



# Environmental Monitoring Report

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Project Number: 34097  
September 2005

## People's Republic of China: Shanxi Road Development II Project Quarterly Report No. 05 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**

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SHANXI ROAD DEVELOPMENT PROJECT-II  
SHANXI HOUMA - YUMENKOU EXPRESSWAY

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# **QUARTERLY REPORT No. 05**

## **ON ENVIRONMENT MONITORING**

### **IN CONSTRUCTION PERIOD**

Shanxi Environment Monitoring & Testing Center of Communications  
September, 2005

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

**Monitoring Agency:** Shanxi Environment Monitoring & Testing Center of  
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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 July to September in 2005. 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.



Testing Analysis



Field Sampling

**ENVIRONMENT MONITORING IN CONSTRUCTION PERIOD**  
**QUARTERLY REPORT NO. 05**

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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 July 11 to September 16, and road construction was normally going during the investigation. By September 10, construction companies altogether had completed 99.1% of earthcut, 99.7 % of earthfill, 95% of designed gravel-soil filling work, 99.6 % of pile foundation work, 99.3 % of base slab work, 98.5 % of bridge abutment and pier work, and 83.6% of precast slab. At same time 204 of bridges and culverts altogether that had been back filled, 195 of them had been constructed. 68.3% of deck-pavement had been finished in E1-E5 contract sections. Protection work with total of 155,000m<sup>3</sup> that had been completed 104,000 m<sup>3</sup>. Totalled 712 piles of Huanghe grand bridge had been installed.

### **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

#### 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

#### c) Water Quality

Water quality should meet Class IV standard in “ Surface Water Environmental Quality Standards” ( GHZB1-1999 ) .ss value (suspended substance) should meet Class II of dry farming standard in “Water Quality Standards on Agricultural Irrigation “ ( GB5084-92 ) . The standard values are listed in table 1-3.

Table 1-3 water quality evaluation standards (extract)  
unit :mg/L ( except for pH )

Evaluation standards		pH	CODcr	SS	Pb	Petroleum
GHZB1-1999 ( class IV standard )	Limited value	6.5-8.5	30	-	0.05	0.5
GB5084-92 ( class II dry farming standard )	Limited value	-	-	200	-	-

## 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:

- All monitoring personnel are qualified and certified.
- 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.
- 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
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TSP	Gravimetric method	GB/T15432-95
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### 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		

### 2.1.3 Monitoring Results and its Analysis

See Table 2-3 for monitoring results

Table 2-3 Monitoring results of environmental air

unit : mg/m<sup>3</sup>

Item	Monitor- ed points	Measured values								
		July			August			September		
		11th	12 th	13 th	8 th	9th	10 th	14 th	15 th	16 th
TSP	BeiPingYuan	0.39	0.30	0.36	0.38	0.34	0.30	0.40	0.35	0.38
	DongHan	0.34	0.38	0.33	0.36	0.33	0.38	0.28	0.37	0.35
	FuBo	0.36	0.30	0.37	0.38	0.38	0.33	0.36	0.39	0.35
	CangTou school	0.41	0.34	0.36	0.36	0.29	0.36	0.37	0.34	0.37

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

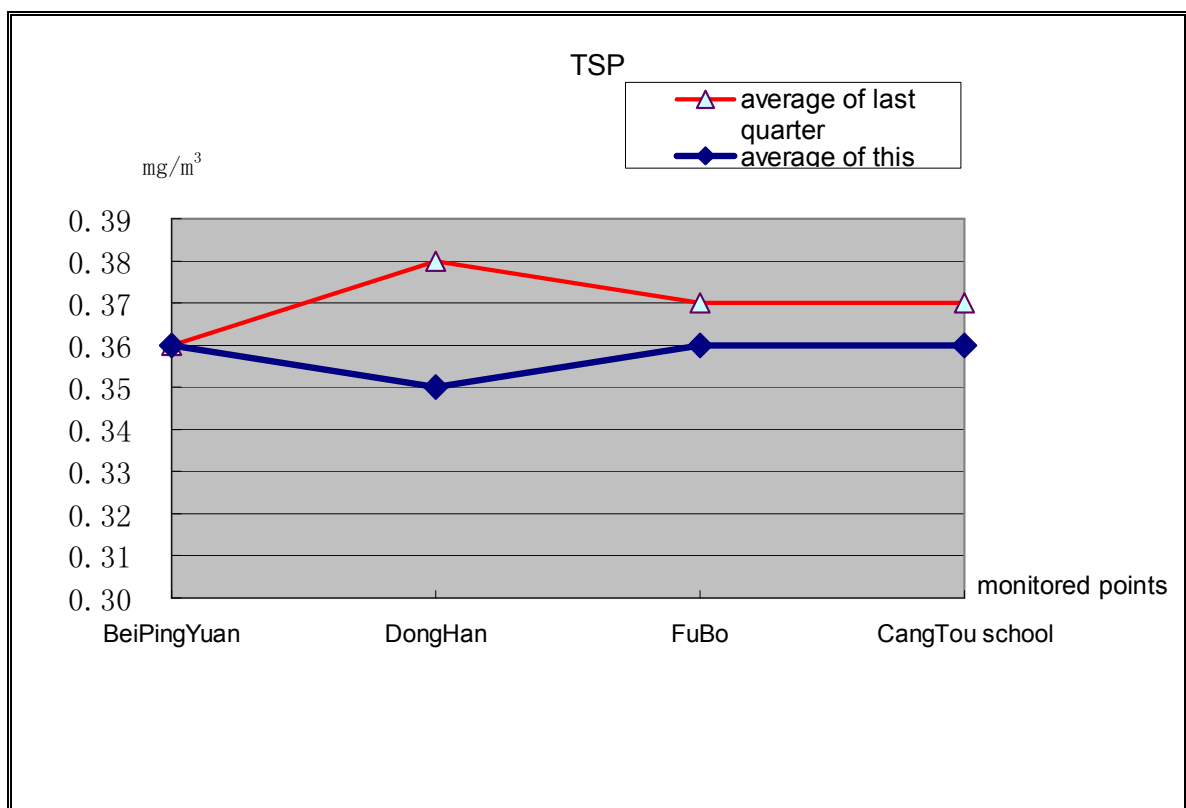
order	Tested points	Range of measured data ( mg/m <sup>3</sup> )	average ( mg/m <sup>3</sup> )	Overproof multiple	Maximum overproof multiple
1	BeiPingYuan	0.30-0.40	0.36	0.20	0.33
2	DongHan	0.28-0.38	0.35	0.17	0.40

3	FuBo	0.30-0.39	0.36	0.20	0.30
4	CangTou school	0.29-0.41	0.36	0.20	0.37
Standard value		0.30			

#### 2.1.4 Analysis of Air Monitoring Results

Analysis of monitoring results: The range of TSP values in 3 months is from 0.28 mg/m<sup>3</sup> to 0.41mg/m<sup>3</sup>. The average of every tested point in 3 months all exceed standard value. The overproof multiples are between 0.17 and 0.20. The maximum overproof multiple this time is 0.40.

#### 2.1.5 Analysis of Air Quality Variation



Graph 1: Quarterly variation of air quality

From the graph above, we can learn that the averages of TSP values in 4 sensitive points declined to some extent compared with that of last quarter.

## 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 2-5 for Monitoring Points, Items and Times

Table 2-5 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 2-6

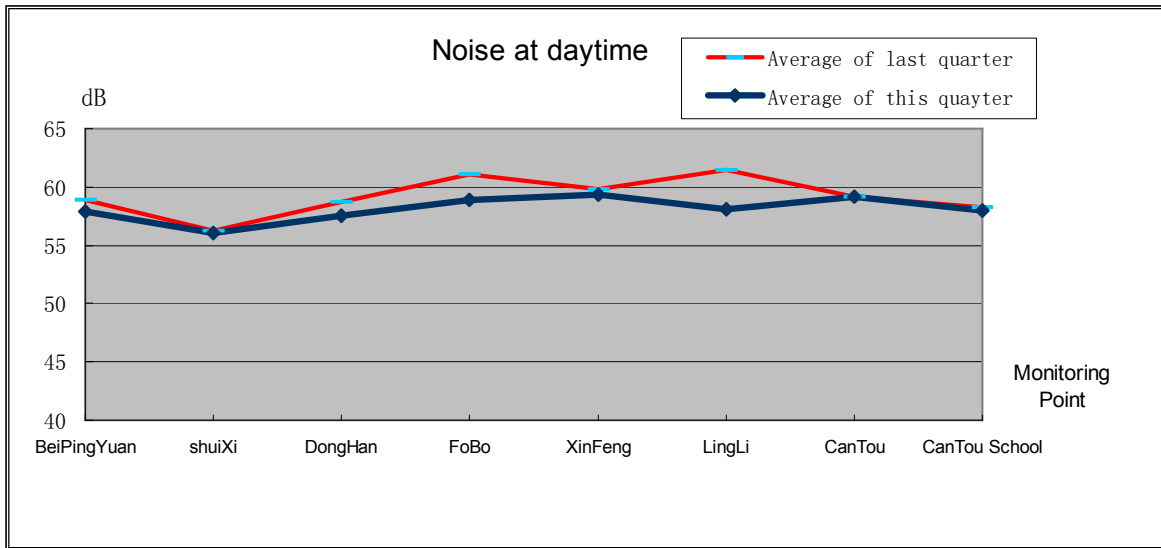
Table 2-6 Monitoring results for noise

No.	Monitored points (villages)	Leq dB(A)					
		July		August		September	
		day	night	day	night	day	night
1	BeiPingYuan	57.8	49.6	57.5	47.2	58.4	47.6
2	ShuiXiZhuang	55.6	45.0	56.0	46.3	56.8	48.6
3	DongHan	58.3	49.8	56.8	48.4	57.3	48.7
4	FuBo	57.9	48.4	60.4	46.8	58.3	49.0
5	XinFeng	60.6	49.2	57.6	50.3	59.7	50.3

6	LingLi	58.8	47.5	57.4	48.6	58.1	47.2
7	CangTou	60.1	49.6	57.9	50.6	59.6	50.2
8	CangTou school	59.2	47.8	56.1	47.9	58.7	48.2

#### 2.2.4 Noise Monitoring Results & its Analysis

( 1 ) The recorded results are between 55.6dB and 60.6dB on 8 monitored

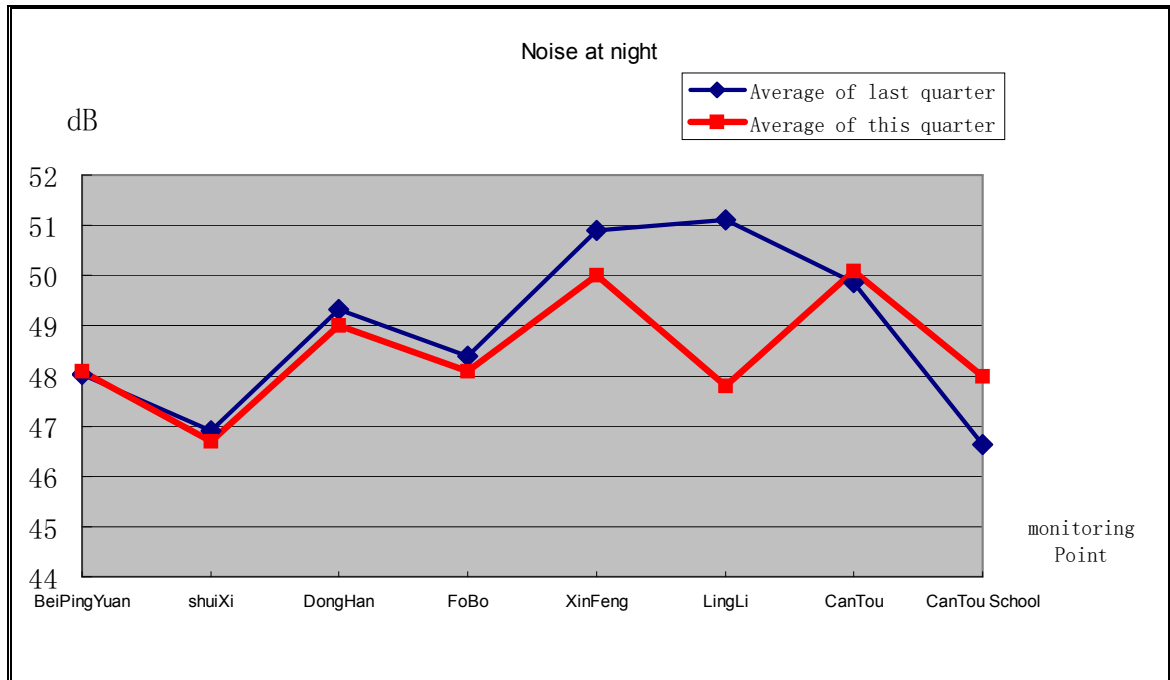


points at day time. All meet the requirement stipulated in “Limited Values of Noise on Construction Sites”.

( 2 ) The results between 45.0 dB and 50.6 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

Graph2: Quarterly variation of noise at daytime



Graph3: 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 Monitoring Results on Surface Water & Analysis

### 2.3.1 Tested Points, Tested Items, Frequency and Analysis Method

For relevant information, you can look at the table 2-7 and 2-8.

Table2-7 Tested point, items, and frequency

Tested points	Items	Frequency	Remarks
Upper reaches 100m from Yellow River bridge	Ph、CODcr SS、Pb、petroleum	Consecutive 2 days	5 tested points along the cross section
Lower reaches 200m from Yellow River bridge	Ph、CODcr SS、Pb、petroleum	Consecutive 2 days	5 tested points along the cross section

Table 2-8

Testing methods

Order	Items	Testing methods	Relevant national standards
1	pH	Glass electrode	GB6920-86
2	CODcr	Dichromate method	GB11914-89
3	SS	Gravimetric method	GB11901-89
4	Pb	Atomic absorption	Analytic test method for waste water ( 4 <sup>th</sup> edition )
5	Petroleum	Infra-red spectrophotometric method	GB/T16488-1996

### 2.3.2 Testing Results

See table 2-9, 2-10 and 2-11 for testing data of 2 cross sections in Yellow River.

Table 2-9 Water quality testing data in upper reaches of the river from Yellow River Bridge

Item Point numbers		pH	CODcr ( mg/L )	SS ( mg/L )	Pb ( mg/L )	petroleum ( mg/L )
1	August 10	8.00	12.8	636	Not detected	0.20
	August 11	8.10	10.0	562	Not detected	0.12
	Average	8.05	11.4	599	-	0.16
2	August 10	8.08	14.5	986	Not detected	0.10
	August 11	8.10	12.1	642	Not detected	0.16
	Average	8.09	13.3	814	-	0.13



3	August 10	8.00	12.6	768	Not detected	0.15
	August 11	8.02	16.2	706	Not detected	0.15
	Average	8.01	14.4	737	-	0.15
4	August 10	8.10	10.4	486	Not detected	0.24
	August 11	8.10	12.8	684	Not detected	0.14
	Average	8.10	11.6	585	-	0.19
5	August 10	8.06	12.0	762	Not detected	0.10
	August 11	8.10	12.2	544	Not detected	0.18
	Average	8.08	12.1	653	-	0.14

Table 2-10 Water quality testing data in lower reaches of the river from  
Yellow River Bridge

Item Point number		pH	CODcr ( mg/L )	SS ( mg/L )	Pb ( mg/L )	petroleum ( mg/L )
1	August 10	8.00	11.5	676	Not detected	0.16
	August 11	8.06	14.1	656	Not detected	0.18
	Average	8.03	12.8	666	-	0.17
2	August 10	8.11	20.1	758	Not detected	0.16
	August 11	8.10	12.4	580	Not detected	0.12
	Average	8.10	16.2	669	-	0.14
3	August 10	8.08	10.6	906	Not detected	0.14
	August 11	8.02	14.2	674	Not detected	0.14
	Average	8. 05	12.4	790	-	0.14

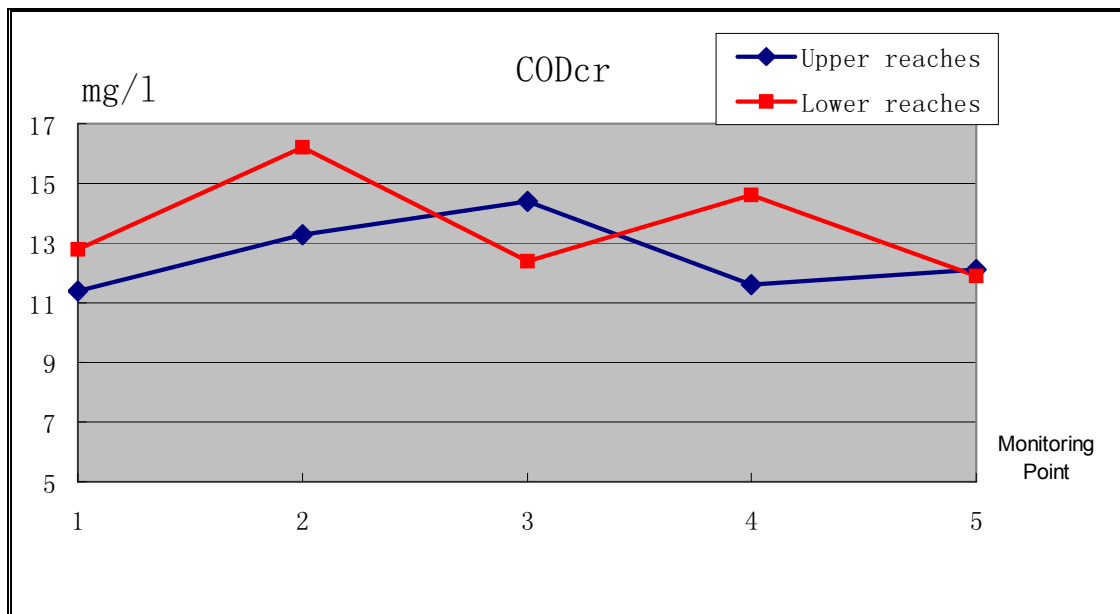
4	August 10	8.07	16.3	548	Not detected	0.18
	August 11	8.10	12.9	780	Not detected	0.13
	Average	8.08	14.6	664	-	0.16
5	August 10	8.12	10.0	688	Not detected	0.13
	August 11	8.10	13.8	514	Not detected	0.19
	Average	8.11	11.9	601	-	0.16

Table 2-11 Comparisons of surface water quality testing data between upper reaches and lower reaches of the River from Yellow River Bridge

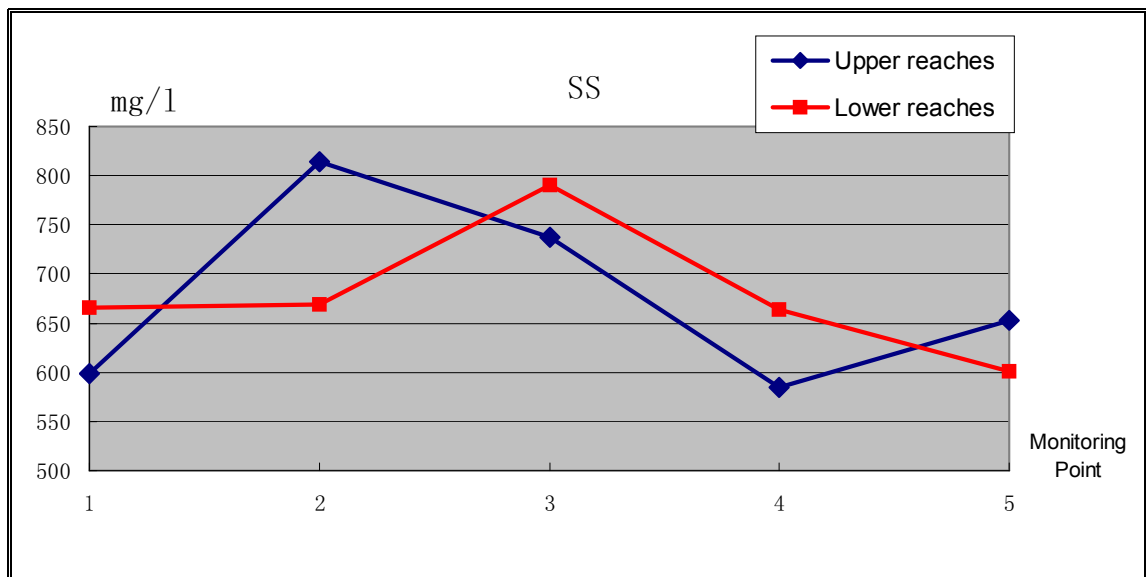
Items	pH	CODcr ( mg/L )	SS ( mg/L )	Pb ( mg/L )	Oil ( mg/L )
Upper reaches average	8.07	12.6	677	Not detected	0.15
Overproof multiple	Within limit	Within limit	2.38	Within limit	Within limit
Lower reaches average	8.07	13.6	678	Not detected	0.15
Overproof multiple	Within limit	Within limit	2.39	Within limit	Within limit

### 2.3.3 Analysis of Surface Water Quality

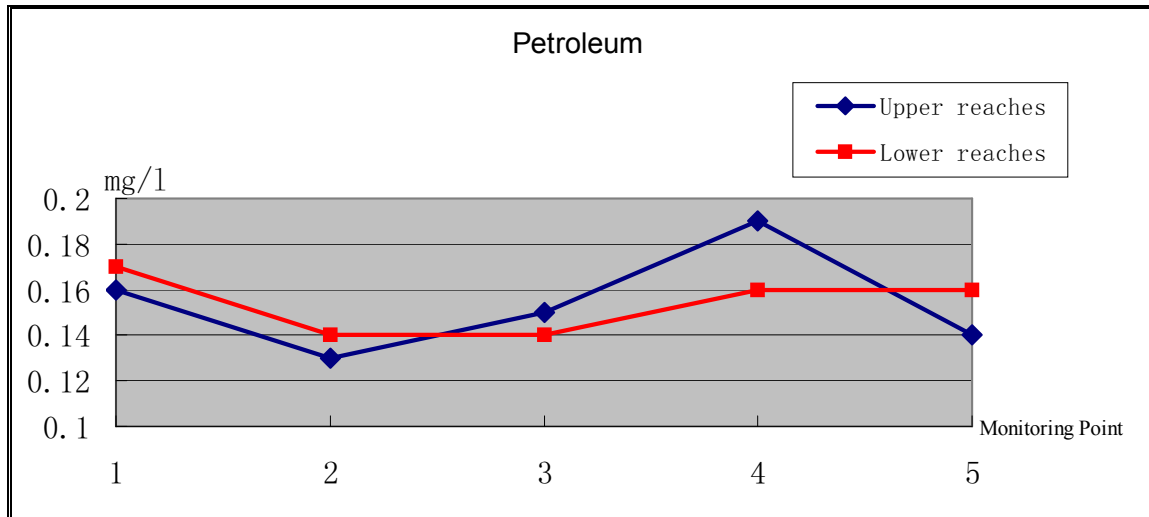
From testing data, we can see that values of pH, CODcr, Pb and petroleum of upper reaches and lower reaches all meet standards. SS value exceeds standard. Overproof multiples of upper reaches and lower reaches are 2.38 and 2.39 respectively. There is no big difference between testing data of 2 cross sections. The comparisons of relevant values are displayed in graph 4, 5 and 6.



Graph 4: Comparison between CODcr values of upper reaches and lower reaches



Graph 5: Comparison between SS values of upper reaches and lower reaches



Graph 6: Comparison between oil values of upper reaches and lower reaches

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

### 2.4.1 Investigation Results

See Table 2-12 for investigation results on rubbish and waste water disposal situation.

Table 2-12 Investigation results on rubbish and waste water disposal

Time	Construction companies	Persons in charge	Residence	Rubbish disposal	Waste water disposal
July	JiLin road construction company Ltd	ZhangLianYi	BeiPingYuan	Disposed rubbish with the villagers together	Discharge waste water into sewage system
			FuYouCun		
August	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
	YunCheng Highway construction company	MaJinHu	TaiDu	Disposed rubbish with the villagers together	Set up settling tank
September	JiLin road construction	ZhangLianYi	ShiCun	Disposed rubbish with	Discharge waste water

	company Ltd		LiuJianZhuang	the villagers together	into sewage system
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#### 2.4.2 Analysis on Investigation Results

Through table 2-12, 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. It is because relevant construction companies adopted effective environmental protection measures according to *HouYu Expressway Environment Protection Strategies*. TSP value exceeds standard in this quarter while all construction work is normally going on, but it is very close to that in the first monitoring report and dropped a little compared with that of last quarter. All monitoring results of noise meet standard and keep relatively stable. There is no big difference between tested values of upper reaches and lower reaches of the river from Yellow River Bridge, which demonstrates the construction produced a little impact on water quality of the river.

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 environment quality along the line.

## Appendix:

### Measured meteorological data along the houyu expressway

Time Point		July 11th				July 12th				July 13th			
		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	22	96.0	windless	-	23	96.0	windless	-	22	96.2	windless	-
	11:00	29	96.3	windless	-	29	96.3	windless	-	30	96.3	windless	-
	15:00	34	96.3	windless	-	35	96.3	windless	-	35	96.3	windless	-
	19:00	31	96.3	windless	-	31	96.3	windless	-	32	96.3	windless	-
Dong Han	7:00	22	96.3	windless	-	22	96.3	windless	-	23	96.3	windless	-
	11:00	30	96.5	windless	-	28	96.5	windless	-	29	96.4	windless	-
	15:00	35	96.3	windless	-	35	96.3	windless	-	35	96.3	windless	-
	19:00	31	96.7	windless	-	31	96.7	windless	-	31	96.3	windless	-
FuBo	7:00	22	97.2	windless	-	23	97.2	windless	-	23	97.2	windless	-
	11:00	29	97.4	windless	-	29	97.4	windless	-	30	97.3	windless	-
	15:00	35	97.4	windless	-	35	97.4	windless	-	36	97.3	windless	-
	19:00	32	97.3	windless	-	31	97.3	windless	-	31	97.3	windless	-
Cang Tou school	7:00	23	97.4	windless	-	23	97.4	windless	-	22	97.3	windless	-
	11:00	30	97.4	windless	-	29	97.4	windless	-	29	97.3	windless	-
	15:00	35	97.5	windless	-	35	97.5	windless	-	35	97.4	windless	-
	19:00	31	97.5	windless	-	32	97.5	windless	-	32	97.4	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		August 8th				August 9th				August 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	24	95.9	windless	-	23	96.0	windless	-	23	95.9	windless	-
	11:00	29	95.9	windless	-	28	95.9	1.2	60	29	95.9	windless	-
	15:00	34	96.0	windless	-	35	96.0	1.5	-	35	96.0	windless	-
	19:00	32	95.8	windless	-	31	95.8	windless	-	32	95.8	windless	-
Dong Han	7:00	22	96.3	windless	-	22	96.3	windless	-	23	96.3	windless	-
	11:00	30	96.5	windless	-	29	96.5	1.5	40	29	96.4	windless	-
	15:00	35	96.3	windless	-	34	96.3	1.5	50	35	96.3	windless	-
	19:00	31	96.7	windless	-	31	96.7	windless	-	31	96.3	windless	-
FuBo	7:00	23	97.2	windless	-	24	97.2	windless	-	24	97.2	windless	-
	11:00	30	97.2	windless	-	29	97.3	windless	-	29	97.3	windless	-
	15:00	35	97.3	windless	-	36	97.3	windless	-	35	97.3	windless	-
	19:00	32	97.3	windless	-	33	97.2	windless	-	31	97.3	windless	-
Cang Tou school	7:00	23	97.1	windless	-	23	97.1	windless	-	24	97.2	windless	-
	11:00	30	97.1	windless	-	29	97.1	1.0	70	29	97.2	windless	-
	15:00	35	97.3	windless	-	35	97.2	1.5	50	35	97.2	windless	-
	19:00	32	97.3	windless	-	31	97.2	1.2	50	32	97.2	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		September 14th				September 15th				September 16th			
		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	14	97.2	windless	-	14	97.2	windless	-	13	97.4	windless	-
	11:00	22	97.3	windless	-	23	97.5	windless	-	22	97.3	windless	-
	15:00	26	97.4	windless	-	27	97.4	windless	-	26	97.3	windless	-
	19:00	22	97.3	windless	-	23	97.6	windless	-	22	97.5	windless	-
Dong Han	7:00	13	96.3	windless	-	14	96.5	windless	-	13	96.9	windless	-
	11:00	20	96.5	windless	-	22	96.5	windless	-	22	96.3	windless	-
	15:00	27	96.3	windless	-	28	96.2	windless	-	27	96.4	windless	-
	19:00	23	96.7	windless	-	22	96.2	windless	-	23	96.6	windless	-
FuBo	7:00	14	97.1	windless	-	15	97.7	windless	-	14	97.5	windless	-
	11:00	21	97.4	windless	-	23	97.3	windless	-	22	97.4	windless	-
	15:00	27	97.3	windless	-	28	97.4	windless	-	27	97.3	windless	-
	19:00	22	97.4	windless	-	23	97.6	windless	-	23	97.6	windless	-
Cang Touschool	7:00	13	97.3	windless	-	14	97.3	windless	-	13	97.5	windless	-
	11:00	23	97.4	windless	-	23	97.1	windless	-	22	97.5	windless	-
	15:00	27	97.6	windless	-	27	97.2	windless	-	28	97.5	windless	-
	19:00	23	97.6	windless	-	23	97.5	windless	-	22	97.2	windless	-

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