The Platveld Aquifer Study (PAS)

Presentation of Results, concentrating on:

1. The Hydrologic Cycle
2. Bush Encroachment in General
3. Impact of bush Encroachment on Groundwater Resources
4. Case descriptions
5. Groundwater Security = Food Security and Stability

Co-operating and Implementing Institutions

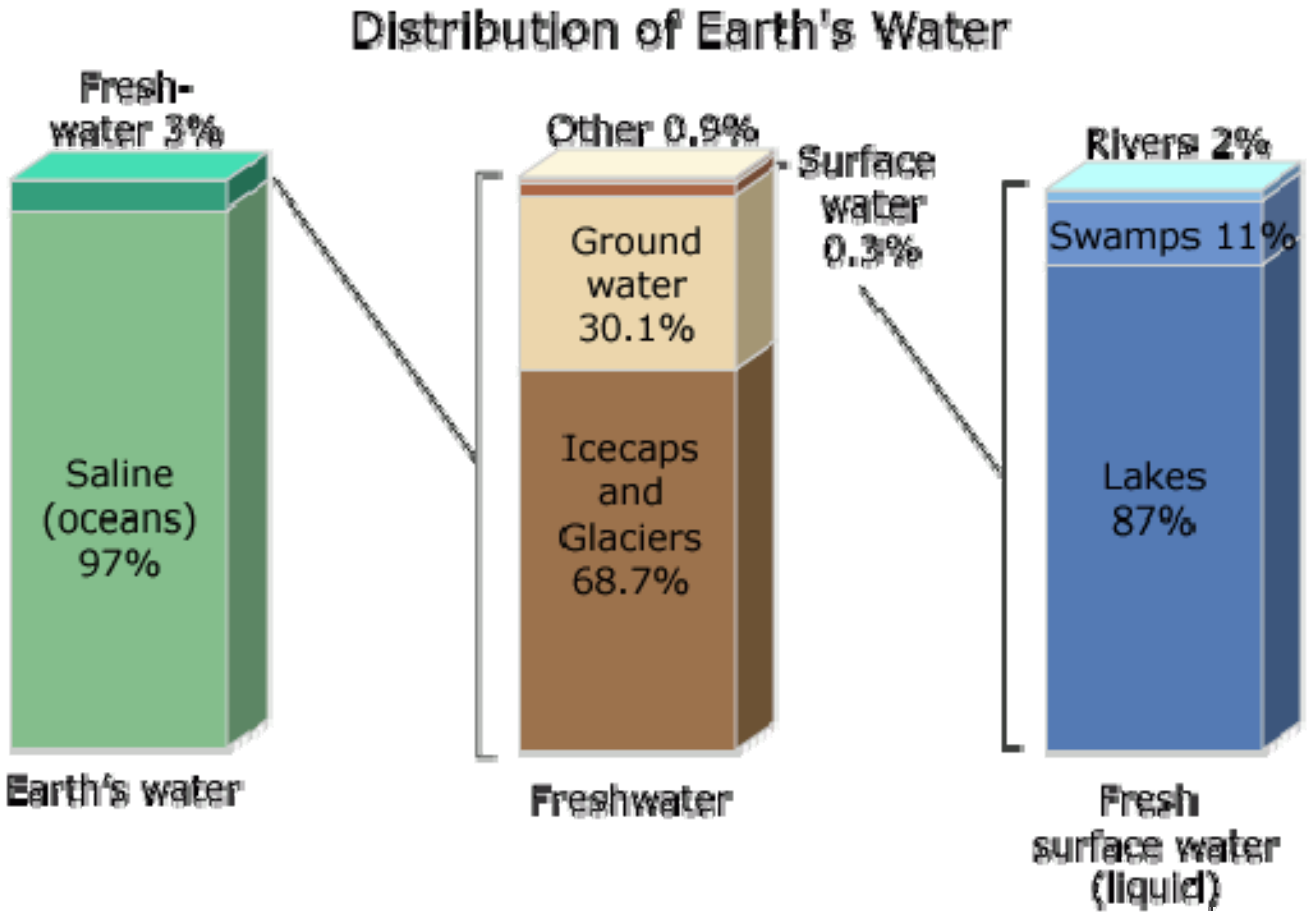
Ministry of Agriculture, Water and Forestry
Department of Water Affairs

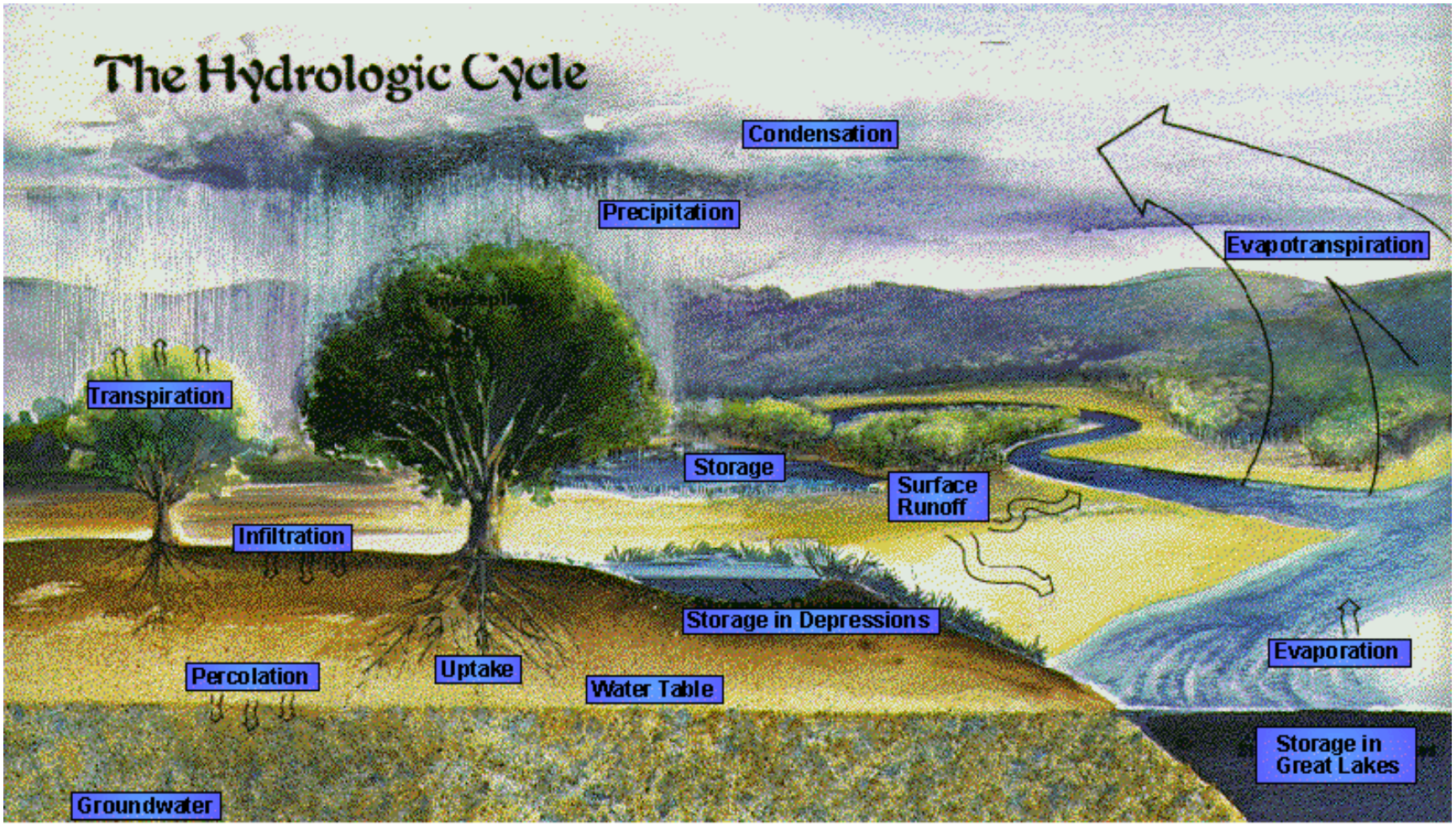
Ministry of Mines and Energy
Geological Survey of Namibia

Geological Survey of Namibia

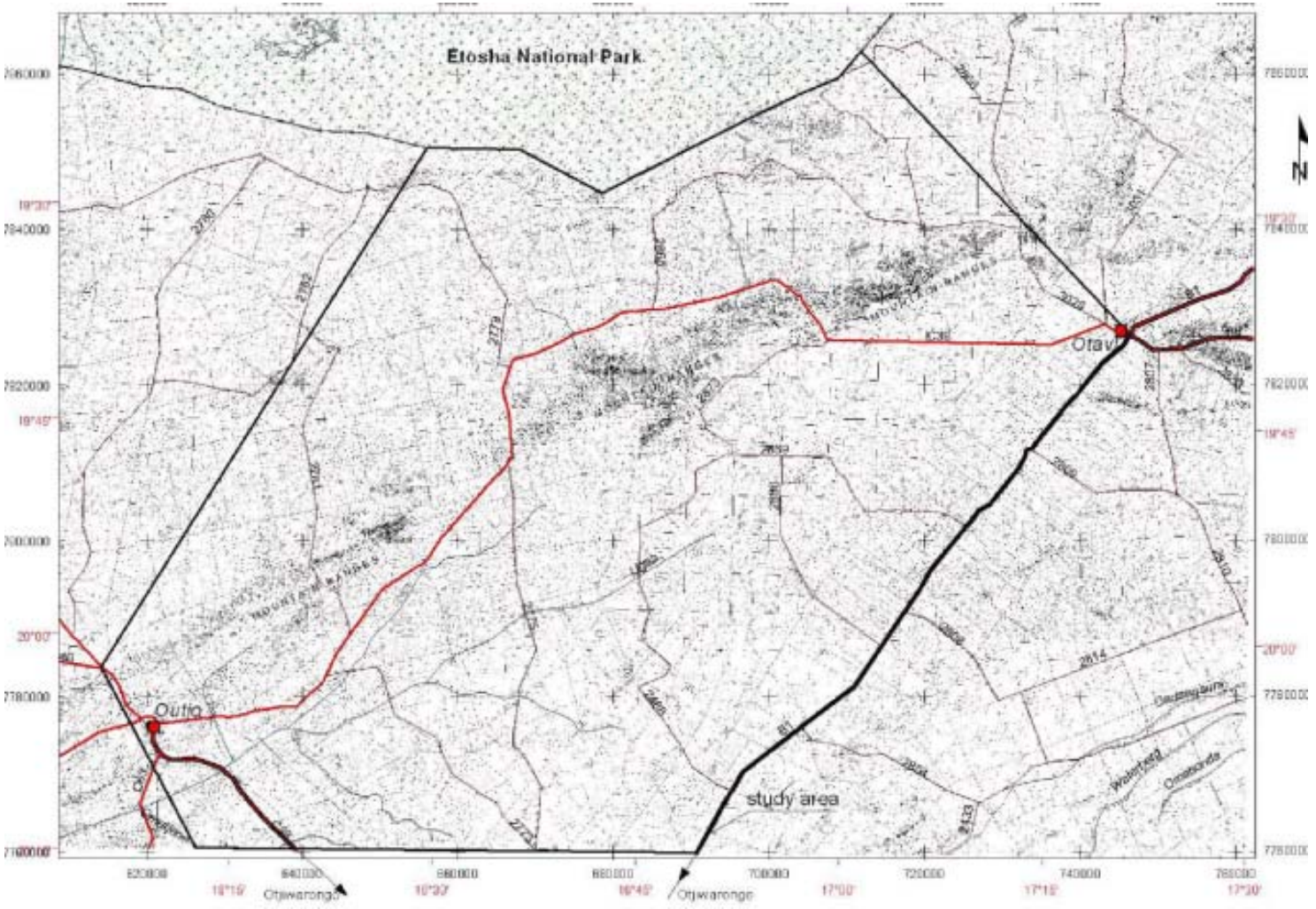
Grand Duchy of Luxembourg
Luxembourg Development

LUX - DEVELOPMENT

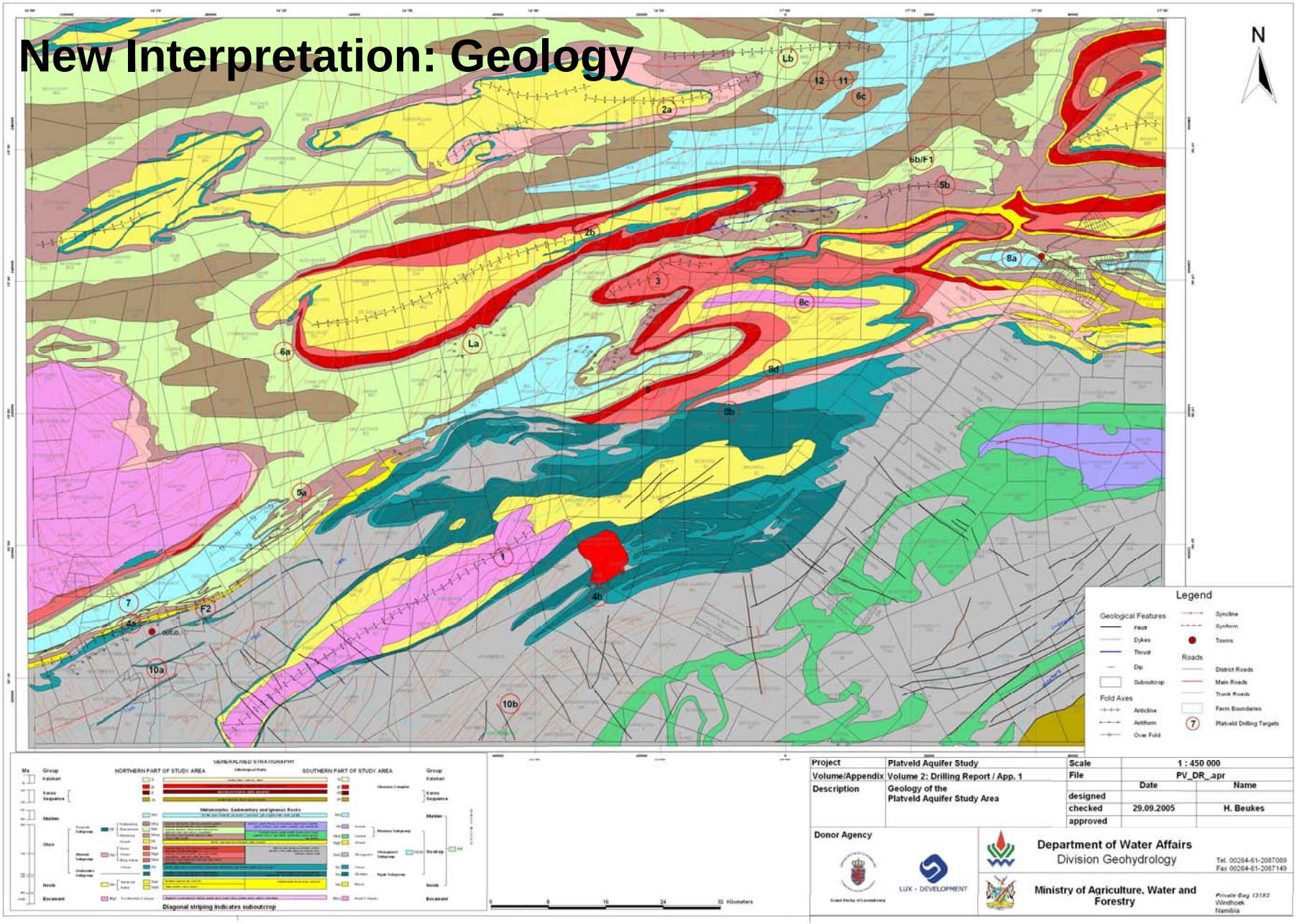

Distribution of Earth's Water
Fresh-water 3%
Saline (oceans) 97%
Earth's water
Other 0.9%
Ground water 30.1%
Icecaps and Glaciers 68.7%
Freshwater
Surface water 0.3%
Rivers 2%
Swamps 11%
Lakes 87%
Fresh surface water (liquid)


The Hydrologic Cycle
Condensation
Precipitation
Evapotranspiration
Transpiration
Storage
Surface Runoff
Infiltration
Storage in Depressions
Evaporation
Percolation
Uptake
Water Table
Storage in Great Lakes
Groundwater

Location: detail



New Interpretation: Geology



Project	Platveld Aquifer Study	Scale	1 : 450 000	
Volume/Appendix	Volume 2: Drilling Report / App. 1	File	PV_DR_.apr	
Description	Geology of the Platveld Aquifer Study Area		Date	Name
		designed		
		checked	29.09.2005	H. Beukes
		approved		

Donor Agency

LUX - DEVELOPMENT

Department of Water Affairs
Division Geohydrology
Tel. 00264-61-2087089
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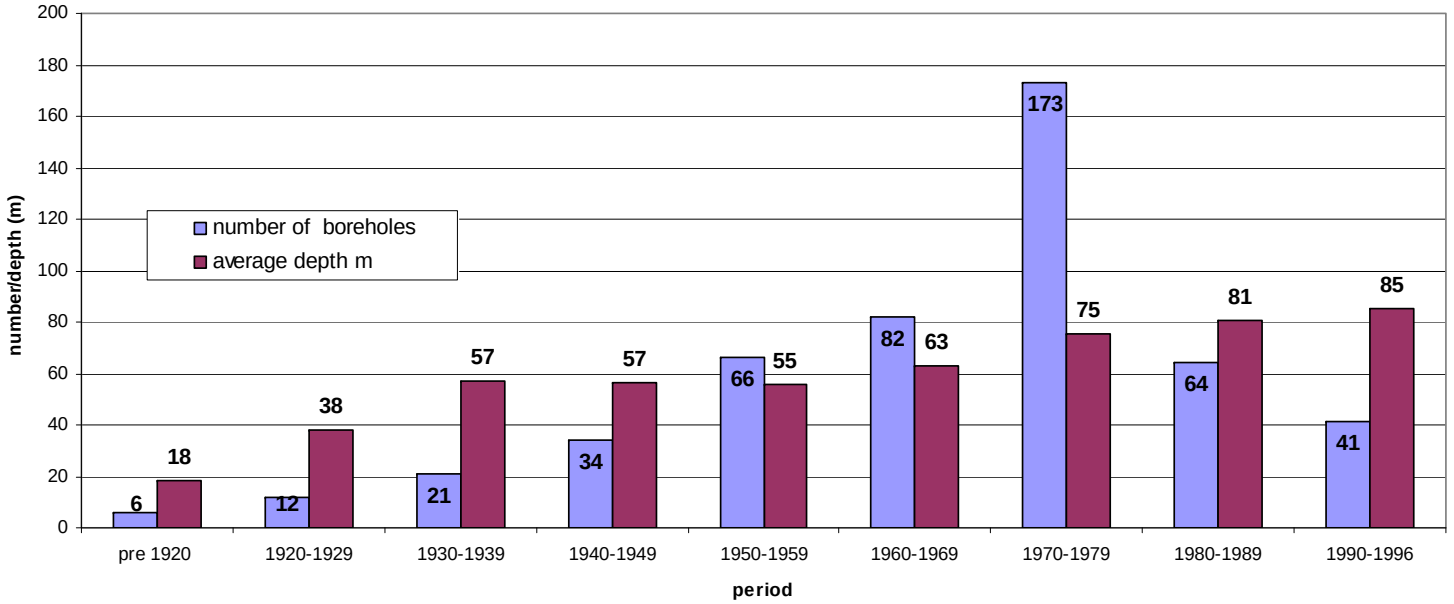
Ministry of Agriculture, Water and Forestry
Private Bag 13193
Windhoek
Namibia

Average Depths of boreholes drilled



Only boreholes for which

1. **Reliable drill-dates have been found**
2. **Reliable depth data was found**

have been used. (500 boreholes)

- **This is not a statistic representing total boreholes drilled.**
- **The tendencies reflected are considered representative.**

Water levels measured

farmers and geohydrologists

- **Goabpforte**
  - 7 boreholes
  - Drop of up to 16 m in up to 26 years

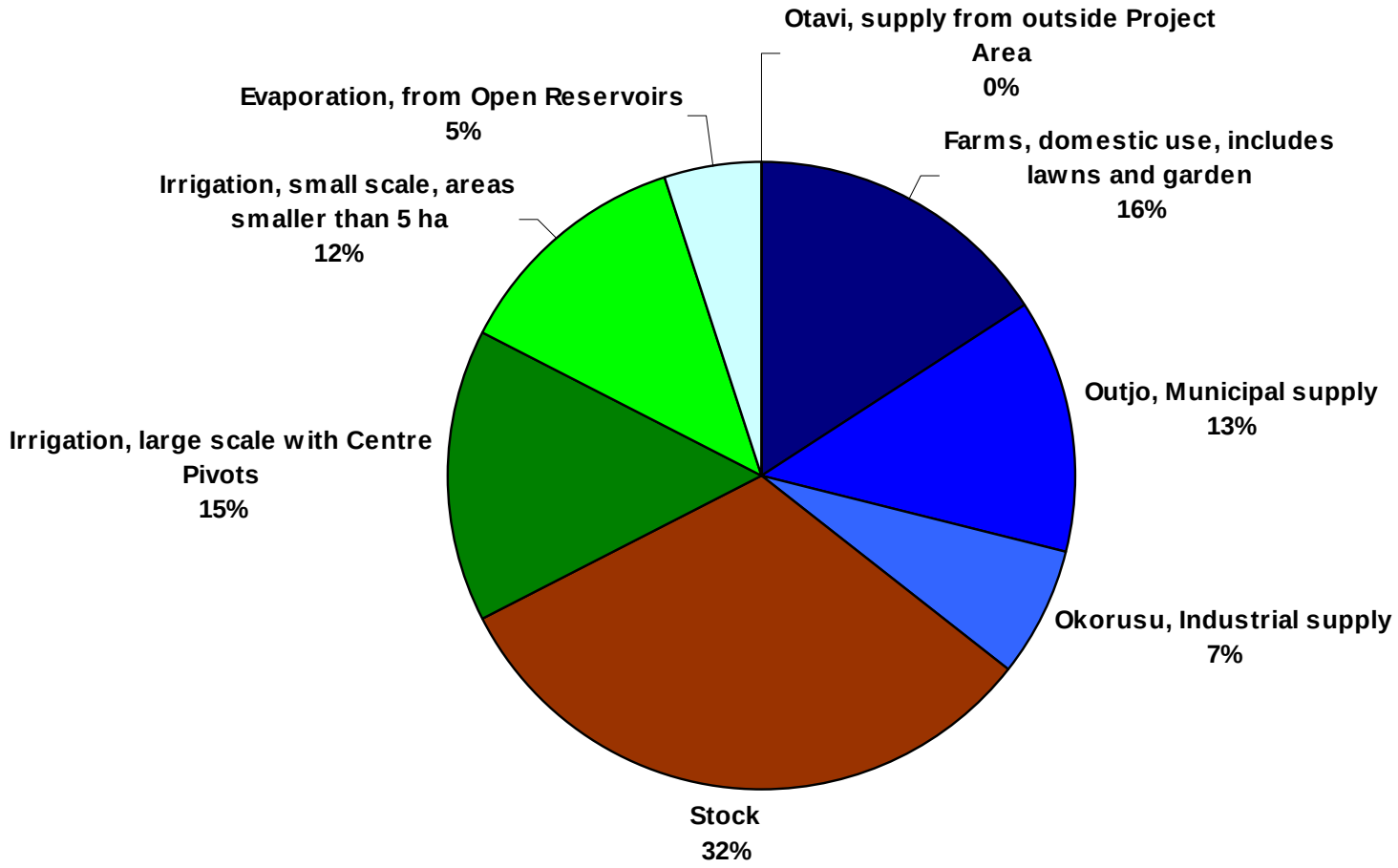
Luggenhof

- Wells started to dry up in 1946
- Presently water levels are in the order of 25 mbgl

- **Uib**
  - Fountain at “Ou Uib” dried up in May 1973
  - In 1986 water level at old fountain in replacement borehole was 10 m
  - 25/11/2003 RWL 24.5 mbgl

Groundwater abstracted Presently on Average

4.6 Mm^3

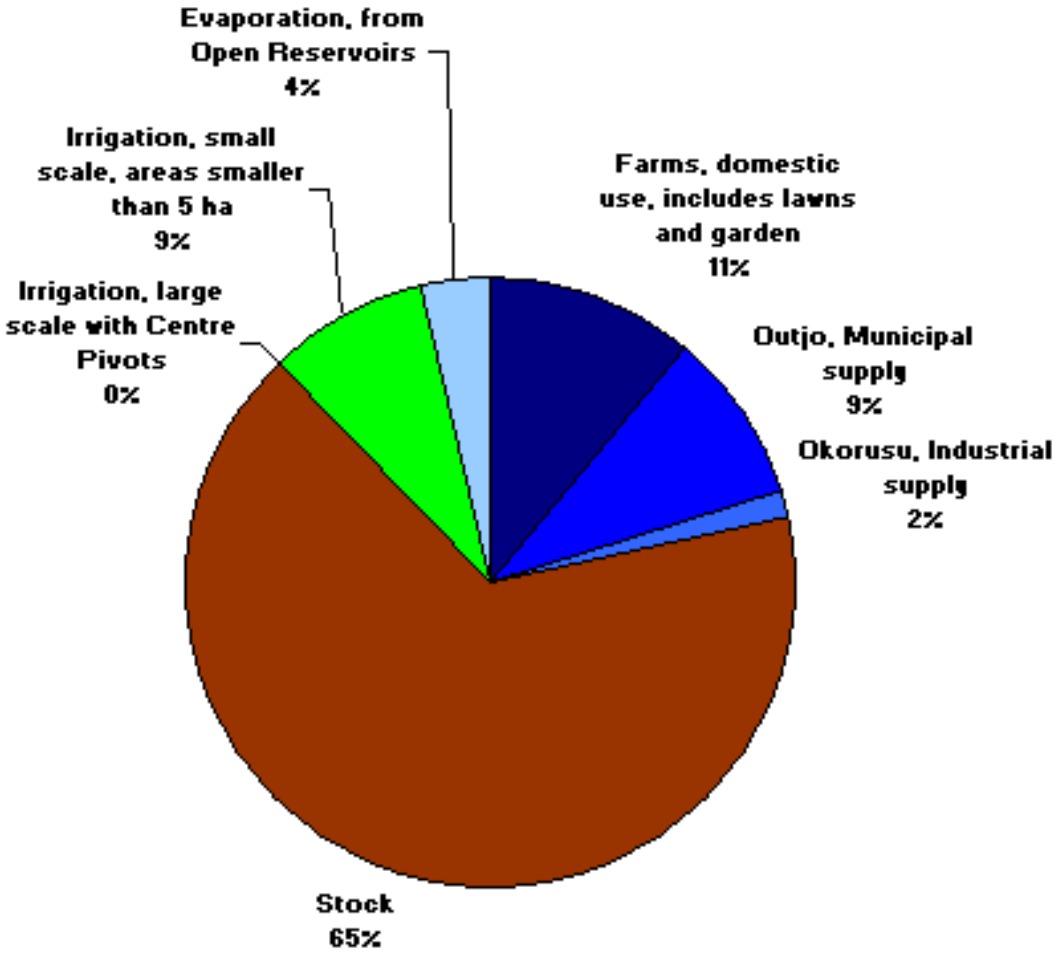


Water Abstraction Historic

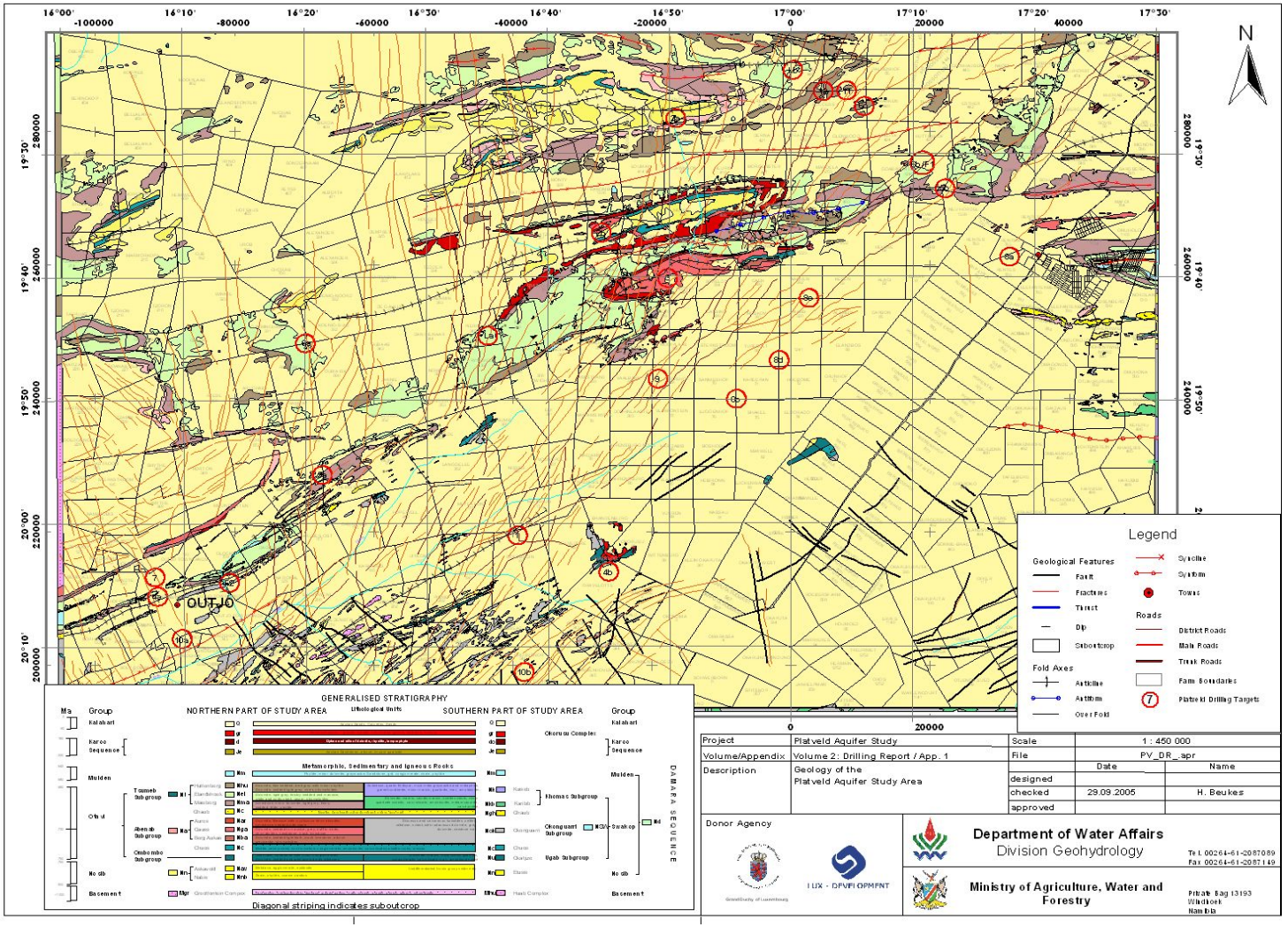
Historically:
- **Outjo Municipality used up to 1 Mm^3/a**
- **Okorusu used less water**
- **Farms used less water for purely domestic use**
- **Small scale irrigation was used regularly**
- **No large scale irrigation**
- **Water used for livestock watering was much more:**

According to Veterinary services, the meat board and slaughtering statistics, in Namibia in commercial farmland during 1958 an estimated 2,7 million head of cattle grazed , compared to only some 700 000 to 800 000 during the late 1990's

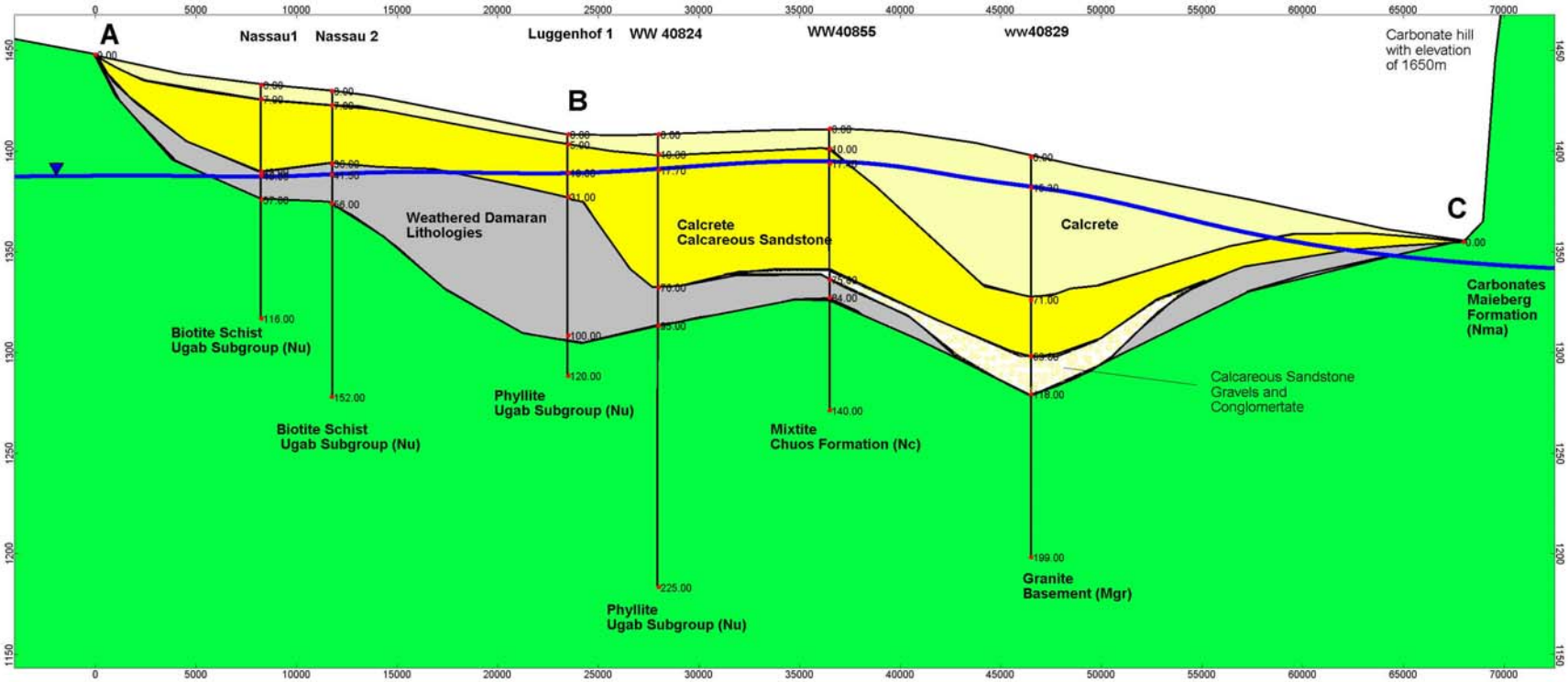
Groundwater Abstracted ~ 1958 **6.5 Mm^3/a**



Kalahari Cover



Platveld Kalahari Basin



Geological Cross section across the Platveld Basin
showing Kalahari and Damaran Lithologies
Vertical Exageration = 100

Typical situation

- Dry borehole drilled in densely vegetated bush. Note absence of grass cover.
- (Farm Smythe, February 2004)

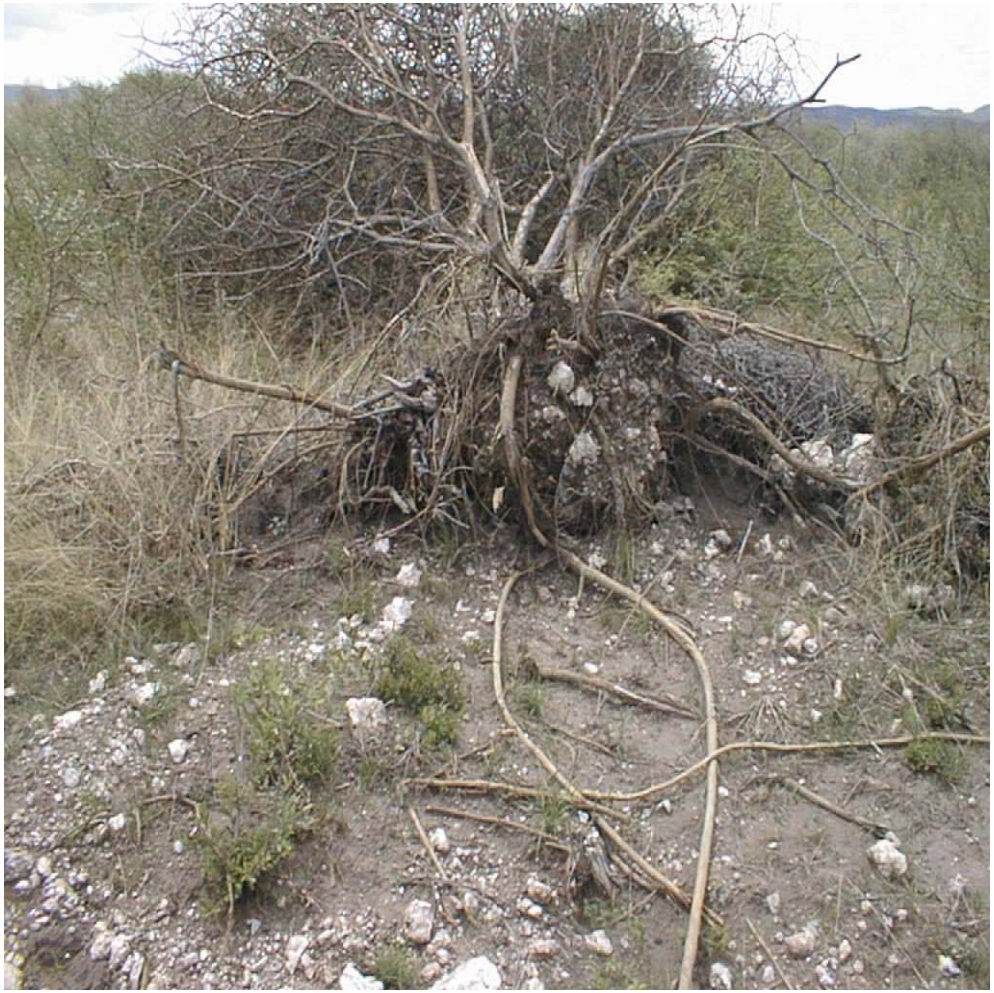
Bushencroachment

Bushencroachment

Bush Encroachment

Site “Abie”
Re-growth after three months rainfall

Root network



Facts about Bush Encroachment (source: de Klerk, et al 2004)

Project area has the following species which can be termed "invasive":

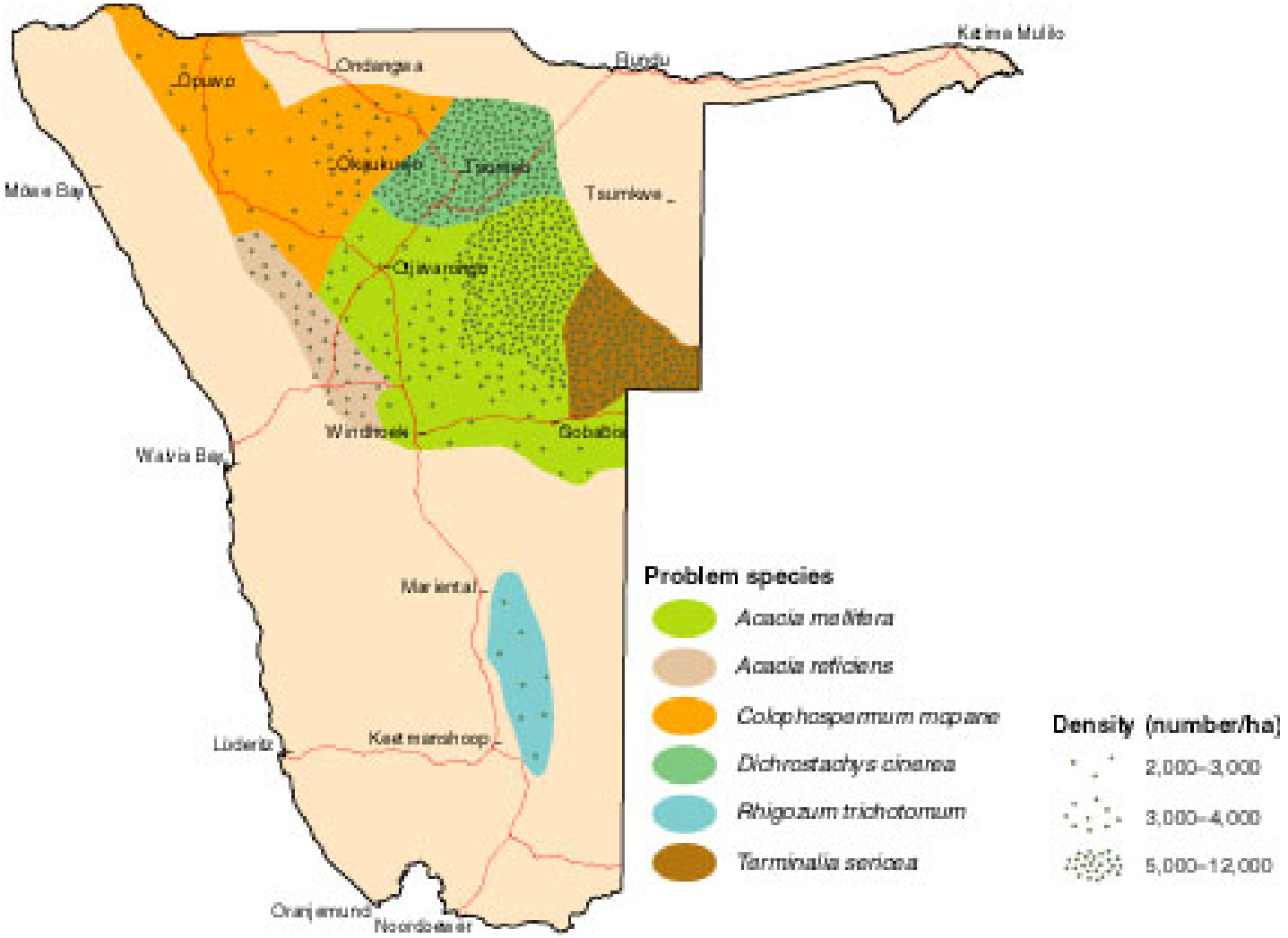
- *Colophospermum mopane* **in the north and western portion (density 4000/ha and more)**
- *Acacia mellifera* **in southern portion of the project area (density 8000/ha or higher)**
- *Dichrostachys cinerea* **in the east (density 10 000/ha and more)**
- **Not in Statistics:** *Terminalia prunioides*

ETTE: evapotranspiration tree equivalents

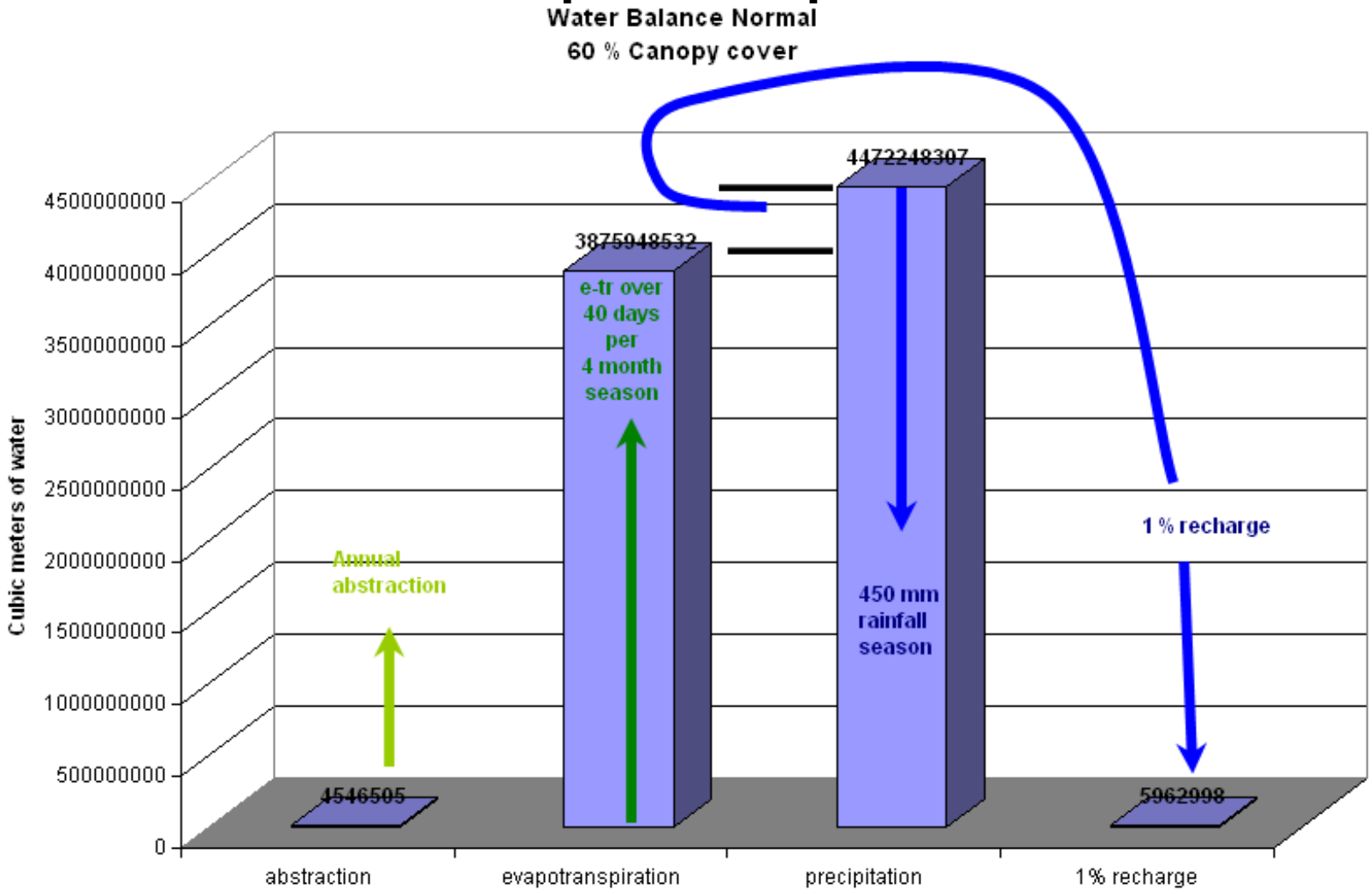
For this comparison: one *Acacia mellifera*, **height 2.5 m, crown diameter 2.8 m, canopy area 6.0 m^2, mean relative daily evapotranspiration per 8-hour day day/plant: 64.8 kg (=liters)**

According to Bester (1996) most of Namibia had its original vegetative characteristics up to the 1940's, but by the mid-1960's, bush thickening was regarded as an environmental desaster.

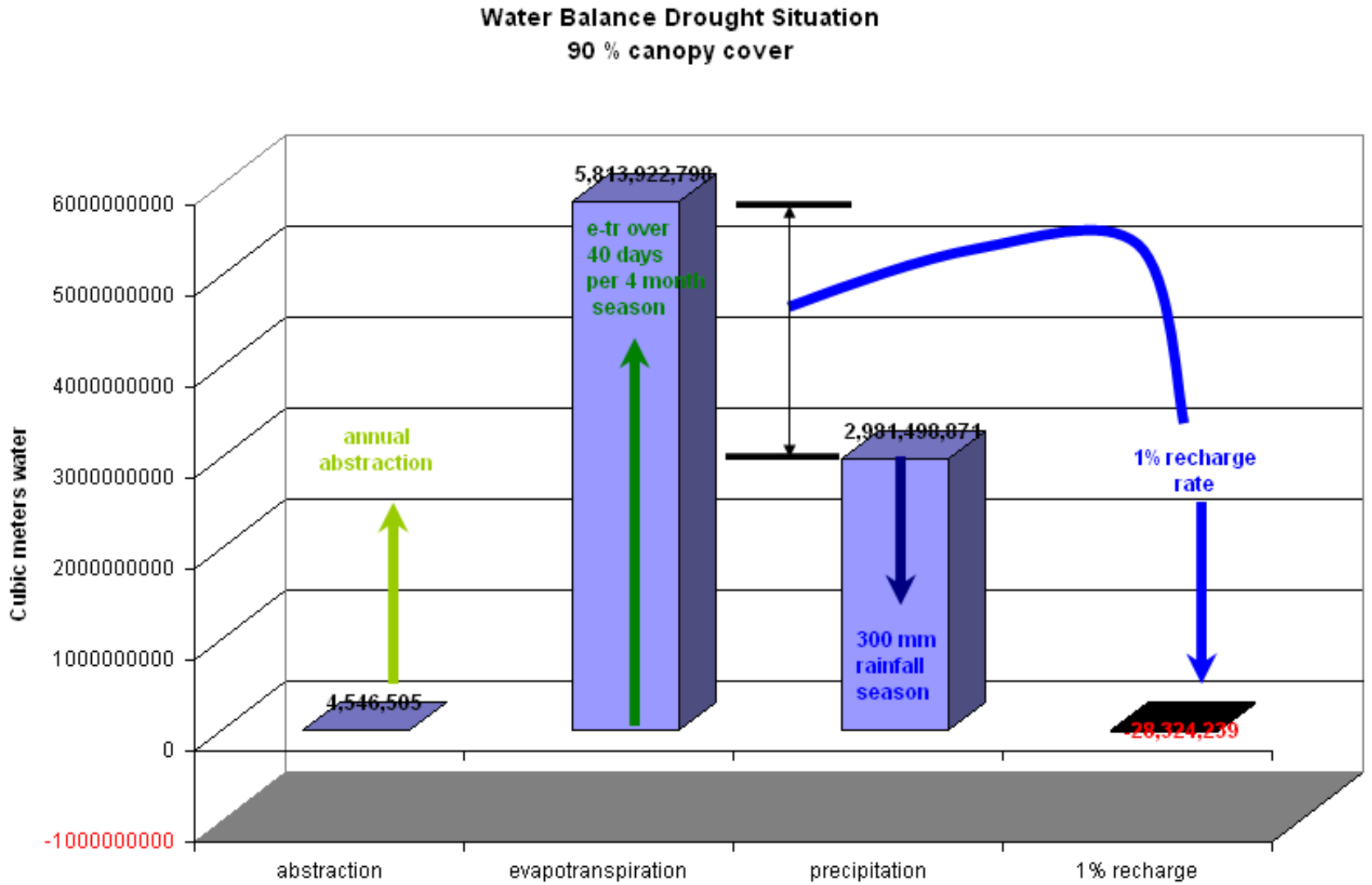
Occurrence of dominant invasive species



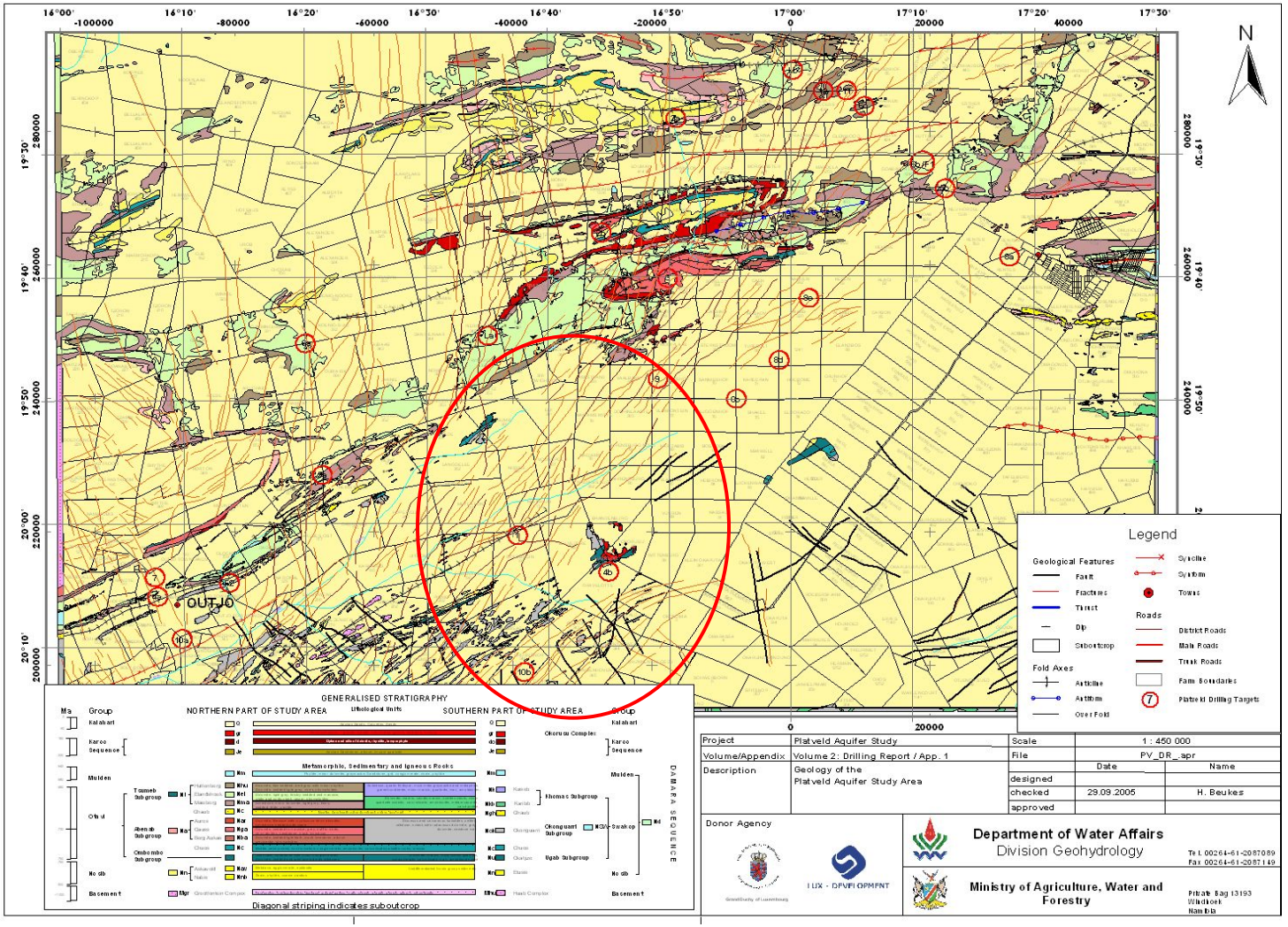
Comparison of Abstraction Evapotranspiration Losses & Total Precipitation optimistic



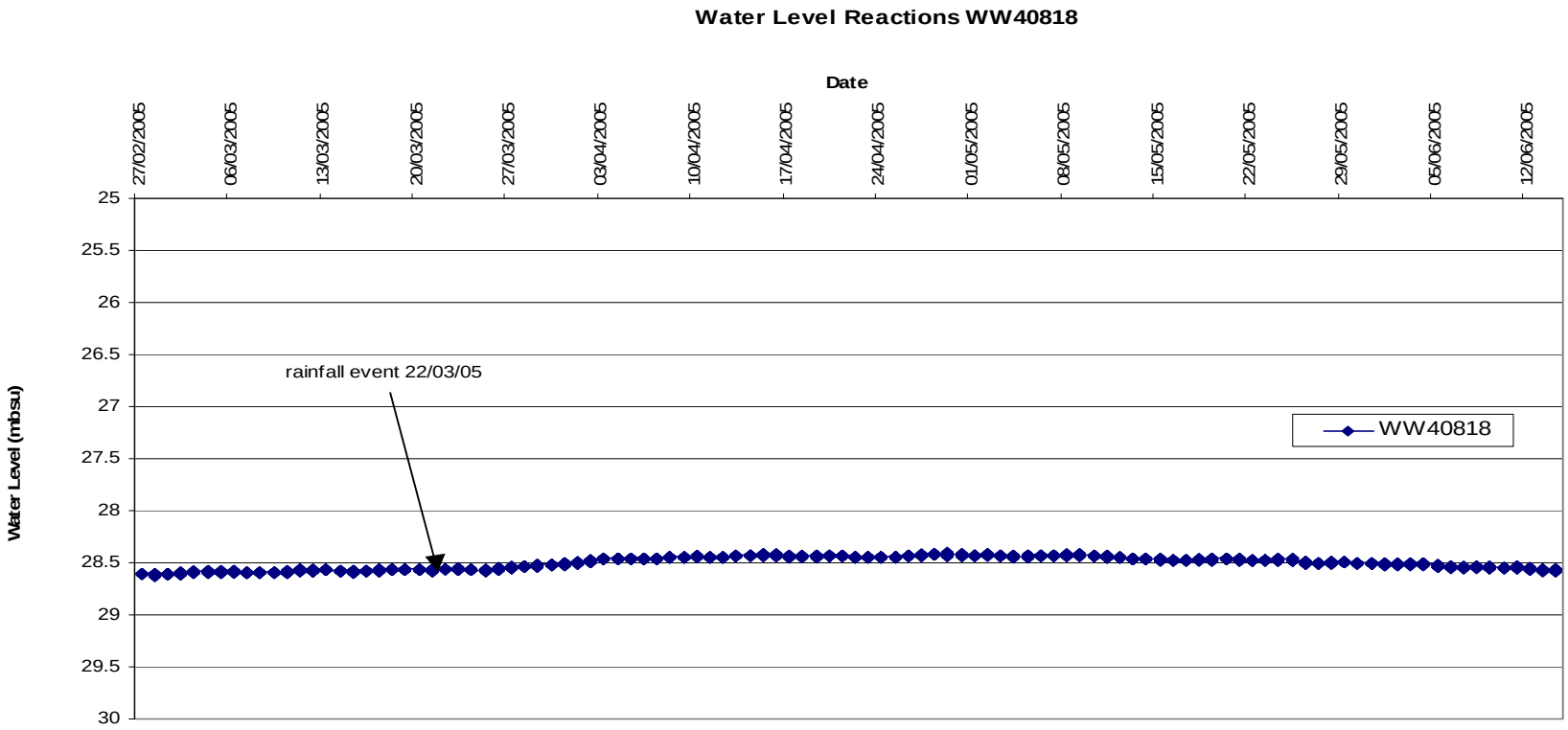
Comparison of Abstraction Evapotranspiration Losses & Total Precipitation worst case



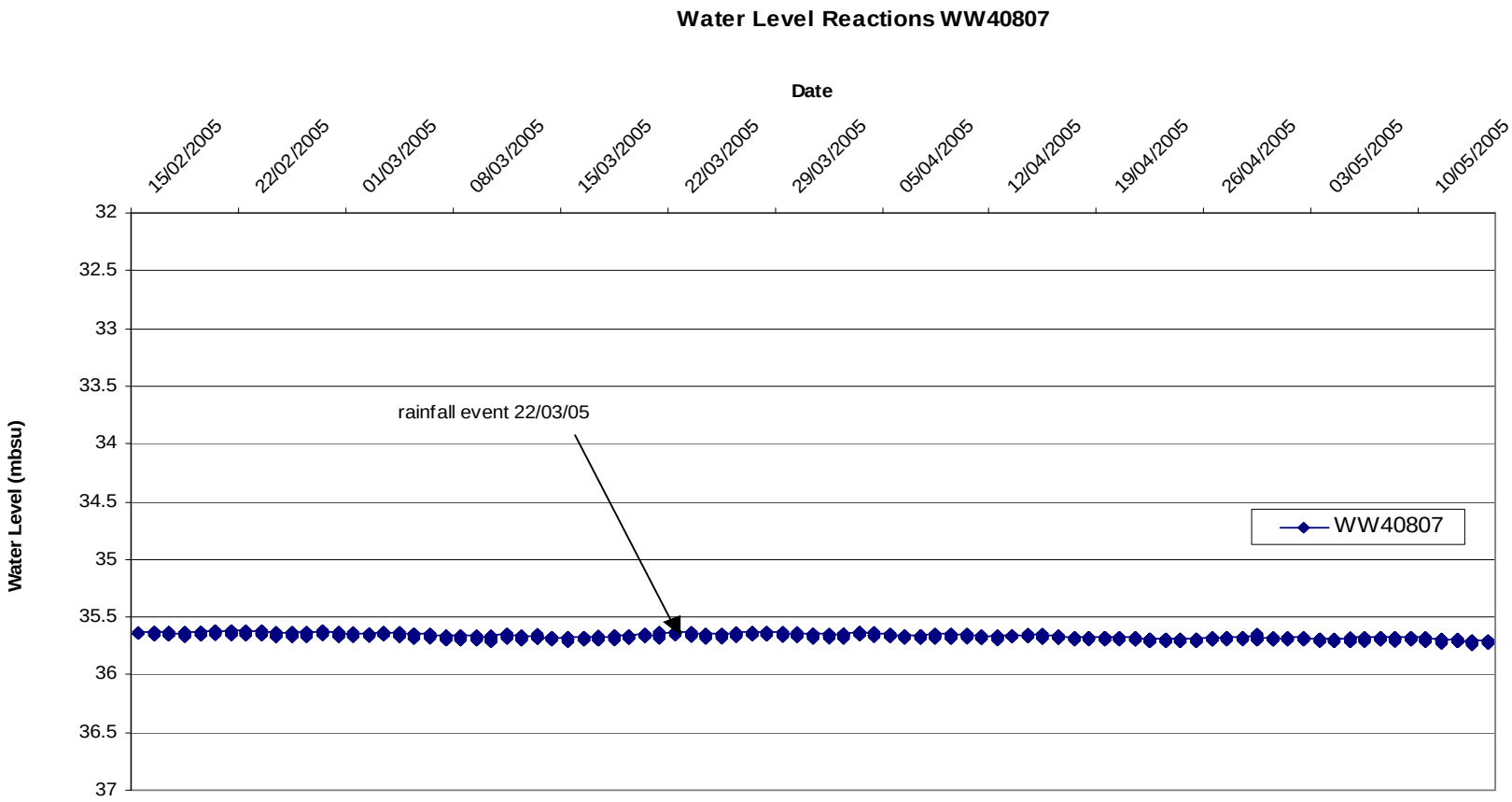
Rainfall event March 2005



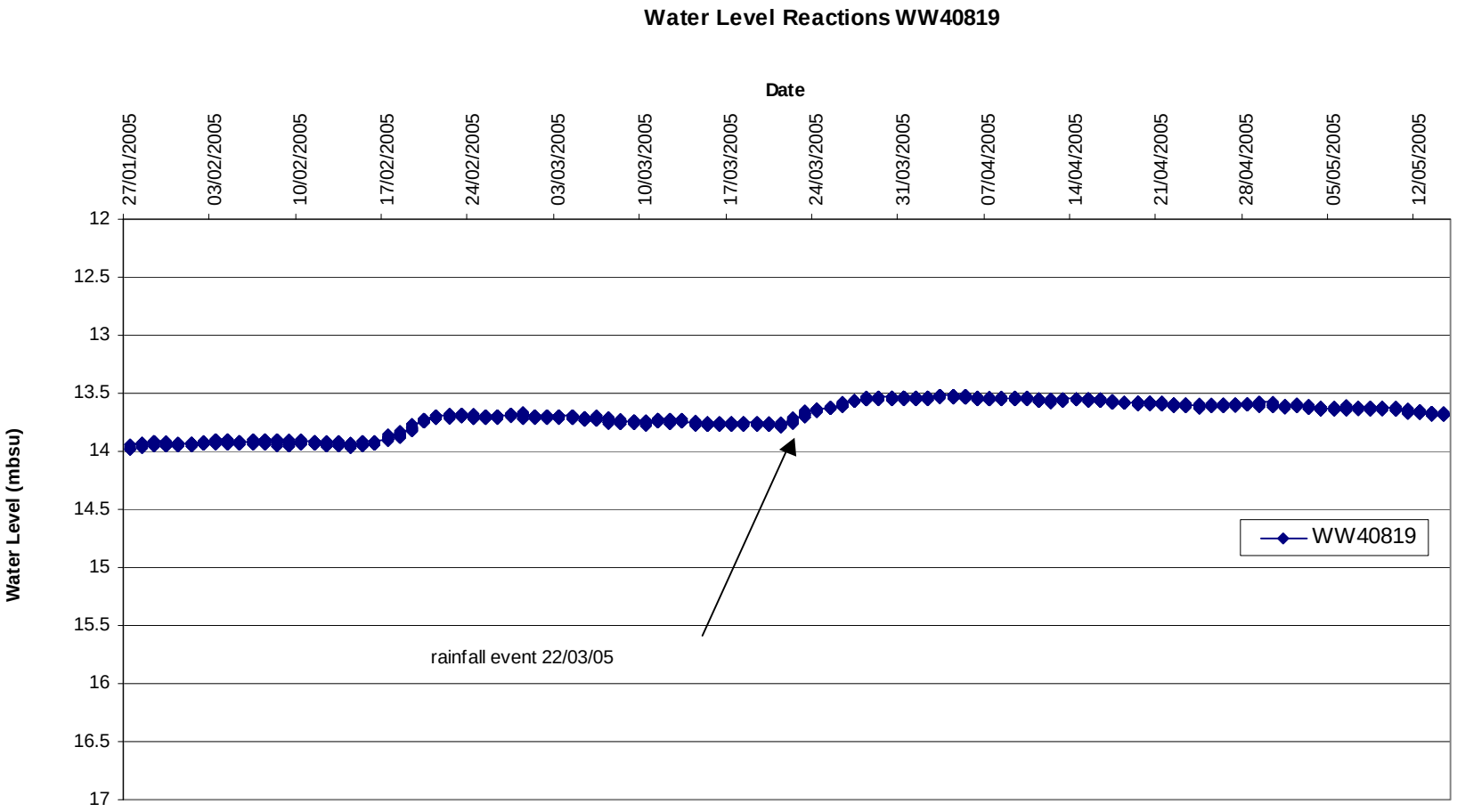
Case history Grosvernor



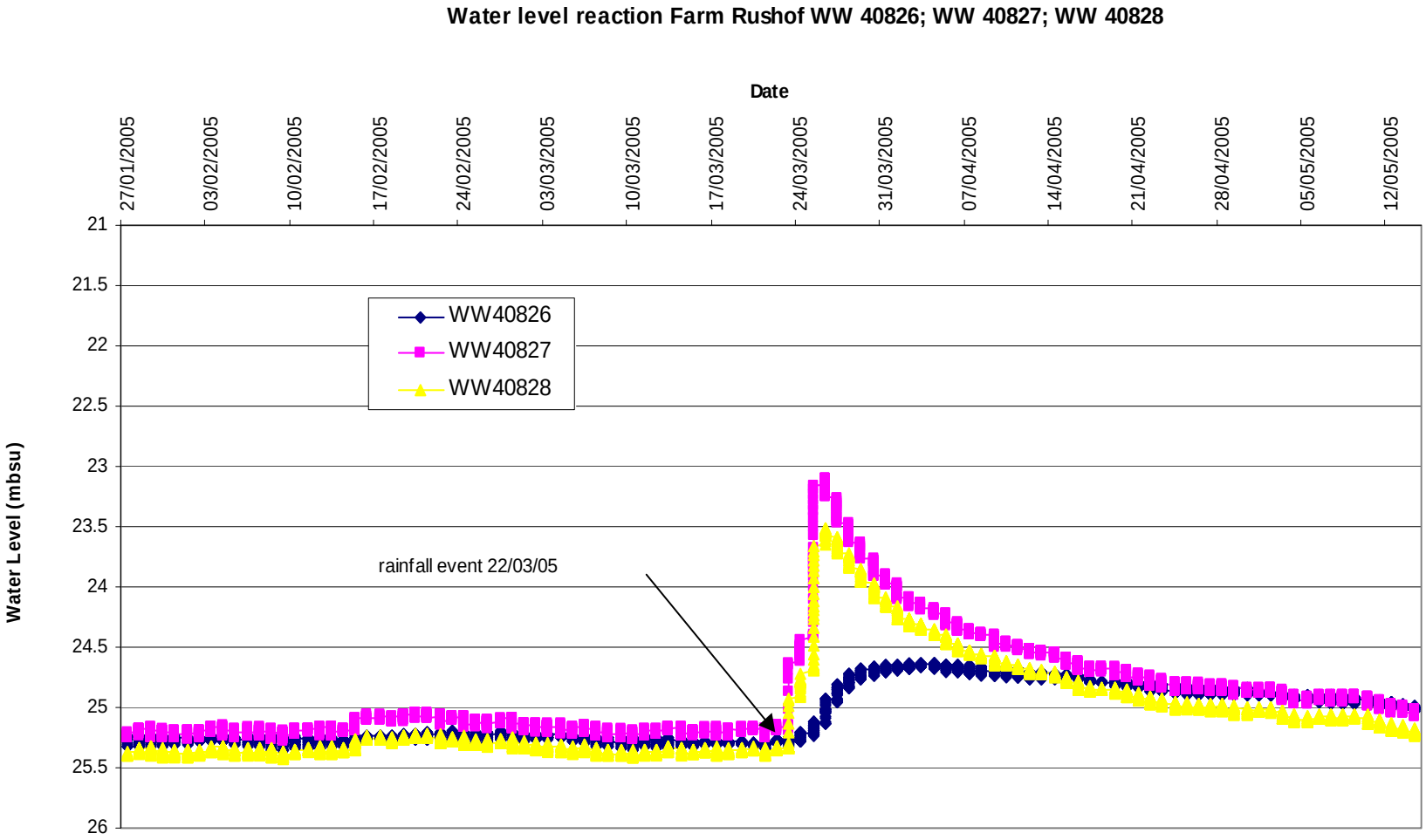
Case history Goedbegin



Case History Marburg



Case history Rushof



Chemical de-bushing

Farm Pforte February 2004

Bushencroachment as a National Crisis: examples

Groundwater to Otjiwarongo

Eastern National Water Carrier

Gobabis

Flow of Rivers, sediment load, silting of dams

ENWC Dam System

Omaruru Swakop basins

Food Production

The object of this study was not to investigate the causes of bush encroachment, nor to find solutions to this specific problem, but the study clearly shows, that immediate action in this regard is necessary. But let us look at some pictures taken in and around Windhoek

Most Recent Success

Conclusions

Bush encroachment has a severe, if not catastrophic influence on recharge to groundwater

Declining water levels were approaching dangerously low levels (before start of 2006 season)

In areas where de-bushing has taken place, groundwater evidently is recharged relatively fast

Bush control on the long term will result in the recovery of groundwater resources

With water levels recovered to the state when fountains re-occur, groundwater will be an asset which can be utilized more reliably:

- Food production
- Irrigation in general
- Industrial use
- Municipal supply

Warning

The impression must not be gained that all bushes should be eradicated

A healthy balance of bushes and grasses ensures good rangeland condition

De-bushing should therefore be done selectively

To ensure both productive rangeland and

Replenishment of ground water