Chapter 2

Geology & Tectonics of the Area
2.1. Central Indus Basin:

Research area lies in the Central Indus Basin of Pakistan. Central Indus Basin may be divided into following broad tectonic divisions from east to west (Kadri, 1995)

(1) Punjab Platform (2) Sulaiman Depression (3) Sulaiman Fold Belt (fig 2.1 & 2.2).

The basin is separated from Upper Indus Basin by the Sargodha High & Pezu uplift in north. It is bounded by Indian shield in the east, marginal zone of Indian Plate in the west, and Sukkur rift in the south. It is the Sargodha High in fact which is considered to be a divide between Upper Indus Basin & Lower Indus Basin (Kadri, 1995). Another major feature of basement topography, as seen on the gravity data, is the Khairpur-Jacobabad High & its associated structures which grew through Jurassic & Cretaceous/Paleocene ages & divide the Lower Indus Basin further into two basins namely Southern and Central Indus Basin. The Southern & Central Indus Basins are separated by Jacobabad & Mari- Kandhkot highs together termed as the Sukkur Rift. (Raza et al., 1989).

The oldest rocks exposed in this basin are of Triassic age (Wulgai Formation) while the oldest rocks penetrated through drilling are of Precambrian Salt Range Formation. The depth to the basement is about 15000 meters in the Trough areas. Precambrian shield rocks are evident along the rim of the Indian Plate (Kadri, 1995).

2.2. Punjab Platform:

Kadri, (1995) describes this part as the eastern segment of Central Indus Basin where no surface outcrops of sedimentary rocks are present. Tectonically it is a broad monocline dipping gently towards the Sulaiman Depression. Punjab Platform is tectonically the least affected area because of its greater distance from collision zone. A number of wells have been drilled on this platform. The stratigraphic sequence established on the basis of these wells revealed some of the most significant stratigraphic pinch outs in Pakistan.
Fig 2.1 Geological map showing the location of Research area (www.gsp.com).

2.3. Sulaiman Fore deep:

The Sulaiman Foredeep is also called Sulaiman Depression. This depression is longitudinally oriented area of subsidence; it becomes arcuate and takes up a transverse orientation along its southern rim. Like many other features, this depression was also formed as a result of the collision between two plates. The seismic evidence shows some buried anticlines (e.g. Ramak) which may have been formed due to the flow of Eocene shales (Kadri, 1995).
Fig 2.2 Area under study comprises of Eastern part of Sulaiman Fold Belt, Sulaiman Foredeep and Punjab Platform (Raza, 1989).

2.4. Sulaiman Fold Belt:

This is a major tectonic feature in the proximity of collision zone & therefore contains a large number of disturbed anticlinal features (Kadri, 1995). There are some large anticlines within Kirthar and Sulaiman belts and especially along the eastern margins, that are clearly detachments. The northward-striking east sulaiman structural play domain has narrow, straight anticlines as long as tens of kilometers with limbs that are broken locally by steeply dipping faults with reverse dip separation. These structures are interpreted as flower structures that are products of large-scale distributive wrench faulting having a prospective reservoirs like Ranikot Formation (Paleocene), Pab Formation, Sember Formation and Lower Goru Formation of Cretaceous age (Kemal et al, 1991). Bannert and Raza (1992) assumed that basement was segmented into three different blocks during the collision of the Indo-Pakistan Plate with the Eurasian Plate. Three basement faults separate these basement blocks from each other and from the central part of the Indo-Pakistan Plate. The Khuzdar Block and the Sulaiman
Block are separated by the Kirthar Basement Fault, the Sulaiman Block and the Hazara Block by the Sulaiman Basement Fault and the Hazara Block and main body of the Indo-Pakistan Plate to the east are separated by the Jhelum Basement Fault (Bender and Raza, 1995).