DA NANG CITY PEOPLE'S COMMITTEE
DANANG PRIORITY INFRASTRUCTURE INVESTMENT PROJECT
MANAGEMENT UNIT

SFG2425 V1

DANANG SUSTAINABLE CITY DEVELOPMENT PROJECT
(Loan No. 5233-VN)

UPDATED ENVIRONMENTAL MANAGEMENT PLAN REPORT

THE ADJUSTMENT WORKS UNDER DANANG SUSTAINABLE CITY DEVELOPMENT PROJECT

Public Disclosure Authorized

March 2016

DA NANG CITY PEOPLE'S COMMITTEE
DANANG PRIORITY INFRASTRUCTURE INVESTMENT PROJECT MANAGEMENT UNIT
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DANANG SUSTAINABLE CITY DEVELOPMENT PROJECT
(Loan No. 5233-VN)

UPDATED ENVIRONMENTAL IMPACT ASSESSMENT REPORT

THE ADJUSTMENT WORKS UNDER DANANG SUSTAINABLE CITY DEVELOPMENT PROJECT

REPRESENTATIVE OF THE CLIENT **CONSULTANT**

DA NANG, MARCH 2016

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ABBREVIATIONS

AHs	Affected households
CC	Climate change
CSC	Construction Supervision Consultant
DONRE	Department of Natural Resources and Environment
DOT	Department of Transport
SCDP	Sustainable City Development Project
EIA	Environmental impact assessment
ECOP	Environmental Code of Practice
EMC	Environmental Monitoring Consultant
EMP	Environmental Management Plan
EMS	Environmental Monitoring System
FS	Feasibility Study
MUDP	Metropolitan Urban Development Project Management Unit
ODA	Official Development Assistance
PPU	Project Preparation Unit
RAP	Resettlement Action Plan
TDC	Resettlement
PPC	Provincial/city People's Committee
URENCO	Urban Environment Company
WB	World Bank
WWT	Wastewater Treatment

PREFACE

1. BACKGROUND OF THE PROJECT

The Danang Sustainable Development Project, a multi-sector project with the overall objective of promoting the City's economic - social development via the improvement of urban facilities, the improvement of living conditions and the poverty reduction for city residents. It will meet the traffic demand and minimize traffic congestion as well as environmental pollution, control flood and enhance disaster prevention in Danang City. The development of Danang city so that it becomes a green city will bring benefits for all citizens through improvement of urban environment and promoting urban transformation towards clean, safe, comprehensive and energy efficient orientation.

The Project has total budget of US.$ 272.135 million, of which IDA fund of the WB is US.$ 202.435 million and counterpart fund is US.$ 69.7 million. The Project consists of 5 following components:

- Component 1: Environmental Improvement: Stormwater and Wastewater Collection and Treatment.
- Component 2: Improvement of Public Transport: Development of Bus Rapid Transit - BRT.
- Component 3: Building Strategic Traffic Road.
- Component 4: Strengthening Capacity in Urban Infrastructure Management.
- Component 5: Items transferred from the Danang Priority Infrastructure Investment Project.

The implementation time of SCDP is estimated from 2013 to 2019. During the project implementation, there are some adjustments to promote and enhance investment efficiency of the Project. Namely, supplement of the Road DH21 to facilitate the travelling of Hoa Vang district and building the BRT depot. These adjustments have been agreed by the Danang CPC under the Dispatch No. 4881/UBND-QLDTu dated 09 June 2014. The adjustment and supplementary works after being completed will bring practical benefits on socio-economic development and environment for Danang city.

Environmental Management Plan report focuses on impact assessment of implementation adjustment, supplementary works for SCDP (List of supplementary works is presented in Table 1-1)

Complying with the Land on Environmental Protection No.55/2014/QH2013, the Government's Decree No. 18/2015/ND-CP dated 14 February 2015 on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental protection plan and WB's safeguard policies, the Client shall prepare an Environmental Management Plan Report (EMP) for the adjustment and supplementary works for managing and mitigating environmental elements throughout the project cycle.

[1] *Environmental impact assessment of "DH2 roaa connecting from Hoa Nhon commune to Hoa Son commune" was implemented a report for this structure.*

2. LEGAL AND TECHNICAL BASES OF EMP IMPLEMENTATION

The Project shall comply with applicable regulations of Vietnam and Donor on environmental protection, including:

2.1. Legal Regulations of the GoV

❖ *Legal Documents:*

- Environmental Protection Law No.55/2014/QH13 the National Assembly passed on 23/6/2014 and has been entered into force on 01/01/2015;
- Water Resources Law No.17/2012/QH13 the National Assembly passed on 21/06/2012;
- Land Law No.45/2013/QH13 the National Assembly of the Socialist Republic of Vietnam passed on 29/11/2013 and has been effective since 01/07/2014;
- Fire Prevention and Fire Fighting Law No.27/2001/QH10 dated 29-6-2001 of the National Assembly;
- Construction Law No. 50/2014/QH13 issued on 18 June 2014 and took effect since 01 January 2015;
- The Government's Decree No. 18/2015/ND-CP dated 14 February 2015 on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental protection plan;
- The Government's Decree No. 19/2015/ND-CP dated 14 February 2015 guiding the implementation of a number of articles of Land on Environmental Protection;
- Decree No. 25/2013/ND-CP dated 29 March 2013 of the Government on environmental protection charges for wastewater;
- Decree No.179/2013/ND-CP dated 14/11/2013 of the Government on sanctioning of
- Decree No.43/2014/ND-CP dated 15/5/2014 of the Government, detailing the implementation of some articles of the Land Law;
- Decree No.140/2006/ND-CP dated 22/11/2006 by the Government, promulgating the regulations on the environment protection in the stages of formulation, appraisal, approval and organization of implementation of strategies, planning, plans, programs and development projects;
- The Government's Decree No. 38/2015/ND-CP dated 24 April 2015 on management of wastes and scraps;
- The Government's Decree No. 80/2014/ND-CP dated 06 August 2014 on wastewater drainage and treatment and took effect since 01 January 2015;
- Decree No.12/2009/ND-CP dated 12/02/2009 of the Government on management of construction and investment projects of works;
- Decree No.83/2009/ND-CP dated 15/10/2009 of the Government, amending and supplementing a number of articles of Decree No.12/2009/ND-CP on management of construction and investment projects of works;
- Circular No. 27/2015/TT-BTNMT dated 29 May 2015 of the Ministry of Natural Resources and Environment on strategic environmental assessment, environmental impact assessment and environmental protection plan;
- Circular No.22/2010/TT-BXD dated 03/12/2010 of the Ministry of Construction on the regulations on labor safety in construction of works;
- Circular No. 36/2015/TT-BTNMT dated 30 June 2015 on hazadous waste management;
- Circular No.19/2011/TT - MOH dated June 6, 2011 of the Ministry of Health, guiding the management of occupational health, employee health and occupational disease;

- Circular No.16/2009/TT-BTNMT and Circular No.25/2009/ BTNMT of the Ministry of Natural Resources and Environment on the issuance of Vietnam's national standards;
- Circular No. 32/2013/TT-BTNMT dated 25 October 2013 of the Ministry of Natural Resources and Environment on issuance of national technical regulations on environment;
- Circular No. 10/2007/TT-BTNMT dated 22 October 2007 on guidance on quality insurance and control in environmental monitoring;
- Decision No.02/2009/TT-BTNMT dated 19 March 2009 of the Ministry of Natural Resources and Environment on the assessment of the water receiving of water sources;
- Decision No.16/2008/QD-BTNMT dated 31 December 2008 by the Ministry of Natural Resources and Environment, promulgating the national technical regulations on the environment;
- Decision No.22/2006/QD-BTNMT dated 18 December 2006 by the Ministry of Natural Resources and Environment for the mandatory application of Vietnam's environmental standards;
- Decision No.505 BYT/QD dated 13 April 1992 by the Ministry of Health on the issuance of the hygiene standard.
- Decision No. 33/2013/QD-UBND dated 13 August 2012 of Danang Provincial People's Committee on management, operation and using of urban drainage system and industrial zones in Danang province;
- Decision No. 57/2012/QD-UBND dated 07 December 2012 of Danang Provincial People's Committee on amendment and supplementation of a number of articles of Regulation on management, operation, exploitation and using of urban drainage system and industrial zones in Danang under Decision No. 33/2012/QD-UBND dated 13 August 2012 of Danang Provincial People's Committee;
- Decision No. 23/2010/QD-UBND dated 10 August 2010 of the City People's Committee, issuing regulations on environmental protection in Danang province.

❖ *Legal documents related to the Project*

- Decision No. 927/QD-UBND dated 29 January 2013 on approving the Danang Sustainable City Development Project;
- Decision No. 2279/QD-UBND dated 23 April 2015 on approving the detailed master plan, scale 1/500 of Hoa Khuong resettlement site (serving the Danang SCDP);
- Decision No. 264/QD-UBND dated 16 January 2015 on approving the detailed master plan, scale 1/500 of the Bus rapid transit (BRT) and connection traffic system;
- Dispatch No. 4104/UBND-QLDTư dated 03 June 2015 on investment construction scale of Yen The – Bac Son cannal.
- Dispatch No. 1355/UBND-QLDTu dated 15 March 2011 of Danang CPC on "investment policy on improvement and upgrading of the road DH2 from Hoa Nhon to Hoa Son";
- Decision No. 4945/QD-UBND dated 14 June 2011 of the Chairman of Danang CPC on "approving the alignment planning and land use boundary of the road DH2 from Hoa Nhon commune to Hoa Son commune";
- Decision No. 7900/UBND-QLDTu dated 06 September 2014 of Danang CPC on "the project: improvement and upgrading of the road DH2";
- Dispatch No. 11103/UBND-QLDTu dated 04 December 2014 of the Danang CPC on "the project: Improvement and upgrading of the road DH2 under the SCDP".

❖ *Applicable Vietnam's standards and Codes*

During the preparation of EMP, Vietnam's standards to be applied to the project include:

- Water quality:
  + QCVN 01:2009/BYT - National technical regulation on drinking water quality.
  + QCVN 08:2008/BTNMT - National technical regulation on surface water quality.
  + QCVN 09:2008/BTNMT - National technical regulation on underground water
  + quality.
  + QCVN 14:2008/BTNMT - National technical regulation on domestic wastewater.
  + TCVN 5502:2003 – Domestic water supply - Quality requirements.
  + TCVN 6773:2000 - Water quality - Quality of water used for irrigation.
  + TCVN 6774:2000 - Water quality – Fresh water quality guidelines for protection of aquatic life.
  + TCVN 7222:2002 – Water quality – Quality of water from the centralized domestic wastewater treatment plants.
- Air quality:
  + QCVN 05:2013/BTNMT – Air quality – National technical regulation on ambient air quality.
  + QCVN 06:2009/BTNMT – Air quality – Permitted maximum concentration of hazardous substances in ambient air.
  + TCVN 6438:2001 - Road traffic means - Permitted maximum level of exhaust gas.
- Solid waste management:
  + QCVN 07:2009/BTNMT – National technical regulation on hazardous waste thresholds.
- Quality of soil and sediment:
  + QCVN 03:2008/BTNMT – Soil quality - National technical regulation on the allowable limits of heavy metals in the soils.
  + QCVN 15:2008/BTNMT - Soil quality - National technical regulation on the pesticide residues in the soils.
  + QCVN 43:2012/BTNMT - National technical regulation on sediment quality in fresh water areas.
- Noise and vibration:
  + QCVN 26:2010/BTNMT - National technical regulation on noise.
  + TCVN 5948:1999 - Acoustic - Noise emitted by accelerating road vehicles - Permitted maximum noise level.
  + QCVN 27:2010/BTNMT - National technical regulation on vibration.
- Labor safety and health:
  + Decision No. 3733/2002/QĐ-BYT dated 10 October 2002 on application of 21 standards on safety and health.

2.2. WB's Safeguard Policies

Beside the legal regulations on environment of the GoV, the Project shall comply with WB's safeguard policies as the table bellowed:

Table 0-1: Safeguard Policies of the WB

Policy	Reasons for Application
OP/BP 4.01 – Environmental assessment	The works is related to construction of traffic infrastructure. During the construction and operation, the project will cause environmentally negative impacts. These impacts mainly occur during the construction. Therefore, an EMP should be prepared to determine potential negative environmental and social impacts and propose essential measures to prevent, minimize or compensate for adverse impacts and improve environment.
OP/BP 4.12 - Involuntary resettlement	The Project will acquire land and on-land assets, including residential land and structures, agricultural land, public land: Total number of AHs: 911 households, of which: - Affected residential land: 418 households - Affected agricultural land: 484 households - Land managed by ward/commune people's committee: 9 households Total area affected by the project: 359,054 m^2 - Affected residential land area: 58,269 m^2 - Affected agricultural land area: 180,822 m^2 Total number of displaced households: 139 households
OP/BP 4.11 – Physical cultural resources	Among the adjustments workds of the project, the construction of Hoa Khuong resettlement site will affect 04 tombs which need to be relocated. In addition, according to the survey results, there is one ancestral temple to be affected with fencing and yard by the project but no need to be relocated. For other adjustment works, there is no religious and cultural works to be affected..
Accesss information	The first report draft is summarized and implemented to announce information to 20 communes/wars to get comments, main contents are implemented at communes/wards: The consultations are implemented in wards, communes by inviting project affected people to meet at People's Committee to take opinions. These opinions from local people and local authority will be showed in the report. The final report after being aprroval will be posted a bill at local.

2.3. Documents and Data prepared by the Project Owner or for reference during the preparation of EMP

The investment project report, preliminary design report, drawings and other relevant documents.

Report on the implementation of the indicators about socio-economy, defense and security in 2014 and report for first 6 months of 2014 of project wards/communes.

Report on survey, sampling and analysis of the environmental status in the project area carried out by the Hydro meteorological Observatory Central in the Central region in June 2015.

The Statistical Yearbook of Danang city in 2013.

Review pollution sources of air, water and land - Technical guidance for rapid assessment and use of environmental control plan - WHO, 1993.

Guidelines of the World Monetary Fund in environment, health and safety (EHS guidelines IFC).

Vietnam Construction Industry Standard: The Design Criteria of the Ministry of Construction, TCVN 7957 2008 - Drainage - Outside network and works (Applicable for reference, hydraulic calculations and determination of drain depth).

WHO - Assessment of sources of air, water, and land pollution, a guide to rapid source inventory techniques and their use in formulating environmental control strategies. Part 1: Rapid Inventory Techniques in Environmental Pollution. Geneva, Switzerland, 1993.

3. IMPLEMENTATION ORGANIZATION OF ENVIRONMENTAL MANAGEMENT PLAN

The Project's Client is Danang CPC and Danang PIIP - PMU under the Danang Department of Transport is line agency.

Preparation Consultant:

- Vietnam Investment and Development Consultancy Co., Ltd. (IAC Vietnam)
- Address: No. 50 Ngo Huyen, Hang Trong ward, Hoan Kiem district, Hanoi
- Tel: 04-6 6251 0258
- Fax: 04-6 6251 0258 E-mail: info@iacvietnam.com
- Director: Mr. Nguyen Van Trung

Table 0-2: List of of Staff Preparing EIA report

No.	Full name	Discipline	Responsibilities
I. Representative of the Client			
1	Luong Thach Vy		Leader of PMU SCDP
2	Le Anh Duc	Environmental Management	Project Management
3	Vo Truc Ly	Environmental Management	Project Management
II. Consultant Specialists			
1	Doan Manh Hung	Master of Environment	Team Leader/ Lead in preparing EIA report
2	Nguyen Manh Truong	Bachelor of Sociology	Public Consultation, social impact assessment
3	Nguyen Thi Ngoc Anh	Master of Sociology	Public consultation, social impact assessment; preparing RP

No.	Full name	Discipline	Responsibilities
4	Lai Viet Thang	Master of Biotechnology	Field survey; environmental impact assessment
5	Phung Thanh Tung	Transport Engineer	Designing infrastructure
6	Nguyen Thi Thu Phuong	Bachelor of Economics	Cost estimate

4. METHODS TO BE APPLIED DURING THE PREPARATION OF EMP REPORT

During the study, survey and preparation of EMP report, the Consultant applied a range of following study methods:

4.1. Methods of Environmental Management Plan

❖ *Rapid assessment method*

The Rapid Assessment Method was issued by the World Health Organization (WHO) in 1993. Basis of this method is nature of materials, technologies and rules of natural processes as well as experiences in rating pollution load.

In Vietnam, this method is introduced and applied in many social and environmental assessment study, relatively performing the accurate calculation of the pollution load in the context of limited instrumentation and analysis. In this report, the pollution load coefficients are taken under the EIA guidelines of the World Bank *(Environmental Assessment Sourcebook, Volume II, Sectoral Guidelines, Environment, World Bank, Washington D.C 8/1991)* and *Handbook of Emission, Non-Industrial and Industrial source, Netherlands.*

❖ *Impact matrix method*

Building correlation between effects of each project activity to each issue and environmental composition as shown in the impact matrix. On such basis, to orientate detailed contents to be studied with impacts.

❖ *Environmental modeling method*

This method is applied to calculate and simulate by Mathematical Equations for the process of spreading exhaust gas, wastewater generated from the project to ambient environment.

❖ *Comparison method*

The comparison method is to assess the environmental quality, effluent quality, pollution load, etc. On the basis of comparison with the concerning environment norms and standards, the regulations of the Ministry of Health as well as the concerning researches and related experiments in the world.

❖ *Identification method*

This method is applied through the following specific steps:

- Describe the environment system.
- Identify the project components that affect the environment.

- Identify the full range of related waste streams, environmental issues to serve the detailed evaluation.

❖ *Listing method*

It is used quite common (since the establishment of the National Environmental Protection Agencies in some countries - NEPA) and bring positive results thank to many advantages as clear approach, systematic provision during system analysis and evaluation. It includes 2 main categories:

- *The description listing table:* This method lists the environment components in need of research in addition to the information on the measurement, prediction and evaluation.
- *The simple listing table:* This method lists the environment components in need of study which is possibly affected.

❖ *Systematic analysis method*

This method is applied fairly common in the environment analysis. The advantage of this approach is the comprehensive assessment of impacts, which is useful in identifying effects and waste sources.

This method is applied based on the review of waste sources, impact sources, affected objects, environmental components, etc. like the elements in a system that has close relationship with each other, thereby, to identify, analyze and evaluate impacts.

4.2. Other methods

❖ *Public consultation method*

This method is applied during the interview with local officials and residents for collecting necessary information for the EIA of the Project. Namely, introducing them benefits and possible negative impacts on the environment and their lives. On this basis, make the sum of feedback about the project and expectations of local people.

On the other hand, discuss and interview directly with local officials and residents on local socio-economic development situation.

❖ *The information and data inheriting, synthesizing and analyzing method*

The method is to identify, assess natural, economic - social conditions in the project area through the data and information collected from various sources such as Statistical Yearbook, regional social – economic reports, regional environmental status and involved research work.

At the same time, it inherits available studies and reports which are really necessary because it inherits previous results, simultaneously, improve limitations.

❖ *Field survey method*

The field work is required to carry out the environmental impact assessment to determine the current status of land for the project implementation, concerned adjacent objects, surveys to choose sampling locations, survey the current state of water supply, drainage, power supply...

The consulting agency conducted topographical, geological survey, collecting meteorological data to serve the design in accordance with the current standards of Vietnam. The survey results are used to evaluate the natural conditions of the project area.

❖ *Expert method*

Based on knowledge and experiences in the environmental science of the environmental impact assessment experts of the Consultant and other scientific research units.

❖ *The sampling and sample analyzing method in laboratory*

The sampling and analysis of samples of environmental elements (soil, water, air) is integral in identifying and assessing the current state of the baseline environmental quality in the project area.

After the field survey, the sampling program and sample analysis will be set up with the main content such as sampling locations, measurement and analysis parameters, human resources, necessary equipment and tools, duration, sample preservation plan, analysis plan, etc.

For this project, the project owner coordinated with the Meteorology Station in the Central region to organize monitoring, sampling and analysis of the air, water, soil, sediement and aquatic samples in the project area to assess the status of the quality of the environment components.

Sampling, analyzing and storage of samples shall comply with current Vietnam standards.

CHAPTER 1. PROJECT DESCRIPTION

1.1. GENERAL INTRODUCTION

Project Name: "The adjustment works of the Danang Sustainable City Development Project"

Investor: Da Nang CPC

Executive agency: PMU of Danang Priority Infrastructure Investment Project (PiiP-PMU)

- Address: 54 Thai Phien, Hai Chau District, Da Nang city
- Tel: 0511 562 677 - 562679 Fax: 0511 562678
- Legal representative of the Project Owner: Mr. Luong Thach Vy – Director

1.1.1. Geographic Loation of SCDP

Danang is located in the Central Coast, on the north-south axis; 764 km from Hanoi to the South, 964 km from Ho Chi Minh city to the North and 108 km from Hue to the Southeast. Danang city spreads out from $15^0$55' - $16^0$14' North latitude, and from $107^0$18' - $108^0$20' east longitude. Locations adjacent to the city are Thua Thien Hue province in the North; Quang Nam province in the West; and bordered by the Dong Sea in the East.

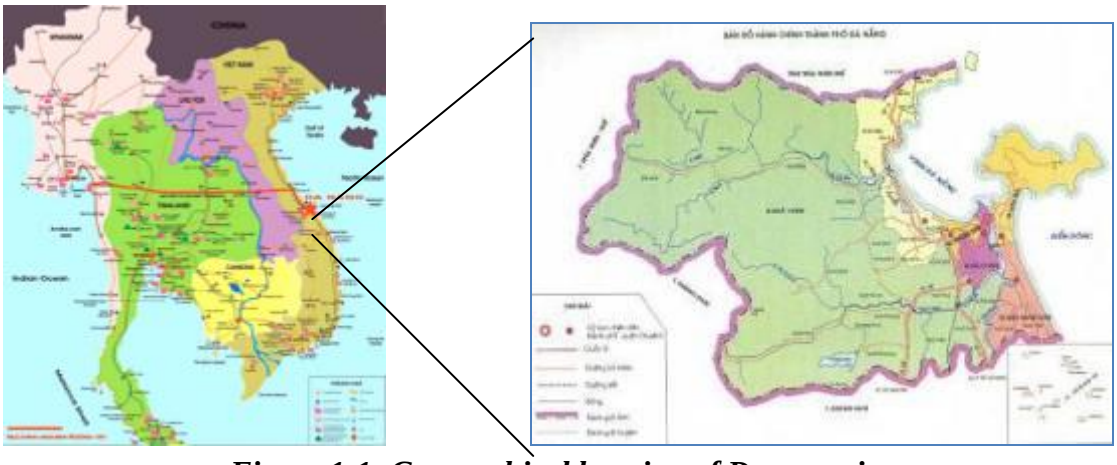


Figure 1-1: Geographical location of Danang city

Da Nang sustainable City Development Project – adjustment items consists of 14 works under components 1, 2, and 3). Therefore, the updated EIA report of adjusted and supplemented items of SCDP is only inclusive of social and environmental issues concerning such 14 works.

The adjustment and supplementary works of project are located in Hai Chau, Thanh Khe, Lien Chieu, Cam Le, Ngu Hanh Son and Hoa Vang districts of Da Nang city. The location of work items are presented in Figure 1-2:

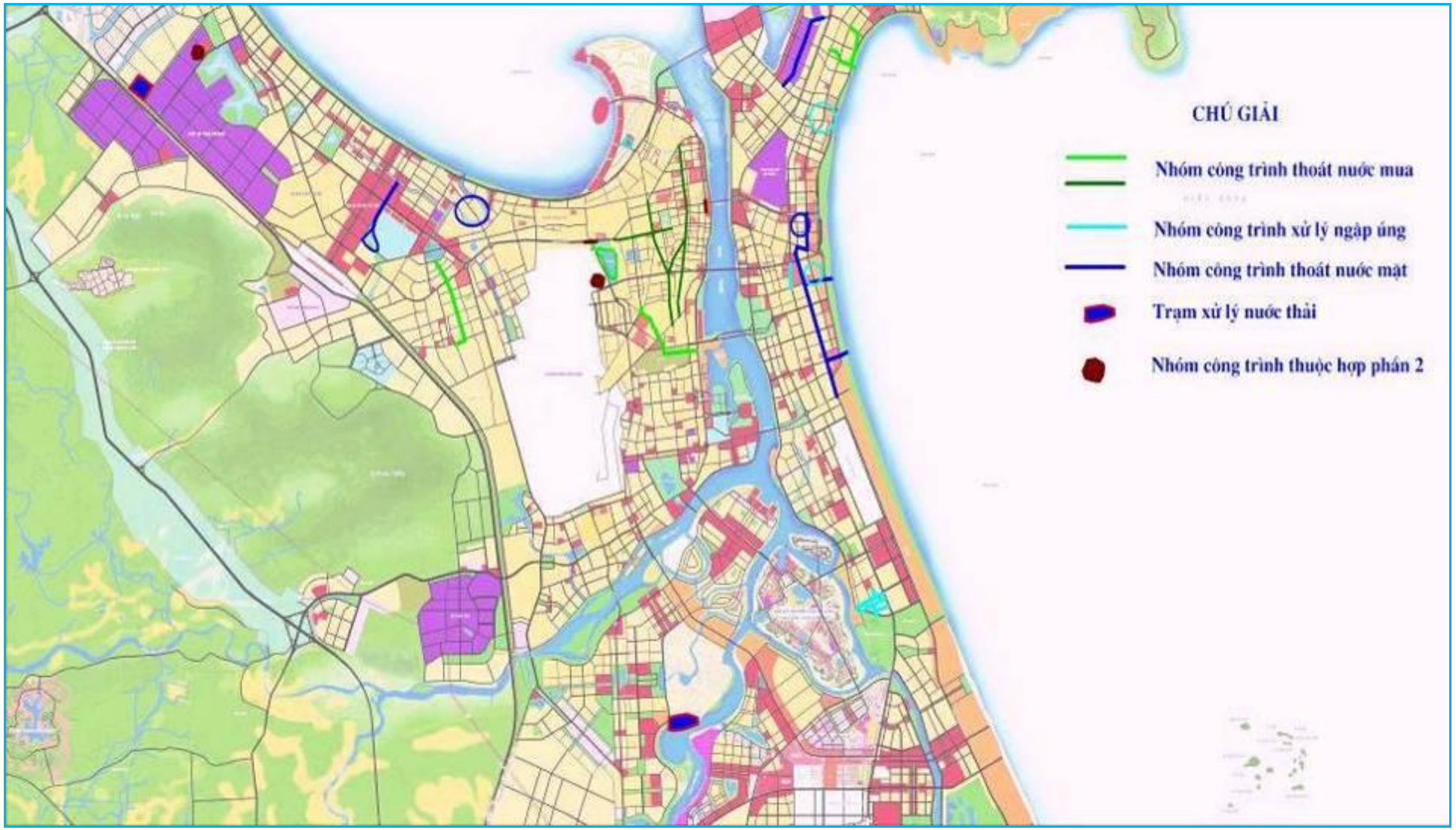


Figure 1-2: Overview map of project works

1.1.2. Summary of work items of Project

The Danang Sustainable Development Project, a multi-sector project with the overall objective of promoting the City's economic - social development via the improvement of urban facilities, the improvement of living conditions and the poverty reduction for city residents. It will meet the traffic demand and minimize traffic congestion as well as environmental pollution, control flood and enhance disaster prevention in Danang City. The development of Danang city so that it becomes a green city will bring benefits for all citizens through improvement of urban environment and promoting urban transformation towards clean, safe, comprehensive and energy efficient orientation.

The Project has total budget of US.$ 272.135 million, of which IDA fund of the WB is US.$ 202.435 million and counterpart fund is US.$ 69.7 million. The Project consists of 5 following components:

- Component 1: Environmental Improvement: Stormwater and Wastewater Collection and Treatment.
- Component 2: Improvement of Public Transport: Development of Bus Rapid Transit - BRT.
- Component 3: Building Strategic Traffic Road.
- Component 4: Strengthening Capacity in Urban Infrastructure Management.
- Component 5: Items transferred from the Danang Priority Infrastructure Investment Project.

The project consists of five main components as follows:

Component 1: Drainage and Wastewater Improvement (US$92.0 million)

Drainage Improvement: rehabilitation of retention lakes; rehabilitation and construction of box culverts and open canals; and rehabilitation and construction of outlets to lakes and offshore outlets.

Wastewater Collection and Treatment: construction of house connections to sewerage networks; construction of wastewater collection and transmission pipelines; construction of Lien Chieu Wastewater Treatment Plant; expansion of Hoa Xuan Wastewater Treatment Plant; and upgrading of existing Son Tra, Hoa Cuong, Phu Loc, and Ngu Hanh Son Wastewater Treatment Plants.

Component 2: Bus Rapid Transit Development (US$50.2 million)

Development of a BRT system, including: (a) construction of the BRT core route and three additional BRT-branded routes; and (b) acquisition of BRT buses.

Component 3: Urban strategic roads (US$77.9 million)

This component comprises: improvement of the connectivity of the urban arterial system, including construction of two new east-west connecting roads to the north-south bypass of Da Nang and the national expressway network; and construction of resettlement sites.

Component 4: Technical Assistance and Capacity Building (US$15.3 million)

Provision of technical assistance to the People's Committee and relevant departments of Da Nang City on urban infrastructure management under the project, including: (a) strategic

planning and effective management of drainage and wastewater collection and treatment systems; (b) oversight of public transport management and operations, and management of road safety, urban traffic and parking; (c) management and monitoring of public service performance contracts; (d) development of a green development and sustainability index; and (e) project implementation support.

Component 5: Transferred Activities of Da Nang Priority Infrastructure Investment Project (US$36.8 million)

This component support completion of some major infrastructure for which construction started under the PIP, including: (a) construction of the southern road link connecting to the Hoa Phuoc - Hoa Khuong Road; (b) construction of the Hoa Xuan Wastewater Treatment Plant, upgrading of Son Tra Wastewater Treatment Plant, and construction of Phu Loc Bridge and embankment of Phu Loc River mount; and (c) associated construction supervision and safeguards monitoring services.

The implementation time of SCDP is estimated from 2013 to 2019

1.1.3. Summary of amended and supplemented items

During the project implementation, SCDP has several design adjustments and supplemented items in Components 1, 2, and 3 to enhance and improve the Project's investment efficiency.

Such adjustments were approved by Da Nang CPC under Official Letter No. 4881/UBND-QLDT dated 09 June, 2014 and Notification No. 241/TB-VP dated 18 September 2015. These The adjustment and supplementary works after being completed will bring practical benefits on socio-economic development and environment for Danang city.

Details of adjusted and supplemented items are mentioned in Table 1-1 below,

Table 1-1: List of adjusted and supplemented items of SCDP

No.	Approved under EIA	Updated according to design adjustment	Reason
1	**Component 1: Improvement of stormwater and wastewater drainage system**		
1.1	**Improvement of stormwater drainage system**		
1.1.1	Improvement of drainage system of Quang Trung sewer	Improvement and Upgrading of Quang Trung drainage area and supplementation of several lines: - Sewer renovation of Ong Ich Khiem road - Sewer renovation of Le Loi road - Anti-flood station at the end of Ong Ich Khiem road	Quang Trung drainage sewer will receive stormwater from Le Loi road, Ong Ich Khiem to avoid flooding. However, due to the severe degradation of existing sewers on Le Loi and Ong Ich Khiem roads, affecting the project's effectiveness, so it is required to extend Le Loi and Ong Ich Khiem drainage basins and to upgrade pumping station.
1.1.2	Dredging and constructioni of culverts, inlets of inter-wards' sewers to Thac Gian lake, then discharged to Da Nang Bay	Adjust to extend and renovate drainage basin of wards around Thac Gian lake by several works: - Sewer renovation of Hung Vuong road - Sewer renovation of Ly Thai To road - Sewer construction from Park 29/3 lake to Le Do sewer	According to initial proposal, the water volume discharged to Thac Gian lake will be big after renovation Therefore, extend more 03 sewer routes on Hung Vuong, Ly Thai To roads, and route towards Park 29/3 lake. These are 03 drainage sewers from Thac Gian lake to Da Nang Bay.
1.1.3	Drainage basin on Le Hong Phong, Hoang Van Thu roads	Adjust to extend and renovate drainage basin on Le Hong Phong and Hoang Van Thu by several works: - Sewer renovation of Hoang Dieu road - Sewer renovation of Phan Chu Trinh road	Stormwater from Phan Chau Trinh and Hoang Dieu roads will be drained to Le Hong Phong, Hoang Van Thu sewers. However, the severe degradation of existing sewers on Hoang Dieu and Phan Chau Trinh roads cause flood . So it is required to extend Phan Chau Trinh and Hoang Dieu drainage sewers
1.1.4	Construction of box culvert along alley 7 Hoang Dieu,	- Extend and upgrade Me Linh sewer system	Due to Master Plan adjustment of water discharge to Han river, it is required to supplement Me Linh sewer system

No.	Approved under EIA	Updated according to design adjustment	Reason
	Chu Văn An roads, alley 168 Nguyen Thien Thuat road towards Han river		to maximize water drainage effectiveness.
1.1.5	Tran Quang Khai water drainage basin	Add sewers at Tran Quang Khai water drainage basin: - Construct Tho Quang – Bien Dong sewer - Le Tan Trung sewer in connection with Tho Quang – Bien Dong	Due to drainage planning adjustement, Tran Quang Khai drainage basin is directed to Tho Quang – Bien Dong and Le Tan Trung basins to ensure water drainage and effectiveness of the project.
1.2	**Flood treatment in residential areas**		
1.2.1	Construction of My Da Tay resettlement area	Invested to upgrade technical infrastructure of several residential areas in connection with My Da Tay resettlement area. Specifically: traffic, water supply and drainage for trees, power supply for groups 5, 6, 7 Son Thuy.	Because drainage basin of groups 5,6,7 is located in My Da Tay's pole. My Da Tay construction investment project is to improve living environment that will affect the drainage system of groups 5,6,7. Therefore, it is required to upgrade technical infrastructure of groups 5,6,7 to maximize the project's efficiency.
1.3	**Construction of waste water collection system**		
1.3.1	My An and My Khe landscape improvement; and building and upgrading wastewater My An, My Khe basins toward Da Nang sea	- Landscape improvement of My An and My Khe outlets; construction of separate wastewater and rainwater drainage system for My An, My Khe; and the mixture of wastewater and rainwater cannot be discharged to the sea. Specificall, rainwater will be discharged to Han river and wastewater will be directed to Hoa Xuan treatment station.	According to the planning, this is a tourism area of the city, mixture of wastewater and rainwater to be discharged to the sea will affect urban landscape and the project, so the adjustment is required.
1.3.2	Construction of covering sewer along Nguyen Tat Thanh road towards Lien	- Construction of sewer system along the canal from Hoa Phu lake to Hoa Minh canal. (no investment in construction of covering sewer	Because wastewater drainage planning of cities is adjusted, the investment in sewers along Nguyen Tat Thanh towards Lien Chieu treatment station does not take

No.	Approved under EIA	Updated according to design adjustment	Reason
	Chieu treatment station	along Nguyen Tat Thanh road)	effect, and being replaced by construction of sewer from Hoa Phu lake to Hoa Minh canal. Collected wastewater will be transported to Phu Loc treatment station.
1.3.3	Construction of covering sewer along Tho Quang navigation lock	- Adjustment to expand: Marinetime wastewater collection sewer of Pham Van Xao raod, Tho Quang marinetime industrial park	Due to adjustments in planning of city sewerage, it is required to expand sewers at Pham Van Xao road, Tho Quang industrial park to prevent re-pollution by wastewater discharged to navigation lock . Marinetime wastewater at Pham Van Xao road will be collected to sewerage around Tho Quang navigation lock, then transported to Son Tra treatment station.
1.4	**Construction of wastewater treatment stations**		
1.4.1	Upgrading wastewater treatment capacity of Hoa Xuan plant from 20,000 m3 /day to 40.000m3/day, using SBR technology.	- Upgrading wastewater treatment capacity of Hoa Xuan plant from 20,000 m3 /day to 60.000m3/day, using SBR technology.	As adjusted drainage planning of the city, 2 treatment stations of Hoa Cuong and Ngu Hanh Son will be decommissioned in 2020. So Hoa Xuan station's capacity is improved to take wastewater from these 2 stations .
1.4.2	Upgrade capacity to 40.000 m3/day-night, usring oxidization ditch technology	Reduce capacity of Lien Chieu WWTP to 20.000 m3/day-night, using SBR technology	According to adjusted drainage planning of Da Nang city, Phu Loc WWTP will be invested to improve its capacity to 120.000 m3/day-night
2	**Component 2: Development of Bus Rapid Transit (BRT)**		
2.1	- Construction of BRT at Park 29/3 - BRT traffic lane is	- Adjust the location to build a bus rapid transit Depot (BRT) (bordering intersection Nguyen Tri Phuong and Nguyen Van Linh Street, Thac Gian Ward, Thanh Khe District). - BRT lane traffic is designed as overbridge	Reduce traffic load for entertainment area of Park 29/03

No.	Approved under EIA	Updated according to design adjustment	Reason
	designed at the same level as Dien Bien Phu - Nguyen Tri Phuong intersection	which is positioned at Dien Bien Phu - Nguyen Tri Phuong roads	
2.2		- Investment on integrated fare collection and Intelligent Transport System (ITS) to enhance BRT operations	Due to the investment of the city is connected to the BRT lines invested by IDA funds, this system is further invested to increase the effectiveness of BRT route.
3	**Component 3: Tactical urban traffic routes**		
3.1	- Construction TA of Hoa Phong resettlement area	– Construction of Hoa Khuong resettlement area (No investment in construction in Hoa Phong resettlement area)	In the first phase of SCDP, Phuoc Hoa – Hoa Khuong route adjusted in alignment. Supplementary EMP for such adjustment was approved by the World Bank and the City. Due to adjustment of Hoa Phuoc – Hoa Khuong alignment, the construction of Hoa Phong resettlement area for affected persons is inappropriate. Thus Hoa Khuong resettlement area was built to facilitate the resettlement layout.
3.2		Construction of tactical route DH2	The proposed 9.2 km DH2 road is parallel to the Da Nang Bypass, which will be the northern extension of Da Nang – Quang Ngai Expressway. The road is recognized in the City Master Plan 2025 since its original approval in 2011, and is an important urban road to separate local urban traffic from the Da Nang Bypass.

** For the new investment of DH2 road, a separated EIA has been prepared separately to cover environmental and social impacts of this investment*

1.2. EMP SCOPE

An addtional FS report was prepared during the implemetation process of adjusted and supplemented items. And, the environmental and social impacts and mitigation measures will be updated in the social environment report. Specifically:

- This EMP report is prepared to evaluate, update the environmental and social impacts then to propose management measures to minimize the impacts for additional categories of the project. This report will be reviewed and approved by the World Bank; adopted and implemented by the Investor in the process of implementation.
- And, a separate EIA report for road DH2 was prepared to evaluate, mitigate and manage the impacts of socio-environmental associated with this category.

The EMP report for adjustment items and EIA report for road DH2 are in compliance with Environmental Protection Law No. 55/2014/QH13, Decree No. 18/2015/ND-CP of the Government dated 14 February, 2015 on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental protection plan, and the operational policy OP4.01 (environmental assessment) of the World Bank (WB).

1.3. DETAILED DESCRIPTION OF ADJUSETD AND SUPPLEMENTED ITEMS

Details of adjusted and supplemented items are described in the Table below.

Table 1-2: Details of adjusted and supplemented items

No.	Works	Investment scope
1	**Component 1: Improvement of stormwater and wastewater drainage system**	
1.1	**Improvement of stormwater drainage route**	
1.1.1	Improvement to expand Quang Trung drainage basin: - Renovate and upgrade Ong Ich Khiem sewer of 1,35 km length. Location: from Dong Da intersection to Nguyen Van Linh intersection. - Renovate and upgrade Le Loi sewer of 1,2 km length. Location: from Tran Quy Cap intersection to Phan Dinh Phung intersection. - Anti-flood pump station at the end of Ong Ich Khiem road	Road surface repair and upgrade: + Curb types 1,2,3; + Horizontal line connection; + Add more planting holes, newly consturct and repair manholes + Build horizontal ditch, lengthwise ditch, curb beams; + Repair knit ditch Reinforced pumping station with capacity of 23m3/s, size: 1800 m3 on vacant, public land.
1.1.2	Improvement to expand inter-wards drainage basin of Thac Gian lake - Renovate and upgrade Hung Vuong sewer of 0,8 km length. Location: from Ngo Gia Tu intersection to Ham Nghi road - Renovate and upgrade Ly Thai To sewer	+ Curb types 1,2,3; + Horizontal line connection; + Add more planting holes, newly

No.	Works	Investment scope
	of 0,35 km length. Location: from Le Duan intersection to Hoang Hoa Tham intersection. - Construction of sewerage from Park 29/3 to Le Do sewer of 0.42 km length	consturct and repair manholes + Build horizontal ditch, lengthwise ditch, curb beams; + Repair knit ditch Construction of aperture (3,0x1,5) m; 0.42 km length. - Construction level: grade II - Design reference: based on the rain P=10 years - Design load: 1.4 road culvert with HL93 load; Drain on the pavement with 0.5HL93 load.
1.1.3	Adjust to extend drainage basin of Le Hong Phong and Hoang Van Thu, add several works with 3,46 km length - Renovate and upgrade Hoang Dieu sewer of 1,86 km length. Location: from Phan Chu Trinh intersection to Trung Nu Vuong. - Renovate and upgrade Phan Chu Trinh sewer of 1,86 km length. Location: from Phan Dinh Phung intersection to Trung Nu Vuong.	+ Curb types 1,2,3; + Horizontal line connection; + Add more planting holes, newly consturct and repair manholes + Build horizontal ditch, lengthwise ditch, curb beams; + Repair knit ditch
1.1.4	- Renovate and upgrade Phan Chu Trinh sewer of 0.83 km length. Location: start point from Le Dinh Ly – Nguyen Hoang roads to end point of Le Dinh Tham sewer - Trung Nu Vuong – Le Dinh Tham T-junction	- Local uplift of upstream culverts of Me Linh inter-wards (3-way intersection adjacent Do Quang - Le Dinh Ly roads) from 0.5 to 1.0 m. - Close knit ditch with reinforced concrete width from 1.6 m to 2.2 m, length of 1.6km.

No.	Works	Investment scope
1.1.5	Adjust Tran Quang Khai drainage basin by add several sewers: - Construction of stormwater drainage sewer Tho Quang- Bien Dong with length of 0.23 km Location: start point at Thanh Vinh 1 residential site (pile D8), end point connects with existing sewer at Km7+646.67 on the roads of Son Tra- Dien Ngoc - Construction Le Tan Trung stormwater drainage system connecting Tho Quang – Bien Dong sewer, with a total length of 0.67km Include 2 sections: - Section 1 is devided into 2 branches: + Branch 1: the starting point from alley 11 Le Tan Trung + Branch 2: the starting point from alley 12 Le Tan Trung - Section 2: connecting Tho Quang – Bien Dong sewer.	- Construction reinforced concrete box sewer with length of 229 m; aperture BxH=2x(1.6x1.6) m Total length of 0.67 km + Section 1, branch 1: reinforced concrete box sewer aperture (2.5x1.6)m - (1.7x1.6)m, length L=232 m. + Section 1, branch 2: reinforced concrete box sewer aperture (1.7x1.6)m - (2.5x1.6)m, length L=151m and section connects sewers between 02 branches, aperture (1.2x1.6)m, length L= 36 m. Section 2: reinforced concrete box sewer aperture 2x(2.2x1.6)m , length L=252 m.
1.2	**Flood treatment at residental sites**	
1.2.1	Investment in technical infrastructure of groups 5,6,7, traffic, water supply and drainage, trees, power suppy) (in connection with My Da Tay resettlement area). Location: Project location is 8km far from center of Da Nang city to the Northwest, located at Hoa Hai ward, Ngu Hanh Son district, Da Nang city .	Investment for renovation and improvement Ba Bang Nhan road, Dang Thai Than and 5 branches of 2 roads; + Ba Bang Nhan road: cement concrete road, length L= 483 m, width of 7.5 m and sidewalk with width of 2x3m. + Dang Thai Than: cement concrete road , length L=518 m, width of 7.5 m and sidewalk with width of 2x4.5m. - Investment water supply and drainage, trees, lights and relocation medium voltage, low voltage with 2 roads and branches
1.3	**Construction of wastewater collection route**	
1.3.1	Wastewater collection system and improvement landscape for outlets of My An and My Khe; construction of wastewater and stormwater separate drainage system for My An, My Khe basins; mixture of wastewater and rainwater cannot be discharged into sea. Specifically, rainwater will be discharged to	* My An outlet: Construction sewer with aperture (3.0x1.5) m, length L= 273 m. Construction network system class 1.2 D315-D400 by HDPE pipe, L=9,650m; class 3 D200 L= 17.000 m. Improvement landscape at outlet

No.	Works	Investment scope
	Han river, and wastewater will be transported to Hoa Xuan treatment station. Location: Ngu Hanh Son district	* My Khe outlet: Construction network system class 1.2 D315 – D400 by HDPE pipe, length L=11,100m; class 3 D200 length 21,500m. Improvement landscape of outlet
1.3.2	Construction wastewater pipeline along canal from Hoa Phu lake to Hoa Minh canal Location: Hoa Minh ward, Lien Chieu district	Construction HDPE DN315 – DN560 pipeline with length 1.88km and construction 1 pump station Q=510m3/h.
1.3.3	Expand: Aquatic wastewater collection system at Pham Van Xao road, Tho Quang industrial fishery zone Location: Tho Quang ward, Son Tra district	- Construction 1.7 km D315 - 630 pipeline mmm by HDPE. - Construction sewer under roadbed, far from curb about 1.2m. Install a manhole for each 30m.
1.4	**Construction of wastewater treatment plants**	
1.4.1	Improve treatment capacity of Hoa Xuan WWTP from 20.000 m3 to 60.000m3/day-night, using SBR technology. Location: Hoa Xuan WWTP is located in the SouthEast of Cam Le district.	The existing capacuty of the treatement station is 20,000 m3/day-night Upgrade one more WWT module with capacity of 40,000m3/–day-night
1.4.2	Improve treatment capacity of Lien Chieu WWTP from 20.000 m3 to 60.000m3/day-night, using SBR technology. Location: Lien Chieu WWTP is located at Hoa Lien commune, Hoa Khanh Bac ward, Lien Chieu district	Construction of Lien Chieu WWTP with capacity of 20.000 m3/day-night, using SBR technology.
2	**Component 2: Development of Bus Rapid Transit (BRT)**	
2.1	- Building the Depot of the Bus Rapid Transit (BRT) Location: bordering Nguyen Tri Phuong and Nguyen Van Linh intersection, Thac Gian ward, Thanh Khe district - BRT traffic lane is designed as overbridge at Dien Bien Phu – Nguyen Tri Phuong Location: Chinh Gian ward, Thanh Khe district	Total area of: 11,375 m2 Construction planning for technical infrastructure system, including: ground leveling, internal traffic, water supply, lighting supply, trees, environmental hygine. Traffic: - Road cross surface 1-1: B = 18.5m (3.0m + 10.5m + 5.0m). - Road cross surface 2-2: B = 16.0m (2.5m + 10.5m + 3.0m). The bridge has total length of Lc=129.2m, box girder, Y-shaped profile with 3 continuous spans according to the diagram (34+55+34)m. Of which, one span of 34m length has bridge width of B=0.25+15+0.25 = 15.5m arranged toward Dien Bien Phu

No.	Works	Investment scope
		road side (in front of the Park 29/3). Two spans (55+34)m are two branches toward Bien Phu road with branch width of 0.25+7.5+0.25=8.0m.
2.2	Investment on integrated fare collection and Intelligent Transport System (ITS) to enhance BRT operations	
3	**Component 3: Tactical urban traffic lines**	
3.1	Construction of Hoa Khuong resettlement area Location: Hoa Khuong commune, Hoa Vang district, Da Nang city	- Total planning land area for the resettlement site: 8.4 hectare. - Building infrastructure includes : ground leveling, drainage, water supply, lighting system, trees.

The followings are several Figures and detailed descriptions of Location, implementation contents of stormwater drainage works in Table above:

❖ *Construction of anti-flood pump station at the end of Ong Ich Khiem road (item 1.1.1)*

The pumping station at the end of Ong Ich Khiem road is located at the end of the Outlet 454m far from Nguyen Tat Thanh road, located in Thanh Binh ward, Hai Chau district, Danang city.

Objective: Functions of the pumping station are to pump for drainage in order to anti-flooding for the central area of Danang city in case of tide, water level rise outside Danang bay. Pumping stations only operate in case of tide and heavy rain, at that time, door will be closed to prevent water from overflowing from the bay back into the sewer and pump station will be activated to pump stormwater out. The gravity stormwater drainage is normally implemented by the sewers in case of no occurrence of tide and water level rise outside Danang bay.

Technical parameter of pump station:

- Forms of pumping stations: Submersible pump station uses submersible pump oriented pillar, vertical pillar controlled by electricity.
- The biggest flood flow p = 5% : Qmax = 23.06 m3 / s
- The largest pump flow : Qbmax = 21.00 m3 / s
- Flow of a pump : Qm = 3,00 m3 /s
- The number of pumps : n = 7 pumps

Figure 1-3: Location of Ong Ich Khiem pump station

❖ *Construcion stormwater drainage sewer from lake of park 29/3 to Le Do sewer (item 1.1.2)*

To take advantage of drainage capacity of the Le Do sewer line (this sewer line is newly built and near the sea, therefore, its city drainage capacity is very guaranteed), contributing to minimizing flooding for the area adjacent to Thach Gian – Vinh Trung lake, it is required to actively lower water level in lake of the Park 29/3 and take advantage of the lake's regulation capacity while pulldown load for Xuan Ha sewer. The Consultant suggests to supplement the diversion sewer from lake of Park 29/3 to Le Do sewer line with length of L = 273.7mThe location map of sewer is shown in the following figure:

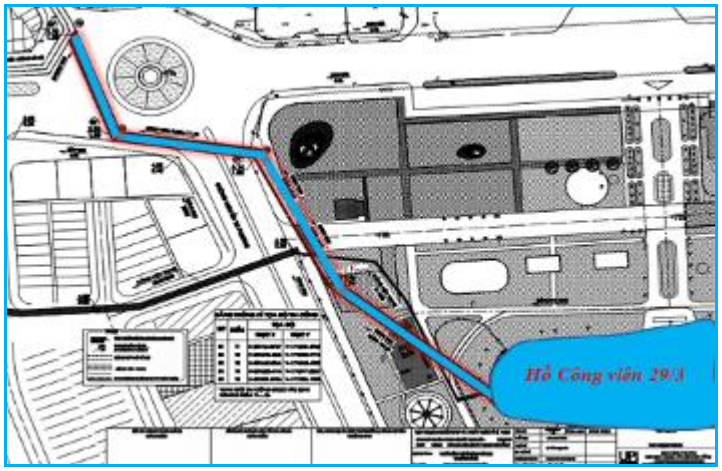


Figure 1-4: Location map of construction sewer from Lake 29/3 to Le Do sewer

❖ *Improvement Me Linh stormwater drainage sewer (item 1.1.4)*

Figure 1-5: Location of Me Linh sewer

❖ *Improvement Tho Quang – Bien Dong (item 1.1.5) (the rest section)*

To collect stormwater in the residential site into coastal outlet (outlet no.16 at Km8+336.82 Son Tra- Dien Ngoc road). Section is under construction(red colour) has the starting point at Thanh Vinh 1 residential site(pile D8), the ending point connects with current sewer at Km7+646.67 on Son Tra – Dien Ngoc road.

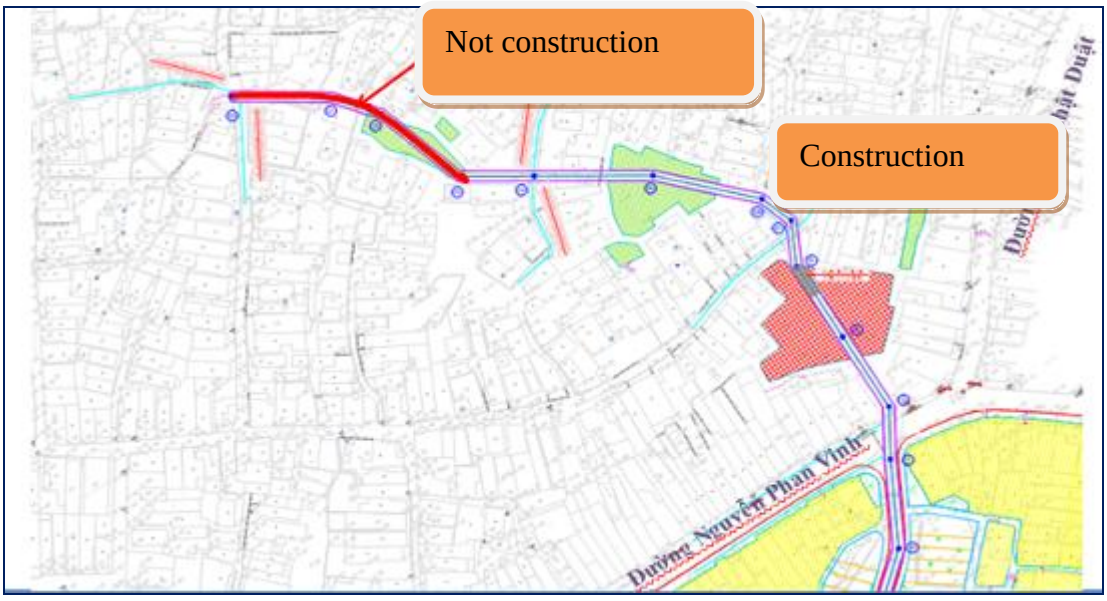


Figure 1-6: Location of renovated sewer of Tho Quang – Bien Dong

❖ *Construction Le Tan Trung sewer connecting Tho Quang- Bien Dong sewer (item 1.1.5)*

Section 1: From Le Tan Trung to EC road which is separated into 2 branches on 02 existing concrete alleys:

- Branch 1: (Alley 11 Le Tan Trung road): Reinforced concrete box sewer, aperture (2.5x1.6)m - (1.7x1.6)m, length L=232m.
- Branch 2 (Alley 17 Le Tan Trung road): Reinforced concrete box sewer, aperture 1.7x1.6)m - (2.5x1.6)m, length L=151m and section connecting sewers between 2 branches with aperture (1.2x1.6)m, length L=36m.

Section 2 : Reinforced concrete box sewer, aperture 2x(2.2x1.6)m connecting section 1 to Tho Quang – Bien Dong sewer, length L=252m.

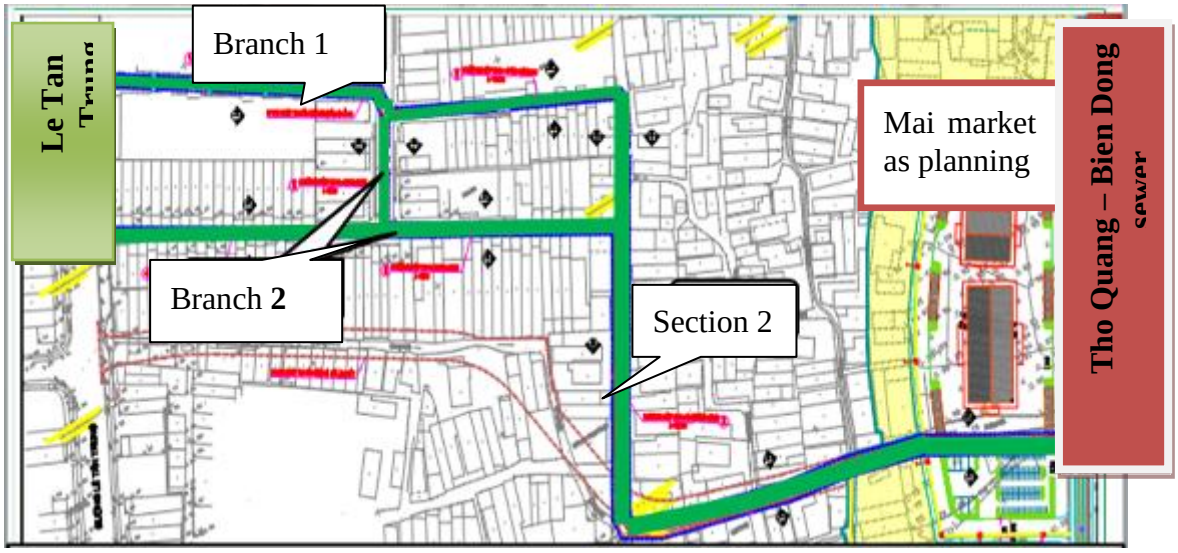


Figure 1-7: Le Tan Trung sewer line connects with Tho Quang – Bien Dong sewer

❖ *Flooding treatment for population groups 5, 6, 7 of Son Thuy commune – invest in building Ba Bang Nhan and Dang Thai Than roads (item 1.2.1)*

Location: Its East borders Son Thuy residential area, Ngu Hanh Son district Administrative Center; Its West borders Co Co river; Its South borders the Non Nuoc tourism resort; Its North borders the groups No. 1,2,3 – Southern new urban area of Tuyen Son bridge.

Figure 1-8: Location map of Ba Bang Nhan, Dang Thai Than

The works items include:

- Traffic: Investment for renovation and improvement Ba Bang Nhan, Dang Thai Than road and 5 braches of 2 roads, investment water supply- drainage system, trees, lighting system and relocation medium and low voltage. In which:
  + Ba Bang Nhan road and Dang Thai Than roads are designed according to urban road standard, with structure of asphalt concrete road surface: Ba Bang Nhan road is cement concrete road, with length of 483m, width of 7.5m and sidewalk has width of 2x3m; Dang Thai Than is cement concrete road, with length of 518m, width of 7.5m and sidewalk has width of 2x4.5m
  + 05 branches N1, N2, N3,N4,N5 are designed with class of rural traffic road type A, is cement concrete road, width of road surface is from 3 to 7m, without pavement, total length of 5 branches is 908m, design load for vehicles is 6.0T.
- Water supply: Water sources are taken from 2 pipelines of D225 HDPE on Le Van Hien road. Based on the current state of water supply system which mainly reused to pipelines for ensuring water supply, replacement some pipelines which are not aligned with larger diameter pipes to supply water and fire prevention. The pipelines are replaced as follow:
  + Pipeline D50 HDPE to the North, on Ba Bang Nhan, length of 664m
  + Pipeline D90 HDPE to the South, on Ba Bang Nhan, length of 465m
  + Pipeline D50 HDPE section 8-10, at alley 55 Ba Bang Nhan, length of 155m
  + Pipeline D50 HDPE to the North, Dang Thai Than road, length of 476m
  + Pipeline D75 HDPE to the South, Dang Thai Than, length of 512 m
  + Pipeline D225 HDPE at Dang Thai Than intersection and Le Van Hien, length of 643m
  + Pipeline:D63, D50, D40 HDPE at alley 596 Le Van Hien (equivalent length: 60m, 267m; 227m)
- Water drainage:
  + Water drainage mainly from East to West, water flows into water drainage system on Le Van Hien. Water is collected systematically along the vertical ditch between the local concrete roads, Ba Bang Nhan and along 2 sides Dang Thai Than road.
  + Vertical ditch: with aperture 0.6 - 1.5 m, made of reinforced concrete
  + The total length of the vertical ditch along Dang Thai Than road: L = 1.100,25m
  + The total length of the vertical ditch along the Ba Bang Nhan road: L = 420m
- Trees planting:
  + Holes to plant trees on Ba Bang Nhan, Dang Thai Than, about 10m /hole.
  + Type of trees: Sau (Dracontomelon duperreanum), Lim xet (peltophorum), mun , Caesalpinia pulcherrima, sao den (*Hopea odorata)* , xa cu (*Khaya senegalensis)*...
- Relocation of medium voltage, low-voltage lines: the medium-voltage lines, low voltage, lighting systems of the work are summarized below:
  + Total medium voltage line to be relocated: relocation 6 pillars (LT14m; LT10.5m) with a total length of lines is removed: 796m.
  + Total voltage line to be relocated: relocation of 10 pillars (LT14m; LT10.5m) with a total length of lines is removed: 1,452.5m.
  + Dismantling lighting line: Dismantling and withdraw the entire line of lighting and materials and equipment on 2 roads. Length of road dismantled: 1055m. Length of lighting system which is newly built is 999.5m

❖ *Wastewater collect system and improvement landscape for My An and My Khe outlets (item 1.3.1)*

Location of My Khe outlet	Location of My An outlet
- Its North borders Pham Van Dong road - Its South borders Nguyen Van Thoai road - Its West borders Pham Cu Luong and Phan Boi roads - Its East borders My Khe beach	- Its North borders Nguyen Van Thoai road - Its South borders Bui Thi Xuan road - Its West borders Ngo Quyen - Its East borders My An beach

My An outlet

My Khe outlet

My An and My Khe outlets are main drainage outlets for more 390 ha in My An and My Khe areas, Son Tra district, Da Nang city. Status of storm water and waste water drainage for 02 outlets of My An and My Khe:

- Currently, in dry season, wastewater flows in sewer with small capacity and speed, causing sediment and odor, wastewater flows into 02 outlets and collected by pump station to waste water treatment to be treated. Small amount of waste water can be leaked, flows into the sea, but not negligible.
- In rainy season, partially stormwater and wastewater overflows outlets and flows into the sea, causing environmental pollution and having influence on landscape. Storm water flows on sand, causing aesthetic for bathing area.

According to the guidelines in Notice No. 243 / TB-VP dated 19.09.2015, the city People's Committee has agreed on the plan design of transferring rainwater and wastewater into Han River to handle, not the construction of the offshore outlet at An Khe and An My to thoroughly prevent wastewater from flowing into the sea, causing aesthetic manner, affecting marine tourism environment.

Design alternative:

- Block 2 outlets of My An and My Khe, prevent stormwater and wastewater from flowing directly into the sea.
- Construction stormwater drainage pipeline by reinforced concrete with aperture(2.0x2.0)m, length 1,322m, direction from My Khe outlet along Vo Nguyen Giap road into My An, drainage sewer by reinforced concrete with aperture(1.5x1.5)m, length 1,320 from Furama outlet along Vo Nguyen Giap road to My An outlet. From My An outlet, continue to build reinforced concrete pipeline with aperture (2.5x2.5)m,

length 707m and sewer D3000, length L=907 along Vo Nguyen Giap road, to Phan Tu road across Phan Hanh Son road to Han River.

- Construction wastewater pump station with capacity Q=2.000m3 /h
- Construction separate well and pipeline to transmits wastewater by HDPE D800-900 pipeline with length L=3,800m to Ngu Hanh Son wastewater treatment station to treat wastewater.
- At location intersecting with Han river, construction lifting pump station to take stormwater into Han river with capacity Q=13.42m^3 /s.

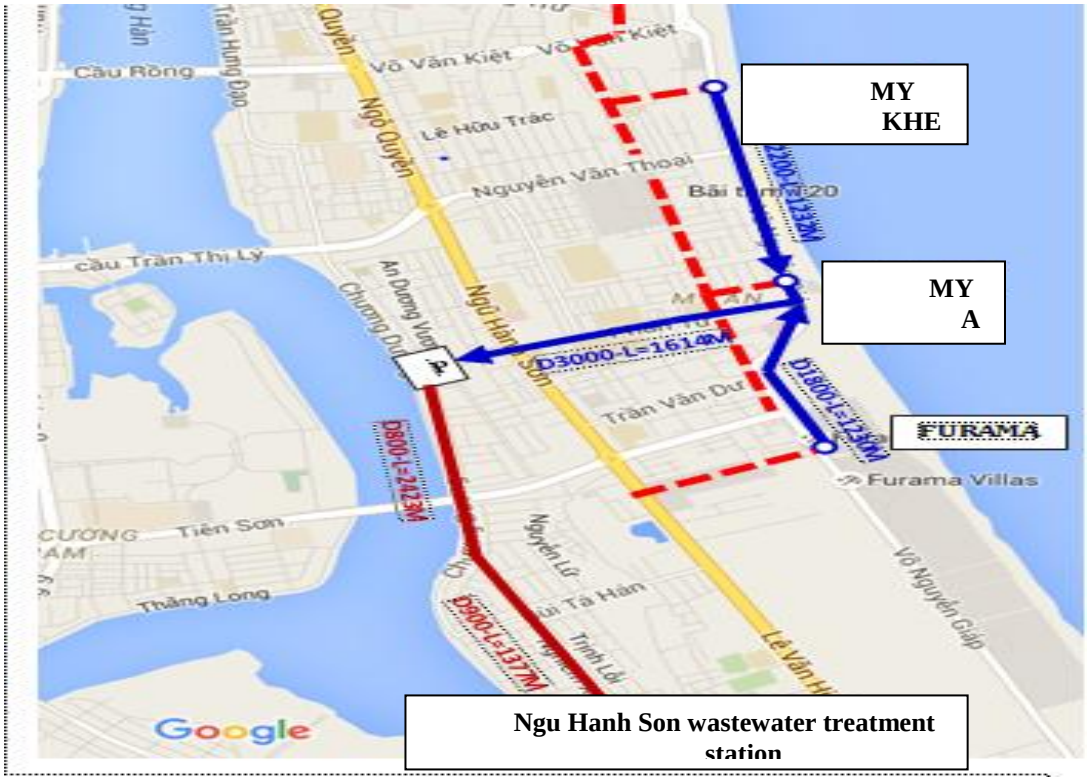


Figure 1-9: Solution for wastewater treatment at My An and My Khe outlet

- Create landscape for 2 outlets: Construction sidesteps to cover outlets and planting coconut trees to create landscape as Figure 1-10.

Figure 1-10: Description landscape in My An and My Khe outlets

❖ *Construction wastewater sewer along canal from Hoa Phu to Hoa Minh canal (item 1.3.2)*

Currently, Hoa Phu lake receives large amounts of wastewater at Bac Hoa Khanh, Hoa Khanh Nam ward. Currently, the outlets into the lake are being polluted and becoming more and more serious if wastewater continues to flow into the lake. Therefore, wastewater collection around the lake (with sewer) is essential, take wastewater into Phu Loc wastewater treatment plant.

Construction investment of wastewater collection system surrounding Hoa Phu lake and along Hoa Phu canal to Hoa Minh canal, including HDPE DN315-DN560 sewer, length L=1.9km and 01 pump station with capacity Q= 510m^3 , located in the starting point of Hoa Phu canal, far from Hoa Phu lake about 300m (Figure 1-11). Wastewater in area will be collected and pumped into Phu Loc wastewater treatment station with existing wastewater treatment station of Hoa Minh canal.

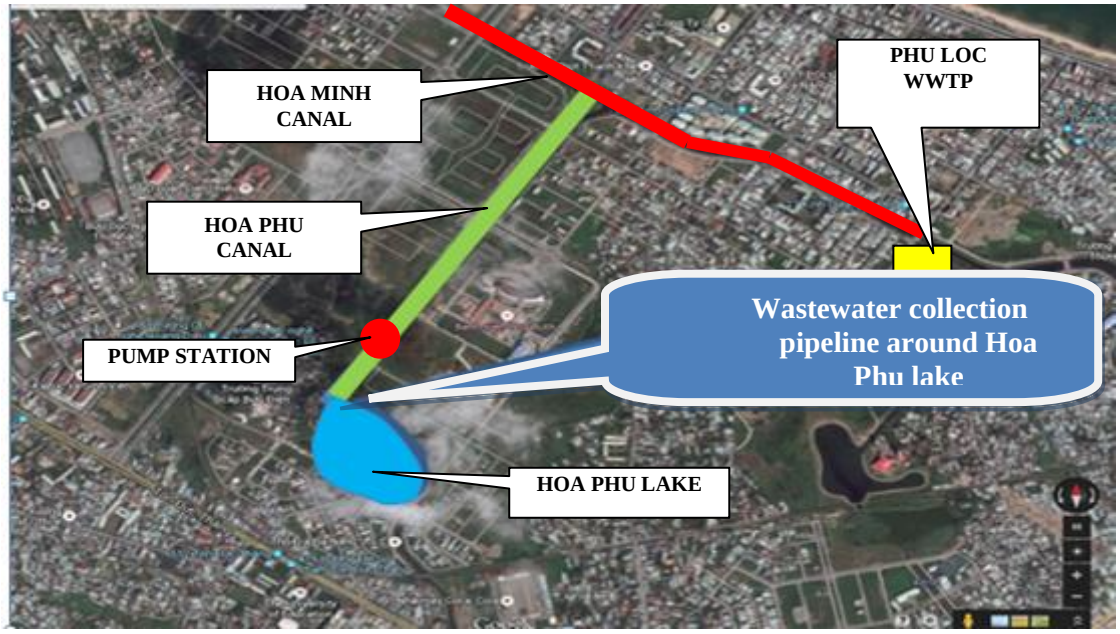


Figure 1-11: Map of wastewater collection at Phu Loc lake

❖ *Aquatic wastewater collection pipeline at Pham Van Xao road, Tho Quang fishery industrial zone (item 1.3.3)*

Tho Quang service-industrial zone has area of 50.43 ha in Tho Quang ward, Son Tra district

Wastewater collection system of Tho Quang service-industrial zone, running along Pham Van Xao road, are taken into Quoc Viet wastewater treatment station. However, due to the wastewater collection system is degraded; wastewater collection does not meet the demand. At collection lines, many manholes had to raise lids of manhole higher than sidewalks of 0.3 - 0.5m to minimize waste water to overflow out of system. In addition, Son Tra wastewater treatment station is being upgraded to handle wastewater part of Quoc Viet pump station. Thus, investors need to build the collection system along Pham Van Xao road to convey waste water in area into Son Tra wastewater pump station.

In order to minimize investment costs, operation of collection and wastewater treatment system in Tho Quang Industrial Zone, Da Nang City People's Committee agreed with the investment program to build sewage collection pipelines in Tho Quang Seafood Service Industrial Zone (1,7km long); D400 - 630 mm, with HDPE to take waste water into Son Tra wastewater treatment. Wastewater collection pipelines comes along Pham Van Xao and Van

Don roads to take wastewater into Son Tra waste water treatment station. Son Tra wastewater treatment station has a capacity of 10,000m3 / day, went into operation in June 2014.

Figure 1-12: Pham Van Xao road in Tho Quang industrial zone

❖ *Improvement Hoa Xuan wastewater treatment station (item 1.4.1)*

As planned by 2030 and vision towards 2005, and according to approved Hoa Xuan WWTP construction investment project (2008), Hoa Xuan WWTP will be constructed with 08 modules of wastewater treatment, each module has a capacity of 40,000 m3/day. Treatment plant will provide a capacity building wastewater treatment of 320,000 m3/day.

Location of Hoa Xuan WWTP: the North borders Hoa Xuan Sports Union area; the South is Nam Cau Cam Le residential area, the East borders Cai river (where wastewater is discharged from Hoa Xuan WWTP)

Its total planned area is 23 hectera which is adequate to build 8 modules. No land acquisition is required for upgrading Hoa Xuan WWTP, as well as no influence on the local households because it is a planned vacant and public land

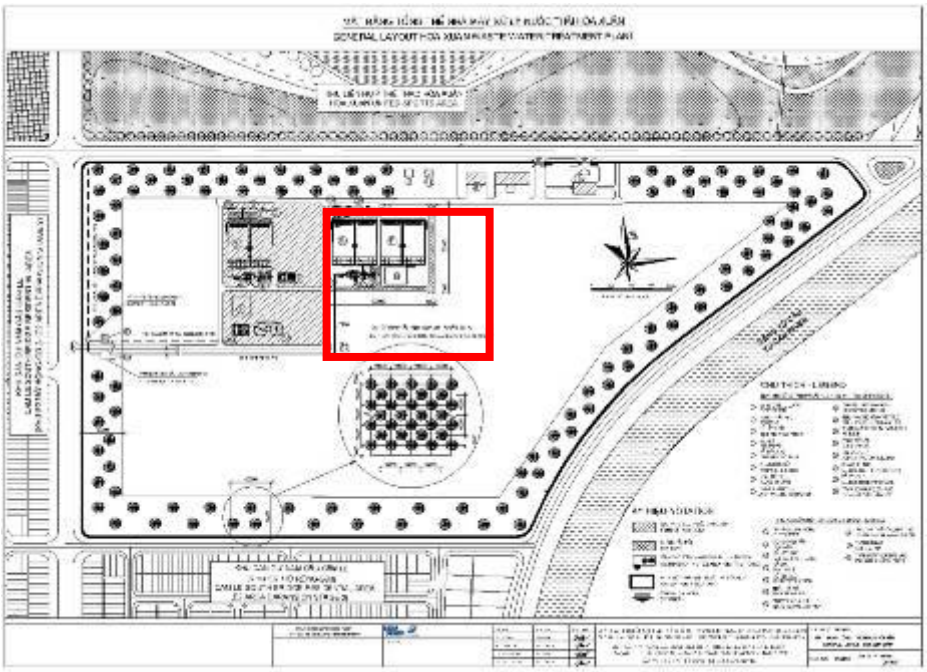


Figure 1-13: Module consutrction location in Hoa Xuan WWTP

At present, Hoa Xuan wastewater treatment station, Phase 1, was built from 12/2011, the station was completed and came into operation on 16 February, 2015. The station belongs to B54B Package of Da Nang Priority Infrastructure Investment Project (PiiP) by IDA loan from WB (Source: Monitoring Report quarter 1/ 2015 of Saigon WEICO). Current capacity of Hoa Xuan station : 20,000m^3 /day, using SBR technology.

Under adjusted SCDP , Hoa Xuan WWTP will be further built with 1 module of 40.000 m3/day-night, increasing sum capacity to 60.000m3/day to meet the requirement of wastewater treatment of the locality by 2020.

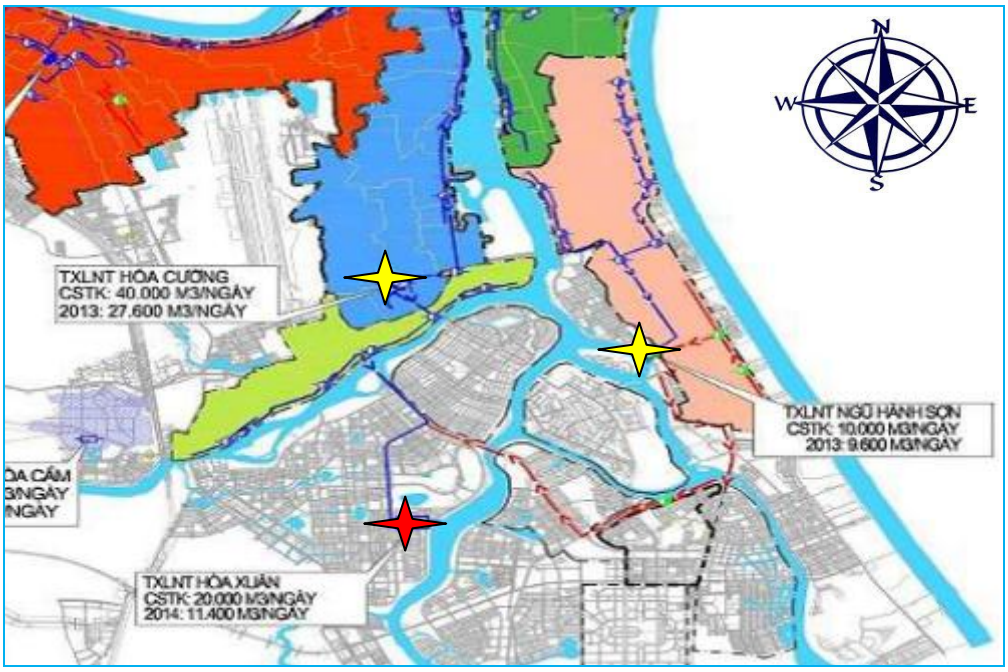


Figure 1-14: Wastewater treatment stations of Hoa Xuan, Hoa Cuong &Ngu Hanh Son

Scale of design work of Hoa Xuan station in adjusted SCDP:

- Construction newly a waste water treatment unit with a capacity of 40,000 m3/day.
- Treatment standard: treat wastewater with level 2 standards consistent with ISO 7222: 2002 on building wastewater treatment stations and Standard of Vietnam 14: 2008/BTNMT, column B for wastewater.
- Treatment technology: SBR biological treatment technology in consistence with Phase 1.
- The construction works in phase 2 will be connected with the construction works in phase 1 with the following items:
  + Construction input wastewater pumping station with capacity of 40,000 m3/day
  + Construction flume; garbage separation; sand deposited meeting the demand of capacity of 40,000 m3/day
  + Construction biological treatment tank (SBR tank) with capacity of 40,000 m3/day
  + Construction of pasteurizing tank with capacity of 40,000 m3/day.
  + Construction gas supply system to meet capacity of 40,000 m3/day.
  + Construction of odor treatment for SBR tank by activated carbon
  + Installation of power system, lighting, automatic electricity, Scada for phase 2

❖ *Construction of Lien Chieu wastewater treatment plant (item 1.4.2)*

Lien Chieu WWTP is planned by 2050 with total capacity of 80,000 m^3/day-night, divided into 04 modules, corresponding to 4 planning stages, each stage has capacity of 20,000 m^3/day and using SBR technology.

Location: Hoa Lien commune, Hoa Khanh Bac ward, Lien Chieu district, Da Nang city

Lien chieu waste water treatment station : This area is located in construction planning for waste water treatment station of Da Nang city. Currently, this area is vacant and public land,thus, Iand acquisition and implementation compensation is not necessary.

The plant location is narrowed by: Its North borders land area of building worker's houses and adjacent houses in Hoa Khanh industrial zone. Its South borders National Highway 4 and planning area of South- North railway. Its West borders Hoa Khanh drainage canal and Hoa Khanh industrial zone. Its East borders existing vacant area.

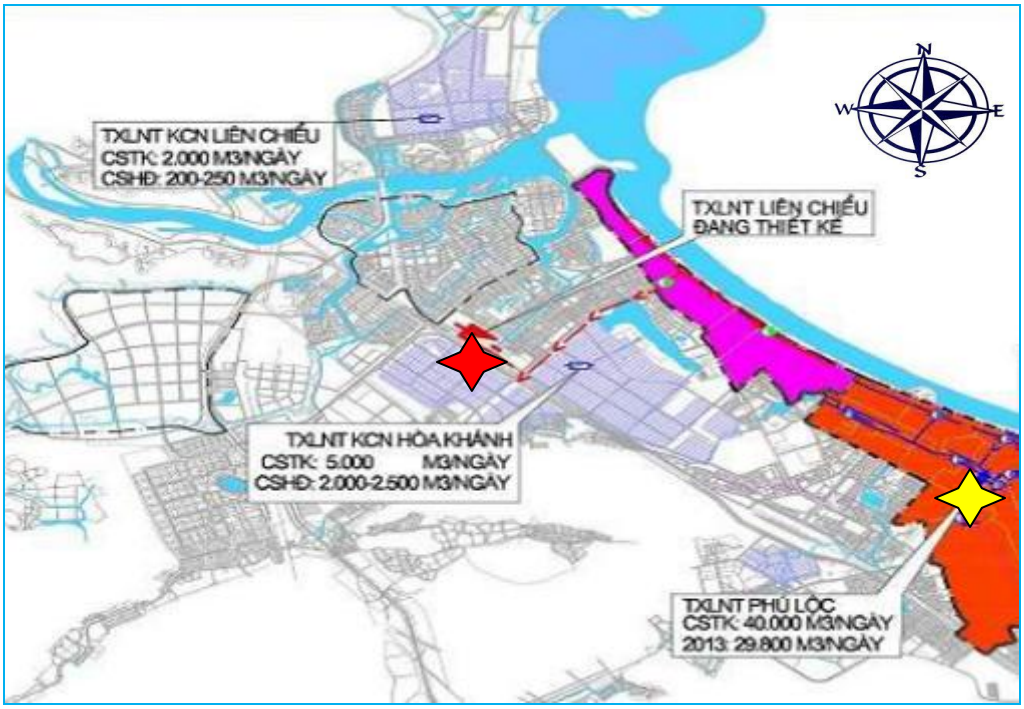


Figure 1-15: Wastewater treatment stations of Lien Chieu and Phu Loc

In the framework of project, Da Nang infrastructure investments project (PiiP) as the previous plan for new construction investment Lien Chieu waste water station with a capacity of 40,000 m3 / day, using technology OD (2011). However, construction activity for Lien Chieu waste water treatment station has not been implemented at this phase and it is transferred to Sustainable City Development Project (SCDP).

According to adjusted SCDP (Table 1-1), Lien Chieu WWTP will be built with capacity of 20.000 m3, using SBR technology.

Reasons for technology adjustment of advantages of SBR wastewater treatment technology compared with OD wastewater treatment technology such as: simple and more durable structure; It can be easily operates and reduces manpower requirements; Easily integrated nitrification/denitrification and phosphorus removal; Simple install and easily to expand and enhance; High effectiveness of pollution; treatment. Moreover, waste water treatment technology SBR is a trend in the future and has been applied many places across the country.

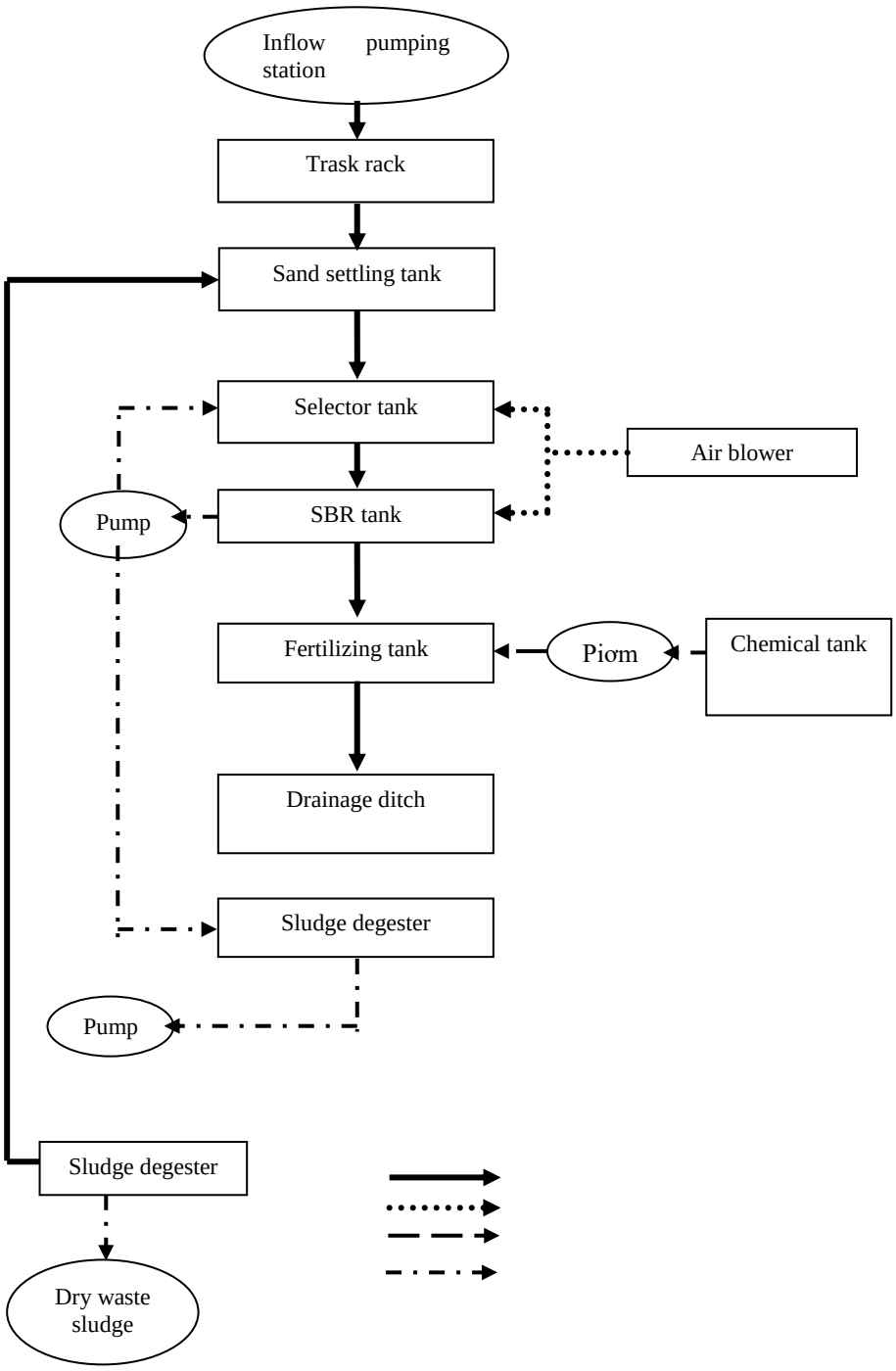


Figure 1-16: Diagram of SBR wastewater treatment technology

The works to be built include:

Construction of treatment facilities to meet the capacity of stage 1 of 20,000 m3 / day. However, some works will be designed with a capacity of 40,000 m3 average / day for both a later stages, these works will be installed equipment to meet the capacity of 20,000 m3 / day. The projects will be developed include:

- Inflow wastewater pumping station with capacity of 40,000 m3/day.
- Flow meter, trash separator and sand settling with capacity of 40,000 m3/day.
- SBR tank, capacity of 20,000 m3/day.
- Sterilizing contact tank, capacity of 40,000m3/day

- Sludge degester, capacity of 40,000m3/day.
- Sludge disposal compartment, capacity of 40,000m3/day.
- Odor treatment facility for SBR tank by activated coal.
- Biological odor treatment facility
- Technical pipeline inside the WWTP
- Electric system and power supply
- Tools and control system SCADA
- Aeration compartment
- Generator compartment
- Chemical mixing compartment- Chlorine
- Warehouse, workshop
- Transformer substation
- Administration house equipped with control room for the WWTP
- Leveling, drainage system, internal road and fencing wall.

❖ *Construction of Depot of the Bus Rapid Transit at Thac Gian ward, Thanh Khe district (item 2.1)*

The proposed BRT has its length of about 23 km from Hoa Khanh industrial park in the NorthWest of the City to Viet-South Korea College School in the SouthEast, cross the city center and new Dragon bridge.

Different from public buses with the same lane of other vehicles, BRT is arranged with its own special lane in the city as described in the figure below:

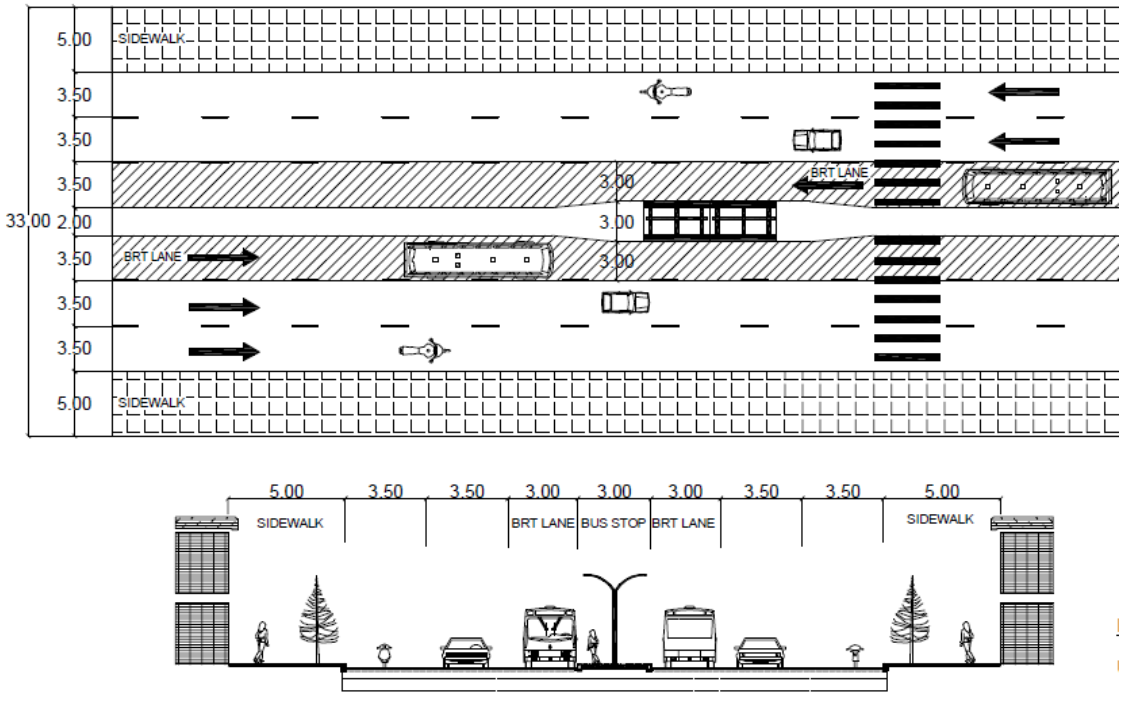


Figure 1-17: BRT description

To maximize the project's investment effectiveness, as well as connect to public bus infrastructure, terminal station in Park 29/3 will be moved to airport area of Thac Gian, Thanh Khe district.

Location: Nguyen Tri Phuong intersection and Nguyen Van Linh road

- Its North borders: Nguyen Van Linh road (about 150m from airport area) and residential area;
- Its East borders: Residential area in the starting point of Nguyen Van Linh road and existing residential site;
- Its West borders: Residential sites at the starting point of Nguyen Van Linh road and petrol area.
- Its South borders: Nguyen Phi Khanh road;

Real status: Total planned area is 1.14 hectera, of which the majority of 1.07 hectera is public land (94%) and the rest is 0.07 hectera (6%) of residential land. At Depot location near the airport, there are 06 of 08 affected households to be relocated and resettled, 02 households only suffering from partial loss of residential land without resettlement. Plan for site clearance compensation was recorded in RAP of adjusted SCDP.

Figure 1-18: General diagram of the BRT

❖ *Dien Bien Phu underpass (item 2.1)*

Status of interchange Dien Bien Phu, Nguyen Tri Phuong, Le Do:

The interchange of operation in critical state during rush hours in the morning, and the afternoon. Speed of circulation through the lower interchange with many conflicts.

Congestion occurred at rush hour in all the branches. Especially the conflict between direct lines through interchange on Dien Bien Phu street with straight lines or turn left on Nguyen Tri Phuong and Le Do roads.

With BRT route going on the line of Dien Bien Phu (left) and Nguyen Tri Phuong occupies one separated lane in the case of interchange, congestion capacity in all branches is high, especially, if the prior signal lamp design for BRT buses will reduce implementation capacity on branches, increasing time of loss of time over interchange and causing congestion at interchange.

Design alternative for Dien Bien Phu overbridge

Overbridge has a total length of 396m, reinforced concrete structures. Part L1 path has length of 140m; L2 path is 176m long; Tunnel length L = 80m. Tunnel width B = (0.5 + 7.0 + 1.5 + 7.0 + 0.5) = 16.5 m for the Ly Thai To Street branch. Tunnel width B = (0.5 + 7.0 + 0.5) = 8.0 to 2 branches the Dien Bien Phu Street tunnel. Clearance in underpass H = 4.5 m. Roadway surface for vehicles by asphalt concrete 12.5 on cement concrete pavement subgrade.

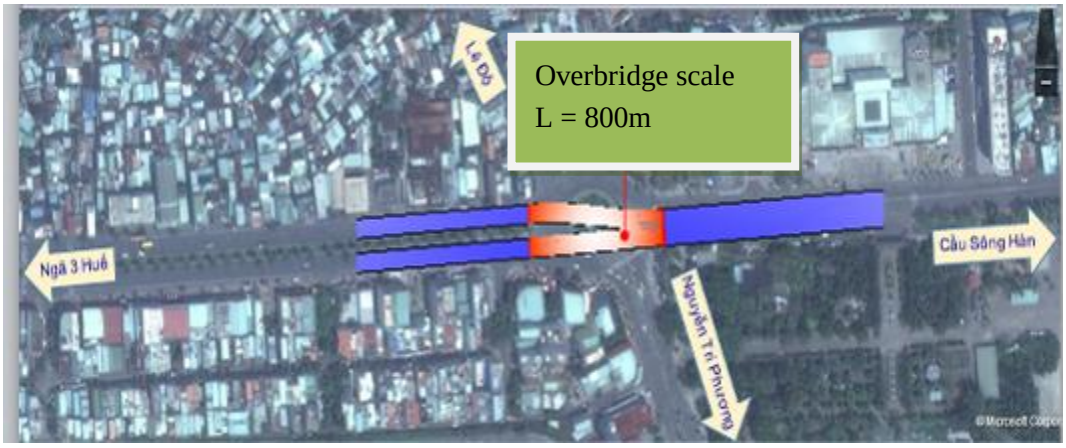


Figure 1-19: Design scale of Dien Bien Phu overbridge

Figure 1-20: Model of Dien Bien Phu overbridge

❖ *Building infrastructure for the Hoa Khuong resettlement site (item 3.1)*

Location: The project is located in Hoa Khuong commune, Hoa Vang district, Da Nang city. its North borders road DH8; its South borders paddy fields; its East borders the existing residential area land; its West borders the existing residential area land.

Status: Total planning land area for the resettlement site: 8.4 hectera, inclusive of cultivation land of 4.3 hectera (51.4%); 1.98 hectera of residential land (23.5 %), 1.35 hectera of farmland (16%); 0.1 hectera (1.24%) of annual tree land; and a small area of 0.5 hectera of salted land and traffic land; 50 m2 of tomb land (04 graves). At present, this area is equipped with water supply and drainage from DH409 road.

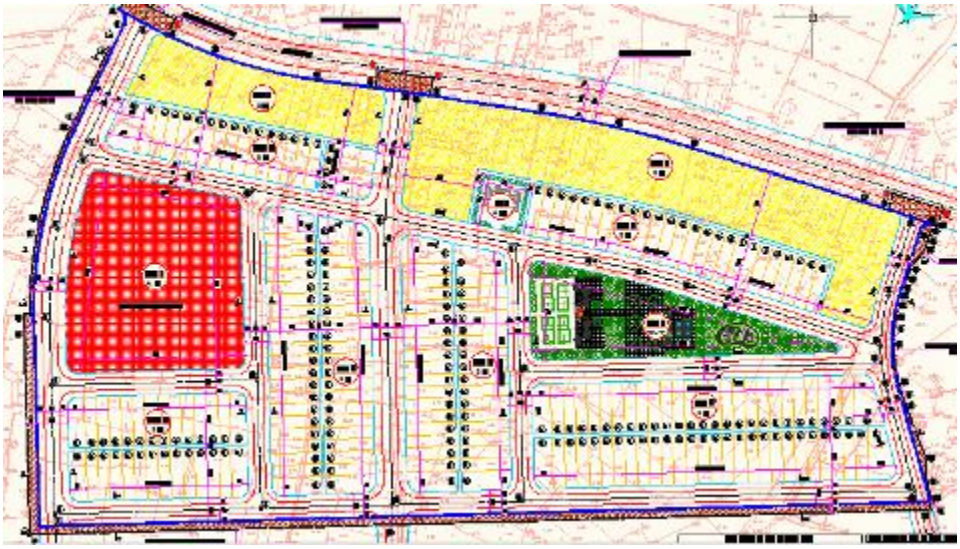


Figure 1-21: Layout of Hoa Khuong resettlement area

Figure 1-22: Picture of current land area

Construction planning of infrastructure

Include infrastructures such as: height planning, water supply and drainage, lighting supply, urban design, trees and environmental hygiene and ground leveling. Namely:

- **Traffic:**
  + Based on thope structure of the road network in planning ground drawing was approved, and the nature and section cross of the route. Also, compare with similar projects which have been approved to clarify grades of the road. Scope of the project

includes 09 branch lines, with a total length of 1.9 km; hot asphalt concrete road surface.

- **Ground leveling:**
  + This project has many technical infrastructures, thus, construction of ground leveling need to coordinate to implement synchronously for items, avoid overlapping and ensure the volume and technical requirements.
  + Compacted coefficient K = 0.85.
  + Clean up the ground and cut down trees around the area.
  + The area of landfill must be compacted from 0.3m to 0.5m, ensuring compaction coefficient K = 0.85.
  + Selection of leveling design elevations based on joint elevation with neighboring areas.
  + Drainage direction: focus on design sewer with aperture B = 2m
- **Drainage:**
  + Based on the actual situation of the sewerage system in selected areas combined sewer form because:
  + Drainage in the area is common drainage.
  + In areas without sewage collection pipelines, thus, connecting it very difficult and expensive.
  + Requirements: Wastewater must be treated locally over septic tank with front 3 compartment to general sewerage system.
  + Design solution:
  + Road surface water is collected through the inlets arranged on the sidewalk, then taken along the ditch under the road and focus on planning box culverts (aperture BxH = 2000x1600).
  + To handle inundation for residential areas, it is necessary to retain and arrange water inlets in the low-lying position.
  + The entire focused basin to box culverts BxH= 2000x2000, on the road DH8, then water flows into farms.
  + Structure solution:
  + Box sewer: Using pipe sewer made of spun concrete with pre cast by stone 1x2 25 Mpa, 2 steel class.
  + Pipe sewer manhole : Stone concrete 1x2 25Mpa, Graded aggregates Dmax=37.5mm with thickness of 100.
  + Reinforced concrete sewer under road: Stone concrete 1x2 25Mpa, Graded aggregates Dmax =37.5mm with thickness of 100.
- **Water supply:**
  + Status of water supply: Currently, there has not been water supply pipeline in Hoa Khuong resettlement site. On DH409, currently, there are existing D160 HDPE and D63 HDPE water supply pipelines
  + Water supply solution: Water resource which is supplied for Hoa Khuong resettlement site, taken from existing D160 HDPE pipelines mentioned above. Main pipeline network has diameter of D100. Branch pipeline network has diameter D63. On branch pipeline, Clamp saddled D63-3/4 is installed to take water to households.
- **Lighting system:** Currently, there are systems of medium voltage and low voltage on DH409 road. Newly building lighting electricity system on the roads in the project boundary of traffic lighting with a roadside sharing column with low voltage line, another operates independently on the spun concrete pillar of 8,4m.
- **Trees:** Planting shady trees along the main roads. Trees added to work on a direction to creating a synchronization and diversity of trees of trees on roads. Select plants suitable

for the soil and climate with little defoliation, pleasant-odor flower and no toxic sap... Types of tree selected to use are: Yellow flame tree, Lagerstroemia speciosa, Samanea saman, Cinnamomum camphora.

1.4. PROJECT IMPLEMENTATION ORGANIZATION

1.4.1. Volume of excavated soil for construction

Table 1-3: Summary volume of soil excavated during work items construction

Items		Filling soil (m3)	Excavated soil (m3)	Excavated soil to be reused (m3)	Remaining volume of excavation and filling (m3)	Total volume of transported (m3)
		1	2	3	4	5
Component 1	Storm water drainage sewer	83,136	28,822	24,950	3,873	62,058
	Flood treatment at residential site	9,188	389	389	-	8,799
	Construction sewers to collect wastewater	7,890	6,.230	6,230	-	1,660
	2 wastewater treatment station : Hoa Xuan and Lien Chieu	21,750	-	-	-	21,750
Component 2	- Construction Depot at the airport area - Construction Dien Bien Phu overbridge	2,215	3,801	1,915	1,886	2,186
Component 3	Construction infrastructure at Hoa Khuong resettlement area	7,326	405,327	7,326	398,001	398,001
Total		131,504	444,507	40,810	403,760	494,454

Source: Summary from Basic Design of project

Note : (4) = (2) – (3); (5) = (1)-(3)+(4)

1.4.2. Plans for handling construction solid wastes and removed organic soils

For construction solid wastes generated in the process of clearance and excavation of organic soils, handling measures are as follows:

- *Construction wastes:* Debris can be reused as filling material for construction works/areas having demand in Da Nang city. Parts that can not be reused will be collected and dumped at the disposal landfill of the city as dealt by contract between the Contractor and Da Nang URENCO.
- *Organic soil removal:* The organic soils removed will be analyzed on quality, if heavy metal pollution is not detected, they can be used as grade 2 soil for leveling and compression in place.

1.4.3. Materials supply plan and landfills

The project will use building materials from construction material mines available in Da Nang. These construction material mines have been granted licenses to operate under the provisions of the city (mines' permits will be added in the construction phase, prior to the purchase of materials). Because the project's work items are located in different areas of the city, the construction material mines are divided into two areas: northern area and southern area serving construction of components of the project.

Material supply plan

1. Northern area

- ***Filling soil sources***

❖ *Hai Yen land mine (DD1)*

Location: The mine is located in Hoa Son commune - Hoa Vang district - Da Nang, currently managed and exploited by Hai Yen private enterprise

Conditions of exploitation and delivery: are being exploited by machines with favorable mining and transporting conditions, not affected by weather. Transport distance to the end of the northern route is about 5.0km (of which 1.50km of 5.0m wide earth road, 2.50km of Hai Van - Tuy Loan road; 0.70Km of 5.0m wide asphalt concrete road and 0.30km of Road 602

Reserve: about 1,000,000m3

Quality: the soil here is a kind of clay mixed with sand and reddish brown soil.

❖ *Truong Ban land mine (DD2)*

Location: The mine is located in Hoa Son commune - Hoa Vang district - Da Nang, currently managed and exploited by Truong Ban Construction Limited Liability Company

Conditions of exploitation and delivery: favorable, not affected by weather. Transport distance to the end of the northern route is about 5.7km (of which 1.30km of 5.0m wide earth road, 4.40km of Hai Van - Tuy Loan road)

Reserve: 800,000m3

Quality: the soil here is a kind of clay mixed with sand and reddish brown soil

- ***Sand materials***

❖ *Tuy Loan sand collection site (C1)*

Location: The collection site is located on the right of Giang bridge in Hoa Nhon commune - Hoa Vang district. The collection site is currently managed by Nguyen Thi Nhut private base.

Conditions of exploitation and delivery: Exploited by machine, conditions of exploitation and delivery are favorable in the dry season and unfavorable in the rainy season. Transport distance from the site to the end of the northern route is about 11.60km (of which, 10.40 km of Hai Van – Tuy Loan road and 1.20km of Road 604).

Supply capacity: unstable, depending on weather and small exploitation sites in the upstream area of Thu Bon river, the site provides average 100 m3/day.

Quality: good, the sand is of coarse medium-grain that is good for concreting.

❖ *Tuyen Son bridge sand collection site (C2)*

Location: The collection site is located on the left side of Tuyen Son bridge in Hoa Cuong Nam ward – Hai Chau district - Da Nang city and currently exploited and managed by Trieu Dan Limited Liability company.

Conditions of exploitation and delivery: favorable in the dry season and unfavorable in the rainy season. Transport distance from the site to the end of the northern route is about 22.30km (Transport road sections includes: Cach Mang Thang 8 road, National road 14B, Hai Van – Tuy Loan road)

Supply capacity: about 500m3/day.

The mine's quality is good, the sand is of coarse medium-grain that is good for concreting

Stone materials

❖ *Truong Ban stone mine (D1)*

Location: The stone mine is in Hoa Son commune – Hoa Vang district – Da Nang city, currently exploited and managed by Truong Ban Construction Limited Liability company.

Conditions of exploitation and delivery: The mine is conveniently exploited by machine. The stone supply site is about 5.40km from the project location (of which, 1.00km of 5.0m wide earth road; 4.40km of Hai Van – Tuy Loan road).

Reserve: 3,000,000m3.

Quality: stone at the mine is of gray green, gray black silicate schist that is good for concreting.

❖ *Phuoc Tuong stone mine (D2)*

Location: Phuoc Tuong stone mine is in Hoa Phat ward - Cam Le district - Da Nang, exploited and managed by Da Nang transport construction company.

Conditions of exploitation and delivery: The mine is conveniently exploited by machine. The mine is about 15.80km far from the northern route (of which, 1.70km of Road 601(vehicle load < 13 tons), 5.50km of Road 602, 8.60km of National road QL1A and Le Trong Tan road).

Reserve: 5,000,000m3.

Quality: stone at the mine is of gray green, gray black silicate schist that is good for concreting and asphalt concreting.

Son Phuoc asphalt concrete mixing plant (AC1)

Location: Hoa Ninh commune, Hoa Vang district, Da Nang city. The plant is exploited and managed by Nguyen Trung Limited Liability company.

Conditions of exploitation and delivery: favorable, is used for various projects in the area. The plant is 4.8Km from the northern route (of which: 4.5Km of asphalt road, 0.3Km of earth road).

The asphalt mixing plant meets the requirement on quality and environment and has been licensed to operate.

Capacity: 60-80T/h

2. Southern area

- ***Filling soil sources***

❖ *Hoc Gia Hanh land mine (DD2)*

Location: The mine is in the area of Tung Son village, Hoa Nhon commune - Hoa Vang district - Da Nang city and is currently exploited and managed by Quang Hung Limited Liability company.

Conditions of exploitation and delivery: favorable, not affected by weather. Transport distance from the end of the southern route is about 8.7km (of which: 0.7km of 4.0m wide earth road; 0.4km of 5.0m wide asphalt road; 6.0 km of Hai Van – Tuy Loan asphalt road; 1.6Km of National road 14B.

Reserve: about 700,000m3.

Quality: the soil here is a kind of clay mixed with sand and gray yellow reddish brown soil.

- ***Sand materials***

❖ *Do bridge sand collection site (C1)*

Location: The collection site is located on the left of Do bridge in the area of Hoa Chau commune - Hoa Vang district - Da Nang city. Currently, it is managed by Le Van private base.

Conditions of exploitation and delivery: favorable in the dry season and unfavorable in the rainy season. Transport distance from the site to the end of the southern route is about 5.10km (of which: 4.90km of National road 1A and 0.20km of earth road).

Supply capacity: The survey shows that the supply capacity of the collection site is not stable and depending on weather and supplies from small exploitation sites; the site provides average 300 m3/day.

Mine quality: of good quality, coarse medium-grained sand that is good for concreting.

❖ *Qua Giang bridge sand collection site (C2)*

Location: Location: The collection site is located on the left of Qua Giang bridge in Hoa Phuoc commune - Hoa Vang district - Da Nang city and is currently managed by Tran Thi Hoa private enterprise.

Conditions of exploitation and delivery: favorable in the dry season and unfavorable in the rainy season. Transport distance from the site to the end of the southern route is about 0.8km (of which: 700m of National road 1A and 100m of earth road).

Supply capacity: about 100m3/day.

Mine quality: - According to the experimental result, the sand here is of good quality, coarse medium-grained sand that is good for concreting

- ***Stone materials***

❖ *Phuoc Thuan stone mine (D1)*

Location: The stone mine is in Hoa Nhon commune - Hoa Vang district - Da Nang city and currently exploited and managed by Asphalt and construction stone exploitation enterprise.

Conditions of exploitation and delivery: are favorable. The stone mine is about 5.10km far from the end of the southern route (of which: 2.0km of 5.0m wide asphalt road; 1.0km of 10.5m wide asphalt road and 2.1m of National road 14B).

Reserve: about 2,000,000m3.

Quality: stone at the mine is of gray green, gray black granite that is good for concreting and asphalt concreting.

❖ *Hoc Khe 2 stone mine (D2)*

Location: Hoc Khe 2 stone mine is in Hoa Nhon commune - Hoa Vang district - Da Nang city, exploited and managed by a branch of Chu Lai JSC in Da Nang.

Conditions of exploitation and delivery: are being exploited by machines with favorable mining and transporting conditions. The stone mine is about 5.90km far from the southern road's end (of which 2.8km of 4.5m wide asphalt road; 1.0km of 10.5 wide asphalt road; 2.1km of asphalt National road 14B)

Reserve: about 1,400,000m3.

Quality: stone at the mine is of gray green, gray black granite that is good for concreting and asphalt concreting.

- ***Asphalt concrete mixing plant (AC)***

Location: The plant is in Hoa Nhon commune - Hoa Vang district - Da Nang city and currently exploited and managed by Asphalt and construction stone exploitation enterprise.

Conditions of exploitation and delivery: favorable, is used for various projects in the area. The plant is 3.10km from the southern route (of which 1.0km of 10.5 wide asphalt road; 2.1km of asphalt National road 14B)

The asphalt mixing plant meets the requirement on quality and environment and has been licensed to operate.

Capacity: 60-80T/h.

Landfills

❖ *Disposal landfill no. 1 (BT1)*

Location: The disposal landfill is in Hoa Nhon commune – Hoa Vang district – Da Nang city

Conditions of transportation: favorable in the dry season and unfavorable in the rainy season. 1.10 Km from the northern route (of which: 0.10 km of 5.0m wide asphalt road and 1.00km of 5.0m wide earth road)

Capacity: About 150,000 m3.

Management unit: The People's Committee of Hoa Lien commune – Hoa Vang district – Da Nang city.

Currently, Nhon Hoa landfill operates, receives and treats of waste of the people in the commune. According to Table 1-3, the volumes of disposal land of the entire project is 90,694 m3 (total maximum volume of waste). Thus, landfill no.1 meets the demand of disposal land of the project.

In the case of landfill No.1 having trouble, causing not meet the demand of capacity of waste treatment of projects, Da Nang city has many disposal landfill, such as landfills in Hoa Phu commune, Khanh Son landfill. The current status of the landfill has guaranteed capable of receiving waste from project.

❖ *Disposal landfill no. 2 (BT2)*

Location: The disposal landfill is in Hoa Phu commune - Hoa Vang district - Da Nang city.

Transport distance: 12.0 km from the end of the southern route (of which 10.5 km of asphalt Road 604 and 1.50km of asphalt National road 14B).

Conditions of transportation: favorable in the dry season and unfavorable in the rainy season.

Capacity: About 130,000m3.

Management unit: The People's Committee of Hoa Phu commune - Hoa Vang district - Da Nang city.

❖ *Disposal landfill no.3 (BT2) – Khanh Son landfill*

The area: 48 ha

In Hoa Khanh Nam ward, Lien Chieu district

Capacity of operation (treatment) : 700ton of trash/ day

Administrative agency: Urban environment joint stock company, Danang city

1.4.4. Construction methods for the project's work items

Before the construction, the contractor shall notify the relevant units to coordinate closely during the construction process. This is an important and complex stage, which requires the coordination of the Employer and the construction unit with the local authorities to ensure the time schedule, timely dealing with the arising problems (if any).

Carry out the tasks to accurately redefine the boundaries of the project, prepare the service road, specify the supply of materials, and prepare the storing yard for materials, vehicles and construction manpower.

- Guaranteed Traffic: Install guide posts, signal lights, warning signs, instruction signs to warn and guide the vehicles on the road
- Mobilization the construction workers

+ Due to the project components are scattered across the city of Da Nang, the number of workers gathered at the construction site at the same time is not much (about 50-100/100 people/component1 and 100-150 people/component 2 and 3).
+ Labor resource for Project will be recruited by contractors and they will be trained in necessary skills to ensure sufficient capacity to perform the tasks. In bid document, the construction contractors will also present alternatives for mobilizing employment, in which giving priority of using labor at local.

- Mobilization equipment
  + The mobilization of equipment depends on construction phases. The types of vehicles to transport materials and excavators used during land filling process. The phase of completing road surface using main equipment, including: rolled machines, Paving stone-laying machine, carpet, compaction machines, plastic watering vehicles, plastic cooking pot. In addition, the construction process uses bored pile drilling, elevators, cranes ... Quantity of mobilization for machines, equipments depends on planning and construction methods in detail.
  + Contractors will propose machines and equipments and Project PMU will approve to meet the demand of construction for components of project and consistaent with general progress. Mobilization machines and equipments depends on construction phases. Type of vehicles to transport materials and excavators used in the process of filling and excavating roads, construction resettlement site…The completed phase of road surface uses main machines, including: rolled machines, paving stone-laying machine, carpet, compaction machine, plastic watering vehicles, plastic cooking pot. Quantity of mobilization for machines, equipments depends on planning and construction methods in detail.

Table 1-4: List of some machines, equipments for project construction

No	Machine, equipment	No	Machine, equipment
1	Dozer	11	Pile driving machine
2	Roller	12	Mobile cranes
3	Bucket front excavator	13	Crane
4	Backhoe excavator	14	Crawler excavators
5	Tractor	15	wheel excavators
6	Scraper	16	Car
7	Concrete mixer machine	17	Watering car
8	Concrete pump	18	Compressor
9	Concrete vibrator	19	Portable drilling machines
10	Generator		

1.4.5. Implementation Schedule

The estimated time to implement supplementary work items: From 2016 to 2019:

Table 1-5: Estimated time of implementation project

No	Content	Implementation time
1	Approval for feasibility study report, components reports and basic design of WB	Quarter 1/2016
2	Approval for detailed design of the previous investment items	Quarter 2/2016
3	Organize bidding, choose construction agency	Quarter 02/2016
4	Construction work	From Quarter 03/2016 – to 2019
5	Check and take over, hand over works comes into operation	2019

1.4.6. Investment fund

Total investment capital of project components is presented in Table 1-6:

Table 1-6: Total investment capital for supplementary items of SCDP:

Component	Content	Approved project (USD)	Adjusted project chỉnh (USD)	Adjusted value (USD)
Component 1	Improvement storm water and waste water drainage system	76,584,138	129,855,531	53,271,393
Component 2	Bus Rapid Transit System (piot)	41,879,947	58,516,345	16,636,398
Component 3	Construction strategic roads and resettlement sites	64,871,486	82,286,759	17,415,273

Source: Adjusted FS report of SCDP

1.4.7. Management organization and project implementation

Investor: Da nang city People's Committee

- Steering and operating the project
- Providing counterpart funds for the project, directing the Client to perform all its obligations as stipulated in the loan agreement. Directing all levels and sectors to meet the relevant sections in the project implementation process.

Representatives of Client: Department of Transport of Danang city

- Establishment and maintance PMU during the project implementation
- Management and operation directly project from investment preparation stage, site clearance and project implementation;
- Preparation compensation plan, resettlement;

- Coordination with agencies, ministries related to solve issues belongs to responsibilities as City People's Committee regulations. Inform with CPC, ministries, sectors and partners of issues related as regulations.
- Organize to select construction contractors in compliane with Bid Law, Decree and instruction circular.
- Implementation as current regulations of State of Vietnam and requirements in agreement signed with donor.

PMU of SCDP

- PMU implements basic tasks:
- Management and operation directly project and monitoring activities from investment preparation stage, site clearance and project implementation;
- Preparation compensation plan, relocation and resettlement;
- Coordination with agencies, ministries related to solve issues belongs to responsibilities as City People's Committee regulations. Inform with DOT, ministries, sectors and partners of issues related as regulations, schedules and results of project implementation.
- Organiztion bid, selecting consultant bid and implementation work items of project as current regulations.

CHAPTER 2. NATURAL ENVIRONMENTAL AND SOCIO - ECONOMIC CONDITIONS OF THE PROJECT AREA

2.1. NATURAL ENVIRONMENTAL CONDITIONS

2.1.1. Geographical and Topographical Conditions

Geographical Conditions

Danang city is located on the edge of the Paleozoic folded domain (Truong Son orogenic zone). The geological structure in Danang area consists of 5 major stratigraphic units: A Vuong Formation, Long Dai Formation, Tan Lam Formation, Ngu Hanh Son Formation and Quaternary Sediment, in which the lithological composition of A Vuong Formation, Long Dai Formation, Tan Lam is mainly shale and sandstone. Ngu Hanh Son Formation is mainly gray, white and flowering limestone. The quaternary sedimentary includes the formations of rivers, river - sea, sea, sea - swamp from early Pleistocene age to late Holocene age. The lithological composition is mainly sand, pebbles, gravel, sand, clay, etc. The earth case in the territory of Danang City contains many latitude and meridian fault systems that separate, reduce the continuity of rock, their strength, especially create fractured zones and water containing level.

Topographical Conditions

The high and steep mountains concentrate in the west and northwest, forming the mountain ranges that reach out to the sea. It is home of many watershed forests which are meaningful for the protection of the ecological environment of the City. The coastal plain is low-lying area which is under the influence of the ocean salinity, where there are establishments of agriculture, industries, services, military, residential and functional areas of the City. The entire project works are distributed in flat areas of the coastal plain.

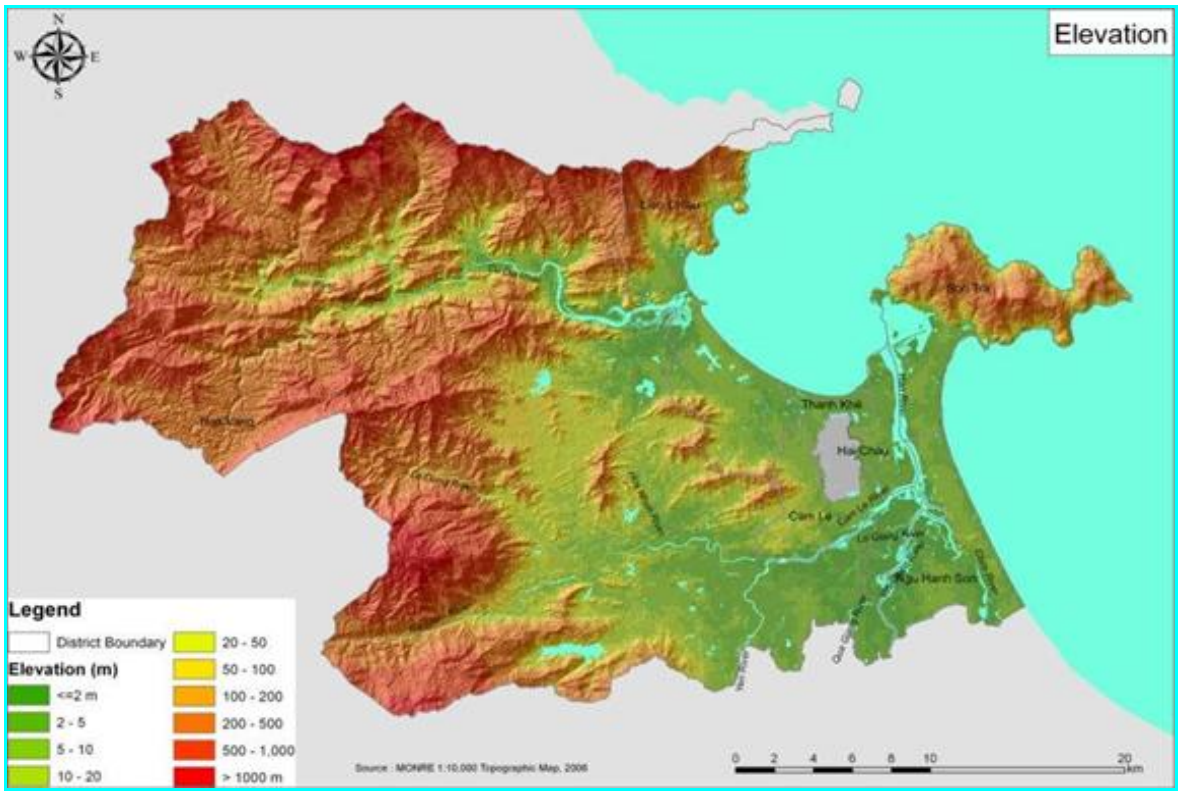


Figure 2-1: Terrain of Danang city

2.1.2. Climate conditions

According to statistics of the Central region meteorological station, Danang has a typically tropical monsoon climate with high temperatures and slight volatile. Danang has two separate seasons with rainy season lasting from August to December and dry season between January and July. Cold winter occasionally occurs but does not last long.

❖ *Temperature:*

The average annual temperature in Danang is some 25.9ºC with the highest temperature ranging from 28ºC to 30°C in June, July and August and the lowest between December and February, varying from 18 to 23°C. Particularly, Ba Na Mountains situates at an altitude of nearly 1,500 meters has the average temperature of around 20°C.

Table 2-1: Average air temperature in months (2009 - 2013)

Unit: ^{0}C

Month / Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual average
2009	20.6	23.7	25.5	26.9	27.6	30.6	29.3	29.2	27.5	26.7	24.4	23.2	**26.3**
2010	23.1	24.4	24.6	26.9	29.4	29.7	29.1	28.1	27.7	25.9	23.7	22.5	**26.3**
2011	20.0	21.5	21.5	24.9	28.1	29.3	29.8	29.2	26.9	25.7	24.6	20.8	**25.2**
2012	21.4	22.2	24.3	27.0	29.3	30.6	29.6	29.7	27.5	26.3	26.0	24.5	**26.5**
2013	21.9	24.4	25.3	27.1	29.2	29.6	28.6	29.3	27.1	26.0	25.2	20.8	**26.2**

(Source: Danang Statistical Yearbook, 2013)

❖ *Rainfall:*

The annual average rainfall is 2,504.57 mm/year; the highest rainfall appears in October and November; lowest in January, February, March and April.

Table 2-2: Average rainfall in months (2009 - 2013)

Unit: mm

Month / Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual average
2009	160	23	23	180	65	36	187	153	1376	456	194	165	**251**
2010	879	0	103	47	621	761	2452	3263	1661	6563	5492	526	**1864**
2011	161	0	31	8	35	101	13	139	812	791	1218	339	**304**
2012	57	37	0	21	11	46	32	181	582	368	302	60	**141**
2013	18	45	45	14	43	25	132	81	751	369	760	34	**193**

(Source: Danang Statistical Yearbook, 2013)

❖ *Humidity:*

The average air humidity is 83.4%; the highest humidity is in September, October and November ranging from 85.67% to 87.67%; lowest in June, July ranging from 76.67% to 77.33%.

Table 2-3: Average humidity in months (2009 - 2013)

Unit: %

Month / Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual average
2009	82	86	83	81	82	71	76	77	84	82	83	84	**80.9**
2010	84	85	83	83	77	77	77	82	83	85	88	84	**82.3**
2011	83	82	82	84	77	75	70	77	88	87	86	89	**81.7**
2012	88	87	82	81	77	70	73	74	85	84	88	85	**81.2**
2013	84	84	86	83	77	72	79	77	85	83	86	80	**81.4**

(Source: Danang Statistical Yearbook, 2013)

❖ *Sunshine hours:*

The average number of sunshine hours per year is 2,156.2; highest in May, June and July ranging from 234 to 277 hours/month; lowest in November, December ranging from 69 to 165 hours/month.

Table 2-4: Average number of sunshine hours in months (2009 - 2013)

Unit: Hour (Hr)

Month / Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual average
2009	117	178	187	163	226	256	212	235	135	136	116	150	**176**
2010	149	201	197	210	268	284	277	210	202	103	50	110	**188**
2011	40	162	113	175	259	223	233	231	106	108	115	18	**148**
2012	64	127	178	210	258	184	242	219	169	163	156	133	**175**
2013	126	157	173	172	288	237	215	164	116	137	111	51	**162**

(Source: Danang Statistical Yearbook, 2013)

❖ *Wind and storms:*

The prevailing wind direction in Danang is the north, east and northeast (from October to April of the following year) and the west and southwest (from May to September). In the city center, the frequency of calm wind is quite high (30-50%).

The average wind speed in 2009 was slightly low (1.4 m/s) and not too different with the previous years. The average wind speed varies from 2.3 to 2.7m/s. The annual average

number of hurricanes is 0.84. Nevertheless, no storm has been recorded in some years while in other years there are from 3 to 4 hurricanes. Storms frequently occur from May to August. The highest average wind speed of storms and tropical depression ranges from 15 to 20 m/s (level 7-8).

2.1.3. Hydrological and Oceanographic characteristics

River network

Da Nang's river network mainly derived from the West and Northwest of the city and Quang Nam province. Most rivers in Danang are short and steep. However, this is the main fresh water supply source for Danang City.

The river system crossing the city has many tributaries including the Tuy Loan River, the Cu De River (in the north), the Yen River, the Qua Giang River, the La Tho River, the Vinh Dien River and the Han River. The Tuy Loan River and Cu De River have separate catchments located within Danang City.

- **Vinh Dien river:** Vinh Dien river is a branch of Thu Bon river with the start point at Cau Lau bridge and about 5km towards the upstream. Vinh Dien river carries a part of water in Thu Bon river and receive additional flow from La Tho and Qua Giang rivers before pouring into Han river.
- **Cu De river:** Cu De river basin is located in north of the city and shaped as bird's feather, inclined towards the Northeast - Southwest . The total area of the river basin is 472km2. The total length of Cu De is 38km. The downstream of Cu De river is often salinizated in the dry season. In flood season, stormwater from the Southwestern basin bounded by An Ngai and So mountains with area of 6,6km2 flows in combination with water level rise of Cu De river will cause widespread flooding. The submerged depth depends on the extent of annual flooding. The highest water level is from 2m (1999).
- **Tuy Loan river:** Tuy Loan riber basin is located on the left of Vu Gia river and connects with Cu De river basin. Tuy Loan river originates from Ba Na mountain at altitude of 1,487 m with a length of about 30km. The catchment area from the river mouth to the junction of the Tuy Loan river with Yen river is 280km2, the average slope of 15%, average basin width of 25km, the average basin width of 10.3km. Tuy Loan river connects with Yen river to form Cau Do – Cam Le river and poured into Han River.
- **Han river:** Han river is the ending point of Vinh Dien river, Cau Do – Cam Le river and pours into Danang sea. The current regime of Han river is strongly influenced by the tide of Danang sea.
- **Phu Loc river:** Phu Loc river is one of the main drainage channels of the city. This river originates from the point connecting with the West Lake and flow through Danang bay crossing the estuary on Nguyen Tat Thanh road, Thanh Khe Dong ward.
- **Co Co river:** Formerly, Co Co river was a coastal river connecting with Thu Bon river at the section of Cua Dai. Currently, this river is sedimented and becomes a dead-end river with the river flow during the dry season in Danang mostly from Cai river and Han river flowing back in.
- **Yen and Qua Giang rivers:** These rivers are beloning to Vu Gia river system, therefore, the hydrological regime of such two rivers is closely correlated together. These rivers mainly flow through the plains, dense canals and ditches. The difference in elevation between the river bed and the surrounding area is minor. In flood season, the water level rises rapidly and causes widespread flooding. However, water is often drawn

very rapidly in the later few days. Yen and Qua Giang rivers have small flow velocity (V1% = 3.3m3/s) with good water quality for serving irrigation for adjacent fields.

- **Tay Tinh river:** Tay Tinh river has a narrow bed width and small flow velocity (V5% = 1.34m^3/s). This river only serves as an irrigation channel for adjacent fields.

Figure 2-2: River Network in Danang city

Tidal regime

Tidal regime of Danang sea consists of diurnal tide and irregular half-diurnal tide which means that in half a day, there is one flow and one ebb but the power of and the time the flow and ebb last are much different. There are in average 03 days of diurnal tide per month (8 days at maximum and 1 day at minimum). Affected by such a tide regime, the hydraulic regime of the canals and sewers in the City is relatively complicated. During floods, the sewers and canals receive both storm water and wastewater from residential areas. Moreover, they are also affected by raising water and wave during flood tide. The highest average flood tide level is 120cm and the lowest one is 80cm.

2.1.4. Climate change and sea level rise

In 2011, the Ministry of Natural Resources and Environment has released the report on "Scenarios of Climate Change and Sea Level Rise for Vietnam" which represents maps of rising levels of temperature, rainfall and flooding risks for some areas in Vietnam.

Danang is one of the coastal cities that is likely to be severely affected by sea level rise. Therefore, the planning of areas at risk of inundation can also be considered as an important direction for the development track of the City.

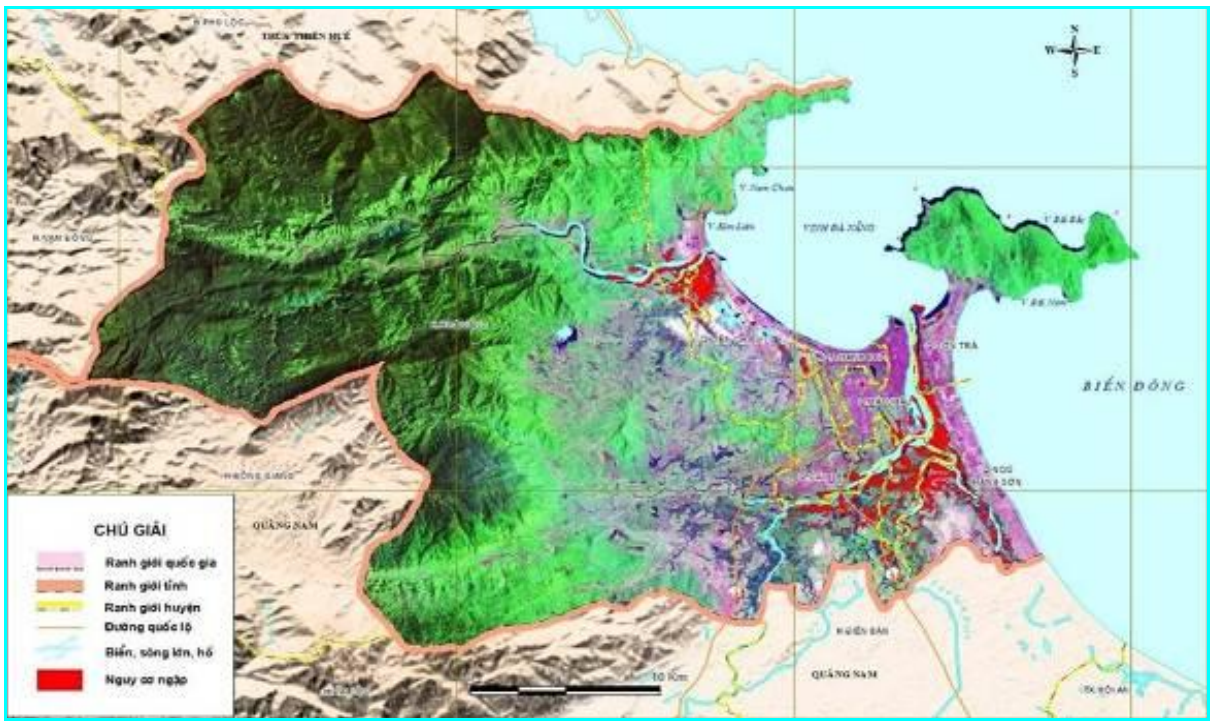


Figure 2-3: Map of inundation areas in Dang city corresponding to sea level rise by 1m

(Source: Scenarios of climate change and sea level rise for Vietnam, MONRE, 2012)

The map indicates that when sea level rises by 1 meter, the areas most prone to inundation are on the right bank of the Cu De River (mainly in Hoa Lien commune and Hoa Vang district) and on the eastern bank of the Han River, where the Cam Le and Do Toa River merge (mostly in Cam Le and Ngu Hanh Son districts).

2.1.5. Current Status of Quality Environmental Compositions

To assess the quality status of the environmental components in the project area, in June 2015 and December 2015, the Consultancy firm in collaboration with the Meteorological Observatory Central implemented the survey, monitoring, measuring and sampling the environment under the Vietnamese standards and the analysis in laboratory. Simultaneously they collected information and relevant data. The detailed results of each sample analysis are in the Annexes.

The methods of measurement and sampling at site, maintenance, transportation, treatment and analysis of samples in laboratory are implemented in accordance with current Vietnam's standards.

2.1.5.1. Quality of ambient air

❖ *Sampling location:*

The status of ambient air environment is implemented through the sampling at work items. Specific locations are shown in Table 2-5:

Table 2-5: Sampling location of ambient air environment

No.	Symbol	Sampling location	Coordinates	
			Longitude	Latitude
1	K2	Interchange of Dien Bien Phu, Nguyen Tri Phuong and Le Do roads	108°12'9.76"	16° 3'55.91"
2	K3	Phan Chau Trinh road intersection with Le Dinh Duong road	108°13'10.75"	16° 3'41.46"
3	K4	Ba Bang Nhan road intersection with Le Van Hien road	108°15'23.91"	16° 0'38.85"
4	K7	Tho Quang sewer, Thanh Vinh 1 residential site	108°15'13.76"	16° 6'4.11"
5	K8	On Pham Van Xao road at Tho Quang Seafood – Service Industrial Zone	108°14'31.33"	16° 5'45.63"
6	K10	Hung Vuong road intersecting Ong Ich Khiem road	108°12'51.20"	16° 4'2.11"
7	K12	Ho Hoa Phu area	108° 9'38.66"	16° 3'53.19"
8	K13	area Lien Chieu wastewater treatment plant	108° 7'4.11"	16° 5'17.94"

❖ *Results of analysis and evaluation:*

Parameters of monitoring and analyzing air include noise, CO, NO2, SO2 and suspended particles. Analytical results are shown in the table bellowed:

Table 2-6: Results of measurement, analysis of ambient air environment

No.	Parameters	Unit	Results								Comparison Standard
			K2	K3	K4	K7	K8	K10	K12	K13	
1	Noise	dBA	77	71	53	60	53	75	46	49	$70^{(1)}$
2	Suspended particle	mg/m^3	0.67	0.43	0.28	0.19	0.25	0.69	0.18	0.31	$0.30^{(2)}$
3	NO_2	mg/m^3	0.15	0.13	0.05	0.02	0.03	0.08	0.02	0.03	$0.20^{(2)}$
4	SO_2	mg/m^3	0.15	0.15	0.04	0.02	0.05	0.10	0.04	0.02	$0.35^{(2)}$
5	CO	mg/m^3	7.9	7.6	3.7	4.4	5.3	7.6	3.4	5.7	$30^{(2)}$

Notes:(-): Not defined by standard; (1): QCVN 26:2010/BTNMT: National technical regulations on noise (Normal area, from 06:00 to 21:00); (2): QCVN 05:2013/BTNMT: National technical regulations on ambient air quality. Samples were taken in December/2015.

❖ ***Comments:***

Noise level measured at the locations ranges from 45.8 - 76.5dBA, mostly remains within the permitted standard limit (QCVN 26:2010/BTNMT); However, noise level at 2 points of K2, K3 and K10 exceed limit as stipulated by Vietnam standard

Concentration of suspended dust in the air at the monitoring location is relatively high, with 04/08 positions exceed the permitted limit of QCVN (this is traffic intersections , thus traffic density remains high), position reached the highest limit at point K10 (Hung Vuong street traffic intersection with Ong Ich Khiem street) is 2.3 times higher.

Content of toxic gases (NO2, SO2, CO) in the ambient air environment at 8 monitoring locations mostly remain within the permitted standard limit (QCVN 05:2013/BTNMT).

2.1.5.2. Quality of surface water

Table 2-7: Sampling location of surface water

No.	Symbol	Sampling location	Coordinates	
			Longitude	Latitude
1	NM4	Surface water at Co Co river, Son Thuy 10 section	108°15'0,80"	16° 0'35,63"
2	NM5	Han river's surface water, far from Tran Thi Ly bridge about 500m to the North	108°13'46.71"	16° 3'17.35"
3	NM6	Han river's surface water, far from Tran Thi Ly bridge about 500m to the South	108°14'1.48"	16° 2'50.72"
4	NM7	Da Nang Bay water, at Ong Ich Khiem outlet	108°12'24.30"	16° 4'54.91"
5	NM9	Hoa Phu Lake	108° 9'42.11"	16° 3'53.06"
6	NM10	Hoa Minh canal- section near Hoa Phu canal	108° 9'48.48"	16° 4'36.92"
7	NM11	Hoa Lien area surface water at bridge across longlasting Nguyen Tat Thanh road (near construction location of Lien Chieu waste water treatment station).	108° 7'23.35"	16° 6'16.43"
8	NM12	Surface water at PAM dam valve to Cu De river	108° 7'35.91"	16° 6'49.50"
9	NM13	Cu De river water at Nam O bridge	108° 7'22.47"	16° 7'15.95"

Results of measurement and analysis of surface water and groundwater parameters are shown in the table bellowed:

Table 2-8: Analytical results of surface qater quality

No	Parameters	Unit	Results									QCVN 08:2008/BTNMT	
			NM4	NM5	NM6	NM7	NM9	NM10	NM11	NM12	NM13	B1	B2
1	pH	-	7.5	7.3	7.3	6.3	7.9	6.8	7.2	7.6	7.8	5.5-9	5.5-9
2	DO	mg/L	6.7	6.6	6.7	4.5	6.1	5.2	5.3	6.6	6.6	>=4	>=2
3	TSS	mg/L	26	45	48	97	39	38	49	41.	40	50	100
5	BOD_5	mg/L	5	5	5	25	8	7	8	8	7	15	25
4	COD	mg/L	12	8	8	49	13	12	17	18	15	30	50
6	NH_4^+-N	mg/L	0.29	0.33	0.38	0.62	0.15	0.35	0.25	0.18	0.19	0.5	1
7	NO_3^--N	mg/L	0.2	0.3	0.3	0.5	0.2	0.2	0.3	0.2	0.2	10	15
8	NO_2^--N	mg/L	0.003	0.006	0.007	0.019	0.009	0.018	0.016	0.012	0.008	0.04	0.05
9	PO_4^{3-}-P	mg/L	0.08	0.08	0.08	0.16	0.13	0.13	0.13	0.13	0.13	0.3	0.5
10	Total grease	mg/L	0.12	0.11	0.13	0.25	0.11	0.12	0.15	0.13	0.18	0.1	0.3
11	Coliform	MPN/ 100mL	5300	750	1200	16000	4200	7500	7500	4300	2100	7,500	10,000

** QCVN08: 2008/BTNMT: Nation Technical Standard on surface water; Column B1: Using for purpose of domestic water supply, but apply suitable treatment technology, conservation of aquatic fauna, or using purposes such as types of B1 and B2;Column B2: Water traffic, and other purposes with low water quality requirement.Monitoring sample is conducted in June and December/2015*

❖ ***Comments:***

Most of the surface water resources in the monitoring locations are not used for domestic water supply purposes (these sources of water is in the city, mainly used for the purpose of storm water and waste water drainage). Therefore, surface water quality at monitoring locations indicated that most of monitoring indicators are within the permitted limits of QCVN 08: 2008 / BTNMT (column B1, for irrigation water and other purposes). However, at Da Nang bay, near location of Ong Ich Khiem pump station (NM7), there are a few indicators at several locations beyond permissible limits as: TSS, BOD5, COD, NH4+ , Coliform, total grease.

2.1.5.3. Ground water quality

Due to specific characteristics of adjusted and supplemented items of SCDP, underground water quality is significantly unaffected. Therefore, Consultant only takes several samples with pollution risk. Sampling location is mentioned below:

Table 2-9: Ground water sampling location

No.	Symbol	Sampling location	Coordinates	
			Longitude	Latitude
1	NN1	Ground water at the starting of Hoa Khuong resettlement site	108° 8'3.68"	15°57'41.01"
2	NN2	Ground water at the end of Hoa Khuong resettlement site	108° 7'53.04"	15°57'25.73"
3	NN4	Ground water at groups 5, 6, 7 of Son Thuy commune	108°15'5.86"	16° 0'36.74"

❖ ***Analytical results:***

Table 2-10: Analytical results of ground water quality

No.	Parameters	Unit	Results				QCVN 09:2008/BTNMT
			NN1	NN2	NN3	NN4	
1	pH	-	6.8	7.2	5.9	5.5-8.5	6.8
2	Hardness	mg/L	51	59	77	500	51
3	TS	mg/L	198	186	165	1500	198
5	COD	mg/L	1.2	1.4	1.8	4	1.2
4	NH_4^+-N	mg/L	0.8	0.8	0.3	0.1	0.8
6	NO_3^--N	mg/L	1.3	2.7	1.2	15	1.3
7	SO_4^{2-}	mg/L	145	128	90	400	145
8	As	mg/L	KPH (<0.001)	KPH (<0.001)	0.002	0.05	KPH (<0.001)

No.	Parameters	Unit	Results				QCVN 09:2008/BTNMT
			NN1	NN2	NN3	NN4	
9	Fe	mg/L	1.4	1.4	0.3	5	1.4
10	Cl^-	mg/L	50	35	39	250	50
11	Coliform	MPN/100mL	7	14	17	3	7

** QCVN08: 2008/BTNMT: National Technical Standard on underground water quality*

Underground water sample was monitored in June/2015

❖ ***Comments:***

- Values of pH, TSS and hardness: The pH values of the underground water samples at the project area are 5.9-7.2, satisfying standards. Total content of solids in ground water is 165-198 mg/L, satisfying the standard. Level of hardness ranges from 51-77 mg/L, satisfying the standard.
- Organic content (COD): Content of COD in ground water ranges from 1.2 to 2.8 mg/L, mostly satisfying Vietnam standard.
- Contents of nutrients (NH_4^+-N, NO_3^-N, SO_4^{2-}), chloride:
  + Content of NH4+-N in ground water is 0.3-0.8 mg/L, mostly does not satisfy permitted limits.
  + Content of NO3--N in ground water is 1.2-2.7 mg/L, satisfying standard.
  + Content of SO42- in ground water ranges from 90-145 mg/L, mostly satisfying the standard.
  + Content of chloride ranges from 35-50 mg/L, mostly satisfying the standard.
- Content of heavy metals As, Fe: Content of heavy metals in the ground water samples: Content of As is 0-0,0022 mg/L, mostly remaining within the permitted limit; content of Fe ranges from 0.257-1.446 mg/L remaining within the permitted limit.
- Content of Coliform: Content of Coliform in ground water ranges from 7 to 17 MPN/100mL, mostly does not satisfy the standard.

In summary, according to analysis results, survey targets of underground water quality comply with Standard QCVN 09-2008/BTNMT on underground water quality. Only 02 targets of NH_4^+-N và Coliform exceed 3 to 8 times of the Standard's allowance. The rest 09 targets are in limitation of water quality.

2.1.5.4. Domestic wastewater quality

Sampling location is mentioned below

Table 2-11: Sampling location of Wastewater

No.	Symbol	Sampling location	Coordinates	
			Longitude	Latitude
1	NT1	Wastewater collected at the house No. 148 Nguyen Tri Phuong	108°12'18.41"	16° 3'38.33"
2	NT2	Wastewater collected at the house No. 292 Phan Chau Trinh	108°13'7.57"	16° 3'29.11"
3	NT3	Wastewater collected at the house No. 68 Bach Dang	108°13'29.71"	16° 4'15.68"

No.	Symbol	Sampling location	Coordinates	
			Longitude	Latitude
4	NT4	Wastewater at sewer on Son Thuy 10 road pouring into Co Co river.	108°15'05.74"	16° 0'39.02"

❖ ***Analytical results:***

Table 2-12: Analytical results of domestic wastewater quality

No.	Parameters	Unit	Results				QCVN 14:2008/BTNMT	
			NT1	NT2	NT3	NT4	A	B
1	pH	-	8.5	7.0	6.6	7.5	5-9	5-9
2	TSS	mg/L	80	77	47	6	50	100
3	COD	mg/L	426	267	42	12	-	-
5	NO_3^--N	mg/L	1.2	1.7	1.9	0.2	30	50
4	SO_4^{2+}	mg/L	0.07	0.08	0.09	0.02	-	-
6	Cu	mg/L	0.01	0.01	0.01	0.01	-	-
7	Pb	mg/L	KPH (<0.0055)	KPH (<0.0055)	KPH (<0.0055)	KPH (<0.0055)	-	-
8	Fe	mg/L	0.6	0.7	0.6	0.4	-	-
9	Cd	mg/L	KPH (<0.0012)	KPH (<0.0012)	KPH (<0.0012)	KPH (<0.0012)	-	-
10	Hg	mg/L	KPH (<0.0005)	KPH (<0.0005)	KPH (<0.0005)	KPH (<0.0005)	-	-
11	Cr VI	mg/L	KPH (<0.02)	KPH (<0.02)	KPH (<0.02)	KPH (<0.02)	-	-
12	Coliform	MPN/100mL	27.105	34.104	16.103	3100	3000	5000

❖ ***Contents:***

Values of pH, TSS: The pH value of the domestic wastewater samples at the project area ranges from 6.6 to 8.5, satisfying the standard. The content of total suspended solid in domestic wastewater ranges from 6-80 mg/L; NT4 sample satisfies the standard of A column; NT1-NT2 and NT3 samples satisfies the standards of B column.

Content of nutrients (NO3—N, SO_4^{2-}):

- Content of NO3--N in domestic wastewater ranges from 0.2 to 1.9 mg/L, satisfying the standard of A1 columns.
- Content of SO42- in domestic wastewater is from 0.02 to 0.09 mg/L, that is not defined by standard.
- Content of heavy metals: Cu, Pb, Fe, Cd, Hg, Cr VI: Content of heavy metals in domestic wastewater samples: content of Cu is 0.001-0.003 mg/L; content of Fe is from

0.4-0.7 mg/L, mostly remaining within the permitted limit of A1-A2 columns. Contents of Pb, Cd, Hg, Cr VI are not detected at sampling locations.

- Content of Coliform: Content of Coliform in domestic wastewater is 3100-27x105 MPN/100mL, NT4 sample satisfies the standard of A1-A2 columns, samples NT1,NT2, NT3 exceed standard of B2 column from 1.2-270 times.

In brief, residential wastewater in mornitoring locations has exceeded permitted standard of wastewater before releasing into environment. Residential wastewater in Da Nang city contains organic substances (BOD), sediment, Amoni, N sum, P sum, smell and zymoma. Such wastewater is not fully treated being discharged into the city's drainage system/ Thus, construction investment, improvement waste water collection and treatment system at these areas is necessary.

According to survey repor of Saigon weico conducted with Hoa Xuan wastewater treatment station, input and output wastewater of station is checked and analyzed from 1/6/2016 to 31/08/2015. The results are presented as follow:

- The input parameters of Hoa Xuan wastewater treatment station exceeding standard many times (compare with Standard of Vietnam 14: 2008 / BTNMT and Standard of Vietnam 40: 2011 / BTNMT) except pH, nitrate, total nitrogen and total phosphorus are not exceeded. It is caused by input wastewater of Hoa Xuan stations are urban wastewater, including domestic waste water and waste water from industrial zones and villages (mostly untreated) mixed together, resulting in the criterias exceeding the permitted standards.
- The output parameters of Hoa Xuan station are both within the permitted standards.

(Source: Survey report Quarter 2/2015 – Operation monitoring and maintenance of Hoa Xuan waste water treatment station, Dannang of SaiGon Weico)

2.1.5.5. Soil quality

Sampling location is mentioned below

Table 2-13: Sampling location of soil

No.	Symbol	Sampling location	Coordinates	
			Longitude	Latitude
1	D1	Soil sample in Hoa Khuong resettlement area	108° 7'50.82"	15°57'42.41"
2	D3	Soil sample at Bang Bang Nhan road near Co Co river	108°15'6.56"	16° 0'30.21"
3	D6	Soil at construction area of Lien Chieu waste water treatment station	108° 7'1.64"	16° 5'19.77"

❖ ***Results of analysis and evaluation:***

Table 2-14: Analytical results of soil quality

No.	Parameters	Unit	Results			QCVN 03:2008/BTNMT	
			D1	D3	D6	Agriculture Land	Residential land
1	Cd	mg/kg of dry soil	0.2	0.3	0.1	2	5
2	As	mg/kg of dry soil	0.6	0.3	0.2	12	12
3	Hg	mg/kg of dry soil	KPH	KPH	0.006	-	-
5	Fe	mg/kg of dry soil	0.5	0.8	0.4	-	-
4	Pb	mg/kg of dry soil	30	9.8	0.7	70	120
6	Cu	mg/kg of dry soil	16	3.8	2.5	50	70

Notes: (-):not defined by the standard (<0.1)

❖ ***Contents:***

Contents of heavy metals Cd, As, Zn, Hg, Fe, Pb, Cu in soil samples are detected with low levels, within the permitted limit of standard QCVN 3:2008/BTNMT for agricultural land and residential land.

2.1.5.6. Sediment quality

Sampling location:

Table 2-15: Sampling location of sediment

No.	Symbol	Sampling location	Coordinates	
			Longitude	Latitude
1	TT1	Sediment sample at water gap at the starting of Hoa Khuong resettlement	108° 8'8.45"	15°57'41.25"
2	TT2	Sediment sample at water gap at the end of Hoa Khuong resettlement site	108° 7'48.16"	15°57'18.90"

❖ ***Analytical results:***

Table 2-16: Analytical results of sediment quality

No.	Parameters	Unit	Results				QCVN 43:2008/BTNMT
			TT1	TT2	TT3	TT4	Fresh water
1	Cd	mg/kg of dry soil	0.625	0.242	2.014	1.028	3.5
2	As	mg/kg of dry soil	1.246	2.438	8.645	7.918	17.0
3	Hg	mg/kg of dry soil	KPH(<0.1)	KPH(<0.1)	0.335	0.281	0.5

No.	Parameters	Unit	Results				QCVN 43:2008/BTNMT
			TT1	TT2	TT3	TT4	Fresh water
5	Fe	mg/kg of dry soil	0.376	0.384	0.812	0.714	-
4	Pb	mg/kg of dry soil	24.438	32.468	56.752	38.272	91.3
6	Cu	mg/kg of dry soil	14.812	23.762	27.227	31.944	197

❖ ***Comments:***

The contents of heavy metals Cd, As, Hg, Fe, Pb, Cu are detected in the sediment samples with low levels, within the permitted limit of standard QCVN 43:2012/BTNMT for sediment in areas of freshwater, salty water and brackish water.

2.1.5.7. Aquatic

Sampling location:

Table 2-17: Aquatic sampling location

No.	Symbol	Sampling location	Coordinates	
			Longitude	Latitude
1	TS1	Aquatic samples in small lakes in Hoa Khuong resettlement area	108° 7'47.31"	15°57'20.03"
2	TS3	Aquatic sampling in Han river, cross with Le Hong Phong – Bach Dang	108°13'27.95"	16° 3'48.80"
3	TS4	At Han river, far from Tran Thi Ly bridge to the South about 500m (is place to collect water of outlets of My An, My Khe).	108°14'0.29"	16° 2'53.42"
4	TS5	At waste water outlet at the end of Ong Ich Khiem road into the sea	108°12'21.38"	16° 4'53.92"

❖ ***Results of analysis and evaluation TS1:***

Table 2-18: Aquatic sampling at lakes in the Hoa Khuong resettlement site (TS1)

No.	Parameters	Results	
		Branch	***Species***
1	Phytoplankton	*Bacillariophyta*	*Fragilaria capucina*
			Synedra acus
		Chlorophyta	*Closterium intermedium*
			Endorina elegans
			Pandorina charkoviensis
			Eudorina elegans
		Euglenophyta	*Lepocinclis* cf. *acuta* Prescott
			Phacus acuminatus Stokes

No.	Parameters	Results	
		Branch	***Species***
			Phacus lismorensis Playf
			Trachelomonas lacustris Drez.
			Trachelomonas sp
			Phacus sp
			Phacus caudatus Hubner
			*Trachelomonas armata (*Ehr.)
		Cyanobacteria	*Lyngbya birgei*
			Gomphosphaeria sp.
		Dinophyta	*Pyrophacus steinii*
			Prorocentrum sigmoides
		Streptophyta	*Staurastrum sp*
2	Zooplankton	*Arthropoda*	*Acanthodiaptomus* pacificus
			Alonella excisa
			Metapolycope hartmanni
			Daphnia pulex
			Heterocypris repetans
			Hyperia macrocephala
		Cladocera	*Moina macrocopa*
			Macrothrix spinosa
		Copepoda	*Tropocyclops prasinus*
3	Zoobenthos	*Mollusca*	*Pomacea canaliculata* L.
			Corbicula sp.
			Pila polita
		Annelida	*Cirratulus cirratus*

TS1 sample, Hoa Khuong pond, Comments

Analytical results at Hoa Khuong pond show that 6 branches and 19 species of phytoplankton were collected. Of which Euglenophyta accounts for a highest portion, 42.2% with 8 species. Dinophyta, Cyanobacteria and Bacillariophyta account for 21% and Streptophyta accounts for 5.3%. The composition and distribution of seaweed is plentiful and varied. However, there are some significant impacts to this area related to the low primitiveness which is reflected through a higher portion of Chlorophyta than Bacillariophyta.

For Zooplankton compositions, 09 species of 3 main branches including Arthropoda, Cladocera and Copepoda have been collected at the lake bed. Of which, Arthropoda with 6 species accounts for 66.7%, Cladocera with 2 species accounts for 22.3% and Copepoda with one specie accounts for 11.1%. Although the phytoplankton compositions are quite plentiful, the zooplankton compositions are less plentiful and varied. This is caused by activities in this area divide lakes, which restrict habitat of Zooplankton.

The analytical results of Zoobenthos show that there are mainly species of Mollusca and Annelida. Of which, Mollusca with 3 families accounts for 75% and Annelida with one specie accounts for 25%.

Although the aquatic analytical results at Hoa Khuong pond showed the diversity higher than urban lakes, there are still negative impacts on environment quality at lakes.

Results of analysis and evaluation TS3

Table 2-1: Aquatic Sampling at Han river, intersection of Le Hong Phong – Bach Dang

No.	Parameters	Results	
		Branch	**Species**
1	Phytoplankton	*Bacillariophyta*	*Fragilaria capucina*
			Chaetocerus sp
			Closterium costaum
			Thalassionema frauenfeldii
			Nitzschia brevirostris
			Synedra acus
		Chlorophyta	*Closterium intermedium*
			Endorina elegans
			Pandorina charkoviensis
			Eudorina elegans
			Dictyosphaerium tetrachotomum
			Monoraphidium caribeum Hindák
			Monoraphidium contortum (Thuret)
			Oocystis naegelii Braun
			Oocystis solitaria Wittrock
			Selenastrum gracile Reinsch
			Selenastrum rinoi Komárek and Comas
		Euglenophyta	*Phacus sp*
		Cyanobacteria	*Lyngbya birgei*
			Gomphosphaeria sp.
2	Zoolankton	*Arthropoda*	*Metapolycope hartmanni*
			Polycopsis compressa
			Heterocypris repetans
			Amphicypris nobilis
			Heterocypris repetans
			Metapolycope microthrix
		Mollusca	*Clione antarctica*
			Clione limacina
			Paraclione longicaudata
			Prionoglossa tetrabranchiata
			Acteon candens
			Chrysallida cancellata
			Eulimella nitidissima
			Platydoris angustipes
		Chordata	*Doliopsis bahamensis*
		Bivalviva	*Cyclosalpa affinis*
			Corbicula subsulcata
			Saccostrea sp.
		Chordata	*Perna viridis*
3	Zoobenthos	*Annelida*	*Cirratulus cirratus*
			Phyllochaetopterus anglicus
			Glycera abranchiata
			Aricia cuvieri

No.	Parameters	Results	
		Branch	**Species**
			Eunoe pallida
			Chloeia rosea
			Leptonereis sp.

❖ ***Comments:***

With nature as brackish and saltwater areas, the compositions of the Phytoplankton in Han river (Han river bridge) are mainly vegetables and saltwater animals. Besides, in the position of the Han river bridge, the estuary area, aquatic compositions here are unstable with high variation.

The Phytoplankton at Han river bridge consists of 20 species with 4 branches. Of which the Chlorophyta with 11 species accounts for 55%, the Bacillariophyta with 6 species accounts for 30% and the Cyanobacteria with 2 species accounts for 10% and the Euglenophyta with one specie accounts for 5%. Impacts on the diversity of the floating vegetation here are mainly caused by the change in flow and tide.

With the great change in flow, the compositions of the Zoolankton at Han river bridge is quite diverse and plentiful. The analytic results collected 19 species with 4 main group of branches including Arthropoda, Mollusca, Chordata, Bivalviva and Chordata. Of which the Mollusca with 8 species accounts for 42.1%, the Arthropoda with 6 species accounts for 31.6%. The Chordata with 3 species accounts for 15.8% and the Bivalviva with 2 species accounts for 10.5%.

For the Zoobenthos, there is only one branches with 7 species existing. The reason is that at the bridge pier with the unstable bottom surface and greatly affected by the flows, therefore the diversity of the Zoobenthos here is low.

Results of analysis and evaluation TS4

Table 2-20: Aquatic Sampling at Han river, far from Tran Thi Ly bridge about 500m to the South

No	Parameters	Results	
		Branch	**Species**
1	Phytoplankton	*Bacillariophyta*	*Fragilaria capucina*
			Chaetocerus sp
			Closterium costaum
			Thalassionema frauenfeldii
			Nitzschia brevirostris
			Synedra acus
		Chlorophyta	*Closterium intermedium*
			Endorina elegans
			Pandorina charkoviensis
			Eudorina elegans
			Dictyosphaerium tetrachotomum
			Monoraphidium caribeum Hindák
			Monoraphidium contortum (Thuret)
			Oocystis naegelii Braun

No	Parameters	Results	
		Branch	**Species**
			Oocystis solitaria Wittrock
			Selenastrum gracile Reinsch
			Selenastrum rinoi Komárek and Comas
		Euglenophyta	*Phacus sp*
		Cyanobacteria	*Lyngbya birgei*
			Gomphosphaeria sp.
2	Zoolankton	*Arthropoda*	*Metapolycope hartmanni*
			Polycopsis compressa
			Heterocypris repetans
			Amphicypris nobilis
			Heterocypris repetans
			Metapolycope microthrix
		Mollusca	*Clione antarctica*
			Clione limacina
			Paraclione longicaudata
			Prionoglossa tetrabranchiata
			Acteon candens
			Chrysallida cancellata
			Eulimella nitidissima
			Platydoris angustipes
		Chordata *Bivalviva*	*Doliopsis bahamensis*
			Cyclosalpa affinis
			Corbicula subsulcata
			Saccostrea sp.
		Chordata	*Perna viridis*
3	Zoobenthos	*Annelida*	*Cirratulus cirratus*
			Phyllochaetopterus anglicus
			Glycera abranchiata
			Aricia cuvieri
			Eunoe pallida
			Chloeia rosea
			Leptonereis sp.

❖ ***Comments:***

With nature as brackish and saltwater areas, the compositions of the Phytoplankton in Han river (far from Tran Thi Ly bridge about 500m) are mainly vegetables and saltwater animals. Besides, in the position of exchanging saltwater and freshwater, aquatic compositions here are unstable with high variation.

The Phytoplankton at sample position consists of 20 species with 4 branches. Of which the Chlorophyta with 11 species accounts for 55%, the Bacillariophyta with 6 species accounts for 30% and the Cyanobacteria with 2 species accounts for 10% and the Euglenophyta with one specie accounts for 5%. Impacts on the diversity of the floating vegetation here are mainly caused by the change in flow and tide.

With the great change in flow, the compositions of the Zoolankton at sample position is quite diverse and plentiful. The analytic results collected 19 species with 4 main groups of branches including Arthropoda, Mollusca, Chordata, Bivalviva and Chordata. Of which the Mollusca with 8 species accounts for 42.1%, the Arthropoda with 6 species accounts for 31.6%. The Chordata with 3 species accounts for 15.8% and the Bivalviva with 2 species accounts for 10.5%.

For the Zoobenthos, there is only one branches with 7 species existing. The reason is that at the bridge pier with the unstable bottom surface and greatly affected by the flows, therefore the diversity of the Zoobenthos here is low.

Results of analysis and evaluation TS5 (Aquatic Sampling at outlet at the end of Ong Ich Khiem road)

Biological components of ecosystems:

- Production creature: Gracilaria verrucosa, Sargassum, Padina, coastal vegetable, bacteria
- Consumption creature: Sea snakes, Siganus, Lutjanus campechanus, gladius, ... Oreochromis niloticus, Cyprinus carpio, Perciformes, ... Shrimp, goby, groupers, Meretrix petechialis Lamarck, Anadara granosa, Corbicula sp, sea cucumbers, oysters, starfish, ...
- Decomposition creature: The anaerobic bacteria and mushroom that live at the bottom of the mud, the bacterias decompose the plant humus and organic substance.
- Plants: Gracilaria verrucosa, Sargassum, Padina, Cynodon dactylon (L.) Pers., Paspalum scrobiculatum L.
- Seaweed have 39 species belonging to 72 genera and 4 branches, of which the brown seaweed (Pheaophyta branch) dominates.
- Seagrass rugs have 3 sea grass species and 35 species of fish in 29 varieties and 22 families, they live on the sea grass rugs, concentrated in Bai Nom – to the South of Son Tra mountain with area of about 10 hectares, with an average coverage is from 16-30%.
- Molluscs : Corbicula sp, Gelonia coaxans Gmelin, Meretrix petechialis Lamarck, Crassostrea belcheri (Sowerby, 1871), Saccostrea cucullata (Born, 1778), (Isognomon ephippium) (Linnaeus, 1758), Trapezium liratum
- Crustacean: Penaeus monodon Fabricius, Penaeus merguiensis de Man, Metapenaeus ensis de Haan, Portunus pelagicus Linnaeus, Portunus sanguinolentus Herbst, Scylla spp.

Large sized benthic belongs to Molluscs, Crustacean, Echinoderms. Molluscs dominates with 53 species, 36 genus and 27 families. Crustacean has 6 species and some Crabs, lobsters have not determined their names and Echinoderms have 23 species.

Phytoplankton has 221 species with 3 classes.

Therea are 8 larvae groups of Crustacean

- Fish: At area, it is determined to have 85 species of fish, 71 genus, 48 families, 15 orders.

+ In which, Perciformes dominate with 22 families(account for 45.83% of total families), 30 genus (account for 42.25% of total genus), 37 species (account for 43.53% of total species).
+ The second advantage: Cypriniformes, with 2 families (account for 4.17% of total families), 12 genus (account for 16.9%), 14 species(account for 16.5%).
+ The rest genus has only from 1 to 7 species (account for 1.18% to 8.24% of total species)
+ List of fish genus in the ecosystem:
+ Rajiformes with 2 families, 2species.
+ Cluepeiformes with 3 families, 7 species.
+ Myctophiformes with 2 families,1 specie.
+ Osteoglossiformes with 1 family, 1 specie.
+ Angulliformes with 3 families, 4 species.
+ Cypriniformes with 2 families,14 species.
+ Siluriformes with 4 families, 4 species.
+ Atheriniformes with 4 species.
+ Mugiliformes with 4 species.
+ Polynemiformes with 1 family, 1 specie.
+ Symbranchiformes with 1 family, 1 specie.
+ Perciformes with 22 families, 37 species.
+ Ophiocephaliformes with family, 1 specie.
+ Scopaeniformes with 1 family, 2 species.
+ Pleuronectiformes with 3 families, 6 species.

In general, creatures of ecosystem of coastal area of Ong Ich Khiem outlet are quite diversified; however, they are not rare species to be preservation. And:

- Ong Ich Khiem pump station has the coordinate of $16^0$4'50.4''-$108^0$12'39.59''which is not under the management of coral reef preservation and ecosystem of the sea from Hon Chao to Nam Hai Van and Son Tra peninsula (according to Decision No. 54/2007/QD-UBND dated 13/9/2007 by Da Nang People's Committee on promulgating the management, preservation of coral reef and ecosystem).
- According to map of aquatic vegetation of Da Nang Bay, the coastal area of Ong Ich Khiem outlet is mostly free from coral and seaweed.
- Otherwise, as mentioned in Project Description, pump station is activated only when flood tide and lasting, heavy rain. Partition gate will be closed to prevent water spilling from the Bay to sewerage system, then the station will operate to release water. The station will not be activiated in normal conditions, and water flows freely in sewers when no flood tide or sea rise in Da Nang Bay. Therefore, the impact of the pump station is insignificant.

Hence, it can be concluded that during operation process, Ong Ich Khiem anti-flood pump station creates no impacts to biological diversity

2.1.6. Ecology

Danang city is characterized by a diversity of terrain, is the crossroad of climate sub-areas, which has led to a diversity of ecosystem. Specifically, Danang is at the intersection of two large biodiversity centers called Bach Ma and Ngoc Linh; thus, the fauna and flora in Danang are rich in species (WWF, 2004). In addition, Danang has diversity in culture as well as agricultural production types; hence, the agricultural ecosystems here are also possessing a high biological diversity.

Forests and vegetation: the forests in Danang city are mainly concentrated in the western Hoa Vang district, a few in the districts of Lien Chieu, Son Tra, Ngu Hanh Son. Coverage rate was 33.1% in 2009, timber volume was about 3 million m3, distributed mainly in steep areas with complex terrain. The natural forest areas are Ba Na - Nui Chua area, Son Tra peninsula, south Hai Van.

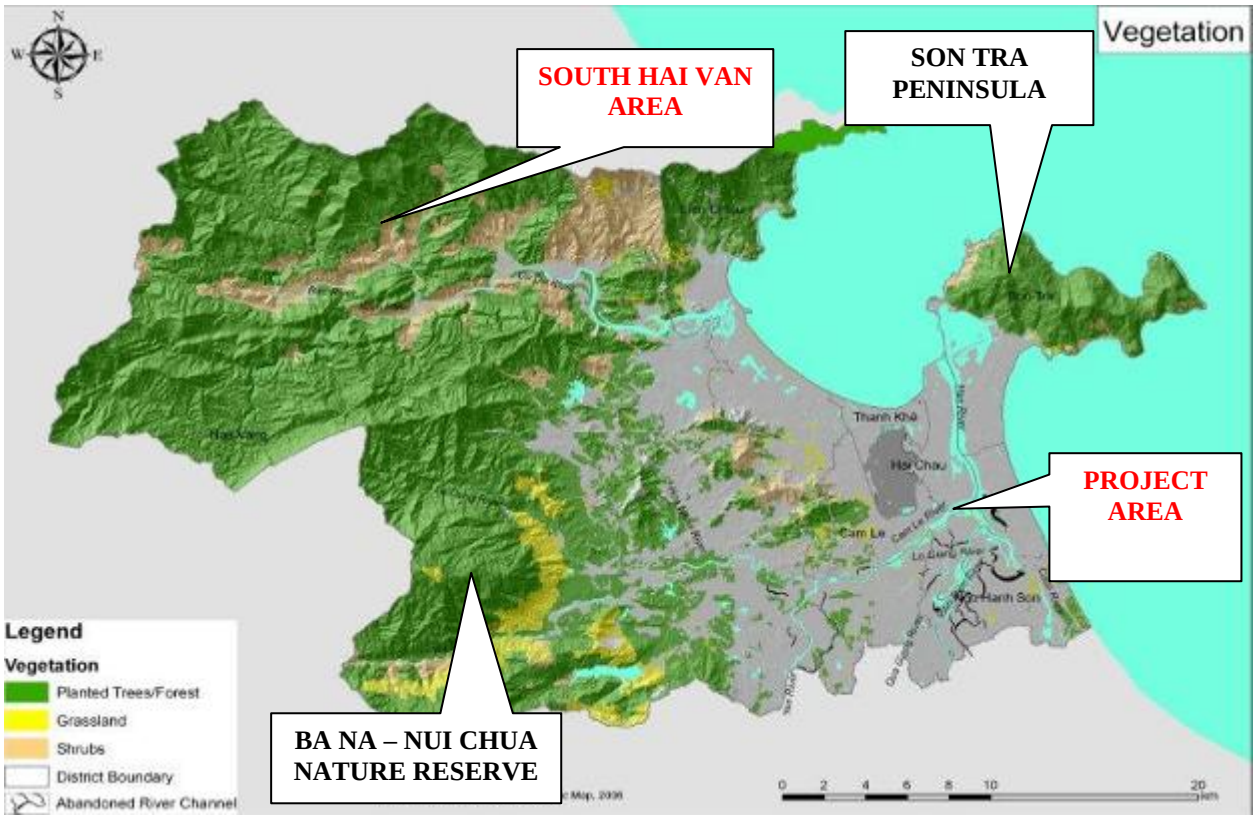


Figure 2-4: Vegetation map of Danang city

❖ ***Natural Reservation Area:***

Ba Na - Nui Chua Nature Reserve: with a total natural area of 28,030 ha, of which the area of forests and forestry land is 26,992 ha, the area of non-forestry land is 1,037.2 ha. There are 793 species of plants, 487 genera and 134 families of 4 branches. Rare plants put in the International Union for Conservation of Nature (IUCN) red list include: Aquilaria crassna pierre, Madhuca pasquieri, Dalbergia cochonchinensis, Sindora tonkinensis.

Son Tra peninsula: Son Tra nature reserve has a total natural area of 2,591 ha, of which the area of forests and forestry land is 2,512.1 ha. The plants in Son Tra nature reserve are relatively diverse with 985 species including 22 rare species recorded in Vietnam's Red Book.

South Hai Van area: a total natural area of 2,544.2 ha, of which the area of forests and forestry land is 2,091.5 ha. The special use forests of the south Hai Van area are adjacent to Bach Ma National Park (Thua Thien - Hue province) and Ba Na - Nui Chua zone, forming a corridor large enough to conserve and grow endangered species. In terms of environment, Hai Van creates distinct differences in climate and weather between two mountain slopes – the southern slope (Danang) and northern slope (Thua Thien - Hue), protecting Danang city from direct impact of annual hurricane as well as regulating salinity level for Cu De river. The natural coastal forests here are well protected, the vegetation is dominated by species such as Symplocos longifolia and Lithocarpus nebulorum (ADB, 1999). However, most of the

mountain pass area are planted forests with common Acacia auri*culiformis, A. Mangium* and *Pinus sp.*

❖ ***The other ecological sites:***

Outlet of My Khe and My An, Ngu Hanh Son district: This is the tourism beach and is the location of anchoring of some small boats of fishermen, long and clean sand beach with good water quality, unremarkable coastal ecosystem. The coastal typical species including 191 species of hard coral reef and 3 species of soft corals, 72 species of seaweed, 3 species of seagrass bed, 162 species of coral reef, benthos and phytoplankton.

Bau Tram lake: Bau Tram lake has the largest water surface area among all lakes in Danang city (about 60ha). The flora around the lake is mostly shrubs. Land bordering the lake at some points is cultivated by the people. According to the monitoring results, lake water has signal of lightly polluted.

According to the map location of works Figure 1-2 and Figure 2-4. Due to adjustment and supplementary work items,mainly concentrated in urban areas, small construction activities, unfocused and away from nature reserves area:

- Location of the area near Son Tra Peninsula is Tho Quang – Bien Dong and wastewater collection pipelines of Pham Van Xảo road, Tho Quang industrial fisheries zone- which is far from 3km The Son Tra Peninsula area to the northeast.
- Location near Ba Na – Chua Mountain Reserve is where of Depot terminal station in Bau Tram – 4 km away from Ba Na – Chua Mountain Reserve to the SouthEast.
- The remaining works are far from nature reserve area more 5km.
- Thus, impact of the construction of the adjusting items, additional projects to the nature reserve is negligible even no impact

2.2. SOCIO-ECONOMIC AND INFRASTRUCTURE DEVELOPMENT STATUS

2.2.1. Socio-economic Situation

The adjustment and supplementary works under the Danang SCDP are scattered in entire city in which Hai Chau, Thanh Khe and Lien Chieu are concentrated with most works. To determine and evaluate the socio-economic development of the project area, the Consultant collected documents available in office of the CPC, PMU and carried out surveys at the project wards/communes.

Danang city is located strategically in the middle point of Vietnam. Danang borders Thua Thien-Hue province to the north, Quang Nam province to the south and the west, and the Eastern Sea to the east. It is 759km far from Hanoi to the South and 964km from Ho Chi Minh City to the North.

The total area of Danang city is about 1.283 km2, of which the urban area is 241.51 km2. The city has 06 urban districts including Hai Chau, Thanh Khe, Son Tra and Ngu Hanh Son, Lien Chieu and Cam Le and 02 suburban districts including Hoa Vang and Hoang Sa.

Total population of Danang city in 2015 is 1,046,876 persons with population density of 892 persons/km², of which the population in urban area accounts for 87% and suburban population accounts for 13%.

The population density is very high in central districts such as Hai Chau and Thanh Khe and gradually decreases in Son Tra, Ngu Hanh Son, Lien Chieu districts where the activities of Components I and II take place.

Hoa Vang district where Component III (Hoa Khuong resettlement site) is implemented has low population density with residential clusters interleaved with agricultural cultivation area.

Table 2-22 :Area, population, population density of the project districts

No.	Districts	Area (Km^2)	Population (persons)	Population density (person/Km^2)
1	Hai Chau	23.28	204,762	8,796
2	Thanh Khe	9.44	186,561	19,763
3	Lien Chieu	79.13	151,933	1,920
4	Ngu Hanh Son	39.12	73,974	1,891
5	Cam Le	35.25	104,669	2,969
6	Hòa Vang	734.89	126,215	172

(Source: Danang Statistical Yearbook 2013)

Danang city has a majority of the Kinh people, accounting for 99.4%.

The number of employees in 2011 was 496,200 people, including 37,914 technicians, 26,039 skilled workers who graduated from upper secondary schools, colleges and universities and 432,247 employees working for other sectors. The labor structure is divided by sectors as follows:

Table 2-22: Labor structure by sectors

No.	Fields/sectors	Quantity	Portion per total laborers
1	Agriculture, forestry and fisheries	38,830	7.8%
2	Industry and construction:	130,929	26.4%
3	Services	223,838	45.1%
4	Others:	-	20.7%

(Source: Resettlement Plan of the Project)

The economic structure focuses on service - industry - agriculture development. The proportion of service sector in GDP in 2010 reached 52.98%, industry - construction reached 43.84% and agriculture reached 3.18%.

Danang is one of the largest education and training centers of the Central-Highland region and the whole country. Currently, the city has 14 universities, institutes, 18 colleges and 50 intermediate schools, vocational training centers and more than 200 schools from pre-school to high school level.

Danang has 19 general hospitals and specialized clinics, 11hospitals and health care centers of districts, 47 commune health centers and over 1,000 private clinics. With the establishment of the University of Medicine and Pharmacy and the Medical Technical University in the city, Danang is orientating to become a major medical center of the Central - Highland region and the whole country, providing high quality human resources and health services for the socio-economic development of the country.

❖ ***Some socio-economic information of the project area:***

According to the results of survey carried out in June 2015 for households living at the project area, some basic information is as follows:

- At the project area, there is no ethnic minority living. Average household size is about 3.7 persons/household, including 49.3% of male and 50.7% of female.
- Most of household heads have education level from secondary or higher, of which the portion of upper secondary education level is highest (52%), followed by intermediate, college and university (30%). The number of persons with secondary education level or lower accounts for a lowest portion (18%). None case of illiterate is found.
- Income level of households is mainly from income group over 70 million dong/household/year (accounting for 63%). Average monthly income per household member is about 1.4 million dong or more.
- The results of survey for 550 households show that among affected households, those engaged farming account for highest portion (more than 50%). It is followed by the portion of households earning wage (about 30%) and small business households (approximate 17%). The rate of unemployment of laborers in working age is minor (below 1%), concentrated in group of teenagers who have not been vocational trained.
- The number of farming households are mainly concentrated in Hoa Nhon and Hoa Son communes. The people are still allocated to cultivate however agriculture is no longer primary income source. The number of households with members earning wage are distributed homogeneously in the surveyed localities. Some occupations include public servants, workers at private enterprises in the industrial park as well as business and services. Business households are mainly private entities either trading at home or renting business premises at the markets or tourism area.
- According to the survey results, the households' facilities are quite sufficient and modern. Some popular facilities include color televisions, motorbikes, phones, refrigerators. The portion of households owning air-conditioners and washing machines is very high.
- Most of houses owned by surveyed households are permanent (with one or two floors), accounting for 75.6%. It is followed by the semi-permanent houses (brick wall, tile/iron roof – house grade 4) accounting for 24.4%.

2.2.2. Status of traffic

Danang is located in the middle of Vietnam on the North-South arterial road axis of the highway- railway-seaway-airway. Danang city is also the ending point of the East-West economic corridor crossing Myanmar, Laos, Thailand and Vietnam. In the framework of the study scope of the project, a number of and roads related and directly affected from the implementation process of the project include:

Provincial roads:

- Nguyen Luong Bang road (National highway 1A) is a national highway intersecting with the starting point of the existing Nguyen Tat Thanh road (joining with the Northern ring road) and the Southern ring road under the Project.
- Hai Van – Tuy Loan bypass, intersecting the ending point of the Northern ring road;
- Existing Nguyen Tat Thanh road runs along the beach and connects with the Northern ring road;

- The road is invested fully with the lighting, drainage systems and asphalt pavement. The traffic density on the road is quite high, especially in peak hour.
- The provincial road DT605, the section intersecting with the railway and the Southern ring road;
- The National Highway 14B, the section intersecting with the Southern ring road;

These roads are quite wide with asphalt pavements and mostly equipped with the lighting systems and drainage sewers. The traffic density on these roads is quite high, especially at the National Highway 1A where heavy trucks are regularly operating.

These arterial roads are also service ones which serves the transport of materials, excavated soil from the construction site in entire project area.

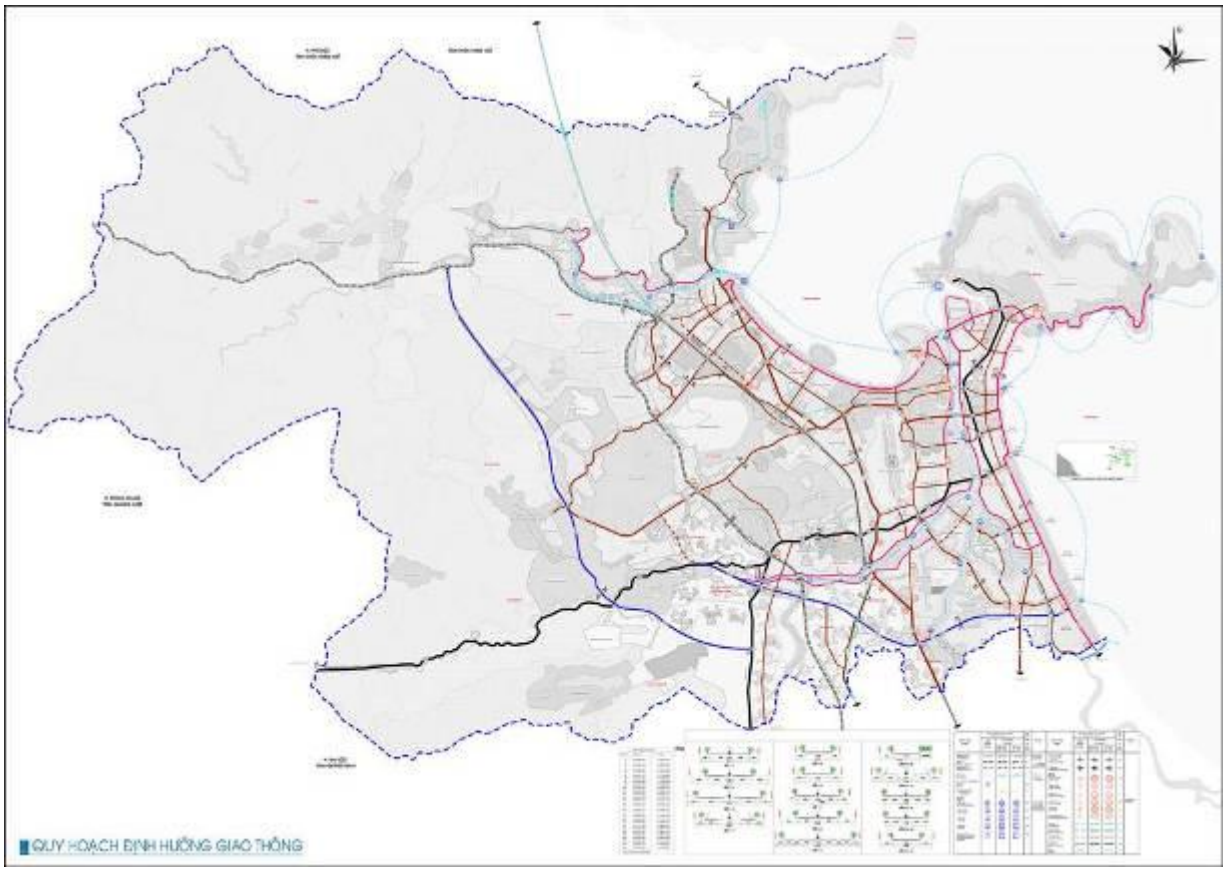


Figure 2-5: Traffic orientation map of Danang city towards 2020

Urban roads:

- Peri-urban area (located in Hoa Vang district): The remaining roads in the project area are mainly inter-village ones. These roads are often aggregated, concreted or some earth road sections, therefore, the quality is unguaranteed, which makes difficult for means of transports to travel.
- The central area (in Lien Chieu, Thanh Khe, Ngu Hanh Son districts): This is an urban road completed with full infrastructure such as water supply, drainage, lighting and cable, etc. The quality of road is very good (because this is asphalt and asphalt concrete road) and regularly maintained. The traffic density is medium
- Nguyen Tat Thanh extension road built will contribute to promoting the development of the Northwest urban areas of the city. The road will connect the tourism centers of the

city, including Son Tra Peninsula, Thuan Phuoc bridge and Nguyen Tat Thanh coastal tourism road with the Thuy Tu urban area.

- The proposed Hoa Phuoc – Hoa Khuong road (is invested to build in SCDP Project) is the southern ring road of the city, in the middle of the National Highway 1A to the East and axis of the National Highway 14B to the West. The proposed road will provide East-West connectivity and reduce traffic congestion. In the East, the road will connect with the National Highway 1A at Son Tra – Dien Ngoc road (the road connecting with the Univeristy Village). In the West, the road will connect with the planned provincial road 604 (Hoa Phu).
- The two proposed roads will contribute to innovating the urban and distribution of population through encouraging people to live in the new urban areas of the city, reducing the population density in the central/southern areas as well as minimizing traffic flow of the crowded roads, attracting foreign investment and promoting economic growth of Danang city.

2.2.3. Water supply

According to Statistics data of 2013, Da Nang Water Supply Company is operating 03 water supply facilities with a total design capacity is 155.000m3 / day; Current capacity is 130.000-140.000m3 / day. Cau Do water supply plant is one of the three largest plans with a capacity of 120.000m3 / day; Airport water treatment plant with medium average, with a capacity of 30,000m3 average / day, and Son Tra water supply plant with a capacity of 5,000m3 / day.

On water pipe network, pipeline type I of company has length of 287 kilometers (Ø> 200); pipeline type II is 253km long (Ø 100-200); and III pipeline type III is over 3,000 kilometers long. The total includes 120,000 connected equipment electronic clock. The proportion of people are providing clean water in 06 urban districts over 65%, including approximately 130,000 households with 500,000 people. On average, water consumption is 128 liters cities / person / day.

Table 2-3: Operation status of surface water treatment plants in Danang city

No	Plant	Location	Capacity (m^3/day)	
			Design	**Exploit**
1	Old Cau Do water plant	Hoa Tho Tay ward, Cam Le district	50,000	Temporarily stopped
2	New Cau Do water plant	Hoa Tho Tay, Cam Le district	120,000	95,000 – 105,000
3	Airport water plant	An Khe ward, Thanh Khe district	30,000	30,000
4	Son Tra water plant	Tho Quang ward, Son Tra district	5,000	5,000
Total			205,000	130,000 – 140,000

Source: www.danang.gov.vn

With current water supply capacity, Da Nang Water Supply Company has met the demands of using clean water from city residents with water pressure in the water supply system network in Danang is at 0.5 – 2.7 bar (approximately 5-27 meters of the water column) and supplied water quality is within standards of drinking water hygiene which are issued with Decision No 1329/2002 / QD-BYT dated 04/18/2002.

❖ ***Water Supply Orientation Phase 2 (towards 2020):***

Nearly 10 years ago, the city was determined to build a sized and modern Danang water supply system, therefore, currently, Water Supply Company has completed and City Water Supply Project Phase I (120,000 m3 / day night) has been exploiting. From 2015 to 2020 the city water supply project phase II will have been completed, improving the ability to supply water to 325,000m3 / day night as follows:

Pipeline network of Danang city has currently focused on the area of Hai Chau, Thanh Khe, Son Tra. At these areas, the covered rate is 90% of the residential area. At Lien Chieu, Ngu Hanh Son districts, the main pipeline network level I was built, network of level II and level III has been growing. In the area of Hoa Vang district, water supply network is not almost found, only some coatal communes have pipelines of level II and level III. The proportion of people using clean water supplied by the Water Supply Company is 9.5%. Also, planning of Phase 2 will concentrate for the development of pipeline networks in suburban areas, the pipeline for Hoa Vang District, pipeline grade II and grade III for Ngu Hanh Son and Lien Chieu districts.

2.2.4. Drainage Status

2.2.4.1. Surface water drainage

According to Statistics data of 2013, stormwater drainage system consists of about 270 km of box culverts, construction ditch and about 20km of land ditch. Stormwater drainage network is a combined system of storm water and waste water which are mainly located in the stone – paving road(stone/ concrete). The typical storm drainage sewers have width of 800 mm and height of 1200mm.

Following drainage plan of Da Nang city towards 2030, the city has implemented many projects by investment capital sources from abroad and within the country to renovate and expand the drainage system for stormwater and wastewater, however, construction has not been completed, many areas are still flooded. Review the current situation of drainage capacity of the system as follows:

- For the northern region: Due to the complex terrain, when storm water from Phuoc Tuong mountain flows down at a faster rate causing flooding at downstream. Drainage capability is increasingly reduced because the system is not regularly maintained and are being occupied by the civil works.
- For the center region: Districts of Hai Chau and Thanh Khe, some positions are often flooded and prolonged due to the lack of sewers and small drainage sewers but meet the demand of drainage for the large basins. Capacity of drainage is good in other areas.
- For the Eastern region: The sewers are large, building density is low, the terrain is relatively high, storm water drainage capacity is quite good, less frequent flooded.

Figure 2.1: Current stormwater drainge system

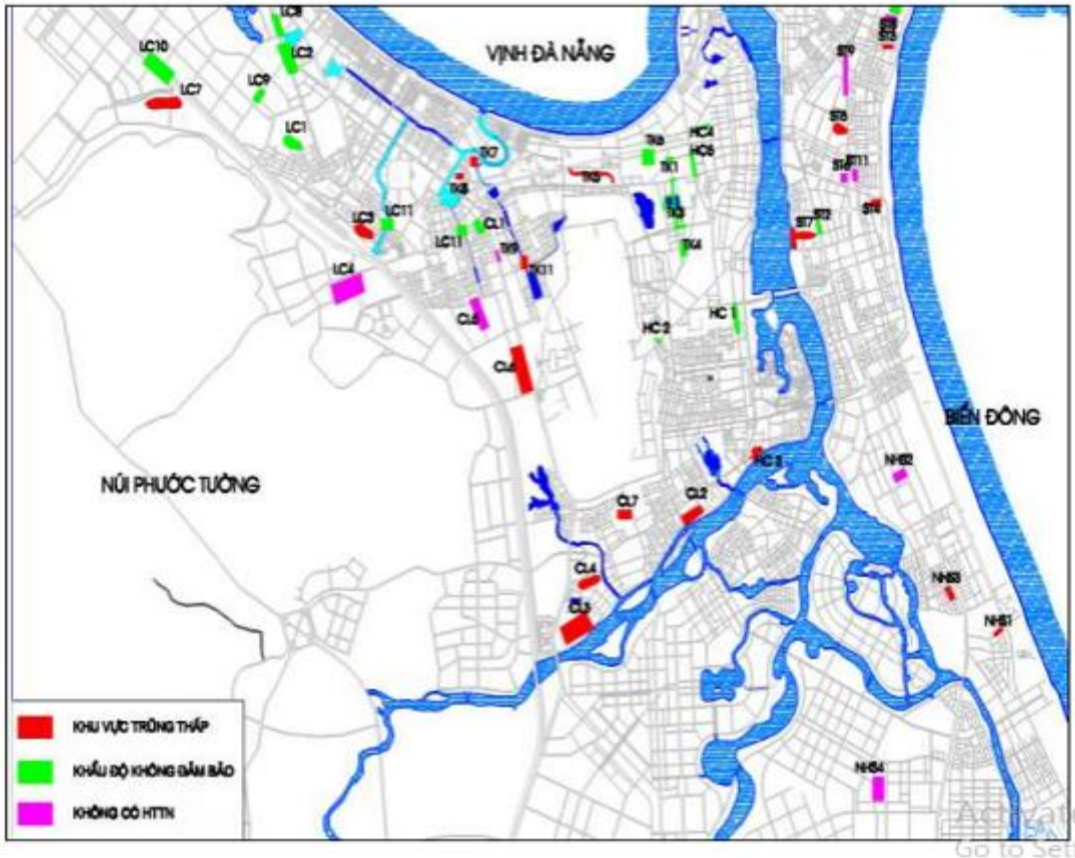


Figure 2-6: Location map of area frequently flooded

2.2.4.2. Waste water collection and treatment

According to drainage plan of Da Nang city towards 2030 (November 2015), its existing wastewater drainage system is mostly the common drainage system. The city's waste water is collected by coastal sewers, sewers near rivers and lakes, lakeside wells through Combined

Sewer Overflow (CSO) at the outlets. Only one small part of the planning area with separate collection systems for waste water treatment plant. Most households have septic tanks.

For household septic tanks, the rate of connecting directly to the drainage system level 3 is not high (approximately 15-20%), mostly households use from septic tank majority to the ground. For domestic water from kitchen, washing, about 46% of households connecting to the collection and drainage system into waste water treatment station.

In Da Nang city, there are 5 centralized industrial parks: Hoa Khanh, Lien Chieu, Tho Quang Fisheries Service, Da Nang and Hoa Cam. These industrial zones have separate wastewater collecting and treatment system. After treatment, waste water needs to be within permitted standard before discharging into receiving water source.

Diagram of existing waste water treatment stations of Da Nang city is shown in the figure below:

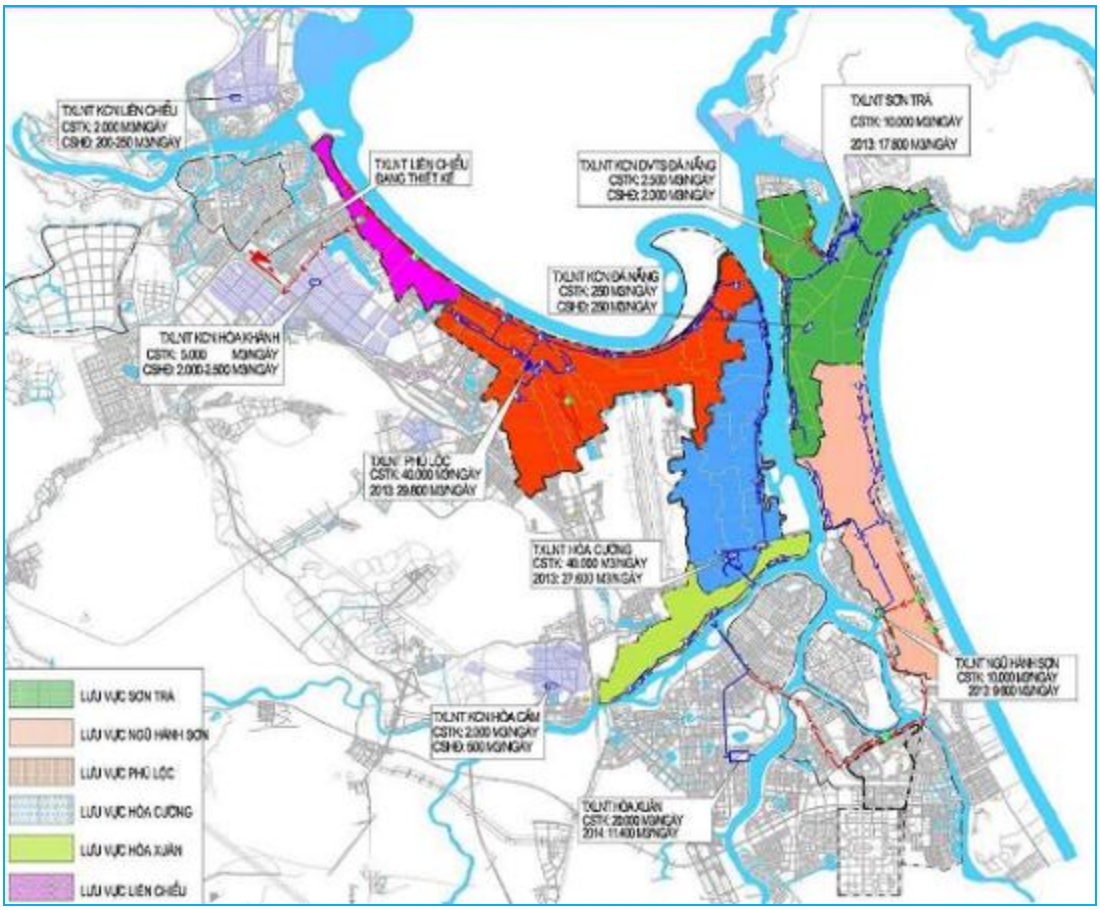


Figure 2-7: Existing waste water treatment stations of Da Nang city

Currently, it is estimated that there are only from 15% to 20% of households which are connected to the drainage system. Wastewater is collected into separate sewer system and moved to be treated at 04 existing waste water treatment plants: Hoa Xuan (capacity of 20,000m^3 / day), Phu Loc (capacity of 40,000m^3 / day), Ngu Hanh Son (capacity of 10,000m^3 / day), Hoa Cuong (capacity of 40,000m^3 / day) and Son Tra (capacity of 10,000m^3 / day) through one sewer system and pressure booster station. In addition, there are also 5 waste water treatment stations of the industrial zones in the city, including: Waste water treatment stations of the industrial zones of Lien Chieu, Hoa Khanh, Danang Seafood service, Hoa Cam and Da nang.

2.2.5. Status of solid waste collection

2.2.5.1. Domestic waste

According to Statistics data of domestic waste collection and treatment by the Urban Environment Company (URENCO), Danang waste about 630 tons of domestic solid waste every day, approximately 85% of which are collected by companies. URENCO conducts daily garbage collection in the urban districts.

In the districts of Danang city, the centralized waste diposal site is used to collect garbage from people. Then, waste is transported to be treated in the solid waste treatment site in Khanh Son landfill. Solid waste treatment site in Khanh Son landfill has a total area of about 10 hectares, consists of 3 seperating lines of garbage manually associated with machines with a total capacity of 800 tons of waste / day; 2 production lines PO, RO from plastic waste with a total capacity of 63 tons of nylon / day; 1 production line of adobe bricks with capacity of 65 tons/day and 1 waste furnace with capacity 162.6 tons / day together with a heat recovery system to produce industrial pellets from organic solid waste.

On 27th June, 2015, Vietnam Environment JSC inaugurated the first phase of the project with a capacity of processing 200 tons of waste / day. The phase 2 of the project is estimated to be completed by the end of 2016. Thus, through the disposal of waste towards recycling and solid waste treatment site in Khanh Son landfill not only contributes to reducing the amount of burial waste but also allows taking advantages of the waste components to form the energy and useful products.

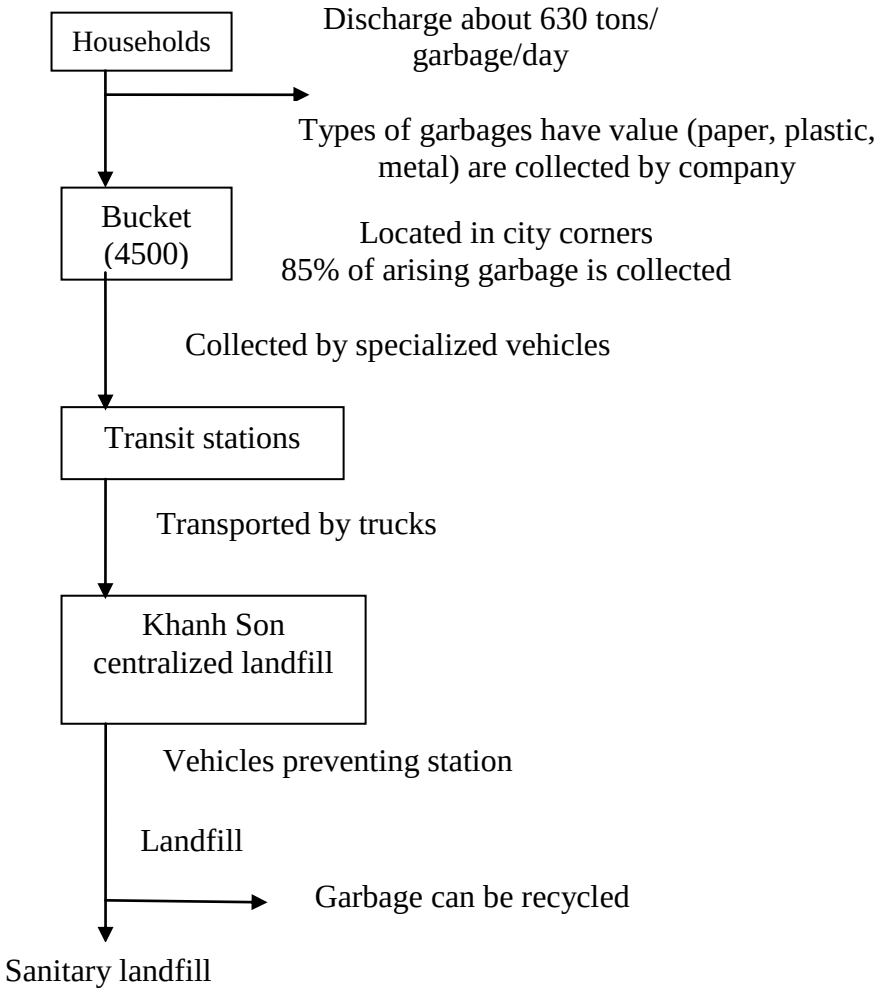


Figure 2-8: Solid waste management system in Da Nang city

2.2.5.2. Sewage sludge

The city's sewage sludge has 2 main sources including: sludge dredged from the sewer system and septic tank sludge. This sludge is collected by drainage company and transferred to Khanh Son landfill (receiving capacity of the landfill is 650 tons/day) under the management of Da Nang Urban Environment Joint Stock Company.

CHAPTER 3. ANALYSIS ALTERNATIVES

3.1. ANALYSIS OF ALTERNATIVES "WITH" and "WITHOUT SUPPLEMENTARY AND ADJUSTMENT PROJECT"

Two alternatives WITH ADJUSTMENT, SUPLLEMENTARY AND WITHOUT PROJECT of all three components will be evaluated according to Table 3-1 belowed:

1. WITHOUT adjustment, supplementary project: For work tems, design will not be adjusted and location of work items will not be supplemented. In this case, works under original SCDP project will be lack of synchronous connection with surrounding infrastructure, effectiveness of works is not high. Moreover, some works are not adjusted about location, leading investment effectiveness is not ensused, causing traffic congestion and impact on entertainment activities of local people.

2. WITH adjustment and supplementary project: The work items are adjusted and supplemented: improvement living condition and hunger elimination and poverty reduce for people in the city; meeting the demand of traveling and limit traffic congestion; reduce environmental pollution, flood treatment and strenthening disaster control capacity for Da Nang city.

Table 3-1: Analysis of alternatives With and Without adjustement and supplementary Project

Environmental and Social issues	**WITHOUT ADJUSTMENT, SUPPLEMENTARY**	**WITH ADJUSTMENT, SUPPLEMENTARY**
Component 1 –Improvement storm water and waste water drainage system ***- Investment for expansion stormwater drainage system*** ***Investment adjustment for drainage system in My An, My Khe from general system to separate one***		
Flooding in the case of adverse weather condition (rain, storm)	<u>Flooding still occur in many areas:</u> According to intial SCDP project, drainage system is improved at some areas. However, drainage situation of adjacent areas connecting with areas is degraded. Thus, drainage efficiency of improved area is not high. In the wards of Lien Chieu, Thanh Khe, Son Tra and Ngu Hanh Son districts, many areas are flooded in the rainy season, flooding level will become more and more serious due to the increasing population, the	<u>Flooding mitigation:</u> Synchronous investment for drainage system of connecting areas, promotion and increase drainage efficiency of the Project - The project contributes to completion the drainage system which has been planned of the city, reducing the risk of flooding in lowland areas in the rainy season in the wards, in Lien Chieu, Thanh Khe districts by activities of drainage system improvement on roads, renovating the

Environmental and Social issues	WITHOUT ADJUSTMENT, SUPPLEMENTARY	WITH ADJUSTMENT, SUPPLEMENTARY
	existing drainage systems of the country has degraded, not meet the demand of drainage of the area.	outlet areas, pumping stations, construction of new drains and sewers and renovation old sewers ... to improve drainage capacity.
Project effectiveness	Benefits of approved works in initial SCDP is not maximized.	Synchronous infrastructure for rain water and sewage drainge system of the city in order to maximize value that works bring to people.
Improvement surface water quality at canals, creeks, lakes.coastal areas	Surface water at canals, creeks is polluted by receiving directly waste water and waste from households in the area. Quality of coastal water is polluted and landscape of oulet areas is affected	<u>Pollution will decrease significantly</u> With investment for waste collection and treatment system expansion, water quality of river systems, lakes and the coast of Da Nang will be improved. Guaranteed treated waste water quality leads to improvement of air quality, pollution of landscape around rivers and lakes will be improved. Waste water and rain water will be collected separately, input wastewater capacity in treatment plants will be reduced, in line with the original design capacity. Processing efficiency will increase, operating costs will be reduced. The water resources in the tourism development strategy of the city as the Han River, beach are protected..
Landslides, coastal water pollution	The outlet may not be upgraded and repaired, rainwater and sewage which is collected together, flowing into the sea causing coastal erosion, affecting recreation activities and entertainment of the people and tourists	Renovation outles of MyAn, My Khe, not to waste water flowing into the sea, to prevent soil erosion and landslides. Landscape of outlets is improved.
Component 2 – Bus Rapid Transit (pilot) ***Adjustment location of BRT station form the park to Thac Gian ward, Thanh Khe district (pilot)***		
Impact on assess to intelligent traffic services	Non-adjustment for Depot' position of BRT station at park 29/03 will: - Not suitable with planning of the city- - Impact in the process of construction on creation activities at this area	Adjustment location of Depot to land area near new location of the airport. - Suitable with the city's planning - Decrease traffic pressure at entertainment areas. - At the same time, new Deport position adjacent the airport is resonable, due to increase of connection between air traffic

Environmental and Social issues	WITHOUT ADJUSTMENT, SUPPLEMENTARY	WITH ADJUSTMENT, SUPPLEMENTARY
	- No integration with bus transit point of the city's urbanization. IST system is only invested for BRT, connection with other systems is not high	and with buses of the city. IST system is invested fully will increase improved interconnectivity between the national expressway system and the city road network)
Interrupting with daily activities of local people	- Impact on creation activities of local people - Do not connect synchronization between bus rapid transit (BRT) and regular bus system of the city.	Minimize impact on the daily activities of the people. Convenient, easy to connect with normal bus system
Component 3 – The strategic urban traffic roads and resettlement sites ***Adjustment location of resettlement site***		
Synchronism with design of Hoa Phuoc – Hoa Khuong road	Not adjustment for Hoa Phong – Hoa Phu resettlement site When Hoa Phuoc- Hoa Khuong road is adjusted alignment, if resettlement site's location has no change and suitablity, local people who have to relieve, will have difficulties, especially, location of resettlement site is far from orginial living area of affected people. There are differences in living location and capacity of livelihoods improvement remains low level	Adjustment for Hoa Khuong resettlement site Hoa Phuoc- Hoa Khuong road is adjusted, location of resettlement site is also adjusted, creating favorable condition for local people who have to be relieved

For 3 components, ADJUSTED and SUPPLEMENTED alternative of items of SCDP brings out positive impacts on environment, society and economy of Danang city in line with for substainable development strategy which the city has implementing.

3.2. ANALYSIS OTHER ALTERNATIVES ON TECHNIQUE

Besides the analysis and evaluation alternatives of WITH and WITHOUT ADJUSTMENT, SUPPLEMENTARY project with 3 components, there are some works in the process of research, design consulting unit has launched various technical alternatives. This section will analyze the alternatives based on the key elements: technical, economic and environmental – social issues.

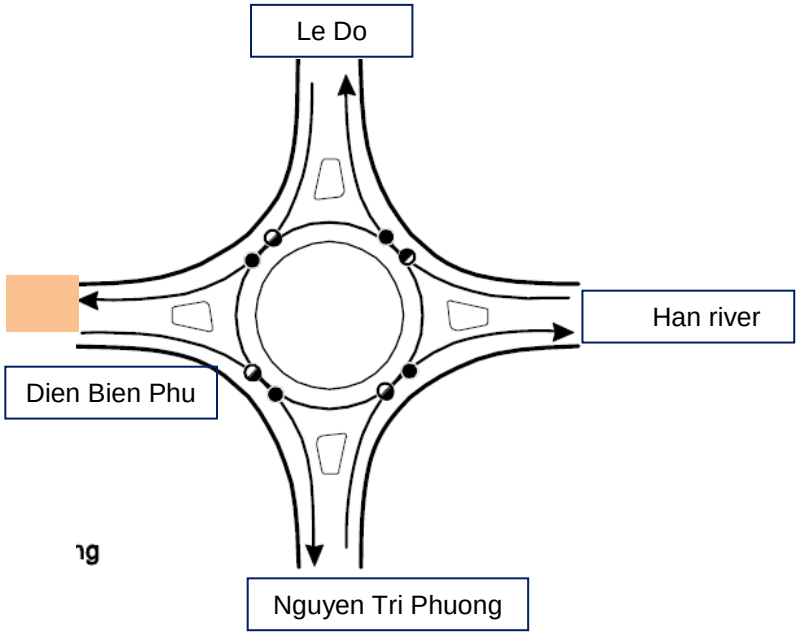
3.2.1. Interchange of Dien Bien Phu, Nguyen Tri Phuong on BRT system (Dien Bien Phu tunnel work)

❖ ***Status***

Interchange operates at rush hour in the morning, and in the afternoon. Circulation speed remains low interchange with many traffic conflicts.

Traffic congestion occurs at rush hour for all branches. Especially there are conflicts between line going straight to interchange on Dien Bien Phu road with lines going straight or turning left on Nguyen Tri Phuong and Le Do roads.

With BRT route schedules on Dien Bien Phu routes (left) and Nguyen Tri Phuong, occupies a separate lane, in the case of rush hour, traffic congestion remains at high rate in all branches, particularly, if lighting signal is designed for BRT buses, capacity of limit in all branches will be reduced, increasing loss of time across interchange and causing traffic congestion at interchange.



❖ ***Design alternative:***

This interchange has 2 alternatives: Construction overbridge or underpass as follow:

- Alternative 1: Design Dien Bien Phu overbridge: The bridge has total length of L_c=129.2m, box girder, Y-shaped profile with 3 continuous spans according to the diagram (34+55+34)m. Of which, one span of 34m length has bridge width of B=0.25+15+0.25 = 15.5m arranged toward Dien Bien Phu road side (in front of the Park 29/3). Two spans (55+34)m are two branches toward Bien Bien Phu road with branch width of 0.25+7.5+0.25=8.0m.
- Alternative 2: Design of Dien Bien Phu underpass: The underpass has total length of 396m. Access road L1=140m; access road L2=176m, The underpass's length L=80m. With x height is (4.8 m x 5.5 m)

Comparison 2 alternatives is shown in the following table:

Table 3-2: Comparision design alternative at interchange Dien Bien Phu

No.	CONTENT	ALTERNATIVE 1 OVERBRIDGE	ALTERNATIVE 2 UNDERPASS (selected alternative)
1	Architecture & Landscape	-Changing landscape in the region. Overpass will obstruct views of surrounding households. - Long road of bridge head impacts on people's daily activities	- Less changing landscape surrounding the area with clear view. Creating high aesthetic - Access road is shorter than the alternative of construction overbridge (about 56m), thus, less impacts on people's daily activities
2	Traffic planning	- Connect effectively with road network in the region - Less impact on underground works, especially drainage system from lake of park to Le Do airport.	- Connect with road network in the region - Relocate drainage system and underground works in the region.
3	Structure solution, construction and exploitation	- Overbridge uses steel structure, surface needs to be painted to create aesthetic in the process of exploiting. Due to steel structure, some vehicles with large load traveling bridge will be limited. - Rapid construction time (estimated in 10 months), thus, less impacts on transport in the process of construction. - Operation system in the process of exploiting is not necessary.	- Underpass's structure is reinforced concrete_common materials. All vehicles can travel over underpass. Traffic congestion will be treated thoroughly. - Long construction time(estimated in 18 months), impacts on traffic in the process of underpass construction. - Operation system in the process of exploiting is necessary.
4	Socio – environmental issue	- Construction process less impacts on environment. However, in the process of operation exploitation, dust, noise caused by vehicles on the bridge impacting on population more at two sides. - The number of households affected by the road bridge obstructing vision about 37 households.	- Underpass construction process can cause dust pollution, solid waste due to 2112 m3 of excavated soil and rock. During operational phase, cars affected by dust, noise for houses two sides are limited. - The number of households affected by underpass about 27 households.
5	Economic issue	Construction cost: 148,404,535,300 VND, lower than alternative 2 Operation and maintenance cost is low	Construction cost 203,312,602,006 VND, higher thanh alternative 1 Operation and maintenance cost is high
Alternative selection		The alternative is not selected	The alternative is selected

Alternative selection: On the basis of analysis elements mentioned above, Client decides to select alternative 2 for implementation alternative because of the following reasons:

- Less impact on surrounding households
- Create landscape, in line with sustainable development orientation
- Durable, stable structure, vehicles can travel easily
- Mitigate environmental pollution in the operation process

-

3.2.2. Construction separate collection system of basins of My Khe and My An to Han river

Alternative 1: Construction separate waste water drainage network for basins of My An, My Khe. Combined with improvement outlet's landscape.

Waste water and storm water is collected separately, is not released into the sea at outlets of My An, My Khe. Wastw water is collected into Hoa Xuan station. Storm water is released into Han river.

- Construction drainage sewer pipeline by reinforced concrete with aperture (2.0x2.0)m with length of 1,322 m according to direction from My Khe outlet along Vo Nguyen Giap road into My An outlet, drainage sewer by reinforced concrete with aperture (1.5x1.5)m with length of 1,320 m from Furama outlet along Vo Nguyen Giap into My An outlet.
- From My An outlet, continue to implement construction pipeline by reinforced concrete with aperture (2.5x2.5) with length of 707m and D3000 sewer with length of 907m along Vo Nguyen Giap road, turning Phan Tu road across Phan Hanh Son road to Han river.
- At location of intersecting with Han river, construction lifting station to take water into Han river with capacity of Q= 13,42 m^3/s.
- Construction separate well and pipeline to transfer water by HDPE D800-900 with length of 3,800m to Ngu Hanh Son station.
- Construction waste water pump station with capacity of Q= 2,000 m^3/h
- Improvement landscape at outlets of My Khe and My An.
- Installation 600 valves to control odor.

Also, waste water and storm water is taken together to separate well near Han river, then, waste water is taken to Ngu Hanh Son station to treat preliminarily and pump to Hoa Xuan wastewater treatment station for further processing to meet standards. Rainwater is taken by lifting pump stations into Han River. Thus, Han River water is not contaminated.

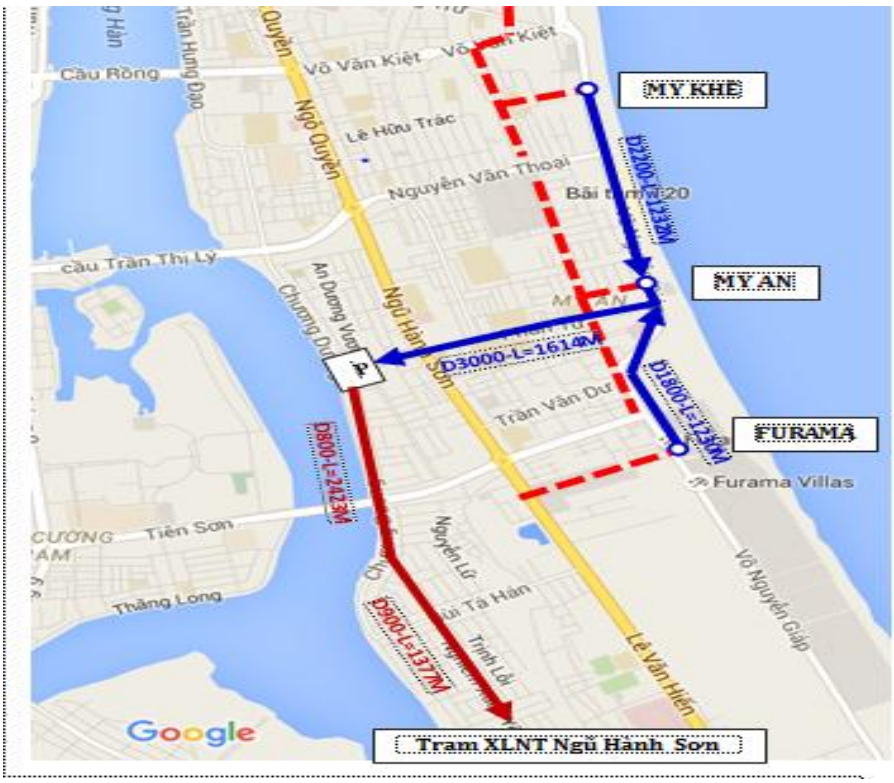


Figure 3-1: Alternative 1 on design for separate waste water drainage system to Han river

<u>Alternative 2: General waste water collection plan, combined with landscape improvement of outlets. Construction tanks to contain storm water and waste water for 20 minutes of first raining (40.000 m^3).</u>

In condition of without rain or small rain, waste water is collected and contained to outlet, remained in tanks with capacity of 40,000 m^3 , then pump into Hoa Xuan station to treat. In condition of heavy rain, waste water and storm water will be released into sea.

- At each location of outlet, construction 01 underground water tank to collect storm water of 20 minutes of first time, then, pump into SPS3 anf SPS4 station and pump into station to treat.
- Capacity of 01 tank: w = 40,000m3;
- Estimated size of 1 water tank : axbxh = 380x30x4m;
- Estimated tank location: located beneath the beach at 02 locations of oulet.
- Construction upstairs and downstairs beach combined with covering outlet in order to create landscape as in Alternative 1.
- Total estimated investment fund: 170 billion

<u>Alternative 3: Construction of offshore outlet, incorporation with outlet's landscape restoration</u>

- Install a offshore pipeline with diameter D1 of 800mm, 300m length at each outlet (of which: 100m length of the pipleline is covered by sand and 200m length is under water). Use underground drilling technology to minize negative effects to landscape and environment of beach.
- Construct steps appropriate at beach, incorporation with outlet coverage to ensure the landscape as mentioned in the Alternative 1.
- Estimated investment: 170 billion

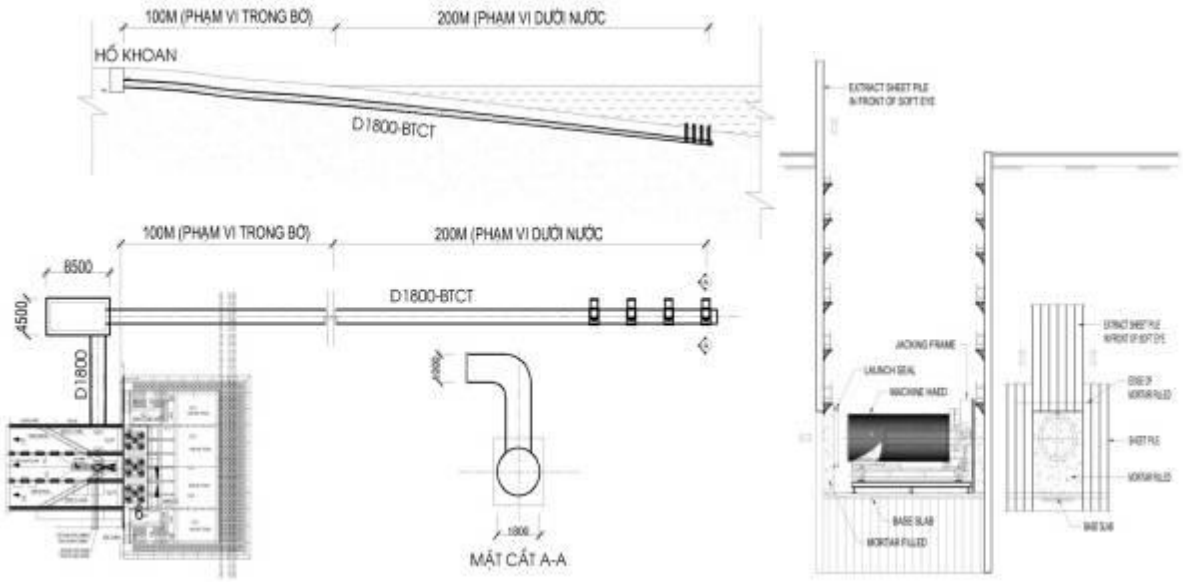


Figure 3-2: Alternative 3 on offshore outlet sewer designing in My An and My Khe

Table 3-3: Comparision alternatives at outlets of My An and My Khe

	Alternative 1 (selected alternative)	**Alternative 2**	**Alternative 3**
Advantage	When connection rate reaches 100%, the entire waste water will be separated and collected, treated, thus, beach area is not contaminated	Separate waste water and storm water in the first time and collect , treat, not release into the beach	Take waste water and storm water in the first time away from the beach Underground drilling will reduce negative impact to the area beaches. The lowest construction investment cost
Disadvantage	In the first phase,household connection doesnot reach 100%, there is one part of wastewater discharged into the beach area with rain. Construction separate sewer network for the area is difficult, due to roads and sidewalks in small areas, narrow. Construction process will greatly affect on environment and population in the region.	Tanks have too large capacity, so selection location of tank placement is difficult, especially along the beach, there are pipelines to take oil now. Tanks will be impacted greatly uplift, due to tank is located below sea level, and solving this problem will increase investment costs. Complex construction due to quicksand, large depth of tank and tank is	Wastewater and stormwater first phase is still discharged into environment, thus not fully processed; Sand will be aggradated into pipelines and washing sand is difficult, if management is not good, sand will be aggradated, causing clogging up sewer.

	Alternative 1 (selected alternative)	**Alternative 2**	**Alternative 3**
	High construction investment cost	located below sea level. The process of construction tanks will have more negative impact on environment and landscape of the beaches area. High construction investment cost	

Based on comparison between advantage and disadvantage of alternatives, it can be seen that Alternative 1 has high investment cost, however it meets requirements of investment objectives:

- Separate completely waste water, collection and treatment
- Landscape of beaches area is not affected
- Waste is treated, leading unpolluted environment
- Therefore, Alternative 1 is selected to invest.

3.2.3. Alternative of Lien Chieu station

Lien Chieu waste water treatment station is newly built and adjusted from capacity of 40,000 m^3 /day night (using Oxidation Ditch Technology) to 20,000 m^3 /day night(using SBR)

Table 3-4: Analysis alternative option at Lien Chieu waste water treatment station

Oxidation Ditch	**SBR**
Advantage	
- Low operation cost due to using less electricity compared with normal active sludge tank; - Reliability, high safety, less shock for biological sludge; - Sludge generated is less than activated sludge tanl due to long time; - Can handle organic matter and nutrients simultaneously.	- Simple and more durable structure (Construction sedimentation tank 2, Aerotank or even conditioned tank). - Operating mode can be changed according to input water, thus, it should be very flexible. - Operation by automatic system is easy and it can reduce required manpower; Reduce costs by minimizing a variety of devices compared with classical procedures. - Occupying the area, handling effectiveness for pollutants is not high. - Maintenance of equipment (equipments) is easy without removing water from pools. Removing water is only implemented in the case of maintenance for devices such as paddle, motor, air blowers, blower systems.
Disadvantages	
- Requirement for large land area is only suitable for rural areas with low property values.	- Process control is difficult, requiring monitoring system with sophisticated and modern indicators. - If the process of sedimentation occurs incidents, sludge will be drifting with output pipeline.

Oxidation Ditch	SBR
- Operating costs depend on operating facilities, chemical processing	- When discharging, high flow rate will greatly affect processing system. - Do not withdraw mud characterized by a blower system should easily clogged with mud Not remove sludge, blower system is easy to clogged

Compared with OD technology, SBR technology requires higher investment cost and more complex operation. However, this alternative has higher treatment effectiveness, less occupying construction land. After considering factors, especially treatment effectiveness in order to ensure output waste water quality, SBR technology is selected for Lien Chieu waste water treatment station construction

CHAPTER 4. ENVIRONMENTAL IMPACT ASSESSMENT

4.1. IDENTIFICATION OF POTENTIAL IMPACTS

Implementation adjustment and supplementary items will increase effectiveness of SCDP project, create positive impacs on living conditions, environmental conditions and infrastructure services in the project area. The main positive effects of the project are as follows:

- *Wastewater collection and treatment systems*: Increased ability to collect and treat water will contribute to improvement of environmental sanitation condition in order to ensure the health of people, gradually complete drainage planned targets of Danang city by 2030 and vision 2050.
- *Drainage and flooding solution*: The project involves in improving drainage sewers systems, canals and lakes in urban and residential areas. Additional, adjustment items will contribute to improving the existing water drainage system, improving existing drainage infrastructure in residential areas, minimizing impacts of flooding in the case of getting adverse weather.
- *Environmental Landscape Improvement*: The project will enhance the aesthetics and value of tourism to the city, and it might create positive changes for microclimate conditions in the region. Two stormwater outlets of My An and My Khe which is currently located at the main beach area, will be renovated and planted trees surrounding. Hoa Phu Lake can be used as public parks and recreation center after being upgraded and renovated and investment in wastewater collection system. Stormwater and wastewater seperation systems have been gradually improved; contribute to surface water environmental protection (rivers, lakes and coastal water).
- *Reducing the risk of traffic congestion, reducing greenhouse gas emissions*: According statistics in 2012, system (pilot) horizontal BRT of city when coming into operation, will attract major traffic amount. The change from personal vehicles (cars and motorcycles) to public transport will contribute to reducing significantly transport emissions and traffic accidents. Also, addition of items for underpass of Dien Bien Phu contributes to reducing traffic congestion at rush hours, reducing fuel consumption.
- *Urban expansion and development of suburban areas*: Construction strategic roads (ring road to the North and the South) will connect the overall transport of the city, as the basis for the urban development. Also, the additional building of technical infrastructure for Hoa Khuong resettlement site contributes to gradually improving living conditions in suburban areas, reducing population pressures in urban areas.

4.2. POTENTIAL NEGATIVE INPACTS

This section summarizes the potential impacts of the project, basing on the characteristics of the project and the collected environmental database, using the experience in implementing similar projects in our country and the foreign ones and in accordance with the procedures and report forms on environmental impact assessment processes of Vietnam government and the environmental safeguard policies of World Bank.

4.2.1. Type and Scale of Potential Negative Impacts

In general, the operational phases of the project cause different impacts on the environment. The sources of environmental impact on the project are identified in 3 phases:

- Phase I - Preparation for construction: Making reports on project investment, design, compensation and site clearance, bomb clearance and so forth.
- Phase II - Construction: Leveling, construction of work items, technical work and installation of equipment and so forth.
- Phase III - Putting the project into operation.

This report is used impact matrixes for screening the effects separately by category (physical, biological, social, etc.) and each type of project. These impacts will be determined the specified extent as follows:

- No (N) – No impact;
- Low (L)- Small works, impact at a low level, on a local scale, temporary effects and self-recovery capabilities
- Medium (M)- Small works in urban areas/ sensitive areas, at the medium scale with moderate impacts which can be reserved and take place on a local scale in the temporary period time.
- High (H)- Scale works in urban/ sensitive areas, impact at the high level with significant impacts on the society and/or the environment, in which some cannot be reversed and require compensation/reimbursement

In general, all operations of adjustment and supplementary items, supplements are concerned construction works with small and medium scale, in which most of the negative environmental impacts that can be changeable, temporary, local and be mitigated through application of construction management measures and appropriate technology, and monitoring of implementation process of contractors and public consultation of local community. However, type and nature of impact changes significantly according to nature and scale of operation, location, and environmental conditions and society, human habits and factors of time.

Table 4-1: Levels of negative impacts by implementing components of project

Component	Physical			Biology		Social				Others		Note
	Air, noise vibration	**Soil, water**	**Solid waste, dredging sludge**	**Forest, natural ecosystem**	**Fish, aquatic**	**Land acquisition, resettlement**	**Indigenous Peoples**	**Physical Cultural Resources**	**Livelihoods, disruption to communities**	**Local flooding, traffic, safety**	**Impacts outside the project area**	
Component I : Improvement stormwater and waste water drainage system **- Adjustment expansion for stormwater and waste water drainage sewers system** **- Adjustment design of drainage system in My An, My Khe, from general system to separate collection system** **- Adjustment increase capacity for Hoa Xuan waste water treatment station: derease capacity and adjustment technology of Lien Chieu waste water treatment plant.**												
Preparation	L	N	N	N	N	L	N	N	L	N	N	The small and medium-scale projects works with small and medium impacts (See Note (2) below)
Construction	M	M	M	N	L	N	N	L	M	M	L	
Operation	L	L	M	N	N	N	N	N	N	M	N	
Component II. Development bus rapid system **- Adjustment location of Deport station of BRT system (from location adjacent park to out of location adjacent the airport** **- Adjustment design of interchange of Dien Bien Phu, Nguyen Tri Phuong on BRT system from similar level fo different level.**												
Preparation	L	L	L	N	N	L	N	N	L	L	N	The medium-scale projects works with mainly small and medium impacts (See Note (2) below). And during the construction of Dien Bien Phu, Nguyen Tri Phuong
Construction	M	M	M	L	N	N	N	L	M	H	M	

Operation	M	L	L	N	N	N	N	N	N	M	L	intersections, traffic and flood impacts are remarkably significant due to high-density population area
Component III . Strategic urban traffic roads **Adjustment location of resettlement site (from resettlement site in Hoa Phong commune to resettlement site in Hoa Khuong commune)**												
Preparation	L	L	L	N	N	M	N	N	M	L	N	The medium-scale projects works with small and medium impacts(See Note (2) below)
Construction	M	M	M	N	N	N	N	L	M	M	M	
Operation	L	L	L	N	N	N	N	N	N	M	L	
Notes: (1) The following criteria are used to assess the level of impact: No (N) No impact; Low (L) - small works, impacts are small, local and reversible, temporary; Medium (M) small works in the urban/sensitive areas, works with medium scale with moderate impacts which can be reversed, minimized and managed, local, temporary; High (H) -The works with medium scale in urban/ small sensitive areas, large-scale project works with significant impact (social and / or environmental) in which many cases are irreversible and requiring compensation, Both M and H should be supervised and implemented mitigation measures as well as adequate institutional capacity for safety. (2) The small and medium-scale works, most of local and temporary impacts, which can be minimized through the application of technical solutions and management practices to build better, with supervision, inspection, and close consultation with local communities.												

Table of preliminary assessment for environmental impacts for 3 project components (Table 4-1) showed that most of environmental and social impacts mainly occur during the preparation and construction phases. These impacts include:

- Impact on communities due to the compensation and site clearance;
- Pollution on surface water source, rivers, lakes
- Air environmental pollution
- Soil pollution, reduced soil quality
- Impact on domestic and construction solid wastewater
- Impact due to dust, emission, noise to public works, near the project area
- Impact on economic, production and business activities
- Impact on traffic
- Labor accidents, risks and incidents.

The negative impacts of the construction phase will be diminished or improved or replaced by positive impacts of the operation phase. The environmental impacts of the operation phase focused mainly on the following issues:

- Odor from the wastewater collection system, waste water treatment
- Sludge from waste water drainage systems, stormwater, wastewater treatment
- Garbage at the outlet area, sewer, from resettlement areas
- Wastewater at the bus depot, resettlement areas
- Risk of explosion at the bus depot, or in resettlement areas
- Risk of traffic accidents in the area of Dien Bien Phu overbridge and Tran Phu underpass

In general, impacts of project can be approached according to the following isues:

- (i) Social impacts: Impacts are long-term social impacts for affected people (mainly related to resettlement issue). The resettlement-related issues will be studied/assessed and resolved through the Resettlement Policy Framework and Resettlement Plan.
- (ii) General impacts: Focus on mainly pre construction phase and construction works items. These impacts can be mitigated after implementation processes/ mitigation measures established in ECOP.
- (iii) Site specific impacts: Some impacts arising at specific places/spaces are minimizable or not, depending on detailed assessment and separate technical solutions/management (specific EMP).
- (iv) Long-term impacts in the process of operation such as: Sewage sludge from waste water treatment systems, from drainage canals; Waste water, waste from the resettlement area; Risks due to traffic accidents, fires and explosions in the operational phase

Characteristics of construction items of the project:

- Changes in construction methods, scope, volume: construction of road, drainage system, bus depot, underpass, overbridge, waste water treatment system, resettlement area.
- Investment items are allocated scatterly in the areas of the city.
- Nature of works is relatively independent among items (all phases of pre-construction, construction and operation).

Therefore, detailed assessment of environmental impacts for supplementary works under SCDP project will:

- Evaluation according to phases of project: Preparation, construction and operation
- Evaluation according to group of works with scale, nature and methods of construction or similar components
- Evaluation according to general impacts of each work group and site specific impacts of each work.

Supplementary, adjustment, expanded work groups of SCDP project will be divided, assessed, including:

- Component 1: Storm water and waste water drainage system improvement (11 works)
  + Group of improvement works for storm water drainage systems (5 works – item 1.1)
  + Group of works for flood treatment in residential sites (1 work) – item 1.2)
  + Group of construction works for waste water collection system (03 works – item 1.3)
  + Group of waste water treatment plant works (02 works – item 1.4)
- Component 2: Buses rapid transit (BRT) pilot (including 02 work: 1 bus depot, 1 underpass)
  + Adjustment location 1 Depot station, construction 01 interchange with different level (tunnel) on BRT 02) (item 2.1)
  + Equipped with control system for automatic ticket for traffic system in the city.
- Component 3: Strategic urban traffic roads, including 1 work: Adjustment location of resettlement site, trasfering from Hoa Phong commune to Hoa Khuong commune(item 3.1)

4.2.2. Impact assessment in the phase of project preparation

This section will summarize, assess impacts related to compensation, site clearance, resettlement and bomb clearance, explosive materials (if any) of project.

a. Impact due to land acquisition for project

According to the scope determined in design documents, the adjustment and supplementary works under the Danang SCDP will be implemented in 06 districts, including Lien Chieu, Hai Chau, Cam Le, Thanh Khe, Ngu Hanh Son and Hoa Vang.

Related to impact of land acquisition to affected households allocated according to project area, total of 911 affected households on land and property on land(in which 902 households and 09 organizations (People's Committee of wards, communes), overall data for each type of affected is shown in the following table:

Table 4-2: Overall of affected volume of Project

Content	Unit	Affected volume
1. Affected households:	***HH***	**911**
Households member	Persons	4,146
In which		
+ Affected households of residential land :	HH	418

+ Affected households of agricultural land:	HH	484
+ Public land (managed by WPC)	HH	9
+ Affected households of housing	HH	206
2. Affected area	***m2***	***359,054***
Of which:		
+ Residential land area	m2	58.269
+ Agricultural land area	m2	180,822
+ Transport, irrigation, agricultural land	m2	119.962
+ Affected houses area	m2	7,564
3. Households of relocation, resettlement	**HH**	**139**
- Relocated HH of Component 1	HH	127
- Relocated HH of Component 2	HH	6
- Relocated HH of Component 3	HH	6
4. Number of HH has 20% or more of affected agricultural land (or from 10% and up for vulnerable HH)	***HH***	***147***
5. HH of affected business	***HH***	***16***

(Source: Report of resettlement plan for supplementary and adjustment works)

The affected households (AH) will be compensated / fully supported based on resettlement plan (RP) which has been cleared by Government of Vietnam and World Bank. According to survey results, public consultation and assessment the demand of resettlement of affected households in the project area, majority of comments of people expect to live in resettlement area, near previous areas for convenience of living and stable life. The planned resettlement sites are estimated to allocate for affected households as follows:

Table 4-3: List of resettlement areas of project

No	**Resettlement area**	**Total area (m^2)**	**Of which**	
			Land plot (m^2)	***Number of plots***
1	Hoa Lien resettlement area	53,784	28,108	271
2	Nothern resettlement area, Southern ring road(phase 3a)	74,562	28,995	276
3	DT 605 resettlement area – phase 2	43,469	23,175	210
4	My Da Tay resettlement area	61,254	31,459	346

Households and individuals who have acquisition of entire housing, residential land or remaining land area after acquisition which is not economically feasible or lower than new residential land cost at local, affected people will be allocated land plots in resettlement areas. According to the survey results of resettlement, the needs of resettlement are 200 land plots (including 139 HHs and 61 contigency plots of land for households which have arasing works)

Currently, the Project has 05 resettlement areas as table mentioned above to serve as relocation and resettlement of households. In addition, PMU is also expected to allocate for households to other resettlement areas belonging land fund of the city (according to the demand and aspirations of farmers) to facilitate for stable life. Construction site of resettlement areas are consulted affected and relocated people, are built near previous residence area of relocated people as close as possible, construction as planning, standard of construction for urban area and basic infrastructure is built before affected people move to.

Impact of land acquisition for residential land and agricultural land

Related to proposed work items, 418 households in 9 wards/communes of project are estimated to have residential land and 484 households have agricultural land affected by project. Impact level for residential land and agricultural land is shown in the following table:

Table 4-4: Summary of residential land and agricultural land

No	Name of works	No of AHs for residential land			Area of residential land affected (m2)	No of AHs for agricultural land			Area of agricultural land affected (m2)
		Partially	Wholly	Total		<20 %	>20 %	Total	
1	Works under Component 1	248	131	379	37,334	302	59	361	124,684
2	Works under Component 2	2	6	8	668	8	-	8	989
3	Works under Component 3	25	6	31	20,267	27	88	115	55,150
	Total	275	143	418	58,269	337	147	484	180,822

Source: Report on Resettlement Plan for adjustment and supplementary works in September/2015

The results of table above shows that, total 418 affected households of residential land with total area of residential land is 58,269 m2, in which 275 affected households partially and 143 other households have to be relocated due to construction of works: a) supplementary work items of Component 1: Improvement for water drainage and supply system and b) Component 2: Public transport : Development Buses Rapid Transit (BRT) and c) Component 3: Construction infrastructure for Hoa Khuong resettlement site (Hoa Vang district).

Area of agricultural land is estimated to be affected is 180,822 m2; with 484 affected households, of which 147 affected households with more 20% agricultural land area and vulnerable households are not determined.

Impact on housing

Through the survey results, houses in the project area are mainly houses grade 4 and some temporary houses (semi-permanent houses) as the planning was informed for a long time. Specific level of impact on housing is shown in the table bellowed:

Table 4-5: Summary of impacts on housing

No	Name of works	No of affected households (HH)			Affected area (m^2)
		Partially	Wholly	Total	
1	Works under Component 1	54	127	181	5,945
2	Works under Component 2	2	6	8	474
3	Works under Component 3	11	6	17	1,145
	TOTAL	67	139	206	7,564

Source: Report on Resettlement Plan of Project

- ***Impacts on Structures, Architechtural Facilities and Trees, Crops***

The table bellowed shows impacts on structures, architectural facilities and trees, crops due to the project's impacts, namely:

Table 4-6: Summary of impacts on Structures, Architechtural Facilities and Crops

No	Works	Volume of affected structures						Impacts on Trees and Crops			
		Toilet (m2)	Wall (m2)	Yard (m2)	Water tank (m3)	Gate pier (m3)	Tomb (pcs)	Fruit tree (tree)	Shade tree (tree)	Ornamental tree (tree)	Crops (m^2)
1	Works under Component 1	1.121	3.957	11.565	32	132	10	81	105	16	197,809
2	Works under Component 2		143	221	-	6	-	4	27	8	39,086
3	Works under Component 3	15	189	436	8	8	4	25	60	6	63,890
	TOTAL	1.136	4.289	12.221	40	146	14	130	192	30	300,785

Source: Report on Resettlement Plan of Project

For this Project, impacts on trees, crops and agricultural land are minor because the project area is mainly located in urban area or located along two sides of the road. Through the survey, some affected trees include fruit trees and timber trees, however the volume of impact is minor.

- ***Impacts on Tombs and Other Cutural Works***

According to results of RP report for adjustment works of SCDP project, 04 tombs are scattered in affected areas which have to be relocated.

Accoring to the results of consultations with households and local authorities, they agreed to relocate tombs as well as fence and yard of the ancestor temple. Thorugh consultation at local, all local people and authorities supported the project and willing to relocate tombs to appropriate places if they receive adequate assistances.

b. Impacts by bomb clearance

Bombs, mines and explosives left after the wars shall be carefully cleared in service of the site clearance to build the road and ensure the safety of the works.

Most of works of adjusted and supplemented items are built on available roadbase: Improvement of storm and waste water drainage system, lakes, infrastructure construction for residential site..., thus,bombs, mines and explosives clearance are not necessary.

Therefore, it is required to pay attention to bombs, mines and explosives clearance, including:

- Construction anti-flood station at the end of Ong Ich Khiem road
- Adjustment of capacity for Lien Chieu waste water treatment station
- Construction BRT Deport at airport area(adjacent crossroad of Nguyen Tri Phuong road and Nguyen Van Linh road)
- Technical infrastructure construction of group 5,6,7 of Son Thuy commune.
- Dien Bien Phu underpass (Interchange Dien Bien Phu, Nguyen Tri Phuong, Le Do)
- Construction infrastructure for Hoa Phong resettlement site

This work will be carried out by specialized units of the Army. The process of bomb and mine clearance is usually dangerous to humans and animals accessing the areas in progress of clearance. Therefore, the project owner and the responsible unit shall use protective barriers and warning signs to minimize the possible risks and dangers to people and livestock

4.2.3. Impact assessment during the contruction phase

4.2.3.1. General impacts of Project

During the construction process, impacts mainly arise as dust, emissions, noise, solid waste, domestic waste water from workers and households. Due to small-scale construction, these impacts are only at low level and can be mitigated by management measures.

a. Air pollution

- ***Degree of dust dispersion form excavation, ground leveling:***

Level of dust generation during the process of leveling depends on volume of excavation, embankment and aggrandisement. Volume of diffused dust is calculated basing on pollution coefficient and volume of excavation and leveling. According to the instruction documents of the World Bank regarding environmental impact assessment *(Environmental Assessment Sourcebook, Volume II, Sectorial Guidelines, Environment, World Bank, Washington D.C 8/1991),* the pollution coefficient E is calculated by the following formula:

$$E = k * 0,0016 * \frac{\left(\frac{\bar{u}}{2,2}\right)^{1,4}}{\left(\frac{M}{2}\right)^{1,3}} \quad (1)$$

In which:

- E - Pollution coefficient (kg/ton).
- k - Grain structure with average value of 0.35.
- Average wind speed in the project area (2.3 m/s).
- M - Average humidity of materials (20%).

With the conditions of average grain structure, average wind speed, humidity of leveling materials and so forth, we can calculate the pollution coefficient E = 0,01189 (kg/ton).

Table 4-7: Content of dust generated from the excavation, backfilling

No	Name of work items	Total volume of excavated soil (m3)	Total volume of backfilling soil (m3)	Total volume of excavated, backfilling soil (m3)	Q_{dust} (kg/day)
1	Group of works for storm water drainage system improvement, component 1	83,136	28,822	111,958	1,731
2	Group of works for flood treatment at residential sites, component 1	9,188	389	9,577	148
3	Group of works for waste water drainage system improvement, component 1	7,890	6,230	14,120	218
4	Group of works for waste water treatment, component 1	21,750	-	21,750	336
5	Group of works under component 2	2,215	3,801	6,016	93
6	Group of works under component 3	7,326	405,327	412,653	6,379

(Remark: Soil density is 1,3 ton/m3, for volume of excavated, backfilling soil, see Table 1-3, *section 1.4.1 of report)*

Table 4-8: Content of dust generated from the excavation, backfilling and ground levelling

No	Type of emission	Unit	Load of emission (mg/s)					
			1.1	1.2	1.3	1.4	2.1	3.1
1	Total of dust load	kg	1,731	148	218	336	93	6,379
2	Surface area	m^2	47,534	14,325	133,400	60,000	13,313	84,187
3	The impact volume on plan of the project	m^2	475,335	143,250	1,334,000	600,000	133,130	841,870
4	Load	kg/day	6.41	0.55	0.61	1.25	0.34	23.63
5	Coefficient of surface dust emission	$kg/m^2/day$	0.13	0.04	0.00	0.02	0.03	0.28
6	Average concentration (1h)	mg/m^3	0.56	0.16	0.02	0.09	0.11	1.17
7	QCVN05:2013/BTNMT	mg/m^3	0.3					

Note: (1.1) – Group of works for storm water drainage system improvement, component 1; (1.2) Group of work for flood treatment at residential sites, component 1; (1.3) Group of works for waste water collection system construction, component 1; (1.4) Group of works for waste water treatment station, component 1; (2.1) Group of works under component 2; (3.1) Group of works under component 3.

The result of dust dispersion concentration in the table above shows that total concentration of dust every 1h at earthwork locations for supplementary, adjustment works has exceed the standard QCVN 05:2013/BTNMT (limit: $0.3mg/m^3$) at items of works 1.1 and 3.1.

- The concentration of dust has exceed the limit of standard QCVN for item 3.1-Component 3 (Construction Hoa Khuong resettlement site), exceeding 4 times than standard of Vietnam due to large volume of excavated soil and backfilling land.

- In addition, dust concentration has exceeded the permitted limit for group of items 1.1 under component 1, exceeding 2 times than permitted limit. Concentration mainly focuses on construction anti-flood pump station at the end of Ong Ich Khiem.
- For groups of other works, total concentration of dust is basically lower than the permitted limit of QCVN 05:2013/BTNMT.

In fact, concentration of dust generated is not higher than calculation due to location of works scattered in the area of the city. Also, the construction time of each work items is different. Moreover, concentration of dust generated decreases very fast by the distance to the source and mitigation measures will be mentioned in Chapter 4, namely, impacts of dust on surrounding air environment as well as local people living near the project area.

In general, the concentration of dust generated from excavated, backfilling activities can affect to the air. However, as construction works are often carried out in different stages and not concentrated in one place but scattered on the project site, the actual concentration level will be lower. Dust is highly concentrated in the construction area and the objects directly affected are the workers at the site and residents living near the ground leveling locations. The dust is only generated during construction and will disappear upon the construction is complete.

Air pollution caused by dust will reduce upon the application of preventive measures such as spraying water onto the road; thus, the dust pollution caused by transport activities on road is rated at average level. In addition, during the construction, the Investor will require the construction contractors adopt appropriate measures to minimize dust generation.

Pollution by dust and gases generated from transport vehicles

According to volumes of earthwork of components excess excavated soil will be transported to another location or to the landfill; volumes of lacking excavated soil will be transported from raw material exploitation area.

Table 4-9: Total excavated land to be transported

Items		Volume of excavated soil (m3)	Volume of backfill land (m3)	Volume of reused excavated land (m3)	Volume of remaining backfill land (m3)	Total volume to be transported (m3)
		1	2	3	4	5
Component 1	Stormwater drainage system (05 works)	83,136	28,822	24,950	3,873	62,058
	Flood treatment at residential site (01 work)	9,188	389	389	-	8,799
	Construction waste water collection system (03 work)	7,890	6,230	6,230	-	1,660
	Waste water treatment plants (2 works of Hoa Xuan and Lien Chieu)	21,750	-	-	-	21,750
Component 2	- Construction Depot near the airport -Construction Dien Bien Phu tunnel	2,215	3,801	1,915	1,886	2,186
Component 3	-Construction technical infrastructure for Hoa Khuong resettlement site	7,326	405,327	7,326	398,001	398,001

Items	Volume of excavated soil (m3)	Volume of backfill land (m3)	Volume of reused excavated land (m3)	Volume of remaining backfill land (m3)	Total volume to be transported (m3)
	1	2	3	4	5
Total	**131,504**	**444,570**	**40,810**	**403,760**	**494,454**

Note: (4) = (2) – (3) và (5) = (1) – (3) + (4)

The land mines are 8 – 10 km far from the project area, the transport road is of asphalt. With an average working frequency of 8 hrs/day, average distance of 32 km/day (2 turns/day x 2 turns x 8 km/turn). Hence, the number of turns is shown in the following table (average loading capacity of a vehicle is 8 tons/vehicle).

Every 2 non-loaded vehicles is presumed as 1 loaded vehicle. Hence, the total number of turns for carrying the ground leveling soil is shown in the following table:

Table 4-10: Number of turns for transporting excavated soil

No	Name of work item	No of vehicles turns	No of turns used to transport
1.1	Group of works for storm water drainage system improvement– Component 1	10,084	15,127
1.2	Group of works for flood treatment at residential sites– Component 1	1,430	2,145
1.3	Group of works for waste water collection system construction- Component 1	270	405
1.4	Group of works for waste water treatment stations – Component 1	3,534	5,302
2.1	Group of works under Component 2	355	533
3.1	Group of works under Component 3	64,675	97,013

Note: (1.1) – Group of works for storm water drainage system improvement, component 1; (1.2) Group of work for flood treatment at residential sites, component 1; (1.3) Group of works for waste water collection system construction, component 1; (1.4) Group of works for waste water treatment station, component 1; (2.1) Group of works under component 2; (3.1) Group of works under component 3.

In the process of construction, it is essential to use many vehicles, equipments involved in the process of transporting materials and construction… Diesel is main fuel consumption, operation of these vehicles and equipments will generate waste into environment, including: hydrocacbon, COx, NOx, SO2, dust from transport vehicles. Load of emission depends on elements such as type of engine, engine capacity, type of fuel used, operation of air, distance of transporting… Level of emission depends on elements, namely: road quality, density, lanes, technical quality of vehicles and amount of fuel used… According to rapid pollution assessment coefficient of WHO, 1993, load of emission of waste from vehicles using diesel as follow:

Table 4-11: Components of motorized vehicles emission

Components of emission	Type of fuel	
	Petrol (g/kg)	Diezen Oil (g/kg)

Oxit cacbon (CO_x)	465.59	20.81
Hydrocacbon (C_xH_y)	2328.00	4.16
NOx	15.83	18.01
SO2	1.87	7.80
Dust	1.00	5.00

(Source: Assessment of sources of air, water, and land pollution, WHO, 1993)

It is supposed that total diesel-driven vehicles with consumption level is 14kg/100km. Total load of emission and dust due to transporting materials is calculated as follow:

$$G = L \times D \times k \times f$$

In which:

- G: Total load of emission(g)
- L: Length of transporting road of 1 vehicle (km)
- D: Number of transporting turns (turns)
- k: Fuel consumption norm in100km (kg/100km)
- f: Emission coefficient of fuel (g/kg)

From formula above, load of emission for pollutants to the air from vehicles using diesel can be estimated as follow:

Table 4-12: Load of emission by transport vehicles using diesel

Type of emission	**Load of emission (g)**					
	1.1	**1.2**	**1.3**	**1.4**	**2.1**	**3.1**
Oxit cacbon (CO_x)	1,306	185	26	458	46	8,374
Hydrocacbon (C_xH_y)	261	37	5	91	9	1,674
NOx	1,130	160	23	396	40	7,248
SO_2	489	69	10	172	17	3,139
Dust	314	44	6	110	11	2,012

Note: (1.1) – Group of works for storm water drainage system improvement, component 1; (1.2) Group of work for flood treatment at residential sites, component 1; (1.3) Group of works for waste water collection system construction, component 1; (1.4) Group of works for waste water treatment station, component 1; (2.1) Group of works under component 2; (3.1) Group of works under component 3.

Table 4-13: Load of emission by vehicles to transport materials

Type of emission	Load of emission (mg/s)					
	1.1	**1.2**	**1.3**	**1.4**	**2.1**	**3.1**
Oxit cacbon (CO_x)	45.3	6.4	0.9	15.9	1.6	290.8
Hydrocacbon (C_xH_y)	9.1	1.3	0.2	3.2	0.3	58.1
NOx	39.2	5.6	0.8	13.8	1.4	251.7
SO_2	17.0	2.4	0.3	6.0	0.6	109.0
Dust	10.9	1.5	0.2	3.8	0.4	69.9

Note: (1.1) – Group of works for storm water drainage system improvement, component 1; (1.2) Group of work for flood treatment at residential sites, component 1; (1.3) Group of works for waste water collection system construction, component 1; (1.4) Group of works for waste water treatment station, component 1; (2.1) Group of works under component 2; (3.1) Group of works under component 3.

Results of predicted load calculated for maximum dust and exhaust gas pollution of each vehicle is described in the table above. With the average working time of 8 hours/car/day, the average stretch of road for movement is 32km/day (2 trips/day x 2 turns x 8km/turns). For this project, the exact number of vehicles and machinery in service of construction and construction time of each works will be determined during the phase of technical design and construction organization. The calculated results show that:

- Dust and emission from vehicles of transporting materials mainly focuse on group of works under component 3(particularly with works for infrastructure construction at Hoa Phong resettlement site, Hoa Vang district) due to large volume of excavated soil and backfilling.
- Dust and emission araising in component 1 and 2 is not large and local at each construction location. Moreover, construction works are allocated in huge scale, thus, impacts by dust and emission is estimated to be minor.

Dust and emission will be mitigated maximum upon application of mitigation measures in Chapter 4(application general mitigation measures and specific mitigation measures for each construction location).

Dust and noise caused by transport vehicles affect the communities living along the road. Increase in the density of vehicles traveling on the road can result in traffic accidents, traffic jam and degradation of road quality. Dust together with NO2, SO2, CO, THC and VOC emissions from transport vehicles will pollute the surrounding air, increase greenhouse effect, affecting air quality, which will impact on the environment, human being and creature

However, in reality, transport vehicles circulate on different roads, depending on locations of work items and in different moments but not concentrate in a certain area. Process of exhaust emissions occur on the running path of vehicles and the project area has an average wind speed of 2,3 m/s, therefore, the exhaust emissions will easily spread far and do not cause serious impacts. The project owner shall require the construction contractors to take effective measures to minimize pollution of exhaust emissions from transport vehicles as specified in Chapter 4.

For excavator, grader and bulldozers, etc., because there are a few devices and it is not concentrated in a certain area, it can be realized that the amount of waste emissions from burn fuel oil of these machinery is small

The above-mentioned sources of pollution are temporary, intermittent, dispersed and depending on the intensity and duration of construction, number of motorized vehicles, and flow of people. Therefore, the impact on the environment is not great. At the same time, during the implementation process, the Employer requires the construction units to implement mitigation measures to limit pollution

b. Noise

During the construction phase, in addition to the above-mentioned impact on the air environment, noise is also an element of physical nature and affects the regional air environment. It mainly generates from the construction machinery, heavy trucks, generators pile driven machine, concrete breaker machine, bulldozer upon construction of water/ waste water drainage with big size, vehicles on construction sites (transport materials, excavated soil/ construction soil), activities of pile drilling upon construction base.

Noise generated at each group of work under components has different impacts and depends on construction items, location and progress, namely:

- Group of works for storm water drainage system improvement (11 works)- component 1: Noise generated from construction of work is evaluated at average rate to people due to sewer system is located in residential sites and drainage system belongs to sidewalk of roads. The distance from works to households is from 5m to 10m (particularly distance at some locations is about 2-3m). However, construction items are quietly simple, equipments araising cause small noise. However, at Ong Ich Khiem pump station, impact caused by noise is evaluated at negligible level due to far distance from residential site (about 300m)
- Group of works for flood treatment at residential sites (01 work)- component 1: Impacts of noise to residents at these works are similar to group of works for storm water drainage system.
- Group of works for waste water collection system construction(04 works) – component 1: Majority noise from construction group of works have small impacts to residents due to distance from construction location to residential area is more 50m and equipments for construction generate small noise
- Group of works for waste water treatment stations (02 works)- component 1: Noise impact on community at 2 construction works is evaluated to be minor due to far distance from residential area.
- Group of works under component 2: Impact by noise from group of works under component 2: Impact by noise of this group of work is evaluated to be high level due to construction activities have to use equipments which generate big noise with high intensity. However, all these works will be equipped with fences by metal in order to mitigate noise to surrounding areas.
- Group of works under component 3: Noise at this group of work is also evaluated to be at average level due to: (i) At Hoa Khuong resettlement area, construction equipments have araising level of big noise, however residential area is far from construction location about more 200m);

Operation of machines only takes place in short time, not continuously within 2 weeks for each sewer (100m long). However, contractor should be pay attention to noise in the construction process. Some sewers are adjacent residential area, however, in fact, there are from 1 to 2 big machines operating, construction works are simple and avoiding implementing construction at night. (mainly excavators, rollers). Thus, affecting level of noise is minor, short-term and can be mitigated on the basis of compliance with ECOP.

According to standard of Vietnam 26:2010/BTNMT, the highest noise level permitted is 70dBA in production area and the lowest noise level is 45dBA in health stations, libraries, sanatoriums, schools from 21h p.m to 6h a.m.

Besides dust and fumes pollution source caused by excavating and backfilling, vehicles, earthwork for construction basement, operation machines and equipments such as bulldozers, compactor, crane, drilling, concrete mixer machine, excavator, truck… also cause noise pollution and vibratory. Noise level generated from construction equipments is shown in the following table. Resonance of noise level by many equipments operating at the same time is not considered.

Table 4-14: Noise level generated from machines used in the process of construction

No	Machines, equipments	Noise level (dBA) being far from source 1.5m
1	Bulldozers	93
2	Compaction machines(road rollers)	72- 74
3	Front bucket bulldozers	72 - 84
4	Amphibious backhoes	72 - 93
5	Tractors	77 - 96
6	Scrapers, graders	80 - 93
7	Concrete mix machines	75 - 88
8	Concrete pump	80 - 83
9	Concrete compactors	85
10	Generators	72 - 83
11	Pile driving machines	75 - 106
12	Mobile cranes	76 - 87
13	Cranes	88

(Source: Environmental protection PC of USA- Noise from construction equipments and machines NJID, 300.1, 31/12/1971)

However, noise level can be reduced according to affecting distance and it is estimated by the formula:

$$L_p=L_p(X_0) + 20\log_{10}(X_0/X)$$

In which:

- Lp(X0): Noise level being 1m far from the source 1.5m (dBA)
- X0= 1.5m
- Lp(X): Noise level at the location to be calculated (dBA)

- X: Position to be calculated (m)

Therefore, maximum noise of level according to the distance from operation of construction equipments is shown in the following table:

Table 4-15: Maximum noise level being far from the distance

No	Machines, equipments	Noise level being far from source 1.5m (dBA)	Noise level being far from source 50m (dBA)		Noise level being far from source 100m (dBA)		Noise level being far from source 200m (dBA)	
			Min	Max	Min	Max	Min	Max
1	Bulldozers	93.0	62.5		56.5		50.5	
2	Compaction machines (road rollers)	72.0-74.0	41.5	43.5	35.5	37.5	29.5	31.5
3	Front bucket bulldozers	72-84	41.5	53.5	35.5	47.5	29.5	41.5
4	Amphibious backhoes	72-93	41.5	62.5	35.5	56.5	29.5	50.5
5	Tractors	77-96	46.5	65.5	40.5	59.5	34.5	53.5
6	Scrapers, graders	80-93	49.5	62.5	43.5	56.5	37.5	50.5
7	Concrete mix machines	75-88	44.5	57.5	38.5	51.5	32.5	45.5
8	Concrete pump	80-83	49.5	52.5	43.5	46.5	37.5	40.5
9	Concrete compactors	85	54.5		48.5		42.5	
10	Generators	72-83	41.5	52.0	35.5	46.0	29.5	40.0
11	Pile driving machines	75-106	44.5	75.5	38.5	69.5	32.5	63.5
12	Mobile cranes	76-87	45.5	56.5	39.5	50.5	33.5	44.5
13	Cranes	88	56.0	58.0	50.0	52.0	44.0	46.0
QCVN 26:2010/BTNMT (6-21h)			45dBA					

On the other hand, construction site has many sources and operations which generate noise is higher due to resonance of noise. Noise need to to be supplemented is shown in the following table:

Table 4-16: Noise level needs to be supplemented in the case of many operations take place at one location

Difference among noise levels (dB)	Noise needs to be supplemented (dB)	Difference among noise levels (dB)	Noise level needs to be supplemented (dB)
0	3.0	7	0.8
1	2.6	8	0.6
2	2.1	10	0.4
3	1.8	12	0.3
4	1.5	14	0.2

Difference among noise levels (dB)	Noise needs to be supplemented (dB)	Difference among noise levels (dB)	Noise level needs to be supplemented (dB)
5	1.2	16	0.1
6	1		

(Source: Le Trinh – Environmental impact assessment – Methods and Application – Science and Technology Edition

High-intensity noise will affect human health such as insomnia, fatigue, psychological discomfort. It also reduces labor productivity of workers on the site, making them difficult in mental focus, easily resulting in occupational accidents.

High-intensity noise will affect the daily life activities of the people (especially the farmers living along the routes of wastewater drainage which are renovated and upgraded).

According to calculation and evaluation result, noise level at construction location is evaluated at medium rate and can be mitigated. Noise mitigation measures need to be implemented at all construction locations and informed to all communities about construction progress, time of construction items.(especially not constructed in the time of rest of people).

c. Waste water

During the construction phase, the sources of wastewater are mainly domestic sewage of workers, water pumped from the process of the works and runoff water through the surface of the project area

- ***Pollution caused by domestic sewage of workers***

Domestic sewage of workers at the construction site is a major cause of affecting water quality of the surrounding area. It many impurities, easily decomposable organic substances, nutrients and malignant bacterium, possibly resulting in contamination of surface water and ground water if not being treated promptly.

Based on the amount of pollutants in the report on current situation of urban wastewater - Institute of Environment Science and Technology - Hanoi University of Technology in 2006, the amount of pollutants daily released into the environment by each person is given in the following table:

Table 4-17: Amount of pollutants daily released into the environment by each person

No	Pollutants	Volume (g/person/day)
1	BOD_5	45 - 54
2	Suspended solid	70 - 145
3	Animal fats and vegetable oil	10 - 30
4	NO_3^- (calculated according to Nitrogen)	6 - 12
5	PO_4^{3-} (calculated according to phosphor)	0,8 - 4,0
6	Coliform	10^6- 10^9 MPN/100ml

Source: Report on current situation of urban waste water - Institute of Environment Science and Technology - Hanoi University of Technology in 2006

At each construction site, there are 20-50 workers involved in the construction of the project works (for 21 construction works). Workers concentrated with the highest number in the first phase of the project and it will reduce after the project completion. With the water usage of 100 liters/person/day (According to Construction Standard 33- 2006), the amount of generated wastewater equal to 85% of the water supply (85 liters/person/day), total amount of domestic wastewater generated daily at the site is approximate from 1.7 to 4.25 m3/day. Load and concentration of pollutants in domestic wastewater in the project construction area is calculated based on the amount of pollutants, the number of workers, wastewater flow, the results of which are shown in the table below:

Table 4-18: Load of pollution in domestic wastewater

Pollutants	Load of pollution (kg/day)					
	1.1	**1.2**	**1.3**	**1.4**	**2.1**	**3.1**
BOD_5	15.59	6.44	7.92	4.95	9.90	2.48
TSS	33.86	13.98	17.20	10.75	21.50	5.38
Animal fats and vegetable oil	6.30	2.60	3.20	2.00	4.00	1.00
NO_3^- (calculated according to Nitrogen)	2.84	1.17	1.44	0.90	1.80	0.45
PO_4^{3-} (calculated according to phosphor)	0.76	0.31	0.38	0.24	0.48	0.12
Coliform	$100x10^6$ - $60x10^9$ MPN/100ml					
Total of waste water generated (m^3/day night)	26.78	11.05	13.60	8.50	17.00	4.25

Note: (1.1) – Group of works for storm water drainage system improvement, component 1; (1.2) Group of work for flood treatment at residential sites, component 1; (1.3) Group of works for waste water collection system construction, component 1; (1.4) Group of works for waste water treatment station, component 1; (2.1) Group of works under component 2; (3.1) Group of works under component 3.

Concentration of pollutants in domestic waste water before treatment is calculated by the following formula:

$$M = \frac{m}{V}$$

In which:

- M: Concentration of pollutants to be calculated
- m: Load of pollution (kg/day) in Table 4-18
- V: Total amout of waste water generated (m3/day night)

The calculated result is shown in 4-19.

Table 4-19: Concentration of pollutants in domestic waste water before treatment

No	Pollutants	Concentration of pollutants in domestic waste water before treatment (mg/l)	Vietnamese code 14: 2008/BTNMT (column B)
1	BOD_5	582	50
2	TSS	1265	100
3	Animal fats and vegetable oil	235	20
4	NO_3^- (calculated according to Nitrogen)	106	50
5	PO_4^{3-} (calculated according to phosphor)	28	10
6	Coliform	$100x10^6$ - $60x10^9$ MPN/100ml	5.000 MPN/100ml

It is shown in the calculated results in the above-mentioned table that pre-treatment domestic wastewater has much higher concentration of contaminants than the rating in the Vietnamese code 14: 2008 / BTNMT (column B). This waste water often contains suspended solid(ss), organic compounds (BOD, COD), nitrogen and phosphor as well as microorganism which need to be treated before released into the environment. If no daily appropriate management measures, these contaminants could be decrease environmental quality and affect on people health. This is a significant source of pollution, directly impacting on the living environment of the workers and the people living around the project area, causing epidemics and causing direct effects on the environment of underground and surface water.

Despite this, the majority of wastewater focus on the first phase of the construction works (usually in quarter 2/2016). The amount of waste water will disperse over large spatial extent and lasting (about 30 construction site) so the actual amount of waste water ranged from 1.7 to 4.25 m3 / day. The amount of waste water will be reduced over time until the end of the project. Moreover, the amount of waste water was not entirely generated on site by using the local labor force in order to minimize the amount of wastewater generated.

For the amount of waste water, the project owner will take the appropriate remedial measures specified in Chapter 5.

- ***Pollution caused by construction sewage***

During the construction, wastewater is generated from washing of materials, equipment, machinery, concrete curing, washing of wheels and so forth. The amount of waste water is approximately from 0.3 to 1.5 m3/day which depends on each construction site (21 construction sites). The amount of waste water by construction sewage is on average of 10.5 m3/day. This type of waste water is characterized by highly contained suspended solids and organic substances. Its composition is listed the following table:

Table 4-20: Concentration of contaminants in construction wastewater

No	Indicator	Unit	Construction waste water	Vietnamese code 40:2011/BTNMT
1	pH	-	6.99	5.5 - 9
2	SS	mg/l	663	100
3	COD	mg/l	641	100

No	Indicator	Unit	Construction waste water	Vietnamese code 40:2011/BTNMT
4	BOD_5	mg/l	429	50
5	NH_4^+	mg/l	9.6	10
6	Total N	mg/l	49	30
7	Total P	mg/l	4.3	6
8	Fe	mg/l	0.7	5
9	Zn	mg/l	0.004	3
10	Pb	mg/l	0.055	0.5
11	As	μ mg/l	0.3	100
12	Oil and grease	mg/l	0.02	5
13	Coliform	MPN/100ml	53×10^4	5.000

Source: Centre for Environmental Engineering of Towns and Industrial Areas (CEETIA), Hanoi University of Civil Engineering (HUCE)

It can be shown in the results of the table above that some quality indices regarding the construction sewage of the project exceeds the permissible limits of the Vietnamese code 40:2011/BTNMT – National technical regulation of industrial waste and the indices of the larger suspended solids, COD, BOD5 and Coliform are 6,6 times, 8 times, 8.6 times and 106 times higher than the permissible limits respectively. Although the amount of water is not much, it will still pollute sources of surface and underground water as well as workers' health if not being collected, treated but discharged directly into the environment.

- ***Pollution caused by overflown stormwater***

Quality of overflow stormwater depends on the atmosphere purity and volume of washing substances on the surface of the project area.

In the area of construction works, the quality of overflow waste stormwater sources only depends on the surface of the construction site because the current state of the air environment's quality of the project area is quite good, possibly making sources of stormwater polluted in the area.

Contaminants in overflow stormwater in the construction phase mainly consist of suspended substances, the oil and grease of which are swept away by stormwater. In particular, during this phase, the surface of construction plan is unfinished, easily resulting in washout and erosion of surfaces

In order to limit contamination of overflow stormwater, the construction units need thorough collection of scattered materials and waste oil and grease of vehicles and machinery in the construction process. As a result, stormwater will not wash away many contaminants into the surrounding water sources, therefore, the impact is insignificant.

d. Solid wastes

- ***Domestic solid waste***

During the construction, domestic solid wastes generating from the workers' activities mainly are nylon bags, waste paper, food packs and so forth.

Table 4-21: Concentration of contaminants in domestic waste water

Components	Weight ratio (%)	Total volume of emission (kg/day)					
		1.1	1.2	1.3	1.4	2.1	3.1
Paper, packing, rice box…	30	24.8	2.7	10.8	9.0	9.0	4.5
Putrescible matter (animals and plants)	25	20.6	2.3	9.0	7.5	7.5	3.8
Glass	12	9.9	1.1	4.3	3.6	3.6	1.8
Plastics	10	8.3	0.9	3.6	3.0	3.0	1.5
Metals	6	5.0	0.5	2.2	1.8	1.8	0.9
Fiber pulps	2	1.7	0.2	0.7	0.6	0.6	0.3
Other inorganic substances	15	12.4	1.4	5.4	4.5	4.5	2.3
Total		82.5	9.0	36.0	30.0	30.0	15.0

Source: Center for Urban Environmental Engineering and Industrial Area – University of Construction of Hanoi

Note: (1.1) – Group of works for storm water drainage system improvement, component 1; (1.2) Group of work for flood treatment at residential sites, component 1; (1.3) Group of works for waste water collection system construction, component 1; (1.4) Group of works for waste water treatment station, component 1; (2.1) Group of works under component 2; (3.1) Group of works under component 3

It is estimated that each worker working in the project area generates approximate 0.3 kg of domestic waste per day, on average, about 202 kilograms of domestic waste per day (total amount of waste generated in the construction process is estimated at approximately 58 tonnes), which will impact on surface water, ground water, causing unpleasant stench in the project area due to the decomposition and sweeping-away of stormwater, if not being effectively managed and collected. The difficultly decomposable inorganic wastes like bottles, nylon bags and other items existing in water will cause unaesthetic, affecting water quality and reduce the possibility of diffusion of oxygen into the water, which impacts aquatic life.

- ***Construction solid wastes***

Solid wastes generating during the construction are mainly: cement bags, grout spillage, rubble, scrap steels and so forth. The volume of generated solid wastes is dependent on many factors as the construction and project management regime, the supply of building materials, etc. Total volume of soild waste generated in the construction includes:

- - Approximately 11,000 m3 sludge from dredging storm water and waste water drainage system and 02 outlets of My An and My Khe.
- - Approximately 90,694 m3 excavated soil and backfilling from construction work items and ground leveling.

In addition, amount of soil creating from the excavation of foundation pit is also significant. It can be used for embankment, backfilling around the foundation pit and landfilling of the foundation pit in the future..

Hazardous solid wastes

Maintenance of facilities, vehicles, and machinery in service of construction can also generate residue oil, oil bottles and containers and oil rags and forth if it is done rightly on the construction site but not collected and treated, which will affect the landscape and pollute the surface water and ground water in the project area. However, contractors only implement minor reparing operations on sites(eg oil change, on average 01 time of oil changing is 16liters/vehicle, oil change cycle is from 3-6 months depending on the intensity of the operation of machinery and equipment). All major repairs of equipment, machinery maintenance are carried out at repairing center. The Employer will take measures to collect and treat it according to the regulations on hazardous wastes to minimize negative impacts on the local environment.

On the other hand, another hazardous waste source during the construction of road is residual asphalt during the spreading asphalt and a small amount of welding rod generated

- Asphalt is a liquid or semi-solid with highly viscousity and black color. Asphalt is a petrochemical product, it may danger or cause adverse impact on the environment and human health if it is not properly stored and used according to technical processes. In particular, if the compact asphalt is regularly stored at high temperature, it can cause the risks of fire, explosion or burning during the transport and using. Essential component of asphalt is bitumen.
- Therefore, it is required to collect and store residual asphalt in dedicated tanks of hazardous waste. The Client and Contractor need to hire an agency for transporting and treatment in accordance with regulations on hazardous waste management to prevent risks of environmental pollution.
- Welding waste generates at each site due to activities by forming the steel frame. However the amount of welding rods arising intermittently and mainly focused on the first phase of the construction works. Welding rod is estimated to be an average waste on each site is 3-5 kgs / month. This amount of welding rods will be collected by workers and bring them to gathered areas for hazardous waste in accordance with regulations.

e. General other impacts

Impacts due to crowded construction workers

During the construction in the project area, the gathering of construction machinery and about 675 labors at the construction site will cause certain disturbance to the area, in particular:

- Demand for regional goods such as food and utensils will increases.
- The relationships between the workers at the construction site and the local people will arise. Possibility of conflict between the workers and the local people will be higher if the workers are those who come from other regions do not understand the customs of the local people.
- During the construction, the concentration of a large number of workers will increase the risk of social evils (gambling, theft, drug addiction, prostitution, etc.) and order and security situation will become more complex and difficult to control, making it difficult for the local police.
- In addition, the concentration of workers in the construction area will also contribute to appear and spread outbreaks of waterborne diseases (cholera, dysentery, typhoid, diarrhea) or through intermediate vectors (fever malaria, dengue, etc.) as well as social

diseases (gonorrhea, syphilis, HIV, etc.), affecting the health of the local communities. This effect will be likely to occur if no management and control measures are taken.

- ***Impacts on health and safety of workers and local residents***

Increased circulation of transport vehicles of construction materials and heavy machinery will affect the safety of the drivers and the road users on the transport roads.

Generation of dust and noise from the vehicles in circulation can seriously affect human health directly or indirectly through food. Pollution-based pathogen can spread immediately or accumulate for a period of time and then appear.

In addition, during the leveling and construction, the fires of temporary electrical systems, explosion of fuel depots and so forth as well as the excavation and embankment of roadbeds can cause landslides and subsidence of adjacent buildings, effects on the underground water level.

Besides, the Employer and the contractors will work closely with the local governments in the project area and the relevant agencies to promptly solve the arisen problems in accordance with the state regulations the people's aspirations.

- ***Impacts on the health of construction workers***

The construction units will set up temporary or hire the local people's houses for their workers to sleep, stay and rest in the far distance from the construction site, therefore, dust, exhaust gases, noise, soil and rock of excavation and leveling, etc. will have no impact on the health of construction workers in their leisure time.

The effects mainly occur when the workers are present on the construction site. However, the construction workers are arranged to work in shifts in the construction site with appropriate works and issued suitable protective cloths, equipment so the impact levels of waste such as dust, emissions, noise can be reduced are controlled.

Sewage and garbage of the construction workers can be pathogenic sources for them if not being collected and treated appropriately

On the other hand, soils and rock excavated and backfilled during the construction can cause accidents (slip, trip and fall, etc.) for the construction workers if being not removed to the appropriate locations

- ***Divides communities and temporary impact on transportation***

During the construction phase, the existing local roads may be temporary congestion. At this time, collection road system and underground are not built. Some existing routes, roads will be used for civil service road. The operation of vehicles / machines with high frequency on these routes will damage the roads. Sandy soil dropping from shipping process of excavated soil to works will make roads muddy, cause dust in the dry season and muddy in the rainy season. The intensity of impact, the impact level will depend on management capacity of construction site, the level of compliance mitigation measures by contractors.

- Group of works for renovating stormwater system (11 works) - Component 1: In this work group, impact on travel of local communities is assessed from medium to high level, so the works mostly take place in residential areas. For renovation projects for 6 urban drainage sewers, namely Tho Quang- Bien Dong sewer system, Le Tan Trung sewer, Me Linh sewer and sewer from lake of Park to Le Do sewer impact level is high due to construction activities taking place in crowded residential areas or across the

road. However, traffic operations are mainly bicycles, motorcycles and frequency of traffic is not large, congestion is insignificant, but people will have difficulties in the process of moving due to small area, large volume of construction materials. However, Ong Ich Khiem anti-flood station has insignificant impact due to adjacent to coastal, far from residential areas.

- Group of works for flood treatment at residential areas(01 work)- component 1: Work of flood treatment for groups 5,6,7 Son Thuy, Ba Bang Nhan road, Dang Thai Than is assessed to be high level due to location is in residential area.
- Group of works for wastewater collection system construction (04 works) - Component 1: In this work group, impacts on traffic are evaluated in small level due to the majority of works away from residential areas, large construction scope
- Group of work for waste water treatment station (02 works)- Component 1: Impact on transportation at 02 works is assessed at a small level due to far distance from residential areas.
- Group works under component 2: The impact on the group's traffic works are assessed at a high level due to high turns of vehicles transporting materials and at construction site or traffic intersections, many traveling activities of people take place. Contractor should note the impact of traffic in this component and take appropriate mitigation measures.
- Group of works under Component 3: Impacts on traffic in this work group are also evaluated at medium level due to: (i) Although Hoa Phong resettlement area away from residential areas, high density of transporting vehicles of materials;

f. General isks and incidents

❖ *Soil excavation*

Most construction works are related to some form of digging foundations, sewers and underground works. Soil excavation and trench digging can be very dangerous and even some of the most experienced workers also have incidents with not reinforced trenches. If workers are buried under a cubic meter of soil which is equivalent to weight of a ton of gravel, workers will not be able to breathe because of the pressure on their chest and external physical trauma will make the body to be suffocated quickly and have death.

Earthwork is also related to the disposal of volumes of soil and rock. The presence of water always should be concerned even if it exists in the moisture in the soil, in a heavy rain, which would cause the risk of landslides. Therefore, the possibility of flooding and other risks are always in need of attention. Cracks which are caused by liberation soil pressure, should be remedied or not to dry out in hot weather. Soil may be changed according to their natural status (eg fine sand can flow easily or hard clay is more coherent). However, any type of soil could not stabilize if only based on specific gravity itself, thus, it is necessary take preventive measures to prevent the subsidence of the pit if its depth is greater than 1.2m.

❖ *Landfill or underground works*

Before workers do anything of digging, by hand or with an excavator, it is noted that there may be underground works beneath the surface. In the construction areas, it is always supposed that underground works exists such as electrical cables, water supply and drainage pipes. These types of services have similar construction methods, so the ability to find workers buried is considered as the worst supposition. Incidents are electrocuted by underground power cable which can cause death or some accidents due to electric shock or

fire incidents. If clean water pipes and drainage pipes are ruptured, they could cause local flooding for areas of earthworks or cause pits subsidence.

❖ *Working on water surface*

Falling into water and being drowned or swept away area considered as a risk when working on or adjacent to water. Even if workers are a good swimmer, the following warnings should always be observed:

- Do not work on water surface alone.
- Check the rules of work to ensure that there are no rules flawed.

❖ *Manual tools*

There are many different types of manual tools for different types of work, such as shovels, axes, crowbars, chisels, screwdrivers, hammers. In many cases, these tools are purchased from an external supplier, it should pay attention to quality or design.

A manual tool of good quality should be designed in accordance with the hands and available functions. It will increase your chances of earning money and reduce the ability accidents. With well- designed manual tools, work will be improved and pressure will be relieved , as a result, work efficiency is increased. The accidents caused by manual tools often arise due to carelessness of users, using of inappropriate tools or neglecting safety warnings or improper maintenance of tools. Therefore, users need be guided and know how to maintain tools properly.

❖ *Working in hot weather*

Workers on construction sites often have to work under all different climate conditions. In tropical countries, under the sun with high temperatures and humidity along with heavy workload, it can cause exhaustion due to heat and sunstroke, some cases of emergency have to taken to the hospital or taking disease. Effect of heat combined with physical workload tends to accumulate. Hence, the need for a regime of healthy welfare in hot climates and suitable arrangement with time is an important work.

❖ *Chemicals and impact level*

Many hazardous chemicals can cause fires, explosions, toxic, with potential and can cause poisoning. Hazardous chemicals cause acute effects, such as nausea, dizziness and headaches due to exposure to solvents in a short time and chronic effects due to exposure in a long time as lung diseases, namely asbestosis and silicosis. Dermatitis can result from contact between skin and some chemicals. In addition, acid and corrosive alkali can damage skin and eyes.

❖ *Traffic accident*

The basic cause of most traffic accidents on the construction site is the failure to implement the plan of work safety systems and the methods of training workers. However, the common direct causes are the combination of one of the following elements:

- Driving technique limitations;
- Careless or negligence for special hazard sources,namely working near power lines or landfills;
- Transportation of passengers without registration;
- Maintenance of incomplete vehicles;

- Overloaded or poorly loaded;
- Obstruction of the construction site;
- Poor transport surface;
- Lack of proper road (bypass) or rough pavement.

❖ *Toxic chemicals*

Cement: Cement mixture is considered as a common cause of skin diseases. Both irritant and allergic contacting dermatitis may have derived from wet cement. The long term exposure to wet cement (for example, if you kneel or stand in it) it can cause cement burn or skin ulcers.

Lead: Inorganic lead is used in many construction products, such as cables, pipes, water gutter and old roofs with thin shell. Organic lead in engine fuel and storage tanks with huge pollution amount

Risks affect health by inhalation of dust or fumes created by burning or cutting of lead-containing materials, including painted surfaces, welding, grinding or cutting, painting spray with leaded paint . Lead can be absorbed in the case of being swallowed, the food is often contaminated and should be provided adequate washing facilities. Organic lead compounds may be absorbed through skin easily. Excessive lead absorption causes constipation, abdominal pain, anemia, weak muscle and kidney damage. It can also affect the brain, causing mental decline, strange behavior, fainting and coma.

❖ *Treatment process for objects finding in excavation process*

In the construction process, objects findings have cultural value or be dangerous, it is necessary to take actions promptly, these actions are metioned in details in the following table:

Table 4-22: Process of objects finding

No	Situation	Action	Implementation responsibility
1	Finding cultural/ archaeological objects/ in the process of soil excavation	Contractors protect current status for the construction area and report to Construction Supervisor / PMU, local museums and Department of Culture and local information Submission of objects for the museum / cultural management agency Review to determine if the excavation has been continued or stopped to survey more Director of Department of Culture and Information in the locality will be responsible for managing the objects under the Law on Cultural Heritage	Contractor, Monitoring Consultant coordinates for implementation Contractor Department of Culture and Information
2	Finding tomb in the process of soil excavation	Protect current situation and notify local authorities Determine how to resolve and duties of the individuals involved, time of implementation and relocation sites if any Implementing proposed measures	Contractor, relevant agencies
3	Finding explosive materials	Protect current situation Notify to local authorities Contact with military units at local for supporting requests	Contractor coordinates with local authorities

4.2.4. Site specific impacts of project in the construction phase

4.2.4.1. Site specific impacts of Component I

For component I, site specific impacts are shown in the following tables:

Table 4-23: Site specific impacts of works under Component 1

No	Works	Site specific impacts
Sub component 1.1: Storm water drainage improvement		
1.1.1 - I.1.5	Adjustment, expansion stormwater drainage system - Improvement sewer for Ong Ich Khiem road - Improvement sewer for Le Loi road - Improvement sewer for Hung Vuong road - Improvement sewer for Ly Thai To road - Improvement sewer for Hoang Dieu road - Improvement sewer for Phan Chu Trinh road - Improvement sewer for Tho Quang – Bien Dong	- Affecting business activities, trafficking of pavement households due to workers concentration workers, equipment and construction machinery digging of pavements for construction: - The gathering of materials, temporary construction solid waste dumping at sidewalks, roadways make the loss of aesthetic manner and transportation of people. - On the other hand, odors of sewers during the construction also affects the surrounding households. - However, these impact are temporary and affects only in a short time when the contractor has a rolling construction methods and arrange reasonable construction schedule.
1.1.1	- Ong Ich Khiem pump station  	- Subsidence: Foundation of work is loacted on the ground with medium to moderate grained sand, not uniformity. Homogenerous engineering geological with sand embankment do not facilitate during construction, it is easy to generate quicksand foundation subsidence. Thus, geological survey work to assess hydrological ground in the expected ground construction area is necessary. - Water pollution : Characteristics of the construction on the beach, so the risk of seawater contamination is inevitable. The degree of contamination depends on the construction method.
1.1.2	Construction sewer system from lake of Park 29/3 to Le Do sewer	Sewer system connecting from lake of Park 29/3 to sidewalk on Nguyen Tri Phuong road, to Dien Bien Phu- Nguyen Tri Phuong crossroad, across the road, then connecting with sewer system on Le Do road. In the process of construction, it may cause: - Cracking down underground works: water supply pipelines, electricity cables, communication cables or pipelines ... crossings or adjacent pipeline;

No	Works	Site specific impacts
		- Cracking down roadbed due to subsidence; cracking down houses near deep excavations location, poor ground. - Causing traffic jams at the roundabout during rush hour.
1.1.4	Improvement Me Linh sewer(1.1.4) 	- Me Linh sewer is located in alleys in a residential area, thus in the process of construction, it will affect the movement of people. Odor when flipping the drain cap also affects the health of people around the construction location. - Narrow construction location is also an obstruct in the process of construction.
1.1.5	Construction Le Tan Trung sewer connecting Tho Quang – Bien Dong sewer	- Located in alleys in a residential area, thus in the process of construction, it will affect the movement of people. - Narrow construction location is also an obstruct in the process of construction.
Sub project 1.2: Flood treatment at residential sites		
1.2.1	Flood treatment for groups 5,6,7 Son Thuy 	- Local flood: + Currently,Ba Bang Nhan and Dang Thai Than roads are penetrate plastic roads, the rest are cement concrete road in the alleys. The roads have no sidewalks, no drainage system, trees, ... Stormwater and wastewater mainly self-absorbed and self-flowing into natural terrain on local points near Le Van Hien road. + Due to the low background of the region, steep slope from the Co Co River towards Le Van Hien road, thus, in the rainy season (October-December) the whole area of group 5,6,7 Son Thuy and 2 routes are flooded. Thus, the process of construction should avoid the typhoon season, it should apply a rolling construction method, quickly, avoid prolonged construction period
Subproject 1.3 : Construction waste water collection system		
1.3.1	Improvement landscape for outlets of My An and My Khe	Due to location of 2 outlets is near the coast, thus, in the construction proces, there will be the following site specific impacts:

No	Works	Site specific impacts
		- Construction on subsidene- prone sand or collapse the building foundation - The risk of coastal water pollution caused by the temporary operation of construction machines and equipment. - Influence temporarily to recreation activities, entertainment of local people. - Waste water from outlets of My An, My Khe is not collected, then with storm water flows over beach causing environmental pollution, landscape.
1.3.2	Collection waste water around Hoa Phu lake and Hoa Phu canal to Hoa Minh lake 	For this work, implementation construction drainage system around Hoa Phu lake(not dredging the lake), Impact is within ECOPs scope
I.3.3	Collection waste water for Pham Van Xoa road, Tho Quang industrial zone	- It should take safety measures during construction to avoid cracking existing pipeline. - A volume of dredged sludge from this work item implemention, estimated to be approximately 340 m3. - Impact is within ECOPs scope.
Subproject 1.4 : Waste water treatment stations		
I.4.1	Improvement capacity of Hoa Xuan waste water treatment station from 20,000 m^3 to 60,000 m^3 / day night, using SBR technology	Currently, Hoa Xuan waste water treatment station has been operating with capacity of 20,000 m^3 / day/night, thus site specific impacts for Hoa Xuan waste water treatment station: - Avoid putting waste, materials near water drainage, supply area of waste water treatment station in order to limit bottleneck capacity. - Risk of subsidence of surrounding works during the process of treatment tanks
I.4.2	Adjustment capacity of Lien Chieu waste water treatment station remains 20,000 m^3 / day night, and using SBR technology.	Impact in specific phase is within implementation scope of ECOPs.

4.2.4.2. Site specific impacts of Component II

Adjustment for construction location of Depot station near airport area

The project area is located in the residential area. At the work's location, at rush hours, number of vehicles traveling remain high rate. There are no construction of high works with large-scale, no construction activities on high and deep scope, thus, construction activities during construction should just use some simple machinery / vehicles, mainly as excavators, bulldozers and other handheld devices. However, the process of construction should be noted a number of problems:

Traffic safety, traffic congestion: due to the location is near densely populated areas, in the process of transporting construction materials, it can cause traffic accidents or traffic jams during rush hours.

Figure 4-1: Construction location of Depot station at airport area

Construction Dien Bien Phu underpass(2.1)

In the process of construction, the largest site specific impact of this work is

- Impact on drainage system beneath sidewalk, roadbed
- Impact on some business households (due to limit of vision, dust, noise, difficulties for customers)
- The risk of subsidence of surrounding buildings, households (in terms of geological processing, works topography does not ensure structural engineering).
- The potential of risk of local flood in underpass digging(due to heavy rain, high underground level).
- The potential risk of traffic safe, traffic accident due to narrowed roadbed, traffic conflicts at rush hour, materials

In addition, construction Dien Bien Phu underpass have no relocation of electric poles, works adjacent the project area.

Figure 4-2: Dien Bien Phu - Nguyen Tri Phuong crossroad

4.2.4.3. Site specific impacts of Component 3

- ***Site specific impacts of Hoa Khuong resettlement(3.1)***

For construction of Hoa Khuong resettlement area, apart from the impact due to compensation, site clearance and resettlement. During the construction process, there are some special impacts such as:

- Concentrated labor force for construction: It can generate social evils, conflicts with local residents.
- The volume of excavated soil and backfilling is relatively large (400,000 m3)
- Currently, agricultural land accounts for the highest rate (51.35%), followed by residential land (253.53%), vacant land (16.04%) and other land. According to monitoring results, (D1 sample in Table 2-14) the land in this area has no signs of contamination. indicators (As, Hg, Fe, Pb, Cu) are within permissible limits for agricultural land and can be used for leving other low-lying areas.
- Remaining volume of excavated soil and backfilling soil should be monitored for used materials to be exploited at permitted mines.

4.2.5. Impact assessment in the operational phase

In the process of project operation, negative impacts in the construction phase will be disappear, and positive impacts will be replaced. The new negative impacts will arise during operation process. The objectives of works coming into operation are different, thus, negative impacts during this phase are mainly special impacts. The impacts will be analyzed by the group of the same nature, scale ... to assess.

4.2.5.1. Impacts in the operation phase under Component 1

Groups of work have impact in the operational phase including: 05 works of storm water collection; 03 works of waste water collection; 02 works of waste water treatment

Works of waste water and storm water collection (item 1.1, 1.2 and 1.3)

Odor from waste water collection and treatment system

For drainage sewer system, although drainage sewer system is designed by cleft to prevent but actually, in the dry season, water in the slot to prevent odor is evaporated. In the FS period, new designs focus on determining alignment s and size of sewer. A technical solution to

prevent odor in the gas hole will be further studied and completed in detailed design phase. This request will be mentioned in the TOR for the detailed design stage.

In general, seperate wastewater collection system, odor will be reduced over the entire drainage system and outlets, the previous wastewater receiving location. However, at these locations, as well as region of 2 wastewater treatment plants will generate odors (mainly H2S ingredients), may affect households adjacent to this location.

Sludge/ sediment dredged from storm water, waste water drainage system

Sand sludge (sediment) by runoff stormwater, deposition in storm water drain system: It is estimated in 2018 (after the project comes into operation), the total amount of sewage sludge to be dredged is approximately 11,000 m3 / year, of which sludge in stormwater drainage sewers accoun for 90%, corresponding to about 10,000 m3 / year. Average per month, there will have approximately 100m3 of sewage sludge / canals need to be collected and disposed. Currently, sludge is contaminated by waste water flowing in the sewer. However, when the project is completed, waste water will be collected and treated by separate systems. Water in sewer is just storm water, sediment / deposition sludge will be cleaned regularly.

Sewage sludge from wastewater collection works: according to design calculation there is a manhole built for each 30m of wastewater collection line. Thus, the length of pipelines with 1, 2, 3, approximately 63,000 m, corresponding to around 2,100 manholes to collect sludge from wastewater collection system (construction of 06 wastewater collection works). The size of manhole is on average of (0.8 x 0.8 x 1.2) m. Thus, volume of sludge from wastewater collection works system (is collected 2 times/ 1 year) is estimated at 3,200 m3 / year, an average of about 270 m3 / month. The amount of sludge will be collected and treated by urban environment company of Danang city and in accordance with regulations periodically on the management of hazardous waste according to Circular No. 36/2015 / TT-BTNMT.

Flood in the operational process of storm water and waste water system

Without maintenance, storm water and waste water drainage system will be degraded, clogged, causing flood incident and environmental pollution.

Impacts in the operation phase of Ong Ich Khiem station

The concerned issue in the operational phase of Ong Ich Khiem pumping station is the possibility of affecting biodiversity (conservation of coral reefs and related ecosystems) when the station is put into operation. To assess impact of this effect, the Consultant and the representative of the Client have conducted a survey to the pumping station construction location and referred to materials related to management and biodiversity conservation in the project area. After surveying and research, we come to the following conclusions:

- Location of the pump station is 1604'50,4 " - 108012'39,59'. This location is not in the scope of management area for the coral reefs conservation and related ecosystems from coasts of Hon Chao to Southern Hai Van and and Son Tra peninsula (under Decision No. 54/2007 / QD-Committee dated 13/9/2007 of the Danang CPC. Danang CPC promulgates regulations on management and conservation of coral reefs and related ecosystem).
- According to the distribution maps of aquatic vegetation at Danang Bay (see Appendix 1), coastal areas of Ong Ich Khiem pumping station has almost no distribution of coral and seaweed.

- On the other hand, as described in project description, the pump station works only in the case of high tide and heavy rain, at that time, the sluice gate will be closed to prevent water from overflowing from the bay back into the sewer, pumping station will be activated and pumping stormwater out. In normal conditions, the station will not operate, stormwater runs by gravity in the sewer system in the absence of tides, surges in Danang Bay. Hence, influence level of the pumping station is inconsiderable.

Thus, it can be concluded that during the operation phase, Ong Ich Khiem anti-flood pumping stations has no impact on biodiversity

Waste water treatment system of Hoa Xuan and Lien Chieu (item 1.4)

Sludge from waste water treatment system Lien Chieu and Hoa Xuan.

Sludge volume is expected to be collected during the 2 treatment plant operation calculated on the following table:

Table 4-24: Estimated volume of sludge generated to be treated from waste water station

Area	Emission coefficient[1]	Unit	Hoa Xuan station		Lien Chieu station
		Q(m3/day)	20,000	60,000	20,000
Sand sedimentation tank	0,005 m^3/1,000 m3	m3/day	0.1	0.3	0.1
Trash crack	0,05 m3/1,000 m3	m3/day	1	3	1
Raw sludge from suspended solids	SS Input: 176 mg/l Efficiency: 50%	kg/day	1,760	5,280	1,760
Redundancy Al and polyme[2]	17 g/m^3	kg/day	340	1,020	340
Biological sludge productivity[3]	BOD5 Input - Output = 154mg/L - 30 mg/L	kg/day	2,480	7,440	2,480
The total amount of sludge not dehydrated		kg/day	4,580	13,740	4,580
Sludge is supposed to be dehydrated from moisture of 90% to 35%	Volume of sludge reduces 15%.	kg/day	687	2,061	687
Sludge volume / year	365	ton	251	752	251

Reference [1] Metcaft and Eddy, 2000; [2] EIA Report of CEPT, 2008; [3] CDM,2011

The total amount of sludge generated from the two waste water treatment stations coming into operation following is about 1000 tons / year (dry pressed). Thus, on average/ day, about 2.73 tons of dried sludge to be dumped.

02 wastewater treatment works for Lien Chieu and Hoa Xuan will generate sludge in the operaion phase. In the process of wastewater treatment, sludge will be generated with the following composition:

- Total volume of solids

- Concentration of pathogenic bacteria
- Concentration of hazardous organic substances
- Receiving ability of soil
- Concentration of heavy metals

Volume of sludge will be dried after sucking up. Ordor will possibly generated, spread to surrounding residential areas which affects the lives of people and workers in the factory. Sludge contains hazardous substances if not treated carefully, it will also contaminate soil, water and air.

To mitigate these impacts, the following measures will be carried out during the implementation of this subcomponent.

The risks and incidents during the operation of 02 wastewater treatment plants:

After completion of WWTPs an the facilities are in operation, the wastewater generation from the service area will be treated and the overall sanitation and water quality in the area will be improved. However, there are risks on the following:

- Treated wastewater discharge below specified quality standards;
- Plant operated in appropriately;
- Sludge from treatment process allowed to remain on site, or discharged other than in a prepared sanitary landfill;
- Plant failure results in contamination downstream, causing health and other impacts on the population living along the waterway into which the plant discharge;

The risks and incidents mentioned above all cause environmental pollution and affect the health of workers and plant operators as well as the people living around. At the same time, the amount of untreated wastewater discharged into the environment will affect the quality of the receiving water bodies, aquatic ecosystems downstream of the plant and other purposes of water use.

The measures of responding and troubleshooting from wastewater treatment system will be proposed in Chapter 5 of the report.

4.2.5.2. Impact in the operational phase Component 2

Development Bus Rapid Transit (BRT)

Waste water from Depot transit station near airport area

Waste water generated from Depot station is mainly domestic waste water by operational workers and a small number of passengers at Depot. Thus, The wastewater will be treated strictly before discharging into the combined sewers of the City.

Risk of fire and explosives at Depot station

In addition, incidents of fire and explosives can be the risk during operation phase. The reasons include:

- Fire due to short circuit in operation;
- Fire and explosion caused by wrong placing of gasoline and raw materials, carelessness in the management process;

- Fire due to too old operation equipment or lack of routine maintenance.

The mitigation measures will be proposed in Chapter 5 of the report.

Local flooding in interchange of Dien Bien Phu- Nguyen Tri Phuong tunnel

When Dien Bien Phu tunnel comes into operation, if the maintenance work is not carried out fully, the stormwater system operations less efficiently, resulting in stuck of rain water will cause local flooding in the tunnel.

4.2.5.3. Impact in operation phase of Component 3

For works under Component 3 of the project, sources of causing impacts on environment in operation phase are mainly positive as the project achieves its objectives: mitigation of flooding in residential areas, strengthening water supply system, completion of infrastructure, urban adjustment…

However, the major effect of the Component 3 is in the resettlement area of Hoa Khuong after being put into operation (fill in the number of households in the resettlement area).

Impacts of wastewater: Estimated average number of household members is 4 persons. The demand for water is 200 liters/person/day. The amount of emissions is calculated by 80% of water supplied. The total volume of wastewater: 200 households x 4 persons x 200 liters/person/day x 80% = 128,000 liters/day (equivalent to 128 m^3/day domestic wastewater).

Impacts of domestic waste from households: Estimated amount of domestic waste generated is 0.5 kg/person/day. The total amount of household waste generated: 200 households x 4 persons x 0.5 kg/person = 400 kg/day.

The amount of wastewater will be collected according to common sewer system of the city, conveyed to the planned wastewater treatment system in Da Nang City to be treated before discharging into the environment. The domestic waste of the people will be collected and processed daily by Da Nang Urban Environmental Company.

CHAPTER 5. MITIGATION MEASURES FOR ENVIRONMENTAL IMPACTS

To minimize environmental and social impacts, the project will access to following groups:

- *Avoidance:* Alternative analysis has been regarded as one of the most important mitigation measures to minimize potential adverse environmental and social impacts. Minimizing land acquisition and resettlement to the extent possible has also been a key criterion for alignment selection during the feasibility and EIA studies
- *Sound Engineering for design and construction:* The project has been designed and will be implemented with state-of-the art engineering
- *Comprehensive Mitigation plans:* The detailed environmental mitigation plan, Compensation and resettlement plan.

These measures will be integrated into the Construction Contractor's technical criteria of environment supervised by the environmental monitoring team as a part of the process of construction technical monitoring

5.1. GENERAL PRINCIPLES

This program identifies measures to minimize the impact of adjusting and supplementary items during the process of preparation, construction and operation phase.

Measures to minimize the overall impacts which are presented in the table ECOPs; and it will be applied to minimize the overall impacts of the project.

For site specific impacts at specific locations of each group of works, it should take their own mitigation measures in these positions for both construction and operational phases apart from general measures identified in ECOPs.

5.2. MITIGATION MEASURES IN PROJECT PREPARATION PHASE

a. Mitigate impacts due to land acquisition and site clearance

The Project acquires land of several surrounding works, including residential areas 5, 6, 7 Son Thuy, bus terminal station near airport area, Hoa Khuong resettlement area (see more details in Table 4.2, Chapter 4).

For land acquisition, affected persons are entitled to compensation policies (compensation and support), complying with provisions of Vietnam and WB. In some specific cases (extremely poor households or households under treatment policy), it requires a confirmation of local authorities, then submitted to Compensation Committee for review and apply additional supports for each case.

Resettlement area of the project will be built in Hoa Khuong commune with total area of 8.42 hectera.

Income recovery program of Da Nang SCDP will concentrate on 2 sectors: (i) vocational training and (ii) employment recommmendation.

b. Impact mitigation due to bomb, mine, explosive objects clearance

The UXO remove activities need to complete before starting construction activities, the several step should follow during UXO remove.

Coordinate with the appropriate agencies at the design stage to identify if UXO is a potential threat to works. According to a preliminary report, bomb clearance is required to carried out in the following locations:

- Construction of anti-flood pump station at the end of Ong Ich Khiem road
- Construction of Lien Chieu WWTP
- Construction of Bus Rapid Transition Depot (BRT) near airport (bordering Nguyen Tri Phuong intersectino and Nguyen Van Linh road).
- Dien Bien Phu overbridge
- Technical infrastructure construction of group 5,6,7 of Son Thuy commune.
- Technical infrastructure construction of Hoa Khuong resettlement area.

Based on the findings, PMU will sign contact with an authorized agency for removing UXO;

Ensure that the civil work activities on the site will be started since PMU get an certified that the project areas are already been cleared.

5.3. MITIGATION MEASURES IN THE PROJECT CONTRUCTION

5.3.1. Mitigation measures for general impacts of project

ECOPs describes the typical general requirements implemented by the contractor and supervised by engineers and construction supervision during construction process. ECOPs will be included as an appendix in bidding documents and contracts (BD / CD) in detailed design phase and the contractor will be announced officially in the bidding process. The scope and content of ECOPs are as follows:

Scope: Construction activities for small projects are governed by ECOPs activities which have impacts within limited scope and impacts are temporary and can be restored, and easily managed with good construction practices

The mitigation measures which are described in ECOPs , are considered sufficient to mitigate most of the potential impacts during construction and are presented in the Table 6-1, Item 6.1.1 below.

- ***Emergency Preparedness and Response Plan***

a. Applicable Standards

The applicable reporting requirements are as follows:

- Law on Work Health and Safety, 84/2015/QH13 dated 25 June 2015
- Joint Circular No. 01/2011/TTLT-BLDTBXH-BYT of January 10, 2011 of MoLISA and MoH on guiding the organization of labor safety and sanitation work in labor-employing establishments; and
- Circular No. 19/2011/TT-BYT of June 6, 2011 of MoH on guiding the management of labor hygiene, laborers' health and occupational diseases.

b. Roles and Responsibilities

All workers and visitors:

- Understand and comply with the provisions set out in this plan;
- Have a working mobile phone with him/her, or be accompanied by someone who has a working mobile phone; and
- Report all emergencies to the Contractor General Manager on-site.
- Contractor General Manager:
- Ensure all personnel on-site understand the requirements and responsibilities in emergency response;
- Organise and facilitate emergency drills;
- Act as a first point of notification in case of an emergency;
- Implement and co-ordinate immediate emergency response with available resources;
- Notify the PMU Health, Safety and Environmental (HSE) Manager of the emergency status as required by the communication protocol;
- Ensure all personnel are accounted for and moved to a place of safety in emergency cases; and
- Ensure that suitable and sufficient equipment for emergency response is available, is fit for purpose and maintained.

HSE Management and Monitoring Officer:

- Monitor and evaluate the effectiveness of the response.

PMU environmental staff

- Arrange resources within PMU to support emergency response, when necessary;
- Liaise with external resources (e.g. local government, police, etc.) for support, when necessary;
- Monitor and evaluate the effectiveness of the response; and
- Make briefings to PMU management on incident and response status.

c. Assembly Point

If directed to perform evacuation by the Contractor Supervisor - Workers, proceed to the assembly point next to the site office (to be identified following determination of site office location).

d. Emergency Procedures

Vehicle Accidents

Vehicle accidents may include, but are not limited to:

- Vehicle roll-over; and
- Vehicle crash with another vehicle, structure or with a person (worker or person from the local community).

Procedure:

- Stop work immediately;
- Turn off the vehicle, if possible;
- Have passengers of the vehicle(s) exit the vehicle and move to a safe place, if possible;

- If there is an injury, follow the procedure for medical emergencies (see below); and
- If there is a fuel/chemical spill, follow the procedure for spill emergency (see below).

Adverse Weather

Potential adverse weather events include, but are not limited to:

- Heavy rain;
- Strong wind; or
- Typhoon
- Severe flood
- The potential for earthquake and tsunami happening at the site is considered unlikely.

Procedure:

The Contractor General Manager will check the national and local weather forecast each morning prior to work commencing. Should adverse weather be predicted, depending on the severity and timing of the weather expected. If adverse weather is expected to be serious, lengthy and soon (e.g. in the case of a typhoon or flood), the Contractor General Manager shall contact all workers to not come to work. If the weather is less serious and is not expected to last long, the Contractor Supervisor - Workers will cover this situation during the daily toolbox talk, continue to monitor the weather situation throughout the day and issue instructions as necessary to stop work, make their worksites safe, and find a safe sheltering location (either back at the site office, if sufficient time to return, or locally to the active works (in the case of the latter, the worker shall call the Contractor Supervisor – Workers to inform them where and when they are in the sheltering location). If the Contractor Supervisor – Workers does not hear from a worker(s) within 15 minutes of instruction to shelter, the Contractor Supervisor – Workers shall mobilise to the location by any possible vehicle to ensure the safety of the worker(s).

Chemical/Fuel Spill

A spill of chemical/fuel has the potential to cause soil and groundwater contamination, if not controlled and cleaned up timely and properly. Chemical/fuel spills include, but are not limited to, the following:

- Fuel spill during refuelling;
- Fuel/oil/grease leaks during vehicle parking or operating; and
- Breaking of fuel tanks on vehicles.

Spill response facilities: A spill kit shall be provided on each heavy equipment (bulldozers and excavators), in the HW and hazardous materials storage areas, and in any designated fuelling locations. A spill kit includes a drip tray, absorbent materials, and impermeable bags to collect contaminated soil and used absorbent materials, and a small spade used for collecting contaminated soil.

Procedure:

- When there is a spill, immediately use the absorbent materials to absorb the spilled materials and locate the drip tray to collect the spilled flow (if the spill continues);
- Collect the used absorbent materials into an impermeable bag;

- Use the spade to collect the contaminated soil into the impermeable bag; note that there should be no contaminated soil left (stained soil must be collected to the full horizontal and vertical depth of the impact);
- Transfer the filled impermeable bag to the Hazardous Waste Storage Area for storage;
- If the spill is larger than one spill kit or person can handle, request another worker to support (e.g. to bring more spill kits);
- Use work gloves, safety glasses, long sleeved tops and trousers during the above response process and minimise direct contact with the spilled fuel/oil; and
- At and around the location of release, samples shall be taken to confirm whether any contaminated soil/groundwater remains. The number of samples will depend on the scale of the release and the estimated impacted area. The parameters to be analysed will depend on the substance released. Depths where samples are to be taken should be at ground surface and immediately above groundwater table. These should be identified in a sampling plan prepared by the HSE Management and Monitoring Office in consultation with appropriately qualified technical staff. Response to any remaining contamination should be defined accordingly.

Sanitary Effluent Spill

A spill of sanitary effluent has the potential to cause surface water, soil and groundwater contamination and nuisance/health hazard to nearby households, if not controlled and cleaned up timely and properly. Sanitary effluent spills can occur during emptying and transportation of effluent from septic tanks being demolished on site.

Spill response facilities: A spill kit shall be provided on each septic tank collection truck. A spill kit includes impermeable bags to collect contaminated soil and a small spade used for collecting contaminated soil.

Procedure:

- When there is a spill, immediately stop the flow;
- Use the spade to collect the contaminated soil into the impermeable bag; note that there should be no contaminated soil left (contaminated soil must be collected to the full horizontal and vertical depth of the impact);
- Transfer the filled impermeable bag to the Waste Storage Area for storage;
- If the spill is larger than one spill kit or person can handle, request another worker to support (e.g. to bring more spill kits);
- Use work gloves, safety glasses, long sleeved tops and trousers during the above response process and minimise direct contact with the spilled effluent.

Electrocution Due to Electrical Cable Collision

While the works are undertaken within a 10m radius of electrical cables and poles is prohibited, electrocution may happen as the result of:

- Collision with power cables and poles;
- Take down of cable poles; and
- Hitting underground cables.

Procedure:

When an electrocution occurs:

- Stop work immediately;
- Isolate the power source, if possible and safe to do so (e.g. using a non-conductive rod to detach cables);
- If there is an injury/medical need, follow the procedure for medical emergencies (see below); and
- Contractor HSE Manager will inform EVN for further action (e.g. stopping power and conduct repair), coordinate authority inspection and facilitate the interface with authorities/media, if required.

Medical Emergency

A medical emergency is a situation in which, due to an acute illness or injury, there is an immediate risk to a person's life or long-term health. Medical emergencies include, but are not limited to, the following:

- Injuries from vehicle accidents;
- Wildlife attacks, e.g. snake bites or bees attack;
- Heat stress;
- Electrocution; and
- Unexploded-ordnance incidents.

Procedure:

- Report the injury to the First Aider, stating your name, location, nature of emergency and assistance required;
- Where safe to do so, stay in the location until assistance arrives;
- The First Aider will co-ordinate first aid response; the First Aider can give first aid as far as they are capable. If further medical attention is required, then the injured shall be transferred to the nearest medical clinic (see below for details) at communal level or for further treatment in Province and City level:

Within two working days from receiving an occupational accident investigation record and the minutes of the meeting about disclosure of the occupational accident investigation record, the First Aider must prepare statistics of the occurred occupational accidents and records in a Statistic Book with following principles:

- Every occupational accident that has happened to workers must be recorded;
- When a worker suffers from multiple occupational accidents, each accident must be separately recorded;
- Every occupational accident that has happened to workers that cause them to take one day off or more must be recorded.

Fire

Flammable hazardous materials and wastes will be present onsite (including fuels, oils, etc.). A fire can also be caused by using ignition sources nearby (e.g. smoking or cooking by workers and residents) or engine incidents.

All the bulldozers, excavators, hazardous waste and materials storage areas, and the site office must be equipped with one portable 2 kg fire extinguisher in each location (type will depend on the immediate fire risk). The fire extinguishers must be in good working condition. The Contractor Supervisor – Vehicles and Devices shall perform monthly checks and replace as needed – tags shall be kept on the extinguishers which indicates their validity.

Procedure:

- Upon identification of a fire incident, try to suppress the fire if it is deemed possible and safe to do so using the available suppression equipment);
- If it is not possible to do so, move to a safe location (up wind and sufficient distance) and report the fire to the fire brigade stating your name, location, the status of the fire;
- Report the fire to the Contractor General Manager; and
- The Contractor General Manager will inform all workers and visitors on-site and ensure they are all accounted for and in safe locations. They shall also inform the PMU HSE Manager, who shall inform the applicable government department and any households on or off site who may be in danger and advise them to evacuate.

e. Communication Protocol

If an emergency is identified, all workers/visitors need to notify the Contractor General Manager by mobile phone call. Specific communication requirements for each incident type are provided within the procedures above.

Each personnel on-site will be provided with a card containing all the relevant emergency contacts. The contacts tentatively will be defined for Contractor General Manager, Contractor Supervisor, Contractor HSE Manager, PMU HSE Manager, HSE Management and Monitoring Officer, Wards/Districts People's Committee, Wards/Districts People's Police, Fire Emergency and Medical Emergency.

Once PMU's permanent HSE Site Supervisors are assigned to replace HSE Management and Monitoring Officers, the contact numbers need to be updated.

g. Drills

Emergency drills for all emergency scenarios outlined above within two weeks of commencement of the contract, and again should the contract extend beyond six months.

The Contractor General Manager is required to plan and facilitate the drills, identify and implement any corrective actions based on the performance, report to the PMU HSE Manager on the outcome of the drills, and communicate to all workers regarding the lessons learned. Drill plans and records shall be prepared and kept on file.

h. Reporting

Reporting to PMU

Spill Incident/Accident Notification

The Contractor General Manager must notify the PMU and CMC of any major spill incident/ accident (larger than 180 litres – volume of a drum) immediately using the fastest means (mobile phone/line telephone), providing the following information:

- Description of the incident/ accident including the location, the material spilled, the volume spilled, and whether any sensitive receivers have been impacted;
- Description of the immediate response taken to stop and clean up; and
- What the next steps are.

Occupational Accident Notification

The Contractor General Manager must notify PMU any accidents that have resulted in a fatality, or serious or multiple injuries (workers or local people) using the fastest means (mobile phone/line telephone), providing the following information:

- Description of the incident/ accident including the location, the number of fatalities/injured, how it occurred;
- Description of the immediate response taken to secure the situation and get medical attention; and
- What the next steps are.

The Contractor General Manager shall complete an Incident Investigation Form (refer to Incident and Non-conformance Section) and submit it to Vinh Phuc PMU immediately after receiving the accident case file from the local Police Department at the locality where the accident happened. The Contractor General Manager must regularly update Vinh Phuc PMU on the progress of closure of associated corrective actions.

Regulatory Reporting to Local Authority

Spill Incident/Accident Investigation Report

A Spill Incident/Accident Investigation Report shall be prepared by the Contractor immediately after each accidental release of hazardous materials/chemicals with a volume of more than 180 litres (equal to a standard drum size) and submit to Vinh Phuc DONRE. The report shall include the following information depending to the polluted objects, but not limited to:

- Description of incident/ accident;
- Incident/ accident investigation;
- Surface/Groundwater quality; and
- Soil Quality.

Occupational Accident Declaration Report

For accidents that result in a fatality, or serious or multiple injuries, the Contractor General Manager shall notify the Inspectorate of the Services of DoLISA of Danang Province, Police Department of Danang City and relevant Districts where project's subcomponents are undertaken using the fastest means (directly or by phone, fax, email).

For accidents happening to workers in traffic (except for accidents on internal routes belonging on the Project site) that cause death or seriously injure two persons or more, the Contractor General Manager shall use either the accident case file from the Traffic police department that handled the case, written confirmation from the local authorities, or written confirmation from the local Police Department at the locality where the accident happened to make a statement to the Inspectorate of the DoLISA of Danang Province and other relevant authorities in Districts.

As defined in Joint Circular 12/2012/TTLT-BTDTBXH-BYT, the content of an Occupational Accident Declaration Report shall include the following information:

- Description of the accident: time, place, summary; and
- Victim's information: name, date of birth, gender, position, health status.

i. Plan Review

Management reviews of this plan may be triggered in the event of significant control weaknesses being identified from drills, inspections, audits, as follow up to an incident, etc

5.3.2. Measures to prevent and respond the general environment incidents for the project items

5.3.2.1. Mitigation measures for works items of Component 1

Table 5-1: Mitigation measures for specific items of Component I

No.	Site specific impacts	Mitigation measures
Sub-component 1.1: Improvement of stormwater drainage		
1.1.1-1.1.5	**Expand the drainage system; improve sewers of Ong Ich Khiem road, Le Loi road, Hung Vuong road, Ly Thai To road, Hoang Dieu road, Phan Chu Trinh road, Tho Quang – Bien Dong;**	
	- Impacts on business activities of the traders on the pavements. - Temporary gathering of materials, dumping of solid waste on the pavements, roadways affect the beauty of the city and traffic of people. - An amount of 11.000m3 of sludge is produced in the sewers, causing pollution and smell.	- The Contractor carries out the partial construction method, speed up the project progress. The site is returned per phase of completed construction. - Place the waste bins in the construction site; place the construction warning signs, signs of restricted speed. - The Contractor collaborates with Da Nang Urban Environment Company to conduct dredging sewers during the construction. - Dredged sludge will be immediately transported to waste location to minimize affecting bad smell. - Sewage sludge is collected, transported by road and treated in Khanh Son landfill. Sewage sludge is collected directly from manhole by specialized trucks. Transporting progress ensures requirements of environment, avoiding leaking sludge. Trucks to transport sludge need to protected and not exceeding load as regulation. - Sludge is classified in Khanh Son landfill, then treated as follows: Spray probiotics (sprayed on the surface of the sludge); Use lime to sprinkle the surface of sewage sludge; After the dump is full of sludge, a class of sand with 20cm thick to avoid odors.
1.1.1	**- Construction of anti-flood pump station at the end of Ong Ich Khiem street**	
	- Depression risk: the construction base is laid on unharmonious average-grained sand layer; therefore, it might be inconvenient for construction, which might arise a phenomenon of quick-sand and slump… - Water contamination: the construction of	- Detailed design requires a hydrogeological survey to assess the ground strength of the expected construction area. - Establish construction rules, collect waste water and garbage in order not to dropping into water source.

No.	Site specific impacts	Mitigation measures
	project on sea beach increases an unavoidable seawater pollution. Level of pollution depends on construction method	
1.1.2	**Construction of the sewer from the lake of 29/3 Park to Le Do sewer**	
	- Cracks and damages of the underground works: water supply pipelines, electricity cables, communication cables or pipelines ... crossing or adjacent the pipeline; - Cracks and damages of the roadbed due to subsidence; cracks and damages of the houses near the deep excavations, the weak ground. - Causing traffic jams at the roundabout during rush hour.	- It is necessary to conduct a detailed survey on the structure to set up the mitigation measures (especially solutions and methods of construction) accordingly. - The clearance border line for the sewer construction should be designed to match the required construction/construction safety standards as well as the construction of pits as well as permanent plans. - Appoint staff to be in charge of controlling traffic when carry out the construction of crossing sewers. - Volume of sewage sludge from sewers is treated as the same with works at roads of Hung Vuong, Ly Thai To.
1.1.4 **1.1.5**	**- Restoration of Me Linh sewer** **- Improvement of Tho Quang – Bien Dong Sewer**	
	- Me Linh sewer is located in the lanes, the alleys in the residential areas, so it will affect the movement of people during the course of construction. - Bad smell under sewer cover can be harmful to the local residents - The narrow construction terrain will make it difficult during the construction process.	- Build the temporary walkways to meet the travel needs of people. - The construction unit arranges the time for construction and reasonable construction measures for not affecting the daily life and travel of people. The time of construction need to be informed prior to local people and label at construction site to follow easily. - Small volume of sewage sludge is collected by Urban Environmental Company of Danang city and treated at Khanh Son landfill, similar to sewage sludge for sewers of Hung Vuong, Ly Thai To..
Sub-component 1.2: Flood treatment in residential area		
1.2.1	**Flood treatment at groups 5, 6, 7 of Son Thuy commune**	
	- Local flood during construction, especially at Le Van Hieu road	- Avoid rainy season; apply concessive, quick construction method to avoid construction expansion. - Install temporary drainage system during construction, use pump machine to minimize flood where necessary.
Subproject 1.3: Construction waste water collection system		
1.3.1	**Creating landscape for outlets of My An and My Khe**	
	- Construction on subsidence- prone sand or collapse the building foundation	Implementation the geological survey drill to take reasonable construction methods to

No.	Site specific impacts	Mitigation measures
	- The risk of coastal water pollution caused by the temporary operation of construction machines and equipment. - Influence temporarily to recreation activities, entertainment of local people. - Waste water from outlets of My An, My Khe is not collected, then with storm water flows over beach causing environmental pollution, landscape.	avoid subsidence for works. - Establishing boundaries for construction area with scope of 200m range from construction location. - To clean the equipment / machinery. - Collection garbage and waste water so as not to affect service activities, affecting urban aesthetic manner.
1.3.2	**- Adjustment for construction waste water sewer system along Hoa Phu lake to Hoa Minh canal**	
	Impact is within ECOPs scope	- ECOPs
1.3.3	**Collection waste water for Pham Van Xoa road, Tho Quang industrial zone**	
	- It should take safety measures during construction to avoid cracking existing pipeline. - A volume of dredged sludge from this work item implementation, estimated to be approximately 340 m3. - Impact is within ECOPs scope.	- Detailed geological survey, topography to provide reasonable construction measures. - The amount of sludge from the sewage is treated similarly to rainwater collection works
Subproject 1.4: Waste water treatment stations		
1.4.1	**Improvement capacity of Hoa Xuan waste water treatment station from 20,000 m3 to 60,000 m3 / day night, using SBR technology.**	
	- khả năng gây tắc nghẽn đường ống cấp, thoát nước của các module đã hoạt động của TXLNT Hoà Xuân Risk of subsidence of surrounding works during the process of treatment tanks	- Collection materials, avoid putting materials areas near water sources. - Detailed design should include geological survey drilling of work in the region to take reasonable measures to subsidence control
1.4.2	**Adjustment capacity of Lien Chieu waste water treatment station remains 20,000 m3 / day night, and using SBR technology**	
	Impact is within ECOPs scope.	- ECOPs

Table 5-2: Measures to site specific impacts of Component 2

No.	Site specific impacts	Mitigation measures
2.1	**<u>Adjustment for construction location of Depot stattion at the area near airport area (2.1)</u>**	
	- Safety, traffic congestion due to transporting of building materials and construction activities surrounding residential site. - Dust arising during digging and ground leveling	- Arrange timing of transporting construction materials with reasonable time frame to avoid traffic congestion at rush hour. - Setting close fence to isolate construction site as well as preventing wind and dust and noise during the construction

No.	Site specific impacts	Mitigation measures
	<u>Construction Dien Bien Phu tunnel (2.1)</u>	
	Affect transportation of people; Risk of loss of traffic safety, traffic accidents caused by narrowing roadbed, traffic conflict during rush hours, the material is not - Affect sewer system under the pavement, roadbed - Affects some business households (due to limited visibility, dust, noise, difficulties for customers to move to). - The risk of subsidence of the surrounding buildings, households (in terms of geological processing, works topography does not ensure structural engineering). - The risk of local flooding during digging tunnel (due to heavy rain, high underground water level).	Contractors will appoint specialized staff in ensuring labor safety, traffic safety and engage in regulating traffic with police during project construction. - Arranging temporary drainage to limit the risk of local flooding. - Limit the use of equipments, heavy construction machinery regularly. - Perform geological survey drilling for work area to take reasonable construction measures - Arranging iron fence to isolate the construction area, limit dust emissions, dust to outside. - Arrange reasonable construction time and should inform surrounding farmers, paste in the construction area for convenience.

5.3.2.2. Mitigation measures for works under Component 3

Table 5-3: Mitigation measures for site specific impacts under Component 3

No.	Site specific impacts	Mitigation measures
3.1	Construction technical infrastructure at Hoa Khuong resettlement site	
	- Concentration labor workers for construction: Generating social evils, conflicts with local people. - A large amount of backfilling soil (approximately 400,000 m3)	- PMU, Contractor cooperates with local administration in Hoa Khuong commune for worker management, avoid having conflicts with communication or generating social evils during the process of construction - Encourage contractor to use local workers - Ensure close monitoring mechanism for used materials have to be exploited in licenced mines

5.4. MITIGATION MEASURES IN THE OPERATION PHASE OF THE PROJECT

Because of the various nature and size of items, operating procedures, there is a specifically negative impact at this stage. Thereof, the mitigation measures to the site specific impacts in per group of the works with the similar nature and size are shown in the following table:

Table 5-4: Mitigation measures of site specific impacts in the Operation phase

No.	Site specific impacts	Mitigation measures
Component 1: Stormwater and wastewater collection		
	<u>Stormwater and wastewater collection works (items 1.1, 1.2, 1.3)</u>	
	Smell from wastewater collection and treatment system	- Tightly cover the wastewater pipelines by building box culverts to limit bad smell. - Regularly clear off the streams to avoid the stagnation of wastewater in the areas of the works producing bad smell. - Workers of cleaning up and operating frequently collect sludge from manholes along the roads, the stormwater and wastewater pipelines to limit bad smell. - Thus, the natural solutions simply can solve the pollution problem of smell in fact. Each pumping station will be fitted with an exhaust pipe at 5 meters height to reduce the pollution of bad smell. - In the long term, should design the greed tree system surrounding the pumping stations, the outfalls, open channels... routes, preference for big trees (> 3m) with thick canopies.
	Sludge/sediment dredged from the drainage and sewerage system	- After being dredged, sludge/sediment with high organic component must be collected and treated in Khanh Son landfill to be able to dry and use as backfilling material. The Da Nang City Urban Environment Company is the unit in charge of dredging and treatment of the dredged sludge. - Because the current system is the general combined sewers, including stormwater and wastewater, the Urban Environment Company often collects and dredges generally, does not distinguish between these two types of sewers. This will be stipulated again for the dredging process of workers. The division list of stormwater sewers and sewers should be clearly defined. There are specific collection and treatment methods for per type of sludge - Sewage sludge is temporarily treated in the sludge treatment tanks of Khanh Son landfill.

No.	Site specific impacts	Mitigation measures
	Flooding during the operation of drainage and sewerage system	- Arrange workers to regularly check drainage and sewerage systems to promptly detect any damage to repair. - Clear flow before the rain and storms to limit congestion. - Arrange workers and equipment to keep watch in days having unusual conditions for timely handling the areas at risk of flooding. - Ensure provision of fund for regular maintenance of works system.
1.4	**<u>Hoa Xuan and Lien Chieu wastewater treatment plants (item 1.4)</u>**	
	Sludge and smell produced from the operation of Hoa Xuan and Lien Chieu WWTP (about 2.73 tons of dry sludge/day)	- Implement regular monitoring within treatment plant area and evaluate the operation effectiveness of smell treatment system or immediate inspection when receiving claims or informed by the local residents - Build green trees buffer zone (at plants' fence) with high and broad-foliage trees (beyond fence height) - Sludge is collected and treated at Khanh Son landfill. + At present, the collected sludge can be temporarily transported to Khanh Son landfill as well as periodically dredged sludge from sewerage system. + In the long term, the city has constructed a sludge treatment plant with area of 06 hectera, next to current Khanh Son landfill. Sludge from sewerage and domestic WWTPs, containing no heavy metals will be treated with compost technology to produce microorganism fertilizer.
	Risks and incidents during the operation of wastewater treatment systems - Wastewater quality after treatment does not meet discharge requirements - Wrong operation of WWTP - Dredged sludge is not transported to landfill or transported to wrong location as regulated - Pollution at downstream caused by the treatment plant, threatening the local residents' health and affecting their livehoods - Smell produced during treatment process	- Construction Contract of WWTPs requires a provision of providing a munual and competent training during operation and maintenance of the plant. - Ensure the plant's operation in compliance with operation manual, and operators are periodically trained during the plant's operation - Ensure that the munual is inclusive of an experiment mode of (i) discharge from the plant, (ii) sludge produced by the plant, and (iii) air and water quality of surrounding area of the plant. - Ensure the plant's detailed design consists of planting and means to separate the plant from surrounding area. - Ensure that the manual contains emergency discharge process, and that such process is

No.	Site specific impacts	Mitigation measures
		publicized and disclosed to the local people and competent authorities in such cases. - The manual requires a safety process of treatment of sludge produced by the plant, and such sludge will be transported and discharged at Khanh Son landfill
Component 2: Development of BRT Depot		
2.1	**Depot near airport area**	
	Wastewater from Depot	Domestic wastewater from Depot will be collected and treated before discharged to sewerage system of the city
	Imflammation risk at Depot	- Design a plan to prevent fire and explosion. - Operators are trained with firefighting safety - Depot is taken into operation only when fire system is verified and approved by Firefighting Police.
2.1	**Dien Bien Phu – Nguyen Tri Phuong intersection**	
	Local flood in Dien Bien Phu – Nguyen Tri Phuong underpass	- Regularly asssign staff to check the underpass in extreme weather conditions - Ensure availability of enforced power supply and pumping system, prevent flooding by heavy rain - Frequently clear sewerage to avoid obstacles.
Component 3: Strategic urban roads		
3.1	Hoa Phong resettlement area	- Wastewater will be treated in septic tank before discharged to sewerage system of the city - Design a consistent wastatwater collection system for households and area. - Arrange a temporary landfill, make contract with Urban Environment Company for daily collection and treatment.

CHAPTER 6. PROGRAM OF ENVIRONMENTAL MANAGEMENT AND MONITORING

Based on the assessment of potential negative impacts referred to as in Chapter 4 and the mitigation measures proposed in Chapter 5 above, this chapter will present Environmental Management Plan (EMP) for the works of the amended and supplemented items for the sustainable development project of Da Nang City (SCDP). EMP determines the actions to be implemented under the items in the environmental monitoring program and implementation organization, to ensure that the requirements in line with the Government's EIA regulations and the (WB) World Bank's safeguard policies, including instructions on Environment, Health, and Safety of the Group of World Banks.

6.1. PROPOSED MITIGATION MEASURES

The mitigation measures of the negative impacts of the phases of the project are divided into two basic parts: (1) The typical mitigation measures - ECOPs - for all construction activities of the project and (2) The specific mitigation measures for each works item.

- (1) ECOPs: the environment code of practices (ECOPs) in the urban construction outlined the typical effects at the low levels that can occur in a series of construction activities of the project. ECOPs also include mitigation measures to these impacts and a procedure to include the mitigation measures into the construction contracts of the contractor. In the detailed design phase of technical solutions for each contract, the technical design consultant will include specific parts of ECOPs into the contract matching with such contract, as well as specific measures determined in the Environmental Management Plan (EMP).
- (2) The individual/specific mitigation measures at per position of the project, but the mitigation measures are not included in the general ECOPs or these impacts happen at the level which requires other mitigation measures beyond range of ECOPs, will be described in more detail in the EMP.

The activities are done to minimize the negative impacts caused by land acquisition and resettlement presented separately (as in the resettlement plan) and they are also carried out and monitored separately.

6.1.1. General mitigation measures

Environment Code Of Practices (ECOPs)

As a part of the Environmental Assessment, Environmental Management Plan (EMP) is a unique safety tool which is often used in many projects. EMP contains information and instructions for the process of mitigating and managing of adverse environmental impacts during the project implementation.

ECOPs is a combination of mitigation measures for the general impacts arising from the activities of the project during construction and attached in the construction bidding documents as a obligatory requirement for the construction contractor. ECOP is not a safe tool officially recognized by the World Bank, but it is still used as a part of the Environmental Management Plan (EMP) for the usefulness and effectiveness to ensure the general impacts and typical activities from the project construction process minimized in an appropriate manner during the project implementation.

The main environmental and social impacts in the construction process of urban works:

The content of ECOPs is limited to construction activities on the small and medium construction impacts, with limited scope, the impact occurs temporarily and can be recovered and managed easily with good construction techniques. The environmental and social issues within this study include:

- *Dust*
- *Air pollution*
- *Impact of noise and vibration*
- *Water pollution*
- *Control of sludge and sewage*
- *Management of stockpiles, quarries, soil mining areas*
- *Solid waste management*
- *Management of dredged sludge*
- *Shuffling vegetation cover and ecological resources*
- *Traffic management*
- *Obstructing the utility services*
- *Rehabilitation of the affected areas*
- *Safe for communities and workers*
- *Contacts with the local community*
- *Opportunities of discovery of cultural, archaeological artifacts*

Table 6-1:Environment code of practices for urban projects (ECOPs)

Environmental and social issues	**Mitigation measures**	**Vietnam's regulations**
Generation of dust	The Contractor is responsible for compliance with the requirements corresponding to Vietnam's regulations on ambient air quality. The Contractor shall ensure that the generation of dust is minimal and it does not make people feel it is a discomfortable source. The Contractor shall perform dust management program to maintain a healthy work environment and minimize disturbance to the surrounding residential areas. The Contractor shall be responsible for implementing mitigation measures of dust (e.g using a water truck to water roads, cover the truck transporting materials ...). The material of transport must be covered reasonably and secured during transport to prevent the spillage of soil, sand and other materials or dust. Excess excavated soil and material stockpiles should be protected against the effects of wind and storage location of the material to be checked the prevailing wind direction and the location of sensitive sources.	QCVN 05:2013/BTNMT: National Technical Regulation on ambient air quality.

Environmental and social issues	**Mitigation measures**	**Vietnam's regulations**
Air pollution due to emitted air from construction vehicles	All means of transport must comply with Vietnam's regulations on control of permitted emission limits for the fumes. All means of transport in Vietnam must undergo an emission test on regular amount of emission and receive the certification as "Certificate of conformity of quality control, technical safety and protection environment" according to Decision No. 35/2005/QĐ-BGTVT; No burning of waste or materials on the Site.	- TCVN 6438-2005: Road transport. Maximum permissible limits of fumes. - Decision No 35/2005/QĐ-BGTVT: Regulation on quality control, safety engineering and environmental protection of motor vehicles imported into Vietnam. QCVN 05:2013/BTNMT: National Technical Regulation on Ambient Air Quality QCVN 06:2009/BTNMT: National technical regulation on hazardous substances in ambient air
Impacted by noise and vibration	The Contractor shall be responsible for compliance with the provisions of the law of Vietnam relating to noise and vibration issues. All means of transport must obtain "Certificate of quality control, technical safety and environmental protection," according to Decision No. 35/2005/QĐ-BGTVT; Prevent the noise emission exceeding standards from the machines which are rarely maintained. Where necessary, measures to minimize noise to acceptable levels must be done and can include parts of noise abatement, sound insulation or replacing the machines emitting noise in the areas required to protect and reduce noise.	QCVN 26: 2010 /BTNMT: National Technical Regulations on noise. QCVN 27: 2010/ BTNMT: Technical regulations on vibration.
Water Pollution	The Contractor shall be responsible for compliance with the laws of Vietnam related to the sources of wastewater discharged into water sources. Building or using mobile toilets for the workers at the construction site. Wastewater from toilets and wastewater from the kitchens, the bathrooms, the sinks must be discharged into	QCVN 09: 2008 /BTNMT: National Technical Regulation on groundwater

Environmental and social issues	Mitigation measures	Vietnam's regulations
	the storage tanks to transport from the site or discharge into the sewage system of the city; not discharge directly into water sources. Wastewater exceeds the allowed threshold under the standards /technical regulations of Vietnam should be collected in tanks, containers and taken out of the construction site by the licensed waste collection units.  Samples of mobile toilets Wastewater with the concentrations higher than permitted standards of Vietnam should be collected in tanks and transported and treated by the authorized units. Before construction, all wastewater discharge permits or wastewater treatment contracts should be made. When the construction works are finished, wastewater collection tanks and septic tanks will be filled up and sealed. Mobile toilets may be re-used for other projects.	quality; QCVN 14: 2008 /BTNMT: national technical standards for the quality of wastewater; QCVN 40: 2011 /BTNMT: National Technical Regulation on industrial wastewater; TCVN 7222: 2002: General requirements for the environment, for the local domestic wastewater treatment plants.
Management of drainage system and silt sediments	The Contractor shall comply with the detailed design of the drainage system shown in the building plan to prevent the local waterlogging or subsidence of pits and the unprotected soil areas due to stormwater resulting in an increase in turbidity affecting the local water resources. Ensure the drainage system always be free from sludge and other obstructions. The areas which are not affected by the construction activities must be maintained in its existing condition. Excavation and backfilling of the pits must be maintained reasonably, in accordance with the construction specifications, including measures such as the installation of sewers, using vegetable cover. To keep sand from being washed away by the flow affecting the water resources, should fit the siltation works in the necessary places to slow or redirect the flow for siltation until vegetation is formed. The amount of excavated soil shall be kept in along the road at the locations agreed in advance with the authorities and local residents and the contractor will make the plan of stopping construction, earthworks in the rainy season to avoid erosion,	TCVN 4447: 1987: Earthworks - Regulations for the construction and acceptance Circular No. 22/2010/TT-BXD on December 3rd, 2010 of the Ministry of Construction stipulating on occupational safety in construction works QCVN 08: 2008 /BTNMT - National Technical

Environmental and social issues	Mitigation measures	Vietnam's regulations
	pollution of water environment. In the case of construction during the rainy season, the contractors should take the appropriate construction methods to prevent local waterlogging as building the embankment, covering the excavated soil with canvas, making temporary stormwater ditches and pumping... to keep the construction area dry, limiting flood...	Regulation on surface water quality
Management of soil, stone mines...and material stockpiles	Soil, stone mines or material stockpiles with a large scale need specific mitigation measures outside the scope of ECOP. All used positions must be clearly identified in the approved construction techniques. The positions of material exploitation/reserve selected should avoid sensitive areas such as landscapes, natural habitats, the areas close to sensitive sources or areas near water sources. The open ditches should be built around the temporary storages to block the drainage line. When starting to exploit, the topsoil is stored and then used to restore the natural conditions as before when the exploitation ends. If necessary, the fencing wall should be built about the disposal are If a new area is required during the construction process, it should be approved by the civil engineers. If the owners of the areas used make the storage or mining areas affected, they are entitled to compensation under the resettlement plan of the project. If the road access is necessary, it should be determined the environmental assessment.	
Solid waste	Before construction, control procedures of solid waste (storage, supply of bins, clearance schedule, schedule of cleaning containers ...) must be prepared by the contractor and must be done carefully out in the construction activities. Before construction, all the necessary permits for waste disposal must be obtained. Measures will be taken to reduce the garbage generation by reusing waste. In all the workplaces, the contractor must provide trash bins, containers and waste collection equipment. Solid waste can be stored temporarily at the site in an area approved by the construction monitoring consultant and local authorities prior to collection and treatment through a authorized unit of solid waste disposal, namely URENCO. Waste bins must be sealed sharps container, weather conditions and collect invading organisms. No burning, burying or littering waste. The materials can be reused as sheets of wood and steel, scaffolding material... collected and sorted at the site from other waste sources for reuse, or for sale. If solid waste and debris are not transported out of the site, they will be treated at the locations identified and approved by the construction monitoring consultant and included in the	Decree No. 38/2015/NĐ-CP on the management of waste and scrap

Environmental and social issues	Mitigation measures	Vietnam's regulations
	management plan of solid waste. In all cases, the contractor must not dispose of any material in the zones of the sensitive environment, such as areas of natural habitat or water sources.	
Chemicals and hazardous waste	Waste chemicals in any form must be treated in the landfills approved and meet the request of the local authorities. The Contractor must obtain a required certificate of treatment. The removal of materials containing asbestos or other hazardous substances to be carried out and treated by the professional workers. Used oils and lubricants will be transported from the site and sold to a company with grease recycling function. Used oil, lubricants, cleaning materials from the maintenance of vehicles, machinery will be collected in tanks and transported from the site by the company with the function of hazardous waste disposal. Used oils or lubricants contain pollutants such as PCBs must be stored securely to prevent from leakage or affecting workers. Contact Danang Department for Natural Resources and Environment for guidance. The asphalt or bitumen products which are not used are returned to the supplier's factory. Timely notify to the relevant authorities on any accidents or spills of chemicals. Carry out the proper chemical storage and appropriate labeling. Communication and appropriate training programs should be implemented to equip workers to identify and prevent the chemical hazards in the workplace. Prepare and carry out a program of remedial action for any incident occurred. In this case, the contractor shall provide a report explaining the causes of chemical spills or accidents, remedial action taken, the consequences/losses from the incident, and the proposed remedies.	Decision No. 23/2006/QĐ-BTNMT: Issuing the list of hazardous waste Circular 36/2015/TT-BTNMT Regulation on Hazardous Waste Management
Sludge management	Dredging plan should be set up, including the schedule, the construction method to meet the requirements of traffic safety, public health and environmental hygiene. To ensure the dredging in line with the environmental regulations, the State appropriate authorities (local government, Department of Environment and Natural Resources, Public Service Company, CSC,...) must be involved and agree in the process of preparing and implementing the plan. The characteristics of the sediment/sludge should be determined by sampling and analysis if not fully evaluated during the environmental impact assessment. Heavily contaminated sludge demanding mitigation measures beyond the scope of ECOPs Ensure that the management plan of dredged materials along with environmental issues in determining the short and long term treatment alternatives, to consider the methods to reduce the dredging, and maximize the using dredged material.	Decision No. 23/2006/QĐ-BTNMT: Issuing list of hazardous waste Decree No. 38/2015/ND-CP on the management of waste and scrap

Environmental and social issues	Mitigation measures	Vietnam's regulations
	Dredging work should be carried out when water is rising. Lixiviate from dredged material is not allowed to discharge into the water source without being filtered or treated appropriately. Dredged material which is collected must be treated according to Vietnam's regulations on waste collection, security and transport, storage, treatment and management of environmental safety. The position of the sanitary landfill must meet the technical requirements, based on the potential level of pollution.	
Destroy vegetation cover and ecological resources	The contractor will prepare a management plan of site clearance, soil restoration and return of the site approved by the construction engineer, according to the relevant regulations. The clearance plan will be approved by the construction monitoring consultant and the contractor should strictly comply with. The area of clearance should be minimized as much as possible. The Contractor is responsible for removal of topsoil from all areas where topsoil will be affected by the rehabilitation activities, including temporary activities such as storage and stockpiling, etc., the removed topsoil must be stored in the areas approved by the construction monitoring consultant for use for the later site restoration and fully protected. Not allowed to use chemicals to release the vegetation. Cutting down any trees is strictly forbidden, unless it is authorized in the clearing plan of the vegetation. A temporary fence should be built to protect trees before starting any construction if any necessary. Must not affect the important potential zones like a natural resource of ecological resources. These zones may include breeding areas and feeding areas of birds or animals, spawning areas of fishes, or any other zones are protected as a green space. The Contractor shall ensure that there is no hunting, trapping, poisoning of animals.	Environmental Protection Law No. 55/2014/ QH13
Traffic Management	Before construction, should consulate with local authorities, communities and with the traffic police. Increasing the number of important automobile trips should be included in the construction plans approved earlier. Itinerary, especially heavy vehicles, to avoid traffic through sensitive areas such as schools, hospitals and supermarkets. Installation of lights at night should be done if it is necessary to ensure traffic safety Place the signs around the construction site to create favorable conditions for the circulation, provide instructions to the various components of the works, provide safety recommendations and warnings Use the traffic safety control methods, including signs for the roads/rivers/canals and the flags to warn the dangerous conditions.	Road Traffic Law No. 23/2008/QH12 Construction Law No. 50/2014 / QH13 Circular No. 22/2010/ TT-BXD on December 3rd, 2010 of the Ministry of construction stipulating on occupational safety in

Environmental and social issues	Mitigation measures	Vietnam's regulations
	Avoid transporting construction materials during peak hours. Walkway for pedestrians and vehicles in and out of the construction area should be separated safely and properly. The signboard must be installed appropriately for both waterways and roads if necessary.	construction works
Discontinuous provision of services	Planned and un-planned discontinuous provision of water, gas, electricity, internet service: The Contractor shall conduct consultations in advance and make the preventive planning with the local authorities about the consequences of the cessation of service or disconnection. Collaborate with suppliers of related utility services to set the reasonable construction schedule. Provide the affected families with the information of work schedules as well as plans to stop providing utility services (at least 5 days in advance). Should not interrupt the water supply to the agricultural zones. The Contractors shall ensure alternatives of water supply for the residents affected in the event of an interruption lasting more than one day. Any damage to existing utility system of cables will be reported to the authorities and repair as soon as possible.	Decree No. 73/2010/NĐ-CP stipulating on sanctioning of administrative violations in the field of security, order and social security
Rehabilitation of affected areas	The cleared areas such as un-used holes, treated zones, infrastructure of the construction site, campsite huts for workers, stockpile areas, and any temporary zones during the construction of the project will be recovered for the landscape, proper drainage and soil. The restoration of soil is done as soon as possible. The local suitable plant species are selected to grow and restore the natural terrain. The pits must be restored and planted with grass to prevent erosion; The landscape of all affected areas must be restored and the remedies should be implemented without delay, including the spacing of green trees, roads, bridges and other existing works. Trees are grown in the bare soil and on the steep slopes to prevent or reduce the risk of landslide and keep the slopes stable. Soil contaminated with chemicals or hazardous materials will be removed, then transported and buried in the landfill. Restore all the roads and bridges damaged by the activities of the project.	Environmental Protection Law No. 55/2014/ QH13

Environmental and social issues	**Mitigation measures**	**Vietnam's regulations**
Safety for workers and communities	The Contractor shall be responsible for meeting the requirements of the law of Vietnam on occupational safety. Prepare and implement action plans to deal with risks and emergencies Prepare the emergency services at the construction site Provide workers with regulations of occupational safety, occupational health Make sure that the ear plugs are provided and used by the workers to work with noisy machines such as generators, pile driving machines, mixing machines, etc., to control noise and protect workers. In the process of dismantling the existing infrastructure, workers and the public must be generally protected from falling debris by the measures such as using gutters, control of traffic and the restricted areas. Install the fences, barriers, warning signs / precaution signs around the construction area with potential risks to the community The contractor is responsible for providing safety measures such as installing fences, warning barriers, lighting systems to avoid traffic accidents as well as other risks to people in the sensitive areas. If previous evaluation results show that the construction area may remain unexploded bombs (UXO) the site clearance must be carried out by qualified personnel and in accordance with the approved detailed plan approved by the civil engineers.	Circular No. 22/2010/ TT-BXD on December 3rd, 2010 of the Ministry of Construction stipulating on occupational safety in construction works Directive No. 02/2008/ CT-BXD on correction and strengthening of the measures for occupational safety and health and environment of the construction units. TCVN 5308-91: Technical regulations for safety in construction Decision No. 96/2006/ QĐ-TTg on May 4th, 2006 by the Prime Minister on the management and implementation of the clearing bombs, mines and explosives.
Communicate to the community	Maintain relationships with the local governments and communities involved, the contractor must coordinate with the local government (commune, village leaders...) agree the construction plan at the areas near the sensitive places or at sensitive times (e.g, religious festivals). The copies in Vietnamese of ECOPs and other related environmental protection documents will be provided to the local communities and workers at the site. Reduce the playing space, lack of playgrounds and parking lots: loss amenities building process is often a unavoidable impacts caused inconvenience to the user in sensitive areas. However, the consultation with the affected people will be provided soon	Decree 73/2010/NĐ-CP stipulating on sanctioning of administrative violations in the field of security and order, social security

Environmental and social issues	Mitigation measures	Vietnam's regulations
	with the opportunity to research and implement alternative measures. Disseminate the project information to the affected groups (e.g local governments, enterprises and households affected ...) through community meetings before starting construction; Provide the community liaison channels there of the interested parties can get information about the construction site's activities, the project status and the project implementation results; Provide all the information, especially technical information, in a understandable language to the public generally and in a useful form to the concerns of the community and the local leaders through preparing brochures and press releases until the project's main information is known during the periods of project implementation; Monitor the concerns and required information of the Community; Answer the questions made on the phone and mail in writing a timely and accurate manner; Notify the local residents of the construction and working schedules, interruption of services, traffic detour routes and provisional bus routes, blasting and demolition, as appropriate; Provide the community with the technical documents and drawings, especially an outline of the construction area and the environmental management plan of the construction site; The Bulletin boards will be erected throughout the construction site to provide information about the project, as well as the information contacting the construction site managers, environmental staff, the medical staff and the safety staff as the telephone number and other contact information to any affected person to contact and notify their concerns and suggestions.	
Procedures for random discoveries	If the contractor discovers archaeological sites, historical monuments, remains and artifacts, including cemetery and / or individual graves during earthworks, construction, the contractor shall: Stop the construction activities in the discovered areas; Circle the position or area of discovery; Protect the position to prevent any damage or loss of the objects which can be moved. In the case of removable antiquities or sensitive remains, appoint a night guard until the local agency in charge of the protection of heritage or the Department of Culture - Information takes over; Notify the Construction monitoring consultant (Supervision consultant), Supervision consultant will inform the national or local agency in charge of the protection of heritage (within 24 hours or less); The national or local agency in charge of the protection of heritage will be responsible for the protection and preservation of the site before deciding on the next procedures. A preliminary assessment report on the detection process is	Cultural Heritage Act (2002) Law amending and supplementing some articles of the Cultural Heritage Act No. 28/2001/QH10 The Government's Decree No. 98/2010/ NĐ-CP on September 21st, 2010 detailing the implementation of some articles of the cultural

Environmental and social issues	Mitigation measures	Vietnam's regulations
	prepared. The meaning and importance of the discoveries are evaluated according to various criteria related to cultural heritage, including aesthetic values, history, science, research, social and economic value; The decision about how to handle the search is done by the local agency in charge of the protection of heritage. This can include changes in the layout (such as when discovering a monument which cannot be moved) conservation, preservation, restoration and recovery; If the position and / or cultural monument has a high value and the preservation of the position is recommended by experts and requirements of the local agency in charge of the protection of heritage, the project owner should change the design to adapt to the requirements and preserve these positions; The decisions relating to the management of the search will be notified in writing by the appropriate authority; The construction works can continue only after obtaining permission from the local agency in charge of the protection of heritage.	heritage act and law amending and supplementing some articles of the cultural heritage act.

6.1.2. Specific mitigation measures per position of the project

The following table presents the site specific impacts according to the specific positions and the mitigation measures which are not presented in full in the application of Environmental code of practices (ECOPs). This is due to the impact but it is not the typical kind and is not included in ECOPs (due to the severity of the impact beyond the mitigation measures in ECOPs, or simply due to the very specific nature of the necessary mitigation measures).

Table 6-2: EMP plan for site specific impact mitigation to the component 3 of the project

COMPONENT 1: IMPROVEMENT OF DRAINAGE AND SEWERAGE SYSTEMS **05 works of storm water drainage (item 1.1.1 -1.1.5)** **01 work of technical infrastructure at group 5,6,7 Son Thuy (1.2.1)** **03 works of water drainage (item 1.3.1 -1.3.3)** **02 works of waste water treatment systems (item 1.4.1, 1.4.2)**	
Pre-construction phase	
Impact	Implementation land acquisition of 1,9 ha at residential sire of group 5,6,7 Son Thuy (1.2)
Mitigation	Implementation compensation according to RP approved of the project
Responsibility	PMU
Funds	City
Monitoring	EMC
Construction phase	
1.1.1 -1.1.5	**Rehabilitation storm water drainage system: Improvement Ong Ich Khiem road; Le Loi; Hung Vuong road sewer; Ly Thai To road sewer; Hoang Dieu road; Phan Chu Trinh road sewer; Tho Quang- Bien Dong sewer**

Impact	- Impacts on business activities of the traders on the pavements. - Temporary gathering of materials, dumping of solid waste on the pavements, roadways affect the beauty of the city and traffic of people. - Generating 11,000 m3 of sewage sludge with odor from sewers
Mitigation	- The contractor applies the rapid rolling construction method; - Place the trash bins in the construction site, sets up the temporary walkways for the people, places the construction warning signs. -The Contractor collaborates with Da Nang Urban Environment Company to carry out dredging from sewers during the construction to minimize bad smell. - Sewage sludge is collected, transported by road and treated in Khanh Son landfill. Sewage sludge is collected directly from manhole by specialized trucks. Transporting progress ensures requirements of environment, avoiding leaking sludge. Trucks to transport sludge need to protected and not exceeding load as regulation. - Sludge is classified in Khanh Son landfill, then treated as follows: Spray probiotics (sprayed on the surface of the sludge); Use lime to sprinkle the surface of sewage sludge; After the dump is full of sludge, a class of sand with 20cm thick to avoid odors.
Implementation mechanism	The conditions of the contract, combined additional conditions ECOPs
Responsibilities	The Contractor, PMU coordinates with the urban environment company
Funds	Credit of International Development Association (IDA)
Monitoring	Supervision consultants
1.1.1	**Construction anti flood at the end of Ong Ich Khiem road**
Impact	The risk of subsidence: Geological work with heterogeneous sand embankment during construction, construction works has difficulties, easy to generate quicksand, leading to foundation subsidence .. - Water pollution: characteristics of construction works on the beach so the risk of seawater contamination is inevitable. Pollution level depends on construction methods
Minimization	Detailed design should include implementation with hydrogeological survey to assess the strength of expected ground construction area. - Establish rules of construction, wastewater collection and garbage to avoid spillage into coastal water.
Implementation mechanism	The conditions of the contract, combined additional conditions ECOPs
Responsibilities	The Contractor, detailed design consultant PMU coordinates with the urban environment company
Funds	Credit of International Development Association (IDA)
Monitoring	Monitoring consultant
1.1.2	**Construction sewers from park lake 29/3 to Le Do sewer**
Impacts	Cracks and damages of the underground works: water supply pipelines, electricity cables, communication cables or pipelines ... crossing or adjacent the pipeline; - Cracks and damages of the roadbed due to subsidence; Cracks and damages of the houses near the deep excavations, the weak ground.

	- Causing traffic jams at the roundabout during rush hour
Minimization	It is necessary to conduct a detailed survey on the structure to set up the mitigation measures (especially solutions and methods of construction) accordingly. - The clearance border line for the sewer construction should be designed to match the required construction/construction safety standards as well as the construction of pits as well as permanent plans. - Appoint staff to be in charge of controlling traffic when carry out the construction of crossing sewers. - Volume of sewage sludge from sewers is treated as the same with works at roads of Hung Vuong, Ly Thai To.
Implementation mechanism	The conditions of the contract, detailed design consultant, construction contractor combined additional conditions ECOPs
Responsibilities	The Contractor, detailed design consultant PMU coordinates with the urban environment company
Funds	Credit of International Development Association (IDA)
Monitoring	Monitoring consultant
1.1.4 **1.1.5**	**- Rehabilitation Me Linh sewer** **- Rehabilitatin Le Tan Trung sewer connectin with Tho Quang- Bien Dong sewer**
Impacts	-Me Linh sewer is located in the lanes, the alleys in the residential areas, so it will affect the movement of people during the course of construction. - Odor when opening sewer also affects to health of people near construction location - The narrow construction terrain will make it difficult during the construction process.
Minimization	- Build the temporary walkways to meet the travel needs of people. - The construction unit arrange the time for construction and reasonable construction measures for not affecting the daily life and travel of people. The time of construction need to be informed prior to local people and label at construction site to follow easily. - Small volume of sewage sludge is collected by Urban Environmental Company of Danang city and treated at Khanh Son landfill, similar to sewage sludge for sewers of Hung Vuong, Ly Thai To..
Implementation mechanism	The contract conditions with the contractor, combined with the additional conditions of ECOPs
Responsibilities	The Contractor, PMU coordinates with the urban environment company
Funds	Credit of International Development Association (IDA)
Monitoring	Supervision consultant
1.2.1	**Flood treatment at group 5,6,7 Son Thuy**
Impacts	-Local flood in the process of construction, especially at Le Van Hien road
Minimization	-Construction should avoid typhoon season, applying rolling construction method, quickly, avoid lasting construction period. - Installation temporary drainage system in the construction process, using the pump if necessary to pump rain water out of the flooded locations

Implementation mechanism	The contract conditions with the contractor, combined with the additional conditions of ECOPs
Responsibilities	The Contractor, PMU coordinates with the urban environment company
Funds	Credit of International Development Association (IDA)
Monitoring	Monitoring consultant
1.3.1	**Creating landscape for oulets of My An and My Khe**
Impacts	Construction on the sand ground which easily make the building foundation subsidence. - The risk of coastal water pollution - Temporary influence to the activities of amusement, bathing of people. - Waste water from basin of My An and My Khe outlets is not collected thoroughly, then overflows into the beach, causing environmental pollution, ecosystem landscape
Mitigation	- Conduct a geological survey to take appropriate construction measures, avoiding works subsidence. - Determine the boundaries of construction area as 200m from the construction location. - Clean up the equipment/ machinery - Collection waste water and garbage in order not to affect to service activities, causing loss aesthetic of urban landscape.
Implementation mechanism	The conditions of the contract with the contractor, combined with the additional conditions of ECOPs
Responsibilities	The Contractor, detailed design consultant PMU coordinates with the urban environment company
Funds	Credit of International Development Association (IDA)
Monitoring	Supervision consultants
1.3.2	**Adjustment construction for waste water sewer along canal from Hoa Phu lake to Hoa Minh canal**
Impacts	Impact is within ECOPs scope
Minimization	ECOPs
Implementation mechanism	The conditions of the contract with the contractor, combined with the additional conditions of ECOPs
Responsibilities	The Contractor, PMU
Funds	Credit of International Development Association (IDA)
Monitoring	Supervision consultants
1.3.3	**Collection waste water on Pham Van Xao roads, Tho Quang industrial zones**
Impact	Pay attention to safe measures in the process of works, avoiding cracking existing pipelines. For the process of construction, the volume of dredged sludge is estimated to be approximately 340m^3 Impact is within ECOPs scope.
Minimization	Conduct detailed geological survey, topography to provide reasonable

	construction measures. The amount of sludge from the sewage treatment works similar to rainwater harvesting
Implementation mechanism	Conditions of the contract, combined with the additional conditions of ECOPs
Responsibilities	Contractor/Detailed design consultant PMU coordinates with the urban environment company
Funds	Credit of International Development Association (IDA)
Monitoring	Supervision consultants
1.4.1	**Upgrading wastewater treatment capacity of Hoa Xuuan wastewater treatment plant from 20,000 m3 to 60,000m3 / day night, using SBR technology.**
Impact	- Ability to clog the pipe water supply and drainage of operatted module of Hoa Xuan waste water treatment plant - The risk of subsidence of surrounding buildings during the construction of treatment tanks.
Minimization	- Collect materials, avoid putting materials areas near water sources. - Detailed design should include drilling of geological survey work in the region to take reasonable measures to control subsidence.
Implementation mechanism	Conditions of the contract, Detailed design consultant, construction contractor combined with the additional conditions of ECOPs
Responsibilities	Contractor/Detailed design consultant PMU coordinates with the urban environment company
Fund	Credit of International Development Association (IDA)
Monitoring	Supervision consultants
1.4.2	**Consttruction Lien Chieu waste water treatment station with capacity of 20,000 m^3 / day night, and using SBR technology**
Impact	Impact is within ECOPs scope
Minimization	ECOPs
Implementation mechanism	Conditions of the contract, combined with the additional conditions of ECOPs
Responsibilities	Contractor
Fund	Credit of International Development Association (IDA)
Monitoring	Supervision consultants
Operational phase	
1.1, 1.2, 1.3	**Works of waste water and storm water collection**
Impacts	-Odor is generated from the wastewater collection system - Mud / sediment dredged from storm water and waste water drainage system - Flooding in the process of operating stormwater, waste water drainage system
Minimization	**<u>Odor</u>** - Cover drainage sewer lines by building box culverts to limit odor

	- Clear flow regularl ,avoiding stagnation of waste water in the project area, arising odors. - Operation workers frequently collect sludge from manholes along the roads, rain water drainage lines and sewage to limit odors. - Thus, simple natural evaporation solutions can solve odor pollution problem. Each pumping station will be fitted with an evaoration pipeline with height of 5 meters to reduce odor emissions. - In the long term, design systems of trees surrounding the pumping station, outlets, opening channels ... prioritties for large trees (> 3m) with thick leaves. **Sludge/ sediment** Mud / sediment after dredging has high organic component, must be collected and processed in Khanh Son landfill by the Danang city Urban Environment Company - the unit ttakes responsible for dredging and dredging sludge treatment. - Due to the current system with combined sewers, including stormwater and wastewater, urban environmental companies usually collect dredging, do not distinguish between these two types of sewers. This requires regulations for the process of dredging of workers. Lists of categorizing type of stormwater and waste water needs to be clearly defined. Each type of sludge has differen collection and treatment methods. -After being collected, sludge is landfilled hygienic in Khanh Son landfill. **Flood** - Regularly check workers to check waste water and stormwater drainage systems, in order to promptly find any damage to repair. - Clear flow in before the time of rain and storms to limit congestion. - Arrangement workers and equipment on duty in unusual conditions for timely handling areas which can potentially cause flooding - Ensure funding for regular maintenance and maintenance for works system
Implementation mechanism	Plan of the operation and maintenance of the city
Responsibilities	Detailed design consultant, City
Funds	City
Monitoring	Da Nang city
1.4	**Hoa Xuan and Lien Chieu waste water treatment system**
Impact	-Sludge and odor generating from activities of Hoa Xuan and Lien Chieu station (Approximately 2,17 tonnes dried sludge/ day) - Risks, incidents in the process of operation for 2 waste water treatment stations
Minimization	**Sludge and odor** - Implementation periodic monitoring programs at regional treatment plant as well as evaluating operational efficiency for odor processing system or unusual monitoring odor in he case of reflection / complaints of local people - Establish trees buffer zone(adiacent to fence of factory) with types of high trees, wide capony (exceeding fence's height) - Sludge is collected and processed in Khanh Son landfill. + Currently, this sludge may be temporarily buried in Khanh Son landfill as

	the same with sludge collected from the periodic dredging process of waste water sewer system. + In the long term, the city has planned to build a sludge treatment zone with width of 06ha, adjacen current Khanh Son landfill. Sludge from sewer system and domestic waste water treatment stations is not contaminated by heavy metal and will be handled by compost technologies, microbiological fertilizer production. **<u>Risks and incidents in the process of operation</u>** -Make sure that construction contract for construction of wastewater treatment plants must include provisions on providing supply operation instruction manuals and training of operators staff for operation and maintenance of wastewater treatment plant. -Ensure that the station must be operated strictly in compliance with operation insttruction Handbook, and staff must be trained periodically during the operation time of station. -Ensure that the operating manuals included an experimental mode of (i) discharge from the treatment plant, (ii) sludge generated from the station, and (iii) environmental quality of air and water in adjacentt areas, next to wastewater treatment plant - Ensure that operating instruction manual for must have emergency discharge procedures in the case of incident for station, and information on this procedure must be provided to local peole in downstream area of wastewater treatment stations and to units of city with management functions such emergency situations -Ensure that operating instructions manual should include a secure process to handle sludge generated from treatment station, this process must include transporting and disposal at Khanh Son sanitary landfills
Implementation mechanism	Operation and management plan of the city
Responsibilities	Operation unit for waste water treatment station, detailed design consultant
Fund	Da Nang city
Monitoring	Da Nang city
COMPONENT 2: PILOT BUS RAPID TRANSIT (BRT) PILOT **-Construction Depot at BRT station at airport area** **-Tunnel at interchange of Dien Bien Phu- Nguyen Tri Phuong**	
Pre- construction phase	
Impacts	Land acquisition and resettlement at Depot construction location near the airport of 1.1 hectares
Minimization	Implement compensation according to approved RP of the project
Implementation mechanism	Resettlement Plan (RP) was approved
Responsibilities	PMU
Funds	Da Nang city
Monitoring	Independent monitoring consultant

Construction Phase	
2.1	**Bus transit station near the airport area**
Impacts	Traffic safety, traffic jam due to the process of transporting construction materials and surrounding construction activities Dust generated in the process of excavation and ground leveling
Minimization	The timing of construction materials transported in a reasonable time frame to avoid rush hour traffic jams caused. Install close fence to isolate construction site as well as preventt wind, dust and vibration during the process of construction.
Implementation mechanism	The conditions of the contract combined with additional conditions of ECOPs
Responsibilities	Contractor/PMU coordinates with the urban environment company
Funds	Credit of IDA
Monitoring	Supervision Consultant
2.1	**Construction Dien Bien Phu tunnel**
Impact	Affect transportation of people; Risk of loss of traffic safety, traffic accidents caused by narrowing roadbed, traffic conflict during rush hours, the material is not - Affect sewer system under the pavement, roadbed - Affects some business households (due to limited visibility, dust, noise, difficulties for customers to move to). - The risk of subsidence of the surrounding buildings, households (in terms of geological processing, works topography does not ensure structural engineering). - The risk of local flooding during digging tunnel (due to heavy rain, high underground water level).
Minimization	Perform geological survey drilling for work area to take reasonable construction measures Contractors will appoint specialized staff in ensuring labor safety, traffic safety and engage in regulating traffic with police during project construction. - Arranging temporary drainage to limit the risk of local flooding. - Limit the use of equipments, heavy construction machinery regularly. - Arranging iron fence to isolate the construction area, limit dust emissions, dust to outside. - Arrange reasonable construction time and should inform surrounding farmers, paste in the construction area for convenience. Wastewater collection system is designed to synchronize with airport Depot infrastructure in order to collection domesyic waste water before flowing into combined sewer system of the city. Propaganda, raise awareness of environmental sanitation for operational staff and passengers at the transit station.
Implementation mechanism	The contract conditions with detailed design consultant and construction contractor, combined with the additional conditions of ECOPs
Responsibilities	Contractor, detailed design consultant, PMU coordinates with the urban environment company
Funds	Credit of International Development Association (IDA)

Monitoring	Monitoring consultantt
Operational phase	
2.1	**Bus transit station near airport area**
Impact	-Waste from Depot station - Risk of fire and explosives at Depot station
Minimization	Waste water Domestic wastewater of operators workers and passengers will be collected and treated before being discharged into general sewer system of the city. Risks of fire and explosives Developmentt plan to cope with fire incidents. Training operation workers on safety for fire prevention. Depot station comes into operation only after the fire protection system shall be evaluated and approved by fire prevention police.
Implementation mechanism	Operation and management plan of the city
Responsibilities	Management and operation unit of station under Department of Transport of the city
Funds	Da Nang city
Monitoring	Da Nang city
2.1	**Tunnel at interchange of Dien Bien Phu- Nguyen Tri Phuong**
Impacts	Local floof at Intersection Dien Bien Phu - Nguyen Tri Phuong
Minimization	The Contractor shall send its staff in charge of checking tunnel at the time of bad weather. Ensure forced electrical system and pump system is always in the best condition, to prevent phenomenon of heavy rain causing flooding. Clear flow regularly to minimize blocked flow of waste water..
Implementation mechanism	Operation and management plan of the city
Responsibilities	Management and operation unit of station under Department of Transport of the city
Funds	Da Nang city
Monitoring	Da Nang city
COMPONENT 3: STRATEGIC URBAN TRAFFIC ROADS **Construction technical infrastructure for Hoa Khuong resettlemen site**	
Pre-construction phase	
Impacts	Land acquisition and resettlement at Hoa Khuong resettlement site about 8,4 hectares
Minimization	Implementation compensation in compliance approved resettlement plan (RP) of the project
Implementation mechanism	Resettlement plan was approved

Responsibilities	PMU
Funds	City
Monitoring	External monitoring consultants
Construction Phase	
Impacts	Crowding workforce for the construction: cause social ills, conflicts with local residents. A large amount of excavated and filled soil(approximately 400 m^3)
Minimization	-PMU, Contractor will coordinate with the government of Hoa Khuong commune to control workers to ensure that officers and employees do not cause conflicts with the community or cause social problems during the construction progress. -Encourage the contractor to use local workers -Ensure close monitoring mechanism for used materials have to be exploited at mines which was licenced.
Implementation mechanism	The conditions of the contracts with the contractor, the technical standards, combined with the terms of ECOPs
Responsibilities	Contractor
Funds	Credit of IDA
Monitoring	Supervision Consultant/Project Manager
Operating phase	
Impacts	Impacts by domestic waste and wastewater of households living in resettlement areas
Minimization	- Waste water will be pre-treated by septic tank before discharging into general drainage system of the region. -Design synchronous wastewater collection system from households to the common drainage system of the area. -Design sytemporary domestic waste storage area for daily collection and treatment
Implementation mechanism	Operation and management plan of Da Nang City
Responsibilities	Detailed design consultant, Operation unit, Da Nang City
Funds	Da Nang City
Monitoring	Da Nang City

6.1.3. Management of the impacts on physical cultural resources

About 04 graves will be relocated to serve for the project. The relocation of these graves has been mentioned in RP.

During the construction phase, the specific procedures should be applied in the case discovering the archaeological objects. Figure 6-1below describes the steps to take. The PMU will be responsible for overall coordination and reporting. The search process will be mentioned in all construction contracts and the employees in charge and the contractors will be trained how to perform this procedure

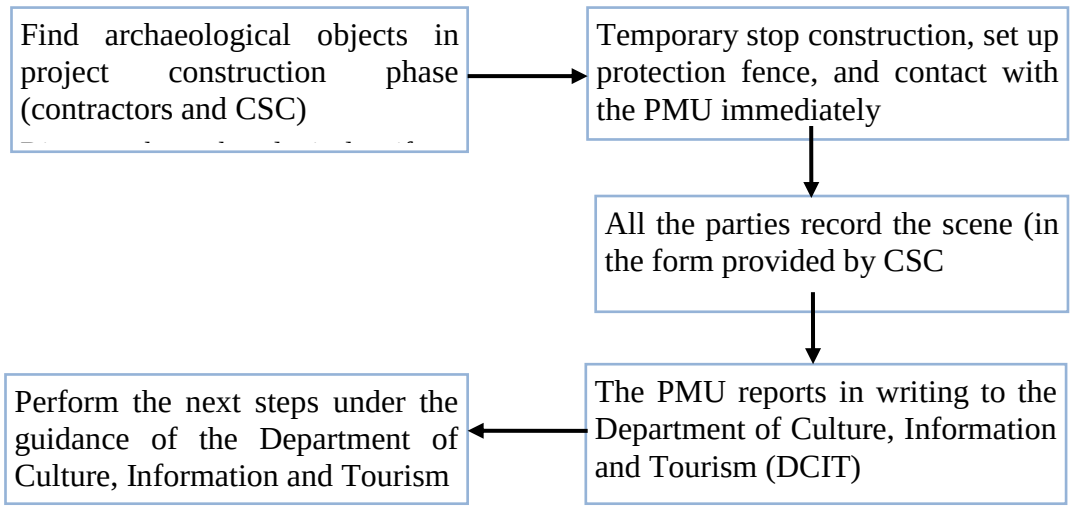


Figure 6-1: Procedures of finding by accident in case archaeologists found relic during project construction

6.2. ENVIRONMENTAL MONITORING PROGRAM

With the impact of adjustment, supplementary items of SCDP the project in the phases of pre-construction, construction and operation mentioned above, adjustment, supplementary items require an environmental monitoring program in order that the mitigation measures are performed most seriously by related units.

It is necessary to make the design of the program and the frequency of monitoring to be able to indicate the general operation of the project as well as the short-term impacts in the peak construction activities. More specifically, it is an important and indispensable part in the environmental management program.

Purposes:

- To determine the actual scale of the impacts.
- To control impacts arisen during the construction of the project mentioned in the report of EMP; Check the pollution standards outlined for the project during construction.
- To check and supervise the enforcement of environmental protection measures during the construction phase on the basis of the report of EMP appraised.
- To make the additional recommendations to strengthen mitigation measures when the impacts arising or not be predicted.
- To recommend to the project owner, to be in collaboration with the central and local environmental organizations to resolve the outstanding issues related to environmental protection under the responsibility of the project.
- To evaluate the effectiveness of mitigation measures in the phases of pre-construction, construction and operation of the project.

Contents of environmental monitoring will be carried out during the construction and operation of three levels:

- Monitoring the level of compliance of mitigation measures;
- Monitoring the popularization to the community;
- Monitoring the environmental parameters;

Details of the monitoring programs will be presented in the following sections:

6.2.1. Monitoring the compliance levels of mitigation measures of the impacts

The monitoring duties of the contractor, construction monitoring consultant (CMC), EMC will be specified in their terms of reference and contract documents will be approved by the World Bank. Construction monitoring consultant (CMC) is responsible for submitting monthly reports on environmental issues, actions and monitoring results updated. Basing on the monthly reports and the field monitoring tests, EMC shall prepare and submit semi-annual reports to SLUDGEP to summarize the environmental issues and mitigation measures applied. Monthly reports will include:

- List of priorities identified in the last month monitoring report.
- The measures are done by the contractor to solve the arisen problems.
- The appropriately unresolved problems and suggestion of handling measures and explanation of the force majeure cases.

An independent environmental monitoring consultant will provide technical assistance and necessary guidance to PPMU and CMC to support their role in monitoring of mitigation measures and the related reports.

6.2.2. Community-based monitoring

The Community will monitor under the project progress to ensure that the Contractor's construction does not violate the regulations on environment, sociality, the principles of the environmental safety as well as to minimize the risks to property, people's health and reduce environmental destruction. By making the information, the community will help assessment of the mitigation measures as well as concerning about the aspirations of the people, contributing to an environmental management mechanisms heartily.

The community-based monitoring forms a spirit of voluntary report and mentions the urgent problems. When there is damage to the environment, the community and local authorities will report to the parties concerned.

6.2.3. Environmental quality monitoring

Environmental monitoring program is carried out in 3 phases of the project: pre-construction phase (background environment); construction phase (three years); operational phase (1 year after the project firstly comes into operation).

In the preparatory phase of construction, the consulting unit should be in collaboration with the Meteorological Station of Mid-Central Region to perform monitoring, sampling environmental monitoring of air quality, surface water, soil and aqua-organisms to assess the current state of environmental components in the project area.

During the construction phase, the impacts on the natural environment and society of the construction of the works items taking place mainly in this period. Therefore, the project owner will implement the monitoring programs such as the table below.

During the operational phase, the majority of the negative impacts disappear, and the positive impacts appear. The negative impacts gradually become more stable, therefore some work items are not required to take the environmental monitoring.

The table below is an overview of the environmental monitoring program of the project in the construction phase and operational phase of the project:

Table 6-3: Contents of environmental monitoring during the project phases

No.	Items	Pre-construction phase	Construction Phase	Operational phase
I	**Environmental monitoring of air and noise/vibration**			
	1. Parameter	- Leq noise level; TSP suspended dust; Respiratory particulate matter (PM10); SO2; CO; NOx	- Leq noise level; TSP suspended dust; Respiratory particulate matter (PM10); SO2; CO; NOx	- Leq noise level; TSP suspended dust; Respiratory particulate matter (PM10); SO2; CO; NOx
	2. Frequency	once before construction	Every 6 months	Every 6 months

No.	Items	Pre-construction phase	Construction Phase	Operational phase
	3. Applied standards	QCVN 05:2013/BTNMT, QCVN 06:2009/BTNMT; QCVN 26:2010/BTNMT; QCVN 27:2010/BTNMT		
	4. Monitoring locations		10 samples	4 samples
II	**Soil quality monitoring**			
	1. Specifications	pH, As, Cd, Cu, Pb, Zn	As, Cd, Cu, Pb, Zn	
	2. Frequency	once before construction	Every 6 months	no monitoring
	3. Applied standards	QCVN 03:2008/BTNMT		
	4. Monitoring Locations		5 samples	-
III	**Surface Water Quality Monitoring**			
	1. Specifications	pH, TSS, DO, BOD5, COD, NH4, NO3, PO4, total fat, Coliform...	pH, TSS, DO, BOD5, COD, NH4, NO3, PO4, total fat, Coliform...	pH, TSS, DO, BOD5, COD, NH4, NO3, PO4, total fat, Coliform ...
	2. Frequency	once before construction	Every 6 months	Every 6 months
	3. Applied standards	QCVN 08:2008-BTNMT		
	4. Monitoring Locations		5 samples	2 samples
IV	**Monitoring of wastewater components**			
	1. Specifications	pH, BOD, TSS, TDS, H2S, amoni, Nitrat, animal fat and vegetable oil, phosphorus, coliform	pH, BOD, TSS, TDS, H2S, amoni, Nitrat, animal fat and vegetable oil, phosphorus, coliform	
	2. Frequency	once before construction	Every 3 months	no monitoring
	3. Applied standards	QCVN 14:2008/BTNMT		
	4. Monitoring Locations		5 samples	-

To ensure objective, scientific aspects, to accurately reflect the impacts of the implementation of the project (both positive and negative aspects), the monitoring programs will have to be adjusted from time to time in line with the actual construction and the project progress. Monitoring locations will be set up on the basis of reference to the map of monitoring

locations set in the preparation process of the EMP report. Where the project is started within 1 year (as of the approval of the EMP report) the monitoring data can be used directly as data mentioned initially

Table 6-4: Estimated Costs for environmental monitoring

(Exchange rate: USD 1 = VND 22,450)

No.	Contents of monitoring	Frequency	Number of samples	Total sample	Unit price (VND)	Amount (VND)	Amount (USD)
I	***Construction phase (3 years)***						
	Frequency: Every 3 months: 12 times during the construction phase						
	Frequency: Every 6 months: 6 times during the construction phase						
1	Air quality, noise and vibration	Every 6 months	10	60	2,140,000	128,400,000	5,719
2	Soil	Every 6 months	5	30	3,640,000	109,200,000	4,864
3	Surface water	Every 6 months	5	30	3,735,000	112,050,000	4,991
4	Wastewater	Every 6 months	5	30	4,060,000	121,800,000	5,425
	Sum up I					471,450,000	21,000
II	***Operational phase (1 year)***						
	Frequency: 6 months/time: twice in the operational phase						
1	Air quality, noise and vibration	Every 6 months	4	8	2,140,000	17,120,000	763
2	Surface water	Every 6 months	2	4	3,735,000	14,940,000	665
	Sum up II					32,060,000	1,428
	Sum up I + II					**503,510,000**	**22,428**

6.2.4. Monitoring of the implementation of the dredging material management plan (DMMP)

To ensure that the activities of dredging, transport and disposal will not cause negative impacts on residents and the local environment, a guide for preparation and monitor of the dredging management plan is presented in the box below. Accordingly, the detailed design will include a basic test program and develop DMMP reflecting the instructions below in a proper manner.

❖ *Guides of preparation and management of DMMP*

The main social and environmental issues related to the dredged materials contaminated include: (a) Pollution in the process of transporting the dredged material from the dredging area to the dump area; (b) The increase in turbidity and water pollution in the lake and channels in the dredging process (c) generation of bad smell and other disturbance to the

residents; (d) The dredged material contaminated infrastructure may be misused for families and public infrastructure. To assist in the preparation of DMMP by the activities carried out in the urban area or the current water bodies can also be used by other using objects, the following issues should be considered:

- Sediment quality evaluation: this evaluation to determine whether the sediments contain a large amount of hazardous materials to the environment as heavy metals and other toxins or not. If these substances are found higher than the allowed threshold in the national environmental standards, a special disposal plan will be prepared with a monitoring plan. Disposal plan will also set up for the program to ensure the local communities not using dredged material for building houses or gardens. The sludge and bottom sediments will be sampled for analysis of major pollution indicators. The sampling and analysis must conform to the governmental regulations meanwhile the sampling locations depend on the risk level for each specific location.
- Identify the land available for disposal of dredged material. The plan should also identify suitable dump sites for dredged material in line with the risk level associated with them. The public land zones, land for construction of rural roads, public buildings, private land ... can be used with the consent of the affected households. If the risk level from dredged sludge is high, this sludge must be dumped at Nghi Phu landfill which is operating.
- Prepare for the plan of dredging and transport of dredged material//sludge. The process of dredging and sludge transportation plan should outline: (a) the dredging methods (using pipelines, pumping before digging ...) and dump sludge at the disposal area or onto the trucks or to a temporary disposal area. If the trucks are used, the way of transport from the dredging site to the disposal area should be specified, (b) the time of dredging, (c) the transport vehicles and the proposed measures to reduce the leakage of dredged material from the means of transport, (d) the contractor's responsibility is to clean up the roads and implement remedial measures results if necessary, and (e) communication plan to the neighboring communities including contacting phone number in case of complaints
- Temporary storage of unpolluted sludge and sediment so the dredged material will be first in slush state with soil particles suspended in 24-48 hours, all water comes out of the sludge temporary storage yard will be directed into the sewers and discharged back into the channels/lakes. For highly contaminated sites, the smelling organic substances, dredged material must be transported in sealed containers out of the construction site as quickly as possible. For less contaminated bottom sludge, organic substances, dredged sludge will be transported to the properly designed storage areas in terms of location and size. A monitoring program for disposal of contaminated dredged material will also be prepared.
- Identify areas/major objects (such as business establishments, schools, public services, etc.) which are sensitive to dredging operations and transport. DMDP will make a general analysis of business operations affected locally, access to water and affected traffic situation (caused by dredging), and provide a plan to mitigate/compensate for the consequences of the obstructions. The plan must also include all possible measures to minimize the impacts on traffic, the local water supply.
- Identify the main objects using other water sources. Dredged lakes can be used by other objects, so dredging activities can affect them. It is necessary to prepare a monitoring plan of water quality with specific stations and possible parameters to monitor potential impacts on users. Priority is monitoring sensitive areas with the change of water quality (high suspended solids, low pH, high BOD and COD, high salt ...) especially in the places where water is used for domestic and agricultural activities. In areas where

dredging activities can cause negative impacts on water users, the project owner must inform and consult the water users and implement actions to address their concerns including implementation of water quality monitoring in DMMP.

6.3. ROLES AND RESPNSIBILITIES OF RELATED PARTIES

Environmental management work requires the participation of organizations and related parties, with various roles and responsibilities to minimize the negative impacts during the project implementation. The main related parties include the project management unit (PMU), the Department in charge of the environment of the PMU, the Environmental Supervision Engineer Supervision of Construction Monitoring Consultant (CMC), the independent environmental monitoring consultants (EMC) and the contractor. The relationship between the parties involved in the environmental management of the project is shown in the below chart:

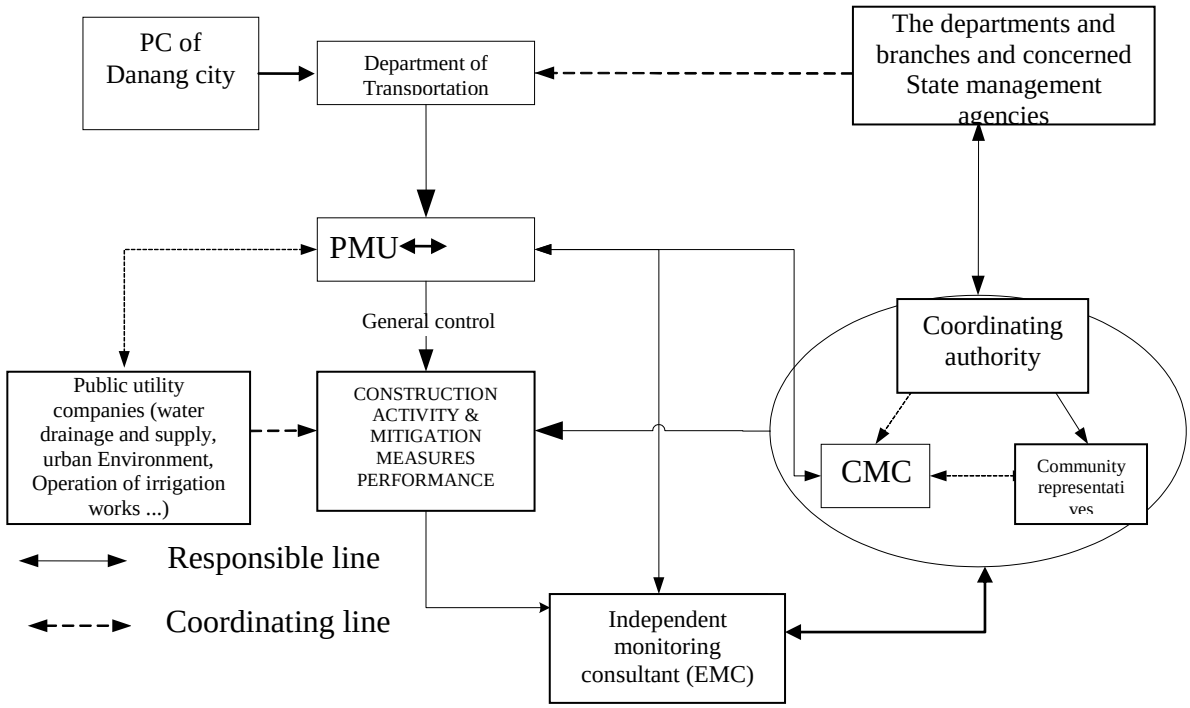


Figure 6-2: Environmental Management System in the construction phase

Roles and responsibilities of related parties in the environmental monitoring system are specified below:

Table 6-5: Roles and responsibilities of related parties in environmental management

No.	Agency/Unit	Responsibilities
1	SCDP Project Management Unit	Project Management Unit (PMU) will be an organization to carry out the daily monitoring and management, including looking for, contracting on behalf of the Department of Transportation. The PMU will be responsible for the financing of activities related to the environment of the project throughout the construction phase and operational phase. The PMU will coordinate closely with the local government to promote community involvement in the preparation and implementation phase of the project. The PMU is responsible for

No.	Agency/Unit	Responsibilities
		reporting on the implementation of environmental management to the World Bank and the Department of Natural Resources and Environment. To achieve high efficiency in the implementation process, the PMU will layout a system in charge of the project's environmental management issues, set in the diagram named EM - PMU.
2	Environmental Management Division (EMD) of PMU	As a semi-responsible division on EM is internally set up in the PMU, headed by a Deputy Director, and some semi-responsible staff of the various departments. This division will be responsible for monitoring the compliance with environmental safety policies of the World Bank in all phases of the project process, which applies to all items of the project: tendering, signing construction contracts, consulting contracts, document reviews of the report and checking the abnormalities in the site, coordinating divisions, troubleshooting... relating to environmental management activities. This division will provide the PMU leaders with professional ideas on environmental issues to ensure the project implementation process to meet the requirements of the environmental safety policies of World Bank.
3	Construction monitoring consultant (CMC)	Construction monitoring consultant will be responsible for the supervision and monitoring of construction activities and ensure the Contractor to perform the requirements of the contract and the EMP. This unit will arrange a sufficient number of qualified staff (such as Environmental Engineer) with sufficient knowledge in the field of environmental protection and the construction of the project management to implement the required duties and to monitor the activities of the Contractor. The terms of reference for CMC will be clearly defined in the contract signed between CMC and PMU.
4	Contractor	On the basis of the environmental management plan approved, the Contractor shall be responsible for making the environmental management plan for each area of the construction site, submit, receive comments from related parties, complete for an approval and strictly comply with the plan. Besides, the construction activities will require full documents for licensing procedures (traffic control and zoning, road excavation, occupational safety, permits for waste dumps etc.) in accordance with current regulations. The Contractor will be required to assign the qualified individuals to act as Safety and Environment Officers (SEO) on the site, be responsible for monitoring contractors' compliance with the requirements of the EMP and the environmental technical parameters. Environmental management plan at the site (approved) and the relevant licenses will be a basis for the management and supervision latter.

No.	Agency/Unit	Responsibilities
5	Local authorities and affected communities	The local government with a role of administrative management in the locality will be responsible for assignment of managing/monitoring staff of the project activities, to ensure the highest safety during the project execution. The Local authorities will organize and facilitate to promote the democratic regulations, monitor people via organization of a community monitoring team, set up a mechanism to track the report of the mitigation measures of environmental impacts, occupational safety, occupational health and related issues. Activities of the group representing the community and the local government will receive professional supports from the consulting units of the PMU.
6	Externa; environmental monitoring consultant (EMC)	EMC is a unit with qualification and much experience in environmental management. EMC, within the contract, will support the PMU establishing and operating the environmental management system, to make recommendations to adjust, improve capacity for related parties in the process of implementing and monitoring the implementation of environmental management at the site during the contractor's construction, as well as in the Operational phase of the initial pilot. EMC will also be responsible for assisting the PMU to set up the monitoring reports of the implementation of EMP to submit to the Department of Natural Resources and Environment for approval. EMC with knowledge and experience in environmental monitoring and auditing will give out the professional, objective and independent guidance in the activities related to the project's environment. To mitigate conflicts of interests, EMC will not coincide with the implementation organization of EMP, not under the Department of Transportation, PMU, EMD, or CMC.
7	Department of Natural Resources and Environment (DONRE)	Playing the State management role of environment, DONRE will be responsible for receiving and verifying the environmental monitoring reports submitted by the PMU. When there are arising problems, DONRE will participate directly in the research and treatment of related issues, minimize the damages arising from the project implementation process.
8	Department of Transportation	To coordinate with the Department of Natural Resources and Environment, to check regularly for the contractor's activities in accordance with the current regulations. Especially, focusing on the following issues: barriers of the signs as prescribed, cleaning up outside the fence, road excavation, circulation of vehicles/facilities for construction etc.
9	Environmental Police Department of Da Nang City	In collaboration with relevant departments, be responsible for monitoring, controlling and handling of violations of environmental law. In particular, the agency will be responsible for dealing with cases of serious violations, conduct the investigation and prosecution against related parties as well as to

No.	Agency/Unit	Responsibilities
		participate in solving the serious environmental incidents.
10	Public utility companies (electricity, water supply, drainage, post and telecommunications)	Coordinate with the PMU and the Contractor to perform the relocation of underground works, temporary connections at the locations of the proposed crossing routes to ensure a continuous providing process of basic services for people's life. Join in handling relevant issues (fire and explosion of power cables, broken telecommunication cables, cracked water pipes etc.)

6.4. CONPLIANCE FRAMEWORK

A framework of compliance programs based on requirements of the Environment has been established in the EMP and environmental specifications included in the bidding documents (it will be closely monitored by CMC latter). The violations of large or small scale will be determined according to the following list:

Table 6-6: Level of sanctions and troubleshooting

Type of violation	Definition	Environmental treatment
Small-scale violations	Incidents causing temporarily damage, but causing reverse consequences on the environment, people and community assets.	Cleanup activities of small scale Adjust/exclude in practice the construction process EMP Compliance
Important/large-scale violations	Incidents have long-term impact or do not cause reverse impacts on the environment, people and community assets.	Cleanup activities of small large The recovery measures require major technological requirements. The large recovery measures for community assets. Compensation for the affected community or individuals.

For the incident causes temporary damages, but causes reverse consequences, the contractor will be offered a reasonable time period to process and restore the environment. If the recovery is made completely within the foregoing time period, other activities won't be necessary to refer to. If the recovery activities are not completed within this time, the PMU will promptly arrange another contractor to carry out the work and deduct the costs from the violating contractor to pay for this contractor. For trouble with the long-term impact otherwise reverse impact, mechanisms of financial sanctions will be added to the costs for recovery activities. To minimize these problems, the recovery activities will be carried out without delay.

Compliance framework will apply the following criteria:

- CMC will determine or be informed of 1 violation (community members, local government)

- CMC will consult the related parties in the evaluation of certain violations in major or minor levels.
- For the violation level on small scale:
- CMC will set up the required mitigation measures and a maximum period of 5 days to handle the situation.
- CMC will review the recommendations and confirm (i) the violation level (major/minor); (Ii) the mitigation measures; and (iii) time for troubleshooting. If the chief consultant does not approve of such behaviors, they will work with the PMU to reach a general consensus on both parties.
- The contractor will be informed of the violation, the mitigation measures are required and time for troubleshooting.
- The contractor will strictly handle the compliance violations under the recommendations in the period agreed.
- CMC will confirm the violations handled satisfactorily in the fixed period and respond to the local government/community.

If the violation is not handled satisfactorily in the fixed period before, the PMU will promptly arrange another contractor to undertake the necessary work and the costs will be deducted from the next payment to the violating contractor.

For major level of violations:

- CMC will immediately inform the PMU on this issue.
- PMU will inform the respective local authorities if any violations (the Contractor) at that location.
- PMU will consult the CMC and the respective local authorities to agree on mitigation measures and clean up measures by the Contractor or a team of experts have been hired by the cost of the Contractor to perform the tasks dealt with urgently and quickly. In order to limit the environmental impact, the recovery activities should be completed within 10 days.
- PMU will provide a Financial sanctions, this level does not exceed 1% of the contract value for each large-scale violation and without adding any costs related to violations which are not liable by the contractor.
- PMU will resolve any conflict between the contractor and CMC.

6.5. CAPACITY STRENGTHENING PROGRAM

The capacity strengthening program for additional items of SCDP project is a part of the capacity strengthening program of SCDP project.

The actual implementation of the projects shows that the coordination of environmental management has not gained the most effectiveness by some of the following reasons:

There is lack of a unified coordination mechanism, an establishment as of the beginning between the PMU and the relevant authorities, especially the local government of wards/ communes where the project is carried out.

Local officials are not familiar with the loan project process, but they often follow habits of domestic projects, the participation is limited.

The community has not been clearly aware of their rights and responsibilities for environmental protection or they understand rights, but lack of a mechanism, a specific tool for feedback.

The relevant authorities are often not ready to coordinate the project. There are some agencies which have sent specialized staff to monitor and coordinate the project, but it is only a temporary nature. The assigned staff also cannot grasp the methods of coordination and deployment as well as the procedures necessary for the exchange, connection to the PMU.

To overcome these problems, the analysis and evaluation of the capacity, the demand of the relevant divisions in the environmental management system, analysis of the actual demand of the project is necessary.

Table 6-7: Analysis and identification of training demand

No.	Subjects	Preliminary evaluation of the qualifications/ awareness	Demand for training/capacity strengthening for environmental management
1	Specialized coordination officers of relevant public companies	Most of them are graduate or higher. There have been many projects which are deployed in Danang funded by the World Bank; the companies have also participated in many on this project and also grasped the basic processes	- It is necessary to be provided with information about the project and EMS operating procedures, liaison, coordination mechanism between relevant organizations. - It is necessary to be provided with the specific requirements of the roles/ responsibilities of these agencies in the process of environmental management coordination, troubleshooting of generated incidents.
2	Team in charge of in environmental management - PMU	Most of them are graduate or higher, more receptive to new content. They have had many experiences participating in previous projects, intensive training on the environment. They are good at computer. It is favorable condition for data management, processing and exchange of information and coordinating with other units.	- Raising awareness about the central operating role of the EMS. - It is necessary to be added knowledge/ regulations related to handling environmental violations. - Adding the processing solutions to the problems arising in the site. - Adding resources to ensure an effective implementation in the project area. - Carrying out the regular site inspection program (at least once a month) - Mandatory requirements participating in regular meetings (monthly) for the construction monitoring consultant (CMC) and the Contractor.
3	Local government representatives	Except some central wards have been involved in many infrastructure projects,	- It is necessary to increase knowledge about the preliminary environmental law, in the contents related to the monitoring coordination between local

No.	Subjects	Preliminary evaluation of the qualifications/ awareness	Demand for training/capacity strengthening for environmental management
		the other wards are not fluent in project processes. Computer skill is rather developed. Remote communication and information exchange via email is possible. Awareness of the organization of community supervision is not clear, it is only implemented for small projects invested by local people. Community supervision in a wide range is not experienced.	wards/communes of projects implemented in the area. - It is necessary to be intensively trained on the community monitoring organization. - It is necessary to catch regularly the project progress, the coordination mechanism to monitor and exchange information. - In particular, It is necessary to be aware of environmental management cycle before, during and after the contractor carries out the construction on the site. - The issues on the construction site should be regularly updated (with the participation of canonical meetings)
4	Community representatives	- Currently, it is not established in the locality so components are unclear - The most of the project areas are rural areas which are urbanized, literacy levels are limited, the working style is mainly spontaneous. - People's income is not high; the infrastructure is inadequate; the awareness of rights and responsibilities as individuals as communities to environmental issues is limited.	- It is necessary to be given more rights and responsibilities of the community to environmental management activities (as defined by law). - It is necessary to be provided with methods, tools which are simple but canonical to be applied during the project execution. - Raising awareness of the community about the environmental management in particular, the effects/potential impacts from the project in particular. - Continue to access more information about the project, important clues in EMS as well as operational mechanism.
5	Construction contract	- The contractor's representatives are qualified, experienced and knowledgeable in the law. - Regularly organize training courses on the occupational safety and health.	- It is necessary to learn about the environment, focusing on content related to the role of local government and role of community supervisor. - It is necessary to capture the process of environmental management as required by the safety policies of the World Bank (such as the participation of an independent monitoring consultant, implementation of

No.	Subjects	Preliminary evaluation of the qualifications/ awareness	Demand for training/capacity strengthening for environmental management
		- The majority of the contractor considers the environmental issues as the additional costs and they do not want to care for implementation. - Awareness of the contractors themselves on environmental issues during the construction is limited. - There is not usually specialized staff/intensive training on environment.	environmental management process on the site ...). However, for the contractor, these requirements will be primarily met through the project documents and the specific criteria in the bidding documents and the construction contracts.

Basing on the analysis of the current state of the capacity, experience and practical needs in the implementation phase of the project, a training program to strengthen the capacity of related parties set up as the following table:

Table 6-8: Suggestion of additional capacity strengthening programs on environmental management

Training Content	Subjects are trained	Number of students	Training time	Training agencies	Funding sources
Learning of Occupational safety and occupational health	Workers and technical staff of the contractor	The entire workers, construction workers on the site	Before implementation of the construction and under the provision of the law	Contractor is in coordination with the Institute of Labor – War Invalids and Social Affairs	Contractor
Learning about the overall EM process	PMU staff and the public utility companies	4 persons	Before implementation of the construction	PMU in collaboration with EMC	Located in EPC contract
Learning about the community monitoring process of CEMP	Personnel in charge of environment of the People's Committee of the ward where the project is located	1 district official and 2x10 officials of the commune where the project is located	Before implementation of the construction	PMU in collaboration with EMC	Located in EPC contracts
Learning	Person in	5-10	Before	PMU in	EMC

Training Content	Subjects are trained	Number of students	Training time	Training agencies	Funding sources
about the process of monitoring the scene SEMP	charge of sanitation construction monitoring consultant (CMC)	students	implementation of the construction	collaboration with Independent monitoring consultant.	

Costs for training and strengthening of capacity

Estimates of expenses for training and strengthening of capacity that is described in the following table:

Table 6-9: The additional costs of implementing the training programs of capacity strengthening

Training Content	Subjects are trained	Number of students	Rate of funds (VND)	Funding sources
Learning of Occupational safety and occupational health	Workers and technical staff of the contractor	The entire workers, construction workers on the site (estimated 200 persons)	200 x 200,000 = 40,000,000	Because the contractor managing unit, included in the construction contract
Learning about the overall EM process	PMU staff in charge of the bid package of construction	1 person (additional)	1 x 10,000,000 = 10,000,000	Should be included in the contract with the Independent Monitoring Consultant
Learning about the community monitoring process of CEMP	Personnel staff in charge of environment of People's Committee of Ward /commune where the project is located.	20 persons (supplement)	20 people x 3,000,000/ person = 60,000,000	Included in the contract with the training consultant or the Independent Monitoring consultant
Total expenses			110,000,000	

6.6. SUMMARY OF EMP IMPLEMENTATION EXPENSES FOR ADDITIONAL ITEM

Table 6-10: Summary of the implementing expenses of environmental management plan for additional items of the project

Contents	SCDP Project	Additional items	Total
Items	Price (VND)		
Expenses for employing independent monitoring consultant	2,400,000,000	899,200,000	3,299,200,000
Expenses for carrying out the monitoring program	468,000,000	503,510,000	971,510,000
Expenses for training capacity strengthening	264,000,000	110,000,000	374,000,000
Total (VND)	3,132,000,000	1,512,710,000	4,644,710,000
In US dollars (rounded), exchange rate USD 1 = VND 22,450	149,000	67,381	206,891

Table 6-11: Estimated additional costs of the independent monitoring consultant

(Exchange rate: 1 USD = VND 22,450)

No.	Contents	A/C Unit	Quantity	Unit price (VND)	Total (VND)	Total (USD)
1	Wage for experts (I)	Month	4	40,000,000	160,000,000	7,127
2	Wage for experts (II)	Month	12	30,000,000	360,000,000	16,036
3	Wage for experts (III)	Month	4	15,000,000	60,000,000	2,673
4	Expenses for local accommodation	Day	160	520,000	31,200,000	1,390
5	Travel expenses	Turn-person	64	3,000,000	180,000,000	8,018
6	Training course	Overall	6	5,000,000	30,000,000	1,336
7	Office equipment	Overall	12	10,000,000	60,000,000	2,673
8	Office rent and communications	Overall	12	3,000,000	18,000,000	802
	Total				899,200,000	40,053

CHAPTER 7. PUBLIC CONSULTATION AND DISCLOSURE OF INFORMATION

7.1. GOAL OF PUBLIC CONSULTATION

The consultation with the participation of local authorities and residents in the project area in the preparation phase and carry out EMP, the environmental impact assessment report, in order to provide the information necessary to better understand adjustment, supplementary items of SCDP project, the impacts of the project implementation adjustment, supplementary items and the possible mitigation measures for the project;

- Clarify the issues discussed in the first phase of the project;
- Notify the benefits achieved when the project is implemented;
- Point out the responsibilities and sense of parties, the beneficiary people in the project area during the project implementation process;
- Encourage community involvement in determining the environmental impacts of the project.
- Collect information about the needs and reactions of the people and the local authorities for the construction of the project and the proposals to reduce the environmental impact of the project or consider adjusting the technical design phase.

The policy of the World Bank (OP/BP 4:01) on environmental impact assessment requires the affected groups and local governments to receive the notice and consult during the preparation of the EIA.

7.2. CONSULTATION PROCESS AND DISSEMINATION OF INFORMATION

7.2.1. Community consultation of the project area

During the period of June, 2015, Consultation Unit is in coordination with PMU of da Nang SCDP to conduct public consultations in 20 wards/communes in the project area. The consultation is to inform the community about the project as well as consult the people about the policies of the project as well as the rights that people enjoy in the project. The Consultants also inform about the negative environmental impact that may occur during the project implementation and the proposed measures to minimize such affects. Specific consultation plan is implemented in Table 7-1 below:

Location: The consultations are conducted in the People's Committees of wards / communes where the project area is located.

Participants:

- PMU representative of Danang SCDP
- Local government representatives
- Representatives of civil society organizations at the locality (Associations of Women, farmers, Fatherland Fund)
- Representatives of the project area’s residents

Content:

- Part 1: Introduction to the project is presented by the project owner's representative

+ Project Introduction: including an overview of the project, the purpose of investment and the construction plan.
+ Environmental impact assessment/ Environmental Management Plan (presented by the Consultant): including the environmental impacts incurred and proposed mitigation measures, management model and implementation plan.
+ Resettlement plan: including the impacts of land acquisition, compensation for site clearance and introduction of resettlement sites for the project.

- Part 2: Discussion - parties contribute ideas to complete construction plans, the content focuses on:
  + Environmental Impact Assessment and Environmental Management Plan of the project area.
  + Resettlement plan and the supporting need to restore the life, the need for resettlement of people.
  + The contributed comments will be synthesized and incorporated into the content of the reports of Resettlement Plan and Environmental Management Plan before submission to the relevant authorities for consideration and approval.

Time: Public consultation is carried out as the table below:

Table 7-1: Implementation time of public consultation in wards/ communes

Time		Ward/ commune	Related Items
Monday, June 8th, 2015	AM	Hai Chau 2	- Improving the drainage system on Ong Ich Khiem Street - Improving the drainage system on Hung Vuong Street - Improving drainage system on Hoang Dieu Street
		Nam Duong	- Improving the drainage system on Ong Ich Khiem Street - Improving drainage system on Hoang Dieu Street - Improving drainage system on Phan Chu Trinh Street
	PM	Binh Thuan	- Improving the drainage system on Hoang Dieu street - Improving the drainage system on Phan Chu Trinh Street
		Binh Hien	- Improving the drainage system on Hoang Dieu street - Improving drainage system on Phan Chu Trinh Street
Tuesday June 9th, 2015	AM	Phuoc Ninh	- Improving the drainage system on Hoang Dieu street
		Thach Thang	- Improving the drainage system on Le Loi Street
	PM	Hai Chau 1	- Improving drainage system on Phan Chu Trinh Street - Improving the drainage system on Le Loi Street - Tunnel of Tran Phu Street (Intersection of Tran Phu, Le Duan and Song Han Bridge)
		Thanh Binh	- Ong Ich Khiem pumping station (anti-flood pumping station in the end of Ong Ich Khiem Street) - Thanh Binh Ward
Wednesday, June 10th, 2015	AM	Hoa Khanh Bac	- Lien Chieu wastewater treatment plant

Time		Ward/ commune	Related Items
	PM	An Hai Bac An Hai Dong	- Construction of 1,2,3 level network and separate sewage collection in My An, My Khe
		Hoa Khuong	- Construction of Technical infrastructure for Hoa Khuong resettlement area
Thursday, June 11th, 2015	AM	My An	- Construction of 1,2,3 level network and separate sewage collection in My An, My Khe
	PM	Chinh Gian	- Dien Bien Phu Overbridge (Intersection of Dien Bien Phu, Nguyen Tri Phuong and Le Do)
		Hoa Nhon commune	- Improving and upgrading DH2 road
	Night	Hoa Hai	Handling waterlogging for 5,6,7 groups - Son Thuy - investment and construction of Badang Nhan, Dang Thai Than streets (*)
Friday, June 12th, 2015		Hoa Son commune	- Improving and upgrading DH2 road
	PM	Thac Gian	- Construction of Rapid Bus Depot (BRT) in the airport area (bordering crossroads of Nguyen Tri Phuong street and Nguyen Van Linh street) - Sewer from the lake of 29/3 park to Le Do Sewer - Improving drainage system on Ly Thai To Street
Saturday June 13th, 2015	AM	Man Thai	Construction technical infrastructure for residential site of group 12
Monday June, 15th 2015	AM	Phuoc My	Construction technical infrastructure for residential site of group 13,14 Construction technical infrastructure for red clay road
Tuesday, June 16th, 2015	AM	Tho Quang	Aqua-culture wastewater collection sewer on Pham Van Xao Street, Tho Quang Industrial Zone Le Tan Trung sewer connected to Tho Quang – Bien Dong sewer Improving Tho Quang – Bien Dong sewer (remaining section)
	PM	Hoa Minh	Construction of the sewer along the canal from Lake Hoa Phu outflow Hoa Minh channel Improvement of Phu Loc river outfall

7.2.2. Consulting local authorities

According to the Government's Decree 18/2015/NĐ-CP "Provisions on strategic environmental assessment, environmental impact assessment, environmental protection plan",

the investor should consult to get the opinions of the local authorities or the People's Committee and Fatherland Front of the ward.

Consultant unit has collaborated with the investor's representative, SCDP PMU to send a official letter No. 570/BQL-NV on June 5th, 2015 on consultation during the preparation of the EIA/EMP report for adjustment, supplementary items of the SCDP project as well as attached to the summary of the EIA/EMP report to the People's Committees of the wards / communes where the project area located for consultation. Until now, the project has received the written feedback of this ward/this commune.

7.3. RESULTS OF PUBLIC CONSULTATION AND LOCAL GOVERNMENT

7.3.1. Public consultation results of the project area

Through the consultation sessions in wards/communes in the project area, the Consulting unit, PMB has noted the comments of the communities when implementing. The consultation comments of community and feedback from the investor are shown in the following table:

Table 7-2: Results/comments gathered from the public consultation

Ward/commune	Discussed issues	Recommendations of the community	Feedback from the PMU
The wards of Hai Chau 2 - Nam Duong - Binh Thuan - Binh Hien - Phuoc Ninh - Thach Thang - Hai Chau 1	Improving the drainage system on the road: Ong Ich Khiem, Hung Vuong, Hoang Dieu, Phan Chu Trinh, Le Loi: - Main discussions related to the improvement of the drainage system will affect the atmospheric environment, waste and business activities of the people. - Current status of the drainage in the rainy season of these roads	- Most of the opinions of people gathered around the issues of construction on the road will affect the air quality of the environment and business interruption. - The people say that the drainage ability of these roads is very poor in the rainy season, causing difficulties in travel and affect daily life.	- Consulting Unit, PMU has explained to the people of the project area that this is a temporary interruption and that the negative impact on the environment can be prevented and minimized. When the project is completed and the road is no longer waterlogged, make it difficult for people. - PMU will require Contractor to carry out the partial construction, finish, should not extend the progress. Simultaneously apply the shielding and warning method in the construction site.
Thanh Binh Ward	Ong Ich Khiem pumping station (anti-flood pumping station at the end of Ong Ich Khiem Street)	The project receives the consent of the people and the local government	Consulting unit, PMU staff has been working with local authorities and received unanimous consent.
Northern Hoa	Construction of Lien	The project has	- PMU ensures

Ward/commune	Discussed issues	Recommendations of the community	Feedback from the PMU
Khanh ward	Chieu wastewater treatment plant: The consensus of the local people.	acquired land and property on the land, so people want to be adequately compensated	compensation, site clearance will be conducted in accordance with the State's current regulations, the People's Committee of Committees and donors.
Southern Hoa Hiep	Construction Depot of Bus Rapid Transit(BRT) at Bau Tram -Environmental pollution in the operational phase Depot Bau Tram (air, water, hazardous waste..)	-Operational, management, construction unit of transit station has plans and mitigation measures for negative impacts on environment when the project comes into operation. - Local people and government support for the project.	Consultancy unit gets comments and opinions form local people and puts these issues into the report and should take appropriate mitigation measures.
Wards: -An Hai Bac -An Hai Dong -My An	Construction of 1,2,3 level network and separate sewer in My An, My Khe: - The connection from the level 3 system from people's houses to the city's main drainage - Beach landscape when improving the outfall in My An, My Khe	Take the appropriate construction methods to avoid cracking water supply, drainage pipeline and damage of floors, pavement and ancillary infrastructure works. - Improving 2 outfalls matching the beach because these are the 2 tourist attraction sites as well as the bathing needs of the local people.	The Contractor is responsible for ensuring that it will carry out the construction in accordance with the specifications and prevent from incident. - Design the ladder steps to obscure 2 outfalls, grow trees to create beautiful landscape for the beach areas.
Hoa Khuong commune	Construction of Technical infrastructure for Hoa Khuong resettlement: the main discussion issues: - Compensation for land acquisition and resettlement - Minimizing the	- Compensation, site clearance must comply with regulations, immigrant resettlement according to the people's wishes. - Paying attention to the dust pollution problem when	- PMU ensures that compensation, site clearance will be conducted in accordance with the State current regulations, the People's Committee of the City and donors. - Take measures to minimize negative impacts on the

Ward/commune	Discussed issues	Recommendations of the community	Feedback from the PMU
	negative impacts on the environment during the construction - Management of workers.	leveling the resettlement area. Gathering material tidy during the construction. - Registration for temporary residence, temporary absence and declaration with local authorities if the workers are hired from other localities.	environment at EMP as the basis for the construction contractor to carry out the impact mitigation of the construction phase. The gathering yards of building materials, disposal must be approved by the local authorities. - PMU, the Contractor will coordinate with the government of Hoa Khuong commune to manage workers to ensure that officers and employees do not cause conflicts with the community or social problems during the construction.
Ward: Thac Gian	Dien Bien Phu Overbridge (Intersection of Dien Bien Phu, Nguyen Tri Phuong and Le Do): - The construction of overbridge contributes to reducing traffic congestion at this key intersection.	- Intersection of Dien Bien Phu, Nguyen Tri Phuong and Le Do regularly suffers traffic jams during peak hours, this is the arterial road of the city thus the construction of the overbridge is a reasonable solution. - During the construction of the overbridge, should take the plan of traffic zoning, staffing in charge of traffic safety at the scene to regulate traffic.	- Overbridge is designed by light steel for the main transport line going straight on Dien Bien Phu street. For this overbridge, when it is completed, it will offload the majority of motorcycles, cars, light vans going below the lane. Thereby reducing traffic congestion. - The contractor will appoint specialized staff in ensuring occupational safety, traffic safety and take part in regulating traffic with Police during the project construction.
Hoa Hai Ward	Handling waterlogging for 5,6,7 groups - Son Thuy - investment and construction of Badang Nhan, Dang	- In rainy season, the project area is often seriously waterlogged, high water, overflowed into houses causing	PMU in receives the suggestions of people, and commits to carry out the project quickly and completes on schedule. PMU will require the

Ward/commune	Discussed issues	Recommendations of the community	Feedback from the PMU
	Thai Than streets: - The problem of waterlogging in the project area in the rainy season. - The issue of compensation and site clearance	difficulties in daily life and travel. Project proposals quickly deployed and completed soon. - The compensation and site clearance must comply with regulations, resettlement immigration according to the people's wishes.	design units to survey the terrain and take the reasonable construction solutions to limit the waterlogging to the project area. -PMU ensures compensation, site clearance will be conducted in accordance with the state's current regulations, the People's Committee of the city and donors.
Thac Gian Ward	Construction of Rapid Bus Depot in the airport area: - Clearance of some households in the project area - The problem of environmental pollution (dust, noise, solid waste) in the construction process. - Access to the BRT system for the disabled, pregnant women and young children.	- Compensation, site clearance must comply with regulations, resettlement immigration according to the people's wishes. - Taking measures to minimize environmental pollution during construction and require the contractor to comply with the regulations on social security, local society. - In addition to the construction of rapid bus depot, it is necessary to research the accessibility to the terminals for the disabled, pregnant women, young children due to its location in the middle of the station route.	- PMU undertakes that compensation, site clearance will be conducted in accordance with the state's current regulations, the People's Committee of the city and donors. - There are so many population and many vehicles in the construction area of the rapid bus depot. Should take shielding measures to limit dust pollution during the construction process. Setting the time for transporting construction materials in a reasonable time frame to avoid traffic jams. - The project will design the station and contour automobile floor: the height of the floor will be about 33cm from road surface, along with the floor height. On the other hand, the pedestrian walkway to the terminal is contour and steadily bevelled, the slope enough for the disabled can move.

Ward/commune	Discussed issues	Recommendations of the community	Feedback from the PMU
Tho Quang	Aqua-culture wastewater collection sewer of Pham Van Xao, Tho Quang Industrial Zone Le Tan Trung sewer connected to Tho Quang – Bien Dong sewer Improving Tho Quang – Bien Dong swer (remaining section)	The project receives the support of the people and local government. However, in the course of construction, the investor should strictly implement measures to reduce, avoid polluting the environment.	Consulting unit, PMU staff are committed to minimize negative impacts on the environment during the construction of the project.
Hoa Minh	Close Yen The- Bac Son canal Construction of wastewater pipelines along the channel from Hoa Phu Lake to Hoa Minh channel Rehabilitation outlet of Phu Loc river	The project receives the support of the people and local government. However, the investor should strictly implement measures to reduce, avoid polluting the environment in the course of construction.	Consulting unit, PMU staff are committed to minimize negative impacts on the environment during the construction of the project.

In summary, through community consultations of project areas, households support the project, hope the project to be quickly carried out. The consultations are generally synthesized as follows:

- The entire local people agree with the implementation of the project, however, they want the project to be carried out fast, delay, extension of construction progress to be limited and want the environment is kept clean and the duties and quality of the work to be fulfilled successfully;
- To minimize the impact on the community and people's living activities, items of the project must be carried out quickly and per phase should be finished, mass construction should be limited. The construction in the city's main roads should be partially finished. Occupational safety, traffic safety for residents should be complied.
- The contractor should comply with commitments to mitigate the negative impacts of the project on the environment.
- People ask the government, the project owner must support a reasonable compensation and resettlement arrangements in accordance with the people’s wishes.
- In addition to, the people want the PMU, the local government to support vocational training, support loans at preferential interest rates for people quickly restoring the life.

7.3.2. Consultation results of the local government

According to the written response, as well as direct consultation of the People's Committee and Fatherland Front Committee of the wards/communes where the project is located, the comments can be summarized as follows:

- People's Committee and Fatherland Front Committee of the wards/communes heartily support the project implementation. When the project is finished, the local people will enjoy great benefits on accommodation, sanitary conditions and clean environment.
- The local government will create favorable conditions and support the project with all efforts, especially with regard to land acquisition for the project through the clearance process and building of the works items
- People's Committee and Fatherland Front Committee of the wards/communes agree with the contents of the summary document of the EIA report. These negative impacts on the environment which are derived from the project are not much, however, should take a reasonable mitigation measures to avoid causing negative impacts on the environment.
- Agree with the mitigation measures of environmental pollution stated in the report;
- Recommend the investor to undertake to seriously minimizing the negative impacts on the environment during the construction process, such as environmental management, environmental quality monitoring.

People's Committee and Fatherland Front Committee of the communes/wards and representatives of the people in the project area will work together to share the problems arising during the project implementation.

7.4. DISCLOSURE OF INFORMATION

The project only receives an investment license after taking appropriate adjustments for the location, design, capacity and/or technology meeting the requirements of environmental protection and resettlement. According to the requirements on information dissemination in OP / BP 4.01, PMU represents the project owner will:

- Provide the Vietnamese version of the EMP and the summary of project to Da Nang City People's Committee and the wards/communes of the project.
- Enviromental Management Plan (Vietnamese version) is sent to SCDP PMU and Da Nang city Department of Natural Resources and Environment.
- Provide a summary of the EMP report of the project in Vietnamese in the People's Committees of wards/communes in the project, announced in the media or through the information committee of the wards before a month of official disclosure of the EMP report and the summary of the project. The community can view and comment for the EMP report to the report feedback book in about a month during the working hours in the following places: 1) People's Committees of wards/communes in the project; and 2) the PMU.
- EMP (English) will be served to the World Bank to publish in InfoShop prior to appraisal in accordance with the provisions of the information popularization policy.
- Vietnamese draft of the report will be published in the locality where the project takes place, the English version is also publicized in Infoshop of the World Bank prior to appraisal.

CONCLUSIONS, RECOMMENDATIONS AND COMMITMENT

1. CONCLUSION

Based on the analyses, assessments of the environmental status, the project's impacts on the environment and socio - economic aspects of the project area, the report makes a number of conclusions as follows:

The project of works amending and supplementing the Sustainable Development Project of Danang City of which the People's Committee of Da Nang City is the project owner. The project management unit is authorized to invest the prior operating infrastructure (PIIP).

The required content of the EMP report is in compliance with Decree No. 18/2015/ NĐ-CP on February 14th, 2015; Circular No. 27/2015/TT-BTMT on July 18th, 2015 of the Minister of Natural Resources and Environment guiding on strategic environmental assessment, EMP and environmental protection commitments; the environmental safety policies of the World Bank. EIA report is to identify and assess all the impacts of the project:

- When the project is finished, it will contribute to stabilizing the people's life, political security and social order and safety of the region in particular upgraded and of the Danang city in general.
- The upgrade of low-income areas is not only feasible in the economic term, but also contributes to improving living conditions, improving new landscape and environment for the current area at present and in the future.
- The process of construction and long term operation of the project will cause some negative impacts on socio - economic aspect and environment if there is no measure to prevent, control and treat the environmental pollution.
- In the course of the operation of the project, it will partly affect some of the current conditions, but it may be considered as not serious compared to the benefits brought by the project.

It is derived from the awareness of its responsibility in the task of the environment protection, the project owner will invest sufficient funds for the project's environmental protection and is committed to strictly implement plans of prevention, control, treatment of environmental pollution set out in the project's EMP report in order to ensure fully meet the Vietnam's environmental standards as prescribed, including:

- The plan for air pollution control in the construction phase.
- The affordable plan for storm water drainage, and domestic wastewater treatment in the construction and operation phase.
- The plan to control pollution caused by solid waste in the construction and operation phase.
- The PMU will coordinate with the relevant authorities in the process of technical design and construction to timely adjust the level of pollution in order to meet the environmental standards and regulations to prevent environmental incidents.

The measures of pollution control and limiting the adverse impacts of the project on the environment proposed in the EMP report are feasible measures to ensure the Vietnam's environmental standards issued.

The Project owner is responsible before the law for environmental issues of the project during the construction and operation phase of the project.

2. RECOMMENDATIONS

To quickly bring the project into operation, the Investor recommends DoNRE of Da Nang city and the relevant appraisal authorities and submits Danang People's Committee to approve the EMP report so that the Investor can deploy the next steps of the project to ensure the investment progress of the project.

The Project's Investor recommends the appropriate authorities to coordinate with the investor tracking and resolving the environmental issues arising during the construction and operation of the project to ensure the safety for the environment and to promote the economic benefits of the project.

The local authorities work together in the process of implementing the programs of propaganda and mobilizing the people to support the project, improve the awareness of the community for the environmental protection during and after the project completion.

3. IMPLEMENTATION COMMITMENT

3.1. General commitment

The Investor and PMU undertake to implement the current provisions of the law of Vietnam on environmental protection in the process of deployment and implementation of the project: the Environmental Protection Act 2005, the law and the relevant documents under laws (the Government's Decree No. 59/2007/NĐ-CP on April 9th, 2007 on management of solid waste, and the Government's Decree No. 88/2007/NĐ-CP on May 28th, 2007 on urban drainage and urban areas etc...).

The investor is committed to the full implementation of measures to minimize the adverse impact of the project on the environment during the construction preparation phase, construction phase and operational phase according to the content presented in Chapter 4 of this report.

The activities of the project are subject to the inspection of the relevant authorities on the environmental management of the Department of Natural Resources and Environment of Da Nang City, the People's Committee of Danang city and the related functional agencies to ensure the development of the project and environmental protection.

The investor is committed to publicly report the content of Enviromental Management Plan approved in the locality where the project is located to conduct supervision of compliance with environmental protection commitments in the EMP report approved.

3.2. Undertaking to comply with environmental regulations, standards

The investor undertakes to strictly comply with environmental regulations, standards, in particular:

- For emissions: According to Vietnam standards QCVN 05: 2013/BTNMT national technical standards for the quality of ambient air;
- Wastewater: Undertaking to carry out the mitigation measures and operate the wastewater treatment system and ensure that the wastewater treatment meets the standards of QCVN 14: 2008/BTNMT (column B): National Technical Regulation on the domestic wastewater quality;
- Noise: Controling the noise arising under QCVN 26: 2010/BTNMT for noise.

- Solid Waste and hazardous waste: Will be collected and processed thoroughly, ensuring no leakage and dispersal into the surrounding environment to ensure the requirements of environmental sanitation as stipulated in the Government's Decree No. 38/2015/NĐ-CP on management of solid waste and srap and Circular No.36/2015/BTNMT of Environmental and Natural Resources on hazardous waste management.

3.3. Undertaking to implement management and control of environmental pollution

Environmental management, environmental pollution control will be prior during the process of construction and when the project goes into operation;

The investor is committed to collaboration with the specialized agencies in the process of design, construction and operation of systems of treatment, protection of the environment;

In the course of operations, the investor promises to implement the program of management and environmental pollution control in the project area as presented in this report and periodic reports submitted to the Department of Natural Resources and Environment of Da Nang City;

The Investor promises to compensate and overcome environmental pollution in case of incidents, environmental risks due to the project's deployment;

The Investor promises to complete the work scheduled to deploy, especially complete the construction of environmental treatment facilities after the approved EIA report.

APPENDICES

- Appendix 01: The legal documents related to the project
- Appendix 02: Map of the locations of environmental monitoring
- Appendix 03: Minutes of the public consultation meeting
- Appendix 04: Some pictures of the project
- Appendix 05: The results of environmental monitoring

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