

**TERMS OF REFERENCE
FOR
DETAILED ENGINEERING DESIGN**

**Subproject 1: Improving the efficiency of water use in irrigation systems
in Dak Mil district, Dak Nong province**

**Subproject 2: Improving the efficiency of water use in irrigation systems
in Cu Jut district, Dak Nong province**

Project: Water Efficiency Improvement in Drought-Affected Provinces

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LIST OF ABBREVIATIONS

ADB	Asian Development Bank
ADF	Asian Development Fund
ARP	Agricultural Restructuring Policy
CPMU	Central Project Management Unit
CMD	Construction Management Department
CPO	Central Project Office
DWR	Directorate of Water Resources
DARD	Department of Agriculture and Rural Development
DED	Detailed Engineering Design
DTF	Design and tracking framework
FS	Feasibility Study
GDI	General Department of Irrigation
GoV	Government of the Socialist Republic of Vietnam
HVCs	High value crops
IMC	Irrigation Management Company
IWR	Irrigation water require
MARD	Ministry of Agriculture and Rural Development
MoF	Ministry of Finance
MPI	Ministry of Planning and Investment
O&M	Operation and Maintenance
PAM	Project Administration Manual
PMU	Project Management Unit
PPC	Provincial People's Committee
PPTA	Technical Preparatorytion Technical Assistance
RP	Resettlement Plan
SBV	State Bank of Vietnam
SPPMU	Specialized Provincial Project Management UnitBoard
TA	Technical Assistance
TCVN	Vietnam Standard
ToR	Terms of Reference
USD	United States Dollar
WEIDAP	Water Efficiency Improvement in Drought - Affected Provinces

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1 PROJECT OVERVIEW

- The Project name in Vietnamese: “Nâng cao hiệu quả sử dụng nước cho các tỉnh bị ảnh hưởng bởi hạn hán” (WEIDAP/ADB8).
- The Project name in English: “Water Efficiency Improvement in Drought-Affected Provinces”.
- Name of the Sponsor: The Asian Development Bank (ADB).
- Executing Agency: Ministry of Agriculture and Rural Development.
- Implementing Agency: Management Unit for Investment Projects on Construction of Agricultural and Rural Development in Dak Nong Province
- Effectiveness Date: 26 June 2019.
- Implementing Period: From June 2019 to 31 December 2025.

1.1 Overview

The Water Efficiency Improvement in Drought-Affected Provinces Project integrates climate-resilient agricultural practices through a transformational shift in irrigation modernization, including (i) strengthening irrigation management to improve climate resilience, (ii) modernizing irrigation infrastructure, and (iii) supporting efficient on-farm water management practices. Specifically, the Project will modernize eight irrigation systems respectively eight Subprojects: Tra Tan, Du Du, Thanh Son - Phuoc Nhon, Nhon Hai - Thanh Hai, Suoi Dau and Cam Ranh, Dak Lak, Cu Jut, and Dak Mil in five drought-affected provinces: Binh Thuan, Dak Lak, Dak Nong, Khanh Hoa, and Ninh Thuan. The modernized systems will enhance the provinces' ability to manage climate variability, improve the water productivity of agriculture, and increase incomes by supporting farmers in growing high-value crops (HVCs) such as coffee, peppers, grapes, apples, dragon fruits, and mangoes.

1.2 Rationale

In Viet Nam, more than half of the irrigation systems operate below their potential capacity mainly because of the poor condition of the asset base. Inadequate and deferred maintenance is a leading cause of premature deterioration of irrigation infrastructure.

The southern central coastal and central highlands regions of Viet Nam are particularly vulnerable to climate change. A climate vulnerability assessment carried out for the project indicated that changes in precipitation will result in hotter and

wetter wet seasons and hotter and drier dry seasons. The ENSO-induced drought in 2014–2016 was the most severe in 40 years. About 60,000 hectares of agricultural land in the central highlands was affected to varying degrees, including permanent loss of perennial crops such as coffee and peppers. The impact is most severe on smallholder farmers who rely on rainfed surface water sources for irrigation.

Water scarcity and economic factors have prompted farmers in the south central coastal and central highlands regions to grow HVCs that can withstand longer dry spells and are more suited to the changing agroecological environment. Notably, an increasing number of farmers are also adopting on-farm micro-irrigation practices such as drip or sprinkler systems. They do so primarily to reduce input costs, including labor, electricity (mainly for pumping of water), and fertilizer. Irrigation systems supporting HVCs and micro irrigation must be sufficiently robust to support the desired level of service, and flexible (able to irrigate only when required), reliable (able to deliver water at a specified flow rate and duration), and accessible (with a point of delivery within 1 kilometer of the farm gate). However, many irrigation existing systems were originally designed for rice and are inappropriate for HVCs.

To address the issue, the Project will combine an innovative solution of pressurized piped irrigation systems with high level technology that meets the level of service required by farmers growing HVCs. These will function like domestic water supply systems and provide water on demand through a system of hydrants and control valves, thereby giving farmers greater flexibility to control the amount and duration of irrigation. Piped distribution systems also allow operators to control and measure water more effectively and apply volumetric water charges. These are necessary conditions to improve efficiency and sustainability, particularly in the operation and maintenance (O&M) of systems, including through third-party service contracts. Finally, piped systems are more resilient to extreme weather conditions and require less maintenance, making them more efficient and cost-effective in the long-term.

The uptake of on-farm micro-irrigation practices by farmers in the project areas is supporting a local micro-irrigation solutions industry. However, farmers lack awareness of and extension services to help them optimize micro-irrigation options and adopt good practices, including fertigation methods. The project will also strengthen the capacity of farmers to use and operate micro-irrigation techniques aimed at improving on-farm water productivity. Once the irrigation systems are fully

operational, incremental production of HVCs such as dragon fruit, coffee, black pepper and mangoes are expected to boost incomes in the targeted provinces.

The Project aligns with key government policies, strategies, and laws, including (i) the government's agriculture restructuring plan; (ii) the Ministry of Agriculture and Rural Development strategy that calls for adopting advanced and water-saving irrigation techniques and technologies on 500,000 ha of upland crops by 2020 to improve productivity, decrease irrigation water use, and increase household incomes; (iii) the national climate change strategy; and (iv) the Law on Water Resources Engineering (2017), which allows for water pricing for irrigation services.

1.3 Impact and Outcome

The Project is aligned with the following impact: climate resilience and water productivity in agriculture improved.

The Project will have the following outcome: climate-resilient and modernized irrigation systems in five provinces established.

1.4 Outputs

Output 1: Irrigation management services strengthened

This output will support policy and institutional development measures to improve climate resilience of agriculture by strengthening irrigation management while taking social and gender dimensions in all relevant activities into consideration. Specifically, the Project will (i) install irrigation water allocation and delivery services, including (a) surface and groundwater assessments, (b) an irrigation water-sharing and allocation framework, and (c) a real-time decision support system for farmers to optimize crop water application; and (ii) improve maintenance of irrigation systems, including (a) developing an asset inventory and management database for each irrigation system supported by the project, (b) developing a systematic asset maintenance schedule with a rigorous approach to funding based on asset condition assessments, (c) developing a water charge pricing framework, and (d) assessing options for engaging third parties in O&M of irrigation systems.

Output 2: Modern irrigation infrastructure developed

This output will modernize eight irrigation subprojects in the five provinces to provide water on-demand to farmers cultivating HVCs, reducing their vulnerability to climate change. The underlying principle of all systems is to provide a higher level of

service - more flexible, reliable, and accessible supply of water to farmers than they currently receive. The infrastructure works include three broad categories: (i) pressurized pipe systems that connect canals or reservoirs with supply hydrants located in reasonable proximity to farmers' fields (enabling direct connection with a hose), with basic supervisory control and data acquisition systems to facilitate operations and monitoring of system flows; (ii) main system modernization, including canal lining, control structures, storage, and installation of flow control and measurement devices with remote monitoring; and (iii) new and improved weirs to replace temporary weirs constructed by farmers to provide storage from which farmers can pump to irrigate HVCs. Other works include upgrading culverts and farm roads to improve management of irrigation systems.

Output 3: Efficient on-farm water management practices adopted

This output will focus on improving on-farm water productivity in the subproject command areas to improve climate change resilience. Water productivity assessments conducted under Output 1 will help determine suitable norms for different crops under different agroecological conditions. Based on this information, farmers will receive training and advisory services to improve on-farm water management to cope with climate variability. The service providers will consult with and provide technical advice to male and female farmers to identify and develop appropriate micro-irrigation systems that meet their individual requirements. Farmers will also be linked with private sector suppliers and provided O&M training on micro-irrigation systems.

2 INTRODUCTION TO THE DAK MIL AND CU JUT SUBPROJECTS

2.1 General information

- Names of Subprojects:
 - + Subproject 1: "Improving the efficiency of water use in irrigation systems in Dak Mil district, Dak Nong province".
 - + Subproject 2: "Improving the efficiency of water use in irrigation systems in Cu Jut district, Dak Nong province".
- Name of the Sponsor: The Asian Development Bank (ADB).
- Executing Agency: Dak Nong Provincial People's Committee
- Implementing Agency: Management Unit for Investment Projects on Construction of Agricultural and Rural Development.
- Implementing time: From June 2019 to 31 December 2025.

The Feasibility Study reports for Dak Mil and Cu Jut subprojects were approved by Dak Nong Provincial People’s Committee at the Decision No.1073/QD-UBND for Dak Mil Subproject and Decision No.1074/QD-UBND for Cu Jut Subproject on July 11, 2018.

The investment contents of Dak Mil subprojects include: (1) Upgrading existing reservoir; (2) Upgrading and constructing new weir to raise and store irrigation water; (3) constructing new water transfer and irrigation pumping stations; and (4) Upgrading and constructing new irrigation canals and pipelines.

The investment contents of Cu Jut subprojects include: (1) Building 10 new weirs along Ea Dier stream; (2) Building new pumping stations and irrigation canals; and (3) Upgrading the road according to Rural Road Standards.

The modernized irrigation systems within the Dak Mil and Cu Jut Subprojects will enable increased and sustainable high-value cropping though efficient distribution and use of water from storage reservoirs. Cropped areas will expand and the pressure on groundwater use will be reduced.

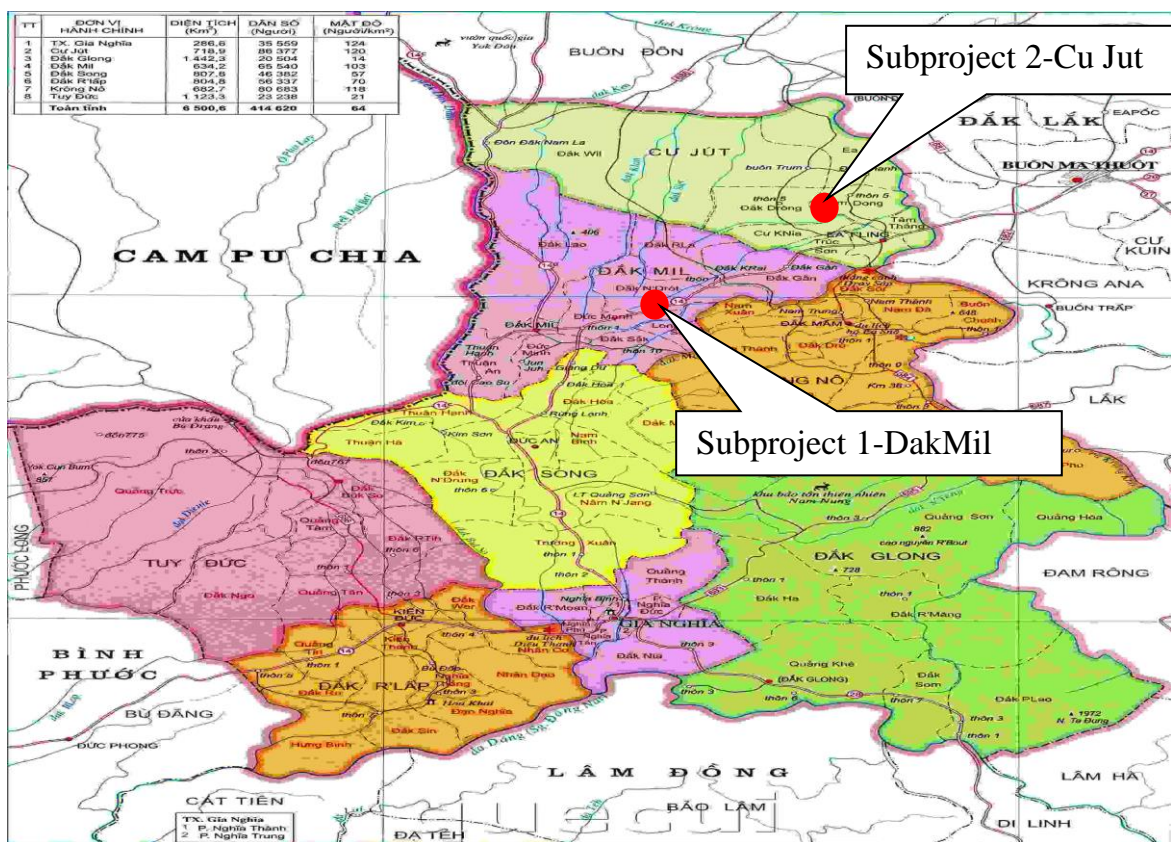


Figure 1: Location of the Subprojects.

2.2 Technical works proposed at the approved Feasibility level designs

2.2.1 Dak Mil Subproject

-The design involves: (i) various upstream works, including rehabilitation of works for several small existing reservoirs that will supply (ii) three new permanent downstream weirs. The three permanent weirs serve a total of about 770 ha. The service areas are within about 1.0 km of each weir site. The new weirs replace farmers' temporary weirs.

-The national design specialist design indicates that a total of 6,750 ha is presently irrigated within the Dak Mil sub-basin. Of this area, 4,229 ha (63%) is presently irrigated by gravity and 2,521 ha (37%) by pumping. Furthermore:

+Of the gravity area, 2,021 ha (48%) is within 250 m of an open canal, 1,610 ha (38%) is between 250 m and 500 m and 598 ha (14%) is further than 500 m; and

+ Of the pumped area, 1,649 ha (65%) is within 250 m of an open canal, 796 ha (32%) is between 250 m and 500 m and only 76 ha (3%) is further than 500 m.

-Upstream Works comprise:

+ Rehabilitation to restore the original design of four existing storage reservoirs (No. 1, 2, 35 and 40) serving 1,029 ha of coffee;

+ Rehabilitation to restore the original design of five existing weirs/overflow structures (Thai Ba Long and numbers 1, 2, 3 and 4) serving 370 ha of coffee and 67 ha of rice;

+ Where it passes through a densely populated urban area, 2.75 km of the Dak Mil River main canal will be provided with a new reinforced covered concrete flume section (box culvert);

+ A new 0.8 mx1.0 m offtake will be provided for the existing E29 Reservoir;

+ The existing Dak Sor-Long Son Weir will be lined with reinforced concrete; and

+ A new pumping station, to replace a temporary one, located on Reservoir #1 to augment supply to existing interconnected Thuan Bac and No. 40 Reservoirs.

- The new pumping station (item vi) is to deliver the peak irrigation water requirement in the critical month (April). The peak crop water requirement adopted based on coffee, is 0.83 l/s/ha, for continuous 24 hours/ day supply. The new

pumping station is designed to deliver 450 m³/hr (head = 55.0 m), to a service area of up to about 150 ha.

- Downstream works comprise three new permanent weirs. Weir design includes the following:

+ Estimates of the 1-in-50-year design flood;

+ Detailed topographic survey and mapping of each weir site;

+ Conventional hydraulic weir design principles and practices including consideration of the cost trade-off between: (a) weir height, width and cost, and (b) upstream river dyke height, length, volume and cost to ensure that the weir does not fail by overtopping of its upstream embankments and erosion of its earth abutments;

+ Downstream energy dissipation and erosion control, including whether the flow over the weir is critical or sub-critical, and design of the stilling basin to ensure that any hydraulic jump is drowned by the normal water level in the downstream channel; and

+ Hydraulic gradient and seepage analysis to ensure that the weir structure does not fail by piping or uplift etc.

- Natural river channels usually overflow their banks on to their flood plains every 2-3 years. To accommodate the 1 in 50-year design floods, weirs need to be as wide, or wider, than the natural river channels.

- Two weir options were considered: (i) gated weirs, and (ii) ungated weirs. The cost of gated weirs was almost double the cost of ungated structures, and the benefit of the additional in-stream storage cannot justify the addition cost. Operation and Management (O&M) costs would also be higher. Further, there remains a risk that gates would not be opened in a time for passage of a flood, with flood damage resulting.

- Ungated weirs were therefore adopted. The proposed reinforced concrete structures have fixed weir crests +1.50 m high, to form pumping pools. In each weir, a central span, up to 1.5 m wide, with grooves for stop logs, is provided to allow flushing of sediment during the monsoon.

The Feasibility Study for the Dak Mil Subproject was approved by the People's Committee of Dak Nong Province at the Decision No.1073/QD-UBND on 11 July 2018 with the objective of construction investment:

- The subproject aims to improve the water usage efficiency from reservoirs: Doi 1 Lake, Doi 2 Lake, West Lake, Dak Sak Lake, E29 Lake, Dak Mol Lake with a total capacity of 13.58 million m³. Increasing the status of irrigation works in the area from 4021ha to ensure irrigation for 6214ha, an increase of 2193ha mainly for coffee and peppers. To build a pumping station to transfer water from Doi 1 lake to lake 40, lake 35 and Thuan Bac lake with a flow of about 450m³/h in the dry season months.

1) Upgrading 04 reservoirs: Doi 1 and Doi 2 Lake in Thuan An commune, Lake 40, and Lake 35 in Dak Lao commune,

2) Upgrading and constructing 08 dams and regulating culverts: C1, C2, Dam: D1, D2, Weir: Thai Ba Long in Duc Minh commune, D1, D2, and 3, Nam Xuan commune.

3) Building a new pumping station to transfer water, creating a source from Lake 1 to Lake 40 and Thuan Bac Lake (watering for about 100 ha). This pump station uses horizontal centrifugal pumps controlled by inverter and system.

4) Construct a pumping station to transfer water up the hill in the dam D1 Nam Xuan commune (watering for about 50ha). This pumping station uses horizontal centrifugal pumps with variable rotation, controlled by inverter and system.

5) Upgrading main canals of Dak Mil stream, branch canal, and canal bank.

6) Upgrading 14.454km of connecting road according to rural road standards grade B.

7) Building operation and management buildings.

2.2.2 Cu Jut Subproject

- The subproject design involves: (i) 10 permanent weirs to replace farmers' temporary weirs, supplied from the existing Dak Dier and Dak Drong Reservoirs, (ii) two pump - pipe demonstration irrigation systems, supplied from new weirs 2 and 9, each serving 50 ha, and (iii) upgrading of 10.95 km of access road.

- Conventional weir design includes the following:

+ Estimates of the 1-in-50-year design flood.

+ Detailed topographic survey and mapping of each weir site;

- + Conventional hydraulic weir design principles and practices including consideration of the cost trade-off¹ between (a) weir height, width and cost, and (b) upstream river dyke height, length, volume, and (c) the cost to ensure that the weir does not fail by overtopping of its upstream embankments and erosion of its earth abutments;
- + Downstream energy dissipation and erosion control, including whether the flow over the weir is critical or sub-critical, and design of the stilling basin to ensure that any hydraulic jump is drowned by the normal water level in the downstream channel; and
- + Hydraulic gradient and seepage analysis to ensure that the weir structure does not fail by piping or uplift etc.
- The national design consultant estimates of design floods are tabulated above for each weir, and vary from 119 m³/s for ‘Weir 1’ to 261 m³/s for ‘Weir 10,’ the furthest downstream.
- Natural river channels usually overflow their banks, on to their flood plains, every 2-3 years. Site visits and discussions with local stakeholders confirmed that the Ea Dier River does indeed regularly flood over its river banks. To accommodate the 1 in 50-year design floods, the weirs would need to be as wide as or wider than the natural river channel.
- Two weir options were considered: (i) gated weirs, and (ii) ungated weirs. The cost of gated weirs was found to be almost double the cost of ungated structures, and the benefit from the greater in-stream storage cannot justify the addition cost. Operation and Maintenance (O&M) costs would also be higher. Further, there remains a risk that gates would not be opened in a time for passage of a flood, with flood damage resulting.
- Final designs have, on average, 1.5 m high fixed weir crests, and long crests with no horizontal constriction of flow. Weir widths range from 20m to 50m. Raised embankments upstream of the weirs reduce the likelihood of the weirs being outflanked. However, with extreme floods the weirs could still be outflanked, so flexible protection to the permanent concrete weir structure is proposed and should be included in the designs.

- The adopted design water requirement for the pumped-pipe schemes, Tan Ninh and Village 12, is 1.16 l/s/ha including for losses and operational flexibility. These schemes will pump water from new weirs, No.2 and No.9, making use of the new permanent ponds. It is anticipated that, over time, similar pump-pipe systems may be developed from the other weirs subject to the available impounded storage volumes achieved.
- The two piped distribution system layouts have been designed to meet the modern irrigation level of service adopted for Water Efficiency Improvement in Drought-Affected Provinces Project (WEIDAP), with farmers' fields within 500 m of the pipeline.
- Required high density polyethylene (HDPE) pipe diameters range from 90 mm to 315 mm (Tan Ninh) and from 125 mm to 315 mm (Village 12). Pipe lengths and densities are 1,176 m and 23.5 m/ha, and 2,045 m and 40.9 m/ha.
- The project will equip each of the two systems with 12 standard hydrant manifolds each with a 5 l/s design discharge. Therefore, the total design discharge of the 12 manifolds is 60 l/s, which is nearly the same as the system capacity of $1.16 \times 50 = 58$ l/s. The unit cost of 80 mm diameter hydrant manifolds is \$435 each. Therefore, the total cost of 12 hydrant manifolds is \$5,220, or \$104 per ha over the service area of 50 ha. The average spacing of hydrant-manifolds will be 98 m (Tan Ninh) and 170 m (Village 12).
- To improve access, and link to the bridge crossing, 10.95 km of 4.0 m wide concrete paved road is proposed and included in the cost estimates.

The Feasibility Study for the Cu Jut Subproject was approved by the People's Committee of Dak Nong Province at the Decision No.1074/QD-UBND on 11 July 2018 with the objective of construction investment:

- The subproject aims to improve the water usage efficiency by construction measures and non-construction measures to adapt to the immediate and long-term drought situation. Thereby ensuring a stable water supply for agricultural and daily life.
- The subproject aims to improve the water usage efficiency from reservoirs: Dak Drong and Dak Dier reservoirs with a total capacity of 8.81 million m³ to ensure irrigation for 2985 ha of crops. Raising the groundwater level to supply water for the communes of Dak Drong, Cu Knia, Nam Dong and Tan Thang.

- Options mentioned in FS:

1) Build 10 new Weirs along Ea Dir stream:

Table 1: Specifications of weirs (approved FS)

No.	Project name	Width, m	Overflow threshold, m
1	Weir 1	20	337.00
2	Weir 2	20	336.00
3	Weir 3	20	334.00
4	Weir 4	20	326.00
5	Weir 5	30	323.00
6	Weir 6	35	320.50
7	Weir 7	40	316.00
8	Weir 8	40	313.00
9	Weir 9	50	303.00
10	Weir 10	50	297.50

2) Build a new Tan Ninh pumping station and irrigation canal at the weir site no.2 and the irrigation system with HDPE to irrigate 50ha. This pumping station uses horizontal centrifugal pumps with variable rotation, controlled by inverter and system.

3) Build a new village 12 pumping station and irrigation canal at the weir site no.9 and HDPE irrigation system to irrigate 50ha. This pumping station uses horizontal centrifugal pumps with variable rotation, controlled by inverter and system.

4) Upgrading about 15.00 km of roads according to rural road standards (TCVN 10380: 2014) of class B with a width of 5m, width of the road surface 3.5m with M250 cement concrete with 18cm thickness.

Table 2: The length of connecting roads (approved FS)

No.	ROADS NAME	LENGTH (m)
1	Road to the dam 1	1325.84
2	Road to the dam 2	534.92
3	Road to the dam 3	958.43
4	Road to the dam 4	1136.67
5	Road to the dam 5	2084.62
6	Road to the dam 6	0.00
7	Road to the dam 7	441.72

8	Road to the dam 8	1933.41
9	Road to the dam 9	194.00
10	Road to the dam 10	2364.46
11	Connecting road dam 7	2000,0
12	Connecting road dam 9	2000,0
	Total	15000.00

2.3 Overall options for compensation, support and resettlement

2.3.1 Implementation principle

- According to Point 2, Article 87 of Land Law No.45/2013/QH13, Compensation, support and resettlement for special cases: "For projects using loans of international organizations Foreign countries that Vietnam has a commitment on compensation, support and resettlement policy frameworks follow that policy framework ”.

- Resettlement Policy Framework for the Project WEIDAP is prepared as an independent document to implement the Government's resettlement policy, while meeting the requirements of involuntary resettlement policy upon request of ADB. Through research activities, consultations and analysis of policies, potential social impacts of sub-projects, the policy framework will address solutions to minimize the rules for implementing Resettlement Action Plans for the subprojects of the project provinces in accordance with the existing policy on resettlement of the Government and of sponsors, legal practices and tools.

- Contents of Resettlement Policy Framework (RPF) include:

+ The objectives and principles of appropriate policies as well as the requirements of safety policies required for the preparation and implementation of subprojects or components;

+ Explain the potential impacts of sub-projects or components invested in the project;

+ The requirements will be implemented to review, classify, evaluate and plan the project, including information dissemination and consultation on solutions related to vulnerable groups including women female, grievance redress mechanism;

+ Describe the implementation procedures including funding, organizational arrangements, and capacity building requirements;

+ Requirements for monitoring and reporting;

+ Determining clearly the responsibilities and powers of the parties related to the preparation, submission, review and approval of documents on social safety policies, monitoring the implementation of social safety plans.

- The Resettlement Action Plan (RAP) will be prepared for the Subproject based on the Resettlement Policy Framework of the project. The RAP implementation plan for the subproject will be prepared and approved before the loan agreement is negotiated.

- The repair, upgrading and construction of new construction items will cause land acquisition impacts, affecting assets and livelihoods. Resettlement Action Plan / Clearance compensation plan built on the principle of compensation / support for the losses of affected households must be fully implemented based on the principles. These are included in the Resettlement Policy Framework of the project and the specific provisions set out in the approved Resettlement Action Plan.

- Prepare Resettlement Action Plan reports with the aim of minimizing involuntary resettlement by studying and designing alternatives, or in case of resettlement is inevitable policies need to be developed to improve or at least restore the living standards of the affected people compared to before the implementation of the project, improve the living standards of the poor and affected groups, or relocate. In the case of affected land and assets as mentioned above, the Subproject Resettlement Action Plan should be prepared and approved by the competent authority before the signing of the agreement project. After the detailed technical designs are completed, the number of affected people will be reviewed, compensation rates for all types of impacts and grants and grants will be updated and all Both are detailed in the updated Resettlement Action Plan.

- In case the project components cause negative impacts on the livelihood of displaced people, support measures will be applied during the implementation of the Resettlement Action Plan so that they can restore or improve living standards compared to the pre-project implementation. In the process of implementation, it will monitor to check how the livelihood restoration process is implemented, if it cannot be restored, additional support policies will be applied so that they can recover soon design and living standards.

- Related activities: This policy applies to all components of the project related to resettlement issues regardless of funding sources. This policy also applies to other activities related to resettlement:

- + Activities that are directly and seriously related to the project;
- + The need to achieve the project objectives;
- + Being implemented or planned to be implemented simultaneously with the project.
- Determination of value and compensation: is a method used to determine the value of damage to use for compensation activities, support for impacts of land acquisition and resettlement of the project (replacement cost so) applies to damages including damage to land, construction works, other assets and trees and crops damaged in this project. Compensation and resettlement units will conduct surveys, investigate and propose the replacement rates for affected land and structures (both agricultural land and residential land), market prices for the damaged crops, this price is determined for the calculation of compensation costs when the state recovers land. Replacement cost survey will be conducted when updating Resettlement Action Plan.

2.3.2 Responsibilities of agencies implementing compensation, support and resettlement

- Responsibilities for drafting and implementing Resettlement Policy Framework (RPF) and Resettlement Action Plan (RAP) are as follows:
 - + The task of preparing and implementing the Resettlement Policy Framework belongs to the Central Management Board of irrigation projects. CPO will hire consultants, collaborating with relevant agencies including central ministries / departments, People's Committees of provinces / districts to participate in the project and affected communities to proceed set up resettlement policy framework. This resettlement policy framework is approved by the Prime Minister and approved by the Donor before the negotiation of the Agreement.
 - + The Resettlement Action Plan of the subproject will be prepared by a social consultant hired by CPO and supported by the locality on the basis of the principles in the above Resettlement Policy Framework. PPC will be responsible for approving and implementing this Resettlement Action Plan.
- CPO is responsible for ensuring the effective implementation of the Resettlement Policy Framework and Resettlement Action Plan, in coordination and consultation with agencies at the same level and provinces participating in the Project.
- The implementation of resettlement activities requires the participation of local agencies and organizations at provincial, district and commune levels, PPC will take

responsibility for the implementation of the overall Resettlement Policy Framework and specific Resettlement Action Plan of the subproject of the province. Compensation, support and resettlement committees will be established at the provincial/district level in accordance with the provisions of Decree 47/2014/CP. The terms and policies of this Policy Framework and Resettlement Action Plans will be the legal basis for implementing compensation and resettlement activities in the subproject.

a. Central:

- MARD on behalf of the government is the project host, responsible for overall management of the whole project. The People's Committees of the provinces in the project area are the investors of the sub-projects under the project, responsible for deciding the investment of the sub-projects managed by the Ministry and the province. A Project Steering Committee (PSC) will be established, consisting of representatives from the Ministry of MARD, and the People's Committees of the project provinces responsible for regularly monitoring and managing the Project during the implementation process.

- CPO whose representative is CPMU will be responsible for monitoring to advise and supervise to ensure compliance with the RPF and fully implement procedures for RAP of the project, including:

+ Coordinate with the provincial People's Committees to direct the implementation of compensation and resettlement, ensure compliance with the provisions in the RPF and ensure compliance with the construction schedule.

+ Training and capacity building for project implementing agencies (PPMUs and Boards of compensation and site clearance in the district) on the process of implementing RPF and RAP.

+ Coordinate with PPMUs to monitor internal implementation of compensation and resettlement of the whole project.

+ Selecting and coordinating an independent monitoring and resettlement unit for the whole project.

+ Periodically report on resettlement issues to MARD and ADB.

b. People's Committee of Dak Nong Province:

- PPC is fully responsible for the implementation of compensation, site clearance and resettlement within the province. PPC is responsible for:
 - + Notifying or authorizing district People's Committees to notify land acquisition right after selecting the subproject locations.
 - + Issuing decisions on land acquisition of organizations.
 - + Approving the Resettlement Action Plan (RAP) of the sub-projects.
 - + Approving the overall compensation plan.
 - + Direct People's Committees of districts to implement compensation, resettlement and site clearance.
 - + Granting sufficient and timely funding for compensation payment.
- In special cases where provincial authorities are required to approve compensation plans, the provincial competent authorities shall set up a provincial appraisal council to appraise compensation plans which the district compensation, support and resettlement committees submitted to the Provincial Competent Authorities for approval in accordance with Government regulations on compensation, assistance and resettlement and resettlement policies applied to the project.

c. Investor of the subproject:

The owner of the subproject is responsible for managing the implementation of compensation, support and resettlement of the subproject, including:

- Making RAP and updating RAP;
- Submit RAP to the Competent Authority for approval;
- Coordinate closely with other departments, agencies and People's Committees in implementing compensation, support and resettlement activities to ensure the implementation of compensation and resettlement in accordance with the construction plan;
- Internal monitoring of the implementation of compensation, support and resettlement of the subproject, quarterly reports on the progress of compensation, support and resettlement of the subproject for CPO.

The owner of the subproject is responsible for managing the implementation of compensation, support and resettlement of the subproject, including:

d. Districts have the project:

- District People's Committees have the following responsibilities:
 - + Approving compensation, support and resettlement plans which district-level compensation, support and resettlement units submitted to provincial People's Committees for consideration and comments.
 - + Making decisions on land acquisition of individuals and households.
 - + Resolving complaints and grievances of affected people within the jurisdiction.
 - + Making decisions on land acquisition of individuals and households.
 - + Resolving complaints and grievances of affected people within their jurisdiction.
- Units implementing compensation, support and resettlement at district level (hereinafter referred to as DRC) are responsible for implementing compensation and site clearance for works in the district, including:
 - + Prepare compensation plan to submit to the District / Provincial People's Committee for approval.
 - + Implementation of compensation and site clearance.

e. Commune/ward/town and Community affected:

Commune / ward / town people's committee has the responsibility:

- Propagating and mobilizing people to implement the resettlement policy framework and law compliance;
- Protection and planning of land use and participation in the protection of safety corridors of dams and reservoirs, maintenance of local security and order;
- Provide a map of land plots, determine the origin of land use for the Compensation Council and appoint officials to participate in the inventory of affected assets of households;
- Coordinate with the district compensation association to organize information dissemination and community consultation;
- Solve questions of affected people related to their inventory.
- Facilitating and helping affected households to restore their livelihoods, incomes and stabilize their lives.

f. Community level:

Affected communities nominate their representatives to participate in the affected asset inventory team to monitor the implementation process and sign the household inventory of affected assets.

2.3.3 Demand for land area

a. Dak Mil subproject:

The total land area used for the project is 4.5 ha, included: 1.5 ha of permanent land loss and 3.0 ha of temporary land loss.

b. Cu Jut subproject:

The total land area used for the project is 12.75 ha, included: 2.0 ha of permanent land loss and 3.0 ha of temporary land loss

2.4 Total investment, funding sources and financial mechanism

2.4.1 Total investment amount

- According to the memorandum of March 2016, the subproject will provide financial support for investment items from key works to irrigation management transfer points of WUGs, cost components supported by the Sub-Project including:

- Expenses for site clearance and compensation are paid to:

+ Long-term compensation for land for pumping stations, water pipelines;

+ Compensation for temporary land acquisition during construction;

+ Compensation of assets on land including infrastructure, houses, trees, crops ...;

+ Support resettlement, fixed cultivation, stable production and daily life;

+ Cost for making compensation, support and resettlement plans, fixed cultivation;

+ Cost of implementing clearance and compensation.

- Construction costs are paid for construction preparation costs (clearing, clearing the ground); construction of construction items (solidifying degraded canal sections, pumping stations and water pipelines), construction of camps and temporary works for construction.

- Equipment expenses are paid for water level gauges, water pipelines, pumps and control devices, transformer stations for pumping stations.

- Project management expenses paid for the organization of managing the implementation of project management jobs from the project preparation stage and project implementation to the completion and acceptance of the project, putting the work into utilization.
- The consulting expenses will cover the preparation phase and the project implementation phase, including the cost of survey, design, phase verification, monitoring and inspection.
- Other expenses to pay for detection and destruction of bombs, mines and explosive objects; construction insurance; construction deformation monitoring; audit, verification and approval of investment capital settlement; fees and charges as prescribed.
- Contingency expenses include volume redundancy and price slippage during construction.

Total investment:

The total investment for the Subproject is 516,715 billion VND (~ 22,169 million USD) in which:

- Loans from ADB: 411,176 billion VND(~ 17,641 million USD)
- Counterpart fund:105,538 billion VND (~ 4,528 million USD)

2.4.2 Sponsor Fund (Donation Fund)

- Loan fund from Asian Development Fund of Asian Development Bank (ADB);
- The counterpart fund of the Vietnamese Government is the local budget capital (Dak Nong province).

a. Loan fund:

- To implement the project, using the Official Development Assistance (ODA) loan from Asian Development Bank, the loan budget is 17,641million USD, equivalent to 79.58% of the total capital of the project. ODA capital will be used mainly for: Detailed technical design activities, construction, supply and installation of equipment.
- Based on commitments and memorandums of understanding between the Government and Donors, based on the demand for capital and counterpart capacity of Dak Nong province, the financial conditions of the Sponsor refer to the International Development Association (IDA) that ADB is a member of.

b. Counterpart fund:

- The counterpart fund of the Vietnamese Government from the local budget (the province participating in the project) is about 4.528 million USD (equivalent to 20.42% of the total project capital). Domestic counterpart funds will be used for: Compensation, support and resettlement costs; Cost of subproject management; Cost of construction investment consultancy.
- The provinces participating in the project will formulate, appraise and approve medium-term investment plans and commit to allocate sufficient capital.

2.4.3 Financial regime

- The subproject is a component project of the project "Improving the efficiency of water use for drought-affected provinces" that have been agreed by the Government so the financial mechanism of the subproject will comply with the financial mechanism of the project regulated by the Government.
- The People's Committee of Dak Nong province, which is the investment decision level of the sub-project, will be responsible for allocating local budgets for the task of spending from counterpart funds. Expected counterpart capital expenditures include: compensation, support and resettlement, consultancy and sub-project management. The sub-project uses borrowed capital through allocation and re-lending to implement the contents to support the strengthening of institutions and policies, building technical and economic norms; construction and installation of canal systems, pumping stations and pipelines; implementing economical irrigation on the field.
- Implement the management and improve the efficiency of using public debt in the spirit of Directive No.02/CT-TTg dated February 14, 2015 of the Prime Minister.
- Therefore, the proposed financial mechanism for the project is as follows:

a. For loan funds:

- Total loan value (ADB) is 17,641 million USD, equivalent to 411,176 billion VND;

Inside:

- + Central budget allocates 80% of the total loan, equivalent to 328,941 billion VND, about 14,113 million USD;

+ Local budget re-borrowed 20% of the total loan, equivalent to 82,235 billion VND, about 3,528 million USD.

b. For counterpart fund:

- Local budget: 105,038 billion VND, about 4,528 million USD.

3 OBJECTIVES AND SCOPE, TASKS OF CONSULTING SERVICES

3.1 Objectives

Objectives of consulting services are to prepare the Detailed Engineering Designs for upgrading and modernizing the water resources development/ irrigation systems within Dak Mil and Cu Jut Subprojects based upon the WEIDAP Guidelines for Detailed Engineering Design, and in order for facilitating efficient O&M, climate resilience and water productivity in agriculture improved, Irrigation management services strengthened (Output 1) and Efficient on-farm water management practices adopted (Output 3).

3.2 Scope of Consulting Services

The Scope of Consulting Services consists of, but not limited to the following:

- Studying further and Identifying, Proposing modifications/ options/ solutions for improving the feasibility study level designs.
- Carrying out necessary surveys.
- Preparing the detailed engineering design documents for the Subprojects.
- Updating the Resettlement Plan and Preparing the Environmental Management Plan for the Subprojects.
- Organizing design workshops to report design options/ DED and consult the experts.
- Attending the study tour in Australia to visit the systems in the Riverland region of South Australia where the policy and institutional framework has been established, to increase water use efficiency in agriculture and developed pressure piping systems and/or water-saving irrigation technologies to be installed in the system.
- Cooperating closely with the project implementation support consultants, if recruited/ appointed in time.
- Regularly reporting the work progress to the Investor/ Dak Nong SPPMU.

- Supporting the SPPMU/ Investor in the process of submission and explanation of examinations and evaluation comments.
- Providing the oversight of the detailed engineering designs' authors' right, etc.

3.3 Specific Tasks of the Detailed Engineering Design

- The main tasks of the Detailed Engineering Designs include:
 - (i) Studying further and Identifying, Proposing modifications/ options/ solutions for improving the feasibility study level designs.
 - (ii) Determining what data to collect/survey and conducting surveys.
 - (iii) Preparing the detailed engineering designs.
 - (iv) Updating changes in the detailed engineering design into the resettlement and environmental management plans, etc.
- Overall requirements: During the implementation process, the consultants must comply with the current recommended standard frameworks for surveys and designs as listed in the Appendix 1, and the WEIDAP Guidelines for Detailed Engineering Design, the Design Principles for Subprojects and Subproject Report: Dak Mil Subproject, Subproject Report: Cu Jut Subproject. Specifically, designs of pressured pipe systems shall/should observe the design standard: Water supply – Distribution pipeline system and facilities (TCXDVN-33:2006).

During the implementation process, the consultants must comply with the recommended standard frameworks for surveys and designs as listed in the Appendix 1.

3.3.1 Studying further and Identifying, Proposing modifications/ options/ solutions for improving the feasibility study level designs

* **Construction sites and solutions:** Construction sites and solutions were suggested during the feasibility study phase. At the detailed engineering design, when the basic documents are collected, more detailed and full surveys will be needed for confirming the optimization of the selected locations and solutions. In case of any changes in the investment project preparation phase, there must be a valid argument. Also, basic documents/data from the surveys and designed works must allow to ensure sufficient volume components (specifically, see Section 3.3.3).

* **Layout of headworks:** There shall be two options for the layout of headworks:

- Option 1 (FS proposed): Pumping into a header tank for subsequent gravity supply (by a pressurized pipe system).
- Option 2: Direct pumping into a main pipeline of a pressurized pipe system. As part of the detailed engineering design, this additional option shall be costed and compared.

Selecting the optimal option for the layout of headworks shall be based on technical and economic arguments/ evaluations, and the requirements for irrigation water delivery services: Equity, Reliability and Flexibility in irrigation modernization projects.

In case of selecting Option 2, pressurized pipe (ring) systems shall be adopted. A single small header tank may be located at the highest (and furthest) location in each pipe system, with pressures (or water levels) triggering pump operations. Alternatively, pump operations may be controlled by pressure sensors in the pipeline.

3.3.2 Collecting additional hydro-meteorological, topographic and geological data

- Depending on the specific conditions of each Subproject, additional topographic and geological surveys, hydrogeological works and other data are required. All work must comply with relevant technical standards, regulations and norms.
- The purpose of construction survey work to provide topographical, geological, meteorological and hydrological documents for the design of the technical design phase of construction of pumping stations and primary irrigation systems of the subproject "Upgrading and building the irrigation system for upland crops in Dak Mil and Cu Jut districts, Dak Nong province".

3.3.3 Evaluating current available documents to propose necessary survey activities

Control of the surface at class IV, grade 1, coordinate system VN2000, control of the height of class IV - Hon Dau (Hai Phong) in accordance with current standards: Re-using the surface control and altitude has been implemented during the F/S phase to deploy the entire measurement area.

- For plane chart of all types: Re-use the implemented plane chart as:
- + Cu Jut Subproject: no further measurements are needed.

+ Dak Mil Sub-project: will need to measure the topographical plane chart of Doi Doi 1 pump station, C2 canal route, construction works on the road and on the channel...

- For longitudinal sections, cross-section of work items that have not been implemented in the previous period, the period of detailed technical design will be performed.

- Place landmarks at the middle of construction, construction monitoring and land clearance landmarks: The previous phase has not been implemented, the period of detailed technical design is implemented.

3.3.4 Identifying components and quantity of topographic survey work in the detailed design phase

3.3.4.1 Collecting documents

The work of collecting data is an important task which help the consultant have enough data to analyze and calculate in order to provide reasonable solutions when conducting surveys and technical design of construction details and construction works:

Data to be collected in the period of detailed engineering design include:

- Topographic maps of all kinds of structure (pipelines, pumping stations, water storage tanks, canals and main pipelines).
- Documents on control points (coordinates, altitudes, benchmarks).

Other relevant survey materials.

3.3.4.2 Identifying quantity of all topographic survey work items

a. Grid controls the plane chart of ground.

The terrain grade IV is connected from the state landmark to the project, (these 4-grade landmarks have been implemented in the previous period.) level 2 marks were available and increased during this period for more detailed regional measurements.

b. High-controlled network.

The technical leveling is guided from the traverse network - grade 2 set up in the previous phase to the station points for the measurement of the topographic section of the construction items.

c. Measuring and drawing plane chart

Measuring and drawing 1/1000 scale plane chart with 1m contour line for irrigation canals and pipes.

Measuring and drawing 1/500 scale plane chart with 0.5m contour line for the works on canals, on residential roads and in management areas.

Measuring and drawing Plane chart that clearly shows the range and location of neighboring works site, houses and residential areas related to the construction route. At the same time, shows clearly the range of old roads, works site, geological topography on the route and related routes.

The irrigation area does not need to be measured; however, the latest plane chart of the communes in the project area is needed (clearly dividing the parcel of land of each household, the routes for cultivation on the fields).

d. Measuring and drawing longitudinal sections and cross sections

Measuring scope includes the system carrying water from the reservoir to the station, power lines, main pipelines, irrigation pipeline and the roads for management.

e. Place landmarks the heart of construction and clearance landmark

Place landmarks the heart of construction including starting point and end point, folded point.

In order to ensure the accuracy of the elevation, we choose two control levels which are grade IV leveling standards to measure and placing landmarks at the heart of construction.

f. Clearance landmarks

The basis of applying section 8.4 TCVN8478: 2010 The landmark system to determine the boundary of land clearance. The boundary of pump stations, tanks, power lines, water pipelines, and management road must be determined ... to serve the ground clearance and compensation payment.

- The accuracy is determined by the accuracy of the measuring points level 2.

- the elevation accuracy is determined according to Leveling Technical standards.

- The size of the landmark is 10x10x60cm made of concrete with name and landmark number.

(Quantity table of topographic survey for detailed engineering design, see Appendix 2)

3.3.5 Identifying components and quantity of geological survey work in the detailed engineering design phase

3.3.5.1 *Collecting documents*

- Existing documents of work items can only be assessed at locations where there are boreholes and survey excavations. Distance and number of survey locations are not guaranteed for the entire construction route. During this period, it is necessary to conduct additional surveys at the dam sites (10 locations) pumping stations (02 locations), management and operation roads + residential roads...

3.3.5.2 *Identifying quantity of geological survey work items.*

a. Cu Jut Subproject

** Drilling work:*

+ For the dams route (from 1 to 10), each dam will drill 3 holes: 1 hole in the heart of the stream, 2 holes in the upper and lower reaches combine with the drilling hole in the previous phase to determine two geological sections including 01 geological longitudinal-section at the centerline of dam, 01 geological cross-section perpendicular to the centerline of dam at the streambed. The stream borehole is 10m deep, the shoulder hole is 15m deep.

+ Pumping stations (02 stations), each station will drill 2 holes: 01 at the pump station location and 01 at the discharge tank. The depth of each hole is 10m.

** Experimental work:*

+ Experimenting the undisturbed soil samples: Experimenting 17 indicators, Take 1 sample every 3m. The total samples: 108 samples.

+ Experimenting the concrete corrosion water samples: 6 samples of surface water and 6 samples of groundwater

b. Dak Mil Subproject

** Drilling work:*

+ For the dams route: drill 2 holes at the stream bed.

+ For the pumping station: 01 on the geological longitudinal-section at the centerline of dam, 01 on the geological cross-section at the centerline of dams.

+ For pipeline: 01 holes every 200m

- + Head regulator: 01 borehole is located at the intersection between the centerline of the head regulator and the centerline of the dams.
- + Water tanks: Arranging 02 boreholes perpendicular to the tanks shaft.
- + Medium-voltage lines: Arranging exploration boreholes along the centreline, 200m from each hole
- + For the irrigation canal route: 03 boreholes on a cross-section, each cross-section is 100m apart on the centerline .
- + Residential road: Drill exploration holes on both sides of the road, each hole is about 500 m apart.
- + Bridge : Drill 2 holes at the two bridge abutments .
- + Operation and management area: Arranging 5 holes, of which: 3 holes along the centerline longitudinal-section and 2 holes along the centerline cross-section, to accurately determine the longitudinal and cross geological profile of the operation and management area.

** Experimental work :*

- + Experimenting soil samples: At the drilling location, taking undisturbed samples to test 17 criteria as a basis to determine the exact distribution of geological layers, and at the same time optimize the foundation design plan.
- + Experimenting the concrete corrosion water samples: 1 samples of surface water and 1 samples of groundwater.

** Material yards :*

- + Arranging boreholes with a distance of 75-100m/1 hole
- + Testing of compacted soft soil sample: 1 layer * 8 samples/1 layer - 3 samples (LDA) = 5 samples.
- + Testing of standard compacted sample: 1 layer * 6 samples/layer - 3 samples (LDA) = 3 samples

(Quantity table of geological survey for detailed engineering design, see Appendix 2)

3.3.6 Preparing the detailed engineering designs

3.3.6.1 Checking Required hydrological and irrigation calculations

- Check and evaluate the calculation data in the phase of preparing the FS report;

- Hydrological characteristics of works in the area:
- + Calculating the maximum flood water level for design and inspection;
- + Calculating the minimum water level to check the stability of structures and foundations of works;
- + Calculating the lowest exploited water level in the river;
- + Calculating the maximum water level for design temporary works in the construction period;
- Irrigation calculations are carried out for engineering items, pumping stations, hydraulic pressure pipes and dams, canal systems and related items to determine/confirm the size of items as well as to evaluate options/technical solutions to improve/modify feasibility level design.

3.3.6.2 Requirements for hydraulic work calculations

a. Calculating hydraulic works.

- Hydraulics calculation of spillway, irrigation pipelines, canal routes.
- Outputs of hydraulics problem:
 - + Determining the width of the spillway and the downstream.
 - + Selection of pumps and mechanical equipment, electrical equipment.
 - + Size of the suction tank and storage tank.
- *Calculating hydraulic pipe.*
 - + Hydraulic diagram and software applied for hydraulic calculation: Prepare a calculation diagram of the whole system corresponding to many problems of irrigation pump operation. Hydraulic calculation of irrigation pump operation using Epanet or WaterGems software unless otherwise approved.
 - + The outputs of the hydraulic calculation: Determining the dimensions and elevation of suction tanks, pipes, push pipes; determine the size of irrigation pipes to meet economic and engineering conditions.

b. Calculating permeability.

- Calculation of permeability through earth dam body: Calculation diagram.
- Output of permeability problem:

- + Determine the saturation line in the dam body.
- + Determine the output permeability gradient.
- + The High of drainage to protect downstream dams.

c. Stable and structure calculation.

- Stable and structure calculation of earth dams, spillways, pumping stations: Calculation diagram.
- Outputs results of stability and structural problems:
 - + Determining the coefficient of earth dam slope.
 - + Section size and steel structure of spillway dam.
 - + Size and structure of pumping stations and water tanks.

3.3.6.3 Detailed Engineering Design for the weirs and reservoirs

The dams must meet the requirements of stability in all working conditions, during construction, and utilization.

The Earth dams must ensure stable conditions of permeability stability in the dam foundation, dam body, two shoulders of the dam adjacent banks and structures inside the dam so as not to cause permeability exceeding the permissible flow and velocity, causing erosion, washed away materials, threatening the sustainability and lifetime of the dams.

The dams must have a safe height and a height high enough to prevent settlement, including the base and the dam body.

When the dams are used to raise and retain waters of a reservoir, the flood discharge works must have sufficient capacity, including the backup works (if any) so that when floods occur, there will be no water overflow over the dam crest.

For large dams and reservoirs with free spillway, it is necessary to install monitoring equipment, safety warnings for dams and downstream areas, specialized hydro-meteorological observation equipment on the reservoir basin.

Calculating the design of the dam's cross-section, the dam roof, and the protective layer of the upper and lower dam roof. Determine the crest elevation, the width, and the structure of the crest.

Further refinement of the ungated weir designs is suggested at detailed design,

including measures to protect the concrete weirs in case of periodic outflanking. For example, gabion protection could be placed at the same level as the weir floor to protect against scour of the structures abutments.

3.3.6.4 Detailed Engineering Design for pumping stations.

- Calculating and selecting the number of pump
- + Number of pump units must be selected through economic - engineering calculation and analysis of advantages and disadvantages in management and operation (number of pump units will be 2 or 3 or 4).
- Calculating and selecting the type of pump
- + After selecting the number of pump units, the consultant must select the type of pump through economic - engineering calculation (the type of pump can be one of 3 types: submersible pumps, vertical or horizontal axis pumps).
- Calculating and selecting types of push pipe material and economic diameter
- + The push pipe will have to prepare from 02 to 03 plans for materials used (the recommended materials can be: Steel, HDPE or Composite ...).
- + The choice of pipe material (steel, HDPE, composite...) will depend on topographic, geological, economic analysis, advantages and disadvantages. The pipe diameter is determined through the calculation of the economic diameter, the optimum velocity in the pipe ranges from 0.7 m/s to 1.2m/s.
- Calculation and selection of header tank capacity
- + The determination of header tank capacity should be based on the following problem: (1) The tank is responsible for directly regulating irrigation water supply and operating pumping stations through water level sensors (Irrigation pipes will take water directly from the tank); (2) The tank has almost no use for regulating irrigation water (the irrigation pipes will then be connected directly to the pump). With this option, the tank has only the task of operating the pump and storing a certain amount of water to provide irrigation in case the pump fails to operate.
- + Irrigation characteristics of the project area are manual, scattered, spontaneous and unstable
- + Irrigation area is small and scattered make it difficult to manage (some households have 5 ha but some others have 0.5 ha...)

+ Therefore, there must be a header tank with the main purpose of supporting the initial operation of the pump, after the irrigation system has stabilized the water inlet valve on the tank will be closed.

+ The selection of tank capacity should be based on the operation problem of the irrigation pump to choose the most appropriate plan. It is recommended that the tank should have a capacity of at least 20 minutes to 30 minutes pumping with all units.

- Electricity supplied to the station

+ A suspended or on-ground substation will be located in the area of management and operation. The capacity of the station must be calculated to ensure the operation of the pumping station.

+ Connection: The connection point is taken at the local medium voltage line passing through the pump station area and there must be an approved connection dossier. Medium voltage 22 kV transmission line will be built from the connection point to the substation.

3.3.6.5 Detailed Engineering Design for Pressurized Pipe Irrigation Supply System

The consultants shall design one ring (main) pressurized pipe irrigation supply system that will be responsible for supplying water to the irrigation area. The system includes the following components:

(1) HDPE pipes (main distribution pipe): Closed-loop design to increase flexibility in water supply. The pipeline is arranged in the irrigation area to ensure that at the outlet points on the pipeline, the farmers there when connecting their pipes to irrigate fields ensure that the farthest pipe distance is no longer than 500m. Length of distribution pipe should not be more about than 20m/ha. The pipe diameter is determined through hydraulic calculation (by EPANET) to ensure that the velocity in pipe is between 0.30 m/s and 2.5m/s. At the hydrant outlets, the designed water column is at least 2.5m for gravity systems when the flow control valves are not required, and at least 10m for the pressure piping system, The flow at each hydrant shall be 5l/s when the system is operating at the designed flow. After determining the pressure in the pipe corresponding to the design flow, the chosen pipe type must be able to withstand pressure greater than 1.5 times the design pressure.

(2) Hydrant-Manifolds (for farmer hose connections):

It is the location on the water distribution pipeline that farmers put their hoses to take water to irrigate the field. The consultants will have to go on a field trip, hold a consultation meeting with the local people/ farmers and the beneficiary area to find the most suitable location for connecting, avoiding disputes later on.

Technically: Each hydrant will be designed with a flow of $5\text{l/s} \pm 10\%$ when the flow in pipe is at the design flow. The design of hydrant is designed to be 63mm in diameter and the loss of water columns through the manifolds is about 6.5m. On each manifold will be installed 1 flow meter, 8 water distribution pipes and water meters. It can be done in the following ways:

- Adjust the diameter of the hydrant so that when it is installed in the main pipe, there will be a water column corresponding to the designed flow. This method is cheap and farmers can get a larger flow if others do not, but when taken with smaller flow than designed will have excess water column.
- Installation of pressure reducing valves on the main pipe so that the pressure at each hydrant with the same design flow, but this will also cause loss to the water column at the taps. This method can be applied at some water intake points that have too much pressure.
- Install a valve to control the constant flow of each hydrant, this way all the hydrant has the same design flow, but it also limits the ability to take water when others do not, but it does not cause loss to the water column.

Consultants will have to base on specific conditions in each case to choose the most reasonable and cost-effective design.

- Cost effective hydrant - manifolds designs shall be adopted so that hydrant flows are $+5\text{ l/s}$ for a range of residual heads at design flow with metering and flow control devices. Direct fuse connections are envisaged between the main HDPE pipeline and the off taking pipe. Adequate protection against tampering shall be considered. Further, constant flow valves shall be adopted at hydrants.
- Relating to minimizing deposit in pipes and suspended materials in water for micro-irrigation systems, farmers may tank up micro-irrigation (drip/ sprinkler) from the pressure pipe hydrants (outlets), and appropriate arrangements need to be made to prevent ingress of sediment. This is likely to require screens at the pumping stations.

(3) Arrangement of measuring and control equipment on pipelines:

- Main isolation valves (closed/open) to control the flow will be located at the pumping station, and at strategic locations where it may be desired to cut off flow for maintenance. They will also be provided at each hydrant and for the manifolds.

- Flow measurement requirements:

For overall pipe system: continuous monitoring relayed to central office/ control at following points: (i) head of main pipeline, (ii) several strategic points around the system to enable monitoring of water use/ distribution and to identify any leaks.

Hydrants: continuous monitoring relayed to central office is ideal, but if this is too expensive, a few of the remote reading type shall be installed, with locally read meters installed at other locations. This will enable operators to see if some areas are getting disproportionately more flow and can allow adjustments to be made.

Individual farmer meters: local read for sharing purposes and post-paid charging if this is envisaged.

3.3.6.6 Detailed Engineering Design for SCADA systems

+ To facilitate operations, informing release of water from the upstream reservoirs, water levels shall be monitored in the reservoirs, as well as in the weir. Over the dry season, flow releases shall be managed to maintain a minimum water level in the pond for the last weir.

+ systems shall allow remote monitoring of water levels, pressures, flows and water meter reading data at appropriate points in the reservoir, on pipeline and open channel systems, in the header tank supplying water for pipe systems, in the main pipeline leading from the pumping stations, at all/ hydrants. Pumping stations shall also be monitored. The operation of the pumps shall be linked to pipe pressures.

+ For the small pumped pipe systems, devices would be installed so that pump operations are linked to pipeline pressures. Also, devices could be installed to ensure against pipe fracture during pump start-up or shut-down. This function may be performed by gradual opening/closure of valves. Control valves would be installed at the pump stations, and possibly at a few key locations in the pipe systems to allow pipe branches to be isolated for maintenance, in case of pipe leak/ burst. Operations would also be monitored, and in the event of problems, including pipeline fracture or leaks, the pumps would automatically shut down. Pipe flows could be metered using clamp-on ultrasonic digital meters fixed around the pipes at the pump stations. Meters

will also be installed at each hydrant.

+ For individual farmers wishing to connect to manifolds, additional meters may be installed to the manifolds to monitor usage. These meters would be cheap, possibly simple mechanical meters read manually. Alternatively, pre-paid meters may be installed to the hydrants to facilitate cost recovery.

+ systems shall link the pumping stations, monitoring stations at the fields, the water measurement system and the central control office via the Internet and the 4G/ 5G universal mobile telecommunication system (UMTS) or the latest mobile technology. The central office shall be located, rehabilitated and equipped as required with server/ computer/ devices/ Internet/ UMTS connections, software, databases and so on.

At the detailed engineering design, the consultants shall consider further:

(i) The transmission of data/ coded signals from sensors – loggers/ remote terminal units (RTUs) to central control offices and vice versa should use the Internet and the 4G/ 5G universal mobile telecommunication system or the latest mobile technology;

(ii) Real time and applications of Internet of Things (IoT) technology shall be considered;

(iii) The Websocket protocol/ technology shall be applied for real time systems;

(iv) SQL Server and ArcGIS databases will be very useful for control and management as well as maintenance of pressure pipe systems, etc.

At the detailed engineering design, the consultants shall consider the use of smart water meters likely RTUs to measure water at the farm offtakes, together with one of communication technologies, especially the Narrowband Internet of Things (NB-IoT). NB-IoT uses an existing infrastructure of antenna sites used for mobile communication (LTE) today. NB-IoT is optimised for good coverage and very small data amounts. This makes NB-IoT interesting for remote reading of smart water meters, which are often installed underground or in steel/ plastic boxes, etc. Remote reading NB-IoT systems can read water metering data from smart water meters.

3.3.6.7 Detailed Engineering Design for access roads and management stations

a. Requirements for roads

- Visits to review the current status of the route to serve the design requirements based on the following principles:

+ The route must meet favorable connection with existing roads and construction items, serving for project management and operation.

+ Considering to make full use of the existing road and construction road to upgrade and expand to meet the design requirements before new construction.

+ Must take advantage of the available local materials (or on-site materials) into the background of road and structure.

- Regarding the roadbed compaction level, permissible settlement of the background of road must comply with current standards.

- Crossroads at intersections and crossroads need to be arranged with curved radius in accordance with the standard to ensure visibility for vehicles to run.

- Signage pile system, road markings, protective guardrails, metal structure detailed drawings (if any).

b. Requirements for management stations

+ Determining main items, service area to meet management requirements

+ Reasonable and convenient location for stations to connect with the main works.

+ Designed in accordance with local architecture and regional landscape to meet requirements.

c. Requirements for Access roads

For access /link roads, at least to reach the pumping stations that will be paved, shall be designed and costed.

Operation and management roads are designed according to the rural road standards (TCVN 10380:2014) type B with a width of 5m and the road surface width of 3.5m of 18cm thick concrete cement grade 250.

3.3.6.8 Detailed Engineering Design for the mechanical works

- Assign requirements to calculate and select items of lifting equipment including location, structure size of lifting equipment for each structure; calculating lift, lowering force and lifting equipment for buildings;

- Select type and layout of crane structure in pumping stations.
- Calculation and selection of materials for water pipeline (steel, HDPE), pipe thickness.

3.3.6.9 Detailed Engineering Design for electric supply

a. The requirement to calculate and select the main electrical equipment:

Calculation of sub electrical load to maintain operation (Pump station, manager house).

Calculation of sub electrical load to conduct construction (Total construction site)

Thus there will be basic to apply for power supply and electricity connection points. Working with the local electricity management agency to determine the location of the match point, supply voltage and length of power supply line for operation management and construction.

b. Design of power supply lines and transformer stations

Design, calculate the main structure and set up the ground and section along the power supply line for the head structure and electrical substations.

Design and calculate the following Electrical substations:

1. Power supply line

Power supply line plan:

- + Longitudinal section of the line
- + Main structural drawings.
- + Summary table.

2. Electrical Substations

Drawings:

- + Station type: Column station.
- + Plan of Electrical substation.
- + Substation section.
- + Summary table.

c. Low voltage electrical design

- Diagram of main electrical connection.

- Diagram of principles of control, measurement and protection of engines for opening and closing the pumping stations
- Diagram of the monitoring and communication system.
- Diagram of lighting system principle.
- The design drawings of the front of electrical cabinets.
- The layout of electrical equipment of pumping station.
- Section of electrical equipment for pump station construction.
- Diagram of lighting system principle.
- The layout of electrical equipment.
- Section of electrical equipment.
- Lightning protection system.
- Earthing system.

d. Required to calculate the volume and total cost estimate of the electrical part

Prepare drawings, calculate the volume and set up the total electricity cost estimate, including the following items:

- Line
- Substation.
- Low voltage electricity in the pump station.

3.3.6.10 Other tasks and solutions for the subprojects:

Confirming the optimum of the tasks and structural measures identified in the investment Subprojects;

In cases of necessary adjustments and additions to the project's tasks and structural measures, it is required to re-calculate and re-determine the requirements for the structures in order to have sound justifications for such adjustments and additions;

For the proposed engineering solutions, it is required to study into and find out foundation treatment measures suitable for the geological conditions, to select structural dimension and measures on the principle of making the most use of local materials and easy construction;

Designing and arranging exactly the layout of main structures, including the pumping stations, electric substation, low-voltage lines, suction basin, raising main pipes, and

header tanks, weirs, canals, intake structures, pipelines and associated structures according to the landscape architectural plan for the structures and being consistent with the system of roads, dykes and embankments in the headwork area of the subproject.

3.3.6.11 Selection of the construction route:

Considering 2 to 3 options of the structure site in the subproject area to select the optimal site based on the structure site selected in the Investment Project;

- + Basis of selection: Characteristics of structures, natural and social conditions, management requirements, etc.
- + Selection of the site to be designed;
- + Overall layout of the structures according to each option of the site;
- + Possibilities for land acquisition and resettlement (if any);
- + Determination of the basic dimensions of the structures;
- + Calculation and analysis to select the optimal structure site.

Selecting and approval of the best technical option: The technical options shall be presented and approved by the concerned authorities, MARD and ADB review consultants, after which detailed design shall proceed. Based on the basic design that had been approved in the Investment Project, the adjustments and additions to the project's tasks and structural measures (if any), and the selected optimal structure site, for the headwork of the pumping station: On the basis of the structures items that had been approved in the Investment Project, the adjustments and additions to the project's tasks and structural measures (if any), and the selected optimal structure site, to make calculations and selection of optimal dimension and structure of the works, detailed composition of structures and items, and select the optimal solution for foundation treatment.

3.3.6.12 Forms of the arrangement of construction structures, selection and arrangement of equipment, measures of waterproof, background treatment, architectural solutions... for construction items

- Studying to calculate and precisely optimize the optimal size of the weirs, bridges across streams, pumping stations, suction tanks, discharge tanks, pipeline systems.

- Studying the structure of major works, together with the electronic and mechanical specialists to select and arrange the equipment, then upon that basis to select the optimal form of structure and foundation treatment measures for the major works.
- Studying on the selection of routes and reasonable structure forms of work items for management roads and construction roads.
- Studying the layout, selection of size, structure and architecture of management systems such as managers, etc.

3.3.6.13 Design calculations of work items

- Identify and correct specifications of weirs, bridges across streams, pumping stations, suction tanks, discharge tanks, discharge channels, operation and management houses.
- Check to correct the scale and basic dimensions of the structures, calculating the stability of the structures.
- Calculating the stability and structure of the pump house, suction tank, propeller, transfer tank, management house, road and other auxiliary facilities.

3.3.6.14 Designing the construction organization and construction method

- Optimal method of exploiting and transporting construction materials.
- Method of construction of main works;
- Construction quality control measures;
- Fire and explosion prevention, and labor safety;
- Environmental protection during construction;
- Transportation inside and outside the construction site;
- Auxiliary facilities (factories, camps ...) and systems to provide electricity, water, and communications for construction and on-site activities;
- Total construction ground general construction progress;
- Provide main materials and equipment for the project;
- Navigation diagrams and construction by year;
- Measures to prevent flow (specifications and volume of materials);
- Construction method of structure;

- Planning and using construction materials;
- Other necessary drawings.

3.3.6.15 Preparing the construction cost estimates

The consultants shall study the local basic construction unit prices, capital construction cost norms, prevailing regimes and policies of the state and province on capital construction, make the summary tables of quantities and detailed forecast, and prepare the cost estimates for the structures and total cost estimates.

- Prepare a summary table of volume and detailed prognosis.
- Estimates of work items and total cost
- Profile content.

Prepared documents on total estimation: explanation, general estimation, extract calculation, material analysis and transportation

3.3.6.16 Preparing Guidelines for operational development and maintenance

In order to develop processes for operation, management, exploitation, maintenance and protection of buildings, including:

- Instructions on O&M;
- Detailed scope of protection and management;
- Details of the item and architecture of the project to serve the operation and protection management of the project;
- Details of the monitoring and control network;
- Details of the communication system;
- The exact number and quantity of equipment and construction operation management system

3.3.6.17 Providing the supervisions of the detailed engineering designs' authors' right.

- The consultant is responsible for conducting supervision of the authors' right according to the current regulations (Decree 46/2015/ND-CP on quality management and construction maintenance).
- Appointing the qualified people to supervise the authors' right during the construction process. The main tasks are as follows: responsible for explaining and clarifying construction design documents to the Investor and other contractors for

management and construction in accordance with the design; modify the design for the content which is not consistent with the actual standards and conditions of the project; detect errors compared to the design; ...

3.3.6.18 Updating the resettlement plan

Based on the resettlement plan that established in the project investment stage, consultants shall update small changes in design of pipelines and canals during the detailed design progress, so the resettlement plan must be updated in conformity with technical modifications.

3.3.6.19 Upgrading the environmental management plan (EMP)

Structure and content of the EMP of the project must be in accordance with Appendix 2.10 in the Circular No.27/2015/TT-BTNMT dated 29 May 2015 issued by the Minister of the Ministry of Natural Resources and Environment on evaluating strategy environment, environmental impact assessment and environmental protection plan. The main content such as below:

Measures, plans in order to minimize negative impacts on the environment during the preparation phase (if any) and the project construction phase, included

- Minimize negative impact on surface water environment (if any)
- Minimize negative impacts on groundwater environment (if any);
- Minimize negative impacts on the air environment (if any);
- Minimize bad impact due to noise, vibration (if any);
- Minimize negative impact on the human community (if any);
- Collection, temporary storage, transport and waste treatment;
- Minimize other negative impacts (if any).

Scheduling the plan of building the environmental protection structures serving operation phase of the project (if any), consists of:

- Waste water treatment works
- Waste water treatment plant
- Emissions treatment works

Works for storage and treatment of ordinary solid wastes, hazardous wastes;

- Plan for construction and installation of other environmental protection works: The contents of the plan for construction and installation of environmental protection works serving the operation stage of the project must clearly show the estimated time of construction, installation and completion.

The environmental monitoring program in the construction phase of the project: The content of the environmental monitoring program should present clearly the monitoring position, monitoring frequency, monitoring parameters and standards and technical regulations applied for quality assessment of environmental samples together with the sampling locations which approved in the environmental impact assessment reports.

3.4 Essential Documents attached to the TOR needing to be observed and referred

3.4.1 The Guidelines for Detailed Engineering Design

The Guidelines for Detailed Engineering Design (Revised version 2019) is prepared to guide the detailed engineering design process, for use by MARD, DARDs, SPPMUs/PPMUs involved in the WEIDAP Project, and ADB, AWP, and will be included/ attached to the Terms of Reference for the procurement of services for detailed engineering designs with support from CPO/CPMU.

The Guidelines, which give the Key Design Principles for design of the Subprojects as well as specific guidance for Subprojects in each Province, shall be observed by the detailed engineering design consultants.

The Guidelines for Detailed Engineering Design can be downloaded at:

<http://onlinedroughtcontrol.com/FinalRevisedGuidelines4DED.pdf>

3.4.2 The Subproject Reports: Dak Mil, Cu Jut Subprojects

The consultants shall also review the following reports when preparing the detailed engineering designs.

“Subproject Report: Dak Mil Subproject”,

<https://www.adb.org/sites/default/files/linked-documents/49404-002-sd-06.pdf>

“Subproject Report: Cu Jut Subproject”,

<https://www.adb.org/sites/default/files/linked-documents/49404-002-sd-05.pdf>

These reports are the linked documents to the ADB's Report and Recommendation to the President (RRP: VIE 49404-002) on the proposed loan, grant, and administration of grant to Viet Nam for the Water Efficiency Improvement in Drought-Affected Provinces Project.

3.4.3 The Design Principles for Subprojects

The Design Principles for Subprojects can be downloaded at:

<https://www.adb.org/sites/default/files/linked-documents/49404-002-sd-01.pdf>.

The Design Principles for Subprojects, especially the specific guidance for System Design Discharge should be referred.

3.4.4 The Feasibility Study reports

The Feasibility Study reports for Dak Mil and Cu Jut Subprojects were approved by Dak Nong Provincial People's Committee at the Decision No.1073/QD-UBND for Dak Mil Subproject and Decision No.1074/QD-UBND for Cu Jut Subproject on July 11, 2018.

The design consultants shall review the Decisions at:

<http://onlinedroughtcontrol.com/DakNongPPCsDcsDakMinFS.pdf>,

and <http://onlinedroughtcontrol.com/DakNongPPCsDcsCuJutFS.pdf>.

And the Feasibility Study Reports (Basic design reports) at:

[http:// onlinedroughtcontrol.com/DakMil_BD.pdf](http://onlinedroughtcontrol.com/DakMil_BD.pdf)

and http://onlinedroughtcontrol.com/CuJut_BD.pdf

4 IMPLEMENTATION DURATION

Consultancy services for the subproject's topographic, geological, technical design and technical design work are expected to begin after approval of both FS and Subproject reports. Contract implementation time is **270 days (09 months)**. The technical proposal of the Consultant will include an action plan with expected members of the project team and the progress of mobilizing experts and support staff:

- Phase 1: the delivery time of completed consulting products is 120 days (04 months), from the effective date of the contract.

- Phase 2: consulting services will coordinate with consultants, PPMU will implement the subproject to provide services until approved for the subproject technical design and no objection from ADB, the expected time of 05 months.

5 REPORTING REQUIREMENTS AND TIME SCHEDULE FOR SUBMISSIONS OF THE DELIVERABLES

5.1 Reporting requirements

Dossiers of the detailed technical design must be prepared in accordance with relevant industry standards and norms and other relevant State regulations and procedures and the Guidelines for Detailed Engineering Design mentioned above.

Main reports and working documents: The components of reports must comply with the National Technical Regulation on composition and content of technical design documents and detailed technical designs of irrigation works. QCVN 04-02: 2010 / BNN-PTNT.

Language of reports: Vietnamese and English

(i) Detailed engineering design description/ full report.

(ii) Specialized reports:

- Topography report: complying with the topographic standards.
- Geological report: complying with geological standards.
- Hydraulic and hydrological calculation report: complying with meteorological and hydrological standards.
- Structural design report.
- Mechanical design report.
- Electrical design report.
- Report on organization and construction measures.
- Report on operation and maintenance procedures.

(iii) Detailed engineering design drawings

- Site geological engineering drawings: in comply with the promulgated regulations on composition and quantity of geological survey in project planning and design phases.

- Drawings of the existing structures.
- Structural design drawings: show the entire contents of a detailed design of the structures, including the location, size, details of elements, equipment layout, construction measures and measures for ecological environment protection, operation, management and maintenance of works. Design drawings must fully and accurately show details to allow actual construction at the construction site according to design requirements; faithfully reflect the content of approved basic designs; clearly, scientifically and comprehensively presented in a specified format.
- Mechanical design drawings.
- Electrical design drawings.
- Design drawings of construction organization, etc.

Survey files and construction design drawings

The results of consultancy services must fully reflect the contents and components of survey dossiers and detailed technical designs according to current regulations. The design dossier must be clear, accurate, complete, qualified and approved by competent authorities.

The number of submitted documents is 09 parts in Vietnamese, including:

- Part 1: Explanation of detailed technical design;
- Part 2: Summary report;
- Part 3: Specialized reports: Hydrological and hydraulic calculation report; construction design; mechanical design; electrical design; construction organization and construction measures;
- Part 4: Topographic survey report (notes, drawings and appendices)
- Part 5: Geological survey report (explanatory notes, drawings, testings, drill samples, drilling images ...)
- Part 6: Engineering design drawings;
- Part 7: Construction cost estimates;
- Part 8: Technical guidelines on construction method;
- Part 9: Operation and maintenance procedure.

Design consultants are responsible for translating design documents into English upon request of the Investor. Do not translate the entire record but only translate the documents to serve the Sponsor's requirements and stakeholders.

Note: Attached to the USB, write the contents of detailed engineering design documents and data and original documents of construction survey documents (including all the data from the above part 1 to part 9 above).

5.2 Time schedule for submissions of the deliverables

Table 3: Progress of submitting the deliverables

No	Name of the dossier	Time of submission	
		Draft dossier	Official dossier
1	Survey and design plan (detailed work plan)	03 days	05 days
2	Topographic survey dossier	25 days after the contract takes effect	30 days after the contract takes effect
3	Geological survey dossier	25 days after the contract takes effect	30 days after the contract takes effect
4	Dossier of the detailed engineering design (including the Study Tour Report, Minutes of Design Workshops and Lists of Participants)	90 days after the contract takes effect (This time includes: Sightseeing, workshops and consults the experts): DARD/SPPMU/PPMU submits detailed engineering design dossiers (review the drafts of detailed design drawings, reports and calculations) for MARD (CPO/CPMU) to review and comment, with the help of ADB and AWP	120 days after obtaining MARD's comments: Submit final engineering design dossiers including full reports, specialized reports, maps, detailed design drawings, calculations, quantity and estimates; technical guidance for construction and installation, operating procedures etc. has been modified
5	Translating consulting products into English at the request of the parties involved.	Per request	
6	Editing consulting products and services at the request of appraisal agencies and Sponsor (if any)	Per request	
7	Summary report of consulting services	Per request	

6 QUALIFICATION REQUIREMENTS FOR CONSULTING FIRM

6.1 Requirements on the capacity of the consulting firm

- The consulting firm must meet the eligibility requirements in accordance with current regulations of Vietnam and "Guidelines on the Use of Consultants by Asian Development Bank and Its Borrowers".
- The consulting firm must be a unit with full legal status and business registration in accordance with the scope of work; with a certificate of construction consulting activity in accordance with regulations;
- The consulting firm has a strong financial capacity in the last 3 years (2016, 2017, 2018), with sufficient infrastructure and necessary equipment for surveying and designing and detailed specifications required;
- Having registered information on the National Bidding Network, having a system of quality management and organization in accordance with the current regulations of the State.
- The consultancy unit must have at least 05 years of experience and 03 consultancy contracts for project preparation, design of ODA projects and projects in the fields of rural development, water resources development, water supply and drainage. The consultancy unit must have at least 01 projects of similar scale and nature: projects with pressurized pipe irrigation supply systems for HVCs/ agriculture.
- Any consultants must demonstrate experience in pressurized water supply systems.
- All potential consultants must attend an "information workshop"/ design briefing before submitting bids.
- If the Consultant is a joint venture, each member must satisfy the requirements as for independent consultant corresponding to the work undertaken.

6.2 Qualification requirements for key specialists

- The Consultant must mobilize qualified and experienced experts in the proposed areas and one of them will be appointed as Consulting Team Leader to coordinate and implement the subproject.
- Note that if the positions do not overlap, an expert can take on multiple positions. The minimum requirements on the number, qualifications and experience of key experts are as follows:

Table 4: Requirements on qualification for consultants for Cu Jut Subproject

No	Expert	Quantity	Requirements on experience and capability	Tasks	Duration (Month)
1	Consulting team leader	01	<ul style="list-style-type: none"> - Graduated from the University of Water Resources, preferably a master's degree in irrigation work or above; Having a valid, appropriate design practice certificate. - Having over 15 years of working experience in the field of design consultancy for irrigation, hydropower works; - Experience in implementing design consultancy for 05 irrigation projects as the Consulting Team Leader; - Experience in implementing design consultancy for 01 similar ODA projects with the role of Consulting Team Leader. - Priority experience in participating in consulting services in similar geographical areas. - Priority to meet and speak English, prepare documents in English. 	<ul style="list-style-type: none"> - Head of coordination of consultants, connecting with PPMU and stakeholders in organizing the implementation of the subproject: - Responsible for organizing production, ensuring the progress and quality of reports and products and coordinating with relevant agencies and advisory teams supported by ADB. - Monitor and evaluate the performance of consultants; Support PPMU to coordinate with MARD and WB in the implementation and approval of detailed technical design. - Prepare and be responsible for the progress and quality of jobs and products of consulting services. - Instructions for collecting and updating subproject related documents prepared by other consultants. - Technical guidance and review is proposed by the member consultants for surveys and detailed engineering design of components under the subproject. - Author supervision at the request of the investor. 	120 days
2	Hydrological and hydraulic experts	01	<ul style="list-style-type: none"> - Having an appropriate university degree; Preferably have a master's degree in hydrology/ hydraulic. - Having over 10 years of working experience in the 	<ul style="list-style-type: none"> - Responsible for conducting data collection activities and performing related calculations and hydrological and hydraulic calculations. 	120 days

No	Expert	Quantity	Requirements on experience and capability	Tasks	Duration (Month)
			professional field. - Experience in participating in 03 irrigation projects as a hydrological/hydraulic expert; - Priority of experienced experts in irrigation projects from ODA. - Priority experience in participating in consulting services in similar geographical areas. - Priority to meet and speak English, prepare documents in English. -Having Experience in using "EPANET" or WaterGEMS unless otherwise approved.	- Synthesizing and reporting specialized hydrology and hydraulics.	
3	Hydraulic structure experts	01	- Having a university degree in irrigation work; having a valid, appropriate design practice certificate. - Having over 10 years of experience working in the field of irrigation design consultancy; - Experience in participating in 02 similar projects as a hydraulic / design expert; - Experience in participating in 02 irrigation projects as a hydraulic expert; Priority is given to experts who have participated and experienced in ODA-funded irrigation projects. - Priority experience in participating in consulting services in similar geographical areas. - Priority to meet and speak English, prepare documents in English.	- Fieldwork, analysis of documents, assessment of the current status of works. - Proposing and synthesizing solutions of construction, non-construction, analyzing and evaluating the overall stability, calculating and designing the construction items. - Participate in the preparation of detailed design documents for the subproject, formulate plans for construction and reporting of hydrodemolition. - Coordinate and support leader in author supervision as prescribed.	120 days
4	Structural expert	01	- Having a university degree in irrigation work; having a valid, appropriate design	- Analyzing and evaluating construction stability, calculating structure of	120 days

No	Expert	Quantity	Requirements on experience and capability	Tasks	Duration (Month)
			<p>practice certificate.</p> <ul style="list-style-type: none"> - Having over 5 years of experience working in the field of irrigation design consultancy; - Experience in participating in 02 irrigation project design projects with the role of calculating structure design; Priority is given to experts who have participated and experienced in ODA-funded irrigation projects. - Priority experience in participating in consulting services in similar geographical areas. 	<p>work items.</p> <ul style="list-style-type: none"> - Coordinate with hydraulic experts to set up appendices and design explanations. 	
5	Construction expert	01	<ul style="list-style-type: none"> - Having a university degree in irrigation work; having a valid, appropriate design practice certificate. - Having over 10 years of experience working in the field of irrigation design consultancy; - Experience in participating in 02 similar projects as a construction expert; - Experience in participating in 02 irrigation projects with the role of construction specialist; Priority is given to experts who have participated and experienced in ODA-funded irrigation projects. - Priority experience in participating in consulting services in similar geographical areas. 	<ul style="list-style-type: none"> - Fieldwork, coordinate with other experts to assess the current status of the work, analyze relevant documents. - Coordinate with the Consulting Team Leader and other experts to set up construction methods, make notes and appendices to calculate the construction flow. - Coordinate and support leader in author supervision as prescribed. 	120 days
6	Mechanic experts	01	<ul style="list-style-type: none"> - Having a university degree in mechanical engineering; have an appropriate design practice certificate. - Over 5 years of experience working in the field of irrigation / hydroelectric 	<ul style="list-style-type: none"> - Propose and synthesize solutions to design mechanical structures of the project. - Participate in making technical design details of Subprojects, making plans and reporting on 	120 days

No	Expert	Quantity	Requirements on experience and capability	Tasks	Duration (Month)
			design consultancy. - Experience in participating in 02 similar projects as a mechanical expert; Priority is given to experts who have been involved and experienced in ODA / hydropower projects with ODA capital.	mechanical engineering. - Coordinate and support leader in author supervision as prescribed.	
7	Electrical and mechanical experts	01	- Having a university degree in electrical major; having certificate of electrical - mechanical engineering design work. - Over 5 years of experience working in the field of irrigation/hydroelectric design consultancy. - Experience in participating in 02 similar projects with the role of electrical and mechanical experts; Priority is given to experts who have been involved and experienced in ODA / hydropower projects with ODA capital. -Having one/two years' experience in planning and designing SCADA systems	- Propose and synthesize solutions to design electrical systems, lines, transformer stations, etc. of the project. - Participate in making technical design details of Subprojects, making plans and reporting on electricity. - Coordinate and support leader in author supervision as prescribed.	120 days
8	Economic experts	01	- Having a university degree in economics/irrigation works; have a certificate of practice in valuation engineer. - Having over 10 years of working experience in the field of estimation, economic analysis, evaluating the effectiveness of the project. - Experience in participating in 02 similar projects as an estimation expert; Priority is given to experts who have participated and experienced in ODA-funded irrigation projects. - Experience in participating in similar geographical	- Review the Decrees, Circulars, Norms applicable to the subproject. - Gather and review the estimated data from the subproject's designs. - Take responsible for chairing and calculating construction cost estimates.	120 days

No	Expert	Quantity	Requirements on experience and capability	Tasks	Duration (Month)
			consultancy services.		
9	Topographic survey specialist	01	<ul style="list-style-type: none"> - Having a university degree in geodesy, map; having a topographic survey practice certificate. - Having over 10 years of working experience in the field of survey and surveying works. - Experience in participating in 02 similar projects as a topographic survey specialist; Priority is given to experts who have participated and experienced in ODA-funded irrigation projects. - Experience in participating in consulting services in similar geographical areas. 	<ul style="list-style-type: none"> - Being topographic survey team leader. - Prepare technical survey plans, topographic survey records as prescribed. - Construction and handover of control points. - Explanation when required. 	120 days
10	Geological survey specialist	01	<ul style="list-style-type: none"> - Having a university degree in engineering geology major; having certificate of geological survey practice. - Having over 10 years of experience working in the field of geological survey and surveying works. - Experience in participating in 02 similar projects as a geological survey specialist; Priority is given to experts who have participated and experienced in ODA-funded irrigation projects. - Experience in participating in consulting services in similar geographical areas. 	<ul style="list-style-type: none"> - Geological survey team leader in the field. - Prepare technical survey plans, geological survey records as prescribed. - Propose measures to handle foundation, body, slope causing instability of the project. - Explanation when required. 	120 days
11	Support staff	30	<ul style="list-style-type: none"> - Have a university degree in suitable majors. - For topographic and geological survey workers must have an appropriate technical intermediate degree. (14 workers in total: 4 in topography and 10 in geology) 	<ul style="list-style-type: none"> - Support key experts in field surveys, information collection, community consultation, quantitative and qualitative information processing. - Support the main experts to implement the detailed planning and cost 	120 days

No	Expert	Quantity	Requirements on experience and capability	Tasks	Duration (Month)
			<ul style="list-style-type: none"> - Having over 03 years of experience in the field of conducting surveys, data collection, community consultation, irrigation work design, support to implement the consultancy tasks; - Priority is given to officials who have participated in the implementation of one or more similar projects for ODA funded projects. 	<ul style="list-style-type: none"> estimation contents. - Support administrative, accounting, transaction and general reporting procedures. - Support editing, printing, publishing documents. 	

Table 5: Requirements on qualification for consultants for Dak Mil Subproject

No	Expert	Quantity	Requirements on experience and capability	Tasks	Duration (Month)
1	Consulting team leader	01	<ul style="list-style-type: none"> - Graduated from the University of Water Resources, preferably a master's degree in irrigation work or above; Having a valid, appropriate design practice certificate. - Having over 15 years of working experience in the field of design consultancy for irrigation, hydropower works; - Experience in implementing design consultancy for 05 irrigation projects as the Consulting Team Leader; - Experience in implementing design consultancy for 01 similar ODA projects with the role of Consulting Team Leader. - Priority experience in participating in consulting services in similar geographical areas. - Priority to meet and speak English, prepare documents in English. 	<ul style="list-style-type: none"> - Head of coordination of consultants, connecting with PPMU and stakeholders in organizing the implementation of the subproject: - Responsible for organizing production, ensuring the progress and quality of reports and products and coordinating with relevant agencies and advisory teams supported by ADB. - Monitor and evaluate the performance of consultants; Support PPMU to coordinate with MARD and WB in the implementation and approval of detailed technical design. - Prepare and be responsible for the progress and quality of jobs and products of consulting services. - Instructions for collecting and updating subproject related documents prepared by other 	120 days

No	Expert	Quantity	Requirements on experience and capability	Tasks	Duration (Month)
				<p>consultants.</p> <ul style="list-style-type: none"> - Technical guidance and review is proposed by the member consultants for surveys and detailed engineering design of components under the subproject. - Author supervision at the request of the investor. 	
2	Hydrological and hydraulic experts	01	<ul style="list-style-type: none"> - Having an appropriate university degree; Preferably have a master's degree in hydrology/ hydraulic. - Having have an appropriate university degree; Preferably have a master's degree in hydrology. - Having over 10 years of working experience in the professional field. - Experience in participating in 03 irrigation projects as a hydrological/hydraulic expert; - Priority of experienced experts in irrigation projects from ODA. - Priority experience in participating in consulting services in similar geographical areas. - Priority to meet and speak English, prepare documents in English. - Having Experience in using "EPANET" or WaterGEMS unless otherwise approved. 	<ul style="list-style-type: none"> - Responsible for conducting data collection activities and performing related calculations and hydrological and hydraulic calculations. - Synthesizing and reporting specialized hydrology and hydraulics. 	120 days
3	Hydraulic structure experts	01	<ul style="list-style-type: none"> - Having a university degree in irrigation work; having a valid, appropriate design practice certificate. - Having over 10 years of experience working in the field of irrigation design consultancy; 	<ul style="list-style-type: none"> - Fieldwork, analysis of documents, assessment of the current status of works. - Proposing and synthesizing solutions of construction, non-construction, analyzing and evaluating the overall stability, calculating and 	120 days

No	Expert	Quantity	Requirements on experience and capability	Tasks	Duration (Month)
			<ul style="list-style-type: none"> - Experience in participating in 02 similar projects as a hydraulic / design expert; - Experience in participating in 02 irrigation projects as a hydraulic expert; Priority is given to experts who have participated and experienced in ODA-funded irrigation projects. - Priority experience in participating in consulting services in similar geographical areas. - Priority to meet and speak English, prepare documents in English. 	<ul style="list-style-type: none"> designing the construction items. - Participate in the preparation of detailed design documents for the subproject, formulate plans for construction and reporting of hydrodemolition. - Coordinate and support leader in author supervision as prescribed. 	
4	Structural expert	01	<ul style="list-style-type: none"> - Having a university degree in irrigation work; having a valid, appropriate design practice certificate. - Having over 5 years of experience working in the field of irrigation design consultancy; - Experience in participating in 02 irrigation project design projects with the role of calculating structure design; Priority is given to experts who have participated and experienced in ODA-funded irrigation projects. - Priority experience in participating in consulting services in similar geographical areas. 	<ul style="list-style-type: none"> - Analyzing and evaluating construction stability, calculating structure of work items. - Coordinate with hydraulic experts to set up appendices and design explanations. 	120 days
5	Construction expert	01	<ul style="list-style-type: none"> - Having a university degree in irrigation work; having a valid, appropriate design practice certificate. - Having over 10 years of experience working in the field of irrigation design consultancy; - Experience in participating in 02 similar projects as a 	<ul style="list-style-type: none"> - Fieldwork, coordinate with other experts to assess the current status of the work, analyze relevant documents. - Coordinate with the Consulting Team Leader and other experts to set up construction methods, make notes and appendices to calculate the 	120 days

No	Expert	Quantity	Requirements on experience and capability	Tasks	Duration (Month)
			construction expert; - Experience in participating in 02 irrigation projects with the role of construction specialist; Priority is given to experts who have participated and experienced in ODA-funded irrigation projects. - Priority experience in participating in consulting services in similar geographical areas.	construction flow. - Coordinate and support leader in author supervision as prescribed.	
6	Mechanic experts	01	- Having a university degree in mechanical engineering; have an appropriate design practice certificate. - Over 5 years of experience working in the field of irrigation / hydroelectric design consultancy. - Experience in participating in 02 similar projects as a mechanical expert; Priority is given to experts who have been involved and experienced in ODA / hydropower projects with ODA capital.	- Propose and synthesize solutions to design mechanical structures of the project. - Participate in making technical design details of Subprojects, making plans and reporting on mechanical engineering. - Coordinate and support leader in author supervision as prescribed.	120 days
7	Electrical and mechanical experts	01	- Having a university degree in electrical major; having certificate of electrical - mechanical engineering design work. - Over 5 years of experience working in the field of irrigation/hydroelectric design consultancy. - Experience in participating in 02 similar projects with the role of electrical and mechanical experts; Priority is given to experts who have been involved and experienced in ODA / hydropower projects with ODA capital. -Having one/twoyears in	- Propose and synthesize solutions to design electrical systems, lines, transformer stations, etc. of the project. - Participate in making technical design details of Subprojects, making plans and reporting on electricity. - Coordinate and support leader in author supervision as prescribed.	120 days

No	Expert	Quantity	Requirements on experience and capability	Tasks	Duration (Month)
			designing SCADA systems		
8	Economic experts	01	<ul style="list-style-type: none"> - Having a university degree in economics/irrigation works; have a certificate of practice in valuation engineer. - Having over 10 years of working experience in the field of estimation, economic analysis, evaluating the effectiveness of the project. - Experience in participating in 02 similar projects as an estimation expert; Priority is given to experts who have participated and experienced in ODA-funded irrigation projects. - Experience in participating in similar geographical consultancy services. 	<ul style="list-style-type: none"> - Review the Decrees, Circulars, Norms applicable to the subproject. - Gather and review the estimated data from the subproject's designs. - Take responsible for chairing and calculating construction cost estimates. 	120 days
9	Topographic survey specialist	01	<ul style="list-style-type: none"> - Having a university degree in geodesy, map; having a topographic survey practice certificate. - Having over 10 years of working experience in the field of survey and surveying works. - Experience in participating in 02 similar projects as a topographic survey specialist; Priority is given to experts who have participated and experienced in ODA-funded irrigation projects. - Experience in participating in consulting services in similar geographical areas. 	<ul style="list-style-type: none"> - Being topographic survey team leader. - Prepare technical survey plans, topographic survey records as prescribed. - Construction and handover of control points. - Explanation when required. 	120 days
10	Geological survey specialist	01	<ul style="list-style-type: none"> - Having a university degree in engineering geology major; having certificate of geological survey practice. - Having over 10 years of experience working in the field of geological survey and surveying works. 	<ul style="list-style-type: none"> - Geological survey team leader in the field. - Prepare technical survey plans, geological survey records as prescribed. - Propose measures to handle foundation, body, slope causing instability of 	120 days

No	Expert	Quantity	Requirements on experience and capability	Tasks	Duration (Month)
			<ul style="list-style-type: none"> - Experience in participating in 02 similar projects as a geological survey specialist; Priority is given to experts who have participated and experienced in ODA-funded irrigation projects. - Experience in participating in consulting services in similar geographical areas. 	<p>the project.</p> <ul style="list-style-type: none"> - Explanation when required. 	
11	Support staff	30	<ul style="list-style-type: none"> - Have a university degree in suitable majors. - For topographic and geological survey workers must have an appropriate technical intermediate degree. (14 workers in total: 4 in topography and 10 in geology) - Having over 03 years of experience in the field of conducting surveys, data collection, community consultation, irrigation work design, support to implement the consultancy tasks; - Priority is given to officials who have participated in the implementation of one or more similar projects for ODA funded projects. 	<ul style="list-style-type: none"> - Support key experts in field surveys, information collection, community consultation, quantitative and qualitative information processing. - Support the main experts to implement the detailed planning and cost estimation contents. - Support administrative, accounting, transaction and general reporting procedures. - Support editing, printing, publishing documents. 	120 days

7 COST ESTIMATES FOR THE CONSULTING SERVICES

7.1 Bases for cost estimates

- Decision No.79/QD-BXD dated on 15/02/2017 regulating the cost norms of project management and construction investment consultancy;
- Circular No.219/2009/TT-BTC dated 19/11/2009 by the Ministry of Finance stipulating some spending norms applicable to projects / programs using Official Development Assistance (ODA). Circular No.192/2011/TT-BTC dated on 26/12/2011 by the Ministry of Finance amending and supplementing a number of articles of Circular No.219/2009/TT-BTC;

- Circular No. 02/2015/TT-BLĐTBXH dated on 12/01/2015 by the Ministry of Labor, War Invalids and Social Affairs stipulating the salary for domestic consultants as a basis for estimating the package of private service provision for adoption of a contract based on the use of state capital.
- Circular No.05/2016/TT-BXD dated on 10/03/2016 by the Ministry of Construction guiding the determination of labor unit prices in management of construction investment costs;
- Circular No.40/2017/TT-BTC by the Ministry of Finance dated on 28/04/2017 stipulating the business trip allowance and conference expenses applicable to state agencies, public and non-government agencies business, political organizations, socio-political organizations and associations that use state budget funds;
- Circular No.01/2017/TT-BXD dated on 06/02/2017 by the Ministry of Construction guiding the determination and management of construction survey costs;
- Estimated cost of construction - Part of construction survey published together with Decision No.1354/QĐ-BXD dated on 28/12/2016 by the Minister of Construction;
- Decision No.2362/QĐ-NLĐK dated on 17/12/2003 by the Ministry of Industry on the height and coordinates of measuring electrical works;

Other Policies and Regulations of the State.

7.2 Cost estimates for the consulting service

7.2.1 Cu Jut Subproject

Table 6: Estimated cost of consulting service for Cu Jut Subproject

No.	Content	Cost	Note
1	Survey	3.205.905.000	
2	Detailed Engineering design	2.273.730.030	
	Salary of specialists	1.760.443.500	
	Other expenses (except salaries)	306.583.800	
	Tax	206.702.730	
3	Contingency cost(10%)	547.963.503	
Total (1+2+3)		6.027.598.533	
Rounding		6.028.000.000	
In words: Six billion and twenty eight million dong			

(Summary of cost of Cu Jut subproject, see Appendix 3)

7.2.2 Dak Mil Subproject

Table 7: Estimated cost of consulting service for Dak Mil Subproject

No.	Content	Cost	Note
1	Survey	4.259.898.000	
2	Detailed Engineering design	3.736.714.652	
	Salary of specialists	2.994.692.320	
	Other expenses (except salaries)	402.321.000	
	Tax	339.701.332	
3	Contingency cost(10%)	799.661.265	
Total (1+2+3)		8.796.273.917	
Rounding		8.796.000.000	
In words: Eight billion seven hundred and ninety six million dong			

(Summary of cost of Dak Mil subproject, see Appendix 3)

8 COORDINATION AND MONITORING

The Consultant must report to the Investor on the progress of the monthly implementation, prepare the documents and attend meetings/workshops on the relevant issues as required by the Investor.

The Consultant will coordinate with the subproject implementation advisors and other stakeholders such as CPO and ADB. Specifically, the discussions/inspections on milestones of subproject are required (as stated in the WEIDAP guidelines). The Consultant should closely coordinate and provide necessary data, information and reports for subproject implementation advisors and other stakeholders during the implementation process. The Consultant must participate in meetings and discussions with relevant agencies at the central and local levels.

The Consultant should work closely with community representatives (traditional and non-traditional way) to ensure the information collection during the FS phase, and accurately assess the impacts of the subproject as well as related issues on the environmental and social protection policies.

9 ORGANIZATION OF IMPLEMENTATION

During the implementation of the task, the Consultant will report directly to PPMU. PPMU will be responsible for providing the Consultant with the contact information of other agencies as required.

The Consultant must organize the implementation of the subproject. All relevant estimated costs must be anticipated in the bidding document and there will be no change in the total cost when signing the contract.

All costs related to fieldwork and data needed to meet the technical requirements of this consulting work must be fully considered in the proposal. Terrain and meteorological data and other information must be expected during the bidding process to ensure that the work is completed within the estimated total cost. For this purpose, the Consultant must estimate the corresponding workload and costs because there will be no change in the total cost of the subproject after signing the contract for any reason.

The Consultant will pay for all travel and accommodation related expenses (including field trips) for the entire consulting team during the contract period. The Consultant will also pay for all support staff (administrative, translators, office clerks, accountants) and field staff to perform the work for all data collection activities.

Technical reports and consulting products will be provided as described in the distribution section. The Investor will only accept the sub-project when subproject implementation advisors agree with the consulting products and ADB issues the No Objection Letter (NOL).

10 RESPONSIBILITIES AND SUPPORTS FROM THE PROVINCIAL PROJECT MANAGEMENT UNIT

10.1 Responsibility of the Design Consultants

- Implement the consultancy service in accordance with the agreed content and workload, and regulations on the application of Vietnamese and ADB standards and regulations;
- Submit the reports to the Investor within the time limit required by ToR;
- Ensure the mobilization and arrangement of personnel, offices and transport facilities;
- Ensure that all consulting works implemented by the Consultant are in accordance with Vietnamese law.
- Implement and be responsible for the quality of the consulting products;

- Participate in meetings related to consulting products when the Investor requests it during the implementation process, ensuring compliance with the regulations of MARD, PMU, PPC as well as the Sponsor; based on the Decision on approval of feasibility study report of the project and the subproject to recommends the Investor to supplement the missing contents according to the Decision;
- Commitment that the Consultant will appoint a competent representative to resolve any problems at any time at the request of the Investor.
- Comply with the direction and guidance of the investor, except for guidances or requirements that are contrary to the law or are not feasible.
- The Consultant shall not disclose any confidential or proprietary information relating to the consulting work, the contract or the work activities of the Investor without prior approval of the Investor in written document.
- The Consultant is responsible for searching and applying appropriate standards and regulations for the subproject. In the absence of such standards, the relevant international standards must be consulted and agreed by the Investor. Some key standards are expected to apply.

10.2 Responsibility of the Implementing Agency

- The SPPMU provides the Consultant with documents of the feasibility study and other relevant legal documents;
- Creates the best possible conditions for the Consultant to perform consulting work;
- Supports and creates conditions for the Consultant to have access to the works location;
- Provides necessary documents according to the Consultant's proposal for the Consultant to perform the consulting work. The SPPMU is responsible for the accuracy and completeness of the documents provided;
- Reviews the requirements and proposals of the Consultant regarding the implementation of consulting and approval work within a reasonable period of time so as not to delay the implementation of the consultancy;
- Pays for the Consultant as the contract price in accordance with the regulations;
- Answers in writing the proposals or requests of the Consultant;

Dak Nong SPPMU

- Appoints any qualified and professional individuals suitable to each job to work with the Consultant and specified in the specific decisions of the SPPMU.

To clarify the information in this terms of reference, please contact the Dak Nong provincial Project Management Unit with the following information:

Implementing Agency: Management Unit for Investment Projects on Construction of Agriculture and Rural Development(SPPMU), Dak Nong Province.

Address: No. 6, Le Duan street, Nghia Tan Ward, Gia Nghia town

Province: Dak Nong

Country: Viet Nam

Telephone: +84 02613581999

Email: bqldadtxdctnptnt@daknong.gov.vn

APPENDIXES

Appendix 1: Legal Bases

- Law of Construction No.50/2014/QH13 dated on 18/06/2014 by the National Assembly session 13;
- Law of Bids No.43/2013/QH13 dated on 26/11/2013 by the National Assembly session 13;
- Law of Investment No.49/2014/QH13 dated 18/6/2014 by the National Assembly session 13;
- Decree No.63/2014/NĐ-CP dated on 15/10/2009 by the Government regulating in details the implementing the Law of Bids and bidder selection under the Law of Construction;
- Decree No.16/2016/NĐ-CP by the Government regulating the capital management and usage from the Official Development Assistant (ODA) source and other preferential loan from foreign Sponsors.
- Decision No.48/QĐ-TTg dated on 03/04/2008 regulating the Guidance on feasibility study report using ODA source from 5 banks (ADB, AFD, JBIC, KfW, WB).
- Document No.1101/BKHĐT-TH dated on 02/03/2015 by the Ministry of Planning and Investment regulating on the approval of the undertakings and decision of investment on public project and program.
- Circular No.02/2015/TT-BLĐTBXH dated on 12/01/2015 by Ministry of Labor, Invalids and Social Affairs regulating the salary levels for local consultants as the basis to estimate the bid of supplying consulting services using State capital in contract form.
- Decision No.1476/QĐ-BTC dated on 28/6/2016 on the disapproval of some articles at Circular No. 219/2009/TT-BTC and Circular No.192/2011/TT-BTC by the Ministry of Finance.
- Circular No.40/2017/TT-BTC dated on 28/4/2017 by the Ministry of Finance regulating the regime of business allowance fee and seminar/meeting fees;
- Document No.1447/VPCP- HTQT dated on 02/3/2015 by the Government Office on upgrading the efficiency cooperation with Sponsors of ODA and preferential loan.
- Cent Memorandum of the Visiting Members to ADB8 Project by Asia Development Bank on 30/3/2016.
- Decisions of the Ministry of Agriculture and Rural Development: No.3239/QĐ-BNN-TCCB dated on 22/10/2008 regulating functions, power, duties and organizational structure of the Central Management Committee for the irrigation projects; No.110/QĐ-BNN-TCCB dated on 13/01/2009 issuing the Charter of Operation and Structure for the Central Management Committee;
- Decision No.727/QĐ-TTg dated on 28/4/2016 by the Prime Minister on the approval of lists of ADB8 Projects with loans at Asia Development Bank (ADB).
- The Decisions No.1073/QĐ-UBND and No.1074/QĐ-UBND of Dak Nong Provincial People's Committee approved the Feasibility Study Reports "Improving the efficiency of water use in irrigation systems".

Table 01: Standards applied to the survey and design work

No.	NUMBER	STANDARDS
I	Standards used for survey work	
1	QCVN 04 - 05: 2010/BNNPTNT	National technical regulation on irrigation works - the main regulations on design
2	QCVN 04 - 02: 2010/BNNPTNT	National technical regulations on composition, content of technical design documents and design of construction works of irrigation works.
3	TCVN 8478:2010	Irrigation works - Requirements on composition and quantity of topographic survey during project and design phases
4	TCVN 8224:2009	Irrigation works - The main regulations on net control of terrain
5	TCVN 8225:2009	Irrigation works - The main regulations on net control of terrain elevation
6	TCVN 8226:2009	Irrigation works - The main regulations on surveying cross-sections and topographic maps from 1/200 to 1/5000
7	TCVN 8477 : 2010	Irrigation works -Requirements on composition and quantity of geological survey in project planning and design phases
8	TCVN 9155-2012	Irrigation works - Technical requirements for machine drilling in geological survey work
9	TCVN 8352-2012	Construction land - Static test method
10	TCVN 8720-2012	Land for construction of irrigation works - Methods of taking, packing, transporting and preserving samples
11	TCVN 8868- 2011	Testing to determine non-cohesive shear resistance - non-draining and consolidation - drainage of soil adhesive on three-axis compression equipment
12	TCVN 9140-2012	Irrigation works - Required to preserve drilling samples in engineering geological survey work
13	TCVN 9351-2012	Construction land - Method of field Testing - Standard penetration test (SPT)
14	TCVN 4195:2012	Construction land - Methods for determining specific gravity in the laboratory
15	TCVN 4196:2012	Methods of determining humidity and moisture absorption in the laboratory
16	TCVN 4197:2012	Methods of determining the flow limit and plastic limit in the laboratory
17	TCVN 4198-2014	Construction land. Methods of particle composition analysis in the laboratory

No.	NUMBER	STANDARDS
18	14 TCN 4 – 2003	Composition, content, quantity of investigation and survey and hydro-meteorological calculation of the project development phases and design of irrigation works
II	Standards for design work	
1	TCVN 10380:2014	Rural roads - Design requirements
2	TCVN 8423:2012	Standard of irrigation works - Irrigation and drainage pumping stations - Requirements for designing hydraulic works
3	TCVN 4118:2012	Irrigation works - Irrigation systems - Design technical requirements
4	TCVN 8732:2012	Land for construction of irrigation works - Term and definition
5	TCVN 8218:2009	Hydraulic concrete - Technical requirements
6	TCVN 8228:2009	Hydro-concrete mixture - Technical requirements
7	TCVN 8636:2011	Irrigation works - Steel pressure pipe - Technical requirements in design, fabrication and installation.
8	TCVN 8412:2010	Irrigation works - Instructions on operating procedures.
9	TCVN 8299:2009	Irrigation works - Technical requirements in the design of valve gates and steel valve slots
10	TCVN 9141:2012	Standard of irrigation works - Irrigation and drainage pumping stations - Requirements of engine and mechanical equipment design
11	TCVN 2622:1995	Fire prevention and fire fighting for houses and buildings - design requirements
12	TCVN 8297:2009	Irrigation works - Earth dams - technical requirements in construction by compaction method
13	TCVN 9145:2012	Irrigation works - Process of calculating steel pipelines
14	TCVN 9162:2012	Irrigation works - Construction road - Design requirements
15	TCVN 9163:2012	Irrigation works - M&E drawings - Content requirements
16		Other relevant standards and regulations

Appendix 2. Surveys quantity*Table 02: Topographic survey quantity during the engineering design phase of Cu Jut subproject*

No.	Task	Terrain level	Unit	Quantity	Note
1	Level 2 leveling point	III	Point	64	
2	Technical leveling	III	km	20,82	
3	Measuring and drawing plane chart 1/2000	III	ha	64,0	
4	Measuring and drawing plane chart 1/1000	III	ha	4,65	
5	Measuring and drawing a longitudinal section 1/500	III	m	7,79	
6	Measuring and drawing cross sections 1/200	III	km	5,63	
7	Landmark	III	Point	240	

Table 03: Topographic survey quantity during the engineering design phase of Dak Mil subproject

No.	Task	Terrain level	Unit	Quantity	Note
1	Level 2 leveling point	III	Point	100	
2	Technical leveling	III	km	26,31	
3	Measuring and drawing plane chart 1/1000	III	ha	30,82	
4	Measuring and drawing plane chart 1/500	III	ha	5,69	
5	Measuring and drawing a longitudinal section 1/1000	III	m	7,08	
6	Measuring and drawing cross sections 1/200	III	km	5,71	
7	Landmark	III	Point	370	

Table 04: Geological survey quantity during the engineering design phase of Cu Jut subproject

Task	Drilling position	Number of holes	Holes depth	Soil level	Depth of soil layer	Unit number	Total drilling depth
Weir	Streambed +Shoulders	30	10-15	I-III	6	10	180
				IV-VI	6		160
				VII-VIII	3		60
Pump station	Centerline	4	10	I-III	6	2	24
				IV-VI	4		16
Total				I-III			204
				IV-VI			176
				VII-VIII			60
Experimental samples remain intact						108	Sample
Experimental samples for concrete corrosion water						12	Sample

Table 05: Geological survey quantity during the engineering design phase of Dak Mil subproject

No.	Name of construction	Number of holes	Depth of 1 hole (m)	Soil level I-III	Soil level IV-VI	Soil level VII-VIII	Total depth of drilling hole (m)	Hole 1x1x2m (m3)	Experimenting 17 indicators of intact soil samples	Experimenting of loose soil samples	Experimenting water samples	Materials test	Standard compaction test
1	Doi 2 lake, Thuan An commune	1	10	6	4	0	10		3		2		
2	Pumping station from Doi 1 lake to Lake 40 and Thuan Bac lake												
	- Pumping station	2	10	12	8	0	20		4		1		
	- Pipeline 1	5	3	15	0	0	15		0	4			
	- Pipeline 2	15	3	45	0	0	45						
3	Lake 35, Dak Lao Commune	1	8	6	2		8		2		2		
4	Canal route on Dak mil stream												
	- Section 1	17	4	68	0	0	68						
	- Section 2	14	4	56	0	0	56			12	2		
	- Section 3	5	4	20	0	0	20						
5	- C2 regulating culvert, Duc Minh communeh												
	Residential route							6		3	2		
	- Irrigation canal	2	3	6	0	0	6		6	4			
6	Weir D1, Duc Minh commune							32		9	1		
7	Weir D2, Duc Minh commune												
	- Dam route	2	8		6	10	16		4				
	- Canal route	2	3	6	0	0	6			4			
	- Irrigation canal	3	3	9	0	0	9				2		
	- Residential road							4		4			
	- Sewer across the road	1	5	5	0	0	5						
8	Thai Ba Long weir												
	- Sewer route	1	8	6	2	0	8		4				
	- Irrigation canal	7	3	21	0	0	21			4	2		
	- Residential road							8		4			
9	Road to Juh Juh lake in Duc Minh commune							6		4	1		
10	E29 sluice gate in Dak Lak commune	2	4 and 8	10	2	0	12		9		2		
11	Dak Sor weir, Long Son commune							10		6	1		
12	Nam Xuan D1 weir												
	- Dam route	4	5 and 10	12	14	4	30		6		2		
	- Pumping station	2	10	12	8		20		6				
	- Water storage tank	2	5	10	0	0	10						
	- D300 steel pipe	4	3	12	0	0	12			4			
	- Medium voltage lines	5	4	20	0	0	20			4			
	- Dam route							6		4			
13	Nam Xuan D2 weir	4	5 and 8	12	10	4	26		4		2		
14	D3 weir of Nam Xuan commune												
	- Dam route	4	5 and 8	12	10	4	26		6		2		
	- Dam route							4		4			
15	Operation management area	5	5	25	0	0	25		8		2		
16	Materials surveying												
	- Doi 1 lake	10	3	30	0	0	30					5	3
	- Doi 2 lake	7	3	21	0	0	21					5	3
	- 40 lake	7	3	21	0	0	21					5	3
	- Ngia Trang lake	15	5	75	0	0	75					5	3
	Total			553	66	22	641	76	62	74	26	20	12

Appendix 3. Summary of cost

Table 01: OTHER COSTS FOR SPECIALISTS-CU JUT

No.	Items	Cost/unit (1)	Quantity (2)	Total cost (VND) (1)x(2)
1	Equipment depreciation			55.200.000
	Office equipments	13.800.000	4,0	55.200.000
2	Stationery			105.783.800
-	A3 papers	122.000	40	4.880.000
-	A4 papers	68.000	35	2.380.000
-	Black inks	871.000	14	12.194.000
-	Color inks	6.334.800	1	6.334.800
-	Photocopy	5.333.000	15	79.995.000
3	Communication, accommodation and travel costs			145.600.000
-	Office phone charges	1.500.000	4,0	6.000.000
-	Telephone contact allowances	350.000	24	8.400.000
-	Travel allowance	200.000	328	65.600.000
-	Accommodation allowance	200.000	328	65.600.000
	Total			306.583.800

- 1 Equipment depreciation: 13.800.000 VND/month, included:
 - Computer: $18.000.000 \text{ VND/Unit} \times 40 \text{ Unit} \times (20\%/12 \text{ month}) = 12.000.000 \text{ VND/month}$.
 - Photocopy: $12.000.000 \text{ VND/Unit} \times 4 \text{ Unit} \times (20\%/12 \text{ month}) = 200.000 \text{ VND/month}$.
 - Design and cost estimation software: $120.000.000 \text{ VND} \times (10\%/12 \text{ month}) = 1.000.000 \text{ VND/month}$
- 2 Telephone contact allowances:
6 people x 4 month = 24 month

Table 02: REMUNERATION FOR SPECIALISTS-CU JUT

No.	Years of experience	Position	Salary	Social cost% of (3)	General management costs % of (3)	Total = (3)+(4)+(5)	6% profit of (6)	Allowance	Payments for specialist / month = (6)+(7)	Number of months - people	Remuneration of specialist = (9)x(10)
	1	2	3	4	5	6	7	8	9	10	11
Key personnel											
1	> 15 years	Consulting team leader	15.000.000	3.375.000	7.500.000	25.875.000	1.552.500	1.250.000	28.677.500	4,00	114.710.000
2	10 to 15 years of experience	Hydrological and hydraulic specialist	12.000.000	2.700.000	6.000.000	20.700.000	1.242.000	1.250.000	23.192.000	2,00	46.384.000
3	10 to 15 years of experience	Hydraulic structure specialist	12.000.000	2.700.000	6.000.000	20.700.000	1.242.000	1.250.000	23.192.000	4,00	92.768.000
4	5 to 10 years of experience	Structural expert	9.000.000	2.025.000	4.500.000	15.525.000	931.500	1.250.000	17.706.500	4,00	70.826.000
5	10 to 15 years of experience	Construction expert	12.000.000	2.700.000	6.000.000	20.700.000	1.242.000	1.250.000	23.192.000	4,00	92.768.000
6	5 to 10 years of experience	Mechanic specialist	9.000.000	2.025.000	4.500.000	15.525.000	931.500	1.250.000	17.706.500	2,00	35.413.000
7	5 to 10 years of experience	Electrical and mechanical specialist	9.000.000	2.025.000	4.500.000	15.525.000	931.500	1.250.000	17.706.500	2,00	35.413.000
8	10 to 15 years of experience	Economic specialist	12.000.000	2.700.000	6.000.000	20.700.000	1.242.000	1.250.000	23.192.000	4,00	92.768.000

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9	10 to 15 years of experience	Topographic survey specialist	12.000.000	2.700.000	6.000.000	20.700.000	1.242.000	1.250.000	23.192.000	3,00	69.576.000
10	10 to 15 years of experience	Geological survey specialist	12.000.000	2.700.000	6.000.000	20.700.000	1.242.000	1.250.000	23.192.000	3,00	69.576.000
	Support staff										
1	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
2	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
3	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
4	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
5	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
6	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
7	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
8	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
9	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
10	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	3,00	42.148.500
11	3 to 5 years of	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	3,00	42.148.500

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	experience										
12	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	3,00	42.148.500
13	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	3,00	42.148.500
14	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	3,00	42.148.500
15	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	3,00	42.148.500
16	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	3,00	42.148.500
17	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	3,00	42.148.500
18	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	3,00	42.148.500
19	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	3,00	42.148.500
20	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	3,00	42.148.500
	Supervisor										
1	5 to 10 years of experience	Designer	9.000.000	2.025.000	4.500.000	15.525.000	931.500	1.250.000	17.706.500	2,00	35.413.000
2	5 to 10 years of experience	Designer	9.000.000	2.025.000	4.500.000	15.525.000	931.500	1.250.000	17.706.500	2,00	35.413.000
	Total										1.760.443.500

Notes:

1. Salary is according to Number: 02/2015 / TT-BLĐTBXH dated January 12, 2015, Regulations on salary level for domestic consultants as a basis for estimating bidding packages for providing consulting services form of contract with the time of using state capital.
2. Social costs is 23.5%, including: Health insurance: 3%, Work accident insurance - occupational diseases: 0.5%, Social insurance: 17%, Unemployment insurance 1%, union 2%
3. General management costs % of (3) is estimated as 50% * Salary
4. Allowances include gasoline, lunch.....

Table 03: UNIT PRICE OF CONSTRUCTION SUR- CU JUT

No.	Code	Task/Description of Quantity	Unit	Quantity	Unit price			Total price	Into money
	Norms			Total	Material	Labor	Machine		
I	HM	TOPOGRAPHIC SURVEY							1.273.448.672
1	CK.21730	Underwater topographic map at scale 1/2000, 1m contour line- Topographic grade III	100 ha	0,448	187.726	32.333.384	2.024.976	73.338.370	32.855.590
2	CK.21730	Underwater topographic map at scale 1/2000, 1m contour line- Topographic grade III	100 ha	0,192	353.510	39.835.902	1.603.983	89.369.678	17.158.978
3	CK.04303	Line level 2 point, Topographic grade III	points	64,000	32.822,3	2.262.041	13.214	4.991.246	319.439.744
4	CL.03103	Technical water leveling, Topographic grade III	km	20,820	3.189,6	1.007.186	3.873	2.205.147	45.911.161
5	CK.11530	On-land topographic map at scale 1/1000, contour line 1m, Topographic grade III	100 ha	0,033	621.690,0	62.818.119	5.186.633	144.419.638	4.708.080
6	CK.21530	Underwater topographic map at scale 1/1000, contour line 1m, Topographic grade III	100 ha	0,014	621.690,0	76.245.317	4.057.846	172.248.787	2.411.483
7	CO.01103	Measuring longitudinal-section. Topographic grade III	100m	77,870	74.585,0	676.961	4.324	1.547.678	120.517.686
8	CO.01203	Measuring cross-section. Topographic grade III	100m	56,300	93.843,2	879.814	9.221	2.050.554	115.446.190
	CF.21130	Center Alignment. Topographic grade III	landmarks	63,000	56.459,5	888.111	33.329	2.051.618	129.251.934
9	CF.21130x1,35	Center Alignment. Topographic grade III	landmarks	177,000	56.459,5	1.198.950	44.994	2.744.338	485.747.826

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II	HM	GEOLOGICAL SURVEY							1.932.456.132
1	CD.01101	Rotary drill, pumps wash by sample pipe underwater, 0-30m deep, Soil/rock level I-III	m	180,00	129.897	1.014.263	192.129	2.624.549	472.418.820
2	CD.01102	Rotary drill, pumps wash by sample pipe underwater, 0-30m deep, Soil/rock level IV-VI	m	160,00	150.104	1.370.434	434.818	3.738.343	598.134.880
3	CD.01103	Rotary drill, pumps wash by sample pipe underwater, 0-30m deep, Soil/rock level VII-VIII	m	60,00	175.724	1.872.848	717.956	5.229.827	313.789.620
4	CC.01101	Rotary drill, pumps wash by sample pipe on land, 0-30m deep, Soil/rock level I-III	m	24,00	111.824	672.244	161.793	1.816.715	43.601.160
5	CC.01102	Rotary drill, pumps wash by sample pipe on land, 0-30m deep, Soil/rock level IV-VI	m	16,00	130.839	905.760	364.034	2.609.661	41.754.576
6	CC.02101	Secondary waterpump, drill on land, deep 0-30 m, Soil/rock level I-III	m	24,00	3.735	165.113	56.484	437.251	10.494.024
7	CC.02102	Secondary waterpump, drill on land, deep 0-30 m, Soil/rock level IV - VI	m	16,00	3.735	224.081	112.967	638.273	10.212.368
8	CP.03101	Testing to determine physical and mechanical parameters of undisturbed soil samples (cut, compressed by 1-axis method)	samples	108,00	46.257	1.486.013	365.157	3.767.811	406.923.588
9	CP.01101	Experimenting of concrete corrosion water samples	samples	12,00	61.875	1.179.375	215.472	2.927.258	35.127.096
PLUS SURVEY COSTS AFTER TAX									3.205.904.804
TOTAL (ROUNDED)									3.205.905.000

Table 04: OTHER COSTS FOR SPECIALISTS- DAK MIL

No.	Items	Cost/unit (1)	Quantity (2)	Total cost (VND) (1)x(2)
1	Equipment depreciation			55.200.000
	Office equipments	13.800.000	4,0	55.200.000
2	Stationery			137.521.000
-	A3 papers	122.000	50	6.100.000
-	A4 papers	68.000	40	2.720.000
-	Black inks	871.000	20	17.420.000
-	Color inks	10.562.000	1	10.562.000
-	Photocopy	5.301.000	19	100.719.000
3	Communication, accommodation and travel costs			209.600.000
-	Office phone charges	1.500.000	4,0	6.000.000
-	Telephone contact allowances	350.000	24	8.400.000
-	Travel allowance	200.000	488	97.600.000
-	Accommodation allowance	200.000	488	97.600.000
	Total			402.321.000

- 1 Equipment depreciation: 13.800.000 VND/month, included:
 - Computer: 18.000.000 VND/Unit x 40 Unit x (20%/12 month) = 12.000.000 VND/month.
 - Photocopy: 12.000.000 VND/Unit x 4 Unit x (20%/12 month) = 200.000 VND/month.
 - Design and cost estimation software: 120.000.000 VND x (10%/12 month) = 1.000.000 VND/month
- 2 Telephone contact allowances:
6 people x 4 month = 24 month

Table 05: REMUNERATION FOR SPECIALISTS- DAK MIL

No.	Years of experience	Position	Salary	Social cost% of (3)	General management costs % of (3)	Total = (3)+(4)+(5)	6% profit of (6)	Allowance	Payments for experts / month = (6)+(7)	Number of months - people	Remuneration of experts = (9)x(10)
	1	2	3	4	5	6	7	8	9	10	11
	Key personnel										
1	> 15 years	Consulting team leader	15.000.000	3.375.000	7.500.000	25.875.000	1.552.500	1.250.000	28.677.500	4,00	114.710.000
2	10 to 15 years of experience	Hydrological and hydraulic specialist	12.000.000	2.700.000	6.000.000	20.700.000	1.242.000	1.250.000	23.192.000	4,00	92.768.000
3	10 to 15 years of experience	Hydraulic structure specialist	12.000.000	2.700.000	6.000.000	20.700.000	1.242.000	1.250.000	23.192.000	4,00	92.768.000
4	5 to 10 years of experience	Structural expert	9.000.000	2.025.000	4.500.000	15.525.000	931.500	1.250.000	17.706.500	4,00	70.826.000
5	10 to 15 years of experience	Construction expert	12.000.000	2.700.000	6.000.000	20.700.000	1.242.000	1.250.000	23.192.000	4,00	92.768.000
6	5 to 10 years of experience	Mechanic specialist	9.000.000	2.025.000	4.500.000	15.525.000	931.500	1.250.000	17.706.500	4,00	70.826.000
7	5 to 10 years of experience	Electrical and mechanical specialist	9.000.000	2.025.000	4.500.000	15.525.000	931.500	1.250.000	17.706.500	4,00	70.826.000
8	10 to 15 years of experience	Economic specialist	12.000.000	2.700.000	6.000.000	20.700.000	1.242.000	1.250.000	23.192.000	4,00	92.768.000

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9	10 to 15 years of experience	Topographic survey specialist	12.000.000	2.700.000	6.000.000	20.700.000	1.242.000	1.250.000	23.192.000	4,00	92.768.000
10	10 to 15 years of experience	Geological survey specialist	12.000.000	2.700.000	6.000.000	20.700.000	1.242.000	1.250.000	23.192.000	4,00	92.768.000
	Support staff										
1	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
2	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
3	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
4	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
5	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
6	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
7	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
8	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
9	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
10	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
11	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
12	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
13	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
14	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
15	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
16	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000

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17	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
18	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
19	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.000	14.049.500	4,00	56.198.000
20	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.001	14.049.501	4,00	56.198.004
21	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.002	14.049.502	4,00	56.198.008
22	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.003	14.049.503	4,00	56.198.012
23	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.004	14.049.504	4,00	56.198.016
24	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.005	14.049.505	4,00	56.198.020
25	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.006	14.049.506	4,00	56.198.024
26	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.007	14.049.507	4,00	56.198.028
27	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.008	14.049.508	4,00	56.198.032
28	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.009	14.049.509	4,00	56.198.036
29	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.010	14.049.510	4,00	56.198.040
30	3 to 5 years of experience	Designer	7.000.000	1.575.000	3.500.000	12.075.000	724.500	1.250.011	14.049.511	4,00	56.198.044
	Author supervision personnel										
1	5 to 10 years of experience	Designer	9.000.000	2.025.000	4.500.000	15.525.000	931.500	1.250.000	17.706.500	4,00	70.826.000
2	3 to 5 years of experience	Designer	9.000.000	2.025.000	4.500.000	15.525.000	931.500	1.250.001	17.706.501	4,00	70.826.004
3	3 to 5 years of experience	Designer	9.000.000	2.025.000	4.500.000	15.525.000	931.500	1.250.002	17.706.502	4,00	70.826.008
4	3 to 5 years of experience	Designer	9.000.000	2.025.000	4.500.000	15.525.000	931.500	1.250.003	17.706.503	4,00	70.826.012
5	3 to 5 years of experience	Designer	9.000.000	2.025.000	4.500.000	15.525.000	931.500	1.250.004	17.706.504	4,00	70.826.016

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6	5 to 10 years of experience	Designer	9.000.000	2.025.000	4.500.000	15.525.000	931.500	1.250.004	17.706.504	4,00	70.826.016
	Total										2.994.692.320

Notes:

1. Salary is according to Number: 02/2015 / TT-BLĐTBXH dated January 12, 2015, Regulations on salary level for domestic consultants as a basis for estimating bidding packages for providing consulting services form of contract with the time of using state capital.
2. Social costs is 23.5%, including: Health insurance: 3%, Work accident insurance - occupational diseases: 0.5%, Social insurance: 17%, Unemployment insurance 1%, union 2%
3. General management costs % of (3) is estimated as 50% * Salary
4. Allowances include gasoline, lunch.....

Table 06: UNIT PRICE OF CONSTRUCTION SUR- DAK MIL

No.	Code	Task/Description of Quantity	Unit	Quantity	Unit price				Total price	Into money
	Norms			Total	Material	Auxiliary materials	Labor	Machine		
I	HM	TOPOGRAPHIC SURVEY								1.800.595.747
1	CK.04303	Line level 2 point, Topographic grade III	points	100,000	32.693		2.262.041	13.261	4.991.141	499.114.100
2	CL.03103	Technical water leveling, Topographic grade III	km	26,310	3.190		1.007.186	3.873	2.205.147	58.017.418
3	CK.11530	On-land topographic map at scale 1/1000, contour line 1m , Topographic grade III	100 ha	0,300	621.690		62.818.119	5.186.633	144.419.638	43.253.682
4	CM.02103	Topographic map at scale 1/500, contour line 0.5m, Topographic grade III	ha	5,690	59.406		2.799.836	34.250	6.224.941	35.419.914
5	CO.01103	Measuring longitudinal-section. Topographic grade III	100m	70,810	74.585		676.961	4.324	1.577.269	111.686.418
6	CO.01203	Measuring cross-section. Topographic grade III	100m	57,050	108.746		879.814	9.294	2.069.762	118.079.922
7	CF.21130x1,35	Center Alignment. Topographic grade III	landmarks	266,000	55.919		1.198.950	33.329	2.728.684	725.829.944
8	CF.21130	Center Alignment. Topographic grade III	landmarks	102,000	55.919		888.111	33.329	2.050.925	209.194.350

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II	HM	GEOLOGICAL SURVEY								2.459.301.831
1	CA.01101	Digging non-supporting pillar, 0-2m deep. Soil/rock level I-III	m3	76,00	79.781		566.100	-	1.324.511	100.662.836
2	CC.01101	Rotary drill, pumps wash by sample pipe on land, 0-30m deep, Soil/rock level I-III	m	553,00	106.440		672.244	161.796	1.793.360	991.728.080
3	CC.01102	Rotary drill, pumps wash by sample pipe on land, 0-30m deep, Soil/rock level IV-VI	m	26,00	117.501		905.760	364.040	2.568.993	66.793.818
4	CC.02101	Secondary waterpump, drill on land, deep 0-30 m, Soil/rock level I-III	m	553,00	4.481		165.113	56.485	434.227	240.127.531
5	CC.02102	Secondary waterpump, drill on land, deep 0-30 m, Soil/rock level IV-VI	m	26,00	4.481		224.081	112.970	633.423	16.468.998
6	CD.01102	Rotary drill, pumps wash by sample pipe underwater, 0-30m deep, Soil/rock level IV-VI	m	40,00	169.815		1.370.434	434.826	3.729.419	149.176.760
7	CD.01103	Rotary drill, pumps wash by sample pipe underwater, 0-30m deep, Soil/rock level VII-VIII	m	22,00	197.702		1.872.848	717.968	5.210.232	114.625.104
8	CP.03101	Testing to determine physical and mechanical indicators of undisturbed soil samples (cut, compressed by 1-axis method)	samples	62,00	55.509		1.486.013	365.157	3.745.316	232.209.592
9	CP.03301	Testing to determine physical and mechanical indicators of disturbed soil samples	samples	74,00	41.596		1.792.650	151.468	4.118.569	304.774.106

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10	CP.01101	Testing to determine chemical and physical criteria of whole water samples	samples	26,00	74.250		1.179.375	215.472	2.916.375	75.825.750
11	CP.03301-VD	Testing compacted soft soil samples	samples	20,00	41.596		1.792.650	151.468	4.118.569	82.371.380
12	CP.03401	Testing to determine standard compaction criterias	samples	12,00	49.764		1.910.588	2.245.240	7.044.823	84.537.876
PLUS SURVEY COSTS AFTER TAX										4.259.897.578
TOTAL (ROUNDED)										4.259.898.000

