Numerical simulation of groundwater flow and particle tracking around the proposed Uranium mine site, Andhra Pradesh, India

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Abstract. Groundwater modelling by numerical methods has been widely used around the world to study and understand the various aquifer systems. Modelling techniques has been successfully used to study the groundwater flow patterns and migration of particles along with flow in a number of mining sites. The present study was carried out to develop a groundwater model and study the groundwater flow regime in and around the proposed Uranium mine site at Lambapur – Peddagattu area in Nalagonda district, Andhra Pradesh with the following objective of predicting the movement of groundwater and particles in the region during next 15 years. Lambapur - Peddagattu deposit lie along the north- western margin of Cuddapah basin. The computer code MODFLOW that numerically approximates this equation by finite-difference method was used to simulate the groundwater flow in the study area. The pre and post processor developed by the United States Department of Defence Groundwater Modelling System was used to give input data and process the model output. Groundwater modelling study of Nalagonda region indicates that the groundwater occurring in the weathered rocks flow towards the Nagarjuna Sagar reservoir. The simulation carried out until the year 2017 suggests that there is not much change in the groundwater flow regime, with the assumed condition of no change in the groundwater pumping during mining activity. As groundwater is expected to move towards the reservoir, it takes more than 15 years for the particles from the proposed mine sites at Peddagattu to reach the boundary (reservoir) of the modelled area. However. the simulation assuming

constant head of 264m at Paddagattu mine sites indicate that the particles have moved to only to some distance by the end of the year 2017 at Mine II and no migration of particles from Mine I. The mineralised zone at Peddagattu occurring below the shale (30-50m thick) may not be in saturated condition, except for small quantity of water available in the fractures. Hence, with the proper dewatering strategy and the lined surface drainage to reduce the recharge, the migration of uranium with the groundwater may be prevented at the Mine II. In the case of Lambapur region as the formation is devoid of groundwater as predicted by the model, there will not be any groundwater problem due the mining. Hence, with the proper management dewatering strategy the migration of uranium with the groundwater may be prevented at Mine II.