PROGRAMMATIC ENVIRONMENTAL ASSESSMENT

of

BAGHDAD POWER DISTRIBUTION SUBSTATIONS PROJECT

(JO-04-506-04)
in Cooperation with

MINISTRY OF ELECTRICITY
GOVERNMENT OF IRAQ

PREPARED BY:

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EXECUTIVE SUMMARY

The Baghdad Power Distribution Substation Project is sponsored by USAID, as a part of Iraq Infrastructure Rehabilitation Program (IIR) for supporting the Government of Iraq, Ministry of Electricity (ME). This $126,640,000 project seeks to improve the existing electric power distribution infrastructure in the City of Baghdad. A large part of the city suffers from daily electricity outages and rolling power blackouts, due to a lack of reliable power distribution and monitoring equipment. The Karkh and Rusafa parts of the city have been identified by the ME as areas with the most critical need for electric power distribution substation improvement. The proposed project will rehabilitate 12 existing 33kV/11kV power distribution substations, construct 13 new 33 kV/11 kV substations, furnish four mobile substations and also supply the required equipment and materials for the 13 new substations that the Iraq ME is planning to construct.

The Baghdad Power Distribution Substation Project activities fall into the category of positive determination for activities that have a potential to cause major adverse environmental impacts, as determined by the IIR program IEE, approved on February 2, 2004. These activities require a complete Programmatic Environmental Assessment (PEA) study as specified by Regulation 22 CFR 216.2 (d)(1)(ix) for electric power supply projects. In planning for the implementation of this PEA study, a decision was made to extend the PEA study scope as far as possible in order to address all the pertinent environmental issues, and to include the participation of all the project stakeholders (ME, USAID Iraq Mission, USAID Washington ANE BEO, local authorities and the project implementing partner). The PEA study Scoping Statement suggested the potential adverse environmental impacts of the Baghdad Power Distribution Project that required more detailed investigation

The PEA study methodology was based on the list of environmental issues of importance that were identified in the study Scoping Statement. This was used during the selection of the multi-disciplinary professional study team, and also in the preparation of an “Environmental Checklist” that was used as a field study tool for ensuring that all the pertinent environmental issues were fully addressed during the study. The study team included: Gib Owen, Team Leader, US Corps of Engineers; John Pennell, USAID MEO; Leslie Perry, USAID Mission Health Officer; Bechtel Electric Power Engineer (not named); Fadiya Fahim and Randy Kraciun, Biology Specialists, US Corps of Engineers; Trey Kish and Janene Van Deroef, Bechtel Environmental Specialists; and, Dick Dumford, USAID Power Specialist. The report was reviewed and finalized by Ephantus Wahome, USAID Mission MEO.

For project alternatives analysis, the PEA study team explored a number of alternatives to the proposed project action to identify the most environmentally-sound alternative that would also achieve the project objectives. The study team and project stakeholders identified the potential adverse environmental impacts associated with each alternative and then compared the alternatives in selecting the most appropriate one for the project. The comparison of the project alternatives showed that the proposed project will not cause severe adverse environmental impacts if the recommend impact mitigation and monitoring are implemented fully as required, and that it will also achieve the desired objectives.

The PEA study methodology included the following:

- Desk Study for detailed review of available Iraq reports for general country information, reports on electric power development projects, general PEA/EIA reports, discussions with key informants from the Government of Iraq ME staff, other Iraq based organizations and individuals working on electric power development projects in Iraq, and the PEA study team members' own professional knowledge and experience in electric power development projects and their associated environmental impacts.
- Environmental Checklist that was prepared for use in ensuring that all environmental issues of importance were properly addressed during the study.
- Field Study in the proposed project sites for identification and assessment of the environmental parameters likely to be impacted by the project activities. The potential environmental impacts were identified in terms of their related project activities, project development stages in which they occur, whether they are short-term or long-term, and their appropriate mitigation and monitoring measures. The study concluded that with appropriate mitigation and monitoring measures the project may not have severe adverse environmental impacts.

The identified project adverse environmental impacts were related to changes in project site topography, ground clearing and leveling for installation of power distribution structures, removal of any live UXO, generation and handling of hazardous waste, alterations to surface and ground hydrological characteristics affecting water quality, and generation of noise and dust during the operation of heavy construction machinery. Most of these impacts are short-term, occurring only during the project construction phase and include:

- Soil erosion impact due to ground excavations and leveling. Mitigated by only clearing and grading the approved project site work limits, and stripping and stockpiling the top soil to be retrieved for ground surface restoration and replanting of original vegetation after project construction is completed.
- Site pollution impact due to accumulation of solid and hazardous waste during the construction stage, composed of debris, defective equipment parts, lead-based paint residues, heavy metals, and accidental spillage of fuel and oil. Mitigated by using recommended procedures for handling hazardous waste including identification, labeling, knowing the exact location, proper storage and disposal, and safe work practices.
- Hydrological and water quality impacts due to increased surface runoff caused by ground pavements, ground surface alterations and hazardous waste transport to surface and ground water caused by surface runoff. Mitigated through construction of site drainage system that is connected to the existing storm water control structures, allowing for cross drainage diversion structures, and site specific drainage plan.
- Biodiversity impact due to vegetation clearing, ground surface excavations and leveling that could interfere with the local flora and fauna. Mitigated by using the removed soil in landscaping around the paved project areas and replanting the original vegetation for enhancement of environmental quality.
- Traffic obstruction impact due to transportation of heavy construction machinery, building materials and power equipment along the urban roads. Mitigated by informing the members of the public about the temporary obstruction of traffic movements, affected routes and the

inconveniences caused by the project construction activities, through announcements in the local press.

- Human heath and safety impacts during the removal of hazardous waste containing PCBs and lead-based paint residues from the project sites during the site preparation for construction of project structures, generation of noise and dust during the operations of heavy construction machinery, and during the removal of live UXO. Mitigated by issuing the project construction personnel with personal safety equipment against noise and dust, and through training on use of safety equipment and safe handling of hazardous waste and UXO.
- Air pollution impact due to dust generated during ground excavations, ground leveling and movements of vehicles. Mitigated by using appropriate dust control measures, such as minimizing the amount of ground disturbance, safe construction material handling, and water use for dust suppression.
- Noise pollution impact due to operation of heavy project construction machinery and movement of heavy transport vehicles. Mitigated by monitoring changes in noise levels, providing the project construction personnel with personal hearing protection devices, and conducting weekly training on use of protective devices.
- Electro-magnetic fields impact around power generation stations. Mitigated by monitoring changes in the fluctuations of electro-magnetic fields around the power distribution stations to ensure that they do not reach danger levels where they could cause significant health threats to neighboring residential and business areas.
- Historical and cultural resources impacts due to ground excavations. Mitigated by conducting field surveys at each project site to detect the presence of any historical and cultural resources before commencement of the project construction activities.
- Socio-economic (positive) impact during the project operation stage, by making it possible for urban domestic households to meet their electric power needs and to operate electric water pumps for domestic water supply needs, hence contributing to the improvement of standards of living.

The PEA study has shown that the adverse environmental impacts due to the project can be easily minimized or prevented through the implementation of recommended adverse impact mitigation and monitoring measures. The Government of Iraq, Ministry of Electricity (ME) field staff and the local authorities need to be actively involved in ensuring that the environmental quality around the project sites is well maintained.

BAGHAD POWER DISTRIBUTION SUBSTATION PROJECT
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

PROJECT INFORMATION

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Country or Region:	Iraq
Activity Name:	Baghdad Power Distribution Project
Funding Begin:	Funding Begin: April 17, 2004 Funding End: April 14, 2006
Funding Amount:	$ $ 126,640,000

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ACRONYMS

22 CFR 216	**Title 22 of the Code of Federal Regulations Part 216**
ANE	**Asian & Near East Bureau**
BEO	**Bureau Environmental Officer**
BMP	**Best Management Practice**
CECP	**Construction Environmental Control Plan**
CEMVN	**U.S. Army Corps of Engineers, New Orleans District**
dbA	**Decibels**
PEA	**Programmatic Environmental Assessment**
EIA	**Environmental Impact Assessment**
EIS	**Environmental Impact Statement**
EMF	**Electric and magnetic fields**
G	**gauss**
HTRW	**Hazardous, Toxic, and Radio Active Wastes**
IIR	**Iraq Infrastructure Reconstruction**
IUCN	**International Union for the Conservation of Nature**
H&S	**Heath and Safety**
km	**kilometers**
km^2	**square kilometers**
kV	**kilovolt**
ME	**Ministry of Electricity**
Mi	**miles**
mi^2	**square miles**
MoE	**Ministry of the Environment**
NEPA	**National Environmental Policy Act**
PCB	**Polychlorinated biphenyls**
ROI	**Republic of Iraq**
T&E	**Threatened or Endangered species**
UNICEF	**United Nations Children's Fund**
USAID	**United States Agency for International Development**
UXO	**unexploded ordnance**
V/m	**volts per meter**

1 INTRODUCTION

The Baghdad Power Distribution Substation Project is sponsored by USAID, as a part of Iraq Infrastructure Rehabilitation Program (IIR) for supporting the Government of Iraq, Ministry of Electricity (ME). This $126,640,000 project seeks to improve the existing electric power distribution infrastructure in the City of Baghdad where a large part of the city suffers from daily electric power outages and rolling blackouts due to unreliable power distribution and monitoring equipment. The Karkh and Rusafa Districts of the city have been identified by the ME as areas with the most critical need for improvement of electric power distribution infrastructure and equipment. The power distribution substations that are planned to be constructed by USAID are as listed in Table 1, and those to be constructed by ME using construction materials and equipment supplied by USAID are as listed in Table 2.

The proposed project will rehabilitate 12 existing 33kV/11kV substations, build 13 new 33 kV/11 kV distribution substations, furnish four mobile substations and also supply all the required equipment and materials for the construction of 13 new substations. USAID funding will support the project design, construction, and rehabilitation of existing power distribution substation structures and equipment in the Karkh & Rusafa Districts, including staff training for operation and maintenance of the power substations. The power distribution equipment installation, testing and staff training are meant to ensure the reliability and sustainability of electric power supply in the City of Baghdad. The equipment that will be installed will conform to the recognized international electrical codes and standards that are recommended for these types of power distribution facilities. This project is intended to benefit over one million urban residents in the City of Baghdad, which has five million residents, primarily in the Rusafa and Karkh Districts of the city. The selected proposed project site locations are as shown in Figure 1, and the design of electric power substation structure is as shown in Figure 2.

1.1 PURPOSE AND NEED OF THE PROJECT ACTION

1.1.1 Purpose

A large part of the City of Baghdad suffers from daily electric power supply outages and rolling power blackouts, due to a lack of reliable electric power distribution infrastructure and equipment. The Baghdad Power Distribution Substation Project is expected to improve the electric power distribution infrastructure in the City of Baghdad.

USAID funding will support the design, construction, and rehabilitation of the power distribution substations in the Karkh & Rusafa Districts, which have the most critical need for the improvement of electric power distribution infrastructure and equipment (Figure 1). The equipment installation, testing and staff training for power substation operations and maintenance are intended to improve the sustainability and reliability of power distribution infrastructure for supplying power to the urban residents of the City of Baghdad.

1.1.2 Need

This project is expected to benefit over one million urban residents, out of a total population of five million residents in the City of Baghdad, to prevent the problem of daily electric power outages and rolling power blackouts, caused by lack of reliable electric power distribution infrastructure and equipment. The Baghdad Power Distribution Substation Project intends to improve the delivery of electric power supply to the urban residents, especially in Karkh and Rusafa Districts, which have the most critical need for improvement of electric power supply infrastructure.

1.2 NEED FOR PEA

A PEA is a study that assists in the identification of potential adverse environmental impacts caused by multiple project activities that are undertaken in a given country or geographic area, so that their appropriate mitigation and monitoring measures can be identified. This may also be applied when the environmental impacts are generic or common to a class of similar project activities that are undertaken in different areas within a country or region.

The Baghdad Power Distribution Substation Project activities fall in the category of positive determination (high environmental risk) as determined by the IIR Program IEE, that was approved in February 2, 2004. This requires a full PEA study as specified by Regulation 22 CFR 216.2 (d)(1)(ix) for power development and management projects, since the proposed activity has a potential to cause significant adverse environmental impacts, which cannot be resolved by the IEE alone. In planning for the implementation of this PEA study, a decision was made to extend the PEA study scope as far as possible in order to address all the pertinent environmental issues, and to include the participation of all the project stakeholders (ME, USAID Iraq Mission, USAID Washington ANE BEO, local authorities and the project implementing partner).

2 PEA STUDY APPROACH AND METHODOLOGY

2.1 STUDY METHODOLOGY

The PEA study for Baghdad Power Distribution Substation Project was carried out in accordance with the requirements of the PEA study Scoping Statement (Appendix 1). The study process included three stages as follows:

Desk Study: This was for review of available relevant reports for obtaining country environmental information (Reports by UNEP, UNDP, IUCN, etc.), reports on previous electric power development projects in Iraq and their associated environmental impacts, and individual study team members' contributions from their field experience and knowledge on Iraq environment. A general overview of the existing environmental threats in Iraq was also discussed during the periodic ad-hoc study team meetings that were held for study coordination. This also included hold discussions with other key informants involved in power development projects and environmental management activities in Iraq.

Environmental Checklist: A checklist was prepared for use as a study tool during the environmental assessment study. This was to ensure that all the pertinent environmental issues were fully addressed during the study as required by the study Scoping Statement.

Field Study: This was carried out to assess the existing environmental parameters in the proposed project sites, and involved detailed field observations of existing environmental features and indicators. It was also during this stage that field assessments were carried out for detection of any present UXO, hazardous waste and objects of historical or cultural importance. The identification of potential adverse environmental impacts was carried out using the proposed project activities as provided in the environmental checklist, and the existing site environmental parameters likely to be impacted by the project activities. The activities included project site clearing, ground preparation and leveling, operation of heavy machinery, transportation of project construction materials, etc. The field study was also used in updating the environmental information that was obtained during the desk study.

2.2 STUDY TEAM

The PEA study was conducted by a multi-disciplinary professional study team that included: Gib Owen, Team Leader, US Corps of Engineers; John Pennell, USAID MEO; Leslie Perry, USAID Mission Health Officer; Bechtel Electric Power Engineer (not named); Fadiya Fahim and Randy Kraciun, Biology Specialists, US Corps of Engineers; Trey Kish and Janene Van Deroef, Bechtel Environmental Specialists; and, Dick Dumford, USAID Power Specialist. The report was reviewed and finalized by Ephantus Wahome, USAID Mission MEO.

2.3 PROPOSED ACTION AND ALTERNATIVES

For project alternatives analysis, the PEA study team explored a number of alternatives to the proposed project action to identify the most environmentally-sound alternative that would also achieve the desired project objectives. The evaluation of project alternatives involved stakeholder participation in identifying the important potential adverse environmental impacts due to each alternative, which were compared during the selection of the most appropriate project alternative.

The comparison of the various project alternatives showed that the proposed project will not cause severe adverse environmental impacts if appropriate adverse impact mitigation and monitoring measures are identified and implemented, and that it will also achieve the desired project objectives.

2.3.1 Proposed Project Action

The proposed project activities will include rehabilitation of 12 power distribution substations, the construction of 13 new power distribution substations, contributions of the ME towards the construction of the 13 new substations, and the acquisition of four mobile power distribution substations as shown in Table 1 and 2, and in Figures 1 and 2.

These substations are located throughout the Karkh & Rusafa Districts of the City of Baghdad, and the majority of the substations are located within residential areas. Each substation consist of a power control building; power station batteries; 33 kV and 11 kV switchgear; switchgear room; and two new transformers.

2.3.2 No Action Alternative

The no action alternative could have only been considered if the potential adverse environmental impacts due to the project were expected to be very severe, and not easy to mitigate and monitor.

As noted earlier, the comparison of the various considered project alternatives showed that the proposed project will not cause severe adverse environmental impacts if appropriate mitigation and monitoring measures are accurately identified and fully incorporated in the project design and implementation stages. This would assist in achieving an environmentally sound project action that would also meet the desired project objectives.

2.4 Selection of Alternative

The present power distribution facilities in some parts of the City of Baghdad have been damaged during the insurgency, making them highly unstable and unreliable. Therefore, a no action alternative would not be acceptable because of the urgent need to provide reliable and sustainable electric power distribution to the urban residents. The proposed project action would meet the urgent needs for supplying reliable electric power to the targeted urban resident communities in the City of Baghdad.

2.5 Report Preparation

The PEA report was prepared using the information obtained during the desk study of available reports from the Government of Iraq ME, other relevant reference materials from professional journals, publications from environmental and electric power development organizations, and the field data collected during the field survey of existing environmental parameters in the proposed project sites.

The public consultation and review was invited during the preparation of the PEA study Scoping Statement, and after the completion of the first draft of the PEA report. The draft report was also review by the ANE BEO and the USAID Iraq Mission Environmental Officer, who compiled all the submitted observations and comments and gave them to the PEA study team to be incorporated during the preparation of the final report.

Table 1: Potential Substations that May be Constructed by USAID

No.	Project Name	New/Rehab	Location	Coordinates
	Dora Al Tawasea	Rehab	Karkh District	MB 42064 79894
	Saba Al Bor	New	Karkh District	MC 20888 03382
	Tarmiya	Rehab	Karkh District	MC 42394 25432
	Ghazalia	New	Karkh District	MB 31802 91308
	Kadumiyh	New	Karkh District	MB 38501 94091
	Tib Al Baytari	Rehab	Karkh District	MB 32631 85504
	Awreej	Rehab	Karkh District	MB 40785 70612
	Hassan Bin Al Haytham	Rehab	Karkh District	MB 38277 97138
	Abu Deshir	New	Karkh District	MB 42190 77129
	Mekanik	New	Karkh District	MB 45013 77640
	Taji Camp	Rehab	Karkh District	MC 35285 08183
	Obaydi	Rehab	Rusafa District	MB 56127 97350
	Abo Nuas	New	Rusafa District	MB 45272 87286
	Basmaya	Cancelled	Rusafa District	MB 61237 73113
	Asbest	Rehab	Rusafa District	MB 50070 81589
	Arasat	Rehab	Rusafa District	MB 44795 83474
	Rekheta	New	Rusafa District	MB 46753 84393
	Al-Muallimin	New	Rusafa District	MB 52277 87342
	Selekh	Rehab	Rusafa District	MB 43004 94928
	Hamad Shihub	New	Rusafa District	MC 43067 07635
	Jadiria	Rehab	Rusafa District	MB 43208 82061
	Kulia Al Fania	New	Rusafa District	MB 51483 80581
	Al Khelani	Rehab	Rusafa District	MB 45081 88250
	Bab Al Sharki	Cancelled	Rusafa District	MB 44717 87955
	Rashid Camp	New	Rusafa District	MB 50036 83003
	Mazara Al Dawla	Cancelled	Rusafa District	MB 61805 60124
	Mushahda	Cancelled	Rusafa District	N/A
	Kasrah Attash	New	Rusafa District	MB 49196 97520
	Khahira	New	Rusafa District	MB 43724 93881

Table 2: Potential Substations that May be Constructed by ME Using Materials Supplied by USAID

No.	Project Name	New/Rehab	Location	Coordinates
1	Yosifia	New	Karkh District	MB 30406 60547
2	Al Rahman Mosque	New	Karkh District	MB 39416 85573
3	Abu Ghraib	New	Karkh District	MB 25777 85864
4	Industrial Dora	New	Karkh District	MB 44800 79124
5	New Amil	New	Karkh District	MB 34762 80267
6	New Saidiya	New	Karkh District	MB 36072 78056
7	Hibna	New	Karkh District	MB 36904 91539
8	New Baghdad	New	Rusafa District	MB 50728 85074
9	Royal Cemetery	New	Rusafa District	MB 40819 92360
10	Greatte	New	Rusafa District	MB 41246 94589
11	Rashidya	New	Rusafa District	MC 45351 12205
12	Al Madain	New	Rusafa District	MB 60960 62964

Figure 1. Proposed Project Site Locations in the City of Baghdad, Iraq.

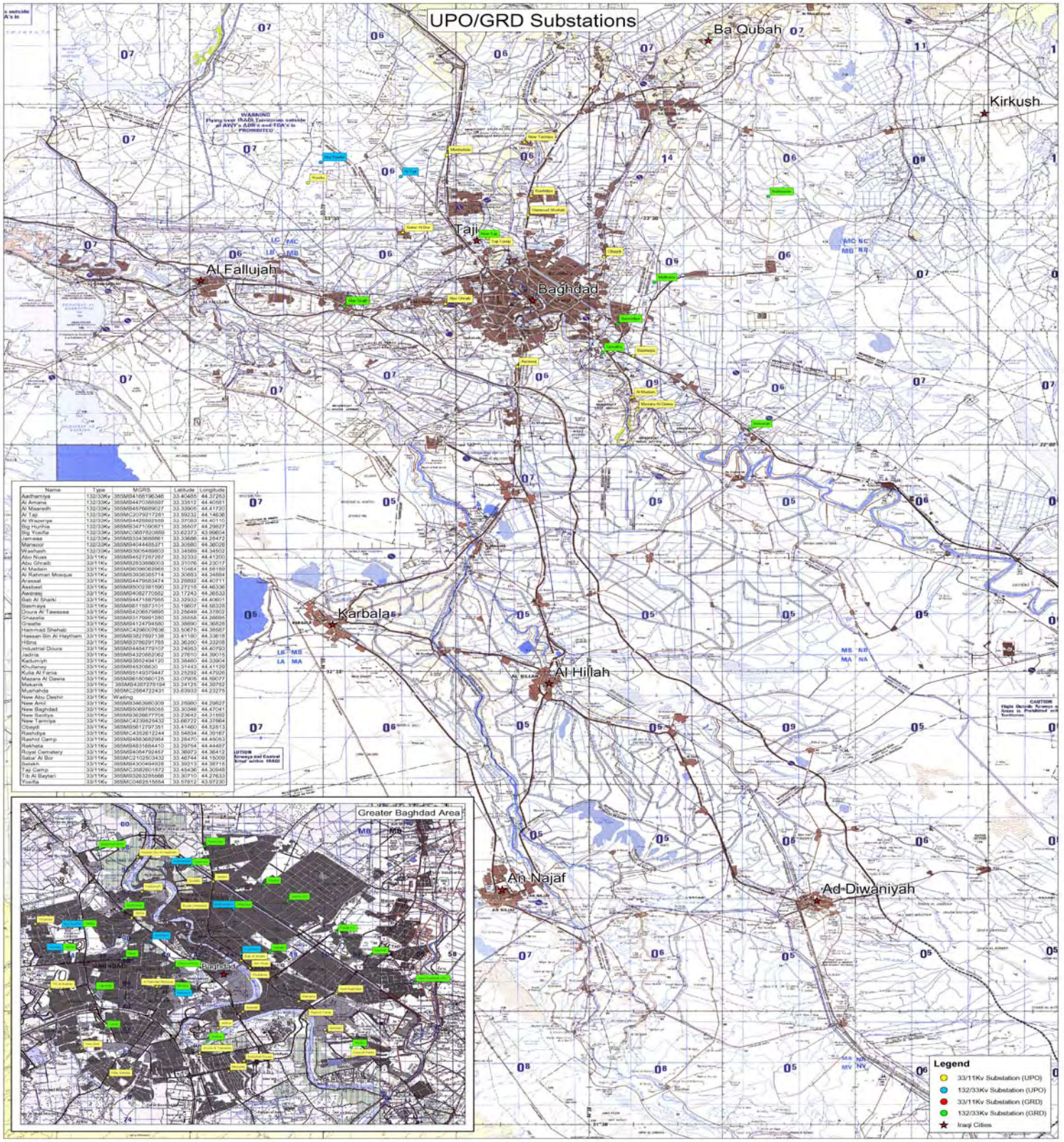
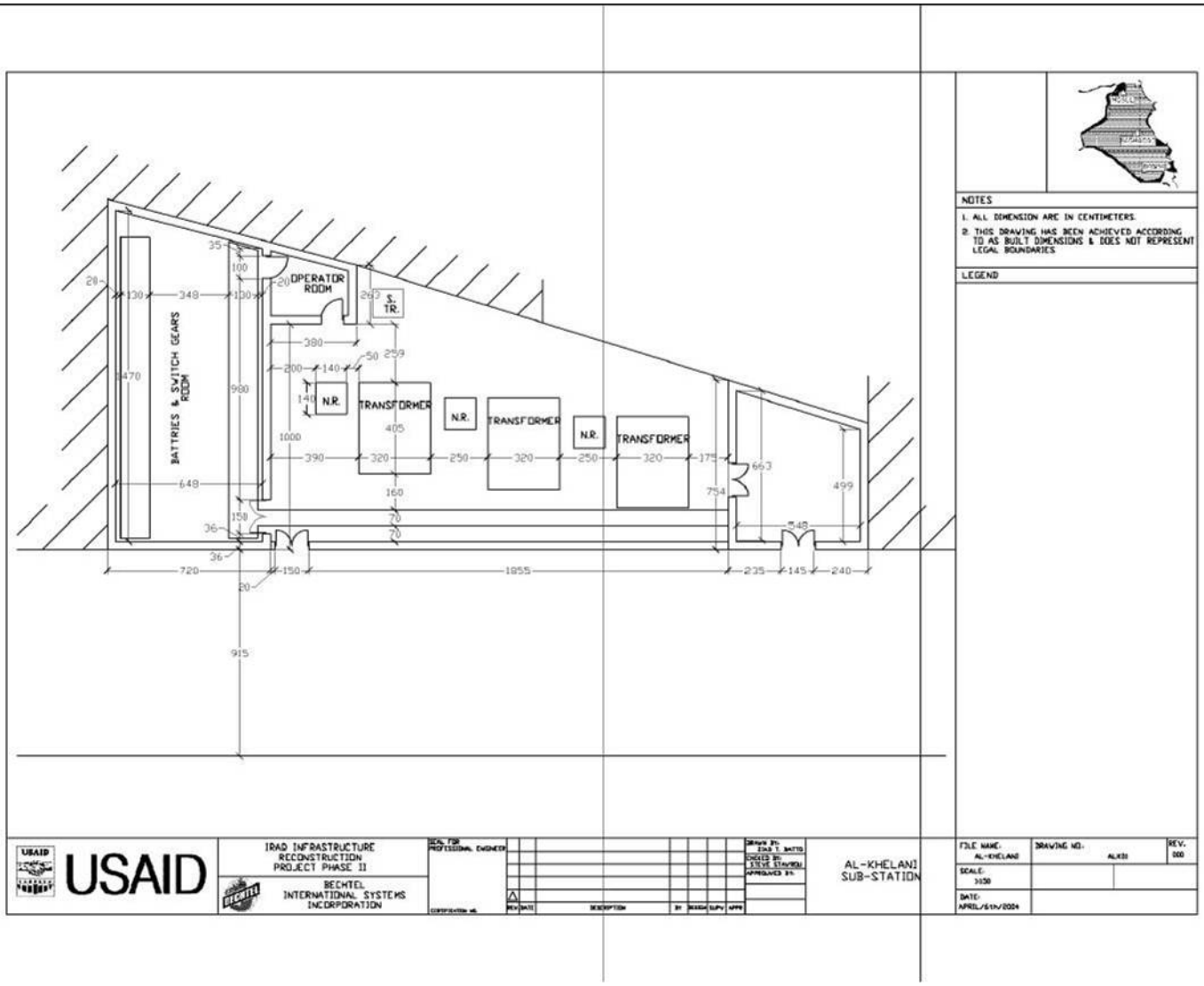


Figure 2. Proposed Typical Layout of an Electrical Power Substation



3 DESCRIPTION OF THE COUNTRY ENVIRONMENT

3.1 COUNTRY LOCATION

The Republic of Iraq is located in the Middle East, and is surrounded by six neighboring states (Iran to the east, Turkey to the north, Jordan and Syria to the west, Saudi Arabia to the south, and Kuwait to the south-east. The country is located between 29 and 38-degree latitude and between 39 and 49-degree longitude, and covers a land area of 438,320 square kilometers, with a coastline of 58 km in length (Figure 3).

3.2 CLIMATE

The country is mostly hot and dry, although the mountainous north and north-east, where the highlands rise to over 12,000 feet have cooler temperatures and more rainfall. The extremely hot,

dry summer months last from May through October and produce maximum daytime temperatures that reach 40 degrees centigrade, usually varying between 31 to 34 degrees Centigrade. Summer months also feature strong winds and sandstorms. During the winter season, the mean daily maximum temperature is 17 degrees centigrade; but the temperatures are colder in the highlands.

Figure 3. Country Location

The main rainfall period is November to April, with most of the rainfall falling between December and March. The remaining period of six months, particularly June to August is dry. Precipitation is highest in the north and north-eastern highlands, which receive 760 – 1,000 mm. of rainfall annually, and snow up to three months per year. The mean annual rainfall ranges between 100 – 170 mm in other parts of the country, and the summer months feature two types of wind. The southerly wind occurring from April to June is a dry dusty wind, and the wind occurring from June to September is dry and hot. The country is hot and humid at the coast and dry in the interior, with a desert covering over 40% of the land area.

3.3 AGRO-ECOLOGICAL ZONES

Iraq has four agro-ecological zones which include desert plateau, northeastern highlands, uplands region and the alluvial plain:

Desert Plateau: Approximately 40% of Iraqi territory consists of a broad, stony plain with scattered stretches of sand, lying west and southwest of the Euphrates River and sparsely inhabited by pastoral nomads. A network of seasonal water courses or wadis runs from the country's western borders towards the Euphrates River. The area west of the Euphrates River is part of the Syrian Desert, which is shared by Syria, Jordan, and Saudi Arabia. This area is uninhabited, except for a few pastoral nomads. The landscape is mainly shaped by wind and water erosion (wadis or dry river and stream beds are present). Desert and steppe cover parts of the alluvial plain, but they are locally interrupted by depressions with drainage channels

North-Eastern Highlands: This region covers approximately 20% of the country, and extends south of a line between Mosul to Kirkuk towards the boarders with Turkey and Iran, where mountain ranges reach up to 3,600 m in latitude. This area is mountainous with valleys that are suitable for cultivation, and are mostly wooded and mainly used for livestock grazing. The Mesopotamian syncline is a deep alluvial valley trough, which is filled with sediments from the mountains deposited by the Tigris and Euphrates Rivers. The City of Baghdad is located within this syncline and occupies both banks of the Tigris River.

Uplands Region: About 20% of Iraq comprises a transitional area between the highlands and the desert plateau, located between the Tigris north of Samarra and Euphrates north of Hit, and forming part of a large natural area that extends into Syria and Turkey. Much of this zone may be classified as desert because watercourses flow in deeply cut valleys, making irrigation far more difficult than in the alluvial plain. The upper Mesopotamia portion of this region, the up-tilting part, is represented by what is called in Arabic "Jirah" (the island) and falls between the middle courses of the Euphrates and Tigris Rivers

Alluvial Plain: Approximately 30% of Iraq is composed of the alluvial plain formed by the combined deltas of the Tigris and Euphrates Rivers. This region begins north of Baghdad and extends south to the Gulf Coast bordering Iran. The once extensive wetlands of the region have been decimated by damming and diversions of the Euphrates River in Turkey and Syria, and by large-scale drainage works carried out by the previous Baathist Iraq regime. The plain begins near Samarra and Ramadi, ending near the Gulf Coast after covering a distance of approximately 600 km long and 200 km wide. From Baghdad the basin tilts to the southeast to the City of Hilla, which is situated on the eastern bank of the Euphrates River, in an area that is also a part of the alluvial plain. Southeastern Iraq also has remnants of Mesopotamian marsh low-lying plains and complex interconnected shallow freshwater lakes and canals. The Tigris and Euphrates Rivers flood this area seasonally during month of March through May. The City of Basrah is located in this area.

3.4 POPULATION AND HEALTH

The 1997 national population census recorded a population of 22.3 million people, with an average population density of 51 persons per square kilometer. The current population growth rate is about 3% per year, with a possibility of the national population doubling in about 25 years. Today, roughly about 40% of the population is under the age of 15 years. There is no reliable estimate for the resident population in the country, and demographic statistics indicate that the population is comparatively worse off than that of its neighbors in terms of life expectancy, nutrition and infant mortality (UNEP, 2003).

Many religions are practiced, but Islam (both Sunni and Shiite sects), account for 97% of the population, with the country including some of the holiest shrines of Islam. There are 23 spoken languages with various dialects of Arabic dominating. Kurdish dialects are spoken by about 20% of the population, highlighting the difference between much of Iraq and "Kurdistan" in the north. The Kurds have long been used as political pawns in the struggles among Iraq, Iran and Turkey, who also have Kurdish communities in their population. Although Saddam Hussein's Sunni dominated Ba'ath Party was in power until recently, Kurds and southern Shiite groups are now political players, but have suffered from Saddam Hussein's repressive regime. The country is currently in a serious political crisis, and the interim and transitional governments have been very weak and unable to function effectively for almost three years. The human health situation is a major concern, not only for Iraqi people but also for foreign soldiers and aid workers operating in the country. There is a variety of diseases and human health hazards that pose a serious health risk, (e.g. malaria, typhoid, tuberculosis, cholera, etc.) that are endemic in the country (UNEP, 2003).

3.5 ELECTRIC POWER DISTRIBUTION INFRASTRUCTURE

About 20 power generation stations, and up to 90% of Iraq's electricity distribution grid system was damaged or destroyed during the 1991 Gulf War. By 1998, the Iraqi Government authorities estimated that about 45% of the maximum pre-war generation capacity had been restored, with a report in November 1999 indicating that this figure may have increased to around 65%. But all the same, power continued to be rationed everyday throughout the country. Before the 2003 conflict, electricity was available for less than 12 hours per day in parts of the country, resulting in the degradation of public services, ranging from water supply and sanitation systems, to educational and health facilities, as well as a substantial drop in overall living standards.

Iraq has for a long time provided services to its citizens for electric power supply, potable water supply, wastewater treatment, health care and education for "free", mainly using the national revenue generated from sales of oil and gas to support these services. The economy of Iraq, in recent years, relied on oil for its economic well being, since it controls what is estimated to be the second largest oil reserves in the world. Beyond oil and natural gas, Iraq's economy is weak, and even the once fertile agricultural areas have been adversely affected by water diversion schemes, salinization, and rural-to-urban migration. Land Use in Project Areas

Electric and magnetic fields (EMF) are produced by power lines, electrical wiring, and electrical equipment. Electric fields are produced by voltage and increase in strength as the voltage

increases. The electric field strength is measured in units of volts per meter (V/m). Magnetic fields result from the flow of current through wires or electrical devices and increase in strength as the current increases. Magnetic fields are measured in units of gauss (G). The Baghdad power grid is based on a standard 33 kilovolt (kV) feeder system with 11 kV trunk lines. Lines can be found overhead or underground in residential and commercial areas. Substations located throughout the Baghdad area are used to split the 33kV feed into multiple 11kV lines that are then routed to residential and commercial areas to provide individual electrical service. The typical layout of the 37 substations covered under this environmental assessment would have up to three incoming 33kV lines, two transformers, and up to fourteen 11kV outgoing. Research has been conducted on the effects of EMF on the biological process of the human body over the past 20 years. The United States Department of Energy website was also searched for pertinent information related to this topic. According to information available, no conclusive evidence has been found to link any health problems to exposure to EMF.

3.6 AGRICULTURE, AGRIBUSINESS, LIVESTOCK, AND FISHERIES

Agricultural production in Iraq includes barley, wheat, rice and fruits products (including dates pears, apples, oranges, grapes, figs and pomegranates). The City of Baghdad is known for date palms that are mainly found along residential streets. The date palms trees bear fruit in September and October if there is ample rainfall and a mild summer. There are more than 300 different varieties of dates, which form an intricate part of Iraqi culture, with many traditional uses, such as furniture, baskets (or large containers), and mats made from leaves that can also be used as flotation devices. The fruit is eaten during religious ceremonies, and has historically been a major export. The populations of date palm trees have been decimated by conflicts (wars), salt-water intrusion, and lack of electricity for irrigation, from approximately 30 to around 13 million trees.

Before the United Nations imposed sanctions after the Gulf War in 1991, Iraq's export of dates accounted for a major share in the world market for this product. Livestock production, such as poultry, sheep, buffalo, camels, goats, and cattle are also raised in the upland regions and on farms within the Mesopotamian syncline. There is limited information on commercial fishing in Iraq, but there is some evidence of a small fishing industry that relies mainly on the common carp fish and other freshwater fish. As Iraq rebuilds itself and its economy stabilizes, opportunities for the expansion of agricultural production and agribusiness activities, and increased livestock and fisheries production will become available.

3.7 TOPOGRAPHY

The terrain of the country includes large flat expanses deeply cut by Euphrates and Tigris Rivers that originate from Syria and Turkey, and wadis (dry river beds) that are dry during most of the year. The delta lowland region of the Tigris and Euphrates Rivers basin extends southerly from the north of Baghdad to Arabian Gulf. The area is flat and encompasses 7,500 square km. of marshland, with scattered lakes in the south-eastern area. The south-western desert region is an extension of the Arabian Peninsula that comprises half of Iraq's total area, but is home to only 1% of the population. The desert region extends into Syria, Jordan, and Saudi Arabia, and is

sparsely inhabited by nomads, mainly consisting a wide stony plain that is interspersed with a few sandy stretches. Some wadis are more than 400 kilometers long, and they flood during the winter rainy season.

The north-eastern region borders with Turkey to the north, and the terrain elevation increases towards Iran. This changes from rolling plateau nearest to Turkey to irregular hills, and then to high mountains ridges (the Zagros Mountains), where summits average 2,440 meters above sea level. Except for a few valleys, the mountain area is mainly used for livestock grazing in the foothills and steppes, and the fertile soil in the valleys and high rainfall, however, make cultivation possible. The uplands region between the Tigris and the Euphrates Rivers extends westwards into Syria and Turkey, with water flowing into deep valleys, making irrigated agriculture more difficult than in the lower plain.

3.8 Drainage

The main sources of water in Iraq are the twin Euphrates and Tigris Rivers that originate in Turkey, which are vital to supporting livelihoods in Iraq. The problem of water scarcity is a continuing source of conflict in the region because of the mostly dry and hot climate. Iraq exercises the greatest control over the Tigris, since more than 1,500 km of the river's total length of 1,900 km. (80%) run through Iraq. Also, nearly 60% of the fresh water inflow enters the Tigris through tributaries originating from the Zagros Mountain range that collect most of the runoff within Iraq. After crossing the Turkish border, the Tigris River maintains a fairly constant slope for 36 km, and a stable course through soft bedrock for approximately 500 km. The average flow rate of the Tigris is approximately 1,500 cubic meters.

The Euphrates extends 2,700 km from its headwaters in Turkey, and only 1,000 km of the river lie within Iraqi borders. There is no fresh water inflow into the Euphrates from within Iraq, and approximately 85% of the inflow occurs within Turkey, with the remaining 15% in Syria. The construction of dams within Turkey has greatly reduced the threat of flooding along the Euphrates within Iraq, but this has also reduced the water supply required for supporting irrigated agriculture in Iraq. Although these dams are necessary in ensuring human health and safety through flood control, they also need to be managed in a way that they ensure sufficient downstream water availability for irrigated agriculture development in Iraq to prevent future resource use conflicts (US Department of Defense, 2003).

3.9 Geology and Soils

The desert plateau which covers approximately 40% of Iraq territory consists of a broad, stony plain with scattered stretches of sand, lying west and south-west of the Euphrates River. The Mesopotamian syncline, on which Baghdad sits, is a deep trough, filled with sediments derived from the mountains and transported by the rivers. The lower plains between the Euphrates and Tigris Rivers have been formed by the sedimentation of fluvial material resulting from historic floods.

Most of the soils are arid-alluvium soils that are some of the most important soils in Iraq because they support irrigated agriculture, which is a major land use type in the area. These soils are

highly susceptible to salinization (accumulation of harmful salts in the crop root zone, due to poor drainage), and soil erosion by water and wind. The soils need to be managed in a way that the occurrence of salinization and accelerated soil erosion caused by wind and water are effectively controlled. Approximately 30% of Iraq is composed of the alluvial plain, formed by the combined deltas of the Tigris and Euphrates Rivers. This region extends from north of Baghdad to the south, and includes the Gulf coast bordering Iran (UNEP, 2003).

3.10 Land Use in Selected Project Sites

The proposed project action will rehabilitate 12 existing 33kV/11kV power distribution substations, build 13 new 33 kV/11 kV substations, furnish four mobile substations and supply all the required equipment and materials for the 13 new substations that the ME is planning to construct. The present land use in the selected project sites is given in Table 3.

3.11 Biodiversity Resources

3.11.1 Vegetation (Herbaceous Cover)

Natural herbaceous vegetation (ground surface cover) in Iraq is extremely sparse, except in the northern mountains and the marshlands (wetlands) areas in the south. The once extensive wetlands of the region have been decimated by damming and diversion of the Euphrates in Turkey and Syria, and by large-scale drainage works carried out by the previous Iraq Baathist regime. The desert ecosystems that are found in a large part of the country are particularly vulnerable to physical damage from vehicle movements, which result in loss of vegetation ground surface cover and desegregations of soil particles. Iraq's deserts have therefore been at risk of widespread degradation during the military conflicts of recent decades (UNEP, 2003). The desert crust is a layer of algae, mosses, lichens, fungi, bacteria and cyanobacteria that occupy the top one millimeter of the desert soil. These organisms are dormant when dry, but they become active when wet. The crust has major ecological value in the desert ecosystem as a protector of the thin desert soil organisms against wind erosion, and as a suitable bed for seed germination. The crust is known to be highly fragile, and is easily damaged by vehicles, and takes a long time to repair itself. Extensive desert crust damage caused by vehicle movements was detected by Birdlife International in Iraq and Kuwait following the 1991 Gulf War (UNEP, 2003).

3.11.2 Forest Cover

Forest cover in Iraq (including both natural forests and plantations) has been estimated to be 799,400 hectares (FAO - Global Forest Resources Assessment, 2000). An earlier FAO study from 1970 included a figure of 1.8 million hectares, which shows a clear suggestion of extensive deforestation during the 1980s and 1990s. A UNEP, 2001 study for assessment of the world's closed forests (where tree cover is greater than 40% of the land surface) gives a figure of 1,100 hectares for Iraq, showing that most of the country's forest cover consists of scattered trees. The only major areas of natural forest cover occur on the slopes of the north east mountain ranges, with a few remnant patches of riverbank scrub along the Euphrates and Tigris Rivers, and their main tributaries. In its undisturbed state, this forest forms dense stands of poplar

(mainly *Populus euphratica*) and tamarisk (*Tamarix* spp.), with an under-story of species such as the Barbary Boxthorn. The remainder of the country is treeless, except for areas where tree plantations have been established, including tree crops such as date palms. Most of the original riverine forests that existed along the Tigris and Euphrates River courses have been cleared and converted to agricultural lands (UNEP, 2003).

Table 3: Existing Land Use at the Proposed Substation Locations

Substations	Site Description	Proposed action
Dora Al Tawasea	An area located inside the Dora Power Plant.	New substation building would be built, along with two new transformers and new 33 kV& 11 kV switchgear.
Saba Al Bor	Existing vacant building.	The existing vacant building would be rehabilitated and two new transformers and new 33 kV& 11 kV switchgear would be installed.
Tarmiya	Existing electrical substation with buildings.	The existing substation building would be rehabilitated and two new transformers and new 33 kV& 11 kV switchgear would be installed.
Ghazalia	Existing electrical substation with buildings.	The existing substation building would be rehabilitated and two new transformers and new 33 kV& 11 kV switchgear would be installed.
Kadumiyh	Empty lot in a residential area.	A new substation control building would be built and two new transformers and 33 kV& 11 kV switchgear would be installed.
Tib Al Baytari	Existing electrical substation with buildings.	The existing substation building would be rehabilitated and two new transformers and new 33 kV& 11 kV switchgear would be installed.
Awreej	Existing electrical substation with buildings.	The existing substation building would be rehabilitated and two new transformers and new 33 kV& 11 kV switchgear would be installed.
Hassan Bin Al Haytham	Existing electrical substation with buildings.	The existing substation building would be rehabilitated and two new transformers and new 33 kV& 11 kV switchgear would be installed.
Abu Deshir	Vacant lot in a residential area.	A new substation control building would be built and two new transformers and 33 kV& 11 kV switchgear would be installed.
Mekanik	Vacant lot in a residential area.	A new substation control building would be built and two new transformers and 33 kV& 11 kV switchgear would be installed.
Taji Camp	Existing electrical substation with buildings.	The existing substation would be demolished and a new substation control building would be built, along with two new transformers and new 33 kV and 11 kV switchgear.
Obaydi	Existing electrical substation with buildings.	The existing substation building would be rehabilitated and two new transformers and new 33 kV& 11 kV switchgear would be installed.
Abo Nuas	A vacant lot owned by the ME. Used as a park by the Iraqi Police.	New substation building would be built, along with two new transformers and new 33 kV& 11 kV switchgear.
Asbest	Existing electrical substation with buildings.	The existing substation building would be rehabilitated and two new transformers and new

Substations	Site Description	Proposed action
	buildings.	rehabilitated and two new transformers and new 33 kV& 11 kV switchgear would be installed.
Arasat	Existing electrical substation with buildings.	The existing substation building would be rehabilitated. Two new transformers and new 33 kV& 11 kV switchgear would be installed.
Rekheta	Resident occupied buildings on the site.	Existing buildings would be demolished, and a new substation building would be built consisting of two new transformers and new 33 kV& 11 kV switchgear.
Al-Muallimin	Existing electrical substation with buildings.	The existing substation would be demolished and a new substation control building would be built. Two new transformers and new 33 kV& 11 kV switchgear would be installed.
Selekh	Existing electrical substation with buildings.	The existing substation building would be rehabilitated and two new transformers and new 33 kV& 11 kV switchgear would be installed.
Hamad Shihub	Existing electrical substation with buildings.	The existing substation would be demolished and a new substation control building would be built. Two new transformers and new 33 kV& 11 kV switchgear would be installed.
Jadria	An empty area; vacant lot.	New substation building would be built consisting of two new transformers and new 33 kV& 11 kV switchgear.
Kulia Al Fania	Existing electrical substation with buildings.	The existing substation building would be demolished and a new substation control building would be built. Two new transformers and new 33 kV& 11 kV switchgear would be installed.
Al Khelani	Existing electrical substation with buildings.	The existing substation building would be rehabilitated and two new transformers and new 33 kV& 11 kV switchgear would be installed.
Rashid Camp	Existing electrical substation with buildings.	The existing substation would be demolished and a new substation control building would be built. Two new transformers and new 33 kV& 11 kV switchgear would be installed.
Kasrah Attash	Existing electrical substation with buildings.	The existing substation would be demolished and a new substation control building would be built. Two new transformers and new 33 kV& 11 kV switchgear would be installed.
Khahira	Vacant lot	A new substation control building would be built. Two new transformers and new 33 kV& 11 kV switchgear would be installed.

3.11.3 Wildlife

There is scant information on the numbers and distribution of wildlife in Iraq. The endangered mammals such as the gray wolf, the smooth-coated otter, and the honey badger are believed to range in the south of Iraq in the marshlands. The database listed 33 threatened species that could be found in Iraq: Cheetah (*Acinonyx jubatus*), Euphrates jerboa (*Allactaga euphratica*), Wild goat (*Capra aegagrus*), Grey Dwarf Hamster (*Cricetulus migratorius*), Forest Dormouse (*Dryomys nitedula*), Asian Garden Dormouse (*Eliomys melanurus*), Cinereous Bunting (*Emberiza cineracea*), European Pond Turtle (*Emys Orbicularis*), Sind Bat (*Eptesicus nasutus*), Sand Cat (*Felis margarita*), Saudi Gazelle (*Gazella saudiya*), Goitered Gazelle (*Gazella subgutturosa*), Striped Hyaena (*Hyaena hyaena*), European Common Tree Frog (*Hyla arborea*), Common Otter (*Lutra lutra*), Indian Smooth-coated Otter (*Lutrogale perspicillata*), Eurasian Lynx (*Lynx lynx*), Common Bentwing Bat (*Miniopterus schreibersi*), Long-fingered Bat (*Myotis capaccinii*), and Bunn's Short-tailed Bandicoot Rat (*Nesokia bunnii*).
The International Union for Conservation of Nature (IUCN) wildlife species list for Iraq includes reptiles and amphibians, such as toads (*Bufo viridis*), tree frogs (*Hyla arborea*), the marsh frogs (*Rana ridibunda)* and the edible frogs, *R. esculenta* (may be a hybrid of marsh frog and pool frog, *R. lessonae).* The common reptiles found in the marshes include the Caspian terrapin (*Clemmys caspia*), a soft-shell turtle (*Trionyx euphraticus*), geckos of the genus *Hemidactylus*, two species of skinks (*Mabuya aurata* and *M. vittata*), and a variety of snakes including the spotted sand boa (*Eryx jaculus*), tessellated water snake (*Natrix tessellata*) and gray's desert racer (*Coluber ventromaculatus*). The desert monitor (*Varanus griseus*) can sometimes be found in the areas adjacent to the rivers and marshes.

The IUCN database lists 404 species of birds that are believed to exist in Iraq, of which 14 are included in the global list of threatened species. For Iraq, the global list of threatened bird species includes: White-headed duck (*Oxyura leucocephala*), Lesser White-fronted Goose (*Anser erythropus*), Red-breasted Goose (*Branta ruficollis*), Marbled Teal (*Marmaronetta angustirostris*), Ferruginous Pochard (*Aythya nyroca*), Corn Crake (*Crex crex*), Slender-Billed Curlew (*Numenius tenuirostris*), Sociable Lapwing (*Vanellus gregarious*), Pallas's Sea-Eagle (*Haliaeetus leucoryphus*), Greater Spotted Eagle (*Aquila clanga*), Lesser Kestrel (*Falco naumanni*), Waldrapp (*Geronticus eremite*), and Dalmatian Pelican (*Pelecanus crispus*) while the Great Bustard (*Otis tarda*) is considered to be Extirpated globally. Bird species considered to be endangered in Iraq include: Imperial Eagle (*Aquila heliaca*), Houbara Bustard (*Chlamydotis undulate*), Pale Harrier (*Circus macrourus*), Lesser Kestrel (*Falco Naumanni*), Black-winged Pratincole (*Galreola nordmanni*), Grey Sea Eagle (*Haliaeetus albicilla*), Basra reed warbler (*Acrocephalus griseldis*), Long-billed Curlew (*Numenius tenuirostris*), and the Band-Tailed Fish-Eagle (*Haliaeetus leucoryphus*). The Long-Billed Curlew is considered critically endangered because all the remaining individuals are believed to live in a single sub-population of less than 50 mature individuals. The three endemic birds of Iraq - the Basra reed warbler, the Iraq babbler (*Turdoides altirostris*), and the Grey hypocolius – are marshland birds and are found primarily in the marshlands of the south. Two of these species, the Iraq Babbler and Basra Reed Warbler, are known to breed only in the marshes.

The Iraq region is especially important as part of the intercontinental flyways used by large populations of birds migrating between Africa and Eurasia. The majority of sites that are important for biodiversity conservation have no protected area status; although many have been recommended for designation (e.g. BirdLife International recognized a total of 42 sites in Iraq as important bird conservation areas, which cover about 35,000 square km, or 8% of the country surface area.). None of these areas have legal protection for biodiversity conservation, and many of the wetlands are critically threatened by flood control, irrigation, and drainage projects being carried out in the country and neighboring countries.

3.12 Biodiversity and Environmental Threats in Iraq

The main biodiversity and environmental threats that are contributing to ecosystem and biodiversity degradation in Iraq are: (1) Destruction of the Mesopotamian marshes and degradation of the Shatt Al-Arab region; (2) Destruction of forest cover; (3) Desertification and drought; (4) Pollution and contamination; (5) Military and Insurgency Conflicts; and, (6) Irrigation and Soil Salinization.

3.12.1 Destruction of Mesopotamian Marshes

The Iraq Mesopotamia marshlands (wetlands) are in a generally arid and semi-arid region and are of great importance for the conservation of biodiversity and support of community livelihoods. The destruction of the marshlands, which were of global conservation value, has been well documented (UNEP Reports: The Mesopotamia Marshlands: Demise of an Ecosystem, 2001; and, Desk Study on the Environment in Iraq, 2003). These studies have revealed that wetlands in the middle and lower parts of the Tigris and Euphrates Rivers were, until recently, the most extensive wetland ecosystems in the Middle East. The marshes covered an area of 20,000 square km, comprised of tall reeds, seasonal marshes dominated by desert shrub and grasses, shallow and deep-water lakes, slightly brackish seasonal lagoons, and regularly inundated mudflats. The wetlands extended from Basra in the south to within 150 km of Baghdad, but the core of the wetland system was located around the confluence of the Tigris and Euphrates Rivers (UNEP, 2003).

Previous government water control projects have drained most of the inhabited marsh areas east of An Nasiriyah by drying up or diverting the feeder streams and rivers. A once sizable population of Marsh Arabs, who inhabited these areas for thousands of years, has been displaced and furthermore, the destruction of the natural habitat poses serious threats to the area's wildlife populations, and inadequate supplies of potable water. The development of the Tigris and Euphrates rivers system contingent upon agreements with upstream riparian Turkey, air and water pollution; soil degradation (salinization) and erosion, and desertification. Massive drainage works in southern Iraq in the late 1980s and early 1990s, together with the effects of major upstream damming along the Tigris and Euphrates Rivers devastated the wetlands through desiccation. This has caused a total loss of 90% of the area originally covered by wetlands, such that only minor and fragmented parcels remain today. As a result this has put an end to the water filtering role of the marshlands for water purification, causing the remaining drainage canals to transport polluted irrigation waste water directly to the waters of the Persian Gulf, with potentially harmful impacts on local fish resources. The entire Marsh Arab community has

suffered huge socio-economic upheaval as a result of the marshlands destruction, with about 40,000 people being forced to flee to the southwest of neighboring Iran, and hundreds of thousands of IDPs within Iraq (AMAR/ICF, 2001). Also, most of the natural freshwater lakes and marshes in central and northern Iraq have been drained for agricultural purposes, although significant remnants of the marshes still remain.

3.12.2 Destruction of Forest Cover

There does not appear to be any readily available data on Iraq's natural forest cover and risks due to threats caused by resource utilization, but the combination of conflict and sanctions have caused increased pressure on the utilization and mismanagement of forests and their resources. During the 1980s and 1990s, about 80% of the approximately 17 to 18 million date palms tree crops lining the Shatt Al-Arab estuary, which was once the largest stand of date palms in the world, yielding an economically important crop of dates, were destroyed. This was mainly due to the consequence of the Iraq and Iran war, increased water salinity in the estuary, and large-scale upstream development of dams and irrigation schemes. There is a need for an up to date assessment of the forest resources in Iraq (UNEP, 2003).

The remaining, weakened palms have been highly susceptible to pest infestations and disease that have further degraded the quality of the environment (Partow - UNEP, 2003). Most of the riverine forests which once lined the banks of Tigris and Euphrates have been replaced by orchards and other cultivated land, but significant stands of natural forest still exist, especially on small islands (UNEP, 2003). The surviving natural forest cover provides important breeding habitat for a wide variety of birds, such as grey *Hypocolius ampelinus*, Iraq babbler, *Turdoides altirostris* , and Dead Sea sparrow *Passer moabiliticus.* These forests are also used as staging areas by large populations of migrating birds, between Africa and Asia.

3.12.3 Desertification and Drought

Desertification is the process of land degradation that is mainly caused by poorly regulated land use practices and climatic factors in arid, semi–arid and dry sub-humid areas. This occurs because dry ecosystems are highly fragile and extremely vulnerable to over-exploitation and inappropriate land use practices, causing the loss of life support capacity of the land. In Iraq the combination of impacts of military conflicts, internal policies and external sanctions have contributed to a high risk of desertification occurrence. This has been exacerbated by drought, and the destruction of the Mesopotamian Marshes (UNEP, 2003). Also, the degradation of grazing areas in the arid and semi-arid areas (rangelands) will have particularly adverse effects on the nomadic pastoralists. Desert ecosystems are particularly highly vulnerable to physical damage from vehicle movements, which result in loss of vegetation cover and desegregation of soil particles. During the military conflict of recent decades, Iraq nomadic grazing areas and deserts have been highly susceptible to the risk of widespread land degradation. The extensive desert crust damage from increased vehicle movements was detected by Birdlife International in Iraq and Kuwait, following the 1991 Gulf War (Greenpeace, 1999).

The problems of uncontrolled resource use due to internal conflicts and poorly regulated irrigated agriculture practices that cause soil salinization, including soil erosion due to

overgrazing, vehicle movements causing loss of vegetation cover and desegregation of soil particles, will have major implications on Iraq's ability to sustain agricultural production and to conserve the natural resource base (UNEP, 2003). In addition to unsustainable land management practices, there are also a number of institutional constraints which are reducing the effectiveness of biodiversity and forestry protection in Iraq. For example, there is poor coordination among various organizations (e.g. NGOs and international organizations) that are involved in natural resources management, due to the present conflict and political instability.

3.13 Environmental Pollution and Contamination

There are specific environmental pollution concerns in Iraq, caused by conflict damaged water and sanitation facilities in urban and industrial areas, oil wells, pipelines, refineries and petroleum storage sites. This stresses the need for identification, assessment and clean up of possible environmental pollution "hot spots" that pose immediate risks to human health, and damage to biodiversity resources and the environment, that require immediate attention. Some of the worst pollution "hot spots" include damaged industrial and military sites, sewage treatment facilities and places where municipal or medical (clinical waste) has accumulated in the urban areas.

Potential health risks due to air pollution caused by burning oil wells and pipelines, and fires at targeted industrial and military sites, also need to be assessed and remedial measures affected accordingly. To address these environmental concerns effectively, the environment should be fully integrated into all Iraq reconstruction and development plans and management operations (UNEP, 2003).

3.14 Military and insurgency conflicts

Iraqis' industrial infrastructure was heavily damaged during the 1991 Gulf War, and during the insurgency conflicts. The damaged industrial and military sites included armaments and oil production installations, and petrochemical industries that make up the most important sector, with products including agricultural chemicals, pharmaceuticals and fibers. The other damaged manufacturing industries include textiles and paper mills, furniture factories, electronic plants, and iron and steel production. All these industries use raw materials and also generate waste that has a potential to cause high risks to the environment, where oil is the major sources of hazardous polluting waste.

Past experience has shown that every conflict generates risk to human health and the environment (UNEP, 2003). The human health and safety (H&S) and environmental threats due to most recent military and insurgency activities in Iraq include air pollution, abandoned live UXO, drinking water contamination and the presence of hazardous substances including heavy metals and depleted uranium. The post-conflict situation in Iraq compounds a range of chronic environmental issues, and presents immediate challenges in the fields of humanitarian assistance, reconstruction and administration. There is a need, after the end of the major military operations and insurgency conflicts to address the post-conflict risk to the environment and to human health, and to promote long-term environmental management. Lessons learnt from earlier conflicts show that the immediate environmental consequences must be addressed as soon as

possible to avoid further deterioration of H&S, and environmental conditions. This requires the integration of environmental considerations across all sectoral development activities in all post-conflict situations.

3.15 Irrigation and Soil Salinization

Irrigated agriculture has been practiced in Iraq for over 7,500 years, dating back to the time when the Sumerians built canals to irrigate wheat and barley on the land between the Tigris and Euphrates Rivers. It was estimated in 1990 that over 5.5 million hectares of Iraqi territory are potentially suitable for irrigation, with 63% of this land occurring in the Tigris basin, 35% in the Euphrates basin and 2% in the Shatt al-Arab basin (UNEP, 2003).

The risk of increased soil salinity and water logging as a result of poor irrigation and drainage practices has long been a priority concern in the country, and was already recorded as a serious cause of reduction of crop yields some 3,800 years ago. In 1970 it was estimated that half the irrigated areas in central and southern Iraq were degraded due to increased soil salinity (UNEP, 2003). A land rehabilitation program was initiated in 1978, comprising concrete lining for irrigation canals and the installation of field drains and water collector drains. By 1970, a total of 700,000 hectares had been rehabilitated. But the continuing use of unsustainable management practices, damage to irrigation and drainage infrastructure during the 1991 Gulf War, and poor irrigation system maintenance practices exacerbated by sanctions, have caused a further soil deterioration due to salinity.

3.16 Air Pollution

Although the Ministry of Environment does not possess the apparatus to effectively monitor the level of pollutants in the air, the air quality in Baghdad and other major cities is generally considered to be not very good.

This has mainly been due to gaseous emissions from burning oil installations (wells, pipelines, refineries, storage tanks, etc.), power plants, brick factories, natural dust storms, and open burning of trash in urban areas and villages. The gaseous emission control methods for air quality standards have also not been consistently enforced in the country.

3.17 Noise Pollution

Ambient sound levels in Iraq are consistent with similar areas elsewhere in the Middle East. Areas in the mountains and areas outside the cities generally have lower ambient sound levels.

But frequent military operations and insurgent activities have contributed greatly to noise pollution in recent years.

4 ENVIRONMENTAL CONSEQUENCES OF BAGHDAD POWER DISTRIBUTION SUBSTATION PROJECT

4.1 ENVIRONMENTAL IMPACT ANALYSIS METHODOLOGY

The Scoping Statement indicated the main areas of focus for the PEA study for identification of potential adverse environmental impacts due to the proposed project. During the field work, the PEA study team confirmed the presence of the indicated environmental issues and identified the potential impacts and their appropriate mitigation and monitoring measures. The urgency for the construction of the power distribution substations and the security situation made it difficult for the team to conduct extensive site investigations for the field study.

The identification of adverse impacts was carried out using the project field site observations of existing environmental parameters likely to be impacted by the project activities, prepared environmental checklist, project activity description documents and interpretation of partner supplied secondary field data. The PEA draft report was submitted for review by all the project stakeholders (USAID Iraq Mission, ANE BEO, Government of Iraq ME, Local Authority and the project implementing partner). The received observations and comments were put together by the USAID MEO and given to the PEA study team for incorporation during the preparation of the final PEA draft report.

The following are the most pertinent references that were used by the PEA study team during the desk study:

1. Bechtel. 2003. Construction Environmental Control Plan for the Iraq Infrastructure Reconstruction Project. Contract Number EEE-C-00-01-00018-00, Document Number 249-2HP-H01-00003.

2. EMF RAPID Program. 1996. EMF Basics from the U.S. Department of Energy, the National Institute for Occupational Safety and Health, the National Institute of Environmental Health Sciences, and Oak Ridge National Laboratory. DOE/GO-10095-218, DE95013123

3. http://www.bsc-eoc.org/avibase/avibase.jsp ; World Bird Database

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5. Arab.net, part of the Saudi Research and Marketing Group, (http://www.arab.net/iraq/iq_agriculture.htm ; http://www.arab.net/iraq/iq_florafauna.htm, and http://www.arab.net/iraq/iq_road.htm).

6. Bird Checklists of the World, (http://www.bsc-eoc.org/links/links.jsp?page=l_mid_iq#spcount)

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13. International Union for the Conservation of Nature (http://www.redlist.org)

14. United Nations Development Program, "Iraq Living Conditions Survey 2004" Tabulation Report (http://www.iq.undp.org)

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This section of the report identifies the various potential adverse environmental impacts, and the project development stages in which they are likely to occur (project design, construction and operation stages). Section 5 of this report provides a list of the various identified adverse impacts due to the project and their recommended mitigation and monitoring measures (Table 4).

4.2 POTENTIAL ADVERSE ENVIRONMENTAL IMPACTS

The environmental consequences of the proposed Baghdad Power Distribution Substation Project are mainly influenced by changes in site topography, ground surface alterations due to site preparation for the construction of substation structures, movements and operation of heavy construction machinery, transportation of electric power equipment and construction materials, accumulation of construction waste debris, and handling and disposal of hazardous waste.

Most of the adverse impacts were found to be short-term and likely to occur mainly during the project construction phase. The occurrence of the impacts could be easily prevented or minimized by incorporating the recommended mitigation and monitoring measures during the project design and implementation stages. The following are the identified potential adverse environmental impacts due to the project and their recommended mitigation measures:

4.2.1 Soil Erosion Impact

Ground preparation and leveling for the installation of power distribution equipment and the transportation of equipment using heavy trucks could disturb the topsoil, making it susceptible to soil erosion occurrence. The disturbed soil could be easily transported by surface runoff to cause clogging of nearby drains and sewer pipes, and also cause dust problems to the project personnel and nearby residents. The soil erosion and dust generation occurrence would be expected to be temporarily, ceasing after the project construction stage is completed. It is anticipated that the proposed project will not have significant soil erosion impact around the power distribution sites if the preventive measures are addressed during the project design and construction stages.

Mitigation Measures: Measures taken to control erosion will include only clearing and grading the ground surface within approved work limits, stripping the top soil layer from the subsoil, stockpiling the removed soil in approved areas to be retrievable for restoration, maintaining drainage systems and replanting the original vegetation after construction is completed. The prevention of the soil erosion problem will be addressed during the project design and construction stages when the necessary control measures will be considered and included in the project design. The CECP 5.2.4 guidelines for sediment and erosion control will be followed to the practicable extent. Site restoration in the affected power distribution sites to the original environmental conditions, by replanting the local flora will return the landscape to its original natural condition and also prevent further soil erosion occurrence.

4.2.2 Site Pollution Impact

Eight of the 12 power distribution substations selected for rehabilitation are already contaminated by known PCBs, due to leakage from old or damaged power transformers. These transformers pose human health and safety threats to the general public if they are not disposed of in an environmentally-sound manner. The present hazardous waste at the sites also contains lead-based waste paint. This waste will be cleaned up before the installation of power distribution equipment, documented and stored in containers (labeled in English and Arabic) in preparation for safe disposal. The hazardous waste will be turned over to the ME, using DD1149 property transfer forms.

The accumulation of solid waste generated during the project construction stage will mainly be composed of debris from bits of wood, bricks, stone and metal; defective equipment parts; different types of plastics, broken glass, and ceramics; and, other non-noxious materials. The waste could also contain lead-based paint residues, heavy metals, and other products that could be considered as hazardous waste. Also, the hazardous waste material from the site backup generator (leakages of fuel and oil required for the operation of the generator) could end up in the groundwater, causing long-term health problems if the contaminated water is used in meeting domestic and livestock needs.

Mitigation Measures: The contractor will be required to safely manage hazardous materials, in accordance with the recommended HMMP, CECP Section 5.2.8. The procedures for handling hazardous waste include identifying, labeling, keeping data sheets, knowing the exact location, proper storage, and using recommended safe work practices to handle hazardous waste material.

Also, all fuel system and fuel storage systems will be placed within concrete containment areas so that any oil spills would be contained according to safe environmental BMP. A lined containment basin will be constructed for the generator to sit in, so that the released oil does not leak into the ground to pollute underground water resources. In addition, any waste material generated will be stored until a proper disposal facility is constructed.

For handling and disposal of various types of waste generated at the construction sites, the contractors will be required to follow the recommended measures provided in the CECP Sub-Section 5.2.9 for safe waste material management and disposal procedures. The hazardous waste will be stored and eventually disposed of in a safe manner to prevent potential harm to the local communities.

4.2.3 Hydrology and Water Resources Impacts

Construction on the sites will cause increased surface run-off, since the sites will be paved, causing changes in local drainage characteristics and possible flooding in nearby homes. The project sites are located in the existing residential and industrial areas, and the rainfall for this region is very limited. The transportation of PCB hazardous waste material by surface runoff to the underground water resources, could cause long-term contamination and, human health and safety problems if the contaminated water is used for drinking. It is anticipated that the proposed project would not have any significant adverse impacts to the hydrology and water quality.

Mitigation Measures: Storm water will be managed according to CECP 5.2.3 guidelines for surface runoff controls that include having construction site draining system connected to the existing storm water control structures, allowing for cross drainage diversion structures and a site-specific drainage plan for new project construction. Any hazardous waste material generated during the project construction activities that could impact water quality will be stored until a proper disposal facility is constructed. The waste will be handled in accordance with the recommended HMMP CECP Section 5.2.8 to minimize or prevent the occurrence of water pollution impacts.

4.2.4 Biodiversity (Flora and Fauna) Impact

The selected power distribution sites are all located in the urban area. There are no threatened or endangered species that are known to exist within the affected urban areas, and there are no protected areas within the project sites. Thus, it is expected that the project will not have significant impacts on sensitive or protected areas for any threatened or endangered biodiversity species because the proposed power distribution sites are either already developed, or they are vacant plots within developed residential urban areas.

It may become necessary to clear the vegetation cover in the undeveloped sites before the ground excavations and leveling for the installation of power distribution equipment are started. Any bush clearing, ground excavations and leveling, and digging of trenches will cause minimal or no biodiversity impacts in the sites. The proposed power distribution project will not cause any significant biodiversity impact in the selected project areas.

Mitigation Measures: The soil removed from the power distribution equipment installation sites will be used in landscaping around the paved areas for enhancement of environmental quality. The surrounding areas will be replanted with grass and flowers, and other suitable plants. The Government of Iraq will be encouraged to monitor the recovery of the planted natural vegetation to ensure full recovery.

4.2.5 Traffic Obstruction Impact

Transportation of project substation construction materials and power distribution equipment along the main roads will likely impede the movement of local traffic and also require the use of one lane in two-lane streets during the use of heavy trenching equipment and vehicle packing, causing traffic to be directed to alternate lanes or routes. If commuters are well informed of construction delays and utilize alternate routes, the impacts to local business and residents will be minimal.

Traffic obstructions caused by construction should be temporary and conditions are expected to return to normal once the construction activities are completed. CECP 5.2.11 states, "At construction site entry/exit points, public roads will be maintained such that roads are clear of debris and any street markings are visible. Any damage to public roads, markings, or signs caused by construction activities caused by construction will be restored to pre-existing conditions or better".

Mitigation Measures: The Ministry of Transportation will be asked to inform the members of the public about the temporary traffic movement inconvenience caused by the project construction activities involving road closure and detour signs. This is expected to be achieved through announcements on radio, television, and notices in the local newspapers, so that commuters can use alternate routes to avoid delays likely to be caused by traffic obstruction during the project construction activities.

Arrangements for alternate routes will rely on the guidelines provided in the CECP Section 5.2.11, which states that, "At construction site entry, or exit points, public roads will be maintained, such that the roads are clear of debris, that street markings are visible, and that any damage to public roads, markings, or signs caused by project construction activities will be restored to pre-existing conditions or better" after the completion of the project construction stage.

4.2.6 Human Health and Safety Impacts

The handling of hazardous PCB and lead paint contaminated waste during the project site preparation, and the possibility that the ground excavations for installation of power distribution equipment could lead to the discovery of UXO's have a potential for human health and safety concerns. The hazardous waste could also affect the quality of underground water resources that may cause long-term human health problems if the contaminated water is used for drinking.

The presence of UXO's could pose a serious risk to project construction personnel and project construction equipment if not properly identified and safely removed before the commencement of construction activities. The worker safety could be a significant issue if appropriate safety measures are not followed, due to the nature of the work preformed during the project construction activities. The construction activities could elevate the project personnel exposure to chemical hazardous waste, noise and dust pollution that could be injurious to the project personnel.

Mitigation Measures: The project construction personnel will be issued with personal safety equipment including steel toed boots, impermeable coveralls, impermeable gloves, safety hats, dust masks, gas masks, and special indicators such as methane detection devices and radiation exposure badges, if radiation exposure becomes an issue. Safety harness will be used while working in any trenches where methane might accumulate and displace air, and "First Aid" kits will be placed in every project office and in every project vehicle. The ME will be responsible for the storage of hazardous waste materials until they can safely disposed of in an environmentally sound manner. This will be done in accordance with the CECP 5.2.8, Hazardous Material Management Guidelines, Attachment B. The management of other wastes generated during the construction process will be carried out in accordance with the specifications provided in CECP, 5.2.9 Guidelines, Waste Management (Hazardous/Non-Hazardous), Attachment C. All the project sites will be investigated for live UXO in accordance with CECP 5.2.6 guidelines, and any discoveries made at the sites will be reported to the contractor for safe handling and disposal. Spill prevention and response will be implemented according to the specifications in the CECP, 5.2.10, Spill Prevention and Response, Attachment D. Iraqi project personnel will be trained in the BMP to safely operate and maintain the power distribution substations and associated facilities.

4.2.7 Air Pollution Impact

The project construction activities involving ground excavations and leveling for installation of power distribution structures will generate dust, causing temporary air pollution impact. The disturbed soil could be easily transported by wind to cause dust problems to the project personnel and nearby residents. The air polluting particles could contain carbon dust, silica dust, oil hydrocarbons, and other noxious fumes and gaseous emissions generated during the operation of heavy machinery. It is anticipated that there will be no significant lasting adverse impacts on air quality due to project construction activities.

Mitigation Measures: The present air pollution due to dust in the City of Baghdad is likely to continue in the foreseeable future even if the project is not implemented. The "BMP" outlined in the CECP 5.2.2 guidelines will be used in construction material handling to minimize the occurrence of fugitive dust to the extent possible. The population density around the project area ranges from heavy to moderate, but most residences are located at least several dozen meters away from the power distribution sites. Appropriate dust control measures, such as minimizing the amount of ground disturbance, material handling, and water use for dust suppression would limit the amount of dust and particulate matter produced during the project construction activities.

4.2.8 Noise Pollution Impact

The project construction activities involving operation of heavy equipment for ground preparation, installation of power distribution equipment and movement of heavy machinery during the transportation of project equipment will cause temporary increase of noise levels in the selected project sites. It is anticipated that there will be no significant lasting noise pollution impacts. The noise levels outside the project site boundary will not exceed 70 dBAs according to CECP Section 5.2.1 Guidelines.

Mitigation Measures: Noise levels will be monitored on weekly basis during the project construction stage, especially in residential areas so as to ensure that the levels do not to exceed 55 dBA. Also, the heavy machinery operators will be encouraged to wear personal hearing protection devises, and weekly training will be provided to the project construction personnel on "BMP" and use of appropriate protective devises. Also, changes in noise levels will be monitored, including regular project personnel health checks, keeping records of employee health, occurrence of safety events (accidents) and weekly safety meetings.

4.2.9 Electro-Magnetic Fields Impact

The 37 substation locations proposed by the ME for this project are found in residential and commercial locations through the City of Baghdad. Desk studies were undertaken on review of the information available in reports from the World Bank, U.S. Environmental Protection Agency, and the U.S. Department of Energy web sites to obtain the latest information available on EMF.

Based on the information gathered, it was concluded that, the highest magnetic fields generated at an electric power distribution substation are caused not by the substation equipment, but by overhead or underground power transmission lines entering or leaving the substation. The construction any new power lines would be the work of others, such as the ME. The 33kV and 11kV lines typically used by the ME are found throughout the city of Baghdad and are typical of those found throughout the major cities of the world. Based on available information the operation of these substations should not pose any significant health threats to nearby urban residents or business premises.

Mitigation Measures: Measurements will undertaken to monitor changes in the fluctuation of electro-magnetic fields around the power distribution stations to ensure that they do not cause any significant health threats to nearby urban residents or business premises.

4.2.10 Historical and Cultural Resources Impact

Iraq is a country that is rich in historic and cultural resources, being one of the cradles of ancient civilizations. No historic or cultural resources are known to exist at the 12 existing sites to be rehabilitated, but the sites for the 13 proposed new sites will be investigated for the presence of ant historical and cultural resources. There is a possibility that these resources could be impacted by the power distribution project during the construction activities, where the presence of these resources may not be unknown.

Mitigation Measures: Field surveys will be performed at each proposed new site to identify the presence of any historical and cultural resource before commencement of project site measurements, and construction activities. This will be done during the time of field surveys for any presence of live UXOs. At the moment no cultural resources are known to exist at any of the selected new sites. If any human remains or other possible cultural resources are found, all work will cease in the site and USAID Iraq and the Iraq Bureau for Tourism will be notified. Work will not commence again at the site of the find until USAID authorized it.

4.2.11 Socio-Economic (Positive) Impacts

The power distribution project in the City of Baghdad is expected to cause positive socio-economic impacts by easing the problem of domestic water supply to the urban residents, especially in the Karkh and Rusafa parts of the city, which have the most critical electric power needs. It is expected that the project will make it possible for domestic households to operate electric water pumps to meet household water needs, contributing to the improvement of standards of living for domestic households, which could potentially decrease the children and adults mortality rates in the project areas.

Also, the present PCB contamination of the selected project sites will be cleaned up before the installation of power distribution structures, thus promoting environmental quality and preventing potential contamination of the local groundwater resources.

5 RECOMMENDED ADVERSE ENVIRONMENTAL IMPACT MITIGATION AND MONITORING MEASURES

The purpose of this PEA study is to identify potential adverse environmental impacts due to the Baghdad Power Distribution Substation Project, and their appropriate mitigation and monitoring measures (table 4), so as to make the project environmentally-sound. This would make it possible to achieve a reliable and sustainable electric power supply to the urban residents of the City of Baghdad by integrating project engineering design and implementation with sound environmental management practices. The incorporation of recommended adverse environmental impact mitigation and monitoring measures (Table 4) during the project design and

implementation (construction, operation and management) stages will be expected to assist in achieving an environmentally-sound project design. This requirement needs to be included as a part of the contracting process for the implementation of Baghdad Power Distribution Substation Project.

The implementation of recommended adverse environmental impact mitigation and monitoring measures should not be the exclusive responsibility of the Baghdad Power Distribution Substation Project implementing partner and the ME staff. The local government authority (which is one of the project stakeholders) can also play an important role in ensuring that the recommended mitigation and monitoring measures are fully implemented and performing as required. These measures are required to be addressed during the project planning and design, construction and operation stages. The following Table 4 shows the occurrence of the identified potential adverse environmental impacts due to the project, including their associated project development stages, as outlined in Section 6.

Table 4. Mitigation and Monitoring Measures Associated with Baghdad Power Distribution Substation Project Construction and Operation

Activity	Impact	Mitigation Measures	Monitoring Requirements
1. Planning and Design Phase			
Design and assessment of electric power distribution substation structures and installation of equipment by electrical engineering design consultants.	Environmental sensitivities may not be considered at this stage, but it is important to ensure that the adverse impact **mitigation and monitoring measures** are considered and budgeted for**.**	Ensure good collaboration with the ME so that project activities can be coordinated. Encourage understanding of the affected areas of ecological sensitivity, if any. Power distribution station rehabilitation and new construction may require having an "Environmental Checklist" for use by those assessing construction needs. . Costs of environmental protection and management become an explicit part of the BOQ.	Government of Iraq ME review completed checklist and verify that it has been adequately completed Possible field visit by MEO to substation construction sites to assess status of environmental parameters, and mitigation and monitoring plans.
	Human health and safety impacts during the ground preparation for rehabilitation and construction of substations caused by handling hazardous waste containing presence of PCBS and lead paint, and during field survey for removal of any live UXO before project construction. .	Ensure that project workers are provided with protective field equipment before removal of hazardous waste. Ensure that the personnel doing the field survey for removal of UXO are well trained and fully equipped for detection, removal, safe handling and storage, including proper storage for hazardous waste.	Carry out regular field checks to ensure that workers are provided with protective field equipment for removal of hazardous waste and live UXO, that the equipment is working well, and that the removed waste and live UXO are safely stored.

2. Construction Phase			
Soil surface disturbance from bush clearing, ground excavations and leveling for installation of power distribution structures and equipment, requiring transportation and operation of heavy construction machinery.	**Soil erosion impact** leading to soil displacement and sedimentation, and clogging of near by drains and watercourses or surface water bodies.	Plant grass or other ground cover using local plants and flowers around the power distribution structures. Cost of spreading and, or compaction of disturbed soil incorporated into BOQ. Ensure adequate maintenance of affected water drainage ways to prevent blockages and failure	Monitor sediment and debris buildup in nearby drains, ditches or culverts. Measure drainage flow, or local hydrology to increase the understanding of local conditions, and impact cause and effect.
	Air pollution impact due to generation of dust during ground surface excavations and leveling.	Ensure that the field crew has breathing equipment to prevent health hazards due inhalation of dust.	Check breathing equipment to ensure that it is working well.
	Noise pollution impact during the operation of heavy machinery.	Ensure that machinery operators have personal hearing protection equipment.	Ensure that the personal hearing protection equipment is working well.
	Historical and cultural resources impact, causing possible damage to the present resources.	Ensure that field surveys are carried out for detection of presence of any historical and cultural resources of importance before power distribution structure construction starts.	Carry out regular field checks to ensure that the necessary field surveys are done in every site before project construction activities are started.

Increased surface runoff due to roof catchments and construction of ground pavements in the power distribution station compounds.	**Hydrology and water resources pollution impact** due to transportation of PCB and lead paint pollutants to surface and underground water resources. **Human health and safety impacts** during the handling of hazardous PCB contaminated waste and removal of live UXO before the rehabilitation and construction of power substations.	Ensure that leakages of PCBs and lead paint residues are safely removed from power distribution substations to prevent their transportation by surface runoff when it rains. Ensure that project personnel involved in project construction are well trained and fully equipped for safe detection, removal, storage and disposal of hazardous waste and live UXO.	Carry out regular inspection of the power substations to ensure that all types of waste are completely removed and safely disposed off. Carry out regular checks to ensure that field equipment for removal of hazardous waste and live UXO is working well, and that the removed hazardous waste and live UXO are safely stored and disposed off.
Ground excavations and leveling for construction of power distribution structures.	**Biodiversity impacts** due to removal of plant material and other living organisms from the site, leading to possible loss of local flora and fauna species	Avoid areas sensitive for nature conservation when selecting new sites for power substations, especially those used for recreation in urban areas. Ensure that removed soil is well kept and used for environmental restoration and landscaping around the power distribution substations after the construction is completed.	Verify that environmental restoration and landscaping activities meet the mitigation standards. Verify natural plant regeneration on restored areas and if necessary, replant.

Generation of hazardous solid and liquid waste during the power distribution structure construction stage.	**Site pollution impact** due to accumulation of hazardous waste from garbage, fuel leaks or waste oil and other lubricants from motorized equipment.	Ensure project personnel training on specified site pollution safeguards. Provide equipment for storage of waste oil and other lubricants. Incorporate full field cleanup costs well into BOQ. Ensure that the field crew is well trained in safe handling and disposal of hazardous waste.	Ensure that the hazardous waste is properly removed stored and regularly disposed off in a safe manner. Ensure that training on safe handling of hazardous waste is regularly provided, including equipment for safe handling of waste.
Construction vehicle and traffic use of the road during the transportation of construction materials and power distribution equipment.	**Traffic obstruction impact** during movement of heavy construction machinery with heavy trucks along the roads, with a possibility of creating heavy traffic jams along the roads, especially in urban areas.	Transmit messages on affected roads through radio, TV and newspapers to warn members of the public to avoid affected roads during project construction periods. Arrange for regulation of traffic movement during project construction along affected roads. Install road signs to enforce speed limits and slow down traffic along affected roads during project construction periods. Arrange for road signals for alerting drivers to the dangers of passing on affected roads during project construction.	Ensure that traffic laws are enforced during the project construction period. Ensure that roads liaison officer maintains continuous log of community enquiries and complaints on road use inconveniences during project construction periods.

3. Operations Phase			
Operation of power distribution equipment in substations.	**Electro-magnetic fields impacts** due to high voltage equipment that could cause human health and safety considerations in residential areas.	Undertake measurements for changes in the fluctuation of electro-magnetic fields around the power distribution stations.	Monitoring changes in the fluctuation of electro-magnetic fields to ensure that they do not cause any significant health threats to nearby residents or business.
	Human health and safety impacts due to leakage of hazardous PCB during the operation of transformers.	Ensure that the ME staff technicians involved in the operation and maintenance of the power distribution substation equipment are well trained and fully equipped in safe handling and disposal of PCB contaminated hazardous waste.	Monitor the occurrence of PCB leaks from transformers, and safe removal of PCB contaminated hazardous waste.

6 CONCLUSION

The Baghdad Power Distribution Substation Project will rehabilitate 12 existing 33kV/11kV power distribution substations, build 13 new 33 kV/11 kV substations, furnish four mobile substations and supply all the required equipment and materials for the 13 new substations that the ME is planning to construct. This will provide more reliable and efficient supply of electric power to the residents of the City of Baghdad, especially the residents of Karkh and Rusafa parts of the city that have been identified by the ME as areas with the most critical need for the improvement of electrical distribution and supply. This will make it possible for domestic households to operate electric water pumps to meet household water needs, thus contributing to the improvement of standards of living for domestic households, which could potentially decrease the children and adult mortality rates.

The project construction and operation activities have been shown to have a potential to cause adverse environmental impacts, most of which are temporary impacts. The occurrence of the adverse impacts should be considered early in the project design and construction stages, so that the recommended adverse impact mitigation and monitoring measures can be fully incorporated in the project design. This should also be a mandatory requirement for the contracting process for

the project construction company. Also, the project personnel require be trained and provided with the necessary equipment for preventing the occurrence of any potential human health and safety impacts during the project construction and operation stages.

The contracted company should be required to ensure that all the recommended adverse environmental impact mitigation and monitoring measures are fully incorporated in the project design and implementation stages. The urban Local Government Authority in the City of Baghdad and the urban residents should be encouraged to participate in the implementation of the adverse impact mitigation and monitoring measures so as to ensure that the measures for environmental restoration and landscaping around the power distribution substations are properly implemented and maintained.

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13. International Union for the Conservation of Nature (http://www.redlist.org)

14. United Nations Development Program, “Iraq Living Conditions Survey 2004” Tabulation Report (http://www.iq.undp.org)

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10 APPENDIX 1: STUDY SCOPING STATEMENT

SCOPING STATEMENT
for the
PROGRAMMATIC ENVIRONMENTAL ASSESSMENT
of the
BAGHDAD ELECTRIC POWER DISTRICT DISTRIBUTION SUBSTATIONS

(JO-04-506)
in cooperation with the

GOVERNMENT OF IRAQ MINISTRY OF ELECTRICITY

INTRODUCTION

In order to support the people and the Government of Iraq, and to improve the management and supply of electricity for the Baghdad area, the United States Agency for International Development ("USAID") proposes to finance and rehabilitate 12 existing 33kV/11kv substations, build 25 new 33 kV/11 kV distribution substations, and provide four mobile substations. The substation work is located in the Baghdad area and has been identified by the Ministry of Electricity (ME) as the most critical area of need for improving the electrical distribution within Baghdad. There are over 5 million people in the Baghdad area and this project will benefit over 1 million of them, particularly in the Rusafa and Karkh Districts of Baghdad. The environmental review requirements of USAID (22 CFR 216) require the preparation of an Environmental Assessment (EA) or Environmental Impact Statement for new construction, specifically, the construction of facilities such as industrial plants. An EA is a detailed study of the reasonably foreseeable significant effects, both beneficial and adverse, of a proposed action on the environment of a foreign country. The first step in this process is the preparation of a Scoping Statement, which is a document used to anticipate potentially significant issues, issues that are potentially not significant, and to determine how and by whom the study will be conducted. The purpose of this Scoping Statement is to set forth clear understanding between USAID and the Ministry of Electricity with respect to these issues for this project.

BACKGROUND

The Bureau Environmental Officer (BEO) for USAID's Asia Near East (ANE) bureau concurred with the recommendations contained in a Programmatic Initial Environmental Examination (PIEE) of the Iraq Infrastructure Reconstruction Program in February 2004. This PIEE anticipated a finding of a positive determination for activities that involve major construction activities and suggested the need for an EA for such activities. Construction of new electric substations is the type of new construction that would require the preparation of an EA based on the PIEE and section 216(2) (d) (1) (x) of Regulation 216 and thus is generally considered to have potential significant impacts on the Environment.

The proposed equipment installation, testing, and training are intended to improve the reliability of the distribution system. The substations will provide increased efficiency in electric distribution for a large area of Baghdad. Equipment that will be installed will conform to recognized international codes and standards for these types of facilities. The estimated cost of this project is $64.6 million.

The scope of work will include a site security assessment, operation/maintenance training, and management training. All instruction and procedure documents will be transmitted to the appropriate responsible parties.

DIRECT, INDIRECT AND CUMULATIVE POTENTIALLY SIGNIFICANT EFFECTS

1) Storm Water
Scope – Construction on the site will potentially cause added run-off since the site will be covered and water will be unable to infiltrate and could potentially cause changes to the drainage and potentially flood nearby homes.
Significance – This is potentially significant if drainage is not considered in the site plan.

2) Site Erosion during Construction
Scope – During construction the topsoil will be disturbed by trucks and heavy equipment. This could clog up nearby sewer pipes.
Significance – This is potentially significant if erosion is not mitigated by proper erosion control techniques.

3) Hazardous Material from Existing Substations
Scope – The existing substations may contain polychlorinated biphenyls, which have been shown to cause health problems. There may be other materials present in the existing substations including asbestos and lead-based paint. Workers would need to take precautions when they are in the presence of any of these chemicals, since many of the chemicals could cause long-term health problems if not properly contained and disposed of. Also, the soils in the proposed work area could be a hazard to any children that play near the sites.
Significance – This is potentially significant if the hazardous materials are not disposed of properly during construction phase or during periodic maintenance.

4) Unexploded Ordnance
Scope – The recent wars have scattered UXO throughout the country. Most are located in predictable locations, but many are located in areas with limited or sporadic fighting.
Significance – This is potentially significant and will be mitigated with a UXO review.

5) Construction site debris
Scope – Debris will be generated during the construction process. Construction site debris would primarily be rubble, brick, stone and waste bits of wood and metal; but it also may include many diverse types of plastics, glass, ceramics, and other non-noxious materials. Construction debris could contain paint residuals, perhaps heavy metals, and other products that would be considered hazardous wastes. A site-specific permit should be obtained to allow disposal in the sanitary landfill following material recognition and hazard identification.
Significance – This is significant only if any hazardous chemicals or products are present in the debris or waste products.

6) Air pollution control, dust and air quality control
Scope - This means the control of particulates; notably elemental carbon, silica dust, hydrocarbons, smoke, other carcinogens and other noxious fumes and gases that could potentially be generated during the construction process.
Significance – This will need to be the highest priority of management during construction activities, but will cease to be an issue after construction is complete.

7) Worker health and safety
Scope – Workers must be protected with knowledge of the materials they are handling, an active safety program, and appropriate safety equipment including appropriate gloves, steel toed boots, non-permeable coveralls, safety helmets, protective masks (including gas masks if necessary), and hearing protective devices. Hazard detection equipment (chlorine badges), if warranted, must be used and an institutionalized monitored program set-up and monitored daily. Smoking on the site must be allowed in designated areas only.
Significance – This is extremely significant and must be a high priority for site management.

8) Noise
Scope – Machinery noise is the major source of noise. Air horn use must be restricted to emergency warnings only. Strict silencer standards are needed. Silencers must be used on all equipment and kept in a well-maintained state.
Significance – Personal hearing protection devices must be worn by machinery operators when required noise levels exceed 85 dbA. This is a minor issue.

9) Archeological
Scope – Care must be exercised during site development to identify and effectively deal with any archeological discoveries.
Significance – This is a major issue with regard to the site only during the preparation of the site. This is a high priority item during the period of new site development.

10) Traffic
Scope – During construction, traffic could be disrupted resulting in large traffic jams, so a plan must be developed to cause the least disruption in traffic patterns as possible.
Significance – This is a major issue with regard to the site during the preparation of the site. This is a high priority item during the period of new site development.

ISSUES THAT ARE POTENTIALLY NOT SIGNIFICANT

Threatened and Endangered Species
Scope – The site is a finite site that does not provide habitat for any species that are critically threatened, threatened, vulnerable, or endangered.
Significance – This issue is NOT significant for this site, since it is now an industrial site within the city limits. The IUCN database was searched for T&E species in Iraq. Results lead one to believe that this issue is NOT significant.

Seismic, Geology and Soils
Scope – Iraq is not a seismically active area – USGS records show there have been no recorded earthquakes in Iraq since before 1998. The area is urban with development throughout. The geology and soils of the sites will be investigated prior to construction.
Significance – These issues are primarily design issues, and if well treated in the plan and design, are believed to be NOT significant.

Desertification
Scope – This regional concern is the result of overgrazing from oversized herds resulting from the ever-increasing population pressures on the land.
Significance – This is NOT a significant issue for this proposed project since all work areas occur within an urban area.

TIMING OF PREPARATION OF ENVIRONMENTAL ANALYSIS

It is anticipated that the Scoping Statement document will be completed in Baghdad by July 25, 2004 and forwarded to the ANE BEO for circulation. The Scoping Statement document will be circulated by the Mission Environmental Officer (MEO) to the Mayoralty of Baghdad, Ministry of the Environment, Ministry of Health, Ministry of Electricity, Ministry of Transportation and interested in-country NGOs concurrently with circulation to other federal agencies by the ANE BEO. The comment period provided by REG 16 may be up to thirty (30) days. EA preparation can commence and the work progress pending BEO approval of the Scoping Statement document. Comments received following circulation can be incorporated in the final Scoping Statement document. Following the receipt in June of comments on the Scoping Statement, the EA team can perform any additional studies necessary and prepare the final project design and the design of the monitoring and mitigation plan. The EA can be submitted in August to the BEO and final approval can be obtained before the end of August.

VARIATIONS IN THE FORMAT OF PEA

No variations in the format of this Environmental Assessment are needed at this time nor is it anticipated that any variations will be needed at a later time.

SCHEDULE OF PLANNING AND DECISION MAKING

July 25 – Scoping Statement sent to BEO and circulated in country
July 28 – BEO sets up Washington based EA review team
July 28 – August 27 – Draft EA prepared
August 27 – Final Scoping Statement Prepared
August 28 – Final EA sent to BEO in Washington
August 30 – September 10 EA circulated for comment
September 10 – Final EA approved by BEO
September 11 – Construction can commence

DESCRIPTION OF HOW ANALYSIS WILL BE CONDUCTED

The analysis will be conducted in Baghdad through individual contributions of the team members with periodic ad-hoc meetings to coordinate the study of significant issues and track the progress of the work.

DISCIPLINES THAT WILL PARTICIPATE IN THE ANALYSIS

1. Team Leader – Gib Owen, Corps of Engineers

2. Mission Environmental Officer – Robert Macleod, USAID
3. Power Engineer – Bechtel - TBD
4. Mission Health Officer – Leslie Perry
5. Environmental Specialist – Janene Van Deroef, Bechtel
6. Biologist – Fadiya Fahim, Corps of Engineers
7. Power Specialist – Dick Dumford, USAID

SUBJECT AREA SPECIALIST

1. Baghdad Amanat
2. Ministry of Electricity
3. Ministry of Transportation
4. Ministry of Health
5. Ministry of Environment
6. Corps Sector Manager

11 APPENDIX 2: COMMENTS FROM MINISTRY OF THE ENVIRONMENT AFTER REVIEW OF DRAFT ENVIRONMENTAL ASSESSMENT REPORT

بسم الله الرحمن الرحيم

Republic Of Iraq
Ministry Of Environment
Office Of The Senior Deputy For Technical Affairs
NO: 2271
DATE: 12/Sept/2005

جمهورية العراق
وزارة البيئة
مكتب الوكيل الفني
العدد: ٢٢٧١
التاريخ: ١٢/٩/٢٠٠٥

Dear Mr. Owen,

With reference to your letter dated 22nd August, 2005 , requesting the Ministry's comments regarding the Draft Environmental Assessement (EA) for Baghdad Distribution Substation project, would you kindly provide us with the following information:

1- Details of the early warning and fire fighting systems.
2- The distance between the Substations and the nearest residential areas (in meters please).

Please accept the assurances of my highest consideration.

Yours sincerely,

Dr. Muthanna Al-Omar
Deputy Minister
September, 12, 2005

Mr. Gib Owen
Environmental Compliance Manager
U.S. Army Corps of Engineers
USAID Project Office, Baghdad

العنوان البريدي – بريد الكرادة – صندوق بريد (١٠٠٦٢)

RESPONSE TO THE MINISTRY OF THE ENVIRONMENT COMMENTS.

Dr. Muthanna Al-Omar

Please accept the following information in regards to your September 12, 2005 letter to me in regards to the USAID Baghdad Distribution Substations Project.

1. For each substation, a fire detection/protection system (smoke/fire detectors, control/annunciation panel, fire extinguisher, etc.) will be installed in accordance with applicable industry standards and the manufacturer recommendations. Fire detection & protection shall be provided at a minimum at the following locations in each substation, all transformer locations, switchgear room, battery room, accessible cable spreading areas under the building operating floor, and the control room/kitchen. Outdoor detectors for transformers shall be thermostatic detectors and shall be protected against sunshine, rain and weather. For indoor equipment/areas, ionizing or optical type smoke/fire detectors shall be provided. In an accessible cable spreading area under a floor, smoke detectors shall be provided with a local indicator light. All the smoke/fire detectors shall be wired to the substation main fire alarm/control panel. In the event a fire or smoke/fire is detected, the main panel shall indicate the specific local alarm source and also activate local alarm sirens, one inside and one outside the substation enclosure building. Substation layouts will provide for a personnel life-safety egress route from enclosure buildings to the site perimeter gate for fire escape. In addition, a master fire alarm signal is to be provided for remote alarming at the distribution dispatcher center via the Minister of Electricity's SCADA system. Additionally, a portable fire extinguisher shall be positioned in a conspicuous location at each substation.

2. Many of the substations (existing and new) are located in developed residential areas business areas and as such the distance between the substation perimeter wall and a residence in some cases would be zero meters. In most locations the distance from transformers, switchgear, and other equipment is ten meters or more. The Ministry of Environment raised the question of electro magnetic forces (EMF) in response to the scoping statement that was sent out in 2004. The authors of the environmental assessment investigated the issues concerning EMF and determined that no significant impacts to local populations would occur from the construction of the substations.

We will incorporate your comments into the final environmental assessment being prepared for USAID staff in Washington DC. Please do not hesitate to contact me with any other concerns or questions you may have.

Gib Owen
USAID Environmental Compliance
US Army Corps of Engineers