GOVERNMENT OF SOCIALIST REPUBLIC OF VIET NAM
MINISTRY OF TRANSPORT

Consulting Service for Detailed Design
for
Da Nang – Quang Ngai Expressway Development Project
IDA Credit No. 3843-VN

Contract
for
Hydrological Survey Works

(Lump Sum Contract)

BETWEEN

NIPPON KOEI CO., LTD

AND

THANG LOI ENGINEERING CONSULTANTS CO., LTD.

Dated: 05 October 2011

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CONTRACT AGREEMENT
ON
HYDROLOGICAL SURVEY
FOR
CONSULTING SERVICES FOR DETAILED DESIGN FOR
DANANG - QUANG NGAI EXPRESSWAY DEVELOPMENT PROJECT
PROJECT ID NO. P.106235
IDA CREDIT NO. 3843-VN

This Contract made and entered into this 05 October 2011, by and between:

Nippon Koei Co., Ltd. duly organized and existing under the laws of Japan, with its principal office located in 4, Kojimachi 5-chome, Chiyoda-ku, Tokyo, 102-8539 Japan. (hereinafter referred to as the "Consultant") and Thang Loi Engineering Consultants, duly organized and existing under the laws of Vietnam, with its principal office located at 16A/93 Trung Kinh Street, Cau Giay Dist, Hanoi, Vietnam (hereinafter referred to as the "Sub-consultant")

WITNESS THAT the parties covenant, promise and agree as follows:

The Sub-consultant agrees to do and complete the Hydrological Survey (hereinafter referred to as the "Works") in accordance with the terms, conditions and requirements of this Contract.

The Consultant agrees to pay the Sub-consultant in consideration of the fulfillment of the Works, the Contract Price of Forty Nine Thousand Seven Hundred Eighty Five US Dollar only (USD49,785), including USD4,526 of VAT, in lump sum, in accordance with the terms and conditions specified in Clause 2.12 of General Conditions.

It is agreed that the terms, conditions and requirement of the Contract shall prevail to the extent that are expressly modified or altered by this Contract.

IN WITNESS WHEREOF, each of the parties hereto has caused this Contract to be executed in duplicate as of the date first above written by its duly authorized representative.

For and on behalf of the Consultant	For and on behalf of the Sub-consultant
Ichizuru ISHIMOTO	**Nguyen Manh Cuong**
Project Manager	General Director
Nippon Koei Co., Ltd.	Thang Loi Engineering Consultants

II. GENERAL CONDITIONS OF CONTRACT

2.1 Definitions

The following words and expressions shall have the meaning assigned to them except where the context otherwise requires:

(a) The “Client” shall mean Project Management No.85 (PMU85) under Ministry of Transport (MOT) of Government of Socialist Republic of Vietnam (GOV).

(b) The “Project” shall mean Da Nang – Quang Ngai Expressway Development Project, approximately 140 km long, in the central Vietnam.

(c) The “Service” shall mean the Consulting Services for Detailed Design for Da Nang – Quang Ngai Expressway Development Project to be carried out by the Joint Venture.

(d) The "Joint Venture" shall mean the Joint Venture of Nippon Koei Co., Ltd., Nippon Engineering Consultants Co., Ltd., Chodai Co., Ltd. and Thai Engineering Consultants Company Limited to supervise the Works at the Site(s) in Vietnam where the Contract has to be carried out. Whereas, the Joint Venture, was assigned by the Government of Vietnam to undertake the Consulting Services for Detailed Design for Danang - Quang Ngai Expressway Development Project.

(e) “NK” shall mean Nippon Koei Co., Ltd., the prime consulting firm responsible for the implementation of the Service having an address of its head office at;

4, Kojimachi 5-chome,
Chiyoda-ku, Tokyo, 102-8539, Japan

(f) The “Project Manager” shall mean team leader of the Joint Venture approved by the Client.

(g) The "Consultant" shall mean a person or persons of the Joint Venture appointed by the Project Manager.

(h) The "Sub-consultant" shall mean the person whose bid has been accepted by the Consultant and approved by the Client.

(i) The "Contract" shall mean the agreement between the Consultant and the Sub-consultant, and include General Conditions, Term of Reference (TOR), Technical Specifications and Priced Bill of Quantities (BOQ) attached hereto.

(j) The "Site" shall mean the places of the area shown on the attached project location map in Appendix-A.

(k) The "Works" shall mean the works for the Hydrological Survey as shown in the Bill of Quantities attached in the Appendix E.

(l) The “Contract Price” shall mean the sum named in the Contract as the Contract price.

(m) The "Bill of Quantities" or “BOQ” shall mean the price schedule attached to the Contract.

(n) The "Unit Price" shall mean the unit price stated in the Bill of Quantities.

(o) The "Drawings" shall mean the drawings referred in the Contract and any modification of such figures and drawings approved in writing by the Consultant.

(p) “Day, Week, Month, Year” shall mean calendar day, calendar week, calendar month and calendar year.

(q) “Approval” or “Approved” shall mean approval or approved in writing by the Consultant.

(r) “Writing” shall mean any manuscript, typewritten or printed statement under seal or hand. Words importing the singular only also include the plural and vice versa where the context requires. The fact that the words defined in this Clause are or are not capitalised in the Contract shall not affect their meaning.

2.2 Sub-consultant to Inform Himself Fully

The Sub-consultant by bidding shall be deemed to have satisfied himself as to all the conditions and circumstances affecting the Contract price, and to have fixed these prices according to his own view for these as no additional allowances, except as otherwise expressly provided, will afterwards be made beyond the Contract Price. The Sub-consultant shall be responsible for any misunderstanding or incorrect information, whatsoever, obtained except information given in written by the Consultant. The Sub-consultant shall determine the presence of all services or ground facilities that may be affected by his work.

2.3 Time for Commencement and Completion

The commencement date of the Works is 5 September 2011 and The whole of the Works shall be completed not later than 31 December 2011.

2.4 Manner of Execution

1) The Works to be done under this Contract shall be executed in accordance with the Sub-consultant where not specified therein shall be in accordance with such instructions as the Consultant may issue from time to time as he considers necessary and appropriate. If something, which is not described in this Contract, occurred, the Sub-consultant shall consider and judge based on the conscience and justice of the engineership.

2) The Sub-consultant shall be responsible for observing all regulation and safety precautions required by authorities and/or through legislation.

3) The Sub-consultant shall keep good relation with concerned persons and organization of the Works and shall settle any conflict with them at his own responsibility and expense.

2.5 Information and Official Permission

1) The Consultant shall make available to the Sub-consultant for the purpose of performing the Works which are listed in the Contract.

2) Official permission from the authorities concerned for the execution of the Works at the Site shall be arranged by the Sub-consultant at his own expenses.

2.6 Sub-consultant's Representative and Persons

1) The Sub-consultant shall make his own arrangements for the engagement of all the engineers, technicians and labours necessary for the execution of the Works. The Sub-consultant shall submit to the Consultant for approval a complete list of principal staff showing names, functions, personal histories and periods of assignments prior to commencement of the Works.

2) The Sub-consultant shall appoint one or more competent representatives from the Sub-consultant's engineers assigned to the Works to superintend the carrying out of the Works on the Site. The names, training and experience of the Sub-consultant's representatives shall be submitted to the Consultant for approval before they are appointed. The said representative, or if more than one shall be appointed, then one such representative shall be present on the site during working hours, and any orders or instructions which the Consultant may give to the said representative of the Sub-consultant shall be deemed to have been given to the Sub-consultant by the Consultant.

3) The Sub-consultant shall be responsible for observation of all regulation and safety precautions imposed by labour legislation and authorities in Vietnam. The Sub-consultant shall prepare a safety policy document for submission to the Consultant for approval prior to starting work on the site. No work will be allowed to proceed until this document has been submitted and approved. Any costs delay due to the late submission of this document will be at the Sub-consultant's expense.

4) The Consultant shall be at liberty by notice in writing to the Sub-consultant to object to any representative or other person employed by the Sub-consultant in the execution of the Works who shall, in the opinion of the Consultant, misconduct himself of be incompetent

or negligent or be sick and the Sub-consultant shall remove such person from the Works and provide an acceptable replacement for such person at the Sub-consultant's expense.

2.7 Working Days and Hours

The Sub-consultant shall carry out the Works on the Site continuously during the normal working hours generally recognised in Vietnam. The Sub-consultant may, with the arrangement of the Consultant, carry out work at other time if it shall be practicable in the circumstances for work to be so done.

2.8 Materials, Equipment and Facilities to be provided by the Sub-consultant

The Sub-consultant shall, at his own expense, supply and provide all the equipment, materials, labors and other things or every kind required for the execution and completion of the Works.

2.9 Program to be Furnished

1) The Sub-consultant shall submit to the Consultant for his approval his proposed time schedule and field operation program for each section of the Works.

2) After approval by the Consultant of such time schedule and field operation program, the completion time for the Works stipulated in the same time schedule shall be considered as "Guaranteed Time for Completion of the Works", and the Sub-consultant shall adhere to the order of procedure method and time schedule unless he obtains the written permission of the Consultant to vary such order or method or time schedule.

3) Such time schedule and field operation program shall be supplemented by the Sub-consultant in weekly progress reports indicating the actual state of progress of all items during the course of the Works at the Site. The form and substance of such weekly reports shall be satisfactory to the Consultant. The weekly progress report shall be submitted by Monday of the following week to which it applies.

4) In the course of the Works, when the Consultant calls the Sub-consultant for a meeting, the Sub-consultant and/or his representatives shall at any time and at his own expense attend the meeting and shall report the actual state of Works.

2.10 Insurance

1) The Sub-consultant shall at his expense effect accident and insurance for engineers, technicians and labours employed by the Sub-consultant for the execution of the Works, and shall indemnity the Consultant from any claim for the compensation of such accident and injury, damage to property and third parties caused in undertaking the duties and all claims whatsoever.

2) The Sub-consultant shall, at his expense, insure the equipment, materials and facilities to be provided by the Sub-consultant and keep each part thereof insured for its full value against loss, damage and fire.

2.11 Force Majeure

1) If either party is temporarily unable by reason of force majeure or the law or regulation of to meet any of its obligation under the Contract, and if such party gives to the other party written notice of the event within fourteen (14) days after its occurrence, such obligations of the party, as it is unable to perform by reason of the event, shall be suspended for as long as the inability continues.

2) Neither party shall be liable to the other party for loss or damage sustained by such other party arising from any event referred to in Clause 2.11 1) or delay arising from such event.

3) The term "Force Majeure" as employed herein shall mean Act of God, strikes, lock-outs or other industrial disturbances, acts of the public enemy, wars, blockades, earthquakes, storm, lighting, floods, washouts, civil disturbances, explosion, curfews, and any other similar event, beyond the control of either party.

2.12 Terms of Payment

1) This is a lump sum contract.

2) As soon as the Works has been started, the Sub-consultant shall submit to the Consultant, the invoices of amount payable. After checking the invoices, the Consultant shall pay the Sub-consultant in respect of the Works. The Consultant reserves the right to exclude such items that are not considered to be authenticated, from the payment.

3) Advance payment equivalent to Forty percent (40%) of the Contract Price shall be made to the Sub-consultant after approval by the Consultant for the following items:

   - Completion of mobilization of personnel and equipment at the Site,
   - Work plan.

4) Interim payment equivalent to Forty percent (40%) of the Contract Price shall be made to the Sub-consultant upon acceptance of the outcome by the Consultant.

5) Final payment equivalent to Twenty percent (20%) of the Contract Price shall be made to the Sub-consultant upon issuance of "Work Completion Certificate" by the Consultant after receiving the acceptance letter by PMU85.

6) No extra payments in respect of overtime, holiday work, additional equipment, materials and facilities, or special conditions of hardship shall be claimed by the Sub-consultant beyond the Contract price.

7) Payment procedure is provided in Appendix-B. Remittance charge shall be paid by the Sub-consultant.

2.13 Taxes and Related Charges

All the income and other taxes, levies, imposes, deductions, charges, fees and similar assessments whatsoever imposed, assessed, levied or collected by the Government of Vietnam or any subdivisions thereof or any taxing authority therein, upon the Sub-consultant and his staff shall be paid and/or borne by the Sub-consultant.

2.14 Variations and Omissions

1) The Sub-consultant shall not alter any of the Works except as directed in writing by the Consultant. The Consultant shall have full power, from time to time, during the execution of the Contract, to direct the Sub-consultant to alter, amend, omit, add to or otherwise vary any of the Works, by notice in writing, and the Sub-consultant shall carry out such variations. In case the Consultant asks the Sub-consultant, on the spot, to change the areas to be investigated from the originally proposed areas, the Sub-consultant shall at that instance obey such directions and later obtain written confirmation from the Consultant.

2) If a decrease in the Works is ordered by the Consultant, such orders shall not constitute any ground for claim for damage or loss of anticipated profits on the Works. All extra additional Works shall be performed with the same materials and workmanship as employed for the Works of similar character in the original one as far as they are applicable thereto.

~~3) In any case there such a direction involves an increase or decrease in the Contract Price, the difference in cost to the Contract, if any, occasioned by such variations, shall be adjusted from the Contract Price as the case may require, unless otherwise specified. The amount of such difference shall be ascertained and determined in accordance with the unit prices specified in the BOQ, so far as the same may be applicable, and where the unit prices are not contained therein, such amount shall be reasonably agreed between the Consultant and the Sub-consultant in writing.~~ (Not applicable to this lump sum contract)

4) In case some modification and/or variation are requests made by Consultant and/or Client, those works shall be paid by Consultant basing on the unit price in BOQ and the actual quantity. In case such modifications and/or variations requested are not included in the BOQ, both Parties will discuss to make a supplementary agreement to the Contract.

2.15 Sub-consultant's Default

1) If the Sub-consultant shall neglect to execute the Works with the diligence and expedition or shall refuse or neglect to comply with any reasonable instructions or orders given in writing by the Consultant in connection with the Works, or shall contravene the provisions of the Agreement, the Consultant may give notice in writing to the Sub-consultant to make good the failure, neglect or contravention complained of.

2) In case, the Sub-consultant fail to comply with the notice within a reasonable time from the date thereof, then and in such case the Consultant shall be at liberty to employ other workmen and forthwith execute such part of the Works as the Sub-consultant may have neglected to do, or, if the Consultant shall think fit, it shall be lawful for him, without prejudice to any other right he may have under the Contract, to make the Works wholly or in part out of the Sub-consultant's hands and re-contract with any other person or persons to complete the Works or any part thereof.

3) The Consultant shall be entitled to retain and apply any balance which may be otherwise due by him to the Sub-consultant, or such part hereof as may be necessary to payment of the cost of executing the said part of the Works of completing the Works as the case may be. If the cost of completing the Works or executing part thereof as aforesaid shall exceed the balance due to the Sub-consultant, the Sub-consultant shall pay such excess upon request writing from the Consultant.

2.16 Rejection

If at any time before the Works are accepted by the Consultant, the Consultant shall decide that any work done by the Sub-consultant is defective or not in accordance with the Sub-consultant or that the Works or any portion thereof are defective or do not fulfil the requirements of the Contract, then the Sub-consultant shall with all speed and at his own expense make good defects so specified. In case the Sub-consultant shall fail so to do, the Consultant may, provided he does so without undue delay, take at the cost of Sub-consultant, such steps as may in all the circumstances be reasonable to make good such defects.

2.17 Time for Completion

1) The whole of the Works shall be completed with the time guaranteed by the Sub-consultant or such extended time as may be allowed under the following paragraph.

2) The Sub-consultant shall not be held responsible for failure to carry out his obligations in case of force majeure, such as embargo, blockade, war, natural disasters or any disaster or any circumstances beyond his reasonable control.

3) The Sub-consultant shall notify the Consultant in writing within seven (7) days of the commencement of force majeure conditions. Depending on the production of satisfactory evidence and if the existence of force majeure conditions is accepted by the Consultant, the Consultant will grant extension of the Guaranteed Time for Completion of the Works sufficient to compensate for delay due to force majeure without penalty.

2.18 Delay in Completion

If the Sub-consultant fails to complete the Works in accordance with the Contract within the time fixed by the Contract, there shall be deducted from the Contract Price as and for liquidated and ascertained damages a sum of money equal to a half percent (0.5%) of the Contract Price for each day between the Guaranteed Time for Completion of the Works and the actual date of completion but the amount so deducted shall not in any case exceed five percent (5%) of the Contract Price. Such deduction shall be in full satisfaction of the Sub-consultants liability for the said failure. The Consultant may request the Sub-consultant to employ additional labour or use additional equipment and materials and the Sub-consultant will do so at his expense in case a delay in the completion of the works has to be expected.

2.19 Suspension of the Works

The Sub-consultant shall, on the written order of the Consultant, suspend the progress of the Works or any part thereof for time or times and in such manner as the Consultant may consider necessary and shall be doing such suspension properly protect and secure the works so far as is necessary in the opinion of the Consultant. All expenses incurred by the Sub-consultant by reason of the suspension of the Works by the Consultant will be at the sole responsibility of the Sub-consultant if the suspension is:

(a) Otherwise provided for in the Sub-consultant

(b) Necessary for the proper execution of the works or by reason of whether conditions affecting the safety or the quality of the Works or by some defaults on the part of the Sub-consultant, or

(c) Necessary for the safety of the Works or any part thereof.

2.20 Certificate or Completion of the Works

As soon as in the opinion of the Consultant, the whole of the Works shall have been satisfactory completed, the Consultant shall issue a Certificate of Completion of Works after receiving a written application thereof. Upon issuance of such Certificate of Completion of Works, the Sub-consultant shall cease to be under further obligation under the Contract.

When whole the Work completed, a Certificate of Completion of Works shall be issued to terminate the Contract after receiving the acceptance letter from PMU85.

2.21 Bankruptcy

If the Sub-consultant shall become bankrupt or insolvent or have a receiving order made against him, or compound with his creditors, or being a corporation, commence to be wound up, not being a member's voluntary winding up for the purpose of amalgamation or reconstruction, or carry out its business under a receiver for the benefit or its creditors or any of them, NK shall be at liberty:

1) To terminate the Contract forthwith by notice in writing to the Sub-consultant or to the receiver, or liquidator, or to any person in whom the Contract may become vested, and to act in the manner provided in Clause 2.15 of the Sub-consultant's Default, as though the last mentioned notice has been the notice referred to in such Clause and the Works has been taken out of the Sub-consultant's hand, or

2) To give such receiver, liquidator or other person the opinion of carrying out the Contract subject to his providing a guarantee for the due and faithful performance or the Contract up to an amount to be agreed.

2.22 Assignment and Sublet the Contract

The Sub-consultant shall not, without the prior consent in writing of the Consultant, assign or transfer the Works or the benefits or obligations thereof or any part thereof to any other persons. The Sub-consultant shall not, without the prior consent in writing of the Consultant, which shall not be unreasonably withheld, sublet the Sub-consultant any part thereof or make any sub-contract with any person or persons.

Any such consent if given shall not relieve the Sub-consultant from his obligations under the Contract. The Sub-Sub-consultant shall be regarded as employee of the Sub-consultant. The Sub-consultant shall be solely responsible for the performance of the Sub-Sub-consultant and for all payments to the Sub-Sub-consultant.

2.23 Arbitration

1) If any dispute or difference of any kind whatsoever shall arise between NK and the Sub-consultant in connection with the interpretation or application of the Contract, it shall be settled as much as possible by amicable arrangement between both parties. If such arrangement cannot be realised, the dispute of difference shall be settled by arbitration as provided herein.

2) All questions, disputes or differences arising out of or in relation to the interpretation of the Contract which cannot be settled by manual accord shall be submitted to a committee for arbitration consisting of three arbitrators, one to be nominated by NK, another by the Sub-consultant and the third as chairman by the two mentioned arbitrators above, and shall be finally settled in conformity to the rules and procedures or Conciliation and Arbitration of the International Chamber of Commerce. Such arbitration shall be held at such place and time as the arbitrators may decide. Any decision, opinion, direction, certificate or valuation given by the arbitrators shall be obeyed by both parties and be final.

2.24 Notice and Correspondence

Any notice to be given to the Sub-consultant shall be served by sending the same by post, facsimile, email, or leaving the same at the Sub-consultant's principal place of business, or to the address of his representative at the Site. Any notice to be given to the Consultant shall be served by sending the same by post, facsimile, email, or leaving the temporary site office of the Consultant in Danang, or to NK address as stated in the Contract.

2.25 Documents

1) All the correspondences, figures, drawings and other documents shall be made in both English and Vietnamese.

2) The several documents have to be taken as mutually explanatory of one another, but in case of ambiguities or discrepancies the same shall be adjusted in accordance with the provisions of Clause 2.23 thereof.

2.26 Inspection of Work

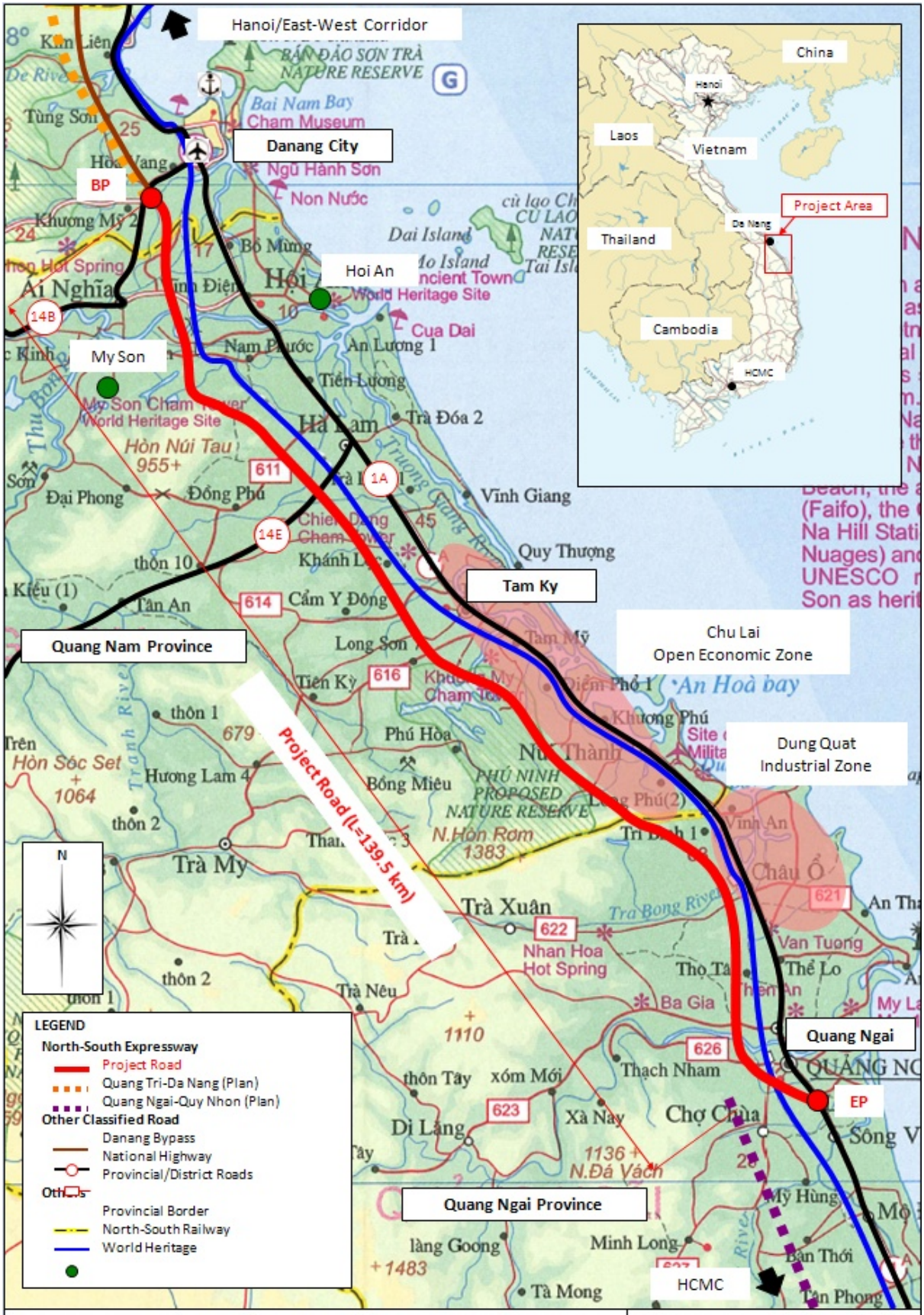
The Consultant shall, at all times, have access to the Works wherever it is in preparation or progress and the Sub-consultant shall provide necessary facilities for such access and for inspection. Where the specifications require any work to be specially tested or approved, the Sub-consultant shall give the Consultant timely notice of his readiness for inspection and, if the inspection is by an authority other than the Consultant, of the date fixed for such inspection.

2.27 Maintenance of Security

Without obtaining the Consultant's prior written approval, the Sub-consultant shall not disclose, not only during the effective period of this Contract, but also after the termination or completion of this Contract, any information and/or data, etc., which has been made known to the Consultant in executing the Work.

2.28 Emergency Communication Network

The Sub-consultant shall submit to the Consultant an emergency communication network which includes contact numbers and addresses in both case of usual and emergency response.



Consulting Services for Detailed Design for Danang Quang Ngai Expressway Development Project (DQEDP-DD)	**Project Location Map**

Appendix-B: Mode of Payment

A. The Sub-consultant shall submit an invoice for services performed by him/her. A sample invoice form is attached hereto.

B. The above invoices shall be submitted to NK with the following particulars:

Address : Mr. Ichizuru Ishimoto
General Manager
Highways and Bridges Dept.,
Nippon Koei Co., Ltd.
Tokyo, 102-8539, Japan

Project Code : JA08O1057

C. The payment shall be made in US Dollar of telegraphic transfer to the account mentioned below within one (1) month from the date of the receipt of the invoice. The Sub-consultant shall confirm in advance the reliability of transferring to this account.

Bank Name	:	
Branch Name	:	
Account Name	:	
Account Number	:	
Bank Address	:	
Country (where the bank exists):		Vietnam

D. Remittance charges shall be deducted from the amount of each payment.

No. (your ref. No.)

INVOICE

Mr. Ichizuru ISHIMOTO
General Manager
Highways and Bridges Dept.,
Nippon Koei Co., Ltd.

Date: _____

Subject : **Invoice for** _____

Payment should be made to:

Name : _____
Account No. : _____
Name of Bank : _____
Sort Code : _____

USD Currency Portion	Expenditure this Period	Expenditure to Date
1. Topographic Survey (Control Point Survey)		
Total	_____	_____

(Signature)
Name
Title

Section 5. Terms of Reference

1. Background

The Government of the Socialist Republic of Vietnam (GOVN) represented by Vietnam Expressway Corporation, through Project Management Unit No. 85 (PMU85) is planning to implement Expressway Development (Da Nang - Quang Ngai) Project (hereafter called the Project). Vietnamese MOT is the line agency who makes investment decision for the Project. VEC is the project owner and PMU85 is the project management consultant at project preparation and implementation phases until the works is handed over and put into operation. PMU85 is also the implementing agency who actively works with relevant authorities to solve all the issues related to the Project. The purpose of the Expressway is to improve the inter-regional transport networks to support the socio-economic development in the Central region and in the whole country and promote traffic safety.

In preparation for the Project, the GOVN commissioned a Feasibility Study (FS) in 2003 which was subsequently revised and completed in March 2008 by JETRO Consultants. In order to meet the requirements of the guidelines and loan procedure of the World Bank and other international financial donors, the FS was updated by Nippon Koei Co., Ltd., being completed in May 2009. This updated FS is being reviewed and further refined by CPCS Transcom Limited.

The Project consists of the following three components;

(1) Component A: Civil Works
Construction of four-lane dual carriageway road (with capacity for eventual widening to six lanes) and 131 km in total length.

(2) Component B: ITS (Intelligent Transport System) Works
Provision of traffic management and toll collection facilities

(3) Component C: Expressway Operations and Maintenance

Planning an institution to operate and maintain the expressway and identifying facilities and equipment that it will need.

It is currently expected that the project will be implemented with financial support from the World Bank and the Japan International Cooperation Agency (JICA). Funds from these agencies would be used to finance separate sections of the Project. The current Terms of Reference pertain to the entire Project.

2. Objectives of the Consulting Services

The objectives of the consulting services are:

- To undertake the efficient and proper preparation of the detailed engineering design;
- To prepare an implementation program that can ensure delivery of the project in an efficient and timely manner infrastructure in accordance with the implementation program; and
- To promote technology transfer by employing suitably qualified Vietnamese professionals for the detailed design and implementation planning for the Project and by providing appropriate training for staff of the related agencies who will be at various times responsible for the Project.

3. Scope of Services

3.1 General

In executing the services, the Consultant shall follow the current relevant Guidelines and regulation/procedures of GOVN and the Bank based on the FIDIC Conditions of Contracts. The Consultant shall assist PMU85/MOT in all aspects of the work including the review of previous studies, detailed design and tender assistance required for implementation of the Project. The scope of the consulting services broadly consists of, but not limited to, the following works:

1. Review of previous studies.
2. Detailed engineering design including cost estimation and preparation of tender documents and other supporting documentation.
3. Assistance with calling and assessing tenders for works and for contract negotiations.

Special attention is drawn to the requirement that the Consultant conduct independent bid evaluations and give the Client advice on issues related to contract negotiations for the Client's reference.

The Consultant shall perform the tasks listed below:

3.2 Review of Previous Studies and Establishing the Detailed Design Framework

The Consultant shall:

(1) Review Previous Studies

The Consultant shall review the previous studies to acquaint themselves with the evolution of the Project and its current features, and to identify matters that may materially affect the work of the current contract. Key issues will be identified for discussion and agreement with PMU85/MOT. The review shall cover, among others, the following subjects:

a. Review of horizontal and vertical alignment and proposed structures.

b. Review site-specific social and environmental impacts identified in the Environmental Impact Assessment (EIA) prepared by PMU85 and the mitigation measures proposed in the associated Environmental Management Plan (EMP).

c. Review construction phasing and management of traffic during construction.

d. Review toll operation and control facilities, operation and maintenance facilities and services, service areas, parking areas, etc.

(2) Establish Detailed Engineering Design Framework

The Consultant shall:

a. Establish design criteria and design standards to be applied for the Project.

b. Recommend and agree with PMU85/MOT the format and content for the Bills of Quantities, cost estimates and prequalification and bidding documents.

c. Recommend and agree with PMU85/MOT the time schedule for preparation of the detailed design, the Bills of Quantities, cost estimates, prequalification documents and bidding documents to allow the tendering

of works and construction for each contract package to commence immediately after the completion of necessary design and documentation work and the gaining of necessary approvals.

3.3 Detailed Engineering Design and Procurement Planning

Tasks to be undertaking by the Consultant to prepare the detailed engineering design and the planning of procurement will include:

1. Identify project packaging.
2. Conduct surveys and investigations.
3. Prepare detailed design for roads, bridges and other structures.
4. Design of intelligent transport systems and toll facilities.
5. Establish an operation and maintenance system for the project.
6. Prepare an Environmental Impact Assessment, Environmental Management Plan, Ethnic Minority Development Plan (if needed) and Resettlement Action Plan.
7. Recommend construction methods and prepare a construction schedule.
8. Prepare a cost estimate for the Project.
9. Prepare pre-qualification, tender and contract documents.
10. Prepare an implementation program.

In undertaking the detailed engineering design, the Consultant shall:

a. Use the reference documents of previous studies approved by GOVN and the World Bank as the basis for detailed design.

b. Use engineering standards approved by GOVN. Where current standards are not available or are unsuitable, the Consultants shall make recommendations for appropriate standards and gain approval from PMU85/MOT for their use.

c. Undertake the work in a phased manner so that pre-qualification of contractors can occur for packages for which detailed design and documentation is completed while detailed design and documentation continues for other packages.

3.3.1 Packaging

The Consultant shall identify a recommended packaging for the project and get agreement with the Client before commencing detailed design. Packaging shall satisfy the following conditions:

a. Individual packages should be confined to a single province;

b. Individual package shall be financed by only a single financier;

c. The value of a package should generally be from about 70 million to 100 million USD, i.e. neither too big nor too small.

d. During D.D preparation, the Consultant shall study, initiate the solutions and design a contract package with reasonable scopes of works beforehand so that its construction can be commenced in 2010.

3.3.2 Surveys and Investigations

(1) Data collection

- Investigate and collect the following data for cost estimate and general cost estimate: Production costs related to local transportation activities; depreciation regulations related

to traffic vehicles; haulage tables for transportation services; charges for travel, bridges and roads, and insurance; costs for traffic accidents; inflation and exchange rate in the previous years; local unit price for calculation of general cost estimate; consult unit prices of projects under implementation in the region; investigate sources of materials and energies for construction; cooperate with local governments to identify disposal areas for soil and waste materials (including liquid waste)

- Survey for construction material transportation

- Investigate and collect planning data related to the project and work with relevant authorities: Collect planning maps of highways, railways, waterways and maritime; plan of industrial and urban zones along the route; plan of systems of hydraulic works , irrigation, canals, dykes, and pumping stations, etc; plan of underground works and system of underground and overhead lines; Plan of water supply and drainage system; plan of electricity supply and lighting; plan of communication system and other relevant plans along the route, etc (the plans must be granted with official approval of relevant authorities)

- Collect project documents and design document of the relevant projects

- Work and agree in writing with relevant authorities of Da nang city, Quang Nam and Quang Ngai provinces, 5th military zone under Ministry of Defense, EVN, VNPT, PMU of industrial zones and other relevant managing agencies about the following contents: Alignments; alternative design of interchange; scale and location of toll plazas, control center, service stations; elevation of detailed plans of urban zones and industrial zones; location, span or width, and elevation of culvert and frontage road; navigational clearance, railway clearance; documents related to hydraulic works, irrigation, water sources and sewage system for urban zones, clearance of large canals and dykes; areas within military structures, military barracks; and the other relevant documents, etc.

(2) Surveys

Implement detailed surveys served for engineering designs of all work items under the project including: surveys of topography, hydrology, geology and testing, material sources, traffic issues, electricity, land acquisition and resettlement, surveys of relevant underground and overhead structures and staking land acquisition,etc ..,and additional survey quantities (if any) during the design. The surveys must comply with current Vietnamese specifications and standards, and supply sufficient data for documentation of detail engineering designs. Before implementation of surveys, the Consultant must carry out thorough studies on existing documents and data in the previous stages (FS, JETRO). Based on the findings from the studies, the Consultant makes and submit detailed plans for VEC's approval to implement. Scope of the work are mainly, but not limited, as follows:

(i) Topographic survey

- Class IV primary control points (national coordinate system VN2000): Installed with GPS technology, mark specification is in accordance with standard 22 TCN 263-2000. Each mark's distance is about 3-4 km along the expressway route, and at least 4 marks/ point at points of intersection and large bridges such as Ky Lam, Tam Ky.... and at least 2 marks/ point for the other interchanges and bridges. The marks along the route and at the large bridges and interchanges should be arranged reasonably to avoid overlapping.

- Class IV leveling network: Installed with highly accurate geometric leveling equipment. Marks of IV class leveling network share same positions with those of IV class primary control points. Its errors are varied within standard 22 TCN 263-2000.

- Secondary control point (traverse net): measured with electronic tachometer which has accuracy and errors according to standard 22 TC 263-2000. Each mark's distance is about 150m-200 m/1 point along the expressway route, and at least 8 marks/ point for points of interchange and large bridges and at least 4 marks/ point for the other interchanges and bridges. The marks along the route and at the large bridges, interchanges should be arranged reasonably to avoid overlapping.

- Technical leveling network: Marks of technical leveling networks share same positions with those of secondary control point. It is measured with highly accurate geometric leveling equipment. Its accuracy and error is in line with standard 22 TCN 263-2000.

- Site planning: According to the alignment determined in FS, a site plan at scale of 1/1000 is made along the route, with measurement range in the expressway from center line to sides of 70 m and that in level crossing (traverse) from center line to sides of 50 m. The site plan is required to have full description of topography, ground objects, underground and surface structures, high voltage and low voltage lines, ground communication lines, railway signals, location of lakes and ponds, system of irrigation and canals, special ground objects, historical site, temples, pagodas, feretories, cemeteries, and administrative land boundary, etc as well as GPS marks, and secondary control points.

- Detailed stakeout works: According to the above site plan at scale of 1/1000, alignment design must comply with the specification and is agreed with relevant authorities (locality, military, etc). Based on system of secondary control points, official setting out in the field includes: top marking, marking in the curve, main stakeout in TS, TC, P, ST, CT; and detailed stake arrangement with max. distance of lower than 20m/ stake, and main stakes in the curve and in changed terrains and stakes of ground objects, culverts, control stakes, locations in planned industrial and urban zones (focusing on starting points and ending points) boundary of communes and districts, etc. Main stakes at top of curves, in TS, TC, P, ST, CT, Km, culverts, bridges, intersection, etc must be concreted according to standard 22 TCN 263-2000.

- Survey of longitudinal section at horizontal scale of 1/1000, and vertical scale of 1/100.

- Survey of cross-section at scale of 1/200. Surveying range is 70 m from center line to both sides of the expressway.

- Survey of culverts for drainage: Planimetric survey of the culverts with span (width) of more than 1.5m is at scale of 1/500 at the culverts, and axial measurement range of 100 m and horizontal one of 100 m for each side. The axial survey of dyke's center line, horizontal survey of dyke, and road crossing at all points of dyke's center line are at scale of 1/200. Surveying range includes range of planimetric survey of the culverts. Intersection angle is surveyed between road and culvert center lines. It is necessary to agree in writing with the relevant agencies on irrigation culverts.

- Survey of intersection points with the other works such as railways, high-voltage and low-voltage lines, communication lines including phone lines, electricity and lighting structures, post and communication cables and underground structures in the expressway routes consists of the following works: measurement of height of rail top at the intersection points with the existing routes; investigation of planned elevation of crossroad, if any; survey of elevation and locating alignment and electrical poles (by coordinate), survey of at least two adjacent poles, intersection angle between lines and perpendicular lines, distance from the center line to the poles, height of the poles, clearance between the lowest lines and natural surface; and survey of kinds of poles, electricity, cables, pipeline, electric transmission grid, managing agencies.

- Survey of interchanges: Identify crossroad intersecting with designed route (coordinate, station); identify the intersection angle, width of road base, kind of pavement, existing structure, kinds of vehicle, etc in the interchanges; stake out concrete/ iron piles at centerlines, starting points, ending points, top points, and basic points in the curve; make site plan with scale of 1/500 with measurement range within designed interchange range; survey longitudinal section of interchanges and its branches with length scale of 1/1000 and height scale of 1/100; survey cross-section of interchange at scale of 1/200 and distance from centerline to each side of 50m, and survey range is equal to site plan one.

- Survey of bridge: Make elevation plan at construction place of bridge at scale of 1/500; survey profile of bridge at scale of 1/500 at center line of the expressway; stake center line of the bridge with accuracy equivalent to that of secondary control points (it is noted to collect hydrographic and hydraulic data, and the documents agreed with local authorities on plan of rivers, dykes and hydraulic works. It is necessary to survey meteorological data such as: temperature, wind, rainfall, humidity, earthquake, and figures of flow rate, velocity and water level.

- Survey of residential underpass culverts: Make plan at scale of 1/500 with distance from center line to two sides of 200m and 100m respectively along the main route; survey longitudinal section at center line of residential underpass culverts at scale of 1/500, surveying distance from the centerline to each side of 100 m; survey cross section at distance from the centerline to each side of 30 m at scale of 1/200; survey the intersection angle between the interchange and the main route; survey kinds of intersection (district ones, commune ones, and ward ones), scale and plans (if any). Survey profile of intersection at scale of 1/500, at distance from the expressway's centerline to each side of 200m, and survey cross section of intersection at scale of 1/200 from the intersection's centerline to each side of 30m.

- Survey of canals and dykes: Identify location and boundary of canals and dykes; set plan at scale of 1/500 in boundary of canals and dykes; survey longitudinal section of canals and dykes at scale of 1/1000, and their height at scale of 1/100; survey their cross section at scale of 1/100, at distance from their centerline to each side of 20m.

- Survey of toll plazas, control centers, service station, expressway management offices, bus station, communication stations: Establish area control points equivalent to secondary control points; survey topographic plan at scale of 1/500.

- Survey and investigation of land acquisition and resettlement.

(ii) Survey of hydrographical data

- Collect meteorological and hydrographical data related to rainfall, wind, and temperature, humidity from meteorological stations, and flow rate and water level at hydrographical stations in rivers in the project area.
- Collect relevant documents and work with Ministry and provincial departments of agriculture and rural development to agree with bridge designs. In terms of the culverts over irrigation systems, it is necessary to work with relevant authorities and local governments to gain agreement on culvert location, width, and required elevation from its bottom.
- Survey water level along each 1 km distance of the expressway, forming 1 water level group (each water level includes: highest one, frequent one, average one, and lowest one in 3 consecutive years; survey causes and period of flood....For drainage culverts, survey water level groups (each water level includes: highest one, frequent one,

average one, and lowest one in 3 consecutive years). Survey year and causes of flood. Illustrate surveyed water level groups in the site plan.

- Survey situation of existing drainage works, irrigational system along and through the route, identify existing cross-section of canals and dykes, their top width, bottom width, depth, bottom elevation, functions, flow direction and longitudinal slope, and mark at their side.
- Survey fully existing situation of drainage, utility purposes and managing agencies of irrigation systems along and through the route.
- Hydrologic survey of bridge: Measure cross-section of flow; survey the water level in form of 3 groups at each location of bridge including: highest one, frequent one, average one, and lowest one in 3 consecutive years, causes and duration of flood.
- Hydraulic and hydrologic calculation: Based on survey data, carry out hydrologic calculation for the engineering design such as designed water level along the route, and hydraulic and hydrologic calculation of bridges and culverts (flow rate, velocity, and water level, general and local scour).

(iii) Engineering geological survey:

Deleted here under….

APPENDIX D: SPECIFICATIONS

Table of Contents

SPECIFICATIONS

1. General

The Specifications mentioned hereunder has been designed in order that the Sub-consultant shall carry out the Hydrological Survey of Danang - Quang Ngai Expressway with an approximate length of 140km.

2. Objective of the Work

The objective of the Work is to obtain accurate meteorological and hydrological data along the project area necessary for the detailed design of the proposed expressway, and further to provide reports together with drawings required.

3. Location of the Work

The proposed expressway starts at the beginning point located within Danang City, passes Quang Nam Province and extends to the ending point located within Quang Ngai Province.

Detailed stations, rivers and locations to be surveyed shall be provided by the Consultant to Sub-consultant timely.

4. Scope of the Work

The Sub-consultant shall carry out the survey works stipulated in the Terms of Reference (TOR) of the consulting service contract, and summarized in the next page.

The Works covered by the Specifications includes furnishing all technical staff, labors, materials, equipment and supplies required to perform the Hydrological Survey for the detailed design of the project.

Quantity of the Works shall be as specified in Appendix E-Bill of Quantities (BOQ).

5. Datum for Coordinates and Elevation

The following datum shall be applied to the coordinates and elevation.

(1) Coordinates:

National Coordinate System (VN2000)

Ellipsoid:	WGS84
Projection:	Transverse Mercator (Zone width: 3 degrees)
Central Meridian:	108.00.00 East
Scale Factor:	K=0.9999

(2) Elevation:

National Elevation System (Hon Dau Island, Hai Phong)

6. Unit of Measurement

Unit of measurement shall be the metric system.

7. Language

All correspondences, figures, drawings and reports shall be made in both English and Vietnamese.

8. Work Plan

The Sub-consultant shall submit the draft Work Plan not later than 17 October 2011 for the checking by the Consultant.

The Work Plan shall include:

(a) Work schedule
(b) Organization chart and member list of all survey groups to be assigned
(c) Emergency communication network
(d) List of survey equipment to be used with certificates
(e) Proposal for preparation of staff gauges to read water level in rivers
(f) Proposal of survey for finding the elevation of readings of staff gauges
(g) Proposal of flow velocity survey in rivers
(h) Proposal of water level survey forming group of highest, frequent, average and lowest along the expressway alignment and at locations of bridges and culverts.
(i) Formats for survey data compilation
(j) Others

9. Technical Standards to be Referred

The Hydrological Survey shall be carried out in accordance with the stipulation in the TOR with reference to the following Vietnamese standards. In case, the Sub-consultant would find any discrepancy between the TOR and Vietnamese standards, the Sub-consultant shall immediately report it to the Consultant for further direction.

Hydrological Survey	22TCN263-2000

10. Methodology of the Work

Supplemental to the above standards, each survey item shall be carried out in accordance with the following procedures and methodologies.

10.1 Data Collection

10.1.1 Collection of annual maximum daily rainfalls of following stations:

(a) Da Nang (1964 - 2010)
(b) Cau Lau (1977 - 2010)

(c) Tam Ky (1977 - 2010)
(d) Tra My (1979 - 2010)
(e) Tra Bong (1976 - 2010)
(f) Quang Ngai (1964 - 2010)
(g) Gia Vuc (1981 - 2010)

Data should be collected from Hydro Meteorological Center, Hanoi

10.1.2 Collection of annual maximum rainfall amounts of 5, 15, 30, 45 and 60 minute of Da Nang station duration during 1986 to 2010.
OR
Collection of rainfall intensity duration frequency (IDF) curve of Da Nang station with equation and constants.

Data should be collected from Hydro Meteorological Center, Hanoi

10.1.3 Collection of mean monthly air temperature, wind speed, evaporation and relative humidity of Da Nang station during 2001 to 2010.

Data should be collected from Hydro Meteorological Center, Hanoi

10.1.4 Collection of annual maximum discharges of rivers with catchment areas of following stations:

(a) Thu Bon River: Nong Son station (1977 – 2010)
(b) Vu Gia River: Thanh My station (1977 – 2010)
(c) Tra Khuc River: Son Giang station (1979 – 2010)

Data should be collected from Hydro Meteorological Center, Hanoi

10.1.5 Collection of annual maximum and minimum water levels of rivers of following stations:

(a) Thu Bon River: Giao Thuy station (1976 – 2010) and Cau Lau station (1976 – 2010)
(b) Vu Gia River: Ai Nghia station (1976 – 2010)
(c) Tra Khuc River: Son Giang station (1977 – 2010) and Tra Khuc station (1977 – 2010)
(d) Other River: Cam Le station (1976 – 2010)

Data should be collected from Hydro Meteorological Center, Hanoi

10.1.6 Collection of hourly water levels and rainfalls of one week during the highest flood in 2009:

10.1.6.1 Hourly water levels of 7 days of following stations:

(a) Thu Bon River: Giao Thuy and Cau Lau stations
(b) Vu Gia River: Ai Nghia station
(c) Tra Khuc River: Son Giang and Tra Khuc stations
(d) Other River: Cam Le station

10.1.6.2 Hourly rainfall of 7 days of following stations:

(a) Da Nang
(b) Tra My
(c) Tam Ky
(d) Quang Ngai

Data should be collected from Hydro Meteorological Center, Hanoi

10.2 Survey Works

10.2.1 River Water Level and Velocity of Flow Survey

10.2.1.1 Ky Lam River (KM 17+662):

(a) Scope of Survey

- Water level survey
- Velocity of flow survey

(b) Location of survey

- Along the railway bridge in Ky Lam River.

(c) Frequency of survey

i. Water level survey
   - Conduct survey for 61 days during October, November and December 2011.

ii. Velocity of flow survey
   - Conduct survey during only one high flood in November or December 2011.

(d) Position of survey

i. Water level survey
   - Read daily water levels of the river from the staff gauge on pier P1 (piers should be counted in direction from Da Nang to Quang Ngai) of railway bridge.

ii. Velocity of flow survey

Water level and velocity of flow survey should be conducted at 3 positions in the river as mentioned below,

- At mid-section between piers P1 and P2 of rail way bridge.
- At mid-section between piers P5 and P6 of rail way bridge.
- At mid-section between last pier (P9) and abutment (A) of railway bridge.

(e) Method of survey

i. Water level survey

- Read daily water levels of the river thrice a day at 6:00, 12:00 and 18:00 hours from the staff gauge on pier P1 of railway bridge.
- Staff gauge on the pier of railway bridge measures water levels below from the bridge, therefore, scale of the staff gauge should be changed into elevations. Readings of staff gauge and their corresponding elevations should be provided.

ii. Velocity of flow survey

- Measure water levels and velocities in river about 0.5 m below water surface at 20 minutes intervals along the railway bridge.
- Staff gauges on piers of railway bridge can be used for reading water levels during survey. But scale of the staff gauges on piers should be changed into elevations. Readings of staff gauges and their corresponding elevations should be provided.
- Verify with local residents whether water level in the river frequently crosses 3.0 m mark on staff gauges of piers or not. If not then consult with consultant.
- Water level observer should inform to survey team when water level in river starts rising above 3.0 m mark on staff gauges of railway bridge piers.

(f) Start of survey

i. Water level survey

- Start survey from 29th October 2011.

ii. Velocity of flow survey

- Survey should be started when water level in the river starts rising above 3.0 m mark on staff gauges of piers of railway bridge after heavy rainfall.

(g) End of survey

i. Water level survey

- Stop survey on 28th December 2011.

ii. Velocity of flow survey

- Stop survey when water level starts receding after attaining peak level and falls to 3.0 m mark on staff gauges of piers of railway bridge.

(h) Reporting

i. Water level survey

- Provide elevations of daily water levels (m) in river at 6:00, 12:00 and 18:00 hours during October, November and December 2011.
- Provide survey data sheets.
- Amount of rainfalls in catchments during the survey should be provided.
- Survey report should be prepared and submitted.

ii. Velocity of flow survey

- Provide water level elevations (m) and corresponding velocities (m/s) of 20 minutes intervals at 3 positions of the river.
- Provide the survey data sheets and information on current meters used.
- Survey report should be prepared and submitted.

10.2.1.2 Chiem Son River (KM 20+185):

(a) Scope of survey

- Water level survey
- Velocity of flow survey

(b) Location of survey

- Along the railway bridge in Chiem Son River

(c) Frequency of survey

i. Water level survey

- Conduct survey for 61 days during October, November and December 2011.

ii. Velocity of flow survey

- Conduct survey during only one high flood in November or December 2011.

(d) Position of survey

i. Water level survey

- Read daily water levels of the river from the staff gauge on last pier P8 (piers should be counted in direction from Da Nang to Quang Ngai) of railway bridge.

ii. Velocity of flow survey

Water level and velocity of flow survey should be conducted at 3 positions in the river as mentioned below,

- At mid-section between piers P2 and P3 of railway bridge.
- At mid-section between piers P6 and P7 of railway bridge.
- At mid-section between last pier (P8) and abutment (A) of railway bridge.

(e) Method of survey

i. Water Level survey

- Read daily water levels of the river thrice a day at 6:00, 12:00 and 18:00 hours from the staff gauge on pier P8 of railway bridge.
- Staff gauge on the pier of railway bridge measures water levels below from the bridge, therefore, scale of the staff gauge should be changed into elevations. Readings of staff gauge and their corresponding elevations should be provided.

ii. Velocity of flow survey

- Measure water levels and velocities in river about 0.5 m below water surface at 20 minutes intervals along the railway bridge.
- Staff gauges on piers of railway bridge can be used for reading water levels during survey. But scale of

the staff gauges on piers should be changed into elevations. Readings of staff gauges and their corresponding elevations should be provided.

- Verify with local residents whether water level in the river frequently crosses 5.0 m mark on staff gauges of piers or not. If not then consult with consultant.
- Water level observer should inform to survey team when water level in river starts rising above 5.0 m mark on staff gauges of railway bridge piers.

(f) Start of survey

i. Water level survey
   - Start survey from 29th October 2011.

ii. Velocity of flow survey
   - Survey should be started when water level in the river starts rising above 5.0 m mark on staff gauges of piers of railway bridge after heavy rainfall.

(g) End of survey

i. Water level survey
   - Stop survey on 28th December 2011.

ii. Velocity of flow survey
   - Stop survey when water level starts receding after attaining peak level and falls to 5.0 m mark on staff gauges of piers of railway bridge.

(h) Reporting

i. Water level survey
   - Provide elevations of daily water levels (m) in river at 6:00, 12:00 and 18:00 hours during October, November and December 2011.
   - Provide survey data sheets.
   - Amount of rainfalls in catchments during the survey should be provided.
   - Survey report should be prepared and submitted.

ii. Velocity of flow survey

- Provide water level elevations (m) and corresponding velocities (m/s) of 20 minutes intervals at 3 positions of the river.
- Provide the survey data sheets and information on current meters used.
- Survey report should be prepared and submitted.

10.2.1.3 Tam Ky River (KM 68+308):

Water flow in this river is controlled by dam, Phu Nhin Lake, at upstream parts. Therefore, water level survey and velocity of flow survey will not be carried out in this river. It is out of scope.

10.2.1.4 Tra Bong River (KM 109+320):

(a) Scope of survey
- Water level survey
- Velocity of flow survey

(b) Location of survey
- River section along the expressway centerline

(c) Frequency of survey

i. Water level survey
- Conduct survey for 61 days during October, November and December 2011.

ii. Velocity of flow survey
- Conduct survey during only one high flood in November or December 2011.

(d) Position of survey

i. Water level survey
- Read daily water levels of the river preparing staff gauge at one side of the river near the bank.

ii. Velocity of flow survey

Water level and velocity of flow survey should be conducted at 3 positions in the river as mentioned below,
- At 15 m inside water from left bank of river.
- At main flow or middle position of river.
- At 15 m inside water from right bank of river.

(e) Method of survey

i. Water level survey

- Prepare staff gauge at one side of river near the bank to measure water levels in river. Mark elevations on the staff gauge at intervals of 0.10 m.
- Read water levels of the river thrice a day at 6:00, 12:00 and 18:00 hours from the staff gauge.

ii. Velocity of flow survey

- Measure water levels and flow velocities in river about 0.5 m below water surface at intervals of 60 minutes at river section along the expressway centerline.
- Prepare staff gauge at one side of river near bank to measure water levels. Mark elevations on the staff gauge at intervals of 0.10 m.
- Verify with local residents whether water level in the river frequently crosses 4.0 m level or not. If not then consult with consultant.
- Water level observer should inform to survey team when water level in river starts rising above 4.0 m on staff gauge.
- Use motor boats for conducting velocity of flow survey at river section along the expressway centerline.

(f) Start of survey

i. Water level survey

- Start survey from 29th October 2011.

ii. Velocity of flow survey

- Start survey when water level in the river starts rising above 4.0 m elevation on the staff gauge after heavy rainfall.

(g) End of survey

i. Water level survey

- Stop survey on 28th December 2011.

ii. Velocity of flow survey

- Stop survey when water level starts receding after attaining peak level and falls to 4.0 m on staff gauge.

(h) Reporting

i. Water level survey

- Provide elevations of daily water levels (m) in river at 6:00, 12:00 and 18:00 hours during October, November and December 2011.
- Provide survey data sheets.
- Amount of rainfalls in catchments during the survey should be provided.
- Survey report should be prepared and submitted.

ii. Velocity of flow survey

- Provide water level elevations (m) and corresponding velocities (m/s) of 60 minutes intervals at 3 positions of the river.
- Provide the survey data sheets and information on current meters used.
- Survey report should be prepared and submitted.

10.2.1.5 Tra Khuc River (KM 125+700):

(a) Scope of survey

- Water level survey
- Velocity of flow survey

(b) Location of survey

- River section along the expressway centerline.

(c) Frequency of survey

i. Water level survey

- Conduct survey for 61 days during October, November and December 2011.

ii. Velocity of flow survey

- Conduct survey during only one high flood in November or December 2011.

(d) Position of survey

i. Water level survey

- Read daily water levels of the river installing staff gauge at station KM 125+966 in the river.

ii. Velocity of flow survey

Water level and velocity of flow survey should be conducted at 3 positions in the river as mentioned below,

- At station KM 125+446 in river along the expressway centerline.

- At station KM 125+800 in river along the expressway centerline.
- At station KM 125+950 in river along the expressway centerline.

(e) Method of survey

i. Water level survey

- Install a staff gauge at station KM 125+966 with marking elevations at intervals 0.10 m to read water levels.
- Read water levels of the river thrice a day at 6:00, 12:00 and 18:00 hours from the staff gauge in the river.

ii. Velocity of flow survey

- Measure water level and velocity of flow in river about 0.5 m below water surface along the expressway centerline.
- Install a staff gauge at station KM 125+966 with marking elevations at intervals 0.10 m to read water levels.
- Verify with local residents whether water level in the river frequently crosses 8.5 m level or not. If not then consult with consultant.
- Water level observer should inform to survey team when water level in river starts rising above 8.5 m on staff gauge.
- If water level on staff gauge starts rising above 8.5 m after heavy rainfall, then go to site and start watching water level in river.
- Velocity of flow survey should be conducted renting a motor boat with sailing slowly straight along the centerline during peak water level.
- Velocity of flow should be measured by three current meters together.

(f) Start of survey

i. Water level survey

- Start survey from 29th October 2011.

ii. Velocity of flow survey

- When water level rises above 8.5 m on staff gauge and attains peak level and stops rising then carry out velocity survey (for only one time).

(g) End of survey

i. Water level survey

- Stop survey on 28th December 2011.

ii. Velocity of flow survey

- Stop survey by conducting only one flow velocity survey during peak water level.

(h) Reporting

i. Water level survey

- Provide elevations of daily water levels (m) in river at 6:00, 12:00 and 18:00 hours during October, November and December 2011.
- Provide survey data sheets.
- Amount of rainfalls in catchments during the survey should be provided.
- Survey report should be prepared and submitted.

ii. Velocity of flow survey

- Provide water level elevation (m) and corresponding velocities (m/s) of 3 positions of the river.
- Provide the survey data sheets and information on current meters used.
- Survey report should be prepared and submitted.

10.2.2 Water Level Survey along the Expressway Alignment and at Locations of Bridge and Culverts in the Expressway

(a) Scope of survey

- Conducting water level survey forming a group of highest one, frequent one, average one and lowest one along the expressway alignment at intervals of 1.0 KM and at all proposed locations of bridges and culverts on the expressway.

(b) Location of survey

- Water level survey should be conducted at 1.0 KM intervals in whole length of expressway alignment (from KM0+000 – KM139+522) where existing elevation of ground along the expressway alignment is less than 25.0 m from mean sea level.

- Water level survey should be conducted at all proposed bridges and culverts locations in whole length of the expressway alignment (from KM0+000 – KM139+522) regardless of ground elevation of expressway alignment from mean sea level.

(c) Method of survey

(c.1) For water level group of highest one

(c.1.1) For sections of expressway alignment mentioned below,

i. Section between KM 0+000 – KM 21+000
ii. Section between KM 65+000 – KM 77+000
iii. Section between KM 101+000 – KM 111+000
iv. Section between KM 124+000 – KM 129+000

The high water level survey should be conducted as follows in the mentioned sections:

- High water level survey of 1964, 1999, 2003 and 2007 have already been conducted in previous study. Therefore, it should be updated with including the high water level survey of 2009.
- Survey should be conducted for high water level of 2009 at intervals of 1.0 KM along the expressway centerline and at all proposed bridges and culverts locations.
- Report on high water level survey of 1964, 1999, 2003 and 2007 should be received from the consultant and update it with including surveyed high water level of 2009.

(c.1.2) For remaining sections of expressway alignment

- High water level surveys were not conducted in previous studies on the remaining sections of the expressway alignment.
- Therefore, water level survey should be conducted for high water levels of 1964, 1999, 2003, 2007 and 2009 floods.

(c.2) For water level groups of frequent one, average one and lowest one

The water level survey should be conducted as follows:

- Survey was not conducted for water level groups of frequent one, average one and lowest one in previous studies.
- Therefore, water level survey should be conducted forming groups of frequent one, average one and lowest one.

- Water level survey should be conducted at intervals of 1.0 KM along the expressway centerline in whole length of expressway alignment (from KM0+000 – KM139+522) where existing elevation of ground along the expressway alignment is less than 25.0 m from mean sea level.
- Water level survey should be conducted at all proposed bridges and culverts locations in whole length of expressway alignment (from KM0+000 – KM139+522) regardless of ground elevation of expressway alignment from mean sea level.
- Water level should be surveyed for three consecutive years of 2008, 2009 and 2010 forming groups of frequent one, average one and lowest one.

(d) Start of survey
- Start water level survey from second week of October 2011.

(e) End of survey
- End survey by the end of first week of November 2011.

(f) Reporting
- Surveyed years and corresponding water levels should be illustrated on site plan for each group individually.
- Causes and duration of floods should be mentioned in the report.
- Survey report should be prepared and submitted.

11 General Work Sequence of Hydrological Survey

General work sequence can be as follows:

1) The Consultant provides the name of stations, data type and duration for hydro-meteorological data collection.
2) The Consultant provides intervals along the expressway alignment and stations of proposed bridges, viaducts and culverts on the expressway for water level survey.
3) The Consultant provides locations, positions, intervals and duration for water level survey and velocity of flow survey in rivers.
4) The Sub-consultant should provide the digital files of hydro-meteorological data, survey results and survey reports to the Consultant.
5) The Sub-consultant should prepare reports on hydrological survey and submit to the Consultant.
6) The Sub-consultant should provide the hydro-meteorological data and survey data of highest flood level along the expressway alignment at the earliest to start hydrological analysis.
7) The Sub-consultant should provide trainings to their staffs for carrying out the

hydrological survey. The Sub-consultant should consult with the Consultant if any further clarification needed to conduct hydrological survey.

12. Time Schedule of the Work

The Works shall be commenced immediately after signing of the Contract or the issuance of the Notice to Proceed by the Consultant. All the Work shall be completed not later than 18 December 2011. The Sub-consultant shall submit the detailed plan and schedule to the Consultant.

13. Supervision of the Work

The Consultant has the right to supervise all of the works and to approve the plan of operation, work methods and progress of the Work. The Consultant also has the right to accept and reject the results of the Work.

14. Other Requirements

The Sub-consultant shall arrange at his own expenses so that he may have free access to the land required for performing the Works, whether it may be under the ownership of the Government or the third parties. The Sub-consultant shall indemnify any damages to the land and associated properties.

15. Final Products

The Sub-consultant shall submit the final products listed below in principle.

The Sub-consultant shall confirm with the Consultant for the format and quantities of the final products sufficiently advance to the submission.

After confirmation of the format and quantities of the final products, the Sub-consultant shall submit draft version(s) for approval of the Consultant.

The Consultant shall check the format and quality, and make necessary instruction timely in order to achieve acceptable quality of the products.

1) Hydro-meteorological data	15 sets of hard copy and soft data
2) Survey results	15 sets of hard copy and soft data
3) Survey report	15 sets of hard copy and soft data

Hydro-meteorological data, river water level survey data and river flow velocity survey data should be provided in Excel format. The data of water level survey along the expressway alignment and at locations of bridges and culverts in the expressway should also be provided in Excel format.

However, water level survey data along the expressway alignment and at locations of

bridges and culverts should also be presented in A3 size drawings by AutoCAD forming a group of highest, frequent, average and lowest water levels with station nos. of expressway alignment, bridges and culverts. All the drawings shall be produced using the drawing frame approved by the Consultant. Each drawing will be labeled with the date of generation, unique drawing number, version number and scheme section.

In order to make report of a reasonable size, the Sub-contractor may split the information into manageable parts with the approval of the Consultant.

Survey results shall include calculation results, observation sheets, photographs, etc. The forms and data sheets used in the Survey results shall be approved by the Consultant prior to the preparation.

Survey report shall describe the survey method adopted, equipment used, work schedule, difficulties encountered and its solutions, final results of the survey, etc. The forms and data sheets used in the Survey report shall be approved by the Consultant prior to the preparation.

Sub-consultant shall submit Proof Copies before finalizing reports. Proof Copies of reports shall consist of two (2) hard copies. The Consultant will return one (1) copy within two (2) weeks of receipt with any corrections to be made annotated on the copies.

The approved final reports shall be retained by the Sub-consultant for a period of one (1) year from the issue of the corresponding survey report, during which time they shall be made available to the Consultant on request and copies supplied to the Consultant when instructed.

APPENDIX-E BILL OF QUANTITIES
(HYDROLOGICAL SURVEY WORKS)

Exchange Rate USD 1 = VND 21,000

No.	Item	Specifications	Station/ River/Location	Days/Years/ Points/Nos./ Length	Unit	Unit price (VND)	Unit price (USD)	Quantity	Amount (VND)	Amount (USD)	Equivalent Total (VND)	Equivalent Total (USD)
1	**Data collection**									5,550	116,550,000	5,550
1.1	Rainfall	Annual maximum daily rainfall (one data/year	7 stations	1964-2010	year	---	5	259	---	1,295	27,195,000	1,295
1.2	Rainfall intensities Annual maximum rainfall amounts of 5, 15, 30, 45 and 60 minute of same staion	Annual maximum 5 minute rainfall (one data/year	1 station	1986-2010	year	---	5	25	---	125	2,625,000	125
		Annual maximum 15 minute rainfall (one data/year	1 station	1986-2010	year	---	5	25	---	125	2,625,000	125
		Annual maximum 30 minute rainfall (one data/year	1 station	1986-2010	year	---	5	25	---	125	2,625,000	125
		Annual maximum 45 minute rainfall (one data/year	1 station	1986-2010	year	---	5	25	---	125	2,625,000	125
		Annual maximum 60 minute rainfall (one data/year	1 station	1986-2010	year	---	5	25	---	125	2,625,000	125
1.3	Rainfall intensity duration frequency (IDF) curve	IDF curve of annual maximum rainfall intensities	1 station	1	nos.	---	500	1	---	500	10,500,000	500
1.4	Mean monthly meteorological data (air temperature, wind speed, evaporation and relative humidity)	Monthly air temperature	1 station	2001-2010	year	---	5	10	---	50	1,050,000	50
		Monthly wind speed	1 station	2001-2010	year	---	5	10	---	50	1,050,000	50
		Monthly evaporation	1 station	2001-2010	year	---	5	10	---	50	1,050,000	50
		Monthly relative humidity	1 station	2001-2010	year	---	5	10	---	50	1,050,000	50
1.5	River discharge	Annual maximum discharge of river (one data/year	3 stations	1977-2010	year	---	5	100	---	500	10,500,000	500
1.6	Annual maximum and minimum water level of river	Annual maximum water level of river (one data/year)	6 stations	1976-2010	year	---	5	208	---	1,040	21,840,000	1,040
		Annual minimum water level of river (one data/year)	6 stations	1976-2010	year	---	5	208	---	1,040	21,840,000	1,040
1.7	Hourly water levels and rainfalls of 7 days during high flood of 2009	Hourly water levels of stations	6 stations	7	day	---	5	42	---	210	4,410,000	210
		Hourly rainfalls of stations	4 stations	7	day	---	5	28	---	140	2,940,000	140
2	**Survey works**										**772,562,169**	**37,391**
2.1	**Water level survey for large bridges (Ky Lam, Chiem Son, Tra Bong, Tra Khuc)**									**0**	**471,318,200**	**22,444**
1	Purchasing enamel gauge	Staff gauges for water level reading	4 rivers	Length	M	500,000	---	20	10,000,000	---	10,000,000	476
2	Leveling class IV	Survey to find elevations of staff gauges readings		Length	km	1,190,910	---	20	23,818,200	---	23,818,200	1,134
3.1	Labor cost for Supervison of water level	One engineer for 4 river		61days	person	1,807,692	---	65	117,500,000	---	117,500,000	5,595
3.2	Labor cost for measuring of water level	Number of day for measuring of water level in Ky Lam, Chiem Son, Tra Bong and Tra Khuc Rivers (1person/1 river x61days+4day travelling)		260 days	person	1,230,769	---	260	320,000,000	---	320,000,000	15,238
2.2	**Water velocity survey for large bridges (Ky Lam, Chiem Son, Tra Bong)**									---	**110,192,308**	**5,247**
1	Labor cost for Supervison	One engineer for 3 river	3 rivers	7 days	person	1,807,692	---	7	12,653,846	---	12,653,846	603
1.1	Labor cost for measuring of flow velocity	Number of day for measuring flow velocity of 3 bridges Ky Lam, Chiem Son, Tra Bong (3 bridges, 3 person/bridge, 1 day measuring+4day travelling+2day standby		63 days	person	1,230,769	---	63	77,538,462	---	77,538,462	3,692
2	Material for measuring of flow velocity	Accessories for flow velocity measurements		3	river	5,000,000	---	3	15,000,000	---	15,000,000	714
3	Rental fee for velocity measuring equipment (total 10 sets, 3 sets/1 river and 1 set for stand-by, time for measuring is 1	Current meters for flow velocity measurements		3	days	500,000	---	10	5,000,000	---	5,000,000	238
2.3	**Water velocity survey for large bridges (Tra Khuc)**									---	**108,538,462**	**5,771**
	Labor cost for Supervison	One engineer	1 river	7 days	person	1,807,692	---	7	12,653,846	---	12,653,846	603
1	Labor cost for measuring of flow velocity	Number of day for measuring flow velocity Trà Khúc river (3 velocity cross section, 3 person/ velocity cross section, 1 day measuring+4day travelling+2day standby		63 days	person	1,230,769		63	77,538,462	---	77,538,462	3,692
2	Renting boat for flood velocity measurement at Tra Khuc river (3 boats x 2 day/1 flood, where 1 boat is for provision of	Boats for flow velocity measurements during one high flood in the river		12	days	2,000,000		12	24,000,000	---	24,000,000	1,143
3	Material for measuring of flow velocity	Accessories for flow velocity measurements		1	river	5,000,000		1	5,000,000	---	5,000,000	238
4	Rental fee for velocity measuring equipment (total 4 sets, 3 sets/1 river and 1 set for stand-by, time for measuring is 1	Current meters for flow velocity measurements		4	days	500,000		4	2,000,000	---	2,000,000	95
2.4	**Water level survey forming highest, frequent, average and lowest groups**								---	**3,929**	**82,513,200**	**3,929**
1	Survey points along expressway alignment at intervals of 1.0 KM	Water level survey should be conducted along the expressway alignment at intervals of 1.0 KM and at all proposed locations of bridges, viaducts and culverts on the expressway forming 4 groups (highest one, frequent one, average one and lowest one)	135 locations	1	points		8.36	135	---	1,129	23,700,600	1,129
2	Survey points at 5 large river bridges		5 rivres	3	points		8.36	15	---	125	2,633,400	125
3	Survey points at other river, stream and canal bridges		51 rivers or streams or canals	1	points		8.36	51	---	426	8,953,560	426
4	Survey points at box and pipe culverts		269 locations	1	points		8.36	269	---	2,249	47,225,640	2,249
	Sub-Total (1)+(2)										**889,112,169**	**42,941**
3	**Direct cost**										**48,673,365**	**2,318**
1	Air ticket Engineer(4 persons x 2ways)				ticket	1,500,000		8	12,000,000	---	12,000,000	571
3	Car rental for mesuring				LS	-		1	10,000,000	---	10,000,000	476
4	Reporting (3%)				LS	-		1	26,673,365	---	26,673,365	1,270
5	**Total (1)+(2)+(3)**										**937,785,534**	**45,259**
6	**VAT**										**93,778,553**	**4,526**
7	**Total amount (including VAT)**										**1,031,564,088**	**49,785**