ERE
HIDROELEKTRIK URETIM VE TICARET A.S.

SARIGUZEL DAM, HEPP AND BORROW SITES PROJECT

EIA REPORT

KAHRAMANMARAS PROVINCE, DISTRICT CENTER

ENCON ENVIRONMENTAL CONSULTANCY CO.

FINAL

ANKARA, JUNE 2007

Owner of the Project	ERE Hidroelektrik Uretim ve Ticaret A.S.
Address	Anadolu Bulvarı 11. Sokak No: 14 06510 Sogutozu / Ankara/Turkey
Telephone and Fax Numbers	0 (312) 287 30 00 0 (274) 286 18 81
Name of the Project	Sariguzel Dam, HEPP and Borrow Sites Project
Full Address of Project Location:(Province, District, Municipality, Location)	Kahramanmaras Province, Central District
Name of Institution/Study Group Prepared the Report	ENCON Environmental Consultancy Co.
Address	Resit Galip Cad. No: 120, Gaziosmanpasa 06700, ANKARA/TURKEY
Telephone and Fax Numbers	0 (312) 447 71 22 (pbx) 0 (312) 447 69 88
e-mail	encon@encon.com.tr
Submission Date of Report	June 05, 2007

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

SECTION I

DEFINITION AND PURPOSE OF THE PROJECT

SECTION I. DEFINITION AND PURPOSE OF THE PROJECT

At the Eighth Five Year Development Plan period, in Turkey, which has rapid development and industrialization; important increase at primary energy and consumption of electrical energy parallel to economical and population increase, occurred. At this period, primary energy consumption reached to 92.5 millions of tons petroleum equivalence with a yearly average increase of 2.8%, by the end of year 2005, and electrical energy consumption reached to 160.8 billion kWh with a yearly average increase ratio of 4.6. The period, after the year 2003, when economy stabilized and the effects of 2001 crisis decreased; the increases became more evident as primary energy consumption increased with a yearly average of 5.7% and electrical energy consumption increased with a yearly average of 6.7%. On the other hand, at the Ninth Development Plan period, it is estimated that electrical demand will have a yearly average 8.1 increase parallel to developments in industrial production and service sector.

As mentioned in development plan and programs prepared by State Planning Organization (DPT), Turkey's energy policy, meets the energy need of country in a reliable, continuous, inexpensive way (DPT, 2006). The development of renewable energy sources is important for Turkey. Preparation of a program on increasing the production by using renewable sources is mentioned in short-term targets of European Union Accession Partnership. Hydroelectric is the one of the most important and useful Renewable energy source.

At United Nations (BM) Sustainable Development Meeting (2002), it is confirmed that hydroelectric takes place in the renewable energy technology without small – big differentiation. As a result of that important decision, hydroelectric energy and dams became more important.

Turkey, that has the 1.5% of the technically feasible hydroelectric potential of the world, is behind of the European Countries such as Norway, France, Sweden and Italy for hydroelectric energy production, in today's conditions. However, in economical potential aspect, Turkey is the second country after Norway.

Today, hydroelectric covers an average of 25% of the total electric production in the country. This ratio was about 40%'s in previous years. However, in recent years, due to the decline of dam and hydroelectric power plant projects and the energy policy that highlights the natural gas fueled power plant, the ratio of hydroelectric production declined.

Today, in Turkey, 142 hydroelectric power plants are in operation. These stations have a yearly average production capacity of 45,930 GWh, which equals to 35% of the total potential. 40 hydroelectric power plants, which have 10,518 GWh yearly production capacity, equal to the 8% of the total potential, are still in construction. To use the remaining potential of 73,459 GWh/year, 565 hydroelectric power plant is planning to be constructed in the future steps, by this way, the number of the hydroelectric power plants will expected to be 747. In Table I.1 the distribution of Turkey's hydroelectric energy potential according to project levels.

Table I.1. Distribution of Turkey's Hydroelectric Energy Potential by means of Project Levels (February-2006) (TMMOB, 2006)

State of Hydroelectric Power plant Projects	Number of Projects	Installed Power	Total Yearly Hydroelectric Energy Production				
			Reliable Energy	Total Energy	Ratio	Cumulative Energy	Ratio
			(GWh)	(GWh)	(%)	(GWh)	(%)
1- In Operation	142	12,788	33,560	45,930	35.4	45,930	35.4
2- In Construction	40	3,197	6,358	10,518	8.1	56,448	43.5
3- To be Constructed in the Future	565	20,667	40,006	73,459	56.5		
3.1- Final Project Completed	14	3,556	7,089	10,752	8.3	67,200	51.8
3.2- Plan (Feasibility) Completed	175	7,306	13,305	26,562	20.4	93,762	72.2
3.3- Master Plan Completed	96	5,120	10,582	17,819	13.7	111,581	85.9
3.4- First Study Completed	280	4,685	9,030	18,326	14.1	129,907	100.0
Total Potential	**747**	**36,652**	**79,924**	**129,907**	**100.0**	**129,907**	**100.0**

Official numbers shows that, Turkey will be in energy shortage in 2007. Because of this reason, the solution package, which is prepared by State Hydraulic Works (DSI) in 2004, aims to find a remedy for energy shortage until the year 2010. In accordance with these aims, a three-stage solution package is suggested: Completing the ongoing HEPP projects, realization of the available projects, encouragement of private sector. In this scope, at the third stage, the private enterprise will construct and operate HEPP's by taking ''Water Usage Rights'' (build - operate model). Installed capacity of these projects is expected to be 6,000 MW.

Kandil Energy Group Project, which is planned to be constructed on Ceyhan River by ERE Hidroelektrik Uretim ve Ticaret A.S. (ERE), is in Ekinozu district and central district borders. Sariguzel Dam is one of the four projects in HEPP and Barrow Site, Kandil Energy Group Projects, and is in central district borders. The said projects from upstream to downstream is listed as following, and the map which is showing these projects, is given in Appendix 1.1

i. Dagdelen Regulator, HEPP and Borrow Sites,
ii. Kandil Dam, HEPP and Borrow Sites,
iii. Sariguzel Dam, HEPP and Borrow Sites,
iv. Hacininoglu Regulator, HEPP and Borrow Sites,

Kandil HEPP output currents which are stored with Sariguzel Dam, produce energy by falling to central with transmission tunnel, balance stack, penstock system and the currents are left again to the riverbed.

Kandil Energy Group Project including Sariguzel Dam and HEPP is in the northern side of Kahramanmaras central distinct, between 38º07'30"-37º49'30" north latitudes and 36º57'00"-37º07'30" east longitudes. Project area is in 100 – 150 km distance with asphalt road to Kahramanmaras.

An agreement about Water Usage Rights and Operation Principles was conducted in 31 January 2006 between DSI and ERE for Kandil Energy Group Project including Sariguzel Dam and HEPP Project. After that, a 49-year Production License is given to the firm by EMRA's decision dated 9 March 2006. Water Usage Rights Agreement, the Agreement of Principles of Operations and Production License are given in Appendix 2.

Sariguzel Hydroelectric Power Plant is aimed to have 98 MW installed power and the total yearly average produced power is aimed to be 284.29 GWh. These numbers is around %19 of the total aimed number of 1,525.03 GWh with Kandil Energy Group Projects of 501.60 MW. Although the license is taken for 61.00 MW installed power, 10th article of Electricity Market License Regulation allows increasing %50 of installed power. In Table I.2, installed powers and yearly average energy productions of power plants in addition to Sariguzel Hydroelectric Power Plant and Kandil Energy Group Projects are given.

Table I.2. Installed Power and Yearly Average Energy Production in Kandil Energy Group Projects Power Plants (FR, 2004)

PROJECT UNIT	INSTALLED POWER (MW)	YEARLY AVERAGE ENRGY PRODUCTION (GWh)
Dagdelen HEPP	11.60	50.86
Kandil HEPP	230.00	716.04
Sariguzel HEPP	98.00	284.29
Hacininoglu HEPP	162.00	473.84
TOTAL	**501.60**	**1,525.03**

In addition to the need of corresponding lack of energy, it is important to correspond these lacking by local sources for economy of the country and by renewable sources for environmental and indirect costs. Because of this, 98 MW installed power and yearly 284.29 GWh energy production of HEPP and Sariguzel Dam is suggested as a part of Kandil Energy Group Project. Putting it into service will rapidly show important contribution for corresponding the lacking by hydroelectric energy, which is a local and renewable source.

Moreover, it is clear that hydroelectric energy is an important energy source in a period Turkey needs a reliable, continuous, environmentally-friendly, high quality and the most importantly cheap and equity capital based energy. It is obviously seen that the need is appeared for a responsive policy for rational usage of water in developing the water and soil sources of our country. Because of this reason, developing the water sources considering the environmental effects is important for providing continuance in socio-economic development.

SECTION II

LOCATION OF THE PROJECT

SECTION II. LOCATION OF THE PROJECT

II.1. Project Location (Maps/Plans Approved by the Governorate or Municipality, if Maps do not Exist Presentation of Project Location on Land Use Map)

The proposed Sariguzel Dam and HEPP, which will be located on the Ceyhan River, is 100-150 km (highway distance) away from the Kahramanmaras Province. Sariguzel Dam and HEPP is one of the four project planned under the scope of Kandil Energy group Projects and is located in the boundaries of Kahramanmaras Central District. Sariguzel Dam and HEPP will be just at the upstream of Hacininoglu Regulator and HEPP project, which will be the most downstream element of the Kandil Energy Group Project. The planned location of the Sariguzel HEPP is shown in Figure II.1.

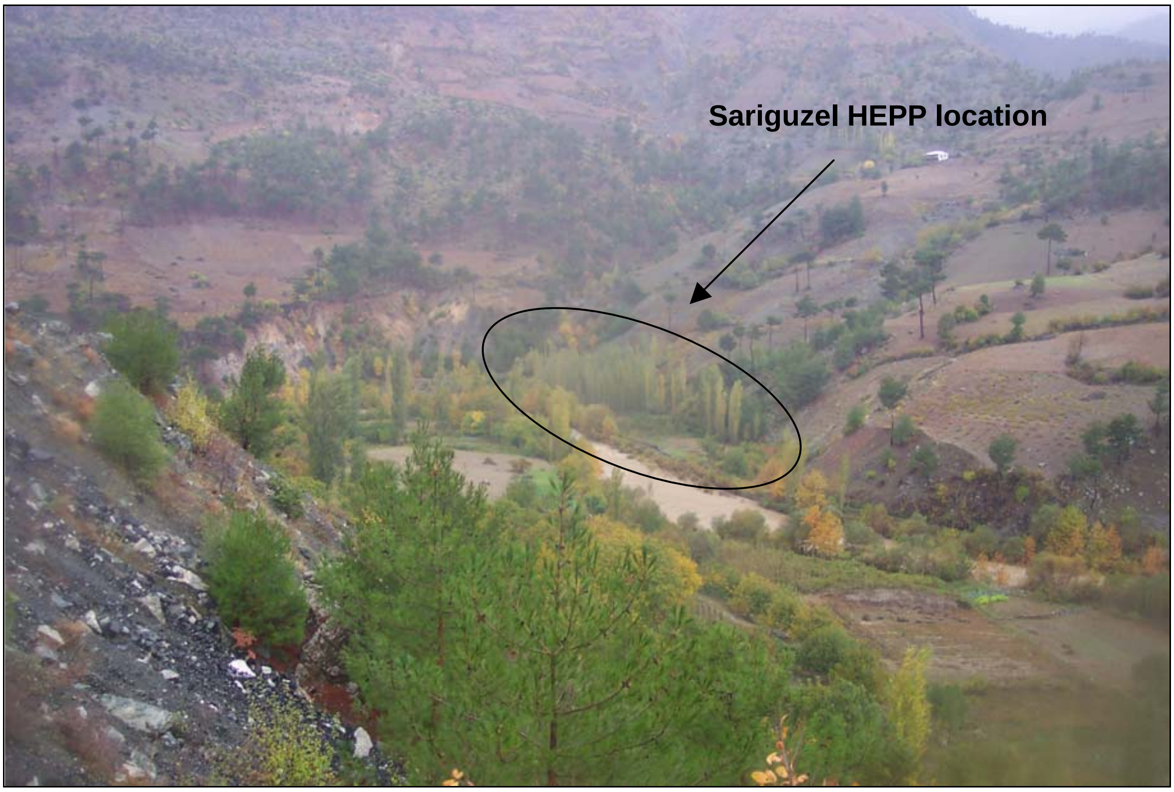


Figure II.1. Planned Location of the Sariguzel HEPP

Kandil Energy Group Project area is on the north of the Kahramanmaras, and between 38^{o}07'30" - 37^{o}49'30" north latitude and 36^{o}57'00" - 37^{o}07'30" east longitude. The x and y coordinates of the Sariguzel Dam, HEPP and Borrow Sites project units, which will be built under the scope of the above mentioned energy group project, is given in Table II.1. In addition, the coordinates of the borrow sites are presented in Section V.1.5.

Table II.1. Coordinates of Sariguzel Dam, HEPP and Borrow Sites Project Units

Unit	Coordinates	
	x	y
Dam Axis	321250	4198151
	321646	4198385
	321683	4198323
	321287	4198092
Start of the Reservoir Area	Start from the dam body	
End of the Reservoir Area	324395	4204421
Start of the Transmission Tunnel	321263	4198329
End of the Transmission Tunnel	320714	4196500
HEPP	320712	4196486
Switchyard	320608	4196504
	320745	4196503
	320745	4196436
	320609	4196436
Explosive Storage Area	320896	4194413
	320959	4194383
	320926	4194328
	320879	4194365
Concrete Station	321118	4196710
	321201	4196776
	321228	4196745
	321153	4196684
Crushing and Stock Area	321263	4196821
	321290	4196789
	321375	4196850
	321341	4196886

Sariguzel Dam and HEPP Project area is in the northern parts of the East Mediterranean Region. Project location map and map showing the project area and its vicinity is given in Figure II.2 and Appendix I.2, respectively.

Although the Kandil Energy Group Project is located in the Mediterranean Region, Sariguzel project area is like the Middle Anatolian and Eastern Anatolian regions regarding climatic and natural conditions. Therefore, summer season are hot and dry, winter is cold and rainy/snowy at the project area.

Sariguzel Dam is on the 1 km southeast of Domuler Quarter of Sariguzel Village, between Kayacukuru Hill and Cukurcam Ridge, and on the 1,300 m northeast of Sariguzel Village. Right bank of the Sariguzel Dam axis is reached via the village road located 1,500 km NE of Sariguzel Village. Left bank is reached by passing the Ceyhan River Bridge and 2 km north of Hacininoglu Village. Area determined as the Sariguzel dam axis is shown in Figure II.3.

Kandil Energy Group Project area including the Sariguzel project area is a mountainous area. The area is surrounded by Amanos on the west, Afsin-Elbistan Plain on the north, Nurhak and Kocdagi mountains on the east, Engizek mountains on the south.

The most important water sources in the area are, Topaklar Creek, Sogan Creek, Degirmen Creek (ephemeral), Kayak Deresi (ephemeral), Kizilkaya Creek (ephemeral) and Alisar Creek.

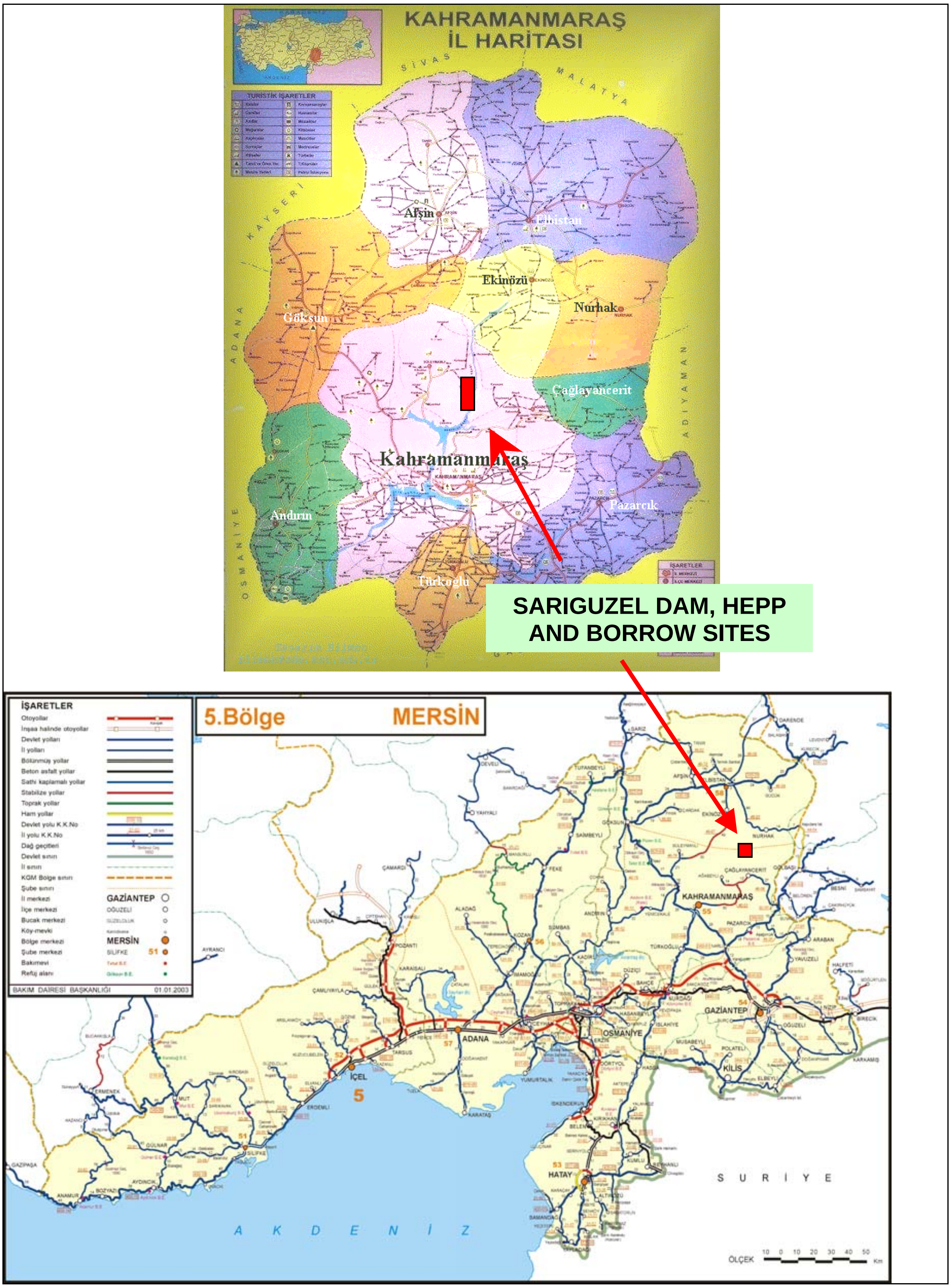


Figure II.2. Sariguzel Dam, HEPP and Borrow Sites Location Map

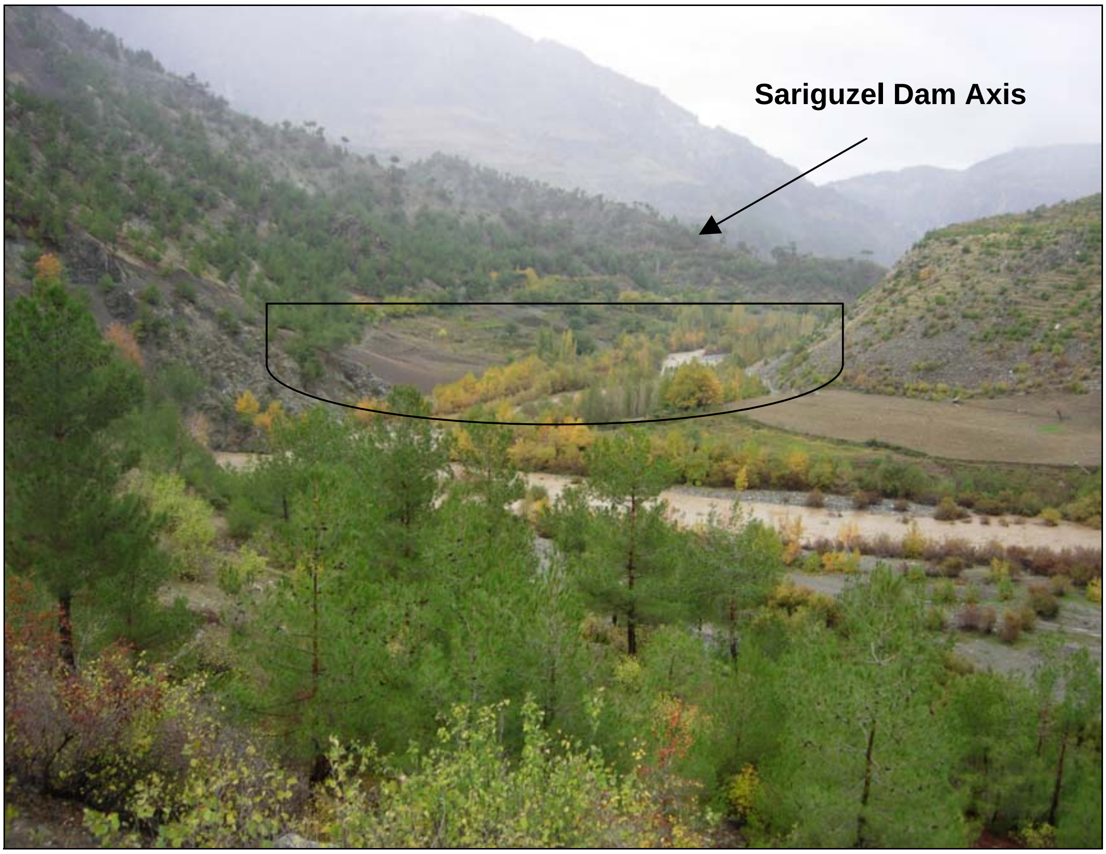


Figure II.3. Location of Sariguzel Dam Axis

Nearest settlements are the Demirlik and Alisar Villages on the east, Sariguzel and Hacibudak Villages on the west, Kertmen Village on the southwest and Haciningoglu Village on the south. Uludere Quarter of Haciningoglu Village and Domuler Quarter of Sariguzel Village will be affected by the reservoir area. Moreover, there are some agricultural areas belonging to the above listed settlements in the reservoir area. Uludere Quarter and Sariguzel Reservoir area are shown in Figure II.4.

Project area is out of the boundaries of municipality contiguous zone. There is no approved management plan for the region. Therefore, if it is planned to construct office, social, etc. buildings inside the project area, geological and geotechnical feasibility reports should be prepared and approved by the General Directorate of Disaster Affairs in line with the communiqué dated 31.05.1989 and No: 4343. Land use map showing the project area is given in Appendix 1.3.

Figure II.4. Sariguzel Dam Reservoir Area and Uludere Quarter

II.2. Locations of the Project Units (Dam Embankment, Spillway, Bottom Outlet, Transmission Tunnels, Hydroelectric Power Plant Unit and Related Facilities, Technical Infrastructure Units, Administrative and Social Units, their Projection Areas, Projection of the location of These Units on General Plan, Projections with Representative Images or Small-models, 1/25,000, 1/5,000 and 1,000 Scaled Maps showing the Construction Areas and Borrow Sites)

Sariguzel Dam and HEPP is located in the boundaries of Kahramanmaras Centre District. Sariguzel Dam is on the 1 km southeast of Domuler Quarter of Sariguzel Village, between Kayacukuru Hill and Cukurcam Ridge, and on the 1,300 m northeast of Sariguzel Village. Ilica-Kertmen-Hacininoglu Village road is reaching to Sariguzel Village and Domuler Quarter. Right bank of the Sariguzel Dam axis is reached via the village road located 1,500 km NE of Sariguzel Village. Left bank is reached by passing the Ceyhan River Bridge and 2 km N of Hacininoglu Village. Balancing stack is reached by the road passing through the Sariguzel Village. There is not an existing road between the stack and the power plant. The service road mentioned in Appendix 1.2 will be constructed within the scope of Hacininoglu Regulator and HEPP project. The units that will be constructed within the scope of this project can be listed as:

- Dam
- Diversion Tunnel
- Energy Transmission Tunnel
- Balancing Stack
- Penstock
- Power Plant

General location map of these units are presented in Appendix 1.2. The areas of the above mentioned units are given in Table II.2.

Table II.2. Area Sizes of the Project Units

Units	Area (m^2)
Dam	50,400
Diversion Tunnel	360
Energy Transmission Tunnel	9,350
Penstock	932
Power Plant and Switchyard	6,000

Maximum water elevation of the Sariguzel Dam and HEPP is limited by the tailrace elevation of the Kandil Dam. The water outlets from this dam are passed through the Hacininoglu HEPP units. Hacininoglu Regulator and HEPP will be the completion part of the Sariguzel Dam and HEPP. Although the optimization study results showed that, Sariguzel Dam could be constructed with a normal water elevation of 836.00 m, it is decided to design it in accordance with the Kandil HEPP in the upstream.

Sariguzel Project is a storage type plant. During the operation studies of the plant, storage characteristics was taken into consideration and it was tried to keep the diverted flow at minimum and regulated water amount at maximum mostly during the storm events.

After the Sariguzel project and other planned projects of the Kandil Energy Group Project are completed, the projects will be a part of a cascade system working together. This cascade system will be very beneficial for the regulation of water flows and usage of firm flow. The inflow of the cascade system is calculated by adding the outflow of the upstream plants to the flows between the two plants.

Natural alluvium existing in the riverbed and at the locations shown in Appendix 1.2 will be used for the aggregate material of the dam body and other concrete works. The material borrow site which is approximately 65 ha, will be used both for the Sariguzel and Hacininoglu projects. The parts of the material borrow site which will be inundated by the Hacininoglu water collection area will be enough for the Hacininoglu project and the rest will be used for the Sariguzel project. Material will be transported from the riverbed to the concrete production unit by the access roads, which will be opened for the construction of the dam body.

30% of the excavation material, which will be formed during the construction works, will be used for concrete production after crushed in the crushing plant. The vegetative soil excavated during the construction will be stored temporarily and will be used for filling processes and for leveling the area.

SECTION III

ECONOMIC AND SOCIAL ASPECTS OF THE PROJECT

SECTION III. ECONOMIC AND SOCIAL ASPECTS OF THE PROJECT

III.1. Investment Program and Financial Sources For the Implementation of the Project

For Sariguzel Dam and HEPP Project, the total investment value corresponding to project value was calculated as 51,424,652 US Dollars. This sum will be spent in 3 investment years. 30% of the total investment sum that corresponds to 15,427,396 US Dollars is planned to finance via equity capital, whereas remaining 70% that corresponds to 35,997,256 US Dollars via credit. The interests and charges for the credit taken, which add up to 5,460,294 US Dollars, will be paid in project investment years. Investment sums that correspond to investment years are given in Table III.1.

Table III.1. Investment Finance Table ($)

INVESTMENT FINANCE MODEL and INVESTMENT PERIOD CREDIT EXPENSES	INVESTMENT YEARS			TOTAL
	1	2	3	
Annual Investment Sum	12,931,138	20,218,328	18,275,186	51,424,652
Equity capital (30%)	3,879,341	6,065,498	5,482,556	15,427,395
Credit (70%)	9,051,796	14,152,830	12,792,630	35,997,256
Credit Interest and Expenses	724,144	1,856,370	2,879,780	5,460,294

The content of the investment that will be done under the scope of Sariguzel Dam, HEPP and Borrow Sites Project was planned under 13 titles and program of the investment was formed through the extent of the investment years. 13 titles that designated as investment items and, the investment plan that prescribed for each item is given in Table III.2.

Table III.2. Investment Program Table ($)

No:	FACILITIES	INVESTMENT YEARS			TOTAL
		1	2	3	
	Operation-Construction Site Facilities	227,500	-	-	227,500
	Transportation Roads	197,383	98,692	98,692	394,767
	Dam Facilities	3,913,298	2,934,973	2,934,973	9,783,244
	Headrace Tunnel	1,763,371	881,685	881,685	3,526,741
	Surge Chamber	-	-	652,000	652,000
	Powerhouse	-	1,578,927	2,932,293	4,511,220
1	**CONSTRUCTION TOTAL**	**6,101,552**	**5,494,277**	**7,499,643**	**19,095,472**
	Penstocks	-	814,000	814,000	1,628,000
	Turbines and Generators	963,757	4,176,279	1,285,009	6,425,045
	Auxiliary Equipment	280,924	1,217,336	374,565	1,872,824
	Other Equipment	137,387	595,342	183,182	915,911
	Substation and Switchyard	183,000	793,000	244,000	1,220,000
2	**ELECTRO-MECHANICS TOTAL**	**1,565,068**	**7,595,957**	**2,900,756**	**12,061,780**
3	**ESTIMATED ACCOUNT (1+2)**	**7,666,619**	**13,090,234**	**10,400,399**	**31,157,252**
4	**CONTINGENT EXPENDITURES**	**688,409**	**929,226**	**895,002**	**2,512,636**
5	**ENERGY TRANSMISSION LINE AND SWITCHYARD**	**686,750**	**686,750**	**588,642**	**1,962,142**
6	**COST of FACILITY (3+4+5)**	**9,041,777**	**14,706,209**	**11,884,043**	**35,632,029**
7	**SURVEY-PROJECT AND CONYTROL (15%)**	**1,356,267**	**2,205,931**	**1,782,607**	**5,344,805**
8	**INSURANCE (0.3%)**	**38,793**	**60,655**	**54,826**	**154,274**
9	**EXPROPRIATION**	**421,500**	**-**	**-**	**421,500**
10	**ROAD RELOCATION**	**6,250**	**3,125**	**3,125**	**12,500**
11	**VAT**	**1,342,407**	**1,386,038**	**1,670,805**	**4,399,250**
12	**Investment Period Interest and Expenses**	**724,144**	**1,856,370**	**2,879,780**	**5,460,294**
13	**PROJECT VALUE (6+7+8+9+10+11)**	**12,931,138**	**20,218,328**	**18,275,186**	**51,424,652**

III.2. Flow Chart or Timetable for the Implementation of the Project

Construction works for Sariguzel Dam and HEPP Project, one of the Kandil Energy Group Projects, will commence immediately afterwards the construction works of Hacininoglu Project. Construction works will begin with excavation of diversion tunnel. In Kandil Energy Group Projects, generally, construction works for a project starts upon completion of construction works of one of the other projects. Timetables for the projects included in Kandil Energy Group are given in Table III.3.

The processing period for Sariguzel Dam, HEPP, and Borrow Sites Projects was started with the sign of production license with EMRA (Energy Market Regulatory Authority) in 9 March 2006. In the license, the pre-construction period was set as 18 months and the construction period was set as 30 months. License will be valid 49 years from enforcement date. Timetable for the Sariguzel Dam, HEPP, and Borrow Sites Projects is given in Table III.4. As can be seen from the table the construction works are planned to be completed in total period of 900 days. 154 kV, approximately 8 km long energy transmission line, which will transmit the energy produced to Kandil Hydroelectric Plant, will be realized within this period. This transmission line will be evaluated in scope of another EIA in later stages.

Table III.3. Kandil Energy Group Projects Timetable

	PROCESS DESCRIPTION	PROCESS FLOW CHART																																				
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
Hacininoglu Project	HCO-SRG* Transportation Roads Excavation and Paving																																						
	Diversion Tunnel Excavation																																						
	Transmission Tunnel Excavation and Backfilling																																						
	Regulator Excavation																																						
	Regulator Construction																																						
	PH* Excavation																																						
	PH Construction																																						
	PS* Excavation and Montage																																						
	Turbine-Generator Montage																																						
	Tests and Commencement of Operation																																						
Sariguzel Project	Diversion Tunnel Excavation																																						
	Transmission Tunnel Excavation and Backfilling																																						
	Dam Embankment Excavation																																						
	Dam Embankment Excavation																																						
	PH Excavation																																						
	PH Construction																																						
	PS* Excavation and Montage																																						
	Turbine-Generator Montage																																						
	Tests and Commencement of Operation																																						
Kandil Project	Tunnel Access Roads Excavation and Backfilling																																						
	Transmission Tunnel Excavation and Backfilling																																						
	Embankment Place Transportation Roads Excavation and Backfilling																																						
	Diversion Tunnel Excavation																																						
	Dam Embankment Excavation																																						
	Dam Embankment Construction																																						
	PH and PS Transportation Roads Excavation and Paving																																						
	PH Excavation																																						
	PH Construction																																						
	PS Excavation and Montage																																						
	Turbine-Generator Montage																																						
	Tests and Commencement of Operation																																						
Dagdelen Project	Transmission Channel Excavation and Construction																																						
	Regulator Excavation																																						
	Regulator Construction																																						
	Excavation																																						
	PH Construction																																						
	PS Excavation and Montage																																						
	Turbine-Generator Montage																																						
	Tests and Commencement of Operation																																						

*HCO: Hacininoglu Regulator and HEPP
SRG: Sariguzel Dam an HEPP
PH: Powerhouse
PS: Penstock

Table III.4. Sariguzel Dam, HEPP and Borrow Sites Project Timetable

NO	PROCESS DESCRIPTION	TIME (DAY)	PROCESS FLOWCHART
1	**License Taking**	**0**	
2	**Pre-construction Period**	**540**	
	• Gathering available maps	90	
	• Preparation of Expropriation Plans	90	
	• Preparation and approval of location zone plan of HEPP area	200	
	• Preparation of the projects and ground surveys	60	
	• Preparation of EIA report and taking EIA positive decision (July 2006-June 2007)	340	
	• Expropriation of production facility areas (private property –without cadastre)	200	
	• Production facility areas – forest permission	200	
3	**Construction Period**	**900**	
	• Energy production facilities construction works	899	
	• Energy transmission facilities EIA, survey and expropriation works	100	
	• Energy transmission facilities construction works (SRG HEPP-HCO HEPP-8 km)	200	
	• Production start	1	
	Sariguzel Dam, HEPP and Borrow Sites Project	**1440**	

Works to be done

Milestone

III.3. Cost Benefit Analysis of the Project

The cost-benefit analysis of the project was conducted for a period of 42 years with 6% reduction ratio on the basis of 4 periods. In calculation of cost, the summation of the present values of 42 years flows of the Investment Sum, Credit Payment, Interest Payment, and Operating Costs were used. Aggregate utility found by present values was calculated with year 2007, 2010, 2015, and 2020 values of 42 years total utilities. It is seen on Table III.5 that project benefits will decline in following years while total cost remain constant.

Table III.5. Financial Cost-Benefit Analysis of the Project

Years	With Present Values		Benefit/Cost Ratio	Internal Profitability Ratio (%)
	Total Costs for 42 Years (US Dollars)	Total Benefits for 42 Years (US Dollars)		
	Investment Sum+Credit Payment+Interest Payment+Operating Costs	Electricity Production		
2007	91,666,238	191,730,582	2.092	16.15
2010	91,666,238	179,573,555	1.959	14.97
2015	91,666,238	164,403,571	1.794	13.48
2020	91,666,238	161,024,823	1.757	13.14

Financial acceptability of the project is evident from benefit cost ratios (B/C>1). Besides internal profitability ratios also show that project will be profitable for all 4 periods from financial aspect. This project is a financially profitable investment having more benefits than its costs, with its internal profitability ratios of %16.15 for 2007, %14.97 for 2010, %13.48 for 2015 and finally %13.14 for 2020.

III.4. Other Economical, Social and Infrastructure Projects That Are Not In The Scope of the Project But Planned to Realize by Project Owner and Other Investors In Relation to the Implementation of the Project.

During the construction and operation stages of the project, employment opportunities will be available for local people. Besides, a considerable part of the social needs of workers will be obtained from nearby settling areas and these facilities will also create a subsidiary source of income for locales. It is estimated that employment opportunity will be given to around 100 people during the construction stage of the dam, and to 10 people throughout the operation stage. Priority will be given to local people from affected villages when filling vacancies.

III.5. Other Economical, Social and Infrastructure Projects That Are Not In The Scope of the Project But Essential for the Realization of the Project and Planned to Realize by Project Owner and Other Investors

The roads that will be constructed to provide transportation between Sariguzel Dam axis and HEPP building are planned to be completed during the construction stage of the Hacininoglu Regulator, HEPP and Borrow Sites Project, which is included in the Kandil Energy Group Projects. The length of the road to be constructed in this part will be 5.29 km, the length of the part which is planned to be improved will be 1.62 km and its width will be 10 m. Transportation in this region becomes a problem especially in winter season. Hence, constructed road will meet transportation needs of neighboring villages at the same time. The building shed, crashing-grinding facility, and concrete batch plant will be used jointly with Hacininoglu Project. Therefore, the construction of these facilities will be completed during the construction period of Hacininoglu Project.

Though not in the scope of this EIA, a 154 kV, approximately 8 km long energy transmission line should be constructed in order to transmit the energy produced to Kandil Hydroelectric Plant. Works related to this transmission line will be planned in later phases.

III.6. Expropriation and/or Resettlement Process

III.6.1. Expropriation

Expropriation works of the areas which will stay under the reservoir and be used during the construction and operation phases of the planned project will be realized in accordance with the Expropriation Law No: 2492 and its amendment, Expropriation Law No: 4650, which came into force upon its publication in the Official Gazette dated 05/05/2001.

Settlements, which will stay under the reservoir and areas to be expropriated due to Sariguzel Dam and HEPP Project, are given in Table III.6.

Table III.6. Areas to be Expropriated within the scope of Project (Including Dam Embankment, Diversion Tunnel, Tunnel Eentrance-Exit, Penstock, Powerhouse, Reservoir Erea, Transmission Roads)

Settlements	Parcel Number (Unit)	Area (Ha)
Hacininoglu Village	284	74.83
Kertmen Village	53	13.41
Sariguzel Village	237	51.65
Demirlik Village	20	1.23
Forest Area	50	96.38
Area of Treasury	53	25.15
TOTAL	**697**	**262.65**

In Hacininoglu village there exist 6952 m^2 graveyard, which is affected.

Buildings and houses affected under the influence range of the project are given in Table III.7.

Table III.7. Number of Buildings and Houses Affected by the Project

Settlements	Building Type	Number
Hacininoglu Village* (Uludere District)	House	31**
	Stall	13
	Mill	1
Sariguzel Village (Dömüler District)	House	10
	Stall	1
	Mill	1
TOTAL		**57**

* 6,952 m^2 of 11,540 m^2 village graveyard will stay under water.
** Out of 31 houses, 25 houses will stay under reservoir area, 6 houses will be affected due to danger of landslide.

As a result of conducted field studies, houses were determined to be nearly 300 m^2 together with fields and gardens.

Project area lies within the borders of Kahramanmaras province. Therefore land acquisition works for the areas to be expropriated will be performed in Kahramanmaras governorship. Expropriation plan is being prepared under the scope of the project. According to this the total areas to be expropriated;

According to Electricity Market Law No. 4628 Article 15/c (Amended: Law No. 5496 Article 5); expropriation will be performed by Energy Market Regulatory Authority (EMRA); the decision on the requirement of expropriation will be deemed as public interest decision and expropriated immovable assets will be registered to Treasury in the register of the title deeds. Processes in the expropriation works, which will be performed by EMRA, are given in Figure III.1.

A new cemetery area will be constructed instead of the old cemetery that fall to expropriation area. For this purpose, the rules of Regulation on Cemeteries (published in the Official Gazette dated 09/08/1931, numbered 1868) will be followed. Required precautions will be taken for immovable assets, which are out of the expropriated areas, not to be affected by landslide or baseline water increase during the construction or the operation phase of dam.

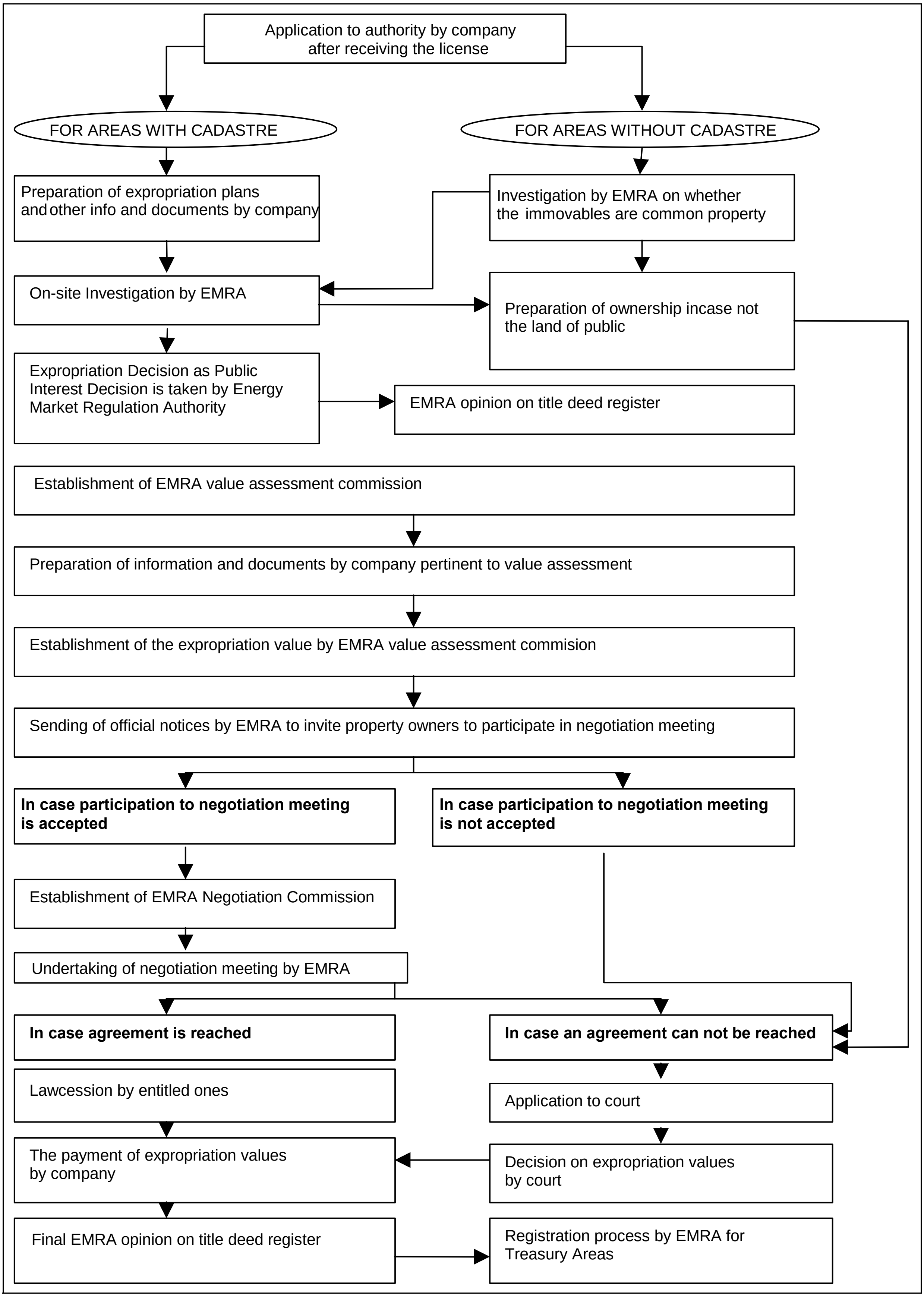


Figure III.1. Flow Chart of Expropriation Process

To expropriate public immovable assets (land, building etc.) owned by public institutions, the project owner makes written application to concerned administration also stating the amount payable. Processes concerning public immovable assets are given as a flow chart in Figure III.2.

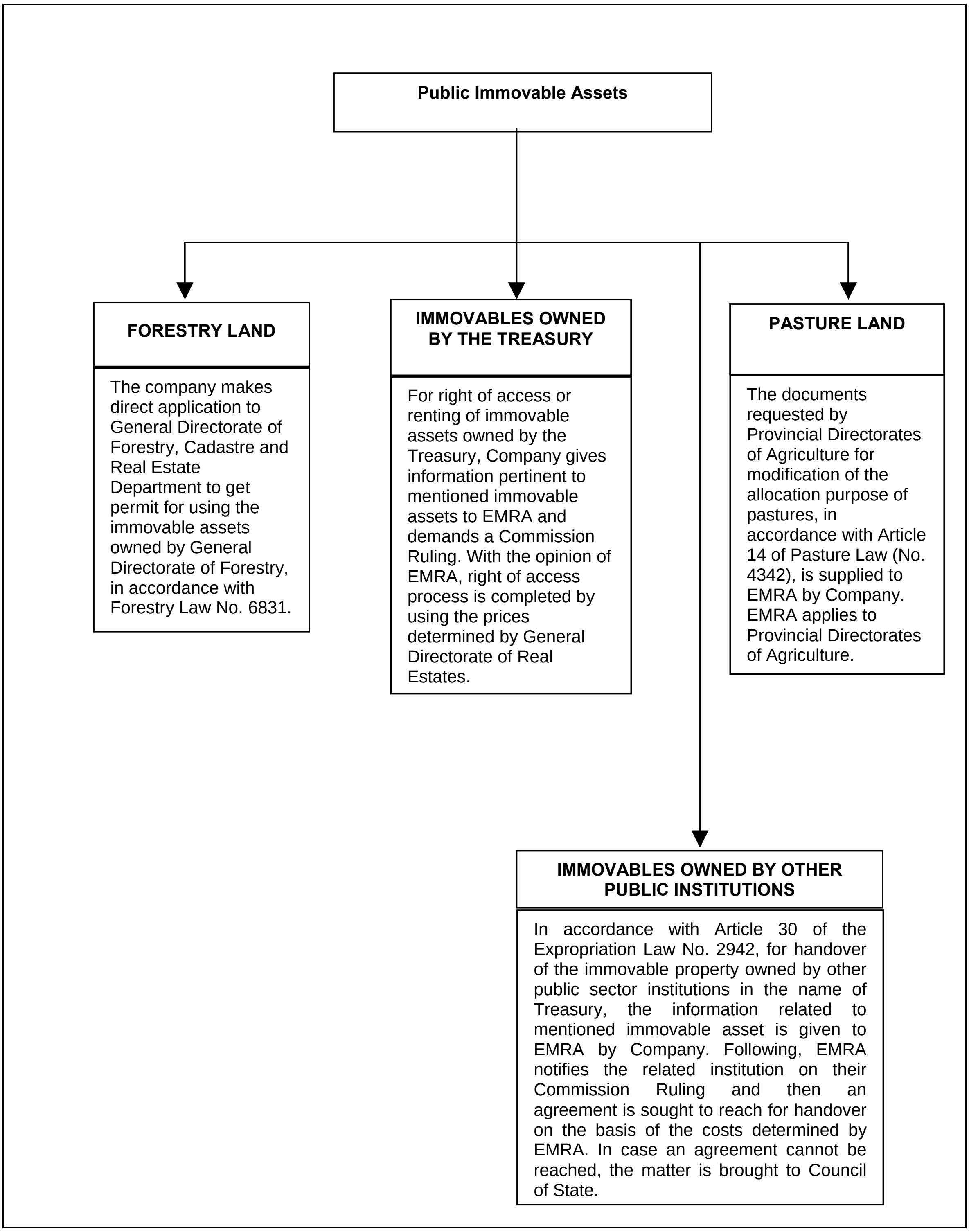


Figure III.2. Flow Chart of Expropriation Processes for Publicly Owned Immovable Assets

III.6.2. Legal Framework for Resettlement Process

It is anticipated that there will no need for a resettlement as a result of Sariguzel Dam, HEPP and Borrow Sites Project. However, the process is described here for the possible resettlement needs that may arise in the future. In the scope of the project, 31 houses, 13 barns, and 1 mill belong to Uludere quarter of Hacininoglu village; and 10 houses, 1 barn, and 1 mill belong to Domuler quarter of Sariguzel village will be affected by the project. Besides, 6,952 m^2 (out of 11,540 m^2) of the Hacininoglu village cemetery will be inundated. There are no constitutional principles for resettlement applications in Turkey. However, the articles 44 and 45 are indirectly related with resettlement activities; article 44 deals with land possession and stipulates the role of the government on the protection of “landless” farmers, whereas article 45 sets forth the responsibility of the government to support agricultural and stockbreeding activities. Moreover, article 56 states that all the people have the right for a healthy environment. Resettlement process in Turkey is regulated by the Resettlement Law. Resettlement Law (no: 5543) and the Regulation for the Implementation of the Resettlement Law mainly states the duties, responsibilities and authorities related to settlement works, the conditions of resettlement eligibility, financial matters, the establishment of resettlement commission and the implementation. According to Resettlement Law government-assisted-resettlement can be provided for urban and rural areas. In Article 17, settlement is defined as to provide;

- A family with a house or land, according to number of inhabitants and the needs,
- Artisans and traders with shop or store or this kind building or land for it for additional income and elastic capital,
- Farmers with adequate farmland, farm animal, equipment, seed, barn and hayloft or land for it.

According to Law, Ministry of Public Works and Settlement carry out the resettlement works in cooperation with other ministries (Ministry of National Education, Ministry of Environment and Forestry etc.). This coordination is established by Undersecretariat of State Planning Organization (DPT). The General Directorate of Rural Affairs (KHGM) was the responsible organization for resettlement processes till the acceptance of the Law 5286, which was put into force in January 13, 2005, regarding the abolishment of the General Directorate of Rural Affairs. With the promulgation of this Law, Ministry of Public Works and Settlement (MPW) became the responsible government agency for the resettlement process as of March 16, 2005. From this point on, Ministry of Public Works and Settlement (MPW) will be referred to for these processes.

III.6.2.1. Fundamental Steps of Resettlement Process

Resettlement works are done with a high coordination, and planning. The basic steps constituting the plan and coordination in resettlement process are:

- ***Announcement of resettlement works*** – Following the determination of construction subcontractor via tender calls, the EMRA informs the MPW about the resettlement requirement, whereupon the MPW visits the site and announces the resettlement works by using written adverts. Adverts of resettlement stays posted on visible places (such as municipality, school, mosque, villager chamber,

cooperative buildings) for at least 30 days. The PAPs who prefer government-assisted resettlement, submit their petitions (stating whether they prefer rural or urban settlement) to the District or Provincial Governorship within 30 days after the announcement. After this period, (if there are no documented compulsory reasons for absentee such as the military service, imprisonment), no claims are accepted.

- ***Resettlement Investigation*** – During this period of 60 days, called "resettlement investigation", representatives of MPW and Provincial Governorship consult with people and provide information about the advantages/disadvantages of government-assisted resettlement, presenting two resettlement options as urban or rural and determines the number of people to be resettled. PAPs who prefer government-assisted-resettlement can waive their rights whenever they want until the allocation of land plots and residences.

- ***Establishment of the local resettlement commission*** – Following the resettlement investigation process, during which the number of people to be resettled is identified, a local resettlement commission is established. The commission, headed by the governor, comprises of representatives from both the central government and district managements of relevant organizations and ministries. The main responsibility of this commission is identification of resettlement right holders. [1]

- ***Site selection*** – For site selection, MPW and Provincial Governorship inquires upon the availability of treasury lands in the vicinity of the project area. If no treasury land is available at the site, the resettlement site(s) can be obtained through purchasing or expropriation. There are no statements about the site selection process in Turkish Laws and only a few criteria are provided about the ownership and quality of the sites to be selected. According to the Law, in case an area is not suitable for agriculture, it shall only be considered after the implementation of rehabilitation and/or improvement works. However in practice, the distance of the arrival site from the departure area, and the similarity of environmental characteristics are also considered as a valid factor since livelihoods of most rural people depend directly on natural resources and their traditional knowledge about the characteristics of the region. This also helps to maintain the social interactions. For the same reasons, in case a forest village is to be resettled, the resettlement site is determined in a forest area determined by the MPW, Provincial Governorship and MoEF.

MPW and Provincial Governorship undertake surveys at the potential resettlement areas and apply to the governor (of the city, where resettlement site is located) for approval of the selected site. If the new resettlement area is to be a district center, the selection is then submitted to the Parliament for approval. The new district centers are promulgated by the law. Since the time period of this process is not limited by the Law, it may extend to several years.

- ***Preparation of the resettlement project*** – MPW and Provincial Governorship prepare the resettlement projects (standard projects according to the population and requirements of the village; including residences, schools, mosques, village house, police stations, market place, graveyards, pasture field, wells, infrastructures, irrigation channels, etc.). Although not stated by the Law, MPW

[1] This is the commission, which decides, among other things, whether the applicants for government assisted resettlement are eligible, so PAPs are not (themselves) in this commission. In practice, however, PAPs do drop by the local office and comment on things of their concern.

and Provincial Governorship also consult with the project affected people (PAPs) during the preparation of resettlement projects

- ***Preparation of the resettlement area*** – MPW and Provincial Governorship implements the resettlement projects (including rehabilitation/improvement for agricultural purposes, construction of residences, public buildings, infrastructures etc.) through bidding. In case the PAPs are displaced prior to the completion of the resettlement site, MPW and Provincial Governorship are also responsible to provide temporary housing for PAPs. In case a resettler waives his/her right for resettlement at this stage (due to the delays in the preparation of resettlement area etc.), the MPW and Provincial Governorship provide land and residence credit.

III.6.2.2. Eligibility for Resettlement

Resettlement Law extends eligibility for resettlement to the following categories of residents:

- Families, whose assets are completely expropriated,
- Families, who have to abandon their places due to part of their assets, are expropriated.
- Families without any assets at the expropriation area, who settled in the expropriation area at least three years prior to the expropriation surveys.

However, amongst the households whose assets are expropriated, the below mentioned ones are not entitled for resettlement:

- The households that do not reside in the expropriation area even though they have immovable assets.
- The households, without any immovable assets, that cannot document that they have been residing in the expropriation area for more than three years (in January of the year the resettlement investigation is started).
- Government officers or permanent workers (regardless of how long they have been residing in the expropriation area).
- The retired people, small traders and artisans earning more than 12 times the minimum official wage annually (regardless of how long they have been residing in the expropriation area).

Government Assisted Rural/Urban Resettlement

MPW and Provincial Governorship presents two resettlement options as urban or rural:

- ***Rural resettlement:*** Following the selection process, MPW and Provincial Governorship prepare projects and construct the settlement site through bidding. The planning and construction of these sites are regulated with a number of regulations. Rural resettlement is mainly preferred by the farming families. The families entitled to rural resettlement receive; housing, farm buildings, farm land, credit to undertake animal husbandry activity and initial agricultural production, equipment and inputs for crop production such as fertilizers and agro-chemicals.

Farmers are also provided consultancy services by the government on sustainable land use and relevant activities. In this context, MARA arranges trainings for resettled farmers on modern agricultural production methods. Every rural resettlement site is provided a health center staffed by a doctor, a nurse, and a midwife. In addition, routine health controls and informative meetings are undertaken at the resettlement sites. Social activities are promoted in such areas in order to ease the integration of resettlers with the host population

In case a forest village is to be resettled and the villagers choose rural resettlement, they are replaced into a forest area determined by the MPW, Provincial Governorship and MoEF, so that they do not loose their advantages/privileges from the forest. These advantages include benefiting from some funds provided by the MoEF ORKOY (General Directorate of Forest-Village Relations), permit for cutting and selling the trees as directed by the MoEF.

- ***Urban resettlement:*** The urban resettlement areas are planned and established in accordance with the Law on Public Works (Law no: 3194), which mainly regulates the provisions to plan and establish settlement areas considering the health and environmental conditions. In urban areas, the resettlers are provided with residences and necessary commercial facilities.

Following the preparation of resettlement sites, the displaced people are transported to the site by MPW and Provincial Governorship. During this process, the PSO and other governmental organizations may also provide assistance if required. All the transportation costs of the resettlers are covered by the government. If the affected people have to abandon their places before the resettlement site is prepared, MPW and Provincial Governorship provides temporary housing and financial assistance (assistance for renting) for the resettlers.

Moving Above the reservoir with Credit

According to the Regulation for the Implementation of Resettlement Law (Article 15), in case development becomes impracticable at a village (because of population ageing, unavailability of natural sources, natural disasters, etc.) it may be resettled and credits may be provided to the villagers. This article also applies for partially expropriated villages (for dam projects) through interpreting the article in favor of displaced people. Thus, at partially expropriated villages, credits may be provided for the whole village to resettle collectively or only to the expropriated parts, to resettle in the other parts of the village that will not be inundated.

Since this article is not related with expropriation originated from development projects, it does not require the expropriation value be deposited to the bank account of MPW and Provincial Governorship and thus, the displaced people may take both the expropriation value and the credit. The amount of this credit provided for residential structures, agricultural land and other facilities are determined via the approval of the Minister of Agriculture and Rural Affairs.

This credit is paid back in 20 years after a grace period of five years and its interest rate is 12% (Regulation for the Implementation of Resettlement Law, Article 16).

Self resettlement

Another option for the project-affected people (PAPs) is self-resettlement. If a PAP prefers self-resettlement or if she/he is not eligible for government assisted resettlement, then taking the expropriation value, she/he may resettle by her/himself. In this case, the resettler cannot use the rights for government assistance and/or credits. Government will provide consultancy services for the PAPs choosing this type of resettlement option.

III.7. Other Issues

There are no other issues to be discussed in this section.

SECTION IV

DETERMINATION OF THE AREA THAT WILL BE AFFECTED FROM REGULATOR, HEPP AND BORROW SITES PROJECTS AND STATEMENT OF THE PRESENT CHARACTERISTICS OF THE AREA

SECTION IV. DETERMINATION OF THE AREA THAT WILL BE AFFECTED FROM REGULATOR, HEPP AND BORROW SITES PROJECTS AND STATEMENT OF THE PRESENT CHARACTERISTICS OF THE AREA

IV.1. Determination of the Area that will be affected by The Project, (The Criteria for the Determination of Impact Zone will be explained and Impact Zone will be shown on the Map)

The zone of impact for Sariguzel Dam, HEPP and Borrow Sites Project, in construction and operation periods, is determined by a joint assessment of environmental, economical and social effects that may arise at settlements close to dam axis, and at areas that will stay under reservoir. The settlements close to dam axis will be affected by dust, noise, traffic etc. that will be generated in construction period, however these negative impacts will disappear by the end of construction. Around 2,946 ha area located along upstream of dam axis will stay under reservoir area. Types and sizes of lands that will stay under reservoir are given in Section IV.2.7 Table IV.17.

Besides, explosives will be used during construction of energy transmission line, dam axis, powerhouse, diversion conduit and tunnel. Explosives are planned to be stored on project site in the area shown in Appendix 1.2 General Plan of Site. Health boundary zone recommended for storage area is given in Section V.1.20. In determination of impact zone, these distances were also taken into consideration.

Another criteria considered in the determination of the impact zone are concrete batch plant and crashing-grinding-washing facility and their effects on environment. As a result of activities undertaken in these facilities dust and noise will be generated, and these will affect the nearby agricultural and settlement areas.

Impact zone that is determined by parameters mentioned above is shown on map in Appendix 1.4. This area covers a 30-km^2 area, which includes dam axis, energy transmission tunnel, hydroelectric power plant, crashing-grinding-washing facility, concrete batch plant, borrow site and the settlements that will be affected by the operations that will take place therein.

IV.2. Characteristics of Physical and Biological Environment and Use of Natural Resources within The Impact Zone

In this section, information on meteorological, geologic, hydrogeological and such characteristics of the region, which fall within the impact zone and the natural resources therein, and their characteristics are given and these characteristics are being evaluated under separate titles.

IV.2.1. Meteorological and Climatic Characteristics

Though Kahramanmaras Province, in which the project area is located, lies within the borders of Mediterranean Region; Sariguzel Dam, HEPP and Borrow Sites Project area bears the typical characteristics of Central Anatolia and Eastern Anatolia. Therefore summers are hot and dry, and winters are cold and rainy in the region.

In this section meteorological conditions in the project area and surrounding region are assessed. In the scope of this work, the results of continuous measurements done by General Directorate of State Meteorological Services (DMI) are analyzed and results are presented by tables and graphs. In this scope, the data were taken from Kahramanmaras Station of General Directorate of State Meteorological Services, which is close to project area. In Kahramanmaras observation station temperature, wind speed and direction is measured hourly; cloudiness and precipitation is measured three times a day, and maximum rain fall is measured monthly. Kahramanmaras DMI, in which meteorological data through the years 1975-2005 have been observed, takes place in 572 m elevation from sea level, with 37.36 latitudes and 36.56 longitudes. The bulletin in which meteorological data of the reference periods given above which belong to this station is given in Appendix 5.

Air Temperature

Average annual air temperature data determined in reference period for Kahramanmaras DMİ are presented in this section. Average annual temperature in project area is 16.7°C. The maximum temperature was recorded as 44.3°C in July and August. The minimum temperature was recorded as –9.6ºC in February. The average temperatures measured in this station is presented graphically in Figure IV.1, and numerically in Table IV.1

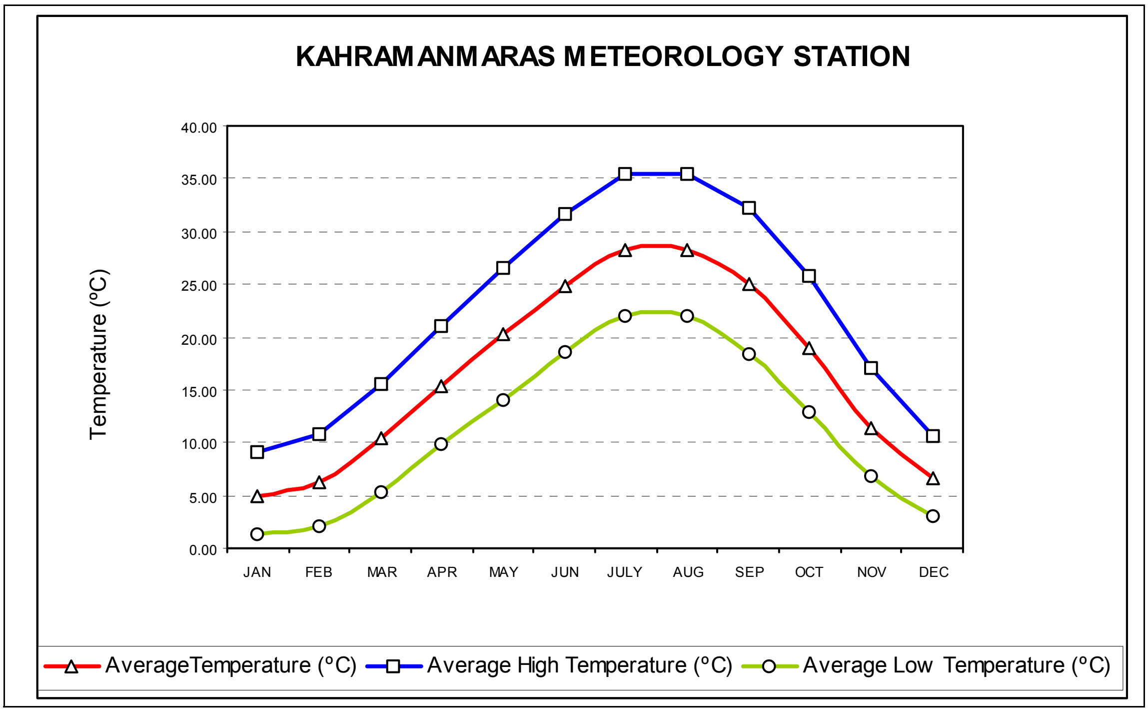


Figure IV.1. Average Temperatures, Average Low Temperatures, and Average High Temperatures in Project Area (DMI).

Table IV.1. Average Temperature Data and Maximum and Minimum Temperatures in Project Area (DMİ)

	Average Temperature °C	Average High Temperature °C	Average Low Temperature °C	The Maximum Temperature °C	The Minimum Temperature °C
January	5.0	9.1	1.4	17.4	-7.8
February	6.2	10.8	2.0	21.8	-9.6
March	10.4	15.6	5.4	26.4	-7.6
April	15.3	21.0	9.8	32.6	-0.6
May	20.2	26.5	14.1	38.0	5.0
June	24.9	31.6	18.6	41.0	11.0
July	28.2	35.4	22.0	44.3	15.6
August	28.2	35.5	22.0	44.3	16.0
September	25.0	32.3	18.3	40.1	8.6
October	18.9	25.7	12.8	37.2	2.2
November	11.4	17.1	6.8	27.2	-4.4
December	6.6	10.7	3.1	20.9	-7.6
Annual	16.7	22.6	11.4	44.3	-9.6

Pressure

Annual average local pressure measured in Kahramanmaras Station is 947.0 hPa. The maximum pressure was seen in September, and the minimum pressure in March within year. Their values are 964.8 hPa and 924.7 hPa, respectively. Local pressure distribution in Province is given in Table IV.2, and the graph of this distribution is given in Figure IV.2.

Table IV.2. Local Pressure Distribution (DMİ)

	Average Local Pressure hPA	Maximum Local Pressure hPA	Minimum Local Pressure hPA
January	950.9	964.3	928.5
February	949.4	963.3	929.5
March	947.8	962.6	924.7
April	946.4	957.7	925.0
May	945.7	955.5	929.4
June	943.1	950.7	928.6
July	940.3	947.5	931.9
August	941.5	951.4	931.9
September	945.8	964.8	936.6
October	949.4	959.1	937.7
November	951.4	964.6	933.1
December	951.8	963.4	931.9
Annual	947.0	964.8	924.7

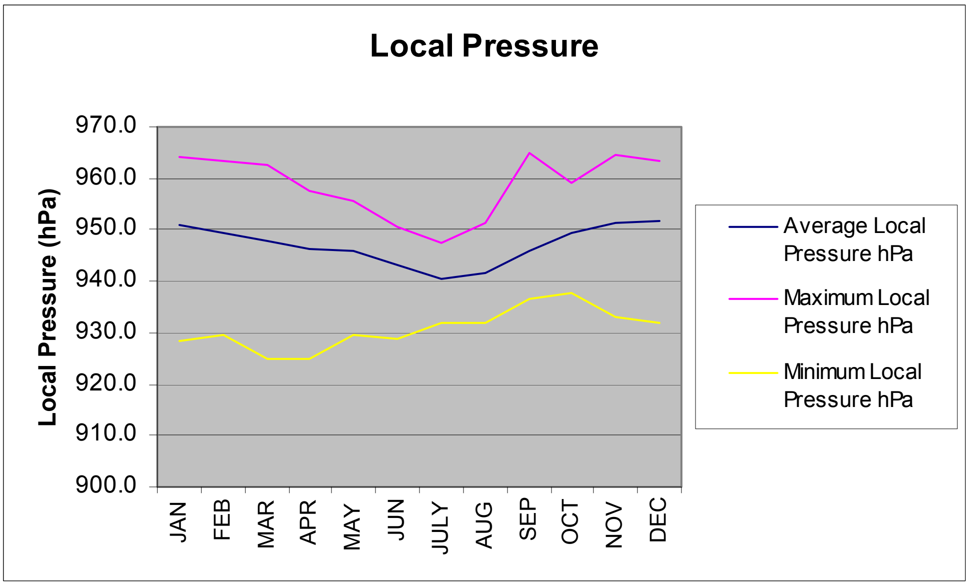


Figure IV.2. Average, Maximum, Minimum Local Pressure Values in Kahramanmaras DMI (DMI)

Precipitation

In Kahramanmaras station average total precipitation amount is 731.3 mm annually. Average total precipitation amount is at its maximum in December with 132.3 mm and at its minimum in August with 0.5 mm. The maximum daily precipitation is observed again in December with 98.2 mm. Average monthly precipitations observed are given graphically in Figure IV.3, and numerically in Table IV.3.

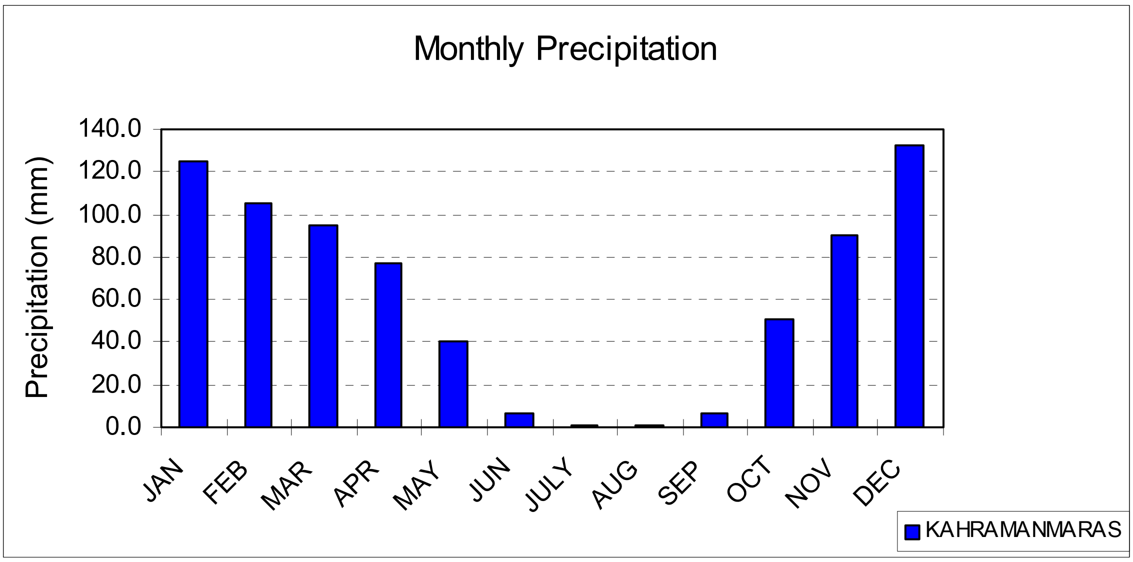


Figure IV.3. Average Monthly Precipitation in Kahramanmaras DMI (DMI)

Table IV.3. Monthly and Annual Precipitation Amounts in Kahramanmaras DMI

	Average Total Precipitation Amount (mm)	Daily Maximum Precipitation Amount (mm)
January	125.2	47.2
February	105.4	58.6
March	94.7	53.5
April	77.3	66.5
May	40.2	46.5
June	6.6	22.3
July	1.0	7.9
August	0.5	5.0
September	6.8	18.7
October	51.1	45.7
November	90.2	72.0
December	132.3	98.2
Annual	731.3	98.2

Relative Humidity

Average relative humidity in Kahramanmaras station is 58% annually. Average relative humidity is minimum in June with 50%, and maximum in December with 72%. On the basis of the monthly average relative humidity values recorded in station, variations in monthly relative humidity are given graphically in Figure IV.4 and numerically in Table IV.4.

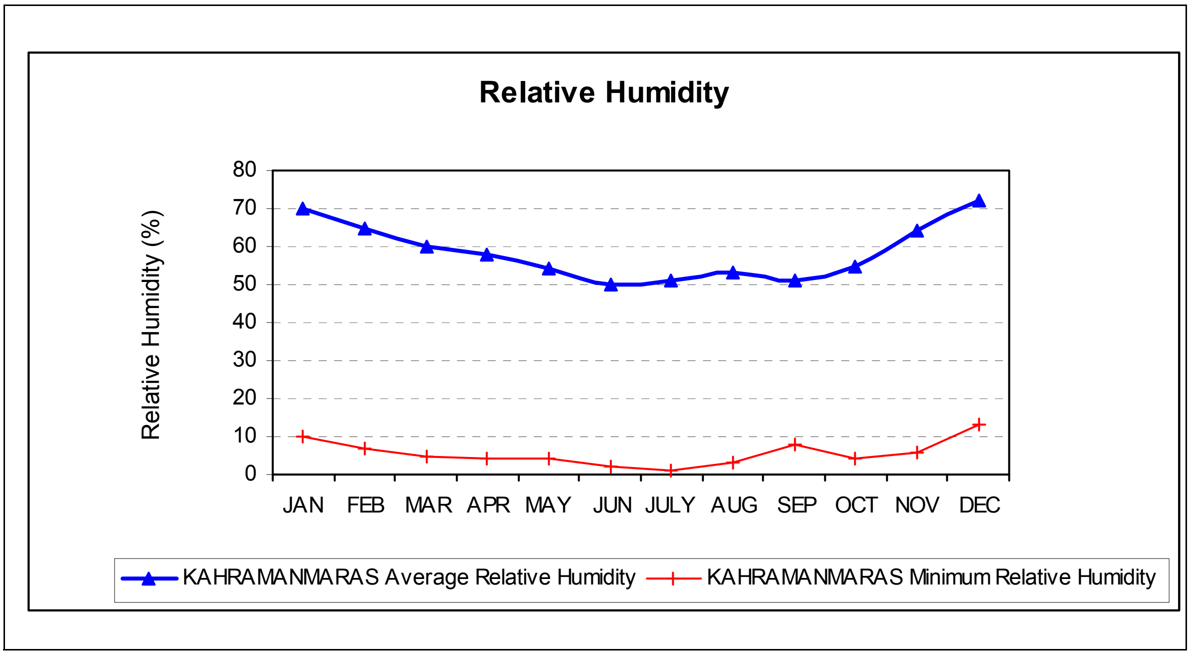


Figure IV.4. Average and Average Minimum Relative Humidity in Kahramanmaras DMI (DMI)

Table IV.4. Average and Minimum Relative Humidity Amounts in Kahramanmaras DMI (DMI)

	Average Relative Humidity (%)	Minimum Relative Humidity (%)
January	70	10
February	65	7
March	60	5
April	58	4
May	54	4
June	50	2
July	51	1
August	53	3
September	51	8
October	55	4
November	64	6
December	72	13
Annual	58	1

Cloudiness

The annual average cloudiness (scale: 0 to 10) in Kahramanmaras station is determined as 3.3. The number of clear days in Kahramanmaras Station (cloudiness: between 0.0-1.9) is recorded as 182.2, indicating clear weather for 50% of the time. For the same station, the annual average cloudy days (cloudiness between 2.0-8.0) is 123.2, corresponding 33.7% of the time. Average cloudy day number recorded in Kahramanmaras Station is 59.5, indicating that the weather is clear 16% of the time. (Figure IV.5)

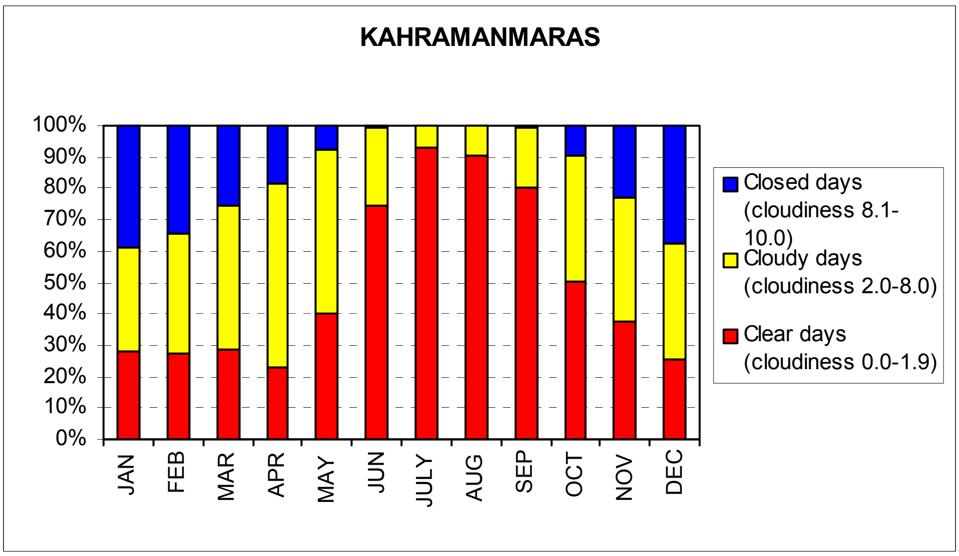


Figure IV.5. Average Cloudiness in Kahramanmaras DMI (DMI)

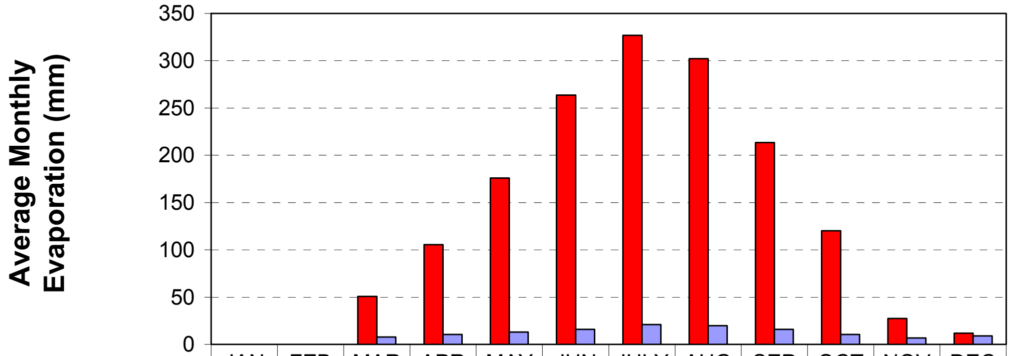
Evaporation

Evaporation data taken from Kahramanmaras station are given in Table IV.5.

Table IV.5. Average and Daily Maximum Evaporation Amounts (DMİ)

	Average Evaporation Amount (mm)	**Daily Maximum Evaporation (mm)**
January	-	0.0
February	-	0.0
March	50.7	7.7
April	105.5	10.5
May	176.0	13.0
June	263.5	16.0
July	326.9	21.0
August	302.2	19.9
September	213.5	16.0
October	120.2	10.5
November	27.3	6.8
December	11.9	8.9
Annual	159.8	21.0

As can be seen from the table maximum evaporation was recorded in July (326.9 mm). Maximum evaporation value recorded in a day is 21 mm. This value that is recorded on daily basis occurred in July. Graphical representation of the evaporation values obtained from station is given in Figure IV.6.



	JAN	FEB	MAR	APR	MAY	JUN	JULY	AUG	SEP	OCT	NOV	DEC
Average Evaporation			50.7	105.5	176.0	263.5	326.9	302.2	213.5	120.2	27.3	11.9
Daily Maximum Evaporation	0.0	0.0	7.7	10.5	13.0	16.0	21.0	19.9	16.0	10.5	6.8	8.9

Figure IV.6. Average and Daily Maximum Evaporation, Kahramanmaras DMI (DMI)

Distribution of Number of Days

According to the data obtained from Kahramanmaras DMİ, Kahramanmaras has annual 14.7 foggy days. It corresponds to 0.04 % of the year. The maximum amount of snow falls in January and approximately 2.9 days passes with snowfall. Throughout the 30 years observation period (1975-2005) it is seen that the snow blanket stays approximately 5.7 days in a year. Monthly distribution of average days with snow blanket, fog, snow, and the maximum snow blanket thickness (cm) are given in Table IV.6.

Table IV.6. Distribution of Number of Days (DMI)

	Average Number of Foggy Days	Average Number of Snowy Days	Average Number of the Days with Snow Blanket	Maximum Snow Blanket Thickness (cm)
January	3.6	2.9	2.3	21.0
February	3.1	2.5	2.3	37.0
March	0.9	0.6	0.2	7.0
April	0.2	0.1	-	-
May	0.1	-	-	-
June	-	-	-	-
July	-	-	-	-
August	-	-	-	-
September	0.1	-	0.0	-
October	0.4	-	-	-
November	2.6	0.3	0.3	6.0
December	4.0	1.5	0.6	17.0
Annual	14.7	7.7	5.7	37.0

Wind

The distribution of monthly and annual wind numbers and speeds recorded in Kahramanmaras station are given in Table IV.7 and Table IV.8. According to this, prevailing wind direction in the province is from the west-northwest.

Table IV.7. Kahramanmaras DMI Distribution of Monthly and Annual Numbers of Winds according to the Directions (DMI)

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
January	148	51	56	106	124	141	77	75	207	79	73	134	211	122	60	69
February	154	69	56	118	131	126	74	74	180	93	64	124	169	122	87	94
March	183	75	73	152	146	138	75	91	209	95	67	154	180	267	129	115
April	150	42	78	113	129	114	95	83	167	91	57	145	243	414	181	99
May	139	44	31	87	113	96	66	50	172	108	59	159	270	566	225	125
June	189	49	34	66	91	67	56	31	90	61	46	168	356	786	233	166
July	188	52	32	71	74	75	59	41	110	61	57	171	470	805	186	160
August	194	44	53	64	67	41	41	42	163	72	63	149	445	751	196	144
September	167	44	53	64	83	23	54	47	211	87	84	130	272	584	184	134
October	184	46	74	60	80	69	89	45	200	91	105	107	173	260	153	108
November	172	38	67	63	114	79	81	58	142	63	72	102	157	101	79	70
December	107	50	72	94	141	133	101	49	187	61	87	115	188	114	84	72
Annual	1975	604	679	1058	1293	1102	868	686	2038	962	834	1658	3134	4892	1797	1356

Table IV.8. Kahramanmaras DMİ Distribution of Monthly and Annual Wind Speeds according to the Directions (m/s) (DMİ)

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
January	3.1	2.1	1.4	2.0	1.8	1.8	1.1	1.0	0.7	1.2	0.9	1.1	1.2	1.8	1.6	3.3
February	3.6	2.3	1.3	1.4	1.7	1.9	1.4	1.3	0.9	1.1	0.9	1.4	1.4	2.1	1.8	3.4
March	3.1	2.4	1.3	1.6	2.0	1.9	1.4	1.5	1.1	1.1	0.9	1.5	1.8	2.8	2.4	3.0
April	2.9	1.8	1.4	1.6	1.5	1.8	1.2	1.4	1.0	1.2	1.0	2.0	2.3	3.3	2.8	2.7
May	3.1	3.0	1.1	1.7	1.1	1.2	1.1	1.2	1.0	1.3	1.2	2.1	2.6	3.7	3.2	3.4
June	4.0	4.5	1.8	1.1	0.9	0.9	0.8	1.0	0.9	1.4	1.3	3.2	3.5	4.4	3.7	4.1
July	4.3	3.7	1.3	1.3	1.1	1.0	1.0	1.2	1.1	1.6	1.7	3.7	4.2	4.8	3.9	4.8
August	3.5	3.5	1.5	0.9	0.9	0.9	1.2	1.4	1.1	1.4	1.7	3.1	4.1	4.6	3.8	4.4
September	3.0	2.8	1.2	1.2	0.8	0.9	1.2	1.0	1.1	1.3	1.3	2.4	2.9	4.1	3.3	3.6
October	2.7	2.5	1.1	1.2	1.0	1.0	1.2	1.0	01.9	0.9	0.9	1.5	1.5	2.8	2.1	2.6
November	2.9	2.3	1.6	1.6	1.3	1.6	1.0	0.9	0.7	0.8	0.8	1.0	1.0	1.5	1.1	3.4
December	2.8	1.7	1.0	1.6	1.7	1.7	0.9	0.8	0.7	0.8	0.7	1.1	1.0	1.5	1.1	2.6
Annual	3.3	2.7	1.3	1.5	1.4	1.5	1.1	1.2	0.9	1.2	1.1	2.1	2.7	3.9	2.9	3.6

According to data obtained from Kahramanmaras DMI in between the years 1975-2005, throughout the 30 years observation period the fastest wind was recorded as North wind with a speed reaching 38.5 m/s. Again in this time period, approximately 17.9 days were determined as “Stormy” with a wind speed equal to or higher than 17.2 m/s, and approximately 105.4 days were determined as “strong windy” with a speed between 10.8 - 17.1 m/s, during the course of the year. These days approximately correspond to 4.9% and 28.9% of a year, respectively. Average wind speeds, the fastest wind directions and speeds, average number of stormy and strong windy days, measured on monthly and annual basis, are given in Table IV.9.

Table IV.9. Kahramanmaras DMİ Annual and Monthly Wind Distributions (DMİ)

Months	Average Wind Speeds (m/s)	The Fastest Wind Direction	The Fastest Wind Speed (m/s)	Average Number of Stormy Days*	Average Number of Strong Windy Days **
January	1.0	N	30.6	1.2	3.2
February	1.2	N	38.5	1.5	3.4
March	1.5	N	35.9	1.6	5.5
April	1.7	NNE	30.3	0.9	5.9
May	2.0	NNE	31.9	0.7	9.3
June	3.0	N	26.1	2.0	17.2
July	3.3	NNW	26.8	3.1	20.7
August	3.0	NNW	29.4	2.7	20.1
September	2.1	NNW	34.4	1.2	12.2
October	1.1	N	25.6	0.8	3.8
November	0.8	N	36.9	1.2	1.8
December	0.8	NNW	38.2	1.0	2.3
Annual	1.8	N	38.5	17.9	105.4

* Wind speed >= 17.2 m/s
** Wind speed 10.8 – 17.1 m/s

Monthly and annual (obtained on the basis of monthly) wind direction and intensities recorded in Kahramanmaras station are shown with wind roses given in Figure IV.7. In Kahramanmaras Province, weak/medium intensity west-northwest winds are prevailing. The percentage of the time the wind blows from that direction is 19.62%. As it can be seen from wind roses given in Figure IV.8 generally the prevailing wind direction is west-northwest in all months.

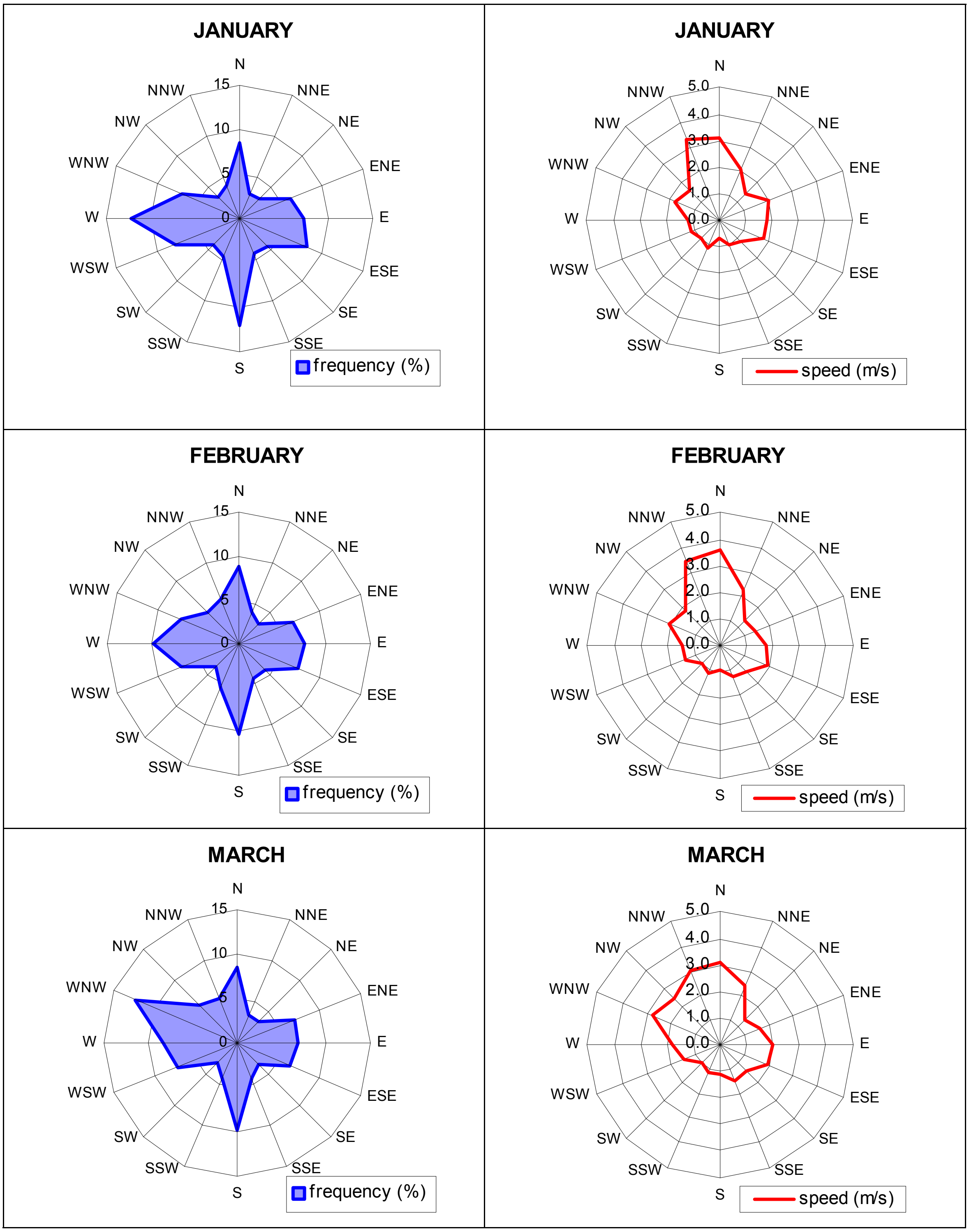


Figure IV.7. Wind Directions and Speeds according to their frequency of occurrence for the months January, February and March (DMİ) (Continued)

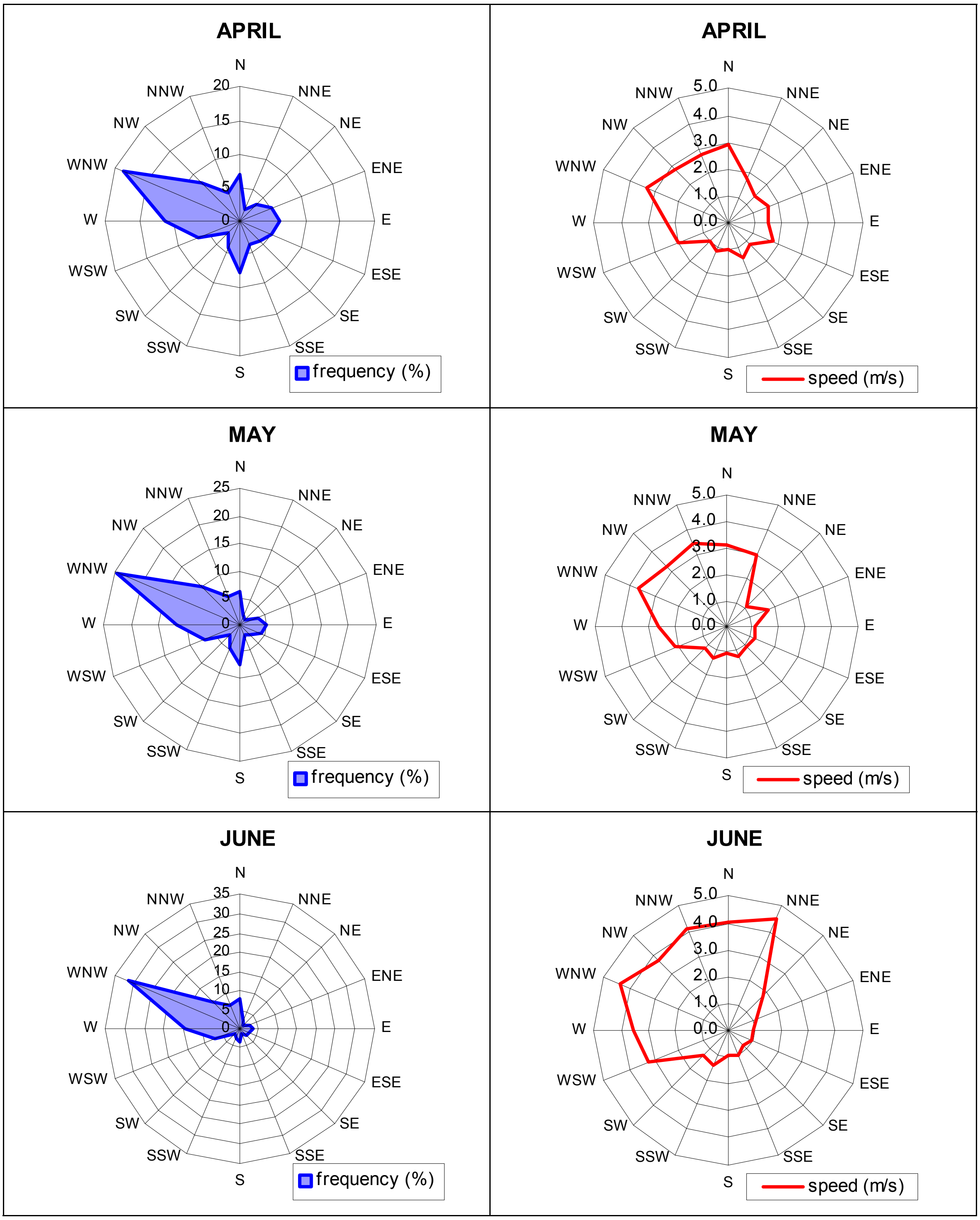


Figure IV.7. Wind Directions and Speeds according to their frequency of occurrence for the months April, May and June (DMI) (Continued)

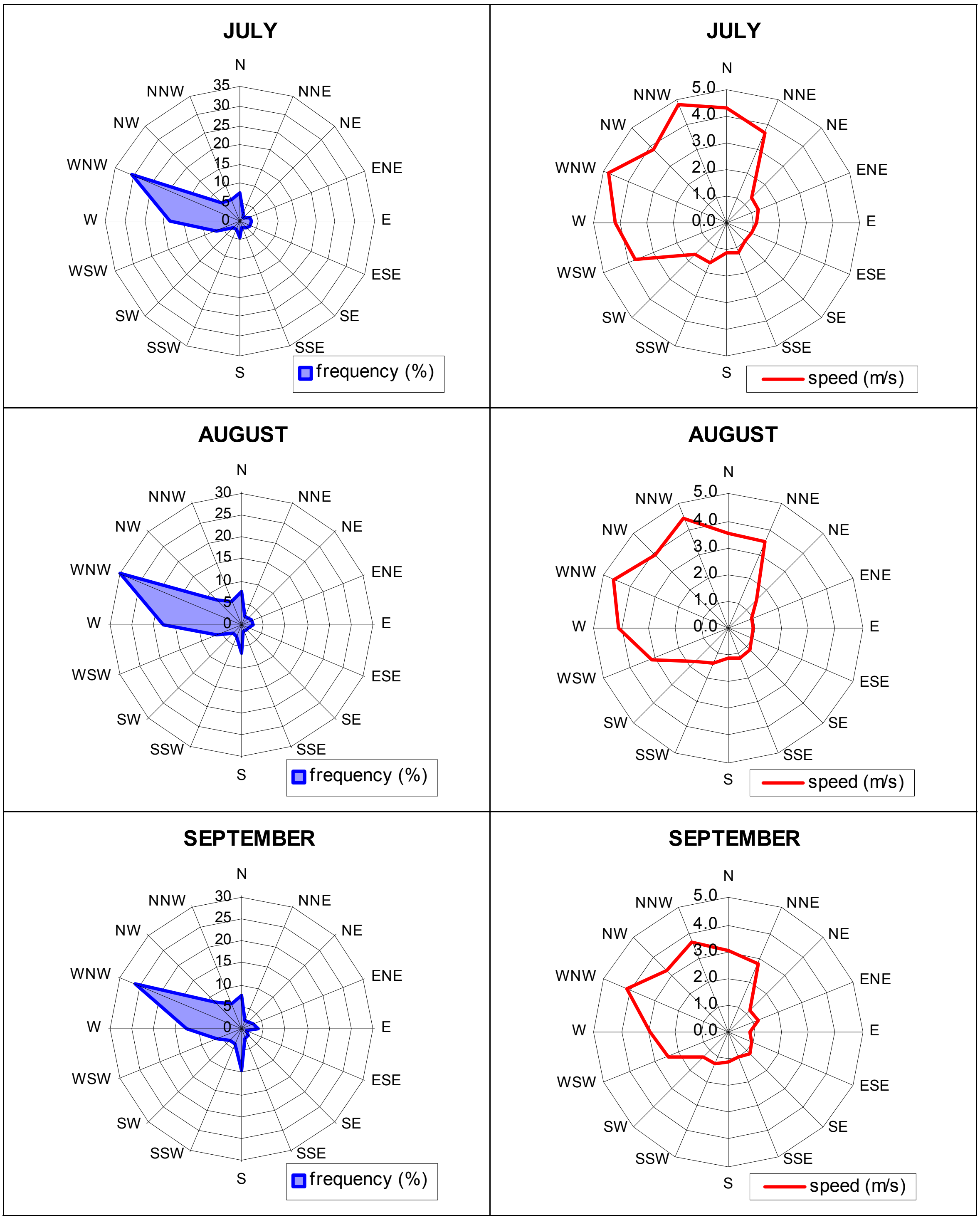


Figure IV.7. Wind Directions and Speeds according to their frequency of occurrence for the months July, August and September (DMI) (Continued)

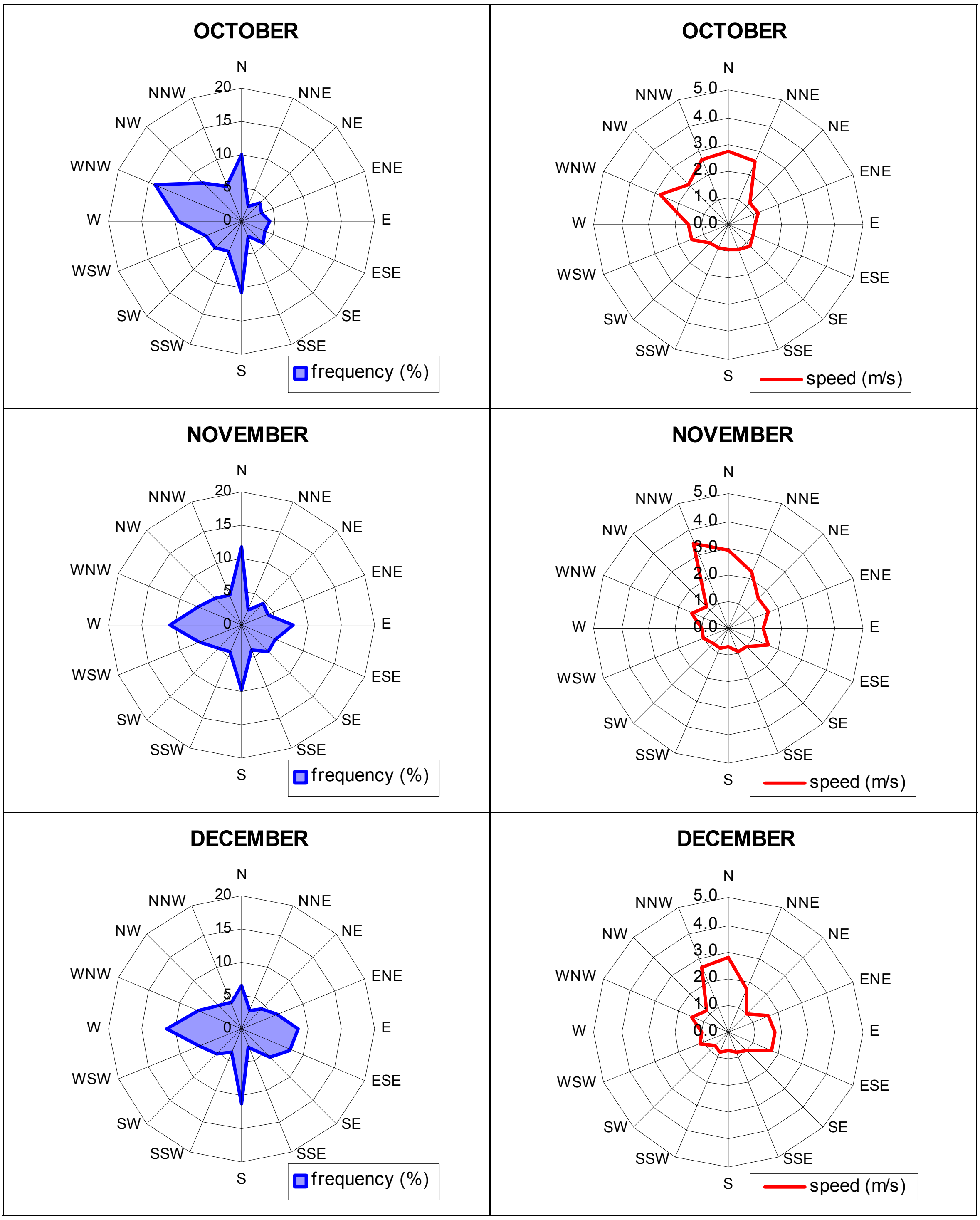


Figure IV.7. Wind Directions and Speeds according to their frequency of occurrence for the months October, November, December (DMI) (Continued)

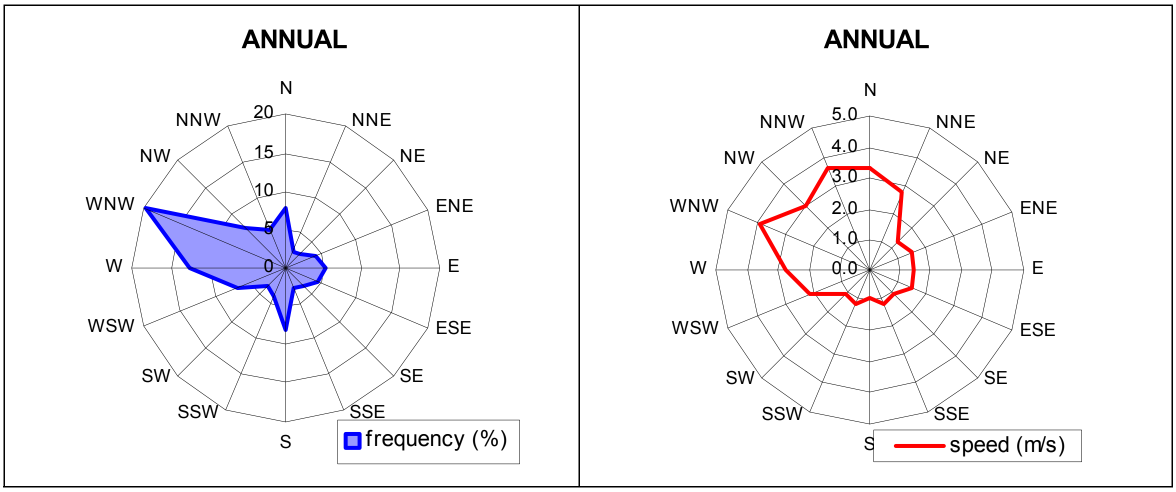


Figure IV.8. Wind Directions and Speeds according to Annual Frequencies (DMI)

IV.2.2. Geological Characteristics (Examination of the Project Area and Borrow Sites under the Headlines of Physical-Chemical Characteristics, Tectonic Motions, Mineral Resources, Landslides, Unique Formations, Avalanches, Floods, Rock Slides; 1/100,000, 1/25,000 and/or 1/5,000 Geological Map and Legend)

IV.2.2.1. General Geology

As a geological data of work area, geology maps produced by MTA in the year 1962 are available. In the years 1974–1978 General Directorate of MTA produced a 1/25,000 geology map of the area for Engizek Project. Kahramanmaras Province has very rich mine reserves. However, there is no mining area in the project area. Detailed information on mines and mineral resources are presented in Section IV.2.12.

IV.2.2.2. Stratigraphic Geology

In the area where Kandil Energy Group Project, that includes Sariguzel Dam, HEPP and Borrow Sites Project, is located, outcrop formations can be arranged from old to new in the following order; Precambrian aged quartzite, hornfels, gnays, amphibolite, gabbro, peridotite, Permian aged marble, Triassic aged clayey-marly limestone, Jura aged dolomitic limestone, Kretase aged ophiolites, Miocene aged gravelstone-sandstone limestone, Quaternaty aged alluvion, slope wash and terraces. Statigraphic cross-section of Lithologic units is given in Figure IV.9.

Sedimentary Rocks

Within and around investigation area the following sedimentary rocks outcrops: Triassic aged clay-marl limestone, Jura aged dolomite limestone, Lower Miocene aged sandstone gravel stone, Middle Miocene aged limestone, Upper Miocene aged mudstone, gravel stone, sandstone, Quaternary aged terraces conglomerate, slope wash and alluvion units.

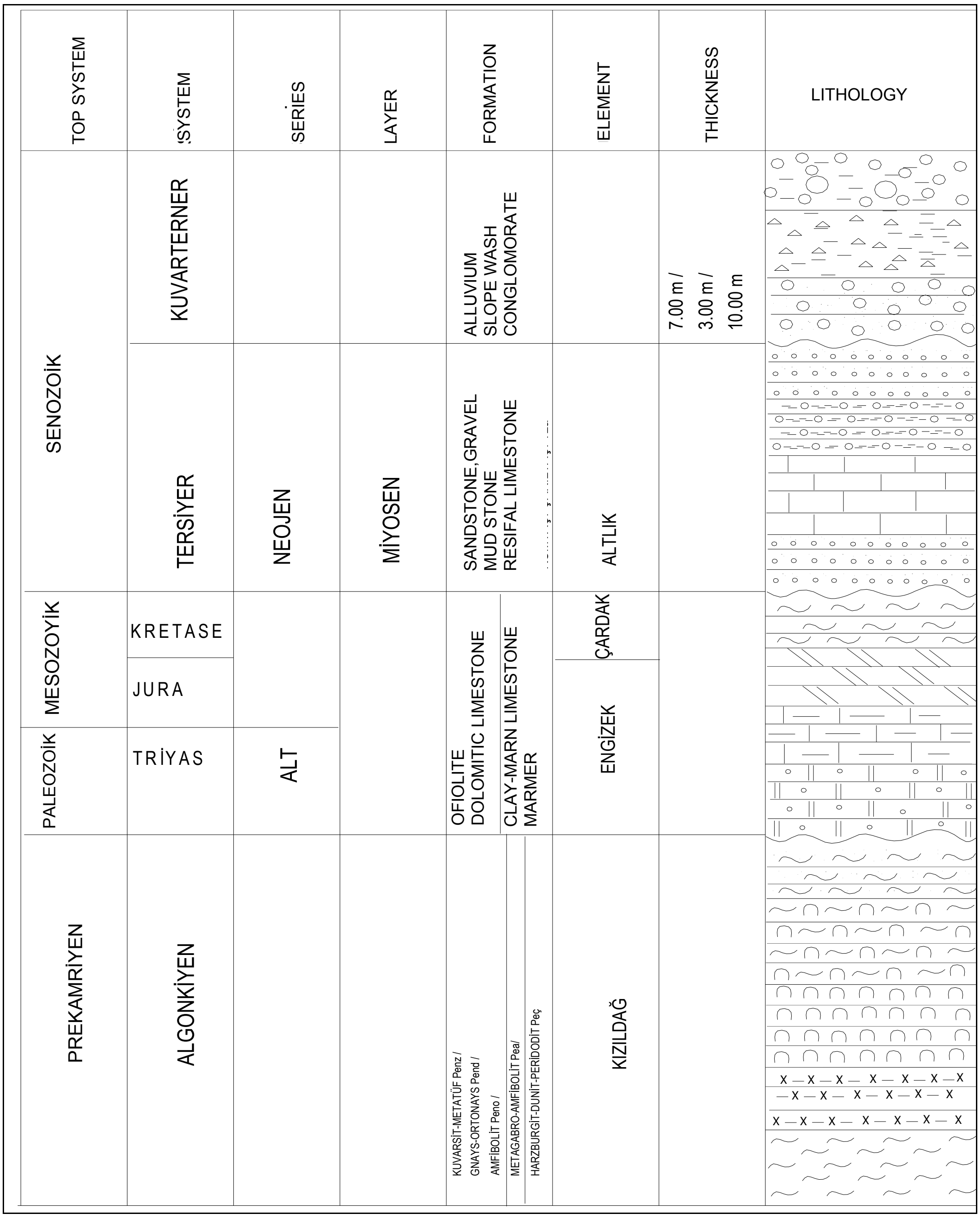


Figure IV.9. Generalized Stratigraphical Cross-Section of the Project Area

Clayey-Marly Limestone (Triassic) (Trd)

As a result of the overlapping of limestone kalker, marne kalker, speckled kalker, clay kalker, shale, silt-stone and kalker schist, it passes on to the carbonated shales on the top layer. The unit starts with pinkish-speckled thin, middle-layer limestone. The marne outer layer continues with speckled limestone, whereas the fresh and cracked surface continues with light bluish limestone. Then its color turns to red. Speckled limestone is followed by grayish limestone – re-crystallized limestone. The unit then passes on to the layer which is composed of greenish speckled, reddish pink carbonated

light clayed limestone, shale – shale-siltstone kalker schist as it goes on to the top. Limestone declines in the pile as it goes on to the top. The unit is represented with pinkish carbonated shale almost in its whole form.

Dolomite Limestone (Jura) (Trjkk)

Calcite veined dolomite limestone is represented by Jura aged, cream-beige-white colored, middle-thick layered, calcite veined limestones of which bottom parts rarely without dolomite metamorphism. It displays carstic characteristic. In bottom levels there exist cornered gravel stone stowed from coarse to fine.

Sandstone, Pebble (Lower Miocene) (Tza)

The pebble is a distostromal unit containing sandstone, lime stone with matrix majority and re-crystallized lime stone blocks. Above the basis with discordance, it begins with up to a few cm long re-crystallized lime stone that is dark gray-blackish, with ambiguous layering, bad dimensions, sharp corners and half-rounded, and that contains carbonate cement and pebble containing re-crystallized lime stone and marble grains. Its fresh cracked surface, from time to time, penetrates into the sandstone laterally and vertically, which has pinkish white, dark gray and multicolored polygenic element, with the matrix containing carbonate, and cement. It is not rich in terms of fossil.

Recifal Lime Stone (Middle Miocene) (Typ)

In the subsoil, it has settled on the clay stone, sand stone in the form of concordance. The shallow sea facies that starts as the sandy limestone in the subsoil becomes a thick layer containing plenty of coral fossil at the middle and ceiling levels and its white colored samples are encountered there. It has many shell fragments, which are white, colored with hard corners.

Clay Stone (Upper Miocene) (Tss)

It is a territorial facies formation with beige like, light gray with thin-medium layers. Although they present a quite hard and robust structure containing thin layers of sand stone, decomposition over the time due to hot and cold effects is encountered in the oxidayon zone.

Sandstone, Pebble (Upper Myosin) (Ta)

This unit, which forms the ceiling level of the Pedestal Group, is mostly composed of pebbles. The origins of the pebbles that form this lithology with a cement that is mostly gray colored are generally serpentine, basalt, amphibole and lime stone.

Alluvium, Hillside Rubble and Terrace Conglomerate (Quaternary) (QAl, QYm, Qt)

They give samples in the riverbed and in the banks of the river. It is composed of huge blocks that did not harden, pebbles and sand. The terrace conglomerate with bad dimensioning, blocks and that half hardened is seen on the banks of the former river bed. It is observed to be 2–10 meters thick.

Magmatic Rocks

In the area under examination and in the surrounding of the area, the ophiolite which is composed of Upper Cretaceous aged spilite, one of the magmatic rocks, lime stones with radiolarian, serpentine, gabbro, diabase complex gives samples.

Ophiolite (Cretaceous) (Ka)

It is a combination of spilite, radiolarian limestones, serpentine, gabbro, diabase. The upper Cretaceous is aged. Since the rock groups comprising the unit have different age, lithology, and formation environments, they are found side by side in pieces with varying size. The co-existence of ophiolite blocks with oceanic crust origin and the lime stone blocks settled in the continent shelf could be demonstrated as an example. The serpentine that is suitable for soft and ductile deformation is the rocks such as the shale, olistostromal groups that engage with complex relations with the shale and fillat schist that is rarely seen. The rocks that are found in the form of block, however, in descending order of abundance, are the lithologies that are suitable for hard and flexible deformation including lime stone, pelagic lime stone, cherd, clay stone, serpentinized predotite, gabbro, quartzite and marble, the metamorphic rocks. The dimensions and forms of the blocks vary greatly.

Metamorphic Rocks

In the project area, Permian aged sileks marble, precambrian aged quartzite, metatuf, gneiss, ortogneiss, amphibolite, metagabbro, metaophiolite, harzburgit, dunite and peridotites are found.

Metaophiolite (Precambrian -Algonkian) (Peç)

Harzburgit, lerzolit, dunite and vebsteritten have formed. It is seen in the samples with a brownish color. They have been subject to advanced levels of metamorphism. Peridotite rocks and the rocks with pyroxenite compound rocks are easily distinguished from the others with their general appearance, structure with layers, texture and main minerals. The largest samples are composed of amphibolschist.

Metagabbro (Precambrian -Algonkian) (Pea)

The study field of these units that are represented by the anorthosite, eclogite–amphibolite, meta–amphibolites is worth attention due to their layering. The layers appear in the form of levels where the dark and light colored minerals are densely located. It starts on the Peridotites with the anorthosite zones, and, firstly, lenses demonstrate layering with a thickness of 10-20 cm. Apart from layering, foliation has developed. It is white colored, very hard with large crystals. The presence of the light green colored foliation gneiss and advanced level metamorphic (eclogite-amphibolite transition) rocks on the top of the metagabbros indicates that the degree of metamorphism drops toward the lower parts. The metagabbro-amphibolites of which minerals that underwent less metamorphism can be identified are found on the ceiling of the pile.

Amphibolite, Ortogneiss, Gneiss, Metatuf, Quartzite (Precambrian -Algonkian) (Pen)

The unit is an advanced metamorphic group composed of biotite–hornblende schist, amphibolite, gneiss, garnet micaschist, staurolite schist, metaquartzite and fillat that contain migmatitic levels. The biotite and biotite–hornblende schists seen at the bottom of the pile are green-brownish. It is extremely hard with gneissic foliation. The rock has porfiroblastic texture. Its minerals underwent weak crushing and disintegration. They are co-located with amphibolites, biotite–biotite hornblende schist. They are dark colored and well-laminated.

Foliation and small curves appear. The micaschists that are densely located in the pile toward the top have huge crystals and also feature gneiss. The gneiss is whitish and well-laminated with multicolor. In the lower levels, it contains garnet and opaque mineral toward the top. Where the opaque minerals are densely located, there are iron ores that stand in harmony with the micashists. The micaschists that follow metaquartzites are composed of large granular quartzite crystals. The quartz demonstrates examples of binding. The quartzites are replaced by thin granular staurolite schists toward the top. Staurolite schists are replaced by micaschists rich in quartz and the gray colored fillats toward the top. At the very top, the carbonate compounds in the fillats increasingly turn into calcschist.

Sileks marble (Permian) (Pt)

It is laminated dolomotic composed of marble and sileks marble with a dark gray color that is mid-thick with a very thick layer with clay in the bottom and low level of sand. It creates chamfers, which rapidly rise in the topography. It looks clear with its durable morphology and whitish-light colored appearance when looking from a distance. Its bind with the cover units has lost its primary relation due to tectonic activities.

IV.2.2.3. Geology of Dam Area and related Structures

Sariguzel Dam and HEPP

The project consists of dam, diversion tunnel, energy transmission line, surge chamber, penstock and power plant. Geology map of the project area and surroundings can be seen in Figure IV.10.

Dam Area

In the location where Sariguzel Dam axis will take place, there exist metaophiolite which consists of Precambrian aged harzburgit, lerzolit, dünit and vebsterit from bottom to top. Amphibole schists constitute the biggest outcrop. Layered structure is a characteristic feature. On top of these around 22 m thick alluvional lithology consisting of clay, silt, sand, gravel and blocks.

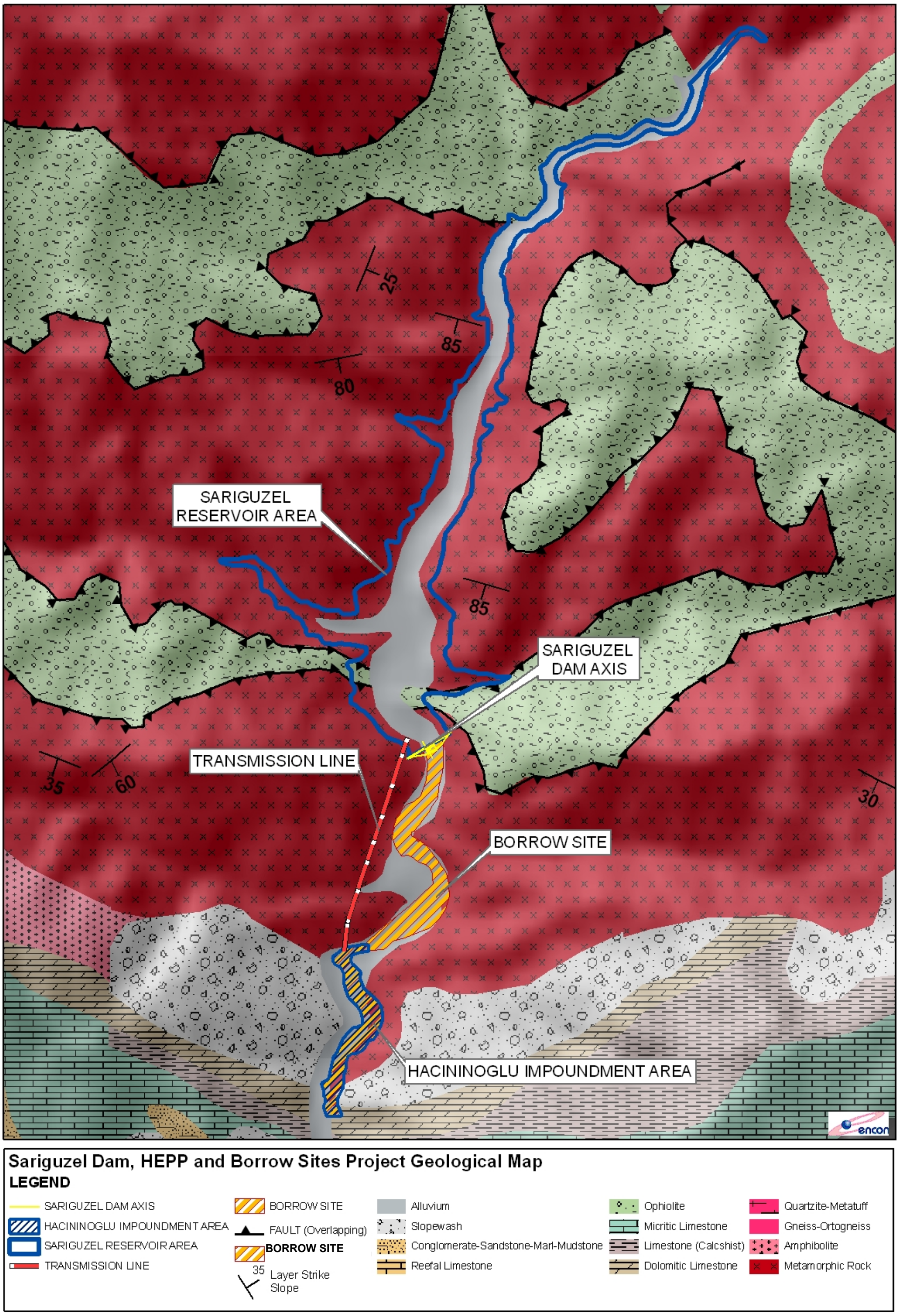


Figure IV.10. Geological Map of the Project Area and Surroundings

In the wells that open to the right shore, in the form of altitude sediment that is dependent on the riverbank elevation; silt within medium clay levels that has a relatively high plasticity in different sizes (from small to large in deep levels) and is observed in a thickness of up to 21 meters between 756 and 804 meters is cut.

When it comes to cutting resistance of the dam area; the alluvial lithology and Precambrian aged metaophiolite do not cause any problems in terms of cutting resistance. The Derivation Tunnel; it shall be opened in the metaophiolite unit composed of Precambrian aged harzburgit, lersolite, dunite, vebsterit.

According to Terzaghi classification, the ground class is 3, the rock load is 0-0.25 B. If the derivation tunnel is to be opened toward the thalweg, a construction in the form of conduit shall be required in the alluvium.

Power Transmission Tunnel

The transmission tunnel that will be opened within the framework of Sarıgüzel Dam, HES and Material Quarry Project shall pass through aphiolites, gabbro, limestone–radiolarian limestone, amphibiolite and metaophiolites. In the power tunnel route, 3 foundation-boring wells have been opened. In these wells, amphibolite schist, amphibolite, serpantinite, gabbro–metagabbro, radiolarian limestone and metaophiolites have been cut.

According to BST results derived from the parts of the wells where metaophiolite was cut, these units are less permeable-permeable.

Penstock

In the section where the penstock shall pass through, metaophiolites are found below vegetable soil that is 1.50 meter thick. The ground class is 3, the rock load is 0-0.25 B. In the penstock route, vegetable soil and hillside rubble shall be removed by excavation and the penstock supports shall be settled on the underlying rock.

Powerhouse

The foundation boring wells have been opened in the area where the powerhouse shall be built. In these wells, vegetable soil with an average thickness of 2 meters that settled as allochthonous, limestone below the soil, 4 meter–7 meter-thick hillside rubble composed of serpentine and other ophiolitic rock pieces with angular pieces that contain clay at the portions close to the stream bed have been cut.

The foundation rock is composed of ophiolite–amphibolite and metaophiolites. It has been observed that there is no problem at the foundation rock in terms of sensitivity and durability, and the foundation rock is totally impermeable except for low level of permeability seen on the contacts of the intermediate levels with clay band according to results of BST experiments.

In the area where the structure shall be built; the vegetable soil, hillside rubble and alluvium residues shall be cleaned by excavation and removal until ophiolite formation that comprises the foundation rock. Under these circumstances, any bearing or sensitivity problem shall not be encountered.

Borrow Site

The material field is the alluvium deposits dragged and brought by the River Ceyhan. According to the potrofic results of the samples taken, the sample composed of sand with varying granule size and flat cornered pebbles contained Fillit, Gabbro, Diabase, Basalt, Marble, Calcschist, Peridotite-schist, Quartzite pebbles as thick materials. The thin materials included Epidote, Chlorite, Biotite, Quartz, Hornblende as the rock sand which the product of the thick material.

IV.2.2.4. Structural Geology

Two vertical fault lines within the direction of northern west-southern east are found at the district called Kısıklı Strait to the south of the study area and at the district Hendekli Stream. It is observed that, to the north, Precambrian aged units overlay the Cretaceous aged ophiolites while Trias aged units overlay the Cretaceous aged ophiolites.

Discordances

Upper Miocen aged bears the Terrace Conglomerates pertaining to Pedestal Formation, Sandstone that is the member of the same formation as angular discordance, Pebbles. Likewise, there is a discordance between Trias aged Engizek Formation unit and between Dolomitic and Limestones with Clay-Marl and Quartzite–Metatuf, a member of Kızıldağ Formation. The ophiolites that are the members of Cretaceous aged Çardak Formation cover them with techtonic contact with discordance.

Faults

One of the large faults in the region is Elbistan Fault that is a fault lien which has not broken yet. To the east, there is Surgu Fault. Toward the northern east of the project area, there is Malatya Fault, which is perpendicular to Surgu Fault with a length of 100 km. In the region, there are gravity and impulsion fault lines with high angles that occurred within the geologic time range due to vertical movements. These settlements within the ophiolites are observed as discordance. In the neighboring areas, nearby the county of Elbistan; there is Elbistan Fault Zone with approximate E–W direction with an approximate length of 75 km. Also, the beat vein of the hollow KOR, the world’s longest sediment trench, is nearby Elbistan. The fault line that stretches from east to the west in the form of a “Y“ is a branch of the hollow KOR, the world’s largest fault line. The region is within the second-degree earthquake zone.

Attachments

When the tock units surfaced in the study area have been examined in a detailed manner with the surface studies, in the Miocen aged formations that vertically and horizontally shift to one another, the vertical or near-vertical main joint systems in the direction of NW–SE and NE–SW that developed perpendicular to one another have been f found active. The vertical main joint system with E–W direction are also seen on the quartzites that are the members of Kizildag Formation.

IV.2.2.5. Natural Disaster Status

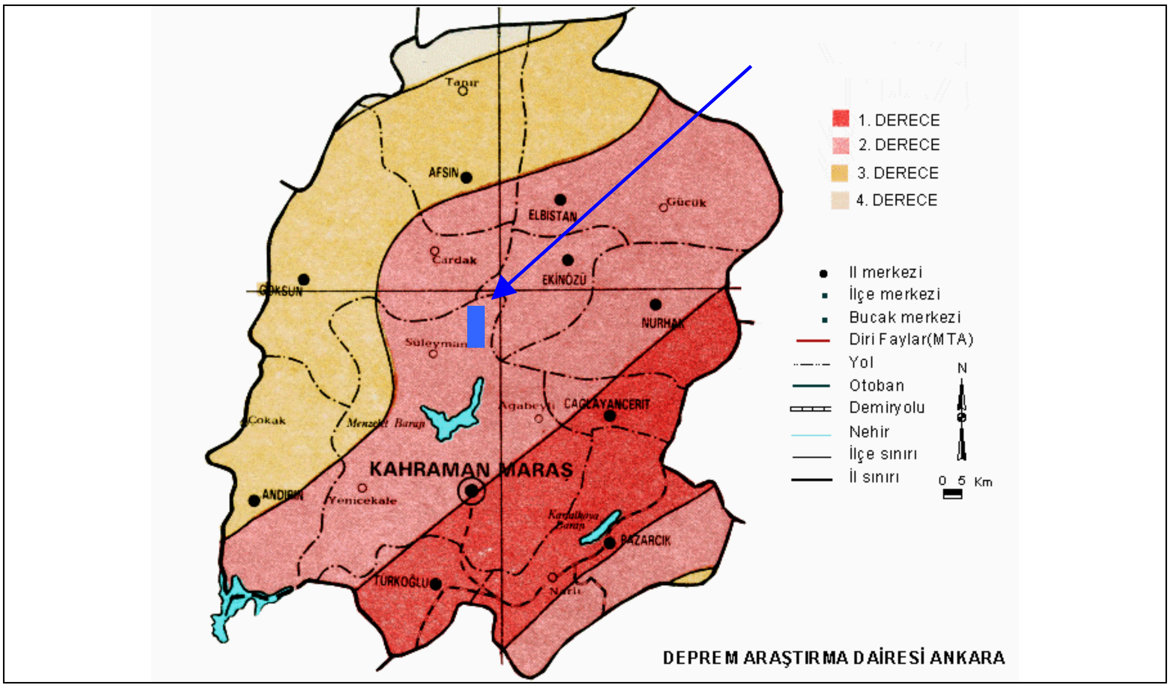
Kahramanmaras Province and surroundings present key data for geology and tectonics of Turkey. Tied up with geological evolution within Alpine-Himalaya belt, a complex geology and tectonic structure is present. When analyzed thoroughly, this complex structure provides important key data and sheds light on tectonism of Turkey. One of the important fault lines on earth, Olu Deniz Fault Line, which constitutes the border between Arabian and African plates, reaches out to Kahramanmaras plains.

In our country, one of the main fault lines that produce earthquakes is East Anatolian Fault Line that starts from Bingol, passes Malatya, and reaches to Kahramanmaras. Toros-Zagros Overlapping Zone that reaches to Kahramanmaras via Bitlis and Lice constitutes another active fault line. Consequently 3 main fault lines meet near Kahramanmaras. Tectonism developed in three main fault lines reflects on the geology of Kahramanmaras and surroundings.

The area that includes Sariguzel Dam and HEPP Project is a 2. Degree earthquake region according to Turkey Earthquake Regions Map of T.R. Ministry of Public Works and Settlement General Directorate of Disaster Affairs Earthquake Research Department. Seismicity map that includes project area is given in Figure IV.11. In surroundings of the region “Elbistan Fault Line” takes place as an active fault line. Elbistan Fault Zone which is near Elbistan District has about an E–W direction and around 75 km length. Active fault map of the region is presented in Figure IV.12.

According to records of the; T.R. Ministry of Public Works and Settlement General Directorate of Disaster Affairs Earthquake Research Department, Bogazici University Kandilli Observatory and USGS (United States Geological Survey), there happened 27 earthquakes with magnitudes between 4.0 and 4.9, and 4 earthquakes with magnitudes greater than 5.0 in project area and its close surroundings between the years 1900-2004. Within these earthquakes having magnitudes between 4.0 and 5.9, the maximum magnitude earthquakes happened in 1908 with 5.4 and 1922 with 5.3. The earthquakes happened in the last one-year with magnitudes higher than 4 are given in Figure IV.13. Earthquake Risk Analysis for the region covering Kandil Energy Group Project Facilities - including Sariguzel Dam, HEPP and Borrow Sites - were done according to probability method. Considering the earthquake data between the years 1900–1987 and tectonic characteristics, earthquakes occurred in project area has magnitudes 5.0 and 5.1.

In addition to earthquake risk, landscapes are observed especially in winter season when precipitation is abundant, due to geological and topographical characteristics in Kahramanmaras Province, provincial center and surrounding districts. Due to landscape risk some part of the villages were taken into scope of control study programs and some part are decided to be transferred in accordance with Disaster Law No 7269.



Deprem Arastirma Dairesi Baskanligi		**Earthquake Research Department**	
1./2./3./4./5. Derece	: 1st /2nd/ 3rd/ 4th/ 5th Degree	Yol	: Road
İl merkezi	: Provincial center	Otoban	: Highway
İlçe merkezi	: District center	Demiryolu	: Railway
Bucak merkezi	: Sub district center	Nehir	: River
Diri faylar	: Active faults	İlçe sınırı	: District boundary
		İl sınırı	: Provincial boundary

Figure IV.11. Seismicity Map of Kahramanmaras

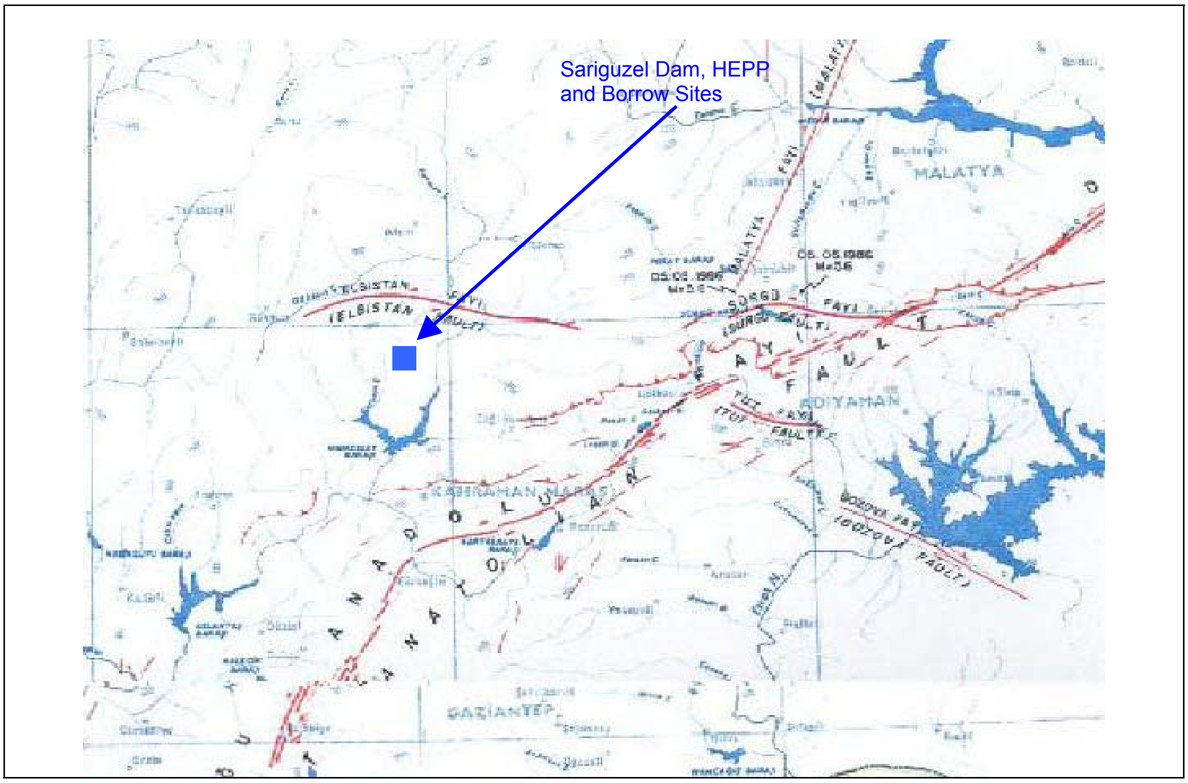


Figure IV.12. Active Fault Map of the Project Area and Surroundings

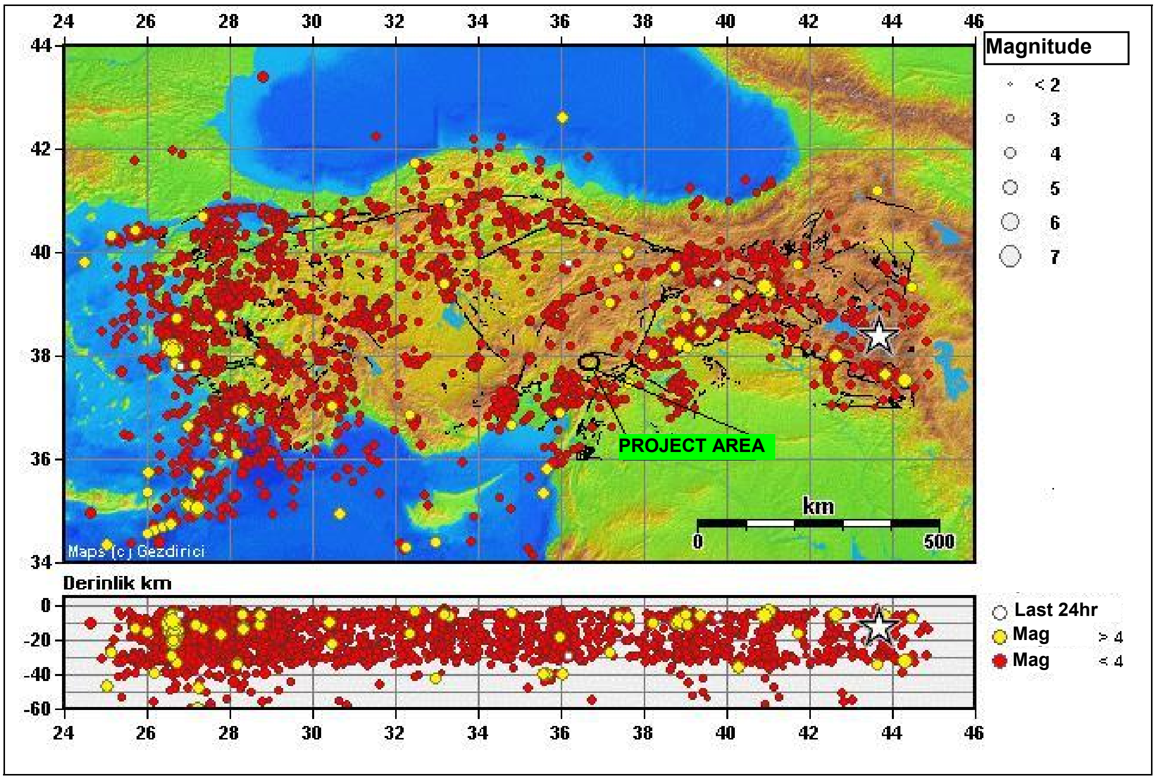


Figure IV.13. Earthquakes Occurred in the Last One Year in Project Area and Surroundings

IV.2.3. Hydrogeological Characteristics of Ground and Thermal Water Resources (Water Levels, Amounts, Flow rates of Sources, Current and Planned Uses)

Generally project area takes place on impermeable metamorphic rocks. A big portion of reservoir area is located on alluvium. In addition to metamorphic rocks, magmatic ophiolite units take place around the working area.

Metamorphic rocks that are main rock type in the project area are determined to be impermeable. In addition to this, when the results of the borehole shear test (BST) of opened wells are analyzed, these units are low permeable as in accordance with their advanced metamorphism.

The properties of groundwater regime was interpreted by evaluating groundwater levels observed in well bores drilled in the area during the engineering geology study done by EN-SU Engineering within the framework of Hacininoglu Regulator, HEPP and Borrow Sites Project which is a part of Kandil Energy Group Projects. Because Sariguzel Dam, HEPP and Borrow Sites Project area and Hacininoglu Regulator, HEPP and Borrow Sites Project area are located on the same region, in order to evaluate the hydrogeology of the area this data was used again.

In working area, groundwater charges surface water. Especially the changes in water level in well bores drilled nearby the valley clearly show the movement of groundwater to Ceyhan River. Water levels in the drills showed a nearly straight gradian in opposite to the topography. Fault fracture controlled movement of groundwater in metamorphic rocks will increase the charge to Ceyhan River in rainy periods.

IV.2.4. Hydrological and Ecological Characteristics of Surface Water Resources

Kahramanmaras Province in which project area takes place is totally within the Ceyhan Basin. Basin is neighbored from west by Seyhan, from north and northeast by Firat, from south by Asi Basins. Total precipitation area of Ceyhan Basin is 21,222 km^2. In basin, annual average flow is 211.19 m^2/s, and annual average flow height is 313.84 mm. Among all basins the contribution of Ceyhan Basin to total flow is 3.56%. Ceyhan River is one of the big streams of Mediterranean Region.

Ceyhan River is 509 km long and its main tributaries consist of Hurman, Goksun, Sogutlu and Aksu Streams. It is sourced from about 2,000m-high mountains around Elbistan Savanna. River converges first with Sogutlu Stream, and then Harman Stream. After this point, Ceyhan river forms narrow meanders and converges with Goksun Stream near Ortakli Village. After that Ceyhan becomes a big river and starts to flow through narrow and deep gorges. The river flows south for a time, turns to east along Ericek Village, and then turns to southeast and turns to southwest from south of Ekinozu.

The flow of Ceyhan River temporarily increases in November and December by the effect of autumn rains. In these months flow increases from 50 m^3/sec to 380 m^3/sec. In spring season the flow increases as a result of rains and melting of snow.

Continuous and discontinuous brooks, which feed Ceyhan River, are determined during the surface water investigations of the project area. In Figure IV.14 surface water resources in the area are seen. There are many low-flow sources in the area. Besides, there are fountains in the vicinity of Guvenli and Berman Quarters and at the west of Kertmen Village. Interviews made with local people indicated that potential water resources do not meet their demand fully.

The nearest surface water resource to borrow sites and construction areas is Ceyhan River. Borrow sites will be established in watercourse of Ceyhan River. Construction site will be around 100 m away from watercourse. There is no water resource used for drinking purposes near to these areas. Water in the nearest village to project area (Hacininoglu) is supplied by storing the spring waters in higher elevations.

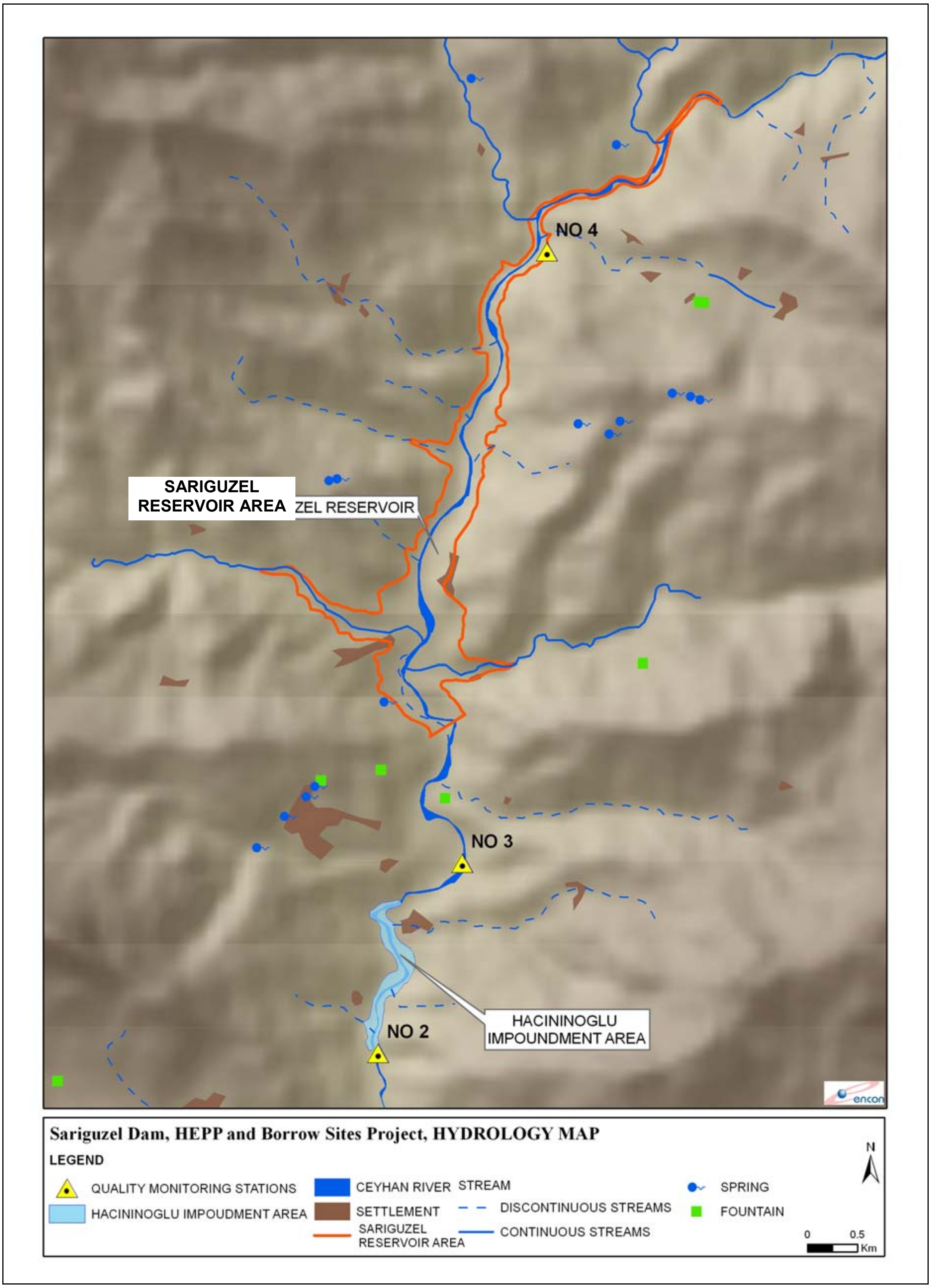


Figure IV.14. Surface Water Resources Map of the Work Area

In the scope of the work, surface water sampling and in-situ measurements were done. In Figure IV.13, sampling point No 2 is located in downstream of Hacininoglu impoundment area (at regulator axis), sampling point No 3 is in downstream of Sariguzel dam reservoir and sampling point No 4 is in upstream of dam area. Measurements done were assessed in detail in Section IV.2.15.2. Water quality values determined in DSI stations related to surface water resources in the area are also given in the same section.

Ceyhan basin (covering planned dam lakes and facilities) and sub drainage areas were determined by using numerical topography data. The flow observation stations of EIE and DSI in basin were located and flow value record periods of these stations were determined. Basin boundaries and locations of stations can be seen in Figure IV.15. Record periods of stations are given in Table IV.10; monthly average flows data belong to EIE stations used in the study are given in Table IV.11.

Table IV.10. Observation Periods of Flow Observation Stations (EIE data)

STATION NO	STATION NAME	1940-1952	1953	1954	1955-1960	1961-1969	1970	1971-1980	1981	1982	1983-1985	1986	1987-1990	1991-2000
20-01	Ceyhan River-Kilavuzlu													
20-05	Ceyhan River-Kabaagac (Akcil)													
20-09	Goksun River-Poskoflu													
20-19	Ceyhan River-Kandil													

Table IV.11. Monthly Average Flow Values (m^3/sec) belong to EIE stations used in the Study

STATION NO/NAME	MONTHS											
	1	2	3	4	5	6	7	8	9	10	11	12
20-19-Kandil	47.7	50.2	91.7	119.0	87.5	49.2	27.1	20.1	22.1	25.4	32.7	40.5
20-09 Poskoflu	10.9	11.2	23.5	35.2	28.2	12.9	4.6	2.5	3.1	5.1	6.3	8.7
20-05 Kabaagac	22.4	24.0	38.8	60.4	45.9	26.6	16.0	13.4	14.4	17.1	20.7	22.8
20-01 Kılavuzlu	73.0	90.6	148.3	210.1	158.5	76.0	41.8	30.3	29.1	33.6	42.8	61.5

In feasibility report prepared for Kandil Energy Group Project, the data belong to flow observation points located in the area are gathered from EIE and Menzelet Dam activity reports. There was no previous flow observation made in Sariguzel Dam and HEPP area. In order to calculate flow amounts in project area, data was gathered from Kilavuzlu Flow Observation Station (No 20-01), and Kandil Flow Observation Station (No 20-19), which belong to EIE.

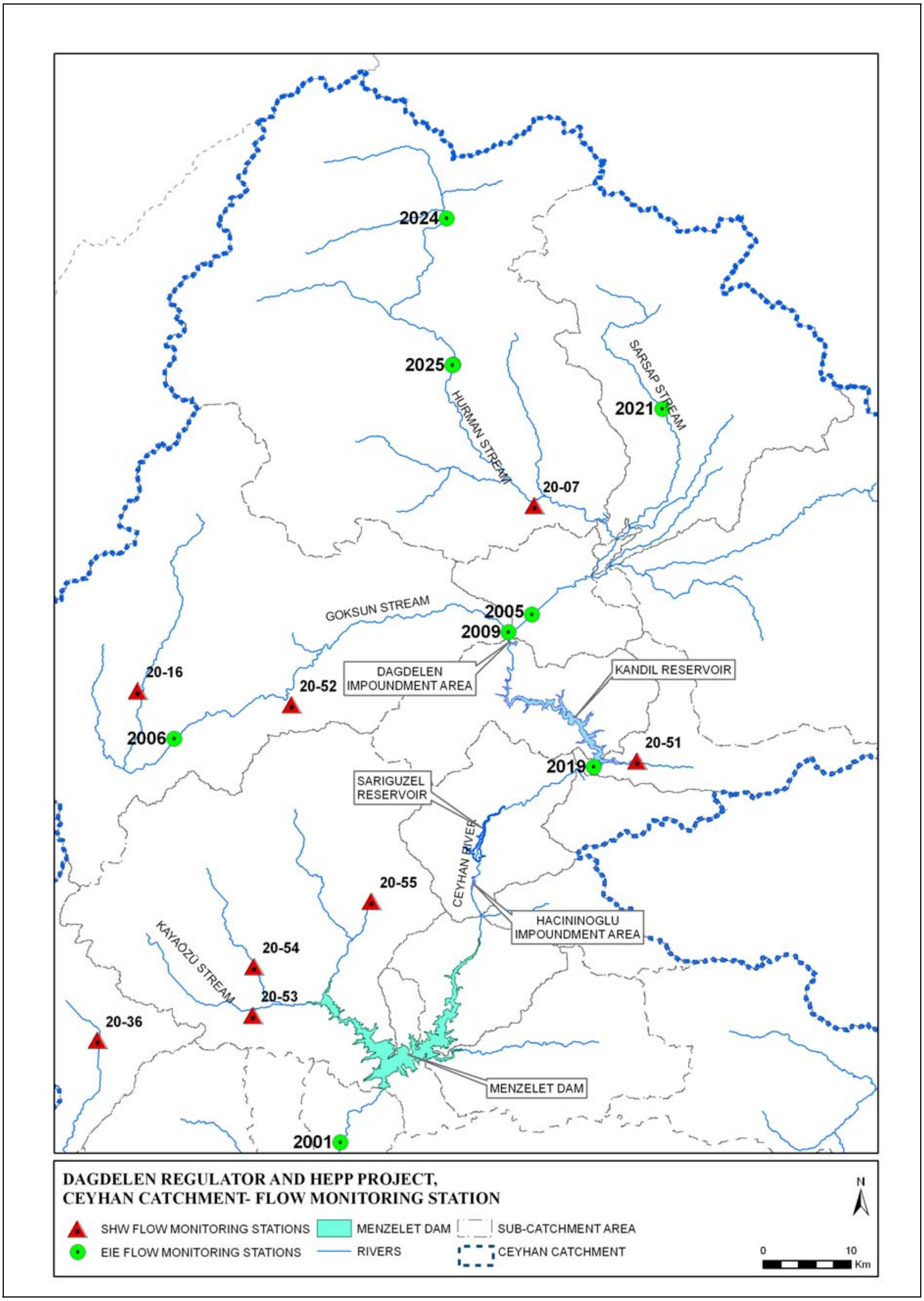


Figure IV.15. Locations of EIE and DSI Flow Stations

Since no previous flow observation in Sariguzel Dam and HEPP area is available, dam input flows are calculated by using General Basin Equation and natural flow data of Kandil flow station. General Basin Equation was established by interpolated data of 20-19 Kandil flow station and 20-01 Kilavuzlu flow station. With these equations, the coefficients forming the characteristics of the basin are calculated. General Basin Equation is given in Table IV.12.

Table IV.12. General Basin Equation

General Equation	**V**	**=**	**K x A^n**
Kandil	1,389.16	=	K x 6,255.00^n
Kilavuzlu	2,632.29	=	K x 8,484.00^n

In the above equations V; shows the average annual flow (hm^3), K and n; shows basin characteristics and A; shows the drainage area (ha). Within the scope of feasibility studies the equations are solved and K and n are calculated as 1.52 *10^{-5} and 2.10, respectively.

Total drainage area of the Sariguzel Reservoir and HEPP area is 6,593.40 ha. It was calculated from the General Basin Equation that, the flow value of this drainage area is 1,551.44 hm^3 and basin flow coefficient is 1.12. For Sariguzel Dam, natural flows are taken into consideration between years 1954-2003.

Dam axis natural flows are calculated by adding the spring water usages to monitored flows, and the estimated flows (for years 2010, 2015, 2020) are calculated by subtracting future water usages from the monitored flows. Moreover, current water usages are subtracted in order to obtain today's flow values. Calculated monthly total flow values are shown in Figure IV.16.

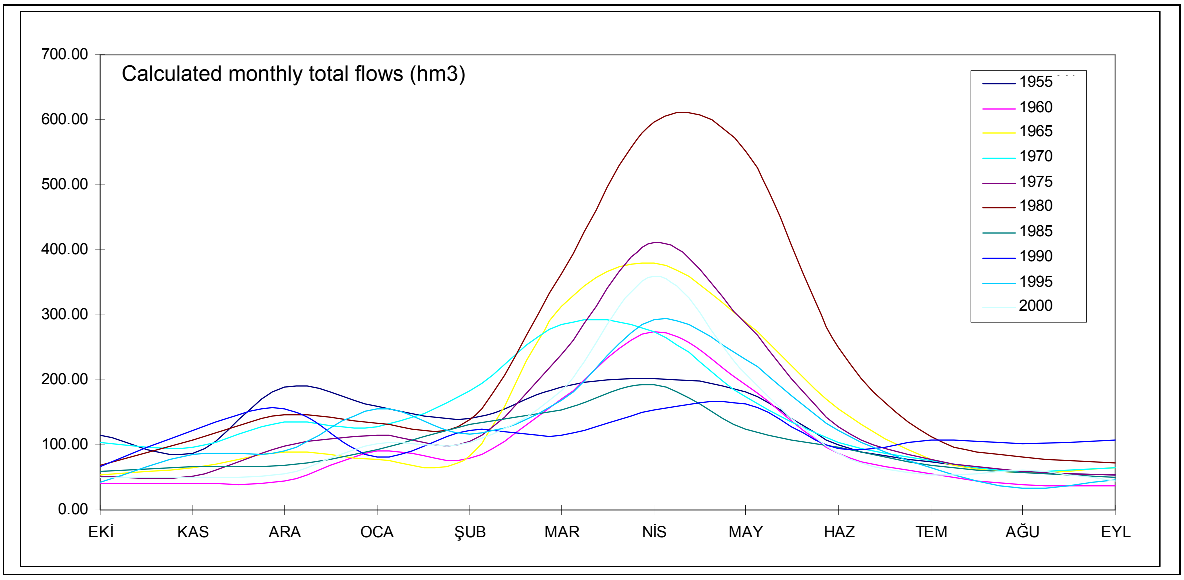


Figure IV.16. Calculated Monthly Total Flows (hm^3)

IV.2.5. Current and Planned Use of Surface Water Resources (Drinking, Utilization, Irrigation Waters, Water Products, Transportation, Tourism, Power Generation, Other types of utilization)

On Ceyhan River, there are Kilavuzlu Dam and HEPP, which was started to be constructed for irrigation, energy production and drinking water purposes in 1994. Four artificial ponds that are under construction in Kahramanmaras Province, namely Zorkum, Merk, Meydan and Sarsap are in the scope of works of DSI.

Local people obtain their domestic water supply from surrounding sources. Project area has a mountainous topography. Local people utilize the low-slope areas of hillsides for agricultural use. They generally use surface water for irrigation purposes. It is determined that water is taken from river to irrigate agricultural areas nearby the riverside.

Ceyhan River has a significant hydraulic potential. Hydraulic projects and thermal facilities established on river are shown in Table IV.13.

Table IV.13. Existing Facilities on Ceyhan River

Facility	Installed Capacity	Annual Production Capacity
Sucati HEPP	7.0 MW	28.0 GWh
Kisik HEPP	9.6 MW	48.0 GWh
Menzelet HEPP	124.0 MW	515.0 GWh
Sir HEPP	283.5 MW	725.0 GWh
Aslantas HEPP	138.0 MW	569.0 GWh
Berke HEPP	510.0 MW	1,668.0 GWh
Kilavuzlu HEPP	57.2 MW	114.0 GWh
Elbistan Thermal	1,200.0 MW	1,860.0 GWh

IV.2.6. Soil Characteristics and Use of Soils (Physical, Chemical and Biological Characteristics of Soil, Land Usage Capability Classes, Erosion, Current Uses of Soil)

In Kandil Energy Group area that consists of two regulators and two dams, some land types, which are devoid of soil coverage, are seen besides big soil groups.

According to Kahramanmaras Province Environment Condition Report, throughout the province alluvial, colluvial, organic soils, brown forest soil, limeless brown forest soil, red brown forest soil, brown soil, limeless brown soil, red Mediterranean soil, red brown Mediterranean soil, basaltic soil and chestnut color soil groups.

In the area where the Kandil Energy Group is located, alluvial soils are transported by rivers on young sediments with (A) C profile and their slope is very gentle. Mineral compositions are heterogeneous and they depend on the lithologic composition of the river basin. There is either none or very low horizoning in the profiles.

Vertical permeability is lower in the fine textured parts and the parts, which have groundwater. Surface has moisture and organic matter content is high. Because of good drainage with the coarse particles surface levels are dried rapidly. The vegetative cover is dependent on the climatic conditions.

Colluvial soils take place at bottom and edges of steep slopes. (A) C profile are young soils formed by gravity, landslides, surface flows and material transport. Some layers are seen in the profile containing different particle sizes according to precipitation or surface flow intensity. The particle diameters are decreasing in line with the decreasing surface flows.

Brown forest soil is formed on main material that rich in lime. The horizons are in A (B) C shape and they gradually pass each other. Color of the A horizon is dark brown because of its advanced structure and the horizon has granular and porous form. Color of the B horizon is varying between light brown and red. These soils are generally formed under the forest cover. Effective soil formation in this area is calcification and podsollation. Soil has good drainage and the area is mostly used as forest and pastureland.

Sariguzel Dam, HEPP and Borrow Sites Project is located within the boundaries of Central District of Kahramanmaras Province. Vegetation covering Kahramanmaras soils has different characteristics than the region. Because Central Anatolian Climate dominates northern and northeastern parts of Kahramanmaras, in this region mainly sugar beet, wheat and pulse grow. Vegetation is weak due to steppe characteristics. However, because south and southwestern parts are in East Mediterranean Region, the vegetation cover here consists of maquis groups. But due to forest-works the forest planted instead of maquis groups eliminated the vegetation cover partly. Province land existence is shown in Table IV.14. It is seen that 35% of Kahramanmaras Province area is covered by forest and shrubbery areas whereas 30% is covered by agricultural areas.

Table IV.14. Kahramanmaras Land Existence Table

Way of Usage	Area (Hectare)	Ratio (%)
Farmland	426,467	30
Forest – Shrubbery	503,321	35
Meadow – Pasture	117,269	8
Non-agricultural Area	371,908	26
Water Surface	15,635	1
TOTAL	1,434,600	100

The land covering Sariguzel reservoir and other project facilities consist of forest area and agricultural areas. Land classifications for Kahramanmaras Central District are shown in Table IV.15. According to this, 70% of the land consists of Class VII soil.

Table IV.15. Kahramanmaras Central District Land Classification

District	Soil Classifications								Total
	I	II	III	IV	V	VI	VII	VIII	
Center (area-ha)	16419	9654	13364	25127	113	18124	243310	20138	346249
Center (area-%)	4.74	2.79	3.86	7.26	0.03	5.23	70.27	5.82	100.0

In Soil Protection Project study done in 2006 by ERE, the required precautions were discussed for preventing regulator, water transmission tunnel, plant and surface of lake from damaging agricultural lands in the zone. Via this project, characteristics peculiar to project area were gathered. Land distribution for project area and surroundings prepared by soil protection project data can be seen in Appendix 1.3. Prepared Soil Protection Project is given in Appendix 3.

Soil depth in the area changes between 0 and 20 cm. The soil has a sandy-loam characteristic and is poor in organic matter. In the area, land problems such as moderate level erosion, medium stoniness and sporadic rocky places and insufficient water holding capacity exist. Alkalinity and drainage problems are not seen.

IV.2.7. Agricultural Areas (Agricultural Development Project Areas, Special Crop Plantation Areas, Size of Irrigated and Dry Farmlands, Product Patterns and Annual Production Amounts

According to Kahramanmaras Province Environment Condition Report, 80% of the agricultural areas in the province are used for irrigated and dry farming, and the remaining agricultural areas are used as orchard, vegetable-garden and vineyard. The usage status of agricultural areas in the province is presented in Table IV.16.

Table IV.16. Land Usage Status of Cultivated Farmland

Way of Usage	Area (Hectare)	Ratio %
Vegetable-garden	10,346	2
Orchard	31,263	7
Vineyard	23,362	5
Other (Field etc.)	361,496	86
TOTAL	426,467	100

The most common individual usage way of agricultural areas, where Kandil Energy Group is located, is dry farming. Dry farmland includes unwatered parts of alluvials and colluvials, adjacent highgrounds, low and middle slope upland soils. In Maras alluvials and surroundings dry farming is practiced without fallow. Grain, leguminous seeds and even cotton are cultivated successively. Dry farming in Afsin-Elbistan region on the other hand, is practiced with fallow. Major portion of the area under dry farming is class IV or lower class.

A main portion of vineyard land is class VI and VII. Transfers from dry farming lands increase vineyard land.

23% (approximately 62 hectar) of Sariguzel Reservoir area consists of agricultural areas. On high lands pasturage and stock farming is prominent. Dry farming is practiced commonly in the area. The most cultivated field crops in agricultural lands are grains. Besides wheat (mainly), barley production, fruit and vegetables are also produced in the region where irrigated farming is practiced. On hillsides, almond and walmut is produced. The land is characteristically a dry marginal agricultural land, its soil depth is in between 0-20 cm, it has moderate level erosion and stoniness problem, and moreover precipitation regime is not appropriate for irrigated farming. These factors restrict the diversity of agricultural products.

In the scope of this study, the types and distributions of lands staying within work area borders are defined using the data of Soil Conservation Project and details are given in Table IV.17 and Table IV.18.

Table IV.17. Land staying under Project Facilities and Sariguzel Reservoir* (Soil Conservation Project, 2006)

	Way of Usage	Area (Hectar)	Ratio %
Reservoir Area	Other Land	24.58	9.25
	Planted Farmland	29.08	10.94
	Prime Farmland	33.12	12.46
	River	27.48	10.34
	Forest Land	151.48	57.00
	Total	**265.73**	**100**
Borrow Site	Planted Farmland	1.93	2.99
	River	14.77	22.87
	Forest Land	45.02	69.68
	Marginal Farmland	2.88	4.46
	Total	**64.61**	**100**
Powerhouse Buildings	Planted Farmland	0.03	16.99
	Forest Land	0.14	83.01
	Total	**0.17**	**100**

* Whole construction area and administrative buildings stay under forest area.

Table IV.18. Land Distribution within the Borders of the Work Area (Soil Conservation Project, 2006)

Way of Usage	Area (Hectar)	Ratio %
Planted Farmland	335.54	11.39
Dry Marginal Farmland	2.82	0.10
Marginal Farmland	86.82	2.95
Prime Farmland	33.43	1.14
River	46.59	1.58
Forest Land	2351.37	79.83
Special Product Land	2.07	0.07
Settlements	12.02	0.41
Other Land	74.92	2.54
Total	**2945.58**	**100**

IV.2.8. Forestry Areas (Kinds and Amounts of Trees, Size and Coverage of Forest Areas, Current and Planned Protection and/or Utilization Purposes)

The forest areas located in the project area generally covers class VII lands. The forest is rarely covered. Elevations are abundant in the middle of the area.

In Kahramanmaras, vegetation cover changes in accordance with elevation. There exist three types of plant formation called Bush formation, Forest formation, and Alpine formation. Among this, Bush formation takes place in between 500-1200 m. This formation of mixed bushes is called Maquis Formation. In Maquis formation the following plant species are seen: Kermes oak, Scarlet oak, *Q. Infectoria*, Pink Rock Rose (*Ciftus salvifolius*), Strawberry *(Arbutus andrachne*), Olive (*Olea europa*), Ash (Fraxinus ornus), Sumac (Rhus coriaria), *Phillyrea latifolia*, Christ's-thorn (*Paliurus spinachristi*), Judas tree. Scarlet oaks appeared as a result of destruction of Turkish pines' forests are important members of maquis formation that generally seen in plateau areas.

Forest Formation that can be divided as dry and half moist, are seen from 900 to 2000 meters. In this region, there exist lots of pine species, especially Turkish pines and in addition there is a few defoliation trees.

Between 1400-2000 meters, Austrian pine (Pinus nigra), Fir (Abief cilicica), Cedar of Lebanon (*Cedrus libani*), Juniper types, Oak types, among Turkish pines are mixed. Over 2000 meters Alpine Grass Formation can be seen. This formation, which is seen in higher parts of Ahir and Cimen mountains, is dominated by species such as *Astragalus, Coronilla sp., Viola sp., Papaver sp., Festuca sp., and Acanthalimo sp*. In Kahramanmaras, natural vegetation cover was destroyed by human activities through hundreds of years.

Vegetation cover in mountainous highland set in between alluvial and arid regions is sparse forest. Forest consists of groups of short oak and pine. In western part, on the other hand, Pinus nigra and Turkish pine speices are abundant and oak also covers a significant area. At high elevations cedar and fir types exist together with other types. In southern part, pine cover is dominant. In areas where Mediterranean Climate dominates, maquis cover consisting of oak, holly oak, maple etc. is common. Fig, olive, elm, and other types found in well-drainaged parts were destroyed and this land opened to agriculture. Cotton, sugar beet, grain, vegetable farming is practiced widely.

Forests are mostly located in west and northwest. South and southeast are poor in forests. However, ¼ of the forests in the area are large logged real forests, the remainder consist of shrubbery maquis and even empty fire areas. Approximately 51% of the forest area is conifer, 27% is leaved and 22% is mixed forest. 76% of these forests consist of groves, and 24% consist of swamps.

The area generally include the following flora species: Turkish pine, Austrian pine, fir, cedar, common juniper, oak (*Quercus sp.*), juniper, Veratrum sp., morcicek, flammea, buttercup, meadow rue, *Nasturtium sp., Aloe sp.,* poppy, corn poppy, yellow corydalis Fumaria officinalis, burunotu, valerian, alyssum, mignonette, viola, *Polygala sp., Polygala sp*., campion, *Rumex sp.*, *Rumex sp*, carduus, liquorise, hibiscus, sumac, buckthorn, St. John's wort, sweet pea, clover, Chinese parsley, artichoke, daisy, dusty miller, *Gundelia toumefortii* , absinthium, alpine pink.

In the area of Kandil Energy Group Project, which also covers Sariguzel Dam, HEPP and Borrow Sites Project, the pastures are generally class VI and VII. IV and lower class pastures are take place in higher elevations where climate does not allow other plants to grow. Pastures are found commonly in arid north region. The rainiest area is covered by shrubberies and forests.

Shrubbery land are also generally class VII. They are found commonly in transition from rainy mountainous land to arid regions in east, mountain foot in south and in patches within mountainous region.

Forest and shrubbery land are also used as pasture. Anyway forest area is sparse. But due to rocks and shallow soil, pasturage value of the land is low. Hence, wideness of the land area used as pasture does not exceed one million hectars.

Forestry maps of the project area were taken from Forestry General Directorate and they were transferred to computer environment by using Geographical Information Systems. The distribution of forest and vegetation cover in the area can be seen in Appendix 1.5. It was determined from vegetation cover distributions that the most common forest type after the farmlands are very degraded forests. Area based distribution of forest and vegetation cover is seen in Table IV.19 and Table IV.20.

Table IV.19. Forestry and Vegetation Distribution* staying under Project Facilities and Sariguzel

	Forestry and Vegetation	Area (Hectar)	Ratio %
Reservoir Area	Treeless Forest Land	20.03	7.54
	Degraded Oak Coppice	9.94	3.74
	Degraded Forest	2.97	1.12
	Degraded Forest-Erosioned	0.63	0.24
	Degraded Forest-Stony	1.50	0.56
	Very Degraded Oak Coppice	4.31	1.62
	Very Degraded Forest	5.86	2.21
	River	27.52	10.36
	Forest	41.39	15.58
	Farmland	151.57	57.04
	Total	**265.73**	**100**
Construction Site	River	0.0005	0.0059
	Forest	7.78	93.37
	Farmland	0.55	6.63
	Total	**8.33**	**100**
Borrow Site	River	14.77	22.87
	Very Degraded Forest	4.21	6.52
	Farmland	20.82	32.23
	Orman	24.33	37.67
	Degraded Forest-Stony	0.46	0.71
	Total	**64.61**	**100**
Powerhouse Buildings	Forest	0.16	95.99
	Farmland	0.01	4.01
	Total	**0.17**	**100**

* All administrative buildings take place under Very Degraded Forest

Table IV.20. Forestry and Vegetation Distribution within Boundaries of Work Area

Forestry and Vegetation	**Area (Hectar)**	**Ratio %**
Treeles Forest Land	194.22	6.59
Treeles Forest Land -Stony	2.51	0.09
Degraded Oak Coppice	92.71	3.15
Degraded Forest	112.99	3.84
Degraded Forest-Erosioned	115.96	3.94
Degraded Forest-Stony	301.56	10.24
Very Degraded Oak Coppice	260.33	8.84
Very Degraded Forest	526.46	17.87
River	47.16	1.60
Forest	214.80	7.29
Forest-Erosioned	7.52	0.26
Forest-Stony	55.38	1.88
Farmland	983.45	33.39
Stony	23.14	0.79
Settlement	7.41	0.25
Total	**2945.58**	**100**

According to data gathered from forest maps and field surveys, the coverage ratios observed in unit areas are listed below.

Unit Area		**Coverage Ratio**
Borrow Site	=	20%
HEPP and switchyard	=	40%
Reservoir		10%

According to soil protection report, approximately 151.48 hectares of forest area will stay under the reservoir in the scope of the project. 45 hectares of the borrow site, which will be used with Hacininoglu Project, consists of forest area and 15 hectares of this forest area will be inundated. This part is considered to be used primarily for Hacininoglu Project, and the part that stays above reservoir is considered to be used for Sariguzel Project. For the forest areas that will be used in the scope of the project, approvals were taken from Ministry of Environment and Forestry, Forestry General Directorate, Kahramanmaras Regional Directorate. Official letter and “Inspection and Evaluation Form” is given in Appendix 2.6.

No expropriation will be done for the above-mentioned forestry areas. For these areas, permits will be taken according to Forest Law No: 6831 Article 17/3 (Amended by Law No: 5192).

IV.2.9. Protected Areas (National Parks, Nature Parks, Wetlands, Nature Monuments, Nature Conservation Areas, Wildlife Protection Areas, Biogenetic Reserves, Biosphere Reserves, Natural Sites and Monuments, Natural, Historical and Cultural Sites and Protection Zones, Special Environmental Protection Zones, Special Protection Areas, Tourism Areas and Centers, The Areas within the context of Pasture Law)

A desk-based study was made to evaluate all the pertinent national laws and regulations and all avaliable information for the determination of the presence of any protected area near the project area.

The nearest cultural property to project area is the historical spa within 9 km. There are three cultural heritages within 15 km of project area. However all of them are placed in a distance such that they will not be affected by the project.

There are no nature park, national park, and nature monument within the boundaries of Kahramanmaras Province. Within the boundaries of Andirin district, there is Korcoban Natural Conversation Area (within 100 km from project area) belongs to Kahramanmaras General Directorate of Nature Conversation and National Parks.

In the region, Adana Kahramanmaras Hancerderesi Wildlife Improvement Area and Amanos Mountains Tekkoz-Kengerliduz Nature Conservation Area (72 ha), Zorkun Wildlife Protection Area (2.8 ha) and Arsuz Wildlife Protection Area (49 ha) exist. However none of the areas are in the impact zone of Sariguzel Dam, HEPP and Borrow Sites Project (the nearest within 25 km distance). The area that was forbidden by the decision of Central Hunting Commission (CHC), for 2006-2007 Hunting Season, starts approximately within 6 km from project area. Nature conservation areas, areas closed for hunting etc. in Kahramanmaras Province are given in Figure IV.17,

Based on the information given above, it can be said that in accordance with the Conservation of Cultural and Natural Assets Law No: 2863 there is no cultural and natural assets under the titles of “Cultural Assets”, “Natural Assets”, “Natural Site” and “Protection Zone” in the project impact zone.

In project area and its vicinity there is no inland water that takes place in Turkey’s internationally important wetlands list and has a protection status.

In addition, there is no area defined under the title of “Special Environmental Protection Zones” of Environment Law No: 2872.

There is no pasture quality land in the project area.

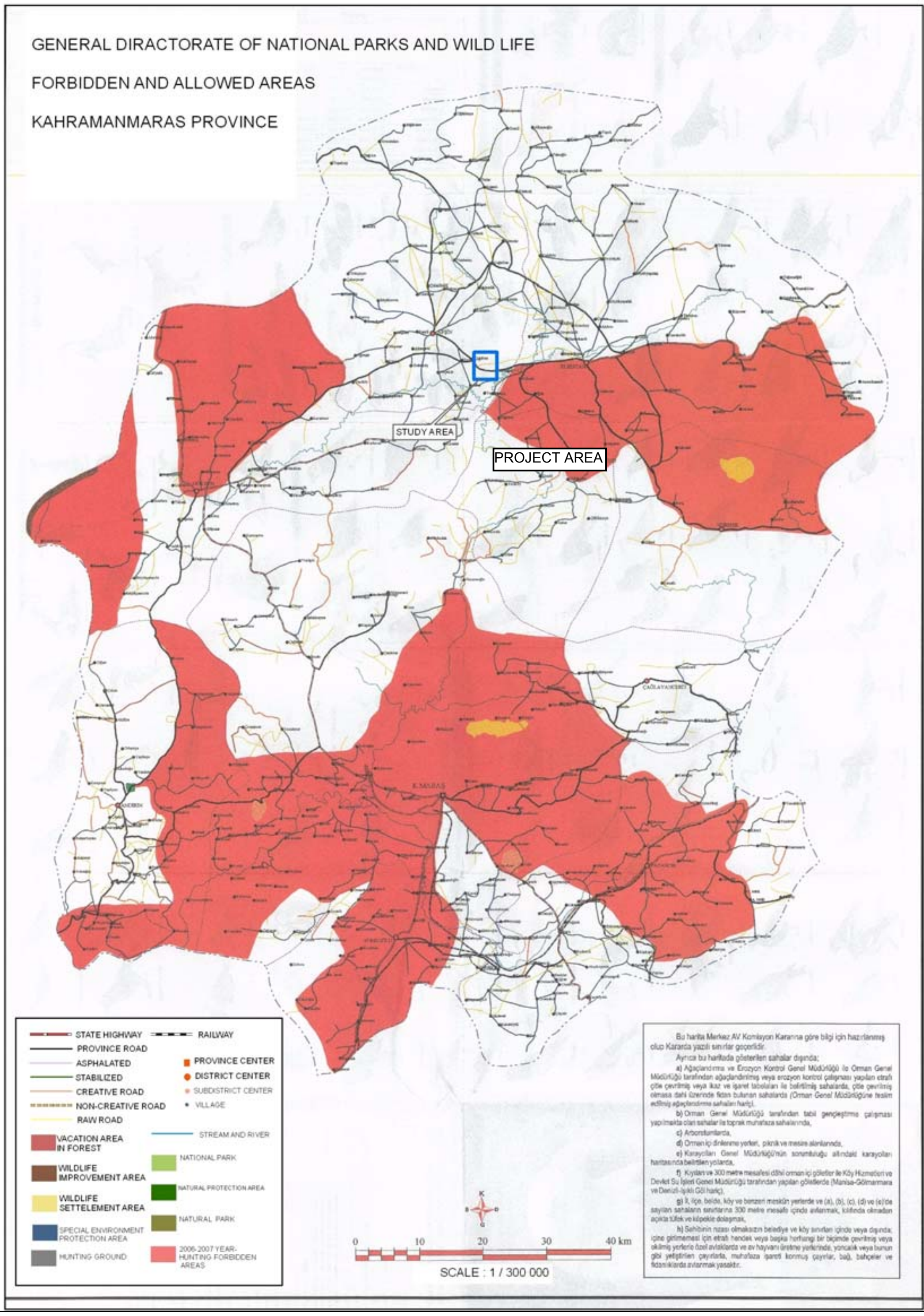


Figure IV.17. Kahramanmaras Province Protected Areas, Forbidden Areas for Hunting etc.

IV.2.10. Species Living in Inland Waters (lakes, rivers) (Natural traits of these species, species protected under national and international legislations, reproduction, feeding, sheltering and habitats of these species, conservation decisions taken with respect to such habitats, Forestry Investigation Assessment Form)

7 fish species determined as a result of observations made in Ceyhan River, surveys done by local fishermen and literature surveys are shown in Appendix 4 Table 4.6. Apart from *Cyprinus carpio* (Carp), other species are local species of Ceyhan River System. *Cyprinus carpio* were implanted to Menzelet Dam Lake by DSI. None of the species living in river is endemic to Turkey. The details are presented in Section IV.2.11.

Cyprinus Carpio (Carp)

Carp that can live in lakes and slowly flowing rivers, is a species that is catched in Turkish waters frequently. Carp prefer shallow and warm waters and has high tolerance to insufficienct water quality conditions. Their reproduction areas generally take place in lake and river coasts where vegetation is abundant. Impregnated eggs sticks to plants living in these regions. Carp generally get badly affected by vegetation groups that are dried as a result of changes in water level. It is an herbivorous species, which feed on insect larva, zooplanktons, fish larva, plant seeds and algae that are generally accumulated on sediments in the water.

Though the species is resistant to many conditions and has high tolerance, generally it prefers slowly flowing big water masses or quiet waters having soft bottom sediments. Common carp species can easily develop in big turbid rivers. In spring and summer months, reproduction occurs by laying sticky eggs on vegetation in shallow regions.

Capoeta capoeta sieboldii

Capoeta capoeta sieboldii is a benthopelagic species. Its habitat is freshwater lakes and streams. Generally it exists in areas where streams make ponds. It is resistant to conditions created by insufficient water quality. Generally feeds on vegetation and wastes in water.

Their reproduction time is from July to January. They lay egg at 15-22 °C. They lay their eggs to sandy and stony areas nearby the lakes. This species show a wide distribution in many of the river systems reaching to the Black Sea.

This species generally found in dried areas in upper parts of rivers and in swamps and dried areas in down parts. They feed on the plants. They lay egg on stony base of rivers.

Silurus Glanis Linnaeus (catfish)

This fish likes warm conditions and it is carnivorous. It lives in muddy regions of deep and bottom parts of slowly flowing waters. Generally they prefer bottom regions of streams. In the daytime they prefer deep parts of water and after daytime or early in the morning they hunt. Their reproduction time can be in different times from May to July according to water temperature. They lay their eggs in the evening or early in the morning when water temperature reaches to 18-21°C to the places they prepared earlier.

They live around hundred years. They may be in different colors according to where they live. They don't form herds. In cold winter months they bury themselves into muds on the bottom of deep parts and hibernate.

Leuciscus Cephalus (chub)

Their length and weight can be at most 80 cm and 4 kg. Within Cyprinidae family this species has the widest geographical distribution. They like slowly flowing clear waters. Feed on plants and insects on surface.

Garra Rufa Obtusa

This ventouse species feed by grabbing the rocks with their lips. Their length can be at most 20 cm. They exist in Dicle and Firat river systems. They can live in temperatures as high as 36°C. They are important as they pick wound and skin residuals on bodies of patiences, who come to this nutrient deficient waters for medical treatment. It increases the effect of water and thereby helps to recovery.

Alburnus Orontis

Generally prefers waters abundant in oxygen but it has high tolerance. It can also adapt to quiet waters. Because its mouth shape is upward it generally feeds on planktons. Besides, it also feeds on invertebrate insects (such as mosquito larva). It lays egg in spring season. It is found in many inland waters in Turkey, and its maximum population is in Asi River in Hatay.

Barbus Rajanorum Rajanorum

Though prefers high flow and high oxygen waters, also accords to live in quiet waters. Because it has a ventral mouth shape, it feeds on benthic organisms. Besides also feeds on water plants. They lay egg in spring season as generally in all cyprinidae family.

Official approval letter of Ministry of Environment and Forestry, Forestry General Directory, Kahramanmaras Regional Directorate and "Forestry Inspection and Evaluation Form" are given in Appendix 2.6.

IV.2.11. Flora and Fauna (Species, Endemic Characteristics, Local Endemic Plant Species, Wildlife Species, Species Protected Under National and International Legislations, Rare and Endangered Species and their Habitats within the area, Names and Populations of Game Animals, and the Decisions taken by Central Game Hunting Commission) Indication of Vegetation Types existing in the Project Area on a map, Mitigation Measures that need to be taken with regard to Species which would be affected by Project Activities (during construction and operation phases), Realization of Floristic Studies that would be carried out in the Project Area during Vegetation Period and Indication of this period

Within the scope of Kandil Energy Group Project, Dagdelen Regulator and HEPP, Kandil Dam and HEPP, Sariguzel Dam and HEPP, Hacininoglu Regulator and HEPP will be constructed. Among these, Dagdelen Regulator and HEPP is the most upstream project, Hacininoglu Regulator and HEPP is the most downstream project. Biological characteristics of impact zones of these projects were determined with detailed flora and

fauna studies, and evaluated for each project respectively. Sariguzel Dam and HEPP which is within the boundaries of Kahramanmaras Central District will be established in upstream of Hacininoglu Regulator and HEPP, within 1 km southeast of Domuler Quarter of Sariguzel Village, in between Kavakcukuru Hill and Cukurcam Ridge. Flora and fauna studies cover these areas.

Flora and Fauna Study Methodology

To determine the general floristic and faunistic structure of the area the field surveys were undertaken on November (2006) and March (2007) by biolog Erdinc Durmus. Flora of the work area was determined based on the previous investigations and observations done and plants gathered in this field survey.

During the study flora and fauna related area specific data were gathered. The data were evaluated throughout the study and special attention was given to internationally important species and their habitats.

The results of the studies constitute the main features of the general knowledge on floristic and faunistic characteristics of the project area. During the site visits, habitat characteristics and plant communities were observed. The species with well-known characteristics were identified by direct observation, whereas other species were investigated in the laboratory via samples collected during the site visits.

The following items can summarize the survey methodology used:

1. Survey area and route were determined based on 1/25,000 topografic maps.

2. All of the identified species were assessed for their threat and conservation status by further desk-based studies. Detailed characteristics of the species (e.g. endemism, threat status, phytogeographical region) are presented in tables with related reports. The species in these lists were presented according to their phylogenetic order (*Pteridophyta, Gymnospermae, Angiospermae)* with their Turkish common names (if exist), phytogeographical regions, endemism, and national/global threat/conservation statuses (Appendix 4).

3. National/global threat/conservation and endemic statuses of all fauna species and faunal list including threat, endemism statuses, hunting restrictions of all determined fauna species, with their Latin, common English, and Turkish names were given in tables (Appendix 4).

During the field studies, in addition to the direct observations, other means of identification (such as traces and wastes of the faunal elements when investigating nesting areas) were also used. Direct observations were carried out by means of optical instruments (16 x 24 Pentax binoculars and Vista-80 (20-40 x 80) Konus monocular telescope) for the identification of bird species in the area. GPS was also used for the determination of elevations and geographical coordinates during the field studies

The flora and fauna studies at the site were aimed to determine the detailed list of the species by gathering together the local floristic and faunistic characteristics at the site and to determine habitat quality at the area. This will indicate the ecological significance and sensitivity of the project impact area, which will enable the assessment of the extent of the impacts on the biological environment. For this purpose, two main characteristics of the species were taken as the basis of the decision on the sensitivity of the habitats and

the species. These would be the endemism and threat status of the species. Within this context, not only the national but also the global threat and/or conservation status of the species were identified for each species, and the species classified as threatened or under conservation were defined to be particular of care and requiring particular protection.

Global threat statues of the identified flora and fauna species were assessed according to the latest updated criteria and lists of IUCN (International Union for the Conservation of Nature and Natural Resources) 2003, CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) 2004 and BERN Convention, 2002 lists. In addition to this, national status, especially for endemic flora species, were determined using Red Book of Turkish Plants (Ekim et al., 2000) that is based on year 1994 (Ver 2.3.) IUCN categories. Besides, hunting restrictions of mamalians, birds and reptiles, were determined based on national laws. In Section IV.2.9 tha map showing open and closed area for hunting in 2006-2007 season determined by Central Hunting Commission is given (Decisions of Central Hunting Commission 2006-2007).

International agreement CITES signed by 164 nations' governments (including Turkey), aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival. CITES principles are based on the sustainability of the trade, which is important to safeguard ecological resources (various wildlife products obtained from many live animal and plants, products to add to eatables, exotic skin products etc.) for the future. CITES was signed in 1973 and entered into force on 1 July 1975. Turkey became a party to this convention in 1996.

Species in CITES are listed under 3 distinct appendices according to required conservation level. Appendix I include those species that are threatened with extinction. These species may not be traded internationally except extraordinary conditions. Appendix II includes those species that, although not necessarily threatened with extinction, may become so unless trade is strictly regulated in order to avoid utilization incompatible with their survival. Appendix III includes those species that under conservation of at least in one Party and needs the cooperation of other Parties to monitor international trade.

Bern Convention was signed by 26 member states (including Turkey) of the Council to protect European wildlife and natural habitats, to protect and increase biological diversity, to promote national policies for the conservation of wild flora, wild fauna and natural habitats, to have regard to the conservation of wild flora and fauna in planning and development policies and in measures against pollution, to promote education related to conservation and to encourage and coordinate studies conducted on this issue.

Contracting parties, which also signed up the Convention on Biological Diversity, are obliged to ensure every possible step, to be consistent with their national development, to protect endangered species and fragile habitats. (European Council, 1994). Flora and fauna species that are protected under this convention are listed in Appendix 1 (strictly protected flora species), Appendix 2 (strictly protected fauna species), Appendix 3 (protected fauna species).

IUCN Red List is published to highlight those species that are facing a risk of extinction. A species may be listed in IUCN Red List after studies on its population decrease. Due to Red List is based on more researches, some countries attach more importance to species taking place in IUCN list than species taking place in Bern List. 1994 (ver2.3) and 2001 (ver.3.1) categories of IUCN Red List;

IUCN Red List Categories and Criterias, 1994 (ver. 2.3)		IUCN Red List Categories and Criterias, 2001 (ver. 3.1)*	
EX	: Extinct	EX	: Extinct
EW	: Extinct in Wild	EW	: Extinct in Wild
CR	: Critically Endangered	CR	: Critically Endangered
EN	: Endangered	EN	: Endangered
VU	: Vulnerable	VU	: Vulnerable
LR	: Low Risk		
	cd : conservation dependent	NT	: Near Threatened
	nt : near threatened	LC	: Least Concern
	lc : least concern		
DD	: Data Deficient	DD	: Data Deficient
NE	: Not Evaluated	NE	: Not Evaluated

** The IUCN Red List Categories and Criteria have undergone an extensive review in recent years to produce a clearer, more open, and easy-to-use system. The revised Categories and Criteria (IUCN Red List Categories and Criteria version 3.1) were adopted by IUCN Council in February 2000 and published in 2001.*

Flora

Kahramanmaras Province, where the Sariguzel Dam, HEPP and Borrow Sites Project is located, is located in the transition zone of Mediterranean and Iran-Turan Phytogeographic Regions. However, in some regions of the project area plants that are belong to Europe-Siberia Phytogeographic Region are also observed. Investigation area has a hilly structure. It covers right and left coasts of Ceyhan River. Elevation changes between 700 and 1,000 m. During field surveys, three different vegetation types were identified. This area consist of the following vegetations: Turkish pine and common juniper that have demolished populations at hillside of canyons; mixed lemur vegetations that includes oaks (*Quercus petraea*), rockrose (*Cistus creticus*), *Paliurus spina-christ* and river fluvial habitat. Willow and European aspen are dominant species at fluvial habitat. As a result of field surveys 146 species and subspecie level taxon that are belong to 38 families were identified. Among these species, none of them is endemic to Turkey.

General Evaluation

As a result of field survey and observations done in the area, 146 species and subspecies were determined. None of these plants are endemic to Turkey. Some losses will occur in the population of the species determined in impoundment phases after construction due to construction activities that will be executed within the scope of project. However these species are abundant in the project area surroundings and in the region.

Fauna

During the Fauna survey, the construction and operation area of the project and right and left sides of Ceyhan River were investigated. During the faunistic survey, continental vertebrate fauna elements which they have motile ability, were observed. It was seen that they prefer using this habitat for feeding and wandering. Colonized fauna elements weren't observed in the region. In the field and in the vicinity, aquatic and continental fauna elements were categorized as mammas, birds, reptiles, amphibians and fishes. Findings were assessed separately for each of the categories.

Mammals

According to the survey results, 13 mammal species were identified at the site. The list of identified species is presented in Appendix 4. All the identified species are listed in IUCN Red List (2003). 10 of these species are classified under Lower Risk - least concern (LR:lc / LC) class, which means the taxa is evaluated as widespread, abundant, and not under threat. One species is classified as Lower Risk - near threatened (LR:nt) category indicating that the taxa is classified as currently not under threat but likely to qualify for a threatened category in the near future. Also, one species is classified under Vulnerable (VU) category, however this species is abundant in Turkey and have high reproduction potential. According to Bern, one species is placed under Annex 3 (protected species). According to CITES, one species is taken under protection within the context of Appendix 3.

On the basis of the decisions taken by the General Directorate of National Parks and Game Wildlife Central Hunting Commission (MAK) for 2006-2007 hunting season; 1 mammal species are found in Appendix-1, 4 mammal species are found in Appendix-3, that is, in the list of hunting animals that are allowed by the Central Hunting Commission to be hunted in certain periods. Remaining mammal species are not included in any class.

Ornithofauna (Birds)

Evaluation of Area and Vegetation According to Ornithofauna

Because of the fact that the project site dominantly contains shrubbery areas, vineyards and orchards, it forms breeding and sheltering habitat for small passers (Passeriformes). Non-passeres species was observed to use the habitat for feeding and passage purposes. Besides, Ceyhan River is the most important water resource for birds, and a diversity factor especially for the bird species that prefer littoral areas.

Bird Species Identified in The Project Area and Their Systematic Categories

According to the observations, 23 bird species belonging to 6 ordos and 13 families were identified. The number of bird species identified in the project area is expected to increase in different seasons. Out of the 23 bird species observed 8 species are non-passeres and 15 species are passeres. This indicates that the habitat is mostly preferred by passers.

National and International Conservation Statuses of the Birds Identified in the Project Area

All of the bird species that were identified in the project area are found in LC (least concern) category according to the IUCN Red List (2003) of the World Conservation Monitoring Center (WCMC). No species that are classified as endangered and/or threatened were identified in the project area.

10 of the bird species identified in the study area are listed as strictly protected fauna species in Annex 2 of the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention). Besides, 10 species are included in the list of protected fauna species, Annex 3 of the Bern Convention. The remaining 3 species are not included in any protection class of Bern Convention. In this perspective, 20 of the 23 bird species identified in the area are protected species according to the Bern criteria. However, according to the Bern Convention, 90% of the Turkish ornitho-fauna appear as those species requiring protection. This is because the Bern Convention is aimed to provide strict protection of the bird species due to the risk of decrease in the population of the bird species in Europe. However, it should be noted that owing to its rich ecosystem, to be located on the migration routes, containing various different climatologic characters and various habitat types for the bird species and including most of the diversity and intensity of West Paleartic bird population, Turkey is not under as high risk as the European ornithological system is. According to CITES, 2 bird species are under protection within the context of Appendix 2.

On the basis of the decisions taken by the General Directorate of National Parks and Game Wildlife Central Hunting Commission (MAK) for 2006-2007 hunting season; 12 bird species are found in Appendix-1, that is, in the list of wild animals that are protected by the Ministry of Environment and Forestry, 4 bird species are found in Appendix-2, that is, in the list of hunting animals that are protected by the Central Hunting Commission, 7 bird species are found in Appendix 3, that is, in the list of hunting animals that are allowed by the Central Hunting Commission to be hunted in certain periods.

Population Density and Species Diversity of the Bird Species Observed in the Project Area

According to observations done and the results of the other studies, population densities of the bird species in the project area and its vicinity are very low. Apart from some Passeriformes, generally only 1 to 10 individuals represent them. Density decreases from small Passeriformes to bigger birds.

Reptiles

During the survey performed, 7 reptile species were identified in the area. Table given in Appendix 4 lists the identified species according to their phylogenetic order indicating their Latin and common Turkish names and also gives their status. From the identified species, *Testudo graeca* (common tortoise) takes place in VU (Vulnerable) category of IUCN Red List. This species is widely distributed in the world. It mainly exist in Afghanistan, Bulgaria, China, Greece, Iran, Iraq, Israel, Jordan, Kazakhstan, Lebanon, Moldovia, Mongolia, Pakistan, Rumania, Russia, Turkey, and Ukrain. 3 species are included in Low Risk – least concern (LR:lc / LC) class in IUCN Red List.

All of the identified reptile species are Strictly Protected Fauna Species according to Bern Convention Annex 2. All reptile species are under the protection of Ministry of Environment and Forestry (MoEF) and hunting is forbidden throughout the year according to decision taken by General Directorate of National Parks and Game Wildlife Central Hunting Commission (MAK) for 2006-2007 hunting season,

Amphibians

According to the results of the survey conducted at site only one amphibian species (Green Toad - *Bufo viridis*) was identified in the close vicinity of small surface water bodies. Green Toad - *Bufo viridis* is under LC (least concern) category of IUCN Red List. It is under the conservation of Bern Convention as Protected Fauna Species in Appendix 3.

Fish

7 fish species identified by means of observations made in Ceyhan River, surveys done by local fishermen and literature surveys, are shown in Appendix 4 Table 4.6. Apart from *Cyprinus carpio* (Carp), other species are local species of Ceyhan River System. *Cyprinus carpio* were implanted to Menzelet Dam Lake by DSI. According to IUCN, two of these species takes place in “LR/lc”- ‘’LC’’ (low Risk / least concern) category, and one species takes place in ‘’DD’’ (Data deficient) category. Also another one species take place in EN (Endangered) category. None of the species is endemic to Turkey. They are widely distributed.

IV.2.12. Mineral and Fossil Fuel Sources (Amounts of Reserves, Present and Planned Exploitation, Annual Productions and Significance and Economical Value of such production for the Nationwide or Local Uses)

Kahramanmaras is very rich in mines. Iron beds exist in Bıçakçılar, Murata and Nargele Villages of Elbistan. Barite is mined in Turkoglu District. There exist low-calorie lignite deposits in a 100-km^2 area in between Afsin–Elbistan. Extracted lignite coal is used in Afsin-Elbistan A and B Thermal Plants, which is among the biggest public sector investments of Turkey. It is the richest basin of Turkey with 3.5 billion tones Lignite reserve. Rich marble beds are available in Goksun District. The richest cement soil in Turkey exists in this region. In addition to these, chromium, mineral coal, zinc, copper, manganese, magnesite, talc, onyx, lead, graphite, amianthus, and pyrites mines are extracted in Kahramanmaras.

Mine beds in Kahramanmaras Province are Lignite (Afsin- Elbistan), Chromium (Turkoglu), Manganese (Pazarcik), Barite (Merkez, Afsin, Turkoglu). General Directorate of Mineral Research and Exploration conducted some polymetal (occurred due to tectonic lines after Middle Eosene) researchs in Malatya-Elazig-Adgyaman-Kahramanmaras Provinces. In 1991, within the frame of activated project under the name of SEAP (South East Anatolian Project), geochemical, geological, geophysical, and drilling activities intended for polymetal research were conducted in Malatya-Elazig-Kahramanmaras Provinces in various sites. No mining venture exists in project area. Mine map of Kahramanmaras Province in which project area takes place is given in Figure IV.18.

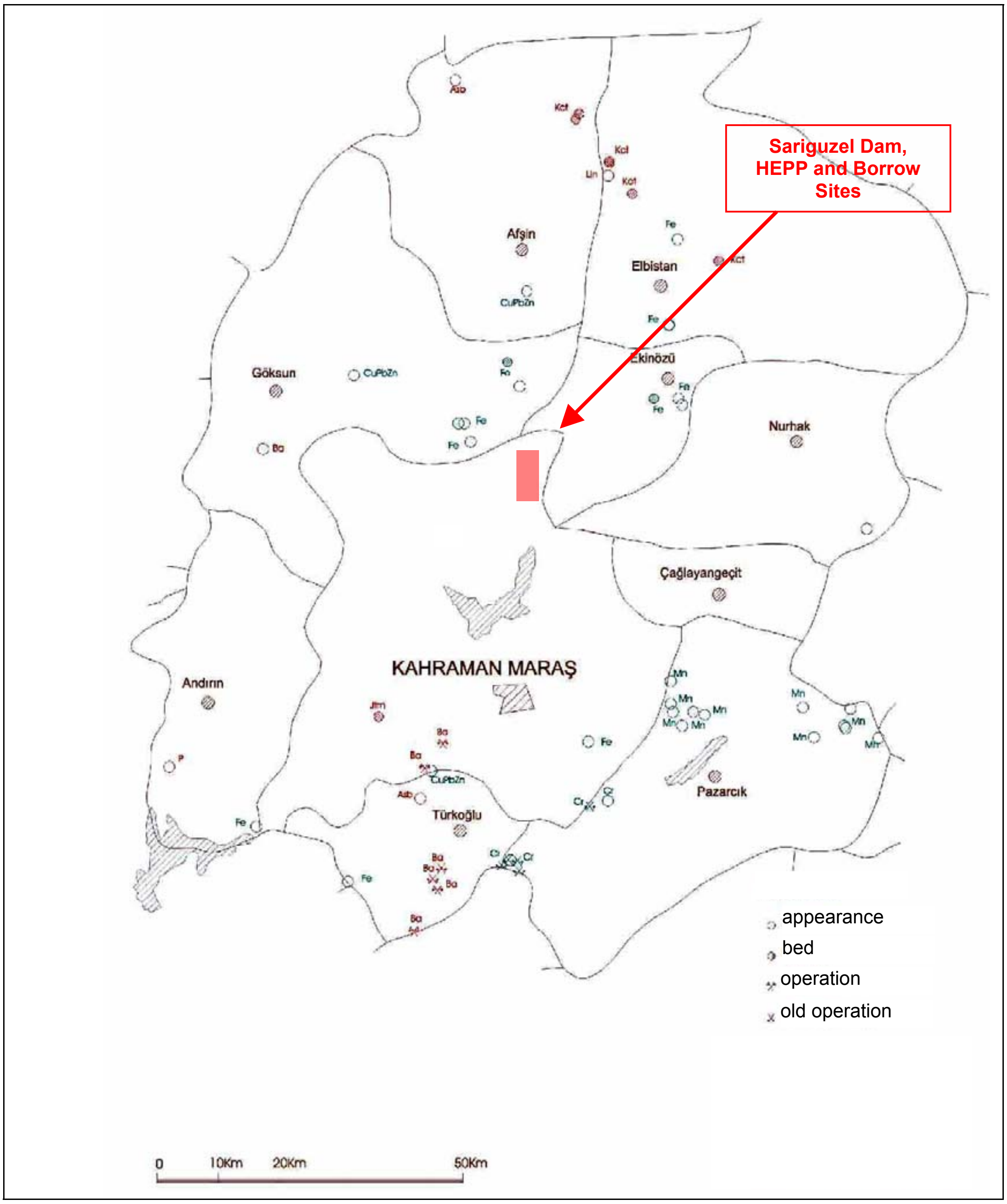


Figure IV.18. Mine Map of Kahramanmaras Province

IV.2.13. Stockbreeding (Species, Feeding Areas, Annual Production Amounts, The Importance of this Products in Economy of Nation)

In project-affected settlements, people make their livings from agriculture and stockbreeding. A major portion of stockbreeding products is sold in markets set in district centers. Stockbreeding substantially contributes to living of households. Meat and dairy products produced in mentioned settlements are sold in markets established in Ilica District, Elbistan District and Provincial Center.

The number of cattle and small cattle per household in project-affected settlements are presented in Table IV.21.

Table IV.21. Number of Cattle and Small Cattle in Project-Affected Settlements

Settlement	Number of Households Practicing Animal Husbandry	Number of Cattle	Average Number of Cattle per Household	Number of Sheep and Goat (Small Cattle)	Average Number of Small Cattle per Household
Demirlik Village	72	150	2.0	-	-
Hacininoglu Village	125	150	1.2	200	1.6
Hacininoglu Village-Uludere Quarter	32	75	2.3	-	-
Kertmen Village -Tilkiler Quarter	35	150	4.2	300	8.5
Sariguzel Village-Ikizce (Ikizler) Quarter	110	500	4.5	300	2.7
Sariguzel Village-Domuler Quarter	24	100	4.1	60	2.5
Sariguzel Village-Evcili Quarter	10	30	3.0	200	20.0

IV.2.14. Lands Pieces that are Under the Rule and in Possession of Authorized State Organs (Military Restricted Zones, Areas that have been allocated to Public Agencies and Institutions for certain purposes, etc.)

There are no lands within the project area under the control and responsibility of authorized governmental agencies.

IV.2.15. Determination of Existing Pollution Load of Project Area and Impact Zone in terms of Air, Water, Soil and Noise

IV.2.15.1. Air Quality

In the region where Sariguzel Dam and HEPP facilities take place, there are village settlements but no industry. Domuler Quarter of Sariguzel Village is the closest place to dam axis construction area. Apart from industry, there is also no activity in the region that may lead to dust, noise, water, and soil pollution such as constructions.

Project area is located approximately within 100 km distance from Kahramanmaras Province by asphalt road. Kahramanmaras Province takes place in 1st degree air pollution suffering provinces. The main reason of this is the consumed wood and coal for heating in winter season. Approximately 195,000 tone coal and 80,000 tone wood is utilized in province. The coal used is mainly imported.

Another major reason of air pollution in the province is traffic. According to information in Kahramanmaras Province Environment Status, there are total 96,500 vehicle registered to province traffic documents.

Air pollution measurement in Kahramanmaras Province was conducted in one point from the most polluted region until the year 1999. Below, winter and summer SO_2 (Sulphurdioxide) and PM concentrations are presented (MoEF, 2005).

Sulphure dioxide Concentration

YEARS	WINTER SEASON SO_2 AVERAGE
90-91	167
91-92	255
92-93	253
93-94	267
94-95	201
95-96	125
96-97	138
97-98	126

YEARS	SUMMER SEASON SO_2 AVERAGE
1995	47
1996	45
1997	61
1998	52
1999	64

The values determined for sulphurdioxide (SO_2) exceeded the long-term limit value stated in Air Quality Protection Regulation (long-term limit: 150 µg/m^3; short-term limit 400 µg/m^3) in the winter season between the year 1990 and 1995. However, short-term limit was not exceeded in this period. Sulphurdioxide values between years 1995-1998 stayed under long-term and short-term limit values. On the other hand, neither short-term nor long-term limit values were exceeded in summer season; moreover the values fairly decreased. This shows that the main reason for air pollution experienced in Kahramanmaras Province during winter season is the combustibles used for heating purposes. In addition to the use of poor quality fuel (low calorie, and high sulphur content), vehicles using fuel oil also causes an increase in sulphurdioxide concentration.

Particulate Matter Emissions

YEARS	WINTER SEASON PM AVERAGE
90-91	130
91-92	130
92-93	123
93-94	153
94-95	94
95-96	116
96-97	110
97-98	107
98-99	103

YEARS	SUMMER SEASON PM AVERAGE
1995	29
1996	30
1997	40
1998	37
1999	41

The values determined for particulate matter (PM) did not exceed the short and long-term limit values stated in Air Quality Protection Regulation (long-term limit: 150 µg/m^3; short-term limit 300 µg/m^3) in the winter season between the year 1990 and 1999. Likewise, neither short-term nor long-term limit values were exceeded in summer season; moreover the values fairly decreased. Due to combustibles used for heating, PM values determined throughout winter season are much greater than in summer season.

Furthermore, in 24.02.2005 an air quality measurement station was established in the garden of governorship and the results were gathered. Values gathered are presented in Table IV.22. By using this table a general evaluation about the monthly changes in air quality in Kahramanmaras Province will be able to be done. According to this, particulate matter values increased and exceeded the long-term limits (150 µg/m^3) in winter season (November, December, March). SO_2 values exceeded the long-term limit (150 µg/m^3) slightly only in February.

Table IV.22. Air Pollution Measurement Data

No	Months	SO_2 (µg/m^3)	PARTICULATE MATTER (µg/m^3)
1	February	153	147
2	March	109	173
3	April	63	86
4	May	34	67
5	June	21	69
6	July	15	72
7	August	15	66
8	September	20	67
9	October	30	77
10	November	95	153
11	December	140	207
Average		**Winter: 109**	**Winter: 151.4**
		Summer: 28	**Summer: 71.1**

IV.2.15.2. Water Quality

Project area is located on Ceyhan River. DSI XX. Region makes quality observations at the intake and outlet of Menzelet Reservoir in downstream of Hacininoglu impoundment area and at the intake of Kandil Dam. Observations from these stations gathered from Kahramanmaras Province Environment Status Reports are given in Table IV.23, Table IV.24, Table IV.25, Table IV.26 and Table IV.27.

Table IV.23. Year 2006-2005 Quality Observations that belong to DSI Station No: 20-038 (Menzelet Dam Outlet)

Quality Observations		Year 2006	Year 2005		
Parameter	**Unit**	**April**	**April**	**July**	**September**
T	C^o	11	10	12	13
PH		8.15	8.71	6.55	7.09
EC	µS/cm	341	348	339	324
TDS	mg/l	218	221	217	207
M-Al	mg/l$CaCO_3$	153.7	148.2	127.5	140.9
p-Al	mg/l$CaCO_3$	0	12	12	0
Cl	mg/l	3.5	3.5	7.1	7.1
NH_3-N	mg/l	0	0.438	0	0.04
$N0_2$-N	mg/l	0.008	0.01	0.089	0.02
$N0_3$-N	mg/l	0.646	0.036	0.7	1.2
DO	mg/l	6.7	5.7	7.1	2.6
PV	mg/l	0.8	1.3	1.5	0.8
BOD_5	mg/l	1	1.4	2	0
TH	mg/l$CaCO_3$	155.5	155	156	150.5
o-PO_4	mg/l	0.007	0.004	0.008	0.034
SO_4	mg/l	37.4	25	33.1	35
Na	mg/l	5.88	6.38	5.5	4.82
K	mg/l	1.64	1.17	1.05	1.17
Ca	mg/l	36.27	48.5	34.47	34.27
Mg	mg/l	15.81	8.51	17.02	15.85

Table IV.24. Year 2004-2003 Quality Observations that belong to DSI Station No: 20-038 (Menzelet Dam Outlet)

Quality Observations		2004			2003		
Parameter	**Unit**	**April**	**July**	**September**	**April**	**July**	**September**
T	C^o	12	13	14	9	15	17
PH		8.53	8.79	8.4	9.24	8.82	8.15
EC	µS/cm	358	446	412	350	355	581
TDS	mg/l	228	285	264	224	294	372
M-Al	mg/l$CaCO_3$	140.3	244	195.2	162.9	152.5	317.2
p-Al	mg/l$CaCO_3$	12	0	3	0	9	0
Cl	mg/l	7.1	3.5	7.1	5.4	4	7.4
NH_3-N	mg/l	0.005	0.058	0.079	0.001	0.038	0.021
$N0_2$-N	mg/l	0.001	0.003	0.002	0.002	0.012	0.014
$N0_3$-N	mg/l	2.22	0.086	0.088	1.34	2.44	3.86
DO	mg/l	5.7	8.2	3.7	3.8	3	4.1
PV	mg/l	2.2	1	1.1	2.1	1.6	1.9
BOD_5	mg/l	-	2.5	0.6	0.8	0	0.6
TH	mg/l$CaCO_3$	163.5	220	195	162.6	170	268.5
o-PO_4	mg/l	0.048	0.052	0.054	0.035	0.023	0
SO_4	mg/l	32	35	32.7	32.7	35.4	19.4
Na	mg/l	5.84	5.89	5.11	4.44	4.25	8.85
K	mg/l	1.64	1.25	1.09	2.15	3.59	2.29
Ca	mg/l	51.5	54.11	44.09	54.11	48.09	75.35
Mg	mg/l	8.51	20.67	20.57	6.73	13.38	19.48

Table IV.25. Year 2002-2001 Quality Observations that belong to DSI Station No: 20-038 (Menzelet Dam Outlet)

Quality Observations		**2002**			**2001**		
Parameter	**Unit**	**April**	**July**	**September**	**April**	**July**	**November**
T	C°	11	12	11	10	17	10
PH		8.45	8.41	8.63	8.65	8.41	8.63
EC	µS/cm	348	339	324	355	350	715
TDS	mg/l	221	217	207	227	243	458
M-Al	mg/l$CaCO_3$	148.2	127.5	140.9	146.4	113.9	214.8
p-Al	mg/l$CaCO_3$	12	12	0	3	6.1	35.8
Cl	mg/l	3.5	7.1	7.1	10.6	35.5	35.5
NH_3-N	mg/l	0.438	0	0.04	0.031	0	0
$N0_2$-N	mg/l	0.01	0.069	0.02	0	0.2	0.3
$N0_3$-N	mg/l	0.036	0.7	1.2	0.85	0	0.04
DO	mg/l	5.3	7.1	2.6	5.25	21.7	5.33
PV	mg/l	1.3	1.5	0.8	1.12	0.96	1.52
BOD_5	mg/l	1.4	2	0	0.9	10.35	0.74
TH	mg/l$CaCO_3$	155	156	150.5	164	178	345
o-PO_4	mg/l	0.034	0.008	0.034	0.02	0.01	0.01
SO_4	mg/l	25	33.1	35	36.4	38.9	38.4
Na	mg/l	6.38	5.5	4.92	5.66	4.85	5.02
K	mg/l	1.17	1.05	1.17	1.07	1.3	1.55
Ca	mg/l	48.5	34.47	34.27	47.7	35.27	36.12
Mg	mg/l	8.51	17.02	15.82	10.64	21.68	25.54

Table IV.26. Year 2003 and 2005 Quality Observations that belong to DSI Station No: 20-098 (Güredin Stream-Menzelet Dam Intake)

Quality Observations		**2005**			**2003**		
Parameter	**Unit**	**May**	**July**	**October**	**May**	**July**	**October**
T	C°	13	24	16	14	24	19
PH		8.76	8.58	8.08	9.04	8.91	8.8
EC	µS/cm	271	297	285	291	273	313
TDS	mg/l	173	190	182	186	175	200
M-Al	mg/l$CaCO_3$	115.9	111.6	129.9	132.6	102.5	159.2
p-Al	mg/l$CaCO_3$	12	12	0	9	9	9
Cl	mg/l	1.4	3.5	7.1	2.7	3.3	2.5
NH_3-N	mg/l	0.07	0	0.012	0.072	0.119	0.002
$N0_2$-N	mg/l	0.032	0.068	0.021	0.025	0.005	0.008
$N0_3$-N	mg/l	0.5	0.88	0.36	24.84	2.82	0.053
DO	mg/l	7.2	5.5	5.2	4.5	3.6	3.1
PV	mg/l	1.3	0.6	1.5	1.8	1.4	2.3
BOD_5	mg/l	2.1	1	1.1	1.4	0.7	-
TH	mg/l$CaCO_3$	128	134	124.5	137.5	111.5	148
o-PO_4	mg/l	0.027	0.007	0.031	0	0.089	0.008
SO_4	mg/l	17.7	30.2	25	17.1	31.4	7.2
Na	mg/l	2.14	5.5	7.13	2.47	8.97	2.74
K	mg/l	2.11	1.37	2.07	-	-	-
Ca	mg/l	33.27	29.66	27.86	1.85	4.17	1.83
Mg	mg/l	10.94	14.59	13.38	29.26	40.08	43.29
T-Coll	EMS/100ml	-	-	-	15.69	2.8	9.73

Table IV.27. Year 2005 Quality Observations that belong to DSI Station No: 20-065 (Kandil Dam Intake)

Quality Observations		Year 2005	
Parameter	**Unit**	**June**	**September**
T	C°	25	21
PH		8.75	8.46
EC	µS/cm	419	462
TDS	mg/l	268	296
M-Al	mg/l$CaCO_3$	142.7	217.8
p-Al	mg/l$CaCO_3$	24	12
Cl	mg/l	10.6	10.6
NH_3-N	mg/l	0	0.032
$N0_2$-N	mg/l	0.054	0.113
$N0_3$-N	mg/l	0.5	1.3
DO	mg/l	5.1	4.8
PV	mg/l	2.3	1.4
BOD_5	mg/l	0.8	1.7
TH	mg/l$CaCO_3$	190	210.5
o-PO_4	mg/l	0.049	0.171
SO_4	mg/l	35.9	35.9
Na	mg/l	7.13	8.05
K	mg/l	2.26	1.76
Ca	mg/l	44.09	50.3
Mg	mg/l	19.46	20.67

Determination of the quality of surface waters was made by a joint-assessment of WPCR and the data belong to quality observation stations of DSI at the intake point of Kandil Dam and at the outlet point of Menzelet Dam which is located on Ceyhan river. Yearly Average values for the parameters measured by quality observation station No DSI-20-038, which is located at the outlet of Menzelet Dam, is given in Table IV.28. The data from stations No DSI-20-098 and DSI-20-065 are given in Tablo IV.29.

Table IV.28. Water Quality Classification of Average Annual Values that belongs to DSI Station No: 20-038 in accordance with WPCR (Water Pollution Control Regulation)

Quality Parameter	Unit	2006	Class	2005	Class	2004	Class	2003	Class	2002	Class	2001	Class
T	C°	11.0	I	11.7	I	13.0	I	13.7	I	11.3	I	12.3	I
PH		8.2	II	7.5	I	8.6	II	8.7	II	8.5	II	8.6	II
EC	µS/cm	341.0	C2	337.0	C2	405.3	C2	428.7	C2	337.0	C2	473.3	C2
TDS	mg/l	218.0	I	215.0	I	259.0	I	296.7	I	215.0	I	309.3	I
Cl	mg/l	3.5	I	5.9	I	5.9	I	5.6	I	5.9	I	27.2	II
$N0_2$-N	mg/l	0.0	I	0.0	I	0.0	I	0.0	I	0.0	I	0.2	IV
$N0_3$-N	mg/l	0.6	I	0.6	I	0.8	I	2.5	I	0.6	I	0.3	I
DO	mg/l	6.7	II	5.1	III	5.9	III	3.6	III	5.0	III	10.8	I
BOD_5	mg/l	1.0	I	1.1	I	1.6	I	0.5	I	1.1	I	4.0	I
SO_4	mg/l	37.4	I	31.0	I	33.2	I	29.2	I	31.0	I	37.9	I
Na	mg/l	5.9	I	5.6	I	5.6	I	5.8	I	5.6	I	5.2	I

Table IV.29. Water Quality Classification of Average Annual Values that belongs to DSI Station No: 20-098 and No: 20-065 in accordance with WPCR (Water Pollution Control Regulation)

YEAR 2005 MEASUREMENTS		Menzelet Dam Intake	Class	Kandil Dam Intake	Class
Parameter	**Unit**				
T	C°	17.67	I	23.00	I
PH		8.47	III	8.61	III
EC	µS/cm	284.33	C2	440.50	C2
TDS	mg/l	181.67	I	282.00	I
Cl	mg/l	4.00	I	10.60	I
$N0_2$-N	mg/l	0.04	III	0.08	IV
$N0_3$-N	mg/l	0.58	I	0.90	I
DO	mg/l	5.97	III	4.95	III
BOD_5	mg/l	1.40	I	1.25	I
SO_4	mg/l	24.30	I	35.90	I
Na	mg/l	4.92	I	7.59	I

EC, pH and DO content of surface waters were determined by in-situ measurements done by ENCON at locations No 2, No 3 and No 4 shown on Figure IV.14. Results of the survey are presented in Table IV.30.

Table IV.30. The Data Related to Measurements Done in Points No 2, No 3 and No 4 in Project Area

Measurement Point	Location	Tha (C°)	TpH(C°)	pH(C°)	TEC(C°)	EC(µS/cm)	TDO(C°)	DO(mg/l)
NO 2	Hacininoglu Dam Power Plant	13.00	11.90	8.40	11.90	321.00	12.00	6.02
NO 3	Sariguzel Dam Downstream	13.60	12.20	8.31	12.20	315.00	12.20	5.90
NO 4	Sariguzel Dam Upstream	13.40	12.20	8.40	12.20	375.00	12.20	6.00

During land surveys, surface water quality was determined regionally by in-situ pH and EC measurements. The total concentration of salts in water can be represented by the electrical current conducted by the ions in solution. This is expressed as electrical conductivity (EC) in µmhos/cm. The higher the concentration of salts in solution, the higher the EC. Irrigation water is divided into four quality classes (C1 through C4) depending on the value of EC. C1 (EC<250 µmhos/cm) is excellent quality of water with low salinity that can be used for all types of crop and at every soil type. C2 (250<EC<750 µmhos/cm) represents good quality of irrigation water with medium salinity and appropriate to for all types of crops, but only for soils with medium drainage characteristics without salinity control requirement. C3 (750<EC< 2250 µmhos/cm) indicates high salinity in water that is improper for irrigation unless drainage is provided. These high salinity waters can only be used for plants that are resistant to salinity. Extremely saline waters that are improper for irrigation are indicated with C4 (EC>2,250 µmhos/cm). Irrigation with this type of water can only be permissible if excellent drainage with high volumes of water sufficient for washing of the soil is supplied, and the plants are known to be very resistant to salinity (Uslu, 1987).

WPCR set only two intervals for pH values as following: pH values from 6.5 to 8.5 are Class 1 or Class 2 and pH values from 6.0 or 6.5 to 8.5 or 9.0 are Class 3. WPCR does not take into consideration pH values that are under and over these limits. When the in-situ Dissolved Oxygen values are compared to WPCR standards waters in the area are determined as Class II.

Average of EC measurements taken at observation points is found as 337 µmhos/cm. According to Uslu (1987) surface water in the area is determined as class C2 and has good quality, and medium salinity. According to pH measurements, the surface waters are determined as class II and III in WPCR standards.

IV.2.15.3. Soil Quality

With the development of agricultural works and increase of industrial activities in our country, soil pollution has become an environmental problem. The main factors causing soil pollution are wastes originating from settlements, exhaust gases, industrial wastes, agricultural protection chemicals and chemical fertilizers.

Soil pollution occurs where the areas that garbage originating from settlement areas are discharged, and areas that sewer network discharged directly, without a treatment. Toxic materials are accumulating in soil due to wrong or excessive use of agricultural chemicals; and the salinity of soils are increased due to excessive use of fertilizers. Therefore, these materials cause soil and groundwater pollution as a result of agricultural irrigation.

Because there is no industrial facility in working area, no pollution is seen in the region in that respect. However, in villages where no infrastructure and fosseptic tanks are found, soil pollution occurs due to direct discharge of domestic wastewater to soil.

IV.2.15.4. Noise

In order to determine the existing noise level, the data related to measurements made in 4 different points are given in Table IV.31. More detailed information relevant to noise measurements are presented in Acoustic Report (Appendix-6).

Table IV.31. Measurement Results

Measurement No	Coordination	Measurement Date	Weather Condition	Measurement Time	Measurement Place	Measurement Results (dBA)
1	320825 E 4198776 N	05.04.2007 13:10	Very Cloudy	5 min.	The closest residence to Domuler Quarter dam axis	52.8
2	320701 E 4197255 N	05.04.2007 13:25	Very Cloudy	5 min.	Ikizler Quarter, beside the School	49.8
3	320781 E 4196775 N	05.04.2007 13:40	Very Cloudy	5 min.	The closest residence to construction area in Tilkiler Quarter	57.8
4	320984 E 4196340 N	05.04.2007 14:05	Very Cloudy	5 min.	Hacininoglu Village, besides village clinic	55.0

dBA = A unit of measure for sound which especially emphasize the middle and high frequencies that human ear is most sensitive. dBA unit that is frequently used in noise reduction or control is related with the subjective assessment of sound level.

Daily meteorological data that belongs to measurement day are taken from the closest meteorology stations (Kahramanmaras DMI stations) to area and presented in Table IV.32.

Table IV.32. Kahramanmaras Meteorological Station Hourly Data, Dated 05 April 2007.

HOUR	TEMPERATURE (°C)	WIND SPEED (KNOT) AND DIRECTION (km/h)	PRECIPITATION (mm)	PRESSURE (hPa)	HUMIDITY (%)
10:30	10.0	No wind	-	1,018.9	70
13:00	17.0	No wind	-	1,018.3	41
14:00	17.9	No wind	-	1,018.2	41
15:00	18.0	No wind	-	1,018.3	39

IV.2.16. Other Characteristics

There are no other issues to be discussed under this heading.

IV.3. Characteristics of Socio-Economical Environment

In construction and operation phases of the project, the possible socio-economic effects will most intensely affect the project area and settlements in close surrounding. Sariguzel Dam, HEPP and Borrow Sites Projects are one of the four projects within the scope of Kandil Energy Group Projects, and it is located within the borders of Kahramanmaras Central District. In construction and operation phases of the project, project area and close surroundingds will be affected. Ikizce (Ikizler), Domuler and Evcili Quarters of Sariguzel Village, Hacininoglu Village and its Uludere Quarter, Tilkiler Quarter of Kertmen Village and Demirlik Village of Ekinozu District are the project-affected settlements.

In order to evaluate socio-economical characteristics in the said project region and to determine existing socio-economical structure, the data gathered from State Planning Organization (DPT) and year 2000 population census results by Turkish Statistical Institute (TUIK) was evaluated.

According to Classification of Statistical Region Units by DPT, Kahramanmaras Province is in 3rd Level developed provinces group. In Socio-economical Development ranking Kahramanmaras is 48th among 81 provinces, with a development index of -0.34968.

Within the scope of Kandil Energy Group Projects, a Public Relations Plan was prepared in order to establish positive and independent relations between project and local people. Plan covers all the activities from pre-construction period to the end of operation period of expropriation and project. Public Relations Plan is given in Appendix 9.

IV.3.1. Economical Characteristics (Main Sectors that form the Economical Structure of the Region, Distribution of Regional Workpower to these Sectors, The Share and Importance of Good and Service Production of Sectors in the Economy of Region and Country, Other Relevant Information)

According to year 2000 population census results, man-woman distribution, percent and working areas of economically active (working) population in Kahramanmaras Province General and Central District are as seen in Table IV.33 (TUİK, 2000).

The majority of working population in Kahramanmaras Central District works in “Manufacturing Industry” and “Public Services”. In Kahramanmaras Province General the majority of working population works in “Agriculture, Hunting, Forestry and Fishery”. The population working in “Manufacturing Industry” in Cenral District comprises 31.2% of total working population in this district, whereas population working in “Public Services” comprises 30.9%. In Kahramanmaras Province General, the population working in “Agriculture, Hunting, Forestry and Fishery” sector comprises 65.6% of total working population in the province.

Following “Manufacturing” and “Public Services” sectors, the third big economical activity branch is the “Wholesale and retail Commerce and Restaurant and Hotel” sector in Central District. 16.3% of the working population works in this sector in Central District. In Kahramanmaras Province on the other hand 12.2% of the working population works in “Public Services” sector.

Table IV.33. The Distribution of Active Population in Economical terms to Sectors in Kahramanmaras Province General and Central District (TUİK, 2000)

Economical Activities		Central District	%	Kahramanmaras Province General	%
Agriculture, Hunting, Forestry, Fishery	Male	2,316	3.38	106,968	28.17
	Female	326	0.48	142,236	37.46
Mining Sanayi	Male	161	024	828	0.22
	Female	2	0.003	7	0.002
Manufacturing Industry	Male	19,178	28.00	28,753	7.57
	Female	2,241	3.27	3,127	0.82
Electricity-Gas-Water	Male	587	0.86	4,574	1.20
	Female	22	0.03	82	0.02
Construction and Public Works	Male	5,733	8.37	15,355	4.04
	Female	50	0.07	85	0.02
Wholesale and Retail Commerce, Restaurant, Hotel	Male	10,675	15.59	19,358	5.10
	Female	524	0.77	965	0.25
Transportation, Communication and Storing	Male	2,856	4.17	6,551	1.73
	Female	65	0.09	105	0.03
Financial Institutions, Insurance, Works and Institutions related to Immovables, auxiliary work services	Male	1,931	2.82	3,324	0.88
	Female	461	0.67	723	0.19
Public Services	Male	17,585	25.68	39,399	10.38
	Female	3,640	5.31	7,013	1.85
Acitivity not clearly defined	Male	118	0.17	249	0.07
	Female	17	0.02	28	0.01
TOTAL WORKING POPULATION	**Male**	**61,140**	**89,27**	**225,359**	**59,35**
	Female	**7,348**	**10,73**	**154,371**	**40,65**
	Total	**68,488**	**100.00**	**379,730**	**100.00**

When the economical characteristics of the project-affected areas were analysed, it is seen that apart from Provincial Center, Elbistan and Afsin District, there is no industrial plant or any industrial activity in project area and surrounding region.

In mentioned affected-settlements (Hacininoglu Village and its Uludere Quarter, Tilkiler Quarter of Kertmen Village, Ikizce (Ikizler), Domuler and Evcili Quarters of Sariguzel Village and Demirlik Village) main economical activities are stockbreeding and agriculture. Hacininoglu Village has mostly irrigated farming. Seasonal fruits and vegetables cultivated are sold in markets in Kahramanmaras and Elbistan. In comparison to farming, stockbreeding is less in Hacininoglu Village. In Tilkiler and Ikizce (Ikizler) Quarters dry farming and stockbreeding is done. In Domuler and Evcili Quarters of Sariguzel, Uludere Quarter of Hacininoglu Village and Demirlik Village irrigated farming is predominant. In these settlements mainly viniculture, and seasonal vegetable and fruit cultivation is done. Though not commonly, bee keeping is also present in the region. Produced honey is generally bought by other houseolds in villages or sold in Kahramanmaras provincial center and Elbistan. Besides farming, stockbreeding, and seasonal workings, village guarding is also another sources of income in Demirlik Village of Ekinozu District. In Demirlik Village 34 village guard “korucu” is working on monthly salary. Farming and stockbreeding products compose a large part of household budget besides their contribution to subsistence economy of households. Since there is no economical activity other than farming and stockbreeding in these settlements, some villagers go to Kahramanmaras, Elbistan, Afsin and big cities such as Ankara and İstanbul as seasonal workers in particular seasons of the year.

IV.3.2. Population (Urban and Rural Population Movements in the Region; Migrations, Population Increase Ratios, Average Household Population, Other Information)

While the population in Turkey increased around 5 times in the last 73 years, the population increased 5.4 times in Kahramanmaras. This situation shows that population increase speed of Kahramanmaras Province is higher than the nation average. According to year 2000 demographic data of TUİK, the share of Kahramanmaras Province in nation population is %1.47.

According to year 2000 demographic data, the population of Kahramanmaras Province is 1,002,384 and annual population increase ratio between the years 1990-2000 is approximately ‰ 11.41. Of the total population in Kahramanmaras Province, 46.5% is rural population (live in villages and towns), and remaining 53.5% is urban population (live in cities). Among the 9 districts of province, Elbistan District has the most crowded population with 128,267 people, while Ekinozu District has the minimum population with 17,102 people. According to annual population increase ratios based on districts, the district with the maximum annual population increase speed is Nurhak with ‰ 14.10, and the district with the minimum annual population increase speed is Ekinozu with ‰ -16.87. In Table IV.34, population data for districts in years 1990 and 2000 are defined under urban, rural and total amounts and also annual population increase speeds are determined.

According to urban population increase ratios shown in Table IV.34, urban population increase speed of Kahramanmaras Central District is 35.7‰. In districts belongs to Kahramanmaras Province, the maximum urban population is seen in Elbistan District (71,500), whereas the minimum urban population is seen in Ekinozu District (6,880). Urban population increase is maximum with ‰ 28 in Goksun District, and

minimum with ‰ -20 in Türkoğlu District. Annual population increase speed for the whole districts and villages of Kahramanmaras is ‰ –4.3.

Table IV.34. Province and Ditrict Population Changes in 1990 and 2000

	1990			2000			Annual Population Increase Speed (‰)		
	Total	**Urban Population**	**Rural Population**	**Total**	**Urban Population**	**Rural Population**	**Total**	**Urban Population**	**Rural Population**
Central District	359,870	228,129	131,741	465,370	326,198	139,172	25.70	35.75	5.49
Afsin	99,321	28,524	70,797	92,718	35,834	56,884	-6.88	22.81	-21.87
Andirin	44,337	7,506	36,831	41,051	8,311	32,740	-7.70	10.18	-11.77
Cagliyancerit	26,914	10,435	16,479	29,580	12,642	16,938	9.44	19.18	2.75
Ekinozu	20,246	8,184	12,062	17,102	6,880	10,222	-16.87	-17.35	-16.55
Elbistan	113,411	54,741	58,670	128,267	71,500	56,767	12.31	26.70	-3.30
Goksun	72,539	22,847	49,692	76,033	30,232	45,801	4.70	28.00	-8.15
Nurhak	14,990	7,087	7,903	17,260	8,118	9,142	14.10	13.58	14.56
Pazarcık	81,644	25,154	56,490	72,628	24,374	48,254	-11.70	-3.15	-15.75
Turkoğlu	60,992	14,608	46,384	62,375	11,918	50,457	2.24	-20.35	8.41
Province Total	**894,264**	**407,215**	**487,049**	**1,002,384**	**536,007**	**466,377**	**11.41**	**27.47**	**-4.34**

Present and 15 year back data of population and household number belong to project-affected Hacininoglu Village and its Uludere Quarter, Tilkiler Quarter of Kertmen Village, Ikizce (Ikizler), Domuler and Evcili Quarters of Sariguzel Village and Demirlik Village are given in Table IV.35. This information consists of actual data taken by key informative surveys with village headmans during the land survey.

Table IV.35. Household Number and Population Data and Its Changes in Project Affected Settlements

Province, District	Settlement Area	Population 15 years ago	Population year 2006	Household Number 15 years before	Household Number year 2006
Kahramanmaras Ekinozu District	Demirlik Village	480	420	80	72
Kahramanmaras Central District	Hacininoglu Village	900	800	140	125
	Hacininoglu Village-Uludere Quarter	150	165	32	32
	Kertmen Vilage-Tilkiler Quarter	280	220	44	35
	Sariguzel Village-Ikizce (Ikizler) Quarter	300	1000	50	110
	Sariguzel Vilage-Domuler Quarter	220	150	35	24
	Sariguzel Village-Evcili Quarter	100	65	15	10

Apart from Ikizce (Ikizler) and Uludere Quarters, there happened big migrations in the last 15 years from project affected Hacininoglu, Demirlik Villages, Tilkiler, Domuler and Evcili Quarters to especially Kahramanmaras, Elbistan and other big cities. Therefore the population in the mentioned places shows a decreasing trend. As it can be seen from Table IV.35, the population of Hacininoglu Village decreased 100 people during the last 15 years and around 15 houses left the village. Likewise, a sharp decrease in population and household numbers was seen in Demirlik Village, Tilkiler, Domuler and Evcili Quarters within the last 15 years due to migration. Contradictory to other settlements, in Ikizce Quarter of Sariguzel Village the population showed a big increase in the last 15 years. Quarter population was increased from nearly 300 (value in 15 year ago) to 1000 by 2006, showing around 3 times increase. The main reason of this increase is the more central and suitable agricultural areas in Ikizce Quarter that drew many households within the borders of Sariguzel Village during the last 15 years. Furthermore, no big migration happened from quarter to outside in that period. Lastly, in Uludere Quarter belongs to Hacininoglu Village no noteworthy increase have been observed during the last 15 years on household basis, however a small increase have been occurred in population. Average age of the population live in project-affected settlements is higher than middle-age level (over 40-45).

Total household number in Kahramanmaras Province is 185,792. 56% of households live in cities. While average household size is 5.6 throughout Province, in Central District it is around 5. When project affected settlements are investigated it is seen that average household size is 6.4 in Hacininoglu Village, 5.4 in Demirlik Village, 5.15 in Uludere Quarter, 6.3 in Tilkiler Quarter, 6.5 in Evcili Quarter, 6.2 in Domuler Quarter, and 9 in Ikizce Quarter. While household sizes in settlements other than Ikizce and Uludere Quarters are close to average household size of whole villages throughout Kahramanmaras Province (6.2), the average household size of Ikizce is greater and that of Uludere District is lower than province average.

Number of people per km² (population density) is 70 in province general, 157 in provincial center, and changes between 14 and 104 for different districts. Having the biggest area, the population density in Elbistan District is 55, and with minimum area, the population density in Caglayancerit District is 71. Areas and population densities of districts of Kahramanmaras Province are presented in Table IV.36. In addition to this, information related to city-village population and population density in province is shown on Kahramanmaras Province Map given in Figure IV.19 (This information was gathered from year 2000 population census data collected by TUIK). The population in 260 villages out of 529 villages in Kahramanmaras is under 500. Most of the villages have high population as it was also observed in this investigation.

Table IV.36. Area and Population Density Data of Districts of Kahramanmaras Province

Settlement	Area (km^2)	Population Density
Center	2,956	157
Afsin	1,428	65
Andırın	1,162	35
Çağlıyancerit	417	71
Ekinozu	595	29
Elbistan	2,319	55
Goksun	1,940	39
Nurhak	1,219	14
Pazarcık	1,710	42
Turkoglu	600	104
PROVINCE TOTAL	**14,346**	**70**

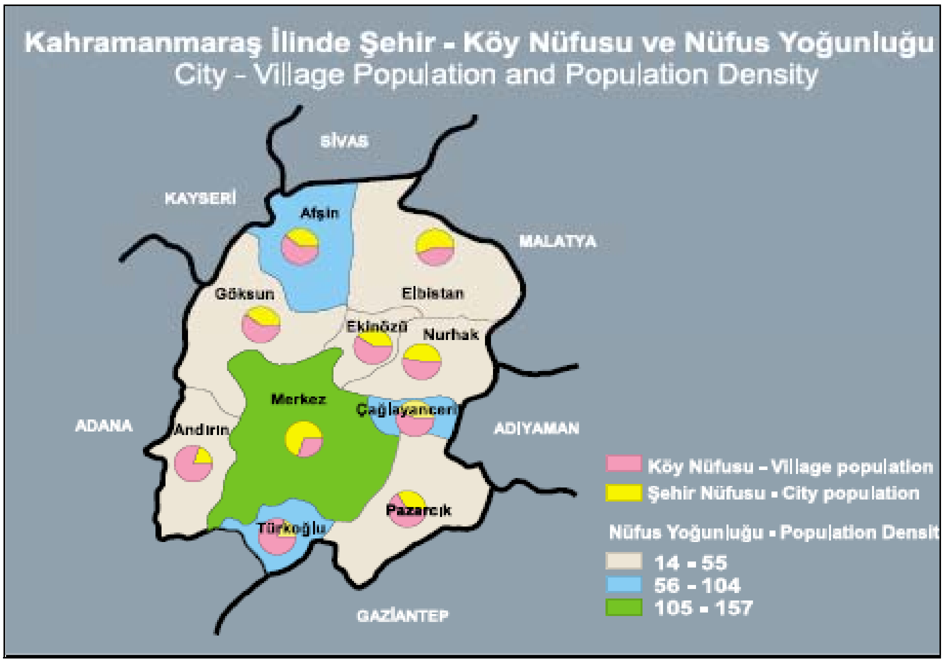


Figure IV.19. City-Village Population and Population Density

Population age distributions for Central District which includes Sariguzel, Hacininoglu and Kertmen Villages, Ekinozu District which includes Demirlik Village and Kahramanmaras Province which will be affected by construction and operation activities of the project, are presented in Table IV.37.

In Figure IV.20, age distribution graphics for Kahramanmaras Province General, Central district and Ekinozu District are presented.

Table IV.37. Distribution of Population according to Age Groups for Kahramanmaras Province General, Central District, and Ekinozu District (TUİK, 2000)

Province		**Kahramanmaras**					
District		**Ekinozu District**		**Central District**		**Kahramanmaras Province General**	
Age		**Number of Person**	**%**	**Number of Person**	**%**	**Number of Person**	**%**
0-4	Male	395	5.74	22047	6.76	63603	6.35
	Female	369	5.36	20088	6.16	58287	5.81
5-9	Male	408	5.93	19594	6.01	60786	6.06
	Female	393	5.71	18075	5.54	56499	5.64
10-14	Male	514	7.47	19552	5.99	61177	6.10
	Female	401	5.83	17061	5.23	56362	5.62
15-19	Male	430	6.25	20512	6.29	61025	6.09
	Female	399	5.80	17843	5.47	59401	5.93
20-24	Male	375	5.45	16672	5.11	46739	4.66
	Female	356	5.17	16058	4.92	49521	4.94
25-29	Male	270	3.92	14841	4.55	42446	4.23
	Female	276	4.01	14377	4.41	42739	4.26
30-34	Male	232	3.37	12094	3.71	34181	3.41
	Female	226	3.28	11252	3.45	32216	3.21
35-39	Male	225	3.27	11429	3.50	32222	3.21
	Female	162	2.35	10568	3.24	30269	3.02
40-44	Male	125	1.82	9267	2.84	26069	2.60
	Female	136	1.98	8184	2.51	23212	2.32
45-49	Male	112	1.63	7102	2.18	20375	2.03
	Female	115	1.67	6192	1.90	19773	1.97
50-54	Male	114	1.66	5191	1.59	16583	1.65
	Female	126	1.83	4757	1.46	16489	1.64
55-59	Male	96	1.40	3583	1.10	12863	1.28
	Female	102	1.48	3170	0.97	12435	1.24
60-64	Male	61	0.89	2771	0.85	10414	1.04
	Female	97	1.41	3023	0.93	11725	1.17
65-69	Male	72	1.05	2360	0.72	9848	0.98
	Female	78	1.13	2269	0.70	9385	0.94
70-74	Male	64	0.93	1498	0.46	6620	0.66
	Female	62	0.90	1779	0.55	6938	0.69
75-79	Male	18	0.26	744	0.23	3047	0.30
	Female	29	0.42	851	0.26	3181	0.32
80-84	Male	16	0.23	298	0.09	1363	0.14
	Female	10	0.15	426	0.13	1790	0.18
85+	Male	9	0.13	277	0.08	1216	0.12
	Female	7	0.10	345	0.11	1426	0.14
Unknown	Male	-	-	31	0.01	85	0.01
	Female	-	-	17	0.01	74	0.01
Total	**Male**	**3,536**	**51.40**	**169,863**	**52.07**	**510,662**	**50.94**
	Female	**3,344**	**48.60**	**156,335**	**47.93**	**491,722**	**49.06**
	Total	**6,880**	**100.00**	**326,198**	**100.00**	**1,002,384**	**100.00**

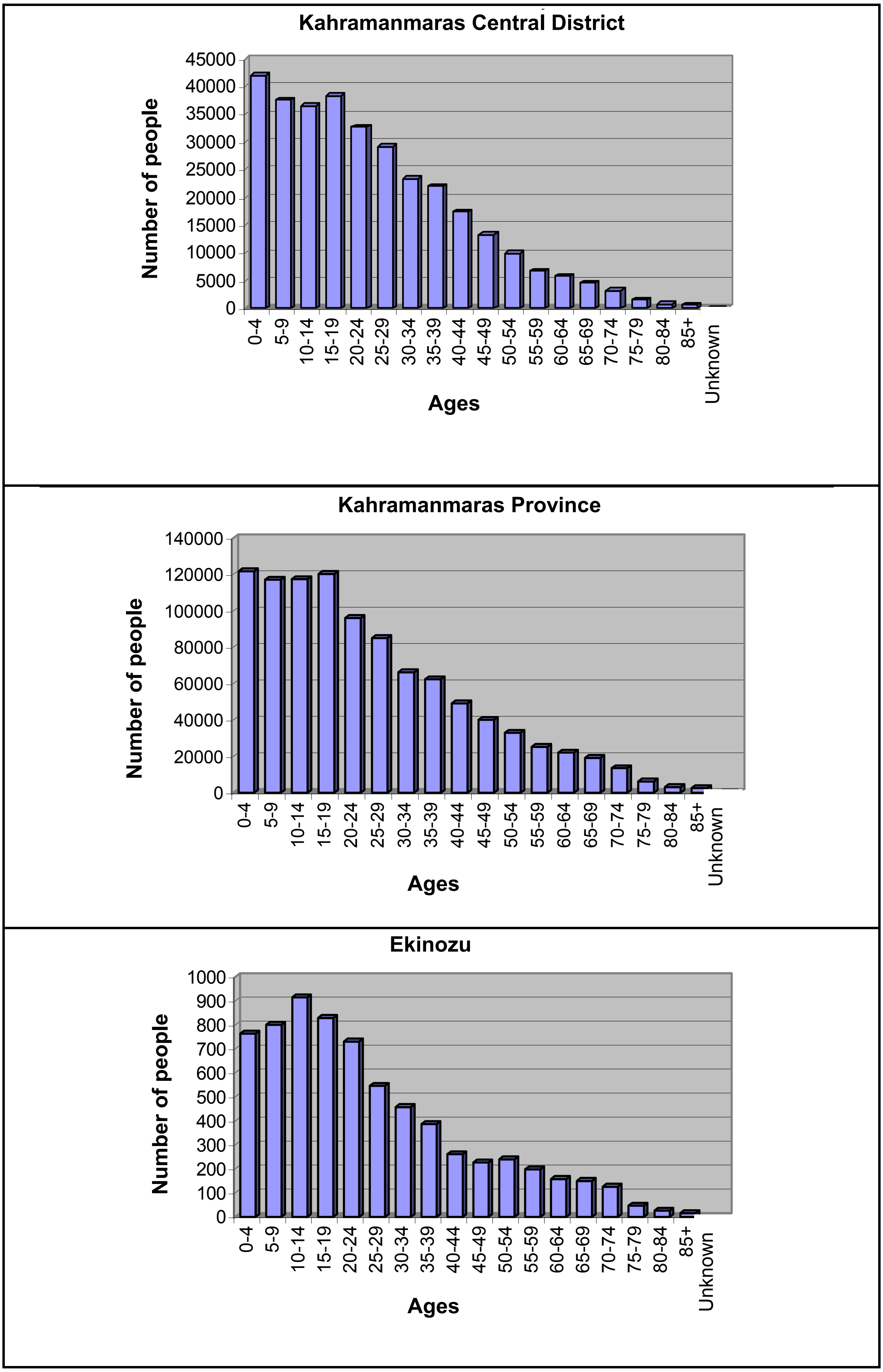


Figure IV.20. Age Distribution Graphics of Kahramanmaras Province General, Central District, and Ekinozu District

When the age distributions throughout Kahramanmaras Province, Central District and Ekinozu District are investigated, it is seen that afore-mentioned three settlements have a young population (Figure IV.20). According to Table IV.37, share of the weighted age interval (0-24) within total population is around 57.2 % for Kahramanmaras Province, 57.4 % for Central District and 58.7 % for Ekinozu District

Throughout Kahramanmaras Province and Central District, half of the male population is younger than 21 years old, and half of the female population is younger than 22 years old. As the share of 25-49 age intervals in total population is 30.2 % throughout Kahramanmaras Province, 32.3 % for Central District, and 27.3 % for Ekinozu District, the share of 50-74 age group is approximately 11.3 % for Kahramanmaras Province, 9.3 % for Central District and 12.6 % for Ekinozu District. Furthermore, the minimum number of person in total population belongs to 74-85+ age group, corresponding 1.2 % of Kahramanmaras Province general population; 0.9 % of Central District population; and 1.3 % of Ekinozu population.

Throughout Kahramanmaras Province and Central District the old population is very low in compare to young population. Because, the lifespan in this region is not very long and prolificacy speed in the province (3.54) is higher than Turkey average (2.5). Population increase speeds calculated on the basis of 1990 and 2000 populations are given in Table IV.34 for a more detailed investigation of population movements throughout Kahramanmaras Province, Central District and Ekinozu District. As it can be seen from this table as urban population shows an increasing trend, rural population shows a decreasing trend for the last 10 years throughout Kahramanmaras Province and in Central District. On the other hand in Ekinozu District both urban and rural population show a decreasing trend due to migration out from the district. This shows that, people go to provincial center and district centers that have better health, education and job opportunities.

As can be inferred from the last 10 years demographic movements, a social changing period sourced from industrialization, is experienced in Kahramanmaras provincial center and relatively developed Afsin and Elbistan Districts. In parallel with industrialization and economical development in the province, a dense migration from rural areas to Kahramanmaras provincial center was occurred. With this movement, many buildings were constructed in provincial center. This internal migration bring along an infrastructure problem. Especially in provincial center a fast mass housing is observed. However in spite of the migration from rural areas to provincial center, according to TUIK data between the years 1995-2000 net migration speed[1] observed in Kahramanmaras is ‰ –28.3, which shows that migration out from Kahramanmaras Province is higher than migration in.

IV.3.3. Income (Distribution of Local Venues of Income to Sectors, Per Capita Maximum, Minimum, and Average Income)

In settlements that are affected by the project, people make their living by farming and stockbreeding. In these settlements peasants both gain revenue and make contribution to their subsistence economy with farming and stockbreeding. In other words,

[1] Net migration number for each thousand people possible to migrate in 5 years. **Ref:** United Nations, 1970, Guide VI, Immigration Calculation Methods, No: 47, New York

peasants consume some part of their agricultural and animal products, and make money with the other part in markets nearby provincial center and districts. Another means of income is periodic jobs that are available for specific times of year in provincial center, Elbistan, and Afsin Districts or in big cities such as Adana, Ankara, Antalya and İstanbul (farm labor, common labor, construction labor). In last 20 years, young population living in the region moved to Kahramanmaras provincial center, Elbistan and Afsin Districts, or big cities such as Adana, Antalya, Ankara and İstanbul, due to unemployment.

In Table IV.38, financial indicators that belong to Kahramanmaras Province which are taken from DPT *Performance Indicators of Provinces* index are presented.

Table IV.38. Financial Indicators for Kahramanmaras Province

KAHRAMANMARAS PROVINCE FINANCIAL INDICATORS	PROVINCE	UNIT	KAHRAMANMARAS	PLACE (among 81 Provinces)
Share in Gross National Product	2000	Percent	0.98	24
Gross National Product per Person	2000	Million TL	1.215	46
Bank Deposit per Person	2000	Million TL	142	63
Share in Total Bank Deposits	2000	Percent	0.22	38
Share in Total Bank Credits	2000	Percent	0.36	25
Agricultural Credit Amount per Rural Population	2000	Million TL	30	65

IV.3.4. Unemployment (Unemployed Population and its ratio to Active Population in the Region)

The unemployment ratio[2] in Kahramanmaras Province General is 7.8%. This ratio is 10.3% in male population and 4.1% in female population. In Kahramanmaras, the unemployment ratio is higher in district centers than provincial center. While the unemployment ratio in provincial center is 18.3%, it is 28.9% in district centers, and 0.9% in villages. While in villages unemployment ratio of men is higher than women's, in provincial center and district centers the unemployment ratio of women is higher than men's. In provincial center the unemployment ratio is 28.3% for women and 16.9% for men. In villages the unemployment ratio is 0.4% for women and 1.5% for men. The majority of unemployed population consists of young population. 64% of unemployed population is under the age of 30.

As in the other villages, unemployment in project-affected villages is much lower than provincial center and districts. The main reason is, households living in rural areas work in agricultural fields (own fields) and use some part of agricultural and animal products for their own needs (subsistence economy). In project-affected settlements the great majority of unemployed population consists of the young, as in Kahramanmaras province general.

[2] Unemployment rate; The ratio of people who were unemployed and did not have a work connection within one week before census; currently seeking a job and attempted to find a job in the last three months, to total work force population. Source: DIE, 2000 General Population Census Results Section 4.

IV.3.5. Social Infrastructure Services in the Region (Education, Health, Cultural Services and Utilization of this Services)

Education

Throughout Kahramanmaras Province, 888 educational institutions provide service, one of them being a university. Approximately 11,000 students receive education in Kahramanmaras Sutcu Imam University that started to give education in 1992. University made contribution to social and cultural improvement of Kahramanmaras, besides it also boosts the economy in Kahramanmaras and the region. Actual information related to the number of educational institutions, the teacher-student distributions, and schooling ratio in Kahramanmaras Province are obtained from Kahramanmaras Province National Education Directorate (from 2005-2006 academic year province general statistics) (Table IV.39).

Table IV.39. Statistical Data Related to Pre-school, Primary, and High School Education in Kahramanmaras Province General

Type of School	School Number	Classroom Number	Total Student Number	Teacher Number	Schooling Ratio	Student Number per Class	Student Number per Teacher
Official Pre-school	6	47	1,079	55	% 18.3	23	20
Official Kindergarten	(277)	292	6,974	436		24	16
Private Kindergarten	(10)	11	164	9		15	18
Pre-school Total	**6**	**350**	**8,217**	**500**			
Official Primary School	768	3,745	169,417	6,165	% 92.7	45	27
Private Primary School	10	140	2,470	200		18	12
Primary School Total	**778**	**3,885**	**171,887**	**6,365**			
High School	39	604	25,302	1,285	% 40.2	42	20
Vocational High School	50	525	14,750	1,014		28	15
Private High School	4	34	677	74		20	9
Secondary Education Total	**93**	**1,163**	**40,729**	**2,373**			
General Total	**877**	**5,398**	**220.833**	**9,238**			

As it can be seen from Table IV.39, in Kahramanmaras Province general, there are 877 schools in total, of which 6 is pre-school, 778 is primary school and 93 is secondary school. In these schools, a total of 9,238 teachers work and 220,833 registered students study. Additionally, schooling ratio in Kahramanmaras Province for pre-school, primary school, and secondary schools are 18.3%, 92.7% and 40.2%, respectively.

There is one primary school which provide 5 year period education in each of the following places: Ikizce (Ikizler) Quarter which belongs to project affected Sariguzel Village, Hacininoglu Village, and Uludere Quarter and Demirlik Village which belong to this village. 75 students attend to primary school in Hacininoglu Village, 150 students attend to primary school in Ikizce (Ikizler) Quarter, 25 students attend to primary school in Uludere Quarter, and 74 students attend to primary school in Demirlik Village. Primary school students in Tilkiler Quarter of Kertmen, attend to primary school in Ikizce Quarter of Sariguzel Village due to its closeness. The students in Evcili and Domuler Quarters go to

primary school in Ikizce or go to boarding schools in provincial center. Students in mentioned settlements go to boarding schools in Kahramanmaras or other schools in district centers in order to complete secondary and high school educations upon graduating from the primary school.

The literacy and educational background throughout Kahramanmaras Province, Central District and Ekinozu District are presented in Table IV.40.

Table IV.40. Literacy in Kahramanmaras Province General, Central District, and Ekinozu District (TUİK, 2000)

Literacy		Ekinozu District	Central District	Kahramanmaras Province General
Illiterate Population	Male	151	8,383	35,851
	Female	644	25,979	105,994
Total Literate Population	Male	2,919	135,142	398,334
	Female	2,243	106,307	315,652
Uneducated Population	Male	842	34,351	110,543
	Female	735	33,359	104,706
Population Graduated from Primary School	Male	812	45,453	152,630
	Female	977	44,836	146,270
Population with Primary Education	Male	158	5,982	15,844
	Female	96	3,688	10,146
Population Graduated from Secondary School	Male	416	13,127	36,633
	Female	151	6,110	16,341
Population Graduated from Secondary School Equivalent	Male	7	558	1,137
	Female	6	243	461
Population Graduated from High School	Male	479	18,984	46,393
	Female	221	10,753	24,039
Population Graduated from High School Equivalent	Male	88	5,897	14,332
	Female	20	2,898	6,108
Population Graduated from College	Male	117	10,780	20,798
	Female	35	4,365	7,477
Population whose Education level is not known	Male	-	10	24
	Female	2	55	104

Literate population rate is 83.4% for Province, 87.5% for Central District, and 86.6% for Ekinozu District. Throughout the Province there is difference in literate ratio of different sexes between Central District and Ekinozu District. In Central District literate ratio for male population is 94.1% and for female population is 80.3%, in Province general, this ratio is 91.7% for male population and around 74.8% for female population. In Ekinozu District, literate ratio is 95% for male population and 77.6% for female population. In villages literate ratio for male population is 89%, for female population is 69%. In all settlements, the ratio of (at least) secondary school graduates within the population aged 25 or above is higher in male population than in female population. The ratios of (at least) secondary school graduates are 42% for males, 19% for females in provincial center; 42% for males, 16% for females in district centers; 21% for males and 5% for females in villages.

In settlements that are affected from the project, literacy ratio of men is higher than of women, as in villages throughout the province. Most of the illiterate population consists of old population over the age of 50.

Health

In Kahramanmaras Province there are 7 State Hospitals, 2 Social Security (SSK) Hospitals, 1 University Hospital, 2 Private Hospitals and 2 Tuberculosis Dispensaries. In addition to these, healthcare services are provided within the province by 2 Public Health Laboratories, 4 Health Colleges, 106 Village clinics, 592 Health houses, 3 mother-child health and family planning centers (ACSAP) and 13 branch managerships of Health Department.

In Kahramanmaras provincial center, 1 state hospital, 1 SSK hospital, 1 university hospital, and 2 private hospitals are available. In Elbistan district, health services are provided by 1 state hospital and 1 SSK hospital. Afsin, Andirin, Goksun, Pazarcik and Turkoglu districts have 1 state hospital each. In Kahramanmaras provincial center and districts there are total 12 hospitals and the total bed capacity is 1,310.

Health indicators related to Kahramanmaras Province obtained from “Performance of Provinces” index prepared by DPT is presented in Table IV.41. In light of this data, it is seen that health services and infrastructures in Kahramanmaras Province is more limited in compare to Turkey general.

Table IV.41. Comparative Health Indicators for Kahramanmaras Province and Turkey General

HEALTH INDICATORS	UNIT	KAHRAMANMARAS	TURKEY GENERAL	PLACE AMONG 81 PROVINCES
Doctor number per 10,000 people	Doctor of Medicine	6	13	59
Pharmacy number per 10,000 people	Number	2	3	54
Hospital Bed Number per 10,000 people	Number	10	23	71

(year 2000 State Planning Organization Performance Indicators of Provinces)

In the province, the population who benefits from health services is under Turkey averages. While nation-wide hospital bed number in Turkey is 180,000, bed number in Kahramanmaras is 1,310. While the bed number rate per 10,000 people is 23 throughout Turkey, in Kahramanmaras the number is 10. In province, total 624 doctors (229 expert, 395 practician), 39 dentists, 631 nurses and 555 midwifes work in health services. While in Kahramanmaras the number of doctors per 10,000 people is 6, throughout Turkey this number is 13.

There is a health house in Hacininoglu Village in which a midwife works. In order to get health services villagers go to the village clinic, which is in Ilica district near to Hacininoglu Village, or they go to the hospitals in provincial center. Since there are no village clinics or hospitals in other settlements that are affected by the project, the people living in those places go to Ilica district, provincial center or nearby district centers in order to get health services.

Some indicators related to socioeconomic infrastructure of Kahramanmaras Province that obtained from “Performance of Provinces” index prepared by Undersecreteriat of DPT are presented in Table IV.42. Kahramanmaras Province has values near to Turkey averages for indicators such as proportion of asphalt-paved roads, drinking water and electricity consumption per person in rural settlements. However

telephone contour per person in the province is lower than 50% of the Turkey average. The number of green card holders is above the country average.

Table IV.42. Other Infrastructure Indicators in Kahramanmaras Province

OTHER INFRASTRUCTURE INDICATORS	UNIT	KAHRAMANMARAS	TURKEY GENERAL	PLACE AMONG 81 PROVINCES
Proportion of Asphalt-paved Road in Rural Settlements	Percent	47.95	45.23	44
Proportion of Population Supplied With Enough Drinking Water	Percent	82.60	84.98	49
Asphalt-paved Road Ratio	Percent	90.56	91.28	51
Electricity Consumption per Person	Mws	1	1	22
Proportion of Green Card Holders	Percent	23	15	28
Telephone Contour per Person	Unit	763	1,852	69

(year 2000, The State Planning Organization (DPT) Province Performance Indicators)

IV.3.6. Urban and Rural Area Usage (Distribution of Settlement Areas, Existing and Planning Usage Areas, In This Concept Industrial Zones, Dwellings, Tourism Areas etc.)

There is no any industrial establishment in project area and its close proximity. In the region the villages and quarters are dispersed. Since there is no urban settlement area, rural area usage is common in the region. Usage conditions and distributions of the areas that will be affected by Sariguzel HEPP Project (including Dam embankment, diversion tunnel, tunnel entrance-exit, penstock, powerhouse, lake area) are given in Table IV.43.

Table.IV.43. Usage Conditions and Distributions of the Areas that will be affected by the Project

	Parcel number (Unit)	Area (Ha)
Hacininoglu Village	284	74.83
Kertmen Village	53	13.41
Sariguzel Village	237	51.65
Demirlik Village	20	1.23
Forestry Land	50	96.38
Treasury	53	25.15
TOTAL	**697**	**262.65**

IV.3.7. Other Characteristics

There are no other issues to be discussed under this heading.

SECTION V

IMPACTS OF PROJECT ON THE AREA DEFINED IN SECTION IV AND MEASURES TO BE TAKEN

SECTION V. IMPACTS OF PROJECT ON THE AREA DEFINED IN SECTION IV AND MEASURES TO BE TAKEN

In this section, impacts of project on physical and biological environment, legal, administrative and technical measures that will be taken to mitigate, minimize and improve these impacts are explained individually and in detail.

V.1. Preparation of Land, Projects in Construction and Planning Phase, Impacts on Physical and Biological Environment and Measures to be Taken (Regulator, HEPP, Borrow Sites Included)

V.1.1. Within the Scope of Works to be Done for the Preparation of Land Where and How Many Areas Be Excavated, Amount of Excavation, Where the Excavation Waste Soil, Stone, Sand etc. Will be Hauled, Where These Materials Will be Stored or What Purposes They Will be Used, Materials That Will Be Used During Excavation

Facilities that will be built within the scope of Sariguzel Dam, HEPP and Borrow Sites Project are dam embankment, diversion facility, power tunnel, surge chamber, penstock and power plant. There is not an existing road that connects the dam to the powerhouse. For this reason, within the scope of Hacininoglu Regulator, HEPP and Borrow sites Projects of which construction works were started earlier, construction of 5.29 km road and improvement of 1.62 km road will be completed. Power generated in the powerhouse will be connected to (154 kV) Hacininoglu HEPP via nearly 8 km length transmission line. However, activities related to transmission line are not included in the context of this report.

For dam embankment, tunnel concrete works and powerhouse reinforced concrete works concrete agrega materials; the area, shown in Appendix 1.2 and will be used commonly in Hacininoglu Regulator, HEPP and Borrow Sites Projects, will be exploited. For Hacininoglu Project, the part under Hacininoglu impoundment area is planned to be used prefentially. On the other hand, for Sariguzel Project, the part from impoundment area to Sariguzel Dam axis is planned to be used.

During the concrete agrega supply from borrow site (646,073 m^2), dam (50,400 m^2), powerhouse and switchyard (6,000 m^2), diversion tunnel (360 m^2) and power tunnel (9,350 m^2) construction; excavation works will be performed and excavate will be occurred. In accordance with the said facilities, excavation is planned to be done on approximately 71 ha area in total. Excavation amounts that will be done are reported in Table V.1.

Table V.1. Excavation Amounts to be done Within the Scope of Project

Facility	Excavation amount (m^3)
Dam	20,590
Powerhouse	36,300
Diversion Conduit	11,000
Diversion Tunnel	1,700
Power Tunnel	54,000
TOTAL	**123,590**

During the excavation works, in order to prevent the contamination, topsoil will be stripped and stored in order not to loose its fertility. Subsoil that forms the topsoil will also be stripped and accumulated in order not to loose its horizon. While stripping the topsoil, materials that are not soil on the topsoil should be separated. Plant parts such as seed and bulb that enable the continuity of plant species will be separated. Furthermore, upper surface of vegetative soil will be protected against the erosion, drying, and weeds and covered with grass and grassland etc. in order to keep the soil alive. This stripped vegetative soil will be used during the landscape works of site and vegetative landscape arrangements of recreation sites. Excavation works will be performed by construction machines or blasting. During these works and concrete production, 2 dozers, 6 excavators, 4 loaders, 10 trucks, 2 sprinklers, 4 compressors, 6 transmixers, 8 tunnel drilling revolvers, 17,365 kg ANFO, 283,492 kg Power gel Magnum 365, concrete pump and 4 tunnel ventilation fans are planned to be used.

Appraisable materials formed during the excavation works will be used as concrete agrega material. Other materials will be used as filling material in borrow site for holes from where concrete agrega is taken.

V.1.2. Haulage, Storage and Use of Flammable, Explosive, Hazardous, Toxic and Chemical Materials That Will Be Used During Preparation of Site and Also in Construction of Units; Equipment and Machinery That Will Be Used for These Works

During the preparation of site together with the excavation works, blasting will also be executed. In open site excavation 37,940 kg ANFO, however in tunnel excavation 300,028 kg (22,314 kg in diversion tunnel + 277,714 kg in power tunnel) explosive is planned to be consumed. The said explosives will be stored in four mobile tanks each of 2 tones. Tanks will be located properly as shown in Appendix 1.2 with or without mils and tank surroundings will be wired in accordance with the safety distances given in Section V.1.20. Blasting will be performed under the control of gendarme, and locales will be informed in respect of place and time of blasting. Detailed information about the explosives that will be used is given in Section V.1.6. Equipment and machinery that will be used during blasting are:

In open site blasting:

- Rockbit driller,
- Anfo explosive,
- Power gel magnum primer,
- Exel capsule igniter,
- Blast detonator,
- Flow meter device and,
- Igniter magneto

In tunnel blasting:

- Jumbo driller,
- Jackleg driller,
- Powergel magnum primer,
- Exel capsule igniter,
- Blast detonator,
- Flow meter device and,
- Igniter magneto.

Except this, in the construction phase of project, fuels such as diesel and gasoline that will be consumed by construction equipment will be provided from a gas station in Kahramanmaras. Diesel fuel transfer to the machinery will be provided in specific periods (daily, every other day, etc.) according to consumption of construction equipment by diesel fuel delivery vehicle of the gas station. By this way, storage will not be performed in construction site.

Heater and air conditioner are planned to be used prefentially for heating purposes, moreover central heating system operating with fuel oil is another option. In case of central heating system operating with fuel oil is used, fuel will be stored in 5 tones sealed fuel tank. Necessary precautions will be taken against fire, sabotage and leakage in fuel tanks.

The following regulations will be obeyed for the explosive issues of the project: “Constitution on the Production, Import, Transportation, Storage, Usage, Disposal, Inspection of Explosive Substances and Hunting Material (29 September 1987, No: 12028, amended 28 October 2004, No: 8057)”and “Rules and Regulations on Precautions for Working with Flammable, Explosive and Hazardous Chemicals (27 November 1973, No: 7551)”.

V.1.3. Flood Control and Drainage Works

In feasibility studies conducted by ERE in 1995, gauged flows and synthetic methods in project areas/points determined within the scope of Kandil Project group; Dagdelen impoundment area (Point 1), Kandil reservoir (Point 2), Sariguzel reservoir (Point 3) and Hacininoglu impoundment area (Point 4) axis, are considered and flood analyses are conducted.

Most of the deposition areas in project points are located in Eastern Anatolia climate region. Project points are located in Eastern Anatolia climate region and Mediterranean climate region transition belt. South of the said belt is under the influence of Mediterranean climate and sudden increase in rainfall causes increases in basin fertility. Thus, it is decided to work with the instant flood observations of flow gauging stations in working area.

Observed maximum historical floods in the gauging period of the project areas that may become valuable are dotted correspond to the areas of FGS (Flow Gauging Station) and historical flood envelope is drawn. Flows are determined from historical flood envelope by using project deposition areas. In Table V.2, hydrologic characteristics of hydrometry stations included in regional flood analysis are given.

Table V.2. Hydrologic Characteristics of Hydrometry Stations Included In Regional Flood Analysis

Station No	Name of Station	A (km^2)	Elevation (m)	Gauging Interval and Gauging Status	Year Considered
20-09	Hurman J. -Kerevin	635.0	1280	1965-1967	3
2015	Hurman S. -Tanir	915.2	1160	1957-	34
20-07	Hurman S. -Kus Kayasi	2084.0	1150	1961-	26
20-66	Sogutlu S. -Karahasanusagı	150.0	1455	1988-	3
2022	Sogutlu S. -Han	428.0	1340	1973-	18
2016	Sogutlu S. -Turkseven	692.8	1150	1957-1969	11
20-11	Ceyhan N. -Elbistan	407.0	1128	1962-1964	3
20-12	Sarsap D. -Guvercinlik	356.7	1279	1962-1967	6
20-21	Sarsap D. -Guvercinlik	402.0	1279	1972-1974	3
2005	Ceyhan N. -Akcil	4202.0	1114	1953-	36
20-15	Torbezek S. -Camkopru	189.7	1374	1964-	18
20-16	Komur S. -Aliclibucak	291.0	1386	1963-	27
20-34	Goksun S. -Aslanbey	727.7	1335	1972	1
2006	Goksun N. -Karaahmet	739.2	1324	1954-	37
20-52	Findik D. -Findik	23.0	1285	1984-	6
2009	Goksun N. -Poskoflu	1387.2	1040	1954-	36
20-51	Nergele Ç. -Topal Yusuflar	131.5	1110	1984-	6
2019	Ceyhan N. -Kandil	6248.0	1000	1961-1968	8
(20-12)*	Sarsap D. -	-	-	-	-
(2021)	Guvercinlik	402.0	1279	1962-1974	9

* After closing 20-12 No Sarsap D. -Guvercinlik FGS, same station was operated as EİE 20-21 No Sarsap D. -Guvercinlik and then closed again.

Methods implemented in this study are same as the methods used in maximum flow determination study that is one of the most encountered problems in preparing the project of river structures. CN (Curve Number) in this method expresses the vegetation, structure of land utilization, hydrologic ground groups and moisture content at the start of rainfall. Flow amount in any point of the basin where gauging is not performed can be calculated by using Synder and Mockus methods.

The Kolmogrov-Simirnov Test is made to the maximum precipitation values of Meteorology Monitoring Station (MMS) and 24 h storm event is found for the distribution function. In addition, by using the precipitation areas of the project site 24-h precipitation frequency analysis is conducted for the basin.

In these calculations various key curves belonging to climate regions and prepared by SHW General Directorate, Survey-Planning Directorate, Hydrology Department are used.

As a result, floods observed in project areas and synthetic flood methods were analyzed and the results of Regional Flood Frequency Analysis for project areas were attained. By developing the flood recurrence hydrographs in project areas; 1, 3, 5, 7, 10 days average total flow recurrence of No 20-19 Ceyhan River Kandil FGS was hauled to project areas, results of the regional (flood recurrence) that accepted for the project areas were dotted as instantly and flood recurrence hydrographs of project areas were drawn by using 1, 3, 5, 7, 10 days average total flow recurrence (for project areas).

During the determination of 1,500 m snow limit elevation in Kandil Dam location (2nd Point) and the 3rd Point (in deposition areas), snow gauging recordings in SHW and EIE 20th basin (Ceyhan Basin) were compared with daily average flows in gauging periods of No 20-05, No 20-08 and No 20-19 FGS, topographical slope status of deposition areas were considered as a factor. Possible greatest snow melting flow hydrographs that could be occurred in areas above 1,500 m elevation were attained.

Base flows of the project sites, Kandil Dam Axis (2nd point) and 3rd point, are found by using the 20-19 Ceyhan Kandil flow gauging station's average monthly flow values.

Flood period was determined by identifying the peaks that floods occur throughout the gauging duration of No 20-19 FGS and peaks' dates. Flood Period is between January and May and lasts 5 months. Average of the average flows in these months was calculated and the greatest of these averages was taken as a base flow of No 20-19 FGS.

Base flow equation of No 20-19 FGS $(Q1/Q2) = (A1/A2)^n = 2/3$ was hauled to project area and continuous flows in various frequency were found. During the calculation of PMF (Possible Maximum Flood) in Kandil Dam location (2nd Point) and the 3rd Point of project areas, result of Synder (with superpose) method was accepted and it was also accepted that the catastrophic flow is formed in CNIII. For Kandil Dam Location; if CNII = 65, CNIII = 81.5, at the 3rd point; if CNII = 66, CNIII = 82.2 was determined.

Project flood recurrence values were attained by evaluating flows gauged as a result of calculations with the regional flood frequency analysis. These values are given in Table V.3.

Table V.3. Flood Recurrence Flows

FLOOD RECURRENCE FLOWS (m^3/s)						
Project Location	**Recurrence (Year)**					
	2	**5**	**10**	**25**	**50**	**100**
1st Point	180	306	403	549	679	824
2nd Point	190	323	426	580	716	870
3rd Point	195	332	437	595	735	893
4th Point	200	340	448	610	754	916

Flood analysis results determined in detail in the project area are assessed and maximum flows are attained in accordance with the calculated flood recurrence values. By taking these values into consideration, spillway flow will be determined and necessary flood precautions will be taken.

Sedimentation

Although its bed has steep slope, it is very normal that a river with a volume as high as Ceyhan River hauls a great amount of sediment.

It is obvious that Kandil and Sariguzel Dams, which are included in Kandil Energy Group Projects and have storage facilities, will be affected by the accumulation of these sediments. However, because of the dead space of the dams (Kandil Dam: 244.78 hm^3, Sariguzel Dam: 65.26 hm^3) are quite high, it will take very long time for these accumulations reach to an amount that can affect the reservoir operations.

On the other hand, since Kandil Energy Group is formed consecutive 4 facilities and storage volume could be utilized effectively, impacts of filling the reservoir was considered as negligible.

Even if the reservoirs are assumed to be completely full and storage cannot be achieved, power above one billion kilowatt-hour per year could be generated as river power plant of Kandil Energy Group formed by four units.

V.1.4. Amounts of Stone, Sand, Gravel and etc. Formed During the Excavation, Dredging, and Works etc. That Will Be Performed For Some Purposes in Water Environment in Project Area, Where They Are Hauled or For What Purposes They Will Be Used

Within the scope of Sariguzel Dam, HEPP, and Borrow Sites, during the construction of dam embankment and providing required concrete agrega material, excavation-filling works will be performed in aquatic media. Total embankment fill concrete volume of dam will be 502,000 m^3. Total excavation that will be done in this area is 20,590 m^3. How the appraisable materials extracted from this area will be used and where they will be stored are discussed in Section V.1.1.

As it was mentioned before, concrete agrega materials needed for dam, tunnel concrete works and powerhouse concrete works will be attained from borrow site given in Appendix 1.2. Amount of material that is planned to be provided from the borrow site is 191,510 m^3. Necessary information about the assurance of concrete agrega material is given in Section V.1.7.

V.1.5. Number of Borrow Sites Such As Quarry, Sand Pit, Clay Pit to be Opened Because of Dam Construction, Number of Pits, Area Size, Operation Area Size and Coordinates, Production Quantities Planned Dependent To Years, Production Methods to be Implemented, Step Height, Width, Angle of Repose, Number of Steps, Representation of Pit's Initial and Final Conditions On Production Maps

For Sariguzel Dam, concrete load compressed with RCC cylinder is determined as the most proper and most economical embankment type. Required material for dam and tunnel concrete works and powerhouse concrete works will be provided from the area shown on the map in Figure V.1. Coordinates of the points given on the map are also given in Table V.4. Therefore, within the scope of project, one sand/gravel pit will be opened.

Sand – gravel material that will be borrowed from borrow site (along the river bed where alluvion material is taken) via free excavation by excavators will be loaded to dumper trucks and hauled to crushing – grinding facilities. Proper sized materials grinded according to material sizes that will be taken from riverbed will be grinded, stacked neatly with conveyor belts and hauled to stock site via loading to the trucks by loaders. If sand material is to be washed, firstly these materials will be processed in proper type (drum, turbinal, etc.) washing facility, then they will be hauled to stock site.

Gravel size materials will also be grinded and separated and if washing is needed, washing will be performed and hauled to stock site by trucks in the same way. Materials 64 mm and above will also be crushed. Crusher type will be projected as primary – secondary and fixed located and selected in construction phase (jaw, hydraulic stroke, etc.). Materials subjected to crushing will also be sized on the screens and separated and will be hauled to stock site by conveyor system and trucks.

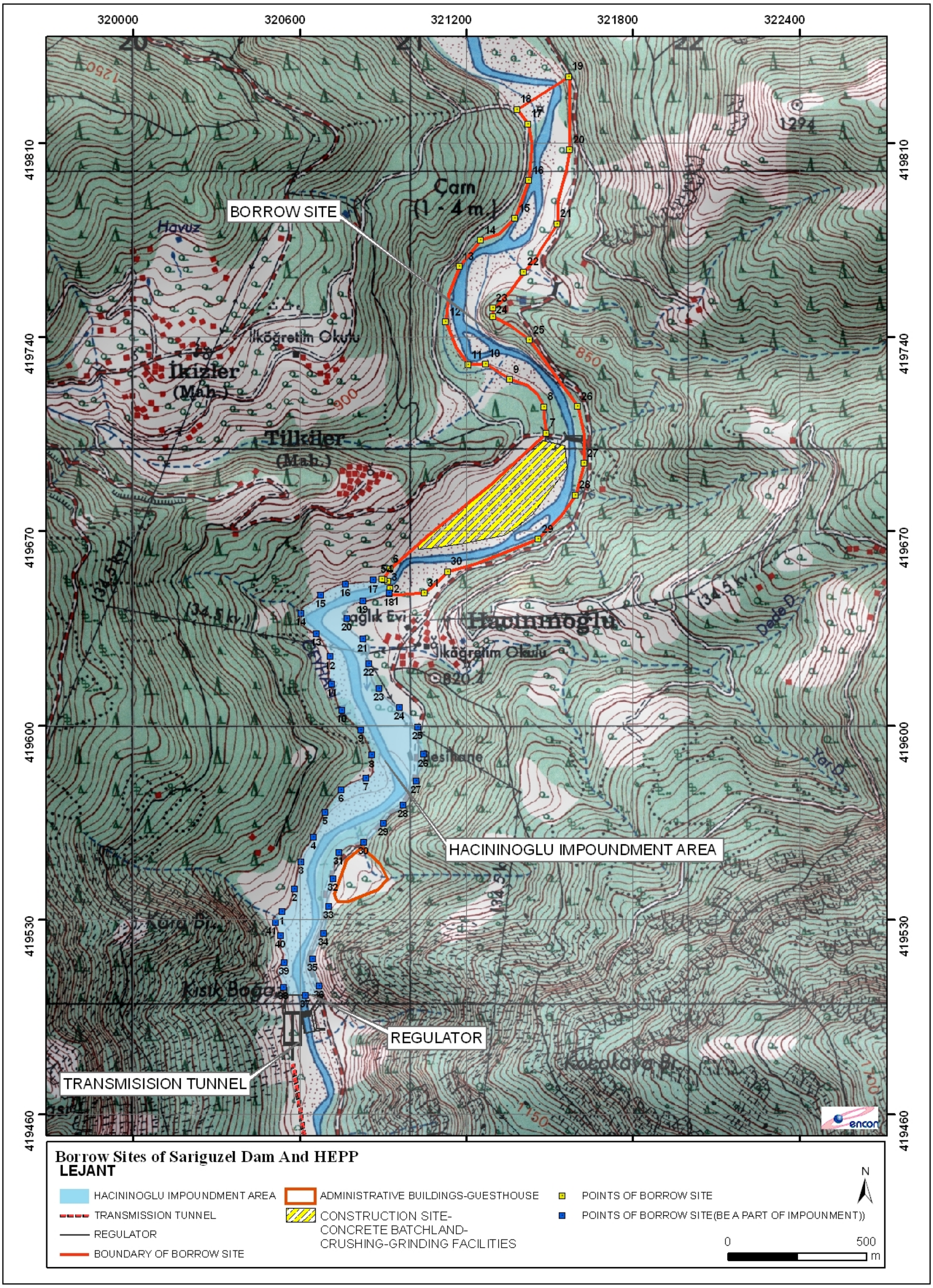


Figure V.1. Map of Borrow Site

Table V.4. Coordinates of Borrow Sites

No	X	Y	No	X	Y
1	320539.73	4195328.94			
2	320584.42	4195411.92	22	320850.51	4196224.07
3	320605.64	4195509.64	23	320888.42	4196132.83
4	320650.75	4195596.99	24	320960.74	4196065.07
5	320693.83	4195687.24	25	321027.84	4195993.60
6	320752.20	4195768.09	26	321047.28	4195896.33
7	320840.85	4195811.54	27	321021.27	4195800.90
8	320862.77	4195893.45	28	320975.29	4195712.65
9	320821.74	4195983.50	29	320902.43	4195648.42
10	320753.23	4196055.53	30	320831.36	4195580.40
11	320718.28	4196148.96	31	320744.05	4195542.94
12	320711.30	4196247.71	32	320722.70	4195447.71
13	320662.83	4196331.00	33	320707.01	4195349.35
14	320606.93	4196403.99	34	320688.38	4195251.65
15	320677.35	4196469.29	35	320650.08	4195159.68
16	320767.24	4196508.89	36	320673.21	4195062.98
17	320865.66	4196523.88	37	320622.35	4195027.38
18	320925.58	4196476.52	38	320544.38	4195057.41
19	320831.16	4196449.36	39	320545.59	4195147.07
20	320771.24	4196385.84	40	320534.51	4195242.63
21	320830.21	4196310.75	41	320515.17	4195291.39

Most part of the agrega material will be used in the construction of Dam and Regulator embankment. For the structures that is planned to be constructed in the type of RCC (Roller Compacted Concrete), adequate amount of suitable finer or coarser material is planned to be provided from the said borrow sites and therefore, it is thought that grinding will be more adequate than the crushing. Process flow chart of crushing – grinding – washing facility is given in Figure V.1a.

Area that will provide concrete agrega is 64.61 ha. The said area will be used for Hacininoglu Regulator, HEPP and Borrow Sites Project where is located in the downstream of Sariguzel Project. For Hacininoglu Project, concrete agrega material is planned to be provided firstly from nearly 26 ha section that will stay under the regulator impoundment area. For regulator and tunnel works, in total 53,040 m^3 (106,080 tones) concrete agrega material will be provided from this area. For concrete works of Sariguzel Project, 191,510 m^3 (383,020 tones) concrete agrega material is planned to be provided. Since construction works will take 2 years, yearly production amount is 244,550 tones in total. Borrow site was approved in terms of both material properties and closeness to the utilization area. Production maps of the section not staying under Hacininoglu impoundment area were given in Appendix 11. After EIA positive certificate is taken for the sections not included in the expropriation plan in this area, necessary license works will be performed with Kahramanmaras Special Provincial Administration.

Specific weight of material is 2 tones/m^3. After extracted material is formed in desired size in crushing – grinding – washing facility, it will be used for ready mixed concrete production. In borrow sites, agrega material will be extracted by excavators via free excavation and hauled to crushing – grinding facility by loading to the trucks. In here, material poured to crushers by loaders will be subjected to crushing - grinding and stocked by moving with conveyor belts and separating in suitable sieves according to material sizes. Material will be extracted from 3 – 5 m depth depending on topography. While material will be extracted 5 meter depth from the points where the conglomerate – flood material formed in river bed depending on the surface elevation; it will be extracted 3 meter depth from the points where the river bed is shallower. Permanent elevation change will not be performed and hallows that can cause congestion will not be left.

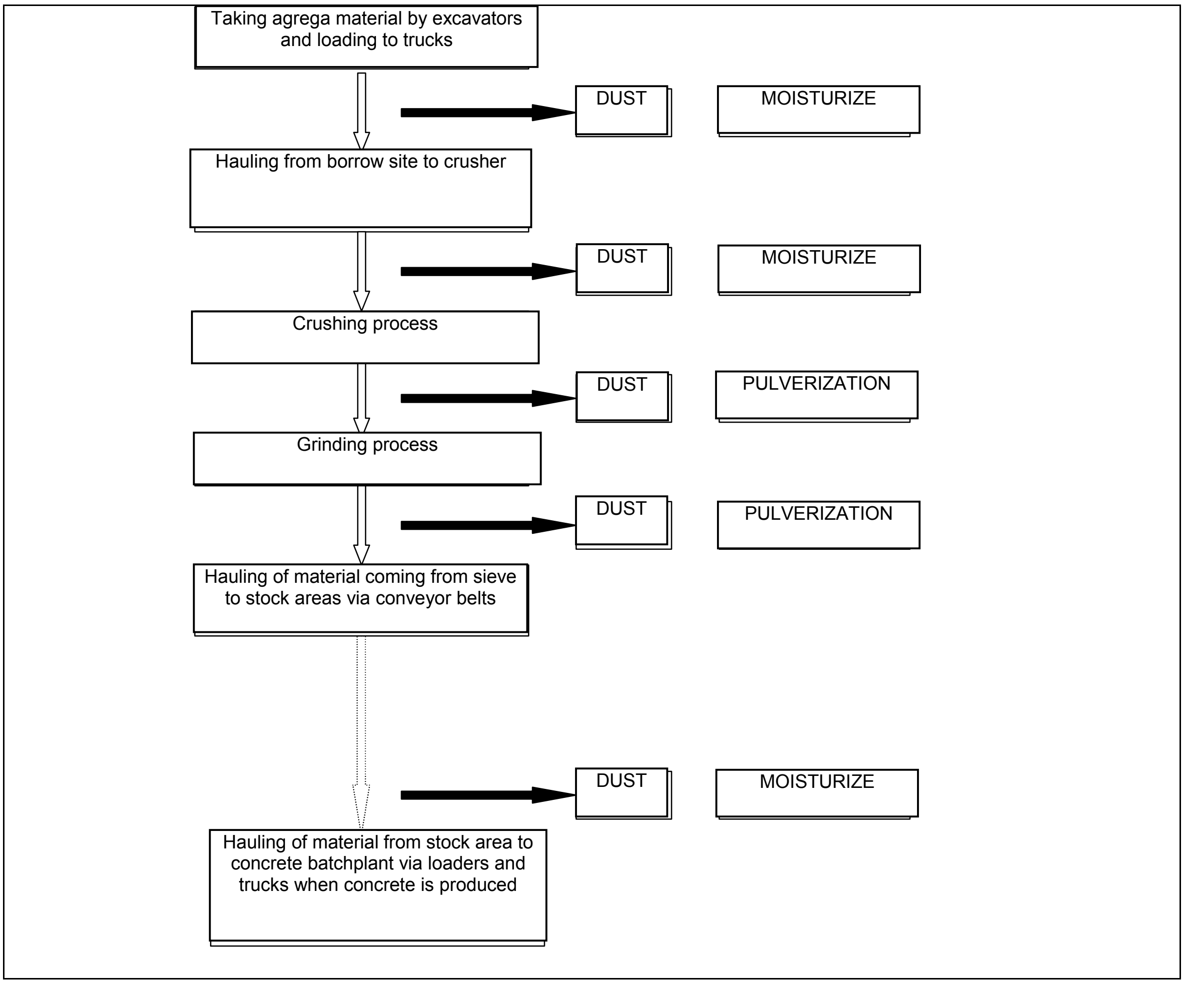


Figure V.1a. Process Flow Chart of Crushing – Grinding – Washing Facility

The nearest settlements to the location where the quarry will be operated are; Hacininoglu Village (100 m), Kertmer Village (1500 m), Tilkiler Quarter (410 m), Ikizler (Ikizce) Quarter (450 m), Dedeler Quarter (1070 m), Domuler Quarter (950 m) and Uludere Quarter (1300 m). Impacts that can be resulted in the activities performed in the borrow site on the said settlements are analyzed in the next sections.

V.1.6. Explanation of Blasting on Borrow Sites, Pattern of Blasting, Amount of Explosives That Will Be Used At A Time, Its Haulage, Storage and Utilization, Performing Air Overpressure and Rock Throws Calculations and Assessing Their Impacts

Embankment type of Sariguzel dam, which is included in the project, will be constructed in the type of concrete load with RCC cylinder. For this reason, the only required material is concrete agrega that will be used for the preparation of concrete. This will be provided from the area that is located in the riverbed shown in the map given in Appendix 1.2. Blasting will not be performed during assurance of the material.

Blasting will be performed in open area; dam axis, diversion conduit and the necessary locations for the excavation works of powerhouse and closed area; during the opening of diversion tunnel and power tunnel. Information related to explosives that will be

used during open area excavations and the construction of diversion tunnel and power tunnel is given in Table V.5.

Table V.5. Explosives Planned to be Used In Construction Phase and Their Quantities

Facility	Excavate Amount With Blasting (m^3)	Explosive Type To Be Used	Amount of Explosive To Be Used	Capsule Type To Be Used	Amount of Capsule To Be Used
Dam	10,250	ANFO	17,850	Exel Handidet 9 m 25/500 ms)	1,020
Powerhouse	15,000				
Diversion Conduit	3,000				
Diversion Tunnel	6 meter diameter 60 meter length	Powergel Magnum 365 36*400 mm	22,314	Exel LP 3 m	9,429
Power Tunnel	5.5 meter diameter 1,700 meter length	Powergel Magnum 365 36*400 mm	277,714	Exel LP 3 m	113,143

Open site, diversion tunnel and power tunnel blasting parameters are as follows:

Open Site:

Formation	: Hard
Hallow diameter (mm)	: 89
Hallow length (m)	: 6
Face length (m)	: 5
Distance between hallows (m)	: 2.7
Volume attained from one hallow (m^3)	: 29.7
Type of explosives	: ANFO
Amount of explosive to be used (kg/hallow)	: 20
Type of capsule	: Exel Handidet 9 m 25/500 ms
Amount of capsule to be used (unit/hallow)	: 1
Feeding	: Powergel Magnum 50*225 mm
Feed usage (kg/hole)	: 0.5
Total explosive (ANFO) material amount (kg)	: 17,850
Total capsule amount (item)	: 1,020
Total amount of feeding (kg)	: 510

Diversion Tunnel:

Formation	: Mid Hard
Tunnel cross sectional area (m^2)	: 32.1
Hallow diameter (mm)	: 45
Hallow length (m)	: 3.5
Throw efficiency	: 1
Progress (m)	: 3.5
Type of explosives	: Powergel Magnum 365 36*400 mm
Amount of explosives that will be used at a time (kg)	: 142
Type of capsule	: Exel LP 3 m
Amount of capsule that will be used at a time (unit)	: 60
Total explosive amount (kg)	: 22,314
Total capsule amount (item)	: 9,429

Power Tunnel:

Formation	: Mid Hard
Tunnel cross sectional area (m^2)	: 27
Hallow diameter (mm)	: 45
Hallow length (m)	: 3.5
Throw efficiency	: 1
Progress (m)	: 3.5
Type of explosives	: Powergel Magnum 365 36*400 mm
Amount of explosives that will be used at a time (kg)	: 135
Type of capsule	: Exel LP 3 m
Amount of capsule that will be used at a time (unit)	: 55
Total explosive amount (kg)	: 277,714
Total capsule amount (item)	: 113,143

Blasting pattern of diversion tunnel and power tunnel is given in Figure V.2.

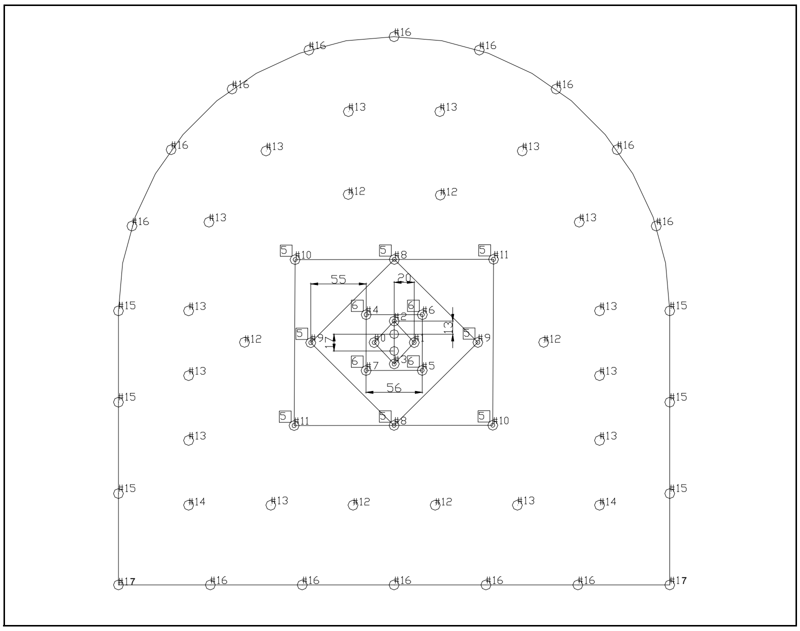


Figure V.2. Blasting Pattern of Diversion - Power Tunnel

Four mobile tanks each of 2 tones is planned to be used for the storage of explosives that will be used. These tanks will be used optimally on the area shown in Appendix 1.2. Surroundings of the storage area will be wired in accordance with the safety distances given in Section V.1.20. Required and adequate amount of safety personnel will be on guard duty with guns on a rotative basis. Fire prevention equipment will be available at all time. Required explosives will be provided from Ankara/Elmadag. Explosives will be transported via main road from the factory to the tank in which will be stored in the care of security staff of seller firm and with the transportation document taken from related Police Department. Explosives will be taken from the tank in the care of certificated fireman and

educated pit boss responsible for blasting and engineer and after blasting; remaining material will be stored in the tank by counting and recording.

In open site blasting, environmental safety will be ensured and blasting will be performed with the consent of gendarme station in the region. In the settlement areas located in the tunnel route, if vertical distance between the tunnel axis and settlement is not adequate (changes with the ground-rock type, for instance less than 40 meter), blasting will be performed with communication and if any damage is stated, blasting will be continued by ensuring expropriation and relocation. Secondary damages (ground collapse, etc.) that can occur after blasting are also mitigated by monitoring.

According to blasting plan, for the site where dam axis is located, maximum amount of explosive that will be exploded per unit time is 20 kg and this amount is 135 kg for transmission tunnel. However, as long as the maximum weight of charge detonated per unit time will not change in Ikizler Quarter located 225 m to the transmission tunnel and Tilkiler Quarter under which transmission tunnel will pass, damage may occur in the structures. For this reason, explosive amount will be reduced and number of blasting will be increased when a structure is in 421-meter distance. In order not to cause damage on any structure located 225 m to the transmission tunnel, amount of explosive that will be consumed is estimated and found as 52.73 kg. The minimum distance between tunnel and houses is 50 m and in this distance explosive amount will be reduced down to 5.52 kg. Detailed information related to explosive amount estimation and the subject are presented in Acoustic Report (Appendix-6).

The following regulations will be obeyed for the explosive issues of the project: “Constitution on the Production, Import, Transportation, Storage, Usage, Disposal, Inspection of Explosive Substances and Hunting Material (29 September 1987, No: 12028, amended 28 October 2004, No: 8057)”and “Rules and Regulations on Precautions for Working with Flammable, Explosive and Hazardous Chemicals (27 November 1973, No: 7551)”.

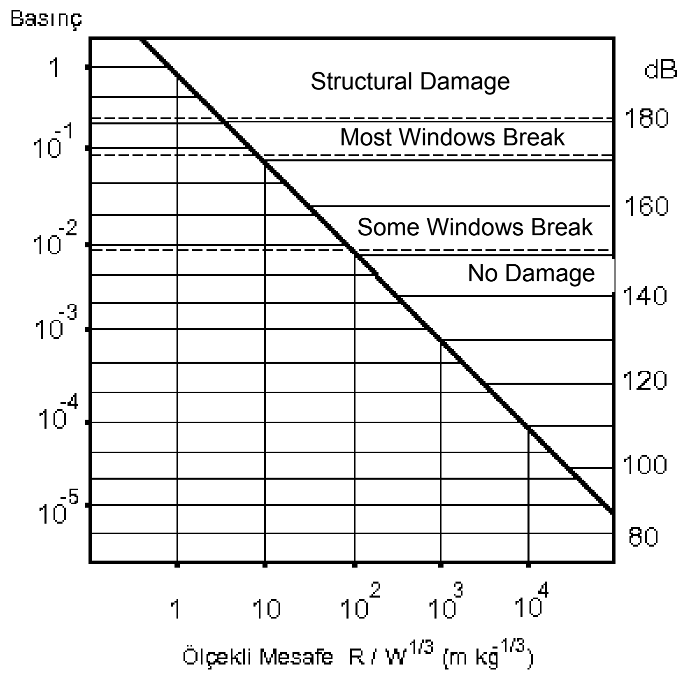
Estimation of Air Overpressure Level

Followings can be listed among the main reasons of air overpressure caused by blasting:

- Gases formed during the explosion of explosive and emitted to the atmosphere with high speed and energy
- Compressing the air via moving of rock surface that blasting performed
- Explosives, which is exploded in open site, such as blast detonator on step surface

Certain Turkish standard related to air overpressure level caused by blasting does not exist. Literature information related to potential impacts of air overpressure on structures is presented on Figure V.3.

There is no air overpressure risk in tunnel blasting. For the purpose of estimating air overpressure values of blasting that will be performed in dam site, in order to find the corresponding dBL value of the result derived from the formula shown in Figure V.3, air overpressure nomogram is used given in the same Figure. As it is the case in the studies related to vibration, for air overpressure estimations, weight of charge per unit time is assumed to be 20 kg and air overpressure values (in dBL) that may arise in various distances is estimated and presented in Figure V.4.



Basınç	*: Pressure Scaled distance*	*Yapısal hasar*	*: Structural damage*
Olçekli mesafe		*Camların çoğu kırılır*	*: Most windows break*
R (Mesafe)	*: Distance*	*Bazı camlar kırılır*	*: Some windows break*
W (Patlayıcı miktarı)	*: Weight of charge*	*Hasarsız*	*: No damage*

Figure V.3. Air Overpressure Nomogram

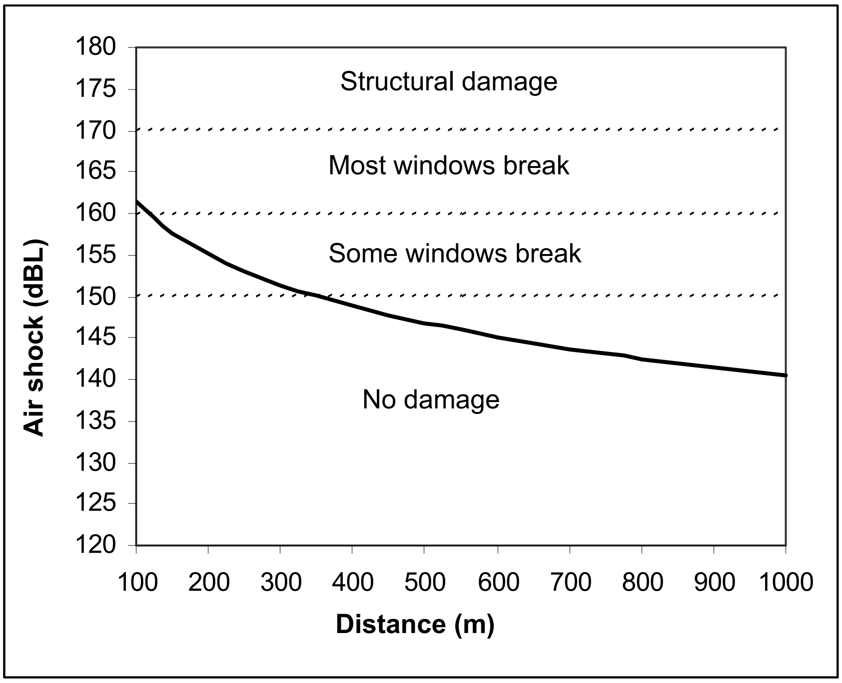


Figure V.4. Estimated Air Overpressure Level During Blasting

When the values shown in Figure V.4 are analyzed, it is understood that there is no any damage risk because of air overpressure on structures located in further than 350 m from the blasting area. The nearest settlement area (Domular Quarter – 1,000 m) will also not be affected from the air overpressure caused by blasting.

In conclusion, quaking of rock ground due to blasting at the beginning of excavation and after is not expected. Even if people feel the vibration and noise pressure levels that will be caused by air overpressure, damage risk of the buildings is considerably low. Furthermore, TR Ministry of Labor and Social Security will comply with the decisions of Occupational Safety and Health Regulation and for the health safety of working people all necessary mitigations will be taken and equipments will be controlled periodically for this purpose. Detailed information related to vibration estimations is given in Acoustic Report in Appendix 6.

V.1.7. Working Periods of Production Amounts in Borrow Sites (Day-Month-Year), Transport Routes, Transportation Infrastructure Plan, Construction Works of Infrastructure, Machinery Equipment That Will Be Used

The only borrow site that will be used within the scope of project is the borrow site located in the riverbed and from which concrete agrega will be provided. Location of this borrow site that will be used commonly in Hacininoglu Regulator, HEPP and Borrow Sites located in the downstream of Sariguzel HEPP is shown in Appendix 1.2. Throughout the construction period (2.5 years, 12 months, 10 hours a day) borrow site is planned to be used. For Hacininoglu Project nearly 53,040 m^3 and for Sariguzel Project 191,510 m^3 material is planned to be provided from this area. For concrete works of Hacininoglu Project, material is planned to be provided firstly from the section that will stay under the impoundment area. Concrete agrega material that will be extracted from the borrow site will be hauled to crushing – grinding – washing facility firstly in order to reduce to the suitable size for concrete production and then this material will be hauled to concrete batchplant. Transportation to borrow site, crushing – grinding – washing facility, concrete batchplant and transportation between these facilities will be ensured via roads that will be constructed/improved within the scope of project. Transport routes and existing village roads are given in Figure V.5.

As it is seen in Figure V.5, in order to ensure transportation between dam axis and HEPP building, a road is need to be constructed. Furthermore, village roads will also be improved. Construction works related to access roads will be completed during construction phase of Hacininoglu Regulator, HEPP and Borrow Sites Project. In this phase, nearly 21 km road in total will be constructed/improved. During these activities, excavation works with 57,450 m^3 will be performed and 25,000 m^3 of this will be achieved by blasting. During excavation works excavator, dozer and truck will be used and in order to mitigate dust formation sprinkler will be used.

Furthermore, during the activities that will be performed in borrow sites; material extraction from aquifers will not be held and solid or liquid waste will not be dumped to the locations closer than 50 m to the wells that surrounding settlements use for drinking water. In all activities, full compliance with (d) and (o) clauses of 22nd Article of Water Pollution Control Regulation will be achieved.

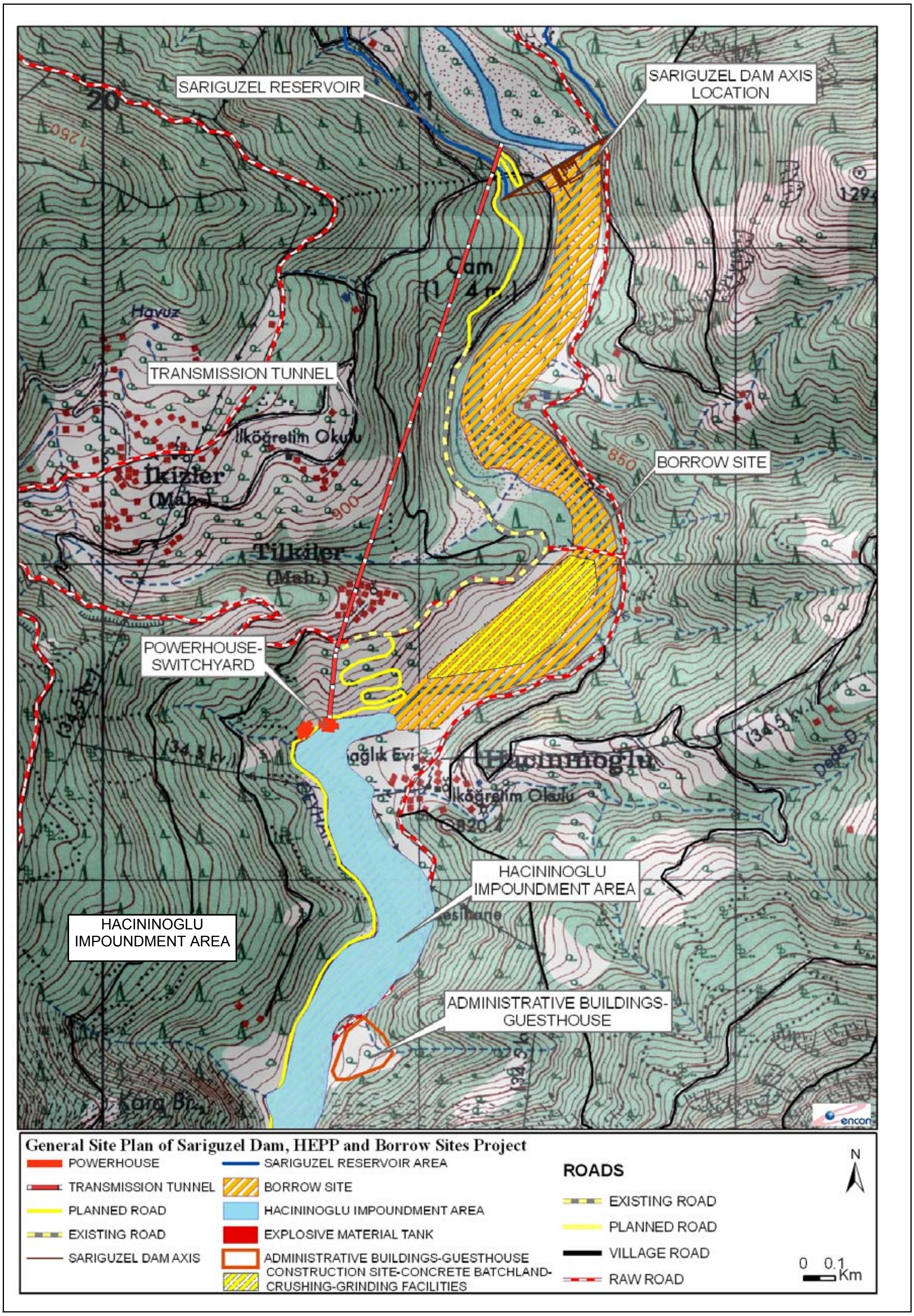


Figure V.5. Borrow Site and Transport Routes

V.1.8. Dust Emitting Activities during Construction Works, such as Crushing, Grinding, Haulage and Storage, Cumulative Values

Dust emitting activities during construction works are excavation works, open site blasting, works performed in crushing-grinding-washing facility and concrete batchplant, movements of construction equipment in roads, loading of excavated material to trucks, unloading of trucks and storage of excavated material. Emission amounts originated from these activities were calculated in Appendix 7 and compared with the limit values originated from the locations except from stacks, given in Annex 2 of Regulation on Control of Industrial Originated Air Pollution (RCIOAP) and demanding calculation of contribution values to air quality in case of exceeding these values. As it is seen in Appendix 7, as a result of all these activities, 135.56-kg/h emission formations are expected in total. During dust emission estimations, calculations were done according to worst-case scenarios. Therefore, expected emission value in practice will be lower than the calculated value.

Contribution to air quality was calculated since dust emission value exceeded the 1.5 kg/h value stated in Annex 2 of RCIOAP. Dust emission and deposition values were calculated in specified points by using ISCST3 model. Calculated values were compared with the short and long-term limits given in Table 6 of Air Pollution Control Regulation and these values are observed not to exceed the standards. Comparison of these values with the regulation is given in Table V.6 and equivalent concentration curves that show the distributions are given in Figure V.6.

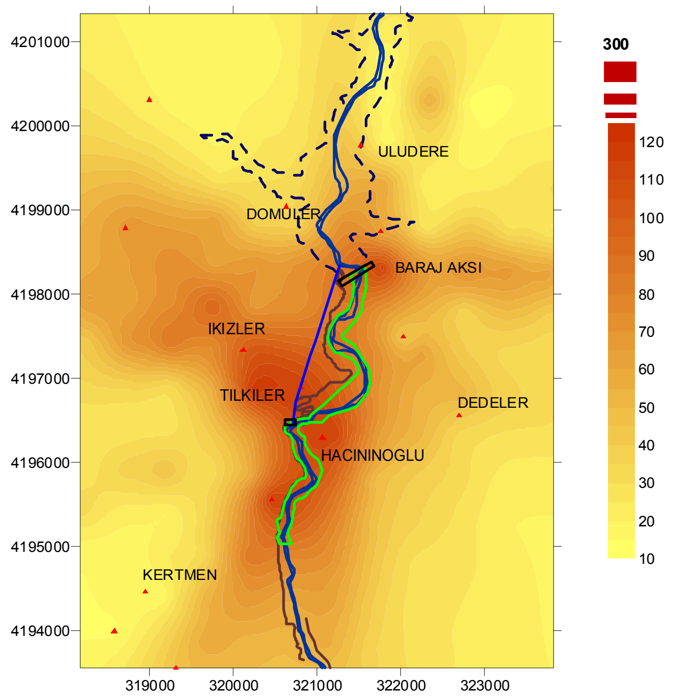


Figure V.6. PM Equivalent Concentration Curves for Project Construction Phase (µg/m^3)

Table V.6. Distribution Results and Deposition Values for PM

Parameter	Concentration	Regulation Value	
	(Maximum)	APCR	RCIOAP
Daily PM Emission	118.17 (μg/m^3)	300 (μg/m^3)	-
Yearly PM Emission	25.96 (μg/m^3)	150 (μg/m^3)	-
Short Term Deposition Value	390.99 (mg/m^{2}day)	650 (mg/m^{2}day)	450 (mg/m^{2}day)
Long Term Deposition Value	84.65 (mg/m^{2}day)	350 (mg/m^{2}day)	

As it can be seen from Figure V.6, when dust emission distributions were analyzed, a condensation was seen in the west part of both the project area and the sources that will cause emission. The main factor of this situation is west-northwest wind direction. Since the region is mountainous and generally sources are present in the valley, dust will not be dispersed too much. It can be seen from the figure that Tilkiler, Ikizler Quarters and Hacininoglu Village that are close to HEPP building and borrow site are affected from the dust emissions. However, in here, dust emission values are lower than the maximum dust emission values, therefore, it is below the Regulation limit values. Dust values in these settlement areas are given in Table V.7.

Table V.7. Daily and Yearly Dust Values in Settlement Areas (μg/m^3)

Settlement Areas	Daily Maximum Concentration Value	Yearly Maximum Concentration Value
Uludere Quarter	38.78	1.86
Domuler Quarter	34.47	3.89
Ikizler Quarter	98.61	10.39
Tilkiler Quarter	113.66	4.13
Hacininoglu Village	102.73	10.96
Kertmen Village	17.68	0.99
Dedeler Quarter	41.31	3.72

Detailed information related to model, emission amounts, method used in calculation and modeling, model outputs and equivalent concentration curves are given in Appendix 7. In addition to watering performed to prevent dust formation, following regulations will be complied with: Air Pollution Control Regulation, published on Official Gazette dated November 2, 1986 and numbered 19269; and Regulation on Control of Industrial Originated Air Pollution, published on Official Gazette dated July 22, 2006 and numbered 26236.

V.1.9. Measures to be Taken Against Ground Stability and Water Leakage

Measures taken for ground stability in dam site and against water leakage will be presented according to geological activities that will be performed in dam site. Within this scope, area should be investigated geologically and geotechnical for Sariguzel Reservoir and HEPP project.

Engineering geology activities performed by ENSU within the scope of Hacininoglu Regulator and HEPP project located in the downstream of project area include similar geological units and give general information about the region. For Sariguzel dam site, similar mitigations to Hacininoglu project could be taken. These mitigations can be listed as; construction of injection screen up to maximum water elevation in dam axis, shotcrete in tunnel construction, wire nettings and geodetic rock bolt applications.

In engineering geology activities that will be performed, rock mechanic experiments will be conducted with the cores that will be taken via wells, and resistance of conglomerates will be produced. Therefore, measures that will be taken to ensure the stability in the points where ground is weak, and to prevent the water leakage will be presented after the engineering geology actives are completed.

V.1.10. Kinds and Numbers of Trees to be Cut Down for the Purpose of Obtaining Land which is Required for Land Preparation Works and Construction Areas, Impacts of Trees to be Cut Down on the Forest Ecosystem in the Region, Natural Plant Species which are to be Destroyed, and Size of Land on which These Activities will be Performed, Impacts That May Occur on Fauna

Forestry and vegetation properties of the area were presented by digitizing the forestry maps obtained from General Directorate of Forestry, Department of Management Planning. Furthermore, forestry areas, pasture areas and agricultural lands in the region are identified in detail by analyzing the data of Soil Protection Project prepared for project area.

Dominating vegetation is maquis especially in downstream of the tributaries, and kermes oak, mazi oak, sumac, Christ's-thorn, black pine, firs, cedar and Turkish pine species are found in this maquis formation. Mixed pine species are seen especially in the regions that lie in reservoir area.

Saplings belonging to locales and stay under the reservoir area will be moved to available places by ERE or optionally, monetary values of trees will be paid to the owners. Flora – fauna species in project area are given in Section IV.2.11.

Fauna species, which use the low flow part of the river and inundated lands within the scope of project for feeding and reproduction purposes, will be affected from the project. Furthermore, it is possible that the fish species living and reproducing in the river may be affected from potential variations in the water quality due to variations in river structure. In addition to these, fauna living in the region will be affected from dust, vibration and noise caused by blasting, crushing – grinding, excavation – filling activities that will be performed in the borrow sites and the areas where transmission tunnel will pass in the construction phase. Besides, during construction period, most of the terrestrial fauna species are expected to leave the area that surrounds the construction region and move temporarily to similar areas depending on the intensity of construction activities. Since reservoir area is not too large, terrestrial media will leave its place to aquatic media in limited amounts and as a result of this, some variations may occur in limited amounts in land use, water and food chain. However, as a result of these variations, new living media will be formed for many animal species, and species that use similar habitats may come to the area and this may be a positive effect for fauna.

As it was mentioned in Section IV.2.8, in the region, variation and intensity in vegetation increase going down to surface water (i.e. along the borrow site and reservoir area) along a narrow corridor. However, in point of soil, dominating the VIIth Class soils in the region is one of the factors that cause closeness ratios observed in the region and forest quality being low.

Species discussed to be cut down will be the species that are predominantly present in the borrow site and reservoir area. These species are generally not tall trees and they are in maquis character. Furthermore, as it was mentioned in Section IV.2.8,

degraded Turkish pine and oak communities are found predominantly in the region and in addition to these, poplar tree communities located in surface water banks are also found. In the following list, number of plant to be cut down that was estimated in accordance with the closeness ratios and according to unites given in Section IV.2.8 is given.

Unite Area		**Trees to be Cut Down**
Borrow site	=	13,007
HEPP and switchyard	=	190
Reservoir	=	23,602
Number of total shrubs and tree to be cut down	=	**36,799**

V.1.11. Size of Agricultural Areas to be Disposed of for the Purpose of Obtaining Land which is Required for Land Preparation Works and Construction Plots, Land Utilization Capabilities of Such Areas, and Kinds of Agricultural Crops

Agricultural areas that will be affected within the scope of Soil Protection Project prepared for project area is identified. Detailed information related to these areas is given in Section IV. Kahramanmaras Provincial Land Use report and soil group maps were attained from General Directorates of Rural Affairs. Soil data of the region determined as working area were digitized.

Common soil properties in Sariguzel reservoir area and the areas where other facilities are located were identified as alluvial soils and brown soil without lime.

According to Soil Protection Project, since the agricultural areas in the region are generally located in riverbed, agricultural activities are limited because of frequent floods and being agricultural areas as too little parts. In the region where Sariguzel Dam, HEPP and Borrow Sites Project will be constructed, most part of the existing agricultural areas will stay under the surface area. Total agricultural area sizes that will be affected from the project were determined by ERE. In addition to these, cadastral survey is still conducted in the project area. By completing these surveys, detailed information related to agricultural areas will be attained. In Appendix 2.7, positive official letter intended for agricultural areas that will be consumed within the scope of project of Kahramanmaras Governorship Province Agriculture Directorate is given.

V.1.12. Types of Fuel to be Used during Execution of Activities Beginning with Land Preparation Works up to Commissioning of Project Units, Fuel Properties, Emissions that are to Result from Use of Fuels

Fuel that will be used during execution of activities beginning with land preparation works up to commissioning of project units are fuels such as diesel and gasoline that will be used in construction equipment. Emissions that will be formed from the exhausts of construction equipment were analyzed in Appendix 7. NO_2, CO, HC, SO_2, PM and lead emissions in PM were analyzed and determined to be below the limit values given in Appendix 2 of the Regulation on Control of Industrial Originated Air Pollution and require calculation of contribution values to air quality when exceeded.

Heater, air conditioner or central heating system operating with fuel oil is planned to be used for heating purposes in construction site. Central heating system that has regular maintenance by providing good quality fuel will be used in case of fuel oil tank is used. Fuel will be stored in 5 tones sealed fuel tank. Required precautions will be taken against fire, sabotage and leakage in fuel tanks.

New and well-kept vehicles will be used in order to control emissions originated from construction equipment. Furthermore, Regulation on Control of Exhaust Gas Produced by Vehicles in Traffic (8 July 2005, No: 25869) will be obeyed.

V.1.13. Amounts of Water to be Drawn from Water Supply Resources within the Scope of the Project, Water Supply System and Itemization of Water Amounts According to Usage Purposes, Types and Amounts of Wastewaters that are to be Generated, Receiving Environment into which such Wastewaters are to be Discharged

Main water consumptions in construction phase of the project are concrete production, washing of concrete agrega material, prevention of dust formation, and drinking-potable water for employees. Required water for concrete batchplant, washing of concrete agrega material and prevention of dust formation will be provided from Ceyhan River and tributaries that feed the river. Drinking-potable water will be provided from the settlements located close to construction site that will be constructed between Ikizler (Ikizce) Quarter and Hacininoglu Village.

Domestic water consumption at the construction site will be 7.5 m^3/day, based on a daily water demand at the site of 75 liters per person (Tchobanoglus, 1991), and 100 people will work in construction phase. For water to be used as drinking and utilization supply, Regulation on Water to be used for Human Consumption (17 February 2007, No: 25730) will be obeyed. Water amount that will be used in addition to precautions so as to prevent dust that may be formed during construction activities may change depending on surface geometry of hauled material, meteorological conditions of media before and after watering and topographical conditions of the area that will be excavated. Water amount that will be used for the prevention of dust formation is not known certainly. Necessary amount of watering will be performed by taking the 10% moisture content of topsoil into consideration in the areas that excavation will be performed and excavated material will be dumped. Required water for this process that will be implemented except for rainy and snow covered days will be provided from Ceyhan River. Furthermore, 28,800 m^3 water will be needed for concrete production and washing of concrete agrega material. Required water amount per day will be 130 m^3 based on a water demand of 0.13 m^3 for 1 m^3 (S. Abdol Chini and William J. Mbwambo, 1996) of concrete production. This water will be used for washing of mixers in concrete batchplant, mixers of ready concrete vehicles, and concrete agrega that will be used during concrete production.

Wastewater will be formed due to domestic wastewater originated from the employees in construction phase, and washing of ready concrete batchplant and concrete agrega material. Wastewater amount will be 7.5 m^3 based on the assumption that daily water demand of the employees in the construction phase turn into domestic wastewater. Wastewaters that will be produced in the construction phase will be stored in the septic tank that will be opened in an acceptable point and sealed by appropriate methods in order to prevent leakage to the underground. This wastewater will be vacuumed by the sewage trucks in specified periods and discharged to the system that Municipality of Kahramanmaras discharges its wastewater. In this respect, Article 22 and 32 of Water Pollution Control Regulation will be taken into consideration. Furthermore, a protocol will

be conducted with Municipality of Kahramanmaras in connection with the vacuuming of wastewater collected in sealed septic tanks with sewage trucks. In accordance with Article 32 of Water Pollution Control Regulation, documents to be taken as a result of waste disposal with sewage trucks will be kept for 3 years and during auditing, these documents will be proved to the people concerned. Information related to sizes of septic tank that is planned to be constructed is given in Figure V.7. The septic tanks will be appropriate to Regulation on Pit Opening Where Sewer System Construction is not Applicable (19 March 1971, No: 13783).

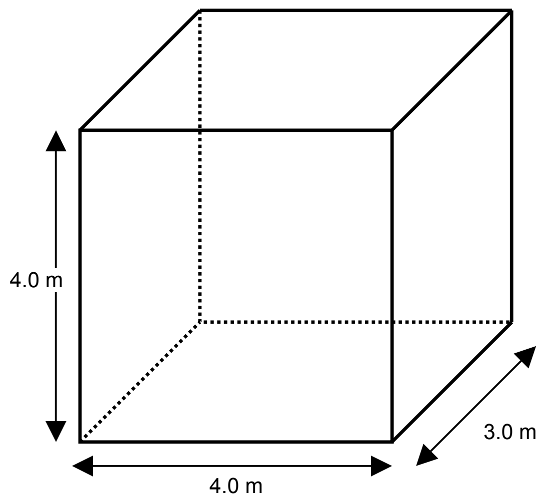
Daily wastewater amount per capita: 75 L/day	
Daily wastewater amount of 100 employee: Approximately 7,5 m^3/day	
Total wastewater amount produced in 6 days: 7,5 m^3/day x 6 = 45 m^3/day	
Septic tank volume: Length = 4.0 m Width = 3.0 m Height = 4.0 m Volume of tank = 48 m^3 Control volume = 48 – 45 = 3 m^3	Not scaled

Figure V.7. Volume of Septic Tank Planned to be Built (Construction Phase)

Within the scope of project, concrete batchplant is planned to be built in work area to produce ready concrete. In concrete batchplant, agrega material will be mixed with cement, water and additives depending on the property of desired concrete, and ready concrete will be produced. As a result of consuming 130 m^3 water for washing the mixer in concrete batchplant, mixers in ready concrete vehicles and concrete agrega material that will be used during concrete production, wastewater with high content of suspended solid will be produced. After treating these waters in sedimentation tank that is planned to be constructed, they could be used for washing of concrete agrega and mixers. After treatment, discharging of unused water to Ceyhan River is to be discussed. On this issue, Water Pollution Control Regulation, published on Official Gazette dated December 31, 2004 and numbered 25687 and Water Products Law numbered 1380 will be complied.

For the treatment of wastewater that will be produced by washing of concrete agrega, a tank with 24-hour hydraulic retention time and 3 m depth, 5 m width, and 8 m length is planned to be used.

In sedimentation tank, only physical treatment will be performed. For this reason, chemical will not be used.

Due to activities that will be performed in construction phase, dust will be formed and water will be used for dust suppression. Since water, which will be used for dust suppression, will evaporate wastewater will not be produced as a result of this activity.

V.1.14. Amount of Solid Waste to be Generated during Execution of Activities Beginning with Land Preparation Works up to Commissioning of Project Units, Disposal Methods

Within the scope of project, during land preparation, construction of units and the employees that will work in these activities will generate solid waste. Solid wastes to be generated in this phase can be classified in three main topics.

- Construction and excavation wastes
- Domestic solid waste
- Sludge from sedimentation

Wastes such as wood wastes, construction iron and iron pipe can be recovered. These wastes will be collected in available places in project area, and sent to a licensed facility for recovery. Concrete waste material will be used for filling material. Some part of the excavation waste will be sent to crushing-grinding facility for concrete production. Remaining part will be spreaded to holes from where concrete agrega is taken in the area that will be used as borrow site. Excavation amounts that are planned to be executed are given in Section V.1.1 in Table V.1.

100 people will work in construction phase. Domestic solid waste originated from employees work in construction phase will be 134 kg based on a daily solid waste amount of 1.34 kg/day per person. These wastes will be collected in proper container and taken by Municipality of Kahramanmaras in specified periods or disposed to an area that Municipality of Kahramanmaras will determine.

After dewatering, sludge formed in sedimentation tank will be sent to a disposal area that Municipality of Kahramanmaras will show. In case the wastes will be stored together with the domestic wastes then especially Article 28 of Solid Waste Control Regulation (14 March 1991, No: 20814) will be obeyed.

V.1.15. Sources and Levels of Vibration and Noise to Arise during Execution of Activities Beginning with Land Preparation Works up to Commissioning of Project Units, Cumulative Values, Preparation of Acoustic Report for Borrow Sites according to Regulation on Assessment and Management of Environmental Noise

Attained values as a result of calculations were compared with Article 26 of Regulation on Assessing and Management of Environmental Noise. Limit values for noise level are satisfied 250 m far from the construction site, 91 m far from the dam site and 56 m far from the HEPP construction site. In Hacininoglu Village that is determined as critical for construction site and located in nearly 290 m displacement, and Tilkiler Quarter located in 300 m displacement; construction phase noise level impact modeling results were calculated as 68.94 dBA and 68.70 dBA respectively. Noise level that will occur due to HEPP building construction was calculated as 58.53 dBA in Hacininoglu Village located in 325 m distance and 55.73 dBA in Tilkiler Quarter located in 500 m distance. In addition, noise levels that will arise due to construction activities in Ikizler Quarter (1,300 m) and Domuler Quarter (1,000 m) that are the nearest settlements to dam embankment are 52.68 dBA and 54.39 dBA respectively.

Among the settlements that are near to noise sources, in Ikizler Quarter, Domuler Quarter, Hacininoglu Village and Tilkiler Quarter, cumulative noise level was calculated in the nearest houses to the said settlements in the worst case of construction works as mentioned below (Table V.8).

Table V.8. Cumulative Noise Level Calculated in the Nearest Settlements

Settlement	**Existing Noise Level (dBA) (A)**	**Noise Impact Originated from Construction Activities (dBA) (B)**	**Noise Impact Originated from HEPP Construction Activities (dBA) (C)**	**Noise Impact Originated from Dam Construction Activities (dBA) (D)**	**Cumulative Noise Level (dBA) (E) E= 10 log ($10^a+10^b+10^c+10^d$)**
Hacininoglu Village	55.0	68.94	58.53	48.42	69.51
Tilkiler Quarter	57.8	68.70	55.73	49.88	69.29
Ikizler Quarter	49.8	51.97	49.76	52.68	57.27
Domuler Quarter	52.8	44.50	43.53	54.39	57.13

In worst-case conditions, cumulative value (existing noise + construction activity noise) calculated in the nearest settlement to the construction site is below the maximum noise level (70 dBA) determined in Regulation on Assessing and Management of Environmental Noise. In the model, calculations were done based on the assumption that construction machines work at the same time, which is the worst case. Nevertheless, results are below the limit values. However, all machines will never work at the same time in here. Therefore, noise that will be originated from construction activities will not affect settlements negatively.

Vibration will occur as a result of blasting that will be performed in transmission tunnel and dam embankment within the scope of project. According to vibration level calculations conducted for transmission tunnel, after 421 m, vibration that will occur was observed to be lower than the limit value given in Regulation on Assessing and Management of Environmental Noise. However, Ikizler Quarter located 225 m to the transmission tunnel and Tilkiler Quarter under which transmission tunnel will pass will be affected due to vibration that will occur as a result of blasting. In order to prevent these effects, firstly, before starting to construction activities, necessary activities such as ground survey in the areas that tunnel will pass will be conducted and according to the results of these surveys tunnel will be constructed. Houses that may be damaged after the surveys will be expropriated and their values will be paid. Other than these, public and gendarme will be informed about blasting. Furthermore, during tunnel blasting under Tilkiler Quarter, weight of charge detonated at a time will be reduced and number of blasting will be increased.

According to vibration level of blasting that will be performed in the site where dam axis will be constructed, it is seen that damage will not occur on the structures that are further than 118 m. Since the nearest settlement (Domuler Quarter) is 1,000 m far from the dam axis, there is no probability that damage will occur due to blasting. Moreover, detailed information related to noise calculation and vibration level that will be originated from blasting is given in Acoustic Report (Appendix 6).

For Tilkiler Quarter under which transmission tunnel will pass, it was pointed that ground survey and necessary studies will be conducted before the construction activities and tunnel will be constructed according to the results of these surveys. It was said that houses that may be damaged after the surveys will be expropriated and their values will be paid.

V.1.16. Place and Method of Meeting Housing and Other Technical/Social Infrastructural Needs of the Personnel who are to be Employed in Project Activities Beginning with Land Preparation Works up to Commissioning of Project Units, as well as those of their Family Members

In the construction activities that will be performed beginning with land preparation works up to commissioning of project units, 100 people are planned to be employed in total. Required personnel will be chosen firstly from close vicinity. Services will be provided for these personnel. For other personnel, engineer dormitory, guesthouse will be built on the area located between Hacininoglu Village and Tilkiler Quarter. This area is shown in Appendix 1.2. For family members of personnel, any housing is not planned to be built. Project area is 100 – 150 km far from Kahramanmaras. Technical/social infrastructural needs will be provided firstly from close settlement otherwise these will be provided from Kahramanmaras.

V.1.17. Works which Pose a Risk and are Hazardous for Human Health Out of Those to be Performed from the Beginning of Land Preparation Works up to Commissioning of Project Units

During the activities that will be performed within the scope of project, blasting and the usage of heavy construction equipment is to be discussed. Occupational accidents may occur due to personnel's inattention, not obeying safety instructions and not using safety equipment. In order to reduce occupational accidents, qualified personnel will be employed and personnel will be educated about occupational safety.

In order to prevent all occupational accident in this phase, warning signs will be placed in working areas and personal protective equipment will be given to employees. The risk of occupational accidents caused by low concentration of employees will be prevented via short brakes in working hours. Blasting will be announced earlier and nobody will be taken to blasting area. Local public will be noticed via siren before blasting.

Blasting will be performed in open site excavations and during providing the material from riverbed. ANFO and Powergel Magnum 365 will be used as explosive and stored in project site. Constitution on the Production, Import, Transportation, Storage, Usage, Disposal, Inspection of Explosive Substances and Hunting Material (29 September 1987, No: 12028, amended 28 October 2004, No: 8057) will be obeyed.

For these issues the following regulations will be obeyed: Public Health Law (24 March 1930, No: 1593); Occupational health and Safety (9 December 2003, No: 25311); Regulation on Safety and Health Signs (23 December 2003, No: 25325); Regulation on Protective Systems and Equipment to be Used in Areas where Explosion is Possible (27 October 2002, No: 24919); Regulation on Noise Control (23 December 2003, No: 25325).

V.1.18. Surface Area and Methods of Site Arrangements (Afforestation, Arrangement of Green Areas, Etc.) to be Realized in the Project Location for the Purpose of Creating Landscape Elements or for Other Purposes, Kinds of Plants and Trees that are to be Selected to Serve this End

Landscape character, which will start to change in construction phase, will change irreversibly from the beginning of operation phase. Source of changes in landscape character can be classified as,

- Surface cover changed (in terms of surface water)
- Vegetation to be stripped
- Units/facilities to be constructed
- Change in land pattern/utilization
- Topography

The biggest visual change that will occur is the conversion of river structure to lake structure. Visual change that will occur in this respect can be described as positive. Description was made as positive, since the whole landscape of the area is not found to be effective. Number of plants will reduce because of the plants inundated. In order to compensate reducing vegetation, to prevent erosion and to form better visual impact; plantation activities will be performed in the areas where powerhouse, switchyard and turbine will be constructed. However, it will become harder to achieve a landscape design that corresponds to a colorful/variable landscape structure formed as a result of various plant species seen especially in riverbank living together and various habitats coming together.

Since moderate level erosion is seen in the region, increase in erosion degree could be seen because of stripped vegetation in construction and operation phase, stripped topsoil and slope. For this purpose, after the construction activities, more flat surfaces will be attained via forming figures in the regions where slope is high and landslide is seen, and these regions will be planted. This activity will both decrease the flow of soil to the surface water and increase the economical life of dam because sediment transport is reduced. In order to succeed plantation activities that will be performed in regions where erosion is seen, necessary warning signs will be placed and in order to reduce the entrance to the site, fence or vegetative barrier will be placed.

Dominating vegetation is maquis especially in downstream of the tributaries, and kermes oak, mazi oak, sumac, Christ's-thorn, black pine, firs, cedar and Turkish pine species are found in this maquis formation. During afforestation, dominating vegetation of the region will be taken into consideration and according to this, tree species that will be used in afforestation will be chosen. In addition to tree species, formation of vegetative cover will be enhanced by seeding in the areas where landslides are often observed. In order to succeed seeding, if necessary, additional mitigations (mulching etc.) will be applied.

Visual change will be observed clearly in the areas where large vista is found. Change in land utilization will stay under lake face. However, visual impact of both the units that will be constructed in operation phase and the changed landscape will be seen clearly.

Together with the operation phase, dam site could be used as picnic area for local public. For this purpose, dam could be used as recreation area for hobbies and sports such as fishing, picnic, jogging, bird watching and photography; and arrangements intended for this purpose will be brought into the area. Thus, structural and vegetative landscape projects will be prepared for new land utilizations.

V.1.19. Determination of Potential Impacts on Cultural and Historical Assets (Traditional Urban Pattern, Archeological Heritage, Natural Values That should be Protected) Present Under Ground and Above Ground Including Project Area and Borrow Sites

According to Cultural Assets Inventory and desk works, any cultural and natural assets are not found in project area. In the official letter of Adana regional Directorate of Conservation of Cultural and Natural Assets given in Appendix 2.5, it was stated that any cultural and natural assets are not found in the project area according to the field study conducted on 16-17th of December 2006 by the Directorate and the investigations conducted in archive of Directorate. However, in case of coincidence with such an asset during construction, construction activities will be stopped and the nearest museum directorate will be informed about the situation.

V.1.20. Suggested Width for Health Protection Zone

According to the Article 16 of Regulation on Workplace Initiation and Working License that came into force at August 10, 2005, health protection zone has to be designated around the industrial site, organized industrial site and industrial areas and 1st degree non-hygienic facilities to be built outside these areas. Health protection zone cannot be determined out of the property boundaries, and structuring for residing of people is not allowed in this zone.

According to the same article, health protection zone is determined by the most authorized person of the area for the 2nd and 3rd degree non-hygienic facilities or in case the facility will expand in the industrial area, organized industrial area. Health protection zone is determined by investigation commissions via taking the harmful impacts of facilities and pollutant factors into consideration. Health protection zone is determined by taking the protection of industrial site as a base, and the distances given in this report is accepted in the facilities that EIA report is needed.

Within the Annex 2 of Regulation on Opening and Operation License of Facilities, 1st, 2nd and 3rd degree non-hygienic facilities are listed. In these lists, explosive tanks within the scope of Sariguzel Dam, HEPP and Borrow Sites Project are included in 1st degree non-hygienic facilities list; sand pits, sand washing and grinding facilities and ready concrete facilities are included in 2nd degree non-hygienic facilities list.

Within the scope of project, explosives, 17,850 kg ANFO and 300,028 kg Type 365 Powergel Magnum, is planned to be stored in the area shown in Appendix 1.2. The said explosives contain ammonium nitrate in specific rates. For this reason, during the determination of distance to be suggested for health protection zone around the explosive tanks that will be located in project area, “Regulation on Precautions to be Taken in the Facilities where Flammable, Explosive, Hazardous and Toxic Substances are Used (24 December 2007, No: 14752)” will be obeyed. Distances are given in Table V.9

Table V.9. Distances Related to Explosives Containing Ammonium nitrate (Distances from Buildings Without Mil*)

Amount of Explosive (kg)	Distances from Occupied Buildings (m)	Distances from Land Routes And Rail Roads (m)	Distances to each other (m)
1	4	2	0
5	8	4	1
10	10	5	1
50	25	13	3
100	35	18	4
500	75	38	8
1,000	100	50	10
5,000	250	125	25
10,000	350	175	35

* During the calculation of distances related to buildings with mils that stores ammonium nitrate, liquid oxygen, liquid air and explosives that contain them; distances in the chart can be 50% reduced by taking the properties of existing mil into consideration.

Furthermore, Annex 1 of the Constitution on the Production, Import, Transportation, Storage, Usage, Disposal, Inspection of Explosive Substances and Hunting Material (29 September 1987, No: 12028, amended 28 October 2004, No: 8057) gives the safety distances for the explosive magazines. These distances can be seen in Table V.10.

Table V.10. Safety Distances of Explosive Work Place and Tanks From Surroundings

	Line	Buildings and Tanks		(D) Safety Distances (Meter)	(Q) = Total Explosive Amounts (Kilogram)									
					2000	5000	10000	20000	30000	40000	50000	60000	70000	75000
From Surrounding	1	Together with tanks and work place buildings belonging to all sorts of facilities that produce and store explosive material, Explosive Material Tanks, Railway, Road, Sea, Lake, River, Jetty and Seaports	Without mil		186	253	319	402	460	506	545	579	610	624
			With mil		160	214	269	339	388	427	460	489	515	527
	2	Village and Forest Roads, Private Land, Sea or Water Routes belonging to Mine pit	Without mil		117	159	200	252	289	318	343	364	383	392
			With mil		100	100	101	128	146	161	173	184	194	198
	3	School, Hospital, Temple, Barracks, Prison, Theatre, Cinema, Bazaar, Official and Private Work Places, Industry, Agriculture and Telecommunication Facilities, Airports, House, Bakery, Buildings and Places such as Markets and Marts	Without mil		280	380	478	603	690	759	818	869	915	936
			With mil		270	270	330	415	475	523	564	599	631	645
From Each Other	4	All Work Place Buildings and Explosive Material Tanks located in the same place with the Work Places that produce and store Explosives	Without mil *		30	41	52	65	75	82	88	94	99	101
			With mil		21	29	37	46	53	58	63	67	70	72

**For the light tanks without mil, double distances with mil stated in the chart are taken.*

NOT: A) Minimum safety distances for the explosive material tank amounts that are not present in this table are calculated according to following formula provided that Minimum 160 for the 1st line, 100 for the 2nd line, 270 for the 3rd line.

	Without Mil	With Mil
For the 1st Line	$D = 14{,}8 \times Q^{1/3}$	$D = 12{,}5 \times Q^{1/3}$
For the 2nd Line	$D = 9{,}3 \times Q^{1/3}$	$D = 4{,}7 \times Q^{1/3}$
For the 3rd Line	$D = 22{,}2 \times Q^{1/3}$	$D = 15{,}3 \times Q^{1/3}$
For the 4th Line	$D = 2{,}4 \times Q^{1/3}$	$D = 1{,}7 \times Q^{1/3}$

(D) = Safety Distances (meter)
(Q) = Total explosive amount (Kilogram)

B) For the tanks in which hunting gear (except powder) will be stored, safety distances determined by this table and the distances that should be bought or rent by entrepreneur are halved.

*C) Safety distances for underground gallery tanks were given in Appendix-6. (Soil thickness that should be present above the existing burial tanks among the tanks covered with soil and gallery type burial tanks *except gallery type* will be calculated in centimeter and safety distances will be assessed according to Paragraph **D**.)*

D) Distances that should be bought or rent according to tank load limit by entrepreneur from the tank provided that safety distances remain same were shown as below.

	Total Explosive Amount (Ton)				
	2-75 Tonnes	76-100 Tonnes	101-150 Tonnes	151-200 Tonnes	201 Tonnes and More
For the 1st Line :	160	180	200	220	240
For the 2nd Line :	100	120	140	160	180
For the 3rd Line :	270	290	310	330	350

For the storage of explosives that will be used within the scope of project, 4 mobile tanks each of 2 tones is planned to be used. Mobile tanks are planned to be used as immobile in the area shown in Appendix 1.2. As it is given in Table V.10, safety distances of a tank without mil and 2 tones weight to the structures specified in 1, 2, 3 and 4th rank are 187 m, 117 m, 280 m, and 30 m respectively.

During the determination of health protection zone around the area, where sand pits, sand washing and grinding facilities and ready concrete facilities included in 2nd degree non-hygienic facilities list located, air emissions and noise values originated from project were taken into consideration. For the calculation of maximum concentrations of air pollutant emissions (gas and dust) that could be originated from construction and operation activities of the project modeling studies (USEPA – developed by USA Environmental Protection Agency, ISCST3 model) are conducted in order to determine Health Protection Zone. Similarly, noise level around the project area was calculated by using the method suggested in UNDP's document called "TEM Traffic and Construction Noise Control Report" (UNDP, 1990).

ISCST3 air modeling results shows that the maximum ground level concentration values estimated around the project area, and calculated for PM and gas emissions through the construction and operation phases are below the limit values defined in APCR. For this reason, an important effect of the project construction and operation activities on surrounding of the area will not occur provided that emission-reducing mitigations mentioned in related sections are taken. As a result, air quality will not be a restricting parameter during the determination of health protection zone distance.

Noise level calculated under worst-case conditions in construction phase is below the limit values identified in Regulation on Environmental Noise Assessment and Management. A strict approach that assumes all the equipment work at the same time and place (the worst case conditions) was applied. Noise level originated as a result of activities performed in construction site where concrete batch plant is also located complies with the limit values in 75 m distance.

In conclusion, it is recommended to choose the health protection zone distance 250-300 m far from the four 2-ton explosive storage tanks (described as 1st degree non-hygienic facility); in case it is requested by the most authorized person of the locality the zone distance is recommended to be 75-100 m far from the sand borrow site, sand washing unit and sieving units.

V.1.21. Other Issues

There are no other issues to be discussed in this section.

V.2. Activities to be Conducted During Operation Phase of the Project, Impacts of These Activities on Physical and Biological Environment and Measures to be Taken

V.2.1. Properties of All Units Within The Scope Of Project, Which Activities will be Performed In Which Units, Their Capacities, Product or/and Services That will be Produced In Units, Production Amounts of Final and By-Products

As it was mentioned before in previous sections, units that will be built within the scope of Sariguzel Dam, HEPP and Borrow Sites Project are given as follows:

- Dam
- Diversion Tunnel
- Power Transmission Tunnel,
- Surge Chamber,
- Penstock and,
- Power Plant.

General site plan of these facilities are shown in Appendix 1.2.

Maximum water elevation in Sariguzel Dam and HEPP facilities is limited with Kandil Dam HEPP tailrace elevation. Waters that will come out of this dam will be passed to Hacininoglu HEPP facilities. Hacininoglu Regulator and HEPP facility are planned to be a complementary part of Sariguzel Dam and HEPP facility. Although building Sariguzel Dam higher than 836.00 m normal water elevation was found to be appropriate in conducted individual optimization studies, this elevation was chosen due to Kandil HEPP located upstream of Sariguzel Dam.

Dam: In the activities performed in the region, watertight material could not be found in close vicinity. On the other hand, an abundant amount of agrega was found in upstream and downstream of dam axis. Concrete load compressed with RCC cylinder, which minimizes the filling amount and accordingly haulage, and is possible to be built in a short time, is determined as the most proper and most economical embankment type. However, as a result of studies that will be conducted in future, dam embankment would be constructed as rockfill if it were more economic and more proper.

The only effective reason during the determination of dam elevation was Kandil HEPP tailrace elevation that is the only appropriate power plant area. According to this, normal water elevation of dam is 836.00 m, and crest elevation of dam is 840.00 m. Dam will be 68.00 m higher than thalweg and 72.50 m higher than foundation. Crest width is 4.00 m and crest length is 418.00 m. Upstream face of the dam embankment will constitute steep slope, however, downstream face will constitute a bevel of 0.8/1.0.

Spillway of Sariguzel Dam will constitute above embankment and as gated. Radial gate was chosen as gate type. Crest elevation of spillway sill is 821.00 m. In project planning, spillway was sized according to catastrophic flow (q_{kat}=5,141m^3/s). According to this, four gates with 10.00x15.40 m size were recommended to be constructed.

Spillway drainage channel will constitute, as it will accord to dam embankment and ‘ogie’ profile. Drainage channel will be in 46.00 m width and 64.00 m length. Ejection threshold was determined as proper for energy breaking structure at the end of drainage channel. Geological structure located at the end of drainage channel and the bank of Ceyhan River is suitable for constructing ejection threshold. Rip-rap with 46.00 m width and 10.00 m length will constitute at the end of ejection threshold.

Diversion tunnel: Sariguzel Dam diversion tunnel will constitute in dam right bank as circle sectioned, 6.00 m in diameter and 60.00 m in length conduit. Diversion conduit will enter to 772.63 m elevation and exit from 772.00 m elevation. After diversion construction is completed, conduit will be plugged. A steel pipe with 2.40 m in diameter and 10.00 m in length will be placed into plug concrete. A gate valve with 2.40 m in diameter and after the valve, dead-end stopper will be placed at the end of steel pipe. Bottom outlet is constructed in order to empty the dam in case of failure. It will be kept close at other times.

Power Transmission Tunnel: Sariguzel power tunnel is in 130 m north of right bank of dam axis. This tunnel takes water from reservoir at 810.00 m elevation and arrives surge chamber after 1,670 m. Tunnel ends 30 m after the surge chamber. Exit elevation of tunnel is 806.60 m. Sariguzel power tunnel is circle sectioned with 5.50 m in diameter and 1,700 m in length.

Tunnel route was passed, as it will provide the approaches in power tunnel. Excavation was performed where soil load above tunnel is shallow. In those places, conduit was constructed and covered. In this case, number of opening is increased in tunnel activities and the longest part of power tunnel is 655 m. 0+590-0+670 and 1+325-1+345 km of tunnel was fixed with conduit. This case, however, enabled to work at 6 openings in 1+700 km tunnel.

Surge Chamber: Sariguzel is in 1+670 km of power tunnel. Inner diameter of surge chamber is 20.00 m and excavation diameter of surge chamber is 24.00 m. Stack height is 30.00 m.

Penstock: As a result of conducted hydraulic calculations and operation studies, total installed capacity of Sariguzel was optimized as 98 MW. Power plant is formed by two units each has 49 MW power. Penstock that will transmit the water from power tunnel to power plant is 207 m in length, 4.50 m in diameter and 24 mm in wall thickness.

Power Plant: Powerhouse that is recommended in the project is 30.00 m in length, 13.00 m in width and 22.50 m in elevation. Another tailrace channel was not needed since Sariguzel HEPP powerhouse was built in the bank of Ceyhan River. Power plant outlet structure will be connected to riverbed. Within the scope of Sariguzel Dam and HEPP Project, 2 Francis type Vertical Axis turbine with a unit capacity of 49,000 kW was stipulated to be used.

Concrete Batch Plant: In the borrow site from where concrete agrega material will be provided, a concrete batch plant, where production of ready concrete is performed by storing and mixing the components of ready concrete such as agrega, cement, water and additive materials under control and its filling with transmixers takes place, is present. Hourly production capacity of concrete batch plant that works fully automatic and is electronic is approximately 100 m^3.

Crushing-Grinding-Washing Facility: A crushing-grinding-washing facility with a daily capacity of 2000 tones will be present next to the area where concrete batch plant is located. In here, agrega material provided from borrow site will be sized suitable for concrete production before sending it to concrete batch plant. Washing is the process of watering of prepared material near to the crushing-grinding facility in order to separate it from dust and fracture material before stocking it in stock site. Sizes of the pond, in which wastewater that will be produced during this process (if needed and performed) is set aside, will be 15m x 5m. Water set aside will be discharged to Ceyhan River and grinded material that will be formed in the pond will be disposed to an area that Municipality of Kahramanmaras will determine. The nearest settlements to the crushing-grinding-washing facility are Tilkiler Quarter (310 m), Ikizler Quarter (690 m), Hacininoglu Village (450 m) and Dedeler Quarter (1330 m).

Characteristics of Sariguzel Dam and HEPP are given as follows.

- **Hydrology**

Catchment area	: 6,593.40 km^2
Present yearly average flow (natural)	: 1,469.56 hm^3
Project flood flows	
Q_5	: 332 m^3/s
Q_{10}	: 437 m^3/s
Q_{15}	: 595 m^3/s

- **Reservoir**

Normal water level	: 836.00 m
Minimum water level	: 830.00 m
Total storage volume	: 80.40 hm^3
Active volume	: 15.14 hm^3
Dead Volume (min operation volume)	: 65.26 hm^3
Average operation elevation	: 834.82 m

- **Dam Embankment**

Type	: RCC concrete load
Thalweg elevation	: 772.00 m
Crest elevation	: 840.00 m
Height above thalweg	: 68.00 m
Height above foundation	: 72.50 m
Crest width	: 4.00 m
Crest length	: 418.00 m
Total embankment fill volume	: 0.502 hm^3
Upstream slope	: Steep
Downstream slope	: 0.8/1.0

- **Diversion Facility**

Type	: Circular Conduit
Location	: Right shore
Diameter of diversion tunnel	: 6.00 m
Length of diversion tunnel	: 60.00 m
Capacity of diversion tunnel	: 580.00 m^3/s

- **Spillway**

Type	: Controlled (radial gate)
Location	: Above embankment
Headwork elevation	: 821.00 m
Crest elevation of spillway sill	: 821.00 m
Top elevation of gates	: 836.40 m
Gate sizes	: 10.00x15.40 m
Number of gates	: 4 Unit
Length of discharge channel	: 64.00 m
Width of discharge channel	: 46.00 m
Slope of discharge channel	: According to dam body
Energy breaking pond type	: Ejection threshold
Spillway flood flow	: 5,141.00 m^3/s

- **Power Structures**

Power tunnel type	: Circular
Length of power tunnel	: 1,700 m
Diameter of power tunnel	: 5.50 m
Power tunnel line width	: 0.60 m
Power tunnel capacity	: 85.00 m^3/s
Number of surge chambers	: 1 Unit
Diameter of surge chamber	: 20.00 m
Height of surge chamber	: 30.00 m
Length penstock	: 207.00 m
Diameter of penstock	: 4.50 m
Penstock wall thickness	: 24 mm
Penstock capacity	: 85.00 m^3/s
Number of penstock	: 1 Unit

- **Powerhouse**

Width	: 13.00 m
Length	: 30.00 m
Height	: 22.50 m

- **Switchyard**

Place	: Right of power plant, right of operation road
Width	: 20.00 m
Length	: 40.00 m
Elevation	: 755.00 m

- **Hydroelectric power plant**

HEPP net head	: 87.22 m
Installed Capacity	: 98.00 MW
Number of unit	: 2 Units
Power of unit	: 49.00 MW
Tailrace elevation	: 747.00 m

- **Turbine**

Type	: Francis with vertical axis
Number of unit	: 2 Units
Power of unit	: 49,000 kW
Efficiency	: 0.85

- **Generator**

Type	: Polarized syncron
Number of unit	: 2 Units
Power of unit	: 35,880 kVA
Power factor	: 0.90
Nominal voltage	: 11±%5 kV
Efficiency	: 250 d/d
	: 0.97

- **Unit Transformers**

Type	: Exterior type, oiled
Number of unit	: 2 Units
Power of unit	: 36,600 kVA

Nominal voltage	: 11/154±%5 kV
Cooling type	: ONAN
Efficiency	: 0.99

- **Internal Need Transformer**

Type	: Exterior type, oiled
Item	: 1 Unit
Power of unit	: 500 kVA
Nominal voltage	: 11/0.4±%4 kV
Cooling type	: ONAN

With the completion of units given above and operation of project, yearly 284.29 GWh power will be produced with 98 MW installed capacity in total. Power that will be produced in Sariguzel HEPP will be connected to Hacininoglu HEPP via energy transmission line (154 kV) that is nearly 8 km in length and will be assessed within the scope of another EIA.

V.2.2. Potential Impacts on Water Quality and Living Organisms in Water Media as a result of Impoundment, Water Amount To Be Released to Riverbed and its Calculation

The most possible environmental impact that may occur during head gaining with transmission tunnel is the bed flow loss due to isolation of water from existing river channel. These losses that may occur in existing flow amount may reduce the tolerance of river to a pollutant, and may damage the continuity of river ecosystem. For this reason, calculation of water amount that may ensure the continuity of existing ecosystem is needed.

As a result of conducted field studies and existing flow analyses, it was determined that the surface waters that are formed by rainfalls carry an important amount of water to the area even in September and October when Ceyhan River flow is the lowest. The lowest flow that is needed in order to prevent the loss of living media in the region that is in between dam embankment and power plant was determined by analyzing the long-term daily flow data of EIE 2001 (Kilavuzlu) and EIE 2019 (Kandil) Stations in two different methods.

Since any flow gauging station established near to Sariguzel Dam and HEPP does not exist, dam intake flows were calculated by using EIE 2019 (Kandil) interpolated natural flows. As it was mentioned in Section IV.2.2, since Kandil station was in operation only between years 1961 and 1969, flow values were expanded artificially with Kilavuzlu station data. Correlation of Kandil station and Kilavuzlu station is presented in Figure V.8. General Basin Equation was derived from equations that were attained between 20-19 Kandil flow station long-term data and 20-01 Kilavuzlu Station (Menzelet intake flows). With the help of these equations, daily flow values, which could present the coefficients forming the characteristics of basin and Sariguzel Dam, were attained.

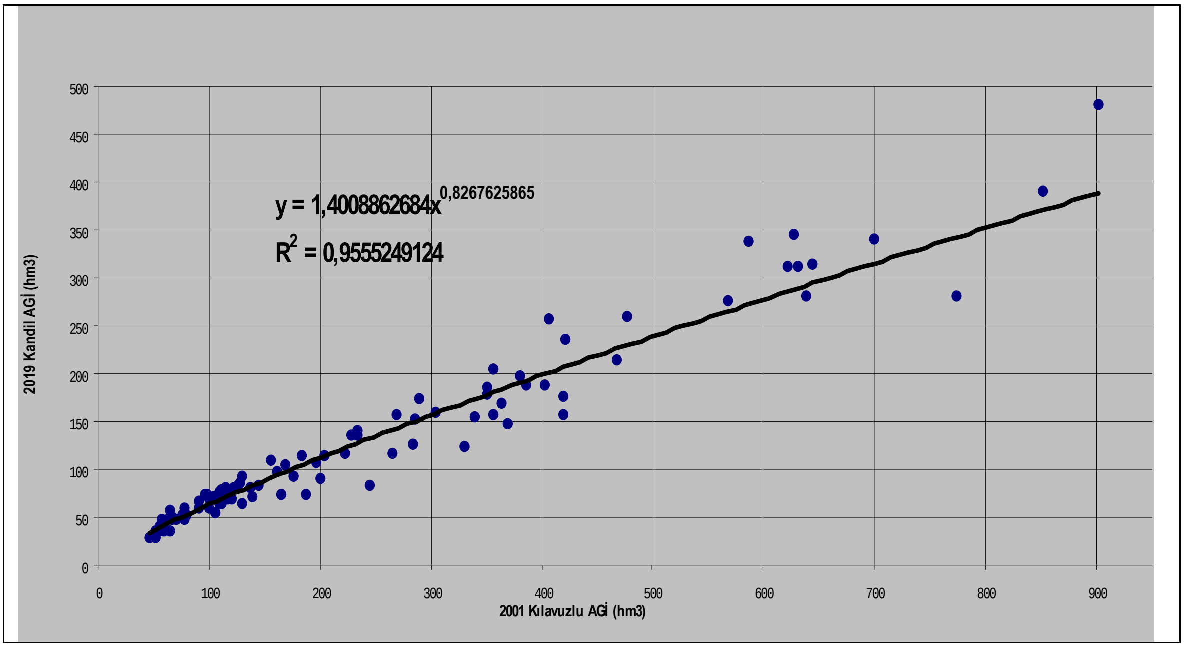


Figure V.8. Correlation of Kandil and Kilavuzlu Station

Montana Method, which is one of the methods used during the determination of minimum flow to be released (Tennant 1975, 1976), recommends that the instantaneous minimum flow to be 10% of yearly average flow and the long term minimum flow to be more than 10 % of yearly average flow depending on riverbed and properties of users. According to this method, water amount that should be released in Sariguzel dam site was determined as 20 % of average annual daily flow that is 11.74 m^3/s.

Another method that is used in determination of minimum flow amount needed in riverbed in order to prevent the negative changes in habitat is the determination of minimum value to be released to riverbed by thinking minimum flow value found in long term rainfall recordings as minimum flow that river ecosystem can survive. Historical minimum flow value that was determined by this way is 9.08 m^3/s that was measured in September 1959.

Water amount that will be released instantaneously during construction was determined as at least 5.87 m^3/sn that is 10 % of yearly average flow, and the water amount that will be released continuously was determined as the flow in riverbed will not fall down to 20 % of yearly average flow (11.74 m^3/s).

Changing in temperature is head of the list of factors that affect water quality and accordingly aquatic life in water storage areas. When the water temperature measurements in Menzelet Dam that was started to be operated in 1991 above Ceyhan River was analyzed, it was stated that water temperature is changing considerably in dam intake and outlet measurements, and region climate, other effective factors have the potential to form different temperature layers in reservoir[1].

[1] *In the measurements conducted for July 2003, Menzelet dam intake water temperature was recorded as 24^0 C and dam outlet temperature was recorded as 19 ^{0} C*

In order not to affect the riverbed ecosystem because of possible temperature changes in Sariguzel reservoir, it will be compatible to release water from the point that is near to minimum water elevation of dam to riverbed. Since the water intake structure of transmission tunnel is 3 m lower than the water elevation, it will not be affected form any stratification in reservoir.

Biomass amount that will affect water quality in reservoir should be minimized before impoundment is started. For this purpose, villagers will be informed before impoundment is started and by this way agricultural products can be collected. Project owner will support such activities in terms of equipment and education.

Compliance with the decisions of Water Product Law numbered 1380 in terms of potential impacts on living organisms found in aquatic media will be achieved.

V.2.3. Impacts on the Areas That Should Be Protected Under National And International Legislations

As it was explained in Section IV.2.9, an area that is protected under national and international legislation does not exist in project site and its surroundings. Consequently, within the scope of project, it is not possible to have any impact on these types of areas.

V.2.4. Potential Changes (Erosion, River Hydrology, Aquatic Life, Sediment Coming etc.) In Downstream as a result of Consuming Resource From Which Water Will Be Supplied

It is expected that hydrological properties and accordingly morphologic properties change in the downstream part of dam axis of riverbed with the construction of dams. Dams will act as a filter for solids formed in the basin, and transportation of solids coming with natural flows will be prevented. Caves are expected to be formed in riverbed since any point in downstream, solid amount coming to that point will be smaller than the amount ruptured/transported.

On the contrary to the situation explained above, high carrying capacity water, of which sediment held by Sariguzel dam, will be removed from riverbed via transmission tunnel, thus, it will not cave the riverbed. In addition to this, since environmental flow calculated in section V.2.2 will be given near to a constant flow value, high and low flow values that ensures transportation and accumulation in river will not occur, and this will prevent the change in morphology of riverbed at the present day.

Environmental flow (make up water) needed for the continuity of aquatic life will continuously release to riverbed.

V.2.5. Other Usage Types and Their Impacts Belonging to Resource If Any

In the conducted field studies, it was determined that villagers deal with irrigated farming on a limited scale and for irrigation of these fields water transmission lines installed by using resources in higher elevations and small channels installed in riverbed are used. Since a great difference between the highest water level and the lowest water level will not occur after the reservoir is completed, villagers could supply their irrigation water loss from reservoir.

Since some water mills, which are used for energy purposes in reservoir area, will be inundated, these tenancies will be paid to their owners with expropriation rights.

V.2.6. Potential Impacts on Groundwater and Surface Water Resources

During the field studies conducted in reservoir area, resources with various flows were determined near to impoundment area. It was observed that these resources were formed in the intersection point of geological formations and topography. During the drilling activities, it was determined that groundwater level is near to river level and in a location that is approximately parallel to topography and was formed fractured/cracked effective.

Increasing of water level for about 68 m due to impoundment could change the groundwater flow direction in small scale in reservoir area. Among the existing resources, the ones that are near to riverbed elevation will stay under the reservoir area.

Water level in alluvion that is related to water level in river will be affected depending on level changes in riverbed. This impact will not be important since water well opened in this region does not exist.

V.2.7. Place and Method of Meeting Housing and Other Technical/Social Infrastructural Needs of the Personnel who are to be Employed during the Operation of Project

10 people will work in total in the operation phase of project. For the operation personnel, a guesthouse will be built next to hydroelectric powerhouse. A service vehicle will be provided for the personnel that will work by shifts. Other technical/social infrastructural needs of the personnel will be met from the city center located 100 – 150 km far from the project area.

V.2.8. Giving Detail about the Wastewater Treatment Plant Characteristics Process that is to be Implemented for the Treatment of Wastewater that is to be Generated from Administrative and Social Units as a Result of Usage of Drinking and Utilization Waters and the Amount of and Method of Disposal of the Treated Wastewater to the Receiving Environment

In the operation phase, 10 people is planned to be employed in total. Daily domestic water demand is estimated to be 1.14 m^3 based on the assumption that daily water demand will be 114 liter per person (Tchobanoglus, 1991) in the operation phase. This water will be supplied from the close settlements and Regulation on Water to be used for Human Consumption (17 February 2005, No: 25730) will be obeyed.

Daily wastewater amount will be 1.14 m^3 based on the assumption that all of the daily water demand of employees in the operation phase is converted to domestic wastewater. Wastewaters that will be produced in operation phase will be stored in the septic tank that will be opened in an acceptable point near to guesthouse in which personnel will accommodate and leakage to the underground will be prevented by appropriate techniques. This wastewater will be vacuumed by the sewage trucks in specified periods and discharged to the sewerage system that municipality discharges its wastewater. Furthermore, a protocol will be conducted with Municipality of Kahramanmaras in connection with the vacuuming of wastewater collected in sealed

septic tanks with sewage trucks. In accordance with Article 32 of Water Pollution Control Regulation, documents to be taken as a result of waste disposal with sewage trucks will be kept for 3 years and during auditing, these documents will be proved to the people concerned. Information related to sizes of septic tank that is planned to be constructed is given in Figure V.9. The septic tanks will be appropriate to Regulation on Pit Opening Where Sewer System Construction is not Applicable (19 March 1971, No: 13783).

Daily wastewater amount per capita: 114 L/day
Daily wastewater amount of 10 employee: 1.14 m^3/day
Total wastewater amount produced in 6 days: 1.14 m^3/day x 6 = 6.84 m^3/day
Septic tank volume: Length = 2 m Width = 2 m Height = 2 m Volume of tank = 8 m^3 Control volume = 8 – 6.84 = 1.16 m^3

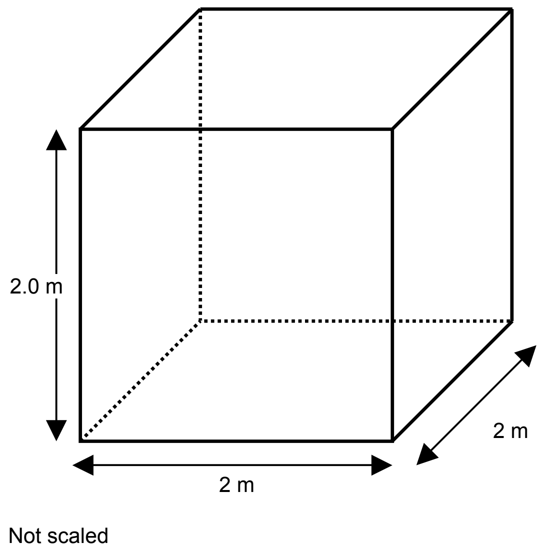


Figure V.9. Volume of Septic Tank Planned to be Built (Operation Phase)

V.2.9. Amounts and Characteristics of Solid Wastes to be generated from House, Social and Administrative Facilities, Where and How These Wastes will be Transported or Method of Assessment

Solid waste that will be produced in operation phase will be domestic and originated from the personnel. In operation phase, 10 people is planned to be employed in total. Domestic solid waste originated from employees work in operation phase will be 13.4 kg based on a daily solid waste amount of 1.34 kg/day per person. If 6 working days in a week is assumed, amount of solid waste that will be produced in a year will be 4,181 kg. These wastes will be collected in proper containers and taken by Municipality of Kahramanmaras in specified periods or disposed to an area that Municipality of Kahramanmaras will show. Wastes that can be recovered such as plastic, glass and paper will be collected in separate containers and given to a collecting firm. For disposal of solid waste that will be produced during operation phase, Solid Waste Control Regulation, published on Official Gazette dated March 14, 1991 and numbered 20814 will be complied.

V.2.10. Sources of Noise to Occur during Operation of Project Units and Measures to be Taken to Control

The only noise source foreseen in operation phase will be generator and turbines located in HEPP building. However, noise and vibration will be kept in the building since

HEPP building, which will be built 325 m far from Hacininoglu Village that is the nearest settlement, will be isolated.

V.2.11. Potential Impacts on Forestry Areas and the Definition of the Measures to be Taken Against These Impacts

Except for the forestry land that will stay under the reservoir area in operation phase, project will not have an activity that may affect the forestry areas. However, necessary precautions will be taken against the forest fire. Necessary device, tools and equipment will be provided against fire in HEPP building, and in case of a fire in the surrounding forests, usage of the equipment and devices in fire fighting will be ensured.

As it was mentioned in section IV.1.18, after the construction works, more flat surfaces will be attained by forming figures in the regions that have steep slope and landslide is seen, and these regions will be planted. During afforestation, dominating vegetation of the region will be taken into consideration and according to this, tree species that will be used in afforestation will be chosen. In addition to tree species, since they spread to surface in a short time and hold soil surface, especially starting from construction phase seeding will be applied (before afforestation activities) and grass will be allowed to cover the surface of the regions where landslide occurs a lot.

V.2.12. Other Issues

There are no other issues to be discussed in this section.

V.3. Impacts of the Project on Socio-Economic Environment

V.3.1. Increases in Income Expected By the Realization of the Project, Employment Opportunities to be Created, Population Movements, Immigration, Educational, Medical, Cultural, Social and Technical Infrastructural Services, Changes to Occur in the Level of Benefiting from these Services, etc.

When the economical properties of the settlements affected from the project are analyzed, it is understood that any industrial site or industrial activity does not exist in project area and it’s surrounding except for City Center, Elbistan and Afsin Districts. Main economical activities in Hacininoglu and Kertmen Villages of Central District, Tilkiler Quarter of Kertmen Village and Ikizce Quarter of Sariguzel Village are stockbreeding and agriculture. Most part of the agricultural activities performed in Hacininoglu Village is irrigated farming. Seasonal vegetables and fruits cultivated are sold in markets in Kahramanmaras and Elbistan. Roads that will be newly constructed and improved will affect the transportation of agricultural products produced by villagers to the markets positively and existing production and incomes are expected to be improved by these positive effects.

According to the results of DIE 2000 Census, unemployment ratio throughout Kahramanmaras Province is 7.8 %. Throughout the province, unemployment ratio for women is higher than the ratio for men. On the other hand, in villages, unemployment ratio for men is higher than the ratio for women. In project-affected villages, unemployment ratio is much lower than the ratio in provincial center as it is in the villages throughout the province. The most important reason is that the households living in rural areas work in agricultural fields (their own fields), and use some part of agricultural and animal products for their own needs (subsistence economy). In project-affected

settlements, the great majority of unemployed population consists of young people as in Kahramanmaras province general. Sariguzel Dam, HEPP and Borrow Sites Project will provide Job opportunities to unemployed young population especially in project-affected settlements. Hence, within the scope of project, employment will be provided in the region and the number of people that will be included in social systems will increase. In addition to these, the population that generally works in agricultural field will meet and learn new trade branches by this investment. In this manner, predicted employment will be 100 people in construction phase and 10 people in operation phase. As a result, existing unemployment ratio is expected to decrease in Kahramanmaras Province and it's villages. By taking the potential employment circulation into consideration, it can be said that employment for 170 houses could be provided. This will be a factor that increases the portion of Kahramanmaras Province in Gross National Product.

According to the last ten years pattern of demographic movement, in Kahramanmaras provincial center and Afsin and Elbistan Districts, which are developed in some degree, a social alteration process is experienced that is caused by industrialization and globalization. Except for Ikizce (Ikizler) and Uludere Quarters that are affected from the project, migrations were experienced from Hacininoglu Village, Tilkiler, Domuler and Evcili Quarters especially to Kahramanmaras, Elbistan and other big cities in last 15 years. Although the migration from rural areas to Provincial Center, according to TUIK's data, NET Migration Speed in Kahramanmaras Province between the years 1995 and 2000 was $\%_0$-28.3 and this shows that migration from Kahramanmaras Province is higher than the migration to Kahramanmaras Province. Although migration from Kahramanmaras is thought to be continued, dynamic employment that project will start in the region will decrease this ratio.

In addition to these, accession to educational and health institutions in the region will be easier via constructing new roads and improvements, and services from these institutions will be activated. As a result of this, number of student in schools and efficiency in education is expected to increase. Furthermore, in health services, transfer of patients will be improved, and medical requirements will be provided effectively.

V.3.2. Environmental Cost Benefit Analysis

Environmental cost-benefit analysis of the project was conducted via 4 period projections with 6% reduction rate in the economical life of project. In calculations, cost of environmental losses together with the Total Investment Cost, Credit Payment, Interest Payment and the sum of net present value of flows of Operation Costs throughout the economical life were used as cost. Total benefits found with present values were calculated with the values of 2007, 2010, 2015 and 2020 as in the cost projection. According to this, decrease in benefits of the project in future in response to the sum of fixed costs is seen in Table V.11.

Measurement of environmental impacts occurred within the scope of Sariguzel Dam, HEPP and Borrow Sites Project, and their monetary equivalent were required to be found. In this manner, cost of environmental impacts such as loss of agricultural lands and forestry areas were assessed in monetary terms. On the basis of information retrieved from expropriation plan that is in preparation, agricultural product patterns produced in 139 ha agricultural fields in affected villages were determined via field studies and key informative questionnaires. Afterwards, the monetary equivalent of yearly fertility loss in affected agricultural fields was found by using TUIK fertility and cost information.

Loss in approximately 96 ha affected forestry fields was determined with tree density and m^3 cost of tree, and monetary equivalents are reported in the following table.

Table V.11. Financial Cost Benefit Analysis of the Project

Years	Net Present Value					Environmental Benefit/Cost Ratio
	Investment Costs (USD)	**Environmental Costs (USD)**		**Total Costs (USD)**	**Total Benefits (USD)**	
	Investment Cost+Loan Payment+Interest Payment+Operation Costs	**Forest**	**Agriculture**	**Investment + Environmental**	**Electric Generation**	
2007	91,666,238	322,873	931,300	92,920,411	191,730,582	**2.06**
2010	91,666,238	322,873	931,300	92,920,411	179,573,555	**1.93**
2015	91,666,238	322,873	931,300	92,920,411	164,403,571	**1.77**
2020	91,666,238	322,873	931,300	92,920,411	161,024,823	**1.73**

Acceptability of the project in financial terms is seen from the cost-benefit ratios (F/M>1). When the total costs formed with the addition of environmental costs in 2007 is estimated with total benefit corresponding to same year and attained from electric generation, F/M ratio is found as 2.06 that is an acceptable F/M ratio. F/M ratios that exhibit the acceptability of project in projection years are given in the same table.

SECTION VI

POTENTIAL AND ON-GOING IMPACTS AFTER CLOSURE OF THE PLANT AND MEASURES TO BE TAKEN AGAINST SUBJECT IMPACTS

SECTION VI. POTENTIAL AND ON-GOING IMPACTS AFTER CLOSURE OF THE PLANT AND MEASURES TO BE TAKEN AGAINST SUBJECT IMPACTS

VI.1. Land Rehabilitation

Sariguzel Dam, HEPP and Borrow Sites Project were given to ERE Hydroelectric Generation and Trade Co. for 49 years via Production License signed with EMRA on 9 March 2006. By the measures to be taken throughout the operation period, sediment filling to reservoir area will be prevented and mechanic equipment will be maintained in order to use them throughout the economical life of facility. Therefore, for Sariguzel Dam, HEPP and Borrow Sites Project, any facility will not be dismantled and land rehabilitation will not be performed.

After construction phase, land rehabilitation will be performed in the areas where construction buildings are located. Buildings in this area will be dismantled and land will be rehabilitated. Required soil will be provided from the topsoil extracted during excavation works and stored in suitable conditions.

VI.2. Land Rehabilitation and Reclamation Works To Be Done on Project Area and Borrow Sites

The area from where concrete agrega material required for concrete and tunnel works will be provided is shown in Appendix 1.2. This area will also be used for Hacininoglu Regulator, HEPP and Borrow Sites Project included in Kandil Energy Group Project. For Sariguzel Project, agrega material is planned to be provided generally from the area that stays above Hacininoglu impoundment area. After the material is extracted, these areas will be filled by the excavation material originated from the dam construction and other excavation works and then, above will be covered by the topsoil stored in suitable conditions.

VI.3. Impacts on Existing Water Resources

After the closure of dam and HEPP, no effect will occur on water resources.

SECTION VII

PROJECT ALTERNATIVES

SECTION VII. PROJECT ALTERNATIVES

(In This Part, Selection of the Location, Technology, Measures To Be Taken, Comparison of the Alternatives and Order of Priorities Will Be Identified.)

The Energy Group Project, of which Sariguzel Dam, HEPP and Borrow Sites Project are a part, has an old history both for State Hydraulic Works and ERE. In Water Sources Development Report by IECO International Engineering Company Inc., which is prepared by DSI General Directorate in May 1966, together with the potential of other various basins, Ceyhan Basin was investigated and firstly the facilities given in Table VII.1 were recommended to be constructed in the region:

Table VII.1. Firstly Recommended Facilities Within the Scope of Kandil Energy Group Project

Facility	Installed Power	Installed Power
Kandil Dam and HEPP	55 MW	178.2 GWh
Kandil-I HEPP	103 MW	371.0 GWh
Kandil-II HEPP	103 MW	362.0 GWh
Total	261 MW	911.2 GWh

Within the scope of Master Plan of Ceyhan Basin, this project, which is taken into DSI investment plan, was not implemented in recent years due to budget deficiency. Within the scope of feasibility report prepared by Ere Hydroelectric Generation and Trade Co. in 1996 detailed map works, field observations and a very large scale of drilling and geological surveys were conducted. As a result of these studies,

- Number of project facility was increased from 3 (1 dam, 2 regulator, 3 HEPP) to 4 (2 dam, 2 regulator, 4 HEPP)
- Total Installed Power was increased from 261.00 MW to 308.60 MW,
- Yearly Total Energy Generation – although the water consumption in upstream has increased – was increased from 911.2 GWh to 1,405.36 GWh.

By this way, contribution of the project to the national economy was tried to be increased.

Operation works of Sariguzel Dam, HEPP and Borrow Sites Project was performed by two different methods. The first one is the construction and operation of Sariguzel Dam and HEPP Project independent of Kandil Energy Group Projects. In this operation method, both small amount of water was tried to be weired and energy generation from unit water was tried to be provided in most efficient way.

Other operation method is the operation of all the facilities included in Kandil Energy Group Project in coordination with each other. With this method of operation, intake flows of Sariguzel Dam was calculated by adding the intermediate basin efficiency that is different from monthly intake flows of two facility to Kandil Dam and HEPP outlet flows (water used in monthly energy and weired water). By this way, assessment of positive impacts of regulation that Kandil Dam provides in Sariguzel HEPP was aimed. As a result, both yearly energy generation, more important is firm energy generation, was increased and total benefit of the facility was improved. Yearly energy generation that is thought to be produced by both methods is given in Table VII.2.

Table VII.2. Yearly Average Energy Generation by Separate and Cascade Operation Methods

	Yearly Average Energy Generation (GWh)				
SEPARATE Operation	**Energy**	**Today**	**2010**	**2015**	**2020**
	Firm	116.69	72.57	17.69	11.81
	Secondary	147.18	177.77	215.73	215.55
	Total	263.87	250.35	233.41	227.36
	Yearly Average Energy Generation (GWh)				
CASCADE Operation	**Energy**	**Today**	**2010**	**2015**	**2020**
	Firm	139.26	114.47	64.83	34.88
	Secondary	130.42	141.66	174.32	198.21
	Total	269.68	256.14	239.15	233.10

As a result of conducted feasibility studies, as it can also be seen from Table VII.2, cascade operation method was preferred due to its higher energy generation.

Primarily, 263.87 GWh yearly average energy generation was aimed with Sariguzel Hydroelectric Power Plant that is planned to have 61 MW installed power. Though the license of Project was taken based on 61 MW installed power, according to item 10 of Electricity Market License Regulation the installed power can be increased up to its 50%. Therefore, increasing installed power to 98 MW increased yearly average total energy up to 284.29 GWh.

During the determination of type and location of Sariguzel Dam, several desk works and field studies were conducted. Various alternatives were researched in order to benefit from the head gain after Kandil HEPP outlet. Since valley is too narrow, installing facilities such as channel-tunnel system and sedimentation tank caused high costs. On the other hand, geological conditions forced storing in the downstream of Kandil HEPP. Therefore, Sariguzel Dam was decided to be constructed in the downstream of Kandil HEPP.

The most suitable place in geological and topographical terms in valley was selected as axis place. Geological structure changes beginning from 1 km downstream of selected axis place and valley causes important permeability problems with karstic limestones.

During the studies conducted in the region, impermeable material was not found in the close vicinity. On the other hand, abundant agrega is available in the upstream and downstream of dam axis. Concrete load compressed with RCC cylinder, which minimizes filling amount and accordingly haulage and can be constructed in a short period, is determined as the most suitable and most economical embankment type. However, if dam type is found more suitable and more economic as a result of studies that will be conducted in future, it could be changed as rock fill.

Several alternatives were assessed while conducting studies, however, any feasible alternative in both technical and economical terms was not able to be determined.

The No-Action Alternative

When the no-action alternative is assessed, it can be said that this alternative is generally not preferred for the energy production aimed projects that will generate benefits to the country. When the no-action alternative is taken into consideration, results that may be encountered can be listed as below:

- Due to increasing energy demand of the country day by day, other energy generation facilities such as thermal and nuclear power plants that can be thought as an alternative of hydroelectric power plant will step in. In this case, an investment, which is more expensive (in terms of construction and operation costs) and has more environmental effects, would need to be eventuated.

- Not constructing Sariguzel Dam and HEPP will affect Kandil Energy Group Project. 284.29 GWh energy, corresponding to nearly 19 % of energy targeted to produce by whole project (1,525.03 GWh) would not be implemented, furthermore, operation conditions of other projects would need to be reviewed.

- In a wider point of view, economic and social development in the country would be limited as a result of deficiency in using hydroelectric energy resources that are low cost and highly available completely.

- Production will be continued in nearly 139 ha (this value was taken from expropriation plan that is in preparation) agricultural field that will loose its value with the implementation of project, and environmental impacts mentioned in previous sections will not occur.

- Employment opportunity for 110 people, 100 people in construction phase and 10 people in operation phase, would not be provided and expected improvement in the economy of the region during ensuring required equipment especially in construction phase would not be eventuated.

SECTION VIII

MONITORING PROGRAM

SECTION VIII. MONITORING PROGRAM

VIII.1. Recommended Monitoring Program for the Construction of Activity, Recommended Monitoring Program for During and After the Operation of Activity and Emergency Action Plan

Monitoring plan is performed in order to control produced activities in the process continuing with the construction and operation phase. In this manner, with the beginning of project, monitoring will provide information about the subjects such as changes in environmental conditions, existing levels of anticipated impacts, compatibility with mitigations, and the achievement of these mitigations in reduction of impacts.

In impact assessment study, during the determination of importance of all potential project impacts, studies intended for including appropriate actions for these impacts are conducted. However, with the implementation of project, unforeseen impacts may occur but retrieved information by means of monitoring program will provide the solution of these impacts before they become a problem.

Predicted parameters that should be monitored within the scope of Sariguzel Dam, HEPP and Borrow Sites Project, monitoring locations chosen for these parameters, frequency of monitoring, how the cost of monitoring will be provided, institutional responsibilities and the reasons of monitoring necessities of parameters are given in the monitoring plan presented in Table VIII.1.

Emergency Action Plan

A draft emergency action plan was prepared for the emergency situations that could occur in both construction and operation phases within the scope of Sariguzel Dam, HEPP and Borrow Sites Project. According to this plan, Coordinator of Emergency Action Plan identified missions and responsibilities of every individual, and furthermore procedures that should be implemented in emergency situations via forming an Emergency Action Team. Draft Emergency Action Plan given in Appendix 10 will be reviewed and improved in construction and operation phases by the Coordinator and Team of Emergency Action Plan by taking the conditions into consideration.

VIII.2. Program Related to Issues Determined in the Second Paragraph of the “Liabilities of the Companies Holding Competency Certificate” in case EIA Positive Decision is Given

According to the Competency Certificate Communique dated 24.02.2004, after the EIA Positive Decision is obtained Final EIA Report Monitoring Reports (given in Annex 4 of the Competency Certificate Comminuque) should be prepared by ENCON Environmental Consultancy Co. and submitted to Ministry of Environment and Forestry semi-annually.

Table VIII.1. Monitoring Plan

PHASE	**Which** parameter will be monitored?	**Where** is the parameter that will be monitored?	**How** will the parameter be monitored/ type of monitoring equipment?	**When** will the parameter be monitored – frequency of monitoring or continuous?	**Why** is the parameter be monitored?	**Cost**	**Institutional Responsibility**
Before Construction	01. Ground and geological structure	In Tilkiler Quarter under which transmission tunnel will pass	Ground survey etc.	Before starting tunnel construction	To prevent affecting the houses belonging Tilkiler from the vibration originated from blasting that will be executed during the construction activities of transmission tunnel	Afforded from project budget.	ERE Hydroelectric Production and Trade Co.
During Construction	01. Meteorological parameters (Temperature, rainfall, evaporation, wind, relative humidity, air pressure)	Throughout Kahramanmaras Province	Retrieving meteorological data from General Directorate of Meteorological Services	Once in 6 months	To provide information especially for environmental management and control and to help for the interpretation of other monitoring results	Afforded from project budget.	ERE Hydroelectric Production and Trade Co.
During Construction	02. Erosion and flow in site	Construction sites, borrow sites	Visual investigation	Every day	To prevent erosion, to control the efficiency of necessary erosion prevention structures To minimize the risk of filling riverbed	Afforded from project budget.	ERE Hydroelectric Production and Trade Co.
During Construction	03. Air Quality	Construction sites, accession roads, concrete batch plant, crushing – grinding facility, temporary storage areas, borrow site, close settlements	Dust sampler or The institutions that took certificate/accredited by Ministry of Environment and Forestry will execute dust measurement.	Once in 6 months Upon complaint	To ensure the security of environment and employees' health, to comply with Air Pollution Control Regulation, Regulation on Control of Industrial Originated Air Pollution, Health and Safety Regulation	Afforded from project budget.	ERE Hydroelectric Production and Trade Co.

Table VIII.1. Monitoring Plan (Cont'd)

PHASE	**Which** parameter will be monitored?	**Where** is the parameter that will be monitored?	**How** will the parameter be monitored/ type of monitoring equipment?	**When** will the parameter be monitored – frequency of monitoring or continuous?	**Why** is the parameter be monitored?	**Cost**	**Institutional Responsibility**
During Construction	04. Air Quality	Construction Equipment and Exhausts	Exhaust measurement devices	Once in 6 months	To comply with the Regulation on Control of Exhaust Gas Emissions Originated from Motor Vehicles and Air Pollution Control Regulation	Afforded from project budget.	ERE Hydroelectric Production and Trade Co.
During Construction	05. Proper storage and utilization of excavation material and topsoil	Construction sites, borrow site and storage areas	Visual investigation	Weekly throughout the construction activities	To monitor efficiency of mitigations taken to minimize the effects on natural habitat To protect natural form of natural soil	Afforded from project budget.	ERE Hydroelectric Production and Trade Co.
During Construction	06. Noise	Construction sites, routes of trucks, settlements close to blasting areas	Noise level measurement devices	Twice a year Upon complaint	To comply with Regulation on Assessment and Management of Environmental Noise and Health and Safety Regulation	Afforded from project budget.	ERE Hydroelectric Production and Trade Co.

Table VIII.1. Monitoring Plan (Cont'd)

PHASE	**Which** parameter will be monitored?	**Where** is the parameter that will be monitored?	**How** will the parameter be monitored/ type of monitoring equipment?	**When** will the parameter be monitored – frequency of monitoring or continuous?	**Why** is the parameter be monitored?	**Cost**	**Institutional Responsibility**
During Construction	07. Vibration	Settlements close to blasting areas	Portable or fixed vibration level measurement devices	In the first blasting performed in different points	To ensure the security of environment and employees' health, to minimize blasting risk and to keep under control, to comply with Regulation on Assessment and Management of Environmental Noise and Vibration Regulation	Afforded from project budget.	ERE Hydroelectric Production and Trade Co.
During Construction	08. Wastewater	Construction site and concrete batch plant	Water coming from concrete batch plant will be analyzed Observation	Once in 3 months	To comply with Water Pollution Control Regulation, to control the impermeability of septic tank, To comply with the Regulation on Pit Opening Where Sewer System Construction is not Applicable	Afforded from project budget.	ERE Hydroelectric Production and Trade Co.
During Construction	09. Water Quality (pH, BOD, oil-grease)	Analysis will be performed by taking sample from upstream and downstream of working area, Ceyhan River In case of an accident, as a result of spilling waste oil, paint etc. to surface water and groundwater, samples will b taken and analysis will be performed	Analyses will be performed in the laboratories that took certificate/accredited by Ministry of Environment and Forestry	When an accident such as spill and leakage is reported	To determine a potential contaminant, to comply with Water Pollution Control Regulation	Afforded from project budget.	ERE Hydroelectric Production and Trade Co.

Table VIII.1. Monitoring Plan (Cont'd)

PHASE	**Which** parameter will be monitored?	**Where** is the parameter that will be monitored?	**How** will the parameter be monitored/ type of monitoring equipment?	**When** will the parameter be monitored – frequency of monitoring or continuous?	**Why** is the parameter be monitored?	**Cost**	**Institutional Responsibility**
During Construction	10.Water quality (Cleaning of field)	Villagers will be informed before impoundment and thus, agricultural products could be harvested. For this reason, monitoring will be performed in all impoundment area	Observation	Once in 3 months and 6 months before starting impoundment	To minimize amount of biomass concentration that affects water quality of impoundment area	Afforded from project budget.	ERE Hydroelectric Production and Trade Co.
During Construction	11. Solid Wastes and Hazardous Wastes (paint, waste oil)	Construction site	Visual investigation Recording Reporting	Daily/Once in two days	To comply with Solid Wastes Control Regulation, Soil Pollution Control Regulation, Hazardous Wastes Control Regulation, Package and Packaging Wastes Control Regulation	Afforded from project budget.	ERE Hydroelectric Production and Trade Co.
During Construction	12. Demolition Wastes	Construction sites	Visual investigation Recording Reporting	Daily	To comply with Regulation on Excavation, Construction and Demolition Wastes	Afforded from project budget.	ERE Hydroelectric Production and Trade Co.
During Construction	13. Cultural and Historical Assets	Project area	Visual investigation	When coinciding a Cultural and Historical Asset	To carry this asset properly, To comply with Protection of Cultural and Natural Assets Law	Afforded from project budget.	ERE Hydroelectric Production and Trade Co.
During Construction	14. Health and Safety	All working areas	Observation, auditing and reporting	Daily	To comply with Labor Law and Regulations	Afforded from project budget.	ERE Hydroelectric Production and Trade Co.

Table VIII.1. Monitoring Plan (Cont'd)

PHASE	**Which** parameter will be monitored?	**Where** is the parameter that will be monitored?	**How** will the parameter be monitored/ type of monitoring equipment?	**When** will the parameter be monitored – frequency of monitoring or continuous?	**Why** is the parameter be monitored?	**Cost**	**Institutional Responsibility**
Operation	01. Impoundment Area Sedimentation	Forestation areas and plantation work areas for the prevention of erosion	Planned forestation sites, visual	Once in 6 months	To provide water quality and to prevent erosion	Afforded from project budget.	ERE Hydroelectric Production and Trade Co.
Operation	02. Solid Wastes and Hazardous Wastes (paint, waste oil)	HEPP Building	Visual investigation Reporting	Weekly	To comply with Solid Wastes Control Regulation, Soil Pollution Control Regulation, Hazardous Wastes Control Regulation, Package and Packaging Wastes Control Regulation	Afforded from project budget.	ERE Hydroelectric Production and Trade Co.
Operation	03. Wastewater	HEPP Building	Visual investigation	Once in 3 months	To control the impermeability of septic tank, to comply with Water Pollution Control Regulation To comply with the Regulation on Pit Opening Where Sewer System Construction is not Applicable	No need to an additional budget.	ERE Hydroelectric Production and Trade Co.
Operation	04. Noise	HEPP Building	Noise level measurement devices	Twice a year Upon complaint	To comply with the Regulation on Assessment and Management of Environmental Noise, and Health and Safety Regulation	Afforded from project budget.	ERE Hydroelectric Production and Trade Co.

Table VIII.1. Monitoring Plan (Cont'd)

PHASE	**Which** parameter will be monitored?	**Where** is the parameter that will be monitored?	**How** will the parameter be monitored/ type of monitoring equipment?	**When** will the parameter be monitored – frequency of monitoring or continuous?	**Why** is the parameter be monitored?	**Cost**	**Institutional Responsibility**
Operation	05. Health and safety issues	All working areas	Observation, auditing and reporting	Monthly	To comply with Labor Law and Regulations	Afforded from project budget.	ERE Hydroelectric Production and Trade Co.
Operation	06. Meteorological parameters (Temperature, rainfall, evaporation, wind, relative humidity, air pressure)	Throughout Kahramanmaras Province	Retrieving meteorological data from General Directorate of Meteorological Services	Once in 6 months	To provide information especially for environmental management and control, and to help for the interpretation of other monitoring results	Afforded from project budget.	ERE Hydroelectric Production and Trade Co.
Operation	07. Minimum flow (can water)	Outlet point of Ceyhan River reservoir	Flow meter Recording	Continuous	To control whether the undertaken minimum flow released or not	Afforded from project budget.	ERE Hydroelectric Production and Trade Co. State Hydraulic Works Ministry of Environment and Forestry
Operation	08. Water quality (Temperature, DO, pH etc...)	Reservoir outlet above Ceyhan River and HEPP outlet	Analyses will be performed in the laboratories that took certificate/accredited by Ministry of Environment and Forestry	Once in 6 months	To control water quality, to comply with Water Pollution Control Regulation	Afforded from project budget.	ERE Hydroelectric Production and Trade Co.

SECTION IX

PUBLIC PARTICIPATION

SECTION IX. PUBLIC PARTICIPATION

(Methods of Public Participation and Information, Integration of Public Comments to the EIA Report)

Studies carried out before the realization of the public participation meeting on December 26, 2006, consultations with public and results of the meetings are summarized in the topics below.

In addition to that, an informatory meeting was conducted by ERE with the chairing of the Governor of Kahramanmaras on 11.12.2006 and the following institutions were invited:

- Provincial gendarmerie commandership,
- Ekinozu District Governorship,
- DSI XX. Regional Directorate,
- Forest Regional Directorate,
- Provincial Administration,
- Ministry of Public Works and Settlement, Provincial Directorate of Agriculture,
- GEDAS Directorate,
- Branch of Highways,
- Province General Assembly,
- Chamber of Trades and Industry,
- KASIAD,
- MUSIAD

During the meeting held in Kahramanmaras Provincial Directorate of Environment and Forestry, information regarding Kandil Energy Group Project and Sariguzel Project was given. Also, questions of the institutions were answered.

In addition, in order to build positive, transparent and non-dependent relations among the project, the local settlements and stakeholders a Public Relations Plan was prepared. The plan covers all the activities starting from the pre-construction phase to the end of the operation period. The Public Relations Plan is given in Appendix 9.

The informatory activities are still carried out by ERE with official/unofficial meetings, interviews, etc.

IX.1. Description of the Project Affected People

With the realization of the Sariguzel Dam, HEPP and Borrow Sites project, an installed power of 98 MW will be achieved with an average annual energy production of 284.29 GWh. The project units' location plans are given in Appendix 1.2. Hacininoglu Village is 290 km away from the area where the HEPP building will be installed. Domuler Quarter is the closest settlement (1 km away) to the dam axis. The transmission tunnel is passing underneath the Tilkiler Quarter. Moreover, with the impoundment of the reservoir some houses belonging to Domuler and Uludere quarters will be inundated. The group, which will be primarily affected by the project, will be the villagers living in the closest settlements to the project area. Detailed information about the socio-economical structure of the local residents is given in Chapter IV.3.

IX.2. Methods for Public Participation within the Scope of EIA Process

Studies related to the project were carried out in accordance with the EIA regulation dated 16.12.2003 with No: 25318.

The Project Inception Report prepared within the scope of the EIA regulation was submitted to the Ministry of Environment and Forestry (MoEF) on November 23, 2006 and a scoping meeting was scheduled in order to determine the format of the EIA report. MoEF requested the reproduction of the Project Inception report on December 1, 2006 and the reproduced reports were submitted to the Ministry on December 4, 2006. The dates of the Scoping Meeting and the Public Participation Meeting were officially informed to the institutions on December 8, 2006. The date of the public participation meeting and the Project Inception Report were put into web page of MoEF and made public accessible.

After the dates of the public participation meetings were determined by the Ministry of Environment and Forestry, newspaper advertisements were given in national (Türkiye Gazetesi, 21.12. 2006) and local newspapers (Bugün Gazetesi, 21.12.2006). Headmen of the villages in the project area were informed about the meeting and they were invited to participate the meeting with the villagers.

Headmen of the villages informed local resident about the project via voiced and written announcements. Moreover, before the meeting, on 04.11.2006 headmen of Hacininoglu Village was interviewed and information regarding project was given.

According to the Article 9 of the EIA regulation, the Public Participation meeting was held on 26.12.2006 at the Ikizce Primary School of Sariguzel Village, Kahramanmaras Central District with the chairing of Provincial Directorate of MoEF and 87 people participated.

IX.3. Project Related Anxieties, Comments/Suggestions of the Public and Assessments

As discussed in Chapter IX.2, Hacininoglu Village was visited on 04.11.2006, before the public participation meeting. Objective of the visit was first to meet the headmen of the village and the villagers and give brief information regarding the project and listening comments of the public.

During the visit and the participation meeting, it was observed that public have some worries regarding the project. But it was also realized that, most people was worrying about the expropriation issues more than the environmental and health and safety impacts of the project. During the participation meeting, information on expropriation and mitigation measures developed against negative impacts of the project was given. Minutes of the meeting and the participation list of the public participation meeting are given in Appendix 8.

General questions raised by the villagers and their anxieties can be summarized as follows:

- How much area will be expropriated,
- Impacts of the transmission tunnel passing underneath Tilkiler Quarter on the Quarter,
- Compensation for the irrigation channels of the poplar orchards, if the channels are closed because of the project,

- What will be the process for the village roads and the graveyards which will be inundated,
- Employment opportunities for the local residents by highlighting the unemployment status,
- Investment opportunities by ERE,

During the meeting generally simple but satisfying answers with a non-technical language were given to the questions raised by the villagers. Regarding the worries about the expropriation issues, Sucati dam that was formerly constructed by ERE was given as an example, since no problems occurred during the expropriation process of the dam. It was mentioned that, ground survey would be conducted for the tunnel that will pass beneath the Tilkiler Hamlet. According to the results of the survey, expropriation will be done for the houses, which have a risk of damage. Moreover, investments will be done in order to replace the structures, which will be inundated by the realization of the reservoir. It was also added that, during employment priority would be given to local residents.

The meeting was found to be successful since it answered most of the questions of the villagers. Comments of the villagers were also taken into consideration while preparing the EIA report. Some photographs taken during the participation meeting are presented in Figure IX.1, Figure IX.2 and Figure IX.3.

Figure IX.1. Public Participation Meeting, Informatory Presentation

Figure IX.2. Public Participation Meeting, Participants (1)

Figure IX.3. Public Participation Meeting, Participants (2)

IX.4. Project Stakeholders, Comments/Suggestions of Stakeholders and Assessments

Within the scope of project EIA process, comments of relevant stakeholders are taken. This step plays an important role in the EIA studies. Stakeholders identified for this proposed project can be listed as below. Positive decisions of the following institutions can be seen in Appendix 2.

- Ministry of Environment and Forestry, Kahramanmaras Directorate of Forestry
- Provincial Directorate of Agriculture
- Ministry of Culture and Tourism, Adana Directorate of Conservation of Cultural and Natural Assets
- Ministry of Public Works and Settlement, Regional Directorate of Highways
- Kahramanmaras Governorate, Provincial Administration

SECTION X

CONCLUSIONS

SECTION X. CONCLUSIONS

(Summary of all explanations and descriptions, an overall evaluation which incorporates significant environmental impacts of the project and which also identifies the level of success to be achieved in prevention of adverse environmental impacts in case the project is realized, choice of alternatives within the scope of the project, and reasons that justify such choice)

X.1. Introduction

Due to rapid industrialization and population increase, energy sector in our country requires immediate investments. Because our country is especially poor in oil sources and rich in surface water sources, energy policy is based on hydroelectric power plants (HEPP). Since HEPPs' operation cost is low and they do not have important detrimental impacts on environment, they are one of the main energy sources in the world.

In these days, hydroelectric power plant projects are being realized in a rapid pace in our country. One of these projects that are planned to be constructed is Sariguzel Dam, HEPP and Borrow Sites Project. Sariguzel Project is one of the 4 projects within the Kandil Energy Group Projects and is located within the boundaries of Kahramanmaras Province Central District. 4 projects that will be constructed on Ceyhan River can be arranged from upstream to downstream in the following order:

i. Dagdelen Regulator, HEPP and Borrow Sites,
ii. Kandil Dam, HEPP and Borrow Sites,
iii. Sariguzel Dam, HEPP and Borrow Sites,
iv. Hacininoglu Regulator, HEPP and Borrow Sites,

In order to realize Kandil Energy Group Projects, firstly, Water Use Rights Agreement was signed between ERE and DSI in 31 January 2006. Following, in 9 March 2006, EMRA (EPDK) issued operation license to the firm valid for a period of 49 years. Although the license of Sariguzel Dam, HEPP and Borrow Sites Project was taken based on 61 MW installed power, according to Article 10 of Electricity Market License Regulation the installed power can be increased up to its 50%. Therefore, by the realization of Sariguzel Hydroelectric Power Plant with an installed power of 98 MW, an average of 284.29 GWh energy productions is aimed annually. By the realization of all Kandil Energy Group Projects, an annual average of 1,525.03 GWh energy will be produced with a total of 501.6 MW installed power.

The facilities that will be constructed within the scope of project are dam, diversion tunnel, energy transmission tunnel, surge chamber, penstock, and power plant. Besides, 5.29 km construction activities and 1.62 km maintenance works of the road that will be used for transportation during construction and operation phases of the project will be completed within the Hacininoglu Regulator, HEPP, and Borrow Sites Project.

Concrete aggregate required for cylinder compressed concrete load embankment type dam and concrete works of other units is planned to be provided from natural alluvium material found in the riverbed of Ceyhan River which is located between Sariguzel dam axis and Hacininoglu Regulator in its downstream. Borrow site which has around 65 hectare area will be used commonly with Hacininoglu Regulator, HEPP and Borrow Sites Project. But for Hacininoglu Project primarily the 25 hectare area, which in the future will stay under impoundment area, is planned to be used. From the remaining area, 383,020-ton material is planned to be provided for Sariguzel Project. Material will be hauled from riverbed to concrete production area by transmission roads completed during the construction period of Hacininoglu Project. Here, concrete aggregate will be sized

suitably in crushing-grinding facility that has a daily capacity of 2000 tones. Then ready concrete will be produced by mixing the material with cement, water and additives in full automatic concrete batch plant, which has an hourly production capacity of 100 ton.

During construction of above-mentioned units and concrete aggregate supply from borrow site, in total 123,590 m^3 excavations will be done on approximately 71-hectare area. Appraisable excavation wastes produced during excavation works will be used as concrete aggregate material, other materials will be used as filling material in borrow site for holes from where concrete aggregate is taken.

Some part of excavation works will be performed by blasting. In open site excavation 37,940 kg ANFO, in tunnel excavation 300,028 kg (22,314 kg in diversion tunnel + 277,714 kg in energy transmission tunnel) explosive is planned to be used. The mentioned explosives will be stored in four mobile tanks each of 2 tones. Mobile Tanks will be located stationary in south of Hacininoglu Regulator in accordance with the safety distances given in regulations, with or without mils. Tank surroundings will be wired. Blasting will be performed under the control of gendarme, and locales will be informed in respect of place and time of blasting.

During excavation, blasting and construction works, 2 dozers, 6 excavators, 4 loaders, 10 trucks, 2 sprinklers, 2 compressors, 6 transmixers, 4 tunnel drillers, 37,940 kg ANFO, 300,028 kg Powergel Magnum 365 and 2 tunnel ventilators are planned to be used.

In Sariguzel Dam, HEPP and Borrow Sites Project, during construction phase 100 people, during operation phase 10 people is planned to be employed. Required personnel will be chosen firstly from close settlements. Services will be provided for these personnel. For other personnel worker ward, engineer dormitory and accommodation house will be constructed in the area between Hacininoglu Village and Tilkiler Quarter. No housing is planned to be built for family members of personnel. Project area is 100 – 150 km far from Kahramanmaras. Technical/social infrastructural needs will be provided firstly from close settlements, otherwise from Kahramanmaras.

In order to determine land usage distributions and other existing characteristics of the affected-areas a 30-km^{2-}work area, which covers project units and the affected settlements was determined. The settlements which are expected to be affected from the project are; Ikizce (Ikizler), Domuler and Evcili Quarters of Sariguzel Village, Hacininoglu Village and its Uludere Quarter, Tilkiler Quarter of Kertmen Village and Demirlik Village of Ekinozu District. Main economical activities in mentioned settlements are agriculture and stockbreeding. Their 2006 populations are between 65 and 1000. Apart from Ikizler Quarter, which is more central and has more suitable agricultural areas, the population showed a decreasing trend in last 15 years. However in Uludere Quarter, though not a noteworthy increase, population increased a small amount. Since people living in mentioned villages work in agricultural areas (their own fields), unemployment ratio is lower than center and districts. As is the case with throughout the province, unemployed population mainly consists of youngs in these villages.

When social infrastructures of the villages are investigated, it is seen that there is one primary school which gives 5 year period education in each of the following places: Ikizce (Ikizler) Quarter of Sariguzel Village, Hacininoglu Village, and Uludere Quarter and Demirlik Village which belong to this village. Primary school students in Tilkiler Quarter of Kertmen, attend to primary school in Ikizce Quarter of Sariguzel Village due to its closeness. The students in Evcili and Domuler Quarters go to primary school in Ikizce or boarding schools in provincial center. Students in mentioned settlements go to boarding

schools in Kahramanmaras or other schools in district centers in order to complete secondary and high school educations upon graduating from the primary school. Besides, there is a health house in Hacininoglu Village in which a midwife works. In order to get health services villagers go to the village clinic in Ilica district or to the hospitals in provincial center. Since there are no village clinics or hospitals in other project-affected settlements, the people living in those places also go to Ilica district, provincial center or nearby district centers in order to get health services.

According to Expropriation Plan that is in preparation; it is expected that 75 ha land in Hacininoglu Village, 14 ha land in Kertmen Village, 52 ha land in Sariguzel Village, 1 ha land in Demirlik Village and 96 ha forestry land and 25 ha treasury land will be affected by the project. Among this lands, 25 houses, 13 stables, and 1 mill in Uludere Quarter, and 10 houses, 1 stable, and 1 mill in Domuler Quarter will stay under the reservoir of Sariguzel Dam. 6 houses located in Uludere Quarter will be expropriated due to landslide risk.

During the feasibility studies of the project, alternatives for operation periods of Sariguzel Dam, HEPP and Borrow Sites and other Kandil Energy Group Projects were developed. According to this:

- The number of project facilities were increased from 3 (1 dam, 2 regulator, 3 HEPP) to 4 (2 dam, 2 regulator, 4 HEPP),
- Total Installed Power was increased from 261.00 MW to 308.6 MW, and then to 501.6 MW
- Total Annual Energy Production – although water usage in upstream increased – was increased from 911.2 GWh firstly to 1,405.35 GWh, then to 1,525.03 GWh.
- Instead of separate operation, cascade operation method was preferred.

Detailed studies on the locations and characteristics of the project units were also done and as a result of topographical and geological studies it is determined that the most suitable areas for facilities that will be constructed within the context of the project are the mentioned areas.

X.2. Environmental Impacts and Mitigation Measures

Construction Phase

Construction phase of Sariguzel Dam, HEPP and Borrow Sites Project is planned to last 900 days. Within this period, in context of another EIA, 8 km long energy transmission line, which will transmit the energy produced in Sariguzel HEPP to Hacininoglu HEPP, will be realized. Environmental impacts originating from construction phase activities will be temporary and by the end of the construction phase, the impacts will disappear. The impacts that are expected to occur during this phase are summarized below.

<u>Potential impacts on water quality</u>

Kahramanmaras Province where the project area takes place is totally located within Ceyhan Basin. Annual average flow in basin is 211.19 m^2/s, and annual average flow height is 313.84 mm. Flow in the river increases temporarily in November and

December due to autumn rains. In this period flow increases from 50 m^3/s to 380 m^3/s. Ceyhan river has an important hydraulic potential and currently there are 7 hydroelectric power plants and 1 thermal power plant is in operation on the river.

DSI XX. Region makes quality observations at the entrance of Kandil Dam and at the entrance and exit of Menzelet Dam Lake in downstream of Hacininoglu impoundment area. Besides during the field surveys done within the scope of EIA, surface water EC (electrical conductivity), pH, and DO (dissolved oxygen) were investigated by in-situ measurements. PH and DO values were compared with standard values set in Water Pollution Control Regulation and as a result surface water was determined to be Class II. As a result of EC measurements, surface water in the area was determined as class C2, good quality, and medium salinity according to Uslu (1987).

In the construction phase of the project main usage of water will be for concrete production, washing of concrete aggregate material, mitigation of dust, and potable water for workers. Water needed for concrete batch plant, washing of concrete aggregate material and mitigation of dust will be provided from Ceyhan River and side tributaries that feed the river. Potable water will be provided from settlements in the vicinity of construction site that will be established between Ikizler (Ikizce) Quarter and Hacininoglu Village. As a result of calculations, the daily domestic water demand of 100 people that will work in construction phase is estimated as 7.5 m^3. Likewise, daily 130 m^3 water will be needed to wash concrete aggregate material and concrete mixers, and throughout the project period total approximately 29,000 m^3 water will be needed for concrete production. The amount of water to be used in addition to the methods that will be applied for mitigation of dust, which will be produced during construction activities, may change according to surface geometry of the material to be transported, meteorological conditions of the area before and after watering, and topographical conditions of excavation area. But, generally enough amount of watering will be provided in areas where excavation will be performed and excavation waste will be disposed so that 10% of the to top soil will stay moist.

As a result of the activities, wastewater will be produced by workers, and due to washing of mixers in concrete batch plant, mixers of the vehicles that carry ready concrete, concrete aggregate to be used in concrete production. Assuming that all of the daily water-demand of the people working in construction phase will turn to domestic wastewater, daily domestic wastewater generated will be 7.5 m^3. As a result of washing of concrete aggregate and mixers, 130 m^3 wastewater that contains high amount of suspended solid will be generated.

Mitigation Measures

Domestic wastewater generated by workers will be accumulated in septic tank, excavated in a suitable place with no seepage to groundwater and will be drawn by vacuum trucks in definite periods to discharge to sewer system of municipality. Water Pollution Control Regulation item 25 will be taken into consideration for this purpose. The septic tanks would be appropriate to the Regulation on Pit Opening Where Sewer System Construction is not Applicable (dated March 1971 and no 13783 Official Gazette). Besides, on this issue, decisions of the Water Pollution Control Regulation, published on Official Gazette dated December 31, 2004 and numbered 25687, will be complied with.

Wastewater originated from washing of concrete aggregate material and concrete mixers will be reused for the same purpose after a pretreatment in a sedimentation tank that is planned to be constructed. The remaining water can be discharged to Ceyhan

River after pretreatment. In this respect, decisions of the Water Pollution Control Regulation (Official Gazette: December 31, 2004, No. 25687) and Water Products Law (No. 1380) will be followed.

Besides, as stated in prepared monitoring plan water coming out from concrete batch plant and sedimentation tank will be analyzed once in three months, and septic tank will also kept under control. In case of any material (dye, oil etc…) spillage or leakage to Ceyhan River firstly Emergency Action Plan will be followed and required analysis will be done.

Potential Impacts on Air Quality

Kahramanmaras Province that is located within approximately 100-150 km from project area is among 1st degree air pollution suffering provinces. The main reason of this is wood and coal that are used for heating in winter season. The second reason is traffic. According to information in Kahramanmaras Province Environment Condition, there are total 96,500 vehicles registered to province traffic (MoEF, 2005).

In the region where Sariguzel Dam and HEPP facilities are located, there are village settlements but no industry. The closest settlements to borrow site and the area that HEPP will be constructed, are located around Hacininoglu Village, Tilkiler Quarter of Kertmen Village and Ikizler (Ikizce) Quarter of Sariguzel Village. Apart from industry, there is also no activity (such as construction) in the region that may lead to dust, noise, water, and soil pollution.

Dust emitting activities during construction works are excavation works, open site blasting, works performed in crushing-grinding-washing facility and concrete batch plant, movements of construction equipment in roads, loading of excavated material to trucks, unloading of trucks and storage of excavated material. Emission amounts originated from these activities were calculated with worst case scenarios assuming that not any mitigation measure was implemented, and as a result of this calculation it is found that total 136 kg dust will be generated hourly. This value was compared with the limit values given in Appendix 2 of the Regulation on Control of Industrial Facility Originated Air Pollution (RCIFOAP) for locations except from stacks and require calculation of contribution values to air quality when exceeded. Since dust emission value exceeded limit value given for dust (1.5 kg/h), dust emission distribution concentrations and dry deposition values were calculated by using ISCST3 model. In this calculations it was assumed that required dust mitigation measures such as watering and vehicle speed limit were implemented. As a result of calculations, it was observed that the maximum daily and annual concentrations originating from construction activities (approximately daily 118 µg/m^3, annual 26 µg/m^3) were lower than short and long-term limits given in Table 6 of Air Quality Protection Regulation (short term 300 µg/m^3, long term 150 µg/m^3). Likewise, the deposition values (short term 391 mg/m^{2}day, long term 85 mg/m^{2}day) are lower than deposition limit values given in Air Quality Protection Regulation (short term 650 mg/m^{2}day, long term 350 mg/m^{2}day) and Industrial Facility Originated Air Pollution Control Regulation (short and long term deposition values 450 mg/m^{2}day).

Besides, equivalence concentration and equivalence deposition curves were drawn in order to observe dust concentration and dry deposition distribution. As a result of this, the distribution was observed to follow the prevailing wind direction (west- north west). Since dust emission sources are located within the valley, distribution is not very dense outside the valley. Tilkiler, Ikizler Quarters and Hacininoglu Village will be affected by dust emissions. However, this impact will come to an end by finalization of the construction works. Moreover, since the values are lower than the maximum values that

are given above, the impacts will not be at the levels that can threat public and environmental health.

Mitigation Measures

In order to mitigate dust emission construction areas will be kept moist by watering. Material will be moistured by pulverize dust suppressing system before being crushed in crushing-grinding facility. Conveyor belt systems will designed closed. Dust holding filters will be attached to silos in ready concrete batch plant. Speed limit will be set for vehicles in working area and regular exhaust examinations will be performed. In order to prevent dust formation, sprinkler will moisturize working area and the roads used for transportation. Before commencing excavation activities, improvement and construction activities will be performed on roads. Topsoil stripped during excavation will be stored in accordance with precautions given for materials stored in open site stated in Appendix 1 of Industrial Facility Originated Air Pollution Control Regulation. For this purpose wind breaker panels will be put into area, loading-unloading works will be performed without spreading, top layers will be stored with 10% moisture content. Besides, in accordance with prepared observation plan once in 6 months and also in case of complaint, samples will be taken from construction area by dust samplers. According to results of the analysis, precautions will be taken if required.

For above-mentioned issues, the following regulations will be complied with: Air Quality Protection Regulation, published on Official Gazette dated November 2, 1986 and numbered 19269; and Regulation on Control of Industrial Facility Originated Air Pollution, published on Official Gazette dated July 22, 2006 and numbered 26236.

Impacts on Soil Quality

Construction activities will be conducted on an approximately 71 ha area within the scope of the Sariguzel Dam, HEPP and Borrow Sites Project. In around 1 hectare of this area excavation activities (transmission tunnel, headwork tunnel) will be performed under the ground. Besides approximately 65 ha area is covered by borrow site. This area will be used together with Hacininoglu Regulator, HEPP and Borrow Sites Project. For Hacininoglu Project firstly the area under the Hacininoglu reservoir, which is around 25 hectare, is planned to be used. Other construction areas are dam, diversion tunnel, powerhouse, and switchyard. In set areas around 123,590 m^3 excavation waste will be produced.

According to prepared Soil Protection Project, reservoir area consist of 57% forest, 23% farm, 10% river and the remaining part is constituted by other land. Of the 65-hectare borrow site, 70% is forest area, 7% is farmland, and the rest is river area. Of the area where the power plant and switchyard is located, 83% is forest and 17% is farmland. The most cultivated field crops in agricultural lands are grains. Besides wheat (mainly), barley, and vetch production, fruit and vegetables are also produced in the region where irrigated farming is practiced on hillsides, almond and walnut is produced. The forest areas are generally covers class VII lands. The forest is rarely covered. Elevations are abundant in the middle of the area.

Change in surface cover, removal of vegetation, units to be constructed, change in area pattern/usage and topography, in the scope of the project, will be effective on the change of landscape characteristic of the area. Because moderate level erosion is seen in the region, erosion risk may increase due to removal of vegetation cover during construction and operation activities, stripped topsoil and also slope.

Desultory disposal of solid wastes that will be produced during construction activities might affect the soil quality. Solid wastes that will be produced in this period can be listed in three parts as construction and excavation wastes, domestic solid wastes of personnel, and sludge from sedimentation tank. 100 personnel that will work in construction activities are expected to produce approximately 134 kg domestic solid waste daily.

Mitigation Measures

After construction works, in order to prevent erosion in the open areas where vegetation cover was removed during construction activities, and in the regions where slope is steep and landslide is observed, terraces will be established to flatten surface and revegetation will be applied in these regions.

This measure will decrease flow of soil to surface water, and therefore sediment transport to the lake. By this way the economical life of dam will increase. For the success of replantation activities where erosion occurs, warning signs will be placed and entries to region will be reduced by establishing hedges or vegetal barriers.

Tree types that will be used in plantation activities will be chosen according to dominant vegetation of the region. In addition to tree types, since they spread to surface in a short time and hold soil surface, especially starting from construction phase seeding will be applied (before replantation activities) and grass will be allowed to cover the surface of the regions where landslide occurs a lot. For the success of seeding additional measures (mulching etc.) will be applied when needed.

Wastes such as wood wastes, construction iron and iron pipe can be recovered. These wastes will be collected in appropriate places in project area, and sent to licensed recovery facilities. Concrete waste material will be used as filling material. Some part of the excavation waste will be sent to crushing-grinding facility for concrete production. Remaining part will be spread to holes from where concrete aggregate is taken in the area that will be used as borrow site.

During the excavation works, in order to prevent the contamination, topsoil will be stripped and stored in a controlled manner in order not to lose its fertility. Sub soil that forms the topsoil will also be stripped and accumulated in order not to loose its horizon. While stripping the topsoil, materials that are not soil and on the topsoil should be separated. Plant parts such as seed and bulb that enable the continuity of plant species will be separated. Furthermore, upper surface of vegetative soil will be protected against the erosion, drying, and weeds and covered with grass and grassland etc. in order to keep the soil alive. This stripped vegetative soil will be used during the landscape works of site and vegetative landscape arrangements of recreation sites.

Domestic solid waste will be collected in proper containers and taken by Municipality in specified periods or disposed to an area that Municipality will show. After dewatering, sludge formed in sedimentation tank will be sent to a disposal area that Municipality of Kahramanmaras will show.

About the above-mentioned issues, the following regulations will be complied with: Solid Waste Control Regulation, published on Official Gazette dated March 14, 1991 and numbered 20814; Regulation on Excavation, Construction and Demolition Wastes, published on Official Gazette dated March 18, 2004 and numbered 25406; Regulation on Packaging And Packaging Waste Control, published on Official Gazette dated July 30, 2004 and numbered 25538; Hazardous Waste Control Regulation, published on Official Gazette dated March 14, 2005 and numbered 25755; Soil Pollution Control Regulation, published on Official Gazette dated May 31, 2005 and numbered 25831.

Impacts on Flora Fauna

To determine the general floristic and faunistic structure of the area the field surveys were conducted in November (2006) and March (2007).

During field surveys, three different vegetation types were identified. This area consist these vegetations; Turkish pine and common juniper that have demolished populations at hillside of canyons; mixed lemur vegetations that consisted from oaks (Quercus petraea), rockrose (*Cistus creticus), Paliurus spina-christi and river fluvial habitat. Willow and European aspen are dominant species at fluvial habitat.* As a result of field surveys 146 species and subspecies level taxon that are belong to 38 families were identified. None of these species is endemic to Turkey.

During the Fauna survey, the construction and operation area of the project and right and left sides of Ceyhan River were investigated. During the faunistic survey, continental vertebrate fauna elements which they have motile ability, were observed. It was seen that they prefer using this habitat for feeding and wandering. Colonized fauna elements weren't observed in the region. In the field and in the vicinity, aquatic and continental fauna elements were categorized as mammas, birds, reptiles, amphibians and fishes. Findings were assessed separately for each of the categories.

As a result of this survey, 13 mammal (10 species are classified under Lower Risk - least concern (LR: lc / LC) class, 1 species is classified as Lower Risk - near threatened (LR: nt) category; 1 species is classified under Vulnerable (VU) category; According to CITES, one species is under protection.

23 bird species belonging to 6 ordos and 13 families (all of them are found in LC (least concern) category according to the IUCN Red List (2003)), 7 reptile species (1 takes place in VU (Vulnerable) class, 3 take place in Low Risk – least concern (Loral / LC) class in IUCN Red List), 1 amphibian species (under LC (least concern) category of IUCN Red List), 7 fish species (two of these species takes place in "LR/lc"- ''LC'' (low Risk / least concern) category, and one species takes place in ''DD'' (Data deficient) category, also another one species take place in EN (Endangered) category) were identified.

None of the above-mentioned flora species is endemic to Turkey. There will be some loss in the population of determined species during the construction and water collection phases of the project. However these species are abundant in the project area surroundings and in the region.

Fauna species are generally common species found in Turkey and they have high reproduction potential. Because of the fact that the project site dominantly contains shrubbery areas, vineyards and orchards, it forms breeding and sheltering habitat for small passers (Passeriformes). Non-passeres species was also observed to use the habitat for feeding and passage purposes. Besides, Ceyhan River is the most important water resource for birds. Ceyhan River is the most important water resource for birds, and a diversity factor especially for the bird species that prefer littoral areas.

Flora and Fauna living in the region will be affected from dust, vibration and noise caused by construction activities. During construction period, most of the terrestrial fauna species are expected to leave the area that surrounds the construction region and move temporarily to similar areas depending on the intensity of construction activities. Noise values determined by calculations complies with limit values in 75 m distance when compared with item 26 of the Regulation on Assessment and Management of Environmental Noise. Noise level calculated under worst case scenarios will end by the end of construction activities, therefore impact would be of short duration.

Mitigation Measures

Impacts such as dust, noise and vibration that effect flora-fauna in the region during the construction phase will disappear by the end of construction activities. However, also during this period in order to minimize impacts, watering will be performed when dust-emitting activities are under way, and construction equipments will not work at the same time. Besides, new and well-cared construction equipment will be used, and regular exhaust examinations will be performed. Vibrations caused by blasting will be kept under control by measurements, and in case vibration is high, the number of explosive that will be exploded per unit time will be decreased.

On this issue, decisions of the “Regulation on Assessment and Management of Environmental Noise”, published on Official Gazette dated July 1, 2005 and numbered 25862, will be complied.

Impacts on Socio-economical Environment

As mentioned before, the project area is located within rural area and no industrial or construction activities exist in the region. Therefore, when construction activities are under way, this will affect local people. Dust and noise generated during construction activities will affect nearby settlements, however these impacts will not be significant due to precautions developed. Besides these impacts will disappear by the end of the construction activities.

Sariguzel transmission tunnel will pass under Tilkiler Quarter, which belongs to Kertmen. Blasting will be performed during the construction of transmission tunnel. Therefore, mentioned place might be affected by vibration that will occur as a result of blasting.

In addition to this, there are agricultural areas that belong to nearby settlements in areas that will be expropriated within the context of the project. Therefore, by the commencement of the construction activities, the project-affected people (PAP) will not be able to continue farming activities on these areas. However they will be able to find new work areas by income they get due to expropriation.

Construction activities of the project will also have positive impacts on PAPs. Firstly, 100 people is planned to be employed during the construction phase and these people are planned to be chosen from locals. Apart from employment opportunities, equipment and vehicles that will be required during construction activities will be provided from the region, influencing the economy of region positively. The roads constructed during the construction phase of Hacininoglu Project to provide transportation between Dam place and HEPP are believed to help in transportation of farm products to markets, positively affecting the existing production and incomes. Education and health facilities will be accessed more easily and services taken from these facilities will be more effective. As a result of this, the number of students in schools and the quality of the education given are expected to increase. Besides, there will be betterment in health services and patience transportation, and the medical needs will be met more effectively.

Mitigation Measures

The biggest impact of construction activities on socio-economical environment will be dust, vibration and noise generated as a result of these activities. As mentioned before, precautions will be taken to minimize impacts. Besides, in order not to cause damage in Tilkiler Quarter under which transmission tunnel will pass, the number of blasting will be reduced in this area. Before construction activities, ground survey and other required examinations would be performed in the region where tunnel will pass and then tunnel will be constructed according to results of these surveys. After the surveys, the houses that may be damaged will be expropriated, and their losses will be compensated. Besides, health boundary zones are suggested for non-hygienic establishments in the project area including explosive storage area and sand pits, sand washing and grinding facilities and ready concrete facilities. According to this, this distance is 250 – 300 m for explosive storage area, and 75 – 100 m for the area covering sand pit, sand washing and grinding facilities and ready concrete facilities.

Operation Phase

The impacts of the activities conducted during operation phase of the project are generally expected to be more limited but of longer time. Since there will not be any emission in this period, no impact on air quality is expected. Impacts generally will be on flora types that stay under reservoir; terrestrial fauna types that use the area for reproduction, sheltering and feeding; fish types living in the region where flow will decrease due to river will turn to a lake and part of water will directed to transmission tunnel; the people of the region where landscape will change by formation of reservoir.

Terrestrial medium will turn to aquatic media and as a result of this some limited changes will occur in soil usage, water and food chain. However, as a result of these changes new habitats for many animal species will form and the species that use similar habitats will come to here making a positive impact on the fauna.

Because water level will increase about 68 meters, a limited change may occur in groundwater flow direction. From the existing sources, the ones that are within close elevation to riverbed will stay under reservoir.

The biggest change that will occur visually will be the transformation of river to a lake area. This visual transformation can be considered positive because landscape of this area does not represent an attractive structure. Because some plants will stay under water, plant number will decrease. To compensate decreased vegetation cover, prevent

erosion, and to form better visual impression, plantation will be performed in areas where powerhouse, switchyard, and turbine will be constructed. However, designing a landscape, to compensate the colorful/variable landscape structure, which formed by meeting of different habitats and various plantation types seen near the river, will be difficult.

By the start of the operation phase, dam area may also be used as excursion spot for local people. For the utilization of the dam area as recreation area for hobby and sports such as fishery, picnic, walking, bird observation, photography, the required arrangements in the region will be made. For this purpose, structural and vegetal landscape projects will be prepared towards new area usage.

During operation phase 10 people are planned to be employed. These people will produce domestic wastewater and solid waste. Daily domestic water demand will be 1.14 m^3, and it is assumed that all of the daily water demand is converted to wastewater. Likewise, solid waste originated from employees working in this phase is estimated to be 13.4 kg. Disposal of these wastes without any precaution will cause negative effect on soil, water, flora – fauna and socio-economic environment.

The only source that will cause noise is the generator and turbines located in hydroelectric building.

Mitigation Measure

Fish species living on Ceyhan River generally have high tolerance and have wide habitat. It is proposed that 11.74 m^3/s flow should be released for the sustainability of natural life in the region where transmission line passes.

Solid waste that will be produced in operation phase will be collected in proper containers and taken by Municipality in specified periods or disposed to an area that Municipality will show. Wastes that can be recovered such as plastic, glass and paper will be collected in separate containers and given to a collecting firm.

Wastewaters that will be produced in the operation phase will be stored in the septic tank that will be opened in an acceptable point close to personnel accommodation house and leakage to the underground will be prevented by proper techniques. This wastewater will be vacuumed by the sewage trucks in specified periods and discharged to the system that Municipality discharges its wastewater.

HEPP building will be isolated, so the noise and vibration will be kept in the building.

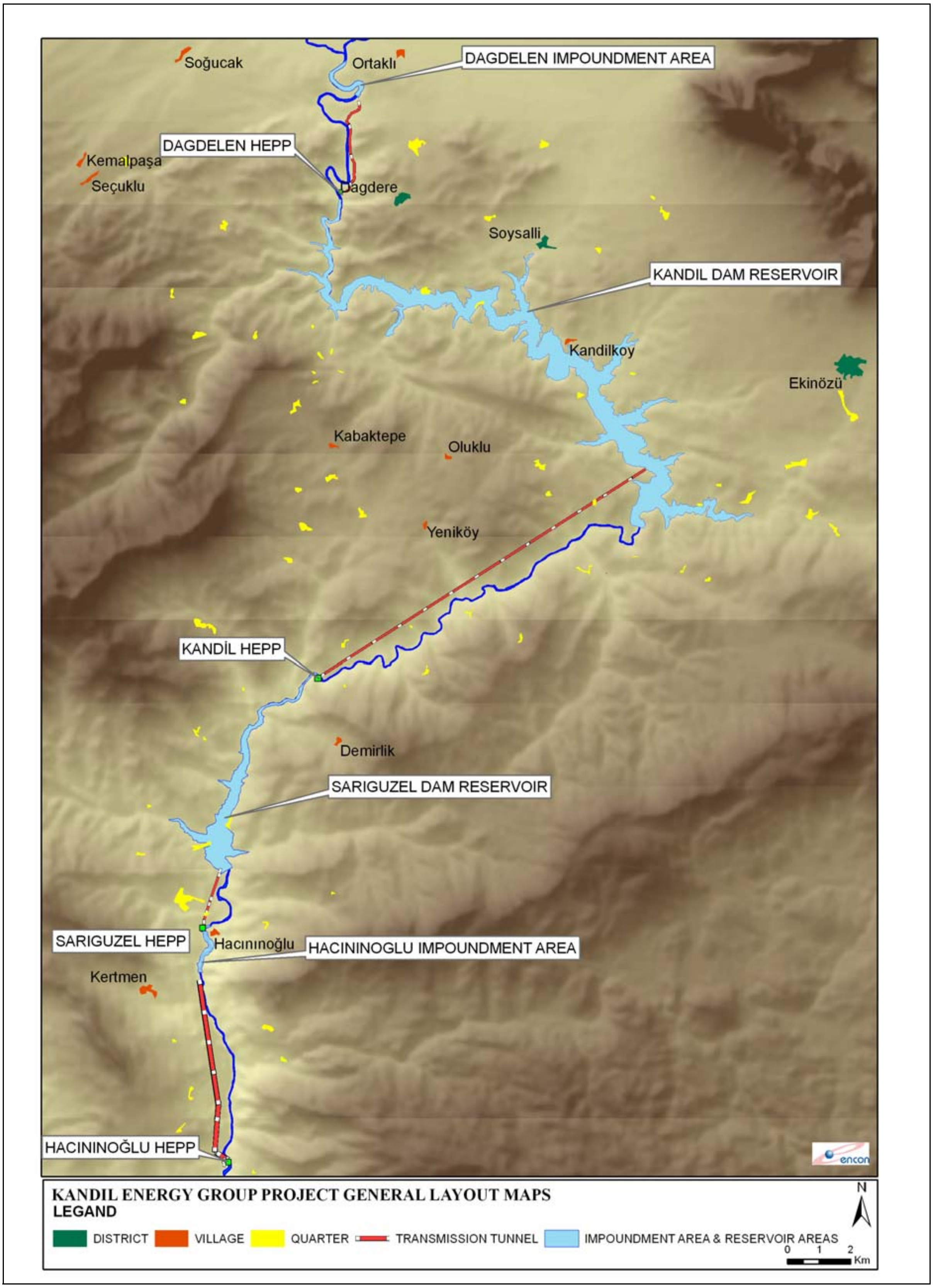
In order to prevent the impacts that will be created during the operation phase, the following laws and regulations will be complied with: Water Products Law numbered 1380; Water Pollution Control Regulation, published on Official Gazette dated December 31, 2004 and numbered 25687; Solid Waste Control Regulation, published on Official Gazette dated March 14, 1991 and numbered 20814; Regulation on Packaging And Packaging Waste Control, published on Official Gazette dated July 30, 2004 and numbered 25538; Regulation on the Assessment and Management of Environmental Noise, published on Official Gazette dated July 1, 2005 and numbered 25862; Air Quality Protection Regulation, published on Official Gazette dated November 2, 1986 and numbered 19269; Regulation on Control of Industrial Facility Originated Air Pollution, published on Official Gazette dated July 22, 2006 and numbered 26236.

APPENDIX

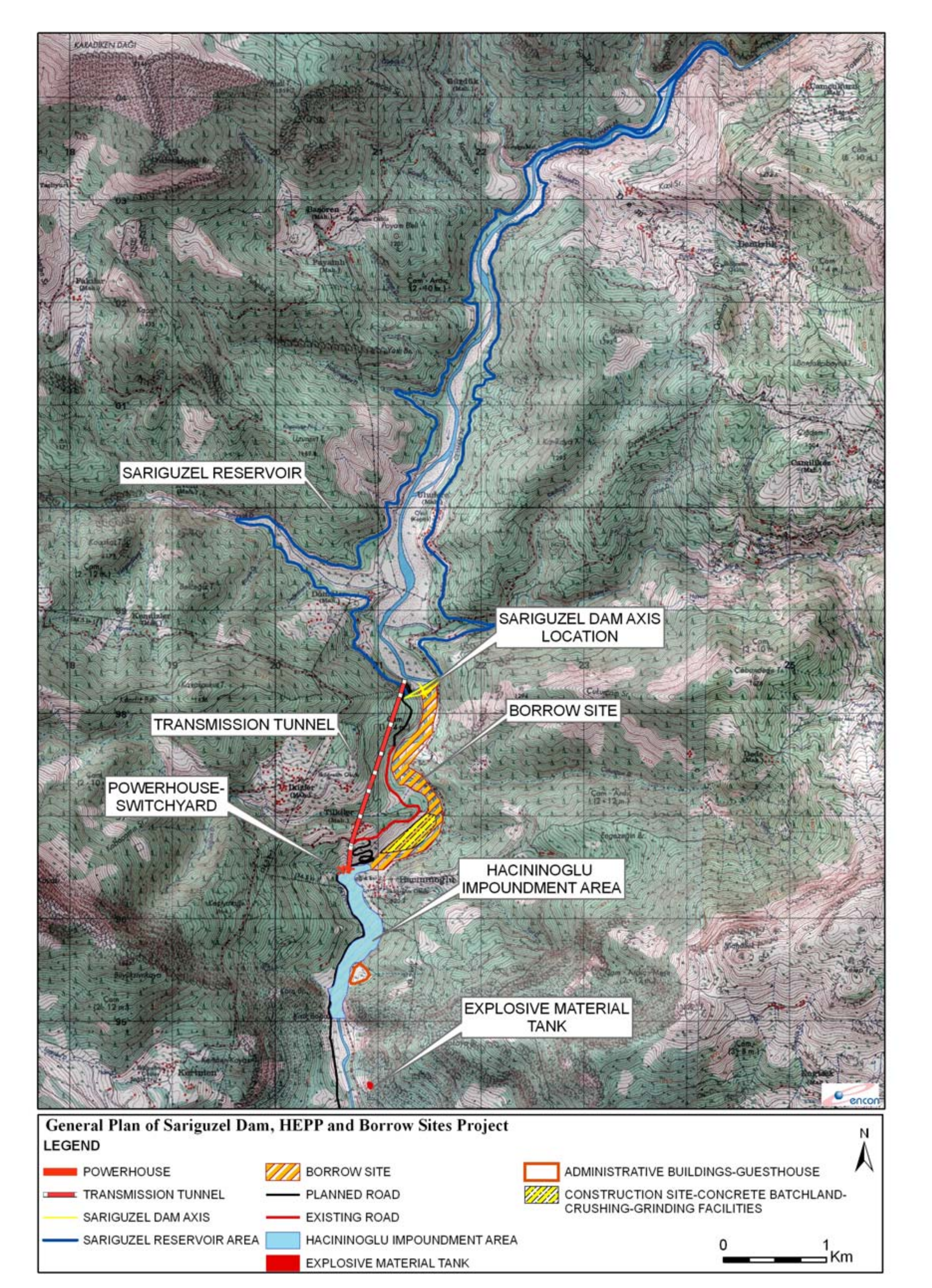
APPENDIX 1

MAPS SHOWING THE PROJECT AREA

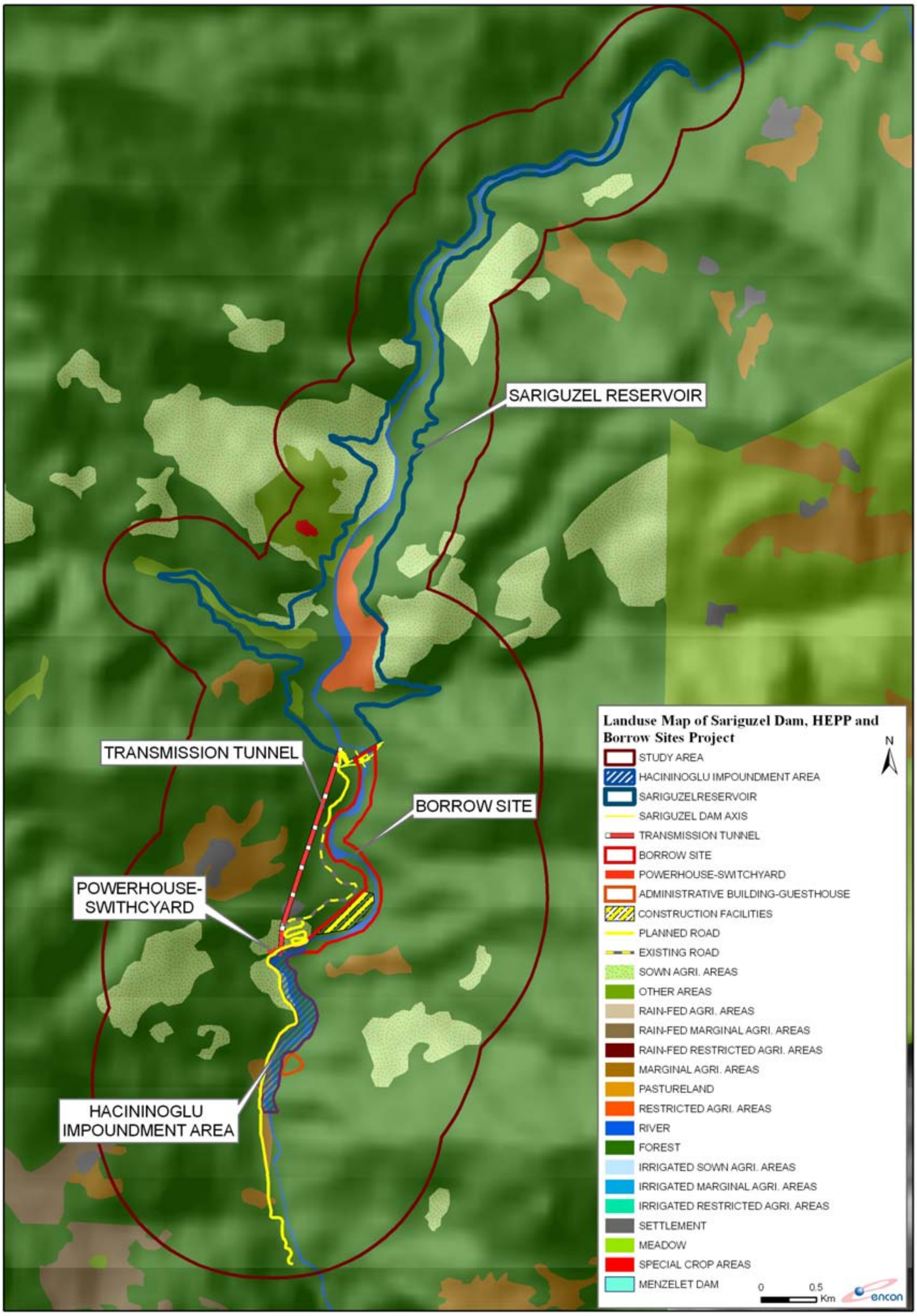
1.1. General Layout of Kandil Energy Group Project
1.2. General Plan of Sariguzel Dam, HEPP and Borrow Sites Project
1.3. Landuse Map of Sariguzel Dam, HEPP and Borrow Sites Project
1.4. Working Area of Sariguzel Dam, HEPP and Borrow Sites Project
1.5. Forest and Vegetation Cover of Sariguzel Dam, HEPP and Borrow Sites Project



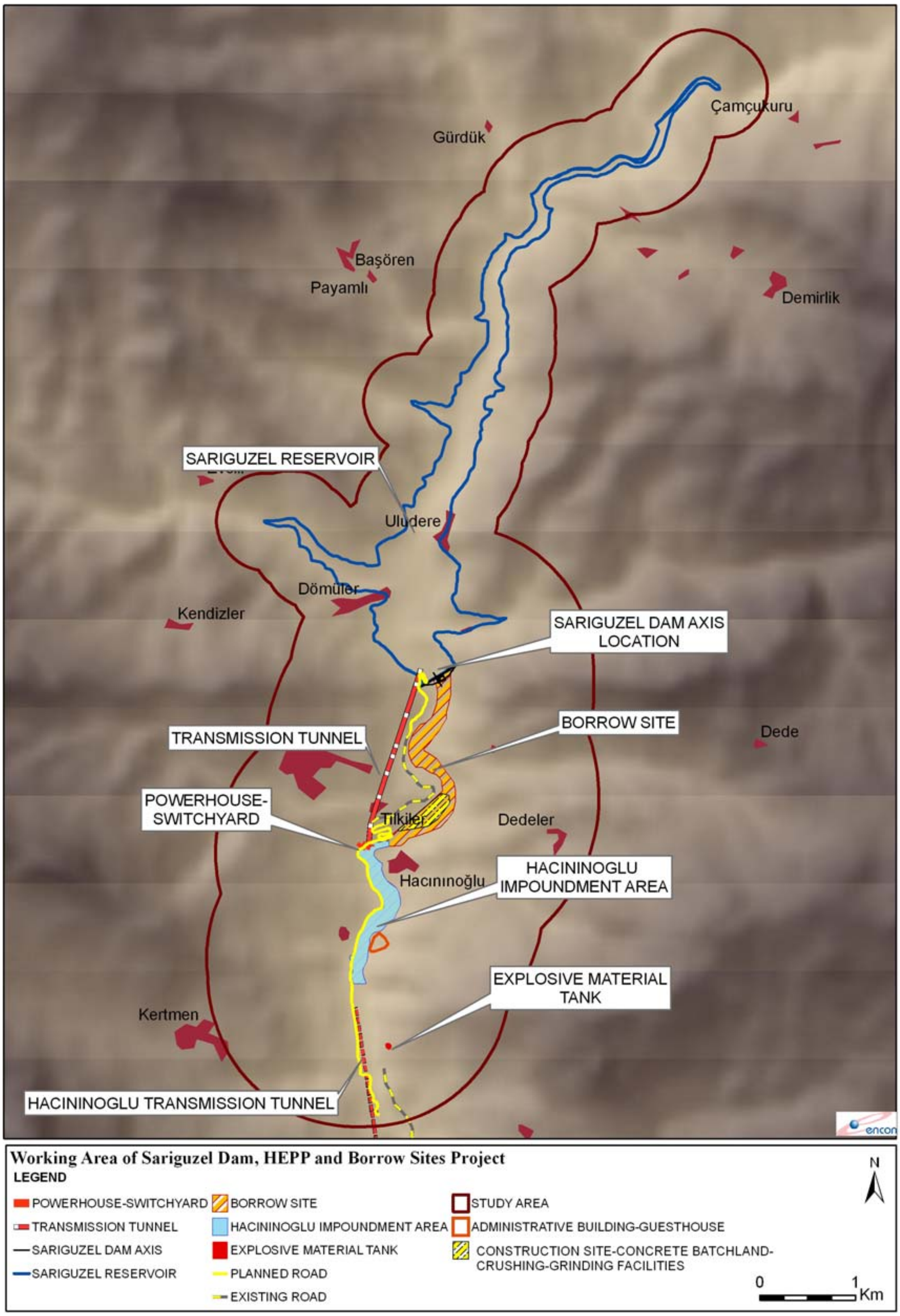
Appendix 1.1. General Layout of Kandil Energy Group Project



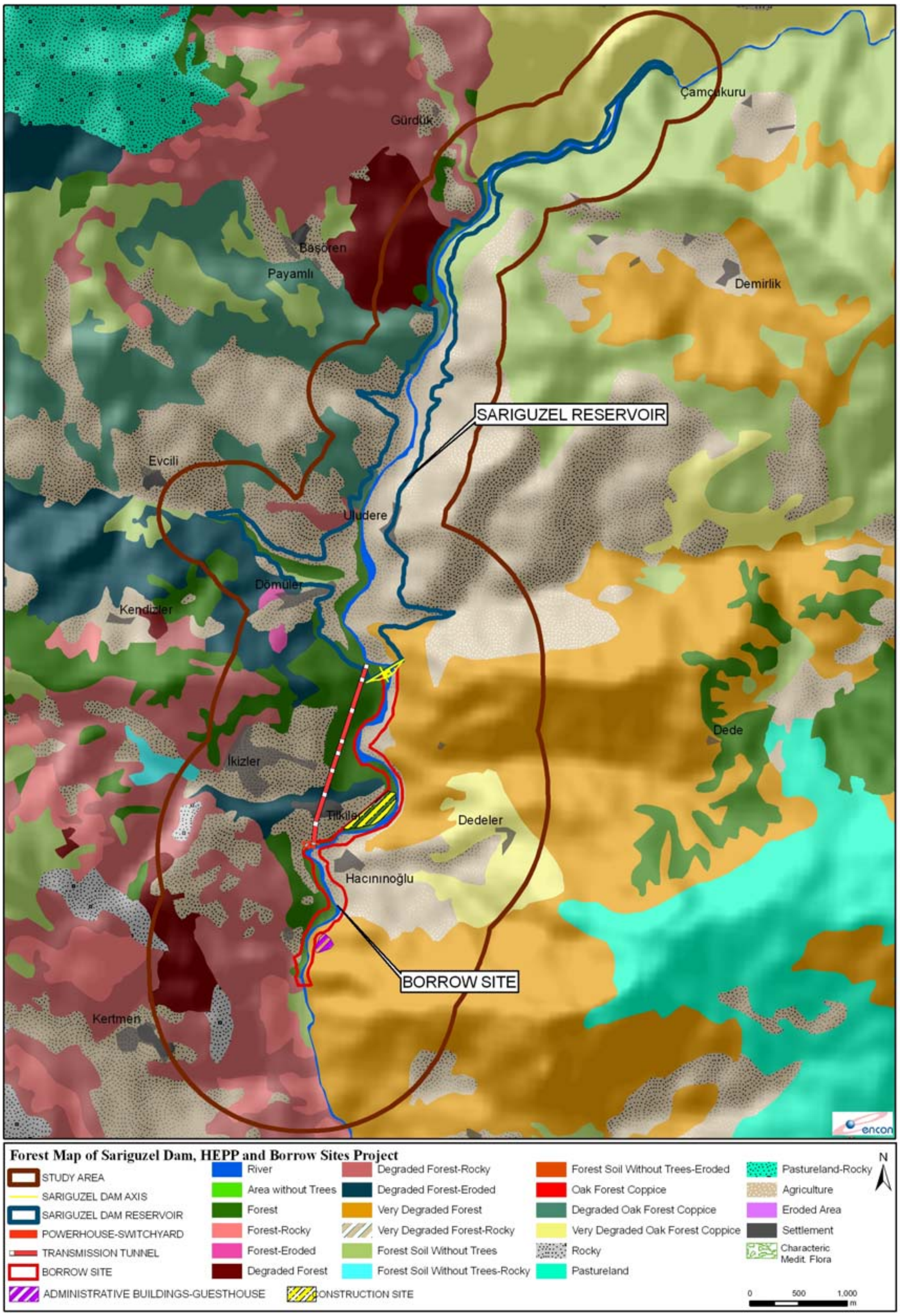
Appendix 1.2. General Plan of Sariguzel Dam, HEPP and Borrow Sites Project



Appendix 1.3. Landuse Map of Sariguzel Dam, HEPP and Borrow Sites Project



Appendix 1.4. Working Area of Sariguzel Dam, HEPP and Borrow Sites Project



Appendix 1.5. Forest and Vegetation Cover of Sariguzel Dam, HEPP and Borrow Sites Project

APPENDIX 2

OFFICIAL LETTERS

2.1.	Kandil Energy Group Projects HEPP Water Usage Right Agreement
2.2.	Sariguzel Dam, HEPP and Borrow Sites Project, Official Letter of Production License
2.3.	Ministry of Public Works and Settlement General Directorate of Highways
2.4.	Kahramanmaras Special Provincial Administration Directorate of Plan Project Investment and Construction
2.5.	Adana Conservation of Cultural and Natural Assets Regional Committee Directorate
2.6.	Ministry of Environment and Forestry, General Directorate of Forestry, Kahramanmaras Regional Directorate
2.7	Kahramanmaras Governorship, Agriculture Provincial Directorate

Appendix 2.1. Kandil Energy Group Projects HEPP Water Usage Right Agreement

T.C.
ENERJİ VE TABİİ KAYNAKLAR BAKANLIĞI
Devlet Su İşleri Genel Müdürlüğü Etüd ve Plan Dairesi Başkanlığı

9 Şubat 2006

SAYI : B 15 1 DSİ 0 10 05 00/123.HES -1098
KONU : Kandil Enerji Grubu Projeleri
HES Su Kullanım Hakkı Anlaşması

Ere Hidroelektrik Üretim ve Ticaret A. Ş.
Anadolu Bulvarı 11. Sokak No. 14
06510 Söğütözü / ANKARA

4628 sayılı Elektrik Piyasası Kanunu hükümleri çerçevesinde; Kahramanmaraş İli, sınırları içerisinde enerji üretimi gayesi ile inşa edilecek Kandil Enerji Grubu Projeleri ile ilgili olarak, DSİ Genel Müdürlüğü ile Ere Hidroelektrik Üretim ve Ticaret A. Ş. arasında 31.01.2006 tarihinde imzalanan ve Ankara 33. Noterliğince 31.01.2006 tarih ve 022251, 02252, 02253, 02254 sayılar ile tescil edilen Kandil Enerji Grubu Projesi Kapsamındaki "Kandil Enerji Grubu Projesi Kandil Barajı Hidroelektrik Enerji Üretim Tesisinin Su Kullanımı Hakkı ve İşletme Esaslarına İlişkin Anlaşma", "Kandil Enerji Grubu Projesi Hacınınoğlu Regülatörü ve Hidroelektrik Enerji Üretim Tesisinin Su Kullanımı Hakkı ve İşletme Esaslarına İlişkin Anlaşma", "Kandil Enerji Grubu Projesi Dağdelen Regülatörü ve Hidroelektrik Enerji Üretim Tesisinin Su Kullanımı Hakkı ve İşletme Esaslarına İlişkin Anlaşma" ve "Kandil Enerji Grubu Projesi Sarıgüzel Barajı Hidroelektrik Enerji Üretim Tesisinin Su Kullanımı Hakkı ve İşletme Esaslarına İlişkin Anlaşma"ların birer sureti/örneği ekte gönderilmektedir.

Bilgilerinize rica ederim.

Prof. Dr. Veysel EROĞLU
Genel Müdür

Eki :
- Su Kullanım Anlaşması (4 x 7 sayfa)

Dağıtım :
- Enerji ve Tabii Kaynaklar Bakanlığı
  (Enerji İşleri Genel Müdürlüğü)
- Enerji Piyasası Düzenleme Kurumu
  (Elektrik Piyasası Düzenleme, İzleme ve Değerlendirme Dairesi Başkanlığı)
- Ere Hidroelektrik Üretim ve Ticaret A. Ş.
  Anadolu Bulvarı 11. Sokak No. 14
  06510 Söğütözü / ANKARA
- İşletme ve Bakım Dairesi Başkanlığı
- DSİ XX. Bölge Müdürlüğü / KAHRAMNAMARAŞ

In the official letter of DSI (State Hydraulic Works) to ERE, dated February 9, 2006, it was stated that one copy of Water Usage Right Agreements of Kandil Energy Group Projects were sent in the appendix part.

Appendix 2.2. Sariguzel Dam, HEPP and Borrow Sites Project, Official Letter of Production License

T.C.
ENERJİ PİYASASI DÜZENLEME
KURUMU

EPDK

ÜRETİM LİSANSI

Bu Lisans kapsamındaki üretim tesisi Yenilenebilir Enerji Kaynağı kullanmaktadır.

Lisans No : EÜ/678-4/623

Tarih : 09/03/2006

Bu Lisans, Ere Hidroelektrik Üretim ve Ticaret Anonim Şirketi'ne, Kahramanmaraş İli'nde kurulacak olan Sarıgüzel Barajı ve Hidroelektrik Santralı üretim tesisinde 09/03/2006 tarihinden itibaren 49 yıl süreyle, üretim faaliyeti göstermek üzere 4628 sayılı Elektrik Piyasası Kanunu ve ilgili mevzuat uyarınca Enerji Piyasası Düzenleme Kurulu'nun 09/03/2006 tarihli ve 678-4 sayılı Kararı ile verilmiştir.

Yusuf GÜNAY
Başkan

Bu lisans, genel ve özel hükümleri ile ayrılmaz bir bütündür.

In the official letter of EPDK (Energy Market Regulatory Agency), dated March 9, 2006, it was stated that Production License is given to ERE for Sariguzel Dam and HEPP for 49 years with the decision of EPDK.

Appendix 2.3. Ministry of Public Works and Settlement General Directorate of Highways

FROM : ERE FAX NO. : 903122861881 KAS. 10 2006 15:20 S1

ERE/016

10-NOV-2006 14:14 TCK 5.BOLGE MD.GU 03243207135 P.01

BAYINDIRLIK VE İSKAN BAKANLIĞI
Karayolları Genel Müdürlüğü 5.Bölge Müdürlüğü

SAYI :B091TCK1050200-161/ 37557
KONU :Kandil Enerji Grubu Projeleri

Faks: 0 (312) 286 18 81
10./11/2006

SN. TOLGA BALTA

ERE HİDROELEKTRİK ÜRETİM VE TİC.A.Ş.
Anadolu Bulvarı 11.Sokak No:14
06510 Söğütözü/ANKARA

İLGİ : 17/10/2006 ve 15-06222 sayılı yazınız.

İlgi yazınızda, Kahramanmaraş İli'nin, Ekinözü İlçesi ile Merkez İlçesi sınırları içersinde yer alan ve Ceyhan Nehri üzerinde membadan mansaba doğru "Dağdelen Regülatörü ve HES, Kandil Barajı ve HES, Sarıgüzel Barajı ve HES, Hacınınoğlu Regülatörü ve HES" projelerinin yapılmasının planlandığı ve ÇED sürecinin devam ettiği belirtilmekte olup, projeler hakkında Bölge Müdürlüğümüzden görüş istenmektedir.

Yapılan inceleme neticesinde; Hacınınoğlu Regülatörü ve HES 1/25000 ölçekli Gaziantep-M37-b2 paftasında, Sarıgüzel Barajı ve HES Gaziantep-M37-b2 paftasında, Kandil Barajı ve HES Elbistan-L38-d4 paftasında ve Dağdelen Regülatörü ve HES Elbistan-L38-d1 paftasında yer almaktadır.

Söz konusu projelerin yer aldığı kesimlerin, mevcut karayolları yol ağımızda bulunan yollar ile irtibatı bulunmadığı gibi, bu kesimlerde tasarı güzergah çalışmamız da bulunmamaktadır.

Bilgilerini rica ederim.

Mehmet AKYİĞİT
Bölge Müdürü A.
Bölge Müdür Yardımcısı

Karayolları 5. Bölge Müdürlüğü
Telefon : 0-324-320 17 27 (10 Hat)
Ayrıntılı Bilgi İçin Dahili: 1801

33220 Toroslar / MERSİN
Faks : 0-324-320 71 35

In the official letter of General Directorate of Highways to ERE, dated October 17, 2006, it was stated that neither connection to existing highways road network nor design route work exists on the location where Kandil Energy Group Projects will be built.

Appendix 2.4. Kahramanmaras Special Provincial Administration Directorate of Plan Project Investment and Construction

FROM : ERE FAX NO. : 903122861881 OCA. 23 2007 16:22 S1

GF07-016

Sn. Tuğrul Bey

T.C.
KAHRAMANMARAŞ İL ÖZEL İDARESİ
Plan Proje Yatırım ve İnşaat Müdürlüğü

SAYI : B.04.4.İÖİ.4.46.01.10/C 68 /0214 .18/01/2007
KONU : Kandil Enerji Grubu Projeleri

ERE HİDROELEKTRİK ÜRETİM VE TİCARET A.Ş.
Anadolu Bulvarı 11. Sokak No: 14 06510
SÖĞÜTÖZÜ-ANKARA

İLGİ : 17.10.2006 tarih ve 15-06223 sayılı yazınız.

İlgi yazınızda söz konusu edilen Ceyhan Nehri üzerindeki Kandil Enerji Grubu Projeleri (Dağdelen Regülatörü ve HES, Kandil Barajı ve HES, Sarıgüzel Barajı ve HES, Hacınınoğlu Regülatörü ve HES) kapsamında bulunan projelerin uygulaması sonucunda;

1- Dağdelen ve HES projesinin uygulaması aşamasında Elbistan Çalış Köyü ve üniteleri ile komşu köyleri ve ünitelerinin,
2- Kandil Barajı ve HES projesinin uygulaması aşamasında Ekinözü-Kandil, Kabaktepe, Yeniköy, Soysallı, Merkez-Sarıgüzel Köyleri ve üniteleri ile komşu köyleri ve ünitelerinin,
3- Sarıgüzel Barajı ve HES projesinin uygulaması aşamasında Ekinözü İlçesi (Bazı köyleri ve üniteleri dahil) ile K.Maraş İli (Bazı köyleri ve üniteleri dahil) ,
4- Hacınınoğlu Regülatörü ve HES projesinin uygulaması aşamasında Kertmen, Beşen, Hacınınoğlu ve Sarıgüzel Köyleri ve üniteleri ile komşu köy ve ünitelerinin,

etkileneceği tarafınızca gönderilen belge ve CD ' den tesbit edilmiştir.

Yukarıda belirtildiği şekilde Kandil Enerji Grubu Projelerinden (Dağdelen Regülatörü ve HES, Kandil Barajı ve HES, Sarıgüzel Barajı ve HES, Hacınınoğlu Regülatörü ve HES) projelerinden etkilenen köy ve ünitelerimizin içmesuyu, kanalizasyon, sulamasuyu (YAS, YÜS, Gölet), ulaşım (yol) ve yol güzergahı üzerindeki sanat yapılarından (menfez, büz, köprü, istinat duvarı vs.) suyun altında kalanlar ile tahrip olanlar standartlara uygun şekilde tekrar hizmete açılması gerekmektedir.

Trabzon Caddesi Özel İdare İş Merkezi Kat. 10 KAHRAMANMARAŞ Ayrıntılı bilgi için irtibat: ... Plan Proj. Yat. ve İnş. Müd.
Tel (0 344) 223 55 70 71 Faks (0 344) 223 55 74
e-posta ... kahramanmaras.gov.tr

Appendix 2.4. Kahramanmaras Special Provincial Administration Directorate of Plan Project Investment and Construction (Cont'd)

FROM : ERE FAX NO. : 903122861881 OCA. 23 2007 16:23 S2

T.C.
KAHRAMANMARAŞ İL ÖZEL İDARESİ
Plan Proje Yatırım ve İnşaat Müdürlüğü

SAYI : B.04.4.İÖİ.4.46.01.10/068/0214 17/01/2007
KONU : Kandil Enerji Grubu Projeleri

Tamamen kullanılmaz hale gelecek olan tesislerimizin ise yeniden projelendirilmesi ve uygulanması gerekmektedir. Kurumumuz teknik elemanlarımızın görüşleri doğrultusunda Köy ve ünitelerimizin kanalizasyon, içmesuyu, sulamasuyu (YAS, YÜS; ve Göletler), yol ve yol güzergahı üzerindeki sanat yapıları ile güzergahlar yeniden geçirilerek standartlara uygun hale getirilmelidir. Söz konusu tahrip olacak ve su altında kalacak olan tesislerimizin yeniden yapılması gerekiyorsa ilgili köy ve ünitelerinin tüm tesisleri yeniden projelendirilerek (kurumumuz teknik elemanlarının görüşleri doğrultusunda) uygulanması gerekmektedir.

Yukarıda açıklandığı şekilde Kandil Enerji Grubu Projelerinden etkilenecek olan tüm köy ve ünitelerimizin içmesuyu, sulamasuyu (YAS, YÜS, Gölet), yol ve yol güzergahı üzerindeki sanat yapılarının yeniden yapılması, onarımı ve gerekiyorsa ilgili köy ve ünitelerin tüm projelerinin ve uygulamasının maddi olarak Ere Hidroelektrik Üretim ve Ticaret A.Ş. (Kamulaştırma yapmak gerekiyorsa kurumumuz adına kamulaştırma yapılması da dahil) tarafından yapılacağına dair kurumumuz ile yapılacak protokol (sözleşme) ile taahhütte bulunulduğu takdirde Kandil Enerji Grubu Projelerinin (Dağdelen Regülatörü ve HES, Kandil Barajı ve HES, Sarıgüzel Barajı ve HES, Hacınınoğlu Regülatörü ve HES) yapılmasında kurumumuzca bir sakıncası bulunmamaktadır.

Bilgilerinize rica ederim.

Mustafa BOLAT
Genel Sekreter

Trabzon Caddesi Özel İdare İş Merkezi Kat 10 KAHRAMANMARAŞ Ayrıntılı bilgi için irtibat: M.T. ... Plan Pr. Yat. ve İnş. Müd.
Tel: (0 344) 223 55 70-71 Faks: (0 344) 223 55 74
e-posta: ...

In the official letter of Kahramanmaras Special Provincial Administration, Directorate of Plan Project Investment and Construction, dated January 17, 2007, it was stated that with the implementation of Kandil Energy Group Projects, there would be infrastructural damage on villages and districts of Kahramanmaras Province. Directorate approves the project only if these infrastructural damages will be paid by ERE.

Appendix 2.5. Adana Conservation of Cultural and Natural Assets Regional Committee Directorate

FROM : ERE FAX NO. : 903122861881 ARA. 08 2006 18:10 S2

46.00/236-237
46.0/8-9

RAPOR

ADANA KÜLTÜR VE TABIAT VARLIKLARINI
KORUMA BÖLGE KURULU MÜDÜRLÜĞÜNE

İlgi:ERE Hidroelektrik Üretim ve Ticaret A.Ş. nin 17.10.2006 gün ve 15-6219 sayılı yazısı.

İlgi yazı ile; Kahramanmaraş ili, merkez Sarıgüzel barajı ve HES, Hacınınoğlu regülatörü ve HES, Ekinözü ilçesi; Dağdelen Regülatörü ve HES, Kandil Barajı ve HES sahalarında yazı eki haritada gösterilen sahalarda 2863 sayılı yasa kapsamına giren taşınmaz kültür varlığı bulunup-bulunmadığı sorulmuştur. Konuya ilişkin Müdürlüğümüz arşivinde ve 16-17.11.2006 tarihlerinde yerinde inceleme yapılmıştır.

Müdürlüğümüz arşivinde yapılan incelemede söz konusu alanlara ilişkin bir kayda rastlanılmamıştır.

Yerinde yapılan incelemlerde; merkez Sarıgüzel barajı ve HES, Hacınınoğlu regülatörü ve HES, Ekinözü ilçesi; Dağdelen Regülatörü ve HES, Kandil Barajı ve HES sahalarında yazı eki haritada gösterilen sahalar 5226 ve 3386 sayılı yasalar ile değişik 2863 sayılı yasa kapsamında değerlendirilecek herhangi bir taşınmaz kültür ve tabiat varlığına rastlanılmamıştır.

Sonuç olarak; Kahramanmaraş ili, merkez Sarıgüzel barajı ve HES, Hacınınoğlu regülatörü ve HES, Ekinözü ilçesi; Dağdelen Regülatörü ve HES, Kandil Barajı ve HES sahalarında yazı eki haritada gösterilen sahalarda 5226 ve 3386 sayılı yasalar ile değişik 2863 sayılı yasa kapsamında değerlendirilecek herhangi bir kültür ve tabiat varlığına rastlanılmamasından dolayı baraj ve regülatör yapımında sakınca olmadığı, ancak yapılacak faaliyetler sırasında herhangi bir kültür varlığına rastlanılması halinde Müze Müdürlüğüyle irtibata geçilmesi gerektiği görüşündeyiz.

Bilgilerinizi ve gereğini arz ederiz.

Ek:-Fotoğraf Albümü

Hasan BATUN
Şehir Plancısı

Mustafa ÇETGİN
Teknik Ressam

M.Evren KAYA
Arkeolog

46.../236 4390 21.12.06

Appendix 2.5. Adana Conservation of Cultural and Natural Assets Regional Committee Directorate (Cont'd)

EK-10 24

FROM : ERE FAX NO. : 903122861881 ARA. 08 2006 18:10 S1

GF06.24

Sn. Tuğrul Bey

T.C.
KÜLTÜR ve TURİZM BAKANLIĞI
Kültür Varlıkları ve Müzeler Genel Müdürlüğü
Adana Kültür ve Tabiat Varlıklarını
Koruma Bölge Kurulu Müdürlüğü

Sayı : B.16.0.KVM.4.01.00.03-46.00.236 – 3194
Konu: Baraj sahaları.

ADANA
04 ARA 2006

ERE Hidroelektrik Üretim ve Ticaret A.Ş
Anadolu Bulvarı 11. Sokak No:14 Söğütözü/ANKARA

İlgi: 17.10.2006 gün ve 06219 sayılı yazınız.

İlgi yazı ile, Kahramanmaraş ili, merkez Sarıgüzel barajı ve HES, Hacınınoğlu regülatörü ve HES, Ekinözü ilçesi; Dağdelen Regülatörü ve HES, Kandil Barajı ve HES sahalarında yazı eki haritada gösterilen sahalarda 2863 sayılı yasa kapsamına giren taşınmaz kültür varlığı bulunup-bulunmadığı sorulmuştur.

Konuya ilişkin Müdürlüğümüz uzmanlarınca yapılan yerinde inceleme sonucunda hazırlanan rapor ekte gönderilmektedir.

Bilgilerinizi rica ederim.

EK:
-Rapor

Vedat KANTÜRK
Müdür V.

Adres. Tepebağ Mah. 19 Sokak No:5 01010 ADANA
Tel (0322) 352 67 42 – 359 57 52 Faks (0322) 352 67 42

In the official letter of Adana Conservation of Cultural and Natural Assets Regional Committee Directorate to ERE, dated December 4, 2006, it was stated that according to investigations conducted by Adana Conservation of Cultural and Natural Assets Regional Committee Directorate, no cultural or natural assets were found in the region where Kandil Energy Group Projects will be constructed. Directorate stated that in case of coinciding any cultural assets, the related Cultural and Natural Assets Protection Committee should be informed. In these conditions, Directorate sees no harm in building Kandil Energy Group Projects.

Appendix 2.6. Ministry of Environment and Forestry, General Directorate of Forestry, Kahramanmaras Regional Directorate

ERE/035

T.C.
ÇEVRE VE ORMAN BAKANLIĞI
Orman Genel Müdürlüğü Kahramanmaraş Bölge Müdürlüğü

Sayı :B18.1.OGM.1.19.Ş3-1- 2001

28.12.06*J 10503

Konu :HES

ERE HİDROELEKTRİK Üretim ve Ticaret A.Ş.
Anadolu Bulvarı 11. Sokak No:14
06510 Söğütözü /ANKARA

İlgi : 17.10.2006 tarihli ve 15/06221 sayılı yazınız.

Şirketinizce yapılması planlanan Kandil Enerji Grubu Projelerinde her bir HES için ayrı ayrı hazırlanan İnceleme ve Değerlendirme Formu ekte gönderilmiş olup, ön veriler itibariyle tesislerinde Kurumumuzca bir sakınca bulunmamaktadır.

Bilgilerinizi rica ederim.

Remzi BİLAL
Bölge Müdür Yardımcısı

EK:
-Rapor (4 tk.)

Hacı Bayram Veli Mah. Sait ZARİFOĞLU Bulvarı 46040 KAHRAMANMARAŞ
Tlf : (0 344) 234 44 01 Faks: (0 344) 234 44 20

Appendix 2.6. Ministry of Environment and Forestry, General Directorate of Forestry, Kahramanmaras Regional Directorate (Cont'd)

SAR...ZEL HİDROELE...RİK SANTRALİ
İNC... ...ME VE DEĞERL...DİRME FORMU

İli - :Kahramanmaraş — ORMAN BÖLG... MÜDÜRLÜĞÜ : Kahramanmaraş
İlçesi :Merkez ,Göksun — ORMAN İŞLET...E MÜDÜRLÜĞÜ :Kahramanmaraş,Göksun
Köyü : Sarıgüzel ,Hacınınoğlu — ORMAN İŞLET...Ş ŞEFLİĞİ :Kapıkaya,Elbistan
Mevkii :

1-Müracaat Sahibinin
Adı ve Soyadı :Ere Hidroelektrik Üretim ve Tica... A.Ş.
Adresi :Anadolu Bulvarı 11.Sokak. No14 ...ğütözü/Ankara
2-Hangi Kanuna Göre Olduğu:5346 Sayılı Kanuna gö...
3-Seri Adı :Kapıkaya, Elbistan
4-Bölme Numaraları: **Kapıkaya Şefliği**: 62,63,65,95,...,100,101,102,135,136,137,138,139,162, 191,192
Elbistan Şefliği :61,62,90,91,92,126,127,128,130
5-Meşçerenin :
a) İşletme Şekli :Muhafaza,
b) Mevcut Ağaç Cinsleri :Çz,Çk,Ar,M
c) Meşçerenin Tipleri :Z,OT,ÇBÇz,ÇBÇkAr,B... z-T,Çzc1,BÇzM,BMBt,BArM-T,BÇzM-E, Çza,BÇz-E
6-1/25000 ölçekli Meşçere Haritası Üzerinde
ÇED raporuna konu sahanın sınır
Noktalarının Koordinatları Sayfalarca Koordinat özet ...zelgesi mevcut olduğu için kesin izin döneminde tek tek belirtilecektir.
8- Orman Tehdit ve Kadastro Durumu :Geçmemiştir.
a) HES Genel Alan :291,04.ha
b) Orman Sayılan Alan :154,40 Ha
c) Orman Sayılmayan Alan :136,64 Ha
9- İzin İslenen Sahanın Alanı ;154,40 Ha
10-Talebin Amacı :Regülatör ve Hidroelektr... ik santrali kurma
11-Talep Şahsında Başka Bir Müracaatın Yapılıp Yap... madığı;Yoktur.
12-Talep Sahası yerin 6831 Sayılı Orman Kanununun
18 maddesinde yangın görmüş ormanları
gençleşmeye ayrılmış veya ağaçlandırılan sahalarla
baraj havzalarında kalıp kalma... :Kalmamaktadır
13-Talep sahasının tohum meş...

Appendix 2.6. Ministry of Environment and Forestry, General Directorate of Forestry, Kahramanmaras Regional Directorate (Cont'd)

Milli Park, Av Yaban Hayatı, Av Üretme Sahası, Turizm Alanı, özel Çevre Koruma Bölgesi, Askeri Yasak Bölge ve Sit Alanı içerisinde kalıp kalmadığı	:Kalmamaktadır.
14-Ormancılık çalışmaları ve Orman Halk münasebetleri açısından mahsuru olup olmadığı	:Yoktur.
15-Orman Yangınları açısından hassasiyet derecesi ve alınması gereken tedbirler neler olmalıdır	:Yangın ihtimaline karşı her türlü önlem alınacaktır.

16-Orman emvallerinin, nasıl değerlendirileceği: İşletme müdürlüğünce değerlendirilecektir.

İnceleme ve değerlendirme formundaki bilgiler ormancılık verileri esas alınarak tanzim edilmiştir.

BAŞKAN	ÜYE	ÜYE
Kemal TOPAL	Ömer Gürkan İNAL	Hasan ÖZŞAHİN
Şube Mühendisi	Kapıkaya İşletme Şefi	Elbistan İşletme Şefi

ÇED Talebinde Sarıgüzel regülatörü ve HES İşletme Müdürlüğümüz açısından herhangi bir sakıncası bulunmamaktadır.

İşletme Müdürü
Ali ÖZDEMİR
İşletme Müdürü

In the official letter of Ministry of Environment and Forestry, General Directorate of Forestry, Kahramanmaras Regional Directorate to ERE, dated December 12, 2006, Directorate stated that they have no objection for the construction of Kandil Energy Group Projects. In addition, directorate attached the Review and Evaluation Form for each HEPP.

Appendix 2.7. Kahramanmaras Governorship, Agriculture Provincial Directorate

FROM : ERE FAX NO. : 903122861881 MAR. 07 2007 11:52 S1

ERE/053

T.C
KAHRAMANMARAŞ VALİLİĞİ
Tarım İl Müdürlüğü

SAYI : B.12.4.İl.M.0.46.00.01/5041 - 1363
KONU : Sarıgüzel Barajı ve HES

28/02/2007

ERE HİDROELEKTRİK ÜRETİM VE TİC. A.Ş.
Anadolu Bulvarı 11. Sok. No:14
Söğütözü / ANKARA

İlgi : 01.11.2006 tarih ve bila sayılı yazınız.

İlgi yazıda, İlimiz Merkez İlçe Sarıgüzel ve Hacımınoğlu Köyleri sınırlarında bulunan, ekli haritada yerleri işaretli, yaklaşık 300 ha'lık alanda, ERE Hidroelektrik Üretim ve Ticaret A.Ş. tarafından, Sarıgüzel Barajı ve HES kurulacağı belirtilerek, Kurumumuz mevzuatı açısından sakıncası olup olmadığı sorulmaktadır.

Bahse konu alanla ilgili olarak, İl Müdürlüğümüz teknik elemanları tarafından hazırlanan rapor ve eklerinin değerlendirilmesi sonucu, Sarıgüzel Barajı ve HES kurulması planlanan sahaların, Orman sayılan yerler dışında kalan kısmının, Diğer Araziler (T) ve Kuru Marjinal Tarım Arazisi (KTA) olduğu anlaşılmıştır.

Bu nedenle, 5403 sayılı Toprak Koruma ve Arazi Kullanımı Kanunu'nun 13. maddesi gereğince, ekli haritada yeri işaretli alanların, Toprak Koruma Projesine uyulması şartıyla, ***istenilen amaçla kullanılması uygun görülmüştür.***

Bilgilerinize rica ederim.

Hülya KAYA
Vali a.
Vali Yardımcısı

EKLER :
EK-1- 1/25000 Ölçekli Harita fotokopisi

Menderes Mah.9. Sokak No:49/Kahramanmaraş Ayrıntılı bilgi için irtibat: Müh. M.ELBİSTAN
www.kahramanmarastarim.gov.tr Telefon: (0 344) 231 32 12 Pbx Fax : (0 344) 231 32 19

06.03.2007
681

In the official letter of Kahramanmaras Governorship Agriculture Provincial Directorate to ERE, dated February 28, 2007, it was stated that the location where Sariguzel Dam and HEPP project will be located is found suitable for the project provided that Soil Protection Project is applied.

APPENDIX 3

SOIL PROTECTION PROJECT

Appendix 3. Sariguzel Dam and Hydroelectric Power Plant Soil Protection Project

ERE HIDROELEKTRIK URETIM VE TICARET A.S.

SARIGUZEL DAM AND HYDROELECTRIC POWER PLANT

SOIL PROTECTION PROJECT

DECEMBER-2006
ANKARA

TABLE OF CONTENTS

SECTION 1. PROJECT SUMMARY

1.1 Purpose of the Project

Sariguzel Dam and Hydroelectric Power Plant is planned to be constructed by ERE Hidroelektrik Uretim ve Ticaret A.S. (ERE) within the boundaries of Central District of Kahramanmaras Province, Sariguzel and Hacininoglu Villages, and Demirlik Village of Ekinozu District on the areas that is the property of General Directorate of Forestry, Treasury and private people, and lies along the river. With this project, it is aimed to take soil protection measures to prevent harmful effects of dam, diversion tunnel, power plant and surface area that will be constructed by the mentioned company, on surrounding agricultural lands.

1.2. Duration of the Project

Soil Protection Project has two phases. The first one includes soil protection measures intended for the prevention of activities that may adversely affect the surrounding agricultural lands, during the construction of dam, diversion tunnel and power plant. These activities will continue during the construction of dam, water carrying canal and power plant, and will be implemented in nearly 3 years.

The second phase includes the necessary measures to prevent contamination and filling of surface area and flood beds after all the facilities related with the electrical energy production is completed. This period is estimated to be two years. Measures that will be taken to prevent filling of flood beds and surface area will be continued throughout the economical life of the project.

1.3 Implementation Place of the Project

Implementation place of the project is in the boundaries of Central District of Kahramanmaras Province, Sariguzel and Hacininoglu Villages, Demirlik Village of Ekinozu District, and this location is a 7 km shoreline from the upstream to the downstream of Ceyhan River. Site is located in 105 km north of Kahramanmaras Province, 20 km southwest of Ekinozu District, 50 km east of Ilica Village, and 10 km east of Kertmen Village, and in the boundaries of Sariguzel and Hacininoglu Villages. In the east of project immovable; Demirlik Village, Uludere Quarter, and Kizilkaya hill and Igdecik hill, in the west; Ikizler, Evcili, Domuler Quarters of Sariguzel Village, and Uzunisik, Kocali and Karakavkut Hills, in the south; Kisik Strait, in the north; Gurduk Quarter and active bed of Ceyhan River are located. The area on which Dam and Hydroelectric Power Plant is planned to be built is about 300 ha.

In this location, an area that is 400,000 m^2 and has marginal agricultural land property is located. In this land, generally wheat, barley and vetch are cultivated. Apple garden, vineyard and vegetables are cultivated in patches. Furthermore, poplar cultivation exists in the boundaries of parcels.

1.4 Project Activities

Project activities have two phases.

Activities to be executed in the first phase;

- **Dam:** thalweg elevation is 772 m, crest elevation is 840 m, normal water level is 747 m, height above thalweg is 68 m, height above foundation is 72 m, crest length is 418 m, crest width is 4 m,
- **Diversion Tunnel:** is circular conduit type, 60 m in length, 6 m in diameter, and has 580 m^3/s capacity.
- **Switchyard:** is 20 m in width, 40 m in length
- **Powerhouse:** is 13 m in width, 30 m in length and 22 m in height,
- **Penstock:** has 4.5 m pipe diameter, length of 207 m, flow of 85 m^3/s
- **Turbine:** is vertical axis Francis type, has 30,500 kw power, 2 units and 0.85 efficiency
- **Borrow Site:** Required material for dam construction will be provided from riverbed, and the distance between riverbed and dam is about 100 m.

In order not to affect surrounding agricultural lands adversely during the construction of above-mentioned activities, soil protection measures that are necessary in all phases were recommended.

The area on which dam is built, and dam surface area consist of General Directorate and Forestry, Treasury and private individual's lands. The said lands were hired for 49 years from the related institutions. Individual's lands were purchased from their owners.

Since material that will be used for dam construction will be provided from the area located in the surface area (will be taken from Ceyhan riverbed), surrounding agricultural lands will not be affected from this activity, and any loss will not occur in agricultural lands. However, since heavy construction equipment will be used during the transportation of materials that will be extracted from the riverbed to dam and other construction areas, dust emissions will occur. In order not to affect surrounding agricultural and forestry assets from the said dust emission, watering the transportation roads via sprinklers will often be provided.

In accordance with the circular on "Accumulated Materials Stored in Open", measures will be taken against harmful effects that may be originated from loading and unloading during the construction of both dam and other buildings.

Water diverted from dam will be transferred to power plant via tunnel. Therefore, during the excavation of tunnel, no activity that may affect the environment will be performed. However, storage and use of nearly 1700 m^3 material to be extracted from the tunnel that is 60 m in length and 6 m in diameter will be provided properly in order not to fill riverbed, and affect agricultural and forestry lands. Extracted materials will firstly be used for filling of dam embankment.

Areas on which power plant and switchyard will be built are non-agricultural areas, and no agricultural activity has been performed on these areas up until now. Because of its soil structure, these lands are not suitable for culture plant cultivation. Therefore, in this area, loss of agricultural land and yield will not occur, and agricultural activity is not performed in surroundings. However, measures are required against erosion in this area. Control of erosion will be ensured by forestation and plantation.

Activities to be executed in the second phase;

In order not to fill dam surface area with silts and to extend the economical life of surface area, terraces will be built on the regions where breaches exist, and these terraces should be afforested to prevent the silts coming from the slope. Through 2 km surface area, terraces will be built, and forestation and plantation will be performed for breach control in 10 different locations that have potential of excess flood flow.

Ceyhan River is one of the most suitable rivers for inland water fishery in point of both water flow, and heat and quality of water. Therefore, in order not to affect fishery activities at reservoir basin, and to continue this activity, measures that are identified in Water Products Law numbered 1380 should be taken.

Since the area on which project will be built is under the ownership of investor for a long time, all structuring activities will not be allowed around surface area, and measures will be taken for water pollution.

These Activities are;

a) Since heavy construction equipment will be used during the extraction of materials that will be consumed for dam, tunnel, powerhouse and turbine construction from borrow site and tunnel excavation, and the transportation of these materials to the construction areas will be executed, dust emissions will occur. In order not to affect surrounding agricultural and forestry assets from the said dust emission, roads will be covered with stabilized material, and watering the transportation roads via sprinklers will often be provided.

b) In accordance with the circular on “Accumulated Materials Stored in Open”, measures will be taken against harmful effects that may be originated from loading and unloading during the construction of both dam and other buildings.

c) Storage and use of nearly 1700 m^3 material to be extracted from the tunnel that is 60 m in length and 6 m in diameter will be provided properly in order not to fill riverbed, and affect agricultural and forestry lands. Extracted materials will firstly be used for filling of dam embankment.

d) Measures will be taken to erosion in the areas on which power plant, switchyard and tunnel will be constructed.

e) In order not to affect trees and plants, wire fence will be used around the areas that will be afforested and planted.

f) In order not to fill dam surface area with silts and to extend the economical life of surface area, terraces will be built on the regions where breaches exist, and these terraces will be afforested to prevent the siltation coming from the slope.

g) In order not to affect fishery activities at Sariguzel HEPP reservoir basin that will be constructed on Ceyhan River that is one of the most suitable rivers for inland water fishery, and to continue this activity, measures that are identified in Water Products Law numbered 1380 should be taken.

h) All protective measures will be taken against water pollution around both Sariguzel dam surface area and powerhouse within the frame of Water Products Law.

1.5 Project Benefits

Some part of the project area is a flood bed due to the materials hauled by Ceyhan River in time; a little part has a property of Dry Marginal Agricultural Land; a big part has the property of Slope Land Topographic positioned Other Lands. Slope changes

between 2-18% in the lands located in dam surface area. Lands that are not present in surface area have more declines. Irrigation is not performed in existing situation of project site, and planting is done depending on the rainfall. However, in a small part, farmers can cultivate vegetable by using water taken from Ceyhan River by their own devices. Generally wheat, barley and vetch are planted in the limited amount of land in vicinity.

According to climate, topography, soil and irrigation situation, it was decided that a big part of the mentioned area is in Other Lands (T) class, and remaining small part is Dry Marginal Agricultural Land (DAL).

Project area is a dry Marginal agricultural land, and generally wheat, barley and vetch that are cultivated in dry conditions are dominant in the vicinity. However, efficiency of cultivated areas is not adequate because of the frequent floods in riverbed especially in springtime. It was determined that no yield was gained from the area in some years. Efficiencies of wheat and barley in the region in optimum conditions are 150-125 kg/1000 m^2 respectively, and efficiency of vetch is 200 kg/1000 m^2 dry herb.

Wheat: 400,000 m^2 x 150 kg/1,000 m^2 x 0.35 YKrs = 21,000 YTL (New Turkish Lira)
Vetch: 400,000 m^2 x 200 kg/1,000 m^2 x 0.2 YKrs = 16,000 YTL

Total = 37,000 YTL/2 = 18,500 YTL

40 % of calculated gross income is production cost, and net income loss will be 11,100 YTL/year.

Construction of dam, tunnel, powerhouse and switchyard, and the installation of electric transmission line that will connect the energy attained from power plant to interconnected system are estimated to be completed in nearly 3 years. In this period, 30 people will work in each year for 240 days in a year, and as a result 21,600-man/day employment will be provided. Nearly 750,000 YTL added values will be provided from this employment. In addition, 3 people will be employed permanently after the facility starts its operation. This will provide 1,800,000 added values in total for nearly 50 years that is the economical life of the operation.

Thus, during the construction and operation of the facility, nearly 2,500,000 YTL added values will be provided to the vicinity. This added value is nearly 10 times greater than the 50-years agricultural income.

In a year, nearly 6 million YTL income will be provided from the Hydroelectric Power Plant to be installed. On the other hand, nearly 70% of energy demand of our country is provided via import. This investment will provide nearly 120 million kw energy in a year, and this shows the importance of the investment evidently in terms of public welfare.

In this manner, through investment, migration from rural areas to urban areas will be prevented, social problems will be prevented by providing employment opportunity for local people in their hometowns, and dependence to foreign countries will be reduced partly.

According to the calculations, income provided from electrical energy is 600 times greater than the income provided from the agricultural production in project area. On the other hand, since the mentioned marginal agricultural land is flood bed, regular income cannot be provided from the agricultural activities in each year.

Investor will provide income-increasing activities in the region for both the sustainability and the safety of the investment. The first one of these activities is fishing in dam surface as an additional income for local people.

Therefore, installation and operation of HEPP facility has a great importance for public welfare and economy of country provided that the above-mentioned protective measures are taken in the said area.

SECTION 2. DETERMINATION OF EXISTING SITUATION

2.1 Existing Situation of Land

2.1.1. Location and Size of Land

Land, where is the implementation place of the project, is in the boundaries of Central District of Kahramanmaras Province, Sariguzel and Hacininoglu Villages, Demirlik Village of Ekinozu District, and this location is a 7 km shoreline from the upstream to the downstream of Ceyhan River. Site is located in 105 km north of Kahramanmaras Province, 20 km southwest of Ekinozu District, 50 km east of Ilica Village, and 10 km east of Kertmen Village, and in the boundaries of Sariguzel and Hacininoglu Villages. In the east of project immovable; Demirlik Village, Uludere Quarter, and Kizilkaya hill and Igdecik hill, in the west; Ikizler, Evcili, Domuler Quarters of Sariguzel Village, and Uzunisik, Kocali and Karakavkut Hills, in the south; Kisik Strait, in the north; Gurduk Quarter and active bed of Ceyhan River are located. The area on which Dam and Hydroelectric Power Plant is planned to be built is about 300 ha.

2.1.2. Soil, Topographic and Geological Structure of Land

a) Geological Structure

Region is commonly permocarbonfiber, and in cover layers based on silurien, devonien and metamorphic base. Limestone is common and land has carstic property. Although, metamorphic shist and permocarbonfiber limestones have different folding directions, they depend on the common paleozoic unity. Clayey limestones includes whitish grey-cream, clayey-yellow, slim mid-layer, and very little chalky planes

b) Soil depth

Soil depth is 0-20 cm, and has sandy-loamy soil structure. In the sites, land problems such as mid erosion, mid stoniness, light rockyness in patches, and deficiency in impounding capacity exists, but land problems such as alkalinity and drainage do not exist. Land is a Dry Marginal Agricultural Land (MAL).

c) Slope of land

Slope of land changes between 2% and 18%.

d) Soil constitution

Soil constitution of land varies in patches, and has a sandy-loamy structure.

e) Soil structure

Soil structure of land has block type, mid class weak degree, and weak structure in terms of organic material constitution.

f) Erosion and stoniness situation in land

Land has mid-intensity erosion, and mid-degree stoniness problem.

g) Irrigation situation of land

Land is not located in the irrigation site of DSI (State Hydraulic Works). Therefore, dry farming is performed depending on the rainfall. However, some of the farmers living in the region are doing fruit and vegetable cultivation for their own consumption by pumping water from the river. Land size in the vicinity is quite lower than the average in Turkey, and varies between nearly 0.05-0.5 ha.

2.1.3 Climate Properties and Hydrology

Project area is present at the intersection point of two different geographical regions that is East Anatolian Terrestrial climate and Central Anatolia Terrestrial climate. In summer season the weather is hot and dry, in winter it is cold and rainy. Annual average temperature in the region changes among districts. Annual average temperature is 8.8°C in Goksun, 10.3°C in Afsin and Elbistan, 9.4°C in the region on which HEPP will be built, and the lowest temperature is - 25°C. Annual rainfall amount is 605 mm in Goksun, 440 mm in Afsin, 358 mm in Elbistan, nearly 500 mm in the region on which HEPP will be built. The warmest months are July and August, and the rainiest months are January and February. Number of snowy days in a year is 13 in Afsin and Elbistan, 19 in Goksun. Snow thickness is 22.5 cm in Afsin, 14 cm in Goksun and 47 cm in Elbistan.

2.1.4 Annual Average Rainfall Amount

Project area is present at the intersection point of two different geographical regions that is East Anatolian Terrestrial climate and Central Anatolia Terrestrial climate. The rainiest months are January and February, and annual average rainfall is nearly 500 mm in the region on which HEPP will be built.

2.1.5 Natural Vegetation

Natural vegetation of Afsin, Elbistan and Goksun districts that are the sources of Ceyhan River in the province are scrubs and oaks in dry regions, rare peaks, thyme, astragallus and water pumpernel. Dominant vegetation of the region is maquis going down the tributaries of the river, and kermest oak, scarlet oak, sumac, blackthorn, black pine in groups, fir tree, cedar, Turkish pine species are found in the maquis formation. Especially, in the upper parts of the place on which dam will be built, rocks and scrubs, and around the riverbed mix pines constitute the dominant vegetation.

2.1.6 Plants Cultivated in the Vicinity

Fruits and vegetables, especially wheat, barley and vetch, are cultivated in the areas that can be irrigated. Vineyard, almond and walnut trees are found in the slope of hills. In the region, areas within the scope of Law on Improvement of Olive Cultivation and Inoculation of Wilds, and the areas accepted as pasture area according to Pasture Law are not found.

2.1.7 Factors Limiting Agricultural Production

Land has dry marginal agricultural land property, and soil depth is in between 0-20 cm. Problems such as mid-degree erosion and stoniness exist in the land. In addition, gravel and stones are found in the land. However, irrigation water is scarce, and generally January and February are rainy. All of these problems are important limiting factors in the diversity and efficiency of agricultural products.

2.1.8 Type of Usage (irrigated-dry) of Required Land and Surrounding Lands

Nearly all of the existing agricultural lands, which are in the region where HEPP will be built, will be inundated and no agricultural lands exist in the surrounding.

SECTION 3. PROJECT REQUIREMENTS AND ITS REASONS

3.1 Potential Impacts of the Activity (Non Agricultural Activity) to be Performed on Environment

a) Since heavy construction equipment will be used during the extraction of materials that will be consumed for dam, tunnel, powerhouse and turbine construction from borrow site and tunnel excavation, and the transportation of these materials to the construction areas will be executed, dust emissions will occur.

b) Damages will occur during both dam and other building constructions due to loading and unloading activities.

c) 1700 m^3 excavation material coming from tunnel excavation will damage riverbed, agricultural and forestry lands.

d) Erosion may occur in the area on which powerhouse, switchyard and turbine will be constructed.

e) Economical life of dam will be reduced since flood beds are unvegetated and dam surface area will be filled with silts.

f) Fishes living in the riverbed will be adversely affected due to structuring.

g) Construction site will damage environment and agricultural lands.

SECTION 4. MEASURES TO BE TAKEN AND PROJECT DETAIL

4.1 Since heavy construction equipment will be used during the extraction of materials that will be consumed for dam, tunnel, powerhouse and turbine construction from borrow site and tunnel excavation, and the transportation of these materials to the construction areas will be executed, dust emissions will occur.

In order not to affect surrounding agricultural and forestry assets from the said dust emission, roads will be covered with stabilized material and watered via sprinklers.

4.2 Damages will occur during both dam and other building constructions due to loading and unloading activities.

In accordance with the circular on “Accumulated Materials Stored in Open”, measures will be taken to prevent these damages.

4.3 1700 m^3 material to be extracted from the tunnel that is 60 m in length and 6 m in diameter will damage riverbed, agricultural and forestry lands.

Since storage of the excavated material will be difficult due to the inclination and steepness of the vicinity, these materials will firstly be used in the filling of dam embankment.

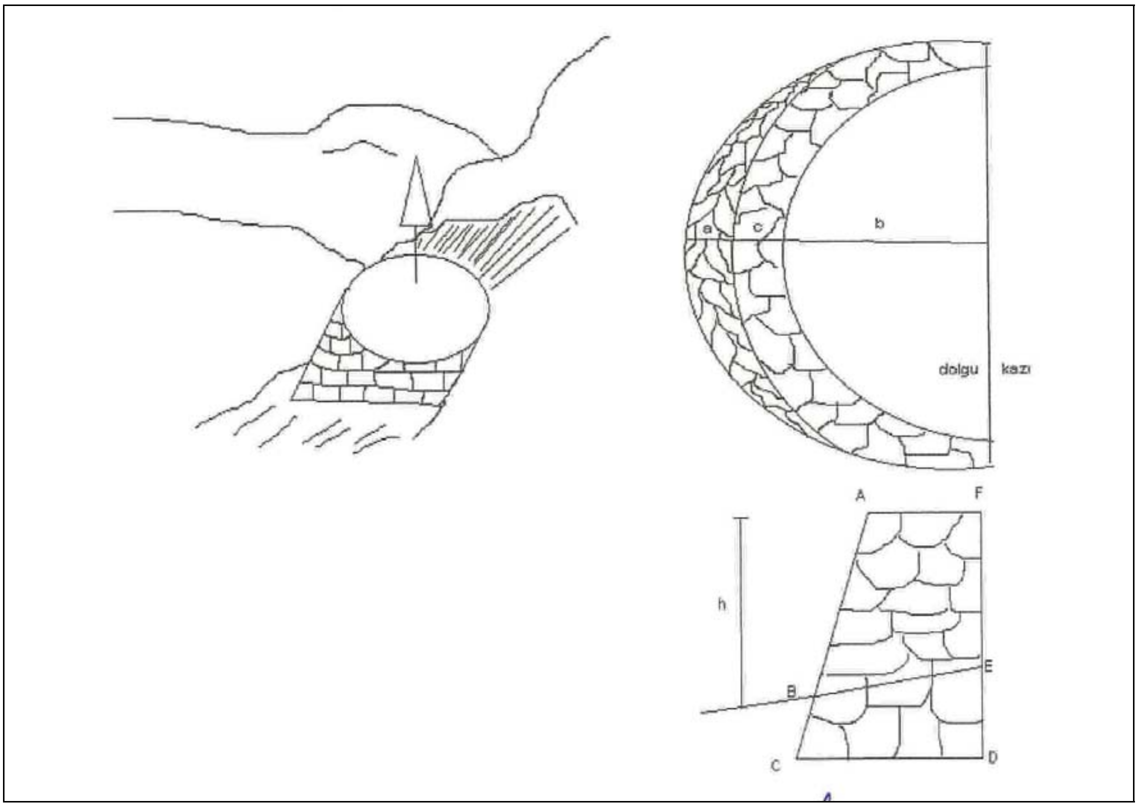
4.4 Erosion may occur in the area where powerhouse, switchyard and turbine will be constructed.

Terraces will be built to prevent erosion in these areas, and afforestation and plantation activities will be executed. Wire fence will be used around this area in order to prevent all types of damages.

4.5 Economical life of dam will be reduced since flood beds are unvegetated and dam surface area will be filled with silts.

In order not to fill surface area with silts and to extend the economical life of surface area, terraces will be built on the regions where breaches exist, and these terraces should be afforested to prevent the silts coming from the slope. Terraces will be constructed and surface flow will be prevented in order to prevent breach formation in the steep areas, where slope is high (20 % and above).

Terraces will be constructed by putting up stonewall. This execution is found appropriate for the areas where stone is abundant. Terraces will be constructed as half circles, and trees will be planted on their middle. Figure and section of terraces that will be constructed is given below.



Stonewall volume was calculated according to the formula given below.

Wall Volume (m^3) = Area of ABCDF x b + u/2 x ½

Wall volume changes depending on the width of breach, radius of terrace, and the height of wall. For instance, nearly 8.3 m^3 stone is required for a terrace with a 1 m of terrace wall, 1 m of wall top width, 2 m of wall bottom width and 4 m of terrace radius. Depending on the slope and width of the breach, 3 to 6 terraces were planned for each riverbed. Depending on the width of breach and type of net, terraces and the number of trees to be planted will be determined. Thus, silts coming from riverbeds will be reduced gradually, and the silts that will fill the dam surface area will be minimized.

4.6 Fishes living in the riverbed will be adversely affected due to structuring.

In order not to affect fishery activities at Sariguzel HEPP reservoir basin that will be constructed on Ceyhan River that is one of the most suitable rivers for inland water fishery, and to continue this activity, measures that are identified in Water Products Law numbered 1380 will be taken.

4.7 Domestic wastes originated from the people that will work during construction will pollute the environment and the river.

All protective measures will be taken to prevent water pollution around both Sariguzel dam surface area and powerhouse within the frame of Water Products Law.

Furthermore, domestic wastes will be stored in septic tank that will be constructed on an impervious ground. Thus, pollution of both environment and river water will be prevented.

4.8 Construction site buildings will damage environment and agricultural lands.

Since construction site buildings will be dismantled after construction is completed and land will be rehabilitated, construction site buildings and their wastes will not damage environment and agricultural lands.

SECTION 5. PROJECT EVALUATION, RESULTS & RECOMMENDATIONS

Some part of the project area is a flood bed due to the materials hauled by Ceyhan River in time; a little part has a property of Dry Marginal Agricultural Land; a big part has the property of Slope Land that is Other Lands Class. Agricultural land, which is 400,000 m^2, is Dry Marginal Agricultural Land that has low agricultural production potential, and this land will be inundated.

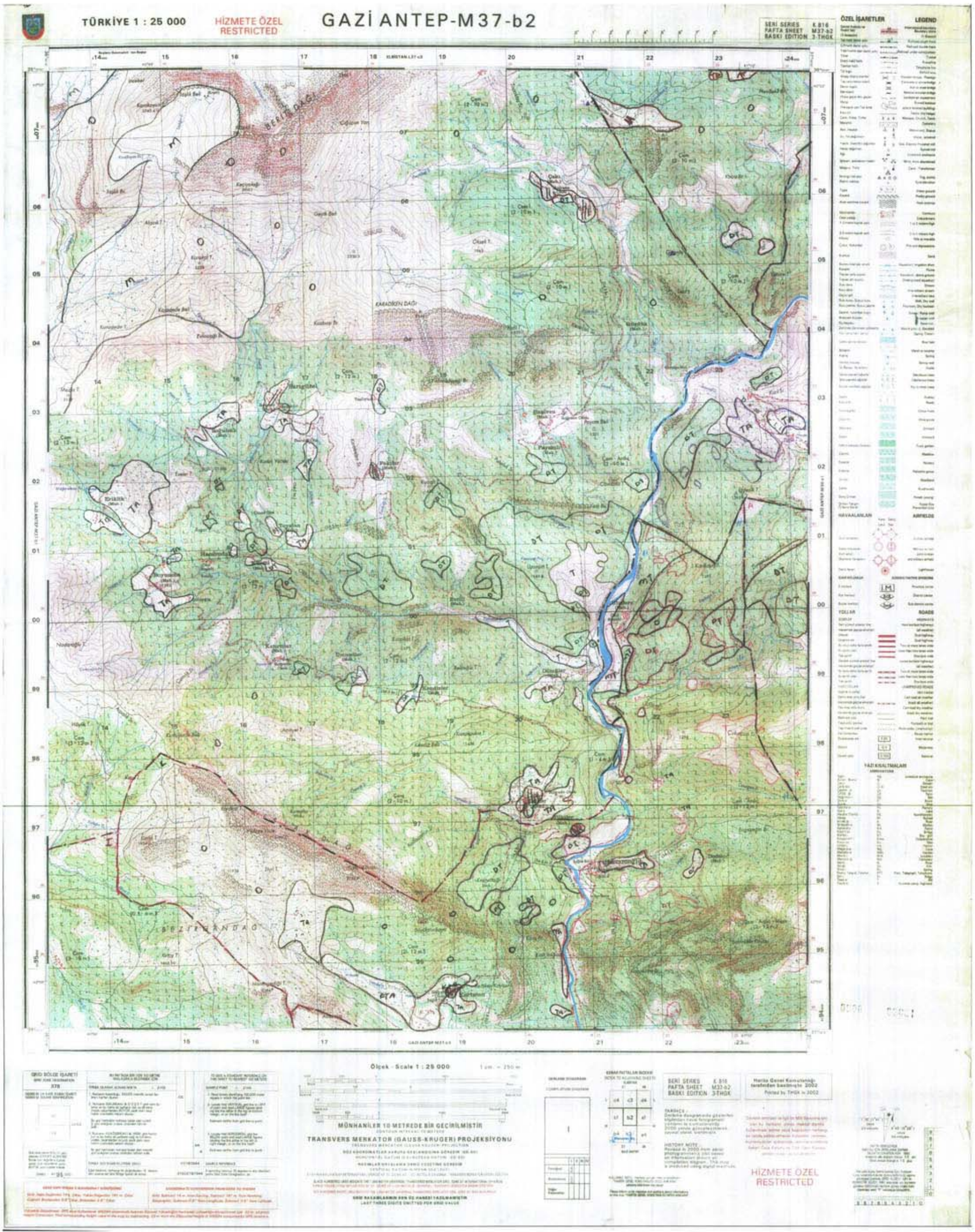
Efficiency taken from the plants cultivated in the region is quite lower than the region average because of land structure. Land is not suitable for the classical method of irrigation. Irrigation investment to the region will not be made by state in short term. However, some of the farmers living in the region are doing fruit and vegetable cultivation for their own consumption by using high-cost irrigation techniques.

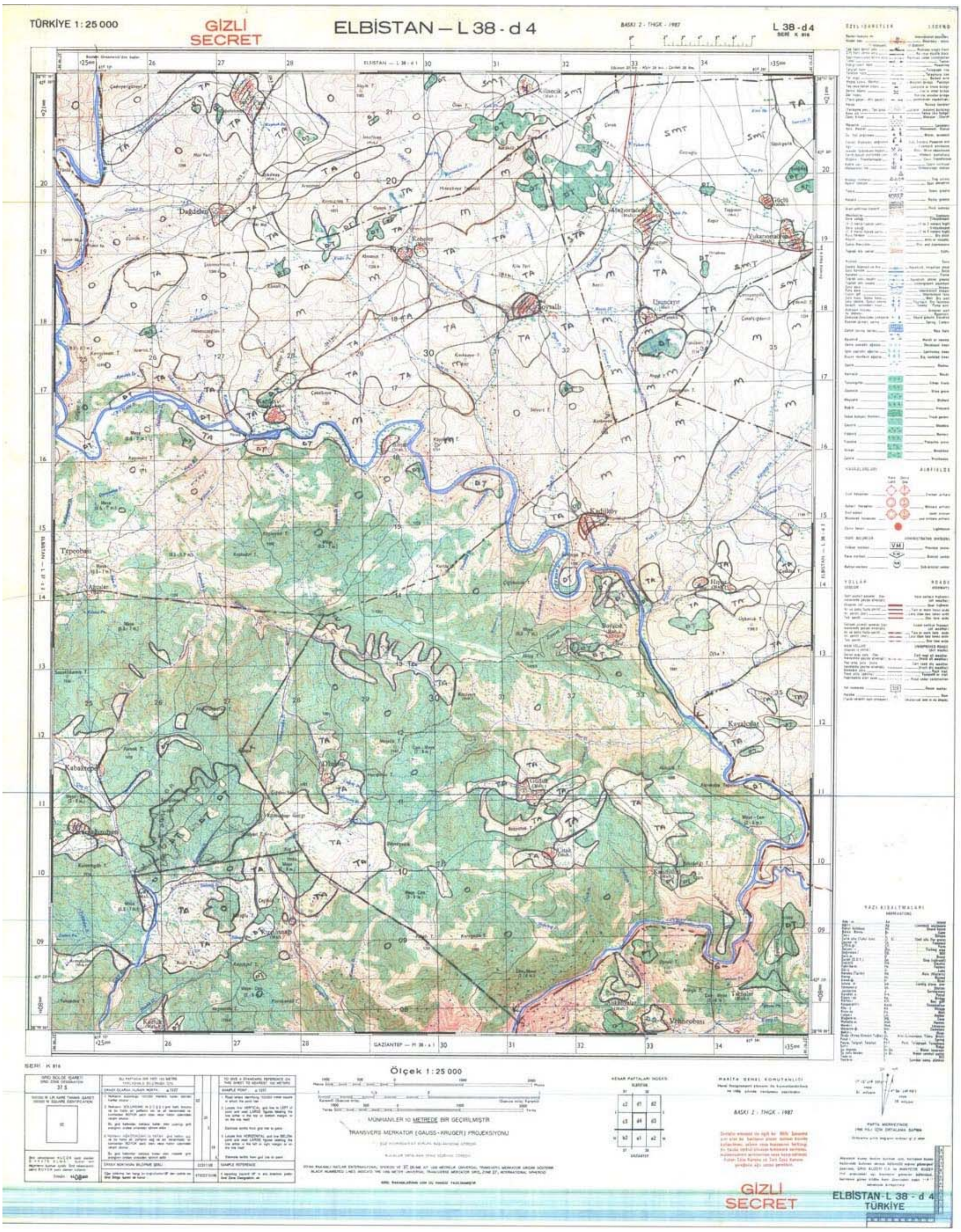
On the other hand, in the region, areas within the scope of Law on Improvement of Olive Cultivation and Inoculation of Wilds, and the areas accepted as pasture area according to Pasture Law are not found. Therefore, land is not suitable for agricultural activities except for urgency situations.

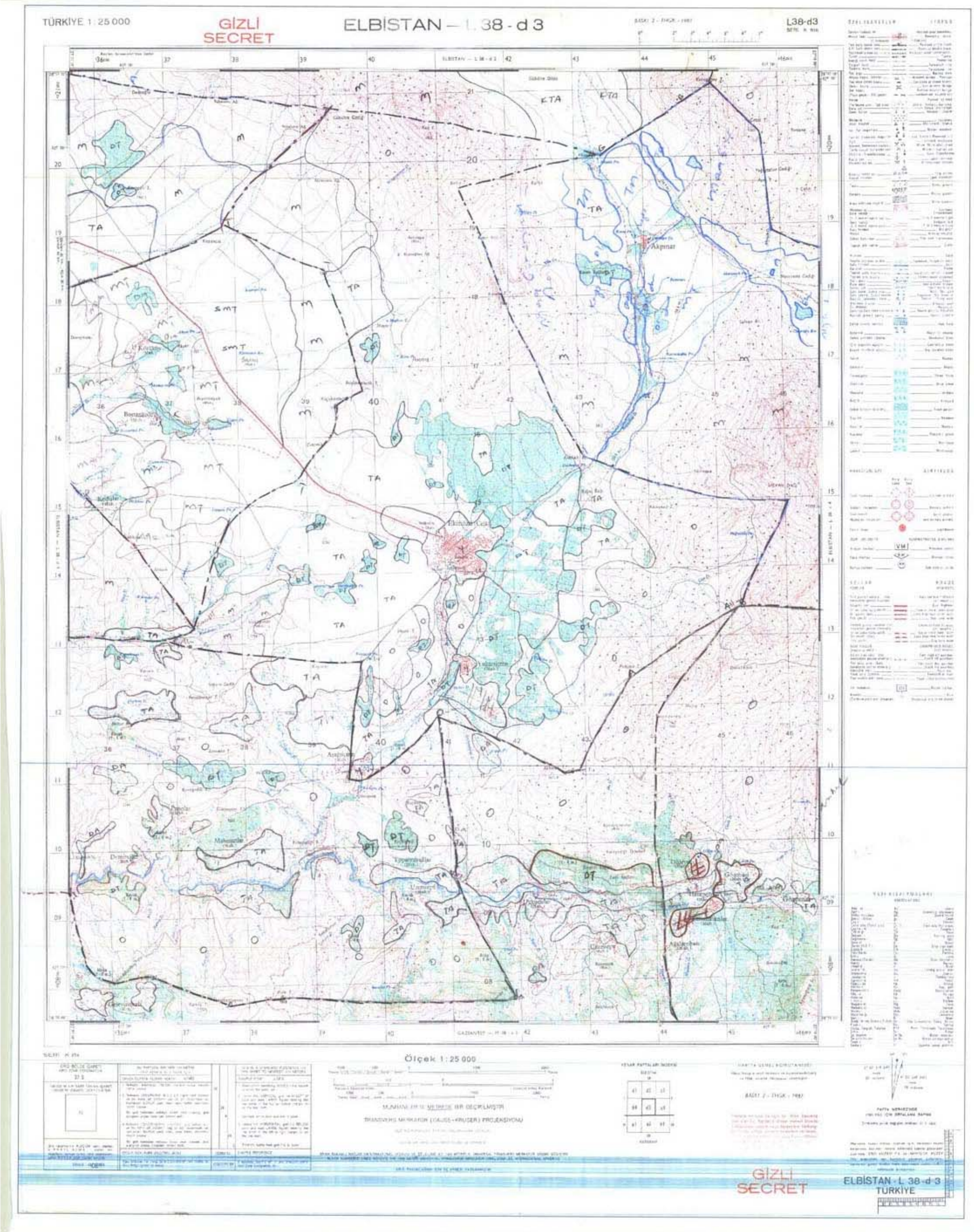
However, in order not to affect fishery activities at Sariguzel HEPP reservoir basin that will be constructed on Ceyhan River that is one of the most suitable rivers for inland water fishery, and to continue this activity, measures that are identified in Water Products Law numbered 1380 should be taken.

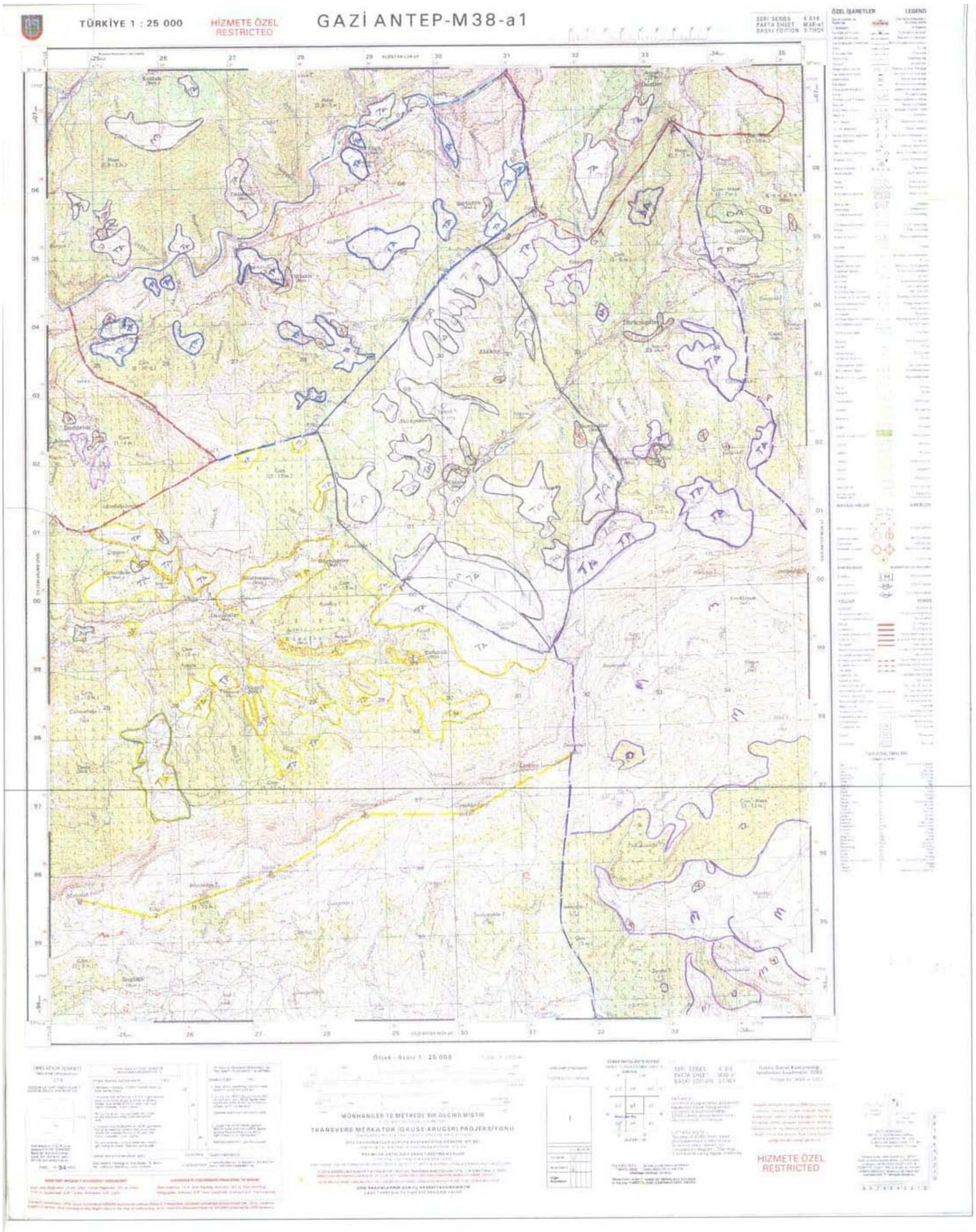
Allocation of the land in accordance with the desired purpose is approved by taking public benefits, inexistence of a more suitable alternative land for the investment, and economical-social benefits of the economy of country into consideration, provided that above-mentioned Soil Protection measures are taken.

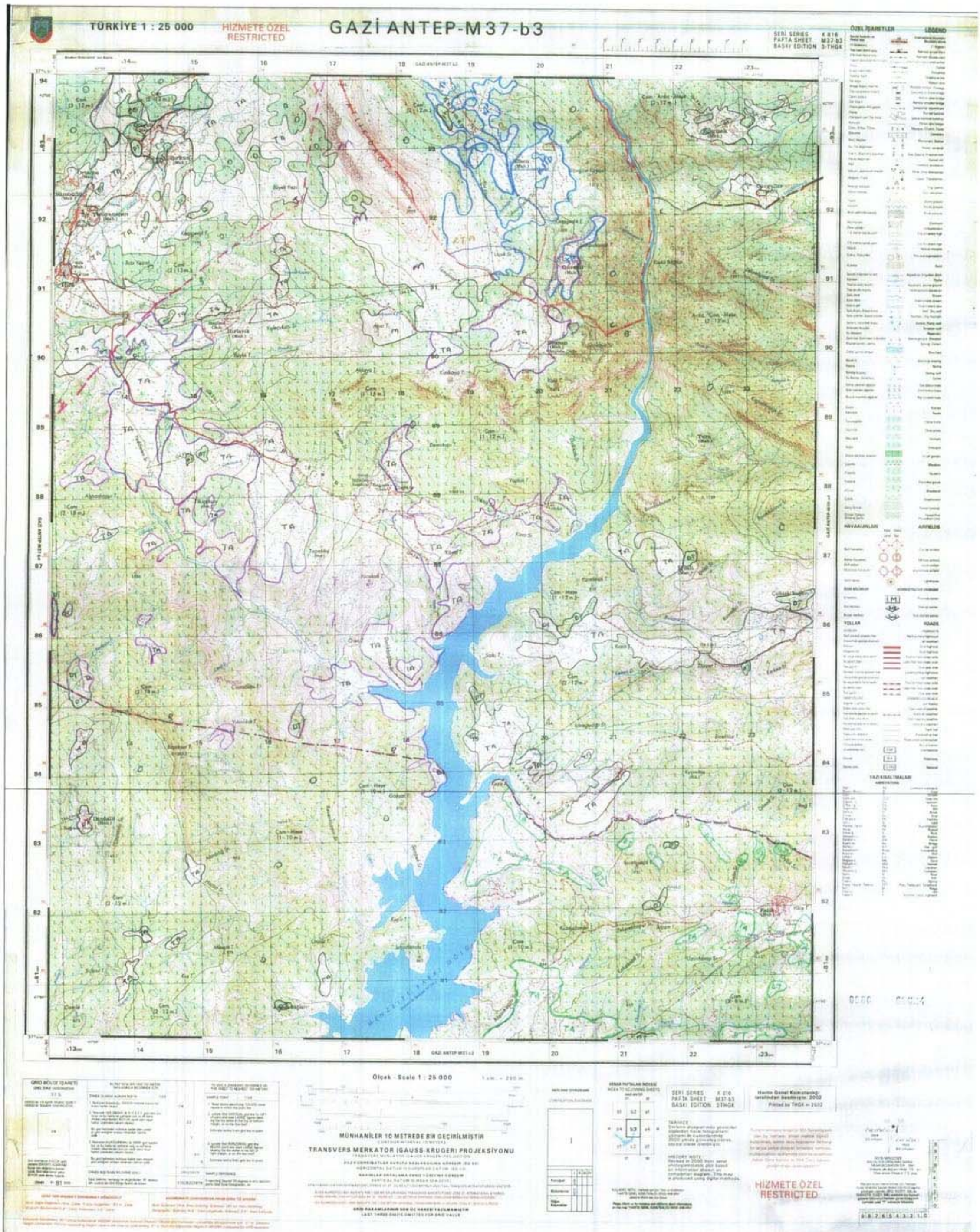
Preparer of the Project
Rahmi Yeni
Agricultural Engineer, Msc.
Chamber Register No: 10420


TÜRKİYE 1 : 25 000
HİZMETE ÖZEL
RESTRICTED
GAZİ ANTEP-M37-b2


TÜRKİYE 1 : 25 000
GİZLİ
SECRET
ELBİSTAN — L 38 - d 4
L 38 - d 4
Ölçek 1 : 25 000
GİZLİ
SECRET
ELBİSTAN - L 38 - d 4
TÜRKİYE


TÜRKİYE 1:25 000
GİZLİ
SECRET
ELBİSTAN – L38-d3
L38-d3
Akpınar
Ölçek 1:25 000
GİZLİ
SECRET
ELBİSTAN - L 38-d 3
TÜRKİYE


TÜRKİYE 1 : 25 000
HİZMETE ÖZEL
RESTRICTED
GAZİ ANTEP-M38-a1
HİZMETE ÖZEL
RESTRICTED


TÜRKİYE 1 : 25 000
HİZMETE ÖZEL
RESTRICTED
GAZİ ANTEP-M37-b3
Ölçek - Scale 1 : 25 000
TRANSVERS MERKATOR (GAUSS-KRUGER) PROJEKSİYONU
HİZMETE ÖZEL
RESTRICTED

APPENDIX 4

FLORA-FAUNA

LEGEND OF FLORA TABLE

P.G.R.
Phyto-Geographic Region

ENDEMISM

B: Regional Endemic
Y: Widespread Endemic

T.S. (THREAT STATUS)
According to IUCN categories (October vd., 2000)
EX: Extinct
EW: Extinct in the wild
CR: Critically endangered
EN: Endangered
VU: Vulnerable
LR: Lower risk
- **cd:** concervation dependent
- **nt:** near threatened
- **lc:** least concern

DD: Data deficient
NE: Not evaluated

BERN (BERN CONVENTION)
Anx1: Strictly Protected Flora Species

IDENTIFICATION METHOD
A: Survey
G: Observation
H:Suitability of Habitat
L: Literature

CITES

Appendix1: Species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances.

Appendix2: Species not necessarily threatened with extinction, but their trade must be controlled to avoid utilization incompatible with their survival.

Appendix3 : Species protected in at least one country, and their trading is under control by CITES in order to prevent or limit excess usage.

Table 4.1. Flora Species Identified in Project Area and Its Vicinity

FAMILY	NO	TAXON	ENGLISH NAME	P.G.R	ENDEMISM		T.S.	BERN	CITES			IDENTIFICATION METHOD			
					B	Y		Anx1	App1	App2	App3	A	G	H	L
PINACEAE	1	*Pinus brutia* Ten.	Turkish pine	Mediterranean				–	–	–	–		x		
CUPRESSACEAE	2	*Juniperus oxycedrus* L. *s* ubsp. *oxycedrus*	Juniper	Mediterranean				–	–	–	–		x		
RANUNCULACEAE	3	*Nigella orientalis L.*	–	Widespread				–	–	–	–				x
	4	*Nigella unguicularis (LAM.) SPENNER*		Widespread				–	–	–	–				x
	5	*Nigella sativa L.*	–	Widespread				–	–	–	–				x
	6	*Ranunculus isthmicus Boiss. subsp. isthmicus*	–	Widespread				–	–	–	–		x		
	7	*Ranunculus sphaerospermus BOISS. ET BALANCHE*	–	Widespread				–	–	–	–		x		
	8	*Anemone blanda SCHOTT ET KOTSCHY*	–	Widespread				–	–	–	–		x		
PAPAVERACEAE	9	*Papaver rhoeas L.*	Corn poppy	Widespread				–	–	–	–		x		
	10	*Papaver persicum LINDL. subsp. persicum LINDL.*	Poppy	Widespread				–	–	–	–		x		
	11	*Fumaria asepala BOISS.*	–	Widespread				–	–	–	–		x		
	12	*Fumaria cilicica HAUSSKN.*	–	Widespread				–	–	–	–		x		
BRASSICACEAE	13	*Sinapis arvensis L.*	–	Widespread				–	–	–	–		x		
	14	*Lepidium perfoliatum L.*	–	Widespread				–	–	–	–				x
	15	*Aethionema heterocarpum J. GAY*	–	Widespread				–	–	–	–		x		
	16	*Alyssum strigosum Banks & Sol. subsp. strigosum*	–	Widespread				–	–	–	–				x
	17	*Alyssum strictum WILLD.*	–	Widespread				–	–	–	–				x
	18	*Alyssum minus (L.) ROTHM. var. minus (L.) ROTHM.*	–	Widespread				–	–	–	–		x		
	19	*Raphanus raphanistrum L.*	–	Widespread				–	–	–	–				x
	20	*Cardaria draba (L.) DESV. subsp. draba (L.) DESV.*	–	Widespread				–	–	–	–				x
	21	*Thlaspi perfoliatum L.*	–	Widespread				–	–	–	–		x		
	22	*Hesperis steveniana DC.*	–	Widespread				–	–	–	–		x		
	23	*Isatis aucheri BOISS.*	–	Widespread				–	–	–	–		x		
	24	*Isatis tinctoria L. subsp. tomentella (BOISS.) DAVIS*	–	Widespread				–	–	–	–				x
	25	*Arabis caucasica WILLD. subsp. caucasica WILLD.*	–	Widespread				–	–	–	–				x
	26	*Arabis aucheri Boiss.*	–	Widespread				–	–	–	–		x		
	27	*Arabis verna* (L.) DC.	–	Mediterranean				–	–	–	–		x		
CISTACEAE	28	*Cistus creticus L.*	Rockrose	Widespread				–	–	–	–		x		
	29	*Helianthemum ledifolium (L.) MILLER var. lasiocarpum (WILLK.) BORNM.*	–	Widespread				–	–	–	–		x		
	30	*Tuberaria guttata (L.) FOURR. var. plantaginea (WILLD.) GROSS.*		Widespread				–	–	–	–				x
CARYOPHYLLACEAE	31	*Velezia rigida L.*	–	Mediterranean				–	–	–	–				x
	32	*Silene vulgaris (Moenc) Garcke var. vulgaris*	Campion	Widespread				–	–	–	–		x		
	33	*Silene italica (L.) PERS.*	–	Widespread				–	–	–	–		x		
	34	*Minuartia recurva (ALL) SCHINZ ET THELL. subsp. oreina (MATTF.) MCNEILL*	–	Iran-Turan				–	–	–	–		x		

Table 4.1. Flora Species Identified in Project Area and Its Vicinity

FAMILY	NO	TAXON	ENGLISH NAME	P.G.R	ENDEMISM		T.S.	BERN	CITES			IDENTIFICATION METHOD			
					B	Y		Anx1	App1	App2	App3	A	G	H	L
	35	*Minuartia meyeri (BOISS.) BORNM.*		Iran-Turan				–	–	–	–				x
	36	*Cerastium dichotomum L. subsp. dichotomum L.*		Widespread				–	–	–	–				x
	37	*Dianthus polycladus BOISS.*	–	Widespread				–	–	–	–				x
	38	*Dianthus orientalis ADAMS*	–	Widespread				–	–	–	–				x
	39	*Cerastium glomeratum Thuill*	–	Widespread				–	–	–	–				x
SALICACEAE	40	*Salix pseudomedemii E. WOLF*	Willow	Widespread				–	–	–	–		x		
HYPERICACEAE	41	*Hypericum olympicum L.*	–	Widespread				–	–	–	–		x		
ANACARDIACEAE	42	*Pistacia terebinthus* L. subsp. *palaestina* (Boiss.) Engler	–	Mediterranean				–	–	–	–		x		
	43	*Rhus coriaria L.*	–	Widespread				–	–	–	–		x		
	44	*Cotinus coggyria SCOP.*		Widespread				–	–	–	–		x		
FABACEAE	45	*Lupinus varius L.*	–	Mediterranean				–	–	–	–		x		
	46	*Cercis siliqustrum* L. subsp. *siliqustrum*	Judas tree	Widespread				–	–	–	–		x		
	47	*Medicago orbicularis (L.) BART.*	–	Widespread				–	–	–	–		x		
	48	*Medicago lupulina L.*	–	Widespread				–	–	–	–		x		
	49	*Medicago rigidula (L.) ALL. var. agrestis BURNIAT*	–	Widespread				–	–	–	–		x		
	50	*Astragalus caraganae FISCH. ET MEY.*	Geven	Iran-Turan				–	–	–	–		x		
	51	*Calicotome villosa* (Poiret) Link	Apdest bozan	Mediterranean				–	–	–	–				x
	52	*Vicia cracca* L. subsp. *stenophylla* Vel.	–	Widespread				–	–	–	–				x
	53	*Vicia sativa L. subsp. segetalis (Thuill.) Ser. ex DC*	–	Widespread				–	–	–	–		x		
	54	*Vicia alpestris STEV. subsp. alpestris STEV.*		Widespread				–	–	–	–				x
	55	*Lathyrus variabilis (BOISS. ET KY.) MALY*	–	Mediterranean				–	–	–	–				x
	56	*Ononis spinosa L. subsp. leiosperma (BOISS.) SIRJ.*	–	Widespread				–	–	–	–		x		
	57	*Trifolium uniflorum L.*		Widespread				–	–	–	–		x		
	58	*Trifolium arvense L. var. arvense*	–	Widespread				–	–	–	–				x
	59	*Trifolium campestre SCHREB.*	–	Widespread				–	–	–	–				x
	60	*Trifolium stellatum L. var. stellatum L.*		Widespread				–	–	–	–		x		
	61	*Coronilla orientalis MILLER var. orientalis (ALL.) VITMAN*	–	Widespread				–	–	–	–		x		
	62	*Ceratonia siliqua L.*	Carob,St. 's john's brea	Mediterranean				–	–	–	–		x		
ROSACEAE	63	*Crataegus orientalis Pallas ex Bieb. var. orientalis*	Howthorn	Widespread				–	–	–	–		x		
	64	*Rubus sanctus Schreber*	–	Widespread				–	–	–	–		x		
	65	*Rubus canescens DC. var. glabratus (GODRON) DAVIS ET MEIKLE*	–	Europe-Siberia				–	–	–	–		x		
	66	*Rosa canina* L.	Rose	Widespread				–	–	–	–		x		
IRIDACEAE	67	*Crocus biflorus MILLER subsp. biflorus MILLER*	Crocus	Mediterranean				–	–	–	–		x		
PUNICACEAE	68	*Punica granatum L*	–	Widespread				–	–	–	–		x		
ERICACEAE	69	*Erica manipuliflora Salisb*	–	Mediterranean				–	–	–	–		x		
CRASSULACEAE	70	*Umbilicus erectus DC*	–	Mediterranean				–	–	–	–		x		
SAXIFRAGACEAE	71	*Saxifraga cymbalaria L. var. cymbalaria*	–	Widespread				–	–	–	–		x		
UMBELLIFERAE	72	*Turgenia latifolia (L.) Hoffm*	–	Widespread				–	–	–	–				x
	73	*Lagoecia cuminoides* L.	Wild cummin	Mediterranean				–	–	–	–				x

Table 4.1. Flora Species Identified in Project Area and Its Vicinity

FAMILY	NO	TAXON	ENGLISH NAME	P.G.R	ENDEMISM		T.S.	BERN	CITES			IDENTIFICATION METHOD			
					B	Y		Anx1	App1	App2	App3	A	G	H	L
	74	*Daucus guttatus SM.*	Wild carrot	Widespread				–	–	–	–				x
	75	*Astrodaucus orientalis (L.) Drude*	–	Widespread				–	–	–	–		x		
RHAMNACEAE	76	*Paliurus spina-christi MILLER*	Karaçalı	Widespread				–	–	–	–		x		
RUBIACEAE	77	*Galium heldreichii Hal*	–	Widespread				–	–	–	–				x
	78	*Cruciata taurica (Pallas ex Willd.) Ehrend*	–	Widespread				–	–	–	–				x
	79	*Sherardia arvensis L*	–	Widespread				–	–	–	–				x
DIPSACACEAE	80	*Scabiosa rotata Bieb.*	–	Widespread				–	–	–	–				x
	81	*Dipsacus laciniatus L.*	–	Widespread				–	–	–	–		x		
COMPOSITAE	82	*Bellis perennis L.*	–	Europe-Siberia				–	–	–	–				x
	83	*Tyrimnus leucographus (L.) Cass.*	–	Mediterranean				–	–	–	–				x
	84	*Carduus nutans L. var. nutans Sensulato*	–	Europe-Siberia				–	–	–	–		x		
	85	*Carduus pycnocephalus L. subsp. albidus*	–	Widespread				–	–	–	–		x		
	86	*Cirsium creticum (Lam.) d' Urv. subsp. creticum*	–	Widespread				–	–	–	–				x
	87	*Taraxacum bithynicum DC.;*	–	Widespread				–	–	–	–		x		
	88	*Taraxacum persicum VAN SOEST*	–	Iran-Turan				–	–	–	–		x		
	89	*Centaurea solstitialis L. subsp. solstitialis*	–	Widespread				–	–	–	–		x		
	90	*Tanacetum parthenium (L.) Schultz Bip*	–	Widespread				–	–	–	–		x		
	91	*Achillea grandifolia Friv*	–	Widespread				–	–	–	–		x		
	92	*Anthemis altissima L.*	–	Widespread				–	–	–	–		x		
	93	*Crepis alpina L.*	–	Widespread				–	–	–	–		x		
	94	*Crepis foetida L. subsp. Foetida*	–	Widespread				–	–	–	–		x		
CAMPANULACEAE	95	*Legousia falcata (Ten.) Fritsch*	–	Mediterranean				–	–	–	–		x		
	96	*Campanula stricta L. var. stricta*	Bellflower	Iran-Turan				–	–	–	–		x		
OLEACEAE	97	*Phillyrea latifolia L.;*	–	Mediterranean				–	–	–	–				x
BORAGINACEAE	98	*Heliotropium circinatum Griseb*	–	Iran-Turan				–	–	–	–				x
	99	*Symphytum orientale L*	–	Europe-Siberia				–	–	–	–				x
	100	*Anchusa azurea MILLER var. macrocarpa (BOISS. ET HOHEN.) CHAMB*	–	Widespread				–	–	–	–		x		
SCROPHULARIACEAE	101	*Verbascum galilaeum BOISS.*	Mullein	Mediterranean				–	–	–	–		x		
	102	*Verbascum phoeniceum L.*	Purple mullein	Mediterranean				–	–	–	–		x		
	103	*Veronica orientalis Miller subsp. orientalis*	–	Europe-Siberia				–	–	–	–		x		
	104	*Linaria genistifolia (L.) Miller subsp. linifolia (Boiss.) Davis*	–	Mediterranean				–	–	–	–				x
OROBANCHACEAE	105	*Phelypaea coccinea (Bieb.) Poiret*	–	Iran-Turan				–	–	–	–				
VERBENACEAE	106	*Vitex angus-castus* L.	Chaste tree	Iran-Turan				–	–	–	–				x
LABIATAE	107	*Phlomis viscosa Poiret*	–	Mediterranean				–	–	–	–				x
	108	*Origanum onites* L.	Pot majoram	Mediterranean				–	–	–	–				x
	109	*Salvia tomentosa Miller*	–	Mediterranean				–	–	–	–		x		
	110	*Salvia virgata Jacq*	–	Iran-Turan				–	–	–	–				x

Table 4.1. Flora Species Identified in Project Area and Its Vicinity

FAMILY	NO	TAXON	ENGLISH NAME	P.G.R	ENDEMISM		T.S.	BERN	CITES			IDENTIFICATION METHOD			
					B	Y		Anx1	App1	App2	App3	A	G	H	L
	111	*Origanum laevigatum Boiss*	–	Mediterranean				–	–	–	–				x
EUPHORBIACEAE	112	*Euphorbia falcata L. subsp. var. falcata*	–	Widespread				–	–	–	–		x		
JUGLANDACEAE	113	*Juglans regia L.*	–	Widespread				–	–	–	–		x		
PLATANACEAE	114	*Platanus orientalis L*	–	Widespread				–	–	–	–		x		
FAGACEAE	115	*Fagus orientalis Lipsky*	–	Europe-Siberia				–	–	–	–		x		
	116	*Quercus petraea (Mattuschka) Lield. subsp. pinnatiloba(C. Koch) Menitsky*	–	Widespread				–	–	–	–		x		
	117	*Quercus coccifera* L.	Scarlet oak	Widespread				–	–	–	–				x
	118	*Quercus cerris* L.	Oak	Mediterranean				–	–	–	–		x		
	119	*Quercus libani Olivier*	Oak	Widespread				–	–	–	–		x		
CORYLLACEAE	120	*Carpinus orientalis L.*	–	Widespread				–	–	–	–		x		
	121	*Ostrya carpinifolia Scop.*	–	Mediterranean				–	–	–	–		x		
SALICACEAE	122	*Populus tremula L.*	–	Widespread				–	–	–	–		x		
LILIACEAE	123	*Ruscus aculeatus* L. var. *angustifolius Boiss.*	Jews myrtle	Widespread				–	–	–	–		x		
	124	*Ornithogalum wiedemannii Boiss*	–	Widespread				–	–	–	–		x		
	125	*Muscari bourgaei Baker*	–	Mediterranean				–	–	–	–		x		
	126	*Muscari comosum (L.) Miller*	Tassel Grape Hyacinth	Mediterranean				–	–	–	–		x		
	127	*Asphodelus fistulous L.*	–	Mediterranean				–	–	–	–		x		
	128	*Smilax aspera L.*	–	Widespread				–	–	–	–		x		
	129	*Allium flavum L. subsp. tauricum (Besser ex Reichb.) Stearn var.tauricum*	–	Widespread				–	–	–	–				x
	130	*Gagea fibrosa (Desf.) Schultes & Schultes*	–	Widespread				–	–	–	–				x
	131	*Gagea villosa (Bieb.) Duby var. villosa*	–	Mediterranean				–	–	–	–				x
	132	*Asparagus palaestinus Baker*	Asparagus	Widespread				–	–	–	–		x		
JUNCACEAE	133	*Juncus inflexus L.*	–	Widespread				–	–	–	–		x		
GRAMINEAE	134	*Poa bulbosa L*	–	Widespread				–	–	–	–		x		
	135	*Poa angustifolia L*		Widespread				–	–	–	–		x		
	136	*Bromus sterilis L*	–	Widespread				–	–	–	–		x		
	137	*Aegilops triuncialis L.*	–	Iran-Turan				–	–	–	–				x
	138	*Avena eriantha Durieu*	–	Widespread				–	–	–	–				x
	139	*Dactylis glomerata* L. subsp. *hispanica* (Roth) Nyman	Parmak otu	Mediterranean				–	–	–	–		x		
	140	*Briza maxima L.*	–	Widespread				–	–	–	–				x
	141	*Lolium perenne L.*	–	Widespread				–	–	–	–				x
	142	*Dactylis glomerata L. subsp. hispanica (Roth) Nyman*	–	Widespread				–	–	–	–				x
	143	*Vulpia myuros (L.) C.C. Gemelin*	–	Widespread				–	–	–	–				x
	144	*Stipa bromoides (L.) Dörfler*		Widespread				–	–	–	–		x		
	145	*Chrysopogon gryllus (L.) Trin*	–	Widespread				–	–	–	–				x
	146	*Triticum aestivum L.*	–	Widespread				–	–	–	–				x

LEGEND OF FAUNA TABLES

IUCN

1994 (ver. 2.3)	**2001 (ver. 3.1)**
EX: Extinct	**EX:** Extinct
EW: Extinct in the wild	**EW:** Extinct in the wild
CR: Critically endangered	**CR:** Critically endangered
EN: Endangered	**EN:** Endangered
VU: Vulnerable	**VU:** Vulnerable
LR: Lower risk	
cd: concervation dependent	**NT:** Near threatened
nt: near threatened	**LC:** Least concern
lc: least concern	
DD: Data deficient	**DD:** Data deficient
NE: Not evaluated	**NE:** Not evaluated

T.E.Y. (IDENTIFICATION METHOD)

A: Survey
G: Observation
H: Suitability of Habitat
L: Literature

STATUS (N.TURAN)

Y : Native species
YG : Summer visitor species
KG : Winter visitor species
G : Transit migratory birds
N : Rare bird species

BERN CONVENTION

Annex2 : SPFS (Strictly Protected Fauna Species)
Annex3 : PFS (Protected Fauna Species)

CITES

Appendix1: Species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances.

Appendix2: Species not necessarily threatened with extinction, but their trade must be controlled to avoid utilization incompatible with their survival.

Appendix3 : Species protected in at least one country, and their trading is under control by CITES in order to prevent or limit excess usage.

HUNTING STATUS, CHC (Decisions of Central Hunting Commission,2006-2007)

Appendix1 : Wildlife species protected by Ministry of Environment and Forestry
Appendix2 : Game animals protected by Central Hunting Commission
Appendix3 : Game animals allowed to be hunted in predefined seasons by Central Hunting Commission

Table 4.2. Mammals Identified in the StudyArea

					IUCN	**BERN**		**HUNTING**			**CITES**			**T.E.Y.**			
MAMMALS				**ENGLISH NAME**		**Anx2**	**Anx3**	**App1**	**App2**	**App3**	**App1**	**App2**	**App3**	**A**	**G**	**H**	**L**
1	INSECTIVORA																
	1	Erinaceidae															
		1	*Hemiechinus(Oryctalagus) auritus (Gmelin, 1770)*	Long eared hedgehog	LR/lc	–	–	x			–	–	–		x		
	2	Soricidae															
		2	*Crocidura leucodon (Hermann, 1780)*	Bicolored shrew	LR/lc	–	–	–	–	–	–	–	–				x
	3	Talpidae															
		3	*Talpa europaea (Linnaeus, 1758)*	Common mole	LR/lc	–	–	–	–	–	–	–	–		x		
2	LAGOMORPHA																
	4	Leporidae															
		4	*Lepus europaeus (capensis) Pallas, 1778*	Brown hare	LR/lc		x			x	–	–	–		x		
3	RODENTIA																
	5	Spalacidae															
		5	*Spalax (Nannospalax) leucodon (Nordmann, 1840)*	Lesser mole rat	VU	–	–	–	–	–	–	–	–				x
		6	*Spalax (Nannospalax) ehrenbergi (Nehring, 1898)*	South mole rat	–	–	–	–	–	–	–	–	–				x
	6	Muridae															
		7	*Rattus rattus* (Linnaeus, 1758)	House rat	LR/lc	–	–	–	–	–	–	–	–		x		
		8	*Apodemus sylvaticus* (Linnaeus, 1758)	Wood mouse	LR/lc	–	–	–	–	–	–	–	–		x		
		9	*Mus musculus* Linnaeus, 1758	House mouse	LR/lc	–	–	–	–	–	–	–	–				x
		10	*Cricetulus migratorius* Pallas, 1773	Grey hamster	LR/nt	–	–	–	–	–	–	–	–				x
4	CARNIVORA																
	7	Canidae															
		11	*Vulpes vulpes* (Linnaeus, 1758)	Red fox	LC	–	–			x	–	–	–				
		12	*Canis aureus (Linnaeus, 1758)*	Common jackal	LC	–	–			x			x		x		
5	ARTIODACTYLA														x		
	8	Suidae															
		13	*Sus scrofa* Linnaeus, 1758	Wild boar	LR/lc	–	–			x	–	–	–			x	x

Table 4.3. Birds identified in the Study Area

BIRDS					IUCN	BERN		HUNTING			CITES			STATUS					T.E.Y.			
														N.TURAN								
				ENGLISH NAME		Anx2	Anx3	App1	App2	App3	App1	App2	App3	Y	YG	KG	G	N	A	G	H	L
1	ACCIPITRIFORMES																					
	1	ACCIPITRIDAE																				
		1	*Buteo rufinus*	Long legged buzzard	LC		x	x				x		x						x		
2	FALCONIFORMES																					
	2	FALCONIDAE																				
		2	*Falco tinnunculus*	Common kestrel	LC	x		x				x		x						x		
		3	*Falco peregrinus*	Peregrine falcon	LC	x		x			x			x								x
3	GALLIFORMES																					
	3	PHASIANIDAE																				
		4	*Alectoris chukar*	Chukar	LC		x			x	–	–	–	x							x	
		5	*Coturnix coturnix*	Common quail	LC		x			x	–	–	–		x		x				x	
4	COLUMBIFORMES																					
	4	COLUMBIDAE																				
		6	*Streptopelia decaocto*	Eurasian collared dove	LC		x		x		–	–	–	x						x		
		7	*Columba livia*	Rock pigeon	LC		x			x	–	–	–	x						x		
5	CUCULIFORMES																					
	5	CUCULIDAE																				
		8	*Cuculus canorus*	Common cuckoo	LC		x	x			–	–	–		x				x			
6	PASSERIFORMES																					
	6	ALAUDIDAE																				
		9	*Galerida cristata*	Crested lark	LC		x		x		–	–	–	x							x	
	7	HIRUNDINIDAE																				
		10	*Hirundo rustica*	Barn swallow	LC	x		x			–	–	–		x					x		
	8	TURDIDAE																				
		11	*Phoenicurus phoenicurus*	Common redstart	LC	x		x			–	–	–	x	x				x			
		12	*Oenanthe oenanthe*	Northern wheatear	LC	x		x			–	–	–		x					x		
		13	*Turdus merula*	Eurasian blackbird	LC		x			x	–	–	–	x					x			
	9	PARIDAE																				
		14	*Parus major*	Great tit	LC	x		x			–	–	–	x						x		

Table 4.3. Birds identified in the Study Area

BIRDS					IUCN	BERN		HUNTING			CITES			STATUS N.TURAN					T.E.Y.			
				ENGLISH NAME		Anx2	Anx3	App1	App2	App3	App1	App2	App3	Y	YG	KG	G	N	A	G	H	L
		15	*Parus ater*	Coal tit	LC	x		x			–	–	–	x						x		
	10	CORVIDAE																				
		16	*Corvus monedula*	Eurasian jackdown	LC	–	–			x	–	–	–	x						x		
		17	*Corvus corax*	Common raven	LC		x		x		–	–	–	x						x		
		18	*Pica pica*	Black billed magpie	LC	–	–			x	–	–	–	x						x		
	11	PASSERIDAE																				
		19	*Passer domesticus*	House sparrow	LC	–	–			x	–	–	–	x						x		
	12	FRINGILLIDAE																				
		20	*Carduelis carduelis*	European gold finch	LC	x		x			–	–	–	x					x			
		21	*Carduelis spinus*	Eurasian siski	LC	x		x			–	–	–	x						x		
	13	EMBERIZIDAE																				
		22	*Emberiza caesia*	Cretzschmar's bunting	LC	x		x			–	–	–		x							x
		23	*Miliaria calandra*	Corn bunting	LC		x		x		–	–	–	x								x

Table 4.4. Reptiles Identified in Study Area

					IUCN	BERN		HUNTING			CITES			T.E.Y.			
REPTILES				**ENGLISH NAME**		**Anx2**	**Anx3**	**App1**	**App2**	**App3**	**App1**	**App2**	**App3**	**A**	**G**	**H**	**L**
1	TESTUDINATA																
	1	Testudinidae															
		1	*Testudo graeca* (Linnaeus, 1758)	Tortoise	VU	x		x				x			x		
2	SQUAMATA																
	2	Scincidae															
		2	*Ablepharus kitaibeili* Bibron et Bory, 1833	Snake eyed skink	LC	x		x			–	–	–		x		
	3	Lacertidae															
		3	*Lacerta viridis* (Laurenti, 1768)	Green lizard	LC	x		x			–	–	–				x
		4	*Lacerta trilineata* Bedriaga, 1886	Balkan green lizard	LC	x		x			–	–	–		x		
		5	*Ophisops elegans* Menetries, 1832	Lizard	–	x		x			–	–	–		x		
	4	Colubridae															
		6	*Coluber jugularis* Linnaeus, 1758	Black whip snake	–	x		x			–	–	–		x		
	5	Typhlopidae															
		7	*Typhlops vermicularis* Merrem, 1820	Blind snake	–	x		x			–	–	–		x		

Table 4.5. Amphibis Identified in Study Area

					IUCN	BERN		HUNTING			CITES			T.E.Y.			
AMPHIIBIAN				**ENGLISH NAME**		**Anx2**	**Anx3**	**App1**	**App2**	**App3**	**App1**	**App2**	**App3**	**A**	**G**	**H**	**L**
1	ANURA																
	1	Bufonidae															
		1	*Bufo viridis* (Laurenti, 1768)	Green toad	LC		x	–	–	–	–	–	–		x		

Table 4.6. Fish Species Identified in Study Area

FISHES				ENGLISH NAME	IUCN	BERN Anx2	BERN Anx3	ENDEMISM	T.E.Y. A	T.E.Y. G	T.E.Y. H	T.E.Y. L
1	SILURIFORMES											
	1	Siluridae										
		1	*Silurus glanis* Linnaeus,1758	Catfish	LR/lc	–	–	–	x			x
2	CYPRINIFORMES											
	2	Cyprinidae										
		2	*Cyprinus carpio* Linnaeus, 1758	Carp	DD	–	–	–	x			x
		3	*Capoeta capoeta angorae* (Hanko, 1924)	Siraz	–	–	–	–	x			x
		4	*Barbus rajanorum rajanorum* HECKEL, 1843	Barbus	–	–	–	–	x			x
		5	*Leuciscus cephalus* (L., 1758)	Chub	LR/lc	–	–	–	x			x
		6	*Alburnus orontis* SAUVAGE, 1882	Bleak	EN	–	–	–	x			x
		7	*Garra rufa obtusa* (HECKEL, 1843)	Garra	–	–	–	–	x			x

APPENDIX 5

METEOROLOGY DATA

Appendix 5. Meteorological Data of Kahramanmaras Province (1975-2005)

Enlem : 37.36
Boylam : 36.56
Yukseklik : 572 m

(KAHRAMANMARAS) KAHRAMANMARAS

	METEOROLOJIK ELEMANLAR	Rasat S. (YIL)	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	YILLIK
PRESSURE	Ortalama Yerel Basinc (hPa)	31	950.9	949.4	947.8	946.4	945.7	943.1	940.3	941.5	945.8	949.4	951.4	951.8	947.0
	En Yuksek Yerel Basinc (hPa)	31	964.3	963.3	962.6	957.7	955.5	950.7	947.5	951.4	964.8	959.1	964.6	963.4	964.0
	En Dusuk Yerel Basinc (hPa)	31	928.5	929.5	924.7	925.0	929.4	928.6	931.9	931.9	936.6	937.7	933.1	931.9	924.7
AVERAGE TEMPERATURE	Saat 07 deki Ortalama Sicaklik (C)	31	2.2	2.8	6.3	11.4	16.2	21.0	24.1	23.6	19.7	13.9	7.6	3.9	12.7
	Saat 14 deki Ortalama Sicaklik (C)	31	8.1	9.7	14.4	19.7	25.3	30.6	34.5	34.7	31.4	24.8	16.2	9.8	21.6
	Saat 21 deki Ortalama Sicaklik (C)	31	4.8	6.1	10.4	15.1	19.7	24.0	27.2	27.2	24.4	18.5	10.9	6.3	16.2
	Ortalama Sicaklik (C)	31	5.0	6.2	10.4	15.3	20.2	24.9	28.2	28.2	25.0	18.9	11.4	6.6	16.7
	Ort. Sicaklik >= 5 C Old. Gunler Sayisi	31	15.9	18.9	28.4	29.9	31.0	30.0	31.0	31.0	30.0	31.0	28.3	21.9	327.3
	Ort. Sicaklik >= 10 C Old. Gunler Sayisi	31	0.7	4.1	16.8	28.0	31.0	30.0	31.0	31.0	30.0	30.6	20.8	3.9	257.9
	Ortalama Yuksek Sicaklik	31	9.1	10.8	15.6	21.0	26.5	31.6	35.4	35.5	32.3	25.7	17.1	10.7	22.6
	Ortalama Dusuk Sicaklik	31	1.4	2.0	5.4	9.8	14.1	18.6	22.0	22.0	18.3	12.8	6.8	3.1	11.4
MAXIMUM TEMPERATURE	En Yuksek Sicaklik Gunu	31	31	27	29	30	31	25	24	7	13	1	2	6	24
	En Yuksek Sicaklik Yili	31	2002	1977	2001	1989	1990	2002	1998	1987	1995	1999	1992	1986	1998
	En Yuksek Sicaklik (C)	31	17.4	21.8	26.4	32.6	38.0	41.0	44.3	44.3	40.1	37.2	27.2	20.9	44.3
HIGH TEMPERATURE NO OF DAYS	Yuk. Sicaklik >=30 C Old. Ort. Gunler Sayisi	31				1.0	7.5	20.5	29.9	30.6	23.4	6.5			119.4
	Yuk. Sicaklik >=25 C Old. Ort. Gunler Sayisi	31			0.4	6.3	20.2	29.4	31.0	31.0	29.3	18.7	1.2		167.5
	Yuk. Sicaklik >=20 C Old. Ort. Gunler Sayisi	31		0.3	6.5	17.4	28.4	30.0	31.0	31.0	30.0	27.3	9.2	0.2	211.3
	Yuk. Sicaklik <=-0.1 C Old. Ort. Gunler Sayisi	31	0.1	0.2										0.0	0.3
	Gunluk En Yuksek Sicaklik Farki														
MINIMUM TEMPERATURE	En Dusuk sicaklik Gunu	31	4	6	1	11	6	1	11	23	28	19	23	27	6
	En Dusuk sicaklik Yili	31	1983	1997	1985	1997	1990	1991	1992	1976	1992	1977	2001	2002	1997
	En Dusuk Sicaklik (C)	31	- 7.8	- 9.6	- 7.6	- 0.6	5.0	11.0	15.6	16.0	8.6	2.20	- 4.4	- 7.6	- 9.6
LOW TEMPERATURE AVG. NO OF DAYS	Dus. Sicaklik <=-0.1 C Old. Ort. Gunler Sayisi	31	9.8	7.3	2.2	0.0							1.0	5.9	26.2
	Dus. Sicaklik <=-3 C Old. Ort. Gunler Sayisi	31	2.5	2.7	0.4								0.1	1.2	6.9
	Dus. Sicaklik <=-5 C Old. Ort. Gunler Sayisi	31	0.6	0.9	0.1									0.3	1.9
	Dus. Sicaklik <=-10 C Old. Ort. Gunler Sayisi	31													0.0
	Dus. Sicaklik <=-15 C Old. Ort. Gunler Sayisi	31													0.0
	Dus. Sicaklik <=-20 C Old. Ort. Gunler Sayisi	31													0.0
	Dus. Sicaklik >=20 C Old. Ort. Gunler Sayisi	31				0.1	0.5	9.8	27.7	28.0	8.5	0.2			74.8
	Dus. Sicaklik >=15 C Old. Ort. Gunler Sayisi	31			0.0	1.3	12.7	28.1	31.0	31.0	27.0	8.1	0.0		139.2
	Dus. Sicaklik >=10 C Old. Ort. Gunler Sayisi	31	0.0	0.1	2.4	14.6	28.4	30.0	31.0	31.0	30.0	26.1	6.2	0.3	200.1
	Dus. Sicaklik >=5 C Old. Ort. Gunler Sayisi	31	4.6	5.7	18.3	28.5	31.0	30.0	31.0	31.0	30.0	30.6	21.6	10.5	272.8
MINIMUM TEMPERATURE ABOVE SOIL	Ortalama Toprakustu Minimum Sicaklik	31	- 0.7	- 0.3	2.9	7.2	11.2	15.6	19.3	19.3	15.2	9.9	4.2	1.1	8.7
	En dusuk Toprakustu Minimum Sicaklik	31	-11.4	-15.8	-10.2	- 5.0	1.4	1.5	2.1	10.6	2.9	0.0	- 7.4	-10.1	-15.8
	Top. us. min. sic. <=-0.1 C Old. Gunler Sayisi	31	15.7	12.2	5.3	0.2							4.5	11.4	49.3
	Top. us. min. sic. <=-3 C Old. Gunler Sayisi	31	9.9	7.4	2.7	0.1							1.2	5.9	27.2
	Top. us. min. sic. <=-5 C Old. Gunler Sayisi	31	5.0	4.3	1.4	0.0							0.4	2.3	13.4
	Top. us. min. sic. <=-10 C Old. Gunler Sayisi	31	0.4	0.7	0.1									0.0	1.2
RELATIVE HUMIDITY	Ortalama Buhar Basinci (hPa)	31	6.2	6.1	7.4	9.7	12.3	15.4	19.2	19.7	15.5	11.5	8.7	7.1	11.6
	Saat 07 deki Ortalama Bagil Nem (%)	31	82	78	76	74	71	63	63	67	67	72	80	82	72
	Saat 14 deki Ortalama Bagil Nem (%)	31	58	52	45	43	37	32	32	32	31	37	47	59	42
	Saat 21 deki Ortalama Bagil Nem (%)	31	71	64	59	57	55	55	59	61	54	55	66	74	60
	Ortalama Bagil Nem (%)	31	70	65	60	58	54	50	51	53	51	55	64	72	58
	En dusuk Bagil Nem (%)	31	10	7	5	4	4	2	1	3	8	4	6	13	1

Istasyonun Calisma Suresi : 1975 - 2005

ARASTIRMA ve BILGI ISLEM DAIRE BASKANLIGI

Enlem : 37.36
Boylam : 36.56
Yukseklik : 572 m

(KAHRAMANMARAS) KAHRAMANMARAS

	METEOROLOJIK ELEMANLAR	Rasat S. (YIL)	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	YILLIK
			AYLAR												
CLOUDINESS	Saat 07 deki Ortalama Bulutluluk (0-10)	31	5.7	5.5	5.0	4.7	2.9	0.8	0.2	0.3	0.7	2.9	4.3	5.7	3.2
	Saat 14 deki Ortalama Bulutluluk (0-10)	31	5.9	5.8	5.6	5.7	4.3	2.2	0.9	0.9	1.5	3.5	4.8	5.9	3.9
	Saat 21 deki Ortalama Bulutluluk (0-10)	31	5.0	4.8	4.2	4.0	2.5	1.0	0.3	0.3	0.8	2.3	3.6	5.1	2.8
	Ortalama Bulutluluk (0-10)	31	5.6	5.4	4.9	4.8	3.2	1.3	0.5	0.5	1.0	2.9	4.2	5.6	3.3
	Ort. Acik Gunler Sayisi (bult. 0.0-1.9)	31	8.6	7.7	8.9	6.9	12.5	22.4	28.8	28.1	24.1	15.6	11.3	7.8	182.7
	Ort. Bulutlu Gunler Sayisi (bult. 2.0-8.0)	31	10.4	10.8	14.2	17.5	16.2	7.5	2.2	2.9	5.8	12.4	11.8	11.5	123.2
	Ort. Kapali Gunler Sayisi (bult. 8.1-10.0)	31	12.0	9.8	7.9	5.6	2.3	0.2			0.1	3.0	6.9	11.7	59.5
TOTAL RAINFALL	Saat 07 deki Ort. Toplam Yagis Miktari (mm)	31	56.1	45.1	39.2	27.8	12.2	1.1	0.0	0.1	1.9	20.1	39.6	58.7	301.9
	Saat 14 deki Ort. Toplam Yagis Miktari (mm)	31	34.6	25.7	26.6	19.7	11.0	0.8	0.2	0.2	1.3	15.0	25.5	33.3	193.9
	Saat 21 deki Ort. Toplam Yagis Miktari (mm)	31	33.5	28.6	25.7	23.4	15.9	4.4	0.8	0.3	3.8	16.4	25.2	36.6	214.6
	Ortalama Toplam Yagis Miktari (mm)	31	125.2	105.4	94.7	77.3	40.2	6.6	1.0	0.5	6.8	51.1	90.2	132.3	731.3
	Gunluk En Cok Yagis Miktari (mm)	31	47.2	58.6	53.5	66.5	46.5	22.3	7.9	5.0	18.7	45.7	72.0	98.2	98.2
	Yagis >= 0.1 mm Oldugu Gunler Sayisi	31	12.7	12.2	12.2	12.0	8.4	2.4	0.5	0.4	2.0	6.5	9.0	12.7	91.0
	Yagis >= 10 mm Oldugu Gunler Sayisi	31	4.7	3.8	3.4	2.6	1.1	0.1			0.2	1.8	3.3	4.5	25.5
	Yagis >= 50 mm Oldugu Gunler Sayisi	31		0.0	0.0	0.1							0.1	0.2	0.4
	Ortalama Kar Yagisli Gunler Sayisi	31	2.9	2.5	0.6	0.1							0.3	1.5	7.7
NO OF SNOW COVERED DAYS	Ortalama Kar Ortulu Gunler Sayisi	31	2.3	2.3	0.2						0.0		0.3	0.6	5.7
	En Yuksek Kar Ortusu Kalinligi (cm)	16	21.0	37.0	7.0								6.0	17.0	37.0
	Ortalama Sisli Gunler Sayisi	30	3.6	3.1	0.9	0.2	0.1				0.1	0.4	2.6	4.0	14.7
	Ortalama Dolulu Gunler Sayisi	31	0.0	0.0	0.2	0.2	0.3	0.1				0.1	0.0	0.0	0.9
	Ortalama Kiragili Gunler Sayisi	30	10.2	6.1	2.8								2.6	8.5	29.8
	Ortalama Orajli Gunler Sayisi	28	0.2	0.5	1.5	3.3	5.4	2.3	0.6	0.7	2.1	2.8	1.2	0.5	21.1
AVERAGE WIND SPEED	Saat 07 deki Ortalama Ruzgar hizi (m/s)	31	0.7	0.8	0.8	0.9	0.8	1.4	1.5	1.3	0.8	0.5	0.5	0.6	0.9
	Saat 14 deki Ortalama Ruzgar hizi (m/s)	31	1.2	1.5	1.8	2.0	2.1	3.3	3.5	3.0	2.0	1.2	1.0	0.9	2.0
	Saat 21 deki Ortalama Ruzgar hizi (m/s)	31	0.9	1.2	1.8	2.3	3.1	4.4	5.0	4.8	3.6	1.6	0.9	0.7	2.5
	Ortalama Ruzgar Hizi (m/s)	31	1.0	1.2	1.5	1.7	2.0	3.0	3.3	3.0	2.1	1.1	0.8	0.8	1.8
DIRECTION AND VELOCITY OF FASTEST WIND	En Hizli Esen Ruzgarin Yonu	31	N	N	N	NNE	NNE	N	NNW	NNW	NNW	N	N	NNW	N
	En Hizli Esen Ruzgarin Hizi (m/s)	31	30.6	38.5	35.9	30.3	31.9	26.1	26.8	29.4	34.4	25.6	36.9	38.2	38.5
AVG NO OF WINDY DAYS	Ort. Firtinali Gun Say. (ruz.hiz>=17.2 m/s)	31	1.2	1.5	1.6	0.9	0.7	2.0	3.1	2.7	1.2	0.8	1.2	1.0	17.9
	Ort. Kuv.Ruz. Gun Say. (ruz.hiz 10.8-17.1 m/s)	31	3.2	3.4	5.5	5.9	9.3	17.2	20.7	20.1	12.2	3.8	1.8	2.3	105.4
WIND	N Ruzgarin Esme Sayilari Toplami	31	148	154	183	150	139	189	188	194	167	184	172	107	1975
	N Ruzgarin Ortalama Hizi (m/s)	31	3.1	3.6	3.1	2.9	3.1	4.0	4.3	3.5	3.0	2.7	2.9	2.8	3.3
	NNE Ruzgarin Esme Sayilari Toplami	31	51	69	75	42	44	49	52	44	44	46	38	50	604
	NNE Ruzgarin Ortalama Hizi (m/s)	31	2.1	2.3	2.4	1.8	3.0	4.5	3.7	3.5	2.8	2.5	2.3	1.7	2.7
	NE Ruzgarin Esme Sayilari Toplami	31	56	56	73	78	31	34	32	53	53	74	67	72	679
	NE Ruzgarin Ortalama Hizi (m/s)	31	1.4	1.3	1.3	1.4	1.1	1.8	1.3	1.5	1.2	1.1	1.6	1.0	1.3
	ENE Ruzgarin Esme Sayilari Toplami	31	106	118	152	113	87	66	71	64	64	60	63	94	1058
	ENE Ruzgarin Ortalama Hizi (m/s)	31	2.0	1.4	1.6	1.6	1.7	1.1	1.3	0.9	1.2	1.2	1.6	1.6	1.5
	E Ruzgarin Esme Sayilari Toplami	31	124	131	146	129	113	91	74	67	83	80	114	141	1293
	E Ruzgarin Ortalama Hizi (m/s)	31	1.8	1.7	2.0	1.5	1.1	0.9	1.1	0.9	0.8	1.0	1.3	1.7	1.4
	ESE Ruzgarin Esme Sayilari Toplami	31	141	126	138	114	96	67	75	41	23	69	79	133	1102
	ESE Ruzgarin Ortalama Hizi (m/s)	31	1.8	1.9	1.9	1.8	1.2	0.9	1.0	0.9	0.9	1.0	1.6	1.7	1.5
	SE Ruzgarin Esme Sayilari Toplami	31	77	74	75	95	66	56	59	41	54	89	81	101	868
	SE Ruzgarin Ortalama Hizi (m/s)	31	1.1	1.4	1.4	1.2	1.1	0.8	1.0	1.2	1.2	1.2	1.0	0.9	1.1
	SSE Ruzgarin Esme Sayilari Toplami	31	75	74	91	83	50	31	41	42	47	45	58	49	686
	SSE Ruzgarin Ortalama Hizi (m/s)	31	1.0	1.3	1.5	1.4	1.2	1.0	1.2	1.4	1.0	1.0	0.9	0.8	1.2

Istasyonun Calisma Suresi : 1975 - 2005

ARASTIRMA ve BILGI ISLEM DAIRE BASKANLIGI

Enlem : 37.36
Boylam : 36.56
Yukseklik : 572 m

(KAHRAMANMARAS) KAHRAMANMARAS

	METEOROLOJIK ELEMANLAR	Rasat S. (YIL)	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	YILLIK
WIND	S Ruzgarin Esme Sayilari Toplami	31	207	180	209	167	172	90	110	163	211	200	142	187	2038
	S Ruzgarin Ortalama Hizi (m/s)	31	0.7	0.9	1.1	1.0	1.0	0.9	1.1	1.1	1.1	0.9	0.7	0.7	0.9
	SSW Ruzgarin Esme Sayilari Toplami	31	79	93	95	91	108	61	61	72	87	91	63	61	962
	SSW Ruzgarin Ortalama Hizi (m/s)	31	1.2	1.1	1.1	1.2	1.3	1.4	1.6	1.4	1.3	0.9	0.8	0.8	1.2
	SW Ruzgarin Esme Sayilari Toplami	31	73	64	67	57	59	46	57	63	84	105	72	87	834
	SW Ruzgarin Ortalama Hizi (m/s)	31	0.9	0.9	0.9	1.0	1.2	1.3	1.7	1.7	1.3	0.9	0.8	0.7	1.1
	WSW Ruzgarin Esme Sayilari Toplami	31	134	124	154	145	159	168	171	149	130	107	102	115	1658
	WSW Ruzgarin Ortalama Hizi (m/s)	31	1.1	1.4	1.5	2.0	2.1	3.2	3.7	3.1	2.4	1.5	1.0	1.1	2.1
	W Ruzgarin Esme Sayilari Toplami	31	211	169	180	243	270	356	470	445	272	173	157	188	3134
	W Ruzgarin Ortalama Hizi (m/s)	31	1.2	1.4	1.8	2.3	2.6	3.5	4.2	4.1	2.9	1.5	1.0	1.0	2.7
	WNW Ruzgarin Esme Sayilari Toplami	31	122	122	267	414	566	786	805	751	584	260	101	114	4892
	WNW Ruzgarin Ortalama Hizi (m/s)	31	1.8	2.1	2.8	3.3	3.7	4.4	4.8	4.6	4.1	2.8	1.5	1.5	3.9
	NW Ruzgarin Esme Sayilari Toplami	31	60	87	129	181	225	233	186	196	184	153	79	84	1797
	NW Ruzgarin Ortalama Hizi (m/s)	31	1.6	1.8	2.4	2.8	3.2	3.7	3.9	3.8	3.3	2.1	1.1	1.1	2.9
	NNW Ruzgarin Esme Sayilari Toplami	31	69	94	115	99	125	166	160	144	134	108	70	72	1356
	NNW Ruzgarin Ortalama Hizi (m/s)	31	3.3	3.4	3.0	2.7	3.4	4.1	4.8	4.4	3.6	2.6	3.4	2.6	3.6
SOIL TEMPERATURE	Ortalama 5 cm Toprak Sicakligi (C)	31	4.8	6.4	11.2	17.1	23.2	29.2	33.4	33.4	29.1	20.9	11.8	6.5	18.9
	En dusuk 5 cm Toprak sicakligi (C)	31	- 0.7	- 1.3	- 0.4	7.7	12.2	20.5	25.8	28.2	18.6	10.5	1.8	0.0	- 1.3
	Ortalama 10 cm Toprak Sicakligi (C)	31	5.0	6.5	11.2	17.0	22.9	28.6	32.5	32.9	29.1	21.2	12.1	6.8	18.8
	En dusuk 10 cm Toprak sicakligi (C)	31	- 0.3	- 0.7	- 0.1	8.5	13.1	20.6	26.4	28.7	20.1	11.1	2.4	0.2	- 0.7
	Ortalama 20 cm Toprak Sicakligi (C)	31	5.6	6.7	10.8	16.4	21.9	27.2	30.8	31.4	28.2	21.5	13.0	7.6	18.4
	En dusuk 20 cm Toprak sicakligi (C)	31	1.2	0.6	1.7	9.0	14.0	20.1	25.7	27.9	21.0	13.2	4.4	0.5	0.5
	Ortalama 50 cm Toprak Sicakligi (C)	31	5.6	5.8	8.8	13.3	18.1	23.1	26.7	27.9	25.9	20.7	13.5	8.2	16.5
	En dusuk 50 cm Toprak sicakligi (C)	31	1.0	- 0.4	0.5	6.0	11.5	15.0	21.2	23.8	19.1	11.7	5.6	1.6	- 0.4
	Ortalama 100 cm Toprak Sicakligi (C)	31	9.7	8.7	10.2	13.4	17.0	21.1	24.5	26.2	25.7	22.7	17.7	12.9	17.5
	En dusuk 100 cm Toprak sicakligi (C)	31	1.6	0.4	0.0	5.6	8.4	14.2	17.2	20.0	18.2	12.8	8.2	3.8	0.0
EVAP. SUN BATH, SEA WATER TEMPERATURE	Ortalama Buharlasma (mm)	30			50.7	105.5	176.0	263.5	326.9	302.2	213.5	120.2	27.3	11.9	
	Gunluk En Cok Buharlasma (mm)	30	0.0	0.0	7.7	10.5	13.0	16.0	21.0	19.9	16.0	10.5	6.8	8.9	21.0
	Gunluk Ort. Guneslenme Suresi (saat,dakika)	22	03:31	04:23	05:44	06:52	08:33	10:27	11:03	10:30	09:20	07:04	04:33	03:11	07:06
	Gunluk Ort. Guneslenme Sidt.(cal/cm^2.dak)	22	161.47	230.58	340.80	432.79	532.51	612.15	618.32	547.99	456.57	309.93	195.77	139.14	381.50
	Aylik En Yuk. Guneslenme Sidt.(cal/cm^2.dak)	22	1.16	1.42	1.54	1.60	1.80	1.65	1.48	1.45	1.40	1.29	1.12	1.12	1.80
	Ortalama Deniz Suyu Sicakligi (C)														0.0
	En Yuksek Deniz Suyu Sicakligi (C)														
	En dusuk Deniz Suyu Sicakligi (C)														

Istasyonun Calisma Suresi : 1975 - 2005

ARASTIRMA ve BILGI ISLEM DAIRE BASKANLIGI

DOMINANT WIND DIRECTION

AYLIK ESME SAYILARINA GORE HAKIM RUZGAR ve YONU (7-14-21 Olcumlerinden)

YIL	OCAK	SUBAT	MART	NISAN	MAYIS	HAZIRAN	TEMMUZ	AGUSTOS	EYLUL	EKIM	KASIM	ARALIK
1996	6 ESE	10 W	8 ESE	9 WNW	17 WNW	24 WNW	29 WNW	27 WNW	16 WNW	14 WNW	3 W	8 ESE
1997	6 N	11 N	15 N	11 W	19 WNW	22 WNW	27 WNW	36 WNW	16 NW	9 NW	4 SSW	11 ESE
1998	10 N	7 N	11 WNW	17 WNW	18 WNW	28 WNW	24 WNW	18 WNW	17 WNW	9 WNW	5 W	7 ESE
1999	5 WSW	5 ESE	10 W	14 WNW	25 WNW	30 WNW	32 WNW	23 WNW	27 WNW	16 WNW	8 N	3 ENE
2000	8 E	5 ENE	9 WNW	14 WNW	20 WNW	21 WNW	24 WNW	24 WNW	24 WNW	11 WNW	4 SSW	10 SE
2001	6 N	5 ENE	9 S	17 WNW	18 WNW	31 WNW	33 WNW	23 WNW	20 WNW	14 WNW	9 N	19 E
2002	9 S	9 E	10 E	14 WNW	19 WNW	21 WNW	29 WNW	27 WNW	19 WNW	8 W	6 S	7 W
2003	7 W	8 E	12 S	12 WNW	12 S	16 WNW	29 WNW	24 WNW	16 N	11 WNW	9 W	7 S
2004	10 W	6 ENE	16 N	12 WNW	21 WNW	19 NW	22 NW	23 W	11 NW	8 SSW	7 WSW	5 E
2005	7 W	8 ESE	9 S	11 NW	18 WNW	20 W	32 NW	20 W	15 W	11 S	5 E	7 SW
2006	3 NE	4 NE	9 S	11 W	18 NW	17 W	28 W	16 W	12 WNW	11 WNW		

KAYITLARIMA UYGUNDUR

APPENDIX 6

ACOUSTIC REPORT

I. INTRODUCTION

This section includes detailed information related to assessment of environmental noise and vibration levels pertaining to noise sources in construction and operation phases of proposed Sariguzel Dam and HEPP project within the framework of Regulation on Assessment and Management of Environmental Noise published on Official Gazette dated July 1, 2005 and numbered 25682. The results regarding the impacts of vibration and noise during the construction and operation phases are also discussed in Section IV.2.15, V.1.15 and Section V.2.10, respectively.

A. GENERAL INFORMATION

1. Commercial Title of the Firm

ERE Hidroelektrik Uretim ve Ticaret A.S.

2. Address of the Firm

Anadolu Bulvari 11. Sokak No: 14, 06510 Sogutozu-ANKARA

3. The Subject of the Firm Services/Production

Sariguzel Dam and HEPP, which is one of the 4 projects planned within the Kandil Energy Group Projects, will provide an annual average of 284.29 GWh energy with an installed power of 98 MW.

4. The Location of the Plant Site (Industrial Zone, Organized Industrial Zone, Settlement Area, Rural Area etc.)

“Land Utilization Map” belonging to area which will be used for facilities and reservoir area within the context of Sariguzel Dam, HEPP and Borrow Sites Project is provided in Appendix 1.3. Project site is located in rural area and there is no industrial facility around. Layout of construction site and project units is provided in Appendix 1.2.

5. Characteristics of the Area that the Facility will be Established (Exist Vegetation Cover, Topography, Meteorological Factors (Dominant Wind Direction, Wind speed, Temperature, and Changes in Relative Humidity during the preparation period of the report), Location and Heights of the Surrounding Buildings, Floor Numbers, Existence of Reflecting and Absorbing Surfaces and the distance of the closest Noise-sensitive Building.)

Topography

Proposed Sariguzel Dam and HEPP Project area is at a distance of 100 – 150 km to Kahramanmaras with asphalt road. Dagdelen Regulator and HEPP, Kandil Dam and HEPP, Sariguzel Dam and HEPP, Hacininoglu Regulator and HEPP will be constructed w ithin the scope of Kandil Energy Group Project which is planned to be constructed on

Ceyhan River. Kandil Energy Group Project area is located in the northern side of Kahramanmaras, between 38º07'30"- 37º49'30" north latitudes and 36º57'00"-37º07'30" east longitudes. Sariguzel Dam and HEPP will be located on upstream of Hacininoglu Regulator and HEPP Project that will be located on the most downstream.

Project area has an active topography, elevated 700 – 1000 m from the sea level. There are both steep and inclined lands, and alluvial base between these. A shallow soil structure exists in this mountainous land.

Vegetation Cover

Existing vegetation cover in the project impact area has been determined through detailed field flora studies. Various climates, vegetation belts exist in the area. Natural cover is pasture in arid regions. Oak scrubs and rare pears are seen at the northwest heights. In addition to this, wheatzones and grasses are abundant. In this area, pasture fields have degraded low. Vegetation is rare forest at mountainous high field ribbon between alluvial and dry areas. Forests consist of short oaks and pines as heaps. In western part, common specieses are Austrian pines, Turkish pines and oaks. In the heights, there are Cedars and Firs with other speciesses. In southern part, dominant vegetation are pines. Common vegetation where mediterrian climate dominates is maquis that consist from oaks, Quercus ilex etc. Detailed information related to vegetation cover on the project area and its vicinity is provided in Section IV.2.11 and Appendix 4. Tree and bushes, covering the project area and surroundings, are expected to decrease noise level which will be sourced from project activities.

Structural and Architechtural Characteristics of the Project Area

Settlements around the project area are presented on topographical map which is provided in Appendix 1.2. Receiving points, that will potentially be affected from noise emissions, are the settlements that are closest to noise sources included in the project. Noise sources within Sariguzel Dam, HEPP and Borrow Sites Project are located in different locations. Dam axis that will be constructed within the scope of the project is located in 1,000 m south east of Domuler Quarter of Sariguzel Village, between Kavakcukuru Hill and Cukurcam Ridge; and 1,300 m north east of Ikizler Quarter of Sariguzel Village. Buildings in Sariguzel Village are generally resembles with the surrounding settlements. They generally consist of 8-9 m height, 2 floor concrete and adobe houses. In addition to this, the closest settlements to the construction site which is likely to be a noise source in construction phase are Tilkiler Quarter of Kertmen Village and Hacininoglu Village. Air distance from construction site to these two settlements is approximately 300 and 290 m, respectively. The buildings in Tilkiler Quarter and Hacininoglu Village generally consist of approximately 8-9 m height, 2-floor adobe and brick houses.

Meteorological Characteristics

Meteorological data of the project area and surrounding region were taken from Kahramanmaras DMI Station, which is operated by General Directorate of State Meteorological Services (DMI), and is closest to the project site. In Kahramanmaras observation station temperature, wind speed and direction is measured hourly; cloudiness and precipitation is measured three times a day, and maximum rain fall is measured monthly. Kahramanmaras DMI, in which meteorological data through the years 1975-2005

have been observed, takes place in 572 m elevation from sea level, with 37.36 latitudes and 36.56 longitudes. Meteorological and climatic characteristics of the project area and its vicinity are provided in detail in Section IV.2.1.

Annual average temperatures measured in reference period for Kahramanmaras Station are provided in Table 6.1. Average temperature in the project area is about 10.6°C. Average maximum temperature was recorded in August about 28.3ºC. Average minimum temperature was recorded as –3.2 ºC in January.

Table 6.1. Average Temperature Data of Project Area (DMI)

	Average Temperature ^{o}C	Average Maximum Temperature ^{o}C	Average Minimum Temperature ^{o}C
January	5.0	9.1	1.4
February	6.2	10.8	2.0
March	10.4	15.6	5.4
April	15.3	21.0	9.8
May	20.2	26.5	14.1
June	24.9	31.6	18.6
July	28.2	35.4	22.0
August	28.2	35.5	22.0
September	25.0	32.3	18.3
October	18.9	25.7	12.8
November	11.4	17.1	6.8
December	6.6	10.7	3.1
Annual	16.7	22.6	11.4

Annual relative humidity in Kahramanmaras Station is 58%. Average relative humidity is minimum in June with 50%, and maximum with 72% in December. Annual average local pressure recorded in Kahramanmaras Station is 947.0 hPa. During a year the maximum and the minimum pressures were observed in September and March, respectively. These values are 964.8 hPa and 924.7 hPa, respectively.

According to DMI station records, mild/mid west-northwest winds are predominant in Kahramanmaras Province. Winds observed in the station blows from this direction in 19.62% of the time. According to data gathered from Kahramanmaras DMI for years between 1975-2005, during 30 years observation period the fastest wind recorded was North wind with a speed up to 38.5 m/sec. Again in this time period, approximately 17.9 days were determined as “stormy” with a wind speed equal to or higher than 17.2 m/s, and approximately 105.4 days were determined as “strong windy” with a speed between 10.8 -17.1 m/s, during the course of the year. These days approximately correspond to 4.9% and 28.9% of a year, respectively.

6. Planned Usage Area of Facility (Total Area, Area Occupied by Facility, Social and Administrative Building Area, Green Area and Empty Area

Locations of all project units within the scope of the Project are shown on the layout map in Appendix 1.2. Approximate projection areas of Project units are given in Table 6.2. Detailed information on planned usage areas and units of the Project are provided in Section I and II.

Table 6.2. Projection Areas of the Project Units

Definition	Surface Area (ha)
Administrative Buildings – Accommodation house	2.250
Construction Site-Concrete plant-grinding-washing facility	8.330
Switchyard	0.176
Reservoir Area	265.730
Borrow Site	64.600

7. Process Units of the Planned Facility and Layout of the Areas used for Social Purposes

General layout of process units that are planned within the scope of the Project is provided in Appendix 1.2. Personnel requirement of the Project will be provided primarily from close region. Services will be provided for these personnel. For other personnel worker ward, engineer dormitory and accommodation house will be constructed.

8. Production Flow Chart of the Facility and Locations of Noise Sources (Demonstration on Sketch)

Flow chart of Sariguzel Dam, HEPP and Borrow Sites Project is provided in Figure 6.1. Besides, the locations of the noise sources within the scope of the Project are shown in Appendix 1.2.

9. Distance of Health Boundary Zone

Explosive depots that are within the scope of the Sariguzel Dam, HEPP and Borrow Sites Project are listed under first class non-hygienic establishments; whereas sand pits, sand washing and grinding facilities and ready concrete facilities are listed under second class non-hygienic establishment list.

Health boundary zone is suggested to be 250 – 300 m for four 2-tones mobile explosive depots which are within first class non-hygienic establishments; for the area where second class non-hygienic establishments: sand pit, sand washing-grinding facilities and ready concrete facilities are located, if the highest chief (or the person in charge) of the responsible administration decides that health boundary zone should be established, in accordance with decision of investigation committee, health boundary zone is suggested to be established at a distance of 75-100 m around the mentioned areas.

10. Information related to Work Period (Total Working Period, Working Continually or in Relays, Shift Number).

For Sariguzel Dam, HEPP and Borrow Sites project, workers will work in daytime, between 07:00-19:00.

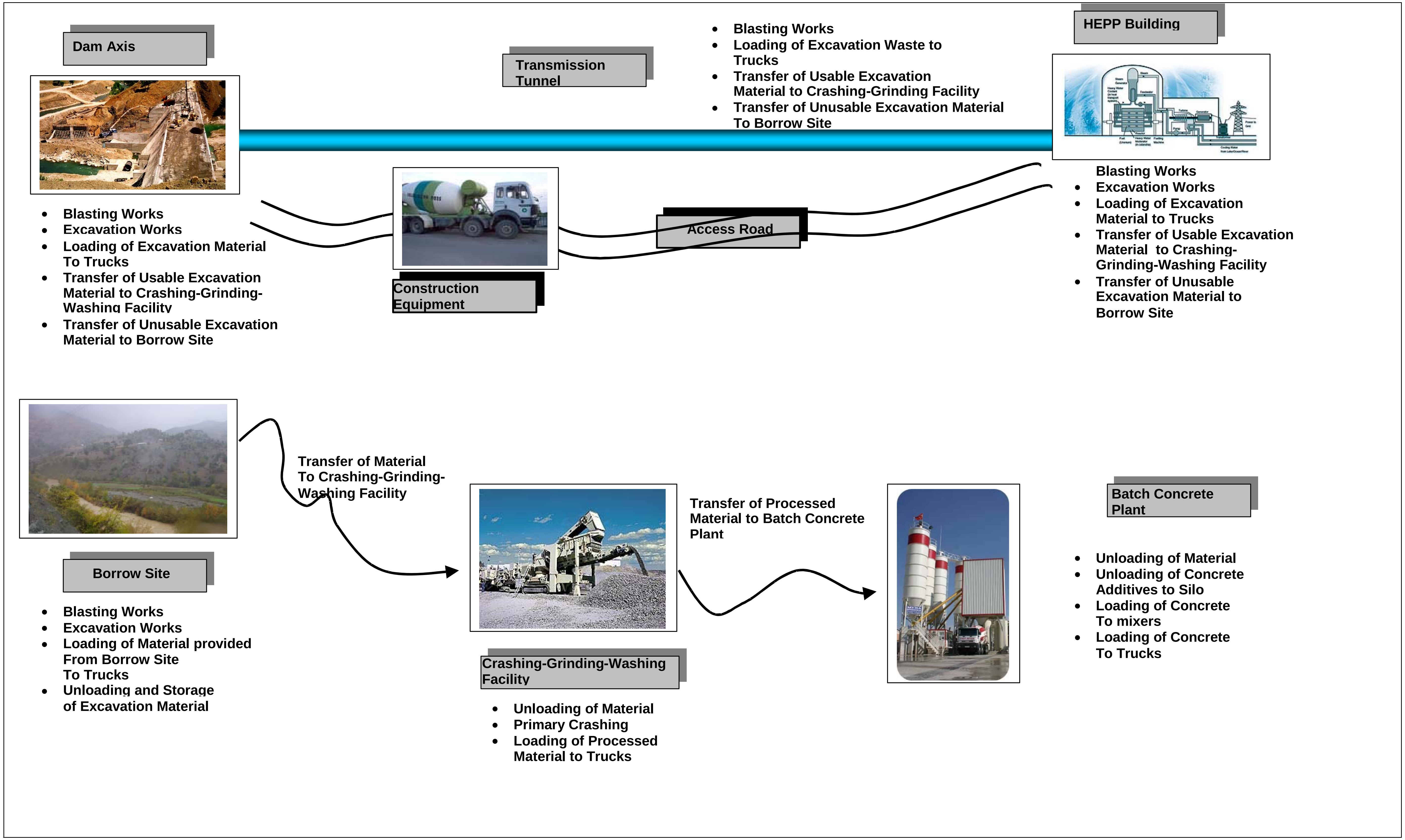


Figure 6.1. Activity Flow Chart

B. INFORMATION ON THE NOISE LEVELS IN CONSTRUCTION PHASE (EMISSION AND IMISSION)

1. Construction Area (Location and Size) and Construction Period,

Total area for buildings that will be established during the project period is 71 ha. Besides construction of these buildings is thought to last 18 months.

2. Number of Machinery and Equipment to be used

Noise that will be originated from works to be done starting from the preparation of the area and throughout the construction period of dam and HEPP will mainly be sourced from vehicles. Total number of equipment that is planned to be used throughout the project:

- 2 bulldozers
- 6 excavators
- 4 loaders
- 10 trucks
- 2 sprinklers
- 4 compressors
- 6 transmixers (truck mixer)
- 1 crusher
- 1 concrete mixer
- 1 concrete pump

3. The Situation of Simultaneous Working and Locations

In order to determine the noise values likely to be created at the receiver points, a mathematical simulation model (quantitative noise model), detailed in the following sections, has been conducted. Mathematical model and relevant developed mitigation measures are also given in following sections. Worst-case scenario (all equipment work simultaneously at the same time) has been taken into consideration during the calculations of noise impact on construction site. However, during noise level calculations for construction of dam axis and powerhouse, the equipments that are likely to work at the same time have been considered.

4. Noise Levels of Equipments and Reference of This Information

The main noise emission sources to be caused by construction activities in the project area throughout the construction phase are various excavation equipments (bulldozers, excavators, haulage trucks etc.). On the other hand, construction traffic is thought to be created by transportation of laborers and materials to the construction area. However, during construction existing roads will not be used, instead a new road will be constructed on route of construction site and dam and HEPP building. Therefore, there will not be any increase in current noise level and traffic load on the existing roads. Noise sources during construction phase and L_{max} noise levels are provided in Table 6.3.

Table 6.3. Number and Noise level (L_{max}) of the equipment that will be used during construction phase

Equipment	Number	L_{max} (dBA)	Source Type
Bulldozer	2	90	Area
Excavator	6	82	Area
Loader	4	84	Point
Compressor	4	80	Point
Transmixer	6	90	Linear
Sprinkler	2	88	Linear
Truck	10	88	Linear
Crusher	1	115	Area
Concrete Mixer	1	85	Area
Concrete Pump	1	82	Area

The noise levels to be caused by the construction equipments and the project traffic throughout the project were estimated based on the method suggested by UNDP in their document “TEM Traffic and Construction Noise Control Report” published in 1990 (UNDP, 1990). L_{max} values of equipment have been taken from “Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances” report prepared by EPA in 1971 and “National Transportation Library, U.S. Department of Transportation” report.

5. Calculation of Total Noise Level due to Construction Activities

In estimation of construction noise that will be produced in the project, equations that were developed for point, area and linear noise sources are used. Estimations are based on type, number and average noise levels (as dBA) of the used equipment.

$L_{p,d} = L_{max} + 10 \log (t / T) + 20 \log (d_o / d)$ Point source
$L_{p,d} = L_{max} + 10 \log [(d_o^2 \times 3.14 \times B) / (d \times 180 \times A)]$ Area source
$L_{p,d} = L_{max} + 10 \log [(d_o^2 \times 3.14 \times Q \times B) / (d \times 180 \times V)]$ Linear source

$L_{p,d}$: Noise level at a distance of d (dBA) (*i.e. noise level at the receptor*)
L_{max} : Maximum noise level of the source (dBA)
d_o : The distance at which the maximum noise level is specified (m)
d : Distance of the receptor from the source (m)
t : Average operating time of the source (min)
T : Computation time (min)
B : The angle between the source axis and the receptor (90º)
A : Operating area of the machinery (m^2)
Q : Movement of the machinery in unit time (no. of movements/3600 sec)
V : average speed of machine (m/sec)

The maximum (cumulative) noise level at the receptor(s) is computed with the assumption that all noise sources work at the same place at the same time (i.e. the worst case scenario). The cumulative noise level is determined by the following equation:

$$\left(L_{p,d}\right)_{cum} = 10 \cdot \log \sum_{i=1}^{n} 10^{\frac{\left(L_{p,d}\right)_i}{10}}$$

Alternatively, the cumulative noise level can be found by adding a certain increment to the maximum noise level –calculated at the receptor– for each of the

remaining noise sources. This increment is proportional to the difference(s) between the maximum noise level and the noise level(s) of other sources (Figure 6.2).

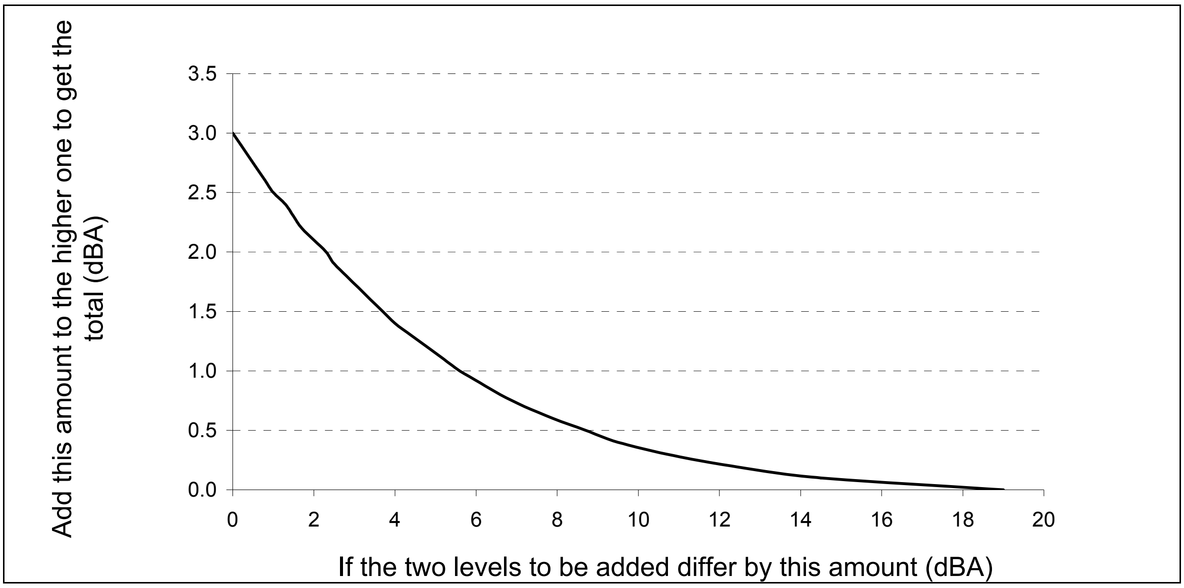


Figure 6.2. Summation of Noise Levels (dBA)

In determining the possible noise level at the receptor(s), consideration should be given to a number of factors that increase and/or decrease the noise level by affecting the propagation of sound. These can be summarised as:

- increase due to roughness of road surface (eg. flagstone, grooved roads)
- increase due to multiple reflections from vertical surfaces (eg. from high buildings on both sides of the road)
- decrease due to air absorption
- decrease due to absorptiveness of road surface (eg. specially designed absorptive surfaces)
- decrease due to absorptive ground cover (such as grass or cultivated land)
- decrease due to trees and woods
- decrease due to effect of ground and barriers of all types (eg. due to topography)

Roughness of the road surface may increase while absorptiveness of the road surface may decrease the noise level experienced at the receptor. Increase or decrease factors for different types of road surface (eg. absorptive surfaces like bituminous asphalt or noise-increasing flagstone roads) are generally established with reference to classical asphalt and concrete roads (UNDP, 1990). The issue of increase due to multiple reflections from high buildings on both sides of the road was also eliminated because no such conditions are present at the site.

In determination of noise level at receptor, only the impact of ground was taken into consideration among the factors that decrease the noise level. Noise level decreasing factors such as air absorption and absorption by grass or cultivated land were not included in calculation in order to evaluate worst-case scenario. Decrease in noise level due to ground (C1) is calculated by following formula:

$C_1 = 5 \times \log (d_o / d)$

The equation adopted to estimate the overall noise level at the receptor(s) is thus given as:

$(L_{p,d})_{overall} = (L_{p,d})_{cum} + C_1$

$(L_{p,d})_{overall}$: The overall noise level at receptor, at a distance of d (dBA)
$(L_{p,d})_{cum}$: Cumulative noise level estimated at a distance of d (dBA)
C_1 : Attenuation of noise by the ground (dBA)

Estimation of Noise Levels – Sample Computation

Noise level calculations depend on type and number of equipments to be used and maximum noise levels (dBA). The worst-case scenarios, in which all equipments work at the same time at the same place, have been adopted in noise calculations. A sample calculation is given below for the equivalence noise level ($L_{p,}100$) to be created 100m away from the source.

Point source :

$L_{p,d} = L_{max} + 10 \log (t / T) + 20 \log (d_o / d)$

$L_{p,d}$: Noise level at a distance of d (dBA)
L_{max} : Maximum noise level of the source (dBA)
d_o : The distance at which the maximum noise level is specified (15 m)
d : Distance of the receptor from the source (100 m)
t : Average operating time of the source (50 minutes)
T : Computation time (60 minutes)

Loader
$L_{p,100}$ = 82 + 10 log (50 / 60) + 20 log (15 / 100)
= 64.73 dBA

Area Source:

$L_{p,d} = L_{max} + 10 \log (d_o^2 \times 3.14 \times B / d \times 180 \times A)$

A : Operating area of the machinery (500 m × 40 m = 20,000 m^2)
B : The angle between the source axis and the receptor (90º)

Grader
$L_{p,100}$ = 83 + 10 log (15^2 × 3.14 × 90º / 100 × 180 × 20,000)
= 45.47 dBA

Linear Source:

$L_{p,d} = L_{max} + 10 \log (d_o^2 \times 3.14 \times Q \times B / d \times 180 \times V)$

Q :Movement of the machinery in a given period of time (20/hr = 20/3600 sec)
V : Average speed of the machinery (30 km/hr = 8.3 m/sec)

Truck
$L_{p,100}$ = 85 + 10 log (15^2 × 3.14 × (20 / 3600) × 90º / 100 × 180 × 8.3)
= 58.72 dBA

Receiving points likely to be affected by noise emissions are the closest settlements to the project area. The closest settlements to noise sources are, Ikizler Quarter, Domuler Quarter, Hacininoglu Village, and Tilkiler Village. Noise sources will be created generally during construction phase (during establishment of process facilities). During operation phase noise is only expected in HEPP building that will be established in vicinity of Tilkiler Quarter and Hacininoglu Village. However because HEPP building will be constructed as closed and isolated, noise will not be heard from outside.

Distribution of noise level that will be created in vicinity of project area during construction phase was calculated based on detailed formula presented above. For overall noise effect sourced from project area during construction activities worst-case scenario was calculated.

According to worst-case scenario the equipment that are likely to be used in construction activities; 6 excavators, 4 loaders, 2 dozers, 10 trucks, 6 truck mixers, 4 compressors, 1 concrete mixer, 1 crusher and 2 sprinklers. The change in noise levels, calculated according to this scenario, with respect to distance are provided in Table 6.4 and Figure 6.3.

Table 6.4. Change in Estimated Worst-Case Scenario Cumulative Noise Levels Originated from Construction Activities with respect to distance for Construction Site

Distance (m)	Construction Leq (dBA)
15	93.14
20	90.42
50	82.29
100	76.73
150	73.67
200	71.57
250	69.98
300	68.70
350	67.62
400	66.70
500	65.17
600	63.93
700	62.89
800	62.00
900	61.21
1000	60.50

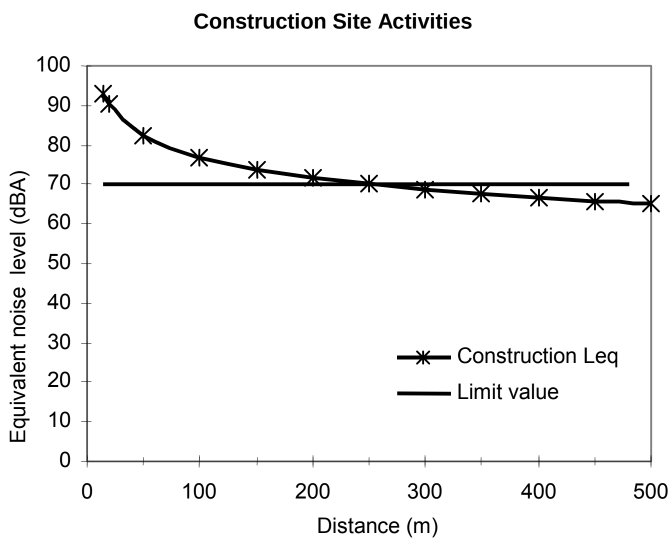


Figure 6.3. Noise Level Originated from Construction Activities under Estimated Worst-Case Scenario

According to worst-case scenario the equipment that are likely to be used in activities near Dam axis; 3 excavators, 1 dozer, 6 trucks, 5 transmixers, 1 concrete pump, and 1 sprinkler. The change in noise levels, calculated according to this scenario, with respect to distance are provided in Table 6.5 and Figure 6.4.

Table 6.5. Change in Estimated Worst-Case Scenario Cumulative Noise Levels Originated from Construction Activities with respect to distance for Dam Area

Distance (m)	Construction Leq (dBA)
15	81.75
20	79.88
50	73.91
100	69.39
150	66.75
200	64.88
250	63.42
300	62.24
350	61.23
400	60.36
500	58.91
600	57.72
700	56.72
800	55.85
900	55.08
1000	54.39

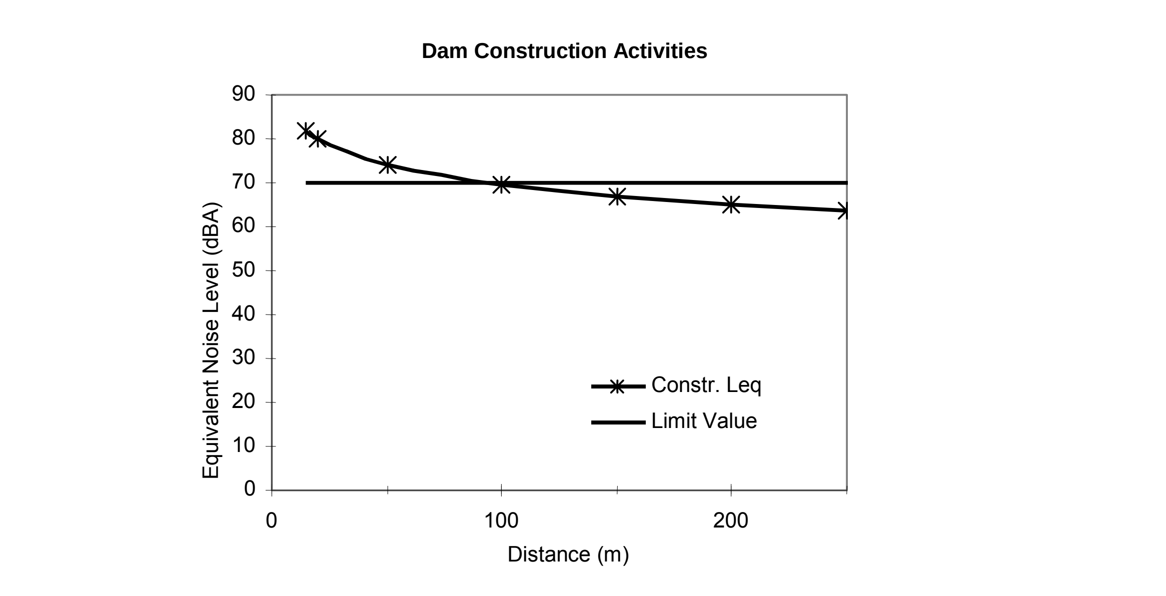


Figure 6.4. Noise Level Originated from Construction Activities under Estimated Worst-Case Scenario for Dam Area

According to worst-case scenario the equipment that are likely to be used in construction activities of HEPP building; 1 excavator, 1 dozer, 3 trucks, 2 transmixer, 1 concrete pump, and 1 sprinkler. The change in noise levels, calculated according to this scenario, with respect to distance are provided in Table 6.6 and Figure 6.5.

Table 6.6. Change in Estimated Worst-Case Scenario Cumulative Noise Levels Originated from Construction Activities with respect to distance for HEPP Conctruction Site

Distance (m)	Construction Leq (dBA)
15	78.57
20	76.70
50	70.73
100	66.21
150	63.57
200	61.70
250	60.24
300	59.06
350	58.05
400	57.18
500	55.73
600	54.54
700	53.54
800	52.67
900	51.90
1000	51.21

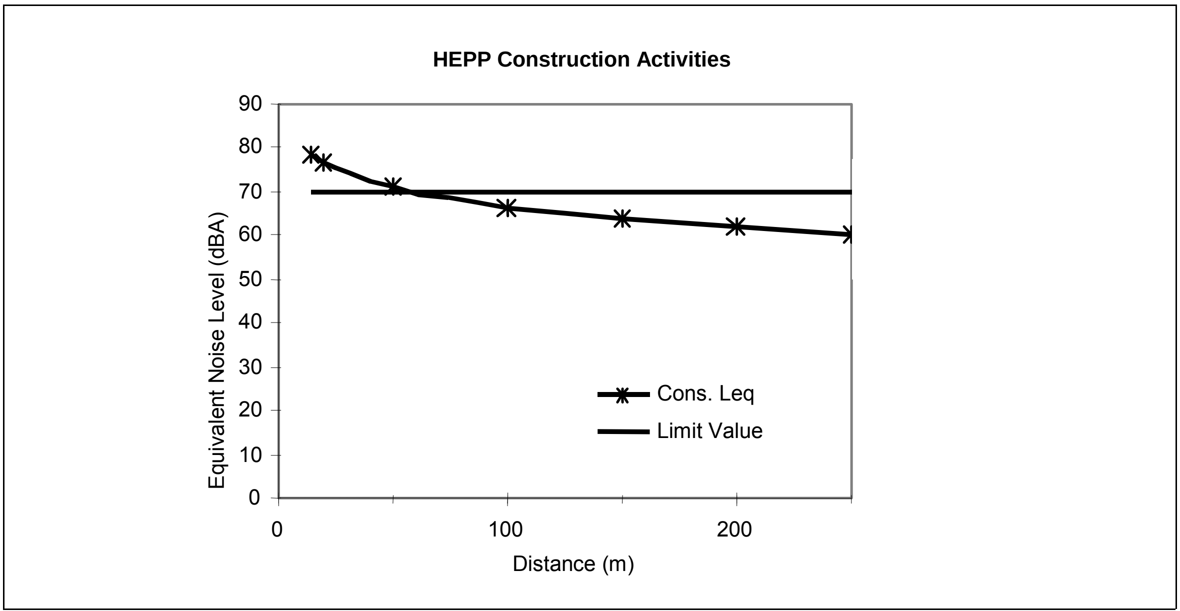


Figure 6.5. Noise Level Originated from Construction Activities under Estimated Worst-Case Scenario for HEPP Construction Site

Limit values set for environmental noise levels originating from construction sites and industrial facilities in item 26 of the Regulation on the Assessment and Management of the Environmental Noise (Published in Official Gazette (NO: 25862) dated July 1, 2005) are provided in Table 6.7.

Table 6.7. Environmental Noise Limit Values for Construction Site.

Type of Activity (construction, demolition and restoration)	**L day (dBA) (07:00-19:00)**	**L evening (dBA) (19:00-23:00)**	**L night (dBA) (23:00-07:00)**
Building	70	70	70
Road	75	75	75
Other Sources	70	70	70

According to calculations, noise levels set in regulation are reached at 250 m distance from construction site, at 91 m distance from dam area, at 56 m distance from HEPP construction site. In Hacininoglu Village, which is 290 m away from construction site and in Tilkiler Quarter, which is 300 m away from construction site, construction phase noise levels were calculated as 68.94 dBA and 68.70 dBA, respectively. Noise level that will be created due to HEPP building construction will be 58.53 dBA in Hacininoglu Village which is at 325 m distance, and 55.73 dBA in Tilkiler Quarter which is at 500 m distance. Besides, in the closest settlements to dam axis, Ikizler Quarter (1,300 m) and Domuler Quarter (1000 m) noise levels that will be originated from construction activities are 52.68 dBA and 54.39 dBA, respectively.

Vibration Impact During Construction Phase

Blasting during construction and tunnel activities will cause a vibration radiating away from source. During blasting, vibration can be sensed by people within approximately 1 km from blasting area, dependent on ground condition of their location. Although very rarely, blast vibration can result in damage to adjacent structures

Air overpressure is also generated by blasting, again radiating away from the blast location. This airborne pressure wave is unlikely to cause damage, but because it has a startle factor it is readily perceptible by humans and animals. Air overpressure is also responsible for the rattling of window frames and loose ornaments, which can enhance the overall perception of the blast event although no damage is experienced.

Estimation of Ground Vibration Level

The level of vibration that would result from a blasting based on explosive amount used in unit time can be calculated by the following formula (Olofsson, 1991):

$$V= K. (Q / R^{3/2})^{1/2}$$

Where;

V : Maximum particle velocity of the resulting vibration level (mm/sec)
Q : Weight of explosive charge detonated per unit time (kg)
R : Distance to the location of detonation (m)
K : Transmission Coefficient ($\leq$ 400)

In addition, Table 6.8 presents literature information on the effects of ground vibration on buildings for different geological conditions.

Table 6.8. Effects of Ground Vibration on Buildings (Olofsson, 1991)

	Sand, clay and groundwater	Soft limestone	Granite, hard limestone, quartz	Impact on buildings
Vibration level (mm/sec)	9 13 18	18 25 35	35 50 70	No damage
	30	55	100	Small cracks
	40	80	150	Distinct cracks
	60	115	225	Significant deformation

Blasting will performed at the place where dam axis will be constructed and along the transmission tunnel. The closest settlements on the route of transmission tunnel are; Ikizler Quarter at 225 m distance, Hacininoglu Village at 450 m distance and Tilkiler Quarter where transmission tunnel will pass under. Blastings in transmission tunnel will be conducted under the ground, not closer to surface than 50 m. The closest settlements to Dam Axis are Ikizler Quarter at 1,300 m distance, and Domuler Quarter at 1,000 m distance. During vibration calculations according to worst-case scenario vibration levels for these settlements were taken into consideration. According to the blasting plan, the maximum explosive amount that will be detonated per unit time is 20 kg for the site where dam axis is located, and 135 kg for transmission tunnel. The change in vibration level

caused by use of 135 kg and 20 kg explosives with respect to distance from project area is presented in Figure 6.6 and Figure 6.7, respectively.

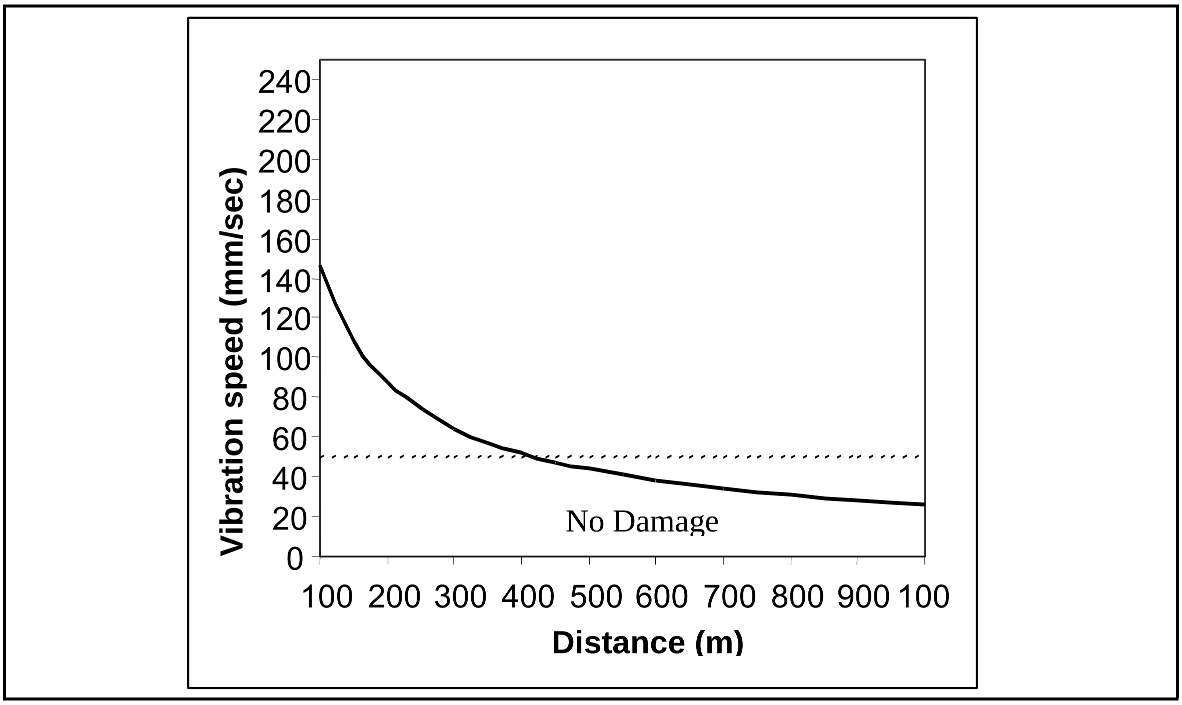


Figure 6.6. Estimated Vibration Level During Blasting in Transmission Tunnel

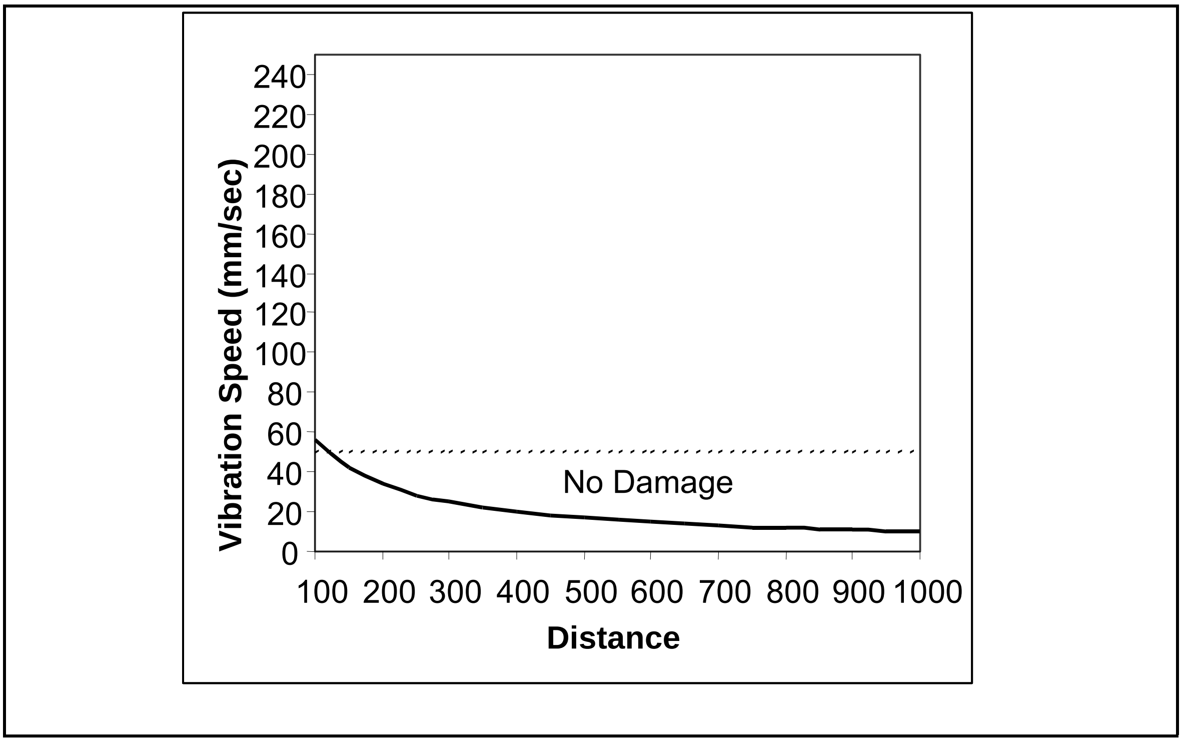


Figure 6.7. Estimated Vibration Levels During Blastings in Dam Axis

According to these data and Figure 6.6, no damage will occur in buildings located 421 m away from blastings conducted throughout the route of transmission tunnel. However, unless explosive amount that will be detonated per unit time changes, there is risk of damage in Ikizler Quarter which is located within 225 m from transmission tunnel, and also in Tilkiler Quarter under which transmission tunnel will pass. Therefore, within 421 m of any structure explosive amount will be decreased and the number of blastings will be increased. The amount of explosives to be used in order not to damage a building located at a distance of 225 m to transmission tunnel was calculated as 52.73 kg according to following formula. The closest distance between tunnel and dwellings is 50 m, and at this distance explosive amount will be decreased to 5.52 kg.

The calculation of explosive amount that will not damage the dwelling located at distance of 225 m to transmission tunnel;

$$Q = \frac{V^2 \times R^{3/2}}{k^2}$$

Prior to construction activities of transmission tunnel, ground surveys will be conducted along the tunnel route and activities will commence according to results of these studies. Besides, during the construction of transmission tunnel, the locations that are close to settlements will be investigated geologically in more detail. In settlements located on the route of transmission tunnel, if the vertical distance between tunnel axis and the settlement is not adequate (though changes according to ground-rock type, for example if less than 50 m) local people will be warned prior to blasting and in case of any damage expropriation or relocation will be provided. Secondary damages (ground collapsing etc.) caused by blastings will also be observed and required mitigation measures will be taken.

In addition to this, according to vibration level during blastings that will be conducted in dam axis area, there will not be any damage in structures located at a distance more than 118 m. Since the closest settlement to dam axis is at a distance of 1,000 m (Domuler Quarter) there is no risk of damage due to blastings.

C. INFORMATION ON BACKGROUND NOISE LEVEL

1. Measurement Points to determine Existing Noise Level, (Determination of probable Environmental Noise Level in Operation Phase taking the calculation or measurement points and values as reference)

In order to determine existing noise level in Sariguzel Dam, HEPP and Borrow Sites Project measurements were done at 4 different places (between 07:00-19:00). Measurements were conducted at Domuler Quarter, Hacininoglu Village, Ikizler Quarter and Tilkiler Quarter.

2. The Reason of Choosing Measurement Points

In order to determine the noise level originated from the project, in addition to noise levels of sources, noise measurements should also be conducted near the buildings that are likely to be affected by activities in project site. For that reason, measurements were conducted in noise-sensitive buildings located in settlements close to the area.

3. Distance from Measurement Points to Project Area

Settlements where measurements were conducted in the scope of the project, and their approximate distances from noise sources are given in Table 6.9.

Table 6.9. Distance of Settlements to Noise Sources

Settlements	HEPP Building (m)	Dam Axis (m)	Construction Site (m)
Sariguzel Village - İkizler Quarter	1,250	1,300	890
Kertmen Village – Tilkiler Quarter	500	2,000	300
Hacininoglu Village	325	2,500	290
Sariguzel Village - Domuler Quarter	3,250	1,000	2,800

4. Distance between Measurement Points

The locations of measurements points and their distances to each other can be seen on the map presented in Appendix 1.2.

5. Measurement Height

Measurements were conducted in accordance with principles provided in standards TS 9798 and TS 9315 ISO 1996-1. Measurements were conducted at a height of 1.5 m from ground level as indicated in the above-mentioned standards.

6. Measurement Methodology

In accordance with measurement methods provided in standards TS 9798 ve TS 9315 ISO 1996-1; measurements were done between 07:00-19:00 and when the noise is stable, taking into consideration factors such as topography, meteorology, the distance of closest receptor and possible noise point. In measurements done near the buildings, measurements were done in direction of noise that the building was exposed to. Measurements were conducted at 1.5 m height and 1 meter away from wall surfaces in order not to be affected by the echos due to wall.

7. Information on Measurement Device Used in Measurements

Existing noise level measurements were conducted with DELTAOHM HD2010 Type 1 Sound Level Meter. Serial number of the device is 06121540897. Device can make noise frequency analysis at center frequencies of octave bands 1/1 and 1/3.

8. Measurement Frequency, Time, Date and Parameters and Measurement Results

Information on the measurements conducted in 5 different locations to determine existing noise level is presented in Table 6.10.

Table 6.10. Results of the Measurements

Measurement No	Coordinate	Measurement Date	Weather	Measure Time	Measurement Location	Measurement Results (dBA)
1	320825 E 4198776 N	05.04.2007 13:10	Partly Cloudy	5 min.	Closest building to Domuler Quarter dam axis	52.8
2	320701 E 4197255 N	05.04.2007 13:25	Very Cloudy	5 min.	Ikizler Quarter, nearby the school	49.8
3	320781 E 4196775 N	05.04.2007 13:40	Very Cloudy	5 min.	Closest building to Tilkiler Quarter construction site	57.8
4	320984 E 4196340 N	05.04.2007 14:05	Very cloudy	5 min.	Nearby Hacininoglu Village clinic	55.0

dBA = A unit of measure for sound which especially emphasize the middle and high frequencies that human ear is most sensitive. dBA unit that is frequently used in noise reduction or control is related with the subjective assessment of sound level

Daily meteorological data that belongs to measurement day were taken from the closest meteorology stations (Kahramanmaras DMI stations) to area and are presented in Table 6.11.

Table 6.11. Kahramanmaras Meteorological Station Hourly Data, Dated 05 April 2007.

HOUR	TEMPERATURE (°C)	WIND SPEED (KNOT) AND DIRECTION (km/h)	PRECIPITATION (mm)	PRESSURE (hPa)	HUMIDITY (%)
10:30	10.0	No wind	-	1,018.9	70
13:00	17.0	No wind	-	1,018.3	41
14:00	17.9	No wind	-	1,018.2	41
15:00	18.0	No wind	-	1,018.3	39

9. Calibration Method, Calibration Levels and Calibration Certificate of Measurement Device

Before and after the measurements, correction is done with DELTAOHM HD9101 acoustic calibrator at 94 dBA level. Calibration Certificate of the device is presented in Figure 6.8.

DICHIARAZIONE DI CONFORMITÀ

DECLARATION OF CONFORMITY
rilasciato da
issued by

DELTA OHM SRL **STRUMENTI DI MISURA**

DATA *DATE* **06/12/18** **CERTIFICATO N°** *CERTIFICATE N°* **06000344R-ISO**

35030 CASELLE DI SELVAZZANO (PD) ITALY
via Marconi, 5
Telefono +39.0498977150 r.a.
Telefax +39.049635596
COD.FISC./P.IVA IT03363960281
N.MECC. PD 044279
R.E.A. 306030
ISC. REG. SOC. 68037/1998

Modello: *Model:*	**HD 2010**
Descrizione: *Subject:*	**Fonometro HD2010 con microfono mod. MK221 n.32867** *Sound level meter HD2010 and microphone mod.MK221 n.32867*
Numero di serie: *Serial Number:*	**06121540897**
Cliente: *Customer:*	**Tetra Teknolojik Sistemler Ltd. Sti - Ovecler/ Ankara (Turkey)**

Il presente strumento è stato costruito, tarato e verificato dalla Delta Ohm Srl.
This instrument has been made, calibrated and verified by Delta Ohm Srl.

Dichiariamo sotto la nostra responsabilità che lo strumento sopra indicato, al quale questa dichiarazione si riferisce, è conforme alle specifiche indicate nelle caratteristiche tecniche aggiornate.

We declare under our own responsability that the above mentioned instrument, which this declaration refers to, fulfills the specification of the up-to-date technical characteristics.

Le caratteristiche tecniche del fonometro integratore HD2010, dei preamplificatori HD2110P e HD2010PN, del microfono MK221 e del calibratore HD9101 rientrano nelle norme:
The technical characteristics of the integrating sound level meter HD2010, the preamplifiers HD2110P and 2010PN, the microphone MK221 and the calibrator HD9101 fulfill the following standards:

HD2010:	**IEC 60651:2001**	CLASSE 1	CLASS 1
	IEC 60804:2000	CLASSE 1	CLASS 1
	IEC 61672:2002	CLASSE 1 GRUPPO X	CLASS 1 GROUP X
	IEC 61260:1995	OTTAVA ED 1/3 OTTAVA CLASSE 1	OCTAVE & THIRD-OCTAVE CLASS 1
HD9101:	**IEC 60942:1988**	CLASSE 1	CLASS 1
MK221:	**IEC 61094-4:1995**	TIPO WS2F	TYPE WS2F

Catena di riferibilità degli strumenti impiegati nelle tarature.
Traceability chain of the calibration equipments.

* DIGITAL MULTIMETER HP MOD.3458A, S.N.2823A16324. CAL. CERTIFICATE N°06-0122-01 OF 2006-03-07, I.N.R.I.M.
* MICROPHONE B&K 4180, SERIAL N°2101416. CAL. CERTIFICATE N° 06-0762-01 OF OCTOBER-2006, I.N.R.I.M. .
* CALIBRATOR B&K 4226, SERIAL N°2141950. CAL. CERTIFICATE N°06001226 OF 2006-10-06. SIT CALIBRATION LABORATORY N.124
*

Responsabile Qualità
Head of Quality
DELTA OHM SRL
Via Marconi, 5 Tel. 0498977150
35030 CASELLE SELVAZZANO PD
ITALY

suonoconfmix

Figure 6.8. Calibration Certificate of the Noise Measurement Device

10. Person/Institution/Establishment that makes the Measurement

On-site measurements were conducted by Encon Environmental Consultancy Co. Curriculum vitae and noise training certificate of person who conducted these measurements are presented in EIA STUDY TEAM section of EIA report.

11. Assessment of Measured Background Noise Level within framework of Article 30 and 31 of the Regulation on Assessment and Management of Environmental Noise

Noise exposure categories have been determined for activities during planning phase within the scope of the Regulation on the Assessment and Management of the Environmental Noise. The below categories are taken into account during siting of appropriate places for the activities planned within this scope:

- Category A (L_{day} < 55 dBA): The environmental noise factor is not a priority in the making of planning decisions and issuing of permits for facilities.
- Category B (L_{day} 55-64 dBA): The environmental noise factor is evaluated for planning decisions and facility permitting for intermediate to high level use, with necessary measures to preserve background noise levels taken. Taking necessary physical measures to protect the settlements is the responsibility of the planner. In the case of the installment of a new facility, the responsibility belongs to the facility owner.
- Category C (L_{day} 64 -74 dBA): Permits are not allowed for planning or facility installation in very sensitive uses. However, in cases where there is significant public benefit to be gained from the project, permits are issued on the condition that necessary precautions are taken to prevent increase in background noise levels.
- Category D (L_{day} >74 dBA): Planning and installation permits are absolutely not issued for high- to intermediate-level uses. Planning permits are issued in situations where uses are insentient and the case is examined and noise barriers are arranged for the structures.

According to measurements done in accordance with article 30 of the Regulation on the Assessment and Management of the Environmental Noise, noise values in Domuler Quarter and Ikizler Quarter was determined as Categori A. Since noise values in Tilkiler Quarter and Hacininoglu Village are Categori B, environmental noise factors were assessed. Besides, precautions to be taken in order to maintain the background noise level are presented in Section V 2.10.

Ikizler Quarter, Domuler Quarter, Hacininoglu Village and Tilkiler Quarter are the close settlements to noise sources. In worst-case conditions, cumulative noise level of construction works in closest residences in mentioned settlements were calculated as following (Table 6.12).

Table 6.12. Cumulative Noise Level in Closest Settlements

Settlement	Existing Noise Level (dBA) (A)	Noise Impact due to Construction Activities (dBA) (B)	Noise Impact due to HEPP Construction Activities (dBA) (C)	Noise Impact due to Dam Construction Activities (dBA) (D)	Cumulative Noise Level (dBA) (E) $E= 10 \log (10^a+10^b+10^c+10^d)$
Hacininoglu Village	55.0	68.94	58.53	48.42	69.51
Tilkiler Quarter	57.8	68.70	55.73	49.88	69.29
İkizler Quarter	49.8	61.28	49.76	52.68	62.35
Domuler Quarter	52.8	53.69	43.53	54.39	58.58

In worst-case conditions cumulative noise (existing noise + construction activities noise) in the settlements closest to construction site is under the maximum noise level (70 dBA) set by the Regulation on the Assessment and Management of the Environmental Noise. In the model applied here the calculations were done according to the worst-case scenario in which all the machinery works at the same time. Despite of this, the results are under the limit values. However in here machines will never work at the same time. Therefore, noise caused by construction activities will not have a negative impact on settlements.

As it is seen in Table 6.12 the main source of the noise in the area is the activities in construction site. Therefore, noise map was prepared so that it shows the impact of activities in construction site on the closest settlements (Figure 6.9).

D. NOISE/VIBRATION LEVEL DURING OPERATION PHASE

During operation phase the only source of noise is anticipated to be generator and turbines in HEPP building. However, HEPP building which is at a distance of 325 m from the closest Hacininoglu Village will be established with isolation and hence noise and vibration will be kept in the building.

E. INFORMATION ON CONTROL PRECAUTIONS

1. Technical Aspects of Control Precautions to be taken in the case that Environmental Noise Level during Construction Phase and Operation Phase exceeds Limit Values provided in the Regulation on the Assessment and Management of the Environmental Noise; Control Precautions to be taken in Source, Receptor and Environment in accordance with Standards ISO 12354-1, ISO 12354-2, ISO 12354-3, ISO 12354-4, ISO 12354-5, TSEN 1793-1, TSEN 1793-2, TSEN 1793-3,

Noise precautions to be applied were determined with the assumption that machineries work at the same time according to worst-case scenario. Even though, the results stay under limit values. Moreover, in here machinery will never work together at the same time.

The most effective solution in control of noise is to control at the source. The main purpose here is to lower the intensity of sound radiating from source. For that purpose, attention will be paid so that sound intensity levels of the equipment that will be used in activity area are set to minimum by using developed technology.

In addition to this, sound screens, barriers and natural obstacles will be placed in between receptor and source. Vegetation cover, tree and bushes are the important natural barriers. These plant types decrease the noise intensity by substantially absorbing the noise. However, choosing the plant types are also very important.

2. Implementation Date and Time of These Precautions,

The results of calculations made for this project stay under the limit values. In operation phase, after determination of any limit value surpass, the most appropriate of the above-mentioned precautions will be applied.

3. The content of Technical Precautions that will be taken in case The Limit Values related to Environmental Vibration and Structural Damage are exceeded,

Uncontrolled blasting vibration can sometimes damage nearby structures and activities. Air overpressure can cause rattling of window frames and loosement of ornaments, although does not cause damage. However, no damage or complaint is anticipated in Sariguzel Dam, HEPP and Borrow Sites Project, because the blastings will be done controlled and in accordance with blasting engineering rules.

Applicable measures to minimize the impacts to be created by vibration and air overpressure are as follows:

- Blasting will be conducted on daytime and all closest settlements will be informed and warned prior to blasting. Thus, people in the closest settlements will not be affected in environmental sense as well as worried or anxious.
- Necessary measures will be taken to prevent unauthorized entries to blasting areas and warning signs will be erected around the area.
- By using modern blasting techniques, the devastating impact of blasting will be focused more on the rocks rather than environment.

The modern blasting techniques are as follows:

- The blasting plan has been optimized by using the best techniques in the design of blasting pattern.
- Optimum design values will be adopted during blasting.
- When necessary, blasting will be monitored at sensitive areas.
- When necessary, design and practice of blasting will be improved in the light of the monitoring results.
- Continual communication will be maintained with the local people in the closest settlements and potential complaints of the people will be recorded and evaluated.

Evaluation of vibration and air overpressure depends on calculation of the vibration and air overpressure levels according to amount of explosives that will be blasted per unit time. It is not expected that the vibration and air overpressure will cause a significant impact on the closest settlements if the above-mentioned effective mitigation measures are taken.

In addition to these, Regulation on the Assessment and Management of the Environmental Noise issued in July 1, 2005 will be fully complied with during the project activities.

4. Following the commence of Operation in Planned Facility, After Noise and Vibration Measurements Operator should undertake the implementation of Control Precautions.

In operation phase of Sariguzel Dam and HEPP Project noise and vibration measurements will be conducted and the required precautions will be taken in case the results are high.

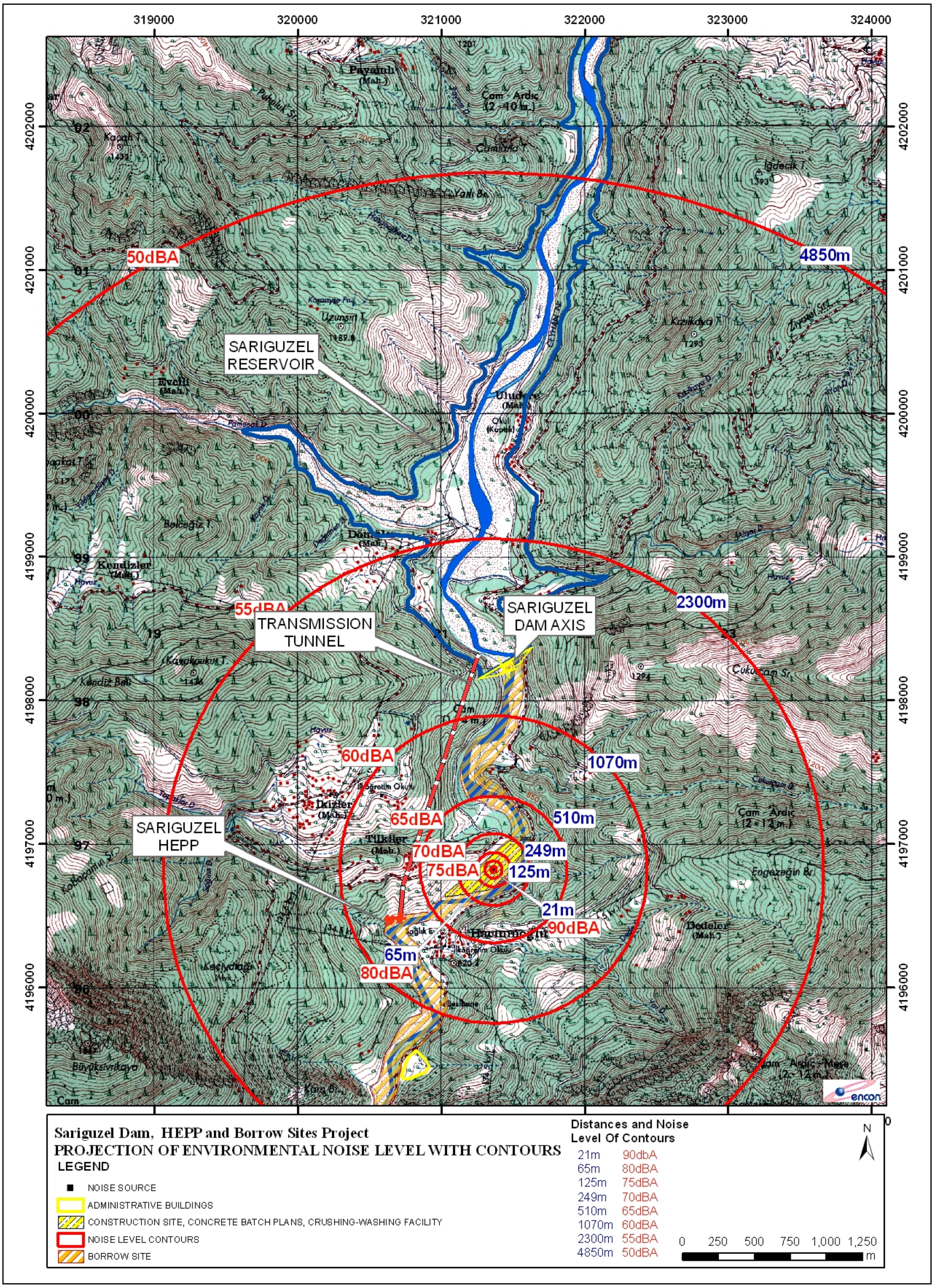


Figure 6.9. Projection of Environmental Noise Level by Contours

APPENDIX 7

AIR QUALITY MODELING

APPENDIX 7. AIR QUALITY MODELING

7.1. Introduction

In this section detailed investigation of dust emissions sourced from construction activities of Sariguzel Dam, HEPP and Borrow Sites Project is presented. Since there will no process that will create dust or gaseous emission during operation phase, no modeling study was conducted for this phase. In order to determine cumulative impact dust emitting processes and pollutants from vehicle exhausts were studied together.

7.2. Legal Framework

Particulates show a big variety in terms of size and composition. PM_{10} (particulate matter smaller than 10μm) standard identifies particulates which people may inhale and PM_{10} has become generally accepted criterion for particulate matter in atmosphere. In this respect, limit values of both Air Quality Protection Regulation and Regulation on Control of Industrial Facility Originated Air Pollution (RCIFOAP) are set as PM_{10}. Total particulate matter was used in calculations, but as depicted in following sections, particulates which are bigger than 10 μm comprise only 0.6% of the total. Therefore it can be said that all concentration measurements of the model was carried out according to PM_{10}.

Air Quality Protection Regulation

Air Quality Protection Regulation came into force upon being published in Official Gazette numbered 19269, dated November 2, 1986. The latest amendment on regulation is Industrial Originated Air Pollution Control Regulation published in Official Gazette numbered 25606 and dated October 7, 2004. This regulation abrogated upon publishment of Regulation on Control of Industrial Facility Originated Air Pollution in Official Gazette numbered 26236 dated July 22, 2006. Short term limit (STL) and long term limit (LTL) values that must be complied with for various pollutants are presented in Table 7.1.

Table 7.1. STL and LTL Values given in Air Quality Protection Regulation

POLLUTANTS	LTL	STL
SO2 (µg/m3)	150	400
NO2 (µg/m3)	100	300
HC (µg/m3)	-	140
CO (µg/m3)	10,000	30,000
PM (µg/m3)	150	300
Lead and its compounds in Settled PM (µg/m3)	2	-
Settled Particulate Matter (mg/m^{2}day)	350	650

Regulation on Control of Industrial Facility Originated Air Pollution

Regulation on Control of Industrial Facility Originated Air Pollution, came into force as published in Official Gazette numbered 26236 dated July 22, 2006, aims to control emissions emitted to atmosphere as a result of activities of industrial and production facilities, and to protect human and environment from risks originating from pollution in receiving air environment. By the enforcement of this regulation, Industrial Originated Air Pollution Control Regulation published in Official Gazette numbered 25606 and dated October 7, 2004, was abrogated.

According to regulation, limit values for places other than stack, and which requires calculation of air quality values if exceeded are provided in Appendix 2. These values are presented in Table 7.2.

Table 7.2. Emission Values originated from places other than Stack

Parameters	**Mass Flows (kg/hour)**
CO	50.00
NO_x	4.00
SO_x	6.00
PM	1.50
Pb	0.05

Emission values originated from construction activities that will be conducted within the scope of the project will be calculated and compared with mass flows given above. In case the calculated emission values exceeds regulation limit values, modeling study will be carried out and contribution of emission values to air quality will be calculated.

Batch concrete plant that will be run to provide concrete to be used in dam and tunnel in the scope of the project is included in the RCIFOAP, Appendix 8, List B, item “Facilities having production capacity 10 m^3/h or higher, producing concrete, plaster or road material from cement; including places where materials are mixed only when dry”. Emission permission in operation phase will be taken from Governorship with approval from Province Local Environment Board.

Regulation to Control Exhaust Gas Emissions Sourced From Motor Vehicles

Regulation to Control Exhaust Gas Emissions Sourced From Motor Vehicles, which came into enforcement after publishing in Official Gazette dated July 8, 2005 numbered 25869, aims to decrease exhaust gas pollutants in order to protect living and environment from hazard and air pollution sourced from exhaust gases of motor vehicles in traffic. It also aims to determine method and principles to control exhaust emissions with measurements.

This regulation will be complied with in order to lower exhaust gas emissions sourced from vehicles that will be used during the construction and operation phases of Sariguzel Dam, HEPP and Borrow Sites Project so that they do not exceed limit values.

7.3. Air Emission Sources Related with Project

In construction phase of the project, emission is expected to occur from following sources:

- Excavation-Fill activities to supply concrete agrega material
- Loading/Unloading of materials,
- Excavation-Fill activities during the construction of Dam axis, hydroelectric powerhouse, transmission line etc.,
- Emissions sourced from exhausts of construction equipment,
- Emissions sourced from blasting,
- Dust sourced from Crashing-grinding facility,
- Dust formed during ready concrete production,
- Dust sourced from roads during haulage of excavation waste, concrete agrega material, and concrete,

7.3.1. Emission Amounts that will be Sourced From Project

Construction Activities

Excavation and Blasting are planned to be performed during the construction of diversion conduit and tunnel, energy transmission line and powerhouse in the scope of the project. During blasting, excavation, loading of excavation waste to trucks, movement of vehicles on road during haulage of material to excavation waste storage area, and during unloading the material dust will be formed. 30% of the excavation waste produced as a result of diversion tunnel, dam axis, HEPP building excavation activities will be used for concrete production and remaining part will be stored to be used during rehabilitation process in borrow site.

<u>Diversion Tunnel and Conduit:</u>

Total 12,700 m^3 excavation will be performed during construction activities of diversion tunnel and conduit. 9,782 m^3 of excavation works will be performed by blasting. Construction activities are planned to be completed in 1 month. Excavation waste that will be produced due to blasting is 9,782 m^3 x 2.8 ton/m^3 = 27,390 ton, due to construction equipment is 2,918 m^3 x 2.6 ton/m^3 = 7,587 ton. For 25 days and 10 hours work time in a month, hourly excavation waste amounts are 109.6 ton for blasting and 30.3 ton for other excavations. Dust amounts that are expected during construction of diversion tunnel and conduit are presented in Table 7.3.

Table 7.3. Expected Emission Amounts due to Construction Activities of Diversion Tunnel and Conduit

Construction Activities of Diversion Tunnel and Conduit		
Blasting Activities		
Emission Factor*	Excavation per hour (ton\hour)	**Emission (kg/hour)**
0.08 kg/ton	109.6	8.76
Excavation Activities		
Emission Factor*	Excavation per hour (ton\hour)	**Emission (kg/hour)**
0.025 kg/ton	30.3	0.75
Loading of Excavation Waste to Trucks		
Emission Factor*	Excavation per hour (ton\hour)	**Emission (kg/hour)**
0.01 kg/ton	139.9	1.40
Total Emission Amount sourced from Construction Activities of Diversion Tunnel and Conduit		**10.91 kg/hour**

* US EPA

Dam:

Total 20,590 m^3 excavation will be conducted during the construction of dam axis. 10,250 m^3 of this will be performed by blasting. Excavation activities in dam axis will last around 4 months. Excavation waste that will be produced due to blasting is 10,250 m^3 x 2.8 ton / m^3 = 28,700 ton, due to construction equipment is 10,340 m^3 x 2.6 ton / m^3 = 26,884 ton. For 25 days and 10 hours work time in a month, hourly excavation waste amounts are 28.7 ton/hour for blasting and 26.9 ton/hour for other excavations. Dust amounts that are expected during construction activities of dam axis are presented in Table 7.4.

Table 7.4. Emission Amounts due to Construction Activities of Dam Axis

Construction Activities of Dam Axis		
Blasting Activities		
Emission Factor*	Excavation per hour (ton\hour)	**Emission (kg/hour)**
0.08 kg/ton	28.7	2.30
Excavation Activites		
Emission Factor*	Excavation per hour (ton\hour)	**Emission (kg/hour)**
0.025 kg/ton	26.9	0.67
Loading of Excavation Waste to Trucks		
Emission Factor*	Excavation per hour (ton\hour)	**Emission (kg/hour)**
0.01 kg/ton	55.6	0.56
Total Emission Amount sourced from Construction Activities of Dam Axis		**3.53 kg/hour**

* US EPA

Powerhouse

Total 36,300 m^3 excavation will be conducted during the construction of Hydroelectric powerhouse and penstock. 15,000 m^3 of this will be performed with blasting. Construction activities are planned to last 4 months. Excavation waste that will be produced due to blasting is 15,000 m^3 x 2.8 ton/m^3 = 42,000 ton, due to construction equipment is 21,300 m^3 x 2.6 ton / m^3 = 55,380 ton. Hourly excavation waste for blasting will be 42 ton/hour, for construction equipment will be 55.4 ton/hour. According to this, expected dust emissions during the construction of powerhouse are given in Table 7.5.

Table 7.5. Expected Emission Amounts during Construction of Powerhouse

Construction Activities of Powerhouse		
Blasting Activities		
Emission Factor*	Excavation per hour (ton\hour)	**Emission (kg/hour)**
0.08 kg/ton	42.0	3.36
Excavation Activities		
Emission Factor*	Excavation per hour (ton\hour)	**Emission (kg/hour)**
0.025 kg/ton	55.4	1.39
Loading of Excavation Waste to Trucks		
Emission Factor*	Excavation per hour (ton\hour)	**Emission (kg/hour)**
0.01kg/ton	97.4	0.97
Total Emission Amount sourced from Construction Activities of Powerhouse		**5.72 kg/hour**

* US EPA

Transmission Tunnel:

Blasting will be carried out during construction of approximately 1,700 m long and 5.5 m wide energy transmission tunnel. With blasting 54,000 m^3 excavation will be done. Excavation waste amount to be produced will be 54,000 m^3 x 2.8 ton/m^3 = 151,200 ton. Construction of transmission tunnel will last 8 months and works will be performed with 3 shifts per day. In that case, excavation waste to be produced per hour is 26.3 ton/hour. Expected emission amounts are given in Table 7.6.

Table 7.6. Expected Emission Amounts during Construction activities of Transmission Tunnel

Construction Activities of Transmission Tunnel		
Blasting Activities		
Emission Factor*	Excavation per hour (ton\hour)	**Emission (kg/hour)**
0.08 kg/ton	26.3	2.10
Loading of Excavation Waste to Trucks		
Emission Factor*	Excavation per hour (ton\hour)	**Emission (kg/hour)**
0.01 kg/ton	26.3	0.26
Total Emission Amount sourced from Construction Activities of Transmission Tunnel		**3.10 kg/hour**

* US EPA

Provision of Concrete Agrega Material

Natural alluvial material found in riverbed will be used for concrete agrega material for concrete, transmission channels and powerhouse construction works. Material will be transported from riverbed to concrete batch plant by transportation roads constructed during construction phase of Hacininoglu Project. Route of this road is given in Appendix 1.2. Dust will be produced due to extracting of material, loading to trucks, movement of vehicles on road during transfer of material to crashing-grinding facility. 191,510 m^3 (383,020 ton) material is planned to be taken from borrow site. Material will be continuously taken from borrow site during the construction activities that will be performed within the scope of the project. Excavation waste per hour will be 102.1 ton/hour. Expected dust emissions from mentioned sources are presented in Table 7.7.

Table 7.7. Expected Emission Amounts due to Activities in Borrow Site

Excavation Activities		
Emission Factor*	Excavation per hour (ton\hour)	**Emission (kg/hour)**
0.025 kg/ton	102.1	2.55
Loading of Concrete Agrega Material to Trucks		
Emission Factor*	Excavation per hour (ton\hour)	**Emission (kg/hour)**
0.01 kg/ton	102.1	1.02
Total Emission Amount sourced from Activities in Borrow Site		**3.57 kg/hour**

* US EPA

Activities to be done in Crashing-Grinding-Washing Facility

Material provided from borrow site to use in concrete production will be processed in crashing grinding facility prior sending to batch concrete plant. It is estimated that whole of the material provided from borrow site, and 30% of the excavation material produced from excavation works of dam axis, HEPP building and diversion tunnel will be brought to crashing-grinding facility. According to this, total material amount that will be brought to the facility is 190.0 ton. Expected emission amounts due to activities in crashing-grinding facility are presented in Table 7.8.

Table 7.8. Expected Emission Amounts due to Activities in Crashing-Grinding Facility

Unloading of Material		
Emission Factor*	Excavation per hour (ton\hour)	**Emission (kg/hour)**
0.01 kg/ton	190.0	1.90
Primary Crusher		
Emission Factor*	Excavation per hour (ton\hour)	**Emission (kg/hour)**
0.243 kg/ton	190.0	46.17
Re-loading of Processed Material		
Emission Factor*	Excavation per hour (ton\hour)	**Emission (kg/hour)**
0.01 kg/ton	190.0	1.90
Total Emission Amount sourced from Activities in Crashing-Grinding Facility		**49.97 kg/hour**

* US EPA

Activities to be done in Batch Concrete Plant

In batch concrete plant, ready concrete will be produced by mixing agrega materials, cement, water and some chemical additives in certain amounts. Cement amount to be used is 57,453 ton. 190 ton/hour material which was sized in crashing-grinding facility will be brought to batch concrete plant and processed. Expected emission amount due to these activities are provided in Table 7.9.

Table 7.9. Expected Emission Amounts due to Activities in Batch Concrete Plant

Unloading of Material to Area		
Emission Factor*	Excavation per hour (ton\hour)	**Emission (kg/hour)**
0.01 kg/ton	190.0	1.90
Unloading of Cement to Silo		
Emission Factor*	Cement Amount to be unloaded per hour (ton/hour)	**Emission (kg/hour)**
0.36 kg/ton	16.4	5.90
Loading of Concrete to Transmixers		
Emission Factor*	Concrete amount to be produced per hour (ton/hour)	**Emission (kg/hour)**
0.01 kg/ton	206.4	2.06
Total Emission Amount due to Activities in Batch Concrete Plant		**9.86 kg/hour**

* US EPA

Excavation Material Storage Area

Excavation will be performed during construction of dam axis, HEPP building and transmission tunnel and as a result excavation waste will be produced. Appraisable excavation waste will be used in concrete production. Remaining part will be used in rehabilitation works of borrow site. Expected emission amounts sourced from excavation waste storage area is given in Table 7.10.

Table 7.10. Expected Emission Amounts sourced from Excavation Waste Storage Area

Unloading of Material		
Emission Factor*	Excavation per hour (ton\hour)	**Emission (kg/hour)**
0.01 kg/ton	231.3	2.31
Total Emission Amount produced in Excavation Waste Storage Area		**2.31 kg/hour**

Construction Equipment

Primary exhaust emissions from vehicles are NO_2, CO, HC, SO_2, PM and lead in PM. Emission characteristics are dependent on parameters such as vehicle age, motor speed, working temperature, ambient temperature, pressure, fuel type and quality. In Table 7.11, emissions of lead petrol and diesel fuel pollutants measured for an average vehicle in 1977 in USA are listed. Emissions are calculated based on a study conducted in 1977 in USA for an average vehicle. The reason for not using emission values belong to more recent years is to increase the safety ratio.

Table 7.11. Emissions sourced from Vehicles (USEPA, 1977)

POLLUTANTS	EMISSIONS (g/km/vehicle)	
	Lead petrol	Diesel
Nitrogen Oxides (NO_x)	1.2	9.0
Carbon Monoxide (CO)	39.0	15.0
Sulfur Dioxide (SO_2)	0.08	1.5
Hydrocarbons (HC)	2.6	2.9
Particulate Matter (PM)	0.4	0.8
Lead (Pb) [1]	0.064	--

[1] *Diesel fuel does not contain lead*

During the construction activities in the project 2 dozers, 6 excavators, 4 loaders, 10 trucks, 6 transmixers and 2 sprinklers will be used. These mentioned vehicles will not be used at the same time. Besides, while excavator, loader and dozer will work in construction area, trucks will mostly work on transportation roads. Therefore, in emission calculations 4 excavators, 2 loaders, 1 dozer, 8 trucks, 3 transmixers and 1 sprinkler are assumed to work at the same time. Emissions sourced from construction equipment's exhausts such as NO_2, CO, HC, SO_2, PM and lead in PM, and dust emissions sourced from movements of vehicles on roads are given in Table 7.12.

Table 7.12. Emission Values sourced from Construction Equipment's Exhausts and Movements in Road

Emission Values sourced from Exhaust (kg/hour)					
NO_X	**CO**	**SO_2**	**HC**	**PM**	**Pb***
0.42	0.70	0.07	0.14	0.04	-
Emission Values sourced from Movement in Road					
Emission Factor**		**Haulage Route Distance (km)**		**Emission (kg/hour)**	
0.7 kg/km-vehicle		3.5		46.55	

* Vehicles used in construction activities works with diesel fuel.
** US EPA

Expected Total Emission Amounts due to Activities in Construction Phase And Comparison with (RCIFOAP)

135.56 kg/hour PM emission is expected to occur from construction activities within the scope of the Sariguzel Dam, HEPP and Borrow Sites Project. This value is above 1.5 kg/hour which is the limit value given in Appendix 2 of RCIFOAP for places other than stack, and which requires calculation of contribution values to air quality when exceeded. For that reason, modeling study was carried out for PM by using ISCST3. NO_x, CO, SO_2, HC and Pb emission values sourced from construction equipment are lower than limit values provided in RCIFOAP and therefore modeling study was not carried out.

7.4. Methodology

7.4.1. ISCST3 Model

The potential impacts of the emissions on air quality are estimated with the help of the ISCST3 (Industrial Source Complex - Short Term 3) model, developed by USEPA (United States Environmental Protection Agency).

ISCST3 as one of the most widely used computer models, provides estimates of hourly, daily and annual ground level concentrations and depositions based on the source emission data. The model deals with different types of sources, such as point, volume, area and open pit, as well as taking aerodynamic waves, turbulence and deposition into account.

ISCST3 model works in a network system defined by the user, calculations are done for corner points of each receptor element which forms network system. Network system used in ISCST3 model can be defined as polar or cartesian; besides remote receptors outside the network can be determined and more detailed calculations can be made for that points, and in addition to ground level concentrations, calculations also can be done for certain heights of the atmosphere. Also, there is an option in the model which takes elevated terrain into account.

7.4.2. Deposition Calculation

Long term modeling studies are important because some pollutants have adverse long-term impacts on soil and water resources. For this reason, the acidification of soil and water resources is investigated with the help of deposition calculations of the related pollutants. Likewise, deposition of PM emitted to air by exhaust gases was investigated by using dry deposition option of ISCST3 model. For wet deposition, on the other hand, a wet scavenging rate was calculated by using the parameters presented below (EMEP, 1991).

$$D_{wet} = W_r \, x \, C \times H \tag{5}$$

D_{wet}: Wet deposition speed (mg/m^2/year)
C: Average yearly pollutant density (mg/m^3)
H: Average yearly mixing height (m)
W_r: Wet Scavenging Rate (sec^{-1})

$$W_r = (\Lambda \times P) / (\phi \times H \times 3.6 \times 10^6) \tag{6}$$

Λ: Wet scavenging coefficient (for PM 1.4 * 10^6)
P: Hourly precipitation (mm/hour)
ϕ: Precipitation likelihood

7.4.3. Method Used in Modeling

Calculations of emission values and dispersions with model was only performed for construction phase of the project. Since there will not be any operation which cause emission during the operation phase, no emission is expected to occur in that phase. The following units will be constructed in Construction phase.

- Dam
- Diversion Tunnel
- Energy Transmission Tunnel,
- Surge Chamber,
- Penstock and
- Powerplant.

During the construction of these structures excavation-filling, blasting activities will be performed. Beside, an 10 m wide road which provides transportation between dam area and hydroelectric powerplant was completed during construction phase of Hacininoglu Regulator, HEPP and Borrow Sites Project. During construction of this road, dust emitting activities such as excavation-filling and blasting were performed and emissions formed during construction activities of this road was investigated in the scope of the Hacininoglu Project. Apart from these, NO_2, CO, HC, SO_2 and Particulate Matter (PM) emissions will be sourced from the movement of vehicles on the area and from the exhausts of construction equipment that will be used for construction activities.

During the air quality modeling studies, at first, mass flows (kg/hour) of dust and gaseous emissions sourced from above-mentioned sources was calculated and compared with limit values provided in Appendix 2 of Regulation on Control of Industrial Facility Originated Air Pollution. Mentioned limit values are given in Table 7.2. Since the calculated emission values are determined to be higher than regulation limit values, spread of above-mentioned pollutants under the topographical and meteorological conditions of the region, and potential ground level concentrations as a result of this spread and total precipitation amount for PM was calculated by the help of the model.

Model takes the meteorological data of the area from user with help of a file in certain format. This meteorological data set is formed in hourly format and this file contains information about the flow vector, wind speed, ambient temperature, stability class, rural mixing height, urban mixing height, wind profile exponent, vertical potential temperature gradient, friction velocity, Monin-Obukhov length, surface roughness length, precipitation code and precipitation rate. Meteorology data of Kahramanmaras DM Station (2005) were used for the air quality modeling. Data except from mixing height was gathered from Kahramanmaras Meteorological Station. Mixing height was provided from a radiosonde type station, Diyarbakir DM Station (2005), which is closest to Kahramanmaras.

For modeling, a working area of 6 km long in east-west direction and 8 km long in north-south direction was selected to include planned units and roads to be used. 1/25,000 topographical maps were digitized and coordinates and heights of 174 points were obtained. Among these 174 points, important ones for impact assessment on air quality (the points close to the project area and settlements) were selected and used in the calculations. Topographical map that shows the locations of planned facilities and transportation roads is given in Appendix 1.2.

Start and end dates of construction activities in construction phase are provided in Section III. Besides, time schedules of other projects in Kandil Energy Group Projects are given in the same section. As can be seen from table the construction activities of units belong to Hacininoglu Regulator, HEPP and Borrow Sites Project which takes place downstream of the Sariguzel Dam, HEPP and Borrow Sites Project are carried out in different times. Also, realized units are located far from each other. Therefore there will not be a cumulative impact sourced from two projects. Likewise, construction activities of Kandil Dam, HEPP and Borrow Sites Project which is upstream of Sariguzel Dam, HEPP and

Borrow Sites, are performed after completion of construction activities of Sariguzel Project. Because of these reasons, in modeling studies only Sariguzel Dam, HEPP and Borrow Sites Project was taken into consideration and the impacts of other projects was not included in calculations.

The ground level concentrations of the above-mentioned pollutants and dry deposition calculation of PM was carried out with the help of ISCST3. The results of the Model are provided in following sections. The outputs of the model are compared to long and short-term limit values stated in “Air Pollution Control Regulation” and related limit values in Regulation on Control of Industrial Facility Originated Air Pollution, and the results are discussed. Outputs of the model are provided at the end of the report.

7.5. Modeling Results

As a result of modeling study, the maximum daily and annual dust emission values were determined. In addition to this by using methods presented in Section 7.4.2 deposition calculations were made for PM. Results and comparison of results with regulation values are given in Table 7.13.

Table 7.13. Distribution and Maximum Deposition Values for PM

Parameter	Concentration (Maximum)	Permissible Value APCR	Permissible Value RCIFOAP
Daily PM Emission	118.17 (μg/m^3)	300 (μg/m^3)	-
Annual PM Emission	25.96 (μg/m^3)	150 (μg/m^3)	-
Short term deposition value	390.99 (mg/m^{2}day)	650 (mg/m^{2}day)	450 (mg/m^{2}day)
Long term deposition value	84.65 (mg/m^{2}day)	350 (mg/m^{2}day)	

Equivalent concentration curves and equivalent deposition curves for emission concentrations and deposition values given in the table are provided in Figure 7.1 and Figure 7.2.

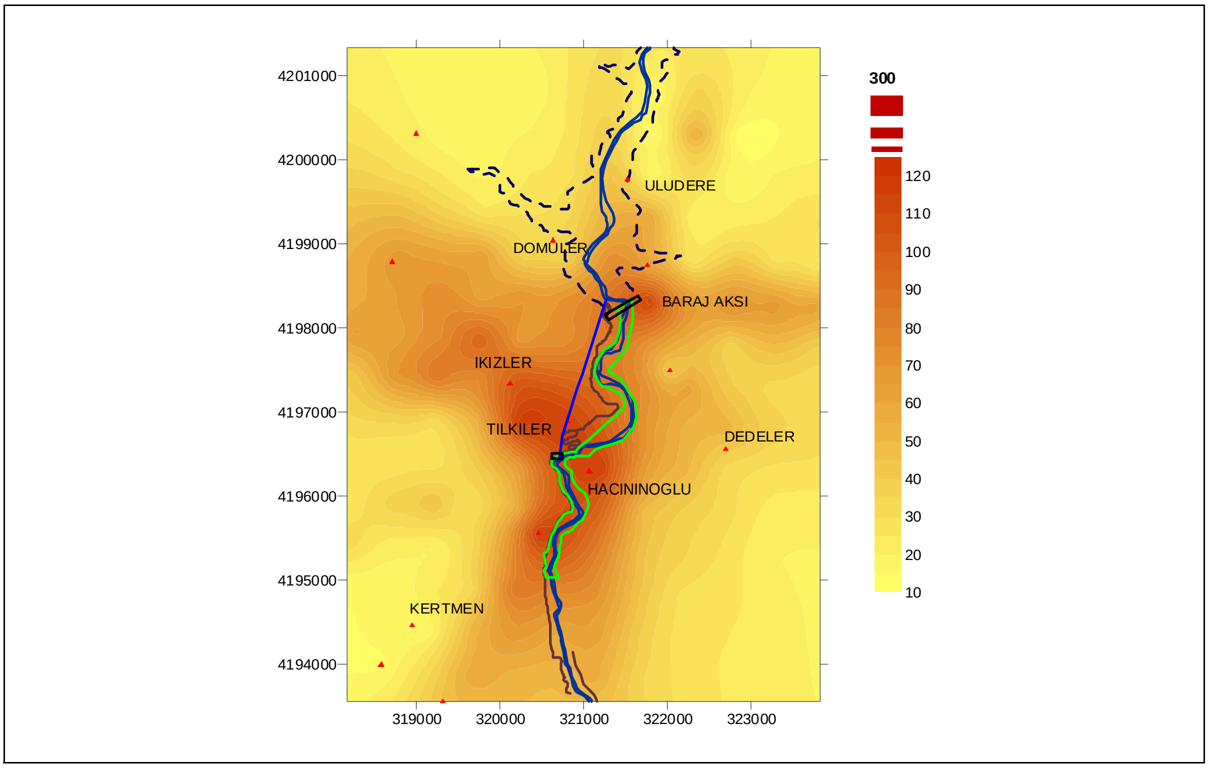


Figure 7.1. Equivalent PM Concentration Curves for Project Construction Phase (μg/m^3)

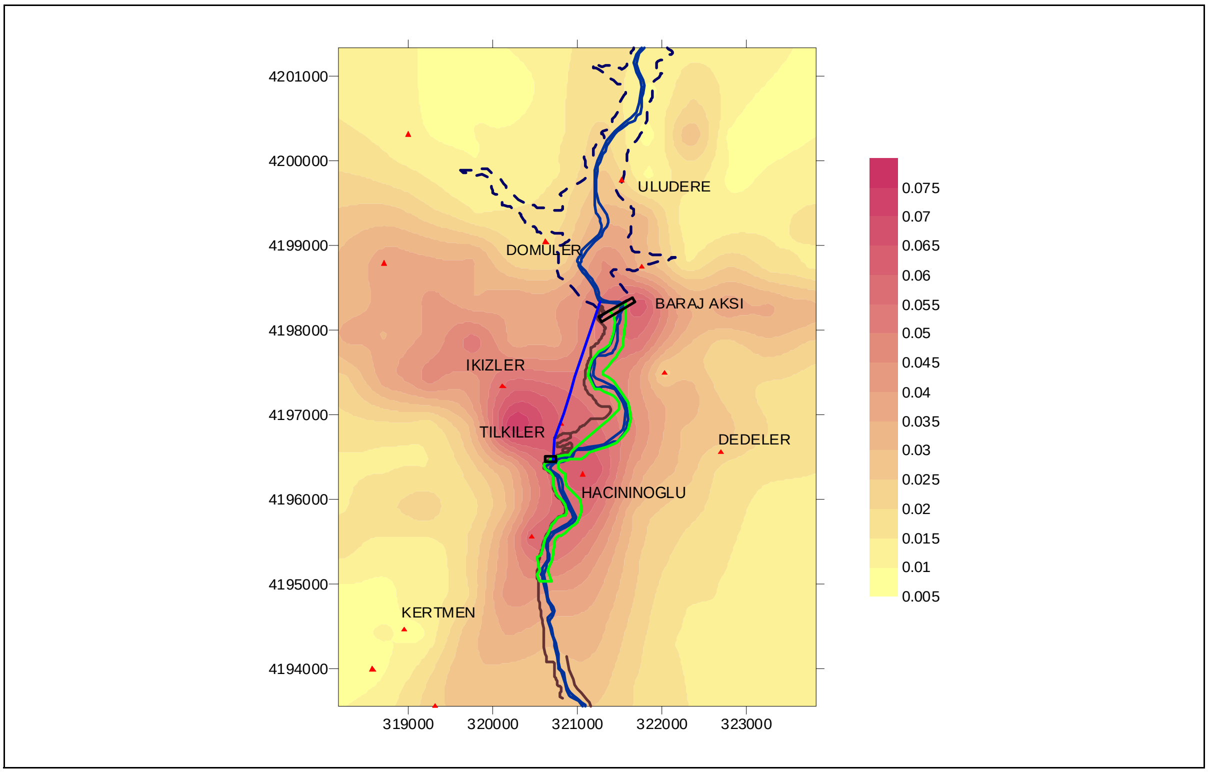


Figure 7.2. Equivalent PM Deposition Curves (g/m^2)

7.6. General Evaluation

In this section emission values that are expected to source from Sariguzel Dam, HEPP and Borrow Sites Project were calculated, and their dispersion behavior under meteorological and topographical factors were investigated.

Dust emissions in the scope of the project will be sourced from: excavations, and blastings during the construction activities of dam axis, HEPP, headwork tunnel, transmission tunnel; loading of excavation waste to trucks; excavation activities for provision of concrete agrega material from borrow site; activities in crashing-grinding-washing facility and batch concrete plant, and movement of vehicles on roads during haulage of excavation waste, agrega material and concrete. In addition to these, emissions such as NO_2, CO, HC, SO_2, PM and lead in PM are expected to source from construction equipment's exhausts.

In the scope of the air quality studies, at first, emission values that are expected to occur from above-mentioned sources were calculated and compared with limit values provided in Appendix 2 of RCIFOAP (dated July 22, 2006, numbered 26236) for places other than stack, and which requires calculation of contribution values to air quality when exceeded In the calculation of emission values it was assumed that no mitigation measure was taken. This value within whole project is 135.56 kg/hour and since it exceeds regulation limits a modeling study was carried out. Likewise emissions which will be sourced from construction equipment's exhausts such as NO_2, CO, HC, SO_2, PM and lead in PM were calculated and because they are lower than the limits in regulations deposition calculations were not carried out.

In modeling study of PM, because the blasting in transmission tunnel and loading of excavation waste from tunnel to trucks will be performed in closed area, the emission values that will be sourced from here were neglected. However, emission values that will be sourced from haulage of this excavation waste were assessed in the scope of the model. In calculation of dust values, it was assumed that emission would be lowered 80% by watering.

Dispersion of calculated dust emissions under meteorological and topographical factors and dry deposition values were calculated by using ISCST3 model. Model results and dispersion are presented in Table 7.13 and Figure 7.1 and Figure 7.2. In table where daily and annual maximum values are presented, emissions are lower than regulation limits.

As it can be seen from Figure 7.1, there is intensity in west part of project area and sources which cause emission. The most important factor here is the dominant wind direction (west-northwest) in the region. Because the region is mountainous and sources are generally located within the valley, dust will not spread much. It is seen in figure that Tilkiler, Ikizler Quarters and Hacininoglu Village are affected from dust emissions. However also here dust emission values are lower than maximum dust emission values and therefore stays below the regulation limit values.

Likewise, when deposition curves given in Figure 7.2 are investigated, it is seen that generally deposition occurs near sources and dispersion occurs in the direction of west-northwest. Maximum deposition value is around 391 mg/m^2day and stays below the limit value. The most important factor that affects the deposition values is high rainfall capacity of the region (annual average total precipitation (rainfall) amount is 731.3 mm). Dust depositions generally affect Hacininoglu Village and Tilkiler Quarter which are located within valley. However, also dust depositions stay under limit values and they will not be a risk.

Crashing-grinding facility in the facility was assessed in the scope of RCIFOAP App. 1. According to this regulation, precipitated dust amount around crashing-grinding facility should not exceed 450 mg/m^2day. As a result of modeling study, even the maximum precipitation amount which includes cumulative effect of sources also other than crashing-grinding facility, is lower than 450 mg/m^2day; therefore dust precipitation value from crashing-grinding facility as a sole source is expected to be lower.

As a result of calculations made and modeling studies, dust and precipitated dust emissions are found to be lower than limits values provided in APCR and RCIFOAP. In order to control dust emissions watering will be performed during excavation activities, and pulverize dust suppressing system will be set up in crashing-grinding facility. With the start of the operation in this dust source unit, water-spray system will also start to operate at the same time and it will continue to work throughout the operation period. Conveyor-belt systems will be designed as closed. Dust holding filters will be attached to silos in ready concrete plant. The topsoil and excavation waste produced during excavation will be pressed and watered together with whole area (pressing of topsoil will be performed gently not to disturb its structure). Loading-unloading operations will be performed without spreading, speed limit will be set for trucks. Besides, vehicles to be used will be new and in well condition as much as possible, and personnel that will work in intense dust emitting works will use masks against dust.

Besides, in order to achieve compliance with air quality standards, the following precautions that are provided in Appendix 1 of Regulation on Control of Industrial Facility Originated Air Pollution will be complied.

- Wind breaker panels will be put or trees will be planted in the area
- Loading-unloading will be performed without spreading.
- Material will be covered with nylon cloth or with materials having particle size greater than 10 mm.
- Top layers will be kept 10% moisturized and equipment required for this will be set up.

In order to lower emissions sourced from equipment and trucks during construction phase, the Regulation to Control Exhaust Gas Emissions Sourced From Motor Vehicles, which came into enforcement after publishing in Official Gazette dated July 8, 2005 numbered 25869, will be complied with; for control of dust and precipitated dust emissions, Air Quality Protection Regulation which came into enforcement after publishing in Official Gazette dated November 2, 1986 and numbered 19269 and Regulation on Control of Industrial Facility Originated Air Pollution, published on Official Gazette dated July 22, 2006 and numbered 26236 will be complied with.

7.7. Model Outputs

*** ISCST3 - VERSION 02035 *** *** ENCON LTD. *** 04/10/07
*** SARIGUZEL PROJESI-ERE *** 11:44:39
**MODELOPTs: PAGE 51
CONC DDEP RURAL ELEV

*** THE MAXIMUM 25 24-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): USTYL1 , USTYL2 , USTYL3 , USTYL4 , USTYL5 , USTYL6 , USTYL7 ,
USTYL8 , USTYL9 , USTYL10 , USTYL11 , USTYL12 , USTYL13 , USTYL14 , USTYL15 , USTYL16 , USTYL17 , USTYL18 , USTYL19
,
USTYL20 , USTYL21 , USTYL22 , USTYL23 , USTYL24 , USTYL25 , USTYL26 , USTYL27 , USTYL28 , USTYL29 , USTYL30 , . . . ,

** CONC OF PM IN MICROGRAMS/M**3 **

RANK	CONC	(YYMMDDHH) AT	RECEPTOR (XR,YR) OF TYPE		RANK	CONC	(YYMMDDHH) AT	RECEPTOR (XR,YR) OF TYPE	
1.	118.16936	(05071624) AT	(320224.00, 4196863.00)	DC	14.	94.86389	(05071624) AT	(319756.00, 4197878.00)	DC
2.	116.65498c	(05060824) AT	(320453.00, 4195554.00)	DC	15.	93.10611c	(05060824) AT	(321191.00, 4195831.00)	DC
3.	115.68863	(05041224) AT	(321207.00, 4196331.00)	DC	16.	92.71769	(05092924) AT	(320802.00, 4196883.00)	DC
4.	114.96468	(05012624) AT	(321771.00, 4198314.00)	DC	17.	90.01321	(05041224) AT	(320802.00, 4196883.00)	DC
5.	113.66456c	(05060824) AT	(320802.00, 4196883.00)	DC	18.	88.99563c	(05011824) AT	(320802.00, 4196883.00)	DC
6.	108.70161c	(05011824) AT	(321771.00, 4198314.00)	DC	19.	85.29377	(05102724) AT	(320802.00, 4196883.00)	DC
7.	106.63454	(05041024) AT	(320802.00, 4196883.00)	DC	20.	84.56696	(05071624) AT	(319240.00, 4197395.00)	DC
8.	106.01681	(05071624) AT	(320802.00, 4196883.00)	DC	21.	83.19003c	(05102424) AT	(320740.00, 4197346.00)	DC
9.	102.73081c	(05060824) AT	(321207.00, 4196331.00)	DC	22.	83.16653c	(05060824) AT	(320159.00, 4194864.00)	DC
10.	102.57404	(05071624) AT	(320240.00, 4197362.00)	DC	23.	82.49268	(05091324) AT	(320802.00, 4196883.00)	DC
11.	98.60668	(05071624) AT	(320114.00, 4197331.00)	DC	24.	81.35462	(05101824) AT	(320802.00, 4196883.00)	DC
12.	98.11932	(05071624) AT	(320740.00, 4197346.00)	DC	25.	81.00778c	(05060824) AT	(321175.00, 4195331.00)	DC
13.	96.64407	(05041224) AT	(321191.00, 4195831.00)	DC					

*** ISCST3 - VERSION 02035 *** *** ENCON LTD. *** 04/10/07
*** SARIGUZEL PROJESI-ERE *** 11:44:39
**MODELOPTs: PAGE 53
CONC DDEP RURAL ELEV

*** THE SUMMARY OF MAXIMUM ANNUAL (1 YRS) RESULTS ***

** CONC OF PM IN MICROGRAMS/M**3 **

GROUP ID		AVERAGE CONC		NETWORK RECEPTOR (XR, YR, ZELEV, ZFLAG)	OF TYPE	GRID-ID
ALL	1ST HIGHEST VALUE IS	25.96171	AT	(320802.00, 4196883.00, 841.00, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	15.71101	AT	(320740.00, 4197346.00, 926.00, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	13.77141	AT	(320224.00, 4196863.00, 900.00, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	11.47055	AT	(320756.00, 4197846.00, 984.00, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	11.15258	AT	(320240.00, 4197362.00, 984.00, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	10.96229	AT	(321207.00, 4196331.00, 815.00, 0.00)	DC	NA
	7TH HIGHEST VALUE IS	10.39342	AT	(320114.00, 4197331.00, 993.00, 0.00)	DC	NA
	8TH HIGHEST VALUE IS	9.73267	AT	(321771.00, 4198314.00, 883.00, 0.00)	DC	NA
	9TH HIGHEST VALUE IS	9.53780	AT	(321723.00, 4196814.00, 860.00, 0.00)	DC	NA
	10TH HIGHEST VALUE IS	9.23723	AT	(320772.00, 4198346.00, 910.00, 0.00)	DC	NA

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
DC = DISCCART
DP = DISCPOLR
BD = BOUNDARY

****
*** ISCST3 Finishes Successfully ***
****

APPENDIX 8

PUBLIC PARTICIPATION

MINUTES OF MEETING

Appendix 8.1. Public Participation Meeting Minutes

ERE/039
3/3

HALKIN KATILIMI TOPLANTISI TUTANAĞI

İlimiz Merkez İlçe, Sarıgüzel Köyü sınırları içerisinde ERE Hidroelektrik Üretim ve Ticaret A.Ş. tarafından kurulması planlanan Sarıgüzel Barajı, HES ve Malzeme Ocakları Projesi hakkında ÇED Yönetmeliğinin 9. maddesi gereğince, halkı yatırım hakkında bilgilendirmek, projeye ilişkin görüş ve önerilerini almak üzere düzenlenmesi gereken "Halkın Katılımı Toplantısı" Sarıgüzel Köyü İkizce İlköğretim Okulu'nda, İl Çevre ve Orman Müdürü Hüseyin ÇANAK başkanlığında, 26 Aralık 2006 tarihinde yapıldı.

İl Çevre ve Orman Müdürü Hüseyin ÇANAK, toplantının amacı ve ÇED Yönetmeliği hakkında kısa bilgi verdikten sonra proje hakkında bilgi vermek üzere Encon Çevre Dan. Ltd. Şti. temsilcisi Özge ÖZDEMİR'e söz hakkı verdi.

Encon Çevre Dan. Ltd. Şti. temsilcisi Özge ÖZDEMİR, Hazırlanan sunu ile Proje hakkında detaylı bilgi verdi.

İl Çevre ve Orman Müdürü Hüseyin ÇANAK, Faaliyet hakkında soru sormak isteyen, görüş ve önerisi olan katılımcıların sırası ile soru, görüş ve önerilerini yöneltebileceklerini söyledi.

Yöre sakinlerinden Halil İbrahim NAVRUZ, Ne kadar alanın kamulaştırılacağını sordu.

ERE Hidroelektrik Üretim ve Ticaret A.Ş. Proje Koordinatörü Cengiz TAŞTEKİN, proje mansapdan başlayarak menba'a doğru sırası ile gidecek. Önce haritalar hazırlanarak nerelerin kamulaştırılacağı tespit edilecek ve akabinde kamulaştırma yapılacak dedi.

Kertmen Köyü, Tilkiler Obasından İsmail TİLKİ, bizim mahallemizin altından tünel geçiyor. Evlerimize ne gibi zararları olacak?

ERE Hidroelektrik Üretim ve Ticaret A.Ş. Proje Koordinatörü Cengiz TAŞTEKİN, tünel için yapılacak etütler sonrasında zarar görme ihtimali bulunan evlerin kamulaştırılarak bedeli ödenecektir dedi.

Kertmen Köyü, Tilkiler Obasından Osman KÖSE, benim kavak bahçem var. Baraj yapılırsa kavak bahçemin su kanalı kapanacak. Benim zararım nasıl telafi edilecek? Dedi..

ERE Hidroelektrik Üretim ve Ticaret A.Ş. Proje Koordinatörü Cengiz TAŞTEKİN, hiç kimsenin hakkının zayi olacağını düşünmemesini, kamulaştırılacak alanların değerlerinin ödeneceğini, baraj altında kalan ve baraj yapımından sonra ihtiyaç duyulacak kanal vs. yapıların kendileri tarafından yeniden yapılacağını söyledi.

Sarıgüzel Köyünden İsmail BAL, Mahalle mezarlığının da su altında kaldığını, bundan bahsedilmediğini, tarla yollarının su altında kalacağını söyledi.

ERE Hidroelektrik Üretim ve Ticaret A.Ş. Yönetim Kurulu Üyesi Zafer BÖKE, biz buraya komşu olmaya geliyoruz. Sürekli buradayız. Her türlü mağduriyetiniz giderilecektir. Hiç kimsenin kaygısı olmasın. Vereceğimiz zararın hepsi tazmin edilecektir. Hakkı olan herkes hakkını alacaktır dedi.

Appendix 8.1. Public Participation Meeting Minutes (Cont'd)

-2-

Kertmen Köyü, Tilkiler Obasından İsmail TİLKİ, yöre halkı işsiz ve fakir, çalıştırılacak adamlar alınırken bu durumun değerlendirilmesini istiyoruz dedi.

ERE Hidroelektrik Üretim ve Ticaret A.Ş. Yönetim Kurulu Üyesi Zafer BÖKE, ihtiyacımız olan elemanın yöreden karşılanması bizimde işimize gelir, öncelikle yöre insanını değerlendireceğiz dedi.

Sarıgüzel Köyünden Hasan CEVİZ, şirket tarafından köylerine kalıcı eserler bırakılıp bırakılmayacağını sordu.

ERE Hidroelektrik Üretim ve Ticaret A.Ş. Yönetim Kurulu Üyesi Zafer BÖKE, günün ihtiyacına göre bizlerde gerekli yatırımı yapacağız. Hiç kaygınız olmasın.
Mezarlar, yeni mezar yerleri belirlenerek, isteyen aileler nezaretinde dini kurallara uygun olarak yeni yere taşınacaktır.

Sarıgüzel Köyü Dömürler Obasından Ali ÇEKİÇ, Bizim evlerimiz ve toprağımız tamamen su altında kalacak. Bunun karşılığında bize az miktarda para verilecek. Para yerine bana Maraş tan arsa veya ev versinler dedi.

İl Çevre ve Orman Müdürü Hüseyin ÇANAK, Şirket değeri üzerinden kamulaştırır. Beğenmezseniz dava açar hakkınızı ararsınız dedi.

ERE Hidroelektrik Üretim ve Ticaret A.Ş. Proje Koordinatörü Cengiz TAŞTEKİN, Bizim amacımız karşılıklı oturup anlaşarak kamulaştırma yapmaktır. Kimseyi mağdur etmeyeceğiz dedi.

ERE Hidroelektrik Üretim ve Ticaret A.Ş. Genel Müdürü Eyüp KOÇAK, Suçatı Barajını işletiyoruz. Yaptıklarımız yapacaklarımızın garantisidir dedi.

İl Çevre ve Orman Müdürü Hüseyin ÇANAK, başka sorusu olan var mı? Diye sordu. Ancak sorusu olan çıkmayınca teşekkür ederek toplantıyı sona erdirdi. 26.12.2006

Zekeriye KÜÇÜKÖNDER Çevre Mühendisi	Kadir AKTEPE Elektrik Elektronik Müh.	Yakup KOZAK ÇED ve Planlama Şube Müdürü

PUBLIC PARTICIPATION MEETING MINUTES

"Public Participation Meeting" related with Sariguzel Dam, HEPP and Borrow Sites Project that is planned to be implemented by ERE within the boundaries of Sariguzel Village was performed in accordance with the 9th Article of EIA (Environmental Impact Assessment) Regulation in order to inform public about investment and take their opinion/recommendation about the project. Meeting was performed in Sariguzel Village Ikizce Elementary School chaired and moderated by Director of Environment and Forestry Provincial Directorate, Huseyin Canak, in December 26, 2006.

After Huseyin Canak, Director of Environment and Forestry Provincial Directorate, gave brief information related with EIA Regulation, Ozge Ozdemir, representative of Encon Environmental Consultation Co., started to give information about the project.

Ozge Ozdemir, representative of Encon Environmental Consultation Co., gave detailed information about the Project via presentation.

Huseyin Canak, Director of Environment and Forestry Provincial Directorate, said that participants could ask their questions and give their recommendations and opinion about the activity.

One of the local people, Halil Ibrahim Navruz, asked how many areas would be expropriated.

Project Coordinator of ERE, Cengiz Tastekin, said that project will be implemented starting from downstream to upstream and locations will be determined by preparing maps, and immediately after this expropriation will be performed.

Ismail Tilki from Tilkiler Quarter of Kertmen Village asked whether the tunnel that will pass under their quarter would damage their houses or not.

Project Coordinator of ERE, Cengiz Tastekin, said that the houses that would be damaged by tunnel construction will be expropriated and compensated.

Osman Kose from Tilkiler Quarter of Kertmen Village asked how would the damage on his poplar garden that will be inundated due to dam construction be compensated.

Project Coordinator of ERE, Cengiz Tastekin, said that all damages will be compensated and values of expropriated areas will be paid, and added that inundated structures such as canal etc. that would be required after dam construction will be restructured by ERE.

Ismail Bal from Sariguzel Village said that cemetery of quarter and field roads will be inundated.

Zafer Boke, Member of the Executive Board of ERE, said that all damages will be compensated.

Ismail Tilki from Tilkiler Quarter of Kertmen Village said that local people are unemployed and poor and added that this situation should be taken into consideration during commitment of employees.

Zafer Boke, Member of the Executive Board of ERE said that required personnel will be chosen firstly from close vicinity.

Hasan Ceviz from Sariguzel Village asked whether any stationary works would be built on their village or not.

Zafer Boke, Member of the Executive Board of ERE said that, they will make necessary investments and added that new places for cemetery will be determined and graves will be moved to new cemetery according to religious rules in the care of families.

Ali Cekic from Domuler Quarter of Sariguzel Village said that their houses and fields will be inundated and a little money will be given to compensate this damage, and wanted a land or a house in Kahramanmaras.

Huseyin Canak, Director of Environment and Forestry Provincial Directorate, said that expropriation is done based on the values of houses, fields, etc. and added that if any objection will occur, you can seek your redress in court.

Project Coordinator of ERE, Cengiz Tastekin, said that their aim is to expropriate based on a mutual agreement. Nobody will be victimized.

Eyup Kocak, General Director of ERE, said that they are operating Sucati Dam and added that what they did until now is the guarantee of what they will do.

Huseyin Canak, Director of Environment and Forestry Provincial Directorate, asked whether people have any more questions or not. Since nobody did have any question, Huseyin Canak closed the meeting. 12.26.2006.

Appendix 8.2. Participant List of Public Participation Meeting

T.C.
KAHRAMANMARAŞ VALİLİĞİ
İl Çevre ve Orman Müdürlüğü

ERE HİDROELEKTRİK ÜRETİM VE TİCARET A.Ş.' NE AİT
"SARIGÜZEL BARAJI, HES ve MALZEME OCAKLARI"
HALKIN KATILIMI TOPLANTISI
KATILIMCI LİSTESİ

26/12/2006

SIRA NO.	ADI-SOYADI	KURUMU	ÜNVANI	İMZA
1	HÜSEYİN ÇANAK	İl Çevre ve Orman Müdürlüğü	İl Müdürü	
2	Yakup KOZAK	İl Çevre ve Orman Müdürlüğü	ÇED ve Planlama Şube Müdürü	
3	Zekeriya KÜÇÜKÖNDER	İl Çevre ve Orman Müdürlüğü	Mühendis	
4	Kadir AKTEPE	İl Çevre ve Orman Müdürlüğü	Mühendis	
5	Aslı USTA DİKMEN	Çevre ve Orman Bakanlığı	Mühendis	
6	Servet VURAL	İl Özel İdaresi	Gn. Sekr. Yrd.	
7	Recep POLAT	İl S.K. Lisesi	Gen. Tm. K.	
8	Cengiz TAŞTEKİN	ERE Hidroelektrik Üretim ve Tic. A.Ş.	Mühendis	
9	Eyüp S. KOÇAK	"	Gn. Md.	
10	Zafer BÖKE	"	Ysn. Kr. Üyesi	
11	TUĞRUL CEM İLTEN	ENCON	PROJE YÖNETİCİSİ	
12	Özge ÖZDEMİR	"	Çev. Müh	
13	Kamil ELMA	Sarıgüzel muhtarı		
14	Yılmaz S. DOĞRULUK	DSİ 20. Bölge Müd.	Jeoloji Müh.	
15	Hasan GÜLER	" " " "	İnşaat Müh.	
16	MEHMET ELBİSTAN	TARIM İL MÜD.	Müh.	
17	Hüseyin GENERAL	" "	Müh.	
18	~~ZAFER BÖKE~~	~~ERE Hidroelektrik~~		
19	Adem SOLMAZ	M. Saplık Müdürlüğü	Şube Müd.	
20	Kemal TOPAL	K. Maraş Orman Bölge Müd.	Orm. Müh.	

Appendix 8.2. Participant List of Public Participation Meeting (Cont'd)

T.C.
KAHRAMANMARAŞ VALİLİĞİ
İl Çevre ve Orman Müdürlüğü

ERE HİDROELEKTRİK ÜRETİM VE TİCARET A.Ş.' NE AİT
"SARIGÜZEL BARAJI, HES ve MALZEME OCAKLARI"
HALKIN KATILIMI TOPLANTISI
KATILIMCI LİSTESİ

26/12/2006

SIRA NO.	ADI-SOYADI	KURUMU	ÜNVANI	İMZA
21	Yüksel Bal	Sarıgüzel		
22	Ali Çelik	Sarıgüzel Köyü		
23	Mehmet Navruz	Sarıgüzel Köyü		
24	Durmuş Koca	Sarıgüzel Köyü		
25	Cuma Çelik	Sarıgüzel Köyü		
26	Muhittin Navruz	Sarıgüzel Köyü		
27	Memili Tilki	Kertmen Köyü		
28	Zeki Elmas	Sarıgüzel		
29	İsmail Bal	Sarıgüzel		
30	Cuma Balta	Sarıgüzel Köyü		
31	Halil İbrahim Navruz	" "		
32	Salim Tosbi	Sarıgüzel		
33	Durdu Mehmet TOS	Sarıgüzel		
34	Selahattin Yoklik	Sarıgüzel		
35	Ali Yıldız	Sarıgüzel		
36	Hasan Ceviz	"		
37	D. Mehmet Ceviz	"		
38	Fevzi Ardıç	Sarıgüzel		
39	Bahçet Ceviz	"		
40	Abdurrahman Kardeş	"		

Appendix 8.2. Participant List of Public Participation Meeting (Cont'd)

T.C.
KAHRAMANMARAŞ VALİLİĞİ
İl Çevre ve Orman Müdürlüğü

ERE HİDROELEKTRİK ÜRETİM VE TİCARET A.Ş.' NE AİT
"SARIGÜZEL BARAJI, HES ve MALZEME OCAKLARI"
HALKIN KATILIMI TOPLANTISI
KATILIMCI LİSTESİ

26/12/2006

SIRA NO.	ADI-SOYADI	KURUMU	ÜNVANI	İMZA
	İsmail Filiz	Kerman		
	Emin [illegible]	Sarıgüzel		
	Erdoğan Söğüt	Sarıgüzel		
	Cuma [illegible]	Dağpınar Sahip		
	Remzi Doğan	Sarıgüzel		
	Ramazan Kabilmış	Sarıgüzel		
	Zekeriya Doğan	Sarıgüzel		
	Yusuf Doğru	Sarıgüzel.		
	İbrahim gözüdeli	Sarıgüzel		
	Cebrail Yılmaz	Sarıgüzel		
	İzzet [illegible]	Sarıgüzel		
	[illegible] Bal	Sarıgüzel		
	İsmail Bal	Sarıgüzel		
	[illegible]	Sarıgüzel		
	[illegible]	Sarıgüzel		
	[illegible]	Sarıgüzel		
	[illegible]	Sarıgüzel		
	Ali [illegible]	Sarıgüzel		
	[illegible]	Sarıgüzel		
	[illegible]	Sarıgüzel		

Appendix 8.2. Participant List of Public Participation Meeting (Cont'd)

T.C.
KAHRAMANMARAŞ VALİLİĞİ
İl Çevre ve Orman Müdürlüğü

ERE HİDROELEKTRİK ÜRETİM VE TİCARET A.Ş.' NE AİT
"SARIGÜZEL BARAJI, HES ve MALZEME OCAKLARI"
HALKIN KATILIMI TOPLANTISI
KATILIMCI LİSTESİ

26/12/2006

SIRA NO.	ADI-SOYADI	KURUMU	ÜNVANI	İMZA
	Maşallah Yardiş	Sarıgüzel		[signature]
	Osman Köse	Kertmen		[signature]
	İsmayıl Çiçek	Sarıgüzel		[signature]
	Mustafa Nevruz	Sarıgüzel		[signature]
	Mustafa balık	Sarıgüzel		[signature]
	Rüstem Polat	Sarıgüzel		[signature]
	Durdu keklik	Sarıgüzel		[signature]
	Turgut Bülbül	Sarıgüzel		[signature]
	Fettah çiçek	Sarıgüzel		[signature]
	Veli Yardiş	Sarıgüzel		[signature]
	Durmuş keklik	Sarıgüzel		[signature]
	İsmail Posma	Sarıgüzel		[signature]
	Ali bal	Sarıgüzel		[signature]
	Ali Balık	Sarıgüzel		[signature]
	Reşit Doğru	Sarıgüzel		[signature]
	Hüseyin tilki	Sarıgüzel		[signature]
	Mikail Polta	Sarıgüzel		[signature]
	Mehmet Çiçek	Sarıgüzel		[signature]
	Mustafa	Doğan		[signature]
	mehmet ~~çiçek~~	çiçek		[signature]

Appendix 8.2. Participant List of Public Participation Meeting (Cont'd)

T.C.
KAHRAMANMARAŞ VALİLİĞİ
İl Çevre ve Orman Müdürlüğü

ERE HİDROELEKTRİK ÜRETİM VE TİCARET A.Ş.' NE AİT
"SARIGÜZEL BARAJI, HES ve MALZEME OCAKLARI"
HALKIN KATILIMI TOPLANTISI
KATILIMCI LİSTESİ

26/12/2006

SIRA NO.	ADI-SOYADI	KURUMU	ÜNVANI	İMZA
	Mehmet Keklik	Sarıgüzel köyü		
	Necati Navur	Sarıgüzel köyü		
	Ali yıldız	Sarıgüzel		
	Yaşar Gekiç	Sarıgüzel		
	Ali Keklik	//		
	İlyas Doğru	Sarıgüzel		
	mehmet Asma	Sarıgüzel		

APPENDIX 9

COMMUNITY RELATIONS PLAN

Appendix 9. Community Relation Plan

9.1. Introduction

The main objective of the Community Relation Plan (CRP) is to build positive, transparent and non-dependent relations among the project, the local settlements and stakeholders. Within this context, the CRP has been prepared to aim for the successful and problem-free realization of Kandil Energy Group Projects for ERE Hidroelektrik Üretim ve Ticaret A.Ş. Community Relation activities will be started before construction and will continue during expropriation, construction and operation phases. Implementation of the community relation plan is critically important for carrying out the project in a socially peaceful environment. In addition, for the community relation plan and activities to be implemented throughout the project, sufficient appropriation must be allocated from the budget. To sum up, public participation is a process that government and nongovernmental organizations communicate with each other, establish partnership, exchange information, and interact in order to design, implement, and analyze development policy, project and programs. This process requires participation and commitment of all stakeholders including sensitive and other disadvantageous groups. Operationally, public participation process includes progressive phases that can be summarized as exchanging information, consultation, negotiation, collaboration and delegation.

9.2. Scope

Community relation activities cover all activities, starting from preconstruction and expropriation phases up to the end of construction phase.

9.3. Objectives

The Community Relation Plan is intended to build healthy relations between stakeholders and project-affected communities. The overarching objective of CRP is to build positive, non-dependent relations between the project and the surrounding communities. These relationships should be based on open communication and mutual respect. Efforts to establish good relations are consistent with the philosophy that the project staff and workers (including the contract workers) are guests in the project area and local residents are their hosts.

Public participation process includes progressive phases such as exchanging information, consultation, negotiation, collaboration and delegation with different functions and scopes. These phases are the part of continuity in which control and responsibility are distributed among primary stakeholders and defined with differences. Sharing information is not the first step in participation process, but the liability or commitment of giving information does not compulsorily include any liability or commitment that accept criticism and change decision process or result. However, this provides a basis for such an information backflow and improves interest and expectation. Consultation is more than giving information. This specifies that the ideas of different sections of public is especially investigated and at least taken into consideration in the design or implementation of the said application. This requires that a) suggested subjects can be modified b) the existence of adequate political demand and institutional capacity that allow the presentation of the changes. Last decision is still of sponsors and regulatory agencies. Negotiation/Collaboration is the phase when sponsors and beneficiaries reduce to a common denominator, collaborate to solve the problems, share sources and make use of consensus or bargain. Delegation represents giving co-decision when all the authority or at least some specified decisions are completely given to beneficiary and/or stakeholder.

9.3.1. Objectives of Community Relation Plan

- Establish an open dialogue with the project affected communities and stakeholders,
- Inform disadvantageous groups and ensure the participation of these groups effectively to the activities about exchanging and sharing ideas,
- Maximize positive social impacts of the project and prevent or mitigate any adverse social impacts,
- Dissemination of information to the public directly or via press conferences, meetings, brochures, leaflets etc.
- Provide all information in a language understandable to all stakeholders,
- Monitor the project affected community concerns and information requirements,
- Maintain open communications between the project owner and project area residents, i.e. the project affected persons (the PAPs) and other stakeholders,
- Provide community relations, contact channels through which all relevant parties can receive information on the project and probable adverse environmental and social impacts,
- Provide all stakeholders including the PAPs, involved agencies, local and state officials, the media, local and national as well as global nongovernmental organizations with accurate, timely information and progress reports through all available means, specifically, by means of issuing press releases, distributing brochures and leaflets that contain factual information about the project to all stakeholders, holding news conferences and community meetings etc,
- Ensure that all PAPs and relevant stakeholders attend all public meetings organized by involved agencies,
- Employ local labor for the construction phase and ensure a fair and transparent recruitment process,
- Give priority to the project affected communities in local employment,
- Encourage and assist subcontractors to employ local labor and services,
- Develop and support community development projects,
- Respond and record all inquiries and written correspondences apropos of various aspects of the project phases and impacts,
- Receive and record all incoming grievances, concerns and feedbacks regarding the project,

- Whenever any reaction, conflict or controversy arises in connection with issues related to the project impacts, try to appease them through open communication,
- Whenever positive or negative views about the project take place on the media, follow the course of news from beginning to end, and see whether there is a real attempt to pervert the course of news with respect to the ultimate implication relevant to progress of the project (via Ajans Press),
- If necessary, modify the Community Relations Plan to address changes in community needs to maintain accuracy and close correspondence during different phases of the project,
- Prepare Remedial Action Plan to reflect changes in any concerns held by all relevant stakeholders. After the remedial action plan is prepared as needed at any stage of project, the Community Relations Plan will be revised to address implementation of the selected remedial actions,
- Keep chronology and description of significant site events to identify key community concerns and issues.

9.4. Identification of Relevant Stakeholders

All stakeholders should be categorized in terms of their concerns and effectiveness. This can be achieved with a detailed stakeholder analysis. A stakeholder database will be formed and this database will be updated and reviewed quarterly by the relevant department (Community Relation Department). The notable stakeholders can be as follows:

- Local Public (Settlements completely or partly affected from the project),
- The print and visual media (mainly local but also regional),
- The local governmental organizations,
- The regional governmental organizations,
- Local governments (Municipalities),
- Regional business organizations
- Nongovernmental organizations,
- Political parties,
- National nongovernmental organizations,
- International nongovernmental organizations,
- Academic institutions

9.5. Community Relation Activities

The community relation experts or officers will be the principal contact point for PAPs and stakeholders in the affected area. In addition, community relation experts/officers will be responsible for the implementation of public participation and consultation program. The success of the public participation and consultation program will surely be supported by those who will voluntarily participate and take an active part in the implementation of the program. The activities in the scope of the public participation and consultation program are as follows:

- Informal meetings with PAPs in places like coffee house, face-to-face conversation, i.e. providing local villagers with the opportunity to express their concerns when necessary,
- Ensuring the sustainability of effective implementation using more qualitative methods and providing the participation of disadvantageous groups (such as older, handicaps, women and young) more efficiently (in such implementations volunteers that will be chosen among the PAPs will also help to success these activities),
- Providing information to all stakeholders having doubts via information offices and improving communication networks between stakeholders preferably in project area and close vicinity,
- Organizing meetings and/or forums with local and regional state authorities and political parties in order to have agreement,
- Preparing presentations and holding meetings for local and provincial governmental organizations to periodically inform state and local officials of each phase of project,
- Collaborating with local media agencies to keep tabs on the news related to the project,
- Briefing print press and media bulletin monthly or once in two months,
- Providing news releases to local television stations, radio stations, and newspapers,
- Having deep interviews with stakeholders, and conducting surveys to maintain exchanging of ideas in informal meetings and to obtain detailed information about the subject,
- Arranging monthly informing meetings to inform PAPs about the project,
- Organizing press conferences for local media and national media when needed,
- Having deep interviews with PAPs and stakeholders, holding focus group meetings for vulnerable groups and conducting surveys to obtain detailed information about the opinions and feelings of the PAPs,

- Formal project status briefings for academic institutions, community groups and concerned residents (if needed) to periodically provide information about significant project developments. Such meetings will be arranged to respond and incorporate any concern into the decision making process as appropriate,

- Preparing fact sheets to summarize major activities about the project in clear and understandable language. Fact sheets may be mailed to interested stakeholders.

- Informing PAPs and stakeholders in Project Information Office, when needed, discussing in the office and recording these discussions.

In addition to these, Community Relations Representative (CRR) will be responsible for the implementation of the grievance and redress mechanism. All grievances and complaints related to the project, concerns, feedbacks and community relation activities conducted would be recorded and followed up by the CRR of the project. Regarding local employment, activities such as employment announcements, interviews and recruitment process will be implemented by the CRR.

9.6. Remedial Action Plan

The remedial action plan, which is an integral part of the CRP, includes the problems that may arise out of distorted communications among the local community, all other stakeholders and the project sponsor. At the same time, the remedial action plan envisages inputs/data that lead any misinformed party to rise against the project. Forms of distorted communications include:

- Misunderstanding of the PAPs and relevant stakeholders of possible social and environmental impacts of the project, which may be caused by politically biased newspaper news and politically motivated NGOs, or social movements stir occasionally up feelings against the project,

- Misrepresentation of project goals and project implementations by relevant stakeholders,

- Conscious and biased exaggeration of adverse/positive social and environmental impacts by opposing groups,

- Modifying Community Relation Plan in order to maintain consistency with the changes in public needs during different phases of project,

- Keeping chronology and description of significant site events to identify key community concerns and issues.

After a remedial action is taken, reactions for the subject remedial action will be reported. The reaction report summarizes concerns and comments on any aspect of the project and responses to them by the project sponsor. The reaction report should address to the selected actions to any discontent and remaining concerns, and also provide information on the lack of contentment after available remedial actions are proposed. Furthermore, It should identify gaps between end result of the remedial actions and remaining grievances to take further action.

9.6.1. Remediation of Possible Discontent

Any discontent that is likely to result from disinformation due to inappropriate and mislead communication between the local community and stakeholders must be foreseen to take immediate remedial action. Ideally, the project sponsor should act in advance before discontents and grievances come on the scene, or it should deal with problems ahead of the time before actual occurrence. Yet, if it fails to do so, as it is impossible to anticipate all the exigencies beforehand, the description of possible concerns and remedial action to handle them with the aid of factual information is required.

Community Relation Department and its employees will be responsible for the implementation of all activities mentioned above. In this fame, implementing of community relation plan and monitoring and reporting this plan regularly will be the main responsibility of this group.

APPENDIX 10

EMERGENCY ACTION PLAN

Appendix 10. Emergency Action Plan

10.1. Purpose

The purpose of Emergency Action Plan (EAP) is to protect lives that would be affected from the situations such as emergency events that are not foreseen during construction and operation phases of the project, natural disasters (fire, earthquake, lightning etc.), hold up, communication loss, incidents in facility, wrong operation, disordered maintenance, and reduce the potential impact on dam and close settlements.

In order to implement Emergency Action Plan that will be prepared during the construction phase successfully, Emergency Action Plan Coordinator and team will be employed by dam owner/representative, and trainings will be given to these personnel and their mission will be identified. Furthermore, in order to minimize complication in potential emergency situations and implement the plan successively, each personnel should know his/her own responsibility.

Accidents, natural disasters, etc. that may occur during dam construction and operation, the mitigation measures, mission and responsibilities of emergency action team in such situations are given below.

10.2. Mission and Responsibility

Dam Owner or Representative

All the activities that are performed in the construction and operation phase of the project are in dam owner/representative‘s responsibility. Other mission and responsibility of dam owner/representative in Emergency Action Plan are identified below:

- Selection of Emergency Action Plan Coordinator and approval of Emergency Action Team,
- Attending annual reviewing EAP meetings and approval of last version of EAP,
- Approval of activities that are not included in EAP during emergency situation,
- Analyzing the reports prepared after emergency situation.

Coordinator of Emergency Action Plan (EAPC)

Execution of the activities improved against an unexpected situation consistent with the prepared Emergency Action Plan, and improving this plan are in the responsibility of Emergency Action Plan Coordinator. Other mission and responsibilities of EAPC are summarized below.

- Establishment of Emergency Action Team,
- Training participants for emergency situations,
- Division of mission in Emergency Action Team,
- Reviewing EAP with the help of participants annually, making necessary changes and distribution of copy of updated plan to participants,
- Controlling functionality and suitability of EAP by performing maneuvers in specified intervals,
- According to type of emergency situation, determination of the people that will be contacted during emergency action, and keeping contact information of these people in written form in a place that everybody in team can reach,

- Correcting the changes in contact information of EAP team and people that will be contacted in emergency situations in contact list,
- In emergency situations, controlling Emergency Action Team in order to comply with EAP,
- After the approval of dam owner/representative, implementing required activities that are independent of EAP when EAP is not adequate, and correcting these in EAP in later process,
- Reviewing the situation with the help of emergency action team after emergency situation, preparing report, and submitting this report to dam owner/representative.

Emergency Action Team (EAT)

Emergency Action Team is established by taking the individual ability of employees working under the responsibility of EAPC into consideration. Mission and responsibilities of EAT are identified below:

- Attending trainings and maneuvers given to implement EAP,
- Reviewing EAP annually with the help of EAPC,
- Informing EAPC when an emergency situation occurs,
- According to type of emergency situation, implementing necessary activities in consistent with EAP,
- Notifying contact people that are determined for emergency situations in advance,
- Reviewing the situation with the help of EAPC after emergency situation, and contributing to preparation of report.

10.3. Possible Emergency Situations

10.3.1. Accidents

Potential accidents during dam construction and operation may cause injuries and even death. In such situations, firstly, EAT that know first aid and present in the construction site and village clinics in close settlements will be applied, if necessary, the nearest hospital is planned to be applied. Emergency action team that knows first aid and/or doctor present in the construction site will do first medical attention to the injuries that would occur in the facility. Meanwhile, to prevent more damage, other team members will ensure environmental safety, investigate fire possibility, and clean spilled materials.

As a result of some accidents, fuel, oil, gas or other hazardous liquids may mix with surface waters. When fuel or other hazardous materials are seen in the surface waters, EAT will intervene this, and if required, fire department will be applied. Fuel, oil, gas and other floating materials will be separated from water via skimming. These materials will be collected in sealed tanks and disposed in accordance with “Waste Oil Control Regulation”.

Mission and Responsibilities of First Aid and Rescue Team

1) All of the team members should know the type of injury risk in each region.

2) In emergency situations, team members investigate for injured people in their region of responsibility. In this manner, team leader can distribute the tasks if needed.

3) When an injured person is found, team starts to first aid immediately. However, if team hesitates about first aid, an authorized person should be waited. Any attempt that may worsen the situation of injured person should be prevented.

4) During first aid activities, a member that will be nominated by the leader wait in the road junction where ambulance will most possibly come, and direct the ambulance to incident location.

5) After ambulance arrives, team members help first aid activities if needed.

6) During first aid activities, team prevents the entrance of irrelevant people to the region.

7) After necessary medical attentions are done and/or injured person is sent to the hospital, record related with the accident is prepared.

8) If any injured person is not found after emergency situation, team members are counted, and present under the head of team leader collectively.

10.3.2. Fire

Fire will be prevented by improving mitigation measures for the fires that may occur in the dam construction site in advance. Furthermore, fire extinguisher and equipment will be put into working area against potential fire.

In addition to this, since especially forestry areas are sensitive to fire, making fire is not allowed in dry seasons except for construction site, and mitigation measures will be taken to prevent fire in the activities.

Mission and Responsibilities of Emergency Action Team

1) All of the team members should know the type of fire risk in each region. In addition, type of extinguisher and action that will be used in different types of fire should be known.

2) In emergency situations, team members make fire investigations in their region of responsibility. In this manner, team leader can distribute tasks if needed.

3) If fire is determined or emergency situation is fire itself, team starts to activities of extinguishing without panic under the control of team leader.

4) During extinguishing activities, a member that will be nominated by the leader wait in the road junction where fire engine will most possibly come, direct the fire engine to fire area.

5) After fire engine arrives, team members help extinguishing activities if needed.

6) During extinguishing activities, team prevents the entrance of irrelevant people to the region.

7) If any fire is not determined after emergency situation, team members are counted, and present under the head of team leader collectively.

10.3.3. Earthquake

Trainings related to safety of personnel working in the facility during earthquake will be given. If an earthquake greater than 5 in Richter scale is determined in the region, and people on duty feel earth tremor or are exposed to specified earthquake criteria (feeling by everybody, not walking normally, moving/falling of objects in the shelf, moving/falling of furniture, fracturing of plaster and wall, quaking of trees and shrubs and hearing of their noise), steps given below will be followed and implemented;

1. General visual control of dam after earthquake will be done.

2. After audits and controls are completed, findings will be notified to relevant authority.

3. If dam is collapsing or had a great damage as much as it will collapse, settlements located in the downstream, and other dams will be informed immediately. Furthermore, water level in reservoir will be reduced under control.

4. If dam is not collapsing but an important damage on its embankment is determined, water level in the reservoir will be reduced under control. Water releasing will continue until dam embankment is controlled by an authorized engineer or dam owner.

5. If dam is damaged but damage is not as serious as it causes dam collapse, nature will be observed immediately and collapse risk of dam will be assessed. Afterwards, given instructions will be applied via contacting with local and national institutions.

10.3.4. Flood Risk

Water level of dam may increase because of excess rainfalls or flows in dam location. In such situations, in order to prevent adverse impacts on dam embankment, reservoir area and its surrounding, settlements located in the downstream, and fields, steps given below will be followed.

1. Local emergency units and DSI will be contacted. Information related to below subjects will be given.

    - Existing reservoir height and free board (safety portion/height) height
    - Reservoir rising velocity
    - Weather conditions (past-momentary-future)
    - Discharge/drainage conditions of downstream of river
    - Leakage velocity from canals

2. If it is possible, discharge amounts at gates and spillways will be increased incrementally.

3. Public living at the downstream will be warned and discharge amount will be increased incrementally in order not to affect them adversely.

4. Depending on the change in water level, increased or decreased leakage will be controlled.

5. Areas close to dam foundation or crest will be controlled against leakage, decadence, collapse, slide and other dangerous situations. If such situations exist, settlements located at the downstream and DSI will be informed immediately.

10.3.5. Leakage-Spill

Road or Soil Contamination

Oil, fuel, dye etc., may spill on project area and/or roads that are used. Activities that will be performed in 30 minutes after these materials spill on road are important in terms of prevention of contamination. Activities that would be performed in case of leakage and/or spill after an accident are as follows:

1. Leakage source will be determined and if possible, leakage will be stopped,

2. In order to prevent leakage spread, sandbags will be placed around the leakage source,

3. In case of big leakages, depending on the slope of land, a small canal will be opened in the down part of the leakage, and this canal will be filled with absorbent material to collect leakage in this canal and prevent mixing with groundwater,

4. Pollutant material, polluted absorbent material and soil will be put into bags that have proper size and durability, and these bags will be labeled,

5. In case of a big leakage and spill, accident will be reported to construction supervisor immediately,

6. Truck, construction equipment etc. that had an accident on road will be brought as fast as possible into their normal position, and this will prevent more leakage and spill.

Leakages to Water Resources

Absorbent pontoons will be used in order to collect and prevent oil-fuel and chemical leakage dispersion originated from an accident to water resources. Inner part of the absorbent pontoons will be filled with absorbent fibrous material. When required, more than one pontoon will be used by taking the amount of leakage and flow of water resource into consideration. Water quality of water resource will be monitored in the downstream and upstream of leakage point.

Pollutant Preventing Equipment and Materials

- Sand: Sand is a good material that absorbs pollutant on road and soil, and prevents pollutant dispersion, but sand should be dry.
- Sawdust: Sawdust is one of the materials used to prevent dispersion of liquid material spilled to the road and soil.
- In the leakages originating from tin, barrel etc., material will be poured to firm tin, barrel, etc. immediately.
- Absorbent pontoons.
- Absorbent bolster.
- Plastic gloves, special clothes and personal protective equipment.

- Vacuum pump.
- Barrel resistant to chemical material.
- Firm plastic bag.

10.4. End of Emergency Situation and Following Activities

If the conditions indicating emergency situation has finished at the dam site, and EAPC has approved the safety of project area, necessary units are informed related to subject. Emergency action team assesses the general situation under the head of EAPC, and recording related with emergency situation is prepared. Accordance of activities, which were performed during emergency situation, to EAP is discussed, and necessary adjustments and/or additions are integrated into the plan. If an unforeseen emergency situation exists, this situation is taken into content of EAP, and mitigation measures and action plans related with this situation is improved.

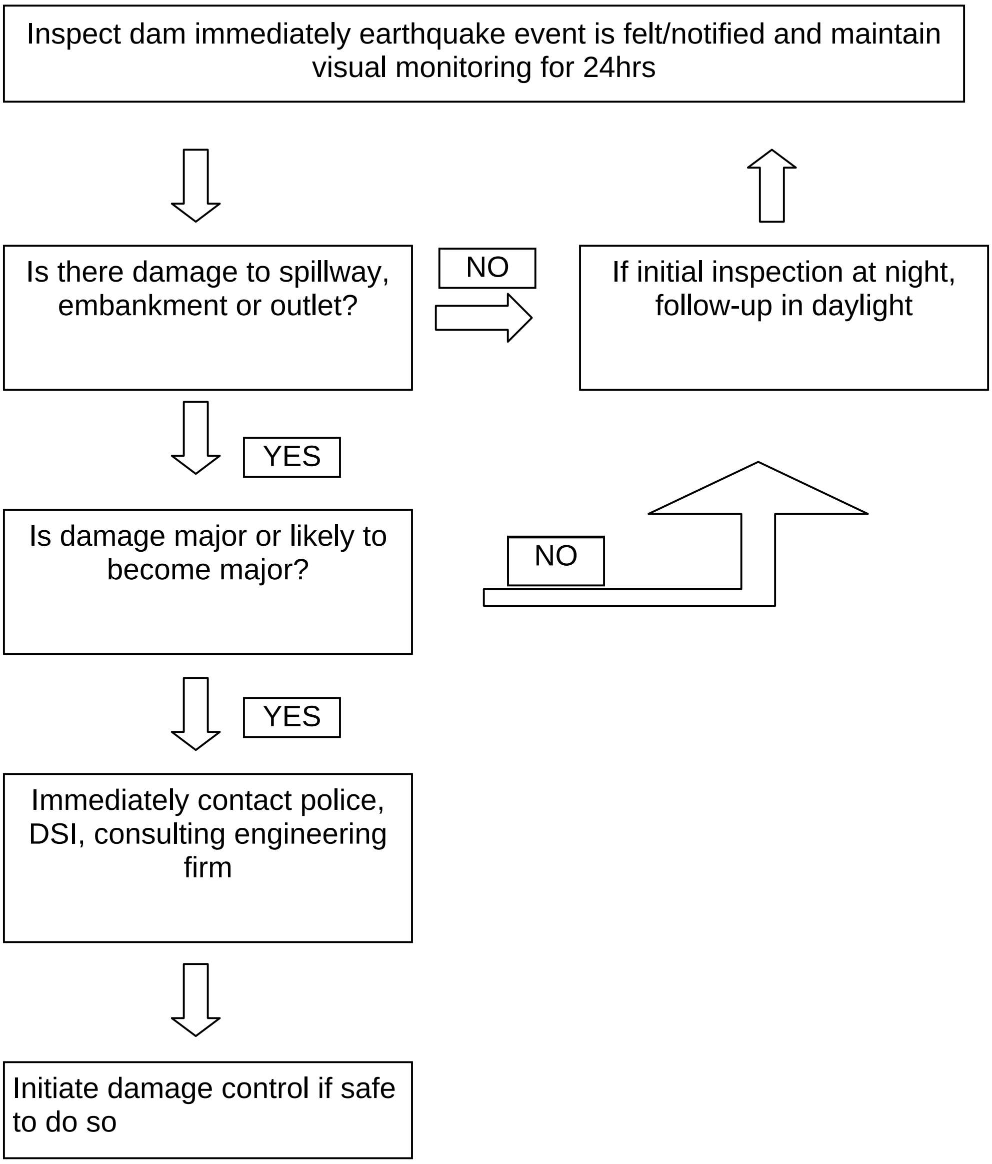
CONTACT LIST FOR EMERGENCY SITUATIONS:

Name of the Institution	Name of the person to be contacted	Contact Number	
Kahramanmaras Police Department			Office
			Out of Office
Kahramanmaras Governorship			Office
			Out of Office
General Directorate of Catastrophe Works			Office
			Out of Office
Hacininoglu Village Headman			Office
			Out of Office
Sariguzel Village Headman			Office
			Out of Office
Kertmen Village Headman			Office
			Out of Office
Fire Brigade			Office
			Out of Office
General Directorate of State Hydraulic Works			Office
			Out of Office

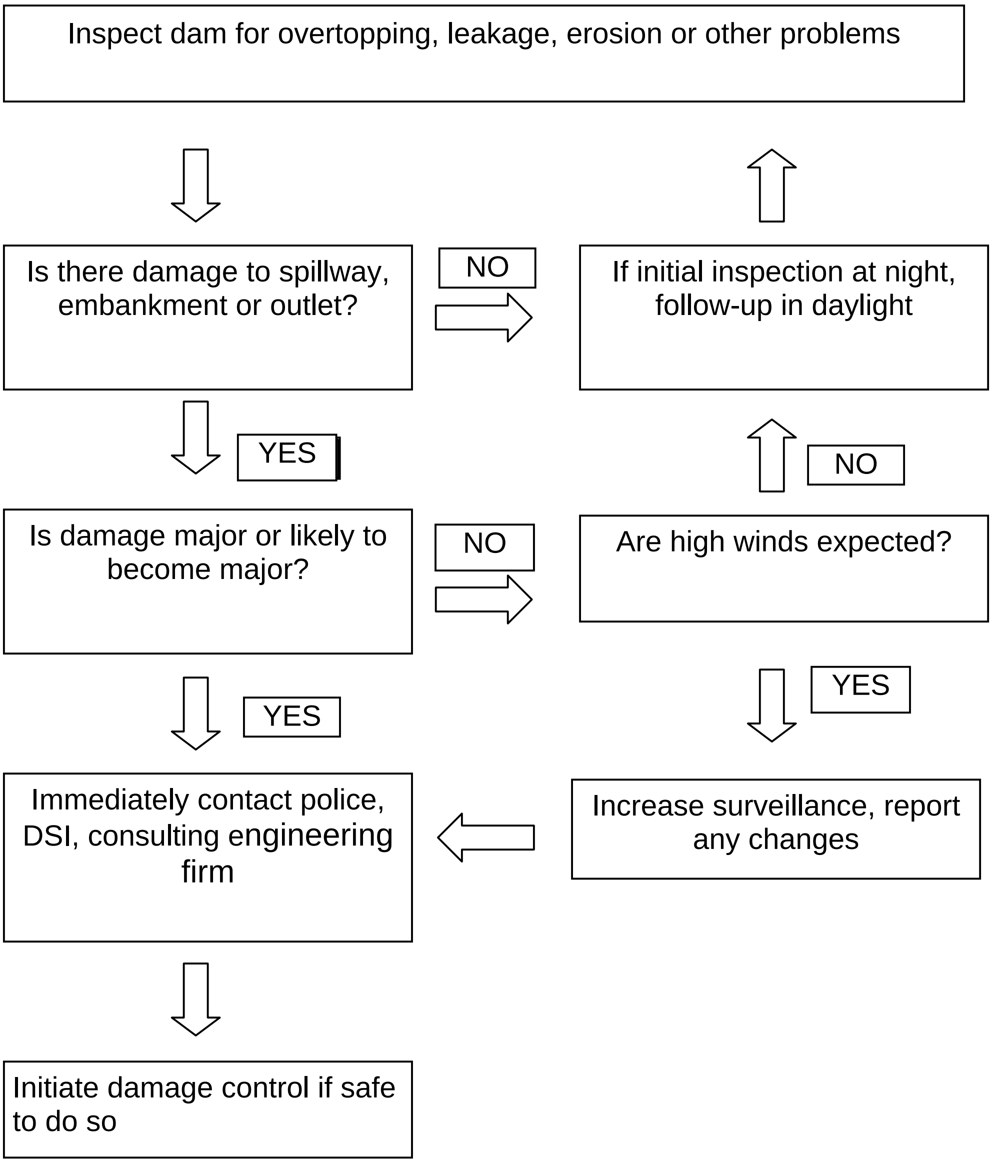
Name of the Institution	Name of the person to be contacted	Contact Number
.... Hospital		Office
		Out of Office
Consultant Engineering Firm		Office
		Out of Office
Menzelet Dam Administration		Office
		Out of Office
Hacininoglu Regulator Administration		Office
		Out of Office
Kandil Dam Administration		Office
		Out of Office
		Office
		Out of Office
		Office
		Out of Office
		Office
		Out of Office
		Office
		Out of Office

EMERGENCY ACTION FLOW-CHART:

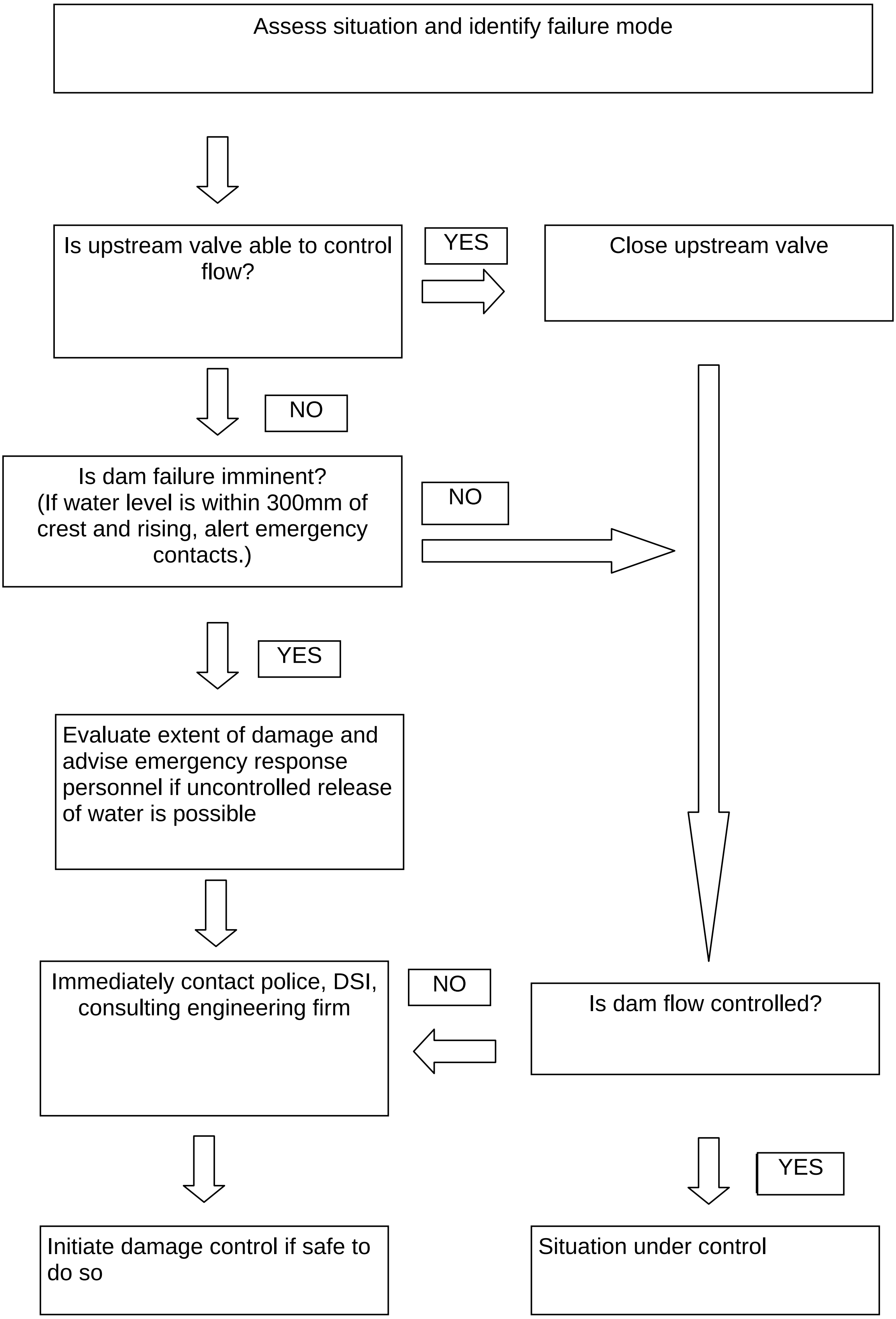
Earthquake:



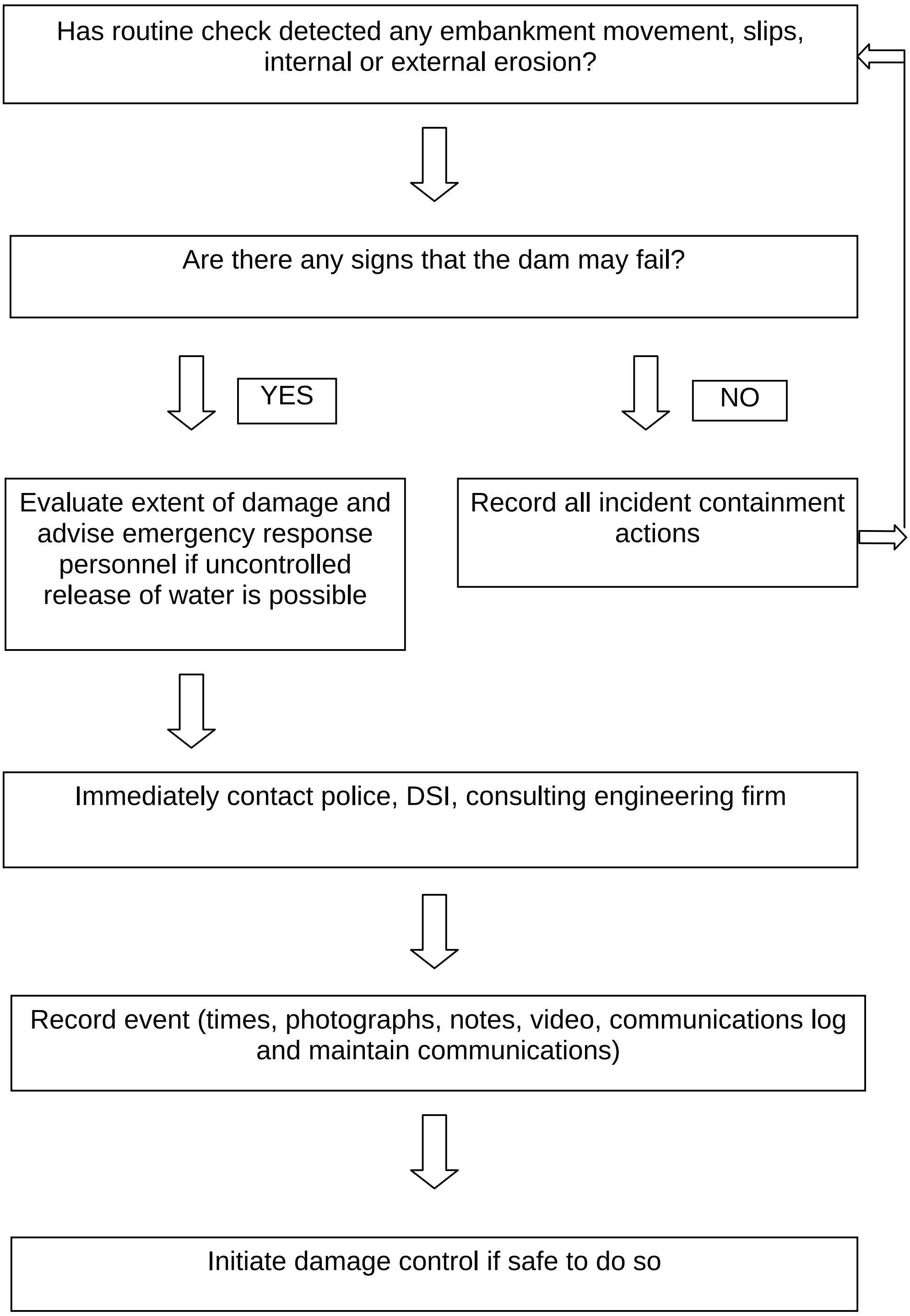
Extreme flood/ flow:



Outlet Works Failure:



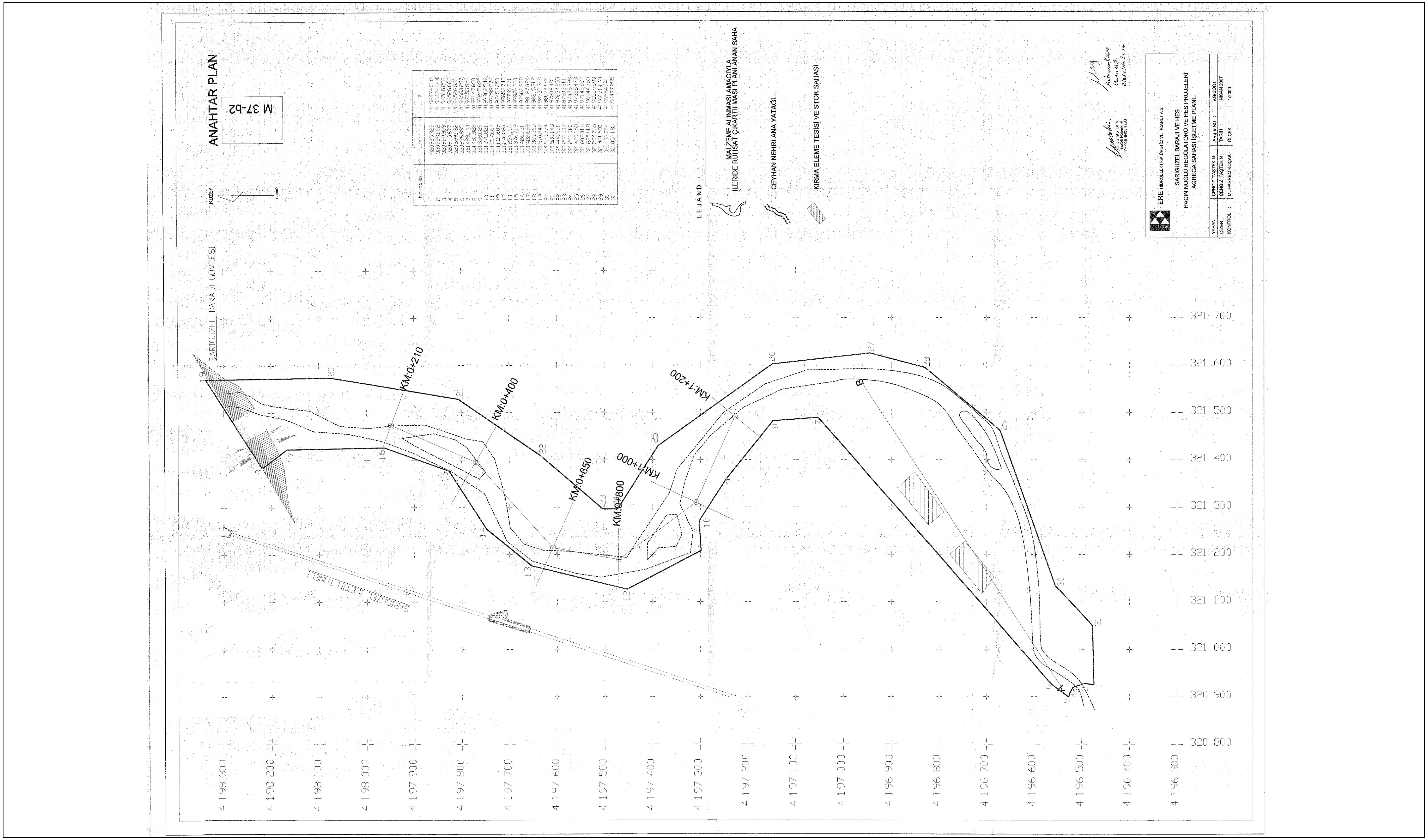
Major Structural Failure:



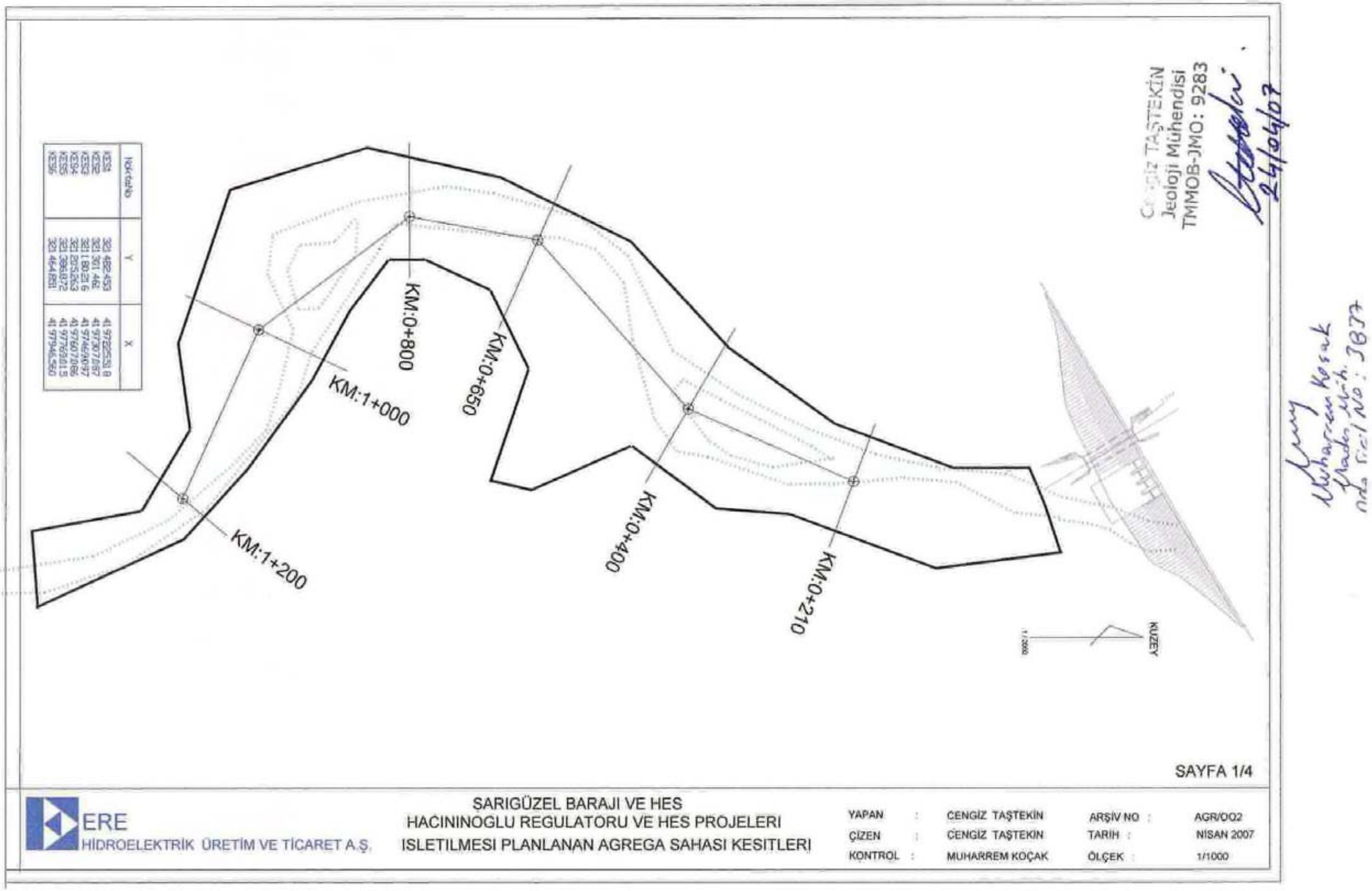
APPENDIX 11

BORROW SITES PRODUCTION PLAN

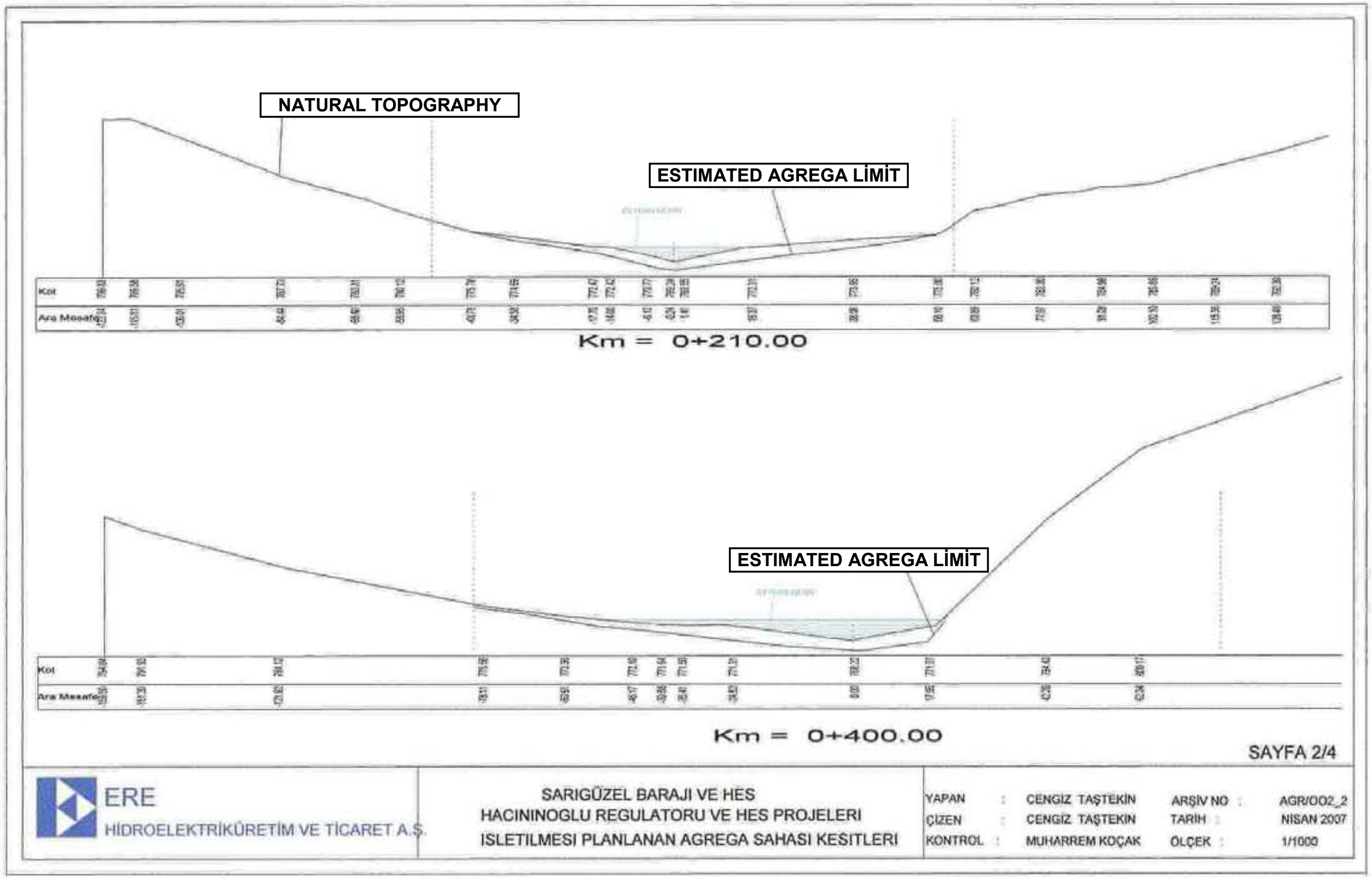
Appendix 11. Borrow Site Production Plan



Appendix 11.1. Sariguzel Dam and HEPP, Hacininoglu Regulator and HEPP Projects Agrega Site Operation Plan



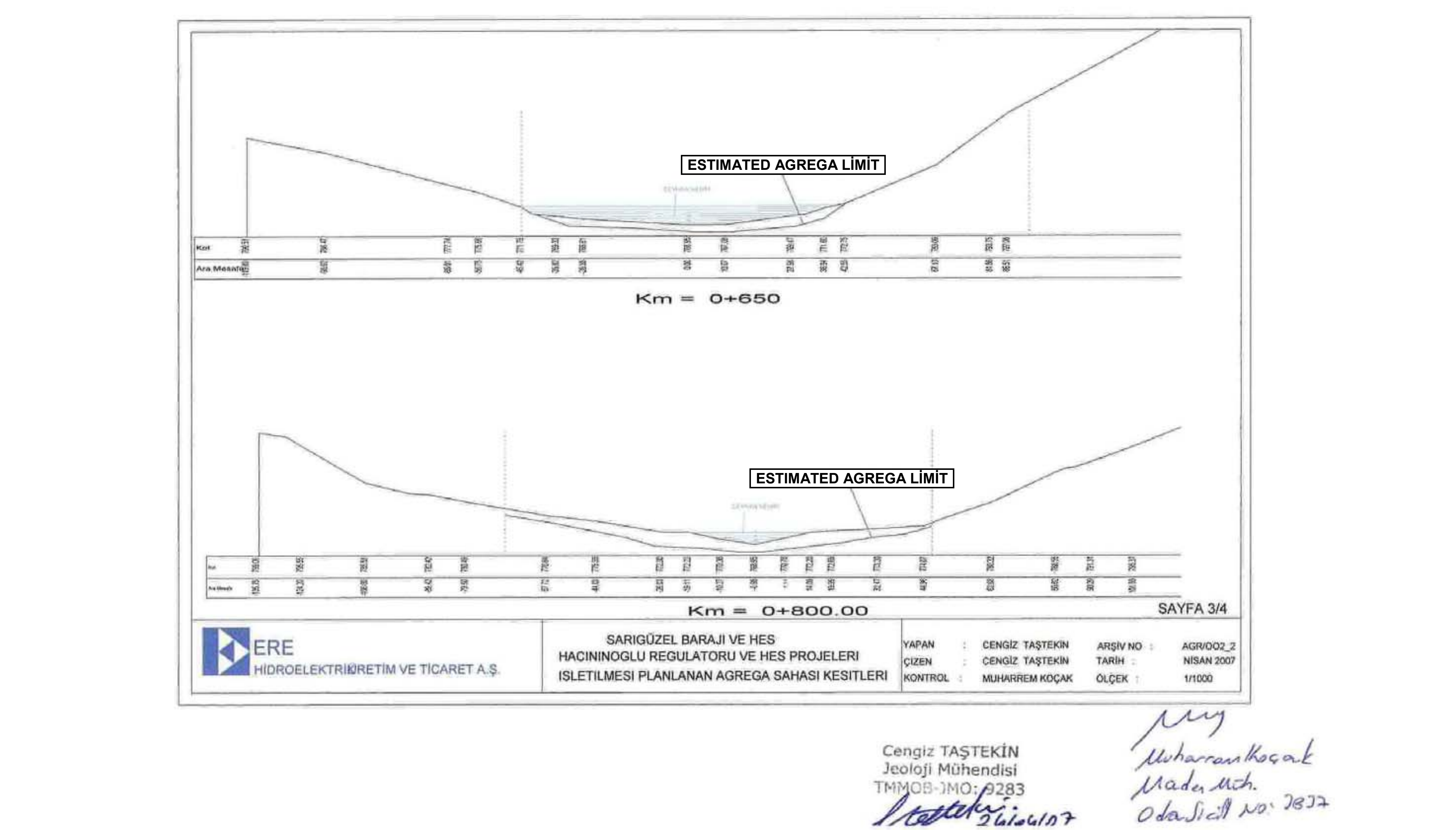
Appendix 11.2. Sariguzel Dam and HEPP, Hacininoglu Regulator and HEPP Projects, Sections of Agrega Site that is Planned to be Operated



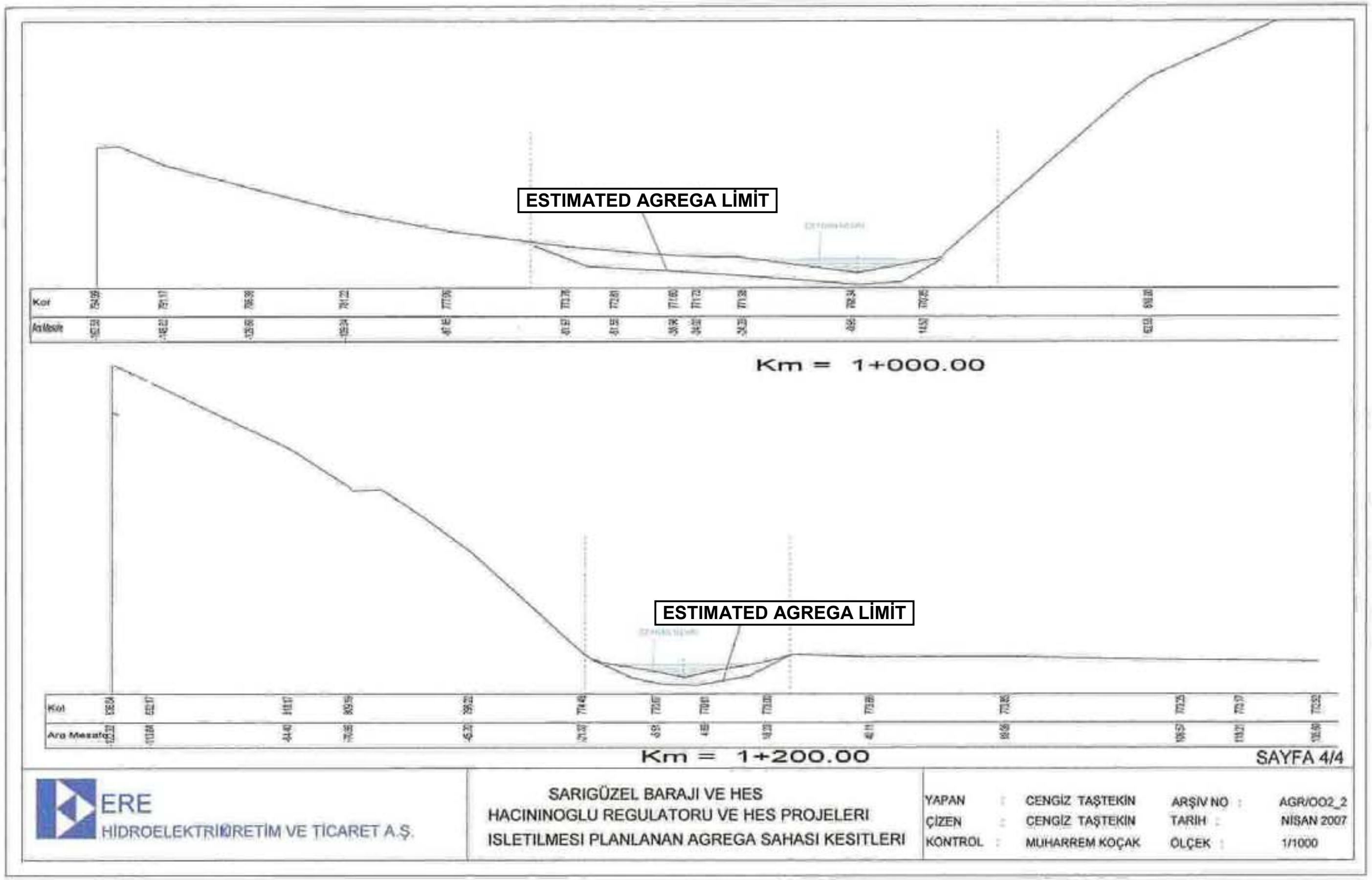
Cengiz TAŞTEKİN
Jeoloji Mühendisi
TMMOB-JMO: 9283
24/04/07

Muharrem Koçak
Maden Müh.
Oda Sicil No: 3837

Appendix 11.2. Sariguzel Dam and HEPP, Hacininoglu Regulator and HEPP Projects, Sections of Agrega Site that is Planned to be Operated (Cont'd)



Appendix 11.2. Sariguzel Dam and HEPP, Hacininoglu Regulator and HEPP Projects, Sections of Agrega Site that is Planned to be Operated (Cont'd)



Cengiz TAŞTEKİN
Jeoloji Mühendisi
TMMOB-JMO: 9283
26/04/07

Muharrem Koçak
Maden Müh.
Oda Sicil No: 7837

Appendix 11.2. Sariguzel Dam and HEPP, Hacininoglu Regulator and HEPP Projects, Sections of Agrega Site that is Planned to be Operated (Cont'd)

REFERENCES

- Devlet Su İşleri Genel Müdürlüğü Web Sitesi: http://www.dsi.gov.tr/
- Elektrik İşleri Etüt İdaresi Genel Müdürlüğü Web Sitesi: http://www.eie.gov.tr/
- Elektrik İşleri Etüt İdaresi Genel Müdürlüğü, 1935-2000 Yılları Su Akımları Aylık Ortalamaları, 2003, Ankara
- EN-SU Mühendislik Müşavirlik Ltd. Şti. Hacınınoğlu HES Mühendislik Jeolojisi Raporu
- ERE Hidroelektrik Üretim ve Ticaret A.Ş., 2004. Kandil Enerji Grubu Projesi Fizibilite Raporu, Ankara
- TMMOB, 2006. Türk Mühendis ve Mimar Odaları Birliği, TMMOB Enerji Raporu, Ankara, 2006.
- Hidroloji, Prof. Dr. Mehmetçik Bayazıt, Birsen Yayınevi, 1995
- National Transportation Library, U.S. Department of Transportation http://ntl.bts.gov/data/rail05/rail05.html
- S. Abdol Chini and William J. Mbwambo, 1996: http://www.p2pays.org/ref/06/05817.pdf
- T.C. Çevre ve Orman Bakanlığı, 2005. T.C. Kahramanmaraş Valiliği, İl Çevre ve Orman Müdürlüğü. Kahramanmaraş İli Çevre Durum Raporu, Kahramanmaraş
- T.C. Çevre ve Orman Bakanlığı, Doğa Koruma ve Milli Parklar Genel Müdürlüğü, 2006. 46 Kahramanmaraş İli Avlanmaya Açık ve Kapalı Alanlar Haritası, Ankara.
- T.C. Çevre ve Orman Bakanlığı. 2004. Çevresel Etki Değerlendirilmesi Yönetmeliği, T.C. Resmi Gazete, No: 25672, Tarih: 16.12.2004.
- T.C. Çevre ve Orman Bakanlığı. 2004. Su Kirliliği Kontrolü Yönetmeliği, T.C. Resmi Gazetesi No: 25687, Tarih: 31.12.2004.
- T.C. Çevre ve Orman Bakanlığı. 2006. Endüstri Tesislerinden Kaynaklanan Hava Kirliliğinin Kontrolü Yönetmeliği, T.C. Resmi Gazete, No: 26236, Tarih: 22.07.2006.
- T.C. Ekinözü Kaymakamlığı Web Sitesi: http://www.ekinozu.gov.tr/
- T.C. Enerji Piyasası Düzenleme Kurumu (EPDK), 2006. Hacınınoğlu Regülatörü ve Hidroelektrik Santrali Üretim Lisansı. Tarih: 09/03/2006
- T.C. Enerji Piyasası Düzenleme Kurumu Web Sitesi: http://www.epdk.org.tr/
- Devlet Planlama Teşkilatı Müsteşarlığı, Bölgesel Gelişme, İllerin Performans Göstergeleri: http://www.dpt.gov.tr/bgyu/ipg/akdeniz/kmarasPER.pdf

- T.C. Enerji Piyasası Düzenleme Kurumu, 2002. Elektrik Piyasası Lisans Yönetmeliği. T.C. Resmi Gazete, No: 24836, Tarih: 04.08.2002.
- T.C. Enerji ve Tabi Kaynaklar Bakanlığı, 2001. 4628 sayılı Elektrik Piyasası Kanunu. T.C. Resmi Gazete, No: 24335, Tarih: 03.03.2001.
- T.C. Enerji ve Tabi Kaynaklar Bakanlığı, Devlet Su İşleri Genel Müdürlüğü Etüd ve Plan Dairesi Başkanlığı, 2006. Kandil Enerji Grubu Projeleri HES Su Kullanım Hakkı Anlaşması, Ankara.
- Bayındırlık ve İskan Bakanlığı. 2006. 5543 sayılı İskan Kanunu, T.C. Resmi Gazetesi No: 26301, Tarih: 26.09.2006
- Bayındırlık ve İskan Bakanlığı. 2002. İskan uygulama Yönetmeliği, T.C. Resmi Gazetesi No: 24849, Tarih: 17.08.2002
- Devlet Su İşleri. 1983. 2942 sayılı Kamulaştırma Kanunu, T.C. Resmi Gazetesi No: 18215, Tarih: 08.11.1983 ve değişiklik yapılan, 4650 sayılı Kamulaştırma Kanunu T.C. Resmi Gazetesi No: 24390, Tarih: 05.05.2001
- T.C. Kahramanmaraş Valiliği Web Sitesi: http://www.kahramanmaras.gov.tr/
- TUİK (DİE), 2000. 2000 Genel Nüfus Sayımı
- Türk Mühendis ve Mimarlar Odaları Birliği (TMMOB), 2006. TMMOB Enerji Raporu, Ankara.
- United Nations Development Program (UNDP), 1990. TEM Traffic and Construction Noise Control Report. United Nations Development Programme (UNDP) and Economic Commission for Europe (ECE), February 1990.
- Uslu, O., Türkman, A., 1987. Su Kirliliği ve Kontrolü, T.C. Başbakanlık Çevre Genel Müdürlüğü Yayınları Eğitim Dizisi, Ankara
- EPA, 1971; "noise from constructıon equipment and operations, building equipment,and home appliances”

CURRICULUM VITAE

ID NO	18725675618
NAME AND SURNAME	Tolga H. BALTA
FATHER NAME	Yılmaz
PLACE AND DATE OF BIRTH	Ankara / 1970
OCCUPATION	Environmental Engineer
LANGUAGE	English (fluent)
EDUCATION	1992-1996 / Middle East Technical University, Department of Environmental Engineering, Ankara, Turkey BSc. Degree in Environmental Engineering 1988-1992 / Middle East Technical University, Department of Environmental Engineering, Ankara, Turkey MSc. Degree in Environmental Engineering
MAILING ADDRESS/ PHONE NUMBER/ E-MAIL ADDRESS (OFFICE)	ENCON Environmental Consultancy Co. Reşit Galip Cad. No:120 06700 – Gaziosmanpaşa – Ankara (312) 447 71 22 (pbx) tbalta@encon.com.tr
PROFESSİONAL EXPERİENCE	1997- / ENCON Environmental Consultancy Co., Managing Partner 1996-1997 / Ministry of Environment, Consultant to the Minister and Undersecretary 1993-1996 / Ministry of Environment, General Directorate of EIA and Planning, Environmental Engineer 1992-1993 / State Institute of Statistics, Waste Inventory of Turkish Industry, Researcher
SHORT CV	Mr. Balta, being one of the partners of the company, is in charge of the executive decisions. He is responsible for the development of new projects and management of ongoing studies. His professional experience includes project development and management, planning studies and environmental cost benefit analysis. He has participated in the preparation of environmental assessments for various projects being funded by international funding institutions (e.g. World Bank, IFC, OPIC, American Ex-Im Bank), especially water development projects. He is also experienced on Environmental Legislation and had taken an important role during the Revision studies for the Turkish Environment Law, Establishment Law of the Ministry of Environment and EIA Regulation.
CONTRIBUTION TO THE REPORT	Whole Report

TÜRKİYE CUMHURİYETİ
ORTA DOĞU TEKNİK ÜNİVERSİTESİ
ANKARA

Tolga Hikmet Balta

FEN BİLİMLERİ
ENSTİTÜSÜ

ÇEVRE MÜHENDİSLİĞİ

ENSTİTÜ ANABİLİM DALI YÜKSEK LİSANS PROGRAMINDA
GEREKLİ ÇALIŞMALARI BAŞARI İLE TAMAMLAYARAK

ÇEVRE YÜKSEK MÜHENDİSİ

ÜNVANINI VE

YÜKSEK LİSANS

DERECESİNİ TANINAN BÜTÜN YETKİLERİYLE BİRLİKTE
ALMAYA HAK KAZANMIŞTIR

12 Eylül 1996

REKTÖR
PRESIDENT

T.C. ORTA DOĞU TEKNİK ÜNİVERSİTESİ REKTÖRLÜĞÜ 1923

ENSTİTÜ MÜDÜRÜ
DIRECTOR OF THE GRADUATE SCHOOL

REPUBLIC OF TURKEY
MIDDLE EAST TECHNICAL UNIVERSITY
ANKARA

Tolga Hikmet Balta

HAVING SATISFACTORILY COMPLETED ALL REQUIREMENTS OF
THE MASTER'S PROGRAMME IN THE DEPARTMENT OF

ENVIRONMENTAL ENGINEERING

IN THE GRADUATE SCHOOL OF
NATURAL AND APPLIED SCIENCES

HAS BEEN AWARDED THE DEGREE OF

MASTER OF SCIENCE IN
ENVIRONMENTAL ENGINEERING

WITH ALL THE PRIVILEGES
CONNECTED THEREUNTO

September 12,1996

ENSTİTÜ ANABİLİM DALI BAŞKANI
CHAIRMAN OF THE DEPARTMENT

CURRICULUM VITAE

ID NO	10174185670
NAME AND SURNAME	İ. Haluk ÇERİBAŞI
FATHER NAME	Ali
PLACE AND DATE OF BIRTH	Ankara, 1971
OCCUPATION	Environmental Engineer
LANGUAGE	English (fluent)
EDUCATION	1995-2000 / Middle East Technical University (METU), Department of Environmental Engineering, Ankara, Turkey PhD. Degree in Environmental Engineering 1993-1994 / University of Illinois Department of Civil Engineering, Urbana-Champaign, Illinois, ABD MSc. Degree in Environmental Engineering 1988-1992 / METU, Department of Environmental Eng., Ankara, Turkey BSc. Degree in Environmental Engineering
MAILING ADDRESS/ PHONE NUMBER/ E-MAIL ADDRESS (OFFICE)	ENCON Environmental Consultancy Co. Reşit Galip Cad. No:120 06700 – Gaziosmanpaşa – Ankara/TURKEY (312) 447 71 22 (pbx) haluk@encon.com.tr
PROFESSİONAL EXPERİENCE	2001-- / Middle East Technical University, Part-time Instructor 1995--/ ENCON Cevre Danismanlik Ltd. Sti., Managing Partner 1994 / University of Illinois at Urbana-Champaign, Illinois, USA Office of International Student Affairs, Fulbright Students and Activities Assistant Adviser 1994 / Middle East Water Talks - Symposium on Technical Issues, University of Illinois at Urbana-Champaign, Illinois, USA, Organization Committee Member 1992-1993 / Middle East Technical University, Department of Environmental Engineering, Research and Teaching Assistant 1992 / State Statistics Institute, Waste Inventory of Turkish Industry, Researcher
PROJECTS PARTICIPATED	Participated in more than 40 projects in ENCON Çevre Danışmanlık Ltd. Şti. Some of the most recent projects he has participated can be listed as ; • Yusufeli Dam and HEPP Project, Artvin, Yusufeli Preparation of Environmental and Social Impact Assessment (EIA) Report for submission to international finance organization (World Bank) • Establishment of an EIA Centre in Turkey • MEDAWARE Project Development Tools and Guidelines for the Promotion of the Sustainable Urban Wastewater Treatment and re-use • Efemcukuru Gold Mine Project, Efemcukuru, Izmir Preparation of EIA Report for submission to MoEF • Kisladag Gold Mine Project, Kisladag, Usak Preparation of EIA Report for submission to MoEF and for submission to international finance organizations in accordance with World Bank Operational Directives (mainly OP 4.01) and European Community (EC) guidelines and directives.
CONTRIBUTION TO THE REPORT	Whole Report

TÜRKİYE CUMHURİYETİ
ORTA DOĞU TEKNİK ÜNİVERSİTESİ
ANKARA

İbrahim Haluk Çeribaşı

FEN BİLİMLERİ
ENSTİTÜSÜ

ÇEVRE MÜHENDİSLİĞİ

ENSTİTÜ ANABİLİM DALI DOKTORA PROGRAMINDA
GEREKLİ ÇALIŞMALARI BAŞARI İLE TAMAMLAYARAK

DOKTORA

DERECESİNİ TANINAN BÜTÜN YETKİLERİYLE BİRLİKTE
ALMAYA HAK KAZANMIŞTIR

14 Eylül 2000

REKTÖR
PRESIDENT

REPUBLIC OF TURKEY
MIDDLE EAST TECHNICAL UNIVERSITY
ANKARA

İbrahim Haluk Çeribaşı

HAVING SATISFACTORILY COMPLETED ALL REQUIREMENTS OF
THE DOCTORAL PROGRAMME IN THE DEPARTMENT OF

ENVIRONMENTAL ENGINEERING

IN THE GRADUATE SCHOOL OF
NATURAL AND APPLIED SCIENCES

HAS BEEN AWARDED THE DEGREE OF

**DOCTOR OF PHILOSOPHY IN
ENVIRONMENTAL ENGINEERING**

WITH ALL THE PRIVILEGES
CONNECTED THEREUNTO

September 14,2000

T.C. ORTA DOĞU TEKNİK ÜNİVERSİTESİ REKTÖRLÜĞÜ 1923

ENSTİTÜ MÜDÜRÜ
DIRECTOR OF THE GRADUATE SCHOOL

ENSTİTÜ ANABİLİM DALI BAŞKANI
CHAIRPERSON OF THE DEPARTMENT

CURRICULUM VITAE

ID NO	10864080704
NAME AND SURNAME	Tuğrul Cem İÇTEN
FATHER NAME	Kaya Muhsin
PLACE AND DATE OF BIRTH	Ankara / 1972
OCCUPATION	Environmental Engineer
LANGUAGE	English (fluent)
EDUCATION	1995- / Middle East Technical University, Department of Environmental Engineering, Ankara, Turkey MSc. Degree in Environmental Engineering (Master Thesis study not completed) 1990-1995 / Middle East Technical University, Department of Environmental Engineering, Ankara, Turkey BSc. Degree in Environmental Engineering
MAILING ADDRESS/ PHONE NUMBER/ E-MAIL ADDRESS (OFFICE)	ENCON Environmental Consultancy Co. Reşit Galip Cad. No:120 06700 – Gaziosmanpaşa – Ankara/TURKEY Tel : (312) 447 71 22 (pbx) tcicten@encon.com.tr
PROFESSİONAL EXPERİENCE	2004- / ENCON Çevre Danışmanlık Ltd. Şti., Project Manager 2000-2004 / Tugal Çevre Teknolojisi Ulaşım ve Enerji Müşavirlik Ltd. Şti. Ankara Region Director (2003-2004) / Project Manager 1997-2000 / Ministry of Environment and Forestry, General Directorate of EIA and Planning, Environmental Engineer 1995-1997 / Middle East Technical University, Ankara, Turkey Department of Environmental Engineering, Research and Teaching Assistant
PROJECTS PARTICIPATED	Mr. ICTEN is Project Manager of ENCON Environmental Consultancy Co. and has over nine years of experience in environmental engineering issues. Up to date, he has been in charge of coordination, management and team leading of various national and international projects in the field. He acted as regional manager for two years.
CONTRIBUTION TO THE REPORT	Whole Report

33517

ÖRNEK

20 ARALIK 2002

T.C.
ANKARA
Yirmidördüncü Noterliği

TÜRKİYE CUMHURİYETİ
ORTA DOĞU TEKNİK ÜNİVERSİTESİ
ANKARA

Yüksek Şeref Öğrencisi

Tuğrul Cem İçten

MÜHENDİSLİK
FAKÜLTESİ

ÇEVRE MÜHENDİSLİĞİ

BÖLÜMÜNDE
GEREKLİ ÇALIŞMALARI BAŞARI İLE TAMAMLAYARAK

ÇEVRE MÜHENDİSİ
ÜNVANINI VE
LİSANS

DERECESİNİ TANINAN BÜTÜN YETKİLERİYLE BİRLİKTE
ALMAYA HAK KAZANMIŞTIR

2 Temmuz 1995

REKTÖR
PRESIDENT

08 KASIM 2005

T.C. ORTA DOĞU TEKNİK ÜNİVERSİTESİ REKTÖRLÜĞÜ 1923

DEKAN
DEAN

REPUBLIC OF TURKEY
MIDDLE EAST TECHNICAL UNIVERSITY
ANKARA
№ 34822

High Honour Student

Tuğrul Cem İçten

HAVING SATISFACTORILY COMPLETED ALL REQUIREMENTS OF
THE DEPARTMENT OF

ENVIRONMENTAL ENGINEERING

IN THE FACULTY OF
ENGINEERING

HAS BEEN AWARDED THE DEGREE OF
BACHELOR OF SCIENCE IN
ENVIRONMENTAL ENGINEERING

WITH ALL THE PRIVILEGES
CONNECTED THEREUNTO

July 2,1995

BÖLÜM BAŞKANI
CHAIRMAN

T. C.
ANKARA OTUZSEKİZİNCİ
NOTERLİĞİ
SURET
İşbu Suret Aslına Uygundur.
Tasdik Ederim.
ANKARA 38. NOTERİ
N.İlknur AYTEKİN

T.C. OTUZSEKİZİNCİ NOTERLİĞİ ANKARA 1923

T.C.

CURRICULUM VITAE

ID NO	10228179426
NAME AND SURNAME	Okan BİLKAY
FATHER NAME	Oktay
PLACE AND DATE OF BIRTH	Ankara, 1971
OCCUPATION	Mechanical Engineer
LANGUAGE	English (fluent)
EDUCATION	1996-2003 / Middle East Technical University (METU), Department of Mechanical Engineering, Ankara, Turkey PhD. Degree in Mechanical Engineering 1993-1996 / METU, Department of Mechanical Engineering, Ankara, Turkey MSc. Degree in Mechanical Engineering 1988-1993 / METU, Department of Mechanical Engineering, Ankara, Turkey BSc. Degree in Mechanical Engineering
MAILING ADDRESS/ PHONE NUMBER/ E-MAIL ADDRESS (OFFICE)	ENCON Environmental Consultancy Co. Reşit Galip Cad. No:120 06700 – Gaziosmanpaşa – Ankara/TURKEY (312) 447 71 22 (pbx) bilkay@encon.com.tr
PROFESSİONAL EXPERİENCE	1997- / ENCON Cevre Danismanlik Ltd. Sti., Managing Partner 1994-1997 / METU, Research Assistant
PROJECTS PARTICIPATED	Participated in more than 30 projects in ENCON Çevre Danışmanlık Ltd. Şti. Some of the most recent projects he has participated can be listed as ; • Yusufeli Dam and HEPP Project, Artvin, Yusufeli Preparation of Resettlement Action Plan (RAP) for submission to international finance organization (World Bank) • Kisladag Gold Mine Project, Kisladag, Usak Preparation of an Environmental Implementation Report for submission to MoEF • OPET Petroleum Company EHS Audit, Istanbul, Izmit Environmental, Key Health and Safety Audit and also Due Diligence Study of OPET Petroleum Products Facilities. • Kisladag Gold Mine Project, Kisladag, Usak Preparation of EIA Report for submission to MoEF and for submission to international finance organizations in accordance with World Bank Operational Directives and European Community (EC) guidelines and directives. • Ahiboz Electrical Equipment Production Facility Preparation of EIA Preliminary Report for submission to MoEF • Bartin Project under Turkey Emergency Flood and Earthquake Recovery (TEFER) Project funded by the World Bank
CONTRIBUTION TO THE REPORT	Section IV, Section V, Appendix 6

TÜRKİYE CUMHURİYETİ

ORTA DOĞU TEKNİK ÜNİVERSİTESİ

ANKARA

Okan Bilkay

FEN BİLİMLERİ
ENSTİTÜSÜ

MAKİNA MÜHENDİSLİĞİ

ENSTİTÜ ANABİLİM DALI DOKTORA PROGRAMINDA
GEREKLİ ÇALIŞMALARI BAŞARI İLE TAMAMLAYARAK

DOKTORA

DERECESİNİ TANINAN BÜTÜN YETKİLERİYLE BİRLİKTE
ALMAYA HAK KAZANMIŞTIR

07 Mart 2003

REKTÖR
PRESIDENT

REPUBLIC OF TURKEY

MIDDLE EAST TECHNICAL UNIVERSITY

ANKARA

Okan Bilkay

HAVING SATISFACTORILY COMPLETED ALL REQUIREMENTS OF
THE DOCTORAL PROGRAMME IN THE DEPARTMENT OF

MECHANICAL ENGINEERING

IN THE GRADUATE SCHOOL OF
NATURAL AND APPLIED SCIENCES

HAS BEEN AWARDED THE DEGREE OF

**DOCTOR OF PHILOSOPHY IN
MECHANICAL ENGINEERING**

WITH ALL THE PRIVILEGES
CONNECTED THEREUNTO

March 7, 2003

T.C.
ORTA DOĞU TEKNİK ÜNİVERSİTESİ REKTÖRLÜĞÜ
1923

ENSTİTÜ MÜDÜRÜ
DIRECTOR OF THE GRADUATE SCHOOL

ENSTİTÜ ANABİLİM DALI BAŞKANI
CHAIRPERSON OF THE DEPARTMENT

ODTÜ-SEM

ORTA DOĞU TEKNİK ÜNİVERSİTESİ SÜREKLİ EĞİTİM MERKEZİ

Sayın Okan Bilkay

MERKEZİMİZCE 16-20 EKİM 2006 TARİHLERİ ARASINDA YAPILAN

"Çevre Gürültüsüne İlişkin Şikayetlerin Değerlendirilmesi, Ölçümü, Denetimi ve İzlenmesine İlişkin A Tipi Sertifikaya Yönelik Eğitim"

PROGRAMININ 30 SAATİNİN ..30..... SAATİNE KATILARAK VE 100 PUAN ÜZERİNDEN .95...... PUAN ALARAK BU BELGEYİ ALMAYA HAK KAZANMIŞTIR.

Eğitmen	Eğitmen	SEM Başkanı
Prof. Dr. H. Nevzat ÖZGÜVEN	Prof. Dr. Mehmet ÇALIŞKAN	Prof. Dr. Hüseyin VURAL

CURRICULUM VITAE

ID NO	24811540364
NAME AND SURNAME	Hüseyin TEKİN
FATHER NAME	Necati
PLACE AND DATE OF BIRTH	Nevşehir, 1967
OCCUPATION	Environmental Engineer
LANGUAGE	English (fluent)
EDUCATION	1989-1992/ Middle East Technical University, Department of Environmental Engineering, Ankara, Turkey MSc. Degree in Environmental Engineering 1984-1989 / Middle East Technical University, Department of Environmental Engineering, Ankara, Turkey BSc. Degree in Environmental Engineering
MAILING ADDRESS/ PHONE NUMBER/ E-MAIL ADDRESS (OFFICE)	ENCON Environmental Consultancy Co. Reşit Galip Cad. No:120 06700 - Gaziosmanpaşa – Ankara/TURKEY (312) 447 71 22 (pbx) htekin@encon.com.tr
PROFESSIONAL EXPERİENCE	1995--/ ENCON Cevre Danismanlik Ltd. Sti., Managing Partner 1993-1994 / TITAS A.S., Environmental Engineer 1993/ OLMUKSA A.Ş., İstanbul, Environmental Engineer 1992-1993/ Ministry of Environment, Foreign Relations Department, Environmental Engineer 1987-1992/ Middle East Technical University, Environmental Engineering Department, Research Assistant
PROJECTS PARTICIPATED	Participated in more than 50 projects in ENCON Çevre Danışmanlık Ltd. Şti. Some of the most recent projects he has participated can be listed as ; • Yusufeli Dam and HEPP Project, Artvin, Yusufeli Preparation of Environmental and Social Impact Assessment (EIA) Report for submission to international finance organization (World Bank) • Preparation of Resettlement Action Plan (RAP) for submission to international finance organization (World Bank) • European Union, Twinning Project Preparation of project fiches for future projects on noise control, waste management and the use of biocidals • Establishment of an Environmental Impact Assessment Centre in Turkey • MEDAWARE Project Development Tools and Guidelines for the Promotion of the Sustainable Urban Wastewater Treatment and re-use • Kisladag Gold Mine Project, Kisladag, Usak Preparation of an Environmental Implementation Report for submission to MoEF • OPET Petroleum Company EHS Audit, Istanbul, Izmit, Ankara

	Environmental, Key Health and Safety Audit and also Due Diligence Study of OPET Petroleum Products Facilities. • Baku Tbilisi Ceyhan Crude Oil Pipeline (BTC) Project
CONTRIBUTION TO THE REPORT	Section IV, Section V

TÜRKİYE CUMHURİYETİ

ORTA DOĞU TEKNİK ÜNİVERSİTESİ

ANKARA

Hüseyin Tekin

FEN BİLİMLERİ
ENSTİTÜSÜ

ÇEVRE MÜHENDİSLİĞİ

ENSTİTÜ ANABİLİM DALI YÜKSEK LİSANS PROGRAMINDA
GEREKLİ ÇALIŞMALARI BAŞARI İLE TAMAMLAYARAK

ÇEVRE YÜKSEK MÜHENDİSİ

ÜNVANINI VE

YÜKSEK LİSANS

DERECESİNİ TANINAN BÜTÜN YETKİLERİYLE BİRLİKTE
ALMAYA HAK KAZANMIŞTIR

11 Eylül 1992

REKTÖR
PRESIDENT

T.C. ORTA DOĞU TEKNİK ÜNİVERSİTESİ 1923

ASLI GİBİDİR
THE TRUE COPY

T.C. ORTA DOĞU TEKNİK ÜNİVERSİTESİ REKTÖRLÜĞÜ 1923

ENSTİTÜ MÜDÜRÜ
DIRECTOR OF THE GRADUATE SCHOOL

REPUBLIC OF TURKEY

MIDDLE EAST TECHNICAL UNIVERSITY

ANKARA

Hüseyin Tekin

HAVING SATISFACTORILY COMPLETED ALL REQUIREMENTS OF
THE MASTER'S PROGRAMME IN THE DEPARTMENT OF

ENVIRONMENTAL ENGINEERING

IN THE GRADUATE SCHOOL OF
NATURAL AND APPLIED SCIENCES

HAS BEEN AWARDED THE DEGREE OF

MASTER OF SCIENCE IN
ENVIRONMENTAL ENGINEERING

WITH ALL THE PRIVILEGES
CONNECTED THEREUNTO

September 11, 1992

ENSTİTÜ ANABİLİM D. BAŞKANI
CHAIRMAN OF THE DEPARTMENT

CURRICULUM VITAE

ID NO	11281055160
NAME AND SURNAME	Özge ÖZDEMİR
FATHER NAME	Mehmet
PLACE AND DATE OF BIRTH	Ankara, 1981
OCCUPATION	Environmental Engineer
LANGUAGE	English (intremediate)
EDUCATION	2000-2004 / Anadolu University, Department of Environmental Engineering, Eskişehir BSc. Degree in Environmental Engineering 1999-2000 / Anadolu University, English Preparatory School , Eskişehir
MAILING ADDRESS/ PHONE NUMBER/ E-MAIL ADDRESS (OFFICE)	ENCON Envirommental Consultancy Co. Reşit Galip Cad. No:120 06700 - Gaziosmanpaşa – Ankara/TURKEY (312) 447 71 22 (pbx) ozgeozdemir@encon.com.tr
PROFESSIONAL EXPERİENCE	2004- / ENCON Envirommental Consultancy Co. Environmental Engineer
PROJECTS PARTICIPATED	In ENCON Environmental Consultancy Co.; • Amasya, Kütahya, Bitlis Solid Waste Management Project • West Black Sea Natural Gas Improvement Project • Yusufeli Dam and Hydroelectric Power Plant Project, Resettlement Action Plan (RAP) • 380 kV Karabiga-Can-Soma (TES) Energy Transmission Line Project, Environmental Impact Assessment (EIA) Report • Yusufeli Dam and Hydroelectric Power Plant Project, Environmental Impact Assessment (EIA) Report • Caldag Nickel Mine Project, Project Inception Dossier • Efemcukuru Gold Mine Project Environmental Database and EIA study, İzmir
CONTRIBUTION TO THE REPORT	Whole Report

ANADOLU ÜNİVERSİTESİ
MÜHENDİSLİK-MİMARLIK FAKÜLTESİ

Lisans Diploması

Özge Özdemir

Mühendislik-Mimarlık Fakültesinin dört yıl süreli Çevre Mühendisliği Bölümündeki öğrenimini 06/09/2004 tarihinde başarı ile tamamlayarak, bu diplomayı almaya hak kazanmıştır.

ASLI GİBİDİR

İsmail ARUSMANOĞLU
Müh. Mim. Fak.
Fakülte Sekreteri

Prof. Dr. Hasan MANDAL
DEKAN

Prof. Dr. Engin ATAÇ
REKTÖR

CURRICULUM VITAE

ID NO	27202962684
NAME AND SURNAME	Göktuğ EVİN
FATHER NAME	Levent
PLACE AND DATE OF BIRTH	Ankara, 1976
OCCUPATION	Hydrogeological Engineer
LANGUAGE	English (intremediate)
EDUCATION	Hacettepe University, Ankara, Turkey Bachelor of Science Degree in Hydrogeological Engineering
MAILING ADDRESS/ PHONE NUMBER/ E-MAIL ADDRESS (OFFICE)	ENCON Environmental Consultancy Co. Reşit Galip Cad. No:120 06700 – Gaziosmanpaşa – Ankara7TURKEY (312) 447 71 22 (pbx) goktugevin@encon.com.tr
PROFESSİONAL EXPERİENCE	ENCON Environmental Consultancy Co.- Hydrogeological Engineer
PROJECTS PARTICIPATED	In ENCON Environmental Consultancy Co. • Ilısu Dam and HEPP Project, Batman Preparation of Resettlement Action Plan (RAP) and conducting relevant field studies • Yusufeli Dam and HEPP Project, Artvin, Yusufeli Preparation of Environmental and Social Impact Assessment (EIA) Report for submission to international finance organization (World Bank) Preparation of Resettlement Action Plan (RAP) and conducting relevant field studies • H-177 Package Project Preparation of EIA Report and Project Inception Report • Akköprü Dam and HEPP Project Preparation of EIA Report for submission to international finance organization (ILI) • Çaldağ Nickel Mine Project Preparation of EIA Report for submission to MoEF and for submission to international finance organizations in accordance with World Bank Operational Directives • Efemcukuru Gold Mine Project, Efemcukuru, Izmir Preparation of EIA Report for submission to MoEF • Baku Tbilisi Ceyhan Crude Oil Pipeline (BTC) Project Pre-construction environmental studies including physical and biological environments, waste and wastewater management, production of reinstatement method statements, management and monitoring of these works • Artova - Sulusaray Highway Preparation of EIA Report for submission to MoEF • Ceyhan-Yumurtalik State Highway Project Preparation of EIA Report for submission to MoEF • Simav - Selendi Highway Project, Kutahya, Manisa Preparation EIA Preliminary Report for submission to MoEF
CONTRIBUTION TO THE REPORT	Section IV, Section V, Section VII, Appendix 1

Diploma No. 01_358_045

TÜRKİYE CUMHURİYETİ
HACETTEPE ÜNİVERSİTESİ
ANKARA

MÜHENDİSLİK FAKÜLTESİ
JEOLOJİ (HİDROJEOLOJİ) MÜHENDİSLİĞİ DİPLOMASI

GÖKTUĞ EVİN

JEOLOJİ (HİDROJEOLOJİ) MÜHENDİSLİĞİ BÖLÜMÜNÜN MEZUNİYET İÇİN GEREKLİ DÖRT YILLIK TEORİK VE PRATİK ÇALIŞMA VE SINAVLARINI

11_6_2001

TARİHİNDE BAŞARIYLA TAMAMLAMIŞ VE KENDİSİNE

JEOLOJİ (HİDROJEOLOJİ) MÜHENDİSLİĞİ

DİPLOMASI VERİLMİŞTİR.

REKTÖR-PRESIDENT

Prof. Dr. Tunçalp ÖZGEN

REPUBLIC OF TURKEY
HACETTEPE UNIVERSITY
ANKARA

FACULTY OF ENGINEERING
GEOLOGICAL (HYDROGEOLOGY) ENGINEERING DIPLOMA

GÖKTUĞ EVİN

HAVING SUCCESSFULLY COMPLETED THE FOUR-YEAR THEORETICAL AND PRACTICAL INSTRUCTION AND EXAMINATIONS REQUIRED FOR GRADUATION FROM THE DEPARTMENT OF GEOLOGICAL ENGINEERING (HYDROGEOLOGY OPTION) ON

JUNE 11_2001

HAS BEEN AWARDED THE DEGREE OF

BACHELOR OF SCIENCE

IN

GEOLOGICAL ENGINEERING (HYDROGEOLOGY OPTION)

WITH ALL THE RIGHTS AND PRIVILEGES PERTAINING THEREUNTO

ASLI GİBİDİR
21.9.2001
Ali DEDE
Hacettepe Üniversitesi
Öğrenci İşleri Dairesi Başkanlığı
Banko Şefi

DEKAN-DEAN

Prof. Dr. Yiğit GÜNDÜÇ

CURRICULUM VITAE

ID NO	18247020962
NAME AND SURNAME	Arzu GÜRBÜZ
FATHER NAME	Suat
PLACE AND DATE OF BIRTH	Ankara / 1977
OCCUPATION	Landscape Architect
LANGUAGE	English (intermediate)
EDUCATION	1999-2002 / Ankara University, Department of Landscape Architecture, Ankara, Turkey, MSc. Degree 1995-1999 / Ankara University, Department of Landscape Architecture, Ankara, Turkey, BSc. Degree
MAILING ADDRESS/ PHONE NUMBER/ E-MAIL ADDRESS (OFFICE)	ENCON Environmental Consultancy Co. Reşit Galip Cad. No:120 06700 – Gaziosmanpaşa – Ankara/TURKEY Tel : (312) 447 71 22 (pbx) arzugencer@encon.com.tr
PROFESSIONAL EXPERIENCE	2002-- ENCON Environmental Consultancy Co., Landscape Architect 2001-2001 / Flora Kentsel Tasarım , Landscape Architect 1999-2000 / Settar Yapı Ltd. Şti., Landscape Architect
PROJECTS PARTICIPATED	In ENCON Environmental Consultancy Co. • Yusufeli Dam and HEPP Project, Artvin, Yusufeli Preparation of Environmental and Social Impact Assessment (EIA) Report for submission to international finance organization (World Bank) • H-177 Package Project Preparation of EIA Report and Project Inception Report • Çaldağ Nickel Mine Project Preparation of EIA Report for submission to MoEF and for submission to international finance organizations in accordance with World Bank Operational Directives • Efemcukuru Gold Mine Project, Efemcukuru, Izmir Preparation of EIA Report for submission to MoEF • Baku Tbilisi Ceyhan Crude Oil Pipeline (BTC) Project Pre-construction environmental studies including physical and biological environments, waste and wastewater management, production of reinstatement method statements, management and monitoring of these works • Artova - Sulusaray Highway Preparation of EIA Report for submission to MoEF • Kisladag Gold Mine Project, Kisladag, Usak Preparation of an Environmental Implementation Report for submission to MoEF • Kisladag Gold Mine Project, Kisladag, Usak Preparation of EIA Report for submission to MoEF and for submission to international finance organizations in accordance with World Bank Operational Directives and European Community (EC) guidelines and directives. • Ceyhan-Yumurtalik State Highway Project Preparation of EIA Report for submission to MoEF
CONTRIBUTION TO THE REPORT	Section IV, Section V, Section VI

ANKARA ÜNİVERSİTESİ
1946

TÜRKİYE CUMHURİYETİ
Ankara Üniversitesi
Fen Bilimleri Enstitüsü

Yüksek Lisans Diploması

Arzu GENCER
Peyzaj Mimarlığı Anabilim Dalı
Yüksek Lisans Programı'nı tamamlayarak
Peyzaj Yüksek Mimarı
unvan ve yetkisi almaya hak kazanmıştır.

18.07.2002
Diploma No: 2712

Prof.Dr.Metin Olgun
Müdür

Salim ÇAKIR
Enstitü Sekreteri

23 MART 2004

Prof.Dr.Nusret Aras
Rektör

CURRICULUM VITAE

ID NO	33412333978
NAME AND SURNAME	Zehra Gözde KAYA
FATHER NAME	Erdal
PLACE AND DATE OF BIRTH	Ankara/1980
OCCUPATION	City Planner
LANGUAGE	English (fluent)
EDUCATION	2003 - / Middle East Technical University, Department of Geodetic and Geographic Information Systems, Ankara, Turkey 1998 - 2002 / Gazi University, Department of City and Regional Planning, Ankara, Turkey BSc. Degree in City and Regional Planning
MAILING ADDRESS/ PHONE NUMBER/ E-MAIL ADDRESS (OFFICE)	ENCON Environmental Consultancy Co. Reşit Galip Cad. No:120 06700 Gaziosmanpaşa – Ankara/TURKEY Tel : (312) 447 71 22 (pbx) gozdekaya@encon.com.tr
PROFESSIONAL EXPERİENCE	2005- / ENCON Cevre Danismanlik Ltd. Sti., City Planner
PROJECTS PARTICIPATED	In ENCON Çevre Danışmanlık Ltd. Şti • Ilisu Dam and HEPP Project, Batman Preparation of Resettlement Action Plan (RAP) and conducting relevant field studies • Yusufeli Dam and HEPP Project, Artvin, Yusufeli Preparation of Environmental and Social Impact Assessment (EIA) Report for submission to international finance organization (World Bank) Preparation of Resettlement Action Plan (RAP) and conducting relevant field studies • Caldag Nickel Mine Project Preparation of EIA Report for submission to MoEF and for submission to international finance organizations in accordance with World Bank Operational Directives (mainly OP 4.01) • Efemcukuru Gold Mine Project, Efemcukuru, Izmir Preparation of EIA Report for submission to MoEF
CONTRIBUTION TO THE REPORT	Appendix 1

ORTA DOĞU TEKNİK ÜNİVERSİTESİ
ANKARA

Zehra Gözde Kaya

FEN BİLİMLERİ
ENSTİTÜSÜ

JEODEZİ VE COĞRAFİ BİLGİ TEKNOLOJİLERİ

ENSTİTÜ ANABİLİM DALI YÜKSEK LİSANS PROGRAMINDA
GEREKLİ ÇALIŞMALARI BAŞARI İLE TAMAMLAYARAK

YÜKSEK LİSANS

DERECESİNİ TANINAN BÜTÜN YETKİLERİYLE BİRLİKTE
ALMAYA HAK KAZANMIŞTIR

02 Mayıs 2006

REKTÖR
PRESIDENT

MIDDLE EAST TECHNICAL UNIVERSITY
ANKARA

Zehra Gözde Kaya

HAVING SATISFACTORILY COMPLETED ALL REQUIREMENTS OF
THE MASTER'S PROGRAMME IN THE DEPARTMENT OF

GEODETIC AND GEOGRAPHIC INFORMATION
TECHNOLOGIES

IN THE GRADUATE SCHOOL OF
NATURAL AND APPLIED SCIENCES

HAS BEEN AWARDED THE DEGREE OF
MASTER OF SCIENCE IN GEODETIC AND GEOGRAPHIC
INFORMATION TECHNOLOGIES

WITH ALL THE PRIVILEGES
CONNECTED THEREUNTO

May 2, 2006

T.C. ORTA DOĞU TEKNİK ÜNİVERSİTESİ REKTÖRLÜĞÜ 1923

ENSTİTÜ MÜDÜRÜ
DIRECTOR OF THE GRADUATE SCHOOL

ENSTİTÜ ANABİLİM DALI BAŞKANI
CHAIRPERSON OF THE DEPARTMENT

CURRICULUM VITAE

ID NO	63094028428
NAME AND SURNAME	Sibel SİVRİKAYA
FATHER NAME	Mehmet
PLACE AND DATE OF BIRTH	İzmir / 1980
OCCUPATION	Hydrogeological Engineer
LANGUAGE	İngilizce (intremediate)
EDUCATION	2003- / Hacettepe University, Ankara, Turkey Master of Science Degree in Hydrogeological Engineering 1998-2003 / Hacettepe University, Ankara, Turkey Bachelor of Science Degree in Hydrogeological Engineering
MAILING ADDRESS/ PHONE NUMBER/ E-MAIL ADDRESS (OFFICE)	ENCON Environmental Consultancy Co. Reşit Galip Cad. No:120 06700 – Gaziosmanpaşa – Ankara/TURKEY (312) 447 71 22 (pbx) sibelsivrikaya@encon.com.tr
PROFESSIONAL EXPERİENCE	2004- / ENCON Environmental Consultancy Co. Hydrogeological Engineering
PROJECTS PARTICIPATED	In ENCON Environmental Consultancy Co., • Ilısu Dam and HEPP Project, Batman Preperation of Resettlement Action Plan (RAP) for submission to international finance organizations • Yusufeli Dam and HEPP Project, Artvin, Yusufeli Preparation of Environmental and Social Impact Assessment (EIA) Report for submission to international finance organization (World Bank) Preparation of Resettlement Action Plan (RAP) for submission to international finance organization (World Bank) • Çaldağ Nickel Mine Project Preparation of EIA Report for submission to MoEF and for submission to international finance organizations in accordance with World Bank Operational Directives (mainly OP 4.01)
CONTRIBUTION TO THE REPORT	Section IV, Section V, Appendix 1

Diploma No. 03-358-009

TÜRKİYE CUMHURİYETİ
HACETTEPE ÜNİVERSİTESİ
ANKARA

MÜHENDİSLİK FAKÜLTESİ
JEOLOJİ (HİDROJEOLOJİ) MÜHENDİSLİĞİ
DİPLOMASI

SİBEL SİVRİKAYA

JEOLOJİ (HİDROJEOLOJİ) MÜHENDİSLİĞİ BÖLÜMÜNÜN
MEZUNİYET İÇİN GEREKLİ
DÖRT YILLIK TEORİK VE PRATİK
ÇALIŞMA VE SINAVLARINI

16-06-2003

TARİHİNDE BAŞARIYLA TAMAMLAMIŞ
VE KENDİSİNE

JEOLOJİ (HİDROJEOLOJİ) MÜHENDİSLİĞİ

DİPLOMASI VERİLMİŞTİR.

REPUBLIC OF TURKEY
HACETTEPE UNIVERSITY
ANKARA

FACULTY OF ENGINEERING
GEOLOGICAL (HYDROGEOLOGY)
ENGINEERING DIPLOMA

SİBEL SİVRİKAYA

HAVING SUCCESSFULLY COMPLETED
THE FOUR-YEAR
THEORETICAL AND PRACTICAL INSTRUCTION AND
EXAMINATIONS REQUIRED FOR GRADUATION FROM THE
DEPARTMENT OF GEOLOGICAL ENGINEERING
(HYDROGEOLOGY OPTION) ON

JUNE-16-2003

HAS BEEN AWARDED THE DEGREE OF

BACHELOR OF SCIENCE

IN

GEOLOGICAL ENGINEERING (HYDROGEOLOGY OPTION)

WITH ALL THE RIGHTS AND PRIVILEGES PERTAINING THEREUNTO

REKTÖR-PRESIDENT
Prof. Dr. Tunçalp ÖZGEN

ASLI GİBİDİR
..3./.3./2003
Uğur İBOOZLUER
Öğrenci İşleri Daire Başkanlığı
Diploma Servis Şefi

DEKAN-DEAN
Prof. Dr. Selçuk GEÇİM

CURRICULUM VITAE

ID NO	12457107614
NAME AND SURNAME	Esra ARIKAN
FATHER NAME	Ahmet Vural
PLACE AND DATE OF BIRTH	Ankara / 1979
OCCUPATION	Environmental Engineer
LANGUAGE	English (fluent) French (intermediate)
EDUCATION	2000-2002 / Middle East Technical University (M.E.T.U.), Ankara, Turkey MSc. Degree in Environmental Engineering, 1996-2000 / Middle East Technical University (M.E.T.U.), Ankara, Turkey Bachelor of Science (BSc.) Degree in Environmental Engineering, July 2000.
MAILING ADDRESS/ PHONE NUMBER/ E-MAIL ADDRESS (OFFICE)	ENCON Environmental Consultancy Co. Reşit Galip Cad. No:120 06700 – Gaziosmanpaşa – Ankara/TURKEY Tel : (312) 447 71 22 (pbx) eatli@encon.com.tr
PROFESSIONAL EXPERIENCE	2003- / ENCON Environmental Consultancy Co., Environmental Engineer 2000-2003 / Middle East Technical University, Department of Environmental Engineering, Research and Teaching Assistant
PROJECTS PARTICIPATED	In ENCON Environmental Consultancy Co. • Establishment of an Environmental Impact Assessment Centre in Turkey Coordination and Execution of setting the communication and training strategies, facilitation of the future facilitators, preparation of guidelines and settlement of an EIA Centre. • Çaldağ Nickel Mine Project Preparation of EIA Report for submission to MoEF and for submission to international finance organizations in accordance with World Bank Operational Directives (mainly OP 4.01) • Akköprü Dam and HEPP Project Preparation of EIA Report for submission to international finance organization (ILI) • Capacity Building on the Adoption and Implementation of Integrated Pollution Prevention and Control Directive (IPPC 96/61/EC) Technical assistance to the Ministry of Environment and Forestry for the implementation of the project in Turkey.
CONTRIBUTION TO THE REPORT	Section IV, Section V

TÜRKİYE CUMHURİYETİ
ORTA DOĞU TEKNİK ÜNİVERSİTESİ
ANKARA

Esra Atlı

FEN BİLİMLERİ
ENSTİTÜSÜ

ÇEVRE MÜHENDİSLİĞİ

ENSTİTÜ ANABİLİM DALI YÜKSEK LİSANS PROGRAMINDA
GEREKLİ ÇALIŞMALARI BAŞARI İLE TAMAMLAYARAK

ÇEVRE YÜKSEK MÜHENDİSİ

ÜNVANINI VE

YÜKSEK LİSANS

DERECESİNİ TANINAN BÜTÜN YETKİLERİYLE BİRLİKTE
ALMAYA HAK KAZANMIŞTIR

03 Eylül 2002

REPUBLIC OF TURKEY
MIDDLE EAST TECHNICAL UNIVERSITY
ANKARA

Esra Atlı

HAVING SATISFACTORILY COMPLETED ALL REQUIREMENTS OF
THE MASTER'S PROGRAMME IN THE DEPARTMENT OF

ENVIRONMENTAL ENGINEERING

IN THE GRADUATE SCHOOL OF
NATURAL AND APPLIED SCIENCES

HAS BEEN AWARDED THE DEGREE OF

MASTER OF SCIENCE IN
ENVIRONMENTAL ENGINEERING

WITH ALL THE PRIVILEGES
CONNECTED THEREUNTO

September 3, 2002

REKTÖR
PRESIDENT

ENSTİTÜ MÜDÜRÜ
DIRECTOR OF THE GRADUATE SCHOOL

ENSTİTÜ ANABİLİM DALI BAŞKANI
CHAIRPERSON OF THE DEPARTMENT

CURRICULUM VITAE

ID NO	19102751130
NAME AND SURNAME	Burak GÜRHAN
FATHER NAME	Oktay
PLACE AND DATE OF BIRTH	Ankara/1982
OCCUPATION	Geological Engineer
LANGUAGE	English (intermediate)
EDUCATION	2000-2005 / Department of Geological Engineering, Ankara University, Ankara, Turkey Bachelor of Science Degree
MAILING ADDRESS/ PHONE NUMBER/ E-MAIL ADDRESS (OFFICE)	ENCON Environmental Consultancy Co. Reşit Galip Caddesi No: 120 06700 Gaziosmanpaşa – Ankara/TURKEY (312) 4477122 burakgurhan@encon.com.tr
PROFESSIONAL EXPERIENCE	2005/-- ENCON Environmental Consultancy Co.
PROJECTS PARTICIPATED	In ENCON Environmental Consultancy Co.: • Ilisu Dam and HEPP Project, Batman Preparation of Resettlement Action Plan (RAP) and conducting relevant field studies • Yusufeli Dam and HEPP Project, Artvin, Yusufeli Preparation of Environmental and Social Impact Assessment (EIA) Report for submission to international finance organization (World Bank) • Caldag Nickel Mine Project Preparation of EIA Report for submission to MoEF and for submission to international finance organizations in accordance with World Bank Operational Directives (mainly OP 4.01)
CONTRIBUTION TO THE REPORT	Whole Report

TÜRKİYE CUMHURİYETİ
ANKARA ÜNİVERSİTESİ
MÜHENDİSLİK FAKÜLTESİ
LİSANS MEZUNİYET BELGESİ

Adı ve Soyadı : BURAK GÜRHAN
Anne / Baba Adı : AYŞE / MEHMET OKTAY
Uyruğu, Doğum Yeri ve Tarihi : TÜRKİYE CUMHURİYETİ , ANKARA 1982
Türkiye Cumhuriyeti Kimlik No : 19102751130
Kayıt Numarası : 00055610
Bitirdiği Bölüm / Program : JEOLOJİ MÜHENDİSLİĞİ BÖLÜMÜ
Mezuniyet Dönemi : ŞUBAT 2005 (Mezuniyet Not Ortalaması : 73.11)
Unvanı : JEOLOJİ MÜHENDİSİ

BURAK GÜRHAN

dört yıllık öğrenimini başarıyla tamamlayarak 08/02/2005 tarihinde Lisans Diploması almaya hak kazanmıştır. Bu belge, ilgilinin başvurusu üzerine, diploması verildiğinde geri alınmak koşulu ile düzenlenmiştir.

ASLI GİBİDİR
Mustafa ASLAN

Mezuniyet belgesi tarih ve numarası: 01329 * 08.03.2005

Prof Dr. Rıdvan BERBER
Dekan V.

Doç. Dr. İ. S... SAYILI
Dekan ... mcısı

CURRICULUM VITAE

ID NO	23956272376
NAME AND SURNAME	Erdinç DURMUŞ
FATHER NAME	Osman
PLACE AND DATE OF BIRTH	Artvin/1974
OCCUPATION	Biologist
LANGUAGE	English (intermediate), Georgian (fluent)
EDUCATION	Hacettepe University, Department of Biology, Ankara, Turkey Bachelor of Science Degree
MAILING ADDRESS/ PHONE NUMBER/ E-MAIL ADDRESS (OFFICE)	ENCON Environmental Consultancy Co. Reşit Galip Cad. No:120 06700 – Gaziosmanpaşa – Ankara/TURKEY (312)4477122 edurmus@encon.com.tr
PROFESSIONAL EXPERIENCE	2003 - ENCON Environmental Consultancy Co.
PROJECTS PARTICIPATED	In ENCON Environmental Consultancy Co.: • Yusufeli Dam and HEPP Project, Artvin, Yusufeli Preparation of Environmental and Social Impact Assessment (EIA) Report for submission to international finance organization (World Bank) • H-177 Package Project Preparation of EIA Report and Project Inception Report for submission to the Ministry of Environment and Forestry (MoEF) of Turkey • Akköprü Dam and HEPP Project Preparation of EIA Report for submission to international finance organization (ILI) • Çaldağ Nickel Mine Project Preparation of EIA Report for submission to MoEF and for submission to international finance organizations in accordance with World Bank Operational Directives (mainly OP 4.01) • Efemcukuru Gold Mine Project, Efemcukuru, Izmir Preparation of EIA Report for submission to MoEF • Baku Tbilisi Ceyhan Crude Oil Pipeline (BTC) Project Pre-construction environmental studies including physical and biological environments, waste and wastewater management, production of reinstatement method statements, management and monitoring of these works
CONTRIBUTION TO THE REPORT	Section IV, Section V, Appendix 4

Diploma No.

99_321_012

Hacettepe Üniversitesi

Fen Fakültesi

Biyoloji Lisans Diploması

ERDİNÇ DURMUŞ

Biyoloji Bölümünün Mezuniyet İçin Gerekli
4 Yıllık Teorik ve Pratik Çalışma ve Sınavlarını
18_1_1999 Tarihinde Başarıyla Tamamlamış ve Kendisine
Biyoloji Lisans Diploması ile Biyolog Unvanı Verilmiştir.

Rektör - President

Prof. Dr. Süleyman Sağlam

Öğrenci İşleri Dairesi
Banko Şefi

Dekan - Dean

Prof. Dr. Ali Kalaycıoğlu

CURRICULUM VITAE

ID NO	18782673732
NAME AND SURNAME	Şuayip BALTA
FATHER NAME	Hikmet
PLACE AND DATE OF BIRTH	1939
OCCUPATION	Forest Engineer
LANGUAGE	English
EDUCATION	1972 / Istanbul University Forest Faculty Forest Engineering Department, License
MAILING ADDRESS/ PHONE NUMBER/ E-MAIL ADDRESS (OFFICE)	Toros sok. 23/18 Sıhhiye, Ankara (0312) 231 53 05
PROFESSIONAL EXPERIENCE	• Minister of Ministry Review Committee • Ministry Inspectorship • Deputy Manager of Forestry Directorate • Forestry Regional Headman
PROJECTS PARTICIPATED	Şuayip Balta has been working in his expertise for a long time, and has experience in many areas including inspectorship. Examples of studies with Encon Environmental Consultancy Co are listed below. • 380 kV Karabiga-Çan–Soma TES Energy Transmission Line Environmental Impact Assessment (EIA) Report • H-177 Package EIA Studies, preparation of Environmental Impact Assessment Report and Project Inception Dossier
CONTRIBUTION TO THE REPORT	Section IV, Section V

№ 3259

09143

T.C.
İSTANBUL ÜNİVERSİTESİ
ORMAN YÜKSEK MÜHENDİSLİĞİ
DİPLOMASI

0 1 NİSAN 2004

İstanbul Üniversitesi Orman Fakültesinde öğrenimini bitiren 1939 tarihinde Pazar'da doğmuş Hikmet oğlu Şuayip Balta özel yönetmelik gereğince yapılan bütün imtihanları 31.10.1972 tarihinde İyi derece ile başarmış olduğundan kanunların verdiği bütün hak ve yetkilerden faydalanmak üzere kendisine Orman Yüksek Mühendisliği diploması verildi.

T.C.
ANKARA OTUZSEKİZİNCİ
NOTERLİĞİ
SURET
İşbu Suret Aslına Uygundur.
Tasdik Ederim.
ANKARA 38. NOTERİ

İstanbul Üniversitesi Rektörü	Orman Fakültesi Dekanı
Prof. Dr. Nazım Terzioğlu	Prof. Dr. İsmail Eraslan