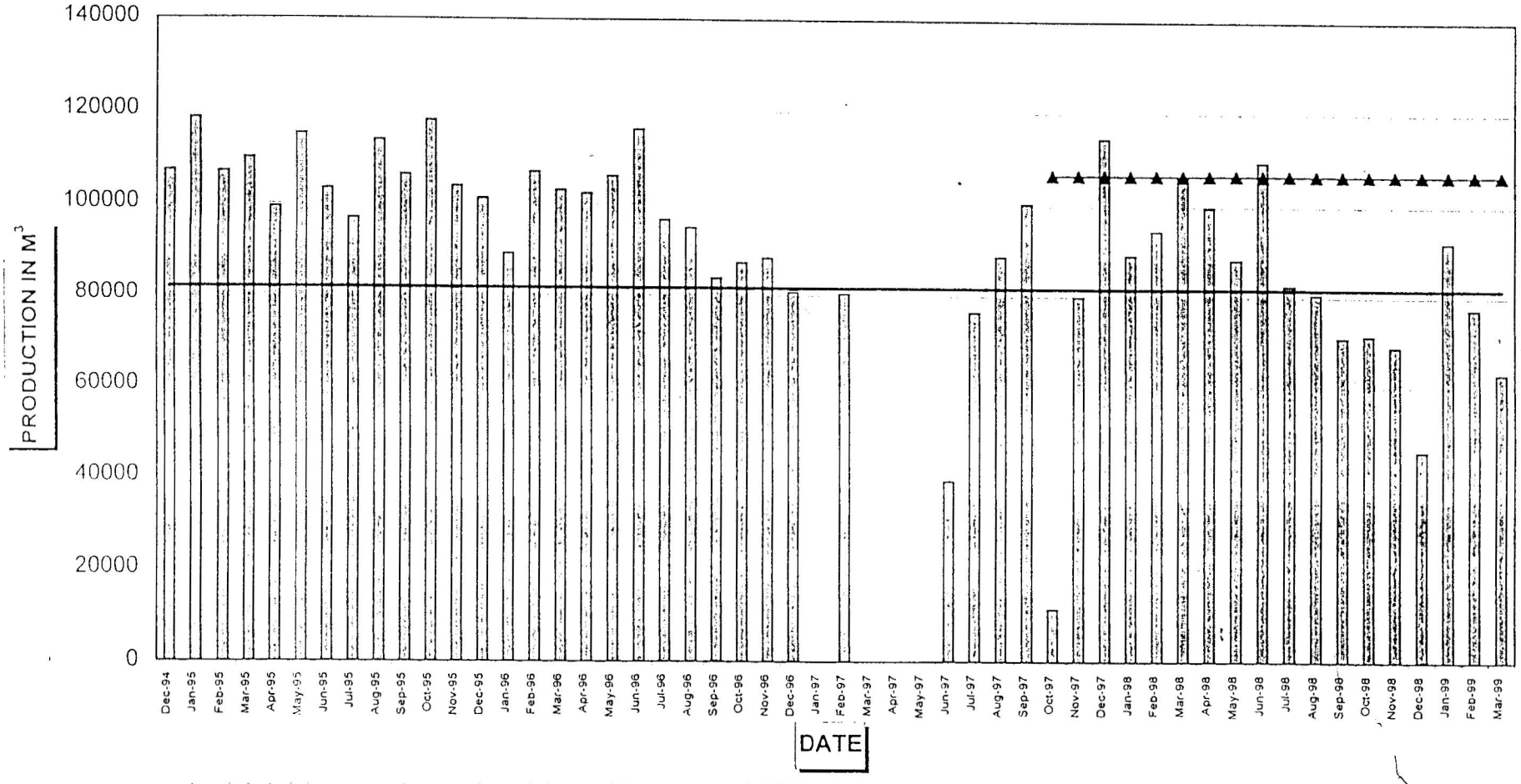
ROOIBANK B

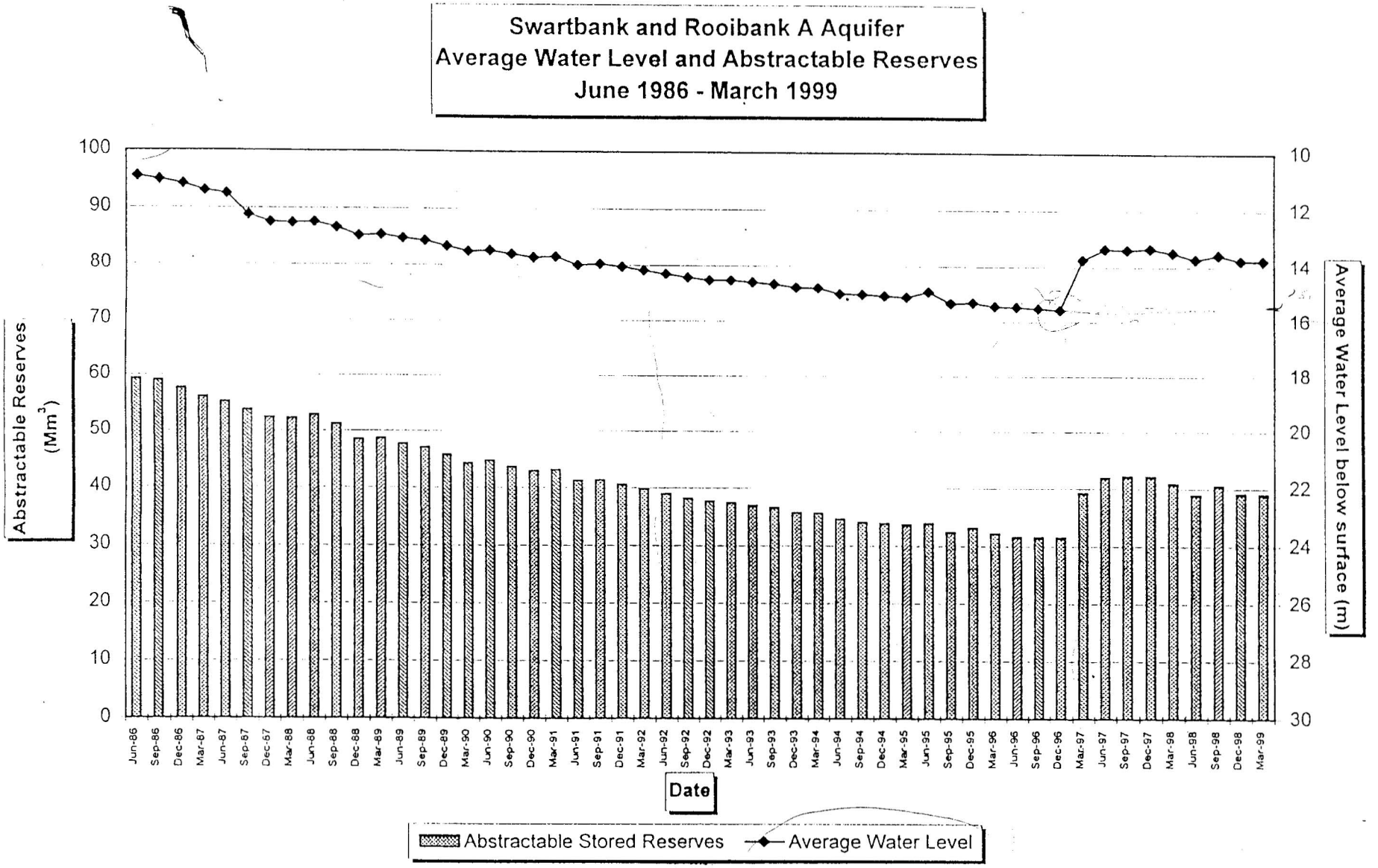
Actual Monthly Abstraction vs Recommended Abstraction 1994 - 1999



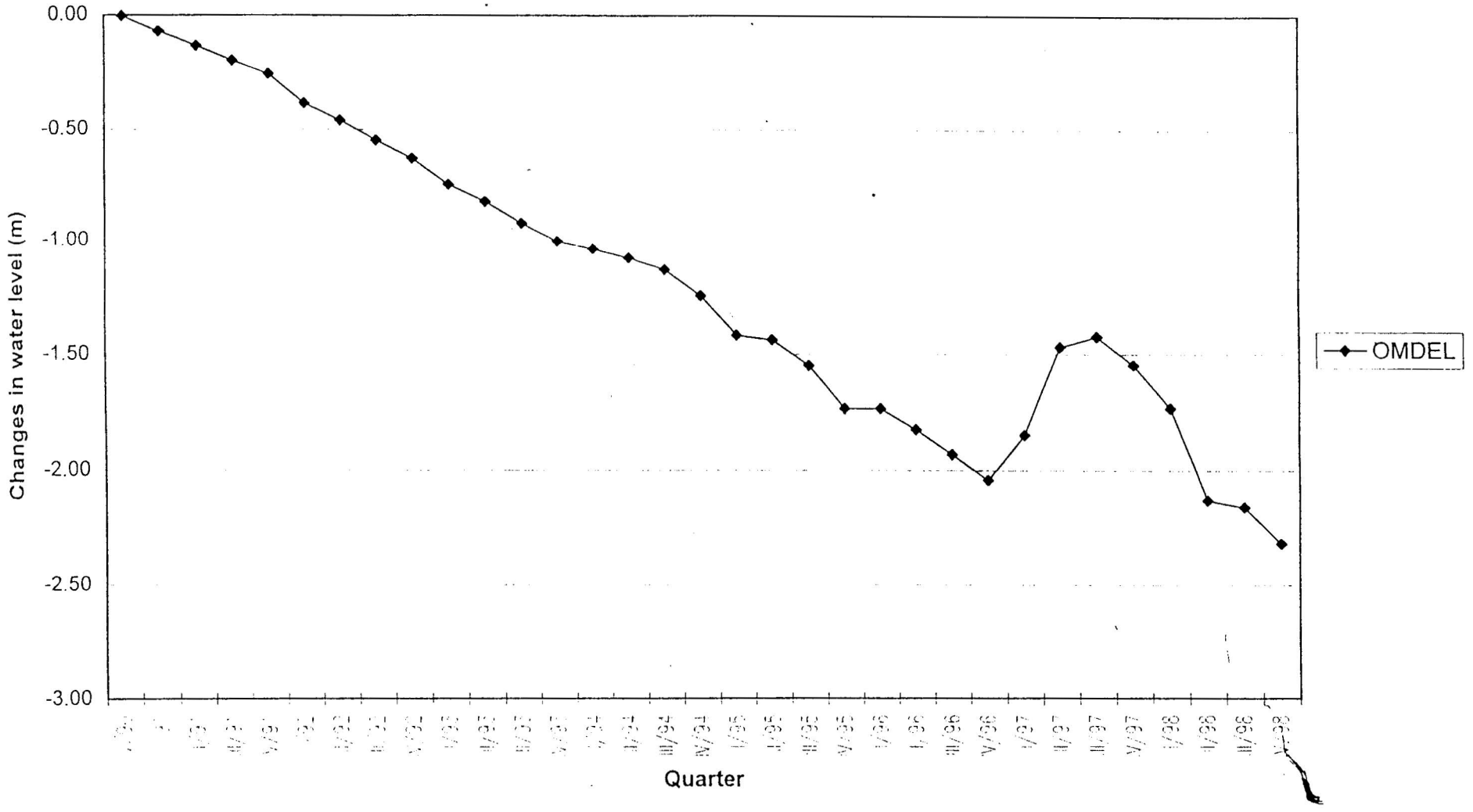
DOROP SOUTH

Actual Monthly Abstraction vs Recommended Abstraction 1994 - 1999



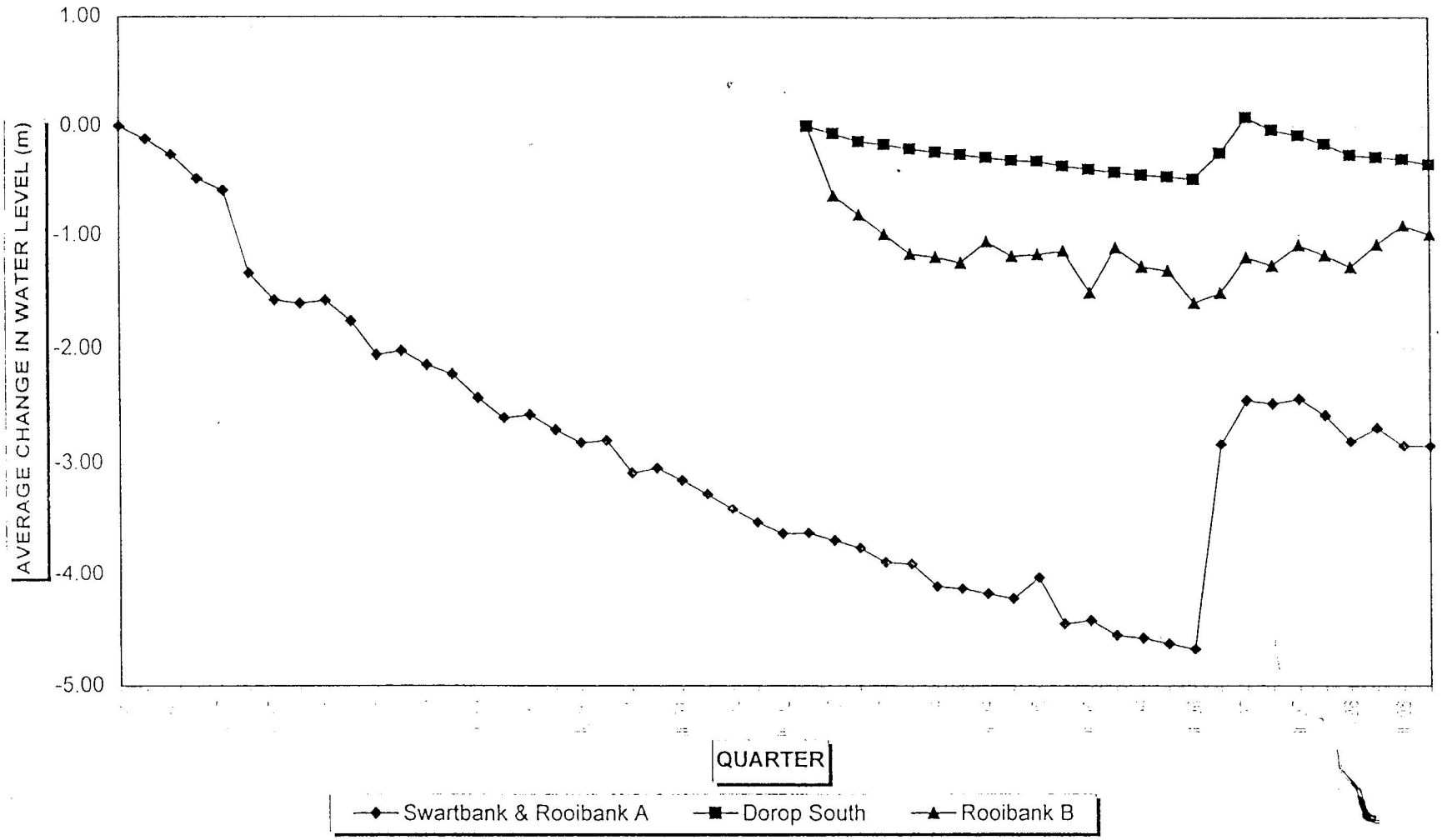

Swartbank and Rooibank A Aquifer
Average Water Level and Abstractable Reserves
June 1986 - March 1999
Abstractable Reserves (Mm³)
Average Water Level below surface (m)
Date
Abstractable Stored Reserves
Average Water Level

Changes in water levels at Omdel WSS (1991 - 1998)



APPENDIX 4

AVERAGE CHANGE IN WATER LEVELS IN THE LOWER KUISEB AQUIFERS (1986-1999)



GROUNDWATER DEVELOPMENT CONSTRAINTS

ENVIRONMENTAL

Lowering of the groundwater Table (threat to vegetation)

Salt (sea water) intrusion (permanent damage to aquifer)

Pipe and power lines in the dune area ???

AQUIFER CONSTRAINTS

Recharge only from flood events in Kuiseb River

Infrequent flood events reach Lower Kuiseb Aquifers

Fragmented nature of low yielding aquifers

Variable water quality of aquifers

TECHNICAL DEVELOPMENT AND MAINENANCE

Moving sand dunes

Large number of boreholes required

Access to widely distributed boreholes