

# Environmental Monitoring Report

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Quarterly Report (4th Quarter 2013)  
January 2014

## VIE: Ho Chi Minh City-LongThanh-Dau Giay Expressway

Package No. 6

Prepared by Hanshin Engineering & Construction Co., Ltd. for the Vietnam Expressway Corporation, the Ministry of Transport of Vietnam, and the Asian Development Bank.

**CURRENCY EQUIVALENTS**  
(as of 1 January 2014)

Currency unit	–	dong (D)
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**NOTE**

In this report, "\$" refers to US dollars unless otherwise stated.

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**ENVIRONMENTAL MONITORING REPORT**

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**HO CHI MINH CITY – LONG THANH – DAU GIAY  
EXPRESSWAY PROJECT  
CONSTRUCTION CONTRACT PACKAGE No.6**

**ENVIRONMENTAL MONITORING REPORT  
CONSTRUCTION PHASE – QUARTER IV- 12/2013**

*Dong Nai, 12/2013*

# ENVIRONMENTAL MONITORING REPORT

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Environmental Monitoring Report  
Construction Phase  
Quarter IV-12/2013

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### HO CHI MINH CITY – LONG THANH – DAU GIAY EXPRESSWAY PROJECT CONSTRUCTION CONTRACT PACKAGE No.6

#### ENVIRONMENTAL MONITORING REPORT CONSTRUCTION PHASE – QUARTER IV-12/2013

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JOINT VENTURE  
ENVIRONMENT AND  
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Dong Nai, 12/2013

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## ABBREVIATIONS

ADB	: Asian Development Bank
BOD <sub>5</sub>	: Biological oxygen demand
CEPT	: Center for Environmental Protection in Transportation
CO	: Carbon monoxide
COD	: Chemical oxygen demand
HCMC	: Ho Chi Minh City
HC	: Hydrocarbon
JBIC	: Japan Bank for International Cooperation
ND	: Not detected
NH	: National highway
NO <sub>2</sub>	: Nitrogen dioxide
SO <sub>2</sub>	: Sulfur dioxide
SS	: Suspended solids
TSP	: Total suspended particulates

## WEIGHTS AND MEASURES

mg/m <sup>3</sup>	: milligram per cubic meter
°C	: Celsius
dB	: decibel
dBA	: A-weighted sound level in decibels
km	: kilometer
L <sub>eq</sub>	: Equivalent continuous noise level
m	: meter

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## PREFACE

Nowadays, Science and Technology are developing, environment is impacted more than. We ensure economic development and protect environment to develop strongly according to policy of government and tendency of worldwide. We should implement environmental quality monitoring program to assess impact level of project activities to environmental quality and healthy citizen.

### **Purpose of report**

We survey environmental actual state of project, determine pollution sources and harmful effect level to environment. Concurrent, we check and assess air, surface water, underground water, noise and vibration, soil and propose solutions to overcome.

### **Implement Organization**

Hanshin Engineering & Construction Co., Ltd associated with joint venture environment and technology center HCM city for natural resources and environment to implement environmental monitoring report for package No.6 from Km37+800 to Km54+983 of Ho Chi Minh City – Long Thanh – Dau Giay expressway construction project.

## CHAPTER I. INTRODUCTION

### 1.1. Introduction

- Project name: **HO CHI MINH CITY – LONG THANH – DAU GIAY EXPRESSWAY PROJECT**
- Introduction to the project:

In the surrounding area of Ho Chi Minh City (HCMC), the traffic volume has long been over the capacity of road. It is foreseen that the demand of traffic in HCMC and Dong Nai area where industrial development has been recently significant with the planned development of industrial zones and the international airport will increase significantly.

The Government of Vietnam (GOV) has decided to construct the HCMC – Long Thanh – Dau Giay Expressway (HLD Expressway) with the assistance from Asian Development Bank (ADB) and Japan International Corporation Genecy (JICA).

Vietnam Expressway Corporation (VEC) was established as a state-owned enterprise under the Ministry of Transports. Under the HLD Expressway project, VEC has the overall responsibility for project implementation and formal correspondence with the line ministries, provincial authorities, JICA and ADB. VEC will delegate responsibility for day-to-day project implementation to the Southern Expressway Project Management Unit (SEPMU).

HLD Expressway construction project with total length of about 55km is divided into 2 parts;

- + Part 1: From Ring Road 2 Intersection (beginning point of package 1a; KM4+000) to NH-51 interchange (End of package No.3; KM23+900). This section is designed in accordance with expressway regulations TCVN 5729-97, grade A, designed speed 120km/h and four lanes. Long Thang Bridge is partly designed to allow a speed of 100km/h.

- + Part 2: From NH-51 interchange (end point of package No.3/beginning point of package No.5; KM23+900) to Dau Giay interchange (end point of package No.6, KM 54+983)

The environmental survey will be implemented in this contract only package No.6 (from KM 39+400 to KM54+983) where the construction work is funded by ADB.

Based on the approved EIA report of the Ho Chi Minh City – Long Thanh – Dau Giay Expressway Technical Assistance Project, implementation of EMP including environmental monitoring in pre-construction, construction and operation phases shall be performed to ensure compliance with the requirements resulting from application of the EIA process.

In a part of environmental monitoring process, the project team/main consultant will conduct the environmental monitoring in pre-construction, construction and operation stages for the project.

- Implementing agency: **Hanshin Engineering & Construction Co., Ltd**
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## 1.2. Scope of work

Contract Package Name: Package - 6 (KM37+800 - KM54+983)

The items of the monitoring program are selected as below:

- 1/ Air quality.
- 2/ Noise and vibration.
- 3/ Surface water quality.
- 4/ Underground water quality.
- 5/ Wastewater quality.
- 6/ Soil quality.

## 1.3. Monitoring location.

Location	Km	Package No. 6		Number of sample
		37+800	54+980	
		Construction phase		
Air – Dau Giay Intersection+ Intersection with NH1+Song Nhan residential area		54+350 54+983 39+400		8
Noise – Dau Giay Intersection+ Intersection with NH1		54+350		Every hour from 6:00 – to 22:00
Vibration – Dau Giay Intersection+ Intersection with NH1		54+983		Every hour from 6:00 – to 22:00
Soil – Bau Ham 2 ward – service station – Dau Giay Intersection – Xuan Thanh residential area.		53+800 41+100 54+350 54+400		4
Groundwater – In the residential area of Xuan Thanh		54+400		2
Surface water – Upstream/ Downstream of Song Nhạn River		49+400		2
Wastewater – Worker’s camp		49+980		1
Wastewater – Concrete mixing station area		54+900		1

Sampling location map is shown in appendix.

#### 1.4. Monitoring parameters and frequency

- Air quality monitoring**

No.	Parameter	Impact monitoring				Remark
		Frequency	Location		Duration	
1.	Humidity Temperature Wind Speed Wind director Atmospheric pressure	Once per quarter	54+350 54+983 39+400	3 sample 2 sample 3 sample	01 day (06h00- 22h00)	Reference regulation: QCVN 05:2009/BTNMT
2.	TSP					
3.	CO					
4.	SO <sub>2</sub>					
5.	NO <sub>2</sub>					
6.	HC					

- Noise monitoring**

No.	Parameter	Impact monitoring				Remark
		Frequency	Location		Duration	
1.	Noise level	Once per quarter	54+350 54+983	16 sample 16 sample	01 day (06h00-22h00)	Reference regulation: QCVN 26:2010/BTNMT

• **Vibration monitoring**

No.	Parameter	Impact monitoring				Remark
		Frequency	Location		Duration	
1.	Vibration level	Once per quarter	54+350 54+983	16 sample 16 sample	01 day (06h00-22h00)	Reference regulation: QCVN 27:2010/BTNMT

• **Surface water quality monitoring**

No.	Parameter	Impact monitoring			Remark	
		Frequency	Location			Duration
1.	pH	Once per quarter	02 point	01 samples/ 01 location	01 day	Reference regulation: QCVN 08:2008/BTNMT
2.	BOD <sub>5</sub>					
3.	COD					
4.	DO					
5.	TSS					
6.	As					
7.	Cd					
8.	Pb					
9.	Cu					
10.	Zn					
11.	Hg					
12.	NH <sub>4</sub> <sup>+</sup>					
13.	Total N (N-Kjeldahl)					
14.	Total P					
15.	Lubricant					
16.	Coliform					

• **Underground water quality monitoring**

No.	Parameter	Impact monitoring			Remark	
		Frequency	Location			Duration
1.	pH	Once per quarter	02 point	01 samples/ 01 location	01 day	Reference regulation: QCVN 09:2008/BTNMT
2.	Color					
3.	Temperature					
4.	Odor					
5.	TDS					
6.	Hardness					
7.	Conductivity					
8.	Turbidity					
9.	CN <sup>-</sup>					
10.	NO <sub>3</sub> <sup>-</sup>					
11.	Cl <sup>-</sup>					
12.	SO <sub>4</sub> <sup>2-</sup>					
13.	Mn					
14.	Fe					
15.	Cd					
16.	Pb					
17.	As					
18.	Total Coliform					
19.	Fecal Coliform					

• **Soil quality monitoring**

No.	Parameter	Impact monitoring			Remark	
		Frequency	Location			Duration
1.	pH	Once per quarter	04 point	01 samples/ 01 location	01 day	Reference regulation: QCVN 03:2008/BTNMT
2.	Organic matter					
3.	Total N					
4.	Total P					
5.	Cl <sup>-</sup>					
6.	SO <sub>4</sub> <sup>2-</sup>					
7.	Cu					
8.	Zn					
9.	Cd					
10.	Pb					
11.	Hg					
12.	As					
13.	Fe					

• **Wastewater quality monitoring (Domestic wastewater)**

No.	Parameter	Impact monitoring				Remark
		Frequency	Location		Duration	
1.	pH	Once per quarter	01 point	01 samples/ 01 location	01 day	Reference regulation: QCVN 14:2008/BTNMT
2.	Temperature					
3.	BOD <sub>5</sub>					
4.	COD					
5.	DO					
6.	SS					
7.	NH <sub>4</sub> <sup>+</sup>					
8.	Total N (N-Kjeldahl)					
9.	Total P					
10.	Lubricant					
11.	Total Coliform					

• **Wastewater quality monitoring (Wastewater from construction activities)**

No.	Parameter	Impact monitoring				Remark
		Frequency	Location		Duration	
1.	pH	Once per quarter	01 point	01 samples/ 01 location	01 day	Reference regulation: QCVN 24:2009/BTNMT
2.	Temperature					
3.	BOD <sub>5</sub>					
4.	COD					
5.	DO					
6.	SS					
7.	NH <sub>4</sub> <sup>+</sup>					
8.	Total N (N-Kjeldahl)					
9.	Total P					
10.	Lubricant					
11.	Total Coliform					

### 1.5. Work plan

Construction Period: 32 (thirty-two) months.

The first, we surveyed to identify the sampling location by using GPS (sampling location coordinates are attached in Chapter V). After that, we made the plan to implement project. Plan includes works as follow:

- Preparing necessary equipment and facilities to take samples for air quality, noise and vibration, surface and underground water quality, wastewater quality and soil quality at the fieldwork.
- Taking samples at the field work in 01 day. pH, DO, Temperature, EC and TDS were measured at field work, the other were analyzed at laboratory.
- After above parameters had been measured, samples were stored in the icebox maintain temperature  $\leq 4^{\circ}\text{C}$ .
- Samples were analyzed as soon as they are brought back to laboratory. After analyzing the end, we immediately processed data and prepare to write report.

Works of this project are summarized in figure 1.

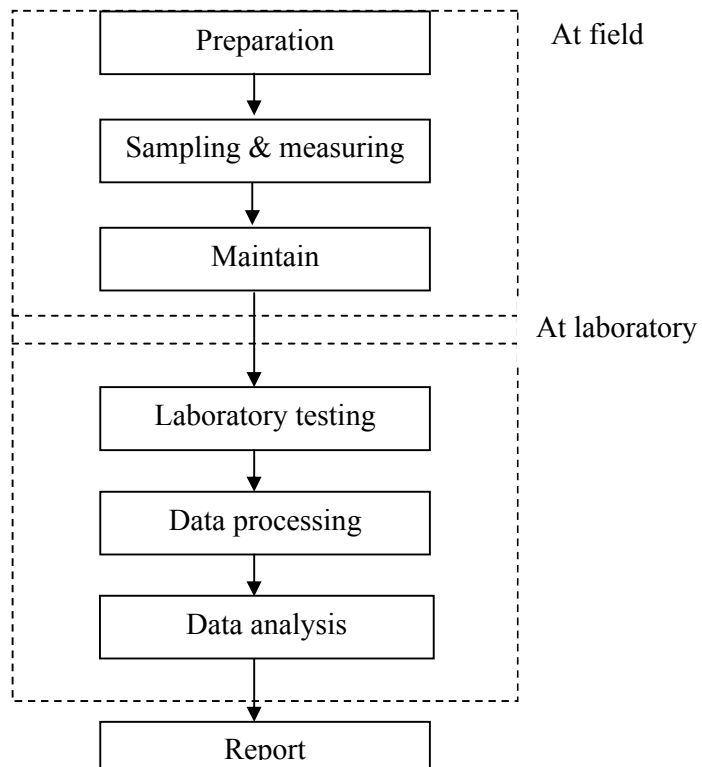








Figure 1: Monitoring plan summary

Table 1: Schedule of environmental survey

	December 2013				January 2014
	01 <sup>st</sup> week	02 <sup>nd</sup> week	03 <sup>rd</sup> week	04 <sup>th</sup> week	01 <sup>st</sup> week
<b>1. Preparation</b> - Work plan - Organization of survey team - Equipment mobilization					
<b>2. Conduction of field survey</b>					
<b>3. Laboratory analysis</b>					
<b>4. Draft of final report</b>					
<b>5. Submissions of draft final report</b>					
<b>6. Revise and submissions of final report</b>					

### 1.6. Environmental monitoring schedule in quarter IV-12/2013

The environmental monitoring schedule in quarter IV-12/2013 is tabulated in Table 2 as below:

Table 2: Schedule for environmental monitoring in quarter IV-12/2013

Công việc	December 2013																														January 2014						
	01 <sup>st</sup> week							02 <sup>nd</sup> week								03 <sup>rd</sup> week								04 <sup>th</sup> week							01 <sup>st</sup> week						
	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	02	03	04	05	06	07			
Air sampling																																					
Water sampling																																					
Noise measuring																																					
Vibration measuring																																					
Ground sampling																																					
Soil sampling																																					
Samples analyzing																																					
Data processing																																					
Final report																																					
Modified and the final report																																					

## CHAPTER II. BACKGROUND CONDITION

### 2.1. Site and location of the project

The Project area is the section between HCMC and Dau Giay, which is a part of on the planned North-South Expressway. An Phu to Ring Road 2 section connecting the expressway and East – West Highway becomes an urban road section according to the plan of Ho Chi Minh City. Although Ho Chi Minh City – Long Thanh – Dau Giay Expressway starts at Km0+000, this Project and subsequently Package 1a, starts at Km4+000. The initial section of 4km length in Ho Chi Minh City – Long Thanh – Dau Giay Expressway will be constructed under other project. The project ends at Km55+300 at Dau Giay with a total length of about 51 km, as shown in the Project Location map.

Total length of Package 6 is 17.2 km, starting from Km37+800 and ending at Km54+983. It consists of the expressway from Km37+800 to Km54+983, the drainage system; nine (09) bridges: Suoi Sau, Suoi Ram, Song Nhan, Railway flyover, Overpass No.01 STA. 41+000, Overpass No.2, Overpass No.3, Dau Giay, Thong Nhat and six (06) underpasses.

### 2.2. Status of the project

The project is construction phase.

### 2.3. Previous and trend of environmental condition

#### Climate

The project area has a monsoon tropical climate with two seasons: Dry and rainy. The climate conditions are rather stable. Annual average temperature is approximately 27°C (Celsius). The temperature varies only slightly; the difference between the hottest and coldest months is between 3°C and 4°C. Temperature fluctuations between day and night times are rather high, approximately from 7°C to 8°C. The rainy season is from May to November (with 90% - 95% of total annual rainfall), coinciding with the dominance of the southwest wind. The dry season runs from December to April (with 5%-20% of total annual rainfall), coinciding with the dominance of southeastern winds. Annual average rainfall is from 1,347 to 1,896 millimeters/year, with 103-159 rainy days per year.

#### Hydrology

The JBIC section of the road in the An Phu – Long Thanh area is located downstream of Dong Nai and Sai Gon rivers, and is accordingly affected by floods on Dong Nai. The area is influenced by the semitide regime of the East Sea with water level fluctuations from 3.5 to 4 m. This section has many rivers and channels, including the

Dong Nai, Ong Nhieu, Tac, Kinh rivers and some channels such as: Dong Ngoai, Ong Cai, and Ba Hien, which all converge at the main rivers of Dong Nai and Saigon.

Along the ADB section from Long Thanh to Dau Giay are some small rivers or streams such as Nhan, Bung Mon, Trau, Cau Mon, and Ram. Particularly near the end of the section at the Thong Nhat district, high hills and big streams partition the project area. This area is affected by the Dong Nai river flood regime. The flood season on Dong Nai River usually lasts from July to October or November with a water volume up to 80% - 85% of the total water mass in a year.

#### **Surface and groundwater Quality**

As quarter IV/2013 monitoring data indicate that surface water quality are significant signs of improvement shown by dissolved oxygen (at the sampling location, DO levels are higher than 5 mg/L). In addition, all the remaining parameters measured in the surface water sampling locations are lower than regulation allow Vietnam (QCVN 08:2008/BTNMT, B2).

Underground water monitoring show that underground quality is so good when compared with QCVN 09:2008/BTNMT.

#### **Air quality**

The project area is mostly agricultural land with good background air quality. However, air quality is adversely affected by traffic on the highways intersecting the project. At the Long Thanh interchange with NH51 (where the JBIC and ADB sections meet), the concentration of total suspended particulates exceeds the permitted level. In addition, other pollution parameters, such as carbon monoxide, sulfur dioxide, nitrogen dioxide, and hydrocarbons in Long Thanh interchange are higher than in other locations, but within the permitted limits.

#### **Soil Quality**

According to the monitoring data in the quarter IV/2013 shows that the quality of soil at all sections is so good, with levels of various parameters, including heavy metals, below the Vietnamese regulation.

## CHAPTER III. POLLUTION SOURCES

### 3.1. Generation sources of air pollution.

The air pollution sources include:

- Transportations generate dust and air pollutions (SO<sub>2</sub>, NO<sub>2</sub>, CO) in ambient air.
- The noise and vibration arises from the operation of machineries.

### 3.2. Generation sources of wastewater.

Wastewater arises mainly from the following sources:

- Water used for the activities of workers at the site.
- Wastewater arises from the construction stages that have used water.
- Be used to clean transport facilities.

### 3.3. Generation sources of solid waste.

#### 3.3.1. Domestic solid waste

Domestic solid waste include: Food waste, packaging, peel fruits, food cans, etc

The amount of domestic solid waste is very little.

#### 3.3.2. Industrial solid waste

In during construction, industrial solid waste generated mainly:

- Dust recovered from dust handling system of the local concrete mixing stations.
- The fuel containers.
- Liquid waste betonies.

In addition, construction activities generate some hazardous waste such as:

- Waste Oil from the engine.
- Lubricant containers.
- Fluorescent lamps were broken.
- Gloves, cloth adhesive lubricant.

## CHAPTER IV. METHODOLOGY OF ENVIRONMENTAL MONITORING

### 4.1 Air quality

Table 3: Test method of air quality monitoring

No.	Parameters	Unit	Sample container	Sampling Instrument	Test method
1.	Humidity Temperature Wind Speed Wind director Atmospheric pressure	% °C m/s -- atm	--	Tes 1360 & Center 315 Skywatch GEOS11	Quick measured
2.	TSP	mg/m <sup>3</sup>	Petri dish	Radeco H809V – US	TCVN 5067:1995
3.	CO	mg/m <sup>3</sup>	Glass	Econo air plus model L-4P-US	TCVN 5972:1995
4.	SO <sub>2</sub>	mg/m <sup>3</sup>	Glass	Econo air plus model L-4P-US	TCVN 5971:1995 ISO 6767:1990
5.	NO <sub>2</sub>	mg/m <sup>3</sup>	Glass	Econo air plus model L-4P-US	TCVN 6137:1996 ISO 6768:1985
6.	HC	mg/m <sup>3</sup>	Glass	Econo air plus model L-4P-US	GC (Gas Chromatograph)

### 4.2. Noise and vibration

Table 4: Test method of noise and vibration monitoring

No.	Parameters	Unit	Sampling Instrument	Test method
1.	Noise	dBA	Tes 1351	QCVN 26:2010/BTNMT
2.	Vibration	dB	Rion VM-83	QCVN 27:2010/BTNMT

### 4.3. Surface water quality

Table 5: Test method of surface water quality monitoring

No.	Parameters	Unit	Sample container	Sampling Instrument	Test method
1.	pH	--	PE	-	TCVN 6492:2011
2.	BOD <sub>5</sub>	mg/L			TCVN 6001-2:2008
3.	COD	mg/L			SMEWW 5220:2005
4.	DO	mg/L			Quick measured by machine Econsan DO 6
5.	TSS	mg/L			TCVN 6625:2000
6.	As	mg/L			SMEWW 3113B, 20 <sup>th</sup> Ed
7.	Cd	mg/L			SMEWW 3113B, 20 <sup>th</sup> Ed
8.	Pb	mg/L			SMEWW 3113B, 20 <sup>th</sup> Ed
9.	Cu	mg/L			SMEWW 3500:2005
10.	Zn	mg/L			SMEWW 3113B, 20 <sup>th</sup> Ed
11.	Hg	mg/L			SMEWW3112Hg,20 <sup>th</sup> Ed
12.	NH <sub>4</sub> <sup>+</sup>	mg/L			SMEWW 4500-NH <sub>3</sub> -F
13.	Total N (N-Kjeldahl)	mg/L			SMEWW 4500-N C
14.	Total P	mg/L			TCVN 6202:1996
15.	Lubricant	mg/L			TCVN 5070:1995
16.	Coliform	MPN/100mL			TCVN 6187-2:1996

#### 4.4. Underground water quality

Table 6: Test method of underground water quality monitoring

No.	Parameters	Unit	Sample container	Sampling Instrument	Test method
1.	pH	--	PE	-	TCVN 6492:2011
2.	Color	Pt-Co			Quick measured by machine DR/890
3.	Temperature	°C			Quick measured by machine Ecoscan Con 6
4.	Odor	--			Sensory
5.	TDS	mg/L			Quick measured by machine Hanna HI 8734
6.	Hardness	mg/L			TCVN 6224-1996
7.	Conductivity	μS			Quick measured by machine Ecoscan Con 6
8.	Turbidity	NTU			Quick measured by machine HI 93703
9.	CN <sup>-</sup>	mg/L			TCVN 6181-1996
10.	NO <sub>3</sub> <sup>-</sup>	mg/L			EPA 352.1
11.	Cl <sup>-</sup>	mg/L			TCVN 6194:1996
12.	SO <sub>4</sub> <sup>2-</sup>	mg/L			TCVN 6494:2:2000
13.	Mn	mg/L			SMEWW 3113B, 20 <sup>th</sup> Ed
14.	Fe	mg/L			TCVN 6177:1996
15.	Cd	mg/L			SMEWW 3113B, 20 <sup>th</sup> Ed
16.	Pb	mg/L			SMEWW 3113B, 20 <sup>th</sup> Ed
17.	As	mg/L			SMEWW 3113B, 20 <sup>th</sup> Ed
18.	Total Coliform	MPN/100mL			TCVN 6187-2:1996
19.	Fecal Coliform	MPN/100mL			TCVN 6187-2:1997

#### 4.5. Soil quality

Table 7: Test method of soil monitoring

No.	Parameters	Unit	Sampling Instrument	Test method
1.	pH	--	-	TCVN 5979:1995
2.	Organic matter	%		Wallkey – Black
3.	Total N	%		Kjeldahl
4.	Total P	%		H <sub>2</sub> SO <sub>4</sub> :HClO <sub>4</sub>
5.	Cl <sup>-</sup>	mg/kg		Titration by AgNO <sub>3</sub>
6.	SO <sub>4</sub> <sup>2-</sup>	%		Titration by BaCl <sub>2</sub>
7.	Cu	mg/kg		SMEWW 3113-Cu-1995
8.	Zn	mg/kg		SMEWW 3111-Zn -1995
9.	Cd	mg/kg		SMEWW 3113-Cd-1995
10.	Pb	mg/kg		SMEWW 3113-Pb-1995
11.	Hg	mg/kg		SMEWW 3112-Hg -1995
12.	As	mg/kg		SMEWW 3114-As-1995
13.	Fe	mg/kg		TCVN 4618-1988

#### 4.6. Wastewater quality

Table 8: Test method of wastewater quality monitoring

No.	Parameters	Unit	Sampling Instrument	Test method
1.	pH	-	-	TCVN 6492:2011
2.	Temperature	°C		Quick measured by machine Hanna HI 8314
3.	BOD <sub>5</sub>	mg/L		TCVN 6001-2:2008
4.	COD	mg/L		SMEWW 5220:2005
5.	DO	mg/L		TCVN 5499:1995
6.	SS	mg/L		TCVN 6625:2000
7.	NH <sub>4</sub> <sup>+</sup>	mg/L		SMEWW 4500-NH <sub>3</sub> -F
8.	Total N (N-Kjeldahl)	mg/L		TCVN 5987:1995
9.	Total P	mg/L		TCVN 6202:1996
10.	Lubricant	mg/L		AFNOR T90
11.	Total Coliform	MPN/100mL		TCVN 6187-2:1996

## CHAPTER V. RESULT OF ENVIRONMENTAL MONITORING

### 5.1. Air quality

+ Sampling location:

- A1: Song Nhan residential area (Km 39+400) (X: 0736854 mE, Y: 1205918 mN)
- A2: Intersection with NH1(Km 54+983) (X: 0733497 mE, Y: 1203915 mN)
- A3: Dau Giay intersection (Km 54+350) (X: 0733484 mE, Y: 1203996 mN)

+ Symbol of sample: 174-KK/2013

Due in QCVN 05:2009/BTNMT specified air concentration under unit  $\mu\text{g}/\text{m}^3$  but the methods of analysis and sampling are used unit  $\text{mg}/\text{m}^3$  should all have been converted to the same unit are  $\text{mg}/\text{m}^3$ . Results of ambient air quality monitoring presented in the following table:

Table 9: Microclimate result

No.	TIME 12/03/2013	THE RESULT				
		Temperature (°C)	Humidity (%)	Wind speed (m/s)	Atmospheric pressure (atm)	Wind direction
A1: Song Nhan residential area (Km 39+400)						
1.	Measuring at 07.00	30,6	65,3	0,4 – 1,0	1	SE
2.	Measuring at 09.00	30,1	61,5	0,5 - 1,2	1	SE
3.	Measuring at 11.00	32,4	69,3	0,3 – 1,1	1	SE
A2: Intersection with NH1(Km 54+983)						
4.	Measuring at 13.00	32,1	54,7	0,4 – 1,1	1	SE
5.	Measuring at 15.00	31,6	53,5	0,5 – 1,2	1	SE
A3: Dau Giay intersection (Km 54+350)						
6.	Measuring at 17.00	30,4	58,1	0,5 - 0,9	1	SE
7.	Measuring at 19.00	30,7	56,4	0,7 - 1,1	1	SE
8.	Measuring at 21.00	27,3	62,4	0,4 - 0,8	1	SE

Source: Joint venture environment and technology center HCM city for natural resources and environment, 12/2013

Table 10: Results of air quality monitoring

No.	TIME 12/03/2013	THE RESULT				
		SO <sub>2</sub> (mg/m <sup>3</sup> )	NO <sub>2</sub> (mg/m <sup>3</sup> )	CO (mg/m <sup>3</sup> )	HC (mg/m <sup>3</sup> )	TSP (mg/m <sup>3</sup> )
A1: Song Nhan residential area (Km 39+400)						
1.	Measuring at 07.00	0,066	0,050	2,46	ND	0,21
2.	Measuring at 09.00	0,076	0,064	3,72	ND	0,23
3.	Measuring at 11.00	0,084	0,076	3,68	ND	0,46
A2: Intersection with NH1(Km 54+983)						
4.	Measuring at 13.00	0,072	0,068	3,40	ND	0,21
5.	Measuring at 15.00	0,075	0,058	4,20	ND	0,20
A3: Dau Giay intersection (Km 54+350)						
6.	Measuring at 17.00	0,071	0,063	5,46	ND	0,22
7.	Measuring at 19.00	0,067	0,057	3,55	ND	0,21
8.	Measuring at 21.00	0,046	0,081	4,20	ND	0,22
QCVN 05:2009/BTNMT		0.35	0.2	30	--	0.3

Source: Joint venture environment and technology center HCM city for natural resources and environment, 12/2013

- Note: ND: Not detected

The following is a comparison of the concentrations of SO<sub>2</sub>, NO<sub>2</sub>, CO, TSP each quarter, from quarter I/2011 to quarter IV/2013. In order to show the change of the targets in each quarter of the year and between years together. The table is shown as follows:

Table 11: Comparison of SO<sub>2</sub> (mg/m<sup>3</sup>) at Dau Giay intersections (Km 54+350) compared to the previous quarter

Time	Pre-construction phase	Q I-03/2011	Q II-06/2011	Q III-09/2011	Q I-03/2012	Q II-06/2012	Q III-09/2012	Q IV-12/2012	Q I-03/2013	Q II-06/2013	Q III-09/2013	Q IV-12/2013	QCVN 05:2009/BTNMT
Measuring at 05.00 pm	0.028	0.034	0.031	0.03	0.063	0.072	0	0.073	0.072	0.07	0.072	0.071	<b>0.35</b>
Measuring at 07.00 pm	0.025	0.027	0.026	0.02	0.071	0.069	0	0.075	0.077	0.08	0.074	0.067	<b>0.35</b>
Measuring at 09.00 pm	0.024	0.028	0.03	0.01	0.068	0.074	0	0.065	0.068	0.07	0.065	0.046	<b>0.35</b>

According the monitoring results which are shown in the table 11, the SO<sub>2</sub> concentrations measured at 5:00 pm, 7:00 pm and 9:00 pm in quarter IV/2013 are lower

than in quarter III/2013 and still within the allowable value of the regularization (QCVN 05:2009 / MONRE, with a value of 0.35 mg/m<sup>3</sup>).

Table 12: Comparison of NO<sub>2</sub> (mg/m<sup>3</sup>) at Dau Giay intersections (Km 54+350) compared to the previous quarter

Time	Pre-construction phase	Q I-03/2011	Q II-06/2011	Q III-09/2011	Q I-03/2012	Q II-06/2012	Q III-09/2012	Q IV-12/2012	Q I-03/2013	Q II-06/2013	Q III-09/2013	Q IV-12/2013	QCVN 05:2009/ BTNMT
Measuring at 05.00 pm	0.089	0.022	0.019	0.02	0.05	0.07	0.026	0.07	0.061	0.06	0.062	0.063	<b>0.2</b>
Measuring at 07.00 pm	0.091	0.019	0.017	0.01	0.06	0.06	0.023	0.07	0.065	0.063	0.061	0.057	<b>0.2</b>
Measuring at 09.00 pm	0.075	0.021	0.02	0.01	0.06	0.06	0.024	0.06	0.055	0.054	0.055	0.081	<b>0.2</b>

According the monitoring results which are shown in the table 12, the NO<sub>2</sub> concentrations measured at 5:00 pm and 9:00 pm in quarter IV/2013 is higher than in quarter III/2013 but the NO<sub>2</sub> concentrations measured at 7:00 pm in quarter IV/2013 is lower in quarter II/2013. But still within the allowable value of the regularization (QCVN 05:2009 / MONRE, with a value of 0.2 mg/m<sup>3</sup>).

Table 13: Comparison of CO (mg/m<sup>3</sup>) at Dau Giay intersections (Km 54+350) compared to the previous quarter

Time	Pre-construction phase	Q I-03/2011	Q II-06/2011	Q III-09/2011	Q I-03/2012	Q II-06/2012	Q III-09/2012	Q IV-12/2012	Q I-03/2013	Q II-06/2013	Q III-09/2013	Q IV-12/2013	QCVN 05:2009/ BTNMT
Measuring at 05.00 pm	3.05	3.27	3.15	3.04	3.69	3.75	2.58	4.35	4.59	4.52	4.53	5.46	30
Measuring at 07.00 pm	3.12	3.17	3.14	2.89	4.23	3.98	2.67	3.74	3.96	3.94	3.92	3.55	30
Measuring at 09.00 pm	3.01	3.16	3.17	2.56	4.28	4.36	2.41	3.69	3.47	3.44	3.42	4.20	30

According the monitoring results which are shown in the table 13, the CO concentrations measured at 7:00 pm in quarter IV/2013 is lower than in quarter III/2013 but the CO concentrations measured at 5:00 pm and 9:00 pm in quarter IV/2013 is higher in quarter III/2013. But still within the allowable value of the regularization (QCVN 05:2009 / MONRE, with a value of 0.35 mg/m<sup>3</sup>).

Table 14: Comparison of TSP (mg/m<sup>3</sup>) at Dau Giay intersections (Km 54+350) compared to the previous quarter

Time	Pre-construction phase	Q I-03/2011	Q II-06/2011	Q III-09/2011	Q I-03/2012	Q II-06/2012	Q III-09/2012	Q IV-12/2012	Q I-03/2013	Q II-06/2013	Q III-09/2013	Q IV-12/2013	QCVN 05:2009/BTNMT
Measuring at 05.00 pm	0.1	0.1	0.12	0.13	0.18	0.21	0.11	0.27	0.26	0.24	0.23	0.22	0.3
Measuring at 07.00 pm	0.05	0.07	0.06	0.04	0.27	0.24	0.1	0.25	0.23	0.22	0.23	0.21	0.3
Measuring at 09.00 pm	0.04	0.08	0.09	0.02	0.26	0.23	0.1	0.24	0.22	0.21	0.20	0.22	0.3

According the monitoring results which are shown in the table 14, the TSP concentrations measured at 5:00 pm and 7:00 pm in quarter IV/2013 is lower than in quarter III/2013 but the TSP concentrations measured at 9:00 pm in quarter IV/2013 is lower in quarter III/2013. But still within the allowable value of the regularization (QCVN 05:2009 / MONRE, with a value of 0.30 mg/m<sup>3</sup>).

The graph shows the change over time of the SO<sub>2</sub>, NO<sub>2</sub>, CO, TSP concentration at various traffic junctions:

❖ SO<sub>2</sub> concentration:

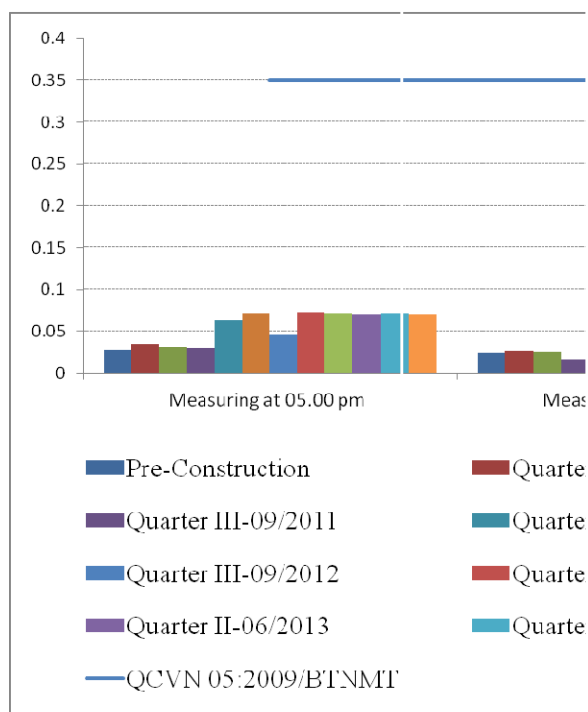


Figure 2: Concentration of SO<sub>2</sub> varies follow time at Dau Giay intersection (km 54+350)

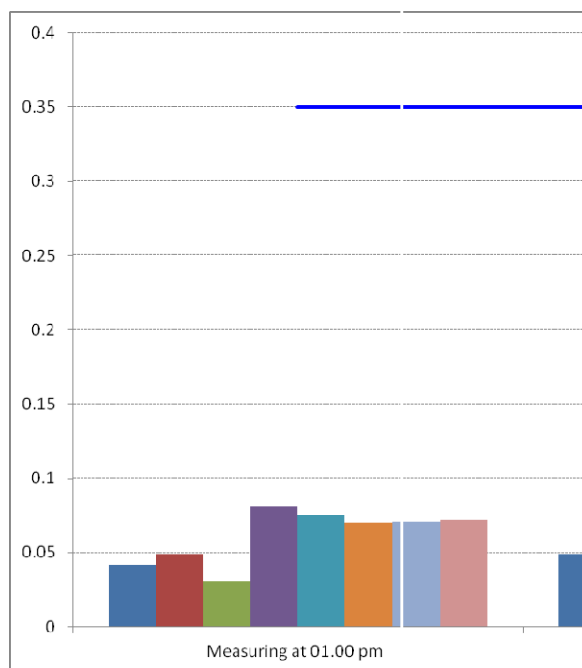


Figure 3: Concentration of SO<sub>2</sub> varies follow time at Intersection with NH1 (km 54+983)

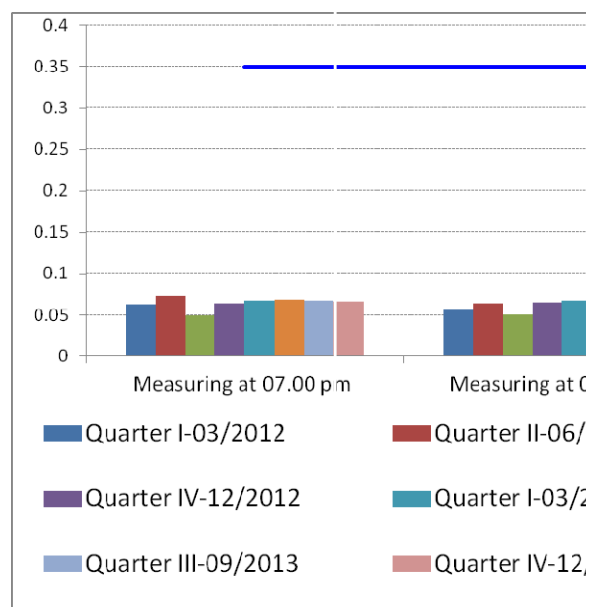


Figure 4: Concentration of SO<sub>2</sub> varies follow time at Song Nhan residential area (km 39+400)

In the quarter IV-12/2013, concentration of SO<sub>2</sub> at Dau Giay intersection (Km 54+350) around 0.046 to 0.071 mg/m<sup>3</sup>, at two new points side the ADB requiemments: Intersection with NH1 (Km 54+983) around 0.071-0.074 mg/m<sup>3</sup> and Song Nhan residential area (Km 39+400) around 0,063-0,067 mg/m<sup>3</sup>. The values analysis in quarter

IV-12/2013 are lower than the previous quarter and lower than Vietnamese regulation allows (QCVN 05:2009/BTNMT;  $0.35 \text{ mg/m}^3$ ) many times.

❖  $\text{NO}_2$  concentration:

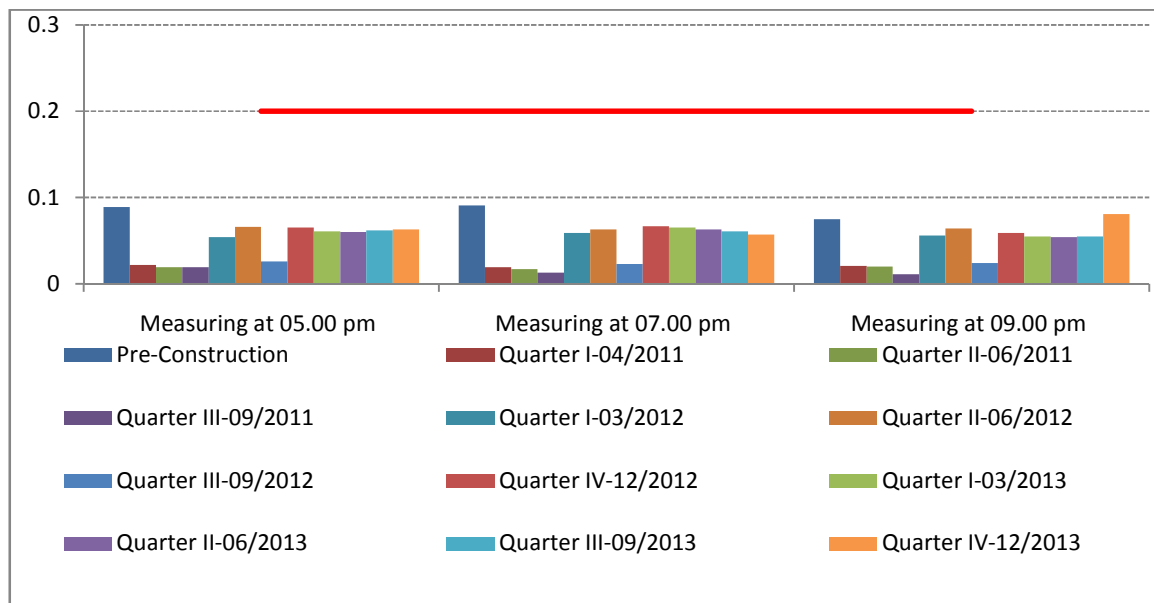


Figure 5: Concentration of  $\text{NO}_2$  varies follow time at Dau Giay intersection (km 54+350)

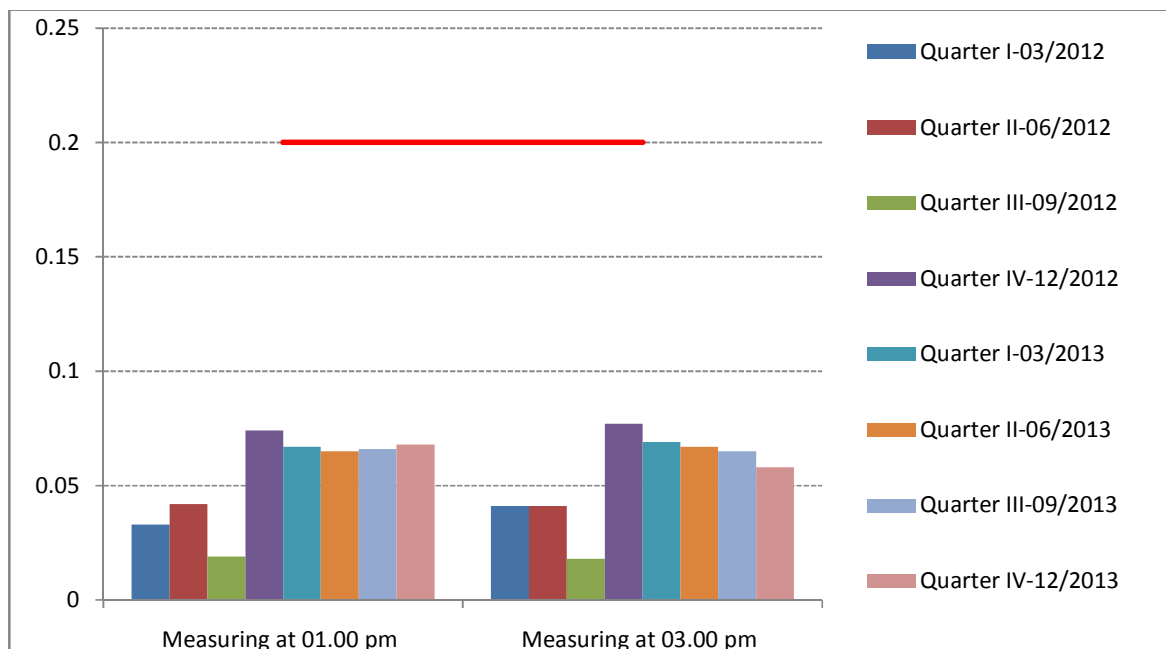


Figure 6: Concentration of  $\text{NO}_2$  varies follow time at Intersection with NH1 (km 54+983)

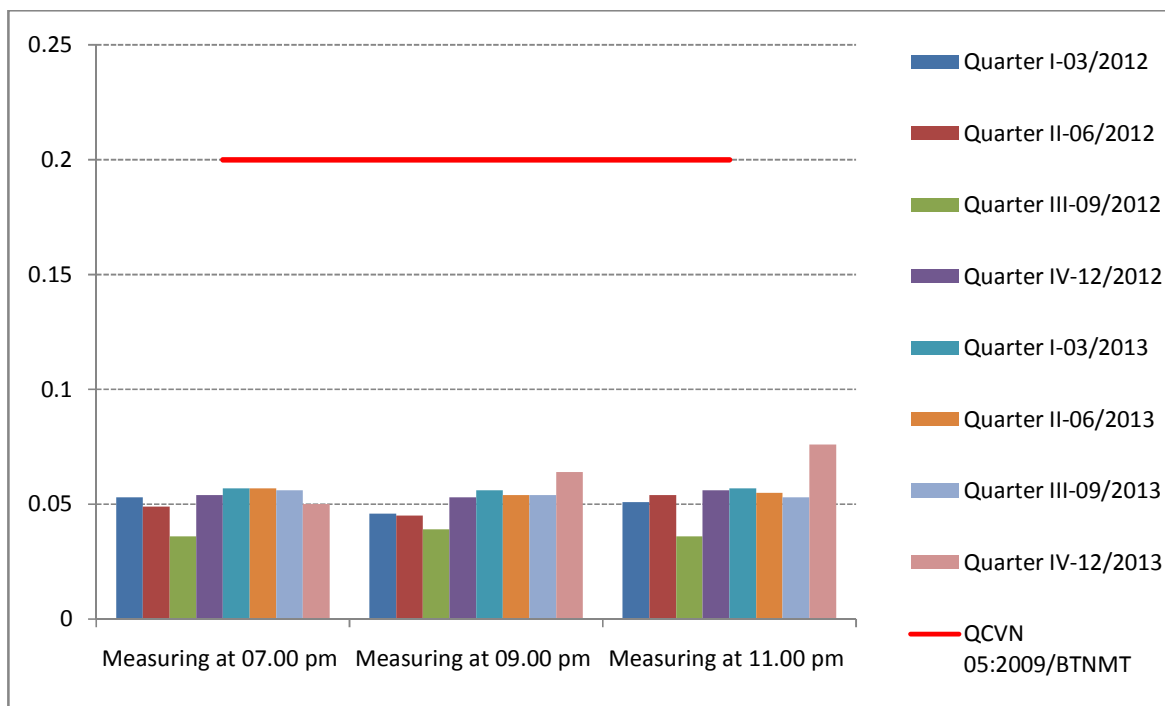


Figure 7: Concentration of NO<sub>2</sub> varies follow time at Song Nhan residential area (km 39+400)

In the quarter IV-12/2013, concentration of NO<sub>2</sub> at Dau Giay intersection (Km 54+350) around 0,057 to 0.081 mg/m<sup>3</sup>, at two new points side the ADB requiements: Intersection with NH1 (Km 54+983) around 0,058-0,068 mg/m<sup>3</sup> and Song Nhan residential area (Km 39+400) around 0,050-0,076 mg/m<sup>3</sup>. The values analysis in quarter IV-12/2013 are still lower than Vietnamese regulation allows (QCVN 05:2009/BTNMT; 0.2 mg/m<sup>3</sup>) many times.

❖ **CO** concentration:

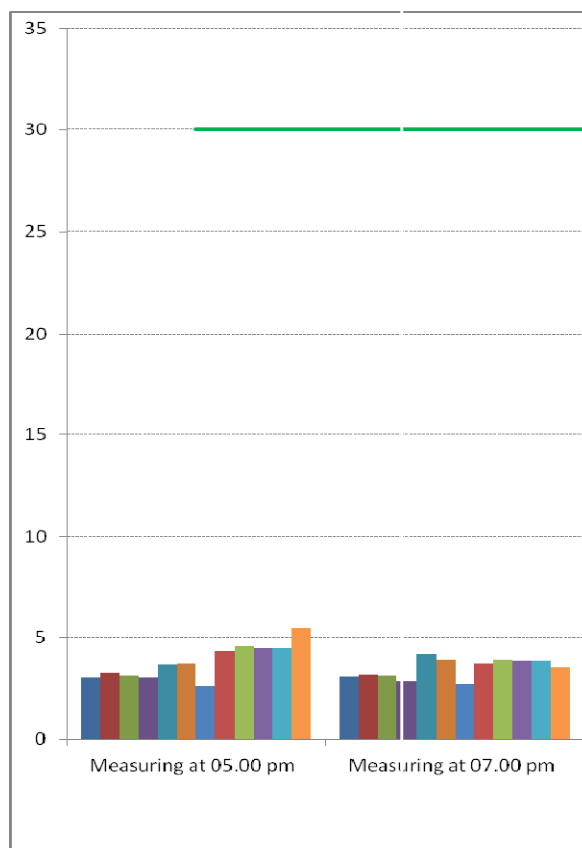


Figure 8: Concentration of CO varies follow time at Dau Giay intersection (km 54+350)

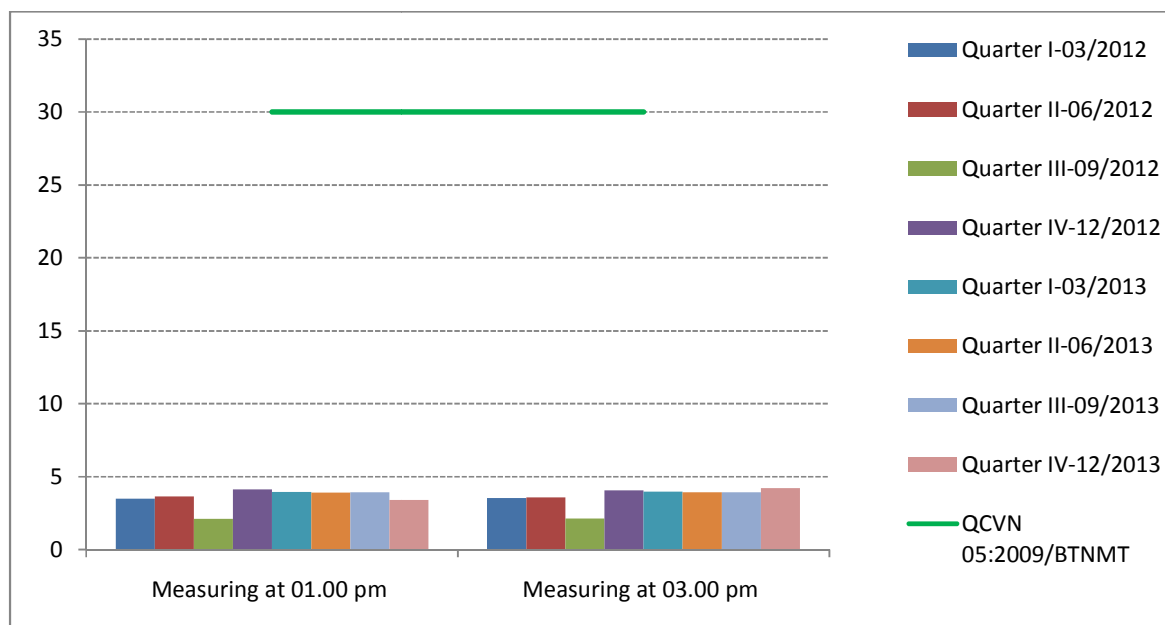


Figure 9: Concentration of CO varies follow time at Intersection with NH1 (km 54+983)

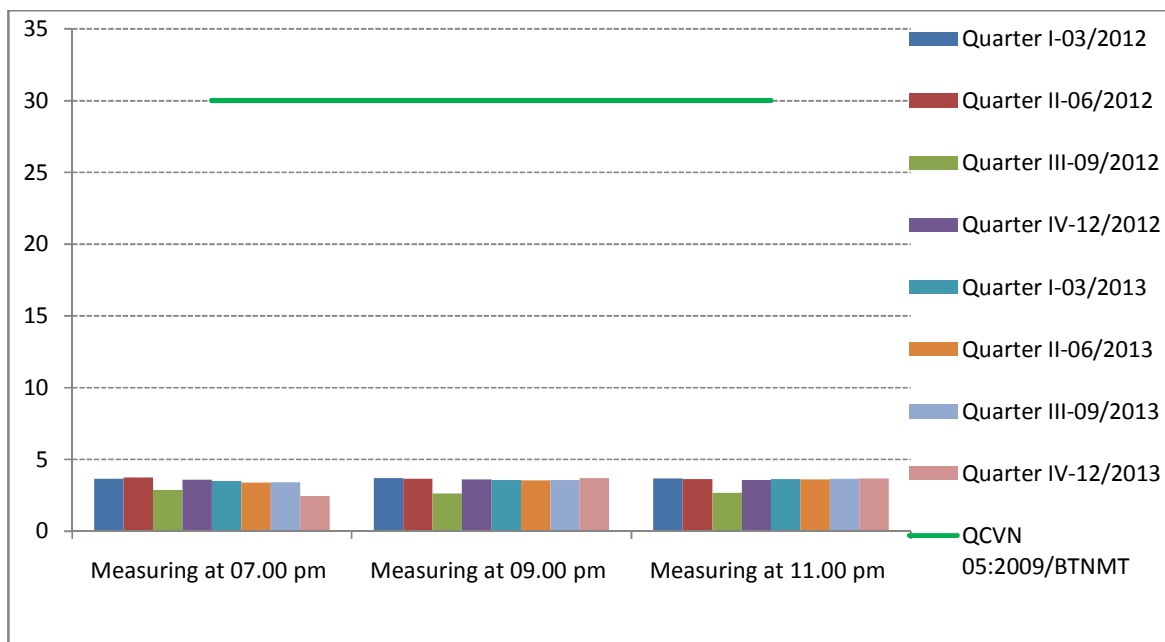


Figure 10: Concentration of CO varies follow time at Song Nhan residential area (km 39+400)

Concentration of CO in the quarter IV-12/2013 at Dau Giay intersection (Km 54+350) around 3.55 - 5.46 mg/m<sup>3</sup>, at two new points side the ADB requiements: Intersection with NH1 (Km 54+983) around 3.40 – 4.20 mg/m<sup>3</sup> and Song Nhan residential area (Km 39+400) around 2.46 – 3.72 mg/m<sup>3</sup>. These values were lower than the Vietnamese regulation (QCVN 05:2009/BTNMT; 30 mg/m<sup>3</sup>) many times.

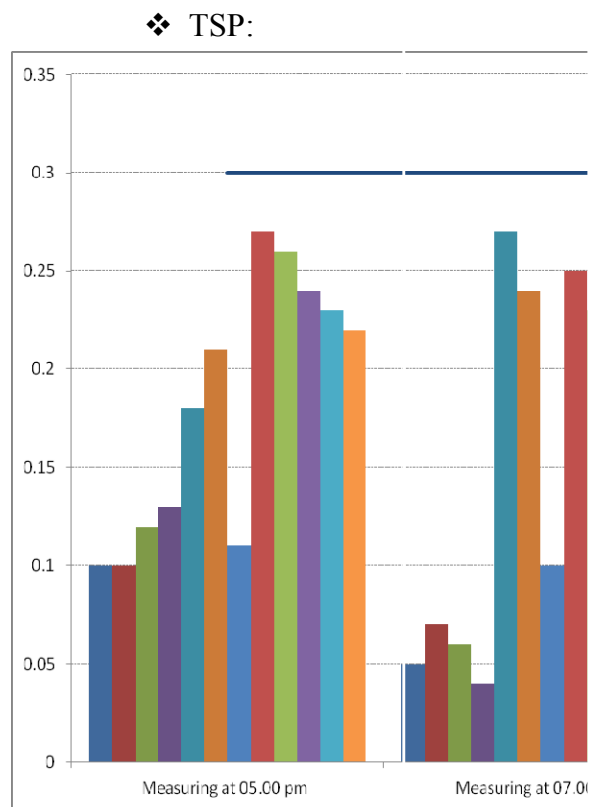


Figure 11: Concentration of TSP varies follow time at Dau Giay intersection (km 54+350)

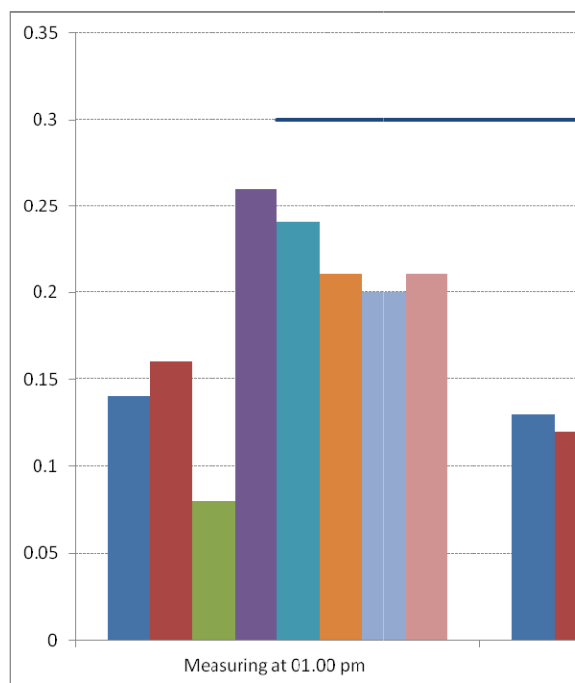


Figure 12: Concentration of TSP varies follow time at Intersection with NH1 (km 54+983)

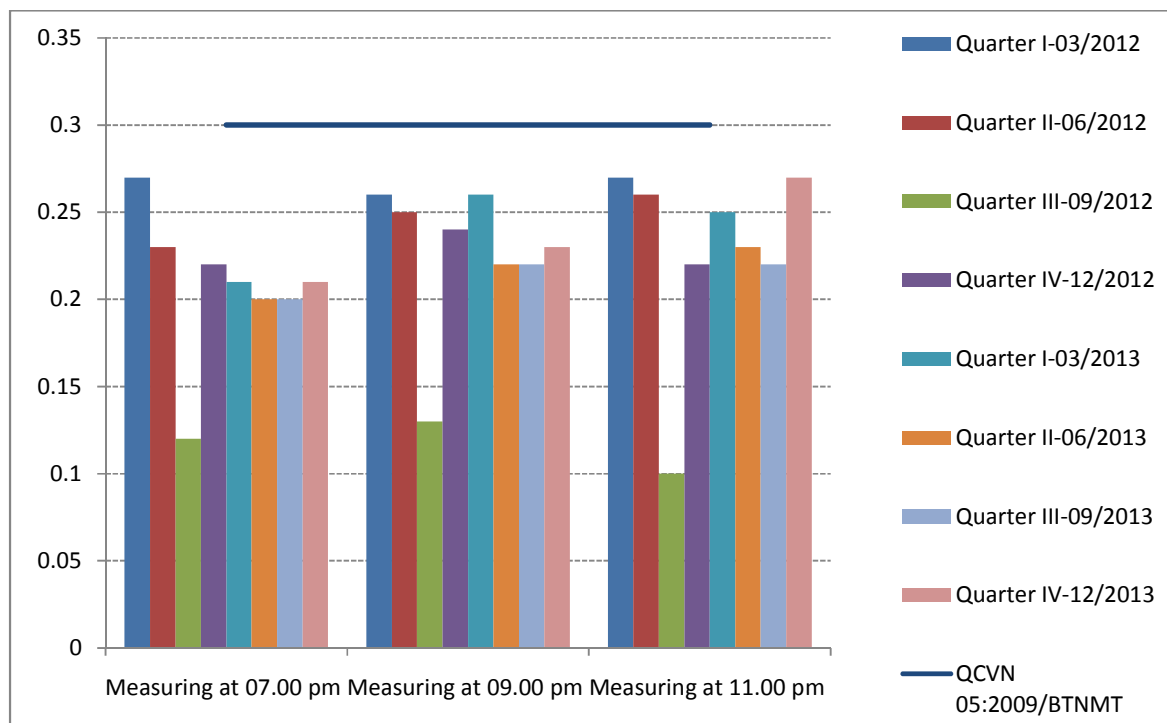


Figure 13: Concentration of TSP varies follow time at Song Nhan residential area (Km 39+400)

In the quarter IV-12/2013, concentration of TSP at Dau Giay intersection (Km 54+350) around 0.21-0.22  $\text{mg}/\text{m}^3$ , at two new points side the ADB equipments: Intersection with NH1 (Km 54+983) around 0,20-0,21  $\text{mg}/\text{m}^3$  and Song Nhan residential area (Km 39+400) around 0,21-0,27  $\text{mg}/\text{m}^3$ . These values were lower than the Vietnamese regulation (QCVN 05:2009/BTNMT; 0.3  $\text{mg}/\text{m}^3$ ) many times.

Based on the figure shows the concentration of NO<sub>2</sub>, SO<sub>2</sub>, CO, TSP in ambient air environment can be seen concentration in the quarter IV/2013 at some time lower than the most recent quarter, some are higher than last quarters but these values still remain within the limits of Regulation (QCVN 05:2009/BTNMT). Individual hydrocarbon concentrations similar to the previous quarter are not detected at the time of sampling.

## 5.2. Noise

+ *Sampling location:*

- 174-ON(01)/2013 : Dau Giay intersection (Km 54+350) (X: 0733484 mE, Y: 1203996 mN)
- 174-ON(02)/2013: Intersection with NH1 (Km 54+983) (X: 0733497 mE, Y: 1203915 mN)

+ *The results of noise monitoring are presented in the following table 15.*

Table 15: Results of noise monitoring

Time 12/03/2013	Noise level (dBA)	
	174-ON(01)/2013	174-ON(02)/2013
6h-7h	56.0	55.2
7h-8h	55.1	60.3
8h-9h	59.3	60.1
9h-10h	62.5	59.0
10h-11h	59.3	60.6
11h-12h	61.0	60.9
12h-13h	59.0	55.2
13h-14h	61.1	61.7
14h-15h	56.5	58.6
15h-16h	58.5	61.4
16h-17h	61.7	60.6
17h-18h	59.1	60.5
18h-19h	64.7	55.6
19h-20h	58.2	58.0
20h-21h	50.9	51.7
21h-22h	54.0	53.3

*Source: Joint venture environment and technology center HCM city for natural resources and environment, 12/2013*

According to the monitoring results, value of noise at Dau Giay intersection (Km 54+350) around 50.9 -64.7 dBA and Intersection with NH1 (Km 54+983) around 51.7 – 61.7 dBA. In general, the value of noise at the two location monitoring in the quarter III/2013 was lower then the regulation (QCVN 26:2010/BTNMT, 55-70 dBA). At some point may find the noise level value is high because the impact of transportation crossing in field and other motor vehicles operating in the field but the impact is negligible. Contractor will continue to monitor to avoid affecting the ambient.

Table 16: Summarize result of noise

Time 12/03/2013	Results (dBA)		<b>QCVN 26:2010/BTNMT (Common area)</b>
	174- ON(01)/2013	174- ON(02)/2013	
6h00-21h00	50.9 – 64.7	51.7 – 61.7	<b>70 dBA</b>
21h00-6h00	54.0 – 55.0	53.3 – 54.5	<b>55 dBA</b>

Source: Joint venture environment and technology center HCM city for natural resources and environment, 12/2013

### 5.3. Vibration

+ Sampling location:

- 174-R(01)/2013 : Dau Giay intersection (Km 54+350) (Tọa độ: X: 0733484 mE, Y: 1203996 mN)
- 174-R(02)/2013: Intersection with NH1 (Km 54+983) (Tọa độ: X: 0733497 mE, Y: 1203915 mN)

+ The results of vibration monitoring are presented in the following table 17.

Table 17: Results of vibration monitoring

Time 12/03/2013	Vibration level				Frequency around
	174-R(01)/2013		174-R(02)/2013		
	La <sub>eq</sub> (m/s <sup>2</sup> )	Lv <sub>eq</sub> (mm/s)	La <sub>eq</sub> (m/s <sup>2</sup> )	Lv <sub>eq</sub> (mm/s)	
06h-07h	0.0019	0.034	0.0023	0.045	1Hz-10Hz
07h-08h	0.0019	0.030	0.0024	0.050	1Hz-10Hz
08h-09h	0.0020	0.040	0.0025	0.038	1Hz-10Hz
09h-10h	0.0025	0.036	0.0020	0.046	1Hz-10Hz
10h-11h	0.0030	0.058	0.0034	0.043	1Hz-10Hz

Time 12/03/2013	Vibration level				Frequency around
11h-12h	0.0032	0.047	0.0028	0.044	1Hz-10Hz
12h-13h	0.0025	0.049	0.0024	0.051	1Hz-10Hz
13h-14h	0.0023	0.035	0.0028	0.047	1Hz-10Hz
14h-15h	0.0024	0.054	0.0022	0.054	1Hz-10Hz
15h-16h	0.0026	0.061	0.0026	0.056	1Hz-10Hz
16h-17h	0.0024	0.059	0.0024	0.054	1Hz-10Hz
17h-18h	0.0023	0.047	0.0026	0.053	1Hz-10Hz
18h-19h	0.0025	0.0412	0.0019	0.051	1Hz-10Hz
19h-20h	0.0024	0.037	0.0024	0.063	1Hz-10Hz
20h-21h	0.0021	0.047	0.0023	0.054	1Hz-10Hz
22h-23h	0.0019	0.039	0.0023	0.042	1Hz-10Hz

Source: Joint venture environment and technology center HCM city for natural resources and environment, 12/2013

According to the monitoring results, value of noise at Dau Giay intersection (Km 54+350) around 0.0019 -0.0032 m/s<sup>2</sup> and Intersection with NH1 (Km 54+983) around 0.0019-0.0034 m/s<sup>2</sup>. Its value is lower than limit regulation (QCVN 27:2010/BTNMT, 55-75 dBA). Similarly the value of noise, vibration at some point high because the impact of transportation crossing in field and other motor vehicles operating in the field but the impact is negligible. Contractor will continue to monitor to avoid affecting the ambient.

Table 18: Summarize result of vibration

Time 12/03/2013	Average result		QCVN 27:2010/BTNMT (Common area)
	174-R(01)/2013	174-R(02)/2013	
6h00-21h00	0.0019-0.0032 m/s <sup>2</sup> (45.6-50.1 dB)	0.0019-0.0034 m/s <sup>2</sup> (45.6-50.6 dB)	75 dB
21h00-6h00	0.0019-0.0021 m/s <sup>2</sup> (45.6-46.4 dB)	0.0023-0.0025 m/s <sup>2</sup> (47.2 - 48.0 dB)	55 dB

Source: Joint venture environment and technology center HCM city for natural resources and environment, 12/2013

#### 5.4. Surface water quality

+ Sampling location: Song Nhan area.

+ Symbol of sample:

174-NM-(1)/2013: Surface water of Song Nhan (upstream)

174-NM-(2)/2013: Surface water of Song Nhan (downstream)

The results of surface water quality monitoring are presented in the following table 19

Table 19: Results of surface water quality monitoring

No.	PARAMETERS/UNIT		RESULTS		QCVN 08:2008/BTNMT
			174-NM-(1)/2013	174-NM-(2)/2013	
1.	pH	--	7.05	7.25	5.5-9
2.	Temperature	°C	27.9	28.8	--
3.	Turbidity	NTU	106.2	95.8	--
4.	Conductivity	μS	168.6	179.3	--
5.	DO	mg/L	6.15	5.68	≥2
6.	BOD <sub>5</sub>	mg/L	20	19	25
7.	COD	mg/L	34	32	50
8.	SS	mg/L	18	20	100
9.	Total N	mg/L	10.25	9.60	--
10.	Total P	mg/L	1.50	0.95	--
11.	Cu	mg/L	2.25 x 10 <sup>-3</sup>	3.45 x 10 <sup>-3</sup>	1
12.	Zn	mg/L	20.08 x 10 <sup>-3</sup>	18.50 x 10 <sup>-3</sup>	2
13.	Cd	mg/L	0.025 x 10 <sup>-3</sup>	0.030 x 10 <sup>-3</sup>	0.01
14.	Pb	mg/L	5.20 x 10 <sup>-3</sup>	3.50 x 10 <sup>-3</sup>	0.05
15.	As	mg/L	0.60 x 10 <sup>-3</sup>	0.75 x 10 <sup>-3</sup>	0.1
16.	Hg	mg/L	KPH	KPH	0.002
17.	Lubricant	mg/L	0.06	KPH	0.3
18.	NO <sub>3</sub> <sup>-</sup>	mg/L	3.25	2.20	15
19.	CN <sup>-</sup>	mg/L	0.06 x 10 <sup>-3</sup>	0.04 x 10 <sup>-3</sup>	0.02
20.	N-NH <sub>4</sub> <sup>+</sup>	mg/L	0.50	0.65	1
21.	Total Coliform/100mL	MPN	4600	5000	10000

Source: Joint venture environment and technology center HCM city for natural resources and environment, 12/2013

- QCVN 08:2008/BTNMT: National technical regulation on surface water quality (Level B2 was used in this case).

- ND: Not detected

#### • pH

At all sampling locations listed above (174-NM-(1)/2013, 174-NM-(2)/2013), pH values are met Vietnamese regulation (QCVN 08:2008/BTNMT; pH: 5.5-9).

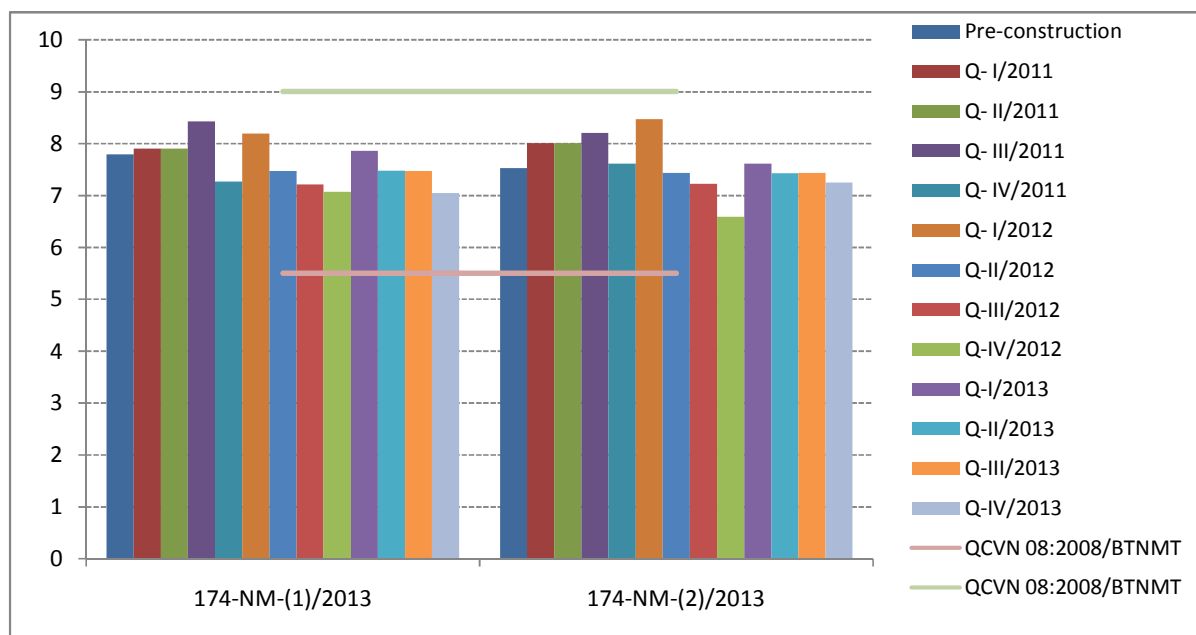


Figure 14: pH varies follow quarter of surface water quality monitoring

#### • DO

Dissolve Oxygen (DO) is a very important parameter that guarantees aquatic life. DO take part in metabolism, maintains energy for growing, breeding and reproduction for aquatic microorganism.

DO concentration definition is the foundation for water quality assessment, the basic for BOD<sub>5</sub> concentration definition, for assessing the pollution level of water source caused by organic matters and for defining the self-cleaning capacity of water source so that this parameter also indicates pollution level of water source. National technical regulation on surface water quality (QCVN 08:2008/BTNMT, level B2) limits value of  $DO \geq 2\text{mg/L}$ . However, if the DO concentration is less than 5mg/L, it can cause effectiveness to aquatic population conversion.

Dissolved oxygen in surface water samples un the project area quarter IV-12/2013 range 5.68 ÷ 6.15 mg/L.

Dissolved oxygen concentrations in quarter IV/2013 is higher than quarter III/2013 and higher than 5 mg / L, so dissolved oxygen concentrations have been increased in the quarter IV/2013 than the quarter III/2013.

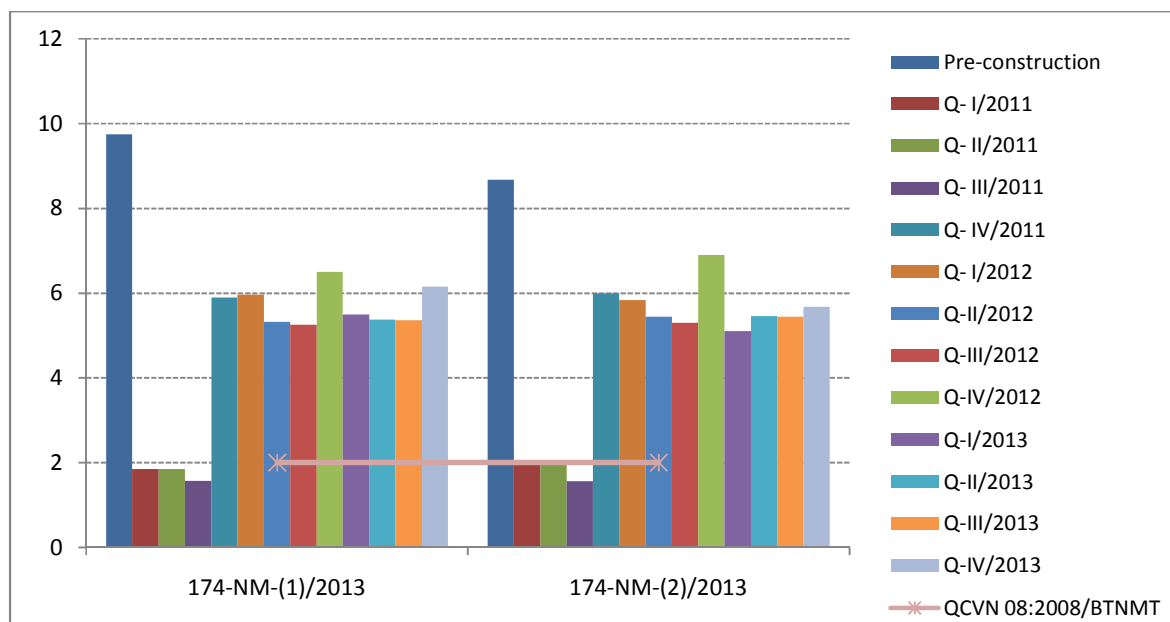


Figure 15: DO varies follow quarter of surface water quality monitoring

### • Organic pollution

Biological oxygen demand (BOD<sub>5</sub>): Concentrations BOD observed at positions although there higher the previous quarter but most have met regulation allow (QCVN 08:2008/BTNMT, level B2; 25mg/L). BOD<sub>5</sub> values fluctuated around 19 ÷ 20 mg/L.

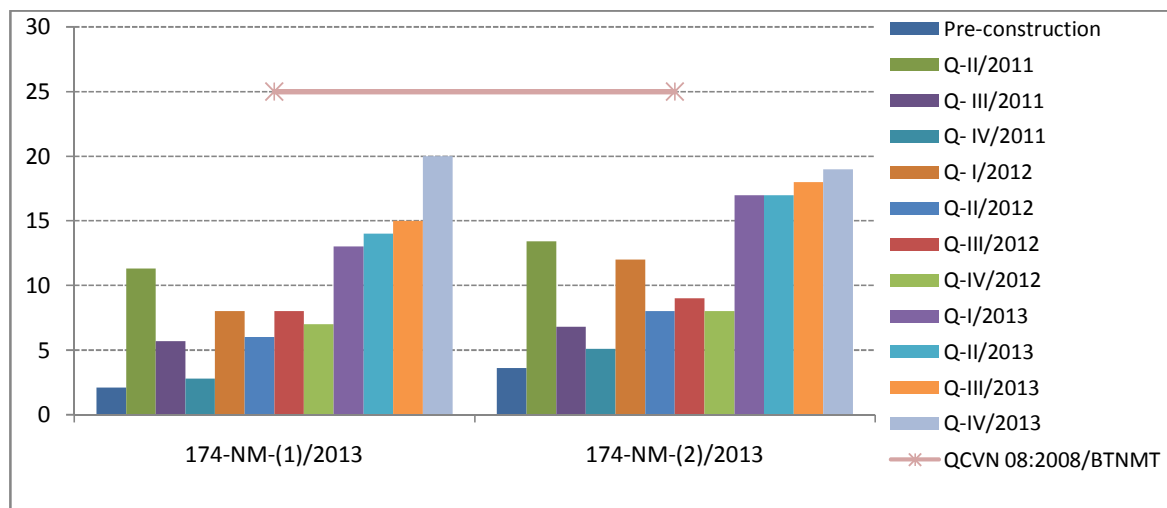


Figure 16: BOD<sub>5</sub> varies follow quarter of surface water quality monitoring

Chemical oxygen demand (COD): The result monitoring, COD concentrations in the sample positions are met the limit regulation allow (QCVN 08:2008/BTNMT, level B2; 50 mg/L). Values of COD fluctuated around  $24 \div 27$  mg/L.

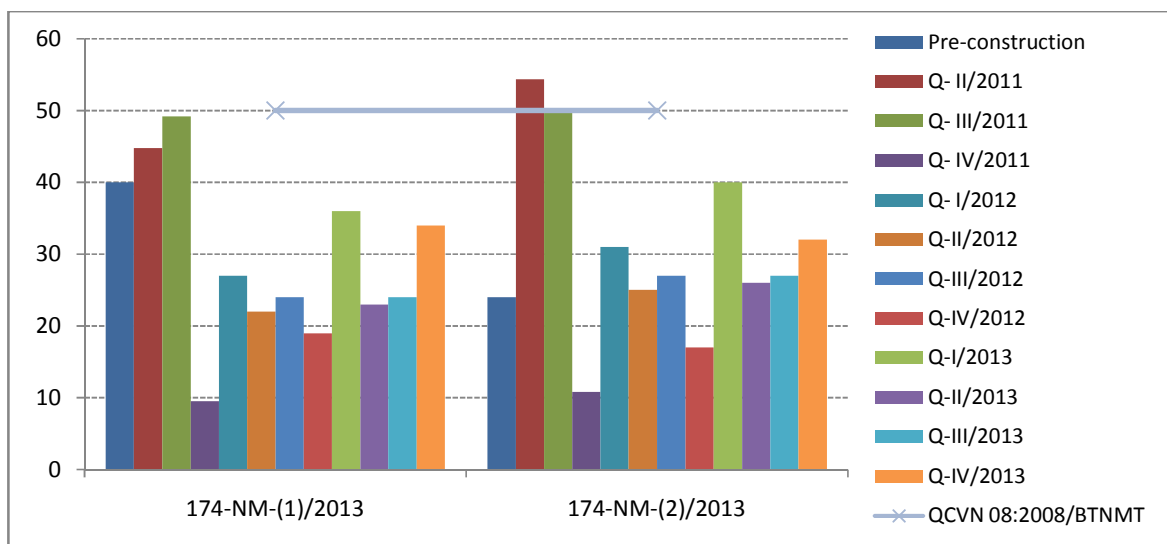


Figure 17: COD varies follow quarter of surface water quality monitoring

• SS

Suspended solid (SS) content is very low at all monitoring locations and lower than the regulation (QCVN 08:2008/BTNMT, level B2; 100 mg/L) with value fluctuated around  $18 \div 20$  mg/L.

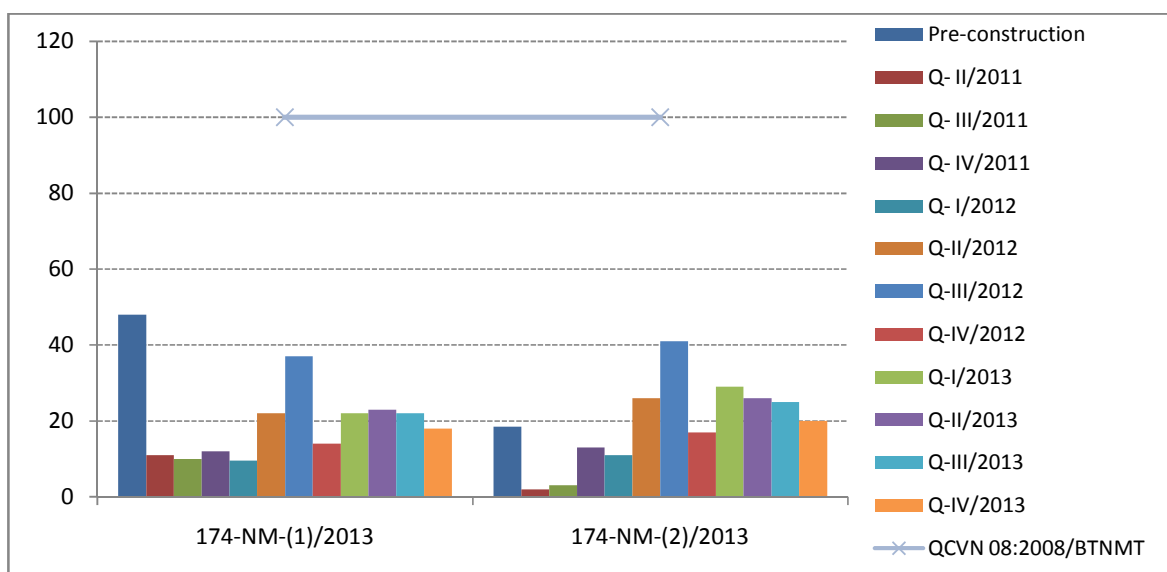


Figure 18: SS varies follow quarter of surface water quality monitoring

- **Heavy metal pollution**

Almost of heavy metals concentration (Cu, Zn, Cd, Pb, As, Hg) in quarter IV/2013 are very lower than the Vietnamese regulation. Copper concentration fluctuated around  $2.25 \div 3.45) \times 10^{-3}$  mg/L (QCVN 08:2008/BTNMT, level B2; 1mg/L). Zinc concentration fluctuated around  $(18.50 \div 20.08) \times 10^{-3}$ mg/L (QCVN 08:2008/BTNMT, level B2; 2mg/l). Cadmium concentration fluctuated around  $(0.025 \div 0.030) \times 10^{-3}$ mg/L (QCVN 08:2008/BTNMT, level B2; 0.01mg/L). Lead concentration fluctuated around  $(3.5 \div 5.2) \times 10^{-3}$  mg/L (QCVN 08:2008/BTNMT, level B2; 0.05mg/L). Arsenic concentration fluctuated around  $(0.60 \div 0.75) \times 10^{-3}$  mg/L (QCVN 08:2008/BTNMT, level B2; 0.1mg/L). Mercury concentration not detected at monitoring locations (QCVN 08:2008/BTNMT, level B2; 0.002mg/L).

- **Lubricant:**

Lubricant fluctuated around ND (not detected)  $\div 0.06$  mg/L, These values are met the Vietnamese regulation (QCVN 08:2008/BTNMT, level B2; 0.3mg/L).

- **CN<sup>-</sup> :**

CN<sup>-</sup> concentration fluctuated around  $(0.04 \div 0.06) \times 10^{-3}$  mg/L. These values are met the Vietnamese regulation (QCVN 08:2008/BTNMT, level B2; 0.02 mg/L).

- **N-NH<sub>4</sub><sup>+</sup>:**

N-NH<sub>4</sub><sup>+</sup> concentration fluctuated around  $0.50 \div 0.65$ mg/L. These values are met the Vietnamese regulation (QCVN 08:2008/BTNMT, level B2; 1mg/L).

- **Total N, total P**

Concentrations of total N, total P, respectively in the around of about  $9.60 \div 10.25$  mg / L,  $0.95 \div 1.50$ mg / L. Because the regulations (QCVN 08:2008 / BTNMT) does not stipulate the content of total N, total P should not be compared.

- **Total Coliform:**

Concentration of total Coliform are fluctuated around  $4600 \div 5000$  MPN/100mL. This value decreased compared to the previous quarter and within the limits Vietnamese regulation (QCVN 08:2008/BTNMT, level B2; 10000 MPN/100mL).

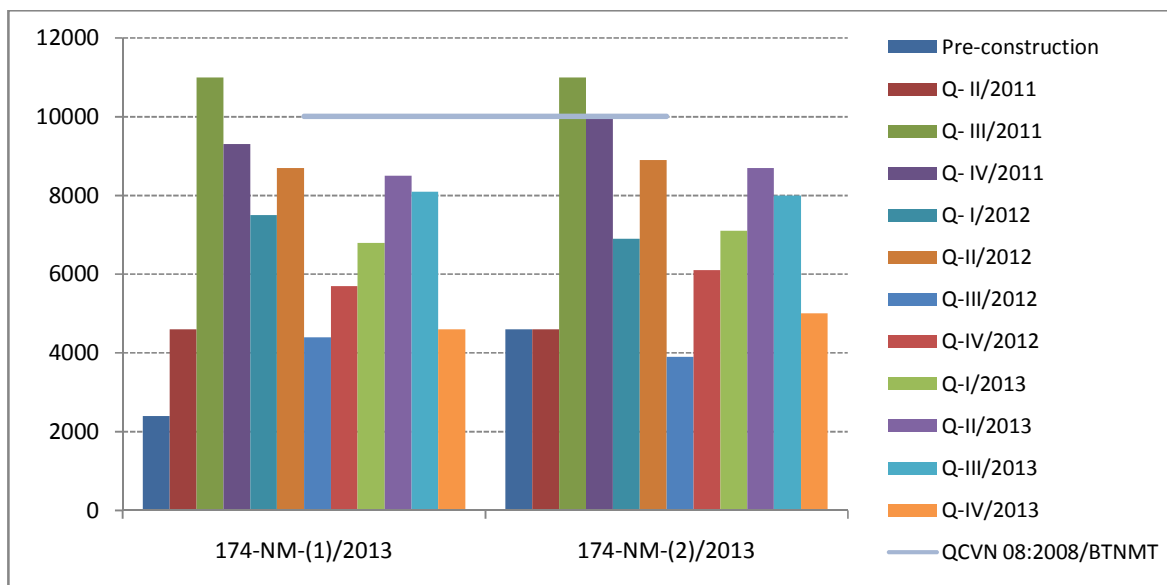


Figure 19: Total Coliform varies follow quarter of surface water quality monitoring

### 5.5. Underground water quality

+ Sampling location: *Xuan Thanh residential area – Km 54+400.*

+ Symbol of samples:

- 174-NN-(1)/2013: *Mr. Tran Ngoc Son households; 1398 Tran Cao Van St, Bau Ham 2 Commune, Thong Nhat District, Dong Nai Province.*
- 174-NN-(2)/2013: *Mr. Cao Van Duong households; Lap Thanh hamlet, Xuan Thanh Commune, Thong Nhat District, Dong Nai Province.*

The results of underground water quality monitoring are presented in the following table 20.

Table 20: Results of underground water quality monitoring

No.	PARAMETERS/UNIT		RESULTS		QCVN 09:2008/BTNMT
			174-NN-(1)/2013	174-NN-(2)/2013	
1.	pH	--	6.48	6.36	<b>5.5 – 8.5</b>
2.	Color	Pt-Co	10	7	--
3.	Temperature	°C	26.9	28.2	--
4.	Odor	--	Không mùi	Không mùi	--
5.	TDS	mg/L	143.4	136.2	<b>1500</b>
6.	Hardness level	mg/L	55.8	68.2	<b>500</b>
7.	Conductivity	µS	135.4	142.6	--
8.	Turbidity	NTU	0	0	--

No.	PARAMETERS/UNIT		RESULTS		QCVN 09:2008/RTNMT
9.	CN <sup>-</sup>	mg/L	0.013 x 10 <sup>-3</sup>	0.017 x 10 <sup>-3</sup>	<b>0.01</b>
10.	N-NO <sub>3</sub>	mg/L	0.23	0.24	<b>15</b>
11.	Cl <sup>-</sup>	mg/L	0.85	0.68	<b>250</b>
12.	SO <sub>4</sub> <sup>2-</sup>	mg/L	0.038	0.042	<b>400</b>
13.	Mn	mg/L	0.012	0.016	<b>0.5</b>
14.	Total Fe	mg/L	0.204	0.169	<b>5</b>
15.	Cd	mg/L	0.186 x 10 <sup>-3</sup>	0.256 x 10 <sup>-3</sup>	<b>0.005</b>
16.	Pb	mg/L	0.603 x 10 <sup>-3</sup>	0.734 x 10 <sup>-3</sup>	<b>0.01</b>
17.	As	mg/L	1.282 x 10 <sup>-3</sup>	1.405 x 10 <sup>-3</sup>	<b>0.05</b>
18.	Fecal Coliform/100mL	MPN	0	0	<b>ND</b>
19.	Total Coliform/100mL	MPN	0	< 2	<b>3</b>

Source: Joint venture environment and technology center HCM city for natural resources  
and environment, 12/2013

Note:

- ND: Not detected

- QCVN 09:2008/BTNMT: National technical regulation on Underground water quality.

• pH:

pH value at two sampling locations: 174-NN-(1)/2013, 174-NN-(2)/2013 are met Vietnamese regulation (QCVN 09:2008/BTNMT; 5.5-8.5) with value around 6,36÷6,48.

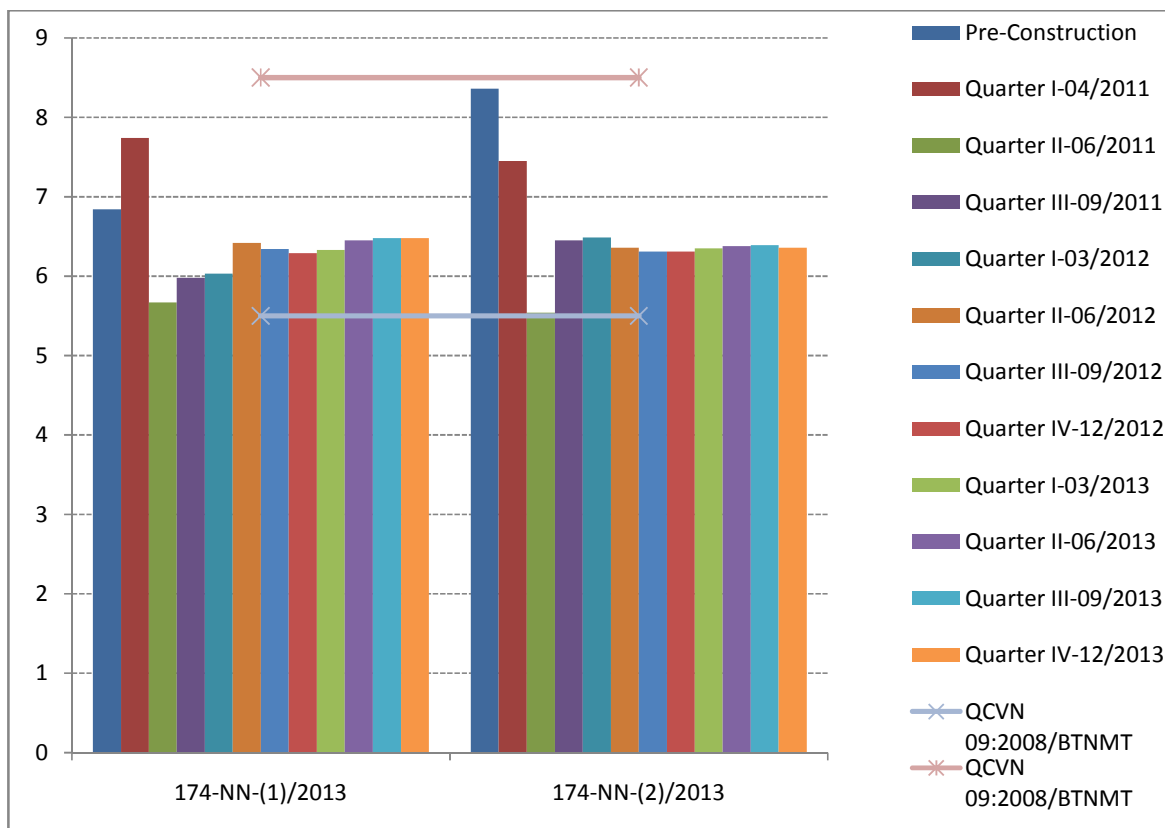


Figure 20: pH varies follow quarter of underground water quality monitoring

• **Total dissolved solids (TDS)**

Total dissolved solid in quarter IV-12/2013 is low at all monitoring locations and its value is about 136.2÷143.4 mg/L. These values are met the Vietnamese regulation (QCVN 09:2008/BTNMT; 1500 mg/L).

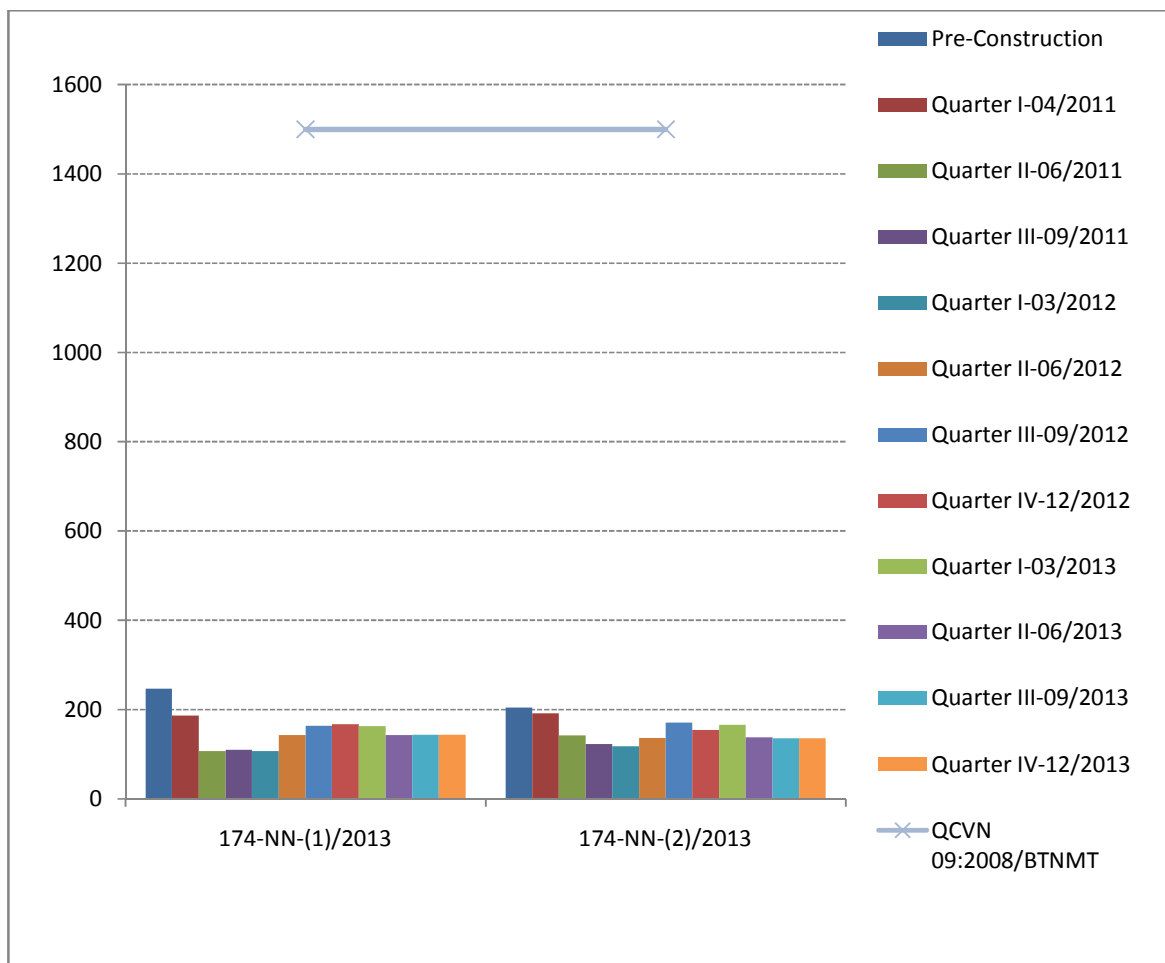


Figure 21: TDS varies follow quarter of underground water quality monitoring

#### • Hardness level

According to the monitoring result, hardness level fluctuated around 62.4÷69.5 mg/L mg/L and these values are met the Vietnamese regulation (QCVN 09:2008/BTNMT; 500 mg/L).

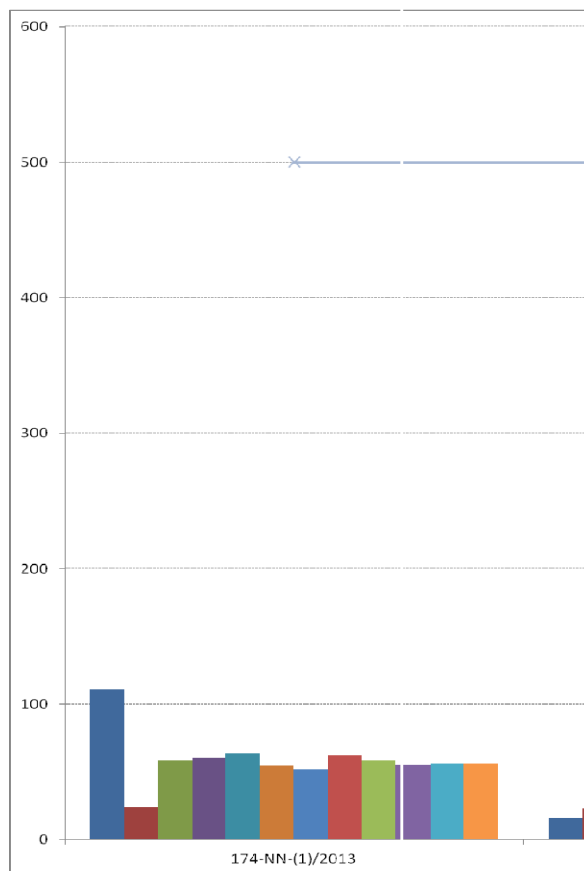


Figure 22: Hardness level varies follow quarter of underground water quality monitoring

- **CN<sup>-</sup>**

CN<sup>-</sup> concentration fluctuated around  $(0.010 \div 0.011) \times 10^{-3}$  mg/L. These values are met the Vietnamese regulation (QCVN 09:2008/BTNMT; 0.01 mg/L).

- **N-NO<sub>3</sub><sup>-</sup>**

N-NO<sub>3</sub><sup>-</sup> concentration at all monitoring locations is very lower than the limit regulation (QCVN 09:2008/BTNMT; 15 mg/L). N-NO<sub>3</sub><sup>-</sup> concentration is fluctuated around  $0.18 \div 0.22$  mg/L.

- **Cl<sup>-</sup>**

Cl<sup>-</sup> concentration at all monitoring locations is very lower than the limit regulation (QCVN 09:2008/BTNMT; 250 mg/L). Cl<sup>-</sup> concentration fluctuated around  $0.67 \div 0.76$  mg/L.

- **SO<sub>4</sub><sup>2-</sup>**

SO<sub>4</sub><sup>2-</sup> concentration at all monitoring locations is very lower than the limit regulation (QCVN 09:2008/BTNMT; 400mg/l). SO<sub>4</sub><sup>2-</sup> concentration fluctuated around  $0.034 \div 0.040$  mg/L.

- **Heavy metals**

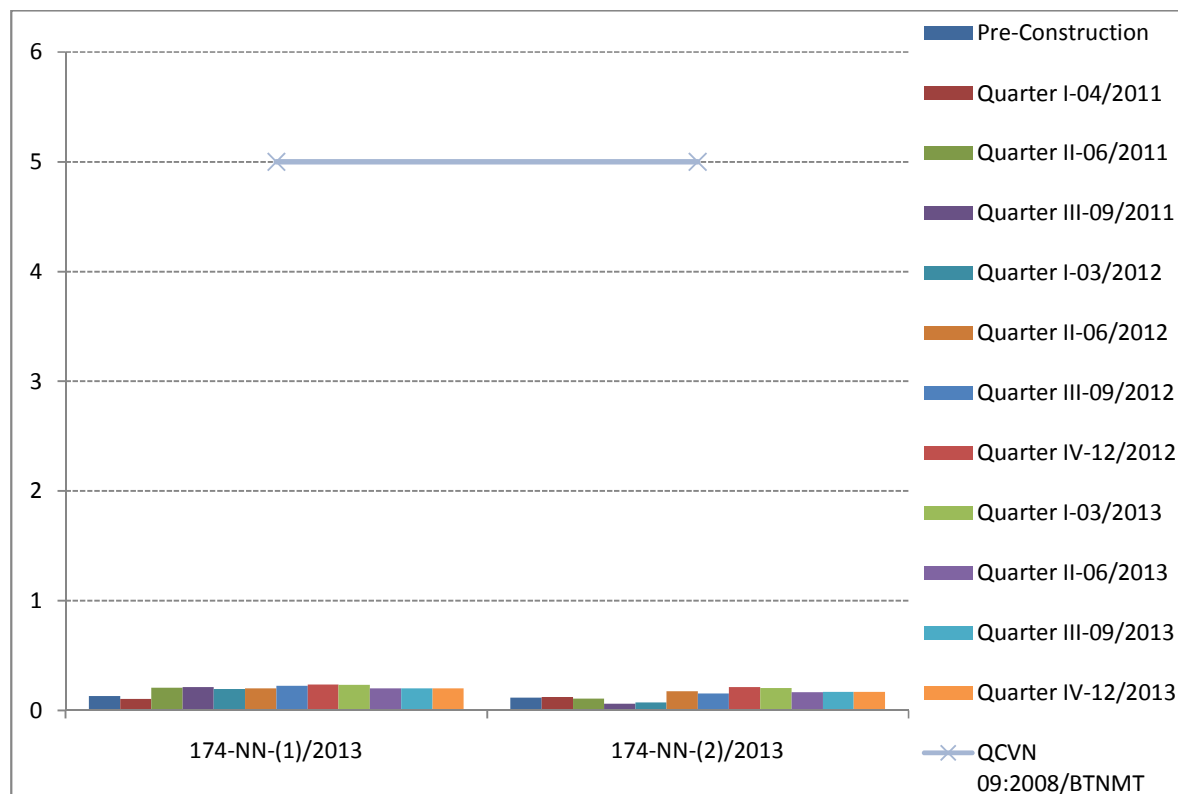


Figure 23: Total Fe varies follow quarter of underground water quality monitoring

Almost of heavy metals concentration (Mn, total Fe, Cd, Pb, As) are very lower than the Vietnamese regulation. Manganese concentration fluctuated around  $(0.013 \div 0.014)$  mg/L (QCVN 09:2008/BTNMT; 0.5mg/L). Total Fe concentration fluctuated around  $0.429 \div 1.105$  mg/L (QCVN 09:2008/BTNMT; 5mg/L). Cadmium concentration fluctuated around  $0.204 \div 0.246$   $\times 10^{-3}$  mg/L (QCVN 09:2008/BTNMT; 0.005mg/L). Lead concentration fluctuated around  $(0.556 \div 0.864) \times 10^{-3}$  mg/L (QCVN 09:2008/BTNMT; 0.01mg/l). Arsenic concentration fluctuated around  $(0.759 \div 1.107) \times 10^{-3}$  mg/L (QCVN 09:2008/BTNMT; 0.05mg/L).

#### • Total coliform and Fecal coliform

According to the monitoring result, almost of total coliform values and fecal coliform values are zero at location: 174-NN-(1)/2013, 174-NN(2)/2013. These values are met the Vietnamese regulation (QCVN 09:2008/BTNMT; Total coliform: < 2 MPN/100mL; Fecal coliform: 0MPN/100mL).

### 5.6. Soil

+ Sampling location: Package No.6 area.

+ Symbol of samples:

174-MĐ-(1)/2013: Bau Ham 2 ward (near Km 53+800, PK.6) (X: 0734106 mE, Y: 1204617 mN)

174-MĐ-(2)/2013: Km 41+100 (X: 0735644 mE, Y: 1205820 mN)

174-MĐ-(3)/2013: Km 54+350 (X: 0733484 mE, Y: 1203996 mN)

174-MĐ-(4)/2013: Km 54+400 (X: 0733147 mE, Y: 1203753 mN)

The results of soil monitoring are presented in the following table 21.

Table 21: Results of soil monitoring

No	Parameter	Unit	Monitoring results				QCVN 03:2008/BTNMT (Agricultural land)
			174-MĐ-(1)/2013	174-MĐ-(2)/2013	174-MĐ-(3)/2013	174-MĐ-(4)/2013	
1.	pH	-	4.5	4.7	4.4	4.9	--
2.	Total N	%	0.153	0.128	0.175	0.220	--
3.	Total P	%	0.109	0.201	0.316	0.236	--
4.	Organic matter	%	2.450	3.120	2.560	2.475	--
5.	SO <sub>4</sub> <sup>2-</sup>	mg/kg	0.146	0.125	0.235	0.250	--
6.	Cl <sup>-</sup>	mg/kg	20.20	35.45	40.30	35.65	--
7.	T.Fe	%	80.20×10 <sup>3</sup>	100.5×10 <sup>3</sup>	100.0×10 <sup>3</sup>	90.5×10 <sup>3</sup>	--
8.	As	mg/kg	1.30	1.55	1.35	1.10	<b>12</b>
9.	Cd	mg/kg	1.05	1.40	1.25	1.60	<b>2</b>
10.	Pb	mg/kg	3.25	3.70	4.30	2.10	<b>70</b>
11.	Zn	mg/kg	15.20	18.90	16.60	12.40	<b>200</b>
12.	Cu	mg/kg	16.60	14.30	14.30	13.80	<b>50</b>
13.	Hg	mg/kg	0.025	0.030	0.040	0.025	--

Source: Joint venture environment and technology center HCM city for natural resources and environment, 12/2013

- Note: (-): Not specified

- QCVN 03:2008/BTNMT: National technical regulation on the allowable limits of heavy metals in the soils (Agricultural land is used in this case)

According to the monitoring results, show all value of heavy metals were analyzed were reached for regulation QCVN 03:2008/BTNMT (Agricultural land). This

demonstrates that the construction activity has yet to impact the surrounding environment. Value analysis at the location 174-MĐ-(1)/2013, 174-MĐ-(2)/2013, 174-MĐ-(4)/2013 in the monitoring quarter IV-12/2013 compared to the previous construction and monitoring previous quarter performed on the following:

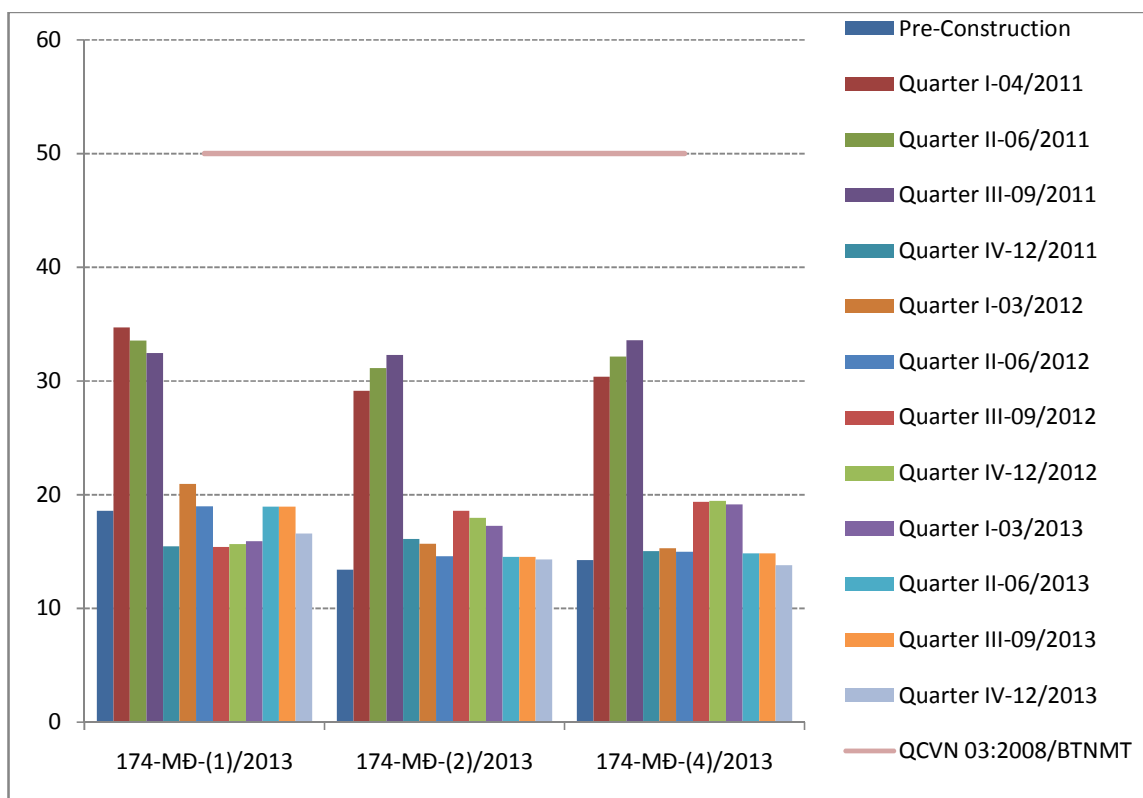


Figure 24: Cu varies follow quarter of soil quanlity monitoring

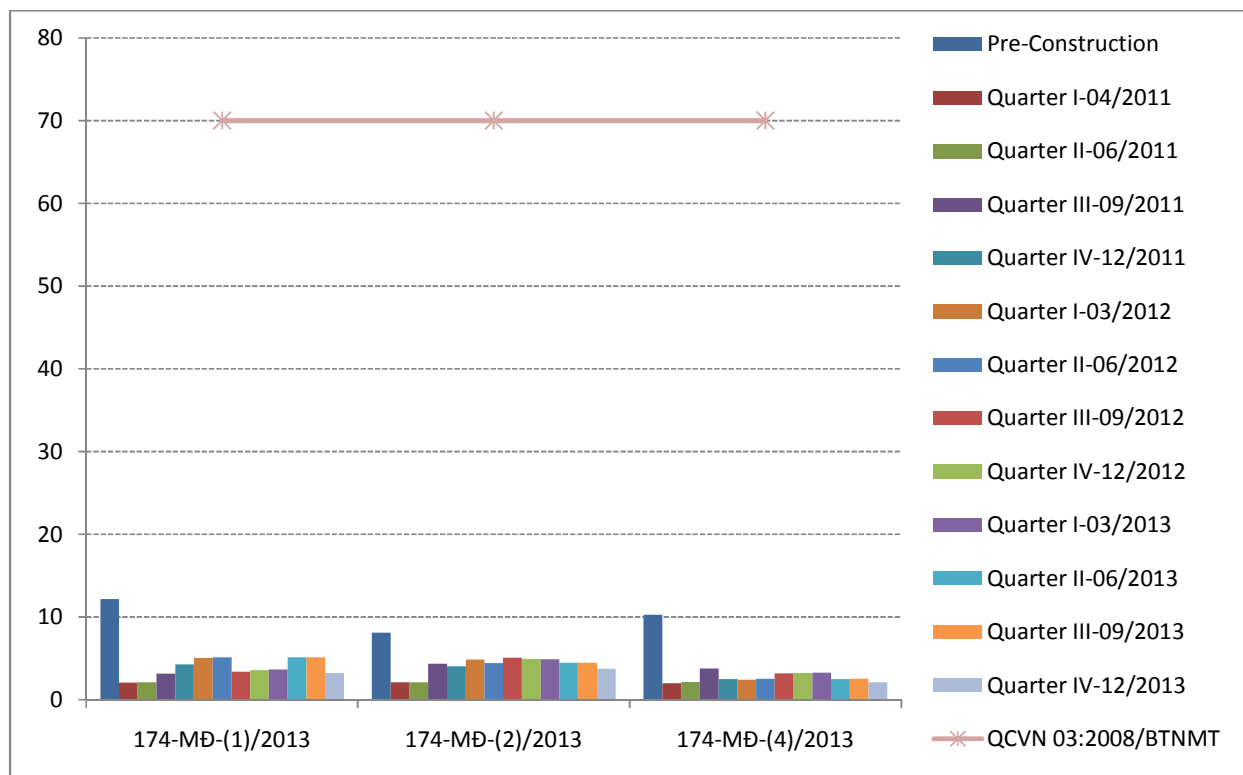


Figure 25: Pb varies follow quarter of soil quanlity monitoring

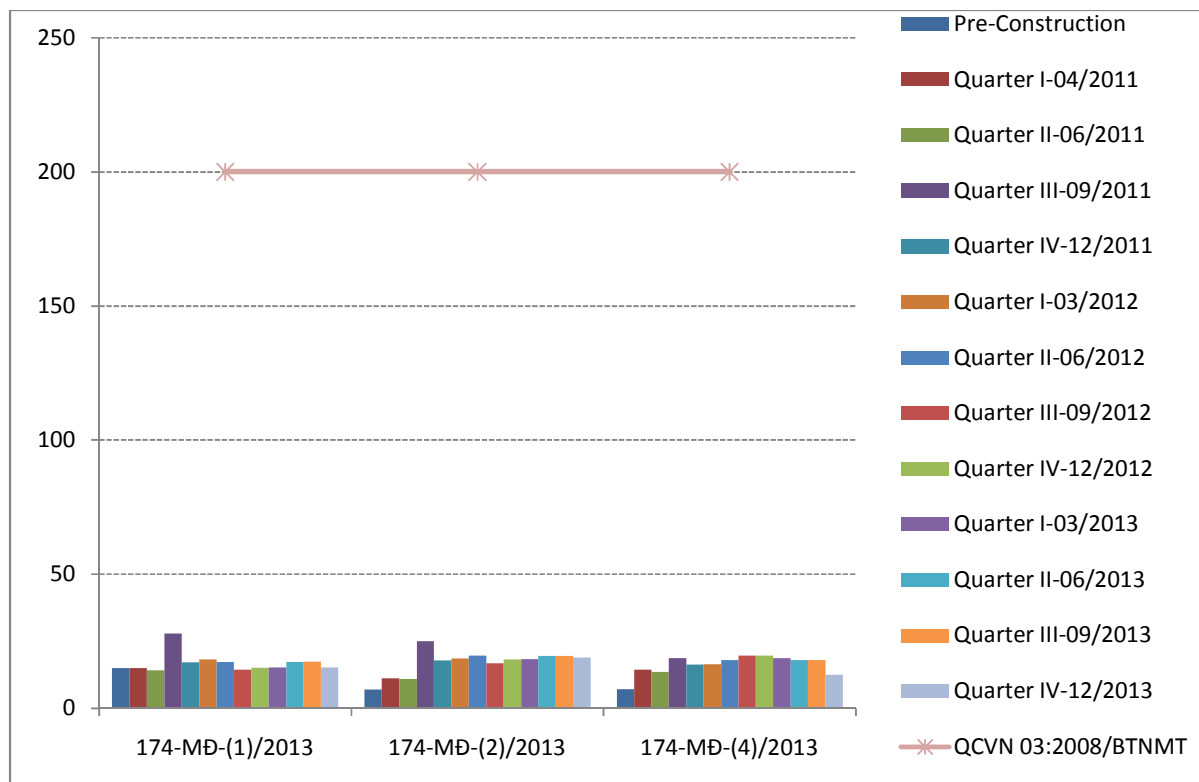


Figure 26: Zn varies follow quarter of soil quanlity monitoring

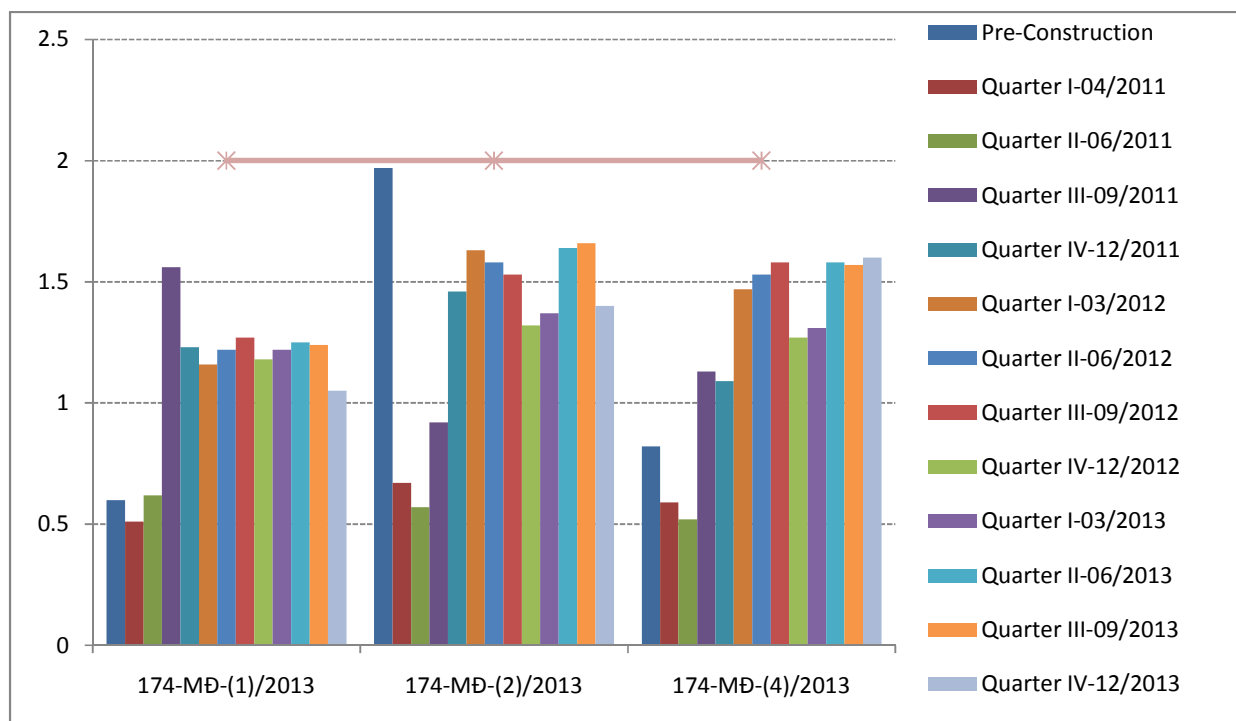


Figure 27: Cd varies follow quarter of soil quanlity monitoring

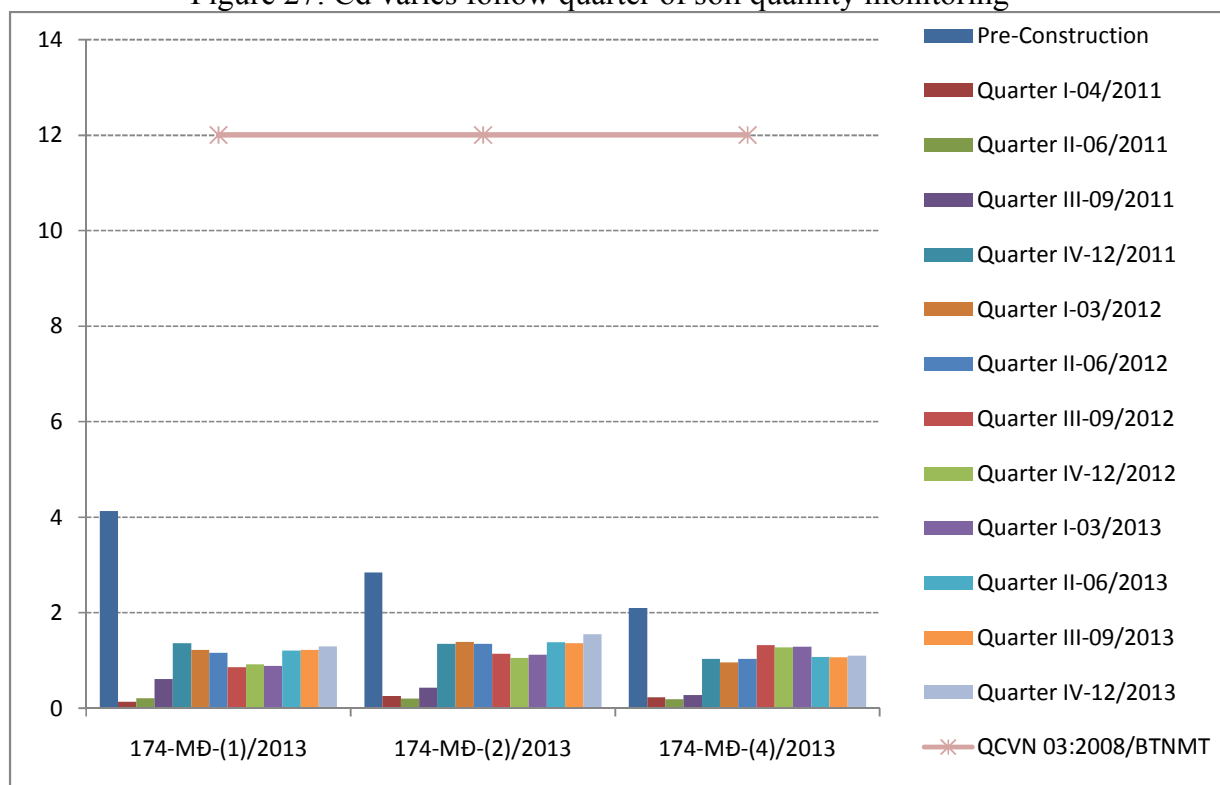


Figure 28: As varies follow quarter of soil quanlity monitoring

At position 174-MĐ(3)/2013 could see the value during the analysis of observations over the quarter IV-12/2013 meet Regulation allow QCVN 03:2008/BTNMT (agricultural land). The demonstrates that the construction activity has yet to impact the surrounding environment are shown in the figure below:

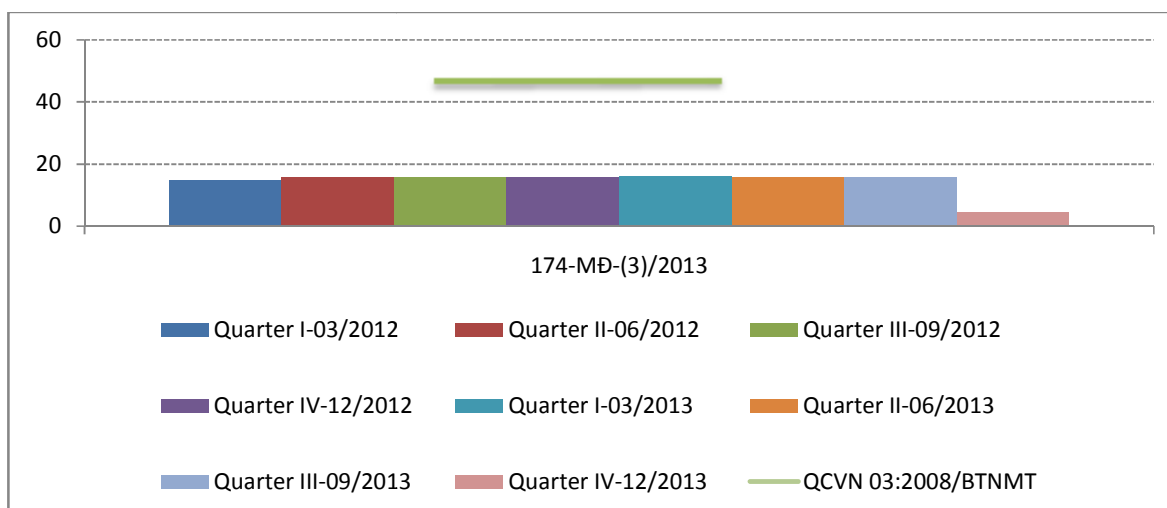


Figure 29: Cu varies follow quarter of soil quantity monitoring

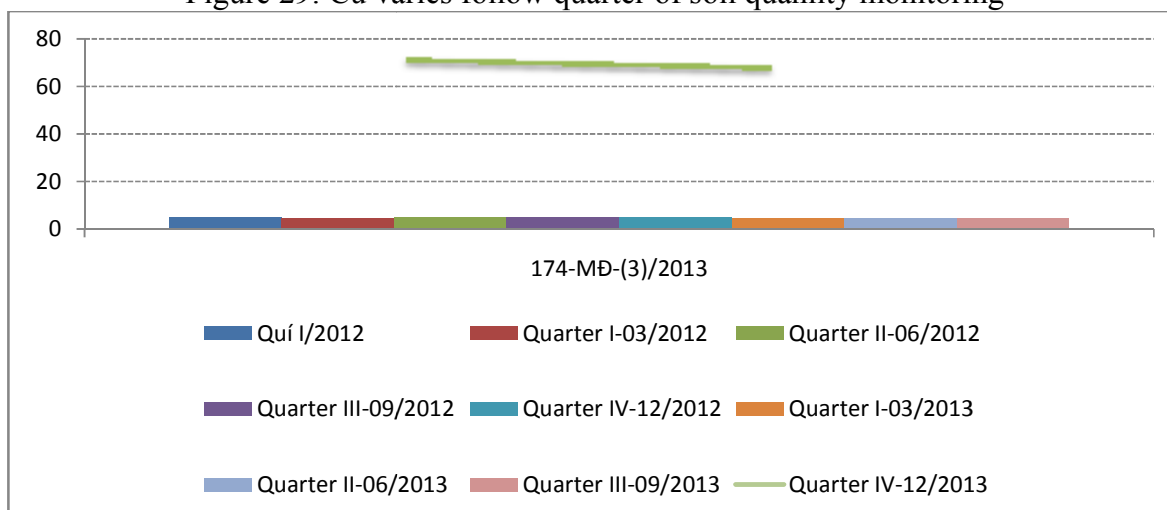


Figure 30: Pb varies follow quarter of soil quantity monitoring

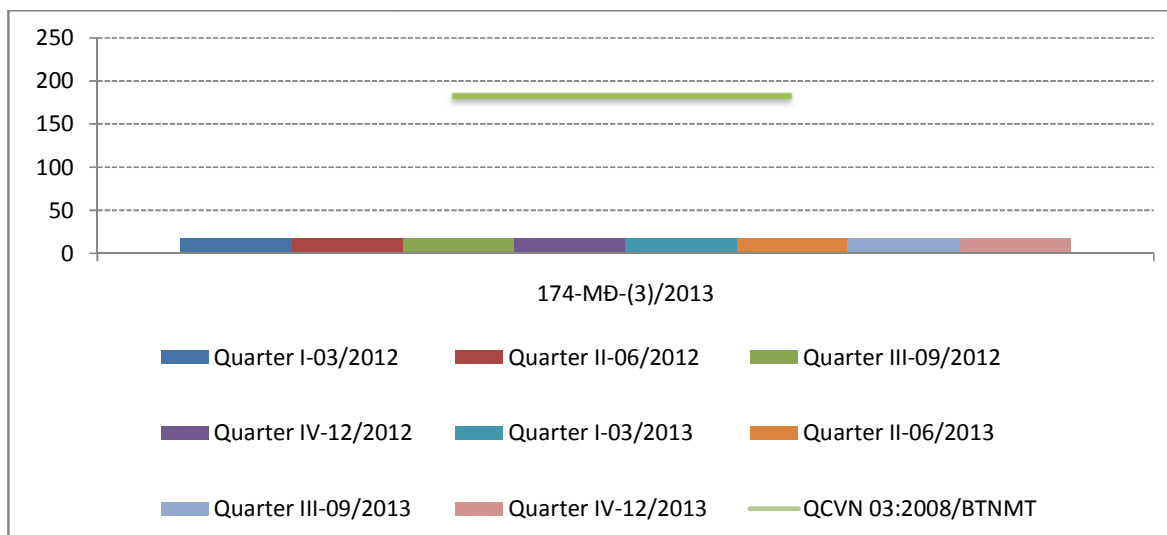


Figure 31: Zn varies follow quarter of soil quanlity monitoring

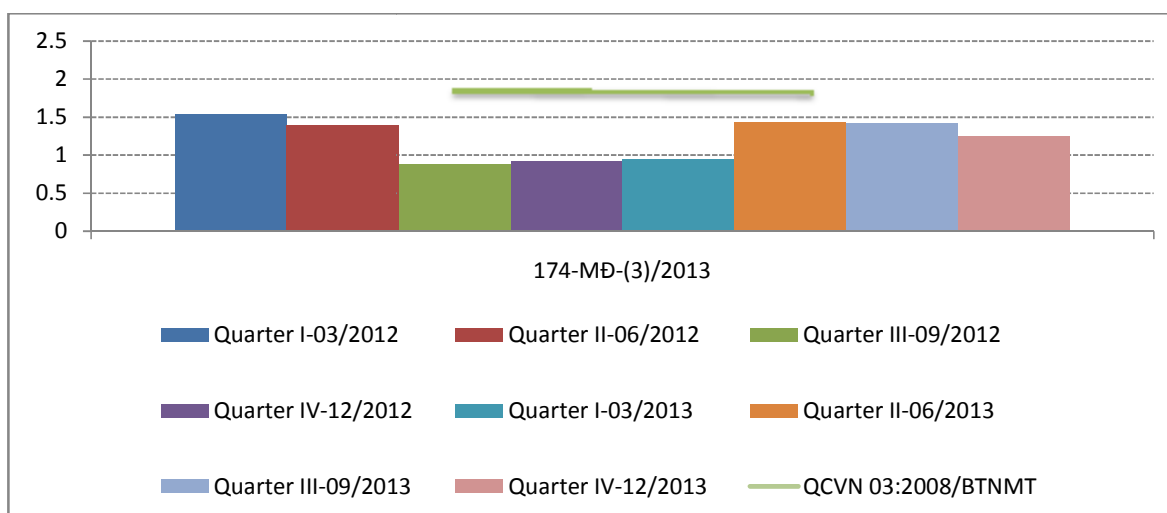


Figure 32: Cd varies follow quarter of soil quanlity monitoring

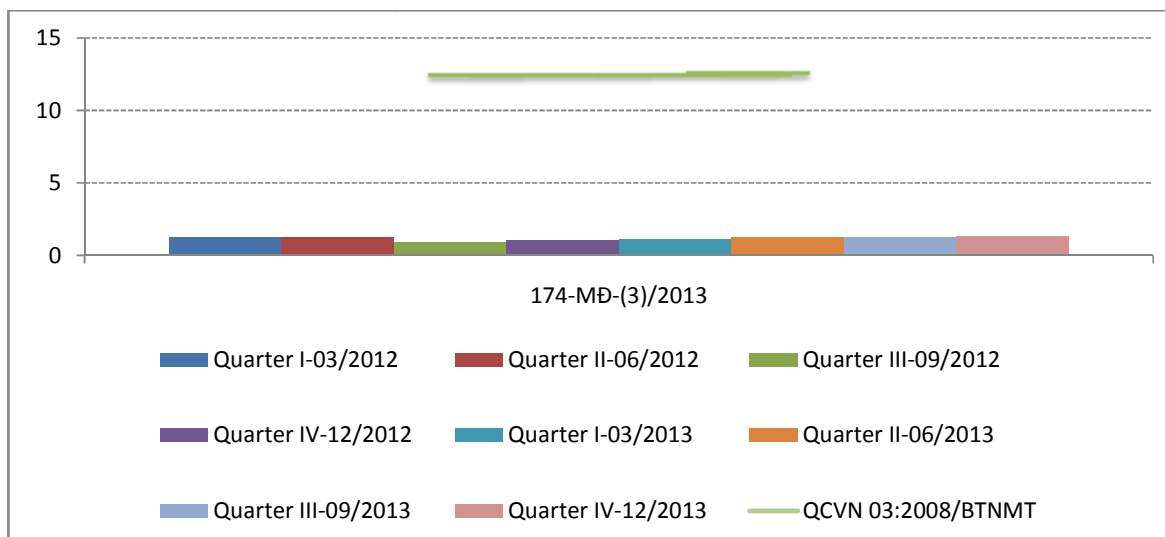


Figure 33: As varies follow quarter of soil quanlity monitoring

## 5.7. Wastewater quality

### 5.7.1 Domestic wastewater:

+ Location: In this quarter IV-12/2013, the location of domestic wastewater quality monitoring in the area of the camp workers continued to perform at Km 54+900 (near the mixing area).

+ Symbol of samples: 174-NT-(1)/2013: Worker's camp area (Km54+900)

Table 22: Result of monitoring domestic wastewater quality

No.	Parameters/Unit		Monitoring results	QCVN 14:2008/BTNMT (Level B)
			174-NT-(1)/2013	
1.	pH	--	6.85	5÷9
2.	Temperature	°C	28.9	--
3.	BOD <sub>5</sub>	mg/L	42	50
4.	COD	mg/L	86	--
5.	DO	mg/L	4.02	--
6.	TSS	mg/L	56	100
7.	NH <sub>4</sub> <sup>+</sup>	mg/L	6.64	10
8.	Total N	mg/L	10.65	--

No.	Parameters/Unit		Monitoring results	QCVN 14:2008/BTNMT (Level B)
9.	Total P	mg/L	2.50	--
10.	Lubricant	mg/L	3.24	<b>20</b>
11.	Total Coliform/100mL	MPN	4900	<b>5000</b>

Source: Joint venture environment and technology center HCM city for natural resources and environment, 12/2013

- Note: --: Not specified

- QCVN 14:2008/BTNMT: National technical regulation on domestic wastewater (Level B is used in this case).

According to the monitoring domestic wastewater quality of worker's camp area at concrete mixing station area (Km54+900) showed that almost all parameters analyzed during the observation in quarter IV/2013 are lower than the standard limit (QCVN 14:2008/BTNMT (level B)).

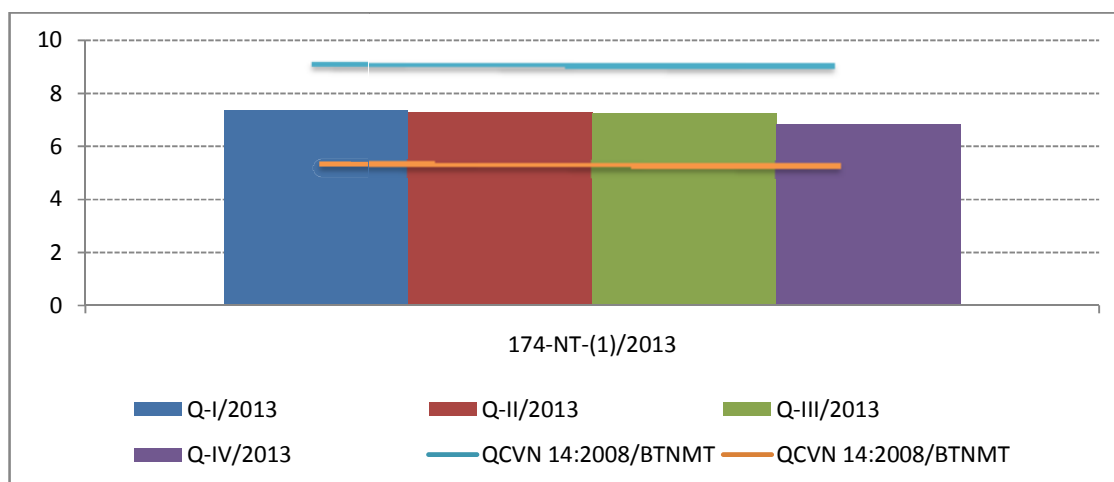


Figure 34: pH varies follow quarter of domestic wastewater quality monitoring

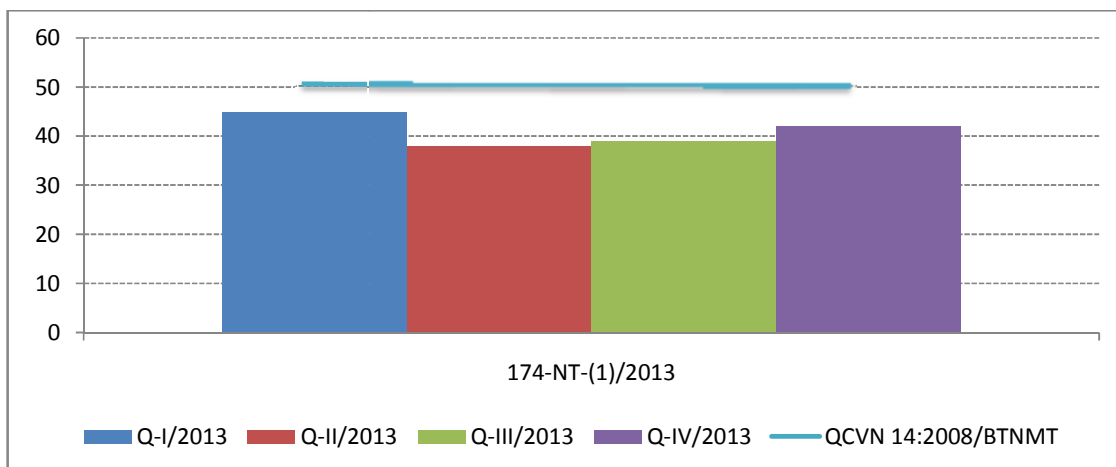


Figure 35: BOD<sub>5</sub> varies follow quarter of domestic wastewater quality monitoring

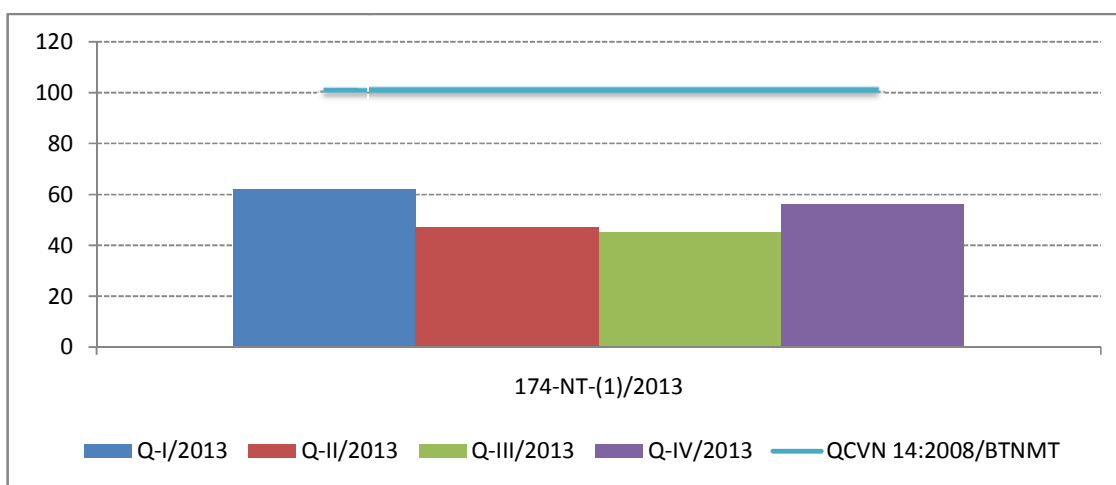


Figure 36: TSS varies follow quarter of domestic wastewater quality monitoring

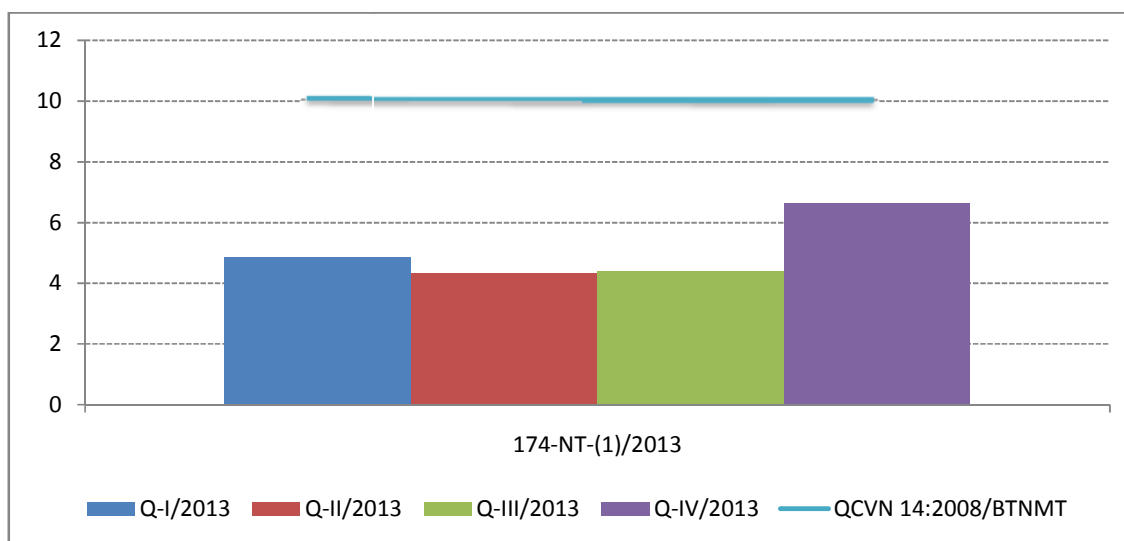


Figure 37: NH<sub>4</sub><sup>+</sup> varies follow quarter of domestic wastewater quality monitoring

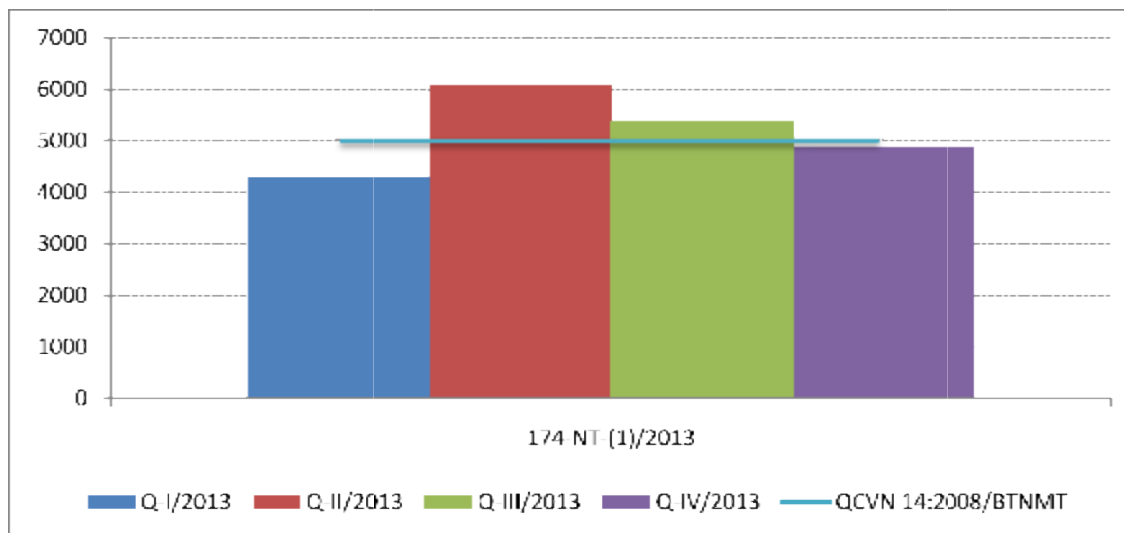


Figure 38: Total Coliform varies follow quarter of domestic wastewater quality monitoring

### 5.7.2 Wastewater from construction activities:

+ Location and symbol of samples:

174-NT-(2)/2013: Concrete mixing station area (Km54+900)

Table 23: Result of monitoring wastewater quality from concrete mixing station area

No.	Parameters/Unit		Monitoring results	QCVN 40:2011/BTNMT (Level B)
			174-NT-(2)/2013	
1.	pH	--	8.60	5,5 - 9
2.	Temperature	°C	28.9	40
3.	BOD <sub>5</sub>	mg/L	15	50
4.	COD	mg/L	72	150
5.	DO	mg/L	1.2	--
6.	TSS	mg/L	95	100
7.	NH <sub>4</sub> <sup>+</sup>	mg/L	3.56	10
8.	Total N	mg/L	4.10	40
9.	Total P	mg/L	1.05	6
10.	Lubricant	mg/L	1.8	10
11.	Total Coliform/100mL	MPN	10	5000

Source: Joint venture environment and technology center HCM city for natural resources  
and environment, 12/2013

- Note:--: Not specified.

- QCVN 40:2011/BTNMT: National technical regulation on industrial wastewater (Level B is used in this case).

According to the results of monitoring the quality of wastewater from construction activities showed that all parameters are lower than the regulation (QCVN 40:2011/BTNMT). Therefore, the construction activities in the quarter IV/2013 has not cause any significant effects. The values analysis in the first of this monitoring compared with the previous quarter are shown in the figures below:

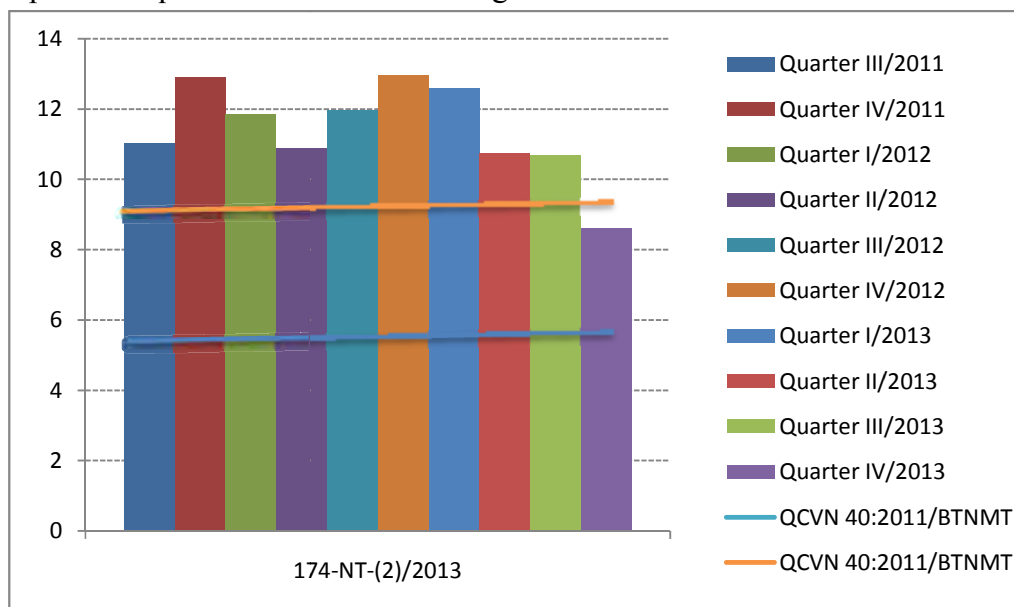


Figure 39: pH varies follow quarter of wastewater from construction activities quality monitoring

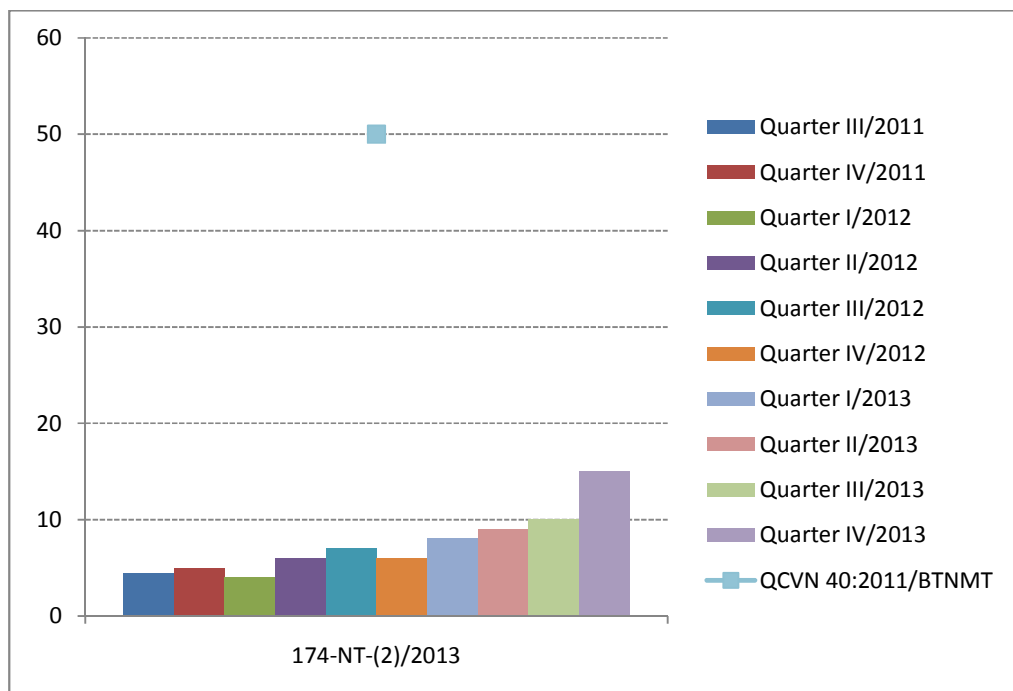


Figure 40: BOD varies follow quarter of wastewater from construction activities quality monitoring

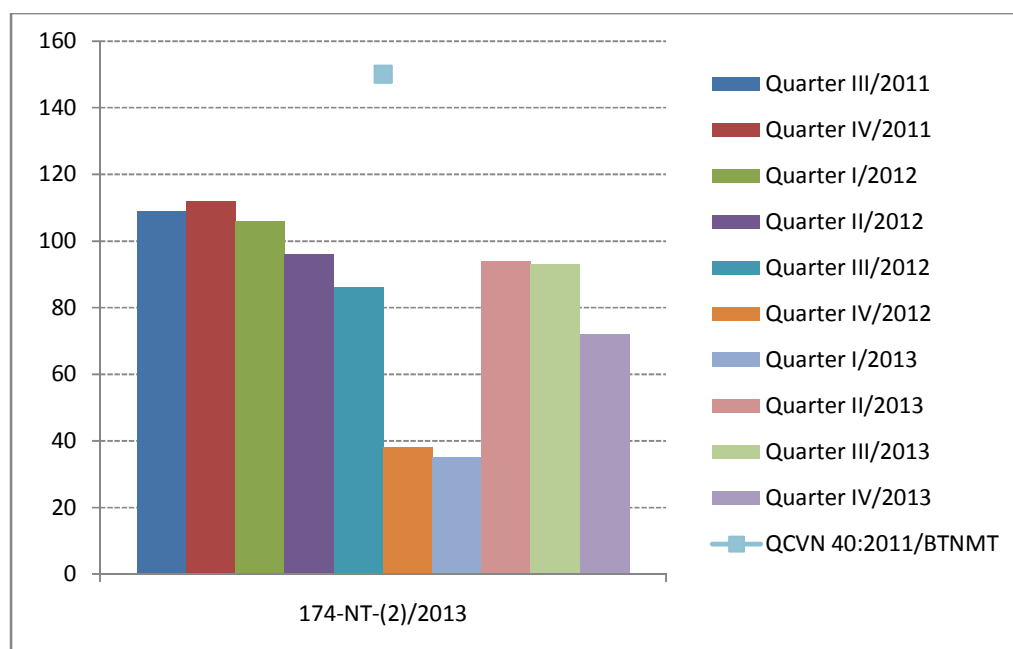


Figure 41: COD varies follow quarter of wastewater from construction activities quality monitoring

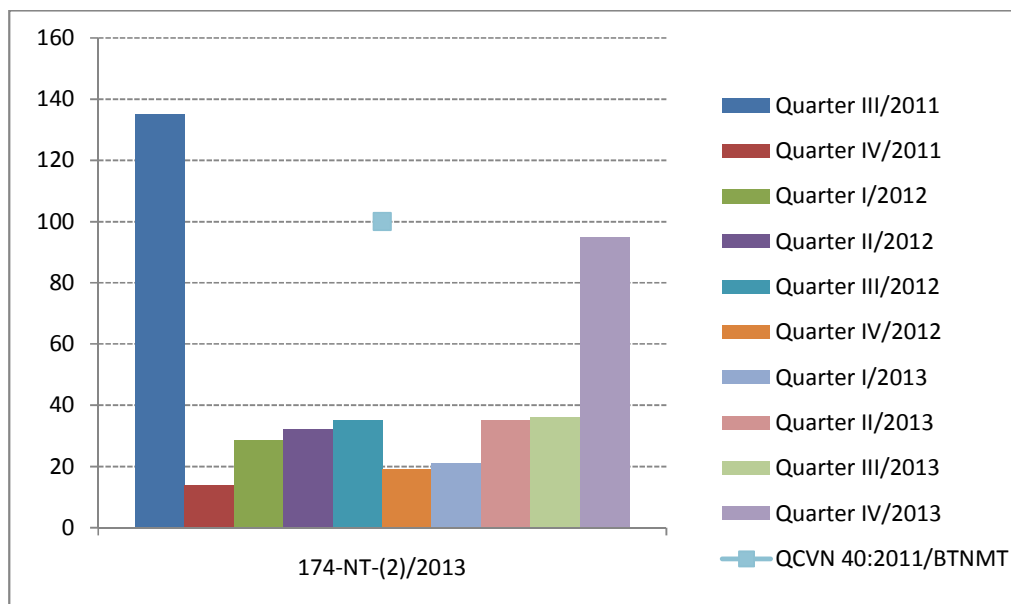


Figure 42: TSS varies follow quarter of wastewater from construction activities quality monitoring

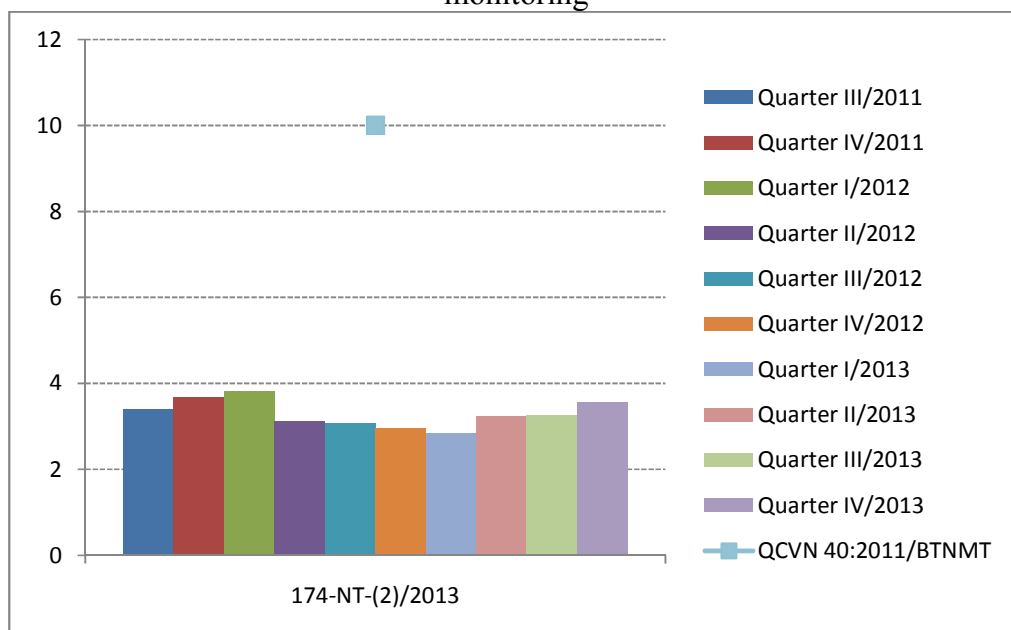


Figure 43: NH<sub>4</sub><sup>+</sup> varies follow quarter of wastewater from construction activities quality monitoring

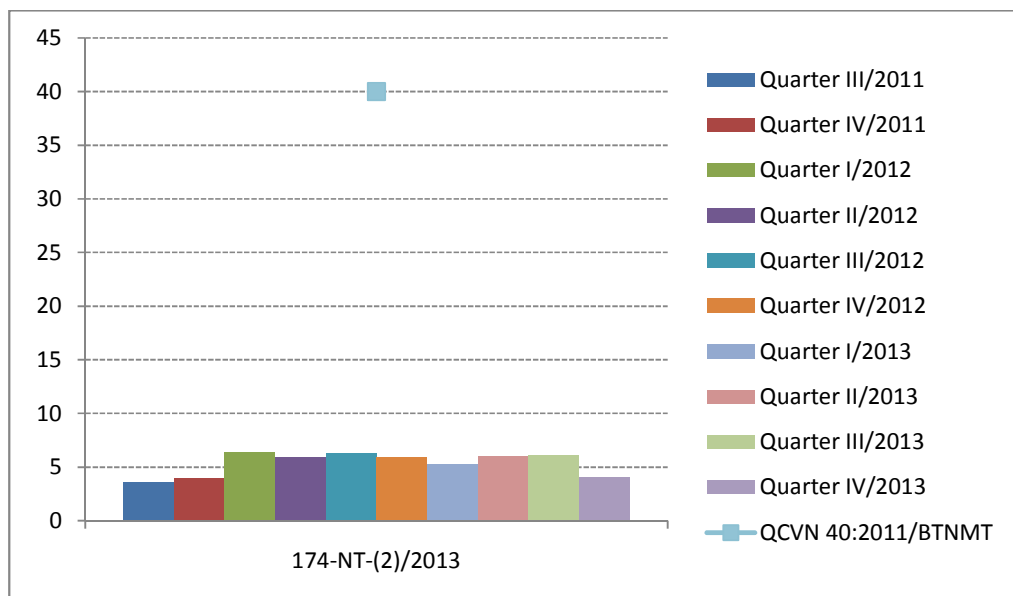


Figure 44: Total N varies follow quarter of wastewater from construction activities quality monitoring

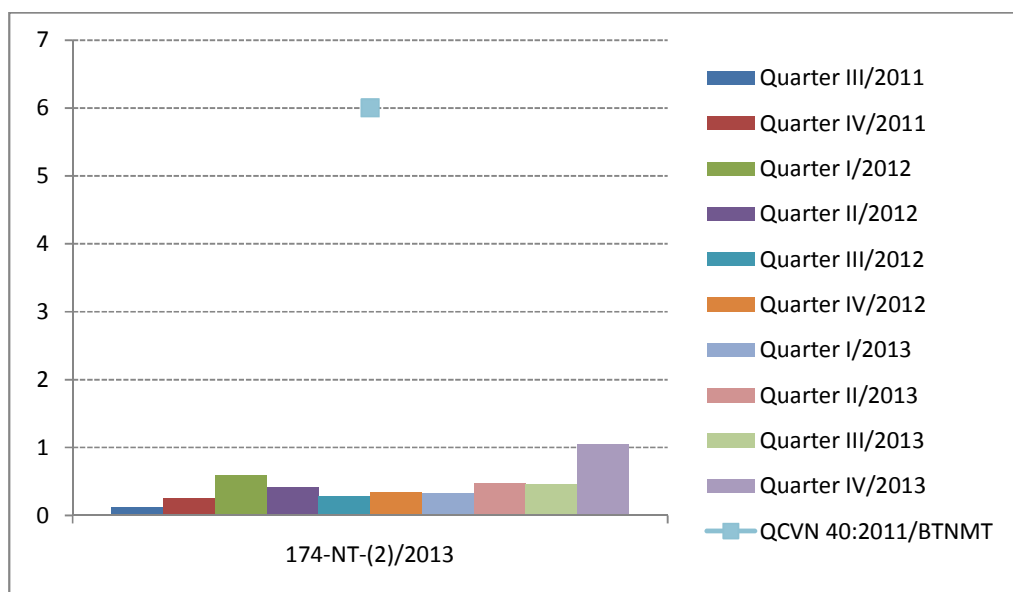


Figure 45: Total P varies follow quarter of wastewater from construction activities quality monitoring

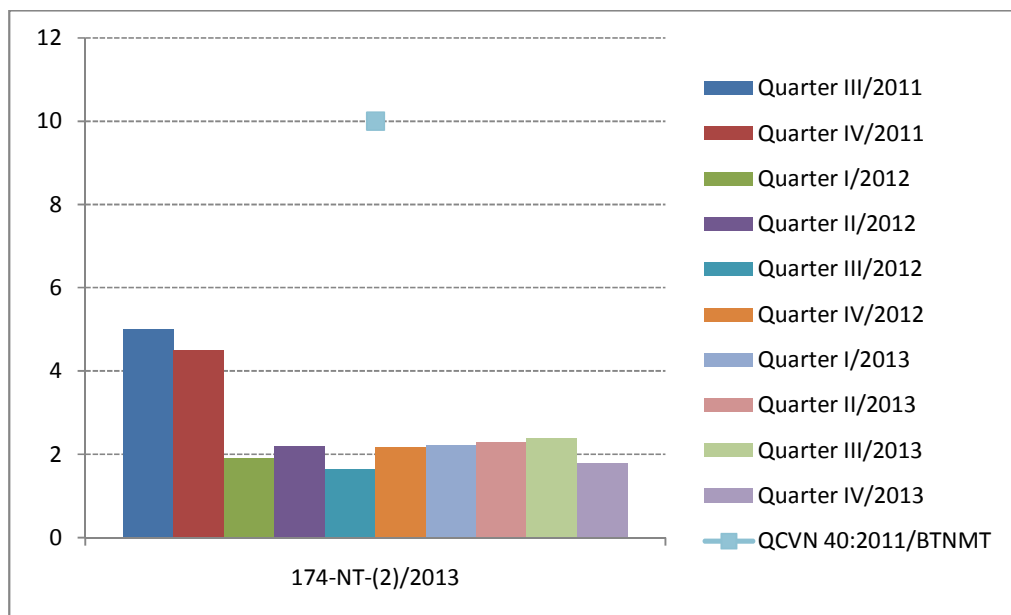


Figure 46: Lubricant varies follow quarter of wastewater from construction activities quality monitoring

### 6.1. Organization of Contractor Package No. 6

```

graph TD
    PM[Project Manager of Pk.6  
Mr. Kim Kyong Sob] --> CM[Construction Manager  
Mr. Choi Dae Soon  
Mr. Park Jea Rung - Highway  
Mr. Kim Chang Ho - Bridge]
    PM --> ES[Environmental Specialist  
Ms. Hoang Minh Phuong  
(HP: 0937.970.596)]
    CM --> SE[Site Engineers]
    SE --> CS[Constructional Subcontractors]
    ES --> ESS[Environmental Subcontractor  
Environment and Technology  
Center – Natural Resources  
and Environment Consulting  
Center Joint Venture  
(Tel: 08.39.162.814)]
    CS --> SEO[Safety – Environment Officers on Construction Site]
    ESS --> SEO
    ES --> SEO
    SEO --> S1[Km37+80-Km41+200  
Mr. Mai Van Luu  
HP: 0903.092.739]
    SEO --> S2[Km41+200-Km45+980  
Mr. Nguyen Van Duong  
HP: 0165.764.7268  
Dao Van Dan  
HP: 0908.796.620]
    SEO --> S3[Km45+980-Km51+500  
Mr. Pham Cong Nghiep  
HP: 01683.983.196  
Bui Ngoc Huy  
HP: 0989.774.987]
    SEO --> S4[Km51+500-Km54+982  
Mr. Nguyen Thanh Hung  
HP: 0908.643.769  
Nguyen Xuan Hung  
HP: 0903.090.932]
    S1 --> C[Construction – Ho Chi Minh-Long Thanh-Dau Giay Expressway Project Package No. 6]
    S2 --> C
    S3 --> C
    S4 --> C
  
```

Project Manager of Pk.6  
Mr. Kim Kyong Sob

Construction Manager  
Mr. Choi Dae Soon  
Mr. Park Jea Rung - Highway  
Mr. Kim Chang Ho - Bridge

Environmental Specialist  
Ms. Hoang Minh Phuong  
(HP: 0937.970.596)

Site Engineers

Constructional Subcontractors

Environmental Subcontractor  
Environment and Technology  
Center – Natural Resources  
and Environment Consulting  
Center Joint Venture  
(Tel: 08.39.162.814)

Safety – Environment Officers on Construction Site

Km37+80-Km41+200  
Mr. Mai Van Luu  
HP: 0903.092.739

Km41+200-Km45+980  
Mr. Nguyen Van Duong  
HP: 0165.764.7268  
Dao Van Dan  
HP: 0908.796.620

Km45+980-Km51+500  
Mr. Pham Cong Nghiep  
HP: 01683.983.196  
Bui Ngoc Huy  
HP: 0989.774.987

Km51+500-Km54+982  
Mr. Nguyen Thanh Hung  
HP: 0908.643.769  
Nguyen Xuan Hung  
HP: 0903.090.932

Construction – Ho Chi Minh-Long Thanh-Dau Giay Expressway Project Package No. 6

ADB  
Environmental Specialist  
Mss. Astra A. Velasquez  
E: avelasquez@adb.org  
Mr. Jong Hyun Nam  
Email. jhnam@adb.org

The Employer  
(VEC/EPMU HLD)  
Environmental Manager- P6  
Mr. Tran Nguyen  
HP: 0973.747.666

Project Supervision  
Consultant  
CDM SMITH INC  
Environmental Specialist  
Mr. Phil Brylski  
Mr. Phan Vu Loi  
(HP: 0983.568.512)

Pertinent Agencies  
- Resource & Environment  
Department of Dong Nai  
Province  
- Resource & Environment  
Department of Thong nhât  
District  
- Resource & Environment  
Department of Cam My  
District

**Figure 47. Chart of Organization & Pertinent Agencies**

## 6.2. Tasks, name and contact details of the individuals/entities

Table 24: The tasks, name and contact details of the individuals/entities in the organizational chart above indicated follows:

INDIVIDUAL/ ENTITIES	RESPONSIBILITY	NAME	CONTACT
<b>The Employer (VEC/ EPMU HLD)</b>	<ul style="list-style-type: none"> <li>- Supervise and check the “Environmental Monitoring Report” implementation and the environmental issues of Contractor.</li> <li>- Handling of complaints on environmental issues</li> </ul>	<b>Environmental Manager of P.6</b> Mr. Tran Nguyen	HP: 0973.747.666 Email: <a href="mailto:nguyenvec@gmail.com">nguyenvec@gmail.com</a>
<b>The Project Supervision Consultant - PSC (CDM SMITH INC)</b>	<ul style="list-style-type: none"> <li>- Check/clearance and review/approval all of the environmental issues of Contractor.</li> <li>- <b>Senior Environmental Specialist of PSC is responsible main on environmental education program.</b></li> </ul>	<b>Senior Environmental Specialist</b> Mr. Phil Brylski  Mr. Phan Vu Loi	HP: 01245.471.786 Email: <a href="mailto:pbrylski@gmail.com">pbrylski@gmail.com</a>  HP: 0983.568.512 Email: <a href="mailto:loipv04@gmail.com">loipv04@gmail.com</a>
<b>Pertinent Agencies (Regarding Environment Issue)</b>	<ul style="list-style-type: none"> <li>- Check the environment on site to ensure they meet EIA and SEMP.</li> <li>- Ensuring that necessary permits or authorizations are obtained.</li> </ul>	Resource & Environment Department of Dong Nai Province	Dong Khoi Street, Tan Hiep Dist, Bien Hoa City, Dong Nai Province Phone: 061.3.895.668 Fax : 061.3.827.364
		Resource & Environment Department of Thong Nhat District	Add: Hung Loc Ward, Thong Nhat Dist, Dong Nai Province Phone: 061.3.771.025
		Resource & Environment Department of Cam My District	Add: Suoi Ca Hamlet, Long Giao Ward, Cam My Dist, Dong Nai Province Phone: 061.3.878.565
<b>Contractor</b>	<ul style="list-style-type: none"> <li>- Implementation of individual mitigation measures and monitoring actions</li> <li>- Handling of complaints on environmental issues</li> <li>- Perform the environmental education program has given and approved by PSC</li> </ul>		
Project Director	Manage entire work of package 6 and supply under-position to do their duty	Mr. Kim Kyong Sob	HP: 0933.856.529 Email: <a href="mailto:kskim@hanshinc.com">kskim@hanshinc.com</a>
Construction Manager	Control all of the works on site.	Mr. Choi Dae Soon Mr. Kim Chang Ho- Bridge Mr. Park Jea Rung - Highway	HP:0932.435.808 Email: <a href="mailto:asd6321@hanshinc.com">asd6321@hanshinc.com</a> HP:0932.504.465 Email: <a href="mailto:krpark@hanshinc.com">krpark@hanshinc.com</a>
Environmental Specialist	Manage environmental issues on the site and the office to ensure the environment protected during	Ms. Hoang Minh Phuong	HP: 0937.970.596 Email: <a href="mailto:minhphuong265vungtau@yahoo.com">minhphuong265vungtau@yahoo.com</a>

	construction.		
Site Engineers	Survey and inspection on site	Mr. Nguyen Xuan Lam	HP: 0986.974.113 Email: nxlam.1707@yahoo.com
<b>Subcontractors</b>			
Site Environment – Safety Staff	Check on construction site about safety – environment, and reports and related communication on SEMP implementation and compliance of contractor every day (such as: wear PPEs; barrier; protect fence; waste and watering for reduce dust, etc.).	Km37+80-Km41+200 Mr. Mai Van Luu	HP: 0903.092.739 Email: italyamyc@gmail.com
		Km41+200-Km45+980 Mr. Nguyen Van Duong	HP: 0165.764.7268 Email: <a href="mailto:vanduong@yahoo.com">vanduong@yahoo.com</a>
		Mr. Dao Van Dan	HP: 0908.796.620
		Km45+980-Km51+500 Mr. Pham Cong Nghiep	HP: 01683.983.196 Email: <a href="mailto:thienphuxdgt@yahoo.com">thienphuxdgt@yahoo.com</a>
		Mr. Bui Ngoc Huy	HP: 0989.774.987 Email: <a href="mailto:ngochuygtvt@gmail.com">ngochuygtvt@gmail.com</a>
		Km51+500-Km54+982 Mr. Nguyen Thanh Hung	HP: 0908.643.769 Email: <a href="mailto:hoangtuankhang248@yahoo.com">hoangtuankhang248@yahoo.com</a>
		Mr. Nguyen Xuan Hung	HP: 0903.090.932 Email: hungnguyennh59@gmail.com
<b>Environmental Subcontractor</b>	Monitor the environment on site, sampling and make the environmental report based on environmental monitoring result (Quarterly)	Environment and Technology Centre – Natural Resources and Environment Consulting Centre Joint Venture Mr. Ton That Lang - Director	20 street 4, ward 15, Go Vap Dist, HCMC Phone: 08.39.162.814 Email: ttlang@hcm.vnn.vn

### 6.3. Environmental permit

- Confirmation letter for registration for the environmental protection commitment for Batching plant of Pk.6.
- Book of registration for the waste source owner of hazardous waste.
- Permit for underground water exploitation.
- Exploitation Permit and the Environmental Permit of Nui Nua Quarry in Xuan Lap commune, Long Khanh town, Dong Nai province.
- Exploitation Permit for Borrow Pit.
- Environmental permit for Asphalt Plant of Pk.6 which has been mobilized.

### 6.4. Air pollution treatment.

#### 6.4.1. Measures to control air pollution caused by vihecles.

A large volume of raw materials and fuel are transported to project area. The transports will be caused significant impact to the environment without the planning and control appropriately.

Air pollution from vehicles contains pollutants such as: TSP, SO<sub>2</sub>, NO<sub>2</sub>, CO, etc. To reduce the pollution, contractors are applying the following measures:

- Stockpiles of sand and aggregate greater than 20 cubic meters (20m<sup>3</sup>) for use in concrete manufacture shall be enclosed on three sides, with walls extending above the pile and two meters (2m) (*at batching plant*).
- Using the fuel that sulfur contain lowly.
- Using the correct type of fuel for the engine.
- Periodic maintenance for construction vehicles.
- Do not carry the prescribed load.
- Transport of sand, soil, raw materials to the construction site must be covered by canvas drop cloth to avoid.
- Regularly clean transportation and water spray moisturizing on the road when it's sunny and moving.
- Watering on the routes with frequency is 4times/day.
- Construction walls are provided in all locations where strong winds could blow dust and debris.
- Speed limit and select the appropriate transport routes.
- Soil, sand and rock stockpiles are protected from winds and sprayed with water as needed.
- The Contractor is cleaning and watering frequently in the concrete batch plant and adjoining area to control dust emissions.
- Areas of reclamation is completed, including final compaction, as quickly as possible consistent with good practice to limit the creation of wind blown dust.
- The operator, using the equipment must be trained to ensure correct operation and reduce the risk.
- **Assessment:**
  - To protect and storage of construction materials by contractors implemented relatively well.
  - Measures to control air pollution and dust are well implemented on site and concrete batch plant.
  - Already submitted Confirmation letter for registration for the environmental protection commitment for Batching plant of Pk.6.
  - Already submitted Environmental permit for Asphalt Plant of Pk.6 which has been mobilized.

#### **6.4.2. Noise and vibration.**

Noise and vibration generated during construction is mainly due to the activities of construction vehicles.

Noise and vibration impacts our health. Especially, workers near the sources. Noise above the permitted standards will affect worker health, reduced attention, headache, dizziness, fatigue and insomnia, ... reduces labor productivity. When exposed to large noise level continuously for eight hours and lasts for many years may increase blood pressure, which affects the digestive system, nervous system leading to occupational deafness, ... And this is an agent that causes inhibition phenomenon (stress).

So, Hanshin contractor has applied the following measures to limit the lowest level noise spread out around.

- Install anti-vibration cushions imbalance for these machines have high noise levels such as the compressor.
- During the construction process, regularly check the balance of the machine, abrasion details, check oil and replace equipment wear.
- Supply equipment for labor protection against noise for workers in noisy areas.
- Restrict the transportation of land, sand activities in the rush hour when traffic on public roads.
- Use of machines that is causing loud noise and vibration (drill, excavator, etc.) is prohibited from 23:00pm to 5:00am.
- Do not use the equipment and machinery to avoid unnecessary noise and vibration.
- Activities causing noise shall be planned to be carried out when they have the lowest impact on people (from 7:30 to 18:00 daily).
- **Assessment:**
  - Workers are supplied labor protection equipment.
  - Noise and vibration are mitigated to lowest level and met Standard Vietnam. This is well implemented.

#### **6.5. Wastewater treatment measures.**

##### **6.5.1. Domestic wastewater**

Wastewater generated at the site during construction. This is domestic wastewater from activities of bathing, washing of the workers at construction sites with very small amounts, so plan should be selected as follows:

##### **Treatment plan**

Domestic wastewater is preliminary treated by a three-compartment septic tanks it is absorbed by soil.

Operation principles of three-compartment septic tanks are: sedimentation, decomposition and fermentation of organic.

Treatment system was built as three-compartment septic tank with the filter holder.

Wastewater in the toilets will be collected in tanks and anaerobic microorganisms decompose with effective treatment to meet 40-45%. Retention time in the tank about 20 days, 95% of suspended solids will settle to the bottom tank. Residue remains in the bottom of the tank for 6-8 months, under the action of anaerobic microorganisms, organic matter will decompose, creating a gas and a form of inorganic dissolved. Wastewater in the tank for a long time to ensure high performance of sedimentation to flow through the filter holder complete removal of suspended matter and escape. Each of septic tanks has vents to release gases from decomposition. Smoking section sediment will be periodically. Composed diagram of three-compartment septic tank with the filter holder has shown in figure 6.

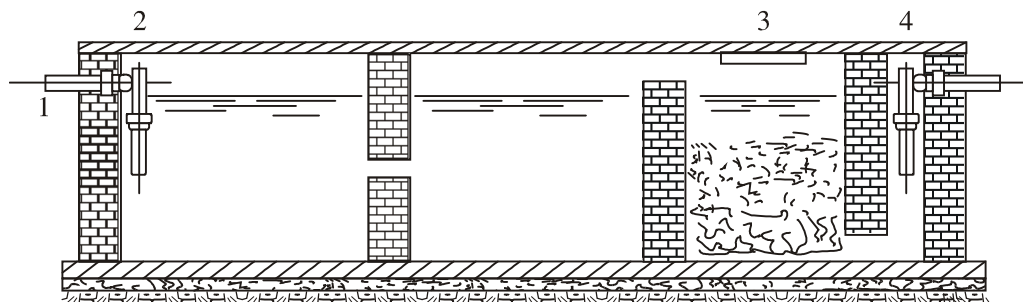


Figure 48: Schematic structure three-compartment septic tank with filter holder

- 1 - Sewage pipe into the tank. 2 - Vent pipe. 3 - Covers visits (to smoke residue).  
4 - Prevention of discharge of wastewater treatment works to the next.

As mentioned above, the amount of wastewater was little generated by workers and were collected into a septic tank system has three tanks with filters before infiltration into soils. Therefore, this process did not affect the surrounding environment.

- **Assessment:**

- Have bathroom on site for worker and ensure environmental problems.

#### 6.5.2. Wastewater from construction activity

Wastewater from construction activity is mainly wastewater from concrete mixing station area: This wastewater is flowed by private sewage systems and focused in tank.

Wastewater is guaranteed deposited time before being discharged into rainwater drainage system.

- **Assessment:**

- Sewer system and tank had been operated on concrete mixing station. Should improve deposited time for tank to ensure come out water (To increase deposited time on compartment of tank).

- Regularly clean the waste water treatment system for treatment has effected.

## **6.6. Solid waste treatment.**

At the current, contractor is applying solid waste management measures:

### **6.6.1. Domestic waste**

Solid waste activities are generated about 4kg/day. At the current, solid waste activities are kept in plastic container with cap and it kept in prescribed place. Every day, this garbage is collected, concentrated and transferred to landfills governed by the people-household waste collection.

### **6.6.2. Solid waste from construction activity**

Management and treatment for solid waste are implemented by contractor as follows:

- The Contractor establishes hygienic groups to collect waste from construction camp sites and to ensure the cleanliness of the whole construction area. The contractor will also co-operate with local authorities or companies to organize the waste collection.
- The Contractor and Sub-Contractors promptly clean up all spillage and waste from the transport vehicles on route to disposal sites.
- The amount of industrial waste generated during construction is very little, mainly packaging containing raw materials and most of these substances are reused, specifically:
  - + Oil can or tank.
  - + Bag of bentonites.
  - + The solid waste is well managed on construction site

Controlling of the bentonite flow: All location where are building bridge (bored piles), bentonites is well managed. Bentonite is contained in the strong tanks and it was recovered, treated and reused.

- **Assessment:**

- The management of solid waste is implemented according to regulation.
- The solid waste collection contract with waste collection company's approved by local authorities

## **6.7. Controlling for Environment and Safety Activities on site**

- Direct training for Safety and Environment problem for all workers and staffs on construction site on the first week of month;
- Monthly meeting for Safety and Environment control;
- Implement of HIV/AIDS & Human Trafficking Prevention Program for all workers on

site, 6 months/times. Already had finished the phase 1 of this above program since last year. Now, we are deploying continue for the phase 2 of this program.

- Taking and testing sample and submitting report for quarterly environment monitoring are happening and following the plan of SEMP which was submitted and approved
- Checking site every day and troubleshooting (if any) for environment and safety on site always ensure.

## CHAPTER VII. CONCLUSION AND RECOMMENDATION

### 7.1. Conclusion

Hanshin Engineering & Construction Co., Ltd has applied measures better protect the environment. According to the results of measurement of air quality, surface water quality, groundwater quality, soil quality, noise and vibration on 12/03/2013 shows: Status of environment in the project area is still quite good. This demonstrates that the methods of environmental protection have implemented well and fully. The company will continue to apply the measures required to achieve the lowest limits to affect the environmental quality of the area.

### 7.2. Recommendation

Bases on the results of environmental monitoring, contractor should take measures to prevent and mitigate the impact of environmental factors. Special attention to the potential impact may change in environmental quality and environmental pollution.

Project Manager





Mr. Kim Kyong Sob

## REFERENCES

- [1]. QCVN 03:2008/BTNMT: *National technical regulation on the allowable limits of heavy metals in the soils.*
- [2]. QCVN 08:2008/BTNMT: *National technical regulation on surface water quality.*
- [3]. QCVN 09:2008/BTNMT: *National technical regulation on underground water quality.*
- [4]. QCVN 14:2008/BTNMT: *National technical regulation on domestic wastewater.*
- [5]. QCVN 40:2011/BTNMT: *National technical regulation on industrial wastewater.*
- [6]. QCVN 05:2009/BTNMT: *National technical regulation on ambient air quality.*
- [7]. QCVN 06:2009/BTNMT: *National technical regulation on hazardous substances in ambient air.*
- [8]. QCVN 26:2010/BTNMT: *National technical regulation on noise.*
- [9]. QCVN 27:2010/BTNMT: *National technical regulation on vibration.*

## **APPENDIX**

- + The minutes of sampling
- + Contact information
- + Sampling location map
- + Results
- + Figures

 	<b>ENVIRONMENT AND TECHNOLOGY CENTER</b>  <b>THE MINUTES OF SAMPLING</b>	Add: No.20, Road No.4, Ward 15, Go Vap District, HCMC Tell: 08.39162814 Fax: 08.39162514 Email: ttlang@hcm.vnn.vn  Date: Page: 1/2
---	--	--

As requested: **HANSHIN ENGINEERING CONSTRUCTION Co., Ltd** .....

Pursuant to the functioning of Environment and Technology Center (ETC).

Tuesday, December 03, 2013.

**I - Representatives of parties:**

1 - Representatives of Environment and Technology Center (The sampling and analysis)

Mr. Doan Van Ngoc ..... Position: Laboratory officer .....

Mr. Nguyen Van Duong ..... Position: Laboratory officer .....

Mr. Nguyen Minh Tu ..... Position: Laboratory officer .....

Mr. Phạm Minh Khoa ..... Position: Laboratory officer .....

Mr. Han Quang Hiep ..... Position: Laboratory officer .....

Mr. Nguyen Cao Phat ..... Position: Laboratory officer .....

2 - Representative of the requirements:

Ms. Hoang Minh Phuong ..... Position: Environment specialist .....

..... Position: .....

3 - Supervisor:

Mr. Phan Vu Loi ..... Position: Environment specialist .....

..... Position: .....

**II - Scope of work:**

Location Survey: Region packages No.6 of Ho Chi Minh - Long Thanh - Dau Giay expressway construction project.

Address: Thong Nhat District and Cam My District, Dong Nai Province.

Sampling purposes: To make environmental monitoring report (quarter IV/2013).

1 - Air sampling: Ambient air ..... Quantity: 08 samples .....


Parameters: TSP, NO<sub>2</sub>, SO<sub>2</sub>, CO, HC, Temperature, Humidity, Wind speed

2 - Measuring noise: Noise level ..... Quantity: 32 samples .....

3 - Measuring vibration: Vibration level ..... Quantity: 32 samples .....

4 - Type of water sample:

4.1 - Surface water in Song Nhan area ..... Quantity: 02 samples .....

	<b>ENVIRONMENT AND TECHNOLOGY CENTER</b>	Add: No.20, Road No.4, Ward 15, Go Vap District, HCMC Tell: 08.39162814 Fax: 08.39162514 Email: ttlang@hcm.vnn.vn
TT12-LM	<b>THE MINUTES OF SAMPLING</b>	Date: Page: 2/2

Parameters: pH; BOD<sub>5</sub>, COD, DO; SS; As; Cd; Pb; Cr; Cu; Zn; Hg; NH<sub>4</sub><sup>+</sup>; NO<sub>3</sub><sup>-</sup>; Total N; Total P; Lubricant; Coliform; Turbidity; Aquatic Ecosystem.

4.2 – Underground water in Xuan Thanh resident ..... Quantity: 02 samples.....

Parameters: pH; Color; Temperature; Odor; TDS; Hardness level; Conductivity; Turbidity; CN<sup>-</sup>; NO<sub>3</sub><sup>-</sup>; Cl<sup>-</sup>; SO<sub>4</sub><sup>2-</sup>; Mn; Fe; Cd; Pb; As; Fecal Coliform; Total Coliform.

4.3 – Waste water ..... Quantity: 02 samples.....

Parameters: pH, BOD<sub>5</sub>, COD, DO, TSS, NH<sub>4</sub><sup>+</sup>, Total N, Total P, Lubricant, Total Coliform.

5 – Type of soil: Soil samples in the project area..... Quantity: 04 samples.....

Parameters: pH, Organic matter, Total N, Total P, Cl<sup>-</sup>, SO<sub>4</sub><sup>2-</sup>, Cu, Zn, Cd, Pb, Hg, As, Fe.

Sampling condition: .....

### III. Sampling methods:

**Air:** ..... ☒ TCVN 5067:1995; TCVN 5971:1995; TCVN 6137:1996; TCVN 5972:1995 .....

**Water:** – Underground water ☒ TCVN 6000:1995 .....

– Surface water ☒ TCVN 5992, 5993:1995 .....

– Waste water ☒ TCVN 5999:1995 .....

**Soil:** ..... ☒ TCVN 5297:1995 .....

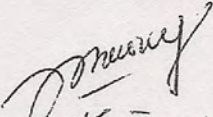
### IV. Sample storage conditions: Samples are stored in refrigerated container.

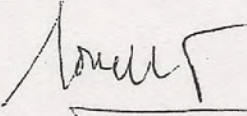
The minutes shall be made to copies, ending at 22:00 PM, 03<sup>rd</sup> Dec. 2013 .....

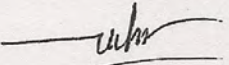
**Representative of the  
requirements**

**Representative of  
Supervisor**

**Representative of ETC**

  
Hoàng Minh Phương

  
Phan Văn Lợi

  
Phan Văn Lợi

## CONTACT INFORMATION

Contact information of the implementing environmental monitoring and related parties are shown in Table A

Table A: Contact information of the implementing environmental monitoring and related parties

STT	Name	Responsibility	Phone	Mail address
1	Dr. Ton That Lang	Project manager	0903983932	ttl@hcm.vnn.vn
2	Nguyen Minh Thien	Monitoring, reporting lead	0987510320	Minhthien.etc@gmail.com
3	Nguyen Van Nang	Measuring, sampling	0943409319	Nguyennang.etc@gmail.com
4	Le Huu Phuoc	Measuring, sampling	0979778620	Huuphuoc.etc@gmail.com
5	Nguyen Minh Tu	Measuring, sampling	01229795742	Ngmtu88@yahoo.com
6	Pham Van Hao	Measuring, sampling	0979325012	Phamhao2008@gmail.com
7	Pham Truc Linh	Analysis	0977444164	Truclinh.etc@gmail.com
8	Hoang Ngoc Tuyet Mai	Data entry	0908844613	steafchia@yahoo.com
9	Ngo Thi Thanh Diem	Report writing	--	Thanhdiem_ngo@yahoo.com
10	Nguyen Thi Thuy Diem	Report writing	0938338045	Diemphuc1923@yahoo.com
11	Tran Nhut Thanh	Analysis	0918414360	nhutthanh@yahoo.com
12	Hoang Minh Phuong	Environmental management – Hanshin Engineering Construction Co.,Ltd	0937970596	Minhphuong265vungtau@yahoo.com
13	Phan Vu Loi	Supervision consultants – Wilbur Smith	--	Loipv04@gmail.com

# ENVIRONMENTAL MONITORING SAMPLE LOCATION (CONSTRUCTION - PHASE)



**ENVIRONMENT & TECHNOLOGY****CENTER - ETC**

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 Tell: 08.38445046 Fax: 08.38445047



TT19-BCKQ

**TEST REPORT**

Code: 174/2013

Date: 10/12/2013

Page: 1/1

- Customer: **HANSHIN ENGINEERING & CONSTRUCTION Co., Ltd**
- Project name: **Ho Chi Minh – Long Thanh – Dau Giay Expressway Construction Project (Package No. 6)**
- Sampling location:
  - 174-R(01)/2013 : *Dau Giay intersection (Km 54+350) (Tọa độ: X: 0733484. Y: 1203996)*
  - 174-R(02)/2013: *Intersection with NH1 (Km 54+983) (Tọa độ: X: 0733497. Y: 1203915)*
- Sample name: Vibration level Quantity: 32 samples
- Date of measuring: 03/12/2013 Time of testing: 03/12-10/12/2013
- The methods of measuring and testing: Ref. QCVN 27:2010/BTNMT
- Test result:

	Time 03/12/2013	Vibration level <sup>(1)</sup>				Frequency around
		174-R(01)/2013		174-R(02)/2013		
		La <sub>eq</sub> (m/s <sup>2</sup> )	Lv <sub>cq</sub> (mm/s)	La <sub>eq</sub> (m/s <sup>2</sup> )	Lv <sub>cq</sub> (mm/s)	
1	06h-07h	0.0019	0.034	0.0023	0.045	1Hz-10Hz
2	07h-08h	0.0019	0.030	0.0024	0.050	1Hz-10Hz
3	08h-09h	0.0020	0.040	0.0025	0.038	1Hz-10Hz
4	09h-10h	0.0025	0.036	0.0020	0.046	1Hz-10Hz
5	10h-11h	0.0030	0.058	0.0034	0.043	1Hz-10Hz
6	11h-12h	0.0032	0.047	0.0028	0.044	1Hz-10Hz
7	12h-13h	0.0025	0.049	0.0024	0.051	1Hz-10Hz
8	13h-14h	0.0023	0.035	0.0028	0.047	1Hz-10Hz
9	14h-15h	0.0024	0.054	0.0022	0.054	1Hz-10Hz
10	15h-16h	0.0026	0.061	0.0026	0.056	1Hz-10Hz
11	16h-17h	0.0024	0.059	0.0024	0.054	1Hz-10Hz
12	17h-18h	0.0023	0.047	0.0026	0.053	1Hz-10Hz
13	18h-19h	0.0025	0.0412	0.0019	0.051	1Hz-10Hz
14	19h-20h	0.0024	0.037	0.0024	0.063	1Hz-10Hz
15	20h-21h	0.0021	0.047	0.0023	0.054	1Hz-10Hz
16	21h-22h	0.0019	0.039	0.0023	0.042	1Hz-10Hz

Measuring staff

**Doan Van Ngoc**

Vice chief of laboratory


**MSc. Hoang Thi Thanh Huyen**

Director

**Assoc.Prof..Dr.  
Ton That Lang**

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<p>TT19-BCKQ</p>	<p align="center"><b>TEST REPORT</b></p> <p align="center">Code: 174/2013</p>	<p>Date: 10/12/2013 Page: 1/1</p>

- Customer: **HANSHIN ENGINEERING & CONSTRUCTION Co., Ltd**
- Project name: **Ho Chi Minh – Long Thanh – Dau Giay Expressway Construction Project (Package No. 6)**
- Sampling location: Package no. 6 area
- Sample name: Industrial wastewater Quantity: 01 sample
- Symbol of sample: 174-NT-(2)/2013: Concrete mixing station area(Km48+800)
- Date of taking samples: 03/12/2013 Time of testing: 04/12-10/12/2013
- Test result

No.	PARAMETER/UNIT		TEST METHODS	THE RESULT
				174-NT-(2)/2013
1.	pH <sup>(*)</sup>	--	TCVN 6492:2011	8.60
2.	Temperature <sup>(*)</sup>	"C	Quick measured by machine Ecoscan Con 6	28.9
3.	BOD <sub>5</sub>	mg/L	Ref. TCVN 6001-2:2008	15
4.	COD <sup>(*)</sup>	mg/L	Ref. SMEWW 5220:2005	72
5.	DO <sup>(*)</sup>	mg/L	Quick measured by machine Econscan DO 6	1.2
6.	TSS <sup>(*)</sup>	mg/L	Ref. TCVN 6625:2000	105
7.	NH <sub>4</sub> <sup>+</sup>	mg/L	Ref. SMEWW 4500-NH <sub>3</sub> -F	3.56
8.	Total N	mg/L	Ref. SMEWW 4500-N C	4.10
9.	Total P	mg/L	Ref. TCVN 6202:1996	1.05
10.	Lubricant	mg/L	Ref. TCVN 7875:2008	1.8
11.	Total Coliform	MPN/100mL	Ref. TCVN 6187-2:1996	10

Measuring staff

Vice chief of laboratory

Director

Nguyen Thanh Luan

MSc. Hoang Thi Thanh Huyen

Dr. Ton That Lang

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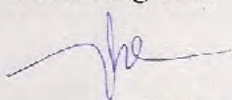
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	<b>TEST REPORT</b> Code: 174/2013	Date: 10/12/2013 Page: 1/1
TT19-BCKQ		

- Customer: **HANSHIN ENGINEERING & CONSTRUCTION Co., Ltd**
- Project name: **Ho Chi Minh – Long Thanh – Dau Giay Expressway Construction Project (Package No. 6)**
- Sampling location: Package no. 6 area
- Sample name: Domestic wastewater Quantity: 01 sample
- Symbol of sample: 174-NT-(1)/2013: Worker's camp area - Near batching (Km49+980)
- Date of taking samples: 03/12/2013 Time of testing: 04/12-10/12/2013
- Test result

No.	PARAMETER/UNIT		TEST METHODS	THE RESULT
				174-NT-(1)/2013
1.	pH <sup>(*)</sup>	--	TCVN 6492:2011	6.85
2.	Temperature (°)	oC	Quick measured by machine Ecoscan Con 6	28.9
3.	BOD <sub>5</sub>	mg/L	Ref. TCVN 6001-2:2008	42
4.	COD <sup>(*)</sup>	mg/L	Ref. SMEWW 5220:2005	86
5.	DO <sup>(*)</sup>	mg/L	Quick measured by machine Econsan DO 6	4.02
6.	TSS <sup>(*)</sup>	mg/L	Ref. TCVN 6625:2000	56
7.	NH <sub>4</sub> <sup>+</sup>	mg/L	Ref. SMEWW 4500-NH <sub>3</sub> -F	6.64
8.	Total N	mg/L	Ref. SMEWW 4500-N C	10.65
9.	Total P	mg/L	Ref. TCVN 6202:1996	2.50
10.	Lubricant	mg/L	Ref. TCVN 7875:2008	3.24
11.	Total Coliform	MPN/100mL	Ref. TCVN 6187-2:1996	4900

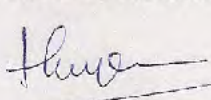
**Note:** (-): Not specified.

Measuring staff



**Nguyen Thanh Luan**

Vice chief of laboratory



**MSc. Hoang Thi Thanh Huyen**




Director



**Dr. Ton That Lang**

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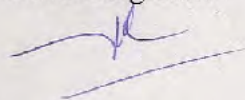
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<p>TT19-BCKQ</p>	<p align="center"><b>TEST REPORT</b></p> <p align="center">Code: 174/2013</p>	<p>Date: 10/12/2013 Page: 1/1</p>

- Customer: **HANSHIN ENGINEERING & CONSTRUCTION Co., Ltd**
- Project name: **Ho Chi Minh – Long Thanh – Dau Giay Expressway Construction Project (Package No. 6)**
- Sampling location:
  - 174-ON(01)/2013 : *Dau Giay intersection (Km 54+350)*
  - 174-ON(02)/2013: *Intersection with NH1 (Km 54+983)*
- Sample name: Noise level Quantity: 32 samples
- Date of measuring: 03/12/2013. Time of testing: 03/12-10/12/2013
- The methods of measuring and testing: Ref. QCVN 26:2010/BTNMT
- Test result:

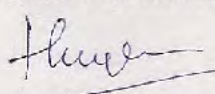
Time 03/12/2013	Noise level <sup>(1)</sup> (dBA)	
	174-ON(01)/2013	174-ON(02)/2013
6h-7h	56.0	55.2
7h-8h	55.1	60.3
8h-9h	59.3	60.1
9h-10h	62.5	59.0
10h-11h	59.3	60.6
11h-12h	61.0	60.9
12h-13h	59.0	55.2
13h-14h	61.1	61.7
14h-15h	56.5	58.6
15h-16h	58.5	61.4
16h-17h	61.7	60.6
17h-18h	59.1	60.5
18h-19h	64.7	55.6
19h-20h	58.2	58.0
20h-21h	50.9	51.7
21h-22h	54.0	53.3

Measuring staff



**Doan Van Ngoc**

Vice chief of laboratory



**MSc. Hoang Thi Thanh Huyen**

Director



**Assoc. Prof., Dr.  
Ton That Lang**

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<p>TT19-BCKQ</p>	<p align="center"><b>TEST REPORT</b></p> <p align="center">Code: 174/2013</p>	<p>Date: 10/12/2013 Page: 1/2</p>

- Customer: **HANSHIN ENGINEERING & CONSTRUCTION Co., Ltd**
- Project name: **Ho Chi Minh – Long Thanh – Dau Giay Expressway Construction Project (Package No. 6)**
- Sample name: Underground water Quantity: 02 samples
- Symbol of sample:
  - 174-NN-(1)/2013: Mr. Tran Ngoc Son households; 1398 Tran Cao Van St. Bau Ham 2 Commune. Thong Nhat District. Dong Nai Province
  - 174-NN-(2)/2013: Mr. Cao Van Duong households; Lap Thanh hamlet. Xuan Thanh Commune. Thong Nhat District. Dong Nai Province
- Date of taking samples: 04/09/2013 Time of testing: 07 days
- The methods of sampling and testing:

No.	PARAMETER/UNIT		TEST METHODS
1.	pH	--	TCVN 6492:2011
2.	Color	Pt-Co	Quick measured by machine DR/890
3.	Temperature	°C	Quick measured by machine Ecoscan Con 6
4.	Odor	--	Sensory
5.	TDS	mg/L	Quick measured by machine Hanna HI 8734
6.	Hardness level	mg/L	Ref. TCVN 6224-1996
7.	Conductivity	μS	Quick measured by machine Ecoscan Con 6
8.	Turbidity	NTU	Quick measured by machine HI 93703
9.	CN <sup>-</sup>	mg/L	Ref. TCVN 6181-1996
10.	N-NO <sub>3</sub> <sup>-</sup>	mg/L	Ref. EPA 352.1
11.	Cl	mg/L	Ref. TCVN 6194:1996
12.	SO <sub>4</sub> <sup>2-</sup>	mg/L	Ref. TCVN 6494:2:2000
13.	Mn	mg/L	Ref. SMEWW 3113B. 20 <sup>th</sup> Ed
14.	Total Fe	mg/L	Ref. TCVN 6177:1996
15.	Cd	mg/L	Ref. SMEWW 3113B. 20 <sup>th</sup> Ed
16.	Pb	mg/L	Ref. SMEWW 3113B. 20 <sup>th</sup> Ed
17.	As	mg/L	Ref. SMEWW 3113B. 20 <sup>th</sup> Ed
18.	Fecal Coliform	MPN/100mL	Ref. TCVN 6187-2:1996
19.	Total Coliform	MPN/100mL	Ref. TCVN 6187-2:1996

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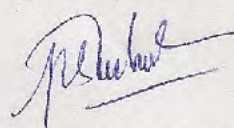
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	<b>TEST REPORT</b> Code: 174/2013	Date: 10/12/2013 Page: 2/2
TT19-BCKQ		

7. Test result:

No.	PARAMETERS/UNIT		RESULTS	
			174-NN-(1)/2013	174-NN-(2)/2013
1.	pH <sup>(*)</sup>	--	6.20	6.15
2.	Color	Pt-Co	5	10
3.	Temperature <sup>(*)</sup>	°C	27.5	28.6
4.	Odor	--	odorless	odorless
5.	TDS <sup>(*)</sup>	mg/L	135.2	148.3
6.	Hardness level	mg/L	69.5	62.4
7.	Conductivity <sup>(*)</sup>	μS	125.6	140.4
8.	Turbidity <sup>(*)</sup>	NTU	0	0
9.	CN <sup>-</sup>	mg/L	0.010 x 10 <sup>-3</sup>	0.011 x 10 <sup>-3</sup>
10.	N-NO <sub>3</sub>	mg/L	0.18	0.22
11.	Cl <sup>-</sup> <sup>(*)</sup>	mg/L	0.76	0.67
12.	SO <sub>4</sub> <sup>2-</sup>	mg/L	0.034	0.040
13.	Mn	mg/L	0.013	0.014
14.	Total Fe	mg/L	1.105	0.429
15.	Cd	mg/L	0.204 x 10 <sup>-3</sup>	0.246 x 10 <sup>-3</sup>
16.	Pb	mg/L	0.556 x 10 <sup>-3</sup>	0.864 x 10 <sup>-3</sup>
17.	As	mg/L	0.759 x 10 <sup>-3</sup>	1.107 x 10 <sup>-3</sup>
18.	Fecal Coliform	MPN/100mL	0	0
19.	Total Coliform	MPN/100mL	0	0

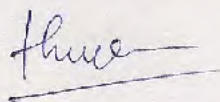
Note: (--): Not specified.

Measuring staff



Phạm Trúc Linh

Vice chief of laboratory



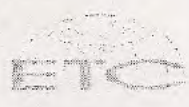


MSc. Hoang Thi Thanh Huyen

Director



Dr. Ton That Lang

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<p>TT19-BCKQ</p>	<p align="center"><b>TEST REPORT</b></p> <p align="center">Code: 174/2013</p>	<p>Date: 10/12/2013 Page: 1/3</p>

- Customer: **HANSHIN ENGINEERING & CONSTRUCTION Co., Ltd**
- Project name: **Ho Chi Minh – Long Thanh – Dau Giay Expressway Construction Project (Package No. 6)**
- Sampling location: Song Nhan area.
- Sample name: Surface water Quantity: 02 samples
- Symbol of sample:
  - 174-NM-(1)/2013: Surface water of Song Nhan (upstream)
  - 174-NM-(2)/2013: Surface water of Song Nhan (downstream)
- Date of taking samples: 03/12/2013 Time of testing: 07 days
- The methods of sampling and testing:



No.	PARAMETER/UNIT		TEST METHODS
1.	pH		TCVN 6492:2011
2.	Temperature	°C	Quick measured by machine Ecoscan Con 6
3.	Turbidity	NTU	Quick measured by machine Hanna HI-937030
4.	Conductivity	μS	Quick measured by machine Ecoscan Con 6
5.	DO	mg/L	Quick measured by machine Econsan DO 6
6.	BOD <sub>5</sub>	mg/L	Ref. TCVN 6001-2:2008
7.	COD	mg/L	Ref. SMEWW 5220:2005
8.	SS	mg/L	Ref. TCVN 6625:2000
9.	Total N	mg/L	Ref. SMEWW 4500-N C
10.	Total P	mg/L	Ref. TCVN 6202:1996
11.	Cu	mg/L	Ref. SMEWW 3113B. 20 <sup>th</sup> Ed <sup>(*)</sup>
12.	Zn	mg/L	Ref. SMEWW 3113B. 20 <sup>th</sup> Ed <sup>(*)</sup>
13.	Cd	mg/L	Ref. SMEWW 3113B. 20 <sup>th</sup> Ed <sup>(*)</sup>
14.	Pb	mg/L	Ref. SMEWW 3113B. 20 <sup>th</sup> Ed <sup>(*)</sup>
15.	As	mg/L	Ref. SMEWW 3113B. 20 <sup>th</sup> Ed <sup>(*)</sup>
16.	Hg	mg/L	Ref. SMEWW3112Hg.20 <sup>th</sup> Ed
17.	Lubricant	mg/L	Ref. TCVN 5070:1995
18.	NO <sub>3</sub> <sup>-</sup>	mg/L	Ref. EPA 352.1

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VILAS 495

TT19-BCKQ

## TEST REPORT

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19.	CN <sup>-</sup>	mg/L	Ref. TCVN 6181-1996
20.	N-NH <sub>4</sub> <sup>+</sup>	mg/L	Ref. SMEWW 4500-NH <sub>3</sub> -F
21.	Total Coliform	MPN/100mL	Ref. TCVN 6187-2:1996

### 8. Test result:

No	PARAMETERS/UNIT		RESULTS	
			174-NM-(1)/2013	174-NM-(2)/2013
1.	pH	--	7.05	7.25
2.	Temperature	°C	27.9	28.8
3.	Turbidity	NTU	106.2	95.8
4.	Conductivity	μS	168.6	179.3
5.	DO	mg/L	6.15	5.68
6.	BOD <sub>5</sub>	mg/L	20	19
7.	COD	mg/L	34	32
8.	SS	mg/L	18	20
9.	Total N	mg/L	10.25	9.60
10.	Total P	mg/L	1.50	0.95
11.	Cu	mg/L	2.25 x 10 <sup>-3</sup>	3.45 x 10 <sup>-3</sup>
12.	Zn	mg/L	20.08 x 10 <sup>-3</sup>	18.50 x 10 <sup>-3</sup>
13.	Cd	mg/L	0.025 x 10 <sup>-3</sup>	0.030 x 10 <sup>-3</sup>
14.	Pb	mg/L	5.20 x 10 <sup>-3</sup>	3.50 x 10 <sup>-3</sup>
15.	As	mg/L	0.60 x 10 <sup>-3</sup>	0.75 x 10 <sup>-3</sup>
16.	Hg	mg/L	ND	ND

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3. Sample retention time: 5 days from the date of result delivery.

4. Name of sample and customer are written according to request of the customer.

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QUY TẮC  
HÀNH VI  
CỦA  
CƠ QUAN  
KIỂM TRA

	<p align="center"><b>ENVIRONMENT &amp; TECHNOLOGY CENTER - ETC</b></p> <p align="center">Add: No. 20, Road No. 4, Ward 15, Go Vap Dist, HCMC          Tell: 08.38445046 Fax: 08.38445047</p>	  <p align="center">VILAS 495</p>
TT19 BCKQ	<p align="center"><b>TEST REPORT</b></p> <p align="center">Code: 174/2013</p>	Date: 10/12/2013 Page: 3/3

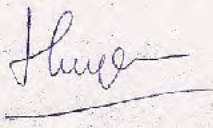
No	PARAMETERS/UNIT		RESULTS	
17.	Lubricant	mg/L	0.06	ND
18.	NO <sub>3</sub> <sup>-</sup>	mg/L	3.25	2.20
19.	CN <sup>-</sup>	mg/L	0.06 x 10 <sup>-3</sup>	0.04 x 10 <sup>-3</sup>
20.	N-NH <sub>4</sub> <sup>+</sup>	mg/L	0.50	0.65
21.	Total Coliform	MPN/100mL	4600	5000

Note: ND – Not detected.

Measuring staff

  
**Phạm Trúc Linh**

Vice chief of laboratory

  
**MSc. Hoang Thi Thanh Huyen**

Director

  
**Dr. Ton That Lang**

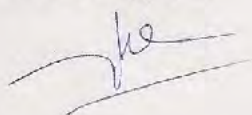
1. Do not extract and copy any part of this test result report without permission of Environment and Technology Center - ETC.
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3. Sample retention time: 5 days from the date of result delivery.
4. Name of sample and customer are written according to request of the customer.

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	<b>TEST REPORT</b> Code: 174/2013	Date: 10/12/2013 Page: 1/1
TT19-BCKQ		

- Customer: **HANSHIN ENGINEERING & CONSTRUCTION Co.,Ltd**
- Project name: **Ho Chi Minh – Long Thanh – Dau Giay Expressway Construction Project (Package No. 6)**
- Sampling location: Package no. 6 area.
- Sample name: Soil. Quantity: 04 samples
- Symbol of sample:
  - 174-MĐ-(1)/2013: Bau Ham 2 ward (neaKm 53+800. PK.6)
  - 174-MĐ-(2)/2013: Km 41+100
  - 174-MĐ-(3)/2013: Km 54+350
  - 174-MĐ-(4)/2013: Km 54+400
- Date of taking samples: 03/12/2013 Time of testing: 04/12-10/12/2013
- Test result:

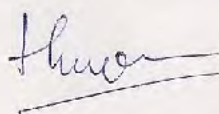
No.	PARAMETER/ UNIT		TEST METHODS	RESULTS			
				174-MĐ-(1)/2013	174-MĐ-(2)/2013	174-MĐ-(3)/2013	174-MĐ-(4)/2013
1	pH	-	TCVN 5979:1995	4.5	4.7	4.4	4.9
2	Total N	%	Kjeldahl	0.153	0.128	0.175	0.220
3	Total P	%	H <sub>2</sub> SO <sub>4</sub> :HClO <sub>4</sub>	0.109	0.201	0.316	0.236
4	Organic matter	%	Wallkey – Black	2.450	3.120	2.560	2.475
5	SO <sub>4</sub> <sup>2-</sup>	%	Titration by BaCl <sub>2</sub>	0.146	0.125	0.235	0.250
6	Cl	mg/kg	Titration by AgNO <sub>3</sub>	20.20	35.45	40.30	35.65
7	Total Fe	mg/kg	TCVN 4618-1988	80.20×10 <sup>3</sup>	100.5×10 <sup>3</sup>	100.0×10 <sup>3</sup>	90.5×10 <sup>3</sup>
8	As	mg/kg	SMEWW 3114-As-1995	1.30	1.55	1.35	1.10
9	Cd	mg/kg	SMEWW 3113-Cd-1995	1.05	1.40	1.25	1.60
10	Pb	mg/kg	SMEWW 3113-Pb-1995	3.25	3.70	4.30	2.10
11	Zn	mg/kg	SMEWW 3111-Zn-1995	15.20	18.90	16.60	12.40
12	Cu	mg/kg	SMEWW 3113-Cu-1995	16.60	14.30	14.30	13.80
13	Hg	mg/kg	SMEWW 3112-Hg-1995	0.025	0.030	0.040	0.025

Measuring staff



**Nguyen Thanh Luan**

Vice chief of laboratory



**MSc. Hoang Thi Thanh Huyen**

Director



**Assoc.Prof..Dr.  
Ton That Lang**

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<p>TT19-BCKQ</p>	<p align="center"><b>TEST REPORT</b></p> <p align="center">Code: 174/2013</p>	<p>Date: 10/12/2013 Page: 1/2</p>

- Customer: **HANSHIN ENGINEERING & CONSTRUCTION Co., Ltd**
- Project name: **Hồ Chí Minh – Long Thanh – Dầu Giây Expressway Construction Project (Package No. 6)**
- Sampling location:
  - A1: Song Nhan residential area (Km 39+400)
  - A2: Intersection with NH1(Km 54+983)
  - A3: Dầu Giây intersection (Km 54+350)
- Sample name: Ambient air quality Quantity: 08 samples
- Date of taking sample: 03/12/2013
- The methods of sampling and testing:

No.	PARAMETER/ UNIT		TEST METHODS
1.	SO <sub>2</sub>	mg/m <sup>3</sup>	Ref. TCVN 5971:1995 ISO 6767:1990
2.	NO <sub>2</sub>	mg/m <sup>3</sup>	Ref. TCVN 6137:1996 ISO 6768:1985
3.	CO	mg/m <sup>3</sup>	Ref. TCVN 5972:1995
4.	HC	mg/m <sup>3</sup>	GCMS
5.	TSP	mg/m <sup>3</sup>	Ref. TCVN 5067:1995
6.	Temperature	°C	Quick measured by machine Tes 1360
7.	Humidity	%	Quick measured by machine Tes 1360
8.	Wind speed	m/s	Quick measured by machine Center 315
9.	Wind direction	--	Using compass
10.	Atmospheric pressure	atm	Quick measured by machine Skywatch GEOS11

- Test result: (see page 2/2)

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- Sample retention time: 05 days from the date of result delivery.
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a. Microclimate condition.

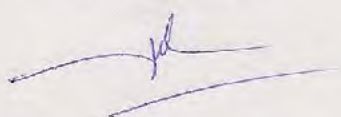
No.	TIME 03/12/2013	THE RESULT				
		Temperature (°C)	Humidity (%)	Wind speed (m/s)	Atmospheric pressure (atm)	Wind direction
A1: Song Nhan residential area (Km 39+400)						
1.	Measuring at 07.00	30.6	65.3	0.4 – 1.0	1	SE
2.	Measuring at 09.00	30.1	61.5	0.5 - 1.2	1	SE
3.	Measuring at 11.00	32.4	69.3	0.3 – 1.1	1	SE
A2: Intersection with NH1(Km 54+983)						
4.	Measuring at 13.00	32.1	54.7	0.4 – 1.1	1	SE
5.	Measuring at 15.00	31.6	53.5	0.5 – 1.2	1	SE
A3: Dau Giay intersection (Km 54+350)						
6.	Measuring at 17.00	30.4	58.1	0.5 - 0.9	1	SE
7.	Measuring at 19.00	30.7	56.4	0.7 - 1.1	1	SE
8.	Measuring at 21.00	27.3	62.4	0.4 - 0.8	1	SE

b. Ambient air quality.

No.	TIME 03/12/2013	THE RESULT				
		SO <sub>2</sub> (mg/m <sup>3</sup> )	NO <sub>2</sub> (mg/m <sup>3</sup> )	CO (mg/m <sup>3</sup> )	HC (mg/m <sup>3</sup> )	TSP (mg/m <sup>3</sup> )
A1: Song Nhan residential area (Km 39+400)						
1.	Measuring at 07.00	0.066	0.050	2.46	ND	0.21
2.	Measuring at 09.00	0.076	0.064	3.72	ND	0.23
3.	Measuring at 11.00	0.084	0.076	3.68	ND	0.46
A2: Intersection with NH1(Km 54+983)						
4.	Measuring at 13.00	0.072	0.068	3.40	ND	0.21
5.	Measuring at 15.00	0.075	0.058	4.20	ND	0.20
A3: Dau Giay intersection (Km 54+350)						
6.	Measuring at 17.00	0.071	0.063	5.46	ND	0.22
7.	Measuring at 19.00	0.067	0.057	3.55	ND	0.21
8.	Measuring at 21.00	0.046	0.081	4.20	ND	0.22
QCVN 05:2009/BTNMT		0.35	0.2	30	--	0.3

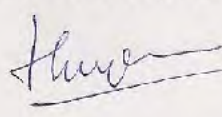
Note: ND: Not detected

Measuring staff



**Doan Van Ngoc**

Vice chief of laboratory



**MSc. Hoang Thi Thanh Huyen**

Director



**Assoc.Prof..Dr.  
Ton That Lang**

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**BM01- TN&BCKQ/01**



Figure 1: Sampling of air in Song Nhan residential area (Km39 +400)



Figure 2: Air sampling at the point of intersection with Highway 1 (Km54 +983)



Figure 3: Noise and vibration sampling at the intersection with Highway 1 (Km54 +983)



Figure 4: Air sampling at intersection Dau Giay (Km54 +350)



Figure 5: Noise and vibration sampling at the intersection with Highway 1 (Km54 +350)



Figure 6: Location of sampling surface water (Song Nhan upstream )



Figure 7: Surface water sampling location (Song Nhan downstream)



Figure 8: Location of groundwater sampling in Thanh Xuan residential area



Figure 9: Location of groundwater sampling Tran Cao Van village - Bau Ham 2



Figure 10: Soil sampling area



Figure 11: Sampling of industrial waste water in the concrete mixing plant (Km54 +900)



Figure 12: Sampling of domestic wastewater at the construction site (Km54 +900)



Figure 13: Area for storage and refueling of motor vehicles used in the site (Km54 +900)