

Contents

ACKNOWLEDGMENT	5
EXTENDED SUMMARY	6
1. INTRODUCTION	8
1.1 General objective of the study	9
1.2 Specific objectives of the study	9
1.3 Scope of the work and phases of the study	10
1.4 Location of the study area.....	11
1.5 Accessibility to the study area.....	11
1.6 Population and settlements in the study area	13
1.7 Water demand	13
1.8 Previous work.....	14
2. PHSIOGRAPHY, VEGETATION COVER, SOIL AND LAND COVER	16
2.1 Physiography	16
2.2 Vegetation cover	17
2.3 Land cover	17
2.4 Soil	18
3. HYDROMETEOROLOGY	20
3.1 Climate.....	20
3.1.1 Precipitation	21
3.1.2 Temperature.....	22
3.1.3 Wind speed.....	25
3.1.4 Sunshine hours	25
3.1.5 Potential evapotranspiration (PET)	26
3.2 Hydrology	27
4. GEOLOGY	29
4.1 Regional geology	29
4.2 Stratigraphy	30
4.3 Geology of the study area	31
4.3.1 Kloan sandstone (Mksst)	31
4.3.2 Baltage limestone (Tblst).....	31
4.3.3 Sereye chert (Tsch)	31
4.3.4 Dedub evaporites (Tdev)	32

4.3.5 Doimo limestone (Tdlst)	32
4.3.6 Quaternary eluvium (Qel).....	32
4.4 Structures	33
5. HYDROGEOLOGY	34
5.1 Hydrogeological characterization.....	34
5.2 Elements of the hydrogeological system of the study area	37
5.2.1 Extensive porous aquifers	37
5.2.2 Extensive aquifers with shallow groundwater in regolith of sandstones	38
5.2.3 Extensive and moderately to highly productive fractured and/or karst aquifers.....	38
5.2.4 Extensive and moderately productive aquifers with mixed permeability	38
5.2.5 Aquitards	39
5.3 Groundwater points	40
5.3.1 Boreholes.....	41
5.3.2 Dug wells	41
5.4 Groundwater flow, recharge and discharge areas	41
5.4.1 Groundwater flow	41
5.4.2 Groundwater recharge area.....	42
5.4.3 Groundwater discharge area.....	43
5.4.4 Hydrogeological conceptual model.....	43
6. HYDROCHEMISTRY	45
6.1 Sampling and analysis.....	45
6.2 Classification of groundwater.....	45
6.3 Major and minor components of groundwater	47
6.4 Water quality.....	48
6.4.1 Domestic use	48
6.4.2 Irrigation	49
6.4.3 Industrial use.....	51
7. GROUNDWATER RESOURCES ASSESSMENT AND DEVELOPMENT.....	52
7.1 Groundwater resources assessment.....	52
7.2 Groundwater resources development	53
7.3 Recommended sites for well siting	54
8. CONCLUSIONS AND RECOMMENDATIONS	56
8.1 Conclusions.....	56
8.2 Recommendations.....	56
