Report for FWD Pilot Program in PuDong and Environmental Impact Assessment

by

Steering Office of Household Garbage Reduction Promotion Initiative of Pudong New Area

National Engineering Research Center for Urban Pollution Control

- November 2013

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According to the Implementation Opinions of shanghai Municipal Government on Promoting the Classification of Life Waste and Source Reduction (HFB [2010] No.62), Pudong New District has been carrying out pilot waste classification and reduction programs since 2011 to further express the theme of Shanghai World Expo 2010, enhance the overall level of urban civilization, gradually solve the contradiction between constant growth of life waste and insufficient capacity of harmless disposal, promote actively the cyclic economy, develop ecological civilization, catalyze the coordinated development of the economy, society and environment, and to build the low-carbon, environment-friendly and livable city.

On January 23, 2011, Steering Office of Household Garbage Reduction Promotion Initiative of Pudong New Area was officially established. The office was led by key district government heads and responsible for studying and developing major waste classification and reduction principles, policies and key issues arising in the implementation process. Pursuant to the overall requirements such as systematic design, sticking to the point, performing comprehensive construction and pushing forward step by step, the office has done a lot of exploration and field works, hence laying a solid foundation for the comprehensive promotion of the life waste classification and reduction during the 12th 5-year plan period.

Since its foundation, the office has made solid progress in many aspects as follows. Life waste reduction initiatives in Pudong have been moving along successfully, the number of life waste classification sites is growing steadily, the classification facilities are improving, the diversion and reduction channels are constantly explored and the residents have developed basic awareness of waste classification.

National Engineering Research Center for Urban Pollution Control

Founded in 1995, National Engineering Research Center for Urban Pollution Control is a research platform for the transformation and promotion of environmental high-tech results, with final acceptance from National Development and Reform Commission in March 2003 and from the Ministry of Education in November 2003. In January 2005, it was converted into Shanghai Engineering Research Center for Urban Pollution Control Co., Ltd., with stake controlled by Tongji University. It has achieved excellent results from the examination and assessment organized by National Development and Reform Commission in 2007 and 2009.

Environmental engineering is the key disciplinary area of Tongji University and center of the rapid and sustainable development of Research Center.

The Center is a National open industry-university-research platform with first-class capabilities of technological innovation and transformation, excellent equipments for engineering verification test, a number of key technological equipments, more than 100 patents, and dozens of national and provincial scientific and technological progress awards. 'Recycling Technology and Application of Heavy Water' was awarded 2nd Prize of National Science and Technology Progress Award 2008, and then being promoted and applied to PetroChina Liaohe Oilfield, oilfields in Xinjiang, Shengli and Henan Province. 'Technology and Control Measures of Urban Sewage Nitrogen and Phosphorus Removal' was awarded 2nd Prize of National Science and Technology Progress Award 2007, and has been promoted and applied to 42 national large and medium sized sewage treatment plants. 'Technology Research and Application of Large Source Water Biological Pretreatment' was awarded 2nd Prize of National Science and Technology Progress Award 2004, and has been applied to the world's largest source water biological pretreatment project "Dongjiang Shenzhen Project". 'New Technology and Equipment Development for Water Treatment' was awarded 2nd Prize of Science and Technology Progress Award 2003 by the Ministry of Education, and has been promoted to Germany, Switzerland, Russia and other countries. In addition, the Center also offers technological support for major government projects. It helped saving nearly one billion RMB for Comprehensive Renovation Project of Shanghai Suzhou River.

中华人民共和国

事业单位法人证书

（副本）

事证第 110000001727 号

国家事业单位登记管理局制

提交年度报告的时间为每年的1月1日至3月31日，不再另行通知

名　　称 同济大学

宗旨和业务范围 培养高等学历人才，促进科技文化发展。 哲学类、经济学类、法学类、教育学类、文学类、理学类、工学类、医学类和管理学类学科高等专科、本科、研究生班和硕士研究生学历教育 理学类、工学类和管理学类学科博士研究生学历教育 博士后培养 相关科学研究、继续教育、专业培训、学术交流与科技法律咨询

住　　所 上海市四平路1239号

法定代表人 万钢

经费来源 财政补助、上级补助、事业、经营、附属单位上缴、捐赠收入

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举办单位 教育部

登记管理机关

年度报告标记

中华人民共和国
组织机构代码证

代　　码：42500612-5

机构名称：同济大学

机构类型：事业法人

地　　址：上海市四平路1239号

颁发单位：上海市质量技术监督局

登 记 号：组代管310110114344

说　　明

1. 中华人民共和国组织机构代码是组织机构在中华人民共和国境内唯一的、始终不变的法定代码标识，《中华人民共和国组织机构代码证》是组织机构法定代码标识的凭证，分正本和副本。
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中华人民共和国　国家质量监督检验检疫总局

中华人民共和国国家质量监督检验检疫总局

年检记录

年　月　日	年　月　日	年　月　日	年　月　日

NO.2004 2104836


城市污染控制
国家工程研究中心
NERC
国家发展计划委员会
二〇〇一年十月

工程咨询单位资格证书

单位名称 同济大学建筑设计研究院（集团）有限公司　　资格等级：甲级

专　业	服务范围
建筑	编制项目建议书、编制项目可行性研究报告、项目申请报告、资金申请报告、评估咨询、工程设计
生态建设和环境工程	编制项目建议书、编制项目可行性研究报告、项目申请报告、资金申请报告、工程设计

此复印件仅限于承接城市污染控制国家工程中心　　工程注册之用

证书编号：工咨甲 21020070004　　发证机关

证书有效期：至 2014 年 8 月 11 日　　2009 年 08 月 12 日

中华人民共和国国家发展和改革委员会制

工程设计

资质证书

企业名称：同济大学建筑设计研究院（集团）有限公司

经济性质：有限责任公司

资质等级：环境工程（水污染防治工程、大气污染防治工程、固体废物处理处置工程、物理污染防治工程）专项甲级；公路行业（公路、特大桥梁）专项甲级；市政行业（给水工程、排水工程、城镇燃气工程、道路工程、桥梁工程、城市隧道工程、公共交通工程、轨道交通工程、环境卫生工程）专项甲级；建筑行业（建筑工程）甲级；风景园林工程设计专项甲级。

可从事资质证书许可范围内相应的建设工程总承包业务以及项目管理和相关的技术与管理服务。******

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有效期：至2014年01月13日

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2010年01月2[illegible]日

No.AZ 0015689

中华人民共和国住房和城乡建设部制

质量管理体系认证证书

同济大学建筑设计研究院

中国　　上海市赤峰路 65 号　　200092

GB/T 19001-2000 idt ISO 9001:2000

体系覆盖范围:

建筑工程、市政工程的设计、工程咨询、
岩土勘察和公路工程（特大桥梁、交通工程）设计及相关活动。

审核地点：上海市杨浦区四平路 1239 号

本证书注册编号：00308Q10170R3M

证书有效期：2008 年 02 月 25 日至 2011 年 02 月 24 日

本证书的有效性依据年度监督审核获得保持

中心主任　　　　　　　　认证机构

2008 年 02 月 25 日

体系认证
CNAS C003-Q

上海质量体系审核中心

中国 上海　　http://www.sac.org.cn

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Directory

I. Introduction

1. Government's headache

With the population growth and urban development in China, Shanghai's household waste output has been increasing per year. According to statistics of Shanghai Environmental Protection Bureau (SEPB), Shanghai's household waste output reached 6.78 million tons in 2008 and the daily removal amount of household waste has exceeded to 20,000 tons, of which 50% to 70% are food waste.

China's household food is characterized by high mixing degree, high moisture content and lower calorific value and is mainly caused by food waste. High in moisture content and lower in calorific value, food waste, after mixing with household waste, changes moisture content and calorific value of the latter and impose negative impact on the application of the landfill and incineration technology, which are the mainstream disposal methods of household waste in China. To dispose household waste in a better manner, containers to recover wet and dry waste separately in Shanghai's residential communities. This effort of waste classification in the initial stages proves to have little effect as well as the follow-up procedure fails to classify the waste.

Compared with the current waste output, Shanghai's waste disposal capacity is not sufficient. Besides, only Songjiang Landfill is complying strictly with the current national landfill standards whereas the other two landfills, namely Laogang Landfill and Liming Landfill, can't meet the national standards of 1997 yet. As a result, 7000 tons of undisposed household waste is piled uncovered at more than 200 temporary stacking sites in the suburbs, polluting the farmland, river, air and leading to breeding of mosquitoes. It has become one of the major factors that impede the eco-environment, standard of life and sustainable development of Shanghai.

According to the *Opinions of the State Council, Ministry of Environmental Protection, Ministry of Housing and Urban Construction and National Development and Reform Commission on Strengthening the Household Waste Disposal and Integrated Control of Environmental Pollution*, the 12th 5-year Plan and

Several Opinions of the shanghai Municipal Government on Further Strengthening Household Waste Management (see Appendix 2), the government has realized the importance of reducing waste at the source and collecting waste separately as well as the problems with the landfills and incineration plants. To solve the social issue and reduce the waste output in Shanghai, the "Outline of the 12th Five-year Plan of Shanghai" clarified the decrement of waste output as one of the 34 development indicators: as an anticipated target, the decrement rate of household waste disposal per capita should be above 20%; as an obligatory target, the disposal rate of household waste should exceed 95%. Since 2011, Shanghai has given great impetus to the pilot work of separate recovery of the wet and dry waste and incorporation of classification and decrement of household waste into one of the 11 practical projects of Shanghai Municipal Government. Under strong support of the government, in 2011, household waste disposal per capita decreased 5% from 2010 and further 5% in 2012, thus, the daily waste output per capital was kept at 0.74 kg. In 2011, for the first time Shanghai's household waste disposal per capital presented a negative growth as per Ma Yun'an, former Director of the Administrative Bureau of Forestation and Urban Aesthetics of Shanghai. According to statistics, in 2011, Shanghai's daily household waste output was 816 tons less than that of the previous year, almost the total daily disposal amount of a 1000-ton capacity waste processing plant. The magic weapon for Shanghai to make this unprecedented achievement is implement waste classification and source reduction.

To further enhance the leadership on the household waste classification and source reduction in Shanghai, the Shanghai Municipal Government set up a joint conference on promoting household waste classification and source reduction, consisting of 17 municipal departments and 17 districts and counties. In November 2012, Lu Yuexing, Party Secretary of Administrative Bureau of Forestation and Urban Aesthetics of Shanghai, organized and chaired the conference of joint work on the household waste classification and reduction. The meeting determined the focal points in the 2013 household waste classification and reduction of Shanghai and put forward clear objectives and targets concerning the height, width and depth of the household waste classification and reduction work, the relevant indicators, the focuses and breakouts of the relevant systems and areas of improvement for the joint operation mechanism.

It suggests that Shanghai municipal government attaches great importance to the reduction of household waste and the urgency of doing the job has become a common focus of the relevant governmental authorities.

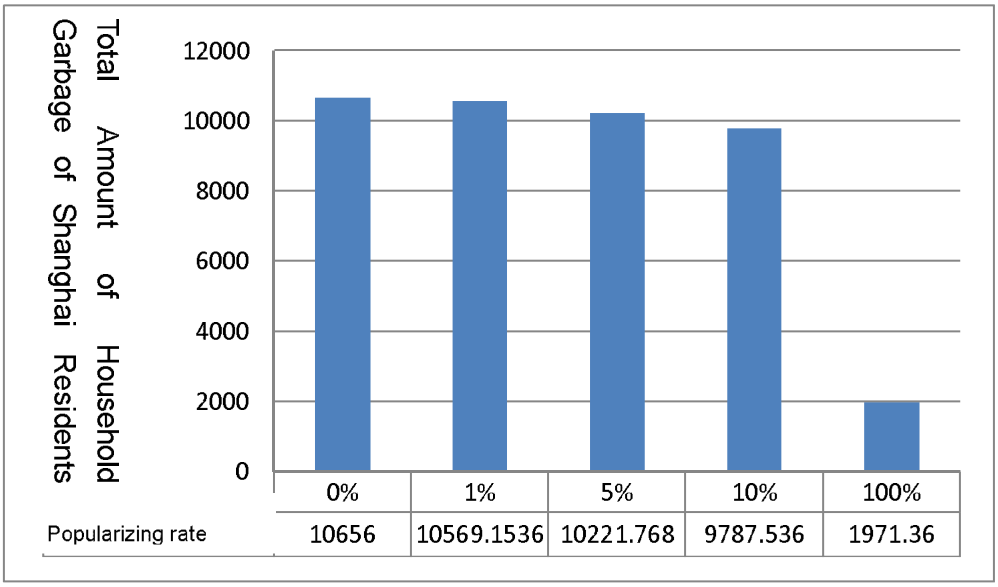
2. Findings of FWD Phase I research project

FWD is an effective way to separate the wet and dry waste from the source. Under lab and household use conditions, Phase I projects conducted survey, tests and analyses of the influence FWD exerted on the household wastewater quality and the physical and chemical properties of household waste and reached conclusions as follows:

（1）According to the results of the lab and household experiments, it is calculated that when the penetration rate of FWD was 10% in Shanghai, the urban sewage concentration rose by 5%, with the concentration of COD, BOD_5, SS, NH_3-N and TP at 311.81 mg/L、134.92mg/L、90.50 mg/L、25.20 mg/L、4.39mg/L respectively. Thus, when the penetration rate of FWD is below 10%, the influent pollutant concentration of Shanghai municipal sewage plant remains in the allowable range and won't impact the sewage treatment system.

（2）According to the results of the lab and household experiments, based on the typical diet structure of urban Chinese residents, using FWD will not cause clogging of the household kitchen drainage system. On the contrary, the vortex flushes helps to prevent food residues settling in the plumbing.

（3）The penetration of FWD reduced the household waste effectively. According to the results of the lab and household experiments, it is calculated that when the penetration rate was 1%, 5%, 10% and 100%, the decrement was 86.85、434.25、868.5、8685t/d respectively, the lower calorific value of household waste rose from 3743 kJ/kg to 3766, 3860, 3987 and 15810 kJ/kg respectively, and the moisture content dropped from 73.4% to 73.3%, 73.0%, 72.5% and 26.4% respectively.



Vertical axis: Total Amount of Household Garbage of Shanghai Residents
Horizontal axis: Popularizing rate

Table 1-1 Physical and chemical properties of household waste at different FWD penetration rates

Indicator / Penetration	Lower calorific value /(kJ/kg)	Moisture content /%	Organic matter /%	Ash content /%
0%	3743	73.4	88.1	7.3
1%	3766	73.3	88.1	7.3
5%	3860	73.0	88.2	7.3
10%	3987	72.5	88.2	7.2
100%	15810	26.4	94.7	6.4

（4）FWD can separate food waste from household waste. It helps to decrease the moisture content and content of organic matter and increase the low calorific value in Shanghai's household waste. It will effectively improve the waste incineration performance, reduce significantly the leachate output during the landfill and incineration processes, decrease the difficulty in collecting and transporting waste and improve the city appearance and environment. While reducing the moisture content and improving the calorific value, FWD also helps to effectively decrease the waste incineration costs and lower the environmental pollution and operational costs throughout the entire processes of household waste from being collected, transferred and transported to being disposed.

3. Pending Issues for FWD penetration in Shanghai

As seen in the research findings of Phase I project, the penetration of FWD is one of the effective ways to get Shanghai out of the difficulty in household waste disposal. After many discussions and communications with the competent governmental authorities such as Shanghai Municipal People's Congress, Shanghai Environmental Sanitation Bureau and Shanghai Environmental Protection Bureau, the governmental authorities expressed their support for the social benefits FWD has brought about through the waste classification and source reduction and has actively promoted the pilot work of FWD in Shanghai. In the Phase I lab and household research, for the stringency in experiment operations, all wet waste (or food waste) are processed with FWD. Besides this, to meet the test needs, all households needed to have 3 meals at home. It is different from the fact that many Shanghai residents don't dine at home or only have some of their food waste processed via FWD. Therefore, during the promotion process, both the community managements and competent authorities of the pilot communities put forward to further conduct follow-up studies by taking into account the use habits of Chinese residents and their influence on the sewage and waste processing systems before determining the actual effect of FWD on the sewage quality and the reduction of wet waste in Chinese households and hence provide more authentic and reliable technical support for the penetration and application.

4. Significance of FWD Phase II Research

Given that Phase I projects focused on the source waste classification effects and use performance of FWD in typical Chinese urban households, for the purpose of further popularization, on the basis of the achievements of Phase I projects, Phase II projects shall, pursuant to the actual use rate and use habits of the residents, give prominence to the actual operations of community sewage system and the actual waste reduction effects so as to provide reliable technical support for the competent governmental departments to make budgets and formulate relevant standards.

To track the impact FWD may exert on the community drainage system and waste collection system, obtaining first-hand technical data and argument whether the penetration of FWD causes silt deposition and changes in the sewage quality and amount and reduces the wet waste amount, Phase II projects carried out 9-month-long survey, experiments and analysis of the FWD-equipped residential communities.

For contrast purpose, we selected Golden Bridge Rich Garden, a medium-sized residential community in Pudong as our pilot community, and Dongfang Zhiyinyuan, a neighboring community of similar scale, as contrast community. The survey involved continuous sampling inspection of the household sewage water of the two residential communities and comparative analysis of the main water quality indicators, namely COD, SS, NH_3-N, TP and TN. With everyday household waste of the residents as our target, studies were also done to understand the impact of penetration of FWD on the reduction effect of the wet waste.

II. Profile of research communities

1. Why we chose those Pilot Communities

Based on the research results of the Phase I project and the current condition in China, we decided to promote the FWD in the city with rain and sewage diversion.

As a cosmopolitan city with an extensive history, Shanghai's drainage system varies widely from district to district. Since Puxi's districts still uses the combined flow system, Pudong's Jinqiao district, which is new and uses a separate flow system (The rainwater is drained into Huangpu River, while the sewage water directly goes to the sewage disposal plant), was selected.

In order to study the impact that FWD may exert on the community sewage and waste collection system, we needed to select two enclosed typical residential communities about the same size to do the comparison. Based on above principles, we selected Golden Bridge Rich Garden and Dongfang Zhiinyuan to conduct the comparison research.

2. Golden Bridge Rich Garden

Golden Bridge Rich Garden (hereafter referred to as Rich Garden) is located on the west side of Jinqiao Road and north side of Zhangyang Road. Covering a total floorage of 160,000 m2, the project consisted of 1,228 finished apartments in 14 small high-rise buildings and 4 high-rise buildings. The ratio of green space in Rich Garden reaches 56% and floor area ratio is 1.4.

FWDs, InSinkErator M-45, were installed in all units.

Graph 1 Golden Bridge Rich Garden

2. Dongfang Zhiyinyuan

Located on East Boshan Road, Dongfang Zhiyinyuan (hereafter referred to as Zhiyinyuan) consisted of 1,479 apartments and 15 shops. The ratio of green space in Zhiyinyuan is 40% and floor area ratio 1.38. No FWD installation in Zhiyinyuan.

Graph 2 Dongfang Zhiyinyuan

Graph 3 Graphical locations of Golden Bridge Rich Garden and Dongfang Zhiyinyuan

III. Sampling and testing methods

1. Sampling

Three sampling points were set respectively at Rich Garden and Zhiyinyuan. Main water quality indicators of the water samples were compared and analyzed to study the impact and role of FWD on change of quality of waste water in the drainage system.

The three sampling points at Rich Garden were set in front of the community bulletin board, on the lawn besides building 32 and by the main path of the community respectively.

Rich Garden 1# sampling point

Rich Garden 2# sampling point

Rich Garden 3# sampling point

The three sampling points at Zhiyinyuan were set in front of the property management building and building 2 and behind Building 40 respectively.

Zhiyinyuan 1# sampling point   Zhiyinyuan 2# sampling point   Zhiyinyuan 3# sampling point

2. Determination methods of water quality indicators

2.1 Determination of Chemical Oxygen Demand (COD)

Potassium dichromate digestion is commonly used to determin COD.

Rationale: An overdose of standard potassium dichromate digestion solution is added into the strong acidic solution. After a heating reflux step, the reducing substances (mainly organic substances) in the sample will be oxidized. The excess potassium dichromate is titrated with ferrous ammonium sulfate. During the titration step, the oxidation-reduction indicator, Ferroin is added. The amount of standard potassium dichromate digestion solution digested is taken as a basis to determine the COD of the sample.

Main instruments and reagents: 250ml glass reflux device, heating device (electric furnace), 25ml or 50ml acid burettes, erlenmeyer flasks, pipettes, volumetric flasks, standard potassium dichromate digestion solution ($K_2Cr_2O_7$), Ferroin indicator solution, standard ferrous ammonium sulfate solution $(NH_4)_2Fe(SO_4)_2 \cdot 6H_2O)$, sulfuric acid- silver sulfate solution, sulfuric acid mercury crystal or powder.

Measurement steps: place 20.00ml of evenly mixed sample (or moderate amount of sample diluted to 20.00ml) into a 250ml ground reflux erlenmeyer flask. Add 10.00ml of standard potassium dichromate digestion solution and a few glass beads or zeolite into the sample. Connect the flask with a ground reflux condenser and slowly add 30ml of sulfuric acid- silver sulfate solution into the flask from the mouth of the condenser. Slightly shake the flask to mix the solution evenly and then heat and reflux it for 2 hours (timing is noted from the moment it boils). After it cools down, wash the condenser with 90ml of water and take the flask down. After the solution cools down again, add 3 drops of ferroin indicator solution into it and titrate with standard ferrous ammonium sulfate solution until the solution changes from yellow to reddish-brown through blue-green. Record the amount of the standard ferrous ammonium sulfate solution as V_1. While testing the sample, take 20.00ml of redistilled water and run a blank test following the same steps as above. Record the amount of the standard ferrous ammonium sulfate solution used in the blank test as V_0.

$$COD_{Cr}\ (O_2,\ mg/L) = (V_0 - V_1) \times C \times 8/V$$

Where C refers to the concentration of the standard ferrous ammonium sulfate solution (mol/L) ;

V_0 refers to the amount of the standard ferrous ammonium sulfate solution used in the blank test (ml);

V_1 refers to the amount of the standard ferrous ammonium sulfate solution used in the sample test (ml);

V refers to the volume of the sample (ml);

8 refers to Oxygen (1/4) molar mass (g/mol)

2.2 NH_3-N Determination of ammonia nitrogen (NH_3-N)

Nessler's reagent spectrophotometric method is commonly used.

Rationale: NH_3-N that exists in the form of free ammonia or ammonium ion reacts with Nessler's reagent to form a reddish-brown complex. The absorbance of the complex is proportional to its NH3-N content. Absorbance can be measured at the wavelength of 420 nm.

Main reagents and instruments: UV spectrophotometer; Nessler's reagent, Potassium sodium tartrate (ρ=500 g/L);

Standard NH3-N stock solution (ρ_N =1000 μg/ml):

Take and solve 3.8190 g of ammonium chloride (NH4Cl GR, drying for 2 hours at 100～105℃) in the water. Move the solution to 1000ml volumetric flask and dilute to the marking line, and then store it at 2～5℃ for one month.

Drawing of the calibration curve:

Add 0.00, 0.50, 1.00, 2.00, 4.00, 6.00, 8.00 and 10.00 ml of standard ammonia nitrogen stock solution (ρN =10 μg/ml) into eight 50ml cuvettes respectively, whose ammonia nitrogen content is 0.0, 5.0, 10.0, 20.0, 40.0, 60.0, 80.0 and 100 μg respectively, and add water till the marking line. Add 1.0ml of potassium sodium tartrate into the solution and shake up. Add 1.5ml of Nessler's reagent and shake up again. 10 minutes later, use 10mm quartz cuvette and take distilled water as reference to measure the absorbance at the wavelength of 420nm.

Take the blank-corrected absorbance as the ordinate and its corresponding NH3-N content as the abscissa and draw the calibration curve.

2.3 Determination of total nitrogen

Alkaline potassium persulfate digestion UV spectrophotometric method is the most widely used.

Rationale: Alkaline potassium persulfate can convert the nitrogen of the nitrogen-containing compounds in the sample into nitrate at 120～124℃. Measure the absorbance at the wavelength of 220 nm and 275 nm respectively by using UV spectrophotometry and we will get A_{220} and A_{275}. Calculate corrected absorbance A according to formula (1) and we will find the total nitrogen (as N) proportion to the corrected absorbance A.

$$A = A_{220} - 2A_{275} \quad (1)$$

Main reagents and instruments: UV spectrophotometer, autoclave sterilizer, alkaline potassium persulfate, Hydrochloric acid solution: 1 + 9

Standard potassium nitrate stock solution (ρ（N）＝100 mg/L):

Solve 0.7218 g of potassium nitrate solution in moderate amount of water and put the solution into 1000ml volumetric flask. Dilute the solution to the marking line with water and shake it up. Add 1 to 2ml of chloroform as protective agent. The solution will stay stable for 6 months if stored in dark at 0～10℃.

Drawing of the calibration curve:

Place 0.00, 0.20, 0.50, 1.00, 3.00 and 7.00 ml of standard potassium nitrate solution (ρN＝10.0mg/L) into 25ml ground glass cuvettes with stopper respectively, whose corresponding total nitrogen (as N) will be 0.00, 2.00, 5.00, 10.0, 30.0 and 70.0 μg respectively. Add water and dilute the solution to 10.00 ml and then add into it 5.00ml of alkaline potassium persulfate. Clog the stopper and truss with gauze and straps so as to avoid it from springing out. Place the cuvettes into the autoclave sterilizer and keep heating till the top pressure valve blows. Switch off the valve and continue to heat it till 120℃. Start timing at the moment and maintain the temperature at 120～124℃ for 30 minutes. Let the device cool in the air and switch on the valve to deflate. Remove the lid and take the cuvettes out. Leave the cuvettes cool to the room temperature. Press tightly the clog and shake up the liquid in the cuvettes for 2 to 3 times.

Add 1.0 ml of hydrochloric acid solution into the cuvettes each respectively and dilute till the marking line of 25ml. clog and shake them up. Use 10mm quartz cuvette and take water as reference to measure the absorbance at the wavelength of 420nm via the UV spectrophotometer.

Take the total nitrogen (as N, μg) as the abscissa and its corresponding Ar value as the ordinate and draw the calibration curve.

2.4 Determination of total phosphorus

Molybdenum blue spectrophotometry is most widely used.

Rationale: ammonium molybdate and potassium antimonyl tartrate react in acid medium with orthophosphate to form a heteropoly acid - phosphomolybdic acid - that is reduced to intensely colored molybdenum blue by ascorbic acid.

Main reagents and instruments: UV spectrophotometer, molybdate solution ($(NH_4)_6MoO_{24}$), ascorbic acid (0.1 mol/L).

Phosphate stock solution (50.00 μg /ml of Phosphorus):

Dry GR monopotassium phosphate (KH2PO4) for 2 hours at 110℃ and place it in the desiccator to cool down. Take 0.2197 g of the solution and solve in water and move the solution to 1000ml volumetric flask. Add 5ml of 1+1 sulfuric acid into the solution and dilute with water till the marking line. The phosphorus content contained in the solution will be 50.00 μg per ml (as P).

Drawing of the calibration curve:

Add 0, 0.50 ml, 1.00 ml, 3.00 ml, 5.00 ml, 10.0 ml and 15.0ml of standard phosphate solution (2.00 μg /ml) into 50ml cuvettes respectively, and the corresponding total phosphorus will be 0.00, 1.00, 2.00, 6.00, 10.00, 20.00 and 30.00 μg. Add water into the solution till 50 ml. Add 1ml of 10% ascorbic acid into the cuvettes and shake the solution up. 30 seconds later, add 2ml of molybdate solution and mix fully with the liquid. Leave it for another 15 minutes. Use 10mm or 30mm cuvette and take zero concentration solution as reference to measure the absorbance at the wavelength of 700 nm.

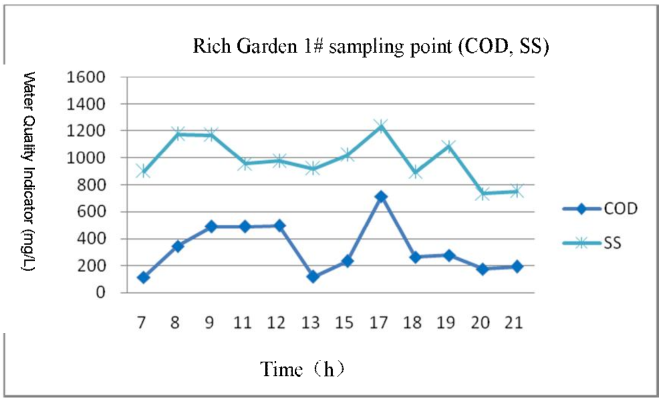
IV. Testing results of water quality indicators

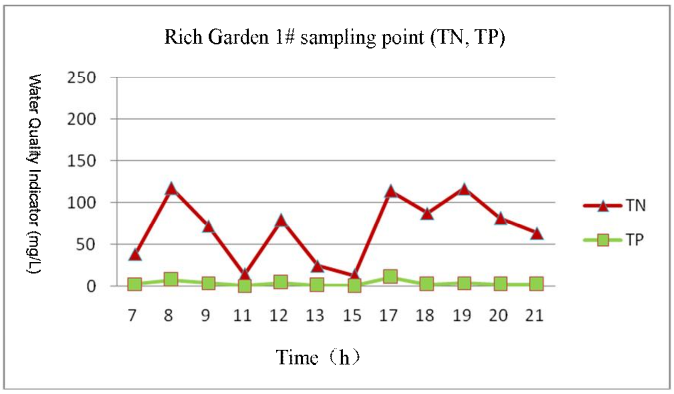
Hourly samples were collected at three points for each development, once a month for a total of nine months, January through August. The data is then presented to compare the average concentrations of COD, TSS, TN and TP. Samples were also collected in September for a final a comparison of the peak conditions during the morning, noon and evening.

4.1 Water quality indicators in January

4.1.1 Common water quality indicators of the wastewater at Rich Garden

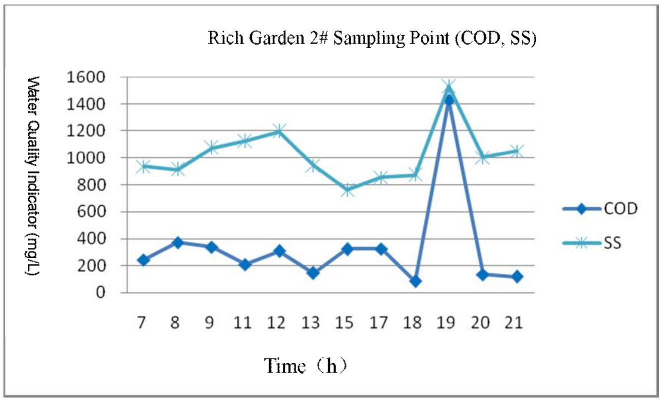
Samples were taken continuously at relevant sampling points at Rich Garden and common indicators such as COD, SS, NH3-N,TN and TP were determined and shown in graphs.

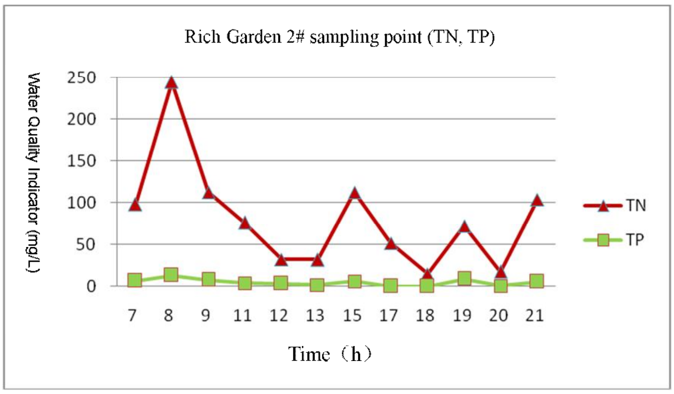




Graph 1.Rich Garden 1# sampling point water quality indicators curve

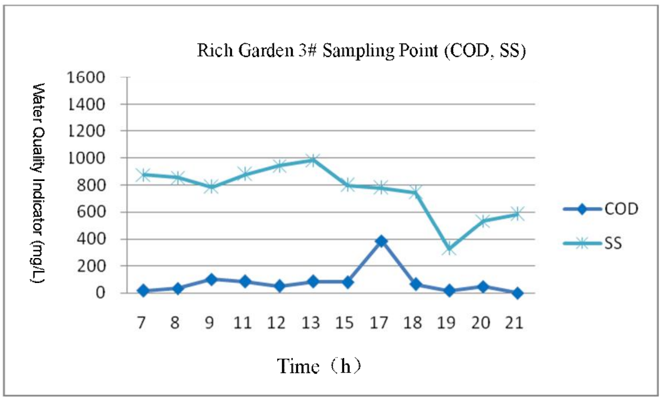
Vertical Axis: Water Quality Indicator (mg/L)   Horizontal Axis: Time

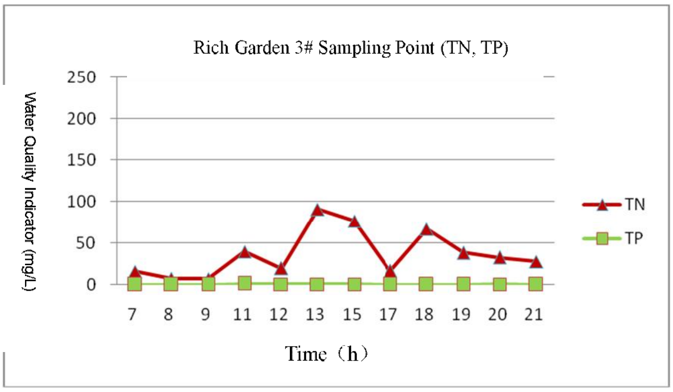




Graph 2.Rich Garden 2# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time



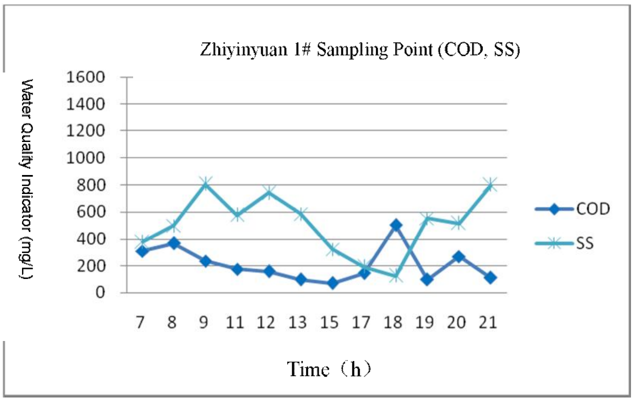


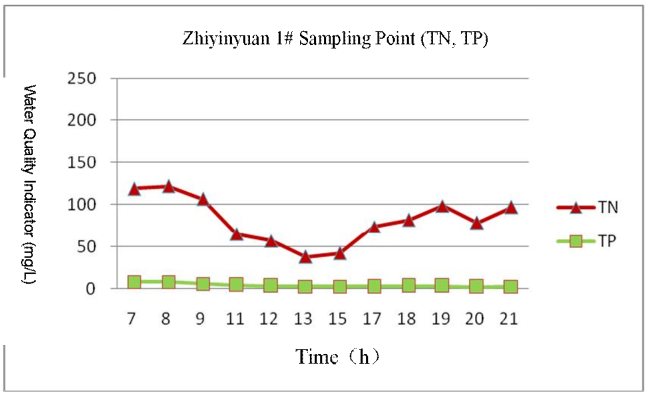
Graph 3.Rich Garden 3# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.1.2 Common water quality indicators of the wastewater at Zhiyinyuan

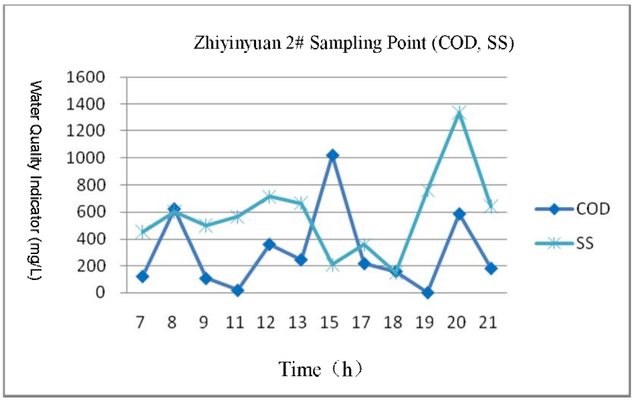
Samples were taken continuously at relevant sampling points at Zhiyinyuan and common indicators such as COD, SS, NH3-N,TN and TP were determined and shown in graphs.

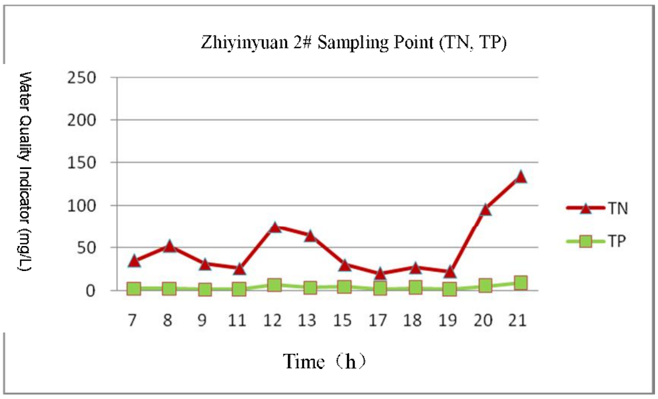




Graph 4.Zhiyinyuan 1# sampling point water quality indicators curve

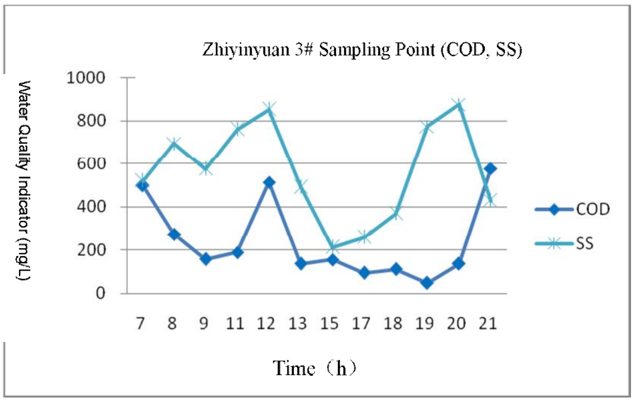
Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

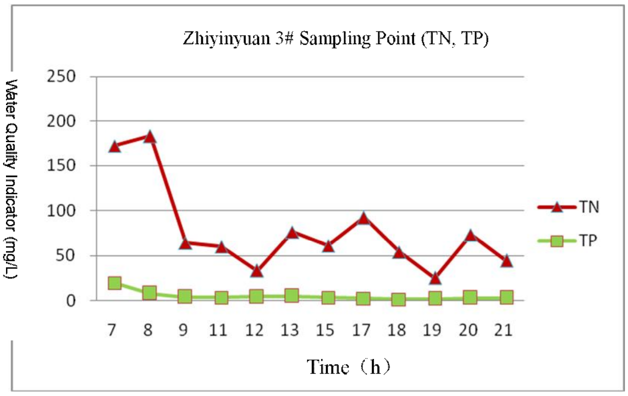




Graph 5.Zhiyinyuan 2# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time





Graph 6.Zhiyinyuan 3# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.1.3 Discussion on the water quality testing results

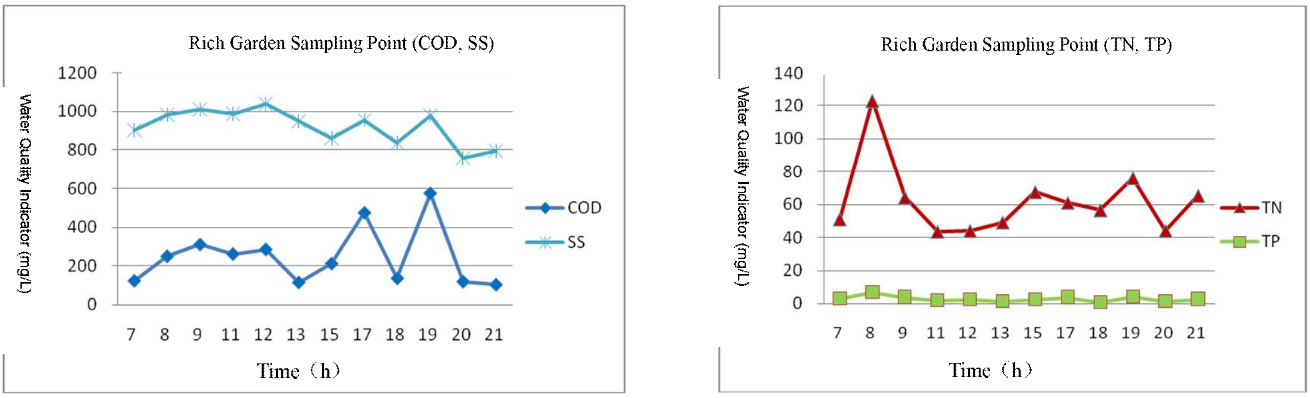
The results suggest that the COD value and SS value of Rich Garden are 330 mg/L and 921 mg/L respectively, higher than that of Zhiyinyuan while Zhiyinyuan beats Rich Garden in the NH3-N value, TN value and TP value.

Graph 1-6 shows the water quality indicators of both Rich Garden and Zhiyinyuan are not correlated as the relevant values reach it's peak at different point of time.

Graph 1, 2 and 3 suggest that the water quality indicators of Rich Garden sampling points reaches it's peak at 17 to 19 p.m. or so, with the mean value of the COD, NH3-N, TN, TP and SS at 330 mg/L, 42.40 mg/L, 62.1 mg/L, 3.0mg/L and 921 mg/L respectively. After analyzing the water conditions of three sampling points, we get the results as shown in Graph 7.

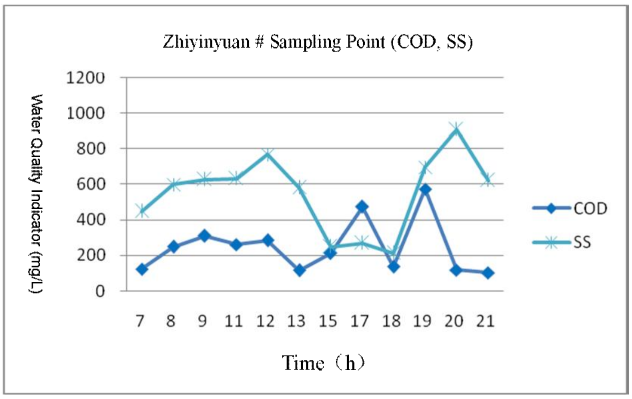
Graph 4, 5 and 6 show that the water quality indicators of Zhiyinyuan sampling points reaches it's peak at three centralized time ranges, namely 7:00-8:00 and 12:00 and 20:00-21:00, and the mean value of the COD, NH3-N, TN, TS and SS with these sampling points stands at 258 mg/L, 50.3 mg/L, 72.9 mg/L, 4.2 mg/L and 563 mg/L respectively. After comprehensive analysis of the water conditions of the three sampling points, we get the results as shown in Graph 8.

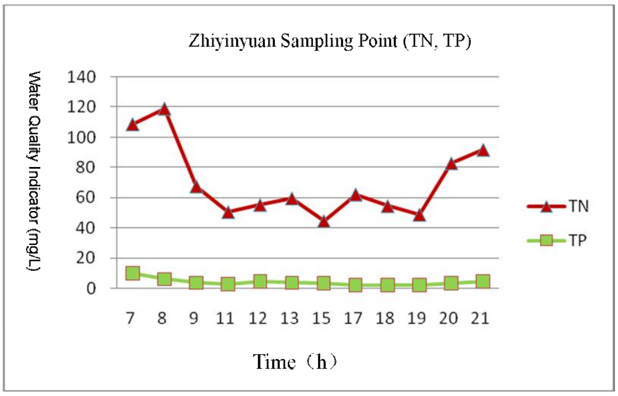
The water quality indicators of Rich Garden, namely NH3-N, TN, TP, COD and SS, perform steadily and reach peak at 19:00, suggesting the data trends as in Graph 1, 2, 3 and 7. It can be seen from the data trends in Graph 4, 5, 6 and 8 that Zhiyinyuan enjoys steady performance of NH3-N, TN and TP and meet it's peak at 17:00 but experiences severe fluctuations of COD and SS, whose maximum value appears at 17:00 and 20:00 respectively.



Graph 7.Rich Garden sampling point water quality indicator mean value curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time





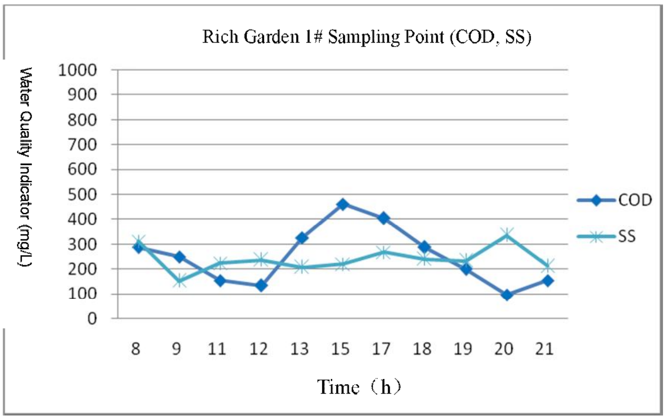
Graph 8.Zhiyinyuan sampling point water quality indicator mean value curve

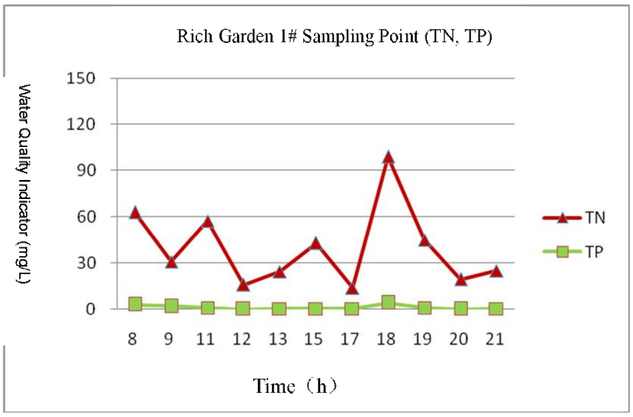
Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.2 Water quality indicators in February

4.2.1 Wastewater testing indicators of Rich Garden

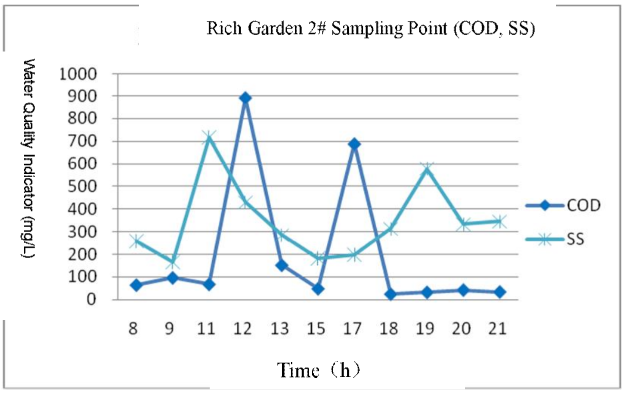
Samples were taken continuously at relevant sampling points at Rich Garden and common indicators such as COD, SS, NH3-N, TN and TP were determined and shown in graphs.

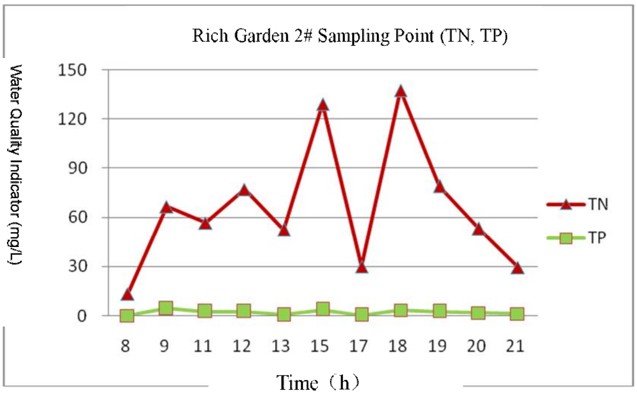




Graph 9.Rich Garden 1# sampling point water quality indicators curve

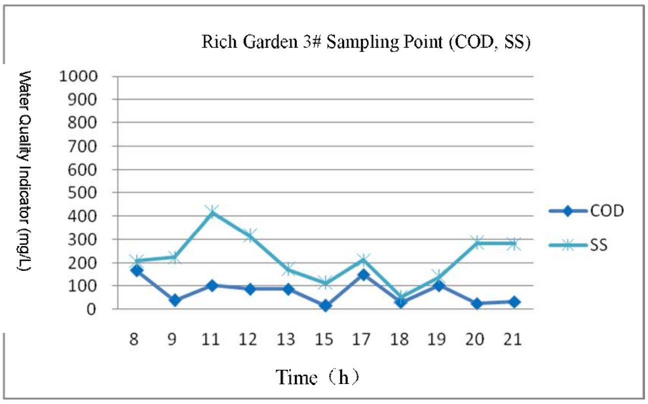
Vertical Axis: Water Quality Indicator (mg/L)　　Horizontal Axis: Time

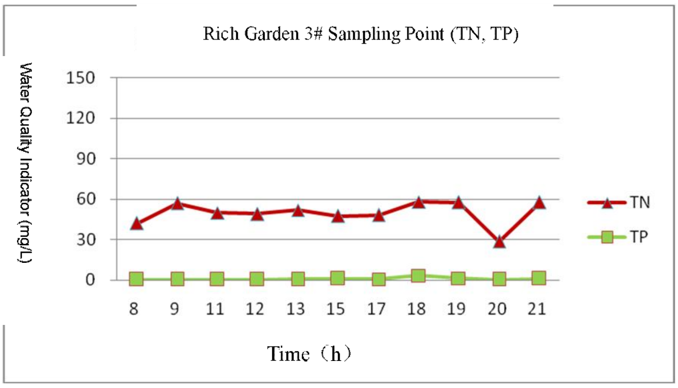




Graph 10.Rich Garden 2# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time



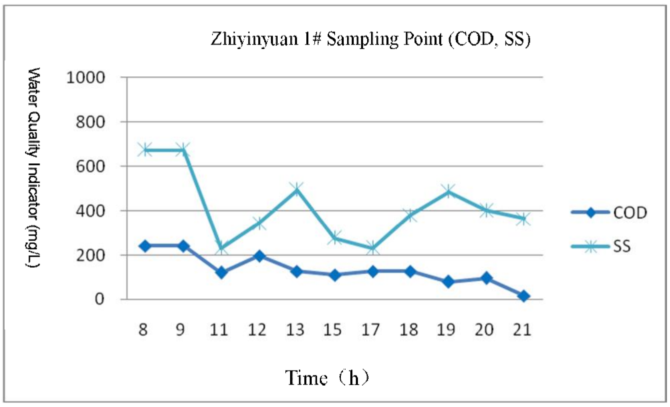


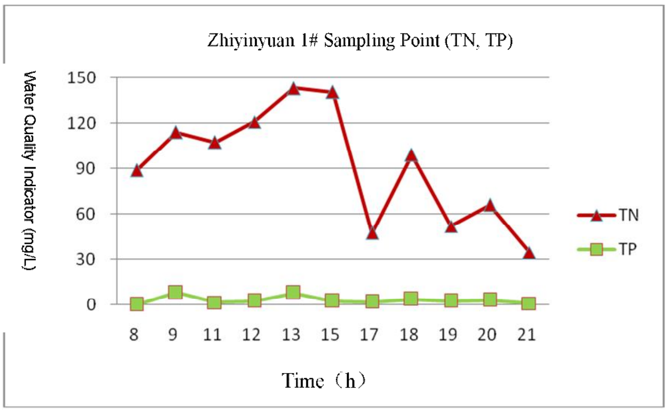
Graph 11.Rich Garden 3# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.2.2 Wastewater testing indicators of Zhiyinyuan

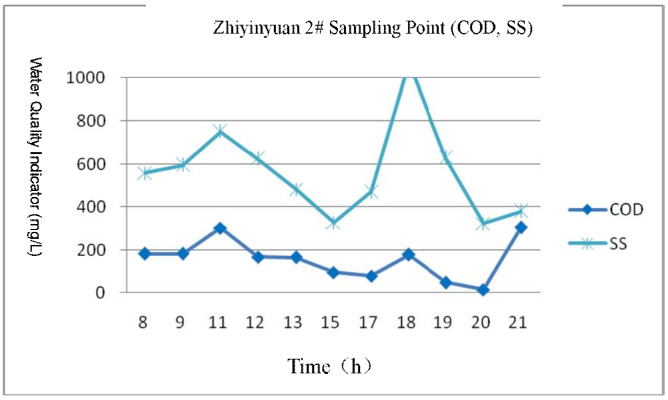
Samples were taken continuously at relevant sampling points at Zhiyinyuan and common indicators such as COD, SS, NH3-N, TN and TP were determined and are shown in graphs.

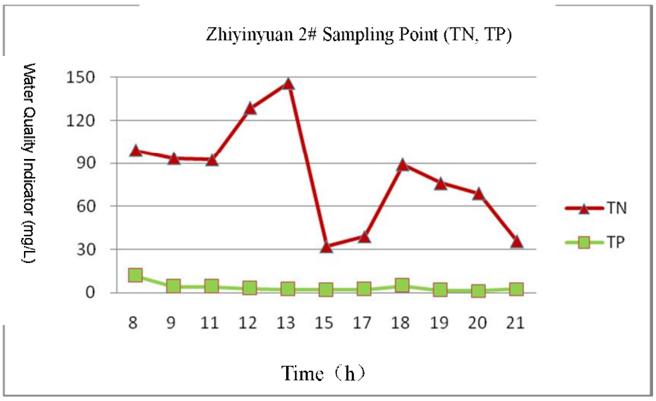




Graph 12.Zhiyinyuan 1# sampling point water quality indicators curve

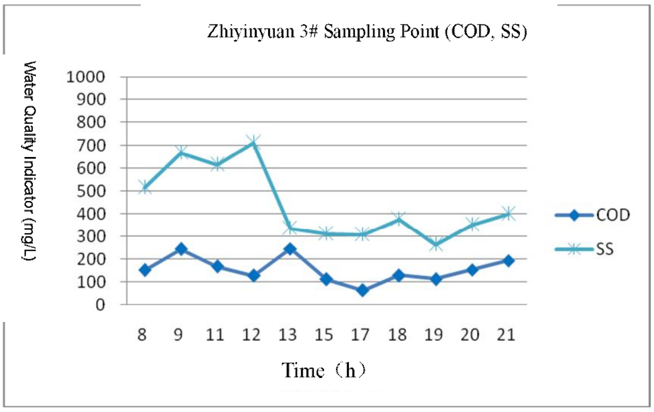
Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

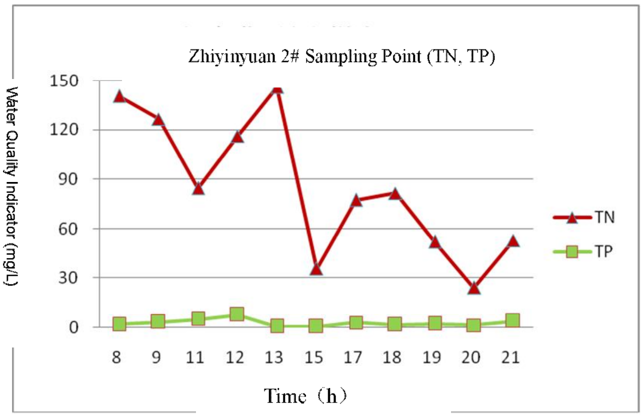




Graph 13.Zhiyinyuan 2# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time





Graph 14.Zhiyinyuan 3# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.2.3 Discussion on the water quality testing results

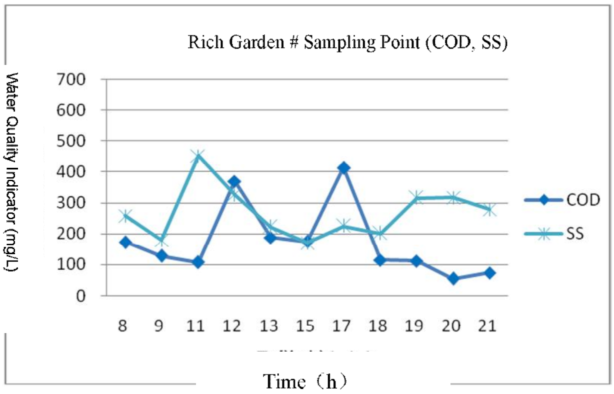
The results suggest that the COD value of Rich Garden is 174 mg/L, higher than that of Zhiyinyuan while Zhiyinyuan beats Rich Garden in the SS value, NH_3-N value, TN value and TP value.

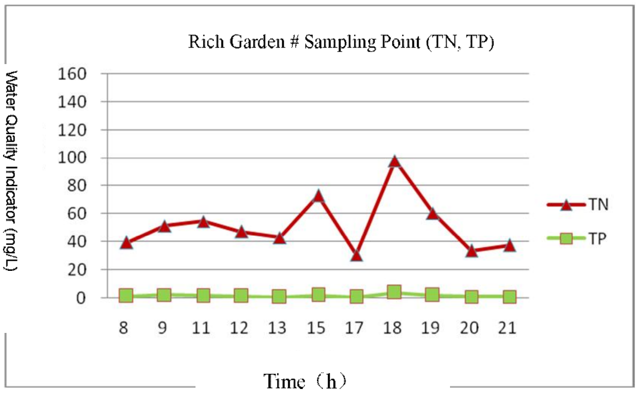
Graph 9-14 shows the water quality indicators of both Rich Garden and Zhiyinyuan are not correlated as the relevant values reaches it's peak at different point of time.

Graph 9, 10 and 11 suggest that all the water quality indicators of Rich Garden sampling points reach peak at 18 p.m., with the mean value of the COD, NH_3-N, TN, TP and SS at 174 mg/L, 27.3 mg/L, 51.8 mg/L, 1.4 mg/L and 268 mg/L respectively. After analyzing the water conditions of the three sampling points, we get the results as shown in Graph 15.

Graph 12, 13 and 14 shows that the water quality indicators of Zhiyinyuan sampling points reaches it's peak at three centralized time ranges, namely 7:00-8:00，12:00 and 20:00-21:00, and the mean value of the COD, NH_3-N, TN, TS and SS with these sampling points stands at 148 mg/L, 51.6 mg/L, 86.4 mg/L, 3.1 mg/L and 474 mg/L respectively. After comprehensive analysis of the water conditions of three sampling points, we get the results as shown in Graph 16.

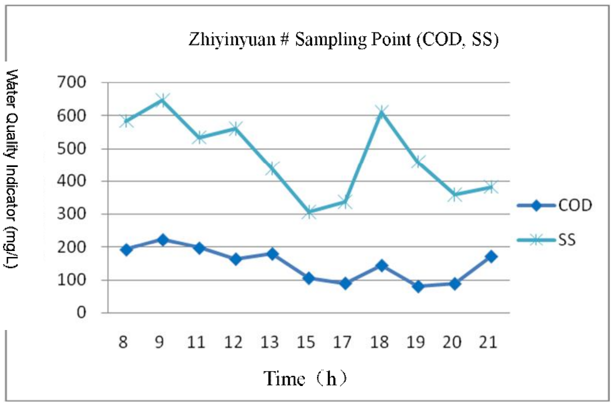
The data trends in Graph 9, 10, 11 and 15 show that some water quality indicators of Rich Garden, namely NH_3-N, TN and TP, perform steadily and reach peak at 18:00 but other indicators, namely the COD and SS, fluctuate violently and meet peak at 17:00 and 11 respectively. It can be seen from the data trends in Graph 12, 13, 14 and 16 that Zhiyinyuan enjoys steady performance of COD, NH_3-N, TN and TP and meet peak at 18:00 but experiences severe fluctuations of SS, whose maximum value appears at 9:00.

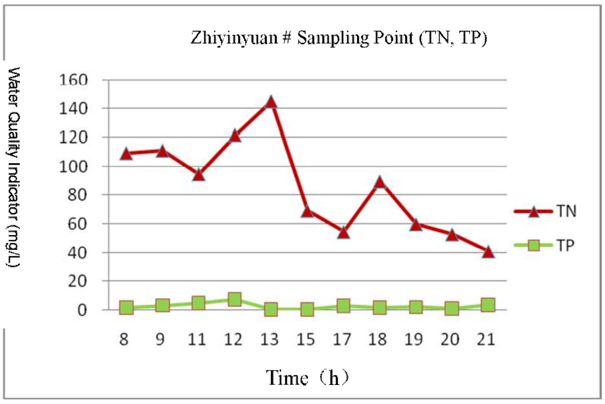




Graph 15.Rich Garden sampling point water quality indicator mean value curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time





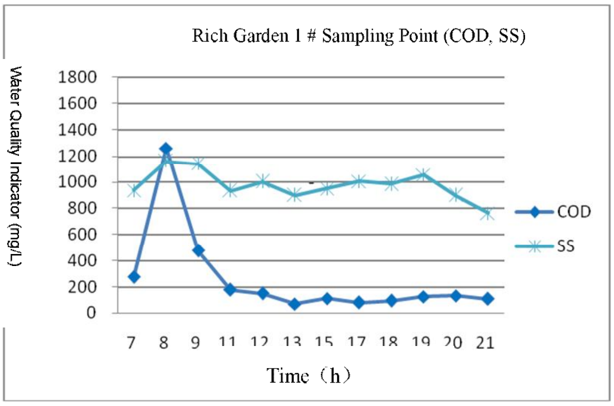
Graph 16.Zhiyinyuan sampling point water quality indicator mean value curve

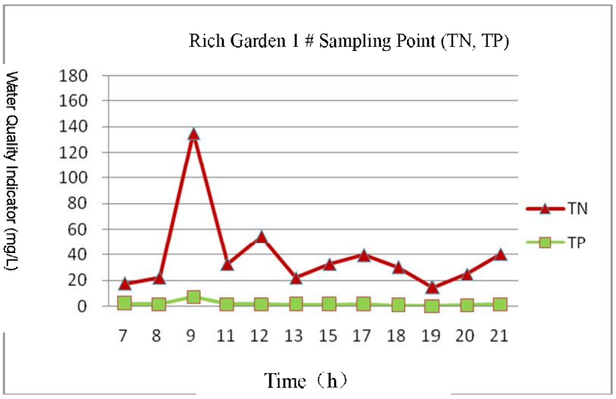
Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.3 Water quality indicators in March

4.3.1 Wastewater testing indicators of Rich Garden

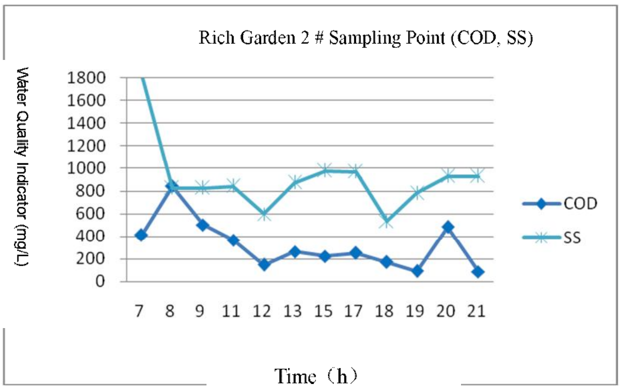
Samples were taken continuously at relevant sampling points at Rich Garden and common indicators such as COD, SS, NH_3-N, TN and TP were determined and shown in graphs.

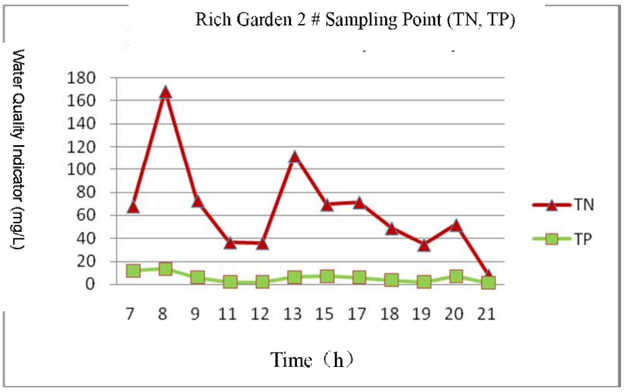




Graph 17.Rich Garden 1# sampling point water quality indicators curve

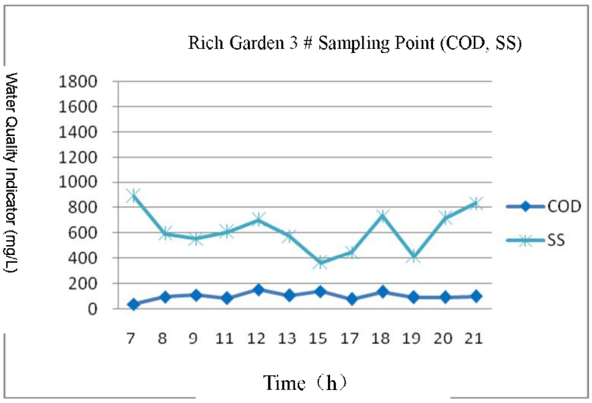
Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

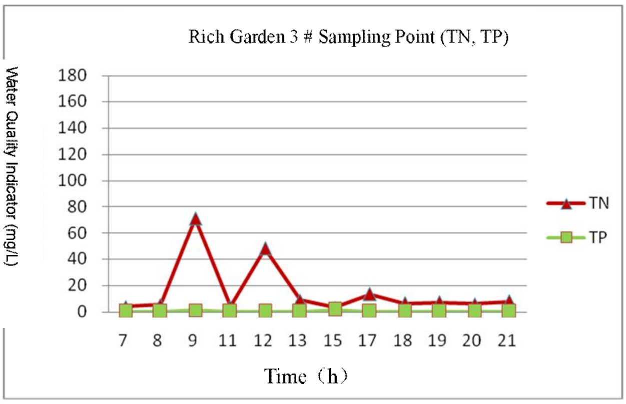




Graph 18.Rich Garden 2# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time



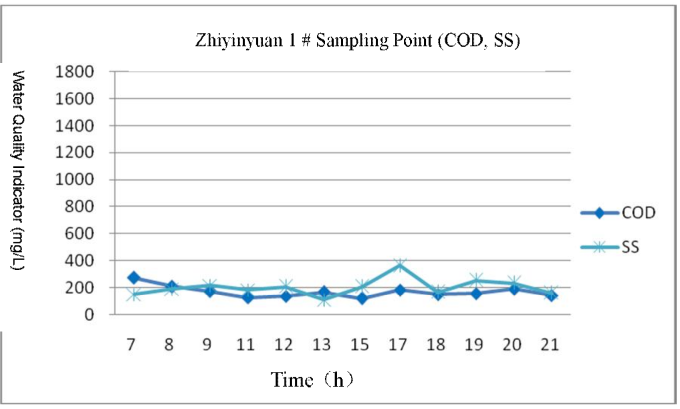


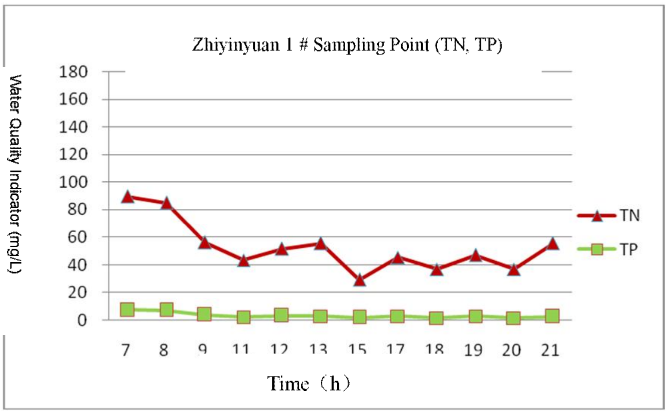
Graph 19.Rich Garden 3# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.3.2 Wastewater testing indicators of Zhiyinyuan

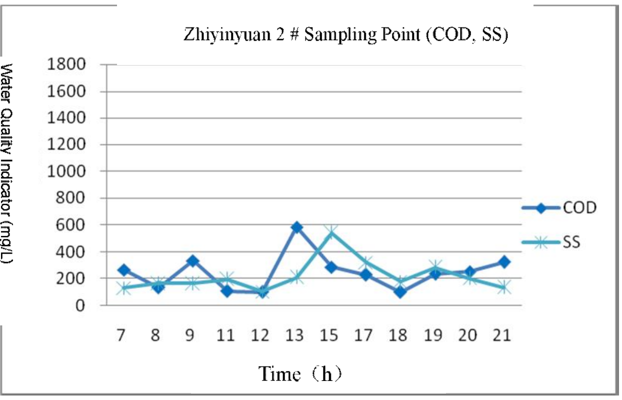
Samples were taken continuously at relevant sampling points at Zhiyinyuan and common indicators such as COD, SS, NH_3-N, TN and TP were determined and shown in graphs.

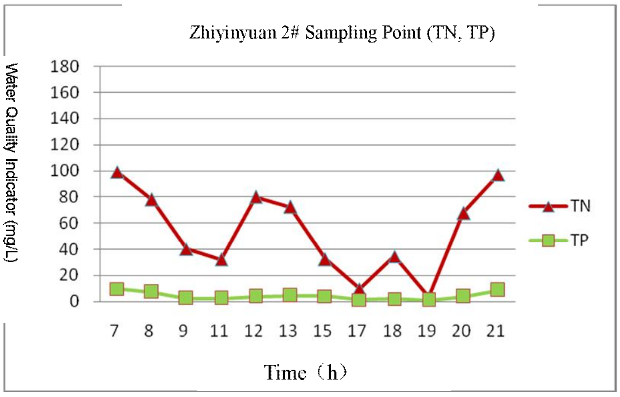




Graph 20.Zhiyinyuan 1# sampling point water quality indicators curve

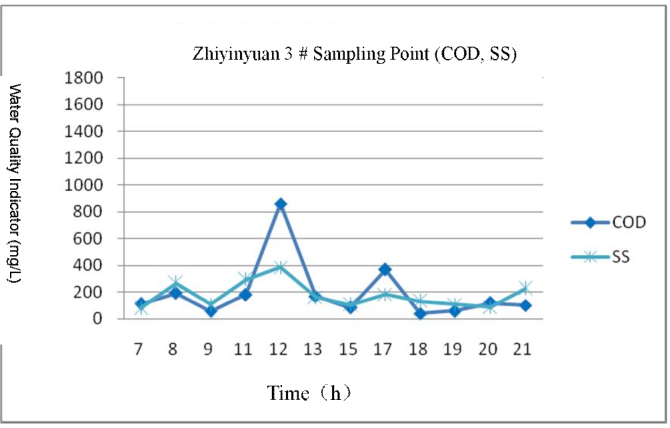
Vertical Axis: Water Quality Indicator (mg/L)   Horizontal Axis: Time

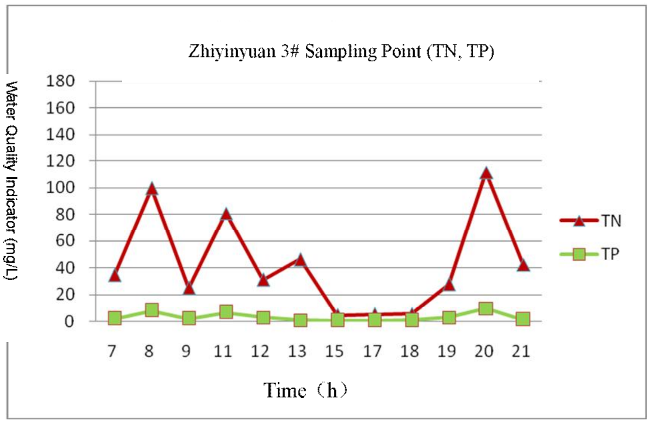




Graph 21.Zhiyinyuan 2# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time





Graph 22.Zhiyinyuan 3# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.3.3 Discussion on the water quality testing results

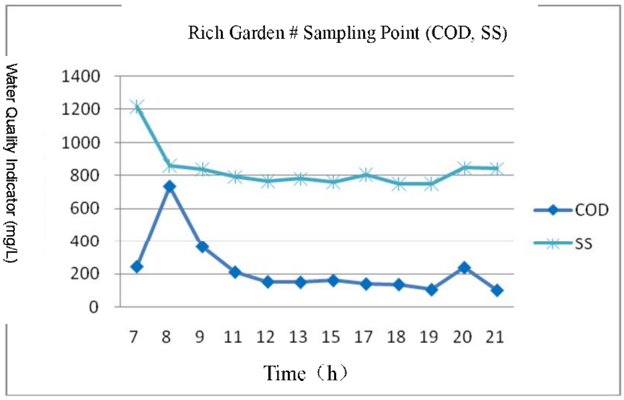
The results suggest that the COD value and SS value of Rich Garden are 225 mg/L and 854 mg/L respectively, higher than that of Dongfang Zhiyinyuan while Zhiyinyuan beats Golden Bridge Rich Garden in the NH3-N value, TN value and TP value.

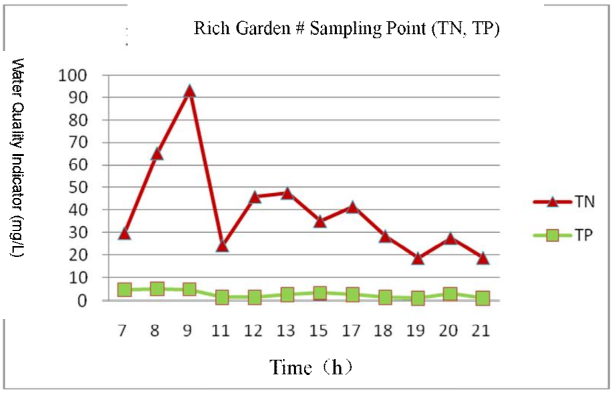
Graph 17-22 shows the COD value and SS value of both Rich Garden and Zhiyinyuan are not correlated with other of their water quality indicators as the relevant values reach peak at different points of time.

Graph 17, 18 and 19 suggest that all the water quality indicators of Rich Garden sampling points reaches it's peak at 8 a.m. or so, with the mean value of the COD, NH_3-N, TN, TP and SS at 225 mg/L, 29.44 mg/L, 39.7 mg/L, 2.54 mg/L and 854 mg/L respectively. After analyzing the water conditions of three sampling points, we get the results as shown in Graph 15.

Graph 20, 21 and 22 show that the water quality indicators of Zhiyinyuan sampling points reaches it's peak at three centralized time ranges namely 7:00-8:00，12:00-13:00, and the mean value of the COD, NH_3-N, TN, TS and SS with these sampling points stands at 204 mg/L, 43.1 mg/L, 49.8 mg/L, 3.5 mg/L and 201 mg/L respectively. After comprehensive analysis of the water conditions of the three sampling points, we get the results as shown in Graph 16.

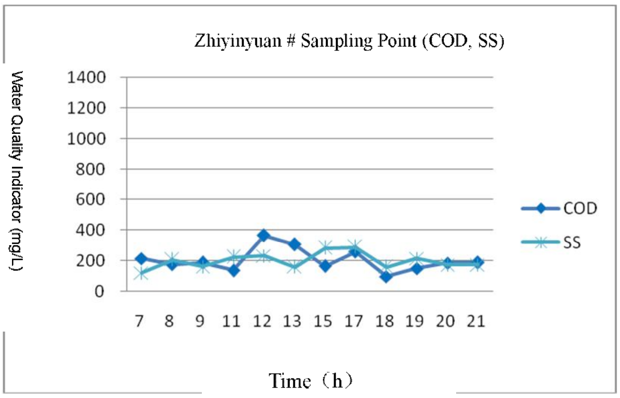
The data trends in Graph 17, 18, 19 and 23 show that the water quality indicators of Rich Garden, namely COD, SS, NH3-N, TN and TP, perform steadily and reach peak at 8:00 and the mean value curve takes on certain linear relationship. Although the mean value curve doesn't have any correct or accurate mathematical directivity, it suggests that the wastewater indicators of Rich Garden can determine the mathematical function equation under certain conditions. It can be seen from the data trends in Graph 20, 21, 22 and 24 that Zhiyinyuan experiences violent fluctuations of COD, AN, TN, TP and SS, with the maximum mean value appearing at 12:00 and many other peak points 8:00, 17:00 and 20:00 respectively.

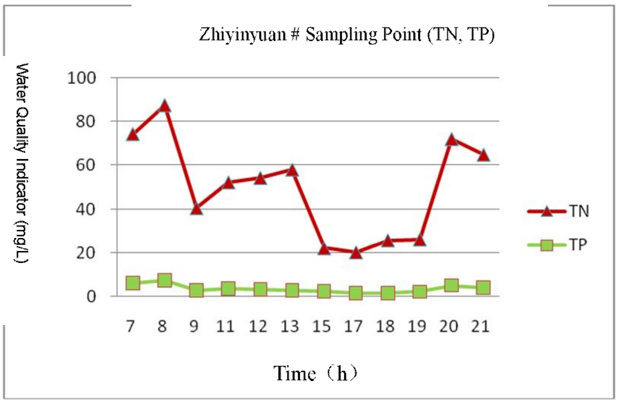




Graph 23.Rich Garden sampling point water quality indicator mean value curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time





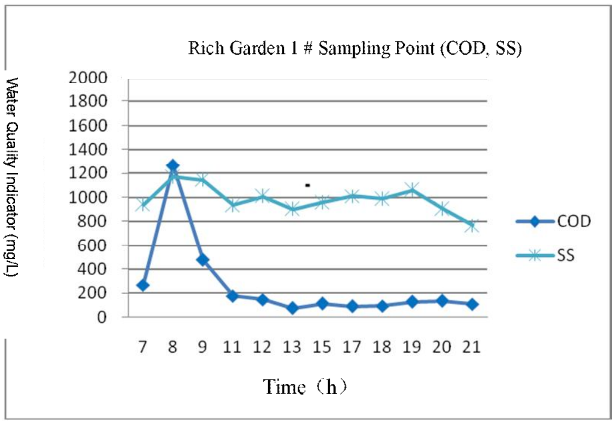
Graph 24.Zhiyinyuan sampling point water quality indicator mean value curve

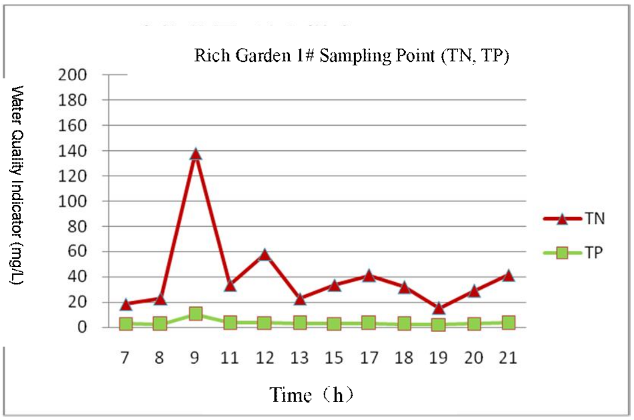
Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.4 Water quality indicators in April

4.4.1 Wastewater testing indicators of Rich Garden

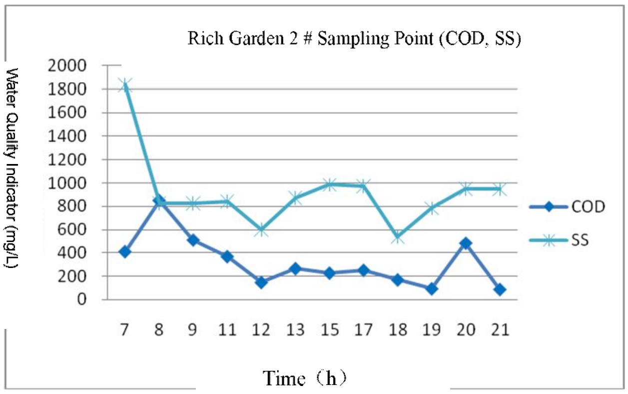
Samples were taken continuously at relevant sampling points at Rich Garden and the common indicators such as COD, SS, NH_3-N, TN and TP were determined and shown in graphs.

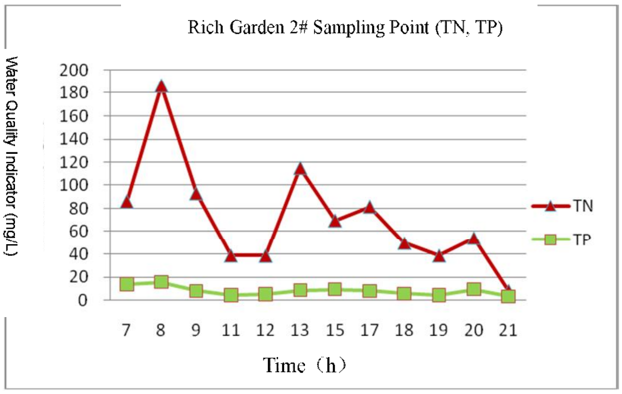




Graph 25.Rich Garden 1# sampling point water quality indicators curve

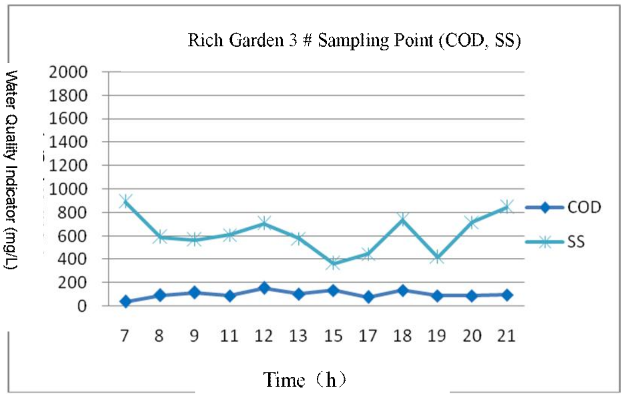
Vertical Axis: Water Quality Indicator (mg/L)   Horizontal Axis: Time

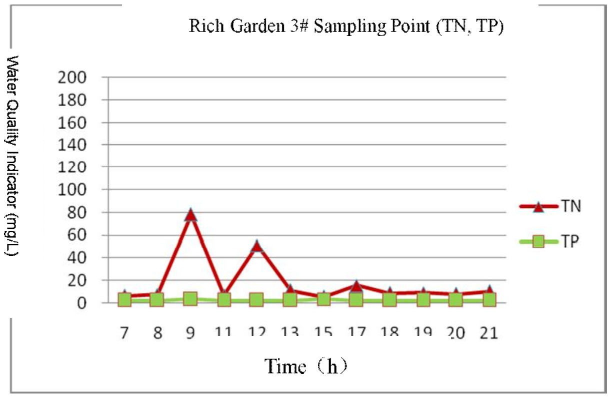




Graph 26.Rich Garden 2# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time



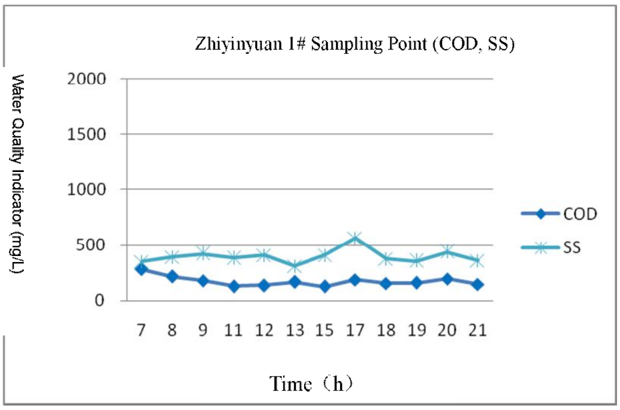


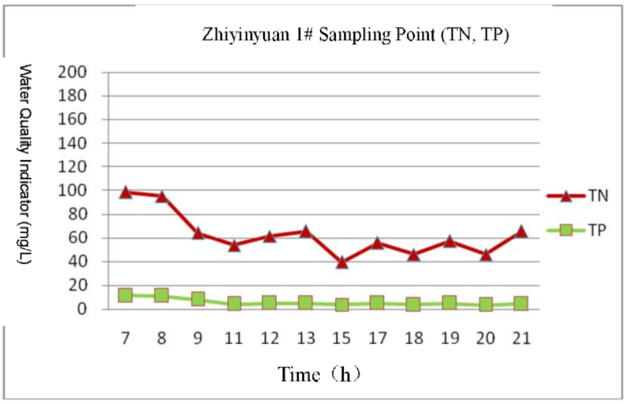
Graph 27.Rich Garden 3# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.4.2 Wastewater testing indicators of Zhiyinyuan

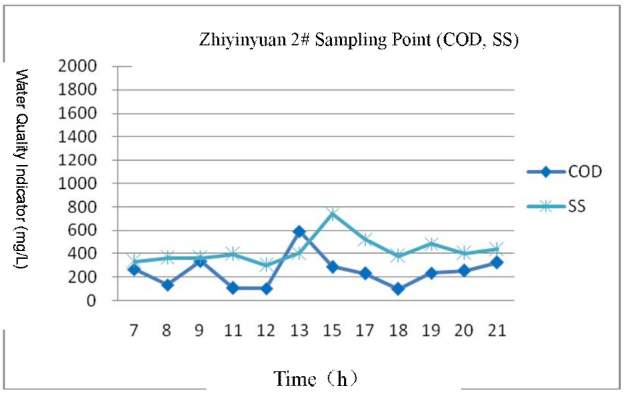
Samples were taken continuously at relevant sampling points at Zhiyinyuan and the common indicators such as COD, SS, NH_3-N, TN and TP were determined and shown in graphs.

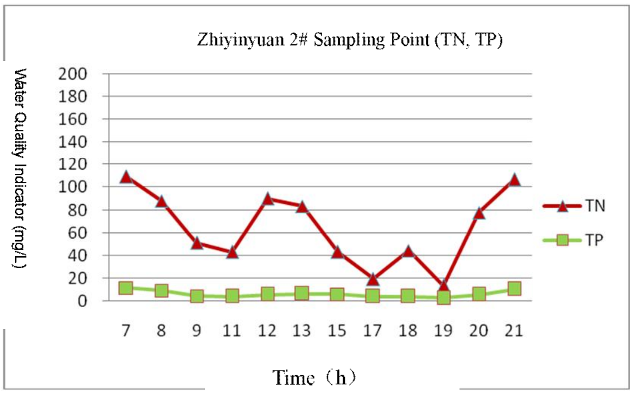




Graph 28.Zhiyinyuan 1# sampling point water quality indicators curve

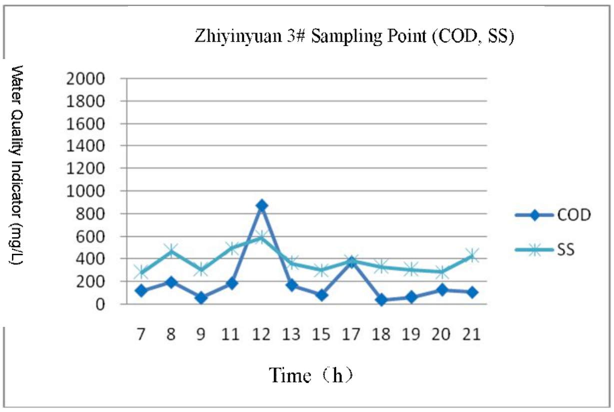
Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

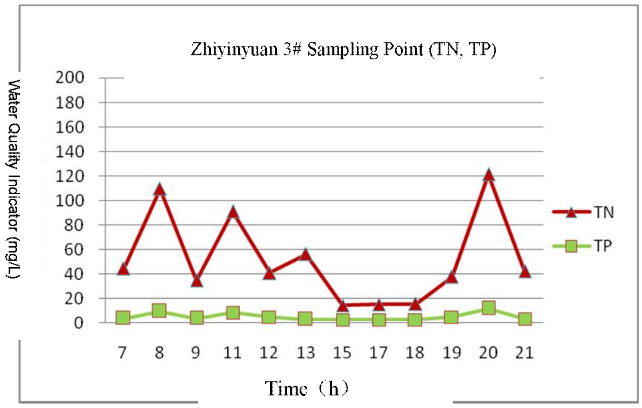




Graph 29.Zhiyinyuan 2# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time





Graph 30.Zhiyinyuan 3# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

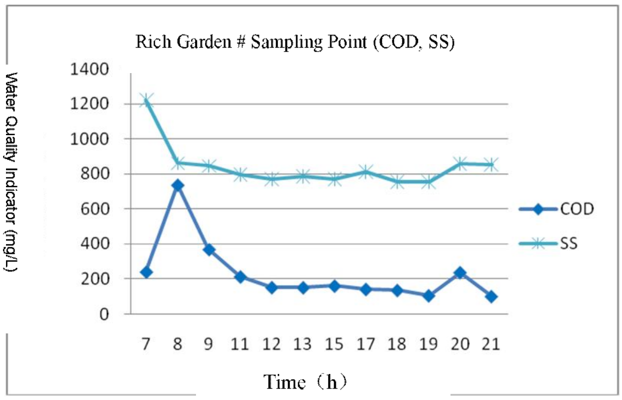
4.4.3 Discussion on the water quality testing results

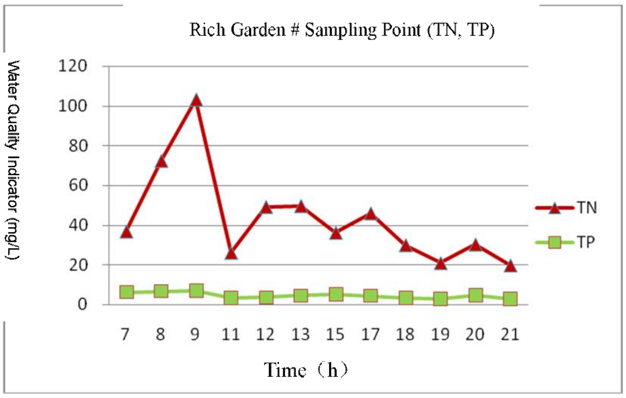
The results suggest that the COD value and SS value of Rich Garden are 226.78 mg/L and 839.33 mg/L respectively, higher than that of Zhiyinyuan while Zhiyinyuan beats Rich Garden in the NH_3-N value, TN value and TP value.

Graph 25, 26 and 27 suggest that all the water quality indicators of Rich Garden sampling points reaches it's peak at 8:00 or so, with the mean value of the COD, NH_3-N, TN, TP and SS at 227 mg/L, 30.5 mg/L, 43.4 mg/L, 4.6 mg/L and 839 mg/L respectively. After analyzing the water conditions of the three sampling points, we get the results as shown in Graph 31.

Graph 28, 29 and 30 show that the water quality indicators of Zhiyinyuan sampling points reach peak at three centralized time ranges, namely 7:00-8:00，12:00-13:00 and 20:00-21:00, and the mean value of the COD, NH_3-N, TN, TS and SS with these sampling points stands at 208 mg/L, 46.3 mg/L, 59.5 mg/L, 5.8 mg/L and 402 mg/L respectively. After comprehensive analysis of the water conditions of the three sampling points, we get the results as shown in Graph 16.

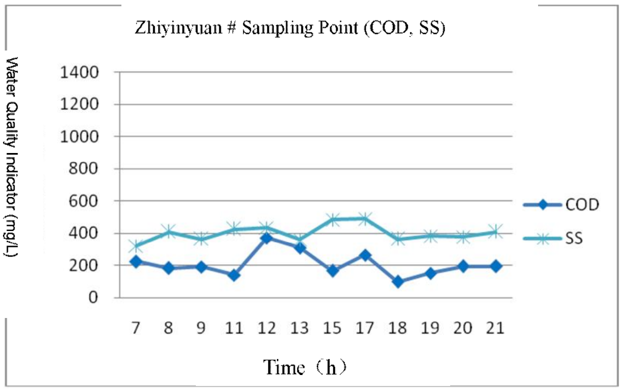
The data trends in Graph 25, 26, 27 and 31 show that the water quality indicators of Rich Garden, namely COD, SS, NH_3-N, TN and TP, perform steadily and reaches it's peak at 8:00 and the mean value curve takes on certain linear relationship. Although the mean value curve doesn't have any correct or accurate mathematical directivity, it suggests that the wastewater indicators of Rich Garden can determine the mathematical function equation under certain conditions. It can be seen from the data trends in Graph 28, 29, 30 and 32 that Zhiyinyuan experiences violent fluctuations of COD, NH_3-N, TN, TP and SS, with the maximum mean value appearing at 12:00 and many other peak points at 8:00, 17:00 and 20:00 respectively. Even so, the mean value curve shows certain linear relations as well.

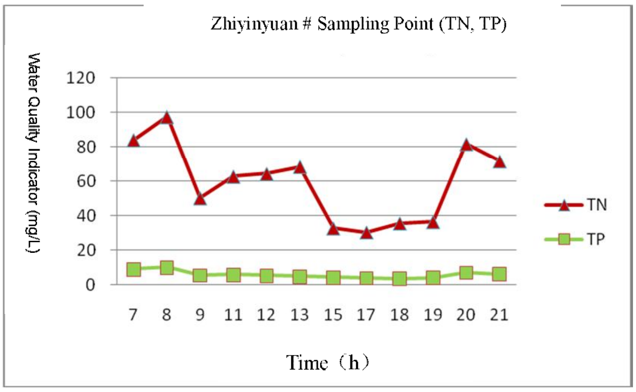




Graph 31.Rich Garden sampling point water quality indicator mean value curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time





Graph 32.Zhiyinyuan sampling point water quality indicator mean value curve

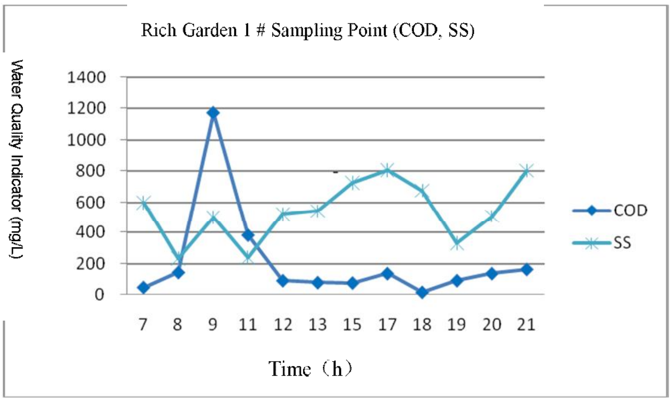
Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

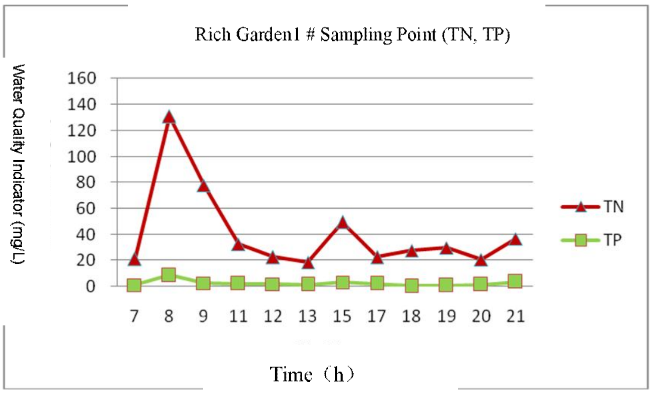
4.5 Water quality indicators in May

We sampled twice in the middle of and late May respectively, hence increasing the work load of the month and the reliability of the test results.

4.5.1 1st-time waste water testing indicators of Rich Garden

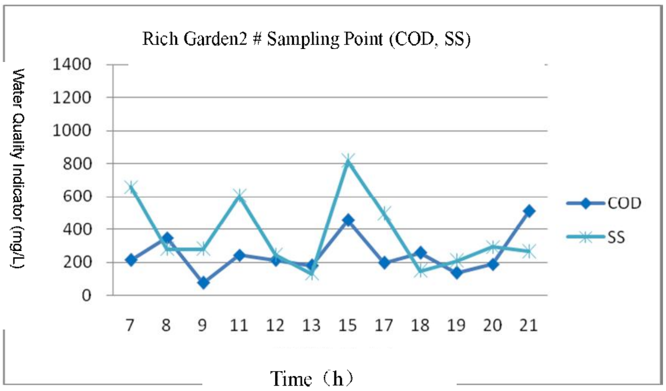
After sampling continuously at the relevant sampling points of Rich Garden, we drew curve graphs on the common indicators including COD, SS, NH_3-N, TN and TP as follows.

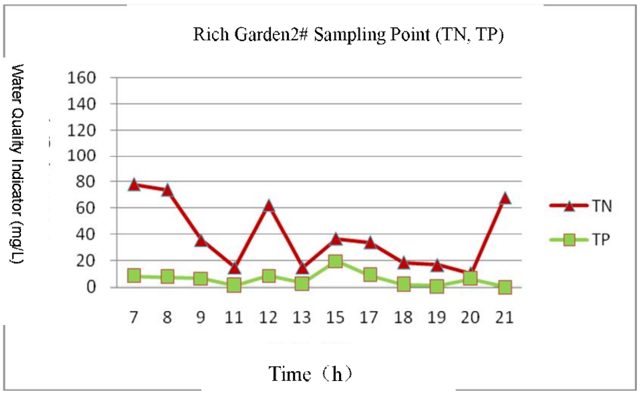




Graph 33.Rich Garden 1# sampling point water quality indicators curve

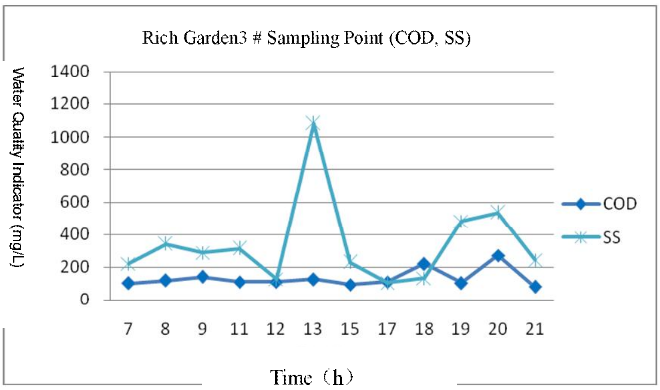
Vertical Axis: Water Quality Indicator (mg/L)   Horizontal Axis: Time

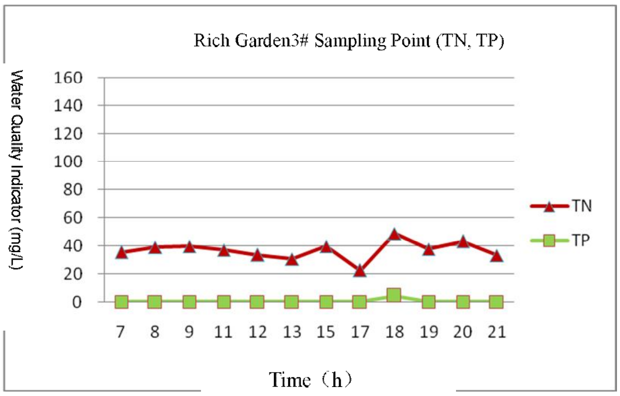




Graph 34.Rich Garden 2# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time



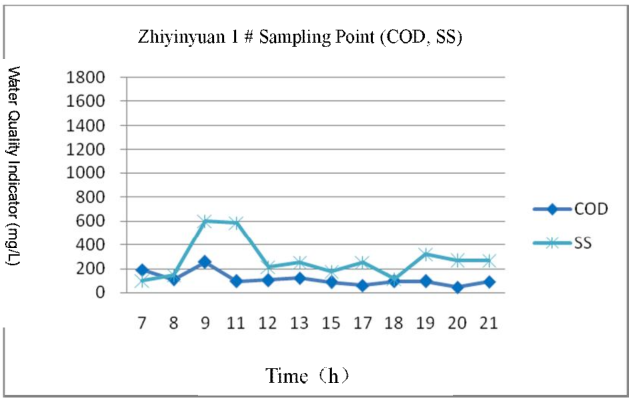


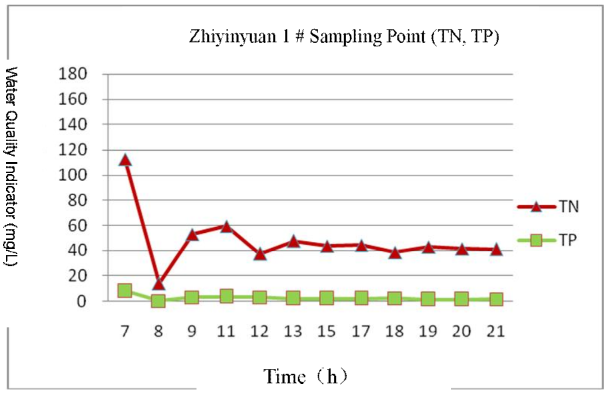
Graph 35.Rich Garden 3# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.5.2 1st-time waste water testing indicators of Zhiyinyuan

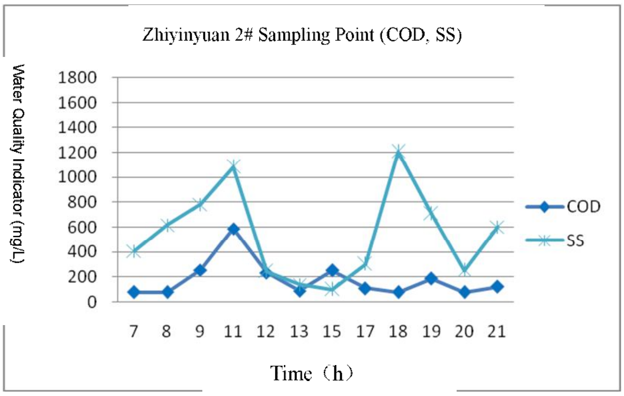
Samples were taken continuously at relevant sampling points of Zhiyinyuan and the common indicators such as COD, SS, NH_3-N, TN and TP were determined and shown in graphs.

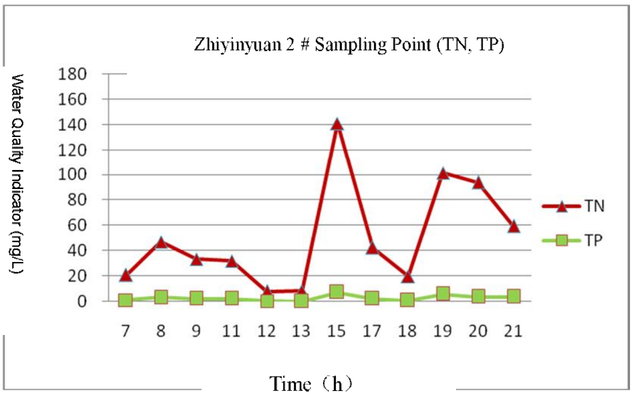




Graph 36.Zhiyinyuan 1# sampling point water quality indicators curve

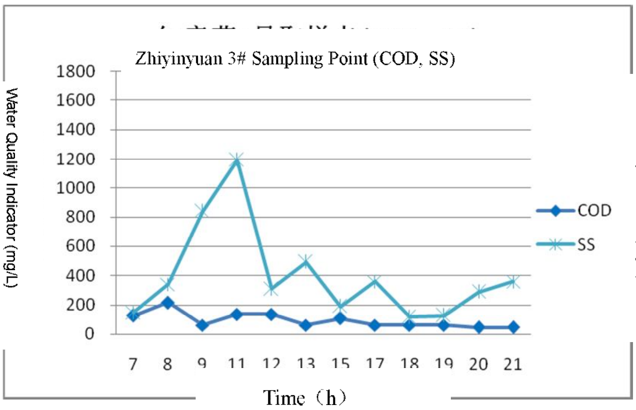
Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

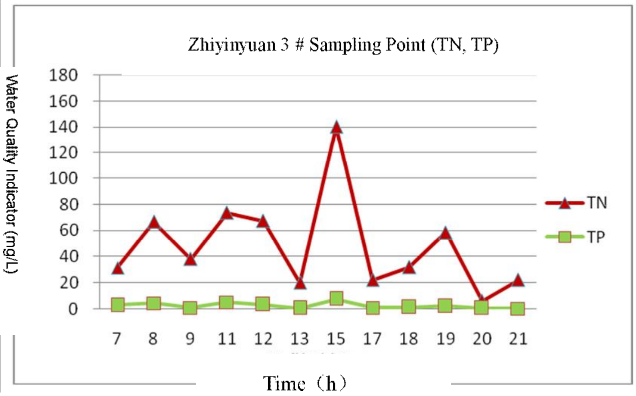




Graph 37.Zhiyinyuan 2# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time





Graph 38.Zhiyinyuan 3# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.5.3 Discussion on the water quality testing results of the 1st sampling

After comprehensive analysis of the testing results, it is found that in the 1st sampling in May, Rich Garden is higher than Zhiyinyuan in COD value, SS value and TP value, which are 198 mg/L, 417 mg/L and 2.9 mg/L respectively, while Zhiyinyuan beats Rich Garden in NH_3-N value and TN value.

Graph 33-38 shows the water quality indicators of both Rich Garden and Zhiyinyuan are not correlated and the trends are not steady. Thus, it can be determined that the water quality experiences severe fluctuations.

As shown in Graph 33, 34 and 35, at relevant sampling points in Rich Garden, most water quality indicators reaches it's peak at 9 and the mean value of COD, NH3-N, TN, TP and SS stand at 198 mg/L, 27.4 mg/L, 38.6 mg/L, 2.9 mg/L and 417 mg/L respectively. After comprehensive analysis of the water quality conditions of the three sampling points, we get the results as shown in Graph 39.

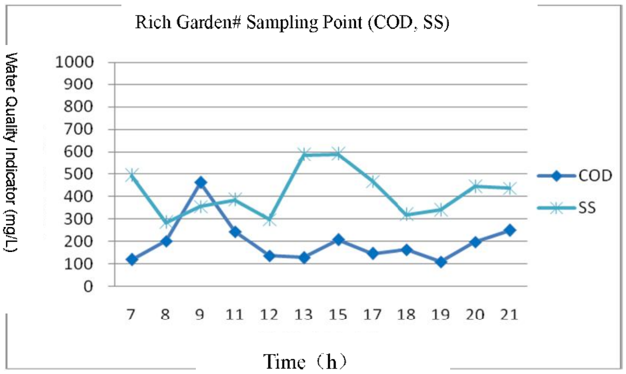
As is seen in Graph 36, 37 and 38, the sampling points in Zhiyinyuan and the water quality indicators reaches it's peak in three centralized time ranges, 11:00 and 17:00-18:00 and the mean value of COD, NH3-N, TN, TP and SS stand at 129 mg/L, 41.8 mg/L, 49.9 mg/L, 2.7 mg/L and 403 mg/L respectively. After comprehensive analysis of the water quality conditions of the three sampling points, we get the results as shown in Graph 40.

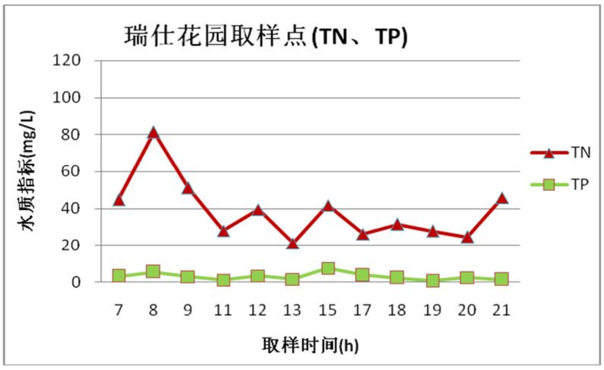
The data trends in Graph 33, 34, 35 and 39 show that the water quality indicators of Rich Garden experienced severe fluctuations, reaching peak at 8:00, and presents certain linear functional relationship in the mean value curve, which, despite the lack of correct or accurate directivity, still indicates that the water quality indicators of Rich Garden can determine the function equation under certain conditions. It can be seen from the data trends in Graph 36, 37, 38 and 40 that Zhiyinyuan experiences severe fluctuations in water quality indicators, with the mean maximum appearing at 15:00 in most cases and other peak points at 7:00, 9:00, 11:00 and 19:00. In addition, the mean value curve also presents certain linear relationship between COD, NH3-N, TN and TP values.

Rich Garden # Sampling Point (TN, TP)

Water Quality Indicator (mg/L)

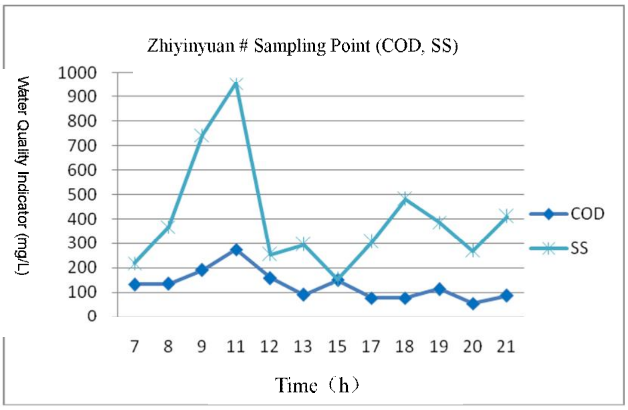
Time（h）

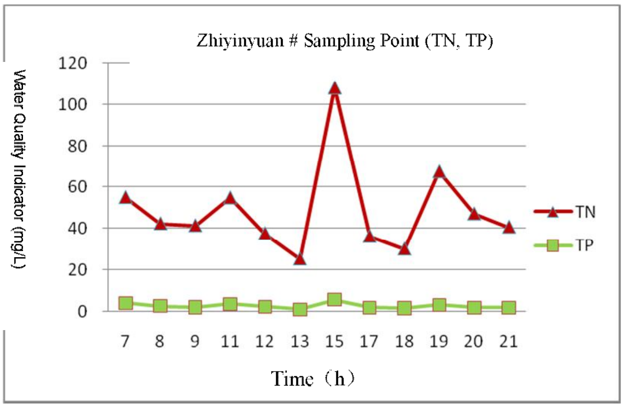




Graph 39.Rich Garden sampling point water quality indicator mean value curve

Vertical Axis: Water Quality Indicator (mg/L)   Horizontal Axis: Time



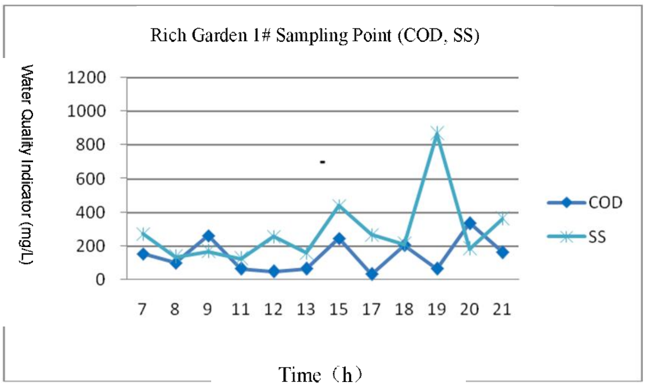


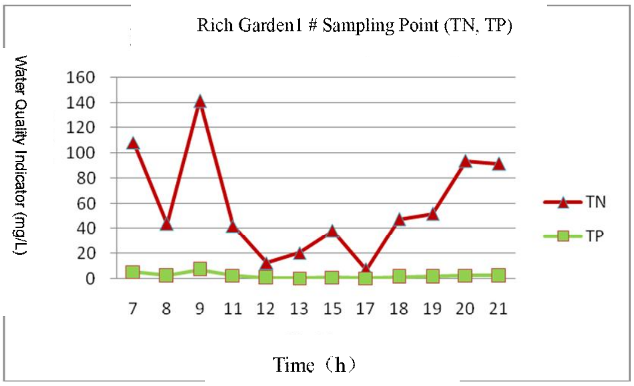
Graph 40.Zhiyinyuan sampling point water quality indicator mean value curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.5.4 2nd-time waste water testing indicators of Rich Garden

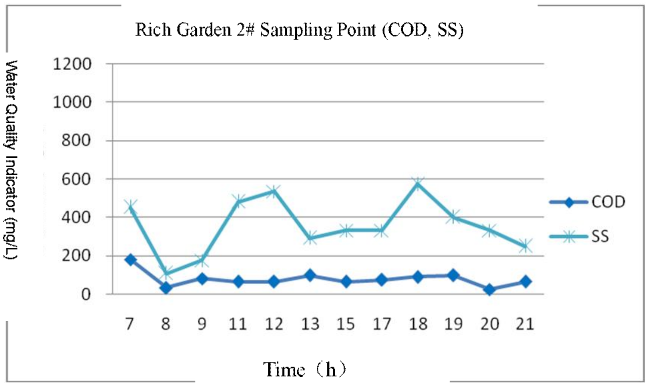
Samples were taken continuously at relevant sampling points of Rich Garden and the common indicators such as COD, SS, NH_3-N, TN and TP were determined and shown in graphs.

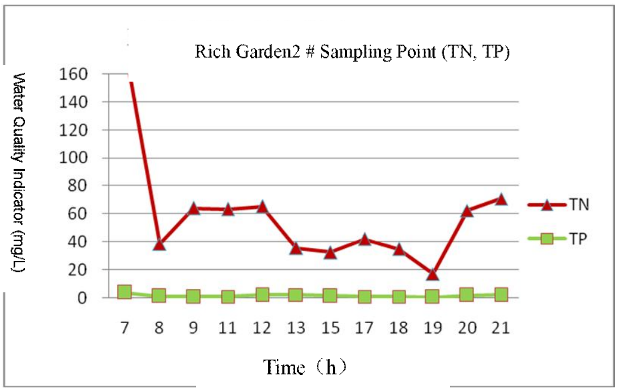




Graph 41.Rich Garden 1# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L)   Horizontal Axis: Time

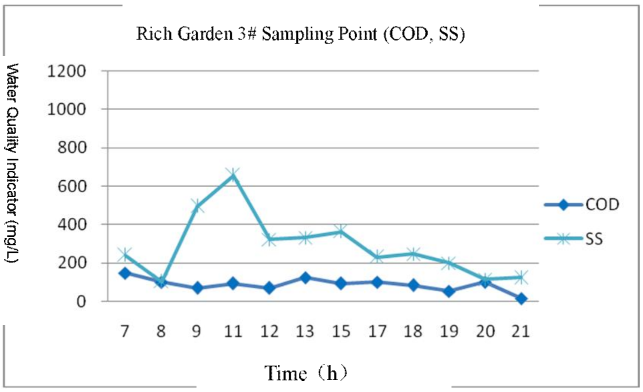


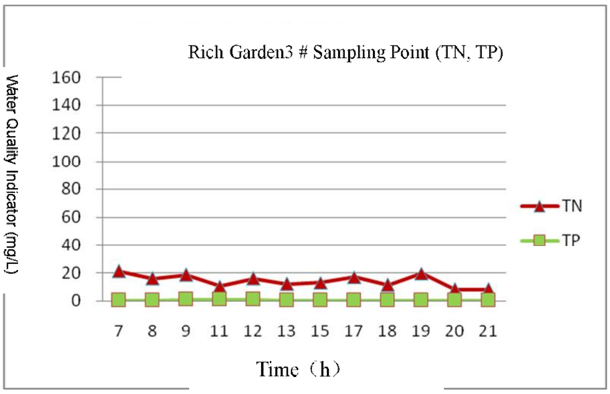


Graph 42.Rich Garden 2# sampling point water quality indicators curve

注：7:00， TN 值为 177mg/L

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time



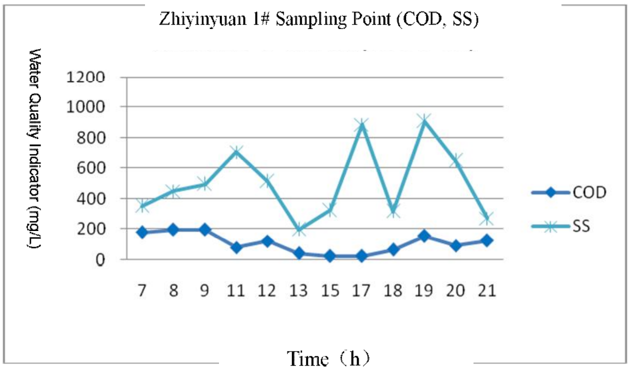


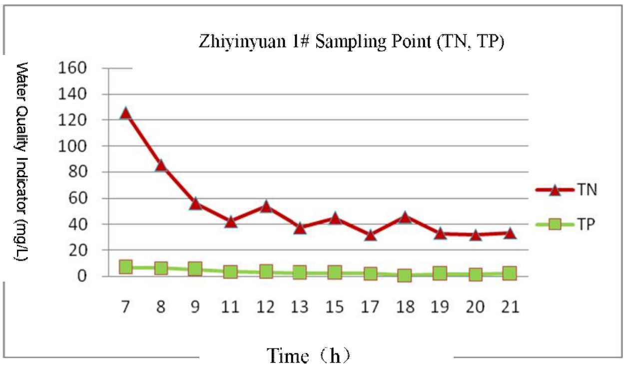
Graph 43.Rich Garden 3# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.5.5 2nd-time waste water testing indicators of Zhiyinyuan

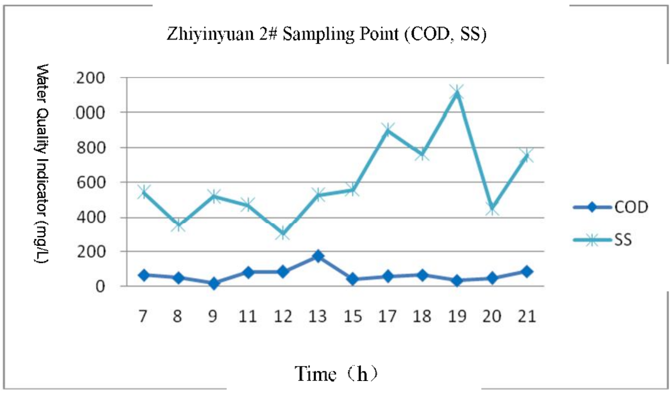
Samples were taken continuously at relevant sampling points of Zhiyinyuan and the common indicators such as COD, SS, NH_3-N, TN and TP were determined and shown in graphs.

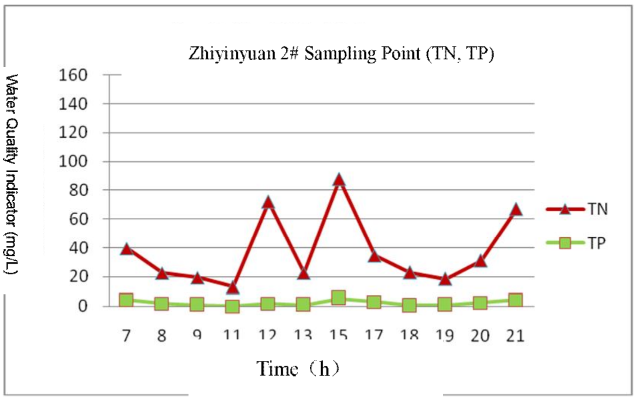




Graph 44.Zhiyinyuan 1# sampling point water quality indicators curve

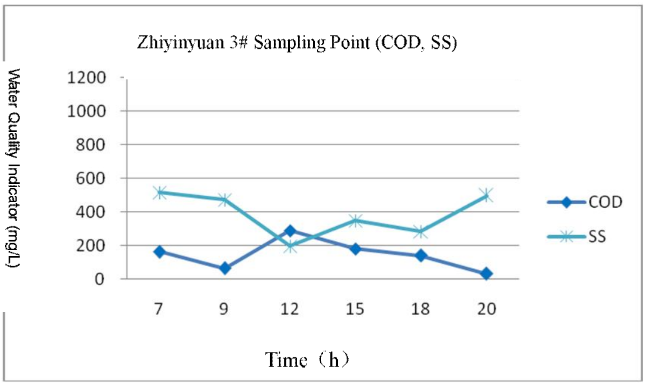
Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

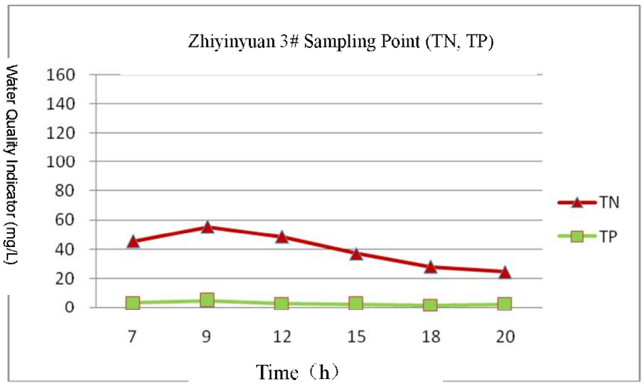




Graph 45.Zhiyinyuan 2# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time





Graph 46.Zhiyinyuan 3# sampling point water quality indicators curve

Note: due to pipeline clogging, 3# sampling point was sampled once every two sampling time.

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.5.6 Discussion on the water quality testing results of the 2nd sampling

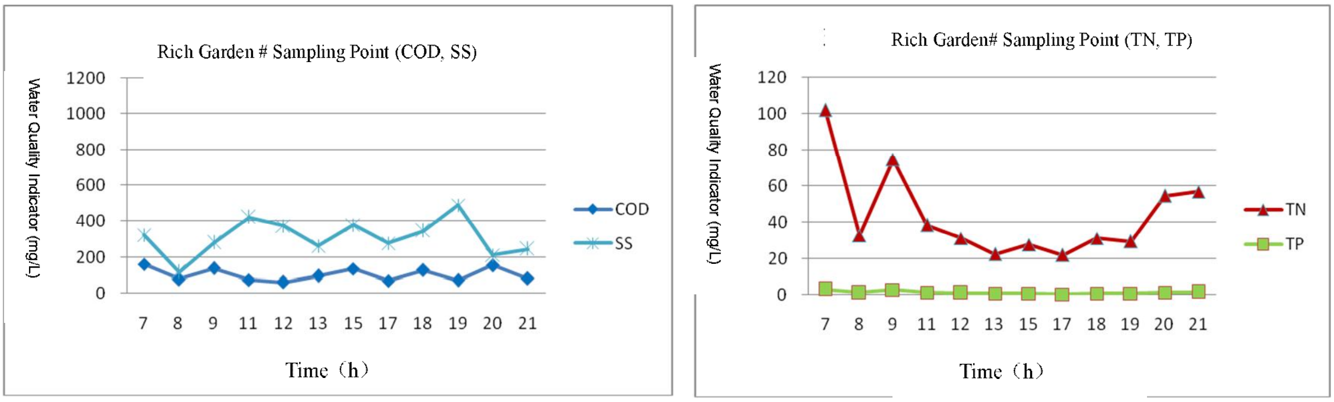
After comprehensive analysis of the testing results, it is found that Rich Garden is higher than Zhiyinyuan in COD value, NH_3-N value and TN value, which are 99 mg/L, 40.2 mg/L and 43.7mg/L respectively, while Zhiyinyuan beats Rich Garden in SS value and TP value.

Graph 41-46 shows tha the water quality indicators of both Rich Garden and Zhiyinyuan are not correlated and the trends are not steady. Thus, it can be determined that the water quality experiences severe fluctuations.

As is shown in Graph 41, 42 and 43, at relevant sampling points in Rich Garden, most water quality indicators reaches it's peak at 7 and 9 and the mean value of COD, NH3-N, TN, TP and SS stand at 99 mg/L, 40.2 mg/L, 43.7mg/L, 1.4 mg/L and 310 mg/L respectively. After comprehensive analysis of the water quality conditions of the three sampling points, we get the results as shown in Graph 47.

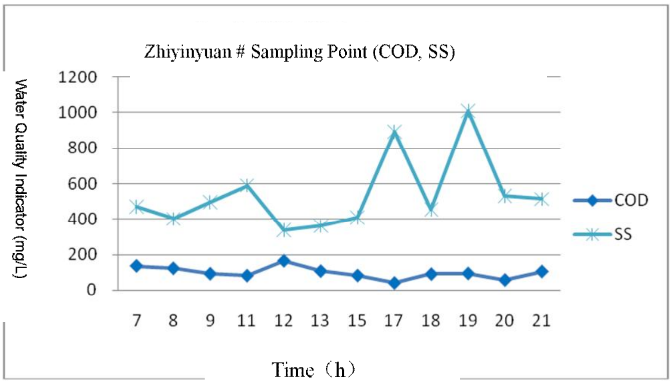
As is seen in Graph 44, 45 and 46, the sampling points in Zhiyinyuan indicates that the water quality indicators reach peak at discrete times and the mean value of COD, NH3-N, TN, TP and SS stand at 98 mg/L, 37.5 mg/L, 42.6 mg/L, 2.7 mg/L and 540 mg/L respectively. After comprehensive analysis of the water quality conditions of the three sampling points, we get the results as shown in Graph 48.

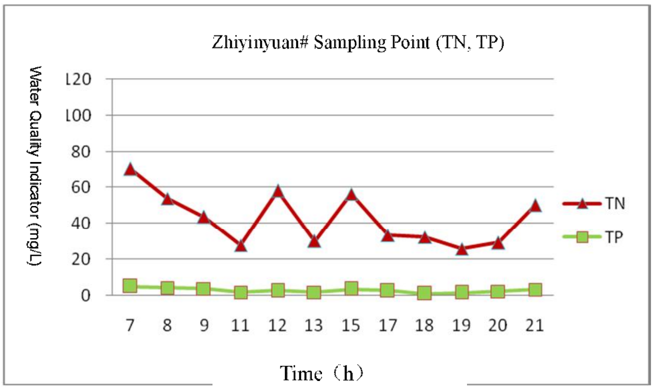
The data trends in Graph 41, 42, 43 and 47 shows that the water quality indicators of Rich Garden experiences slight fluctuations, reach peak at 7:00, and present certain linear functional relationship in the mean value curve of TN and TP, which, despite the lack of correct or accurate directivity, still indicates that the water quality indicators of Rich Garden can determine the function equation under certain conditions. It can be seen from the data trends in Graph 44, 45, 46 and 48 that Zhiyinyuan experiences severe fluctuations in water quality indicators, with the mean maximum of TN and TP appearing at 7:00, 9:00 and 15:00 in most cases and other peak points at 19:00. However, the mean value curve doesn't present any regularity in the COD, NH3-N, TN and TP values.



Graph 47.Rich Garden sampling point water quality indicator mean value curve

Vertical Axis: Water Quality Indicator (mg/L)   Horizontal Axis: Time





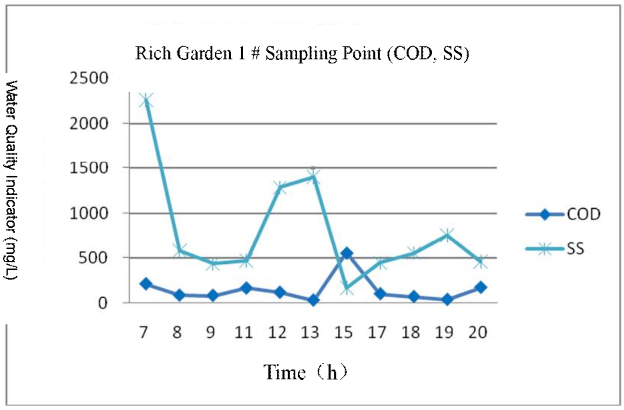
Graph 48.Zhiyinyuan sampling point water quality indicator mean value curve

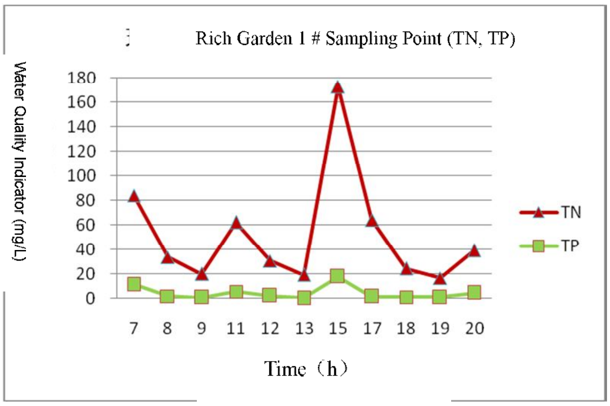
Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.6 Water quality indicators in June

4.6.1 Waste water testing indicators of Rich Garden

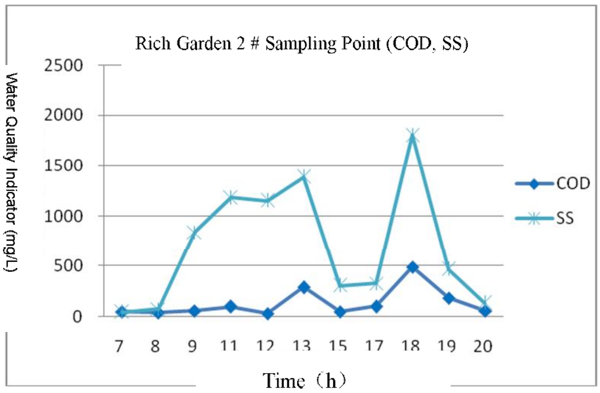
After sampling continuously at the relevant sampling points of Rich Garden, we drew curve graphs on the common indicators including COD, SS, NH3-N, TN and TP as follows.

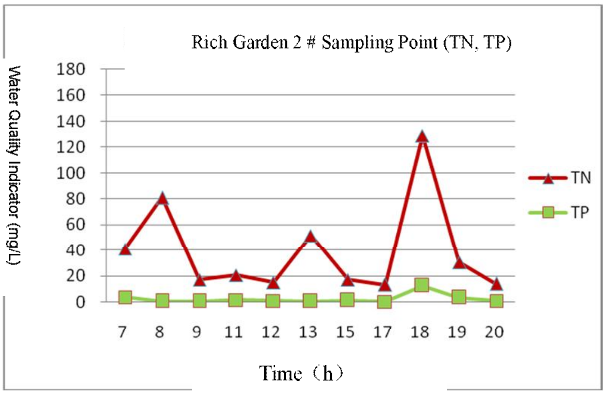




Graph 49.Rich Garden 1# sampling point water quality indicators curve

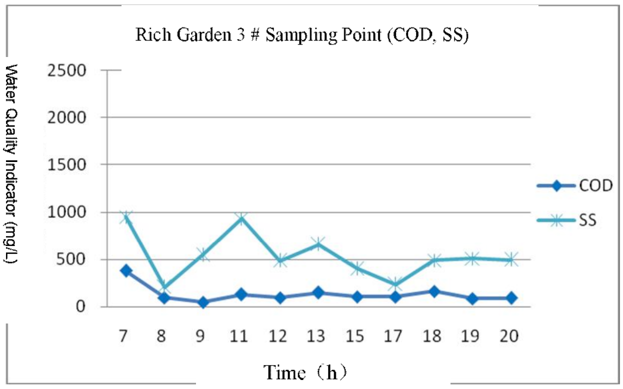
Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

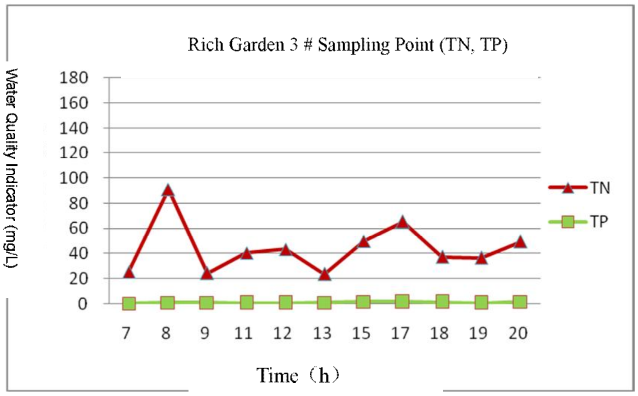




Graph 50.Rich Garden 2# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time



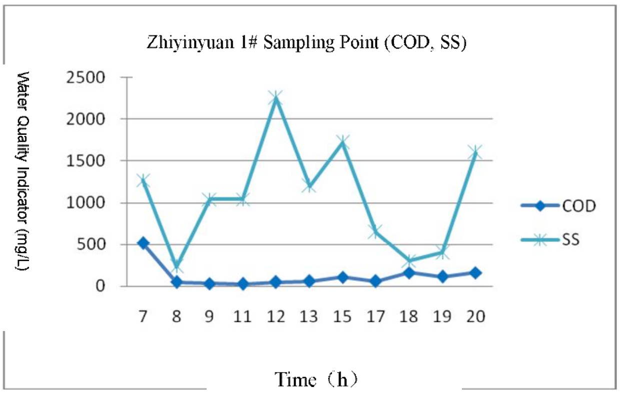


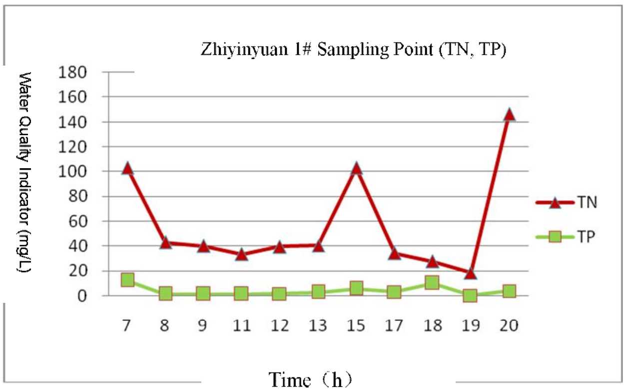
Graph 51.Rich Garden 3# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.6.2 Waste water testing indicators of Zhiyinyuan

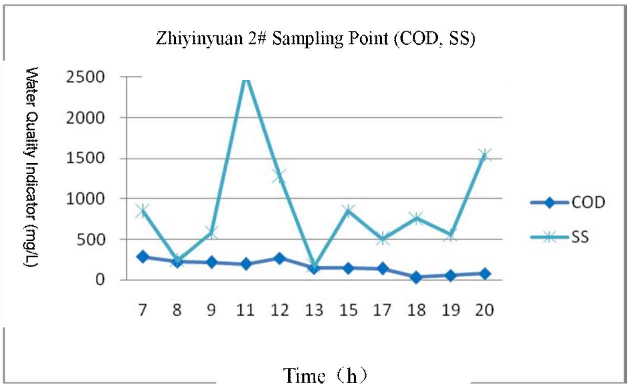
After sampling continuously at the relevant sampling points of Zhiyinyuan, we drew curve graphs on the common indicators including COD, SS, NH3-N, TN and TP as follows.

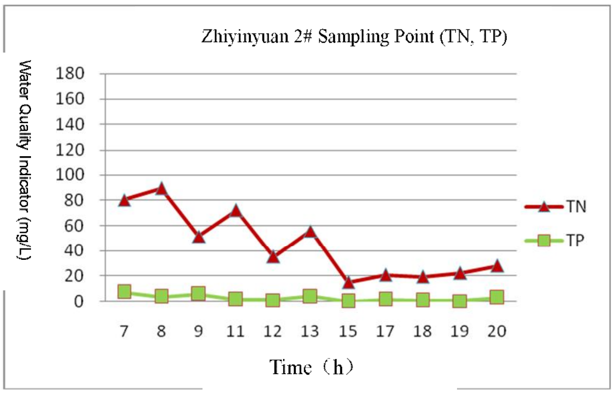




Graph 52.Zhiyinyuan 1# sampling point water quality indicators curve

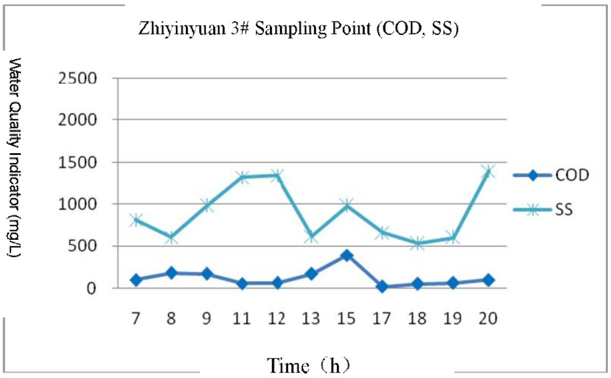
Vertical Axis: Water Quality Indicator (mg/L)　　Horizontal Axis: Time

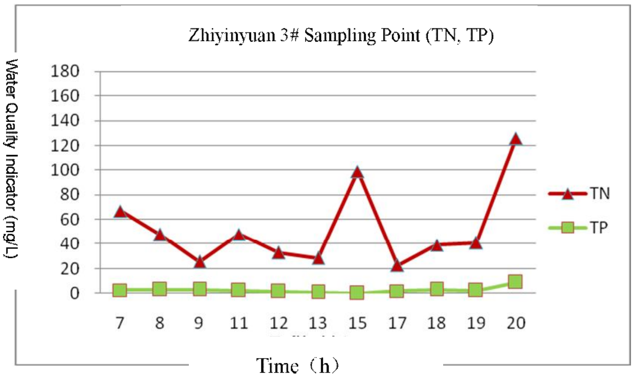




Graph 53.Zhiyinyuan 2# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time





Graph 54.Zhiyinyuan 3# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.6.3 Discussion on the water quality testing results

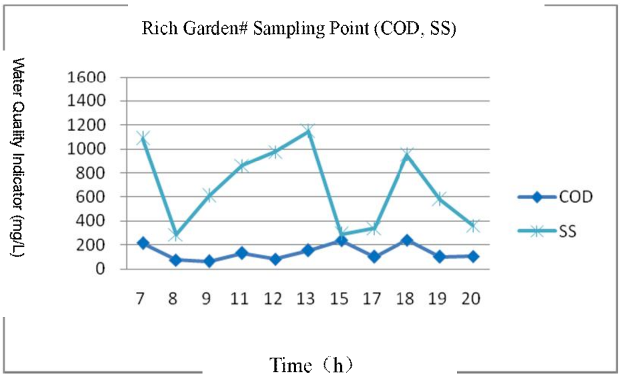
After acomprehensive analysis of the testing results, it is found that with the mean value of relevant indicators at 136 mg/L, 36.9 mg/L, 51.4 mg/L, 3.1 mg/L and 894 mg/L respectively, Zhiyinyuan beats Rich Garden in all indicators.

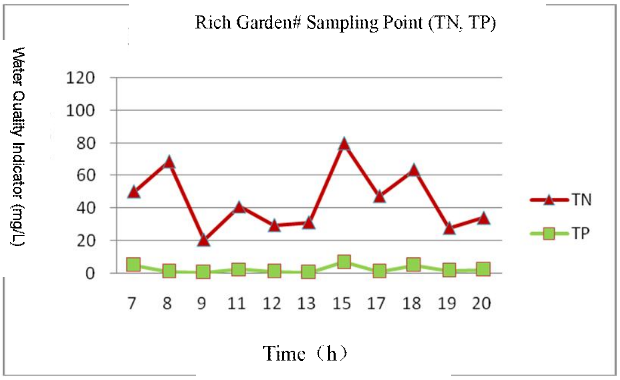
Graph 49-54 shows the water quality indicators of both Rich Garden and Zhiyinyuan are not correlated and the trends are not steady. Thus, it can be determined that the water quality experiences severe fluctuations.

As is shown in Graph 49, 50 and 51, at relevant sampling points in Rich Garden, most water quality indicators reaches it's peak at 15:00-18:00 and the mean value of COD, NH3-N, TN, TP and SS stand at 132 mg/L, 32.1 mg/L, 45.5 mg/L, 2.5 mg/L and 667 mg/L respectively. After comprehensive analysis of the water quality conditions of the three sampling points, we get the results as shown in Graph 55.

As is seen in Graph 52, 53 and 54, at the sampling points in Zhiyinyuan, the water quality indicators reaches it's peak in three centralized time ranges, 8:00-9:00, 15:00 and 20:00 and the mean value of COD, NH3-N, TN, TP and SS stand at 136 mg/L, 37.0 mg/L, 51.4 mg/L, 3.1 mg/L and 894 mg/L respectively. After comprehensive analysis of the water quality conditions of the three sampling points, we get the results as shown in Graph 56.

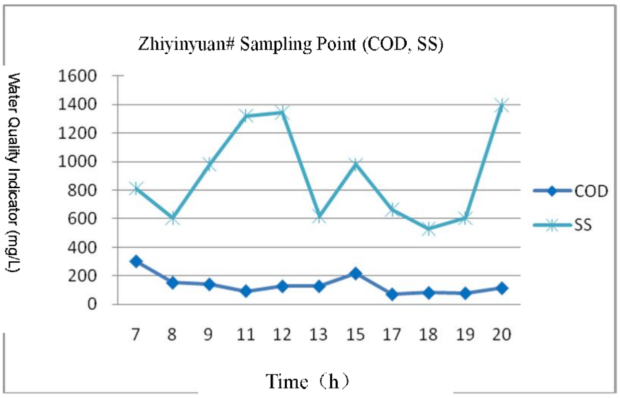
As is shown in the data trends in Graph 49, 50, 51 and 55, except for COD and TP, all of the other water indicators of Rich Garden fluctuate violently and meet peak at 15:00 and 18:00. Besides, except for TP and SS values, which show slight fluctuations and smooth curve constantly, other indicators take on wide fluctuation ranges. It can be seen from the data trends in Graph 52, 53, 54 and 56 that Zhiyinyuan experiences violent fluctuations in the water quality indicators, with maximum mean mostly appearing at 7:00 and 20:00 and other peak points at 12:00 and 15:00. In addition, except for the COD and TP curves, which are smooth, the indicators in the mean value curve, namely COD, NH_3-N, TN and TP don't present any linear relationship.

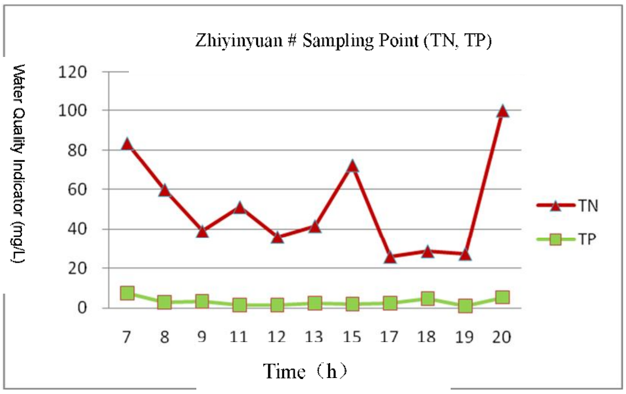




55.Rich Garden sampling point water quality indicator mean value curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time





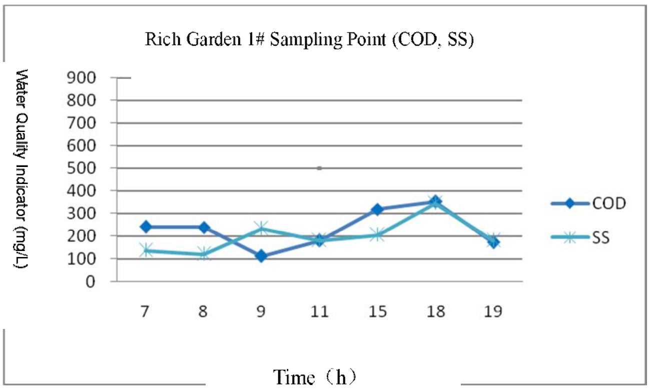
Graph 56.Zhiyinyuan sampling point water quality indicator mean value curve

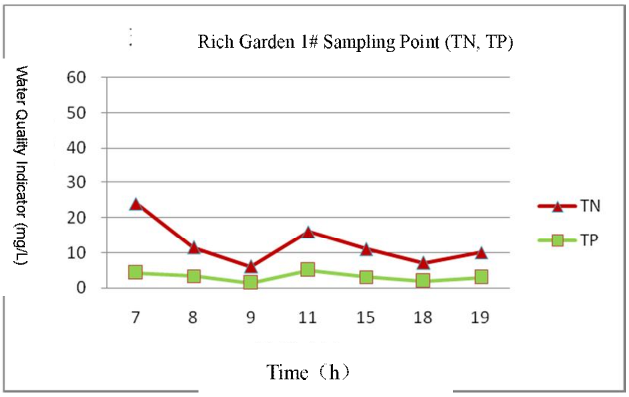
Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.7 Water quality indicators in July

4.7.1 Waste water testing indicators of Rich Garden

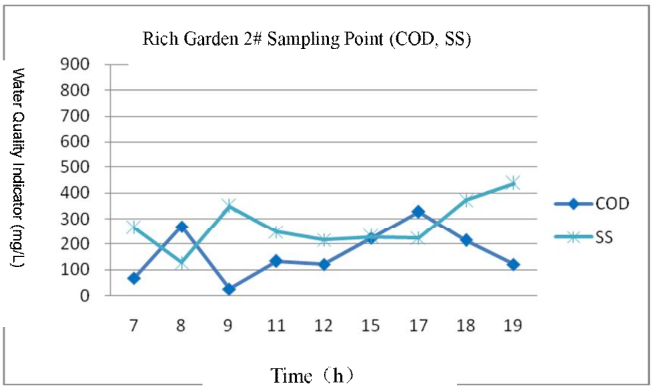
After sampling continuously at the relevant sampling points of Rich Garden, we drew curve graphs on the common indicators including COD, SS, NH3-N, TN and TP as follows.

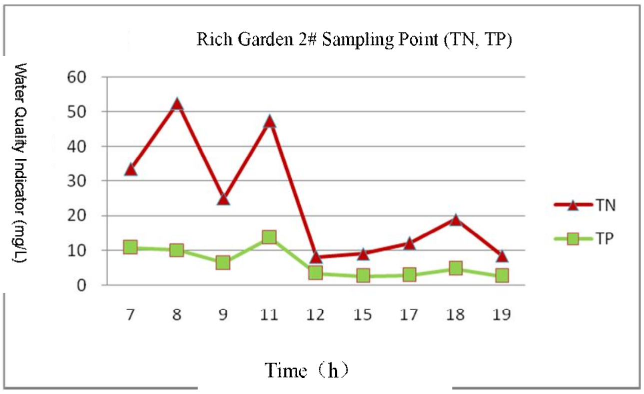




Graph 57.Rich Garden 1# sampling point water quality indicators curve

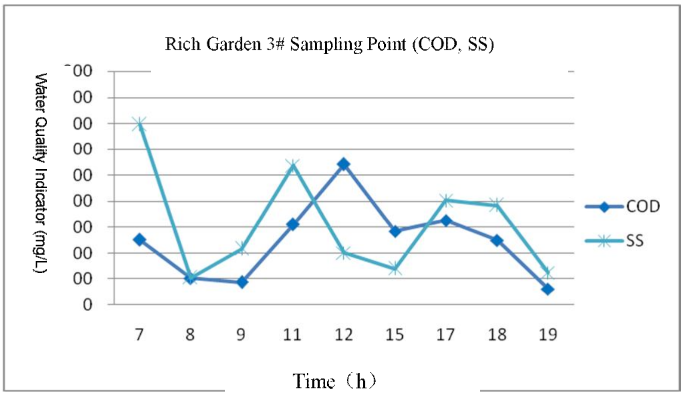
Vertical Axis: Water Quality Indicator (mg/L)   Horizontal Axis: Time

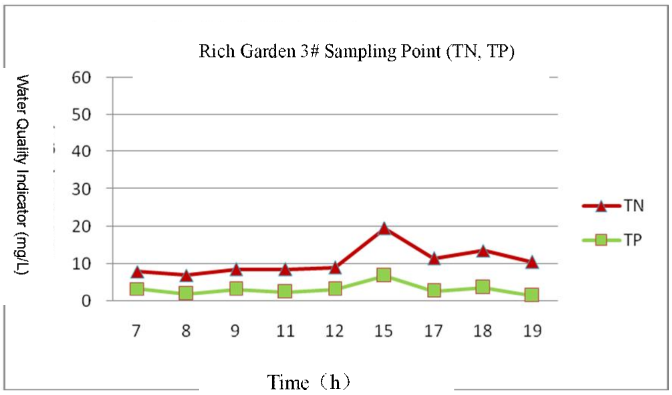




Graph 58.Rich Garden 2# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time



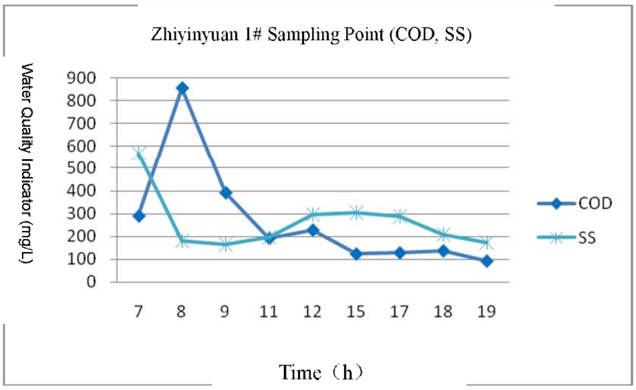


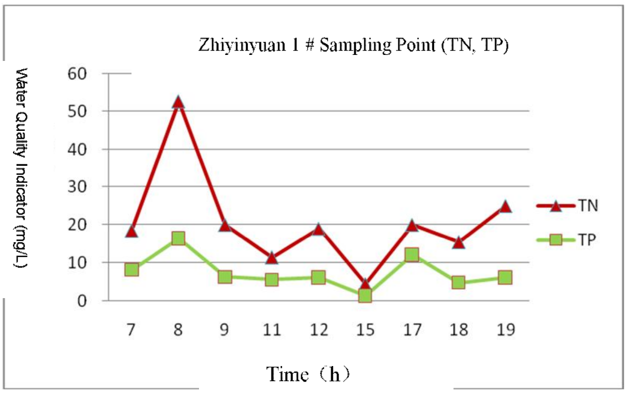
Graph 59.Rich Garden 3# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.7.2 Waste water testing indicators of Zhiyinyuan

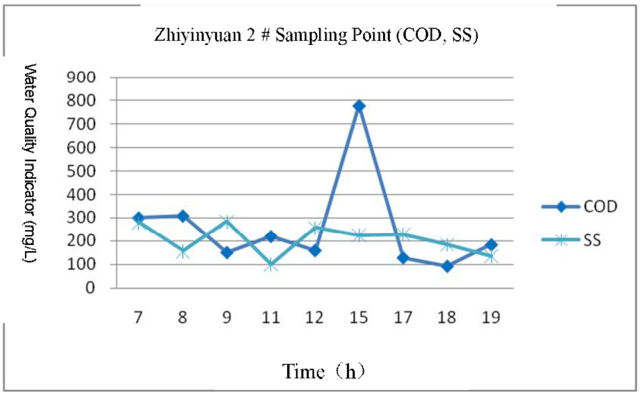
After sampling continuously at the relevant sampling points of Zhiyinyuan, we drew curve graphs on the common indicators including COD, SS, NH3-N, TN and TP as follows.

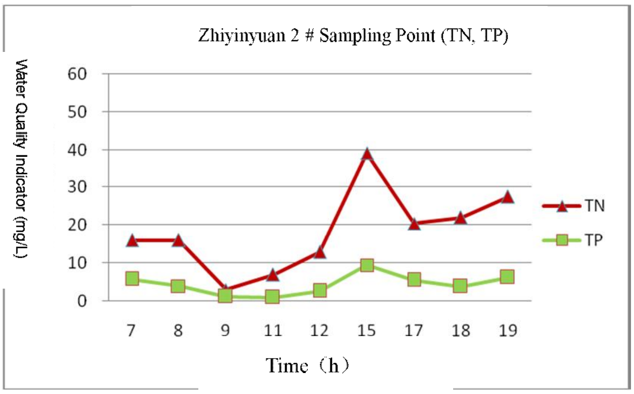




Graph 60.Zhiyinyuan 1# sampling point water quality indicators curve

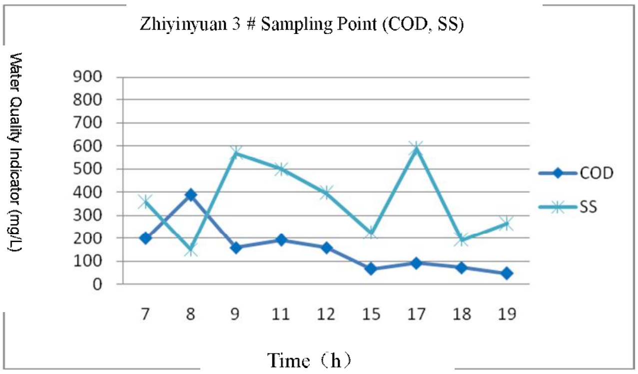
Vertical Axis: Water Quality Indicator (mg/L)　　Horizontal Axis: Time

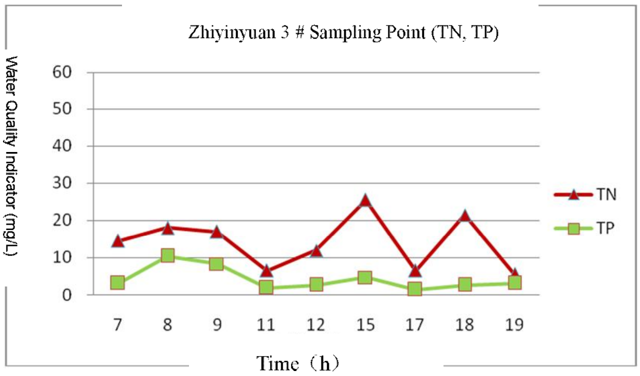




Graph 61.Zhiyinyuan 2# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time





Graph 62.Zhiyinyuan 3# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.7.3 Discussion on the water quality testing results

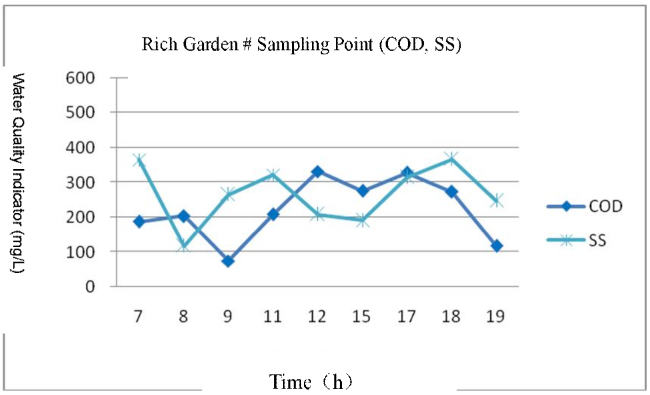
After comprehensive analysis of the testing results, it is found that except for COD, Zhiyinyuan beats Rich Garden in all of the other indicators, with the mean value of relevant indicators at 14.5 mg/L, 17.7 mg/L, 5.4 mg/L and 268 mg/L respectively.

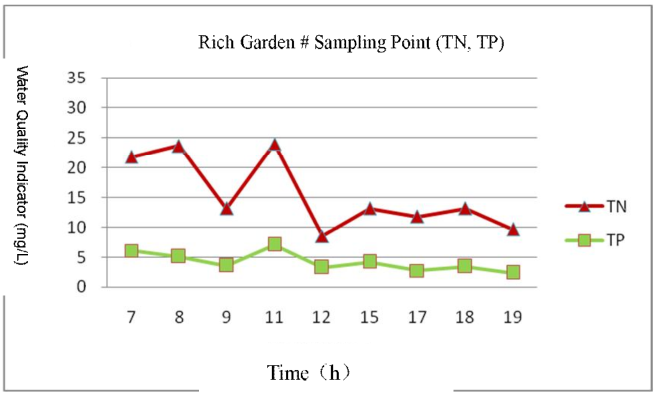
Graph 57-62 shows the water quality indicators of both Rich Garden and Zhiyinyuan are not correlated and the trends are not steady. Thus, it can be determined that the water quality experiences severe fluctuations.

As is shown in Graph 57, 58 and 59, at relevant sampling points in Rich Garden, most water quality indicators reaches it's peak at 11:00 and 17:00-18:00 and the mean value of COD, NH_3-N, TN, TP and SS stand at 228 mg/L, 14.2 mg/L, 15.6 mg/L, 4.2 mg/L and 238 mg/L respectively. After comprehensive analysis of the water quality conditions of the three sampling points, we get the results as shown in Graph 63.

As is seen in Graph 60, 61 and 62, at the sampling points in Zhiyinyuan, most water quality indicators reaches it's peak at 8:00 and 15:00 and the mean value of COD, NH3-N, TN, TP and SS stand at 227 mg/L, 14.5 mg/L, 17.7 mg/L, 5.4 mg/L and 268 mg/L respectively. After comprehensive analysis of the water quality conditions of the three sampling points, we get the results as shown in Graph 64.

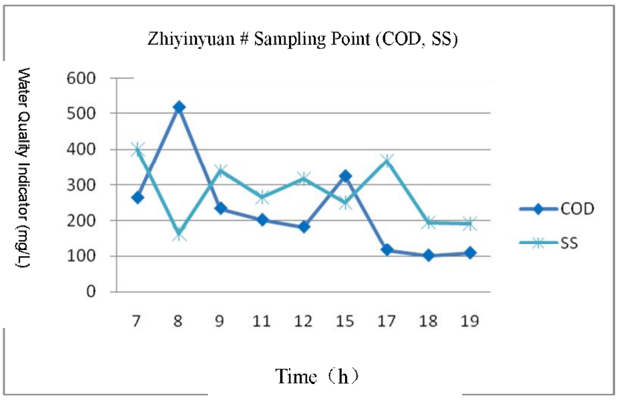
As is shown in the data trends in Graph 57, 58, 59 and 63, most water indicators of Rich Garden reaches it's peak at 17:00-18:00, the indicators of 1# and 2# sampling points take on slight fluctuations and smooth curves while #3 sampling point shows wide fluctuation range in the mean value curve. It can be seen from the data trends in Graph 60, 61, 62 and 64 that Zhiyinyuan experiences violent fluctuations in the water quality indicators, with the mean maximum mostly appearing at 8:00. Besides, the indicators in the mean value curve, namely COD, NH_3-N, TN and TP don't present any linear relationship.

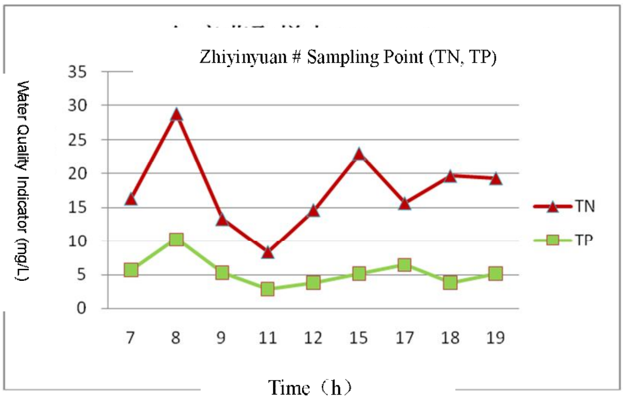




Graph 63.Rich Garden sampling point water quality indicator mean value curve

Vertical Axis: Water Quality Indicator (mg/L)   Horizontal Axis: Time





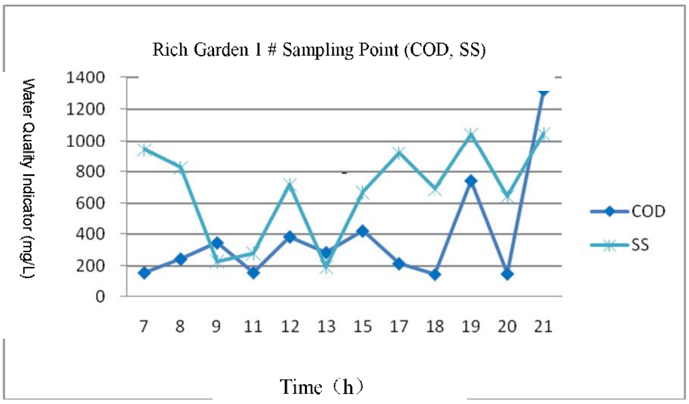
Graph 64.Zhiyinyuan sampling point water quality indicator mean value curve

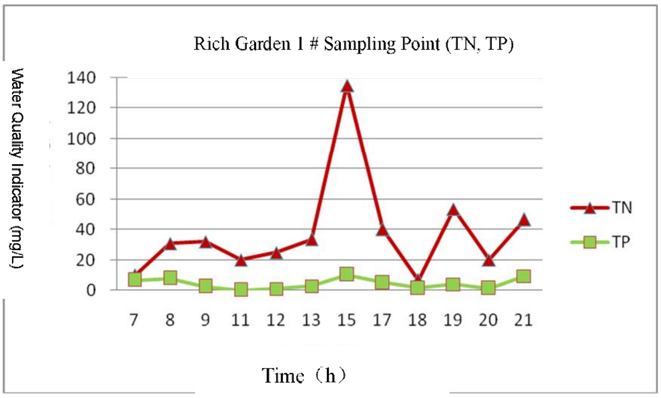
Vertical Axis: Water Quality Indicator (mg/L)   Horizontal Axis: Time

4.8 Water quality indicators in August

4.8.1 Waste water testing indicators of Rich Garden

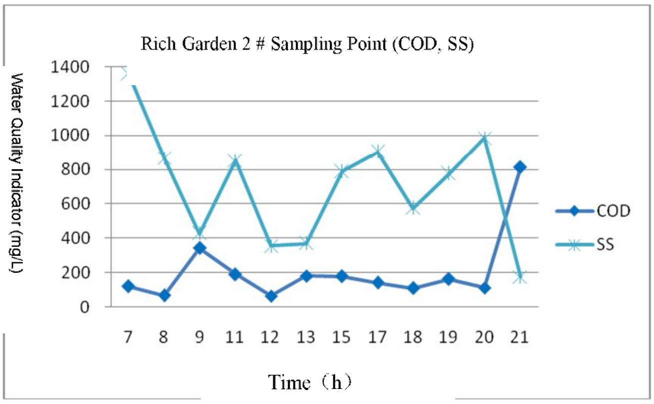
After sampling continuously at the relevant sampling points of Rich Garden, we drew curve graphs on the common indicators including COD, SS, NH3-N, TN and TP as follows.

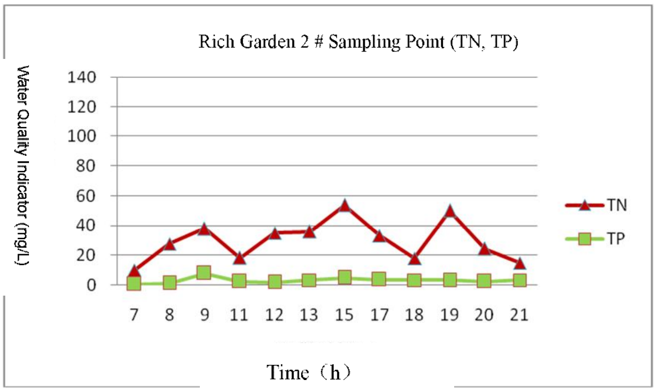




Graph 65.Rich Garden 1# sampling point water quality indicators curve

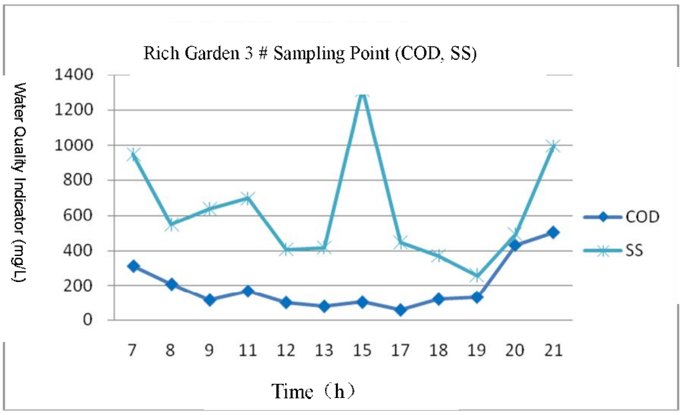
Vertical Axis: Water Quality Indicator (mg/L)   Horizontal Axis: Time

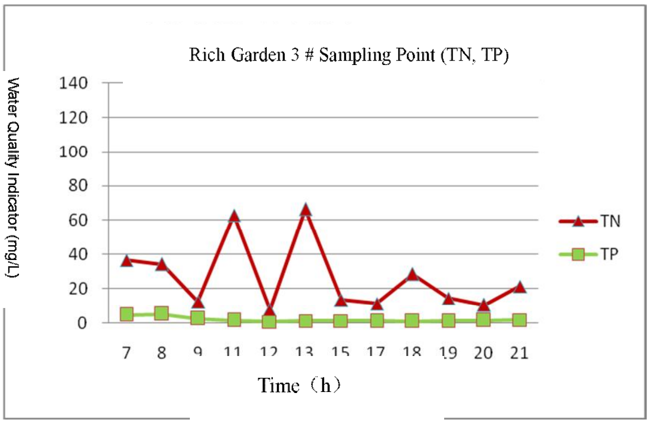




Graph 66.Rich Garden 2# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time



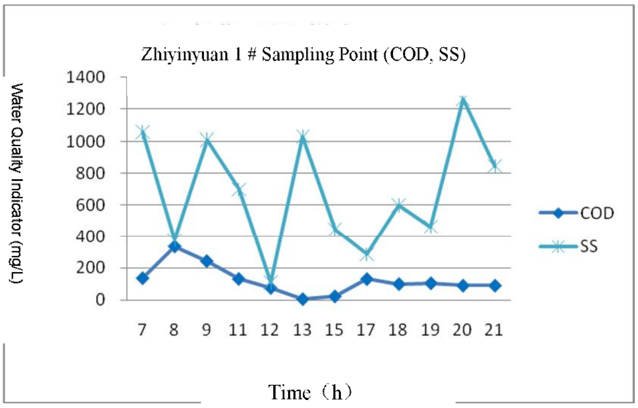


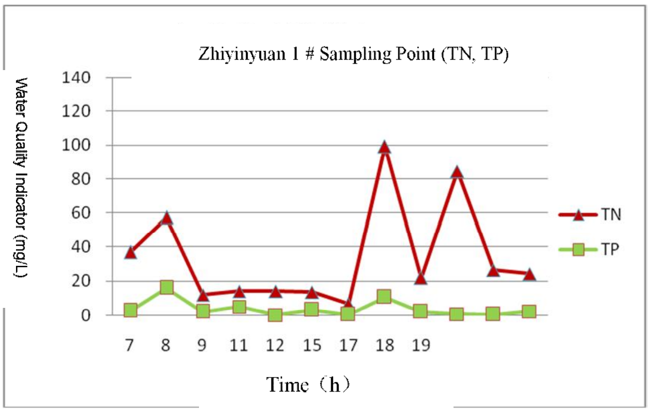
Graph 67.Rich Garden 3# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.8.2 Waste water testing indicators of Zhiyinyuan

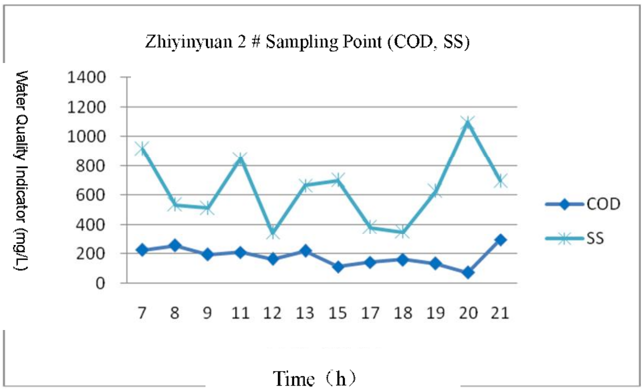
After sampling continuously at the relevant sampling points of Zhiyinyuan, we drew curve graphs on the common indicators including COD, SS, NH3-N, TN and TP as follows.

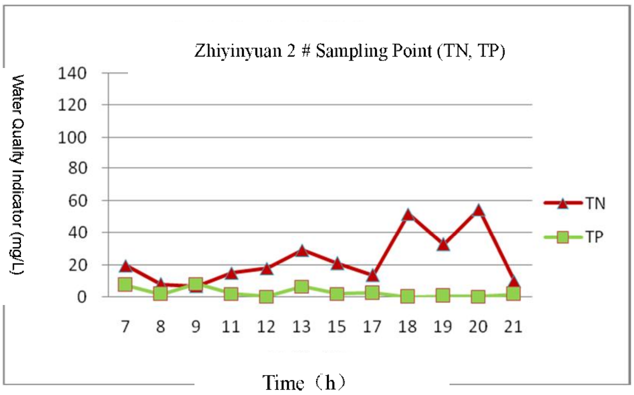




Graph 68.Zhiyinyuan 1# sampling point water quality indicators curve

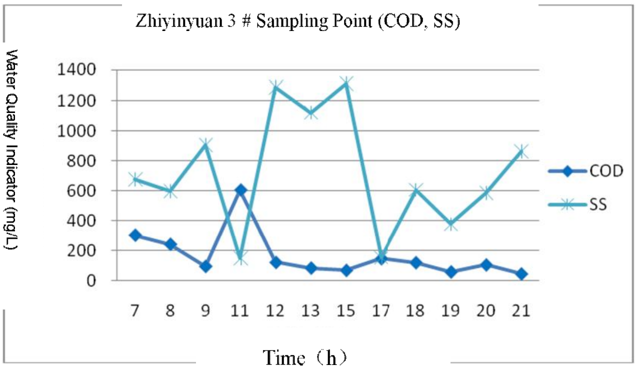
Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

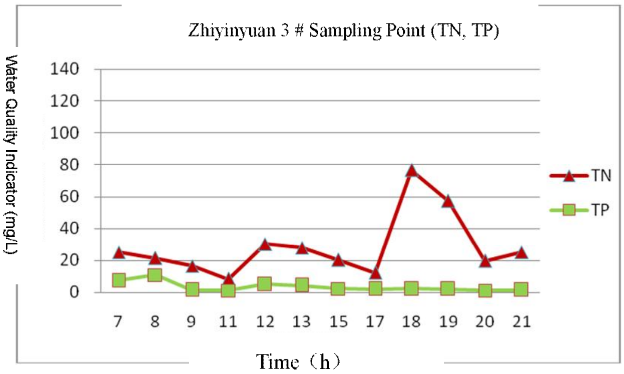




Graph 69.Zhiyinyuan 2# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time





Graph 70.Zhiyinyuan 3# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.8.3 Discussion on the water quality testing results

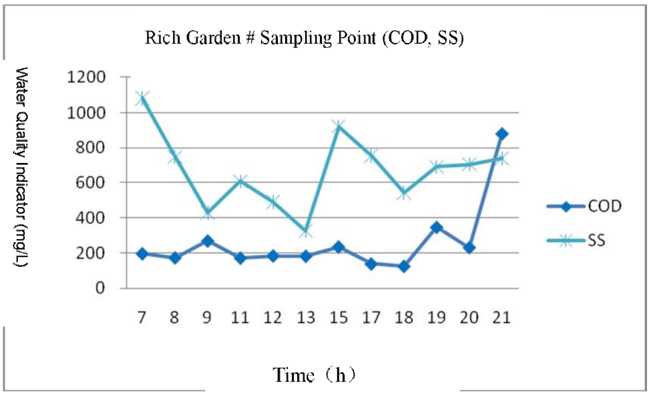
After comprehensive analysis of the testing results, it is found that except for TP, Rich Garden beats Zhiyinyuan in all of the other indicators, with the mean value of relevant indicators at 260 mg/L, 24.7 mg/L, 31.5 mg/L and 670 mg/L respectively.

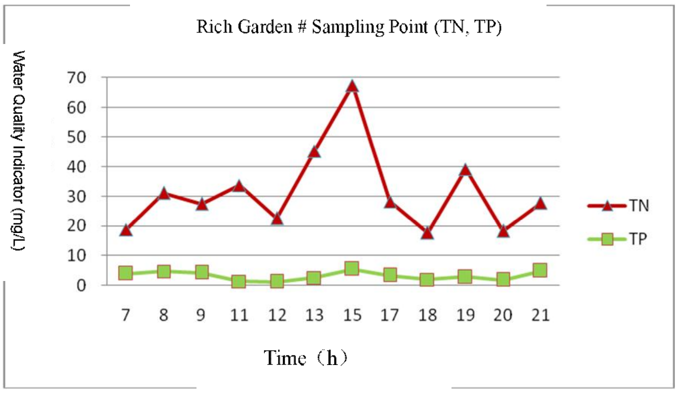
Graph 65-70 shows the water quality indicators of both Rich Garden and Zhiyinyuan are not correlated and the trends are not steady. Thus, it can be determined that the water quality experiences severe fluctuations.

As is shown in Graph 65, 66 and 67, at relevant sampling points in Rich Garden, most water quality indicators reaches it's peak at 21:00 and 13:00-15:00 and the mean value of COD, NH3-N, TN, TP and SS stand at 260 mg/L, 24.7 mg/L, 31.5 mg/L, 3.2 mg/L and 670 mg/L respectively. After comprehensive analysis of the water quality conditions of the three sampling points, we get the results as shown in Graph 71.

As is seen in Graph 68, 69 and 70, at the sampling points in Zhiyinyuan, most water quality indicators reach peak at discrete times and the mean value of COD, NH3-N, TN, TP and SS stand at 147 mg/L, 16.5 mg/L, 17.7 mg/L, 5.8 mg/L and 268 mg/L respectively. After comprehensive analysis of the water quality conditions of the 3 sampling points, we get the results shown in Graph 72.

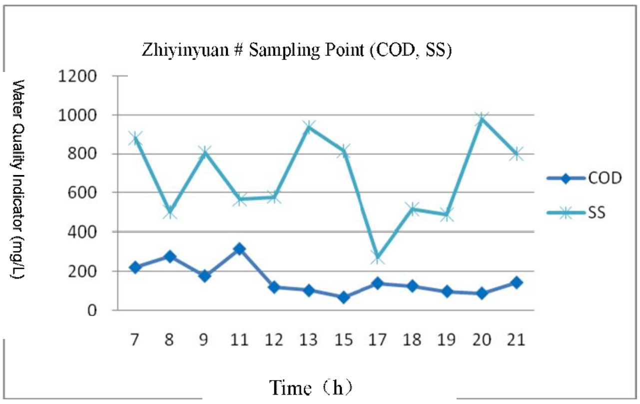
As is shown in the data trends in Graph 65, 66, 67 and 71, the water indicators of Rich Garden are not steady and take on violent fluctuations; between the indicators, only TN and TP remain certain steadiness. It can be seen from the data trends in Graph 68, 60, 70 and 72 that Zhiyinyuan experiences violent fluctuations in the water quality indicators, with maximum mean mostly appearing at 18:00 and 20:00. Besides, the indicators in the mean value curve, namely COD, NH_3-N, TN and TP don't present any linear relationship.

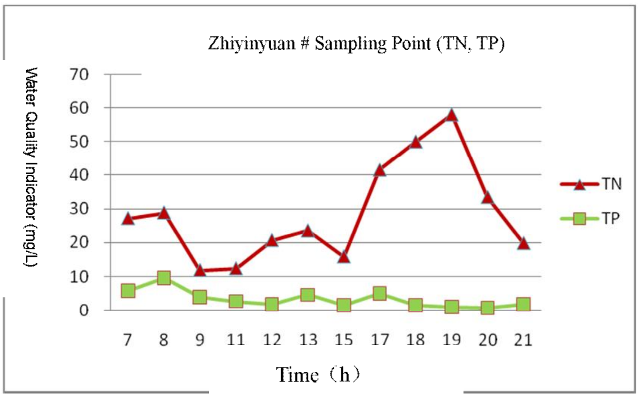




Graph 71.Rich Garden sampling point water quality indicator mean value curve

Vertical Axis: Water Quality Indicator (mg/L)   Horizontal Axis: Time





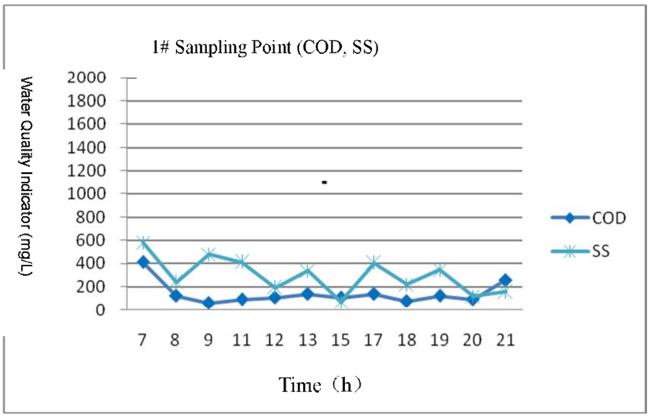
Graph 72.Zhiyinyuan sampling point water quality indicator mean value curve

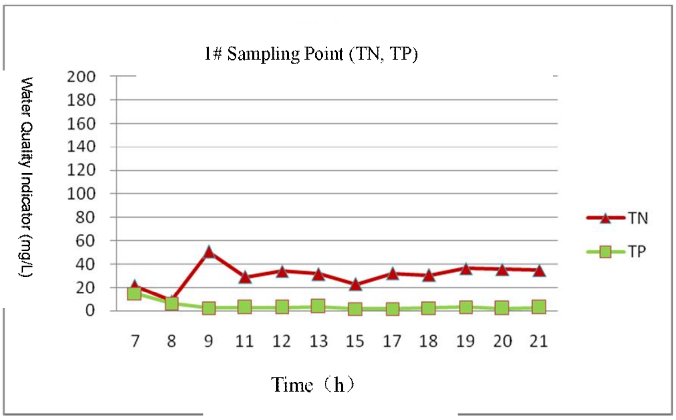
Vertical Axis: Water Quality Indicator (mg/L)   Horizontal Axis: Time

4.9 Water quality indicators in September

Given that the previous samples were taken every other month, their continuity was not completely guaranteed. To make contrast with the previous testing results, we selected 2 sampling points (Building 33 and 36 of Rich Garden) and sampled continuously for the tests and drew curve graphs on the common indicators including COD, SS, NH_3-N, TN and TP as follows.

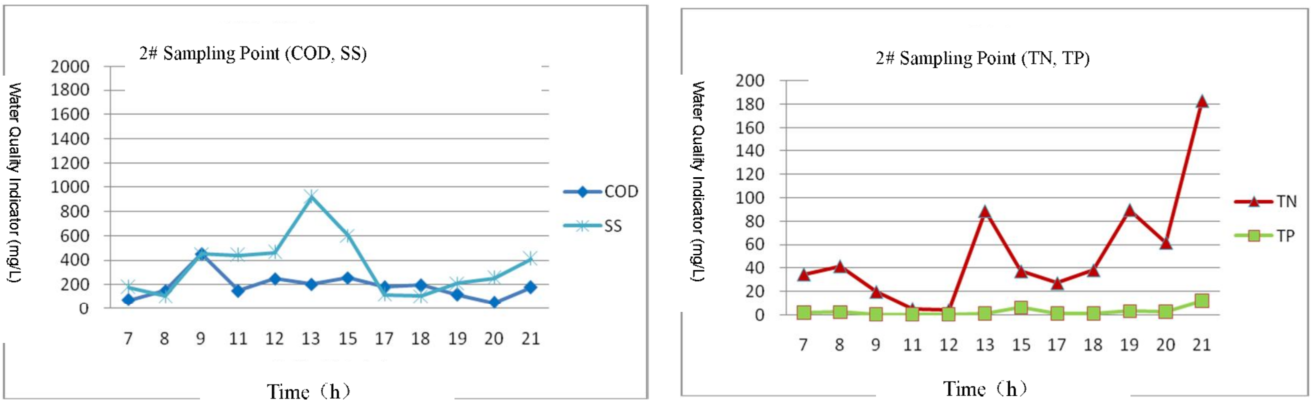
4.9.1 1st-time waste water testing indicators





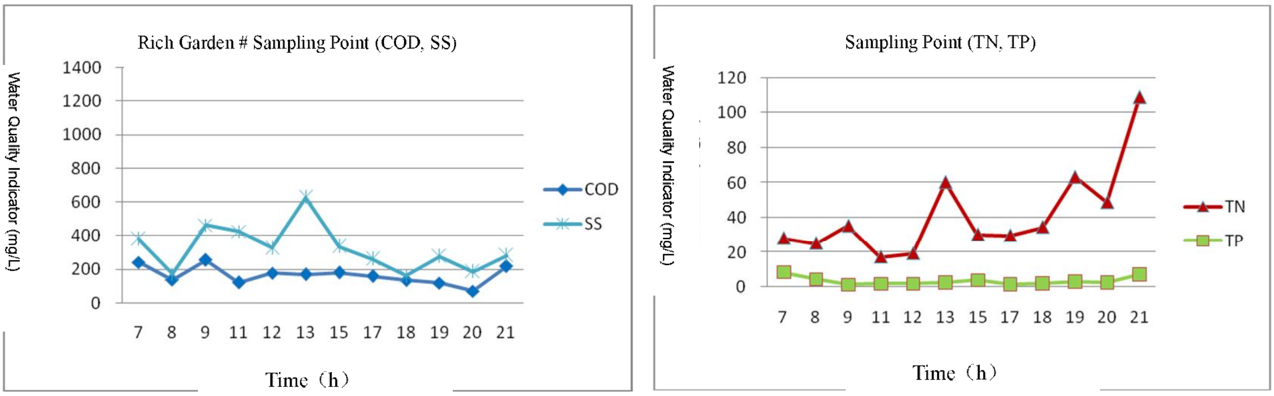
Graph 73. 1# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time



Graph 74. 2# sampling point water quality indicators curve

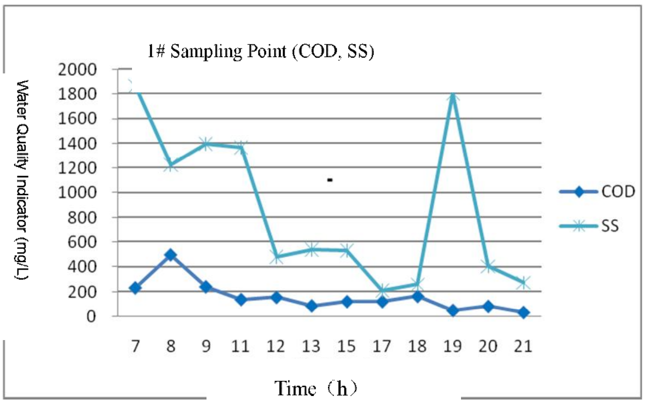
Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

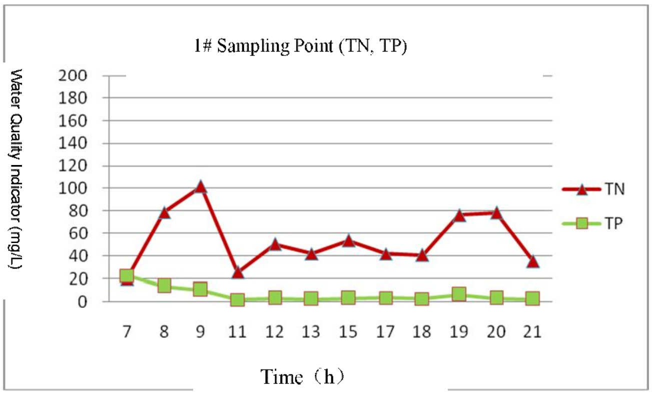


Graph 75. water quality indicator mean value curve

Vertical Axis: Water Quality Indicator (mg/L)   Horizontal Axis: Time

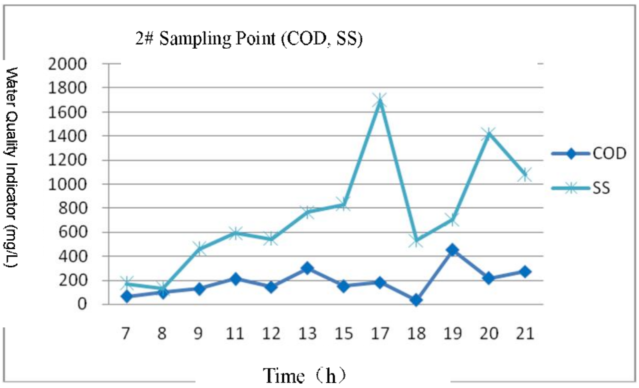
4.9.2 2nd-time waste water testing indicators

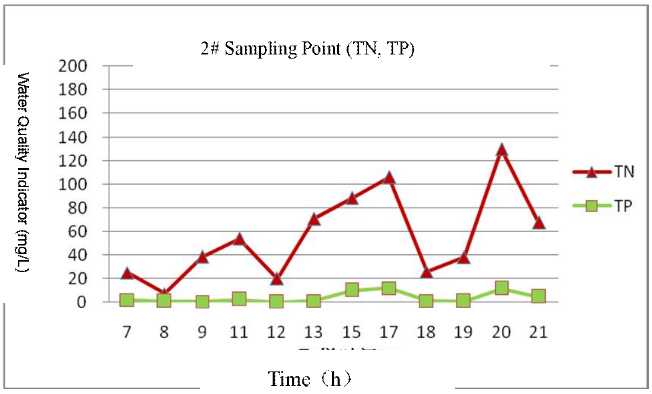




Graph 76. 1# sampling point water quality indicators curve

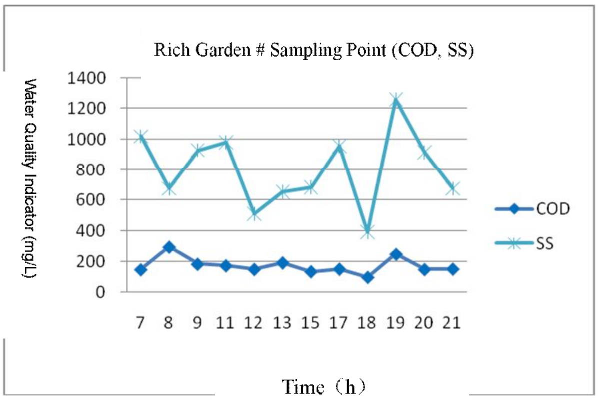
Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

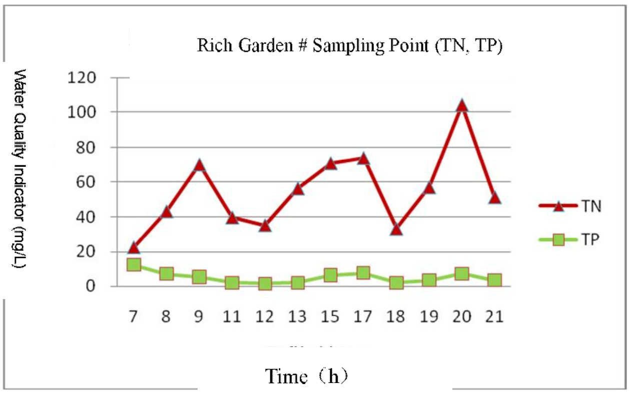




Graph 77. 2# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time



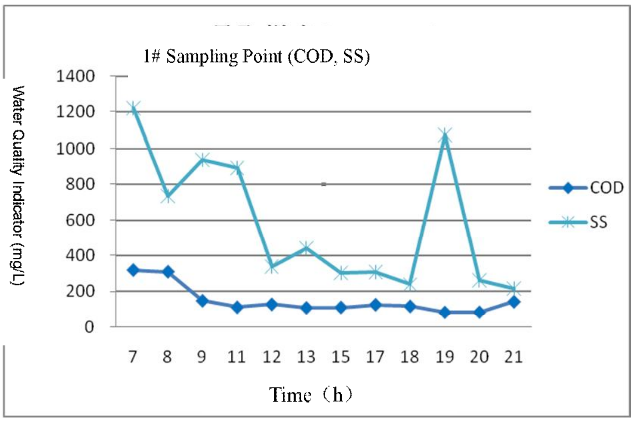


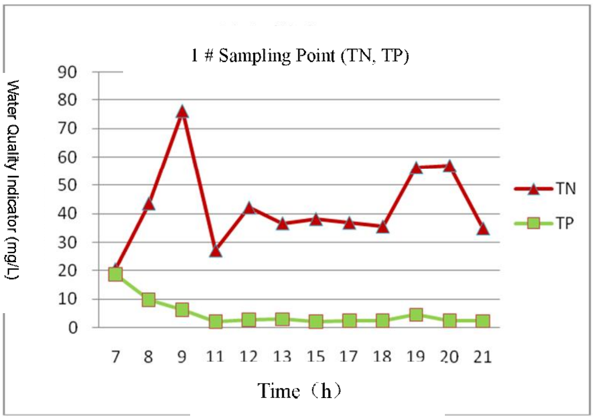
Graph 78.第二次取样 water quality indicator mean value curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.9.3 Wastewater quality indicators

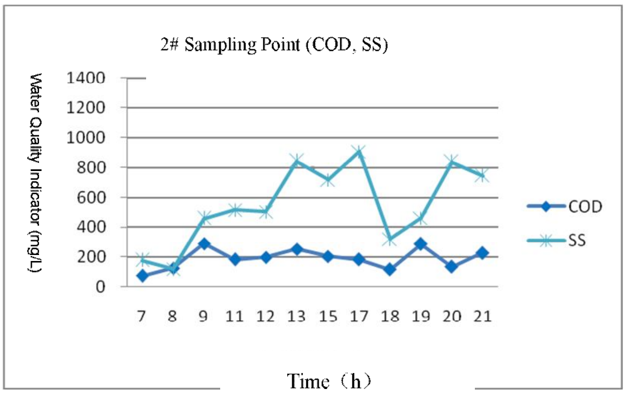
After comprehensive analysis of the concentration of primary pollutants in the samples, we get the results as shown in Graph 79 and 80.

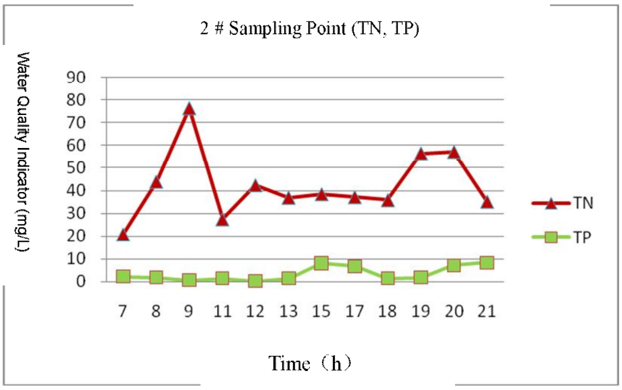




Graph 79. 1# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time





Graph 80. 2# sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

4.9.4 Discussion on the water quality testing results

The testing results suggests that except for TP and SS, all other indicators of #1 sampling point are lower than #2 sampling point and their mean value stand at 151 mg/L, 25. 9 mg/L and 42.2 mg/L respectively.

Graph 73-80 shows the water quality indicators of both #1 sampling point and #2 sampling point are not correlated and the trends are not steady. Thus, it can be determined that the water quality experiences severe fluctuations.

As is shown in Graph 73, 76 and 79, most water quality indicators of #1 sampling point reaches it's peak at 7:00-9:00 and the mean value of COD, NH3-N, TN, TP and SS stand at 151 mg/L, 25.9 mg/L, 42.2 mg/L, 5.0 mg/L and

580 mg/L respectively. As is shown in Graph 74, 77 and 80, most water quality indicators of #2 sampling point reaches it's peak at the time range of 20:00-21:00 and the mean value of COD, NH3-N, TN, TP and SS stand at 189 mg/L, 34.0 mg/L, 54.4 mg/L, 3.4 mg/L and 550 mg/L respectively.

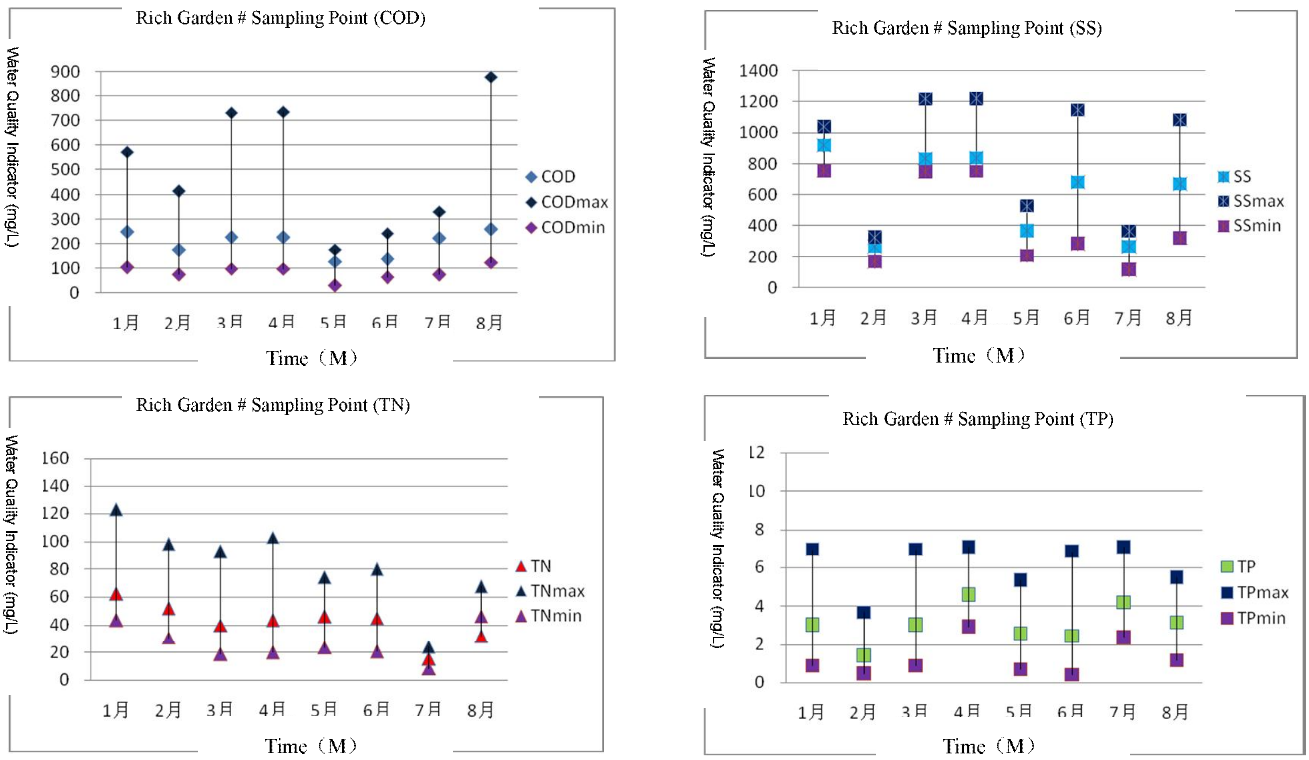
As is seen from the data trends in Graph 73, 76 and 79 except for COD and TP, #1 sampling point experiences violent fluctuations in all of the other indicators; as is seen from the data trends in Graph 74, 77 and 80, #2 sampling point experiences the most violent fluctuations in SS and TN, other indicators remain relatively stable and the mean value curve doesn't show any linear relation between COD, NH_3-N, TN and TP.

4.10 Analysis of the testing results

After comparison and analysis of the testing results of the primary pollutant concentration in the monthly samples taken at the pilot communities and the relevant curve graphs, it is found that since January both Rich Garden and Zhiyinyuan have experienced fluctuations in the water quality indicators. To better analyze the changing trends, we conducted comprehensive treatment to the water quality indicators from January to August.

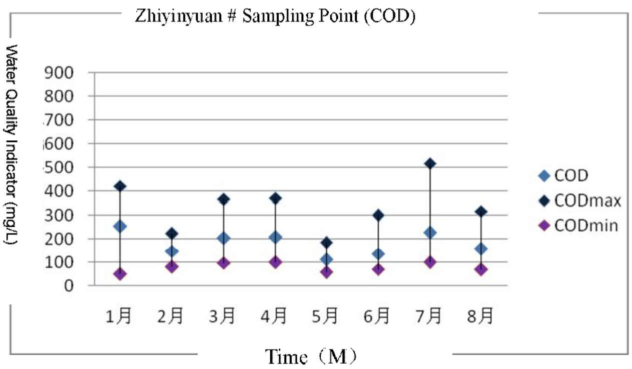
4.10.1 Wastewater testing indicators

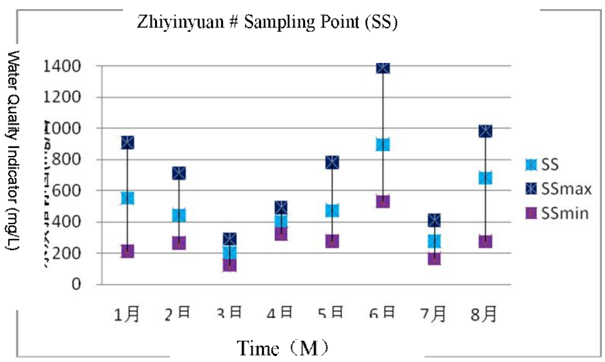
We took samples continuously at the pilot communities for 8 months and determined the concentration of regular pollutants including COD, SS, TN, TP. The testing results of the main indicators which vary with time are shown in Graph 81, 82 and 83.

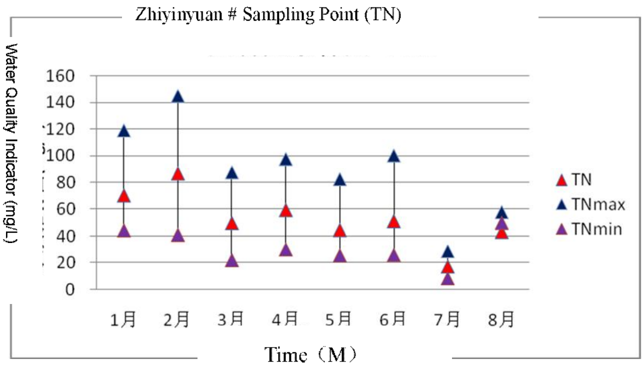


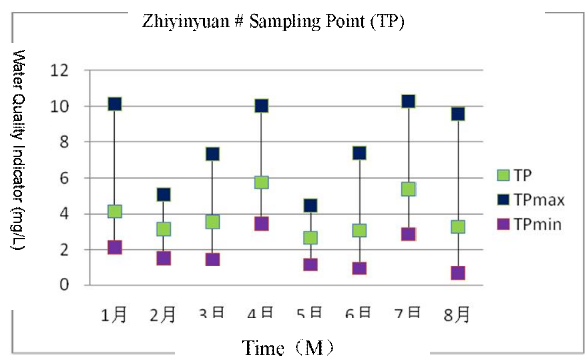
Graph 81. Rich Garden sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L)   Horizontal Axis: Time



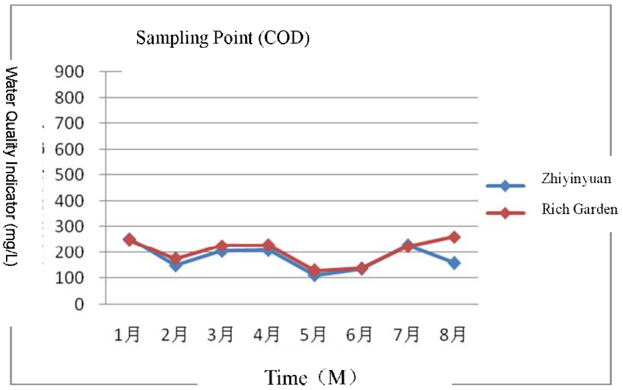


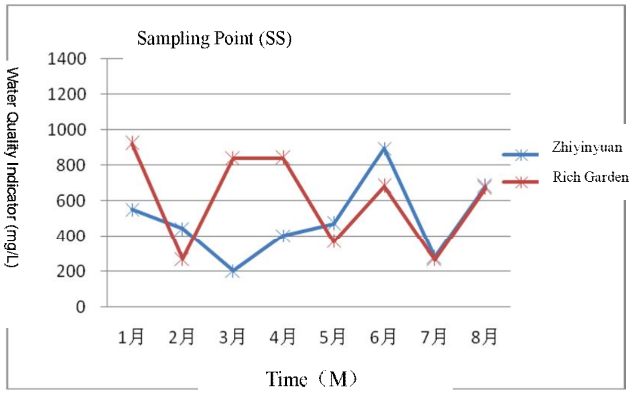




Graph 82.Zhiyinyuan sampling point water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

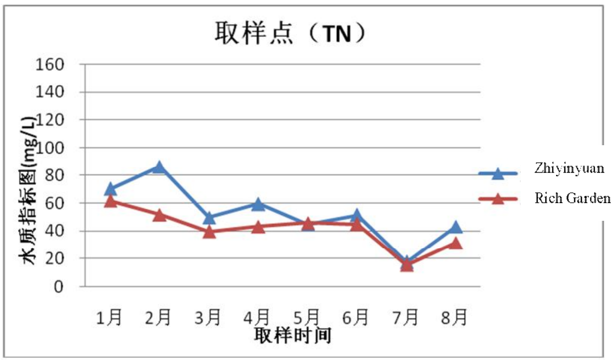


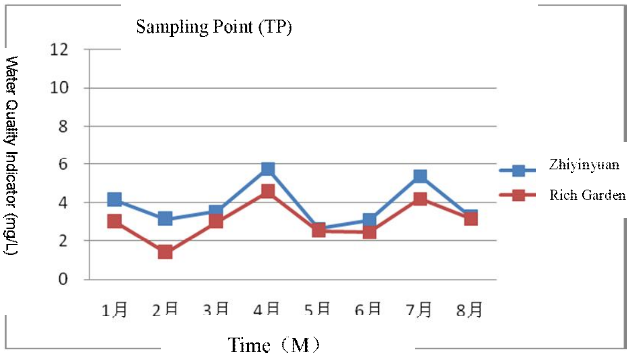


Sampling Point (TN)

Water Quality Indicator (mg/L)

Time（M）





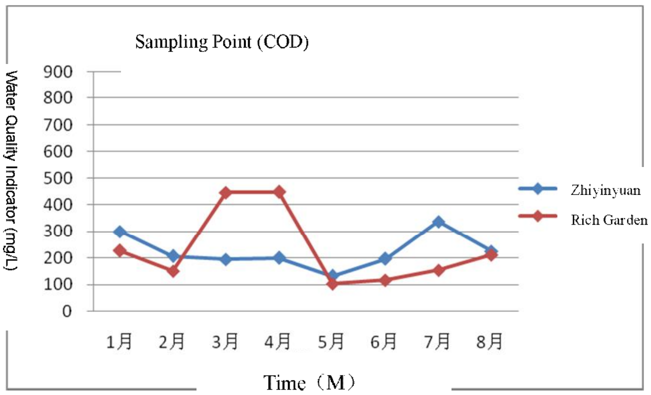
Graph 83. Graph Contrast graphs of water quality indicators of the two communities

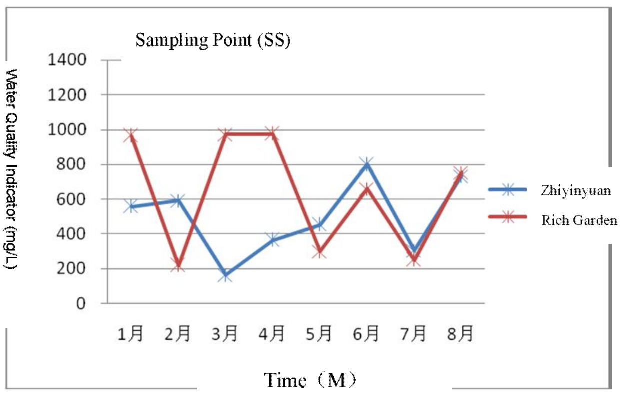
Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

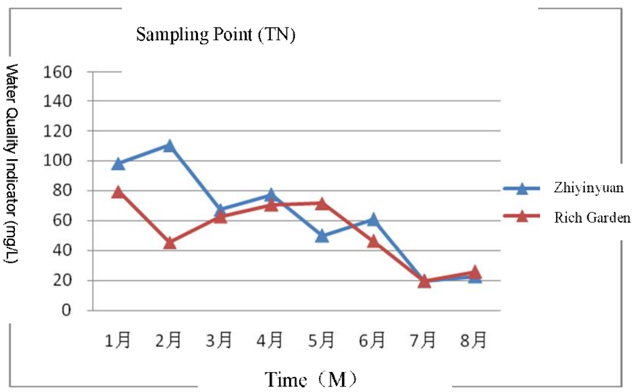
As is seen in Graph 81, 82 and 83, the gap between the mean concentrations of the major pollutants of the pilot communities is not big and the fluctuation range is small; Rich Garden's mean concentration of pollutants is closer to the minimum value, an indication that the pollutant concentration tends to be stable within a small scope; the Zhiyinyuan samples contains higher TN and TP than the Rich Garden samples but Rich Garden is higher in COD and SS values.

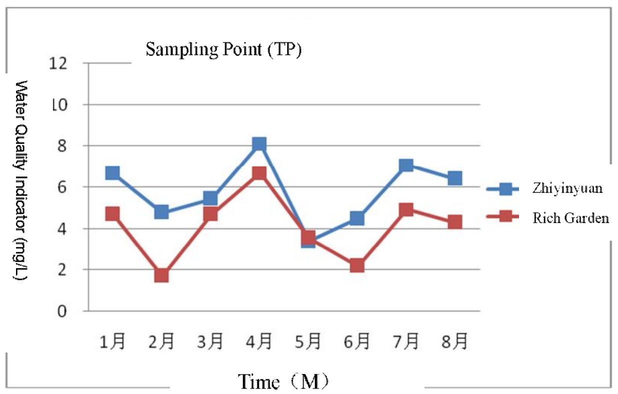
4.10.2 Contrast of water quality indicators in peak periods

The major pollutant indicators of the two pilot communities in different peak periods of water usage including COD, TN, TP and SS are shown in graphs as follows.


Sampling Point (COD)
Water Quality Indicator (mg/L)
0
100
200
300
400
500
600
700
800
900
1月
2月
3月
4月
5月
6月
7月
8月
Time（M）
Zhiyinyuan
Rich Garden

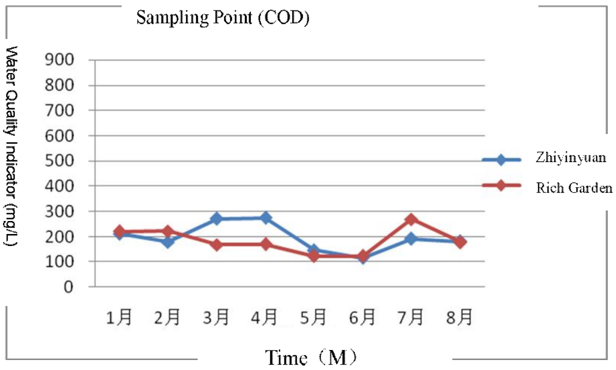

Sampling Point (SS)
Water Quality Indicator (mg/L)
0
200
400
600
800
1000
1200
1400
1月
2月
3月
4月
5月
6月
7月
8月
Time（M）
Zhiyinyuan
Rich Garden

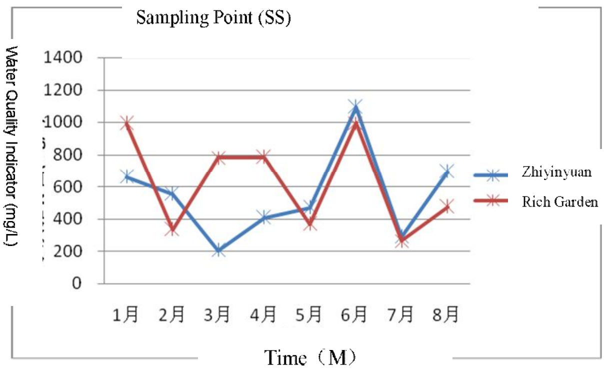

Sampling Point (TN)
Water Quality Indicator (mg/L)
0
20
40
60
80
100
120
140
160
1月
2月
3月
4月
5月
6月
7月
8月
Time（M）
Zhiyinyuan
Rich Garden


Sampling Point (TP)
Water Quality Indicator (mg/L)
0
2
4
6
8
10
12
1月
2月
3月
4月
5月
6月
7月
8月
Time（M）
Zhiyinyuan
Rich Garden

Graph 84. sampling point morning peak water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

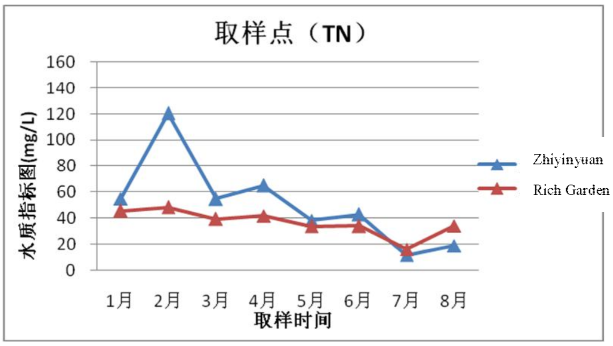


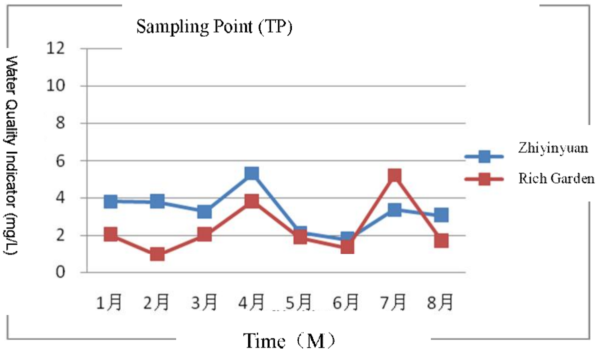


Sampling Point (TN)

Water Quality Indicator (mg/L)

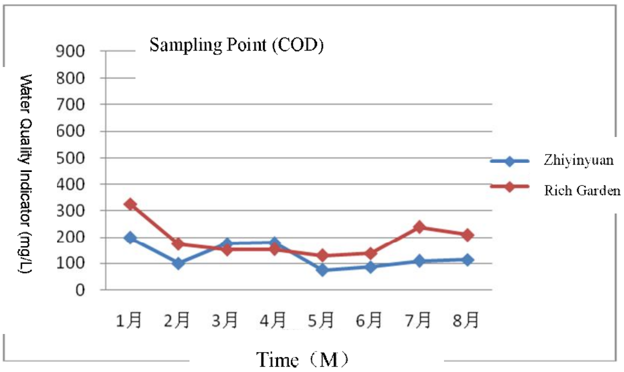
Time（M）

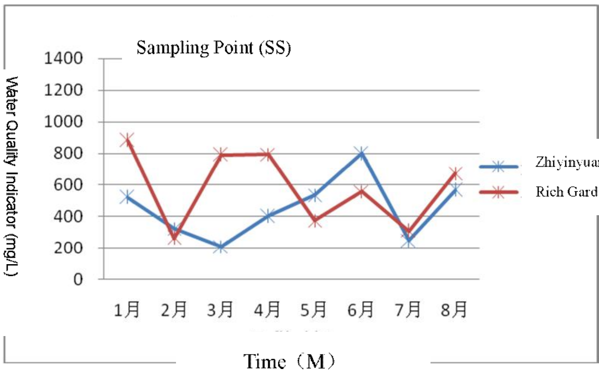


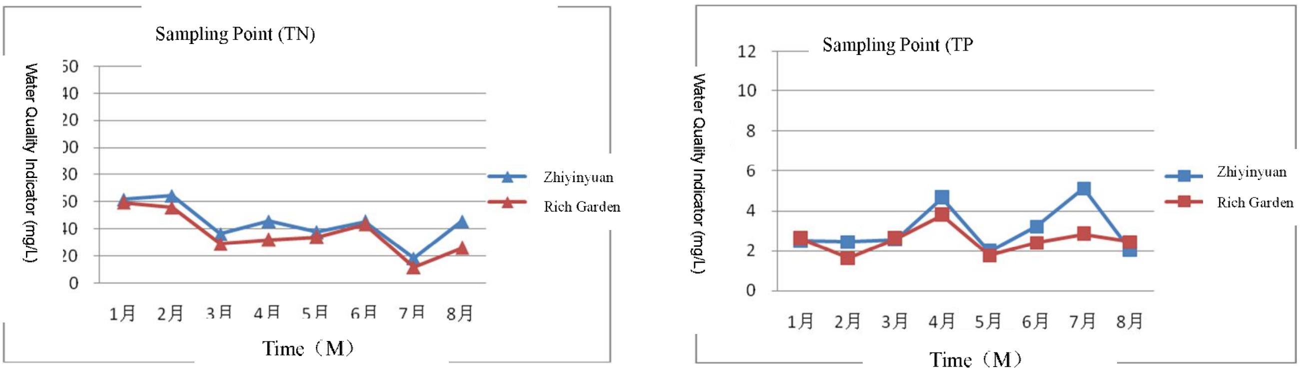


Graph 85. sampling point noon peak water quality indicators curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time







Graph 86. sampling point evening peak water quality indicator mean value curve

Vertical Axis: Water Quality Indicator (mg/L) Horizontal Axis: Time

Domestic sewage and wastewater as research objects, the survey conducted contrast and comparison between the major pollutant concentrations, including COD, SS, TN and TP and performed analysis of the impact that popularization of FWD exerts on the major pollutant concentrations in the domestic sewage and wastewater as is shown in Table 1.

Table 1 residential sewage and wastewater quality (mg/L)

Time (M)	COD			SS			TN			TP		
	Rich Garden	Zhiyinyuan	Increment (%)	Rich Garden	Zhiyinyuan	Increment (%)	Rich Garden	Zhiyinyuan	Increment (%)	Rich Garden	Zhiyinyuan	Increment (%)

1	247	253	-2.09	921	551	67.09	62.1	70.3	-11.64	2.9	4.1	-29.81
2	174	148	17.05	268	442	-39.32	51.8	86.4	-40.07	1.4	3.1	-55.35
3	225	205	10.25	836	201	315.64	39.7	49.9	-20.49	3.0	3.5	-15.68
4	227	208	9.01	839	402	108.92	43.4	59.5	-27.07	4.5	5.8	-20.94
5	128	112	15.01	369	471	-21.69	46.1	44.9	2.72	2.5	2.7	-4.56
6	138	136	0.95	681	895	-23.92	44.9	51.4	-12.64	2.5	3.1	-19.60
7	222	227	-2.32	266	277	-4.07	15.4	17.7	-12.71	4.2	5.4	-21.87
8	260	158	64.90	670	680	-1.45	31.6	43.5	-27.32	3.2	3.2	-2.47
Mean	203	181	12.09	606	490	23.76	41.9	52.9	-20.90	3.0	3.9	-21.70

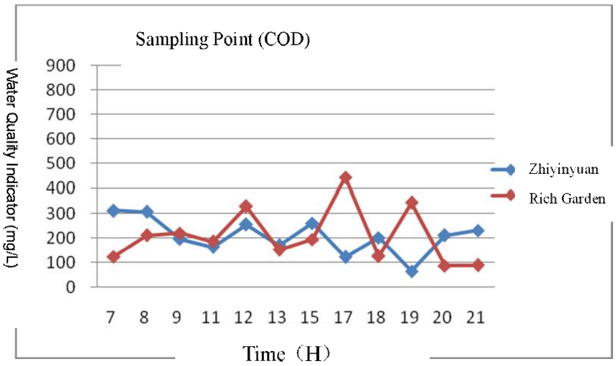
As is seen from the water quality indicators curves of different water usage peak periods; in the evening peaks, Rich Garden has higher COD and SS values than Zhiyinyuan and the fluctuation range is wider. It is also the period when FWD is used the most. However, Zhiyinyuan has higher TN and TP values than Rich Garden. As TN and TP are mainly from bathrooms and other pollutant sources, it indicates that the occupation density of Zhiyinyuan is higher than Rich Garden. As for the morning peaks and noon peaks, given that Rich Garden has more residents engaging in businesses who seldom dine at home, the wastewater quality of Rich garden is lower than Zhiyinyuan.

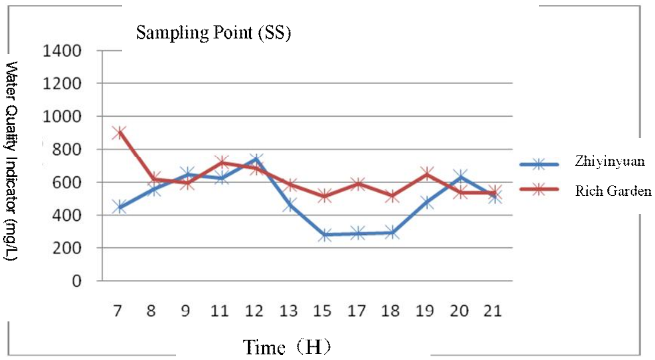
To sum up, FWD-equipped Rich Garden only has higher waste concentrations than Zhiyinyuan during the evening peaks. On a full-day basis, the mean values of COD and SS in Rich Garden's wastewater in winter, spring and summer is 203mg/L and 606mg/L while that of Zhiyinyuan is 181mg/L and 490mg/L. It is, thus, clear that the popularization of FWD increases the COD and SS values in the wastewater by 12% and 24% respectively. However, due to different occupation densities, the TN and TP concentrations of Rich Garden are 20% lower than that of Zhiyinyuan.

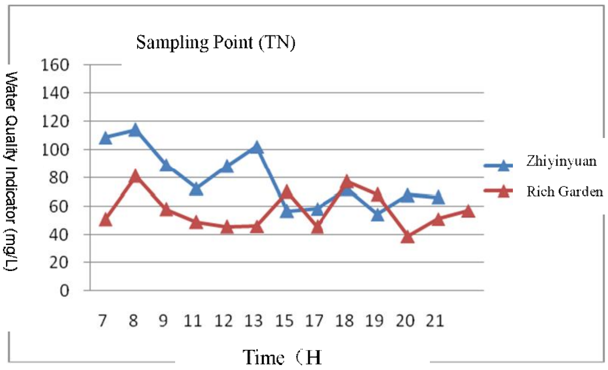
4.10.3 Contrast of water quality indicators by quarter

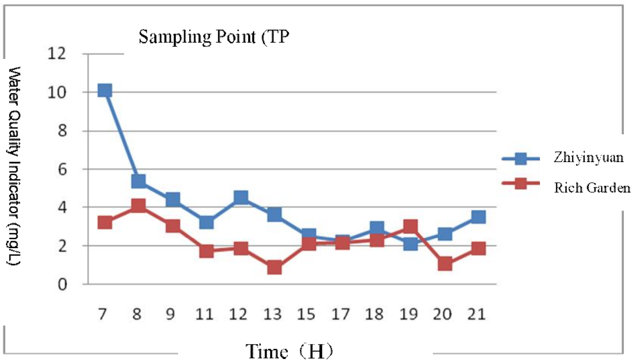
The main pollutant indicators in the domestic wastewater of the two communities including COD, TN, TP and SS are graphed by quarter. Therein, the indicators of January and February are taken as the indicators for winter, the indicators from March to May as the indicators for spring and the months from June to August are discussed as summer indicators.

4.10.3.1 Quarterly water quality indicators per sampling point

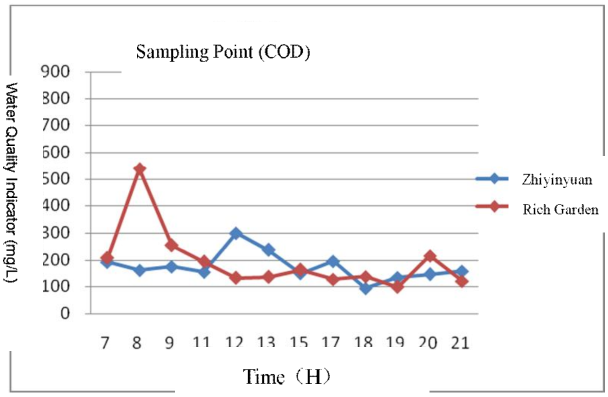


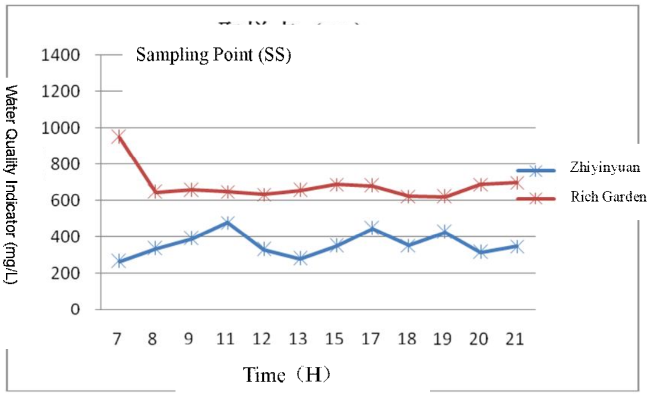


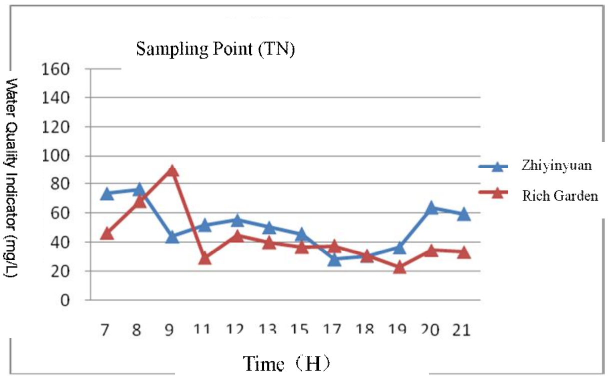


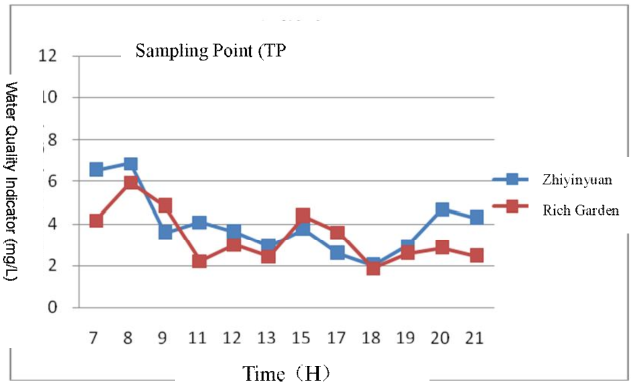


Graph 87. sampling point Winter water quality indicators curve

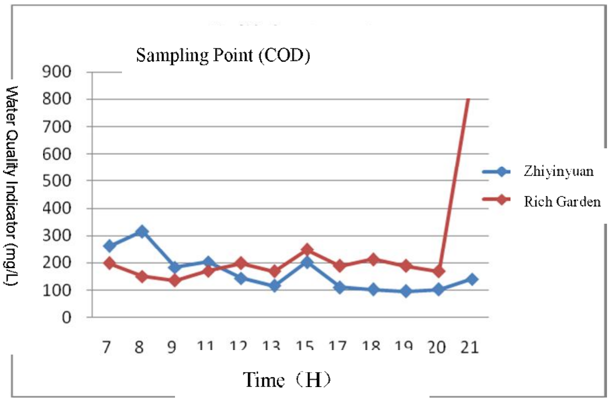


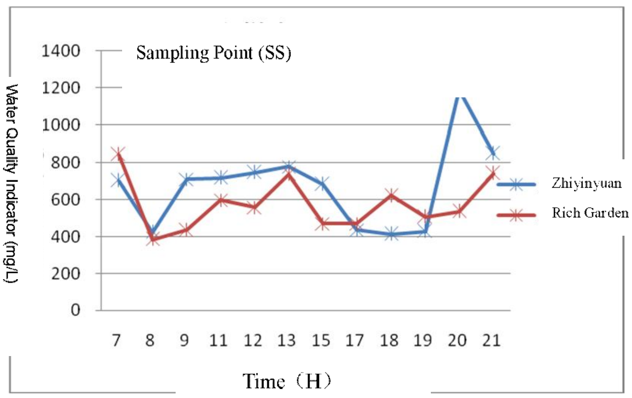


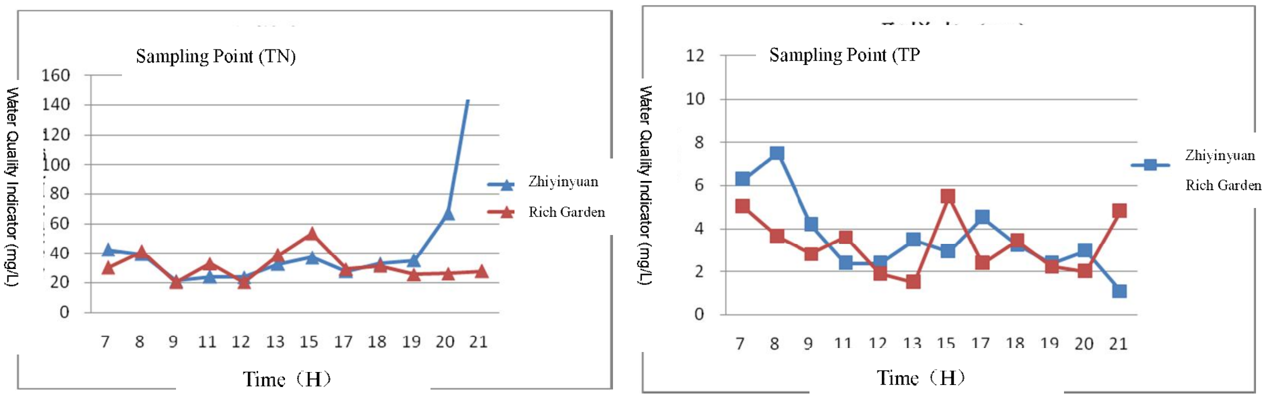




Graph 88. sampling point Spring water quality indicators curve





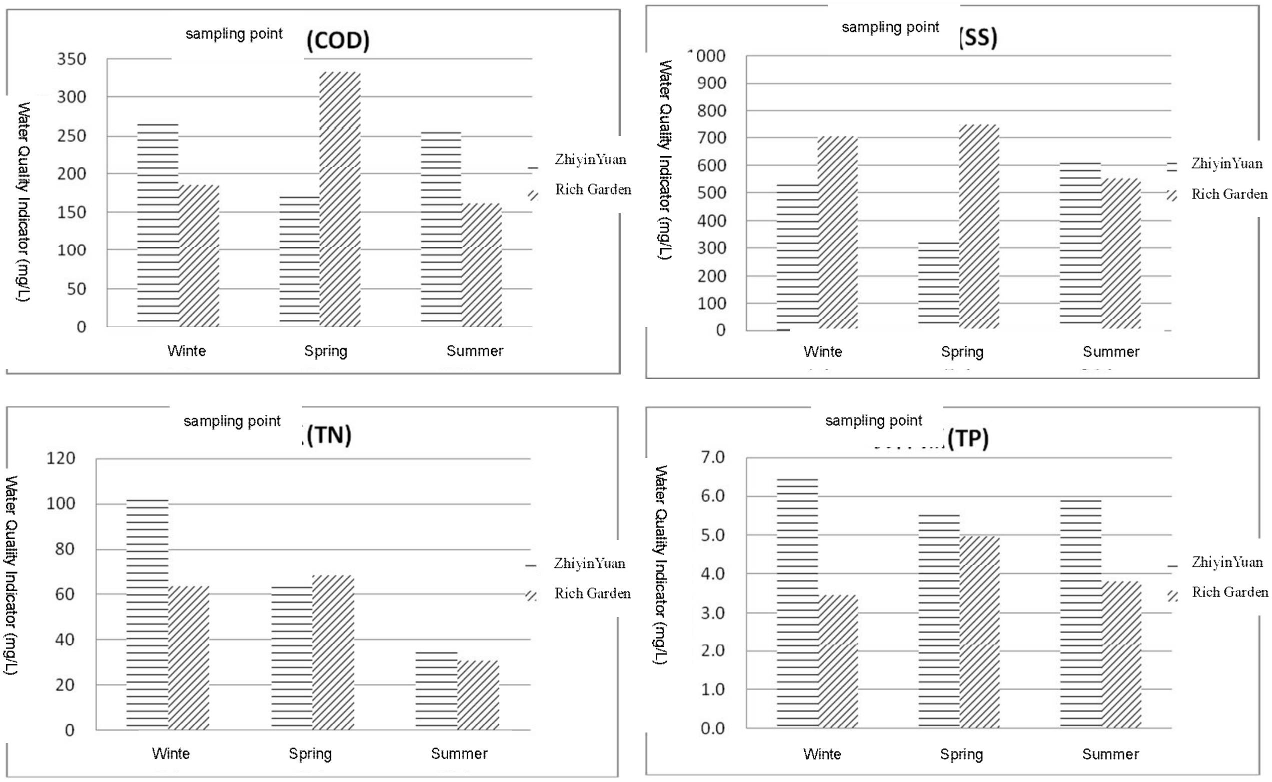


Graph 89. sampling point Summer water quality indicators curve

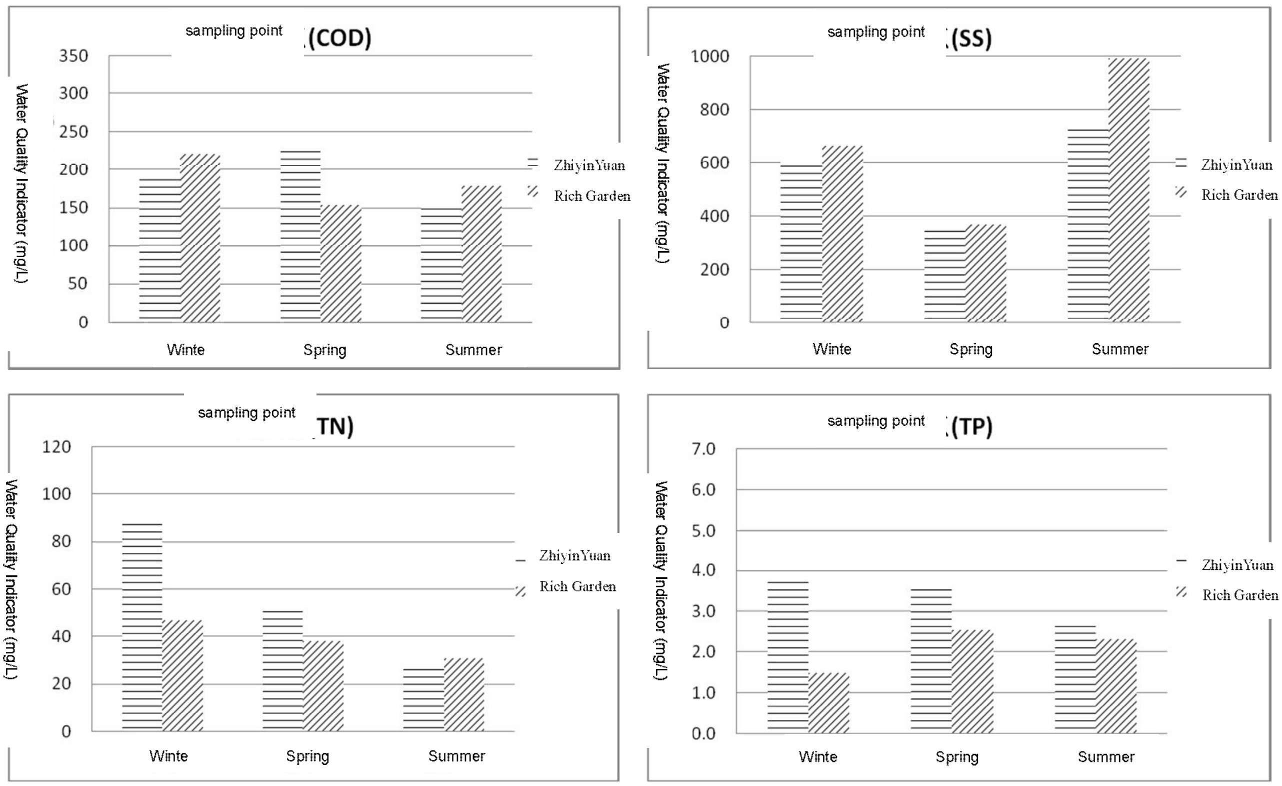
Vertical Axis: Water Quality Indicator (mg/L)   Horizontal Axis: Time

4.10.3.2 Peak-hour water quality indicators per quarter

Quarterly major pollutants indicators of the two communities in different water usage peaks including COD, TN, TP and SS, are graphed as follows:

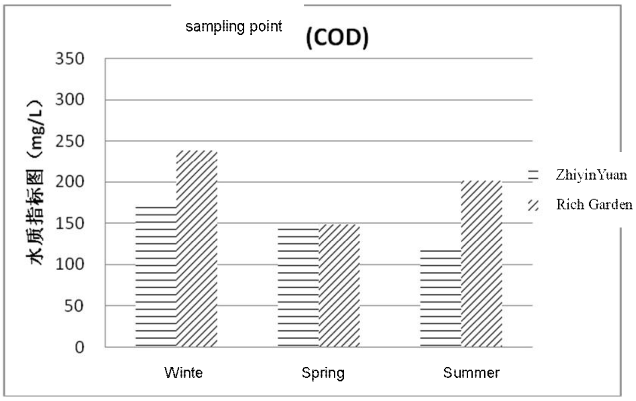


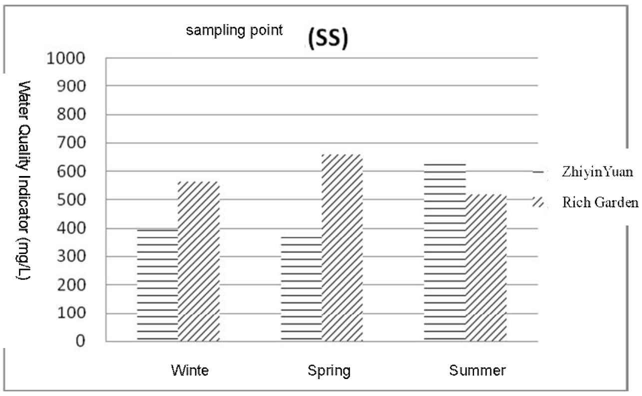
Graph 90. sampling point morning peak water quality indicators curve

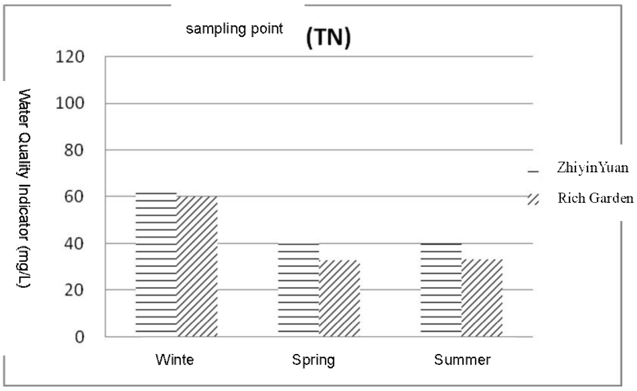

sampling point
.(COD)
Water Quality Indicator (mg/L)
350
300
250
200
150
100
50
0
Winte
Spring
Summer
ZhiyinYuan
Rich Garden
sampling point
.(SS)
Water Quality Indicator (mg/L)
1000
800
600
400
200
0
Winte
Spring
Summer
ZhiyinYuan
Rich Garden
sampling point
TN)
Water Quality Indicator (mg/L)
120
100
80
60
40
20
0
Winte
Spring
Summer
ZhiyinYuan
Rich Garden
sampling point
.(TP)
Water Quality Indicator (mg/L)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Winte
Spring
Summer
ZhiyinYuan
Rich Garden

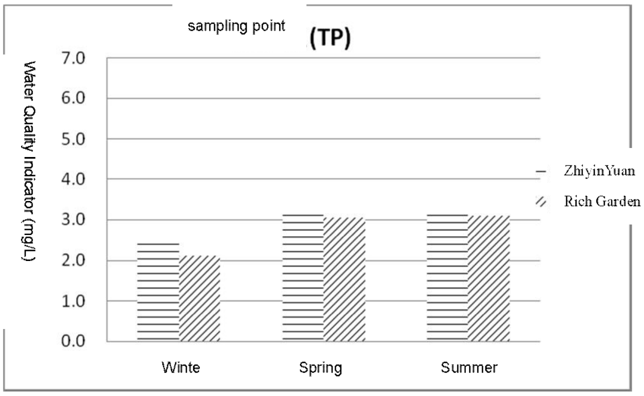
Water

Graph 91. sampling point noon peak water quality indicators curve









Graph 92. sampling point evening peak water quality indicator mean value curve

Domestic sewage and wastewater of the two communities as research objects, the survey conducted contrast and comparison between the major pollutant concentrations, including COD, SS, TN and TP and performed analysis of the impact that popularization of FWD exerts on the major pollutant concentrations in the domestic sewage and wastewater as is shown in Table 2 and 3.

Table 2 Domestic sewage and wastewater quality indicators per quarter (mg/L)

Season	COD			SS			TN			TP		
	Rich Garden	Zhiyinyuan	Increment (%)	Rich Garden	Zhiyinyuan	Increment (%)	Rich Garden	Zhiyinyuan	Increment (%)	Rich Garden	Zhiyinyuan	Increment (%)
Winter	210	200	5.00	595	497	19.72	56.9	78.3	-27.33	2.2	3.6	-38.89
Spring	194	175	10.86	681	358	90.22	43.1	51.4	-16.15	3.4	4.0	-15.00
Summer	207	174	18.97	539	617	-12.64	30.6	37.5	-18.40	3.3	3.9	-15.38

Mean	204	183	12	605	491	32	44	56	-21	3	4	-23

Table 3 Domestic sewage and wastewater quality indicators per quarter (mg/L)

		Morning Peak				Noon Peak				Evening Peak			
		Winter	Spring	Summer	Mean	Winter	Spring	Summer	Mean	Winter	Spring	Summer	Mean
COD	Rich Garden	185	332	161	226	221	154	179	185	239	148	202	196
	Zhiyinyuan	271	176	254	234	196	230	154	193	171	144	122	146
	Increment (%)	-31.73	88.64	-36.61	-3.28	12.76	-33.04	16.23	-4.48	39.77	2.78	65.57	34.78
SS	Rich Garden	706	750	554	670	662	368	630	553	562	405	520	496
	Zhiyinyuan	551	328	612	497	608	361	747	572	395	376	629	467
	Increment (%)	28.13	128.66	-9.48	34.81	8.88	1.94	-15.66	-3.26	42.28	7.71	-17.33	6.21
TN	Rich Garden	63.4	68.4	30.6	54	47.0	38.2	30.7	39	60.1	32.7	33.2	42
	Zhiyinyuan	104.1	64.8	34.3	68	87.7	52.7	26.8	56	61.9	41.1	39.9	48
	Increment (%)	-39.12	5.46	-10.90	-20.14	-46.48	-27.41	14.56	-30.69	-2.84	-20.40	-16.66	-11.75
TP	Rich Garden	3.5	5.0	3.8	4	1.5	2.6	2.3	2	2.1	3.1	3.1	3
	Zhiyinyuan	6.6	5.7	6.0	6	3.8	3.5	2.7	3	2.5	3.2	3.2	3
	Increment (%)	-47.73	-11.86	-36.29	-32.86	-60.74	-27.97	-14.71	-36.69	-14.52	-4.39	-3.44	-6.88

As is shown in the quarterly water quality indicators curves, Rich Garden has higher COD and SS values than Zhiyinyuan in every quarter but smaller fluctuation range, an indication that the sewage and wastewater quality of Rich Garden doesn’t change much with the season and FWD does exert some role in the daily life. During the evening peaks, when FWD is used the most, Rich Garden has higher COD and SS values but lower TN and TP than Zhiyinyuan. As TN and TP are mainly from bathroom and other life pollutant sources, it indicates that the occupation density of Zhiyinyuan is higher than Rich Garden. As for the morning peaks and noon peaks, given that many residents of Rich Garden are business/working people and don’t dine home much, the wastewater quality of Rich Garden is lower than Zhiyinyuan.

To sum up, FWD-equipped Rich Garden has higher wastewater concentration than Zhiyinyuan in all quarters. In terms of seasons, the mean values of COD and SS of Rich Garden in winter, spring and summer are respectively

210mg/L and 595mg/L, 194mg/L and 681mg/L, 207mg/L and 539mg/L, while that of Zhiyinyuan are 200mg/L and 497mg/L, 175mg/L and 358mg/L, 174 mg/L and 617 mg/L. It is, thus, clear that after the installation of FWD, the COD and SS values in the wastewater increase by 5% and 20%, 11% and 90%, 19% and -13% respectively in the three seasons. In terms of entire year, the COD and SS means of Rich Garden for the three seasons are 204mg/L and 605mg/L respectively while the means of Zhiyinyuan are 183mg/L and 91mg/L respectively. Thus the COD and SS values increase by 12% and 32% respectively. However, due to different occupation densities, the TN and TP concentrations of Rich Garden are 20% or so lower than the data of Zhiyinyuan.

4.10.4 Other impacts FWD exerts on the household sewage and wastewater

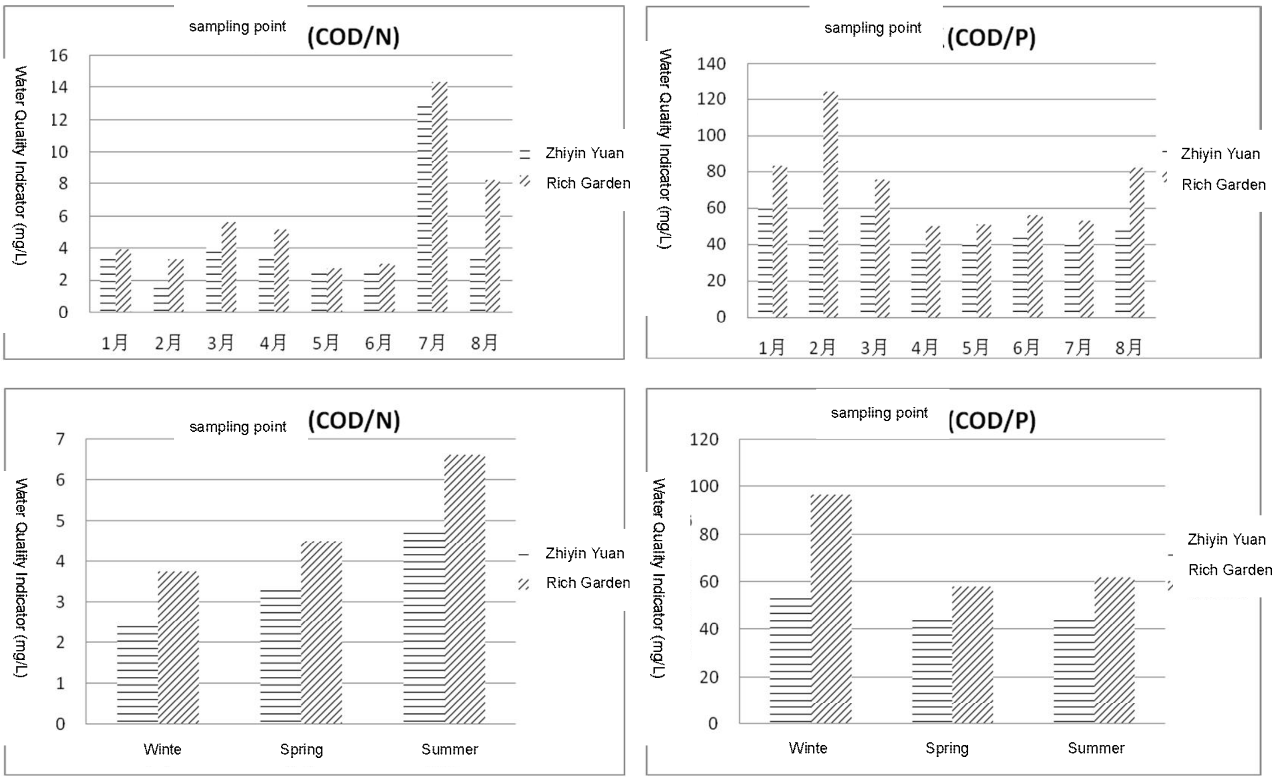
The penetration of FWD affects the quality of the household sewage and wastewater by increasing the COD and SS concentrations and decreasing the TN and TP concentrations. When disposing sewage with activated sludge, to make the microorganisms work and breed better, we need a good cultivation environment including nutrients, temperature, pH value, etc. Therein, nutrients primarily refer to carbon, nitrogen and phosphorus-containing inorganic salts. It is generally accepted that when disposing sewage with activated sludge, it is better to keep the proportion of the influent at COD：N：P=100：5：1. Excessive N and P values may cause eutrophication. Likewise, if the N and P values are too low, the microorganisms will not be able to take full advantage of the carbon and synthesize cellular substances. Superfluous carbon (energy) will be translated into Polysaccharides for better reservation. At present, the proportions between COD and N and COD and P in Shanghai municipal sewage plant are 3.65 and 28.84 respectively. The COP concentration is too low and extra carbon is needed. High in organic contents, food waste increases the COP concentration in the sewage, improves the C/N ratio and helps the sewage plant to remove the nitrogen and phosphorus better.

Table 4 COD/N and COD/P ratios of household sewage and wastewater

		January	February	March	April	May	June	July	August	Mean
COD/N	Rich Garden	3.92	3.35	5.68	5.23	2.78	3.07	14.38	8.23	5.83
	Zhiyinyuan	3.59	1.72	4.10	3.50	2.49	2.65	12.85	3.63	4.31
COD/P	Rich Garden	82.72	124.04	49.85	50.75	56.02	52.02	52.79	82.20	68.80
	Zhiyinyuan	61.30	47.31	57.69	36.15	42.11	44.62	42.23	48.62	47.50

Table 5 COD/N and COD/P ratios of household sewage and wastewater

		Winter	Spring	Summer	Mean
COD/N	Rich Garden	3.75	4.51	6.62	4.96
	Zhiyinyuan	2.53	3.41	4.82	3.59
COD/P	Rich Garden	96.61	58.17	61.93	72.24
	Zhiyinyuan	54.51	43.98	44.78	47.76



Graph 93. Water quality indicators curves of samples

As is seen in Table 4,5 and Graph 93, the COD/N and COD/P ratios of Rich Garden are 5.83 and 68.80 while the data of Zhiyinyuan are 4.31 and 47.50 respectively. In comparison, Rich Garden has better nutrients proportion for sewage disposal and helps improve the bio-processing performance of the sewage plant. As for the quarterly statistics, the COD against N ratio and COD against P ratio of Rich Garden are 4.96 and 72.24 respectively while the data of Zhiyinyuan are 3.59 and 47.76 respectively. Thus, it is clear that the use of FWD is of great significance for us to improve the biochemical performance of the urban household sewage and wastewater. In addition, as is seen in the pipeline tracking pictures, there aren't cloggings (see pictures enclosed).

1st sample

Last sample

Summary

Based on the Phase I household and lab-scale research, Phase II focused especially on the influence of penetration of FWD exerts on the community sewage quality and pipelines. The experiments were conducted at two high-grade residential communities, with the sewage sampled there as the object of study and the influence the penetration of FWD exerted on the pollutants in the household sewage as the content. The results obtained are as follows:

1. The phase II research indicates the use of FWD increased the COD and SS values in the community sewage by 12% and 24% respectively, which fit the allowable range of household sewage still and meet the sewage system discharge standards;
2. The use of FWD increased the COD concentration in the sewage and hence the C/N and C/P ratios of the sewage. In term of the sewage quality, it helps the sewage plant to conduct the biological nitrogen and phosphorus removal procedures more efficiently and hence helps ease the situation of low-carbon, high-nitrogen and high-phosphorus sewage in southern Chinese cities.
3. As is seen in the 9-month-long surveys and relevant pictures, the use of FWD hasn't caused cloggings or mud increase in the community drainage.

V. Sampling and testing methods of household waste

1. Sampling

As the household wastes from the two communities are collected at the compressor station after being sorted, the waste samples were taken at No.588 garbage compression and recycle station on Yunshan Road. Prior to the sampling, such hazardous elements as glass, waste paper, scrap metal, scrap plastic and expired drugs have been removed from the household wastes

Photo 94 Yunshan Road Garbage Compression Station

After sampling the compression station continuously for one week, we separated the wet waste from the dry and took about 1 kg as samples to detect the basic indicators. The waste samples are shown as follows in Photo 95.

Rich Garden household waste sample 1

Rich Garden household waste sample 2

Rich Garden household waste sample 3

Zhiyinyuan household waste sample 1

Zhiyinyuan household waste sample 1

Zhiyinyuan household waste sample 1

Photo 95. Community household waste sample pictures

2. Determination methods of water quality indicators

2.1 Moisture Content

1. Testing equipment

Electric Blast Constant-Temperature Drying Oven: maximum service temperature of 200℃, temperature control precision of ±1℃;

Enamel tray;

Plastic containers: resistant to 150 ℃ or more and easy to clean;

Metal containers: corrosion-resistant and easy to clean;

Balance: sensitivity of 0.1g;

Scale: minimum scale value of 5g;

Dryer: color gel as desiccant

2. Steps

a) Put the sample elements separately in dry containers, place the containers into the Electric Blast Constant-Temperature Drying Oven and dry them at 105℃±5℃ for 4 to 8 hours (extend the drying hours in case of kitchen waste), 0.5 hour after they are cooled, weigh the elements.
b) Redry the elements for another 1 to 2 hours. Weigh again after they are cooled for 0.5 hour. Keep doing so until the difference between two weights is less than 1% of the sample weight. Keep the dried elements properly for later use.

3. Computation

Moisture Content shall be computed according to the following formula:

$$C_{i(w)} = \frac{M_i - M'_i}{m_{\text{样}}(1 + c_i)} \times 100$$

$$C_{(w)} = \sum_{i=1}^{n} C_{i(w)} \times \frac{C_i}{100}$$

Therein：

C_i（w）- % of Moisture Content of certain element;

C（w）- % of Moisture Content of sample;

C_i - % of Wet basis content of certain element;

M_i - Wet weight of certain element in kg or g;

M'_i-Dry weight of certain element in kg or g;

i - Ordinal number of relevant elements;

n - Number of elements

Keep the results to two decimal places.

2.2 Calorific value

1. Instruments

Oxygen Bomb Calorimeter: Temperature accuracy greater than 0.002K;

Analytical balance: sensitivity of 0.0001g;

2. Steps

Choose sample forms according to the specific waste compositions and the testing requirements.

Determine the sample weights according to the calorific values defined in GB213 and the calorimeter operating manual. Keep the weight accuracy of 0.0001g and detect every sample repetitively for 2 to 3 times.

3. Computation

The calorific value determined by the Oxygen Bomb Calorimeter directly can be taken as the dry-base high calorific value of the samples and converted into the wet-base high calorific value and wet-base lower calorific value according to the following formula:

$$Q_{(h)} = \frac{1}{m}\sum_{j=1}^{m} Q'_{j(h)} \times \frac{100 - C_{(w)}}{100}$$

$$H' = \sum_{i=1}^{n}\left[H'_i \times \frac{C'_i}{100}\right]$$

$$Q_{(l)} = Q_{(h)} - 24.4 \times \left[C_{(w)} + 9H' \times \frac{100 - C_{(w)}}{100}\right]$$

Where:

$Q'j_{(h)}$ —Dry-base high calorific value in kJ/kg;

$Q_{(h)}$ —Wet-base high calorific value in kJ/kg;

$Q_{(1)}$ —Wet-base lower calorific value in kJ/kg;

H'—% of Dry-base Hydrogen content

$C_{(w)}$ —% of Moisture Content of the sample

C'_i—% of certain dry-base element (see 6.3.3)

J - Ordinal number of repetitive testing;
M - Times of repetitive testing;
I - Ordinal number of relevant elements;
24.4 - Condensation heat constant of water in kJ/kg
Keep the results to four significant figures.

VI. Household waste testing analysis

As food wastes are smashed in FWD before further discharged into the sewage system, the main components, physical and chemical properties of the household wastes are changed dramatically. Our report focuses on the output, physical and chemical properties and lower calorific value of the household waste and kitchen wastes from the pilot communities.

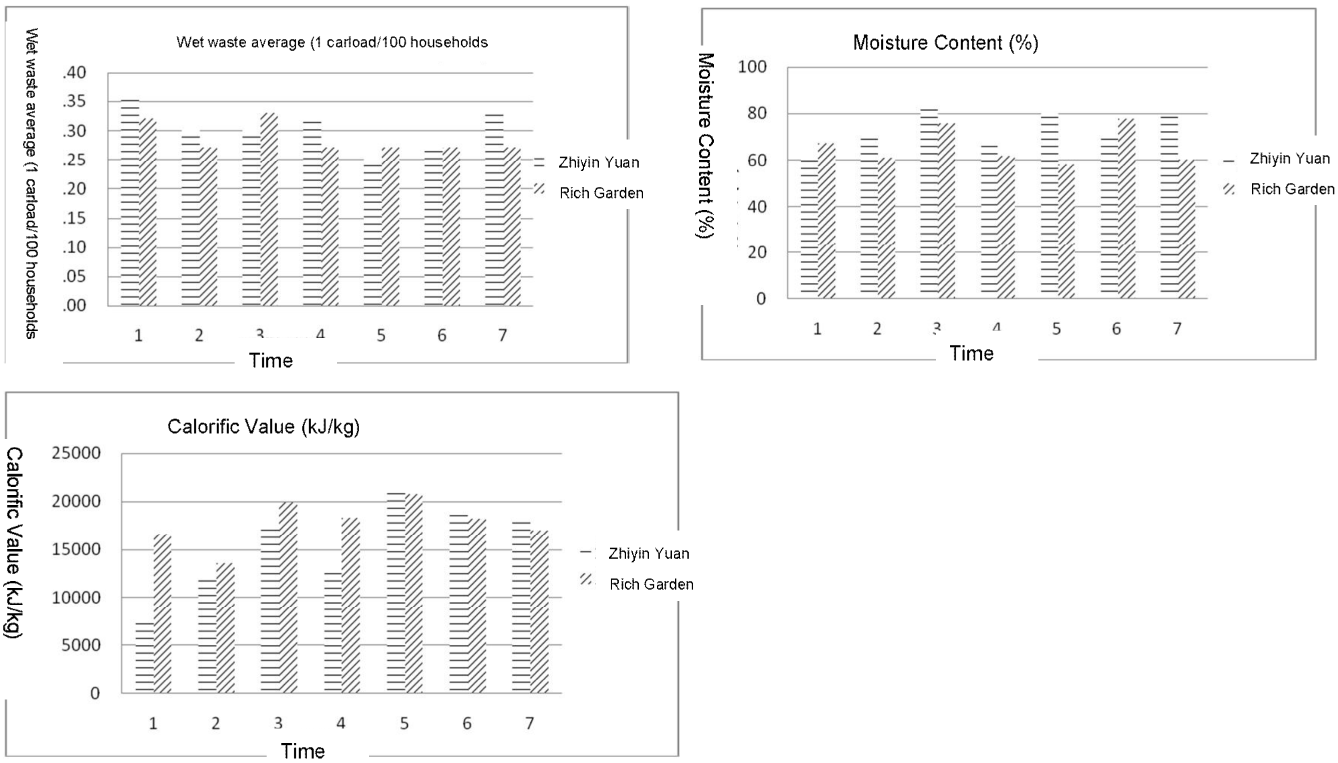
6.1 Testing of household waste

6.1.1 Continuous sampling and testing

As is shown in Table 6 and Graph 93, we tested the basic physical and chemical properties of the household waste samples collected continuously from the garbage compression station.

Table 6 Physical and chemical properties of collected household waste

	Wet waste average (1 carload/100 households)		Moisture Content (%)		Calorific Value (kJ/kg)	
	Zhiyinyuan	Rich Garden	Zhiyinyuan	Rich Garden	Zhiyinyuan	Rich Garden
1	0.32	0.36	60.23	67.10	7440.00	16621.00
2	0.27	0.30	69.82	60.98	11803.00	13594.00
3	0.33	0.30	84.39	75.77	17096.00	19898.00
4	0.27	0.32	66.19	61.61	12725.00	18256.00
5	0.27	0.25	80.25	57.94	21264.00	20762.00
6	0.27	0.27	70.43	77.54	18679.00	18177.00
7	0.27	0.33	78.73	60.17	18406.00	16965.00
Average	0.28	0.31	81.94	74.98	15344.71	17753.29



Graph 96. Testing indicators of household waste

6.1.2 Basic testing of household waste

While sampling sewage and wastewater continuously at the communities in September, we also sampled the household waste of the residents and found basic physical and chemical properties as shown in Table 7:

Table 7 Physical and chemical properties of collected household waste

	% of wet waste	Wet waste volume (Carload/100 households)	Moisture Content	Calorific value
1	50%	0.80	71.41	16578
2	55%	0.60		
3	50%	0.12	73.64	179462
4	35%	0.04		

6.2 Discussion on the testing results of waste samples

6.2.1 FWD's impact on the output of community household waste

It is clear in Table 6 and 7 that the penetration of FWD reduces significantly the wet waste content in the household waste. The changes are shown in Table 8 as follows:

Table 8 Changes in the output of community household waste

	1	2	3	4	5	6	7	Mean
Decrement of wet waste (%)	11.11	10.00	10.00	15.63	8.00	0	18.18	9.68

Based on the Phase I household and lab-scale research, Phase II kept track of the actual waste output of the FWD-equipped community and the contrast community. As is shown in Table 6 and Table 8, the average decrement of wet waste per household is 10% or so. According to the statistics of Shanghai Environmental Protection Bureau, as of 2012, the daily output of household waste per capita will reach 0.74kg, of which 81.5% will be food waste. Given that the resident population of Shanghai is 17 million, the use of FWD will reduce the household waste output by no less than 1070.6t/d. Therefore, the penetration of FWD is of great significance to the waste reduction.

As is seen in the analysis, Rich Garden's waste output per household has been reduced partly because of higher standard of living and better habits and partly because of the use of FWD, which contributes to 10% decrement of the waste output. According to the Phase I household and lab-scale research, if FWD is used by 100%, the decrement of wet waste will exceed 70%. Therefore, we should further enhance the application training of FWD and the use awareness of the residents so as to produce better waste decrement and relieve the pressure on household waste transportation and treatment to a greater extent.

6.2.2 FWD's impact on the physical and chemical properties of the household waste

Around the daily household waste of the two communities, we tested separately the lower calorific value and moisture content in the total household waste of both communities and studied the influence of FWD on the physical and chemical properties of the waste. The basic physical and chemical properties of the household waste are shown as follows in Table 9.

Table 9 Basic physical and chemical properties of the community household waste

		1	2	3	4	5	6	7	Mean
Moisture Content (%)	Zhiyinyuan	60.23	69.82	84.39	66.19	80.25	70.43	78.73	81.94
	Rich Garden	67.10	60.98	75.77	61.61	57.94	77.54	60.17	74.98
Calorific value (kJ/kg)	Zhiyinyuan	7440	11803	17096	18256	20762	18679	18406	15345
	Rich Garden	16621	13594	19898	12725	21264	18177	16965	17753

After comparison and contrast of the calorific values of the household waste sampled from the two communities, it is found that FWD helps reduce the moisture content by 10% and increase the calorific value by 16%. Although the waste decrement and the improvement of the physical and chemical properties fail to reach the level of the household and lab study due to the low use rate of FWD, it is still clear that FWD decreases effectively the household waste output and the moisture content and increases the calorific value in the waste, hence benefiting for further treatment of the waste.

Summary

1. To certain extent, the use of FWD helps reduce the household waste output by decreasing the wet waste output by 10%. According to the statistics of Shanghai Environmental Protection Bureau, as of 2020, Shanghai's resident population will reach 17 million and the daily household waste output per capita will reach 0.74 kg. If so, the use of FWD will reduce the household waste by no less than 1070.6t/d. Therefore, the penetration of FWD is of great significance to the waste reduction.
2. The penetration of FWD helps decrease the moisture content in household waste to 75%, down 10% or so

compared with the data of 82% of the contrast community.

3. The penetration of FWD helps increase the calorific value in household waste to 17783 kJ/kg, up 16% compared with the data of 15345 kJ/kg of the contrast community.

VII. Conclusion

Based on the Phase I study, that is, the study on FWD's impact on the sewage quality and people's quality of life under the household and lab conditions, we further expanded and continued our research on the impact of penetration of FWD may exert on the sewage quality, pipeline clogging, the outputs and physical and chemical properties of the household waste on a community scale by comparing the FWD-equipped community and its contrast community, hence reflecting more authentically and reliably the impact the penetration of FWD may exert on China's urban sewage and household waste in actual conditions of usage.

With Rich Garden and Zhiyinyuan, two residential communities of equal scale in Pudong, as the objects of study, we studies FWD's impact on the pollutant concentrations in the household sewage and wastewater including COD, NH_3-N, TN, TP and SS, and the urban sewage processing system. We also discussed the impact that penetration of FWD may exert on the components, output, physical and chemical properties and lower calorific value of the household waste and the impact on the combustion performance of the waste, etc. The conclusions we've reached are as follows:

1. The study found that the use of FWD will increase the COD and SS values in the community sewage by 12% and 24% respectively but meanwhile keep them in the allowable range of household sewage and in compliance with the discharge standards for sewage system.
2. The use of FWD helps increase the COD concentration in the sewage, and hence the C/N and C/P ratios. In terms of the sewage quality, it helps the sewage processing plant to conduct better biological nitrogen and phosphorus removal procedures and helps ease the situation of low-carbon, high-nitrogen and high-phosphorus sewage in southern Chinese cities.
3. As is seen in the 9-month-long surveys and relevant pictures, the use of FWD hasn't caused cloggings or mud increase in the community drainage.
4. To some extent, the use of FWD helps reduce the household waste output by decreasing the wet waste

output by 10%. According to the statistics of Shanghai Environmental Protection Bureau, as of 2020, Shanghai's resident population will reach 17 million and the daily household waste output per capita will reach 0.74kg. If so, the use of FWD will reduce the household waste by no less than 1070.6t/d. Therefore, the penetration of FWD is of great significance to the waste reduction.

5. The penetration of FWD helps decrease the moisture content in household waste to 75%, down 10% or so compared with the data of 82% of the contrast community.
6. The penetration of FWD helps increase the calorific value in household waste to 17783 kJ/kg, up 16% compared with the data of 15345 kJ/kg of the contrast community.

Meanwhile, during the 9-month-long tracking and testing process, the research team also found that although FWD has been installed in all Rich Garden units, the actual use rate is low due to the residents' weak awareness of usage and poor familiarity with the device. As a result, regardless of the sewage quality or the household waste, there is some deviation between the Phase II study results and the household and lab-scale study results we've obtained in Phase I study. It also indicates that the acceptance of FWD is not high in the Chinese cities and we need further enhance the training for use and awareness of FWD.

On October 24, 2013, after the experiment was finished, the Urban Construction and Environmental Protection Committee of Shanghai Municipal People's Congress sent a survey group to the experimental sites at Rich Garden, heard the research report and organized discussions. The survey group and the leaders from the Administrative Bureau of Forestation and Urban Aesthetics of Shanghai recognized that the practice of taking Rich Garden as the pilot community of FWD did, to some extent, help reduce the wet content in the household waste. They also stated that the government would study carefully the research report and enhance further popularization of FWD in Shanghai.

In the meantime, Pudong Administration of Environmental Protection, City Appearance and Environmental Sanitation further clarified the specific work content of promoting FWD in Pudong. On the one hand, an introductory video of FWD usage in compliance with the Chinese actualities should be produced and uploaded online as demonstration and roadshows of FWD pilot communities shall be implemented. On the other hand, in allusion to Gubei Royal Court Community, also one of the FWD pilot communities, the Administration formulated incentive measures for the FWD-led waste sorting and source reduction. On the premise that FWD is fully used by the residents and guarantees effective processing of wet waste, the community shall be granted with a subsidy of 50 yuan per household per year and the award money shall be further raised based on specific conditions. In the meanwhile, the incentive policy will cover all FWD-equipped residential communities in Pudong.

Appendix 1： Testing records of household sewage

1. Pictures of sampling points (part)

Picture 1.Rich Garden sampling points

Rich Garden 1# sampling point（8:00）

Rich Garden 2# sampling point（8:00）

Rich Garden 3# sampling point（8:00）

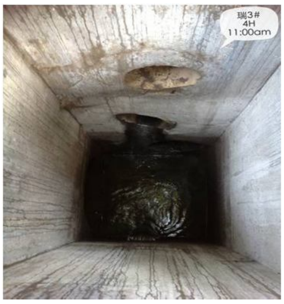
Rich Garden 1# sampling point（9:00）

Rich Garden 2# sampling point（9:00）

Rich Garden 3# sampling point（9:00）

Rich Garden 1# sampling point（11:00）

Rich Garden 2# sampling point（11:00）



Rich Garden 3# sampling point（11:00）

Rich Garden 1# sampling point（12:00）

Rich Garden 2# sampling point（12:00）

Rich Garden 3# sampling point（12:00）

Rich Garden 1# sampling point（19:00）

Rich Garden 2# sampling point（19:00）

Rich Garden 3# sampling point（19:00）

Rich Garden 1# sampling point（21:00）

Rich Garden 2# sampling point（21:00）

Rich Garden 3# sampling point（21:00）

Last sampling 1

Last sampling 2

Picture 2. Zhiyinyuan sampling points

Zhiyinyuan 1# sampling point（7:00）

Zhiyinyuan 2# sampling point（7:00）

Zhiyinyuan 3# sampling point（7:00）

Zhiyinyuan 1# sampling point（8:00）

Zhiyinyuan 2# sampling point

Zhiyinyuan 3# sampling point

Zhiyinyuan 1# sampling point

Zhiyinyuan 2# sampling

(8:00)

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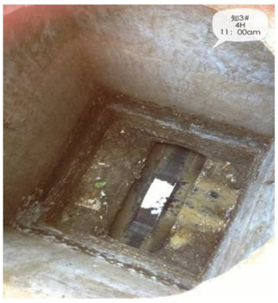
(11:00)

point (11:00)



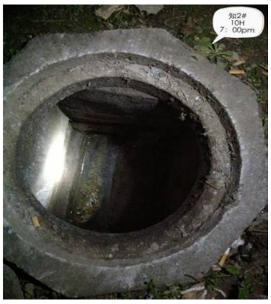
Zhiyinyuan 3# sampling point (11:00)

Zhiyinyuan 1# sampling point (12:00)

Zhiyinyuan 2# sampling point (12:00)

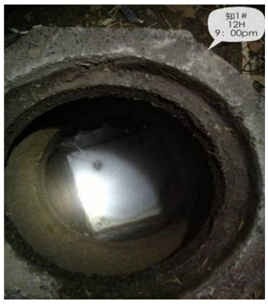
Zhiyinyuan 3# sampling point (12:00)

Zhiyinyuan 1# sampling point (19:00)



Zhiyinyuan 2# sampling point (19:00)

Zhiyinyuan 3# sampling point (19:00)



Zhiyinyuan 1# sampling point (21:00)

Zhiyinyuan 2# sampling point（21:00）

Zhiyinyuan 3# sampling point（21:00）

2. Pictures of sewage samples

7:00 sewage sample

8:00 sewage sample

9:00 sewage sample

11:00 sewage sample

12:00 sewage sample

13:00 sewage sample

15:00 sewage sample

17:00 sewage sample

18:00 sewage sample

19:00 sewage sample

20:00 sewage sample

21:00 sewage sample

3. Testing records of water quality indicators

3.1 Sewage quality indicators of January

Table 1.Sewage quality indicators of Rich Garden sampling points

	COD（mg/L）				SS（mg/L）				NH_3-N（mg/L）				TN（mg/L）				TP（mg/L）			
Time	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean
7	114	242	17	124	900	936	876	904	34.4	69.7	12.6	38.9	39.0	98.0	16.0	51.0	2.9	6.7	0.1	3.2
8	343	371	34	249	1176	912	856	981	117.1	162.1	3.7	94.3	117.5	244.5	7.0	123.0	7.6	13.0	0.2	6.9
9	489	339	102	310	1168	1076	784	1009	55.7	111.3	5.2	57.4	72.5	112.5	7.5	64.2	3.9	7.7	0.1	3.9
11	489	210	85	261	956	1124	880	987	4.6	68.3	33.9	35.6	14.5	76.0	40.0	43.5	0.9	4.2	1.1	2.1
12	496	306	51	285	976	1196	944	1039	33.6	32.1	18.9	28.2	79.5	32.5	20.0	44.0	4.3	3.3	0.6	2.7
13	117	145	85	116	920	944	984	949	20.4	23.2	23.8	22.5	24.5	32.0	91.0	49.2	1.2	1.9	0.7	1.3
15	234	323	80	212	1020	760	800	860	4.6	105.3	12.1	40.7	13.0	112.5	77.0	67.5	0.5	6.4	0.7	2.6
17	715	323	384	474	1232	856	780	956	95.3	9.8	14.9	40.0	114.5	52.0	16.5	61.0	11.2	0.1	0.3	3.8
18	263	85	64	137	892	872	744	836	47.1	14.1	33.6	31.6	87.5	15.0	67.0	56.5	2.3	0.1	0.3	0.9
19	277	1430	16	574	1084	1528	328	980	76.0	37.6	33.3	49.0	117.0	72.5	38.5	76.0	3.9	8.7	0.2	4.3
20	175	136	48	120	736	1004	532	757	39.0	15.5	31.0	28.5	81.5	17.5	33.0	44.0	2.5	0.9	0.7	1.4
21	194	119	0	104	752	1052	584	796	11.5	94.4	20.7	42.2	64.0	104.0	28.0	65.3	2.4	5.7	0.3	2.8
Mean	325	336	81	331	984	1022	758	921	44.9	62.0	20.3	42.4	68.8	80.8	36.8	62.1	3.6	4.9	0.4	3.0

Table 2.Sewage quality indicators of Zhiyinyuan sampling points

	COD（mg/L）				SS（mg/L）				NH3-N（mg/L）				TN（mg/L）				TP（mg/L）			
Time	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean
7	310	123	500	311	376	452	520	449	117.0	21.9	126.2	88.4	119.0	35.0	172.0	108.7	8.3	2.5	19.5	10.1
8	368	622	274	421	500	600	696	599	96.2	35.9	124.3	85.5	122.0	52.0	183.0	119.0	8.3	2.4	7.9	6.2
9	236	108	159	168	804	500	576	627	69.7	2.4	37.3	36.5	107.0	31.0	64.0	67.3	6.0	1.1	3.9	3.7
11	176	20	190	129	576	564	760	633	54.6	3.2	51.1	36.3	65.0	26.0	60.0	50.3	4.6	1.0	3.3	3.0
12	158	360	514	344	740	712	852	768	49.7	61.9	23.8	45.1	57.0	75.0	33.0	55.0	3.6	6.4	4.0	4.7
13	99	246	138	161	588	664	492	581	37.3	36.2	42.1	38.5	38.0	64.0	76.0	59.3	2.9	3.6	4.6	3.7
15	72	1018	156	415	324	208	212	248	28.9	29.7	25.6	28.1	42.0	30.0	61.0	44.3	2.9	4.4	3.2	3.5
17	144	218	96	153	192	356	260	269	58.6	17.0	51.1	42.2	74.0	20.0	92.0	62.0	2.7	1.6	2.1	2.1
18	502	160	111	258	124	148	368	213	68.4	9.4	35.6	37.8	82.0	27.0	54.0	54.3	3.3	2.7	1.2	2.4
19	99	3	48	50	552	760	776	696	68.9	12.7	13.5	31.7	99.0	22.0	25.0	48.7	3.5	1.0	1.9	2.1
20	270	586	138	331	516	1336	876	909	41.1	64.0	53.5	52.9	79.0	96.0	73.0	82.7	2.6	4.8	2.5	3.3
21	110	182	578	290	800	640	428	623	45.9	109.2	24.0	59.7	97.0	134.0	44.0	91.7	2.9	8.5	2.6	4.7
Mean	212	304	242	253	508	578	568	551	61.3	33.6	50.7	48.5	81.8	51.0	78.1	70.3	4.3	3.3	4.7	4.1

3.2 Sewage quality indicators of February

Table 1.Sewage quality indicators of Rich Garden sampling points

	COD（mg/L）				SS（mg/L）				NH3-N（mg/L）				TN（mg/L）				TP（mg/L）			
Time	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean
8	288	63	167	173	312	256	208	259	45.6	3.2	3.7	17.5	63.0	13.5	42.0	39.5	3.1	0.1	0.3	1.2
9	250	95	40	128	152	164	224	180	6.9	58.2	0.9	22.0	31.0	66.5	57.0	51.5	2.1	4.4	0.1	2.2
11	154	67	103	108	224	716	416	452	10.6	43.9	1.7	18.7	57.5	56.5	50.0	54.7	1.1	2.6	0.4	1.4
12	135	889	87	370	236	428	316	327	1.4	47.9	0.6	16.6	16.0	77.0	49.0	47.3	0.2	2.6	0.3	1.0
13	327	151	87	188	208	284	172	221	14.3	36.7	2.3	17.8	24.5	52.5	52.0	43.0	0.3	0.5	0.5	0.4
15	462	48	16	175	220	180	112	171	28.1	119.9	1.4	49.8	43.0	129.0	47.5	73.2	0.5	3.7	0.8	1.7
17	404	686	151	414	268	196	212	225	10.6	29.0	3.2	14.3	14.0	30.0	48.0	30.7	0.3	0.3	0.7	0.4
18	288	24	32	115	240	312	52	201	80.1	130.6	7.7	72.8	99.0	137.5	58.0	98.2	4.3	3.5	3.3	3.7
19	201	32	103	112	232	576	140	316	36.2	76.3	1.1	37.9	45.0	79.0	57.5	60.5	1.1	2.6	1.4	1.7
20	96	42	25	54	336	332	284	317	3.4	51.6	2.0	19.0	19.5	53.0	28.5	33.7	0.1	1.8	0.3	0.7
21	154	33	33	74	212	344	283	280	12.6	26.1	3.2	14.0	25.0	29.5	57.5	37.3	0.5	1.3	1.0	0.9
Mean	251	194	77	174	240	344	220	268	22.7	56.7	2.5	27.3	39.8	65.8	49.7	51.8	1.2	2.1	0.8	1.4

Table 2.Sewage quality indicators of Zhiyinyuan sampling points

	COD（mg/L）				SS（mg/L）				NH3-N（mg/L）				TN（mg/L）				TP（mg/L）			
Time	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean
8	242	182	152	192	672	560	516	583	86.9	96.1	51.4	78.1	89.0	99.0	140.5	109.5	0.1	11.5	1.7	4.4
9	242	182	242	222	672	596	668	645	104.4	66.0	50.2	85.2	114.0	93.5	126.5	111.3	8.1	3.9	3.3	5.1
11	121	303	167	197	232	752	616	533	47.3	74.6	77.5	61.0	107.5	92.5	84.5	94.8	1.7	4.0	4.9	3.5
12	197	167	126	163	344	624	712	560	45.6	48.8	58.2	47.2	121.0	128.5	116.0	121.8	2.5	2.7	7.6	4.3
13	126	166	245	179	492	484	336	437	34.7	20.7	8.9	27.7	143.0	146.0	146.0	145.0	7.8	2.3	0.4	3.5
15	111	95	111	105	276	328	312	305	40.2	16.1	5.5	28.1	140.5	32.0	35.5	69.3	2.4	1.7	0.4	1.5
17	126	79	63	90	232	470	308	337	37.9	37.3	77.5	37.6	47.5	39.0	77.5	54.7	1.9	2.3	2.9	2.4
18	126	177	129	144	380	1072	376	609	97.8	82.6	9.5	90.2	99.0	89.0	81.5	89.8	3.7	4.8	1.7	3.4
19	80	48	112	80	484	628	264	459	39.6	56.8	50.2	48.2	52.0	76.0	52.0	60.0	2.5	1.7	2.1	2.1
20	96	16	153	88	400	324	352	359	41.3	52.5	17.2	37.0	66.0	69.0	24.0	53.0	3.2	1.3	1.3	2.0
21	16	305	193	171	364	380	400	381	26.4	15.8	38.2	26.8	34.5	35.5	53.0	41.0	0.9	2.4	3.8	2.4
Mean	135	156	154	148	413	565	442	474	54.8	51.6	40.4	51.6	92.2	81.8	85.2	86.4	3.2	3.5	2.7	3.1

3.3 Sewage quality indicators of March

Table 1.Sewage quality indicators of Rich Garden sampling points

	COD（mg/L）				SS（mg/L）				NH3-N（mg/L）				TN（mg/L）				TP（mg/L）			
Time	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean
7	276	410	39	242	936	1832	888	1219	8.3	59.4	1.1	23.0	17.5	68.0	4.0	29.8	1.9	11.7	0.2	4.6
8	1263	841	94	733	1164	824	596	861	5.7	147.5	2.0	51.7	22.0	168.5	5.5	65.3	1.5	13.3	0.2	5.0
9	477	502	111	363	1140	824	556	840	124.5	64.6	2.0	63.7	135.0	73.0	71.0	93.0	7.2	5.7	1.2	4.7
11	176	366	83	208	932	840	608	793	22.4	30.7	1.1	18.1	32.5	36.5	4.0	24.3	1.4	1.9	0.2	1.2
12	150	145	154	150	1004	600	704	769	46.8	31.6	1.1	26.5	54.0	36.0	48.0	46.0	1.6	2.0	0.1	1.2
13	71	263	106	147	900	872	576	783	6.9	117.4	8.3	44.2	22.0	112.0	9.0	47.7	1.1	6.3	0.2	2.5
15	112	223	138	158	952	976	364	764	28.1	64.8	1.7	31.6	32.5	69.5	3.5	35.2	1.0	7.1	1.5	3.2
17	80	250	79	137	1008	968	448	808	23.8	66.9	0.9	30.5	39.5	71.5	13.5	41.5	1.3	5.7	0.1	2.4
18	95	169	136	133	984	536	736	752	2.9	51.1	1.4	18.5	30.0	49.0	6.5	28.5	0.5	3.2	0.1	1.3
19	125	91	91	102	1056	780	416	751	0.6	31.6	2.3	11.5	14.5	34.5	7.0	18.7	0.1	2.1	0.1	0.8
20	134	482	90	235	900	928	716	848	12.3	52.2	1.4	22.0	25.0	52.0	6.0	27.7	0.7	7.1	0.2	2.7
21	109	87	99	98	764	928	836	843	29.8	4.3	2.0	12.1	40.5	8.0	8.0	18.8	1.4	1.1	0.1	0.9
Mean	256	319	102	225	978	909	620	836	26.0	60.2	2.1	29.4	38.8	64.9	15.5	39.7	1.7	5.6	0.4	2.5

Table 2.Sewage quality indicators of Zhiyinyuan sampling points

	COD（mg/L）				SS（mg/L）				NH3-N（mg/L）				TN（mg/L）				TP（mg/L）			
Time	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean
7	274	267	112	217	152	132	80	121	87.3	91.8	29.8	69.6	89.5	99.0	34.5	74.3	7.2	9.5	1.8	6.2
8	210	134	192	179	192	164	268	208	83.8	75.8	96.4	85.3	85.0	78.0	99.5	87.5	7.0	7.2	7.9	7.4
9	175	333	57	188	220	164	108	164	53.7	38.2	22.1	38.0	56.0	40.0	25.0	40.3	3.9	2.5	1.9	2.8
11	127	107	182	139	184	196	296	225	39.9	29.6	79.2	49.5	43.5	32.0	81.0	52.2	2.2	2.1	6.8	3.7
12	138	103	860	367	208	104	388	233	45.9	54.5	10.9	37.1	51.5	80.0	31.0	54.2	3.0	3.8	3.0	3.3
13	168	583	170	307	112	208	164	161	50.2	53.4	44.8	49.5	55.5	72.3	46.2	58.0	2.7	4.5	0.9	2.7
15	123	287	86	165	208	540	104	284	27.5	32.1	3.7	21.1	29.2	32.3	4.6	22.1	1.8	4.2	0.7	2.2
17	185	230	370	262	364	320	184	289	42.5	6.3	4.0	17.6	45.4	9.5	5.4	20.1	2.9	1.3	0.7	1.6
18	152	101	41	98	168	180	132	160	31.6	32.1	4.6	22.8	36.9	34.6	5.5	25.7	1.6	2.0	0.7	1.4
19	158	235	59	151	256	284	108	216	46.8	1.7	25.8	24.8	46.9	3.5	27.7	26.0	2.8	0.8	2.9	2.2
20	191	254	119	188	236	204	88	176	33.3	65.1	84.1	60.8	36.9	67.7	111.5	72.1	1.4	3.8	9.8	5.0
21	146	324	103	191	160	136	228	175	37.0	58.8	26.1	40.7	55.4	96.9	42.3	64.9	2.3	8.5	1.4	4.1
Mean	171	246	196	204	205	219	179	201	48.3	45.0	36.0	43.1	52.7	53.8	42.8	49.8	3.2	4.2	3.2	3.5

3.4 Sewage quality indicators of April

Table 1.Sewage quality indicators of Rich Garden sampling points

	COD（mg/L）				SS（mg/L）				NH3-N（mg/L）				TN（mg/L）				TP（mg/L）			
Time	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean
7	266	410	40	239	938	1838	890	1222	9.3	61.4	1.2	24.0	18.6	86.0	6.0	36.9	2.9	13.7	2.2	6.3
8	1265	849	93	736	1168	826	589	861	6.7	147.5	2.1	52.1	23.0	186.5	7.5	72.3	2.5	15.4	2.2	6.7
9	476	509	116	367	1144	826	565	845	125.4	65.5	2.1	64.3	138.0	93.0	78.3	103.1	10.2	7.8	3.2	7.1
11	176	368	89	211	934	840	610	795	23.3	37.3	1.2	20.6	33.5	38.5	6.4	26.1	3.4	3.9	2.2	3.2
12	145	147	157	150	1008	600	704	771	47.9	38.7	1.2	29.2	58.0	38.4	51.2	49.2	3.6	5.0	2.1	3.6
13	74	265	108	149	902	872	577	784	7.7	113.9	8.3	43.3	23.0	115.0	11.1	49.7	3.1	8.3	2.2	4.5
15	110	227	139	159	956	986	364	769	29.3	65.4	1.7	32.2	33.5	69.5	5.5	36.2	3.0	9.1	3.5	5.2
17	87	251	80	140	1012	971	448	810	28.3	69.4	0.9	32.9	41.0	81.5	15.5	46.0	3.3	7.7	2.1	4.4
18	92	170	138	133	986	536	736	753	2.7	51.4	1.8	18.6	32.0	49.5	8.7	30.1	2.5	5.2	2.1	3.3
19	126	94	91	103	1061	782	418	754	0.6	35.7	2.6	12.9	15.5	38.5	9.0	21.0	2.1	4.1	2.1	2.8
20	134	482	90	235	903	948	718	856	13.2	54.4	1.8	23.2	29.0	54.0	8.0	30.3	2.7	9.1	2.2	4.7
21	109	88	99	99	767	947	846	853	28.9	6.3	2.1	12.5	41.5	8.0	10.0	19.8	3.4	3.1	2.1	2.9
Mean	255	322	103	227	982	914	622	839	27.0	62.2	2.3	30.5	40.6	71.5	18.1	43.4	3.6	7.7	2.4	4.5

Table 2.Sewage quality indicators of Zhiyinyuan sampling points

	COD（mg/L）				SS（mg/L）				NH3-N（mg/L）				TN（mg/L）				TP（mg/L）			
Time	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean
7	284	268	122	224	352	332	281	322	90.4	94.9	32.9	72.7	98.5	109.2	44.5	84.1	11.2	11.7	3.8	8.9
8	215	137	197	183	392	364	468	408	86.9	79.9	99.2	88.7	95.1	88.0	109.6	97.6	11.0	9.2	9.9	10.0
9	179	338	59	192	422	364	308	365	56.4	42.4	25.2	41.3	64.0	51.0	35.0	50.0	7.9	4.5	3.9	5.4
11	129	110	185	141	383	396	496	425	42.2	33.8	82.4	52.8	53.6	43.0	91.2	62.6	4.2	4.2	8.8	5.8
12	138	105	871	371	410	304	588	434	49.5	57.6	14.0	40.4	61.2	90.2	41.0	64.1	5.0	5.8	5.0	5.3
13	168	593	170	310	312	408	364	361	50.2	58.3	48.0	52.2	65.5	83.2	56.2	68.3	4.7	6.5	2.9	4.7
15	126	289	87	167	410	740	304	485	30.6	35.3	6.8	24.3	39.4	43.3	14.7	32.5	3.8	6.2	2.7	4.2
17	189	231	376	265	564	522	384	490	45.7	9.1	7.2	20.7	55.3	19.5	15.4	30.1	4.9	4.2	2.7	3.9
18	156	102	41	100	377	380	332	363	34.8	35.3	8.0	26.0	45.9	44.5	15.7	35.4	3.6	4.0	2.7	3.5
19	160	237	63	154	356	484	308	383	53.2	4.8	28.5	28.8	56.8	13.7	38.0	36.2	4.8	2.8	4.9	4.2
20	197	254	129	194	438	404	288	377	36.5	68.2	87.4	64.0	45.9	77.7	121.5	81.7	3.4	5.8	11.8	7.0
21	148	326	108	194	362	436	428	409	40.0	61.7	29.4	43.7	65.5	106.9	42.3	71.6	4.3	10.7	3.4	6.1
Mean	174	249	201	208	398	428	379	402	51.4	48.4	39.1	46.3	62.2	64.2	52.1	59.5	5.7	6.3	5.2	5.8

3.5 Sewage quality indicators of May

Table 1.1st-time sewage quality indicators of Rich Garden sampling points

	COD（mg/L）				SS（mg/L）				NH3-N（mg/L）				TN（mg/L）				TP（mg/L）			
Time	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean
7	46	212	102	120	600	660	220	493	18.7	78.6	35.0	44.1	21.0	78.0	35.5	44.8	1.0	7.9	0.2	3.0
8	142	348	118	203	232	280	340	284	127.1	67.4	32.4	75.7	131.0	74.0	39.0	81.3	8.5	7.3	0.1	5.3
9	1172	76	141	463	500	280	288	356	57.4	7.5	20.4	28.4	78.0	35.5	39.5	51.0	2.4	6.2	0.1	2.9
11	381	242	110	244	240	602	312	385	25.0	8.0	36.4	23.1	32.5	14.5	37.0	28.0	2.0	1.1	0.1	1.1
12	90	212	110	137	524	242	128	298	2.6	37.0	24.7	21.4	22.5	62.5	33.5	39.5	1.5	8.3	0.2	3.4
13	77	181	125	128	544	132	1080	585	14.3	6.0	23.5	14.6	18.5	14.5	30.5	21.2	1.3	2.9	0.1	1.4
15	75	455	94	208	724	816	228	589	17.5	12.3	30.1	20.0	49.5	36.5	39.5	41.8	2.9	19.3	0.1	7.4
17	134	197	110	147	808	492	104	468	6.0	13.8	18.4	12.7	22.5	33.5	22.5	26.2	2.1	8.7	0.1	3.6
18	15	258	220	164	676	148	132	319	25.3	1.4	45.1	23.9	27.5	18.5	48.5	31.5	0.1	1.8	4.3	2.0
19	90	136	104	110	332	208	480	340	8.0	6.0	37.3	17.1	29.5	16.5	37.5	27.8	0.5	0.7	0.1	0.4
20	134	188	271	198	508	292	532	444	6.3	2.9	39.0	16.1	20.5	10.0	43.0	24.5	1.4	5.7	0.1	2.4
21	161	510	80	250	804	264	244	437	12.6	51.4	29.0	31.0	36.5	68.0	33.0	45.8	3.3	0.1	0.1	1.2
Mean	210	251	132	198	541	368	341	417	26.7	24.4	30.9	27.3	40.8	38.5	36.6	38.6	2.2	5.8	0.5	2.8

Table 2.1st-time sewage quality indicators of Zhiyinyuan sampling points

	COD（mg/L）				SS（mg/L）				NH3-N（mg/L）				TN（mg/L）				TP（mg/L）			
Time	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean
7	191	80	127	133	100	408	148	219	108.2	18.7	31.0	52.6	113.0	21.0	31.5	55.2	8.1	1.4	2.9	4.1
8	112	80	215	135	144	616	340	367	10.3	43.9	62.8	39.0	14.0	47.0	66.5	42.5	0.4	3.2	4.3	2.6
9	255	255	61	190	600	784	840	741	50.2	32.1	26.7	36.3	53.0	33.5	38.0	41.5	3.3	2.1	0.9	2.1
11	97	589	137	274	584	1084	1192	953	56.2	30.7	73.2	53.4	59.5	32.0	73.5	55.0	3.7	2.1	5.3	3.7
12	105	234	137	159	212	244	308	255	36.4	6.6	47.1	30.0	37.5	8.0	67.5	37.7	3.3	0.6	3.2	2.4
13	121	89	61	90	252	140	492	295	37.0	7.2	11.5	18.6	47.5	8.5	20.0	25.3	2.3	0.1	0.7	1.0
15	89	250	109	149	176	100	188	155	40.5	136.6	138.9	105.3	43.5	141.0	140.5	108.3	2.3	7.3	7.5	5.7
17	63	109	63	78	252	304	360	305	42.2	38.7	18.7	33.2	44.5	42.5	22.0	36.3	2.1	2.4	1.1	1.8
18	94	78	63	78	116	1208	116	480	4.2	11.5	28.4	14.7	38.5	20.0	32.0	30.2	2.7	0.8	1.2	1.6
19	94	188	61	114	320	708	128	385	15.2	74.6	47.9	45.9	43.0	101.5	58.5	67.7	1.6	6.0	2.2	3.3
20	46	77	46	56	264	252	288	268	23.2	88.4	5.7	39.1	41.5	94.0	6.0	47.2	1.3	3.7	0.5	1.9
21	92	123	46	87	266	604	360	410	23.8	58.2	18.4	33.5	41.0	59.5	22.0	40.8	1.9	3.7	0.2	2.0
Mean	113	179	94	129	274	538	397	403	37.3	45.6	42.5	41.8	48.0	50.7	48.2	49.0	2.7	2.8	2.5	2.7

Table 3.2nd-time sewage quality indicators of Rich Garden sampling points

	COD（mg/L）				SS（mg/L）				NH3-N（mg/L）				TN（mg/L）				TP（mg/L）			
Time	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean
7	155	180	148	161	272	452	240	321	107.3	174.7	2.9	95.0	108.5	177.0	21.0	102.2	5.2	3.7	0.1	3.0
8	101	33	101	78	136	108	104	116	42.5	37.6	10.0	30.0	44.0	38.5	16.0	32.8	2.3	1.3	0.2	1.2
9	262	82	70	138	168	176	496	280	138.9	62.0	18.4	73.1	141.5	64.0	18.5	74.7	7.0	0.7	1.1	2.9
11	66	65	93	75	124	480	656	420	39.0	63.1	8.0	36.7	42.0	63.5	10.5	38.7	2.5	0.9	0.8	1.4
12	49	65	70	62	256	536	324	372	11.5	63.7	6.0	27.1	12.5	65.5	16.0	31.3	0.6	2.1	0.9	1.2
13	66	98	125	96	160	292	332	261	20.1	29.6	5.7	18.5	20.5	35.5	12.0	22.7	0.4	2.1	0.3	0.9
15	246	65	93	135	440	332	364	379	33.6	31.3	11.2	25.3	38.0	32.5	13.0	27.8	1.1	1.4	0.4	1.0
17	33	73	101	69	268	332	232	277	3.2	38.5	7.2	16.3	7.0	42.0	17.0	22.0	0.3	0.9	0.1	0.4
18	205	90	86	127	212	572	248	344	46.2	32.7	8.0	29.0	47.5	35.0	11.5	31.3	1.2	0.9	0.4	0.8
19	65	98	54	73	868	400	200	489	50.2	15.5	9.2	25.0	52.0	17.0	19.5	29.5	1.5	0.5	0.3	0.8
20	336	24	101	154	184	332	116	211	90.7	58.8	6.0	51.8	93.5	62.5	8.0	54.7	2.3	1.7	0.1	1.4
21	164	65	16	82	360	248	124	244	90.1	70.0	5.2	55.1	91.5	71.0	8.0	56.8	2.3	2.1	0.1	1.5
Mean	146	69	83	99	287	355	286	310	56.1	56.5	8.2	40.2	58.2	58.7	14.3	43.7	2.2	1.5	0.4	1.4

Table 4.2nd-time sewage quality indicators of Zhiyinyuan sampling points

	COD（mg/L）				SS（mg/L）				NH3-N（mg/L）				TN（mg/L）				TP（mg/L）			
Time	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean
7	180	65	163	136	352	544	516	471	94.7	39.0	44.2	59.3	126.0	39.5	45.5	70.3	6.5	4.3	3.6	4.8
8	196	49	-	122	452	352	-	402	83.2	19.8	-	51.5	85.5	22.5	-	54.0	6.4	1.9	-	4.1
9	196	16	65	93	496	520	472	496	55.1	18.9	53.1	42.4	56.0	19.5	55.5	43.7	5.1	0.8	5.1	3.7
11	82	82	-	82	708	472	-	590	40.7	11.2	-	26.0	42.5	13.0	-	27.8	3.4	0.1	-	1.7
12	122	82	288	164	512	304	196	337	31.0	37.3	28.1	32.1	54.0	72.0	48.5	58.2	3.0	1.7	2.9	2.5
13	41	173	-	107	196	528	-	362	36.7	17.2	-	27.0	37.5	22.5	-	30.0	2.5	0.9	-	1.7
15	25	41	181	82	324	560	348	411	43.6	85.5	35.9	55.0	45.0	87.5	37.0	56.5	2.4	5.3	2.6	3.4
17	25	58	-	41	888	900	-	894	31.9	18.4	-	25.1	32.0	34.5	-	33.3	2.1	3.0	-	2.5
18	65	65	140	90	316	764	284	455	45.1	21.5	27.3	31.3	46.0	23.0	28.0	32.3	0.6	0.4	1.6	0.9
19	155	33	-	94	908	1116	-	1012	31.3	17.5	-	24.4	33.0	18.5	-	25.8	1.9	0.8	-	1.3
20	93	47	33	57	652	452	496	533	31.0	30.4	24.1	28.5	32.0	31.0	24.5	29.2	1.5	2.5	2.1	2.1
21	124	85	-	105	272	756	-	514	31.3	64.6	-	47.9	33.5	67.0	-	50.3	1.9	4.4	-	3.2
Mean	109	66	145	98	506	606	385	540	46.3	31.8	35.4	37.5	51.9	37.5	39.8	42.6	3.1	2.2	3.0	2.7

3.6 Sewage quality indicators of June

Table 1.Sewage quality indicators of Rich Garden sampling points

	COD（mg/L）				SS（mg/L）				NH3-N（mg/L）				TN（mg/L）				TP（mg/L）			
Time	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean
7	216	48	378	214	2260	44	948	1084	83.5	39.9	4.7	42.7	84.0	41.0	25.5	50.2	11.2	3.7	0.1	5.0
8	88	40	97	75	584	76	204	288	25.5	10.9	20.5	19.0	33.5	81.0	91.0	68.5	1.9	0.4	0.8	1.0
9	85	56	49	64	440	840	544	608	12.8	2.0	16.2	10.3	20.0	17.0	24.5	20.5	0.5	0.4	0.9	0.6
11	168	97	130	131	476	1180	932	863	59.7	15.1	14.8	29.8	62.0	20.5	40.5	41.0	5.3	1.5	0.6	2.5
12	120	32	97	83	1288	1152	484	975	26.4	14.5	17.6	19.5	30.5	15.0	43.5	29.7	2.1	0.9	0.5	1.1
13	32	290	146	156	1400	1384	656	1147	6.0	10.0	10.3	8.8	19.0	51.5	23.5	31.3	0.1	0.4	0.9	0.4
15	559	48	105	237	172	304	400	292	168.9	16.2	27.5	70.9	172.5	17.0	50.0	79.8	17.6	1.1	1.8	6.8
17	104	100	105	103	452	328	236	339	29.7	5.2	28.3	21.0	64.0	13.0	65.5	47.5	1.4	0.1	1.5	1.0
18	72	491	162	242	560	1800	488	949	22.1	128.0	36.9	62.3	24.5	129.0	37.5	63.7	1.1	12.3	1.3	4.9
19	40	185	84	103	760	468	508	579	16.5	59.5	16.5	30.8	16.5	30.5	36.5	27.8	0.8	3.3	0.6	1.6
20	176	56	89	107	464	136	492	364	36.7	33.3	27.8	32.6	39.0	14.0	49.5	34.2	4.2	0.8	1.8	2.3
Mean	151	140	106	132	805	701	494	667	44.3	30.4	21.6	32.1	51.4	38.9	46.2	45.5	4.2	2.2	1.0	2.5

Table 2.Sewage quality indicators of Zhiyinyuan sampling points

	COD（mg/L）				SS（mg/L）				NH3-N（mg/L）				TN（mg/L）				TP（mg/L）			
Time	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean
7	515	287	98	300	1272	848	316	812	83.5	55.1	25.4	54.7	103.0	80.5	67.0	83.5	12.3	7.3	2.6	7.4
8	49	227	179	152	236	240	1340	605	7.9	52.1	22.0	27.3	43.0	89.5	47.5	60.0	1.3	3.8	3.1	2.7
9	33	217	172	140	1044	580	1316	980	8.9	38.7	20.8	22.8	40.0	51.5	25.5	39.0	1.3	5.8	3.1	3.4
11	29	197	55	94	1044	2548	364	1319	17.6	19.5	21.5	19.6	33.5	72.0	48.0	51.2	1.3	1.4	2.1	1.6
12	51	269	60	127	2252	1272	496	1340	19.4	14.1	14.3	15.9	39.5	35.5	33.0	36.0	1.7	1.2	1.4	1.4
13	63	146	171	127	1200	172	480	617	23.0	54.4	6.3	27.9	40.5	56.0	28.5	41.7	2.6	3.8	0.6	2.3
15	110	145	394	216	1720	852	360	977	56.0	0.9	68.1	41.7	103.0	15.0	99.0	72.3	5.8	0.1	0.2	2.0
17	59	139	16	72	644	508	836	663	40.9	14.5	27.7	27.7	34.0	21.0	22.5	25.8	3.0	1.6	2.0	2.2
18	163	33	49	81	304	764	520	529	22.0	16.8	36.6	25.1	27.5	19.5	39.0	28.7	10.1	0.7	2.8	4.5
19	114	60	63	79	400	560	852	604	16.4	12.2	40.2	22.9	18.5	22.5	41.0	27.3	0.2	0.5	2.2	0.9
20	163	81	98	114	1600	1544	1036	1393	144.2	97.1	121.8	121.0	146.5	28.0	126.0	100.2	3.9	3.0	9.0	5.3
Mean	122	164	123	136	1065	899	720	895	40.0	34.1	36.8	37.0	57.2	44.6	52.5	51.4	3.9	2.6	2.6	3.1

3.7 Sewage quality indicators of July

Table 1.Sewage quality indicators of Rich Garden sampling points

	COD（mg/L）				SS（mg/L）				NH3-N（mg/L）				TN（mg/L）				TP（mg/L）			
Time	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean
7	241	69	251	187	136	264	696	365	23.1	32.9	6.9	20.9	24.0	33.5	8.0	21.8	4.3	10.7	3.4	6.1
8	239	269	103	204	120	128	104	117	9.6	50.2	6.5	22.1	11.5	52.5	7.0	23.7	3.3	10.0	2.0	5.1
9	112	26	86	75	232	348	216	265	5.6	22.8	7.9	12.1	6.0	25.0	8.5	13.2	1.4	6.3	3.2	3.6
11	181	133	310	208	180	248	536	321	15.2	45.9	6.3	22.5	16.0	47.5	8.5	24.0	5.1	13.6	2.5	7.1
12	-	121	542	331	-	216	200	208	-	7.6	8.0	7.8	-	8.0	9.0	8.5	-	3.4	3.3	3.3
15	319	224	284	276	204	228	140	191	9.9	6.9	19.4	12.1	11.0	9.0	19.5	13.2	3.1	2.6	6.9	4.2
17	-	327	327	327	-	224	404	314	-	9.6	9.6	9.6	-	12.0	11.5	11.8	-	2.8	2.8	2.8
18	353	215	250	273	344	372	384	367	6.2	17.4	11.0	11.5	7.0	19.0	13.5	13.2	1.9	4.6	3.7	3.4
19	172	121	60	118	180	436	124	247	9.3	7.6	9.8	8.9	10.0	8.5	10.5	9.7	2.9	2.6	1.5	2.3
Mean	231	167	246	222	199	274	312	266	11.3	22.3	9.5	14.2	12.2	23.9	10.7	15.4	3.1	6.3	3.2	4.2

Table 2.Sewage quality indicators of Zhiyinyuan sampling points

	COD（mg/L）				SS（mg/L）				NH3-N（mg/L）				TN（mg/L）				TP（mg/L）			
Time	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean
7	291	299	200	263	568	280	356	401	18.1	13.8	9.5	13.8	18.5	16.0	14.5	16.3	8.2	5.8	3.1	5.7
8	857	308	388	517	180	156	152	163	50.5	15.5	16.8	27.6	52.5	16.0	18.0	28.8	16.5	4.0	10.4	10.3
9	393	150	158	234	164	284	568	339	18.2	2.3	14.8	11.8	20.0	3.0	17.0	13.3	6.3	1.3	8.3	5.3
11	193	219	193	201	196	100	500	265	10.6	5.3	17.9	11.3	11.5	7.0	6.5	8.3	5.6	1.1	1.9	2.9
12	229	158	158	182	296	256	396	316	11.8	10.3	3.7	8.6	19.0	13.0	12.0	14.7	6.2	2.7	2.6	3.8
15	124	778	67	323	304	224	224	251	38.7	22.1	19.1	26.6	4.5	39.0	25.5	23.0	1.4	9.4	4.7	5.2
17	129	127	93	117	288	228	588	368	17.1	3.3	13.5	11.3	20.0	20.5	6.5	15.7	12.2	5.6	1.4	6.4
18	138	91	72	100	208	184	192	195	20.1	20.1	21.4	20.5	15.5	22.0	21.5	19.7	4.9	3.9	2.6	3.8
19	93	183	46	107	172	136	264	191	25.0	12.2	14.2	17.1	25.0	27.5	5.5	19.3	6.2	6.2	3.1	5.2
Mean	272	257	153	227	264	205	360	276	23	12	15	17	21	18	14	18	7	4	4	5

3.8 Sewage quality indicators of August

Table 1.Sewage quality indicators of Rich Garden sampling points

	COD（mg/L）				SS（mg/L）				NH3-N（mg/L）				TN（mg/L）				TP（mg/L）			
Time	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean	RG 1#	RG 2#	RG 3#	Mean
7	155	121	310	195	944	1356	948	1083	8.9	8.6	27.5	15.0	9.5	10.0	36.7	18.7	6.7	0.4	4.7	3.9
8	241	69	207	172	828	868	548	748	26.1	18.5	31.5	25.4	31.0	27.8	34.4	31.1	7.7	1.1	5.4	4.8
9	344	343	114	267	224	428	636	429	27.5	16.4	8.6	17.5	32.1	38.0	12.5	27.5	2.3	7.7	2.6	4.2
11	155	191	166	171	276	852	696	608	17.2	11.0	50.5	26.2	20.0	18.4	63.1	33.8	0.1	2.2	1.6	1.3
12	383	67	100	183	716	356	404	492	10.3	30.4	4.5	15.1	25.0	35.0	7.7	22.6	1.1	1.6	0.9	1.2
13	283	183	78	181	188	368	416	324	30.0	33.3	56.0	39.8	33.6	36.0	66.5	45.4	2.7	3.4	1.5	2.5
15	420	179	101	233	668	788	1316	924	118.2	42.0	8.9	56.4	135.0	53.7	13.5	67.4	10.1	4.8	1.4	5.4
17	212	142	57	137	920	904	444	756	33.0	24.0	11.2	22.7	40.2	33.3	11.5	28.3	5.0	3.7	1.3	3.3
18	144	109	119	124	688	576	368	544	5.2	9.0	14.6	9.6	6.5	18.0	28.5	17.7	1.4	3.4	1.1	2.0
19	743	163	131	346	1040	776	256	691	50.0	36.7	12.3	33.0	53.5	50.0	14.5	39.3	4.0	3.1	1.3	2.8
20	147	114	429	230	640	984	492	705	15.5	20.0	5.0	13.5	20.0	24.5	10.6	18.4	1.2	2.2	1.7	1.7
21	1325	813	502	880	1048	176	996	740	42.5	12.0	10.6	21.7	46.8	14.9	21.5	27.7	9.3	3.2	1.9	4.8
Mean	379	208	193	260	682	703	627	670	32.0	21.8	20.1	24.7	37.8	30.0	26.8	31.5	4.3	3.1	2.1	3.2

Table 2.Sewage quality indicators of Zhiyinyuan sampling points

	COD（mg/L）				SS（mg/L）				NH3-N（mg/L）				TN（mg/L）				TP（mg/L）			
Time	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean	Z 1#	Z 2#	Z 3#	Mean
7	136	227	303	222	1056	916	676	883	33.0	15.5	17.2	21.9	37.0	19.5	25.0	27.2	2.7	7.5	7.1	5.8
8	333	258	242	278	376	536	600	504	38.5	6.0	17.5	20.7	57.4	8.0	21.2	28.9	15.9	1.9	10.8	9.6
9	242	197	95	178	1008	512	908	809	9.7	5.7	8.3	7.9	12.0	7.0	16.5	11.8	2.1	8.2	1.2	3.8
11	132	212	606	317	696	852	152	567	8.6	9.2	5.5	7.7	14.0	15.0	8.0	12.3	5.1	2.0	0.9	2.7
12	76	167	121	121	108	344	1288	580	5.7	8.6	22.0	12.1	14.0	18.0	30.1	20.7	0.3	0.3	4.9	1.8
13	6	223	84	104	1028	668	1120	939	12.6	25.0	21.0	19.5	13.5	29.3	27.8	23.5	3.0	6.5	4.2	4.6
15	23	115	68	69	440	700	1312	817	5.7	17.5	19.8	14.3	6.5	21.0	20.0	15.8	0.4	2.2	2.1	1.6
17	131	146	146	141	284	380	156	273	82.6	11.5	6.0	33.4	99.0	13.8	12.0	41.6	10.5	2.5	1.8	5.0
18	100	162	120	127	596	352	608	519	18.0	46.0	65.0	43.0	21.8	51.6	76.6	50.0	2.1	0.2	2.0	1.4
19	105	135	58	99	460	628	380	489	80.0	30.0	50.0	53.3	84.4	32.7	57.1	58.1	0.7	0.6	1.8	1.0
20	90	75	105	90	1260	1096	588	981	21.0	50.0	15.0	28.7	26.4	54.5	19.5	33.5	0.4	0.5	1.1	0.6
21	90	300	45	145	844	696	864	801	21.0	10.5	22.5	18.0	24.4	10.0	25.0	19.8	2.3	1.8	1.4	1.8
Mean	122	185	166	158	680	640	721	680	28.0	19.6	22.5	23.4	34.2	23.4	28.2	28.6	3.8	2.9	3.3	3.3

3.9 Sewage quality indicators of September

Table 1.1st time sewage quality indicators

	COD（mg/L）			SS（mg/L）			NH3-N（mg/L）			TN（mg/L）			TP（mg/L）		
Time	1	2	Mean	1	2	Mean	1	2	Mean	1	2	Mean	1	2	Mean
7	409	76	243	580	180	380	15.5	20.3	17.9	21.3	35.0	28.2	14.7	2.1	8.4
8	124	153	138	240	108	174	2.6	23.5	13.1	8.5	42.0	25.3	6.3	2.3	4.3
9	61	452	256	476	452	464	28.4	20.0	24.2	50.5	20.1	35.3	2.2	0.3	1.3
11	92	152	122	412	440	426	15.3	1.7	8.5	29.0	5.5	17.3	2.7	0.7	1.7
12	107	250	178	192	464	328	19.7	1.7	10.7	34.0	4.5	19.3	2.9	0.3	1.6
13	137	205	171	336	920	628	16.5	52.0	34.3	31.6	89.0	60.3	3.6	1.3	2.4
15	107	258	182	72	604	338	22.5	20.5	21.5	23.0	37.6	30.3	1.5	6.2	3.8
17	137	182	160	404	120	262	26.4	15.8	21.1	32.0	27.5	29.8	1.7	1.3	1.5
18	76	197	137	220	108	164	17.5	29.5	23.5	30.7	38.5	34.6	2.5	1.3	1.9
19	122	120	121	344	212	278	21.4	64.7	43.1	36.5	90.0	63.3	3.1	3.1	3.1
20	92	52	72	120	254	187	20.6	37.5	29.1	35.5	62.0	48.8	2.1	2.9	2.5
21	258	180	219	156	412	284	15.3	98.6	57.0	35.0	183.0	109.0	2.5	11.9	7.2
Mean	144	190	167	296	356	326	18.5	32.2	25.3	30.6	52.9	41.8	3.8	2.8	3.3

Table 2.2nd time sewage quality indicators

	COD（mg/L）			SS（mg/L）			NH3-N（mg/L）			TN（mg/L）			TP（mg/L）		
Time	1	2	Mean	1	2	Mean	1	2	Mean	1	2	Mean	1	2	Mean
7	232	65	148	1864	172	1018	12.5	15.0	13.7	20.0	25.0	22.5	22.7	2.1	12.4
8	498	98	298	1226	128	677	69.2	1.5	35.3	79.0	7.5	43.2	13.2	1.0	7.1
9	240	128	184	1396	460	928	65.5	14.0	39.8	102.0	38.5	70.2	10.3	0.5	5.4
11	137	211	174	1368	592	980	18.0	47.6	32.8	25.5	54.0	39.8	1.9	2.2	2.0
12	155	146	150	484	544	514	26.0	14.3	20.2	50.5	20.0	35.3	2.9	0.1	1.5
13	86	301	194	544	768	656	25.5	38.5	32.0	42.0	71.0	56.5	2.3	1.3	1.8
15	120	151	135	536	832	684	34.5	77.0	55.8	53.7	88.5	71.1	2.8	9.9	6.4
17	120	184	152	212	1696	954	23.0	39.0	31.0	42.0	106.0	74.0	3.5	11.9	7.7
18	163	33	98	260	532	396	25.5	18.0	21.8	40.7	25.8	33.3	2.5	1.2	1.8
19	49	452	250	1804	708	1256	55.0	20.0	37.5	76.3	38.0	57.2	6.0	0.7	3.4
20	81	218	149	408	1420	914	29.0	115.0	72.0	78.6	130.0	104.3	3.1	11.5	7.3
21	33	273	153	276	1076	676	16.0	29.0	22.5	35.0	67.7	51.4	2.2	4.6	3.4
Mean	159	188	174	865	744	804	33.3	35.7	34.5	53.8	56.0	54.9	6.1	3.9	5.0

Appendix 2： Testing records of household waste

Pictures of household waste samples


Rich Garden waste sample 1


Rich Garden waste sample 2


Rich Garden waste sample 3


Rich Garden sample 4


Rich Garden sample 5


Rich Garden sample 6


Rich Garden sample 7


Zhiyinyuan waste sample 1


Zhiyinyuan waste sample 2


Zhiyinyuan waste sample 3


Zhiyinyuan sample 4


Zhiyinyuan sample 5


Zhiyinyuan sample 6


household waste

Waste sample 1 of September

Waste sample 2 of September

Waste sample 3 of September

Waste sample 4 of September

Appendix 3：Investigation personnel list

Name	Sex	professional ranks	Work unit	contact information
Bin Dong	male	Associate Professor	Tongji University	13918126169
QunBiao He	male	Researcher	Tongji University	13901886183
Xingwu Wu	male	Researcher	Tongji University	65980872
Zengyan Zhou	male	Professor	Tongji University	65980872
Guojian Li	male	Professor	Tongji University	65980872

Jinfeng Meng	female	Master	University of Jinan	13329103476
Ying Xu	male	Master	University of Shanghai for Science and Technology	18817581865
Hao Deng	male	Master	Tongji University	18817871517
Tiange Wang	female	Undergraduator	Tongji University	18616210979
Chen Deng	male	Master	Tongji University	18301953610
Jie Tan	male	Master	Tongji University	18301953110
Fan Luo	female	Doctor	Tongji University	15921273285
Jianghua Li	female	Master	Tongji University	18801736136