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GROUNDWATER PROBLEMS IN ERBIL CITY

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GROUNDWATER FACTS

- Groundwater is the most abundant and accessible source of freshwater available to humans.
- Groundwater supports 40% of irrigated crop production, sustains drinking water for more than a quarter of the world's population, and helps maintain nearly half of all freshwater ecosystems.
- Groundwater in Erbil city is at risk.

GROUNDWATER CHARACTERISTICS

The **chemical** and **physica**l characteristic of groundwater determines its usefulness for various purposes. The most common groundwater characteristics are:

pH

Temperature

Turbidity (mg/L)

Dissolved Oxygen (DO) (mg/L)

Total Hardness (TH) (mg/L)

Total Alkalinity (TA) (mg/L)

Nitrates and Nitrites

Total Solids (TS), Total Dissolved Solids (TDS) and (TSS)

Electrical Conductivity (EC) (µmohs/cm)

Metals (K, Si, Na, Zn, Mn, Ni, Pb, F, Cu, Al …)

Phosphate and Sulfate

GROUNDWATER IN ERBIL CITY

The history of ground water utilization in northern Iraq begins in the antiquity (about 7000 year B.C.). In the mountain regions springs were exploited for water supply.

Erbil city the capital of Kurdistan Region of Iraq which is located in the south of Iraqi Kurdistan, which In Erbil city more than 30% of the water supply is derived from wells. Since the wells are located through the city, the quality of their waters may have widely variation.

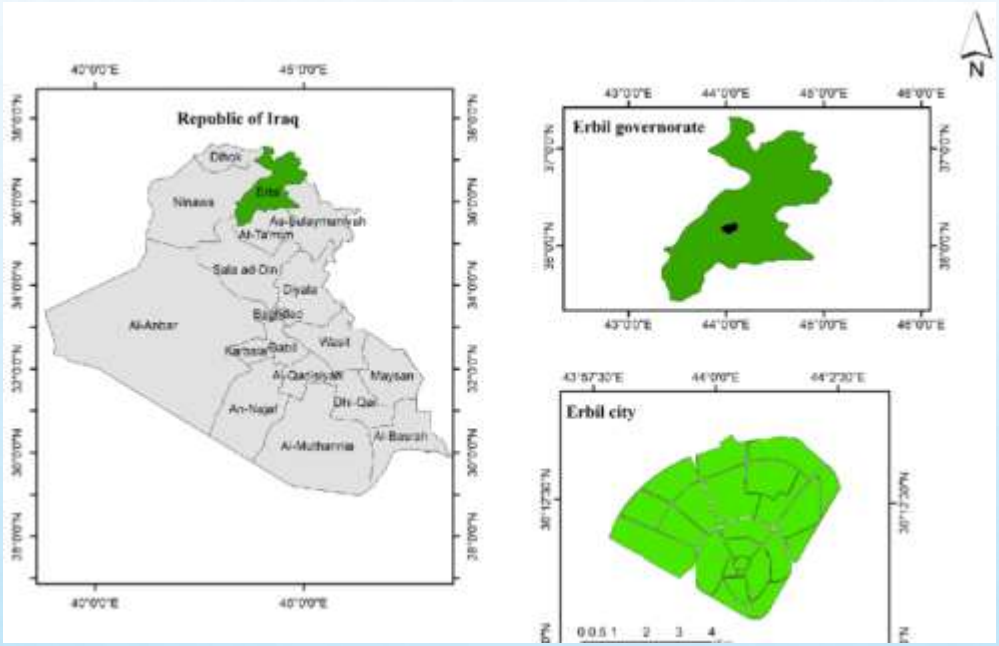

Figure 1 Location maps of the study area, shows the location of the Erbil city in Iraq, Kurdistan region and Erbil city individually.

GROUNDWATER QUALITY IN ERBIL CITY

Water pollution occurs when harmful substances, often chemicals or micro-organisms, contaminate a river, ocean, aquifer, or other body of water, lowering water quality and give toxicity to humans or the environment.

Ground water is less susceptible to bacterial pollution than surface water because the soil and rocks through which ground water flows screen out most of the bacteria.

Water contamination can be assessed based on 3 main features, which are mentioned with examples in below table:

Features	Examples
Physical	Turbidity, taste, smell, color and temperature.
Chemical	pH, chemicals, metals and minerals.
Microbiological	Helminthes, protozoa, viruses and bacteria.

In some neighbor hood in erbil city Majority of contamination comes from nitrate, for example the groundwater in Taajel quarter contains nitrate, one of the reasons is that the waste water had been going back to the same well source for various times, the other reasons for the precence of nitrate goes back to cemeteries which are located in Taajel quarter, many people, especially water experts are not aware of that, that dead bodies decompose to ammonia, this ammonia is converted to nitrate which will cause contamination to groundwater.

GROUNDWATER PROTECTION FROM POLUTION

Groundwater is a valuable resource, and regulations are needed to conserve and protect it.

Some aquifers are naturally protected against pollution by being covered with impermeable soil or rock, but where this is not the case aquifers can be polluted if chemicals are applied to the land surface over the aquifer or if they leak into the aquifer by accident.

To protect these aquifers several approaches are taken, most importantly is to map where groundwater is most vulnerable and to use this information when giving planning permission for activities that are potentially polluting.

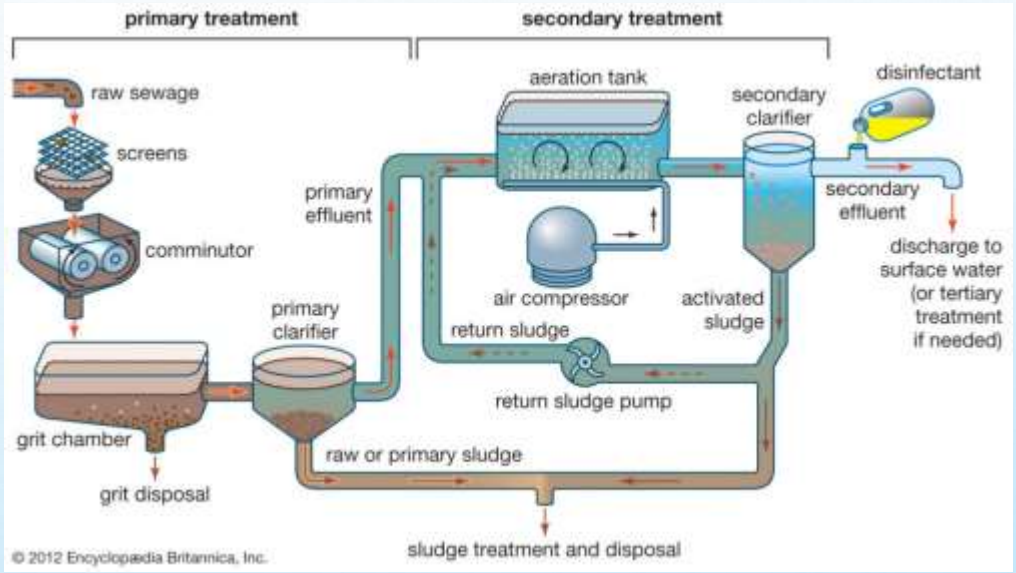

Figure 2 wastewater treatment for polluted water

GROUNDWATER MANAGEMENT ANS STRATEGIES

Strategies for protecting groundwater:
Dispose of toxic chemicals properly
Try to avoid plastic containers
Use phosphate free detergent
Dispose medical waste properly
Do not pour fat and grease down the drain
Plant more trees
Reduce chemical use while planting

GROUND WATER RECHARGE FOR BASIN

Ways of recharging groundwater (basin):
Naturally through rain or snowmelt. Water from rainwater and snow melt can directly fill the aquifer-unconfined from the areas of high altitudes having openings to the unconfined aquifer.
Water from rivers and lake can also contribute to groundwater recharge but marginally.
Wetlands
Artificial Groundwater Recharge

Sub-Basins of Erbil Basin	Area	Geographic Formation	Al-Furat study
1- Northern sub-basin (Kapran)	915 km^2	Gravel, coarse and medium-grained sand, silt and clay beds	No. of wells drilled not exceed: 225 Actual No. of wells drilled: 2554
2- Central sub-basin	1400 km^2	Gravel, coarse sand, clay, and conglomerate strata.	No. of wells drilled not exceed: 738 Actual No. of wells drilled: 4257
3- Southern sub-basin (Bashtapa)	885 km^2	Coarse and mediumgrained sand, clay, with some silt or silty clay	No. of wells drilled not exceed: 500 Actual No. of wells drilled: 583

OBJECTIVES

This study contains problems and main sources of pollution in groundwater of Erbil city. How to manage and suggest strategies to insure the safety of drinking ground water in Erbil city. The main contamination sources that cause contamination in Erbil city will be focused on and discussed with mentioning applicable protection.

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THANK YOU

FOR YOUR ATTENTION!