



# Environmental Monitoring Report

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Project Number: 34097  
March 2006

## People's Republic of China: Shanxi Road Development II Project Quarterly Report No. 07 on Environment Monitoring in Construction Period

Prepared by Shanxi Environment Monitoring & Testing Center of Communications  
Shanxi, People's Republic of China

For Shanxi Hou-yu Expressway Construction Co. Ltd.

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**Asian Development Bank**

ADB LOAN: PRC-1967  
SHANXI ROAD DEVELOPMENT PROJECT-II  
SHANXI HOUMA - YUMENKOU EXPRESSWAY

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**Ref.:** JHJZ(2006)NO.001

# **QUARTERLY REPORT No. 07 ON ENVIRONMENT MONITORING IN CONSTRUCTION PERIOD**

Shanxi Environment Monitoring & Testing Center of Communications  
March, 2006

**Project Name:** Environment Monitoring in Construction Period  
For Shanxi Houma - Yumenkou Expressway

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## **Foreword**

Shanxi Houma-Yumenkou Expressway is a part of national trunk road from Erlianhot to Hekou. It's also an integral section of provincial latitude road network in Shanxi. After this project is completed, it will greatly improve the local traffic situation, which is very conducive to the economic development in Shanxi.

This project began in May 2004, and the expected construction period is three years. Entrusted by Shanxi Hou-yu Expressway Construction Co. Ltd, Shanxi Environmental Monitoring & Testing Center (SEMTC) carried out systematic environment monitoring test along the Project alignment from January to March in 2006. In our working process, we strictly followed the regulations issued by the State Environmental Protection Bureau, Shanxi Provincial Environmental Protection Bureau and Shanxi Provincial Communications Department. Based on the test results, we compiled this quarterly report in construction period.

Finally, we would like to acknowledge support and cooperation that Shanxi Hou-yu Expressway Construction Co. Ltd has given us in our work.



Field Sampling

**ENVIRONMENT MONITORING IN CONSTRUCTION PERIOD**  
**QUARTERLY REPORT NO. 07**

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## **1. General Introduction**

### **1.1 Geographic Position & Direction of the Expressway**

The proposed Shanxi Houma-Yumenkou Expressway is located at 35°23' to 36°55' N and 110°15' to 112°23'E in southwest of Shanxi province, and its entire length is 66.84km. It is a section of national trunk road from Erlianhot to Hekou. This road is started from Houma traffic hub, passing through Xinjiang county, Jishan county and Hejin city and crossing over Yellow River, and finally ended at a place near Xiyaqian in Shaanxi province.

### **1.2 Basis for Work**

This investigation was based on the contract of Shanxi Houma-Yumenkou Expressway Environmental Monitoring and relevant requirements in the Environment Impact Assessment (EIA).

### **1.3 Guides & Purpose**

This investigation was focused on air quality, noise, surface water along the line and rubbish, waste water disposal situation in residential areas of road construction companies. We adopted objective working principle and strictly followed relevant environmental monitoring regulations of various levels. Through this assessment on environmental situation along the line, we can provide scientific information for environmental protection of this expressway during construction period, which is beneficial to the coordinated development between road construction and environment protection.

### **1.4 Monitoring Period and General Situation of Road Construction**

We took the samples three times from January 13 to March 4, and road construction was normally going on during the investigation. By February 28, construction companies had completed construction of 159 platforms on piles and joining beams altogether out of total number 160 in Yellow River Bridge. There are 216 Pier columns in the bridge, of which 214 had been built. One hundred and forty seven 50m-T beams had been fabricated but of total 504 sheets. Among them 111 sheets had been set up. 80.4% of 20cm-gravel and sand layer had been built in P1-P4 contract sections. Also construction companies had finished construction of 85.4 % of 30-cm gravel and sand layer, 76.9% of telecommunication pipelines respectively in P1-P4 contract sections.

### **1.5 Evaluation Standards of Environment Quality**



Construction companies should follow the regulations of environmental protection approved by relevant administrations in the period of project design, construction, acceptance test and its operation. This rule was stated in No.3 document, with its name of Management on Environmental Protection Standards issued by China environmental protection agency in 1999. So we implemented these environmental protection standards in the monitoring work of road construction period. For what was not mentioned in previous regulations, we follow current environmental protection standards according to the practical conditions.

a) Environmental Air

Total suspended particle ( TSP ) should meet standard of Class II demanded in “Quality Standards of the Environmental Air” ( GB3095-1996 ) .The standard value is listed in table 1-1.

Table1-1 Environmental air quality standard (extracted)

Name of pollutant		Limited value ( mg/m <sup>3</sup> )
TSP	Day average	0.30
NO <sub>2</sub>		0.12
CO		4.00

b) Environmental Noise

We conducted test according to the information provided by book “Limited Values of Noise on Construction Sites” ( GB12523-90 ) , part of which is listed in table1-2.

Table1-2 Limited values of noise on construction sites (extracted)

Construction period	Main source of noise	Leq dB ( A )	
		Daytime	Night
Earth & stone work	Bulldozer, excavator、charger etc	75	55
Pile driving	Different kinds of pile driving machine	85	No construction
Structure	Concrete mixer, tamping bar, electric saw etc	70	55
Installation	Crane, Elevator etc	65	55

## 1.6 Assurance for Monitoring Quality

Following the related requirements in the document of SEPA(91) HJZ No.043 About Management Regulations of Environmental Monitoring Quality Guarantee ( interim ) , we have worked out a “Quality Control Plan” and strictly carry out it to ensure the correctness of the data. Including:

- a. All monitoring personnel are qualified and certified.
- b. All monitoring instruments employed by our center must be checked by authoritative measuring bureau before use in order to guarantee the reliability of test data.
- c. Strictly follow the test methods stipulated in the related standards of the state.

## Monitoring Results of Environment Quality

### 2.1 Monitoring Results on Air Quality & Analysis

#### 2.1.1 Monitoring Analysis Methods

See Table 2-1 for monitoring analysis methods

Table 2-1 Monitoring analysis method for environmental air

Tested item	Testing method	Method number
TSP	Gravimetric method	GB/T15432-95
NO <sub>2</sub>	In ambient air-Griess-saltsman method	GB8969-88
CO	Non-dispersive infrared spectrometry	GB9801-88

#### 2.1.2 Monitored Points, Items and Times

See Table 2-2 for monitoring points, items and times

Table 2-2 Monitored points, items and times

Order	Monitored points	chainage	Monitored item	Monitoring frequency
1	BeiPingYuan	K0+500	TSP	Testing for 3 consecutive days with at least 12 hours for sampling every day
2	DongHang	K14+300		
3	FuBo	K44+500		

4	CangTou school	K58+250		
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### 2.1.3 Monitoring Results and its Analysis

See Table 2-3,2-4,2-5,2-6 for monitoring results

Table 2-3 Monitoring results of environmental air

unit :  $\text{mg}/\text{m}^3$

Item	Monitor- ed points	Measured values								
		January			February			March		
		12th	13th	14 th	14 th	15th	16 th	14 th	15 th	16 th
TSP	BeiPingYuan	0.45	0.40	0.35	0.40	0.50	0.41	0.32	0.36	0.39
	DongHan	0.39	0.41	0.38	0.42	0.36	0.39	0.40	0.37	0.40
	FuBo	0.40	0.36	0.30	0.36	0.39	0.44	0.35	0.42	0.38
	CangTou school	0.42	0.36	0.38	0.50	0.36	0.41	0.39	0.43	0.35

Table 2-4 Statistical table of monitoring results on environmental air

order	Tested points	Range of measured data ( $\text{mg}/\text{m}^3$ )	average ( $\text{mg}/\text{m}^3$ )	Overproof multiple	Maximum overproof multiple
1	BeiPingYuan	0.32-0.50	0.40	0.33	0.67
2	DongHan	0.36-0.42	0.39	0.30	0.40
3	FuBo	0.30-0.44	0.38	0.27	0.47
4	CangTou school	0.35-0.50	0.38	0.27	0.67
Standard value		0.30			

Table 2-5  $\text{NO}_2$  content in the air

unit :  $\text{mg}/\text{m}^3$

Item	Monitor- ed points	Measured values			
		March 2th	March 3th	March 4 th	average
$\text{NO}_2$	BeiPingYuan	0.040	0.038	0.051	0.043
	DongHan	0.035	0.043	0.039	0.039
	FuBo	0.041	0.038	0.030	0.036

	CangTou school	0.041	0.045	0.040	0.042
Standard value		0.12			

Table 2-6

CO content in the air

unit :  $\text{mg}/\text{m}^3$ 

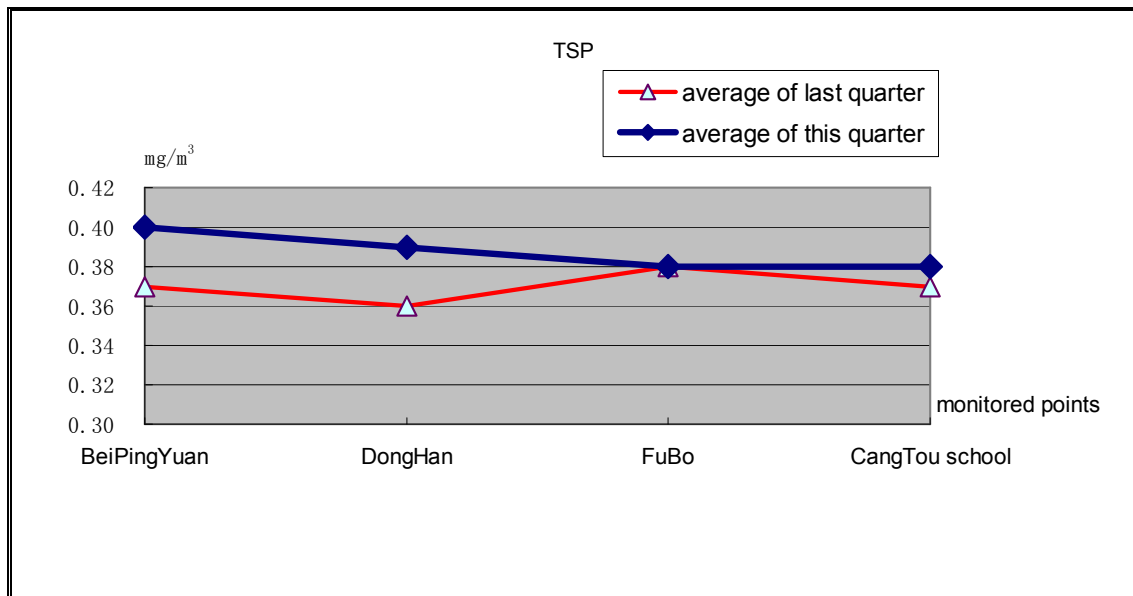
Item	Monitor- ed points	Measured values			
		March 2th	March 3th	March 4 th	average
CO	BeiPingYuan	3.67	3.25	3.77	3.56
	DongHan	3.55	3.33	3.57	3.48
	FuBo	3.52	3.60	3.55	3.56
	CangTou school	3.48	3.53	3.60	3.54
Standard value		4.00			

#### 2.1.4 Analysis of Air Monitoring Results

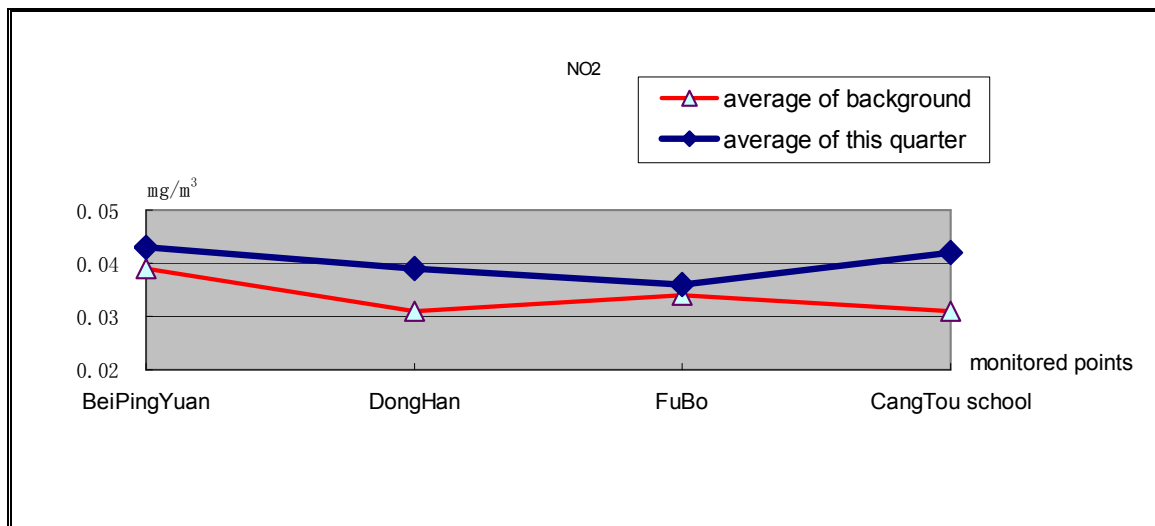
Analysis of monitoring results: The range of TSP values in 3 months is from  $0.30 \text{ mg}/\text{m}^3$  to  $0.50 \text{ mg}/\text{m}^3$ . The average of every tested point in 3 months all exceed standard value. The overproof multiples are between 0.27 and 0.33. The maximum overproof multiple this time is 0.67.

Monitored  $\text{NO}_2$  content is between  $0.036 \text{ mg}/\text{m}^3$  and  $0.043 \text{ mg}/\text{m}^3$ . CO content is in the range from  $3.48 \text{ mg}/\text{m}^3$  to  $3.56 \text{ mg}/\text{m}^3$ . All meet standard value.

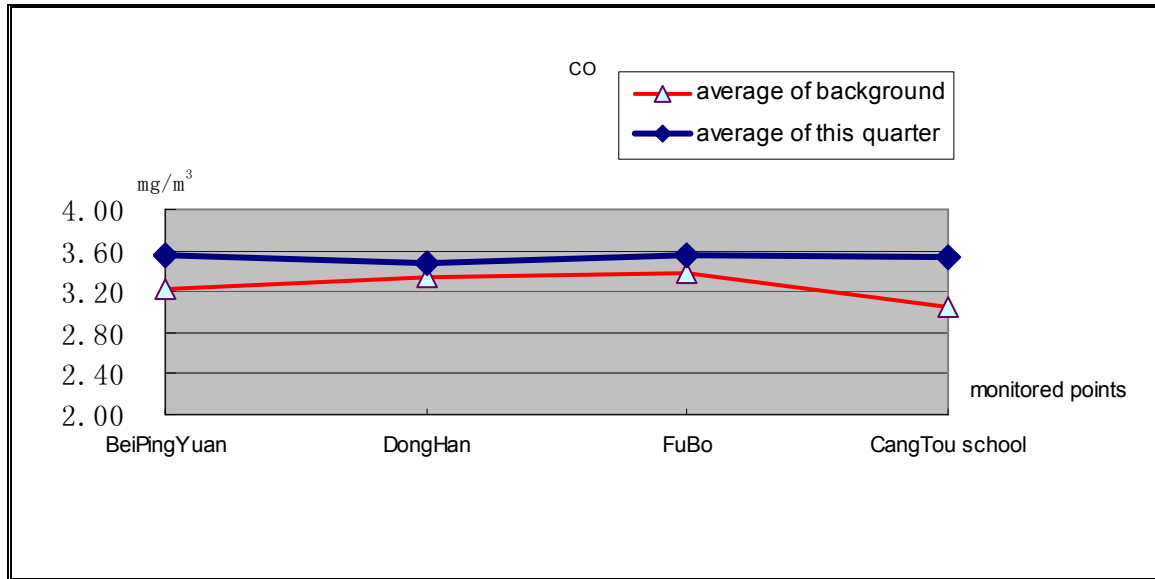
#### 2.1.5 Analysis of Air Quality Variation



GrGraph 1: Quarterly variation of air quality



Graph 2: the comparison of NO<sub>2</sub> content



F

Graph 3: the comparison of CO content

From the graph above, we can learn that the averages of TSP values in 4 sensitive points go up to some extent compared with that of last quarter and Monitored NO<sub>2</sub> and CO content are all higher than that in the background monitoring report.

## 2.2 Monitoring Results on Noise & Analysis

### 2.2.1 Monitoring Method

Measurement was conducted according to GB/T12524-90 "measurement method for noise in construction site". Monitoring instrument: Model HS6288D sound level meter.

### 2.2.2 Monitoring Points, Items and Times

See table 2-7 for Monitoring Points, Items and Times

Table 2-7 Monitoring points for noise and times

Order	Monitored points	Chainage	Distance from road center ( m )	monitored item	Frequency
1	BeiPingYuan	K0+500	100	Noise : equivalent acoustic level A	Measuring once at daytime and night respectively
2	ShuiXizhuang	K6+700	110		
3	DongHan	K14+300	80		
4	FuBo	K44+500	70		

5	XinFeng	K54+800	200		
6	LingLi	K57+900	Left side		
7	CangTou	K58+200	50		
8	CangTou school	K58+250	120		

### 2.2.3 Analysis on Monitoring Results

Monitoring results for noise is listed in table 2-8

Table 2-8 Monitoring results for noise

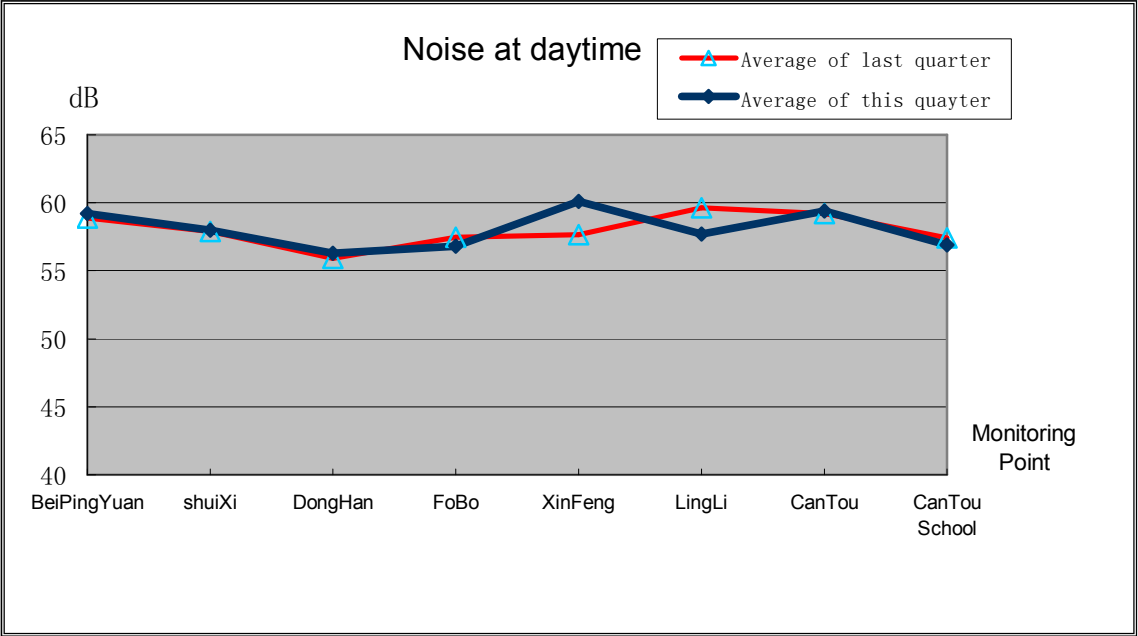
No.	Monitored points (villages)	Leq dB(A)					
		January		February		March	
		day	night	day	night	day	night
1	BeiPingYuan	55.9	47.4	60.4	50.6	61.3	52.0
2	ShuiXiZhuang	57.0	48.6	57.5	47.3	59.5	49.0
3	DongHan	54.0	46.8	58.2	46.2	56.8	47.7
4	FuBo	55.3	47.5	57.8	48.4	57.3	45.6
5	XinFeng	58.4	52.3	60.1	50.2	61.7	51.0
6	LingLi	55.6	45.2	57.6	46.0	59.8	48.6
7	CangTou	57.6	49.6	59.9	50.6	60.7	51.2
8	CangTou school	57.0	47.5	56.1	46.0	57.7	48.0

### 2.2.4 Noise Monitoring Results & its Analysis

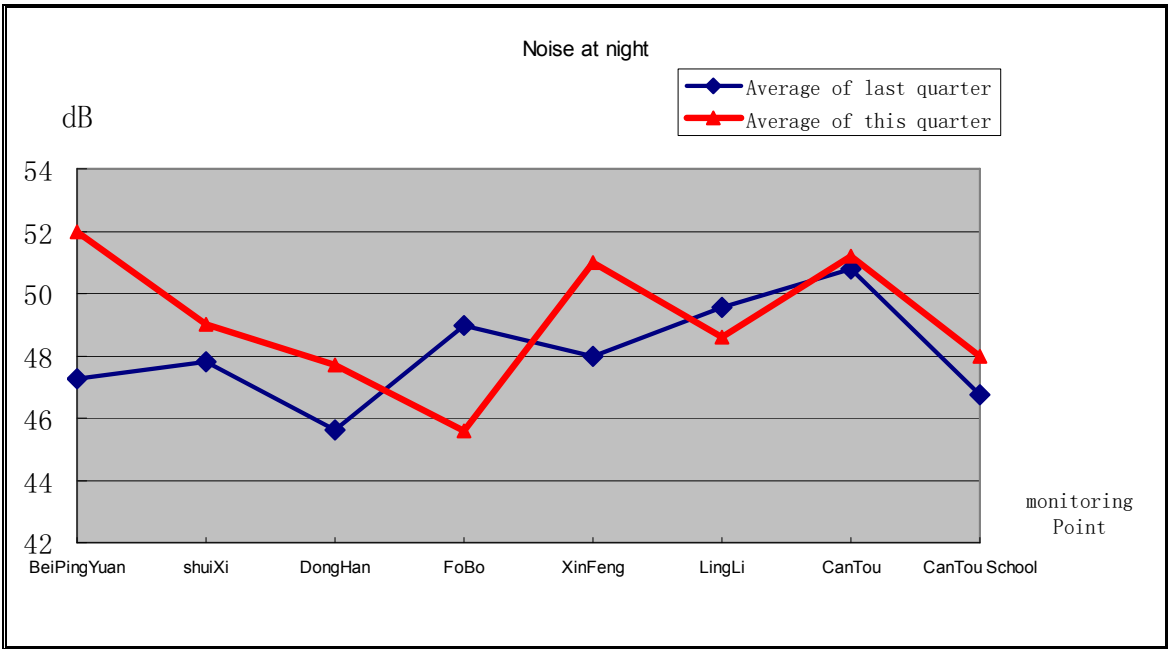
( 1 ) The recorded results are between 55.0dB and 61.6dB on 8 monitored points at day time. All meet the requirement stipulated in “Limited Values of Noise on Construction Sites”.

( 2 ) The results between 45.0 dB and 52.6 dB are recorded on 8 monitored points at night. All meet the requirement of limited value,55 dB.

2.2.5 Analysis on Environmental Noise Quality Variation



Graph4: Quarterly variation of noise at daytime



Graph5: Quarterly variation of noise at night



From the chart above, we can see that environmental noise quality basically keeps stable compared with last quarter.

## 2.3 Results & Analysis on Rubbish, Waste Water Disposal Situation in the Residential Areas of Contractors

### 2.3.1 Investigation Results

See Table 2-9 for investigation results on rubbish and waste water disposal situation.

Table 2-9 Investigation results on rubbish and waste water disposal

Time	Construction companies	Persons in charge	Residence	Rubbish disposal	Waste water disposal
January	Taiyuan Road Construction Group	LiuYouZhi	XiaoLing	Disposed rubbish with the villagers together	Discharge waste water into sewage system
			FuYou		
February	China Railway Bridge construction company	Huang GuoHao	CangTou	First put rubbish into garbage can , then buried it	Set up settling tank for waste water and disinfect it
March	Taiyuan Road Construction Group	LiuYouZhi	XiaoLing	Disposed rubbish with the villagers together	Discharge waste water into sewage system
			FuYou		

### 2.3.2 Analysis on Investigation Results

Through table 2-9, we can know that rubbish in residential areas of construction sites was collectively handled and finally it was buried or transported to rubbish station. We can also learn that waste water was discharged into local sewage system or into settling tank for disinfection. The disposal work was well managed without causing environmental pollution.

## 3 Environmental Quality Assessment & Suggestions

From what we have described above, we can see overall environmental condition along the alignment keeps relatively stable while all construction work is normally going on. It is because relevant construction companies adopted effective environmental protection measures according to *HouYu Expressway Environment Protection Strategies*. TSP values in this quarter exceed standard and go up a little compared with that of last quarter. NO<sub>2</sub> and CO content in the air is little higher than that in the background monitoring report due to local

inhabitants burned coal to warm their houses, but don't exceed the standard. All monitoring results of noise meet standard and keep relatively stable.

It is suggested that construction companies should continue to strengthen their environmental protection management and enhance their employee's awareness of environmental protection for maintaining good environmental conditions along the expressway. Because the noise that heavy machinery produces usually goes beyond limited value, it is also suggested that the heavy machinery should be banned from using at night in order to maintain the good environmental quality along the line.

## Appendix:

### Measured meteorological data along the houyu expressway

Time Point		January 13th				January 14th				January 15th			
		Air temperature	Air pressure	wind velocity	wind direction	Air temperature	Air pressure	wind velocity	wind direction	Air temperature	Air pressure	wind velocity	wind direction
Bei Ping Yuan	7:00	-6	98.3	windless	-	-5	98.1	windless	-	-7	98.6	windless	-
	11:00	-1	98.5	windless	-	-1	98.2	windless	-	-2	98.5	windless	-
	15:00	2	98.5	windless	-	2	98.2	windless	-	1	98.4	windless	-
	19:00	-4	98.4	windless	-	-5	98.3	windless	-	-5	98.5	windless	-
Dong Han	7:00	-6	97.8	windless	-	-6	97.7	windless	-	-7	97.7	windless	-
	11:00	-1	97.4	windless	-	0	97.4	windless	-	-1	97.3	windless	-
	15:00	1	97.4	windless	-	1	97.4	windless	-	0	97.4	windless	-
	19:00	-5	97.5	windless	-	-4	97.5	windless	-	-5	97.5	windless	-
FuBo	7:00	-7	98.4	windless	-	-4	98.2	windless	-	-7	98.4	windless	-
	11:00	-2	98.2	windless	-	-1	98.2	windless	-	-2	98.4	windless	-
	15:00	0	98.2	windless	-	1	98.2	windless	-	0	98.3	windless	-
	19:00	-5	98.3	windless	-	-3	98.3	windless	-	-4	98.3	windless	-
Cang Tou school	7:00	-6	98.5	windless	-	-4	98.1	windless	-	-6	98.4	windless	-
	11:00	-2	98.5	windless	-	-2	98.1	windless	-	-2	98.4	windless	-
	15:00	0	98.4	windless	-	1	98.0	windless	-	0	98.5	windless	-
	19:00	-4	98.4	windless	-	-4	98.2	windless	-	-5	98.5	windless	-

**Note:** related units in this table “°C” for air temperature, “kpa” for atmospheric pressure, “m/s” for wind velocity, degree “°” for wind direction.

## Appendix:

### Measured meteorological data along the houyu expressway

Time Point		February 8th				February 9th				February 10th			
		Air temperature	Air pressure	wind velocity	Wind direction	Air temperature	Air pressure	Wind velocity	wind direction	Air temperature	Air pressure	wind velocity	wind direction
Bei Ping Yuan	7:00	-7	98.5	windless	-	-8	98.5	windless	-	-7	98.1	windless	-
	11:00	-2	98.5	windless	-	-1	98.5	windless	-	-2	98.2	windless	-
	15:00	1	98.4	windless	-	2	98.5	windless	-	1	98.2	windless	-
	19:00	-4	98.5	windless	-	-5	98.4	windless	-	-5	98.3	windless	-
Dong Han	7:00	-6	97.8	windless	-	-6	97.7	windless	-	-7	97.3	windless	-
	11:00	-1	97.4	windless	-	0	97.4	windless	-	-1	97.3	windless	-
	15:00	1	97.4	windless	-	1	97.4	windless	-	0	97.4	windless	-
	19:00	-5	97.5	windless	-	-4	97.5	windless	-	-5	97.3	windless	-
FuBo	7:00	-7	98.2	windless	-	-6	98.2	windless	-	-7	98.4	windless	-
	11:00	-2	98.2	windless	-	-1	98.2	windless	-	-2	98.4	windless	-
	15:00	0	98.2	windless	-	1	98.2	windless	-	0	98.3	windless	-
	19:00	-4	98.3	windless	-	-3	98.3	windless	-	-4	98.3	windless	-
Cang Tou school	7:00	-8	98.5	windless	-	-4	98.1	windless	-	-6	98.4	windless	-
	11:00	-2	98.5	windless	-	-2	98.1	windless	-	-2	98.4	windless	-
	15:00	0	98.4	windless	-	0	98.0	windless	-	-1	98.4	windless	-
	19:00	-3	98.5	windless	-	-4	98.0	windless	-	-5	98.5	windless	-

**Note:** related units in this table “°C” for air temperature, “kpa” for atmospheric pressure, “m/s” for wind velocity, degree “°” for wind direction.

## Appendix:

### Measured meteorological data along the houyu expressway

Time Point		March 2th				March 3th				March 4th			
		Airtempe- rature	Airpress- ure	wind velocity	Wind direc- tion	Air temperat- ure	Airpress- ure	wind velocity	wind direc- tion	Air tempe- rature	Airpress- ure	wind velocity	Wind direc- tion
Bei Ping Yuan	7:00	-4	97.9	windless	-	-3	98.2	windless	-	-2	98.2	windless	-
	11:00	1	98.0	windless	-	1	98.1	windless	-	1	98.2	windless	-
	15:00	4	98.0	windless	-	5	98.2	windless	-	4	98.1	windless	-
	19:00	0	98.1	windless	-	0	98.2	windless	-	0	98.1	windless	-
Dong Han	7:00	-2	97.0	windless	-	-3	97.4	windless	-	-3	97.5	windless	-
	11:00	2	97.0	windless	-	1	97.4	windless	-	2	97.5	windless	-
	15:00	6	97.1	windless	-	3	97.4	windless	-	4	97.6	windless	-
	19:00	1	97.0	windless	-	2	97.4	windless	-	2	97.6	windless	-
FuBo	7:00	-3	97.5	windless	-	-2	97.5	windless	-	0	97.3	windless	-
	11:00	2	97.5	windless	-	2	97.5	windless	-	3	97.3	windless	-
	15:00	5	97.5	windless	-	6	97.6	windless	-	6	97.1	windless	-
	19:00	1	97.6	windless	-	2	97.6	windless	-	2	97.3	windless	-
Cang Touschool	7:00	-3	97.8	windless	-	-2	97.8	windless	-	0	97.6	windless	-
	11:00	3	97.8	windless	-	3	97.8	windless	-	4	97.6	windless	-
	15:00	5	98.0	windless	-	6	97.8	windless	-	6	98.7	windless	-
	19:00	0	98.0	windless	-	1	97.8	windless	-	2	98.6	windless	-

**Note :** related units in this table “°C”for air temperature , “kpa”for atmospheric pressure, “m/s”for wind velocity, degree “°” for wind direction.