NATURAL RADIOACTIVITY LEVELS FOR GROUNDWATER IN AL HASSA, KSA.

By:

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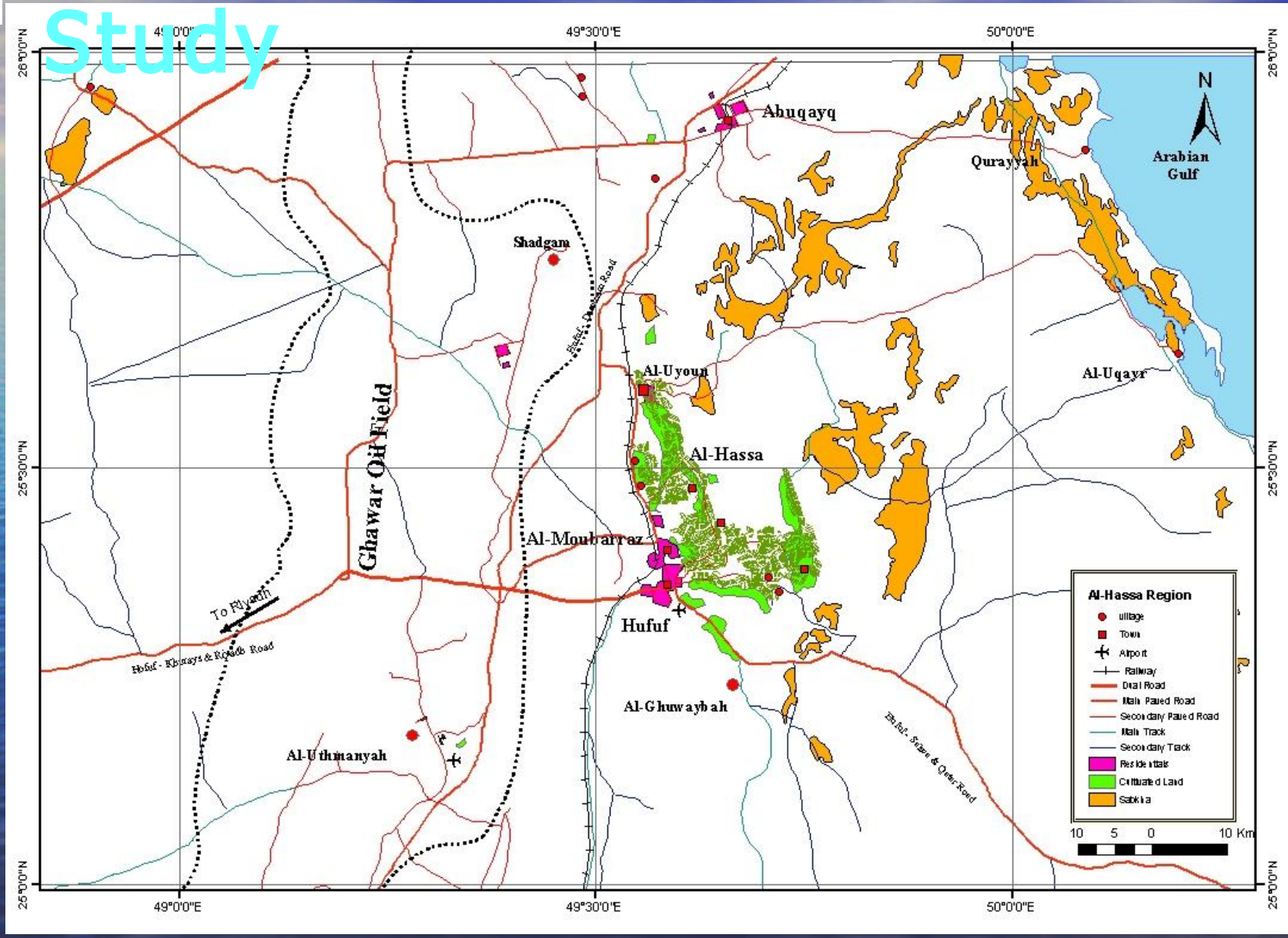
Area of Study

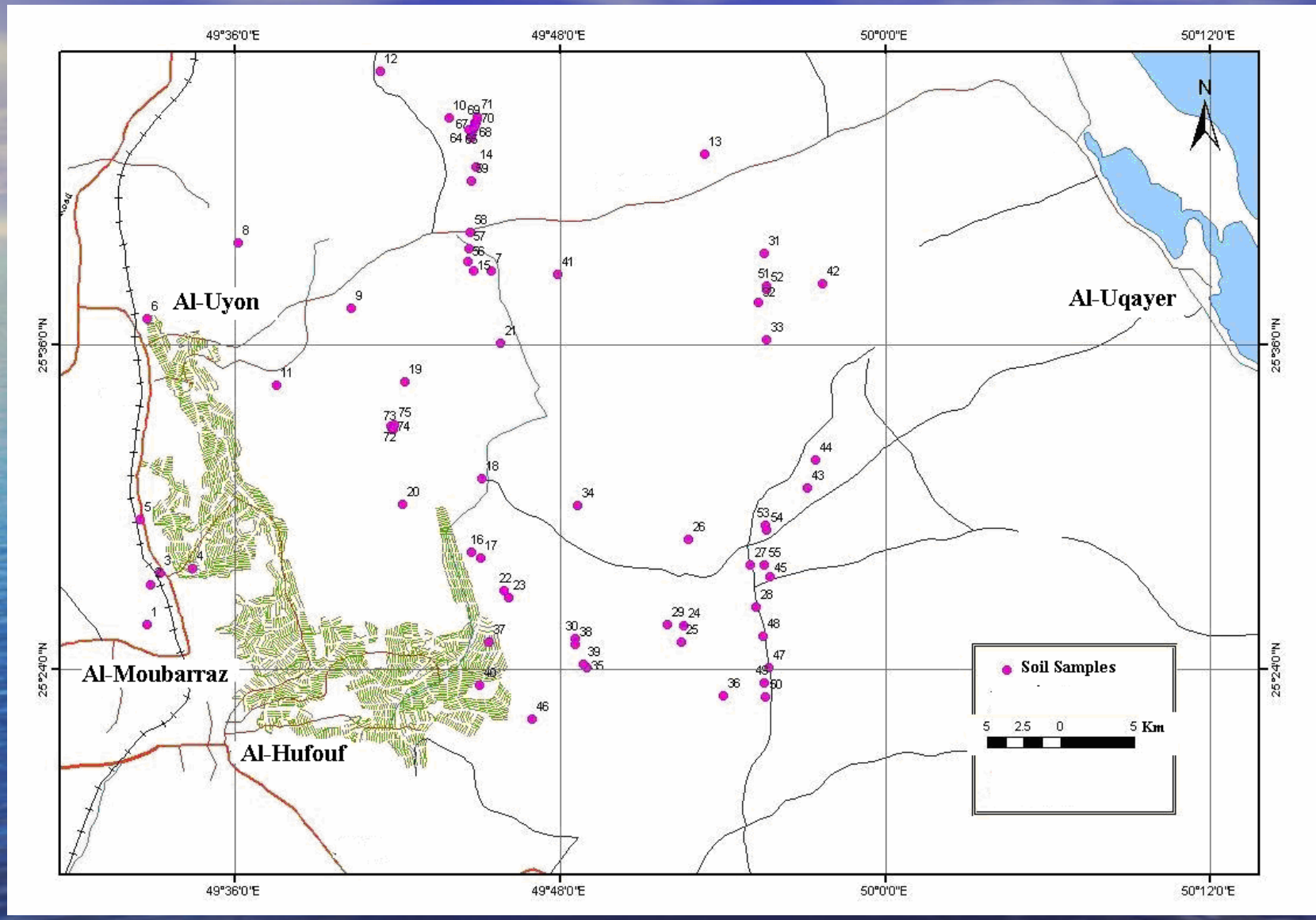


Importance and Main Objectives of this Study

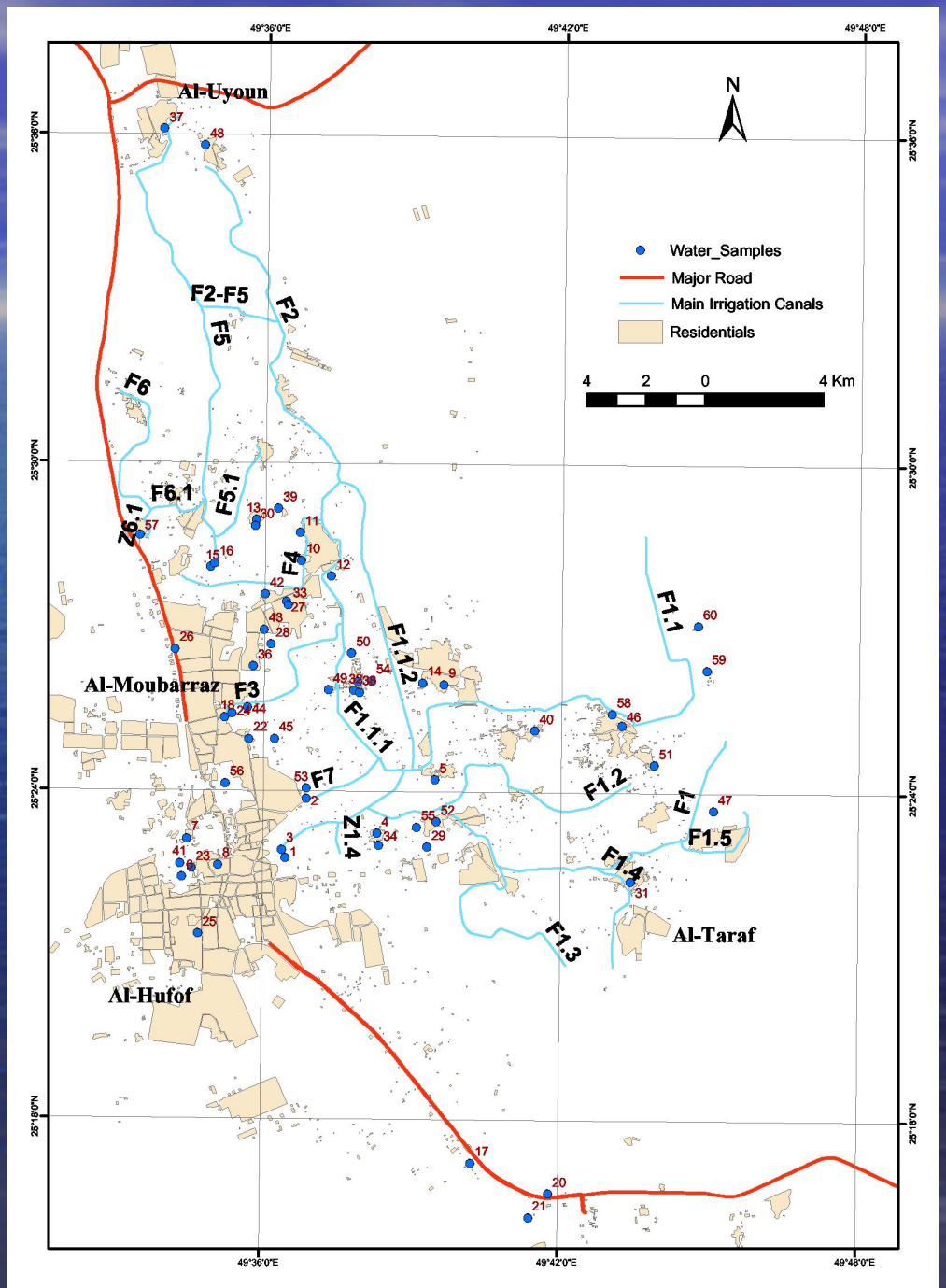
- First of all, the groundwater is consider the main source even not the only source for different purposes of Al Hassa Oasis.
- **
- Increase in the background ionization radiation has various health side effects on the populace.
- Exposure to excess level of background ionization radiation causes somatic and genetic effects that tend to damage critical and/or radiosensitive organs of the body, which ultimately can lead to death (Ajayi, 1999).
- So, The present work aims to initiate a radiological assessment program at a Al Hassa area
- and to establish a baseline maps of radioactivity background levels in the surrounding environment.

Materials & Methods

- At the first stage of the survey, Geiger–counter, a dose rate meter was used first to measure the natural background dose at Al Hassa area.
- 75 soil samples from Al Hassa Area and its surroundings have been collected .
- 60 water samples from active springs and productive wells at Al Hassa have been collected .
- The samples were analyzed for Radionuclides Concentrations at the Space Research Institute, King Abdulaziz City for Science and Technology, KSA.



Base map of the soil samples, Al Hassa Area.



Base map of groundwater samples, Al Hassa Area.

Soil Analysis Results

The activity concentration of ^{238}U in Soil samples, Al Hassa area.

The areal distribution of the ^{238}U activity concentration for the collected soil samples, Al Hassa, KSA.

Clay content percent in the soil samples of Al Hassa Oasis.

From the soil analysis, It could be Noticed that

There is strong relationship between the mineral composition (soil type) and the radioactivity levels of the Al Hassa soil

Silt and mud facies has a remarkable effect on the content of natural radioactivity. This is attributed to the capability of these facies of adsorption of the Uranium series , Thorium series and Potassium. While the sand facies has not the same ability due to the high permeability of these facies

This idea have been confirmed by different authors at different areas (see for example Merdanoglu and Altınsoy, 2006, El Farash et al., 2001, Ewieda et al., 1999 and Kostr et. al., 1988).

Groundwater Analysis Results

The activity concentration of ^{238}U

The gross alpha activity in the groundwater samples originates from the ^{238}U and its daughter ^{226}Ra, while beta activity is principally from ^{232}Th and ^{40}K (Conthern and Rebers, 1990).

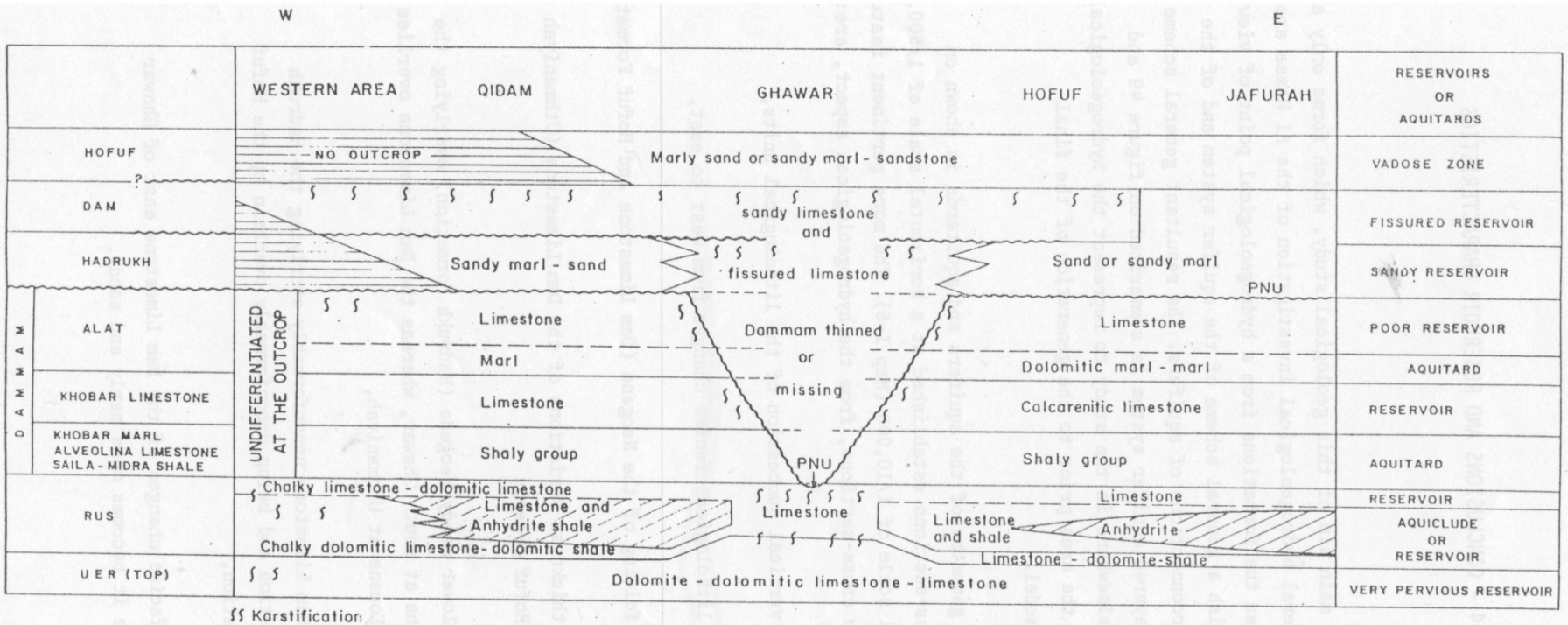
a) The activity concentration of (α)

The areal distribution of the ^{238}Uactivity concentration for the collected groundwater samples, Al Hassa, KSA.

The areal distribution of the gross alfa (α) activity concentration for the collected groundwater samples, Al Hassa, KSA.

The radionuclide concentrations in groundwater depend on the type of mineral derived from aquifer rocks, the chemical composition of the water and the soil ions retention time (Freeze and Cherry, 1979; Andreo and Carrasco, 1999).

Groundwater derived from granitic rocks may contain radioelements (U, Th, Rn, Ra) at levels which may exceed recognized drinking water norms, Örgün et al., 2004 .



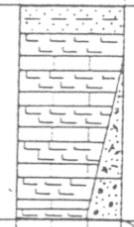
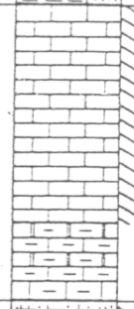
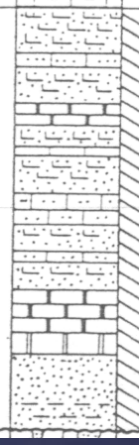
GENERAL SCHEME OF THE MULTILAYERED AQUIFER SYSTEM

Fig. I-49

SCHEMATICAL HYDROGEOLOGICAL LOG

HYDRODYNAMIC PROPERTIES OF THE LITHOLOGICAL UNITS

(Aquifers and Aquitards)

FORMATION	MEMBERS	LITHOLOGICAL LOG	AQUIFER RESERVOIR				AQUITARD		OBSERVATIONS	THICKNESS (in metres)
			PRODUCTIVITY			FISSURE	Permeability			
			HIGH	LOW	POOR		LOW	Very LOW		
HOFUF			VADOSE ZONE							0- 70
DAM									Limestone and sandy limestone, vuggy and fissured at upper part of the formation; less pervious at bottom.	0-125
HADRUKH									Marly sand, sand and sandy limestone (Chert); permeability variable according to content of marly material or clean sand (Generally at bottom of the formation)	0 - 150

Conclusion

- Radionuclide concentration levels in groundwater & soils of Al Hassa area have been assessed. Sixty representative groundwater samples & 75 soil samples have been collected from different localities at Al Hassa area for this purpose.
- The relatively abnormal highs for the analyzed radionuclides are attributed to the heterogeneity of the lithology of the aquifer at these particular locations. Also geological phenomena's such as faults, hydrothermal alterations, weathering could have favored further local enrichment in such areas.
- The results indicated that the radionuclide concentration levels are lower than the International Commission on Radiological Protection (ICRP) maximum permitted limit and therefore, have no significance radiological health burden on the environment and the populace .
- However, the concentration of gross-α radioactivity in some samples is higher than WHO-guide limit in drinking water. Limit values for gross-α radioactivity concentrations in drinking water is 27 pCi/L, (WHO, 1993).
- This study can be used as a baseline for future investigations. It is safe to use the still flowing springs at Al Hassa oasis as health spas.
- Monitoring of Radionuclide concentration levels in groundwater At Al Hassa is recommended as these values may increase in future with the more water depletion and water quality degradation and urbanization

Thank You For your attention