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COMPREHENSIVE STUDY AND PROJECT PREPARATION FOR THE REHABILITATION OF THE NUBARIA AND ISMAILIA CANALS

APPRAISAL REPORT

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AFRICAN WATER FACILITY (AWF) AUGUST 2007

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ACRONYMS AND ABBREVIATIONS

ADB:	African Development Bank
ARE:	Arab Republic of Egypt
AWF:	African Water Facility
ESIA:	Environmental and Social Impact Assessment
ESMP:	Environmental and Social Management Plan
GOE:	Government of Egypt
HEPS:	Horizontal Expansion and Projects Sector
ICB:	International Competitive Bidding
IWRM:	Integrated Water Resource Management
LE :	Egyptian Pound
MWRI:	Ministry of Water Resources and Irrigation
NCB:	National Competitive Bidding
O&M:	Operation and Maintenance
SCT:	Study Coordination Team
TOR:	Terms of Reference
WUA:	Water Users Association

MEASURES

km	=	kilometer
km^2	=	square kilometer
m	=	meter
m^3	=	cubic meter
mm	=	millimeter
Mm^3	=	million cubic meters
BCM	=	billion cubic meters
1 ha	=	2.38 feddans
1 feddan	=	0.42 hectares

CURRENCIES

1 €uro	=	7.67 LE (Egyptian Pound)
1 €uro	=	1.36 U.S.$

HIERARCHY OF OBJECTIVES	EXPECTED RESULTS	REACH (BENEFICIARIES)	PERFORMANCE INDICATORS / SOURCE & METHODS	INDICATIVE TARGET / TIMEFRAME	MAIN ASSUMPTIONS / RISKS MITIGATION
	Impact		**Long-Term Indicators**		
Sector Goal: To contribute to the Integrated Water Resources Management Plan (IWRMP) by improving the efficiency & sustainability of the use of land and water resources in Egypt	Increased efficiency in water availability for agriculture, domestic & industrial uses and transportation	Up to 1,332,000 families country-wide and 2,000 industrial beneficiaries	Increase in overall water availability in the data profile of the Ministry of Water Resources and Irrigation (MWRI)	Overall water availability increases by at least 5% by 2017	Government insures consistent maintenance of the IWRMP with the existing capacity
Purpose of the Study:	**Outcome**		**Medium-Term Indicators**		
To mobilize financial resources to reduce water shortage and logging in the Nubaria & Ismailia canal systems To prepare technical proposals for major infrastructure investment	Euro 120,000 mobilized 244 km of canal rehabilitated upgraded Increased volume of water and area of irrigable land made available Provision of solutions for efficient water control and system management for agriculture, domestic & industrial use, as well as for navigation	Up to 1,332,000 families country-wide and 2,000 industrial beneficiaries	Proposal of feasible solutions for both canals improvement Mobilization of financial solutions	Production of detailed feasibility study for Nubaria and Ismailia canals Funding mobilized	Government ownership of the two studies is achieved through permanent consultations with MWRI during investigations
Activities / Inputs:	**Outputs**		**Short-Term Indicators**		
Phase I: 1. To engage and mobilize the consultant team 2. To undertake review of Literature and field assessment of major previous works on the canals 3. To assess scope and details of the work plan **Cost: €179,835**	1. Current status and knowledge about the canal system acquired 2. Focus areas for further study and investigation identified 3. Establishment of the study implementation critical path	Ministry of Water Resources and Irrigation (MWRI)	Recruitment of consultant team and production of inception report	Team recruited by the 3rd month and inception report produced by the 7th month	Procurement process is not delayed: this will be mitigated by close monitoring of the process

HIERARCHY OF OBJECTIVES	EXPECTED RESULTS	REACH (BENEFICIARIES)	PERFORMANCE INDICATORS / SOURCE & METHODS	INDICATIVE TARGET / TIMEFRAME	MAIN ASSUMPTIONS / RISKS MITIGATION
Phase II: 4. To undertake preparation of full scale field assessment and investigation under a pre-feasibility study of both canals 5. To undertake pre-feasibility study in view of solution of each canal 6. To organize workshops for stakeholders consultation **Cost: €1,116,533**	4. Validation of previous assess-ments and identification of new technical information for both, in view proposing for improve-ment of the two canals 5. Proposal of all possible solutions for rehabilitation and corresponding rough estimates and comparative advantage 6. Choice of the most suitable solution for each canal for all stakeholders	Ministry of Water Resources and Irrigation (MWRI)	Production of pre-feasibility study reports for canal improvements	Production of two pre-feasibility study reports for improvement of the Nubaria & Ismailia Canals by the 21st month	Risk that the proposed solutions are too costly: this will be mitigated by encouraging the most efficient and realistic solutions acceptable to the Government
Phase III: 7. To undertake the detailed assessment of the chosen solutions for both Nubaria & Ismailia canals under a feasibility study 8. To prepare bidding documents 9. To organize workshops for stakeholders consultation 10. To seek funding **Cost: €690,372**	7. Production of detailed semi detailed designs for the chosen solutions with the corresponding costs 8. Production of bidding documents 9. Stakeholders ownership acquired 10. Proposal for funding	Ministry of Water Resources and Irrigation (MWRI) and up to 1,332,000 families country-wide and 2,000 industrial beneficiaries	Production of the detailed semi-detailed reports and contractual documents for canal improvements	Production of the two feasibility reports for the improvement of the Nubaria & Ismailia Canals by the 26th month	Risk that the proposed solutions are too costly: this will be mitigated by encouraging the most efficient and realistic methods acceptable to the Government
Study Cost: €1,900,090					

EXECUTIVE SUMMARY

1. In November 2006, the Bank Group received a request from the Government of Egypt (GOE) to seek grant funding for the proposed Comprehensive Study for the Rehabilitation of the Nubaria and Ismailia Canals. A Bank Group appraisal mission travelled to Egypt between 17th April and 2nd May 2007 to undertake the study appraisal and visited both the Nubaria and Ismailia canal areas. Both these canals are experiencing serious problems such as *decaying* and *poorly functioning infrastructure*, *seepage* and *water logging* adversely affecting valuable agricultural land, *insufficient water conveyance capacity*, *unauthorized abstractions*, *environmental degradation from pollution*, etc.

2. The GOE commissioned in the past a number of technical investigations along sections of these canals, in order to find short-term solutions to the existing problems hindering canal performance. Most of these solutions did not help to improve the poor condition of the canals, and some of the attempted measures even contributed to a worsening of the situation, such as the removal of the silt layer of the soil while enlarging the canals, thereby inducing seepage from the canals into the surrounding agricultural lands.

3. Subsequently the GOE developed an integrated water resources management plan up to 2017 (IWRMP 2017), in view of addressing on a long-term basis, the water control and management systems for irrigation and drainage systems throughout the country. The improvements of the Nubaria and Ismailia canals are major components of the IWRMP. The primary objective of the proposed Study for the improvement of the Nubaria and Ismailia canals is to seek technically feasible and economically and socially viable solutions for efficient water control and system management in these two canals, concentrating on the main canal system only. The implementation of the proposed solutions from the Study will help mitigate the above-cited problems currently hindering the performance of the two canals. The expected impact of canal improvements include enhanced distribution, quantity, quality, equity and timeliness of water delivery to the beneficiaries for a variety of uses such as agriculture (irrigation and drainage), domestic (water supply and sanitation), industrial, as well as for navigation.

4. The Study will undertake pre-feasibility and feasibility level work, to include developing semi-detailed designs, bills of quantities, cost estimates and tender document preparation so that major investment operations for both Nubaria and Ismailia canals can follow immediately upon conclusion of the Study. The Study will also comprise a full Environmental and Social Impact Assessment (ESIA) including an Environmental and Social Management Plan (ESMP) and Environmental Monitoring Programme (EMP) with associated costs for implementation of any recommendations.

5. The beneficiaries of the Study are the people suffering from the problems faced in each of the West Nile Delta (Nubaria Canal area) and Ismailia Regions who will directly benefit from finding effective solutions to the problems faced by the two canals. It is estimated that 832,000 families in the Ismailia Canal command and 500,000 families in the Nubaria Canal command areas could directly benefit from the physical implementation of the Study recommendations.

6. The Study will be awarded to a single consultancy firm to undertake work over a 26-month period at an estimated cost of € 1,900,090 million. This project preparation activity could result in triggering two (2) investment operations in infrastructure rehabilitation and development from the Government through access to African Development Bank lending of approximately € 120 million in total and from other potential sources thus fulfilling one of the main objectives of providing AWF support.

1. BACKGROUND

1.1 Origin of the Project

1.1.1 The Ministry of Water Resources and Irrigation (MWRI) is the key Government agency responsible for the operation, improvement and sustainability of irrigation systems in Egypt. This involves continuously seeking means to reduce system losses, to improve system efficiency and effectiveness, and to optimise water distribution equitably for beneficiaries.

1.1.2 There are many-water related challenges facing Egypt. On the one hand, the growing population of Egypt and related industrial and agricultural activities have increased the demand for water to levels that reach the limits of the available supply. The majority of the population of Egypt is concentrated in the Nile Valley and Delta, i.e. almost 97% of the population live on 4% of the country. To relieve the pressure on the Nile Valley and Delta, the government has embarked on an ambitious programme to increase the inhabited area in Egypt by means of horizontal expansion projects in agriculture and the creation of new industrial areas and cities in the desert. Such new projects increase the demand for water too. On the other hand, water resources in Egypt are limited mainly to the River Nile and therefore the supply is almost fixed. Moreover, pressure on the water resources due to population growth and the related developments have resulted in water pollution and quality issues leading to public health hazards and reducing the amount of good quality water even further.

1.1.3 In response to these challenges, the MWRI has developed a National Water Resources Plan (NWRP) up to the year 2017. The NWRP has three main pillars, one of which is to make better use of existing resources with the aim of improving the efficiency of the water resources system through a mix of infrastructural and financial incentives or measures. The proposed Study will either constitute or be part of the government efforts to tackle the water-resources related problems in two key regions of the country, namely the West Delta and the East Delta.

1.1.4 The first proposed study area is located to the West of the Nile Delta and to the left of the Rosetta Branch of the Nile River (See Annex 1A – Map of Nubaria Study Area). The West Nile Delta Region is an area of high development potential which covers almost 5% of the Egyptian territories and accommodates about 10 million inhabitants (15% of the country's population). The area includes both old Delta lands, previously flooded by the river before the construction of the High Aswan Dam, and other more recently reclaimed lands during the last fifty years. The old Delta lands comprise either heavy or light clays depending on the location; while the reclaimed lands comprise light sandy soils. Also, large areas of land located in the southern part of the West Delta were developed using groundwater following the construction of the Cairo-Alexandria Desert Road about fifty years ago.

1.1.5 The Nubaria Canal is the main water source for the horizontal expansion projects in the West Delta Region with a current command area of 0.42 million hectares (ha). Initially a 61 km canal was constructed in 1952 to serve 77,700 ha along its right bank. The canal length and command areas were successively increased to about 118 km to serve 0.42 million ha by 1993, including an additional 62,160 ha which receive supplementary irrigation during the winter.

1.1.6 The Nubaria Canal branches from the larger El-Rayah El-Behieri canal at km 82.0; its intake is located just upstream of the Bolein regulator. The design discharge into the canal at this branch is 27 million m^3/day. A second intake into the Nubaria Canal comes from the El-Rayah El-Nasseri canal located at km 7.0 and supplies 7 million m^3/day. Over time the canal conveyance has decreased from 266 m^3/s to 221 m^3/s due to progressive material accumulation along the canal bed. Hence the canal has been repeatedly widened to cope with the increasing demand for water of the newly added command areas. Moreover the canal serves as a primary navigation channel to the Mediterranean Sea necessitating an increase of the canal length to 118 km including the construction of five locks to facilitate navigation.

1.1.7 The second proposed study area is located in the Eastern Nile Delta Region within one of the most important agricultural areas in Egypt (Annex 1B – Map of Ismailia Study Area). The area is bounded to the North and West by one of the major irrigation canals in the country, the Ismailia Canal. The Ismailia Canal was created by virtue of two successive agreements between the Government of Egypt and the Suez Canal Company in 1854 and 1856 for the purpose of creating a navigable waterway between the Nile and the Suez Canal, to supply water for irrigation, and to provide drinking water for cities and stations situated along the canal. The canal inlet is located on the Nile River in the North of Cairo and runs directly as far as the city of Ismailia, where it bifurcates into two branches; one to the North to supply the city of Port Said and another to the South to supply the city of Suez.

1.1.8 The Ismailia canal was constructed in 1862 between the cities of Zagazig and Ismailia to carry fresh water to Suez Canal cities. The Ismailia Canal is 128 km long, and for much of its length was constructed through sandy strata. The original canal depth is reported to have been 2-4 m and its width about 18 m. This water was used to irrigate an area of about 138,300 ha, and to provide water for domestic and industrial use of North Cairo, El Abbasa Region, Ismailia, Suez, and Port Said.

1.1.9 The maximum water level of the Ismailia Canal is significantly higher than the surrounding land. The canal is experiencing a significant amount of seepage, especially within sandy areas, contributing to a relatively high water table within adjacent lands. From successive widening over time, the canal width presently varies from 50 m in the upper reaches to 30 m at Ismailia with an average depth of about 3.5 m. The mean monthly flow through the headworks into the canal varies during the year from a maximum of about 135 m^3/s to a minimum of 50 m^3/s.

1.1.10 Information on the past enlargement of the canal is limited but several regulators built in the 1870s were remodelled in the 1920s to allow for greater flow. Future plans called for substantial agricultural production expansion in the East Nile Delta Region. To achieve this goal the widening of the Ismailia Canal started in the late 70’s and was divided into three phases to progressively increase the canal capacity from 135 m^3/s to 439 m^3/s so as to provide for the expansion of water supplies necessary to extend the area to be irrigated from 138,300 ha to 0.45 million ha.

1.1.11 The cross-section of Ismailia Canal has been widened according to criteria set for the second phase although the required discharge is 28.74 million m^3/day while the current maximum discharge is only 17.50 million m^3/day. Physical implementation of two of the three phases has now been completed, including an increase of industrial and domestic water supply to 5 million m^3/day to be increased to 9.4 million m^3/day by the end of the third phase. The canal reach from km 76.0 to km 113.0 has been widened according to the third phase expansion plan; the canal reach from the intake to the km 76.00 is still being widened.

1.1.12 After over two decades of expansion and canal widening, farmers increasingly complain of negative impacts such as water-logging and salinisation especially along areas adjacent to the widened stretches of the canal. As the Nile River no longer carries and deposits substantial quantities of sediment after the construction of the High Aswan Dam, progressive widening of the canal removes layers of less permeable silt without subsequent replacement, thus resulting in increased seepage. Other problems range from deteriorating irrigation infrastructure such as irrigation offtakes, regulators, canal obstacles such as bridges, etc.

1.1.13 It is against this background that the Government of Egypt (GOE) has requested financing from the African Water Facility (AWF) in order to undertake comprehensive studies for the rehabilitation of the Nubaria and Ismailia canals. The Bank fielded a mission to appraise the proposal for the studies and to prepare the Terms of Reference (TOR) in April 2007, and the present appraisal and TOR are based on the findings of this mission and agreements reached with GOE.

1.2 Sectoral Priorities

1.2.1 Background and Context

1.2.1.1 The history of water resources management in Egypt extends back to the time when the first known aqueduct was built. At present, there are significant challenges to water resources development and use in Egypt. Beginning with a single source of water – the Nile River – uncertainties about climate change, future upstream developments, and high population growth have driven efforts to anticipate and prepare for potential future water demands. At present, municipal and industrial water demands are being readily met and agricultural water use yields high levels of production with about 200% cropping intensity. However, costs for providing water services over the next 15 years are estimated to be more than triple the current expenditures. Future public sector allocation for such high costs creates a heavy and unsustainable burden on the Government's resources. Moreover, water quality in such a closed system is deteriorating rapidly due to retained pollutants within the system as part of the recycling and reuse of drainage water, along with poor waste treatment and regulation of urban and rural sanitation. Stakeholders at the local level are organizing water users associations (WUAs) and water boards to confront these issues and to have their voices heard on irrigation and rural sanitation issues. Thus, the main drivers for water management reform at both the central and regional levels include (i) the need to meet water supply/demand imbalances in the future; (ii) water quality deterioration and associated health and environmental risks; and (iii) weak service delivery, reliability, and transparency and

associated quantity and quality measurements along with financial sustainability and cost recovery issues.

1.2.1.2 In essence, the challenges faced by the GOE include: meeting the water demands of a growing society; improving living standards; ensuring a sustainable food policy to feed a growing population; and, addressing water quality degradation, environmental problems and health issues. Given a constant supply and growing demand, there is increasing competition for water from multiple users.

1.2.1.3 These challenges facing the water sector in Egypt are enormous and require the mobilization of all resources and the management of these resources in an integrated manner. It is believed that business-as-usual scenarios are no longer adequate in meeting the current challenges. Changes in the way water resources are currently allocated and managed are inevitable. Accordingly, the MWRI has recently launched a National Water Resources Plan for Egypt (NWRP, 2004). The NWRP is a comprehensive approach which describes how Egypt will safeguard its water resources in the future, both with respect to quantity and quality, and how it will use these resources in the best way from a socio-economic and environmental point of view.

1.2.1.4 The NWRP has been augmented by a transitional strategy including further reform interventions which ensure smooth and enhanced streamlining with Integrated Water Resources Management (IWRM) principles and approaches.

1.2.2 Integrated Water Resources Management Process

1.2.2.1 The successful application of IWRM is essential to meet the challenges of limited water resources, growing demands, and degrading water quality because of increased municipal, industrial and agricultural pollution loads. The Government's current Integrated Water Resources Management Plan (IWRMP) has been prepared to address these concerns and is intended to be a complementary, action-oriented, implementation framework to the NWRP. It addresses gaps in the NWRP and provides for additional measures and provisions which facilitate the transition towards an integrated management approach within the water sector. The IWRMP assesses the current water resources management setup and practices along with the ongoing reform efforts led by the MWRI. The Plan identifies the actions agreed upon as major interventions to pursue an effective integrated framework for water management over the next 15 years.

1.2.2.2 The proposed Study is in line with the country's strategy to implement IWRM within the context of the national policies and strategies related to water development and resources management.

1.3 Problem Definition

1.3.1 The Nubaria Canal infrastructure and command areas are increasingly suffering from negative impacts resulting in water deficiency due to a variety of reasons such as: seepage from the canal and its adverse effects on the surrounding agricultural areas; embankment instability

including breaches along some parts of the canal and its branches; farmers' non-adherence to the Government's irrigation regulations and guidelines such as using highly consumptive surface irrigation instead of prescribed more efficient modern irrigation techniques; water supply shortages from El-Nasseri Rayah (primary supply for the Nubaria Canal) due to unauthorized abstractions for irrigation along this canal; inability to supplement the canal supply from alternative sources such as from the El Umom Drain due to poor water quality in the drain and environmental and health concerns; deteriorating or poorly constructed structures such as irrigation canal intakes, regulators, etc; and decreasing conveyance capacity of the canal due to material deposits along the canal reaches.

1.3.2 In order to address the existing problems in the whole West Delta area, MWRI is planning for a comprehensive project to improve irrigation in the area, namely the West Delta Irrigation Improvement Project (WDIIP). The project includes a major component that seeks to overcome the severe water shortage in the tail reaches of Nubaria canal through the construction of a new large pumping station to lift 12 million m^3/day from Rosetta Branch to Rayah Nasseri, out of which 10 million m^3/day will be diverted to Nubaria canal. This flow would improve irrigation water availability to about 210,084 hectares of new lands spread within the command areas of Nubaria canal and its large branches such as Nasr, Bustan and Hammam canals. Nonetheless, before Nubaria canal can carry this flow, the problems related to its decreased conveyance capacity, excessive seepage and deteriorated infrastructure have to be identified and proper solutions studied and implemented.

1.3.3 The Ismailia Canal is the only water source for the East Nile Delta Governorates namely Kaliobia, Sharkia, Ismailia, Suez and Port Said as it is the main source for irrigation, industry, navigation and domestic water supply. It is also the main water source for future irrigation expansion projects in East Nile Delta. The development of the Ismailia Canal has been continuously implemented starting with the construction of a new canal intake adjacent to the old one to cope with the successive horizontal expansion projects as well as other water demands for industry, domestic use, etc.

1.3.4 Over the past several decades the GOE has implemented two phases of the canal development to expand agricultural production substantially in the Ismailia Canal zone and elsewhere by reclaiming new lands and improving production in old lands. Development of the Ismailia Canal involves significant widening and deepening of the canal cross-section. However, following excavation farmers complained about increased water logging and salinisation of the land adjacent to the widened stretches of the canal apparently caused by canal seepage. At present time, the River Nile is no longer carrying and depositing any substantial amount of sediments, being trapped behind the High Aswan Dam. This means that the canal widening has removed the layer of less permeable silt leaving a seepage surface with relatively lower hydraulic resistance. In addition, the larger flows passing through the canal resulted in canal water levels that are higher than the natural ground level of some of the surrounding lands. The seepage problem is particularly severe along about 20 km of the canal length (from km 54 to km 75) and estimates are as much as 10 km^2 of land is adversely affected[1].

[1] Verbal communication from MWRI field staff, April 2007

1.3.5 In addition to the seepage problem, the canal and some control structures require major rehabilitation work because of the deterioration of such structures. Other problems are canal embankment instability and resultant breaches. Furthermore, the deposit of wastes and floating weeds, which create permanent obstacles to flow by decreasing the canal cross-section capacity, hinders the goal of meeting the increased water demands necessary to implement the planned expansion projects as well as meeting the requirements of other sectors in that region.

1.4 Study Description and Objectives

1.4.1 The Nubaria and Ismailia canals are experiencing similar serious problems such as *decaying* and *poorly functioning infrastructure*, *seepage* and *water logging* adversely affecting valuable agricultural land, *insufficient water conveyance capacity*, *unauthorized abstractions*, *environmental degradation from pollution*, etc.

1.4.2 The proposed comprehensive Study for Nubaria and Ismailia canals will seek technically feasible and economically and socially viable solutions for efficient water control and system management in these two canals, concentrating on the main canal system only. The Study will undertake pre-feasibility and feasibility level work, to include developing semi-detailed designs, bills of quantities, cost estimates and tender document preparation so that major investment operations for both Nubaria and Ismailia canals can follow immediately upon conclusion of the Study. The Study will also comprise a full Environmental and Social Impact Assessment (ESIA) including an Environmental and Social Management Plan (ESMP) and Environmental Monitoring Programme (EMP) with associated costs for implementation of any recommendations.

1.4.3 The implementation of the proposed solutions from the Study will help mitigate the above-cited problems currently hindering the performance of the two canals, which will lead to more efficient and sustainable use of land and water resources. The expected impacts of the canals' physical and management improvements include enhanced distribution, quantity, quality, equity and timeliness of water delivery to the beneficiaries of these canal systems for a variety of uses such as agriculture (irrigation and drainage), domestic (water supply and sanitation), industrial, as well as for navigation.

1.5 Beneficiaries and Stakeholders

1.5.1 The beneficiaries of the Study are the people suffering from the problems faced in each of the West Nile Delta and Ismailia Regions who will directly benefit from finding effective solutions for the problems faced by the two canals and hence, the implementation of two major improvement projects based on those findings. It is estimated that about 832,000 families in the Ismailia Canal command area could benefit from physical implementation of the Study recommendations. For Nubaria Canal it is estimated that 2,000 domestic and industrial beneficiaries could directly benefit from the physical implementation of the Study recommendations as well as about 500,000 families within the study areas.

1.5.2 For both areas it is envisaged that improvements will substantially influence and improve household incomes. The demography and socio-economic conditions in the two areas are relatively similar. The average farm household size is 5 persons with many households female-headed. A typical farm household cultivates an area of about 0.42 ha growing crops such as maize, sorghum, wheat, rice, vegetables, fruit, etc. The majority of the farm households also raise cattle, water buffalo, small ruminants and poultry. A few households are often involved in off-farm activities such as paid employment and fishing. Unemployment rates vary between 8 to 10%, whereas illiteracy rates are below the national average at 35 to 40%. Most of the household lack access to proper sanitary drainage, with subsequent negative impacts on health, especially children.

2. THE PROJECT

2.1 Impacts

2.1.1 The proposed Study supports Egypt's irrigation development strategy articulated in the IWRMP, the implementation of the Horizontal (Agricultural) Expansion Plan till the year 2017, the efficient utilisation of valuable water resources, and to meet water demand in other sectors for different uses such as navigation, domestic, industry, etc. The implementation of recommendations and solutions as a result of the Study will improve agricultural production and productivity thereby contributing to poverty reduction and improved rural livelihoods.

2.1.2 The project is also in line with the Governments' Strategy for Agricultural Reform including the development of irrigation and agricultural production as a means of improving food security and income. The proposed Study will support the rational development of water resources of the two regions in the country with the highest economic potential. This can only be achieved by assisting the beneficiaries of these regions to address water deficiencies and seepage problems which adversely affect agricultural production on their lands. The implementation of the Study and hence the potential improvements that will emanate, will lead to positive impacts.

2.2 Outcomes

2.2.1 The proposed Study and hence potential canal improvement project outcomes may be summarized as follows:

i. Improved irrigation infrastructure development and management ;
ii. Support for implementation of the country's Horizontal Expansion Plan;
iii. Improved agricultural productivity;
iv. Alleviating or mitigating the problems caused by the present canal situation on agriculture production and other users;
v. Safeguarding the water demand for different sectors in the two study areas; and,
vi. Generating higher income levels for the rural households.

2.3 Outputs

2.3.1 The implementation of the Study will provide alternative feasibility level recommendations and solutions with semi-detailed engineering designs, tender documents and cost estimates for potential projects and other interventions necessary to resolve the physical and management constraints of the Nubaria and Ismailia Canals.

2.4 Activities

2.4.1 The Study will be implemented in three phases and completed within a period of 26 months for both Nubaria and Ismailia canals in parallel:

2.4.2 Phase I will be devoted to the review of existing literature, planning for field surveys and technical investigations, including the design of questionnaires and sampling techniques as required. This phase will also be used for extensive consultation with stakeholders and relevant institutions that can contribute to the Study output. The phase will begin the collection of information to be used in the pre-feasibility baseline report.

2.4.3 Phase II will be devoted to: i) primary and secondary data collection and field investigations; ii) the analysis of collected data; iii) production of a pre-feasibility level baseline report; iv) provision of recommendations for physical canal improvements and operation and maintenance; and v) the prioritisation of development proposals and formulation of project interventions for each study area. The output of this phase will be the finalisation of baseline reports with specific recommendations on proposed solutions to resolve physical and management issues for each canal. A draft Environmental and Social Impact Assessment (ESIA) will also be prepared during this phase. Recommendations will be reviewed at a stakeholders' workshop to be organized by the consultant and prioritized before their presentation formally to GOE and the Bank for acceptance and clearance leading to the initiation of Phase III activities.

2.4.4 **Phase III** will be devoted to the preparation of viable interventions at a feasibility level to resolve constraints of each canal. This phase will also involve the preparation of final semi-detailed engineering designs, drawings, bill of quantities, tender documents and cost estimates for major new construction or rehabilitation works proposed as project components, or are found to be needed for urgent interventions that can be implemented by the GOE to resolve outstanding issues. Draft Phase III outputs will be reviewed at a second workshop to be organized by the consultant before final GOE and Bank clearance. A final ESIA will be prepared that will propose mitigation and monitoring measures, with associated costs to be implemented in the Environmental and Social Management Plan (ESMP) and Environmental Monitoring Programme (EMP).

2.5 Risks

2.5.1 Assumptions have been made to estimate the implementation schedule and cost of undertaking the required Study. Although these assumptions have been made using best estimates

and consideration of previous studies of a similar nature, it is possible that the following risks could materialize:

- ✓ Unavailability or unreliability of basic data for the study areas may increase the time required to implement the Study to the desired level and the financial consequences of that time increase;
- ✓ Proposed recommendations beyond the financial means or commitment for the Government to adopt.

2.6 Cost and Financing Plan

2.6.1 Cost Estimate

2.6.1.1 The total cost for the proposed combined Nubaria and Ismailia canals rehabilitation Study net of tax and based on 2007 prices, is estimated at €1.90 Million, comprising €1.36 Million or 72 % of the total cost in foreign cost and €0.54 Million or 28 % of the total cost in local cost financing. This cost is inclusive of physical and price contingencies estimated at average rates of 2 % each. The price contingencies were estimated on the basis of actual and projected levels of local and foreign inflation rates of about 2.5 % and 1.8 % per annum, respectively. The physical contingencies are estimated from 0 to 5.0 %, based on common practices. These contingencies have been made on all items except for all personnel costs. A summary of the Study cost estimates by components and expenditure accounts is shown in Tables 2.1 and 2.2 below, while details are provided in Annex 2.

Table 2.1: Estimated summary costs by component

COMPONENTS	'000 €uros			% F.E	% Base Cost
	Local Currency	Foreign Exchange	Total		
PHASE I – INCEPTION & MOBILIZATION	37.00	136.67	173.67	79	10
PHASE II – PRE-FEASIBILITY	301.36	768.13	1,069.49	72	59
PHASE III – FEASIBILITY	172.51	396.55	569.06	70	31
Total Baseline Costs	**510.88**	**1,301.35**	**1,812.22**	**72**	**100**
Physical Contingencies	13.67	29.53	43.20	68	2
Price Contingencies	16.37	28.30	44.67	63	2
TOTAL STUDY COSTS	**540.91**	**1,359.18**	**1,900.09**	**72**	**105**

Table 2.2: Estimated summary costs by Expenditures Accounts

EXPENDITURES ACCOUNTS	'000 €uros			% F.E	% Base Cost
	Local Currency	Foreign Exchange	Total		
I. INVESTMENT COSTS	**328.43**	**1,248.70**	**1,577.13**	**79**	**87**
Civil Works	11.70	5.01	16.71	30	1
Goods	16.16	64.64	80.81	80	4
Services	300.57	1,179.04	1,479.62	80	82
Workshop	26.74	26.74	53.48	50	3
Technical Assistance	211.39	996.01	1,207.39	82	67
Contractual Services	62.45	156.30	218.75	71	12
II. RECURRENT COSTS	**182.44**	**52.65**	**235.09**	**22**	**13**
Daily Subs. Allowances	156.13	39.03	195.16	20	11
Operation & Maintenance	4.15	6.23	10.38	60	1
General Operation Charges	22.16	7.39	29.55	25	2
Total Baseline Costs	**510.88**	**1,301.35**	**1,812.22**	**72**	**100**
Physical Contingencies	13.67	29.53	43.20	68	2
Price Contingencies	16.37	28.30	44.67	63	2
TOTAL STUDY COSTS	**540.91**	**1,359.18**	**1,900.09**	**72**	**105**

2.6.2 Financing Plan

2.6.2.1 The African Water Facility (AWF) shall finance 100 % of the total costs. The Government of Egypt (GOE) shall support the Study with contributions in kind, by supporting the advertisement of the initial biddings and providing the connected services, including the appointment of a Study Coordination Team (SCT) in charge of the coordination of all works on the Study, the monitoring and the supervision of the implementation of the Study and the liaison with the Bank for all Study-related matters.

Table 2.3: Financing Plan of the Study

('000 €uros)

Financing source	Foreign	Local	Total	% Financing
African Water Facility	1,359.18	540.91	1,900.09	100.0
Total	1,359.18	540.91	1,900.09	100.0

2.7 Justification for AWF Support

2.7.1 The primary objective of the proposed Study is to seek improvement in the Nubaria and Ismailia canals which will lead to more efficient and sustainable use of land and water resources. Physical and management improvements are expected to result in positive impacts on the distribution, quantity, quality, equity and timeliness of water deliver to the beneficiaries of these canal systems.

2.7.2 It is envisaged that the Study will cumulate in a project preparation activity that will encompass comprehensive feasibility studies, semi-detailed designs and tender document preparation to enable implementation of physical rehabilitation and other improvement measures. The project preparation activity could result in triggering investment in infrastructure rehabilitation and development from the Government through access to African Development Bank lending of approximately €120 million and from other potential sources thus fulfilling one of the main objectives of providing AWF support.

3. IMPLEMENTATION

3.1 Recipient

3.1.1 The Arab Republic of Egypt will be the recipient of the grant and the Executing Agency of the Study will be the Ministry of Water Resources and Irrigation (MWRI) through the Horizontal Expansion and Projects Sector (HEPS).

3.2 Implementation Arrangement and Capacity

3.2.1 The studies for both Nubaria and Ismailia canals will be undertaken in parallel as one combined study by a single qualified consultancy, following international recruitment procedures. In fact, the Appraisal Mission considered a number of implementation and cost scenarios to undertake the study of each canal before converging on two possible scenarios: 1) to undertake the

Nubaria and Ismailia Canal studies separately using two independently recruited consulting firms, or 2) to undertake the Nubaria and Ismailia Canal studies combined under a single contract using one recruited consulting firm and team. Although the estimated implementation period for the second scenario was about seven months longer than that for the first scenario, the second scenario was more cost effective due to economy of scale. Discussions with the GOE revealed their interest to follow the second scenario.

3.2.2 The GOE will be the grant recipient and MWRI will be the Executing Agency responsible for the implementation of the Study and supervision of the work of the Consultant. A SCT will be formed comprising relevant MWRI staff to liaise, as needed, with the Bank and the Consultant on all matters related to the Study, such as opening a Special Account to receive the Study grant resources, the recruitment of the consulting firm, technical supervision of the Study, coordination of all Study-related AWF missions, etc. The specific responsibilities and duties of the national focal persons are to: (i) provide any available technical information required by the Consultant to fulfill its assignment at the local and sector level; (ii) follow-up and oversee the day-to-day implementation of the Study; (iii) ensure achievement of Study objectives and proper financial management and accounting of the Study funds; (iv) manage and oversee, under ultimate responsibility of MWRI and in line with Bank rules and procedures, all activities pertaining to procurement of services, preparation of disbursement requests; (v) ensure that reports at all stages of the Study are prepared by the Consultant and that the views of the beneficiaries are duly incorporated; (vi) verify the Consultant's claims for payment, maintain proper financial records of the Study for review by the Bank, which may require from Government to undertake internal audit review prior to AWF financial management assessment mission; and (vii) review all technical documents produced by the Consultant.

3.3 Performance Plan

Activity	Indicator
Nubaria and Ismailia Canals Comprehensive Study Phase I – Inception, Literature Review, Mobilization - Carrying out a literature review of available data, maps, reports published by other institutions and related to the proposed study.	**Submission of the following:** Inception Report including methodology submitted within three months.
Phase II Pre-Feasibility Level Studies - Collection of data and conduct all necessary field investigations / data collection / geotechnical measurements aiming at identifying all required rehabilitation works on the main system and parallel canals, identification of additional dominant infrastructure defects through visual field inspections. - Assessment of all common problems (e.g. stability and seepage) for both and Nubaria and Ismailia main canals including a detailed assessment of the required work on the main system and branches and providing specific recommendations to mitigate the problems, including construction methods, and proposals for continuous operation during rehabilitation. - Hydraulic modelling and hydraulic computations that would include: collection, review and verification of the numerical models and research studies covering water resources assessment and availability, optimum utilization and demand for water. Provision of adequate drainage facilities shall also be considered. - Recommendation to optimize performance of the water distribution system and proposals for sustainable maintenance procedures of main canals and sub-mains.	Draft Pre-feasibility Report including baseline survey and draft Environmental and Social Impact Assessment submitted with 12 months from start of Phase II activities. Final Pre-feasibility Report within 14 months from the start of Phase II activities.
Phase III – Feasibility Level Studies - Detailed assessment of required works on the main systems and branches in terms of engineering feasibility and associated cost. - Preparation of detailed semi-detailed designs, bills of quantities and cost estimates for rehabilitation work. - Environmental and Social Impact Assessment for the two study areas including mitigation measures and monitoring requirements accompanied with the necessary costs included in the Environmental and Social Management Plan (ESMP) and Environmental Monitoring Programme (EMP)	Draft Feasibility Report including semi-detailed designs, bills of quantities, cost estimates and tender documents within 6 months from the start of Phase III activities. Final Feasibility Report and Final Environmental and Social Impact Assessment/Environmental and Social Management Plan to include mitigation measures and monitoring requirements with associated costs within 8 months from the start of Phase III activities.

3.4 Implementation Schedule

3.4.1 The Study will commence after the selection of the consultancy firm. The MWRI will be responsible for overall supervision of the Study activities in collaboration with the field technical staff in the two study areas and concerned Government line Ministries.

3.4.2 Schedule and Duration: The duration of the Study will be 26 months according to the implementation schedule given in the following section. The Study will be executed in three phases for both canals in parallel – a first phase of 4 months duration, a second phase of 14 months and a third phase of 8 months. The first phase will commence one month after the signing of the contract with the Consultant, while the second and third phases will start after the approval of the first and second phase reports by the GOE and the Bank. Table 3.1 shows the indicative implementation schedule.

Table 3.1 Indicative Implementation Schedule

ACTIVITIES	Action By	YEAR 2007						YEAR 2008												YEAR 2009										
		J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N
Procurement of Consultant	**MWRI / Bank**																													
Consulting Firms Shortlist approval	**MWRI / Bank**																													
Selection of the Consultant	**MWRI / Bank**																													
Nubaria and Ismailia Canal Comprehensive Rehabilitation Study	**Consultant**																													
Mobilization, Inception and Phase I Baseline Survey	**Consultant**																													
Phase II Pre-feasibility Level + Stakeholders' Workshop (including draft ESIA)	**Consultant / MWRI / Bank**																													
Phase II Feasibility Level + semi-detailed design, cost estimates and tender documents + final ESIA w/ ESMP	**Consultant / MWRI / Bank**																													

3.5 Procurement and Execution

3.5.1 Procurement arrangements are summarized in Table 3.2 below. All procurement of goods, works and services financed by AWF will be in accordance with the ADB Rules and Procedures for Procurement of Goods and Works, or as appropriate, Rules and Procedure for the Use of Consultants, as applicable to the AWF, using the relevant Bank Standard Bidding Documents.

Table 3.2: Summary of the Study Procurement Arrangement

PROCUREMENT ACCOUNTS	'000 €			
	SHORT-LIST	OTHERS	N.F.B	TOTAL
A. CIVIL WORKS		17.36 [17.36]	-	**17.36 [17.36]**
B. GOODS			-	
Vehicles		69.27 [69.27]		**69.27 [69.27]**
Equipment		14.46 [14.46]		**14.46 [14.46]**
A. SERVICES	-		-	
Workshops		55.50 [55.50]	-	**55.50 [55.50]**
Technical Assistance	1,265.12 [1,265.12]		-	**1,265.12 [1,265.12]**
Local **Contractual Services**	228.02 [228.02]		-	**228.02 [228.02]**
Operating Costs	250.34 [250.34]		-	**250.34 [250.34]**
TOTAL	**1,1798.99 [1,1798.99]**	**156.60 [156.60]**	**-**	**1,900.09 [1,900.09]**

3.5.2 **Civil Works**. Civil works estimated at about € 17,361.00 in the aggregate comprising office rehabilitation works for accommodating the consultant's Study team will be procured using Local Shopping (LS) procedures. The size of this bid is too small to attract external bidders. In addition, it does not require major works and will have to be procured immediately at Study start-up to get the consultant team operational.

3.5.3 **Goods**. Goods estimated at about € 83,737.00 in the aggregate include vehicles (€ 69,273.00) and equipment (€ 14,464.00) will be procured using National Shopping (NS) and National Shopping, respectively. All vehicles and equipment required under the Study are standard goods, which can be obtained on the national market, at competitive prices.

3.5.4 **Services**. Technical Assistance or Consultancy services estimated at about € 1.55 million will be procured through competition on the basis of prequalification to establish shortlist and using the selection procedure *based on Technical Quality, with the price as selection factor*. The selected consulting firm will also procure for civil works, goods and operating cost estimated as required and specified in the above procurement arrangement (Table 3.2). The Consultancy service will be undertaking the Study in accordance with the Terms of Reference (TOR). Workshops estimated at about € 55,500.00 will be procured through Direct Contracting (DC). Only two workshops are planned under the Study (two (2) for each canal – total of four (4) workshops). Local contractual services estimated at about € 228,021.00 will be procured through Direct Contracting (DC). These comprise several very small contracts for which any other procurement method would reduce efficiency.

3.5.5 **Operating Costs**. Operating costs estimated at about € 250,345.00 in the aggregate include operation and maintenance and general operating charges (€ 42,364.00) and daily subsistence allowances (€ 207,980.00) and will be procured using National Shopping (NS) and Direct Contracting (DC), respectively.

3.5.6 The procurement will be subject to *post review* by the AWF. For that reason the recipient will maintain accurate records of procurement steps including signed evaluation forms, minutes of the opening and all meetings of the review team.

3.6 Disbursement Arrangements and Expenditure Schedule

3.6.1 The resources of the AWF grant will be disbursed in a Special Account opened by the Government of Egypt for the purpose in a local bank acceptable to the AWF on the basis of the following undertakings:

i. funds held in the Special Account will not, under any circumstances, be set off, seized or attached to satisfy amounts due to the Bank by the SCT of the project (for example by attachment) or be used as sundry collateral;

ii. monthly statements of the Special Account will be issued and communicated to the project; and

iii. The account and related documents will be placed at the disposal of the AWF/concerned Bank staff and its appointed auditors.

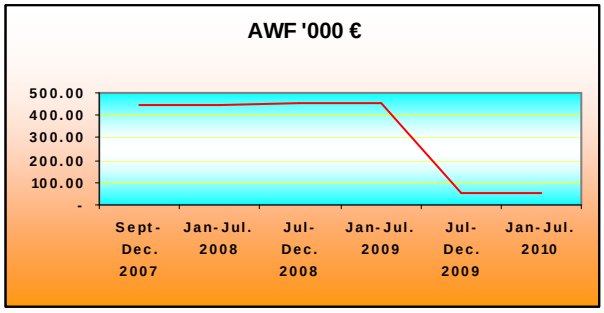
3.6.2 The Special Account will be replenished on the condition that the preceding advance has been utilized and justified up to at least 50 percent and that the other advances have been fully justified. Audit (external and internal) of the Study shall include an audit of the use of the Special Account and attestation that: i) the requests for replenishment of the revolving fund submitted are consistent with relevant information, ii) the internal controls and procedures used for their preparation, are reliable enough to justify the requests for replenishment, and iii) the goods and services financed from the Special Account have been received by the project.

3.6.3 The expected disbursement schedule and profile are shown in Table 3.3 and Figure 3.1, respectively. Payments will be made by the Implementing Unit to the Consultant based on the work flow and that performance with respect to terms of reference (TOR) reports of the assignment.

Table 3.3: Summary of Disbursement Schedule

SEMESTERS	'000 €	
	AWF Amount	TOTAL Project Costs
Sept-December 2007	445.45	445.45
January-June 2008	445.45	445.45
July-December 2008	454.71	454.71
January-June 2009	454.71	454.71
July-December 2009	49.88	49.88
January-June 2010	49.88	49.88
TOTAL	1,900.09	1,900.09

Figure 3.1: Disbursement Profile



3.7 Accounting and Audit Arrangements

3.7.1 The funds for the Study will be accounted for in accordance with the Financial Regulations of the Government of Egypt incorporating the specific additional requirements of the AWF. They will therefore be subject to internal audit by the Government, under the prevailing policies, as well as external audit under arrangements specified by the AWF. The audit of the Study shall include an audit of the Special Account as stated in Section 3.6 above.

3.8 Monitoring, Evaluation and Reporting Arrangements

3.8.1 Headquarters and field-level technical staff will be made available by the Government to help supervise the consultancy work during the implementation period of the Study. In addition to the SCT, a Study Coordination Officer may be appointed as appropriate by MWRI to coordinate the Ministry's technical staff and the Consultant and will serve as the focal point for the Study.

3.8.2 In accordance with the implementation schedule, the Consultants shall submit the following reports to both the GOE and the Bank:

i) The Phase I Inception Report shall be submitted within three months after the mobilization of the team leader. It shall contain information on the status of the consultant's mobilization program, work plans as well as any specific logistical arrangements. It will provide a reconnaissance level review of the study areas, status of existing data and information and present any preliminary insights with regard to the issues. The report will reflect the views of the Consultant and the SCT in the MWRI on the best way to progress with the Study. Proposals for modifications to the arrangements for executing the Study envisaged in the consultancy contract, if considered necessary for more effective implementation of the Study, shall be included at this point. However, any modifications to the work program will require the prior approval of the GOE and the Bank.

ii) Quarterly Reports will be prepared and submitted throughout all the phases of the Study. They will outline the status and progress of work during each quarter and will be submitted within seven days of the end of the relevant period.

iii) The Phase II Pre-feasibility Report shall be submitted 12 months after the start of the Phase II activities inclusive of all baseline information and data. Pre-feasibility level recommendations and alternate solutions will be reviewed at two (2) stakeholders' consultation workshops (one for each study area) and prioritized before their presentation formally to GOE and the Bank for acceptance and clearance, and before the initiation of Phase III activities. The draft ESIA will also be provided at this time.

iv) The Draft Final Reports will be submitted 6 months after the start of Phase III. It shall comprise two (2) feasibility reports of the selected projects and two (2) reports on the stakeholders' seminars. The two (2) reports will also include the final ESIA and each feasibility report will be accompanied by an ESMP, and detailed annexes on each component including semi-detailed designs, bill of quantities, cost estimates and draft tender documents. The draft outputs will be reviewed at a second stakeholders' workshop, one for each study area, prior to formal acceptance by the GOE and the Bank.

v) The Final Reports will be submitted one month following the receipt of the comments of GOE and the Bank by the Consultant.

4. PROJECT BENEFITS

4.1 Effectiveness and Efficiency

4.1.1 The proposed Study has been designed to take a comprehensive approach to rural and urban development and define effective mechanisms for sustainable development in the West and East Nile Delta regions. It will, at a national level, contribute to the water and agricultural sectors goals of Egypt for water conservation, and to propose concrete measures and recommendations for irrigation canal improvements based on an IWRM approach which will contribute to food security, poverty reduction, improved water services, improved welfare of the rural and urban population and sustainable natural resource management in the two regions. The proposed objectives of the

Study are consistent with the focus areas of the AWF as per the Operational Procedures and the Operational Program 2005-2009.

4.1.2 The overall cost estimate for the Study is based on current international price estimates and is justified in view of the need to engage highly qualified experts with previous experience and solid references in conducting such studies.

4.1.3 Finally, it is worth noting that the recommendations and alternative solutions that will form investment projects prepared as an outcome of the Study may, in the future, be considered for future Bank funding.

4.2 Sustainability

4.2.1 The planned Study will extensively analyze issues associated with Nubaria and Ismailia Canals and propose recommendations and solutions bearing in mind the socio-economic and physical environment of the two proposed study command areas. Useful Study findings and recommendations should result in feasible project interventions that can impact positively on the physical infrastructure and operation and maintenance (O&M) of the canals and irrigation systems. Many Government departments are thus likely to refer to the Study output for planning future interventions to improve their respective sectors such as water supply and sanitation. The involvement of the beneficiaries and other stakeholders in the Study will ensure that their concerns are effectively taken into consideration thereby encouraging ownership of the programs and projects that would emanate from the Study. The Study will also contribute to the national data base for each study area.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

5.1.1 The East and West Nile Delta Areas of Egypt are known for high development potential including modest climatic conditions, central location between Africa and Asia, Europe and the Middle East; excellent transportation facilities (roads, sea ports, airports, etc.), fertile land, water, etc. Irrigated agriculture plays a critical role in the economies of these two regions. Seepage, erosion, canal embankment instability, water deficiency resulting from the deterioration of the irrigation systems in the two regions are threatening arable lands, causing water losses and water logging of some agriculture lands. The two study areas represent a land area of about 0.84 million hectares and support a large population with multiple demands for water for agriculture, domestic use, industry, etc. The Study is critical to address serious issues confronting these two regions and to make recommendations and to provide viable solutions to reverse the physical deterioration and poor performance of canal infrastructure and to improve the operation and maintenance of the irrigation systems.

5.1.2 The condition for grant effectiveness shall be the appointment of a SCT by the MWRI to oversee the implementation of the Study. The condition for first disbursement shall be the opening of a Special Account in a bank acceptable to the AWF. The depository bank shall issue a

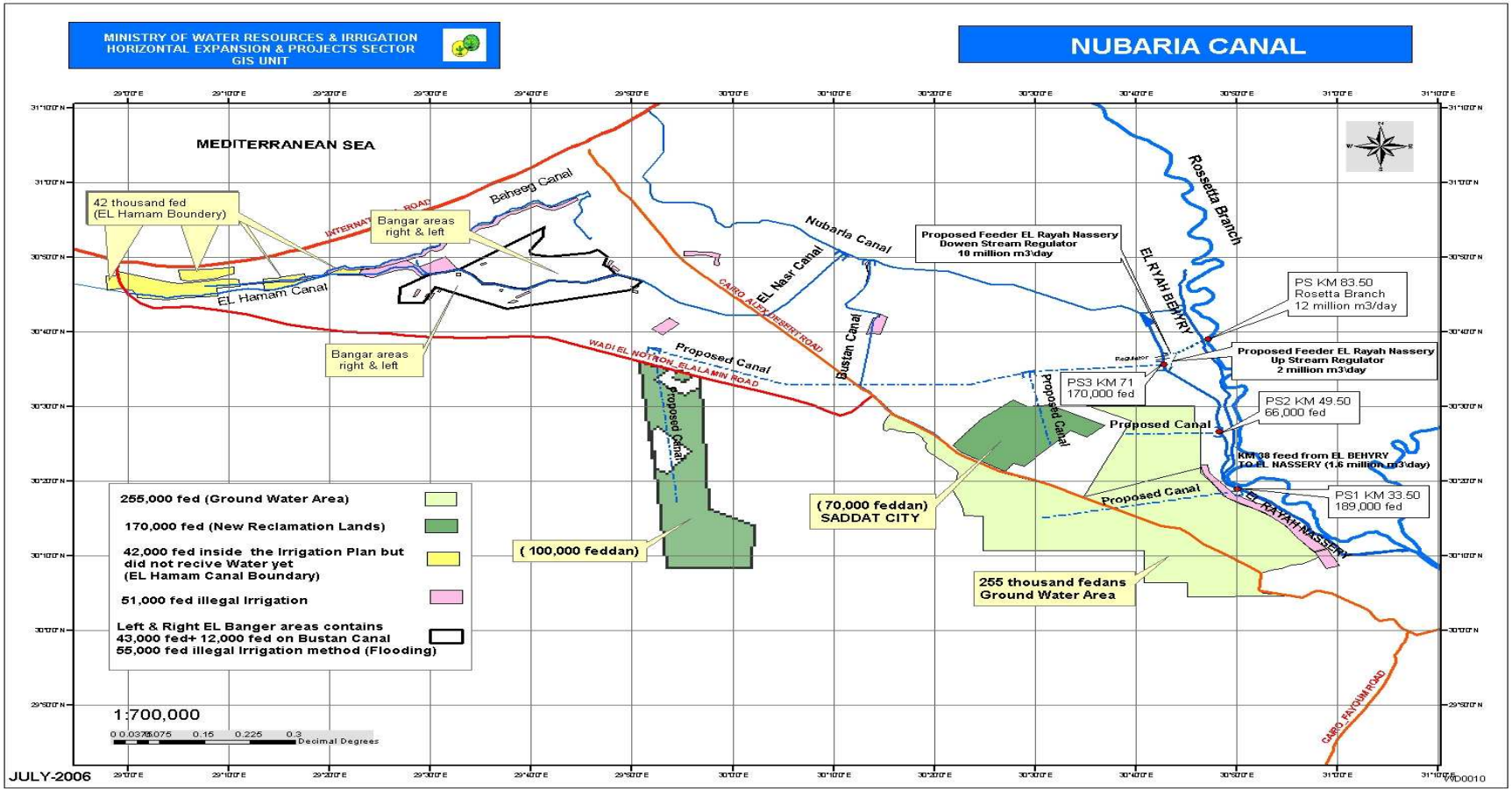
confirmation in a form acceptable to the AWF that the funds in the Special Account will be segregated for the specific purposes for which the Grant is granted, and consequently shall not be subject to setoff, seizure, or attachment.

5.2 Recommendations

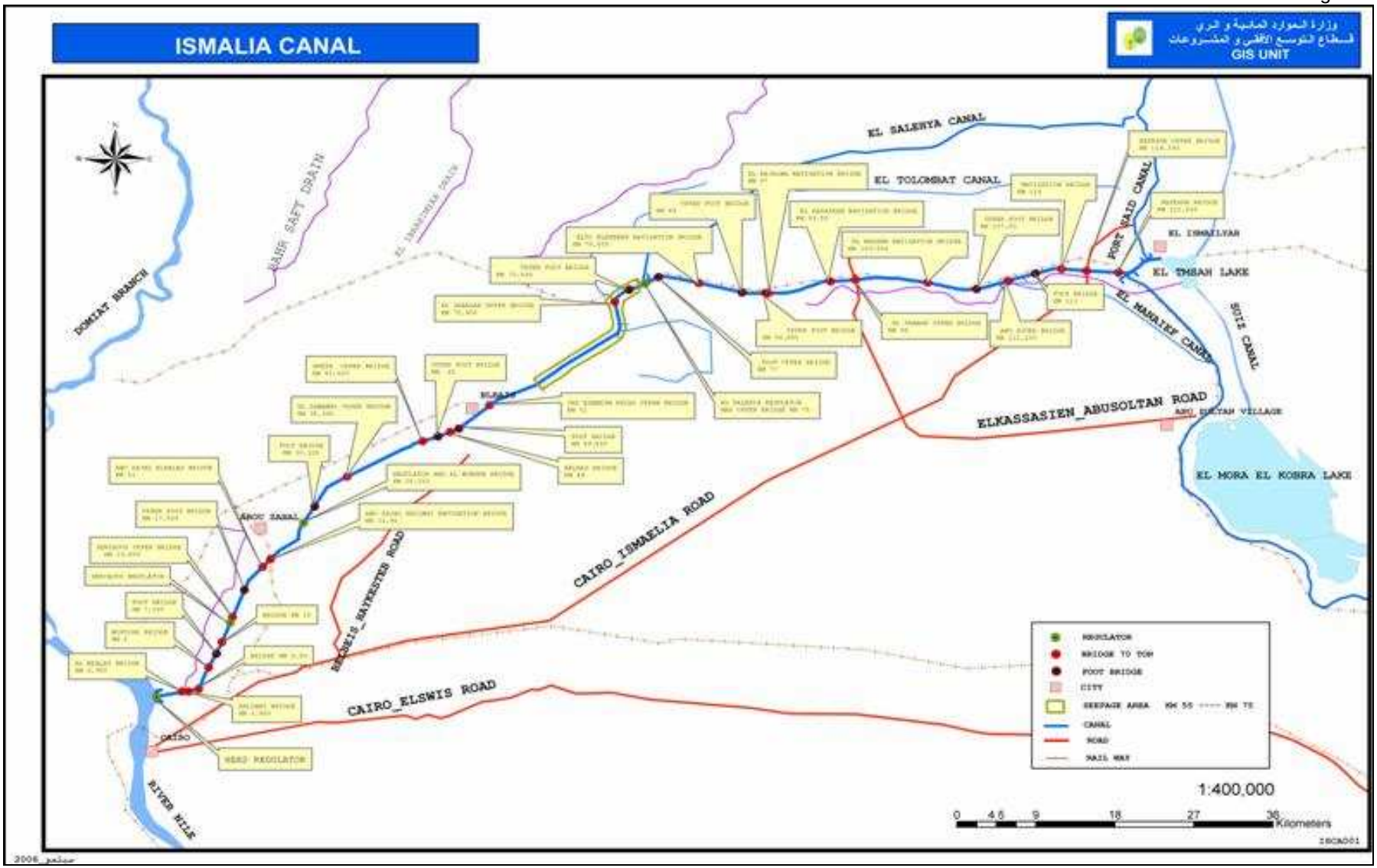
5.2.1 It is therefore recommended that a grant of € 1,900,090 million be awarded to the Arab Republic of Egypt by the AWF to finance the implementation of the comprehensive study for Nubaria and Ismailia canals by a single consultancy. The agreed funding for this project preparation activity will encompass for each canal a comprehensive feasibility study, semi-detailed engineering design, bill of quantities, cost estimates and tender document preparation, so that the implementation of two (2) major investment projects can follow immediately at the conclusion of the Study.

ARAB REPUBLIC OF EGYPT
Comprehensive Study for the Rehabilitation of Nubaria and Ismailia Canals

MAP OF THE STUDY AREAS



Source: Ministry of Water Resources and Irrigation



Source: Ministry of Water Resources and Irrigation

ARAB REPUBLIC OF EGYPT
Comprehensive Study for the Rehabilitation of Nubaria and Ismailia Canals

DETAILED STUDY COSTS

Table 1. INCEPTION REPORT, LITERATURE REVIEW AND MOBILIZATION /a

DETAILED COST ITEMS	Unit	QUANTITIES				UNIT COSTS	Base Cost (L.E. '000)				Totals Including Contingencies (€'000)			
		2008	2009	2010	Total	(LE'000)	2008	2009	2010	Total	2008	2009	2010	Total
I. Investment Costs														
A. CIVIL WORK														
Rehabilitation of an Office Space	m²	250	-	-	250	0.5	125.00	-	-	125.00	17.36	-	-	17.36
B. GOODS														
1. VEHICLE														
Double Cabin FWD Pick-up	units	2	-	-	2	250	500.00	-	-	500.00	69.27	-	-	69.27
2. EQUIPMENT														
Desktop Computer	units	3	-	-	3	6	18.00	-	-	18.00	2.49	-	-	2.49
Laser Printer	units	1	-	-	1	1	1.00	-	-	1.00	0.14	-	-	0.14
UPS	units	3	-	-	3	0.2	0.60	-	-	0.60	0.08	-	-	0.08
Scanner	units	1	-	-	1	0.5	0.50	-	-	0.50	0.07	-	-	0.07
Faxmachine & Connection	units	1	-	-	1	2.5	2.50	-	-	2.50	0.35	-	-	0.35
Inkjet printers	units	2	-	-	2	0.75	1.50	-	-	1.50	0.21	-	-	0.21
Copy Machine	units	1	-	-	1	10	10.00	-	-	10.00	1.39	-	-	1.39
Office Executive chair	units	10	-	-	10	1.5	15.00	-	-	15.00	2.08	-	-	2.08
Visitors' Chairs	units	18	-	-	18	0.85	15.30	-	-	15.30	2.12	-	-	2.12
Office desk	units	10	-	-	10	4	40.00	-	-	40.00	5.54	-	-	5.54
Subtotal EQUIPMENT							104.40	-	-	104.40	14.46	-	-	14.46
Subtotal GOODS							604.40	-	-	604.40	83.74	-	-	83.74
C. SERVICES														
1. TECHNICAL ASSISTANT														
Team Leader	p/m	4	-	-	4	100.975	403.90	-	-	403.90	55.75	-	-	55.75
Plane Ticket	units	1	-	-	1	18.699	18.70	-	-	18.70	2.58	-	-	2.58
Start-up DSA	p/d	30	-	-	30	0.65	19.50	-	-	19.50	2.69	-	-	2.69
Subtotal TECHNICAL ASSISTANT							442.10	-	-	442.10	61.03	-	-	61.03
Team Leader														
Plane Ticket							4.00	-	-	4.00	0.55	-	-	0.55
Start-up DSA							7.40	-	-	7.40	1.03	-	-	1.03
Subtotal TECHNICAL ASSISTANT							3.20	-	-	3.20	0.44	-	-	0.44
2. CONTRACTUAL SERVICES							62.00	-	-	62.00	8.59	-	-	8.59
Administrative Assistant							5.00	-	-	5.00	0.69	-	-	0.69

DETAILED COST ITEMS	Unit	QUANTITIES				UNIT COSTS	Base Cost (L.E. '000)				Totals Including Contingencies (€'000)			
		2008	2009	2010	Total	(LE'000)	2008	2009	2010	Total	2008	2009	2010	Total
Accountant							1.50	-	-	1.50	0.21	-	-	0.21
Driver							83.10	-	-	83.10	11.51	-	-	11.51
Office Rental							525.20	-	-	525.20	72.54	-	-	72.54
Report Production							1,254.60	-	-	1,254.60	173.64	-	-	173.64
Internet Connection														
Subtotal CONTRACTUAL SERVICES														
Subtotal SERVICES							8.40	-	-	8.40	1.17	-	-	1.17
Total Investment Costs							2.01	-	-	2.01	0.28	-	-	0.28
II. Recurrent Costs							10.41	-	-	10.41	1.45	-	-	1.45
A. OPERATION & MAINTENANCE														
Vehicle							2.00	-	-	2.00	0.28	-	-	0.28
Equipment							16.00	-	-	16.00	2.23	-	-	2.23
Subtotal OPERATION & MAINTENANCE							16.00	-	-	16.00	2.23	-	-	2.23
B. GENERAL OPERATING CHARGES							34.00	-	-	34.00	4.75	-	-	4.75
Internet bill							44.41	-	-	44.41	6.20	-	-	6.20
Communication							1,299.01	-	-	1,299.01	179.83	-	-	179.83
Office Supplies														
Subtotal GENERAL OPERATING CHARGES														
Total Recurrent Costs														
TOTAL														

DETAILED COST ITEMS	Unit	QUANTITIES				UNIT COSTS	Base Cost (L.E. '000)				Totals Including Contingencies (€'000)			
		2008	2009	2010	Total	(LE'000)	2008	2009	2010	Total	2008	2009	2010	Total
2. CONTRACTUAL SERVICES														
Administrative Assistant	p/m	4	-	-	4	1	4.00	-	-	4.00	0.55	-	-	0.55
Accountant	p/m	4	-	-	4	1.85	7.40	-	-	7.40	1.01	-	-	1.01
Driver	p/m	4	-	-	4	0.8	3.20	-	-	3.20	0.44	-	-	0.44
Office Rental	ls/m	4	-	-	4	15.5	62.00	-	-	62.00	8.48	-	-	8.48
Report Production	ls	1	-	-	1	5	5.00	-	-	5.00	0.68	-	-	0.68
Internet Connection	ls	1	-	-	1	1.5	1.50	-	-	1.50	0.21	-	-	0.21
Subtotal CONTRACTUAL SERVICES							83.10	-	-	83.10	11.37	-	-	11.37
Subtotal SERVICES							525.20	-	-	525.20	72.23	-	-	72.23
Total Investment Costs							1,254.60	-	-	1,254.60	172.00	-	-	172.00
II. Recurrent Costs														
A. OPERATION & MAINTENANCE														
Vehicle	2 km	10	-	-	10	0.42/kilometres	8.40	-	-	8.40	1.15	-	-	1.15
Equipment	ls/m	3	-	-	3	0.67	2.01	-	-	2.01	0.27	-	-	0.27
Subtotal OPERATION & MAINTENANCE							10.41	-	-	10.41	1.42	-	-	1.42
B. GENERAL OPERATING CHARGES														
Internet bill	ls/m	4	-	-	4	0.5	2.00	-	-	2.00	0.27	-	-	0.27
Communication	ls/m	4	-	-	4	4	16.00	-	-	16.00	2.19	-	-	2.19
Office Supplies	ls/m	4	-	-	4	4	16.00	-	-	16.00	2.19	-	-	2.19
Subtotal GENERAL OPERATING CHARGES							34.00	-	-	34.00	4.65	-	-	4.65
Total Recurrent Costs							44.41	-	-	44.41	6.08	-	-	6.08
TOTAL							1,299.01	-	-	1,299.01	178.08	-	-	178.08

/a: 4 months

Table 2. PRE-FEASIBILITY STUDY /b

DETAILED COST ITEMS	Unit	QUANTITIES				UNIT COSTS	Base Cost (L.E. '000)				Totals Including Contingencies (€'000)			
		2008	2009	2010	Total	(LE'000)	2008	2009	2010	Total	2008	2009	2010	Total
I. Investment Costs														
A. SERVICES														
1. TECHNICAL ASSISTANT														
Team Leader	p/m	8	6	-	14	100.975	807.80	605.85	-	1,413.66	111.51	85.35	-	196.85
Hydraulic Modelling Engineer	p/m	8	6	-	14	86.016	688.13	516.10	-	1,204.23	94.99	72.70	-	167.69
Civil/Geotechnical Engineer	p/m	8	6	-	14	86.016	688.13	516.10	-	1,204.23	94.99	72.70	-	167.69
Environmental Specialist	p/m	8	4	-	12	86.016	688.13	344.06	-	1,032.19	94.99	48.47	-	143.46
Sociologist/Gender Type	p/m	8	4	-	12	20.5	164.00	82.00	-	246.00	22.92	11.81	-	34.73
Agricultural Economist	p/m	8	4	-	12	20.5	164.00	82.00	-	246.00	22.92	11.81	-	34.73
GIS Expert/Survey&Mapping Specialist	p/m	8	6	-	14	20.5	164.00	123.00	-	287.00	22.92	17.71	-	40.63
Plane Tickets	units	3	-	-	3	18.699	56.10	-	-	56.10	7.74	-	-	7.74
Start-up DSA	3 p/d	30	-	-	30	0.65/person day	58.50	-	-	58.50	8.08	-	-	8.08
Subtotal TECHNICAL ASSISTANT							3,478.79	2,269.11	-	5,747.90	481.06	320.53	-	801.59
2. CONTRACTUAL SERVICES														
Lab Analysis	ls						46.75	140.24	-	186.99	6.25	18.75	-	25.00
Field Technicians	16 p/m	8	6	-	14	2.2/person month	281.60	211.20	-	492.80	39.01	29.90	-	68.92
Administrative Assistant	p/m	8	6	-	14	1	8.00	6.00	-	14.00	1.11	0.85	-	1.96
Accountant	p/m	8	6	-	14	1.85	14.80	11.10	-	25.90	2.05	1.57	-	3.62
Driver	2 p/m	8	6	-	14	0.8/person month	12.80	9.60	-	22.40	1.77	1.36	-	3.13
Office Rental	ls/m	8	6	-	14	15.5	124.00	93.00	-	217.00	17.18	13.17	-	30.35
Report Production	2 ls	1	-	-	1	10/lumpsum	20.00	-	-	20.00	2.77	-	-	2.77
Subtotal CONTRACTUAL SERVICES							507.95	471.14	-	979.09	70.15	65.60	-	135.75
3. WORKSHOP														
3-day Workshop	ls	2	-	-	2	100	200.00	-	-	200.00	27.75	-	-	27.75
Total Investment Costs							4,186.74	2,740.25	-	6,926.99	578.95	386.14	-	965.09
II. Recurrent Costs														
A. DAILY SUBSISTENCE ALLOWANCES														
Team Leader	p/d	35	15	-	50	0.875	30.63	13.13	-	43.75	4.28	1.88	-	6.16
Senior Specialist	6 p/d	40	30	-	70	0.65/person day	156.00	117.00	-	273.00	21.78	16.79	-	38.58
Technicians	16 p/d	40	30	-	70	0.5/person day	320.00	240.00	-	560.00	44.68	34.45	-	79.13
Drivers	2 p/d	80	20	-	100	0.2/person day	32.00	8.00	-	40.00	4.47	1.15	-	5.62

DETAILED COST ITEMS	Unit	QUANTITIES				UNIT COSTS	Base Cost (L.E. '000)				Totals Including Contingencies (€'000)			
		2008	2009	2010	Total	(LE'000)	2008	2009	2010	Total	2008	2009	2010	Total
Subtotal DAILY SUBSISTENCE ALLOWANCES							538.63	378.13	-	916.75	75.21	54.28	-	129.49
B. OPERATION & MAINTENANCE														
Vehicle	2 km	26	6.5	-	32.5	0.42/kilometres	21.84	5.46	-	27.30	3.04	0.78	-	3.82
Equipment	ls/m	8	6	-	14	0.67	5.36	4.02	-	9.38	0.75	0.57	-	1.32
Subtotal OPERATION & MAINTENANCE							27.20	9.48	-	36.68	3.79	1.35	-	5.14
C. GENERAL OPERATING CHARGES														
Internet bill	ls/m	8	6	-	14	0.5	4.00	3.00	-	7.00	0.56	0.43	-	0.99
Communication	ls/m	8	6	-	14	4	32.00	24.00	-	56.00	4.47	3.44	-	7.91
Office Supplies	ls/m	8	6	-	14	4	32.00	24.00	-	56.00	4.47	3.44	-	7.91
Subtotal GENERAL OPERATING CHARGES							68.00	51.00	-	119.00	9.49	7.32	-	16.81
Total Recurrent Costs							633.83	438.61	-	1,072.43	88.49	62.95	-	151.44
TOTAL							4,820.56	3,178.86	-	7,999.42	667.45	449.08	-	1,116.53

/b: 14 months

Table 3. DETAILED COMPREHENSIVE FEASIBILITY STUDY /c

DETAILED COST ITEMS	UNITS	QUANTITIES				UNIT COSTS	Base Cost (L.E. '000)				Totals Including Contingencies (€'000)			
		2008	2009	2010	Total	(LE'000)	2008	2009	2010	Total	2008	2009	2010	Total
I. Investment Costs														
A. SERVICES														
1. TECHNICAL ASSISTANT														
Team Leader	p/m	-	6	2	8	100.975	-	605.85	201.95	807.80	-	85.35	29.03	114.38
Hydraulic Modelling Engineer	p/m	-	6	2	8	86.016	-	344.06	-	344.06	-	48.47	-	48.47
Civil/Geotechnical Engineer	p/m	-	6	2	8	86.016	-	516.10	172.03	688.13	-	72.70	24.73	97.43
Environmental Specialist	p/m	-	6	-	6	86.016	-	516.10	-	516.10	-	72.70	-	72.70
Sociologist/Gender Type	p/m	-	6	-	6	20.5	-	123.00	-	123.00	-	17.71	-	17.71
Agricultural Economist	p/m	-	6	-	6	20.5	-	123.00	-	123.00	-	17.71	-	17.71
GIS Expert/Survey&Mapping Specialist	p/m	-	6	2	8	20.5	-	123.00	41.00	164.00	-	17.71	6.08	23.79
Plane Tickets	units	4	-	-	4	18.699	74.80	-	-	74.80	10.32	-	-	10.32
Subtotal TECHNICAL ASSISTANT							74.80	2,351.11	414.98	2,840.89	10.32	332.34	59.84	402.51
2. CONTRACTUAL SERVICES														
Lab Analysis	ls						-	92.75	-	92.75	-	12.40	-	12.40
Field Technicians	16 p/m	-	6	2	8	2.2/person month	-	211.20	70.40	281.60	-	29.90	10.19	40.09
Administrative Assistant	p/m	-	6	2	8	1	-	6.00	2.00	8.00	-	0.85	0.29	1.14
Accountant	p/m	-	6	2	8	1.85	-	11.10	3.70	14.80	-	1.57	0.54	2.11
Driver	2 p/m	-	6	2	8	0.8/person month	-	9.60	3.20	12.80	-	1.36	0.46	1.82
Office Rental	ls/m	-	6	2	8	15.5	-	93.00	31.00	124.00	-	13.17	4.49	17.65
Report Production	2 ls	1	-	-	1	20/lumpsum	40.00	-	-	40.00	5.54	-	-	5.54
Subtotal CONTRACTUAL SERVICES							40.00	423.65	110.30	573.95	5.54	59.25	15.96	80.76
3. WORKSHOP														
3-day Workshop	ls	2	-	-	2	100	200.00	-	-	200.00	27.75	-	-	27.75
Total Investment Costs							314.80	2,774.76	525.28	3,614.84	43.62	391.59	75.80	511.01
II. Recurrent Costs														
A. DAILY SUBSISTENCE ALLOWANCES														
Team Leader	p/d	-	30	10	40	0.875	-	26.25	8.75	35.00	-	3.77	1.29	5.06
Senior Specialist	6 p/d	-	30	10	40	0.65/person day	-	117.00	39.00	156.00	-	16.79	5.76	22.55
Technicians	16 p/d	-	30	10	40	0.5/person day	-	240.00	80.00	320.00	-	34.45	11.81	46.26
Drivers	2 p/d	-	60	20	80	0.2/person day	-	24.00	8.00	32.00	-	3.45	1.18	4.63
Subtotal DAILY SUBSISTENCE ALLOWANCES							-	407.25	135.75	543.00	-	58.46	20.03	78.49

DETAILED COST ITEMS	UNITS	QUANTITIES				UNIT COSTS	Base Cost (L.E. '000)				Totals Including Contingencies (€'000)			
		2008	2009	2010	Total	(LE'000)	2008	2009	2010	Total	2008	2009	2010	Total
B. OPERATION & MAINTENANCE														
Vehicle	2 km	-	20	10	30	0.42/kilometres	-	16.80	8.40	25.20	-	2.40	1.23	3.62
Equipment	ls/m	-	6	2	8	0.67	-	4.02	1.34	5.36	-	0.57	0.20	0.77
Subtotal OPERATION & MAINTENANCE							-	20.82	9.74	30.56	-	2.97	1.42	4.39
C. GENERAL OPERATING CHARGES														
Internet bill	ls/m	-	6	2	8	0.5	-	3.00	1.00	4.00	-	0.43	0.15	0.58
Communication	ls/m	-	6	2	8	4	-	24.00	8.00	32.00	-	3.44	1.18	4.62
Office Supplies	ls/m	-	6	2	8	4	-	24.00	8.00	32.00	-	3.44	1.18	4.62
Total Recurrent Costs							-	479.07	162.49	641.56	-	68.75	23.96	92.71
Total							314.80	3,253.83	687.77	4,256.40	43.62	460.34	99.77	603.72

/C: 8 months