

8. SALTWATER INTRUSION

8.1 INTRODUCTION

Many coastal cities rely on local groundwater to meet domestic and industrial needs. With the increasing demand due to greater population and industrial concentrations along the coastline coupled with sea level rise, the potential for saltwater contamination of the aquifer will increase. As in other cases, there are two general approaches to responding to this problem: 1) abandonment of use of the resource, or 2) adoption of management and prevention measures to reduce salinity intrusion. Considerable experience has been gained in coping with saltwater intrusion not principally due to sea level rise, but due to excessive use of the groundwater resource. Yet sea level rise and excessive groundwater usage both decrease the seaward directed piezometric gradient and are, in some respects, comparable. This chapter reviews the various types of saltwater problems that can occur due to sea level rise and the capability to predict and respond to such intrusion.

8.2 LITERATURE REVIEW

The subject of saltwater intrusion into coastal aquifers has been of interest for several centuries. Recently the interest has increased due to intense use of coastal groundwater resources. Methods have been developed to predict the effects of differing usage and management procedures.

Todd (1980) has presented a review of the theory and management practices related to saltwater intrusion in coastal aquifers. In addition to the excessive pumping and sea level rise, saltwater intrusion can result from surface drainage canals which both lower the freshwater head, and if salt water flows into the canals, surface contamination. In recognition of this problem, the State of Florida has enacted legislation to establish a saltwater barrier line in areas prone to saltwater intrusion through canals (Hughes, 1979). There are a number of approaches for controlling saltwater intrusion, as summarized in Table 8.1. Several of these techniques will be illustrated later by examples.

Methods of predicting saltwater intrusion are based on Darcy's law (e.g. Todd, 1980) and include analytical (Henry, 1959; Henry, 1964; van der Meer, 1978; Kozeny, 1953; Strack, 1976; Hunt, 1983) and numerical (McDonald and