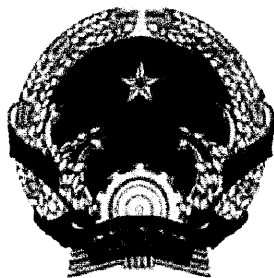


**GOVERNMENT OF SOCIALIST REPUBLIC OF VIET NAM
MINISTRY OF TRANSPORT**



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

**Contract
for
Public Utility Survey Works**

BETWEEN

JOINT VENTURE OF NK – NEC – CHODAI - TEC

AND

E&R ENGINEERING CONSULTANTS JOINT STOCK COMPANY

Dated: 10 SEPTEMBER 2012

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CONTRACT AGREEMENT
ON
PUBLIC UTILITY SURVEY
FOR
CONSULTING SERVICES FOR DETAILED DESIGN FOR
DANANG - QUANG NGAI EXPRESSWAY DEVELOPMENT PROJECT
PROJECT ID NO. P106235
IDA CREDIT NO. 3843-VN

This Contract made and entered into this 10 September 2012, by and between:

Joint Venture of NK - NEC - Chodai - TEC duly organized and existing under the laws of Vietnam, with its principal office located at Unit 2, 11th floor, PVFC Building, Lot A2.1, 30 April Street, Hai Chau District, Danang City (hereinafter referred to as the "Consultant") and E&R Engineering Consultants Joint Stock Company, duly organized and existing under the laws of Vietnam, with its principal office located at No.88, Me Tri Ha Road, Me Tri Commune, Tu Liem District, Hanoi, Vietnam (hereinafter referred to as the "Sub-consultant")


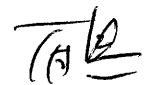
WITNESS THAT the parties covenant, promise and agree as follows:

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

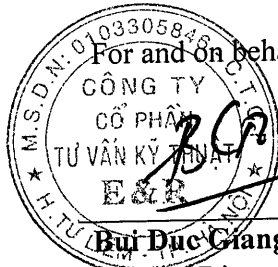

The Consultant agrees to pay the Sub-consultant in consideration of the fulfillment of the Works, the Contract Price of Twenty Three Thousand Five Hundred Forty US Dollars only (USD 23,540), including USD 2,140 of VAT, in accordance with the terms and conditions specified in Clause 2.12 of General Conditions.

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



Ichizuru ISHIMOTO
Project Manager
Joint Venture of
NK-NEC-CHODAI-TEC

For and on behalf of the Sub-consultant



Bui Duc Giang
General Director
E&R Engineering Consultants Joint Stock
Company

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 130 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 Co., Ltd..
- (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 Public Utility 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 10 September 2012 and the whole of the Works shall be completed not later than 31 October 2012.

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 or 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 indemnify 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 unit rate 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) First payment equivalent to Forty percent (40%) of the Contract Price shall be made to the Sub-consultant after approval by the Consultant for both of the following items:
 - Completion of mobilization of personnel and equipment at the Site,
 - Approval of the work plan by the Client.
- 4) Second 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, with adjustment of performed work quantities, 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.
- 8) The Sub-consultant shall issue VAT invoice for each payment.

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.
- 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 of 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 of 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 of 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 project office of the Consultant in Danang:

Danang Project Office:

Unit 2, 11th floor, PVFC Danang Building, Lot A2.1, April 30 Street, Hai Chau District, Danang City, Vietnam

Telephone: +84-(0)511-379-7961

Facsimile: +84-(0)511-379-7962

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.

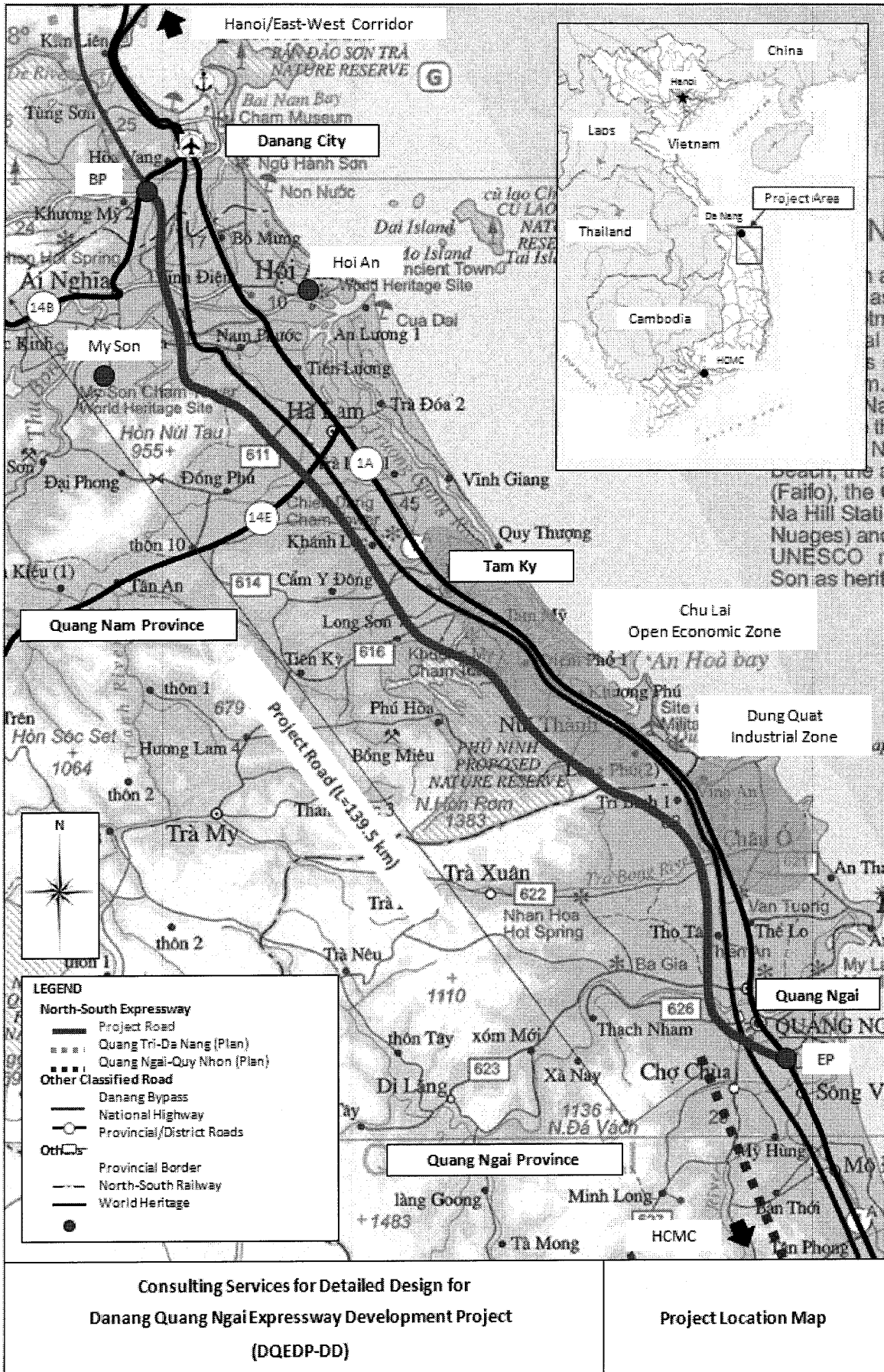
2.27 Maintenance of Security

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.

Detailed Design for Da Nang – Quang Ngai Expressway Development Project
 Appendix A: 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
Project Manager

Detailed Design for Danang-Quang Ngai Expressway
Development Project

Unit 2, 11th floor, PVFC Danang Building, Lot A2, April 30 Street,
Hai Chau District, Danang City, Vietnam

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 : Vietnam
(where the bank exists):

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

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 undertaken 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:

The Consultant is required to study thoroughly geological data in FS stage to arrange the holes drilled at stage of the engineering designs, avoiding to quantity overlapping. Requirements of geological drill are as follows:

- Engineering geological survey of normal foundation: Drill both normal foundation and culverts with two holes at the depth of 7 m per 1 km.
- Survey at special sections such as the ones which need deep excavation, embankment or soft ground ones: Drill one hole at the expressway centerline per 75 m; drill geological cross-sections with two holes for two sides and one hole at the centerline per 150 m and these cross-sections should be combined the locations of drilled culverts. Depth of borings must be enough to meet the requirements of detailed design. Carry out Vane shear test (VST) at drilled holes of the centerline at cross-section location. Distance of vane shear is 2 m to bottom of the holes..
- Engineering geological survey of bridge: Each abutment and bridge pier have one the drilled hole (location of abutment and bridge pier is identified after completion of the plan and profile of bridge's center line); the hole is 3-5 m deeper than pile foundation with the completing conditions equivalent to standard of 22 TCN 263-2000; one sample/ 2m is taken. SPT piercing in the holes is carried out with distance of 2m/ point. Test physico-mechanical properties of ground, especially in case of soft ground, test the additional parameters such as C_v , K , organic content, and compress 3 axes in form of UU and CU to provide sufficient data for soft ground treatment.
- Engineering geological survey of tunnel: Drill one hole at the expressway centerline per 50 m. Depth of borings must be enough to meet the requirements of detailed design. Testing 17 undisturbed soil samples/ each boring and 8 disturbed samples/each boring. Seismic measurement at 4 points at the depth of 50m and 8 points at the depth of 100m is carried out to identify strata structure.
- Engineering geological survey of residential underpass culvert: Drill two staggered holes at each location of the residential underpass culvert, one hole at right lane of the

expressway, and another at left one; Take one sample/ 2m; carry out SPT piercing in the holes with distance of 2m/ point.

- Engineering geological survey of toll plazas, control centers, service station, expressway management offices: each location has at least 4 holes with full depth to provide sufficient data for the design.
- Sampling and testing works is carried out in accordance with the standards of 22 TCN 259-2000, 22 TCN 263-2000, 22TCN262-2000 and enough data is required to collect to serve for detailed engineering design. For the embankments on the soft ground, it necessary to test the parameters such as Cv, K, organic content, and compress 3 axes in form of UU and CU to provide sufficient data for soft ground treatment. The Consultant shall collect and store samples, especially the ones at large bridges. These samples shall be handed over to the client upon the Project completion.

(iv) Material Source Survey

This task must be ensured to collect all data of locations of material sources which meet the requirements of the Project, are practical and feasible during construction.

- Back filling materials (borrow pits) and sand for soft ground treatment: identify exploitable soil and sand quarries; work with local governments to gain agreement in writing and then, map out them on plan at scale of 1/50,000. Collect data related to capacity and quality of each quarry; take testing sample to identify necessary parameters of back filling materials and others for soft ground treatment.
- Survey and evaluation of general situation, capacity and transportation length of the routes for exploitation and transportation to the construction site.
- Borrow pits and quarry sites for construction of bridge and culverts, pavement: For borrow pits and quarry sites which are exploited or being exploited, collect data related to their capacity and quality, exploitability, and transporting conditions to the construction site. For new borrow pits and quarry sites, carry out procedures for survey and testing necessary characteristics of each material.

(v) Survey of other relevant structures

- Survey current situations of traffic works in the area to evaluate usage capacity and level that shall be upgraded to construct service roads for construction of the expressway.
- Survey old bridges and culverts on the cross lines: Identify location, survey profile, main cross-section, and elevation of components of existing works; review construction materials; evaluate loading capacity of the works; evaluate fault degrees, suitability and utilizing capacity.
- Survey current situations of irrigation works within study area.
- Survey underground structures, public works: optical cables, underground cables, pipeline, oil and petrol pipeline, etc.
- Survey existing power supply in the route, and request for supplying capacity and starting points. For transformer stations, request was made to identify their location, scale, capacity, specifications, and works which is supplied with power, etc. Survey additional locations of transformer stations; identify clearly locations of the station by coordinate and full description in maps including topographic, geologic and ground object data, and agreeing with the local governments in writing on these issues, etc.

- Survey cultural buildings, temples, pagodas, and relevant legal religious buildings.

(vi) Additional Traffic Surveys

- The Consultant shall review available traffic data on the existing road and conduct additional surveys as necessary to:
 - Collect data needed for the detailed design of foundations, pavements, interchanges, and toll stations, etc; and
 - Collect base line data that can be used for monitoring performance of the completed Project, where this data shall include the quantity and composition of traffic using the current national highway, total travel time and the variability of the travel time for, separately, cars and trucks, and the number and type of traffic accidents per annum along the current corridor. This data will be collected separately for at least the segments Danang to Tam Ky and Tam Ky to Quang Ngai.

(vii) Independent Land Valuation Survey

As part of the work on updating the Resettlement Action Plan (RAP) the consultant will engage as a sub-consultant a qualified Land Valuation Consultant (LVC). The LVC must be licensed by the Ministry of Finance to undertake land valuation in Viet Nam and be independent of all project stakeholders. As part of the updating work the LVC will undertake a survey to establish current market values for all types of land, by location and use, sufficient to confirm the budget under the updated RAP.

(viii) Environmental and Social Surveys

Undertake surveys as necessary to update the EIA and EMP.

3.3.3 Detailed Design of Road, Bridges and Other Structures

Deleted here under....

APPENDIX D: SPECIFICATIONS

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SPECIFICATIONS

1. General

The Technical Specifications mentioned hereunder has been designed in order that the Sub-consultant shall carry out the Public Utility 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 information on the relevant facilities within the project area which is necessary for the detailed design of the proposed expressway, and further to provide reports together with drawings required.

3. Legal Basis

- Construction Law No.16/2003/QH11 dated 26 November 2003.
- Decree No.12/2009/NĐ-CP dated 12 Febuary 2009, issued by Government for management of construction and investment objects, and Decree No.83/2009/NĐ-CP dated 15 October 2009 for supplementation and modification some provisions of Decree No. 12/2009/NĐ-CP.
- Decree No. 209/2004/NĐ-CP dated 16 December 2004, issued by Government for management of quality construction and Resolution No. 49/2008/NĐ-CP for supplementation and modification some provisions of Resolution No. 209.
- Decree No. 112/2009/ NĐ-CP dated 14 December 2009, issued by Government for cost management of construction and investment.
- TOR for Da Nang - Quang Ngai expressway development project.

4. 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.

The specific locations of the Work are the populous residential areas (25 nos. in total) located along the proposed expressway.

5. Work Policy

All the works shall be carried out in accordance with the Specifications or the instructions by the Consultant may give.

6. Scope of the Work

The Works covered by the Specifications includes furnishing all technical staff, labors, materials, equipment and supplies required to perform the Works.

6.1 Survey Areas

Table 1 is a list of the areas to be surveyed with the range of 500m, 250m from centerline of the Expressway to each side.

Table 1 Survey Areas for Public Utilities Survey

No.	Station		Length (m)	Location				Survey Area (ha)
	From	To		Hamlet	Commune	District	Province	
1	-KM0+250	KM0+650	900	Phu Hoa	Hoa Tien	Hoa Vang	Da Nang	45.00
2	KM5+500	KM5+750	250	La Bong				12.50
3	KM10+680	KM10+840	160	Duc Ky	Dien Tho	Dien Ban	Quang Nam	8.00
4	KM14+040	KM14+500	460	Chau Thuy				23.00
5	KM16+660	KM16+940	280	Ky Long				14.00
6	KM19+100	KM19+320	220	Xuan Dai	Dien Quang			11.00
7	KM23+950	KM24+280	330	Thon 5	Duy Son	Duy Xuyen	Quang Nam	16.50
8	KM24+740	KM24+840	100					5.00
9	KM37+200	KM37+300	100	Thon 4	Phuc Tho	Que Son		5.00
10	KM42+660	KM43+040	380	Thon 1	Binh Quy	Thang Binh	Quang Nam	19.00
11	KM47+100	KM47+500	400	Thon 4	Binh Chanh			20.00
12	KM49+020	KM49+280	260	Binh Hoi	Binh Que			13.00
13	KM51+020	KM51+120	100	Binh Quang	Binh An			5.00
14	KM63+620	KM63+860	240	Thon 10	Tam Thai	Phu Ninh		12.00
15	KM89+060	KM89+240	180	Da Phu	Tam My	Nui Thanh	Quang Nam	9.00
16	KM89+340	KM89+560	220					11.00
17	KM100+120	KM100+760	640	Tri Binh	Binh Nguyen	Binh Son	Quang Ngai	32.00
18	KM105+560	KM105+900	340	Phuoc Binh				17.00
19	KM116+740	KM116+880	140	Tho Tay	Tinh Tho	Son Tinh	Quang Ngai	7.00
20	KM123+840	KM124+140	300	Ha Trung	Tinh Ha			15.00
21	KM128+320	KM128+680	360	An Hoi Nam	Nghia Ky	Tu Nghia	Quang Ngai	18.00
22	KM128+750	KM128+850	100					5.00
23	KM129+350	KM129+450	100					5.00
24	KM131+700	KM132+450	750	Dieu An	Nghia Dien			37.50
25	KM136+850	KM136+950	100	Phu Van 2	Nghia Trung			5.00
		TOTAL	7,410					370.50

6.2 Public Utilities to be Surveyed

Table 2 shows the public utilities to be surveyed. The public utilities on land and underground shall be surveyed and plotted on the planimetric drawings.

Table 2 List of Public Utilities to be Surveyed

No.	CATEGORY	ITEMS TO BE SURVEYED
1	WATER SUPPLY AND DRAINAGE SYSTEM	
1.1	Clean water supply	<ul style="list-style-type: none"> - Management Administration; - Type of structure and dimension; - Current Situations - Conduct survey and show all underground structure positions on the planimetric at scale 1/1000
1.2	Industrial water drainage	
1.3	Domestic water drainage	
2	ELECTRICAL SYSTEM	
2.1	National electric network area No.2	<ul style="list-style-type: none"> - Management Administration; - Type of structure and dimension; - Conduct survey and show all underground structure positions on the planimetric at scale 1/1000
2.2	Province and district electricity	
2.3.	Common electric light	
2.4	Traffic control light	
3	TELECOMMUNICATION SYSTEM	
3.1	International telecommunication area No.2	<ul style="list-style-type: none"> - Management Administration; - Type of structure and dimension; - Conduct survey and show all underground structure positions on the planimetric at scale 1/1000
3.2	Interprovincial telecommunication area No.2	
3.3	Viettel telecommunication in the Central area	
3.4	FPT telecommunication in the Central area	
3.5	Communication cable of Defense Department	
3.6	Post-office optical cable	
3.7	Cable television network	

7. 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)

8. Unit of Measurement

Unit of measurement shall be the metric system.

9. Language

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

10. Technical Standards to be Referred

The Work shall be carried out in accordance with the following technical Standards;

Table 3 List of Technical standards

No.	Standard code	Description	Issued Year
1	22TCN 263_2000	Process for survey of motorway	2000
2	96TCN 43-90	Specification for topographical measurement	1995
3	96 TCN 42-1990	Standard for topographic map on scale of 1:500, 1:1000, 1:2000, 1:5000, 1:10000, 1:25000	1990
4	TCXDVN 309-2004	Geodesy works in engineering – General requirements	2004

11. Work Plan

The Sub-consultant shall submit the draft Work Plan not later than the time instructed by the Consultant for checking and approval.

The Work Plan shall include:

- (1) General
- (2) Implementation Organization and Equipment
- (3) Scope of the Survey
- (4) Methodology of the Survey

- (5) Documents to be Submitted
- (6) Work Quantities
- (7) Time Schedule

12. Method of the Work

12.1 Preparation

- Receive topographic survey document, control network, planimetric drawings scaled 1/1000
- Prepare survey equipment: total station, GPS handheld, laptop, tape measure, etc.

12.2 Collection of the Information on the Public Utilities from the Management Unit

- a) Preparation work at office:
 - Preparation survey documents.
 - Official letters, introduction letters sent to management units/ organizations (Signing by Consultant/ PMU85).
- b) Collection data of Public Utilities:
 - Allocation groups to the public area for preliminary surveys in the population.
 - Assign staff to bring survey documents to management units to ask for the issuance of data, technical specifications and related documents

12.3 Measurement for Identification of the Location of Public Utilities

- a) Go to the field together with the technicians of management organizations to measure and explore to identify the exact locations of public utilities on site. To compare with the data has been provided by authorities of Public Utilities.
- b) Update and supplement the locations of utilities on the planimetric drawings scale 1/1000 has been provided by the consultant.
- c) Narrative documents and binding the survey documents of utilities.

13. Reporting

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

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

After confirmation of the formant 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.

The final products to be submitted are listed below (15 sets of hard copy and soft data).

- (1) Planimetric Drawings presenting all the public utilities in the survey areas scaled 1/1000
- (2) Survey Report
- (3) Other Survey Results

Hard copy drawings to be delivered shall be produced in standard size sheets of A1 (596mm x 841mm). All the drawings shall be produced using the drawing frame approved by the Consultant. Each drawing shall be labeled with the date of generation, unique drawing number, version number and scheme section.

For Planimetric drawings, the band of detail shall be oriented to suit the general alignment of the proposed alignment. A North Point correctly oriented and coordinate grid shall be included on every sheet. The overlap of adjacent drawings shall give a minimum overlap of 40mm of detailed common to each drawing. The Match Lines shall be included on each drawing. The coordinates and heights of all the monuments, markers and bench marks shall be shown on the drawings. Names and annotations shall be horizontally aligned except for names relating to linear features which shall be aligned parallel with those features.

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

The approved final drawings 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.

Soft data drawings shall be produced in AutoCAD dwg format.

In order to keep the model to a reasonable size, the Sub-consultant may split the information into manageable parts with the approval of the Consultant.

The names, colors, and contents of layers created in CAD files shall be further instructed. 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, used equipment, work schedule, difficulties encountered and its solutions, etc. The forms and data sheets used in the Survey report shall be approved by the Consultant prior to the preparation.

14. 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.

15. 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-contractor shall indemnify any damages to the land and associated properties.

16. 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 31 October 2012. The Sub-consultant shall submit the detailed plan and schedule to the Consultant.

17. Reference Data to be Provided

The Consultant provides “Work Plan for Relocation of MV & LV Lines, May 2012” for reference, if requested by the Sub-consultant.

Bill of Quantities (BOQ)

NO.	ITEM	UNIT	QUANTITY	UNIT PRICE (USD)	AMOUNT (USD)
1	Public Utility Survey	ha	370.5	45.0	16,672.5
2	Mobilization and Transportation	LS	1	4,000.0	4,000.0
3	Reporting	LS	1	750.0	750.0
	SUB TOTAL				21,422.5
	SUB TOTAL (ROUNDED)				21,400.0
	VAT (10%)	LS	1		2,140.0
	TOTAL				23,540.0

Detailed Design for Da Nang - Quang Ngai Expressway Development Project
Appendix F: List of Crossing Electrical and Telecommunication Lines

No.	Station	Intersection angle	Type	I.P Elev.	Wires	Bars	Space Clearance	Pillar high		Type of pillar	Pillar's dimension			Perpendicular distance	
								Left	Right		Side 1	Side 2	Φ	Left	Right
1	Km0-527.96	36°15'00"	220KV	7.123	8	8	12.78	15.55	15.53	4 legged steel				152.52	113.34
2	Km0+24.3	76°12'00"	35KV	8.882	3	2	7.8	9.67	9.68	Steel reinforced concrete			0.35	26.91	49.97
3	Km0+24.3	76°12'00"	TT	8.882	1	0	4.9	5.23	5.25	Steel reinforced concrete	0.25	0.2		26.91	49.97
4	Km0+37.8	77°47'00"	TT	1.973	1	0	4.3	5.23	5.25	Steel reinforced concrete	0.25	0.20		32.07	17.35
5	Km0+583.8	141°39'00"	220V	21.959	3	2	5.7	6.55	6.53	Steel reinforced concrete			0.30	52.96	25.39
6	Km0+592.2	148°42'00"	35KV	21.645	3	2	9.05	9.67	9.68	Steel reinforced concrete			0.35	24.28	33.12
7	Km0+597.7	142°39'00"	TT	21.773	1	0	5.0	5.23	5.25	Steel reinforced concrete	0.25	0.20		24.27	33.12
8	Km0+800	77°23'00"	220KV	6.336	8	8	17.4			4 legged steel				128.11	433.95
9	Km1+570.35	45°05'00"	35KV	1.364	3	2	9.85	10.07	10.08	Steel reinforced concrete			0.35	15.64	129.37
10	Km1+596.59	36°15'00"	110KV	-1.76	8	8	13.2	12.55	12.53	4 legged steel				71.56	113.05
11	Km3+050.509	90°33'00"	35KV	3.187	3	2	8.90	9.67	9.68	Steel reinforced concrete			0.35	19.23	29.56
12	Km4+434	69°02'00"	220KV	3.406	8	8	12.7	14.55	14.53	4 legged steel				222.28	190.34
13	Km5+518.75	52°33'00"	220V	4.115	3	2	5.9	10.55	10.53	Steel reinforced concrete			0.30	24.96	22.16
14	Km5+745.8	125°43'00"	35KV	4.935	3	2	8.95	9.67	9.68	Steel reinforced			0.35	24.14	28.09

Detailed Design for Da Nang - Quang Ngai Expressway Development Project
Appendix F: List of Crossing Electrical and Telecommunication Lines

No.	Station	Intersection angle	Type	LP Elev.	Wires	Bars	Space Clearance	Pillar high		Type of pillar	Pillar's dimension			Perpendicular distance	
								Left	Right		Side 1	Side 2	Φ	Left	Right
										concrete					
15	Km5+745.8	109°03'00"	TT	4.935	1	0	4.3	5.23	5.25	Steel reinforced concrete	0.25	0.20		6.81	36.36
16	Km7+369.65	88°41'00"	35KV	5.167	3	2	9.7	10.07	10.08	Steel reinforced concrete			0.35	8.709	43.799
17	Km7+923	109°03'00"	TT	4.41	1	0	3.5	5.23	5.25	Steel reinforced concrete	0.25	0.20		55.28	25.59
18	Km7+957.70	86°54'00"	220V	3.76	3	2	6.8	10.55	10.53	Steel reinforced concrete			0.30	52.32	10.46
19	Km8+038.00	105°04'48"	15KV	2.971	3	1	11.05	10.49	10.65	Steel reinforced concrete			0.30	58.3	53.55
20	Km8+470.50	92°41'	220V	4.906	2	1	5.06	5.22	4.74	Steel reinforced concrete	0.25	0.20		32.03	4.55
21	Km8+980.00	35°09'	6KV	5.485	3	1	7.08	8.89	8.98	Steel reinforced concrete	0.40	0.20		50.16	29.27
22	Km9+27.00	79°00'	TT	5.515	3	0	4.87	5.30	4.90	Steel reinforced concrete	0.25	0.20		3.70	25.89
23	Km9+43.00	79°02'	220V	5.525	4	1	5.00	6.1	5.93	Steel reinforced concrete	0.30	0.25		37.35	31.07
24	Km9+381.30	113°15'47"	6KV	6.859	3	1	9.42	10.61	8.93	Steel reinforced concrete			0.30	73.42	3.73
25	Km9+464.00	29°03'37"	220KV	7.249	8	4	9.87	39.18	40.83	Steel	7.00	7.00		101.10	181.80
26	Km10+330	163°41'	220KV	5.704	8	4	7.56	40.90	40.83	Steel	4.00	4.00		166.14	176.28
27	Km10+554.0	92°12'45"	220V	5.207	3	1	7.73	8.98	9.30	Steel reinforced concrete			0.30	16.80	79.03
28	Km10+764.5	89°89'	220V	6.521	4	1	5.17	7.28	7.02	Steel reinforced concrete			0.30	28.67	16.14

Detailed Design for Da Nang - Quang Ngai Expressway Development Project

Appendix F: List of Crossing Electrical and Telecommunication Lines

No.	Station	Intersection angle	Type	I.P Elev.	Wires	Bars	Specie Clearance	Pillar high		Type of pillar	Pillar's dimension			Perpendicular distance	
								Left	Right		Side 1	Side 2	Φ	Left	Right
29	Km10+770	90°20'01"	TT	6.426	1	0	4.07	4.64	4.81	Steel reinforced concrete	0.20	0.15		10.17	25.93
30	Km13+87.0	103°34'	6KV	5.755	3	1	8.15	8.76	8.97	Steel reinforced concrete			0.30	90.61	8.88
31	Km13+307	18°43'36"	220KV	4.91	8	4	12.96	40.76	45.89	Steel	4.00	4.00		194.67	176.01
32	Km13+620	94°57'	TT	5.91	1	0	4.90	5.21	5.08	Steel reinforced concrete	0.25	0.20		2.17	36.36
33	Km13+637	104°49'	220V	7.063	4	1	8.82	9.37	6.95	Steel reinforced concrete			0.30	5.46	25.73
34	Km13+820	40°06'	220V	6.259	4	1	6.78	7.05	7.00	Steel reinforced concrete			0.30	49.50	48.35
35	Km13+909.5	140°43'	15KV	6.004	3	1	9.44	12.31	10.30	Steel reinforced concrete			0.50	63.56	62.19
36	Km14+112	44°37'	6KV	6.894	7	2	4.99	8.84	8.74	Steel reinforced concrete	0.35	0.25		37.59	23.57
37	Km14+243.5	30°45'	TT	6.672	1	0	4.30	4.57	4.66	Steel reinforced concrete	0.25	0.20		5.25	30.68
38	Km14+276.2	115°57'	220V	6.674	4	1	6.31	7.25	7.31	Steel reinforced concrete			0.30	24.37	21.14
39	Km14+471.5	111°26'30"	220V	6.054	4	1	6.81	5.60	7.46	Steel reinforced concrete			0.30	3.15	2.50
40	Km16+200	102°32'	TT	5.216	1	0	4.30	4.91	4.95	Steel reinforced concrete	0.25	0.20		33.55	4.96
41	Km16+205.6	106°58'	220V	4.651	4	1	6.83	7.29	7.39	Steel reinforced concrete			0.30	9.80	44.12
42	Km16+426	54°01'	220V	5.134	2	1	5.77	6.15	6.07	Steel reinforced concrete			0.30	34.65	10.40

Detailed Design for Da Nang - Quang Ngai Expressway Development Project

Appendix F: List of Crossing Electrical and Telecommunication Lines

No.	Station	Intersection angle	Type	I.P Elev.	Wires	Bars	Space Clearance	Pillar high		Type of pillar	Pillar's dimension			Perpendicular distance	
								Left	Right		Side 1	Side 2	Φ	Left	Right
43	Km16+631.5	136°41'	220V	5.435	4	1	5.60	6.15	6.19	Steel reinforced concrete			0.30	10.43	33.75
44	Km16+785.5	56°41'	220V	5.831	4	1	6.35	5.71	7.11	Steel reinforced concrete			0.30	20.43	32.90
45	Km16+853.5	150°00'	220V	5.803	4	1	3.62	7.37	7.48	Steel reinforced concrete			0.30	24.70	22.47
46	Km16+863.5	152°46'	TT	5.648	1	0	3.88	4.47	4.32	Steel reinforced concrete	0.20	0.15		28.40	4.43
47	Km16+880	66°33'	220V	5.443	4	1	4.38	7.41	7.21	Steel reinforced concrete			0.30	12.60	34.40
48	Km18+077.90	87°06'36"	220V	5.01	4	1	7.01	7.21	7.22	Steel reinforced concrete			0.25	39.10	1.30
49	Km18+109.50	75°04'59"	6KV	5.27	3	1	8.42	8.70	8.75	Steel reinforced concrete			0.35	31.96	56.70
50	Km18+214.60	16°10'06"	TT	5.50	4	1	6.5	6.70	6.70	Steel reinforced concrete	0.2	0.2		7.61	2.32
51	Km19+208.20	94°54'40"	220V	6.44	4	1	6.95	7.16	7.22	Steel reinforced concrete			0.25	6.03	2.62
52	Km19+423.20	75°04'59"	250KV	5.29	4	2	14.8	46.3	46.3	Iron	6.5	6.5		42.4	28.55
53	Km19+491.00	90°10'49"	220V	6.16	4	1	5.25	5.43	5.45	Steel reinforced concrete			0.25	7.61	2.32
54	Km19+569.37	95°32'32"	220V	6.34	4	1	6.0	6.3	6.3	Steel reinforced concrete			0.25	18.03	5.57
55	Km20+482.60	70°10'52"	6KV	13.5	3	1	6.3	6.6	6.6	Steel reinforced concrete			0.35	12.72	63.27
56	Km21+471.36	46°15'46"	220V	12.8	4	1	4.09	4.35	4.35	Steel reinforced concrete			0.25	0.68	34.84

Detailed Design for Da Nang - Quang Ngai Expressway Development Project
Appendix F: List of Crossing Electrical and Telecommunication Lines

No.	Station	Intersection angle	Type	I.P Elev.	Wires	Bars	Space Clearance	Pillar high		Type of pillar	Pillar's dimension			Perpendicular distance	
								Left	Right		Side 1	Side 2	Φ	Left	Right
57	Km21+536.9	56°58'	220V	12.58	4	1	4.5	5	5	Steel reinforced concrete	0.25	0.2		19.18	25.74
58	Km23+284.4	39°53'	220V	6.46	4	1	4.2	5	5	Steel reinforced concrete	0.25	0.2		23.45	25.81
59	Km23+537														
60	Km23+942.2	134°35'	220V	6.48	4	2	8.3	9	9	Steel reinforced concrete			0.35	12.59	22.46
61	Km23+944.5														
62	Km24+220.0	80°52'	220V	11.37	3	2	9	9	9	Steel reinforced concrete			0.35	0.2	38.16
63	Km24+222														
64	Km24+793.9	109°20'	220V	11.54	4	1	4.8	5	5	Steel reinforced concrete			0.35	6.08	22.70
65	Km25+221.6	76°33'42"	35KV	8.56	3	2	8.5	9	9	Steel reinforced concrete			0.35	23.01	48.60
66	Km27+428.6	165°12'41"	220V	11.80	4	1	5.3	6.3	6.3	Steel reinforced concrete			0.35	7.62	9.86
67	Km27+572	110°56'00"	35KV	15.22	3	2	8.3	9	9	Steel reinforced concrete			0.35	1.58	41.67
68	Km28+915	47°53'00"	35KV	14.18	3	2	7.5	9	9	Steel reinforced concrete			0.35	36.11	0.7
69	Km30+323	120°30'12"	220V	17.50	2	1	3.5	4.5	4.5	Steel reinforced concrete	0.25	0.2		37.04	15.85
70	Km32+074.96	58°55'53"	220V	19.76	4	1	7.3	7.58	7.6	Steel reinforced concrete			0.25	25.49	9.39
71	Km34+990.37	15°07'29"	6KV	27.91	3	1	11.5	12.4	13.8	Steel reinforced concrete			0.35	10.79	24.7

Detailed Design for Da Nang - Quang Ngai Expressway Development Project
 Appendix F: List of Crossing Electrical and Telecommunication Lines

No.	Station	Intersection angle	Type	I.P. Elev.	Wires	Bars	Space Clearance	Pillar high		Type of pillar	Pillar's dimension			Perpendicular distance	
								Left	Right		Side 1	Side 2	Φ	Left	Right
72	Km35+432.40	83°06'46"	TEL	28.71	5	1	4.18	5.21	5.19	Steel reinforced concrete	0.20	0.17		35.04	1.79
73	Km35+498.34	82°10'06"	6KV	26.70	4	1	7.72	9.38	8.74	Steel reinforced concrete			0.48	52.36	42.19
74	Km35+687.74	107°52'07"	6KV	28.50	4	1	7.93	8.89	9.21	Steel reinforced concrete			0.45	46.17	6.17
75	Km36+588.36	123°26'11"	220V	21.25	4	1	5.88	6.25	6.38	Steel reinforced concrete			0.45	23.64	19.80
76	Km37+641.26	98°38'27"	220V	14.27	4	1	6.96	6.81	7.04	Steel reinforced concrete			0.37	46.17	6.17
77	Km40+130.28	81°42'42"	220V	16.01	3	1	8.35	9.47	9.53	Steel reinforced concrete			0.45	46.45	24.39
78	Km41+219.70	108°00'31"	6KV	15.82	5	1	5.69	8.90	9.36	Steel reinforced concrete			0.45	3.35	70.02
79	Km41+242.28	106°50'59"	TEL	15.40	1	1	3.51	6.30	6.17	Steel reinforced concrete	0.15	0.20		3.02	90.85
80	Km41+247.09	106°36'52"	TEL	14.88	5	1	4.58	5.43	5.39	Steel reinforced concrete	0.15	0.20		0.66	23.47
81	Km41+839.20	42°26'30"	6KV	14.66	4	2	7.29	8.85	9.12	Steel reinforced concrete			0.45	47.06	16.93
82	Km41+854.68	42°07'06"	6KV	14.54	1	2	5.88	9.10	9.11	Steel reinforced concrete			0.45	18.82	43.53
83	Km42+020.09	132°15'26"	6KV	14.56	4	2	10.85	10.81	8.87	Steel reinforced concrete			0.45	11.27	74.82
84	Km42+718.33	39°15'18"	TEL	14.56	1	1	6.67	6.60	6.67	Steel reinforced concrete			0.35	43.88	15.85
85	Km42+728.08	51°53'14"	TEL	14.67	3	1	4.57	5.04	6.08	Steel reinforced	0.15	0.20		5.03	30.71

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No.	Station	Intersection angle	Type	I.P. Elev.	Wires	Bars	Space Clearance	Pillar high		Type of pillar	Pillar's dimension			Perpendicular distance	
								Left	Right		Side 1	Side 2	Φ	Left	Right
										concrete					
86	Km42+928.35	102°12'18"	220V	14.49	4	1	6.09	6.17	6.39	Steel reinforced concrete				0.85	30.33
87	Km43+669.69	98°35'45"	6KV	13.39	4	2	6.73	9.96	9.14	Steel reinforced concrete			0.48	42.64	37.82
88	Km46+218.01	93°45'31"	TEL	12.08	3	1	4.93	5.17	5.63	Steel reinforced concrete	0.15	0.20		6.42	40.97
89	Km46+218.29	93°45'31"	6KV	12.08	3	1	7.90	8.38	8.59	Steel reinforced concrete	0.40	0.43		60.56	17.83
90	Km47+139.38	104°22'35"	TEL	11.46	2	1	5.00	5.59	5.59	Steel reinforced concrete	0.15	0.20		41.93	22.02
91	Km47+142.54	100°2'51"	220V	11.38	4	1	6.34	6.33	6.00	Steel reinforced concrete			0.35	71.12	43.92
92	Km48+385.85	101°24'45"	TEL	13.52	1	1	3.70	5.55	5.49	Steel reinforced concrete	0.15	0.20		30.01	53.11
93	Km49+027.05	111°9'38"	220V	12.85	4	1	7.80	7.43	7.53	Steel reinforced concrete	0.15	0.20		4.01	42.49
94	Km51+098.97	54°35'56"	220V	14.50	3	1	5.42	6.58	6.41				0.45	63.37	30.24
95	Km51+276.06	114°0'20"	TEL	11.77	1	1	5.21	6.80	6.66	Steel reinforced concrete			0.35	59.63	35.59
96	Km51+287.47	118°20'11"	220V	11.73	6	1	3.84	5.00	5.04	Steel reinforced concrete	0.15	0.20		19.77	15.08
97	Km53+7.40	127°23'26"	220V	11.86	4	1	7.15	7.38	7.65	Concrete			0.20	2.30	44.70
98	Km53+358.00	92°03'50"	220V	12.39	4	1	7.25	7.30	7.45	Concrete			0.20	17.30	10.70
99	Km53+751.80	83°13'15"	220V	9.74	4	1	6.74	7.31	7.04	Concrete			0.30	4.90	39.87
100	Km54+072.00	147°52'22"	220V	9.53	4	1	7.37	7.43	6.92	Concrete			0.20	5.60	20.54
101	Km54+216.00	82°41'12"	TEL	8.11	1	0	4.55	5.24	5.35	Concrete	0.20	0.20		37.10	12.90
102	Km54+216.90	82°41'12"	35KV	8.11	3	1	9.00	9.25	9.26	Concrete			0.30	61.40	2.37
103	Km54+216.90	82°41'12"	220V	8.11	4	1	6.64	9.25	9.26	Concrete			0.30	61.40	2.37
104	Km54+515.70	119°54'17"	220V	8.47	4	1	6.39	7.33	7.21	Concrete			0.20	13.33	45.60

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No.	Station	Intersection angle	Type	I.P. Elev.	Wires	Bars	Space Clearance	Pillar high		Type of pillar	Pillar's dimension			Perpendicular distance	
								Left	Right		Side 1	Side 2	φ	Left	Right
105	Km56+040.00	140°42'55"	220V	6.32	1	0	6.05	6.43	0.00	Concrete			0.20	6.09	
106	Km56+501.20	87°07'00"	35KV	7.57	3	1	7.01	9.14	9.13	Concrete			0.30	31.14	19.65
107	Km56+501.20	87°07'00"	220V	7.57	4	1	4.93	9.14	9.13	Concrete			0.30	31.14	19.65
108	Km56+504.00	87°14'05"	220V	7.92	4	1	6.15	6.21	6.5	Concrete	0.25	0.30		30.80	17.00
109	Km56+505.31	87°14'05"	TEL	7.92	3	1	3	3.50	3.5	Concrete	0.20	0.20		30.80	17.00
110	Km57+495.82	102°31'14"	TEL	7.95	3	0	4.35	4.78	4.95	Concrete	0.15	0.20		33.71	2.49
111	Km57+512.85	102°31'14"	220V	8.73	4	1	6.75	7.11	7.16	Concrete	0.25	0.30		27.50	12.30
112	Km59+980.00		220V	15.11	4	1			7.06	Concrete			0.20		12.30
113	Km60+000.00	123°33'39"	35KV	15.35	3	1	9.75	10.88	10.13	Concrete			0.30	7.34	33.50
114	Km60+000.00	123°33'39"	220V	15.35	4	1	6.25	10.88	10.13	Concrete			0.30	7.34	33.50
115	Km60+040.00	111°13'58"	TEL	15.82	3	0	3.91	5.61	4.62	Concrete	0.15	0.20		25.70	11.00
116	Km60+050.00	111°13'58"	CS	15.52	2	0	4.62	6.05	7.92	Concrete			0.20	12.09	30.38
117	Km60+690.00	50°43'09"	500KV	20.53	14	2	14.89	36.08	28.21	Steel	6.00	6.00		86.60	80.00
118	Km61+780.00	133°14'09"	220V	14.40	4	1	5.75	6.85	6.19	Concrete			0.25	7.70	22.10
119	Km61+958.00	24°11'16"	TEL	12.20	1	0	4.35	4.94	4.89	Concrete			0.20	8.69	11.38
120	Km62+150.00	93°51'50"	220KV	11.14	8	4	22.87	47.26	40.66	Steel	4.00	4.00		60.00	103.00
121	Km63+33.12	58°52'12"	220V	9.80	1	0	6.01	7.45	7.08	Concrete			0.20	10.00	24.00
122	Km63+680.00	54°24'35"	35KV	14.28	3	1	7.71	9.45	9.29	Concrete			0.30	50.00	56.00
123	Km63+694.50	54°50'49"	35KV	14.34	3	1	8.45	9.35	9.79	Concrete			0.30	24.00	35.80
124	Km63+795.00	46°07'17"	TEL	15.88	2	0	3.00			Concrete				51.70	10.80
125	Km63+795.00	46°07'17"	220V	15.88	3	1	3.45	4.31	5.65	Concrete	0.15	0.20		51.70	10.80
126	Km64+213.00	137°19'14"	220V	12.04	1	0	4.85	7.31	7.07	Concrete			0.20	18.80	16.00
127	Km64+637.00	96°44'42"	TEL	11.95	1	0	4.86	4.97	5.00	Concrete			0.20	24.50	7.50
128	Km64+660.00	104°52'58"	35KV	11.90	3	1	8.67	8.95	9.04	Concrete			0.30	45.30	69.00
129	Km64+670.00	82°37'00"	110KV	11.86	3	1	12.86	18.50	18.52	Concrete			0.30	77.00	74.70
130	Km66+14.75	78°52'00"	220V	4.99	3	1	5.00	5.60	5.60	Steel reinforced concrete	0.20	0.20		36.58	43.97
131	Km66+118.00	25°25'00"	500KV	4.97	6	2	14.60	34.00	34.00	Iron	8.76	7.32		111.56	100.19
132	Km66+446.90	53°24'00"	TT	4.34	1	0	6.00	6.45	6.50	Steel reinforced concrete	0.20	0.20		15.72	25.87
133	Km66+446.90	53°24'00"	10KV	4.34	3	1	10.00	10.50	10.80	Steel reinforced concrete			0.25	10.79	37.60
134	Km66+452.00	52°04'14"	220V	4.92	3	1	6.00	6.20	6.20	Steel reinforced concrete	0.20	0.20		47.69	0.37
135	Km67+508.00	76°52'53"	220V	2.03	3	1	6.00	6.30	6.35	Steel reinforced concrete	0.20	0.20		14.30	10.16

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								Left	Right		Side 1	Side 2	Φ	Left	Right
136	Km67+509.12	77°44'09"	10KV	2.03	3	1	10.00	11.10	10.80	Steel reinforced concrete			0.25	38.80	9.66
137	Km67+599.40	70°38'41"	TT	3.43	1	0	5.00	5.40	5.37	Steel reinforced concrete	0.20	0.20		23.36	13.91
138	Km67+711.00	122°59'37"	220V	3.05	3	1	6.00	6.20	6.21	Steel reinforced concrete	0.20	0.20		11.06	14.70
139	Km69+308.91	74°40'32"	TT	5.30	1	0	5.00	5.40	5.35	Steel reinforced concrete	0.20	0.20		27.51	11.18
140	Km69+308.98	61°33'55"	220V	5.66	3	1	5.00	5.60	5.55	Steel reinforced concrete	0.20	0.20		18.44	14.47
141	Km69+384.85	84°29'00"	10KV	3.85	3	1	10.00	10.70	10.80	Steel reinforced concrete			0.25	77.57	43.64
142	Km71+759.00	105°43'00"	10KV	7.51	3	1	10.00	10.50	10.80	Steel reinforced concrete			0.25	59.98	6.68
143	Km73+318.80	56°37'00"	220V	6.05	3	1	6.00	6.55	6.60	Steel reinforced concrete	0.20	0.20		13.20	18.31
144	Km81+325.60	34°53'44"	6KV	13.70	3	1	6.79	7.50	7.50	Steel reinforced concrete			0.30	35.78	5.91
145	Km81+329.00	31°23'34"	TEL	13.00	1	0	6.50	7.10	7.10	Steel reinforced concrete			0.20	15.20	3.70
146	Km81+366.00	50°01'40"	220V	11.65	4	1	5.59	7.25	7.25	Steel reinforced concrete			0.20	24.87	1.43
147	Km81+904.5	130°08'23"	220V	14.43	2	1	5.11	6.50	6.50	Steel reinforced concrete	0.20	0.20		6.14	20.00
148	Km82+158.00	115°43'31"	TEL	11.20	2	1	5.60	6.00	6.00	Steel reinforced concrete			0.20	52.90	9.60
149	Km83+118.00	57°10'05"	220V	8.14	2	1	5.45	7.50	7.50	Steel reinforced			0.20	5.48	33.43

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								Left	Right		Side 1	Side 2	Φ	Left	Right
										concrete					
150	Km86+831.30	162°53'47"	TEL	3.31	2	1	6.50	7.50	7.50	Steel reinforced concrete			0.20	22.91	2.00
151	Km87+340														
152	Km87+577.30	54°30'52"	220V	1.85	2	1	6.48	7.00	7.00	Steel reinforced concrete	0.20	0.20		22.06	30.00
153	Km87+600														
154	Km87+615.40	96°35'27"	220KV	3.52	2	1	5.98	6.90	6.90	Steel reinforced concrete			0.25	28.81	20.00
155	Km87+764.30	118°55'32"	35KV	1.88	3	1	6.65	8.57	8.57	Steel reinforced concrete	0.20	0.35		75.38	8.46
156	Km89+146.09	64°26'46"	6KV	15.77	3	1	8.50	8.80	8.80	Steel reinforced concrete			0.30	19.80	25.00
157	Km89+498.8	70°33'22"	220V	4.06	2	1	6.94	7.50	7.50	Steel reinforced concrete			0.20	39.60	3.70
158	Km91+069.90	160°22'54"	500KV	0.51	4	4	17.97	31.69	31.70	Iron	6.50	6.50		52.78	75.54
159	Km92+315.00	25°59'50"	500KV	1.89	4	4	15.30	31.76	31.70	Iron	5.00	5.00		69.80	81.00
160	Km93+380														
161	Km93+593.50	49°24'46"	220V	7.64	4	1	5.77	6.58	7.22	Concrete			0.30	18.71	12.95
162	Km93+655.00	165°41'42"	220V	7.47	4	1	6.60	6.87	7.13	Concrete			0.30	2.53	5.38
163	Km93+869.00	45°18'08"	220KV	12.78	3	2	29.62	31.60	45.56	Iron	5.00	5.00		135.00	85.00
164	Km93+928.00	43°55'58"	110KV	7.29	4	4	35.30	31.60	42.29	Iron	5.00	5.00		136.00	54.10
165	Km95+610														
166	Km95+641.63	100°06'35"	6KV	7.45	3	1	8.19	8.23	8.40	Concrete			0.35	11.62	37.11
167	Km95+641.00	68°29'11"	6KV	6.22	3	1	6.83	10.29	11.21	Concrete			0.35	35.46	53.24
168	Km95+915														
169	Km96+308.12	80°05'48"	6KV	8.20	3	1	6.83	7.86	7.86	Concrete			0.35	16.83	9.11
170	Km97+138.70	102°58'59"	6KV	9.33	3	1	11.24	8.28	7.82	Concrete			0.35	57.56	34.98
171	Km97+440.00	91°15'09"	6KV	6.41	3	1	8.42	8.60	9.53	Concrete			0.35	33.83	28.92
172	Km97+569		220V												
173	Km97+569.88	116°05'29"	220V	9.55	2	1	6.55	7.10	7.10	Concrete			0.20	21.56	4.67
174	Km97+814.90	94°08'37"	220V	15.95	3	1	7.56	8.68	8.73	Concrete			0.35	1.16	28.29
175	Km97+860.00	13°16'29"	6KV	10.97	3	1	7.45	9.25	9.33	Concrete			0.35	12.29	3.02

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								Left	Right		Side 1	Side 2	Φ	Left	Right
176	Km98+840.00	9°36'53"	110KV	13.03	3	2	7.46	17.06	17.43	Concrete			0.40	19.30	1.55
177	Km99+548		220V												
178	Km99+617.00	91°43'48"	15KV	7.20	3	1	7.73	10.64	8.50	Concrete			0.35	39.89	25.76
179	Km100+060.00	170°19'27"	110KV	5.26	3	1	16.90	17.93	17.08	Concrete			0.40	0.19	26.08
180	Km100+507.63	100°28'02"	220V	2.52	2	1	6.81	7.37	7.37	Concrete			0.20	20.37	19.95
181	Km101+000	112°33'22"	110KV	2.02	3	2	12.63	30.74	29.43	Iron	6.43	6.43		37.42	204.00
182	Km101+373.70	96°07'50"	15KV	1.91	3	1	7.73	9.00	8.98	Concrete			0.35	9.28	57.17
183	Km101+389.20	92°05'58"	TEL	2.53	2	1	6.05	6.50	6.05	Concrete			0.20	6.32	35.13
184	Km102+611.12	78°00'	TT	3.33	1		4.5	4.7	4.7	Concrete	0.20	0.20		11.11	24.40
185	Km102+682.53	81°31'31"	35KV	2.67	3	1	7.9	8.5	8.5	Concrete			0.35	24	52.13
186	Km102+887.58	75°00'	TT	4.01	1		4.3	4.5	4.5	Concrete	0.20	0.20		37.10	3.92
187	Km103+099.83	93°29'13"	110KV	6.35	3	3	19.15	41.5	41.5	Iron	3.5	3.5		269.04	151.02
188	Km103+257.03	91°11'14"	500KV	18.9	12	1	27.5	32.2	33.00	Iron	9.00	9.00		124.57	287.13
189	Km103+302.70	91°33'10"	500KV	18.81	12	1	29.75	30.00	33.00	Iron	9.00	9.00		172.68	228.07
190	Km104+737.70	47°39'00"	110KV	1.14	3	3	15.33	35.60	35.71	Iron	3.5	3.5		159.61	47.97
191	Km105+660														
192	Km105+694.00	140°37'17"	220V	4.75	4	1	7.10	7.3	7.3	Concrete			0.25	6.1	19.9
193	Km106+104.93	118°02'22"	220V	1.78	4	1	7.05	7.3	7.3	Concrete			0.25	10.5	31.3
194	Km106+103.93						6.11								
195	Km106+300	132°00'	TT	3.86	1		4.3	4.5	4.5	Concrete	0.20	0.20		16.70	24.10
196	Km106+600														
197	Km106+701.90	52°02'	220V	4.58	4	1	7.05	7.3	7.3	Concrete			0.25	31.10	4.76
198	Km106+759.64	120°37'50"	6KV	4.61	3	1	7.57	8.72	8.72	Concrete			0.35	25.6	50.4
199	Km107+491.37	20°01'32"	6KV	1.04	3	1	6.39	8.5	8.5	Concrete			0.35	32.5	2.1
200	Km107+660.42	30°14'43"	220V	5.09	4	1	4.75	5.17	5.17	Concrete			0.25	0.5	22.2
201	Km107+834.77	109°00'	TT	3.93	1		4.7	4.9	4.5	Concrete	0.20	0.20		13.25	62.00
202	Km107+838.43	105°56'02"	220V	2.52	4	1	6.13	7.07	7.07	Concrete			0.25	18.9	24.8
203	Km108+097.41	81°21'21"	220V	5.61	4	1	6.06	7.16	7.16	Concrete			0.25	0.7	39.5
204	Km108+157.66	83°00'	TT	5.70	1		4.4	4.6	4.6	Concrete	0.20	0.20		11.70	41.20
205	Km108+160.40	83°32'27"	6KV	5.80	3	1	7.28	8.5	8.5	Concrete			0.35	42.7	57.3
206	Km108+262.23	76°30'48"	220V	5.93	4	1	5.59	7.00	7.00	Concrete			0.25	19.9	27.8
207	Km108+616.11	80°00'36"	220V	3.67	4	1	5.6	7.15	7.15	Concrete			0.25	0.7	41.19
208	Km109+467.80	135°00'	TT	3.64	1		4.5	4.7	4.7	Concrete	0.20	0.20		3.21	30.58
209	Km109+746.23	105°57'49"	220V	8.67	4	1	5.5	7.00	7.00	Concrete			0.25	41.6	14.9
210	Km109+818.16	91°00'	TT	4.30	1		4.5	4.7	4.7	Concrete	0.20	0.20		17.00	30.92
211	Km109+853.26	82°27'55"	35KV	3.87	3	1	6.5	7.5	7.5	Concrete			0.35	78	7.9
212	Km114+938.49	73°05'18"	220V	20.18	4	2	6.50	7.02	7.03	Steel reinforced concrete			0.33	33.44	11.28

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								Left	Right		Side 1	Side 2	Φ	Left	Right
213	Km116+494.44	51°32'14"	TT	13.46	1	0	4.80	5.00	5.00	Steel reinforced concrete	0.25	0.30		9.27	37.84
214	Km116+562.25	72°32'12"	TT	14.33	1	0	4.65	5.00	5.00	Steel reinforced concrete	0.25	0.30		28.66	10.19
215	Km119+123.90	116°56'38"	6KV	12.84	3	2	6.50	7.32	7.13	Steel reinforced concrete			0.33	28.23	62.02
216	Km119+740.00	109°42'19"	6KV	19.50	3	2	6.56	7.22	7.33	Steel reinforced concrete			0.33	37.48	56.99
217	Km120+164.30	96°55'24"	220V	14.70	4	1	6.65	7.12	7.16	Steel reinforced concrete			0.33	0.12	45.10
218	Km119+165.20	109°18'56"	TT	12.21	1	0	3.56	4.50	4.45	Steel reinforced concrete	0.15	0.20		8.91	18.75
219	Km119+994.30	64°19'46"	TT	15.27	1	0	3.62	4.35	4.42	Steel reinforced concrete	0.15	0.20		13.19	50.00
220	Km122+260.00	119°54'36"	TT	16.80	1	0	3.68	4.46	4.48	Steel reinforced concrete	0.15	0.20		19.29	11.42
221	Km121+448.46	11°30'33"	220V	16.95	4	1	6.47	7.02	7.03	Steel reinforced concrete			0.33	8.54	1.92
222	Km122+270.30	121°27'18"	220V	15.94	4	1	6.10	7.04	7.03	Steel reinforced concrete			0.33	14.78	26.33
223	Km123+327.84	170°38'13"	6KV	10.72	3	2	6.10	7.24	7.35	Steel reinforced concrete			0.33	14.35	4.77
224	Km124+142.20	30°21'10"	6KV	7.09	3	2	10.50	11.34	7.32	Steel reinforced concrete			0.33	0.37	49.96
225	Km124+376.00	116°16'02"	6KV	6.78	3	2	9.15	11.08	7.21	Steel reinforced concrete			0.33	37.63	25.93
226	Km124+540.00	103°41'04"	220V	10.39	3	2	6.15	7.24	7.21	Steel reinforced			0.33	10.39	38.18

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								Left	Right		Side 1	Side 2	φ	Left	Right
										concrete					
227	Km126+029.00	110°35'28"	220V	8.79	4	1	14.11	5.22	5.44	Steel reinforced concrete			0.29	20.20	20.20
228	Km126+256.80	72°30'27"	6KV	8.14	3		15.95	8.10	8.17	Steel reinforced concrete			0.30	60.00	37.20
229	Km126+339.00	86°25'29"	220V	9.33	4	1	14.13	5.27	5.40	Steel reinforced concrete			0.30	23.50	25.25
230	Km126+611.00	38°35'26"	TT	8.30	1		12.80	5.35	5.44	Steel reinforced concrete	0.27	0.28		6.40	23.00
231	Km127+766.50	48°58'30"	220V	7.07	4	1	13.97	7.03	7.10	Steel reinforced concrete			0.30	7.40	34.30
232	Km127+961.50	86°27'53"	220V	11.88	3		17.10	5.80	5.87	Steel reinforced concrete			0.30	20.00	31.00
233	Km128+207.00	23°50'54"	TT BC	14.32	4	1	21.19	7.10	7.20	Steel reinforced concrete	0.28	0.28		26.17	8.50
234	Km128+212.50	23°50'54"	220V	14.06	2		18.98	5.81	5.87	Steel reinforced concrete			0.30	8.50	1.80
235	Km128+412.00	90°00'00"	6KV	12.66	3		21.76	10.60	10.71	Steel reinforced concrete			0.31	15.60	
236	Km129+452.50	61°21'00"	15KV	8.54	3		14.24	6.25	6.33	Steel reinforced concrete			0.31	60.70	20.20
237	Km129+740.30	51°00'00"	35KV	6.83	3		15.63	10.90	11.03	Steel reinforced concrete			0.31	8.70	46.50
238	Km129+874.00	19°52'16"	35KV	6.66	3		14.08	8.01	8.14	Steel reinforced concrete			0.31	7.00	5.65
239	Km130+532.40	58°46'50"	35KV	6.80	3		16.12	9.87	10.02	Steel reinforced concrete			0.32		6.16

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								Left	Right		Side 1	Side 2	Φ	Left	Right
240	Km131+794.14	158°00'00"	220V	7.73	4	1	14.53	6.93	7.01	Steel reinforced concrete			0.29	7.85	1.00
241	Km131+896.00	19°32'12"	220V	8.97	4	1	16.57	7.70	7.81	Steel reinforced concrete			0.29	5.30	1.90
242	Km132+043.70	171°49'06"	220V	7.78	4	1	14.38	6.65	6.72	Steel reinforced concrete			0.29	0.90	3.90
243	Km133+323.70	144°40'38"	15KV	5.16	3		14.11	8.55	8.67	Steel reinforced concrete			0.31	45.87	13.38
244	Km133+908.30	68°00'00"	TTBC	5.97	2		11.37	6.10	6.00	Steel reinforced concrete	0.28	0.30		35.35	35.00
245	Km133+912.00	68°00'00"	220V	6.02	4	1	12.72	6.95	7.00	Steel reinforced concrete			0.30	15.86	14.50
246	Km134+934.00	33°05'00"	TT	5.58	12	2	11.18	6.30	6.35	Steel reinforced concrete	0.27	0.28		15.90	13.70
247	Km135+103.30	93°20'00"	220V	6.31	4	1	13.61	7.45	7.47	Steel reinforced concrete			0.29	4.00	52.00
248	Km135+552.00	115°25'45"	220V	5.59	4	1	11.54	6.11	6.07	Steel reinforced concrete			0.29	7.40	50.20
249	Km136+894.00	117°21'08"	220V	7.73	4	1	11.83	6.35	6.24	Steel reinforced concrete			0.29	48.00	12.00
250	Km137+692.33	91°50'29"	15KV	4.24	3		13.19	9.30	9.25	Steel reinforced concrete			0.31	51.30	0.90
251	Km138+361.30	125°24'00"	15KV	4.08	3		13.08	10.10	10.15	Steel reinforced concrete			0.30	39.50	33.00
252	Km139+118.20	146°24'23"	220V	3.29	4	1	9.49	6.13	6.00	Steel reinforced concrete	0.27	0.26		3.00	21.00
253	Km139+156.55	60°00'00"	220V	3.18	4	1	9.63	7.04	6.95	Steel reinforced			0.28	19.00	23.00

Detailed Design for Da Nang - Quang Ngai Expressway Development Project
Appendix F: List of Crossing Electrical and Telecommunication Lines

No.	Station	Intersection angle	Type	I.P Elev.	Wires	Bars	Space Clearance	Pillar high		Type of pillar	Pillar's dimension			Perpendicular distance	
								Left	Right		Side 1	Side 2	φ	Left	Right
										concrete					
254	Km139+166.57	60°00'00"	35KV	3.23	3		10.53	8.32	8.47	Steel reinforced concrete			0.30	25.00	48.24