

TABLE OF CONTENTS

| | | |
|-------|--|----|
| 1 | Chapter One: Introduction | 1 |
| 1 | Background | 1 |
| 1.1 | Government strategy for water resources development..... | 1 |
| 1.2 | Palestinian water resources status..... | 2 |
| 1.3 | Role of Water Resources Conservation and Assessment..... | 3 |
| 1.4 | The Scope of the Current Study:..... | 4 |
| 2 | Chapter 2:The Study Area and boundary conditions..... | 5 |
| 2.1 | General..... | 5 |
| 2.1.1 | Al-Auja Catchment Area | 7 |
| 2.1.2 | Ein samia well field | 8 |
| 2.2 | Topography and Climate..... | 8 |
| 2.3 | Hydrogeological Units and Aquifer Systems..... | 9 |
| 2.4 | Population in the study area..... | 14 |
| 2.5 | Population Projection..... | 14 |
| 2.6 | Urbanization..... | 15 |
| 2.7 | An overview of current water situation | 15 |
| 2.7.1 | Existing Water Supply Systems | 15 |
| 2.7.2 | Current Water Supply And Water Use | 16 |
| 2.7.3 | Future Water Demand Projection..... | 17 |
| 3. | Chapte 3:Assessment of surface water resources..... | 20 |
| 3.1 | Introduction..... | 20 |
| 3.2 | Assessment Of Rainfall..... | 21 |
| 3.2.1 | Average annual rainfall..... | 21 |
| 3.2.2 | Analysis of Daily Rainfall Data..... | 22 |
| 3.2.3 | Calculation of areal rainfall..... | 24 |
| 3.2.4 | Storm Data Analysis | 25 |
| 3.2.5 | Frequency Analysis of Rainfall | 26 |

| | | |
|-----------|---|----|
| 3.3 | Assessment Of Flood Flow | 30 |
| 3.3.1 | General..... | 30 |
| 3.3.2 | The SCS Method..... | 31 |
| 3.3.3 | Application of the SCS Method to the Study Area:..... | 33 |
| 3.3.3.1.. | Estimation of the Curve Number (CN)..... | 33 |
| 3.3.3.2 | Land Use | 35 |
| 3.3.3.3 | Hydrologic conditions..... | 37 |
| 3.3.3.4 | Determination of Hydrological Soil Group..... | 37 |
| 3.3.3.5 | Adoption of Runoff curve Number for the Study Area..... | 38 |
| 3.3.3.6 | Calculation of Surface Runoff..... | 40 |
| 3.3.3.7 | Calculation of Runoff Coefficients..... | 42 |
| 3.4 | Assessment Of Spring Flow..... | 43 |
| 3.4.1 | Springs Discharge | 43 |
| 3.4.2 | Spring Flow Recession Analysis | 45 |
| 4. | Chapter 4:Ground water resources evaluation..... | 49 |
| 4.1 | Groundwater Role And Importance | 49 |
| 4.2 | Hydraulic Characteristics Of Aquifers..... | 49 |
| 4.3 | Groundwater Flow | 51 |
| 4.3.1 | Groundwater Levels and their surface configuration..... | 51 |
| 4.3.2 | Hydraulic Gradients | 53 |
| 4.4 | Groundwater Recharge | 54 |
| 4.5 | Groundwater Discharge | 55 |
| 4.6 | Estimating The Sustainable of Wellfield | 57 |
| 4.7 | The Impact of the current development on aquifers, and the concept of sustainable aquifer yield | 59 |
| 4.7.1 | Discussion | 59 |
| 4.7.2 | Ein Samia Well Field: | 60 |
| 4.7.4 | Is there an overdraft condition in the well fields: | 61 |
| 5. | Chapter 5: Sustainable Yield of Ein Samia Wellfield..... | 62 |
| 5.1 | Optimization Of The Production from the WellFields | 62 |
| 5.1.1 | Ein Samia Well field situation | 62 |
| 5.1.2 | Need for action..... | 63 |
| 5.1.3 | The TWODAN Model | 63 |
| 5.3 | Optimization of The Production from Ein Samia Water Supply Wellfield.... | 65 |
| 5.3.1 | The model area..... | 65 |
| 5.3.2 | The physical setting of the aquifer..... | 65 |
| 5.3.3 | Boundary Conditions | 66 |
| 5.3.4 | Aquifer Hydraulic Properties..... | 67 |
| 5.3.5 | Groundwater Levels, Gradient, and Flow..... | 67 |

| | | |
|-------|--|----|
| 5.3.6 | Historical groundwater abstraction from the well field: | 68 |
| 5.3.7 | Simulation of The Water Level Configuration and Flow Conditions: | 69 |
| 6. | Chapte 6: Conclusion and Rcomendations | 73 |
| 6.1 | Results..... | 73 |
| 6.3 | Recommendations..... | 74 |
| | References..... | 76 |
| | Annexes..... | 79 |