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Interactions between saline and fresh water in coastal region of northwestern Sri Lanka

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ABSTRACT- Study area is the Puttalam lagoon area, which is situated in the northwestern region of Republic of Sri Lanka. The study area groundwater exploring from Quaternary and Miocene aquifers and the centerline water intakes are not available. Three types of favorable saline intrusion aquifer systems were identified in

of seawater intrusion to water intakes with the considering different densities of salt water, on the the analytical method determine the length of t values of saline and fresh water density. The calculations indicate, for the definite groundwater gradients being polluted due to sea water intrusion. The analytical solutions can be used for forecasting the seawater Intrusion in the coastal aquifer areas if correct hydrogeological information being available.

1 INTRODUCTION

Groundwater in the coastal regions there is some direct or indirect interference with sea water (saline water). It can be caused due to infiltration of sea water into coastal aquifers by fresh groundwater exploration. Under natural conditions, in coastal areas an equilibrium exists between seawater and freshwater which depends on the geological and hydrogeological conditions of the region. Due to high density of seawater, it tends to force its way underneath fresh water (Gavich. 1980, Goldberg 1984, Todd 1959, Xue 1993). However, the pizometric head of the fresh water is higher than that of seawater, the fresh water continually discharges to the sea. The fresh water discharges opposite the inland movement of seawater, and thereby equilibrium is established. Once the groundwater level equilibrium has been established, water level will stabilize and only fluctuates annually when there are seasonal changes and other natural causes.

Groundwater salinity can occur by following three types:

- salinity zones of natural and tidal origin
- an advancing seawater front intruding inland as a result of over-pumping
- zones of connate saline water remaining from geological or ancient marine conditions

Groundwater salinity intrusion is brought about by man and the remaining two are natural phenomena for which allowance has to be made in groundwater development planning. If water resources are overdeveloped and abstraction rates exceed the average recharge, groundwater levels will decline. This causes shallow wells and springs to dry up and increases the cost of pumping from deeper tube wells. Otherwise seawater intrusion occurs when fresh water is withdrawn. Eventually, groundwater will no longer be available for abstraction. The with-drawal changes the equilibrium between the fresh and seawater. Other serious problems may develop particularly by deterioration of the water quality caused by such factors as seawater intrusion into coastal aquifers. Hence, the fresh water piezometric head is decreased. The decreased in the fresh water piezometric head allows seawater to move further inland. Sea water (saline) and fresh water actually miscible fluids; therefore the zone of contents between them take the form of a transition zone caused by hydrodynamic dispersion.

In the current century, fresh groundwater uses have been increased enormously, resulting in step declines in the water table and even reversal of the fresh water gradient. This activity has resulted in high-density seawater intrusion in the coastal aquifers. Identification of coastal aquifers is very important in studying the problems of salt water intrusion, helps in finding out the features of the salt water and fresh water interface, it is also very essential to study the pattern of its movements and the hydrochemical characteristics of the sea water intrusion area.

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