Contaminated Ground Water Control by Injected Geo-Barrier for Saline Water Seepage near Geothermal Wells

Yıldırım İsmail TOSUN, Şırnak University, Mining Eng. Dept., Şırnak, Turkey

Keywords: Contaminated Ground Water, Contamination Control, Injected Barrier, Geo-Barrier, Saline Water Seepage, Geothermal Wells

Abstract

There is a great concern about surface water pollution with phosphorus (P) from saline seepage are prompting land control so that limit residual saline contaminants. The contamination rate changes to those based on seepage concentrations and wetness. Such contamination Zn, Fe, SO4 rates were so low that the oxidation recycling of residual contaminants was not a serious threat. Greater rate of nitrogen (N, NH_4) and CO_3 based anions and As, Pb require a critical precaution for land such as residuals (low soluble contaminant contents) and soil amendments, such as geo barrier construction to control soluble salts concentration. The field studies and bitumen silty sand mixtures were investigated for composite geo barrier. The field studies to evaluate the stability of heavy metal concentrations and salts were scarce. The initial objective of this study was to determine the effects of seepage flow to surface and groundwater from the geothermal well. Injected bore design model were studied. The optimized diagram of barrier construction and application was determined.

1. Introduction

The parameters and data controlling hydrologic processes by Geographic Information Systems (GIS) have become an integral part of hydrologic studies. The main management is to bring together the use GIS to model s and hydrologic data. The general distribution of the inputs and parameters can control the surface sources or underground loss. GIS maps commonly describe topography, land use and cover, soils, rainfall, and meteorological variables may become model parameters or inputs in the simulation of hydrologic processes.

This investigation of water logging can be extremely useful in suitable water management strategies by reclaiming existing water logged areas. The problems of water logging and quality mostly exist in the irrigated areas like in South Eastern rocky plains of Batman, Turkey. The climate change and ground water changes generally results in over irrigation, seepage losses through channel and distributions, poor water management practices and inadequate control of drainage system. Analysis of high water table in water logged areas and drainage of irrigated areas have not been paid adequate attention in the planning and management of water resources, partly due to lack of requisite data and partly due to flood and rainfall in the country. In order to develop suitable water management strategies and controlling the extent of water logging in the area. GIS may facilitate the reconstruction of the ecological environment but also to accommodate the sustainable development of the water resources and waste water.

In this study, the hydrological characteristics of the Batman city were explained and the effect of these characteristics on the the city was examined. In the investigation, hydrological features and the urbanization with new settlements needs modeling regarding available water source. The hydrological property of settlement areas with dense populated areas in the model was determined by Geographic Information Systems (GIS) techniques. This study produced more systematic data

with hydrological studies carried out with GIS support. GIS has made it possible to obtain more qualified data by enabling the use of multi-criteria decision making method (CCCF) in this research. Calcarous rocks permitivity was determined by columbn tests as Darcy flow as below equation 1

$$q = \frac{k}{\mu} \mathrm{A} \left(\frac{\Delta p}{L}\right) \qquad (1)$$

where *q, k,* □*, A, L,* □*p* flow, Permeability, Viscosity, surface area, hydraulic gradient.

1.1 Geology of Batman City Province

The main purpose of this study is to investigate the effect of settlement on the basic hydrological structure by studying the characteristics of the ground topography, ground water elevation, slope and viewing. GIS techniques were used in the creation of the thematic maps and in the analysis of the parameters. Finally, the GIS study models created , the available water source change and a stream network model was provided sufficient source control at the Batman province. The presence of this stream network structure in the Batman province reveals the potential flood scale and flood risk. (Figure 1 and Figure 2).

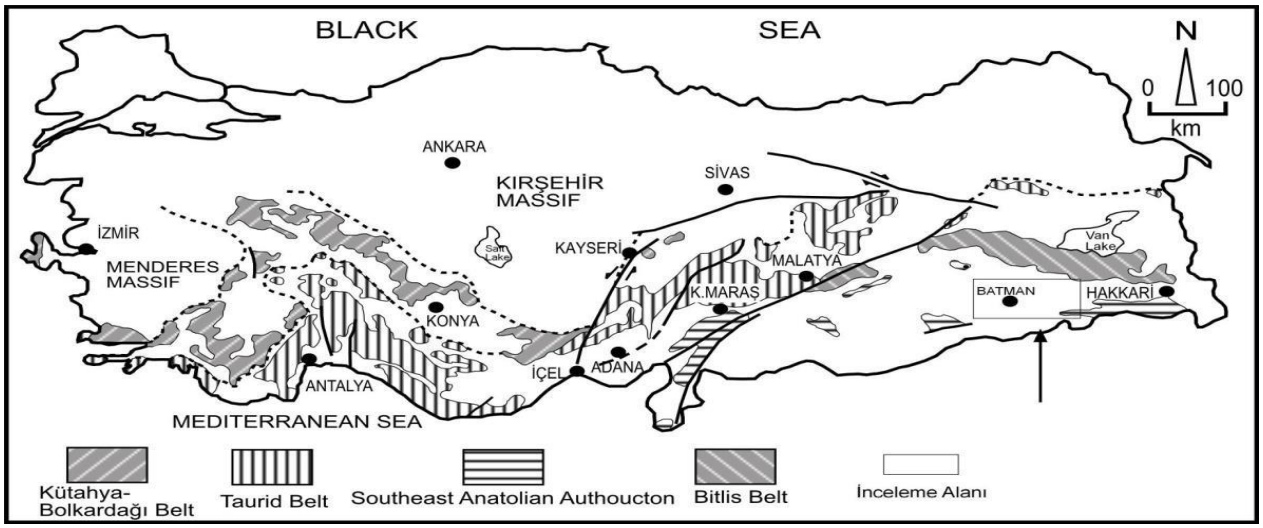

Figure 1. Techthonic and Fault Map, Field, geological cross sections in Turkey

Figure 2. Satellite Image of Investigation Field Possible flood sections Scale 1/18000

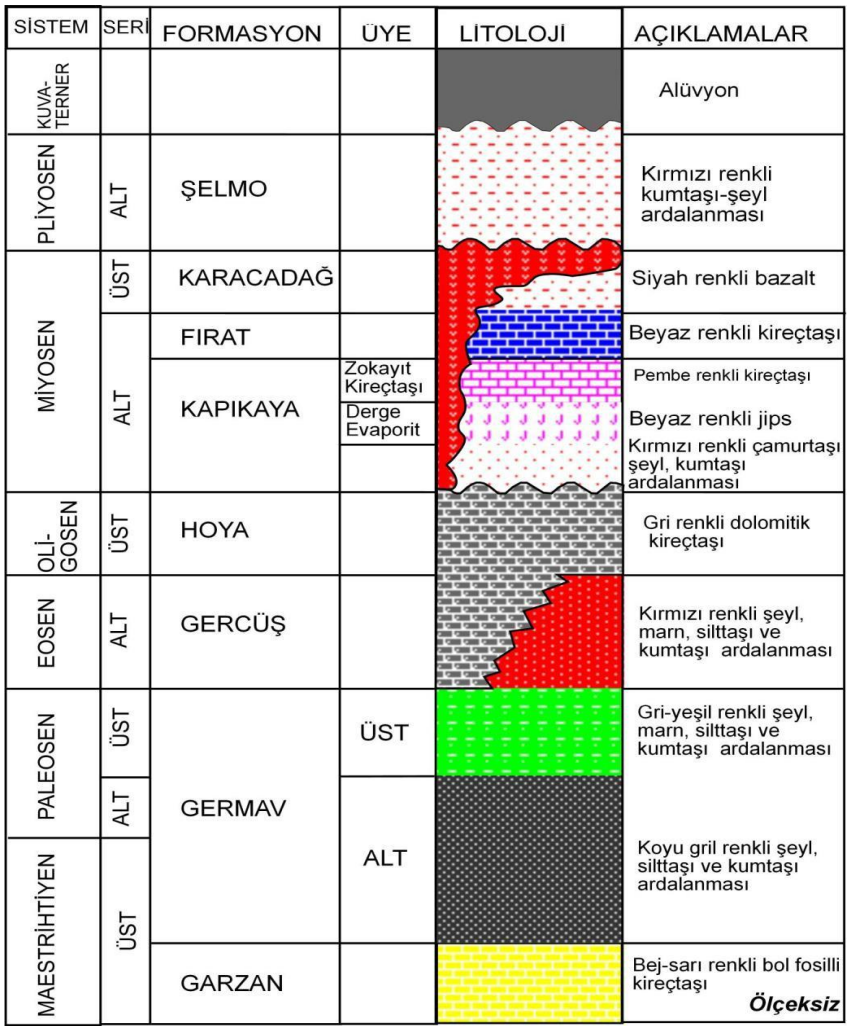

Figure 3. Geology Stratum of Investigation Field Possible landfill cross sections

1.2. Geotechnical Parameters of Limestone Layers in Batman

Urbanization and economic growth in the twentieth century evolved along with the management of natural resources. In this process, provision of drinking water supply and distribution service for urban areas also developed on the same plane. Figure 3

2. Method for Injected Geo Barrier in Limestone Layers in Batman

Urbanization and economic growth in the twentieth century evolved along with the management of natural resources. In this process, provision of drinking water supply and distribution service for urban areas also developed on the same plane. The effective role of the public was felt in meeting the water resources management and service. Infrastructure investments are centrally located, water resources are found, structured, stored, distributed and refined. Figure 4

3. RESULTS AND DISCUSSION

Infrastructure investments are centrally located, water resources are found, structured, stored, distributed and refined. Technically this process has been called "hydrological age" since engineers have determined this process. The whole process is based on "need". Large investments have been made in order to meet the need. The use of water resources (water withdrawal and ordinance) and evaluation for development and community needs have been studied. However, the amount and quality of water that the eco-system will need is not addressed. Everything is built on the theme of "develop-supply-use". Parameters considered in the planning of water resources were population estimate, per capita water demand, agricultural production, economic productivity level. Using these parameters, future water demand forecasts are used and these estimated values are used when designing the systems to meet the demand. In this approach, the demand for water has been determined independently of the specific needs of human needs, the amount of water a healthy ecosystem will need, or actual regional water availability. The next step in traditional planning is to identify projects that will reduce the gap between estimated water supply and demand. In every scale, the planning action (region, basin, city) is used for the regular and healthy spatial development uses (housing, commerce, industry, recreation, other social) in the metropolitan cities which are especially migrating in our country and in medium size settlements Such as equipment) as directed by location decisions; It also determines the water demand of the city at the same time with its population and density of buildings and its quality and quantity of usage. Figure 5, While city plans shape the socio-economic and physical structure of the city, with the proposed land use, employment, population and density decisions, the city's daily water demand is also shaped. Therefore, any kind of urban development outside the plan creates an unhealthy environment that affects the quality of life of the city, as well as poses a serious threat to the water resources (increased water consumption pressure and pollution) (Urban Planning Chamber Water Commission, 2006). Survey, planning (feasibility) and project work will be given efficiency. The quality of the water quality will be preserved, improved and monitored.Flood hazard maps will be prepared and an early warning system will be established. Figure 6

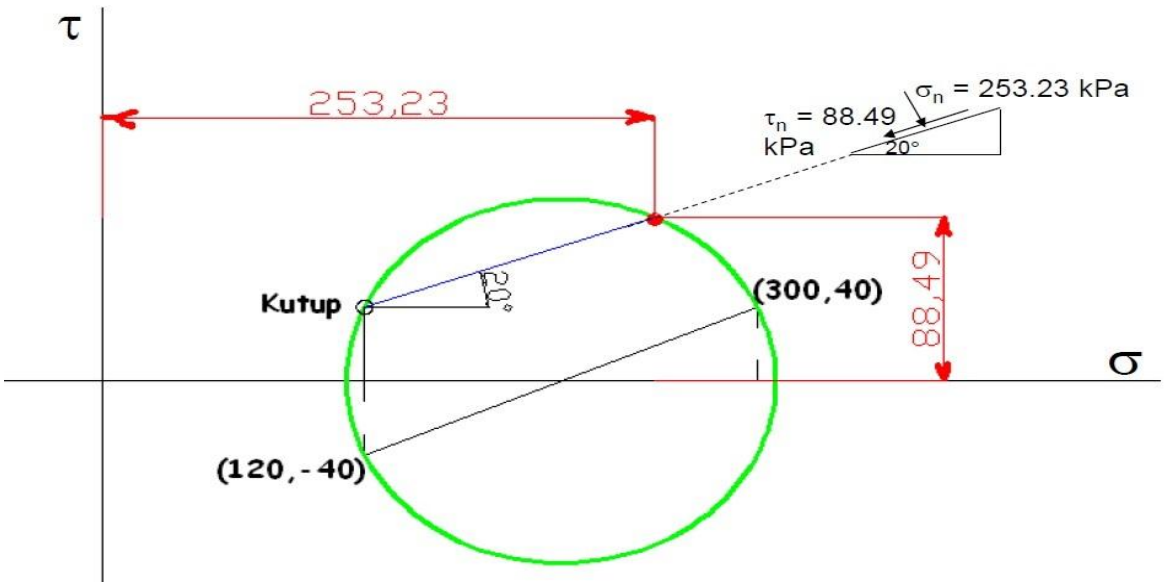

Figure 4.Mohr Shear Diagram for Stability Calcareous Rocks in the Investigation Field in Batman Provice

Figure 5.Drainage and stability of geobarrier at the Investigation Field near Batman river

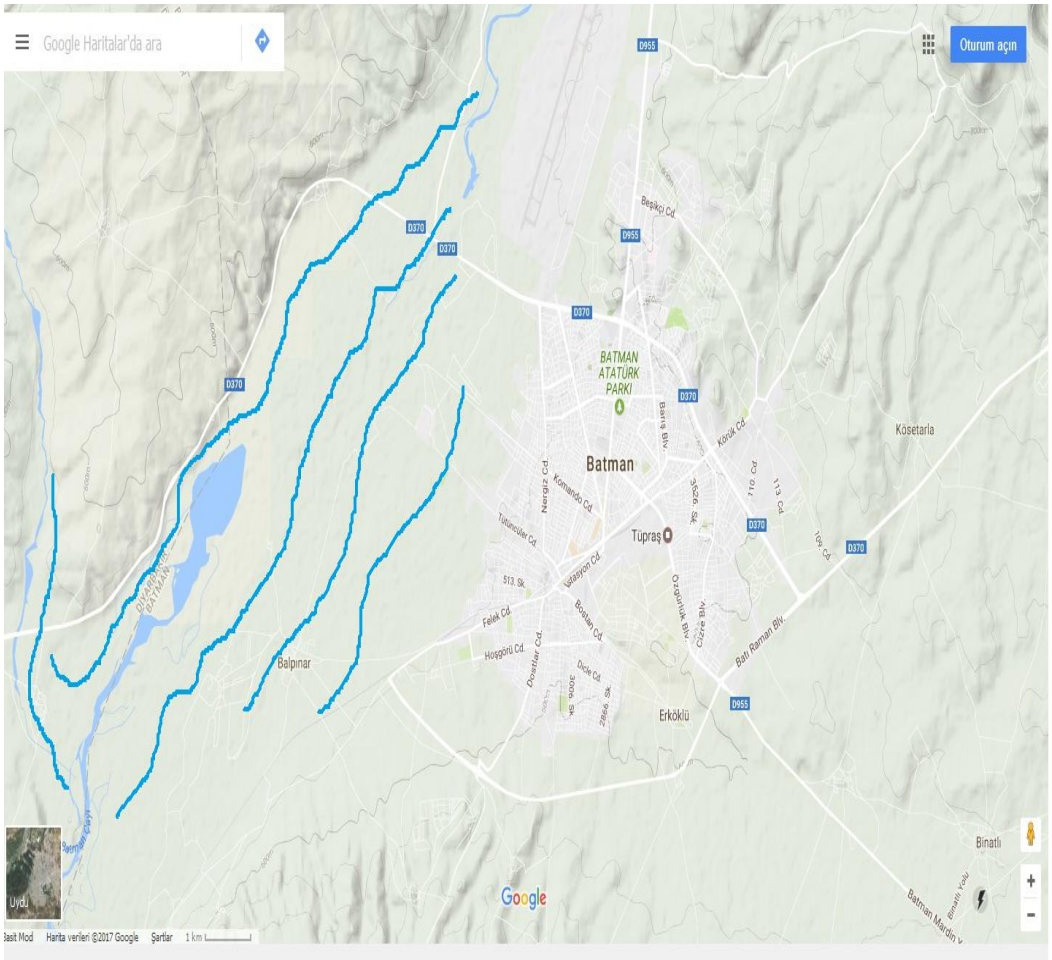

Figure 6.Flood contou stability of Investigation Field as Possible flows

3. RESULTS AND DISCUSSION

Urbanization and economic growth in the twentieth century evolved along with the management of natural resources. In this process, provision of drinking water supply and distribution service for urban areas also developed on the same plane. The effective role of the public was felt in meeting the water resources management and service. Infrastructure investments are centrally located, water resources are found, structured, stored, distributed and refined. Technically this process has been called "hydrological age" since engineers have determined this process. The whole process is based on "need". Large investments have been made in order to meet the need. The use of water resources (water withdrawal and ordinance) and evaluation for development and community needs have been studied. However, the amount and quality of water that the eco-system will need is not addressed. Everything is built on the theme of "develop-supply-use". Parameters considered in the planning of water resources were population estimate, per capita water demand, agricultural production, economic productivity level. Figure 7.

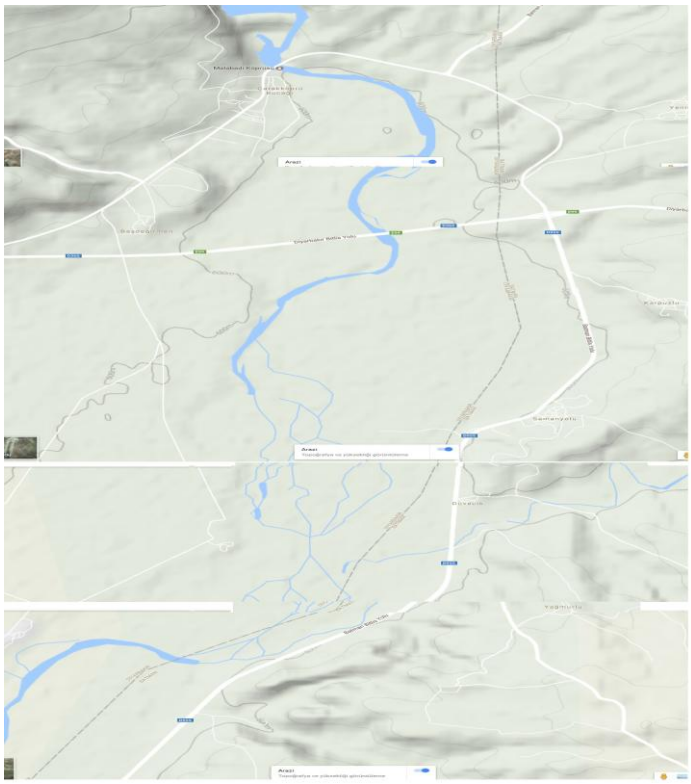

Figure 7.Drainage and stability of Investigation Field in Batman Province

Using these parameters, future water demand forecasts are used and these estimated values are used when designing the systems to meet the demand. In this approach, the demand for water has been determined independently of the specific needs of human needs, the amount of water a healthy ecosystem will need, or actual regional water availability. The next step in traditional planning is to identify projects that will reduce the gap between estimated water supply and demand. In every scale, the planning action (region, basin, city) is used for the regular and healthy spatial development uses (housing, commerce, industry, recreation, other social) in the metropolitan cities which are especially migrating in our country and in medium size settlements Such as equipment) as directed by location decisions; It also determines the water demand of the city at the same time with its population and density of buildings and its quality and quantity of usage. While

city plans shape the socio-economic and physical structure of the city, with the proposed land use, employment, population and density decisions, the city's daily water demand is also shaped. Therefore, any kind of urban development outside the plan creates an unhealthy environment that affects the quality of life of the city, as well as poses a serious threat to the water resources (increased water consumption pressure and pollution) (Urban Planning Chamber Water Commission, 2006). Survey, planning (feasibility) and project work will be given efficiency. The quality of the water quality will be preserved, improved and monitored.Flood hazard maps will be prepared and an early warning system will be established.

4. Conclusions

Şırnak was investigated by urban areas close to border regions participating in the colliery waste heaps of soil samples taken from four different slopes of slope stability and geotechnical properties of the unit field studies and laboratory experiments. Of the slope stability calculations with risk maps and risk section of program GEO5 programs are discussed.

The weathering of rocks in the study area is weakening quickly change the height and tilt angle of the slopes to erosion and slope. Dissociation seen in rocks in the study area also offers a negative contribution to stability problems. The compression strength could be easily tested by indentation on the landfill as shown in Figure 8. The durability of the landfill bottom layer was tested easily on the chart of fly ash and lag mixture content as given in the Table 2.

REFERENCES

Altınlı, E. İ., 1978 “Uluslararası Stratigrafi Kılavuzu” TPAO Yerbilimleri Yayınları, Ankara, Nuray Matbaası,.

Anbalagan, R., 1992, Landslide hazard evaluation and zonation mapping in mountainous terrain” Engineering Geology, 32:269–277,

Anonim, d 2011, Şırnak İl Özel İdare Raporları

Anonymous, 2010, Şırnak İl Özel İdare Raporu.

Anonymous, a 2013, GEO5 - Engineering Manuals - Part 1, - Part 2. http://www.finesoftware.eu/geotechnical-software/

Anonymous, b 2009, GEO5 - FEM - Theoretical Guide http://www.finesoftware.eu/geotechnical-software/ *Surname, Jordan, Stefanovski, Popovska / DECGE 2018*

Anonymous, c 2011, “Türkiye Deprem Bölgeleri Haritası”, Afet ve Acil durum Yönetimi Başkanlığı Deprem Dairesi Başkanlığı, Ankara

ASTM, 1990 “Standard Test Method for Direct Shear Test of Soils Under Cosolidated Drained Condition”, D3080-90,

Bishop, A.W., 1955, The use of the slip circle in the stability analysis of earth slopes, Geotechnique, Vol. 5, 7-17.

Dickinson, M., Cooper, R., McDermott, P. and Eaton, D. (2005). An analysis of construction innovation literature. *Fifth International Postgraduate Research Conference*, April 14-15, Vol. 2, pp. 589-594, Salford, UK.

Dramis, F., Sorriso-Valvo, M., 1994 “Deep-Seated gravitational slope deformations, related landslides and tectonics”, Engineering Geology 38, 231- 243,

Erguvanlı, K, ve Erdoğan, Y., “Yeraltı Suları Jeolojisi”, İTÜ yayınları No: 23, Maçka İstanbul, Nisan 1987

Görög P & Török Á, 2006, Stability problems of abandoned clay pits in Budapest, IAEG2006 Paper number 295 , The Geological Society of London

Görög P & Török Á, 2007 Slope stability assessment of weathered clay by using field data and computer modelling: a case study from Budapest ,Natural Hazards and Earth System Sciences, 7, 417–422, www.nat-hazards-earth-syst-sci.net

Güz, H , 1987, “Geoteknikte Gelişmeler”, DSİ Yamaç ve Şevlerin Stabilitesi ve Dayanma Yapıları Semineri, Samsun