【APPENDICES】

1 Survey Team Members

(1) JICA

Name	Assignment	Organization
Mr. Yoshiki Omura	Leader	JICA International Specialist (water supply)
Mr. Yuji Maruo	Senioe Advisor	JICA International Specialist (Groundwater)
Mr. Hidetake Aoki	Planning Management	JICA Water Resource I

(2) Consultants

Name	Assignment	Organization
Mr. Ikuo Miwa	Team Leader/Water Supply Planning	NJS Consultants Co., Ltd.
Mr. Shin-ichi Osaka	Mechanical Equipment	NJS Consultants Co., Ltd.
Mr. Akio Natsui	Electrical Equipment	NJS Consultants Co., Ltd.
Dr. Kenji Takayanagi	Groundwater Control	NJS Consultants Co., Ltd.
Mr. Toshiaki Ooka	Construction/Procurement Plan, Cost Estimation	NJS Consultants Co., Ltd.
Mr. Takasi Kudo	Coordination	NJS Consultants Co., Ltd.

2 Survey Schedule

(1) First Field Survey (June 27, 2013 – July 26, 2013)

		JICA Mission	Mr. Miwa	Mr. Osaka	Mr. Natsui	Dr. Takayanagi	Mr. Ooka	Mr. Kudo (Voluntary)
2013/6/27	Thu	Tokyo-Lahore	Tokyo-Lahore	Tokyo-Lahore		Tokyo-Lahore		
2013/6/28	Fri	Call on WASA & P&D, IC/R	Call on WASA & P&D, IC/R	Call on WASA & P&D, IC/R		Call on WASA & P&D, IC/R		
2013/6/29	Sat	WASA P/S inspection	WASA P/S inspection	WASA P/S inspection		WASA P/S inspection		
2013/6/30	Sun	Internal meeting	Internal meeting	Internal meeting		Internal meeting		
2013/7/1	Mon	Discussion w WASA & P&D	Discussion w WASA & P&D	Discussion w WASA & P&D		Discussion w WASA & P&D		
2013/7/2	Tue	Discussion with WASA & PHED	Discussion with WASA & PHED	Discussion with WASA & PHED		Discussion with WASA & PHED		
2013/7/3	Wed	M/D signing, to Islamabad	M/D signing, to Islamabad	M/D signing, to Islamabad		Office setup		
2013/7/4	Thu	WB, EAD, EOJ, JICA	WB, EAD, EOJ, JICA	WB, EAD, EOJ, JICA		Data collection		
2013/7/5	Fri	Islamabad-Tokyo	Call on WQ companies	Call on WQ companies		Call on WQ companies		
2013/7/6	Sat		Interview on local supporters	Interview on local supporters		Interview on local supporters		
2013/7/7	Sun							
2013/7/8	Mon		Preparation of outsourcing	Preparation of outsourcing		Hearing on P/S O&M		
2013/7/9	Tue		Agreement signing for WQ	Data analysis		Data analysis	Tokyo-Lahore	
2013/7/10	Wed		Training on flow measurement	Training on flow measurement		Training on flow measurement	Hearing on P/S O&M	
2013/7/11	Thu		Data analysis	Request for quotation		Attendace on sampling, etc.	Hearing on P/S O&M	
2013/7/12	Fri		Data analysis	Hearing on P/S O&M		Attendace on sampling, etc.	Hearing on P/S O&M	
2013/7/13	Sat		Data analysis	Hearing on P/S O&M		Attendace on sampling, etc.	Hearing on P/S O&M	
2013/7/14	Sun							
2013/7/15	Mon		Call on meteorological office	Hearing on P/S O&M		T/W data analysis	Discussion on WASA material	
2013/7/16	Tue		Data analysis	Hearing on P/S O&M		T/W data analysis	Discussion on WASA material	
2013/7/17	Wed		Data analysis	Hearing on P/S O&M		T/W data analysis	Request for quotation	
2013/7/18	Thu		Data analysis	Hearing on P/S O&M		T/W data analysis	Request for quotation	
2013/7/19	Fri		Data analysis	Request for quotation		T/W data analysis	Request for quotation	
2013/7/20	Sat		Data analysis	Data analysis		T/W data analysis	Inspection on T/W drilling site	
2013/7/21	Sun							
2013/7/22	Mon		Data analysis	Data analysis		WQ data analysis	Data analysis	
2013/7/23	Tue		Discussion with DMD(O&M)	Data analysis		WQ data analysis	Data analysis	
2013/7/24	Wed		Inspection on PV power generation	Inpection of PV generation site		WQ data analysis	Data analysis	
2013/7/25	Thu		Greeting to WASA MD	Greeting to WASA MD		Greeting to WASA MD	Data analysis	
2013/7/26	Fri		Lahore-Tokyo	Lahore-Tokyo		Lahore-Tokyo	Lahore-Tokyo	

F/P: Filration Plant
MD: Managing Director
MD: Minutes of Discussion
DMD: Deputy Managing Director
P/S: Pump Station
PD: Project Director
T/W: Tubewell
Engg: Engineering
WQ: Water Quality
O&M: Operation & Maintenance

(2) Second Field Survey (August 18, 2013 – October 1, 2013)

		JICA Mission	Mr. Miwa	Mr. Osaka	Mr. Natsui	Dr. Takayanagi	Mr. Ooka	Mr. Kudo (Voluntary)
2013/8/18	Sun		Tokyo-Lahore		Tokyo-Lahore	Tokyo-Lahore		
2013/8/19	Mon		Courtesy call to WASA MD		Courtesy call to WASA MD	Courtesy call to WASA MD		
2013/8/20	Tue				Study on PV pumping system	T/W data analysis		
2013/8/21	Wed	Tokyo-Lahore	Explanation to WASA MD		Explanation to WASA MD	Explanation to WASA MD		
2013/8/22	Thu	Discussion with WASA	Discussion with WASA		Discussion with WASA	Discussion with WASA		
2013/8/23	Fri	Discussion with PHED	Discussion with PHED		Syudy on PS	T/W data analysis		
2013/8/24	Sat	Discussion with WASA	Discussion with WASA		Explanation to WASA MD	T/W data analysis		
2013/8/25	Sun							
2013/8/26	Mon	Discussion with PHED	Discussion with PHED	Tokyo-Lahore	Explanation to WASA MD	T/W data analysis		Tokyo-Lahore
2013/8/27	Tue	M/D signing	M/D signing	M/D signing	M/D signing	M/D signing		Inspection of P/S operation
2013/8/28	Wed	Lahore-Tokyo	WQ data analysis	Inspection of P/S operation	Inspection of P/S operation	T/W data analysis		Inspection of P/S operation
2013/8/29	Thu		WQ data analysis	Inspection of P/S operation	Inspection of P/S operation	Call on Punjab Univ.		Inspection of P/S operation
2013/8/30	Fri		F/P data analysis	Inspection of P/S operation	Inspection of P/S operation	T/W data analysis		Inspection of P/S operation
2013/8/31	Sat		F/P data analysis	Inspection of P/S operation	Inspection of P/S operation	T/W data analysis		Inspection of P/S operation
2013/9/1	Sun							
2013/9/2	Mon		T/W data analysis	Call on pump repairing shop	Call on LESCO for request	T/W data analysis		Call on pump repairing shop
2013/9/3	Tue		T/W data analysis	Call on pump repairing shop	Call on pump repairing shop	T/W data analysis		Call on pump repairing shop
2013/9/4	Wed		T/W data analysis	Operation data analysis	Call on pump repairing shop	Inspection of polluted-T/W		Operation data analysis
2013/9/5	Thu		T/W data analysis	Operation data analysis	Operation data analysis	T/W data analysis	Tokyo-Lahore	Operation data analysis
2013/9/6	Fri		Call on T/W contractor	Call on T/W contractor	Operation data analysis	T/W data analysis	Call on T/W contractor	Call on T/W contractor
2013/9/7	Sat		Call on T/W contractor	Call on T/W contractor	discussion with LESCO	T/W data analysis	Call on T/W contractor	Call on T/W contractor
2013/9/8	Sun							
2013/9/9	Mon		Study on T/W selection	Call on pump mfg factory	Call on pump mfg factory	T/W data analysis	Collection of quotation	Call on pump mfg factory
2013/9/10	Tue		Study on T/W selection	Operation data analysis	Inspection of P/S operation	T/W data analysis	Collection of quotation	Operation data analysis
2013/9/11	Wed		Discussionn with DMD (Engg)	Discussionn with DMD (Engg)	Inspection of P/S operation	Discussionn with DMD (Engg)	Quotation data arrangement	Inspection of P/S operation
2013/9/12	Thu		Report preparation	Operation data analysis	Inspection of P/S operation	Call on T/W contractor	Quotation data arrangement	Inspection of P/S operation
2013/9/13	Fri		Report preparation	Operation data analysis	Inspection of P/S operation	T/W data analysis	Quotation data arrangement	Operation data analysis
2013/9/14	Sat		Inspection of Faisalabad WASA	Inspection of Faisalabad WASA	Inspection of Faisalabad WASA	Inspection of Faisalabad WASA	Inspection of Faisalabad WASA	Inspection of Faisalabad WASA
2013/9/15	Sun							
2013/9/16	Mon		Lahore-Tokyo	Report preparation	Discussionn with DMD (Engg)	Env. & soc. data collection	Witness on topo survey	Operation data analysis
2013/9/17	Tue			Discussionn with PD	Discussionn with PD	Call to T/W material mfg com.	Witness on topo survey	Operation data analysis
2013/9/18	Wed			Report preparation	discussion with WASA engr.	Env. & soc. data collection	Witness on topo survey	Operation data analysis
2013/9/19	Thu			Report preparation	Design of electrical equip.	Call on T/W contractor	Quotation data arrangement	Operation data analysis
2013/9/20	Fri			Report preparation	Report preparation	Env. & soc. data collection	Quotation data arrangement	Operation data analysis
2013/9/21	Sat			Report preparation	Report preparation	Env. & soc. data collection	Quotation data arrangement	Operation data analysis
2013/9/22	Sun							
2013/9/23	Mon			Report preparation	Report preparation	Env. & Soc. Data Collection	Report preparation	Operation data analysis
2013/9/24	Tue			Lahore-Tokyo	Report preparation	Inspection of disposal sites	Report preparation	Lahore-Tokyo
2013/9/25	Wed				Design of electrical equip.	Env. & Soc. Data Collection	Report preparation	
2013/9/26	Thu				Design of electrical equip.	Discussionn with DMD (Engg)	checking of survey drwaings	
2013/9/27	Fri				Report preparation	Env. & Soc. Data Collection	checking of survey drwaings	
2013/9/28	Sat				Discussionn with DMD (O&M)	Discussionn with DMD (O&M)	Discussionn with DMD (O&M)	
2013/9/29	Sun							
2013/9/30	Mon				Report preparation	Env. & Soc. Data Collection	checking of survey drwaings	
2013/10/1	Tue				Lahore-Tokyo	Lahore-Tokyo	Lahore-Tokyo	

(3) Explanation and Discussion of ODR (February 25, 2014—March 8, 2014)

		JICA	Mr. Miwa	Mr. Osaka
2014/2/25	Tue			yo-Bankok-Lahore
2014/2/26	Wed			lanation and discussion of ODR
2014/2/27	Thu		yo-Bankok-Lahore	ussion with WASA PD
2014/2/28	Fri		ring on status of surface water induction survey	rectionof Report
2014/3/1	Sat		ey on using status of filtration plants	ey on using status of filtration plants
2014/3/2	Sun		rectionof Report	rectionof Report
2014/3/3	Mon	yo-Bankok-Lahore	er quality and consumption data analysis of filtrati ts	ectionof Report
2014/3/4	Tue	ussion with WASA MD		
2014/3/5	Wed	ussion with P&D		
2014/3/6	Thu	ing of M/D, Discussion with WASA MD、Visit to A filtration Plant, Lahore - Islamabad		
2014/3/7	Fri	A Pakistan, EOJ< ERD		
2014/3/8	Sat	nabad-Bankok-Tokyo		

3 List of Organizations Concerned in Pakistan

Water and Sanitation Agency Lahore (WASA)

Dr. Javed Iqbal	Managing Director
Mr. Syed Iqtidar Hussain Shar	Deputy Managing Director (O&M)
Mr. Aftab Ahmad	Deputy Managing Director (Engg)
Mr. Shakeel Ahmed Kashmiri	Director (P&E)
Ms. Naheed Gul Baloch	Director (Finance)
Mr. Mohammad Arif Saeed But	Director (Hydrology)
Mr Naveed Mazhar	Senior Engineer
Mr. Muhammad Rafiq	Executive Engineer (Electricity)
Ms. Zainab Abbas	Chemist

Lahore Development Authority (LDA)

Mr. Ahad Cheema	Director General

Department of Housing, Urban Development and Public Health Engineering (HUD&PHED)
Provincial Government of Punjab

Mr. Suhail AamiSr	Secretary

Department of Planning and Development (P&D)
Provincial Government of Punjab

Mr. Arif Ali Baloch	Secretary

Urban Unit (UU), Department of Planning and Development (P&D)
Provincial Government of Punjab

Dr. Kiran Farhan	Sr. SWM Specialist

External Resource Department (ERD)
Federal Government of Pakistan

Mr. Mohammad Asif Shiekh	Additional Secretary

4 Minutes of Discussion (M/D)

(1) Minutes of Discussion (July 3, 2013)

MINUTES OF DISCUSSIONS
ON THE STUDY FOR THE OUTLINE DESIGN SURVEY
ON THE PROJECT FOR ENERGY SAVING IN WATER SUPPLY SYSTEM
IN LAHORE
IN THE ISLAMIC REPUBLIC OF PAKISTAN

Lahore, July 3, 2013

Dr. Javed Iqbal
Managing Director
Water and Sanitation Agency
Lahore Development Authority

Mr. Yoshiki Omura
Leader,
Preparatory Study Team for Outline Design Survey,
Japan International Cooperation Agency

Mr. Israr Saeed
Chief Engineer
Lahore Development Authority

Dr. Nasir Javed
Chief Executive Officer
Urban Unit, P&D Department
Government of Punjab

Mr. Shahid Latif
Additional Secretary
Housing Urban Development and Public Health Engineering Department,
Government of Punjab

Mr. Arif Anwar Baloch
Secretary
Planning and Development Department,
Government of Punjab

Dr. Iftikhar Amjad
Deputy Secretary
Economic Affairs Division,
Government of Pakistan

(ASGHAR ALI)
Section Officer
Economic Affairs Division
Government of Pakistan
Islamabad

In response to a request from the Government of the Islamic Republic of Pakistan (hereinafter referred to as "Pakistan") for THE PROJECT for ENERGY SAVING IN WATER SUPPLY SYSTEM IN LAHORE (hereinafter referred to as "the Project"), the Japan International Cooperation Agency (hereinafter referred to as "JICA") sent the Preparatory Study Team (hereinafter referred to as "the Team") for the Outline Design Survey on the Project to Pakistan from June 28 to July 25, 2013.

The Team held a series of discussions with relevant organizations and conducted field visits to develop scope and implementing arrangements of a further survey. In the course of discussions, both sides confirmed the items described on the main points discussed in the Appendix 1. The tentative schedule of the Preparatory study is attached in the Appendix 3. The Japan's Grant Aid Scheme is described in the Appendix 4.

It should be noted that implementation of the Outline Design Survey does not imply any decision or commitment by JICA to extend its grant for the Project at this stage.

Appendix 1: Main Points Discussed
Appendix 2: Attendant list
Appendix 3: Tentative schedule
Appendix 4: Japan's Grant Aid Scheme

Appendix 1

MAIN POINTS DISCUSSED

1. Objectives of the Project

The Pakistani side understood that the Project is an emergency measure against a decrease in production of water due to aging, outdating and inefficiency of existing tubewells so that the objectives of the Project are to restore the initial capacity of tubewells and to improve energy efficiency for reduction of operation and maintenance cost.

2. Study of additional water sources

The Team mentioned that the Lahore Water and Sanitation Agency (Lahore WASA) has duties of supplying drinking water to meet water demand of the Lahore city, and there will be a limitation of supplying with only groundwater source so that the Pakistani side should consider additional water sources. The Pakistani side explained that a study titled "Feasibility study for construction of water treatment plant to treat the surface water intake from BRB Canal, Lahore" will be executed FY 2013-14 to pursue a possibility of developing surface water for drinking water supply.

3. Request for replacement of tubewells under the Project

The Team mentioned that the Japanese government had received the original request with 67 tubewell replacement out of 105 targeted tubewells and recognized that the remaining 38 targeted tubewells will be rehabilitated with updating pumps. However, the Pakistani side explained that the entire 105 tubewells should be replaced with new tubewells. Since most of the tubewells have deteriorated with age and overuse, it is hard to rehabilitate the existing tubewells.

The Team mentioned that the Japanese side might not cover all the tubewell replacement due to budget limitation, etc, therefore the Team requested the Pakistani side to prioritize them.

4. Request for the Grant Aid Project

Both sides confirmed the request for the Japan's Grant Aid Project as follows:

(i) Project Site
Within the service area of Lahore WASA, in Lahore, Punjab

(ii) Civil Works
- Replacement of tubewell pumps
- Drilling of tubewells
- Provision and installation of Solar energy systems for tubewells
- Construction of a laboratory with water quality analysis equipment and glasses
- Construction of a workshop with equipment for calibration and repair of meters
- Provision of instruments for energy audit

(iii) Consulting Services
- Detailed design

- Assistance for tendering
- Construction supervision
- Technical assistance (soft component)

5. List of targeted tubewells for the study

The 17 tubewells for replacement in the original request were already re-drilled by Lahore WASA in emergency and the Pakistani side requested to substitute them with new candidate tubewells. Lahore WASA submitted a list of targeted tubewells for the study to the Team as shown in table 1.

6. Specification of pumps to be installed for replaced tubewells

Lahore WASA mentioned that it had applied pumps with a few varieties of capacity for convenience of maintenance. Both sides agreed that pumps with appropriate capacity and head will be selected so as to make their operation sustainable and achieve high efficiency of energy consumption.

7. Criteria of site selection for the Project

Both sides agreed that the appropriateness of site selection out of existing over 480 tubewells will be checked through data collection and analysis, actual flow measurement and questionnaire to the operation and maintenance staff. The final targeted sites will be selected with the criteria as follows:

- Long-term pump operation over 15 years
- Pump operation discontinued due to severe drawdown of groundwater level
- Reduction of discharge
- No suitability due to sand blowing
- Deterioration of water quality (no compliance with the Pakistani drinking water quality standards)
- No necessity of land acquisition of private lands
- Accessibility of construction vehicles
- Possibility of water pumping test with appropriate drainage on construction sites

8. Water production of new tubewells

Both sides agreed that water production of new tubewells will be determined with pumping test so that it could be resulted in less than their previous design discharge.

9. Consideration of water quality

Considering water quality especially of arsenic concentration in well water, the provisional value is 0.01 mg/l according to the WHO guideline for drinking-water quality and 0.05 mg/l of the Pakistan-adopted standard. The Pakistani side mentioned that the WHO guideline will be preferable but due to hydrogeological condition of the area the Pakistan-adopted standard shall be applicable. The Team strongly recommended to adopt the WHO guideline of 0.01 mg/l for the Project.

10. Solar power generation system

The Pakistani side reiterated its request that solar system for running / operation of

tubewells should be part of the Project. The Japanese side mentioned that the application of solar system to Lahore WASA water supply system is considered technically unfavorable due to such problems as power surge at starting large pumps and DC-AC conversion besides financial issues.

Both sides agreed that solar power generation system will be included in the Project, if the cost-effectiveness and sustainability of solar power generation system are clarified through the study, regarding sustainability in operation and maintenance, energy efficiency and effectiveness of introduction of the system to the total water supply system in Lahore, and, initial and operational costs.

11. Instruments for energy audit

The Pakistani side recognized the importance of energy conservation recently so that energy audit has been necessary. The Team requested the Pakistani side to provide the information of member list of the energy audit teams of Lahore WASA, present survey performance with existing facilities, operation and maintenance of equipment, necessity and plan of utilization of instruments, for further survey during the study.

12. Re-utilization of existing over-head reservoirs

The Pakistani side provided a list of existing over-head reservoirs to the Team as shown in Table 2. The Team explained that reutilization of existing over-head reservoirs will contribute to enhancement of energy efficiency. Both side agreed that the Team will conduct further survey on re-utilization of some reservoirs with the aspect of storage volume comparing with its distribution area, cost for rehabilitation and so on.

13. Laboratory and analytical instruments

The Pakistani side explained the present situation of water quality test, that the laboratory of Lahore WASA is functioning in analysis of such parameters as temperature, pH, odour, colour, taste, turbidity, clay/sand/rust etc., conductivity, TDS, total hardness, Ca, Mg, alkalinity, residual chlorine, NO_2, NO_3, NH_4, carbonates, bicarbonates, and fluoride (F), while other analyses are contracted out to the external institutions for parameters such as arsenic and heavy metals, which are examined less frequently. The Team suggested Lahore WASA to continue daily water quality test at its laboratory and outsource those of being tested less frequently. The Pakistani side requested the Team to reconsider it for further survey during the study.

14. Undertakings to be taken by the Pakistani side for the project implementation

(i) Land acquisition (land use agreement / temporary construction permission)

The Pakistani side agreed to obtain the relevant approval documents on land use agreement and temporary construction permission from respective government department in a timely manner, if land acquisition is to be necessary in the further survey.

(ii) Tax exemption arrangement

The Pakistani side agreed to undertake necessary procedures for tax exemption and custom clearance of the products at the port of disembarkation.

15. Consultation

JICA and Lahore WASA will consult with each other in respect of any matter that may arise from or in connection with the Preparatory Study (Outline Design Survey).

Table 1 LIST OF TARGETED TUBEWELLS

Sr. NO.	Name of Tubewell	Sub Divisions	Years of Installation	Designed Capacity (cfs)
1	Huma Block	A.I.T	2002	4
2	Neelam block	A.I.T	2007	4
3	Pak Block	A.I.T	1986	4
4	Jahanzaib Block	A.I.T	1986	4
5	Ravi Block	A.I.T	1998	4
6	Abdul karim Road (Mela Ram Park)	Anarkali	2003	2
7	Nisar Scheme Qila Gujjar Singh	Anarkali	1996	4
8	Dhobi Mandi	Anarkali	2004	2
9	Patiala Ground	Anarkali	1990	4
10	Rashi Bhawan (Pathi Ground)	Anarkali	2002	2
11	Circular Road Guru Argum Nagar)	Anarkali	1988	4
12	Hilton Hotel	Anarkali	1977	4
13	Royal Park	Anarkali	1995	4
14	Suraya Jabeen Park	Baghbanpura	2003	4
15	Salamatpura Takkia (Village)	Baghbanpura	1998	4
16	Shah Gohar Abad	Baghbanpura	1992	4
17	Milap Street	Baghbanpura	1996	4
18	Dhobi Ghat.	Baghbanpura	1998	4
19	Madhu Lal Hussain	Baghbanpura	1999	4
20	Iqbal Park-I	City	1998	4
21	Iqbal Park-III	City	1998	4
22	Chomala	City	2005	2
23	Iqbal Partk fort	City	2002	4
24	Sabzi Mandi	City	1993	4
25	Sharanwala Gate	City	1998	4
26	Ali Park	City	1998	4
27	Iqbal Park-II	City	1998	4
28	Raheem Road Data Nagar	Data Nagar	1998	4
29	Khokhar Road No.III	Data Nagar	1996	4
30	Hussain Park	Data Nagar	2002	4
31	Siddique Pura	Data Nagar	1995	4
32	Jia Musa	Farrukhabad	2003	2
33	Latif Chowk(Wandala Road)	Farrukhabad	1994	4
34	Farrukh Abad Disposal	Farrukhabad	1998	4
35	3-D-I	Green Town	2001	2
36	D-I Block-III	Green Town	1999	4
37	D-II Block-IV	Green Town	1997	4
38	Tanki No.4 Township	Green Town	1985	1
39	Tanki No.3 Township	Green Town	1985	1
40	Gawala Colony No.1	Green Town	1993	2
41	Henry Key (Old)	Gulberg	1986	2
42	Zafar Ali Road/Jail Road	Gulberg	1996	4
43	M-Block Gulberg	Gulberg	1997	4
44	WASA Head Office	Gulberg	1996	4
45	B-I Block Gulberg (A-Block Gulberg)	Gulberg	1998	4
46	Mehboob Park, Ichra	Icchra	2001	4
47	A-Block Muslim Town	Icchra	1993	4
48	C-Block Muslim Town	Icchra	1998	4
49	Fareed Colony Printing Press	Industrial Area	1999	4
50	Nishtar Colony	Industrial Area	1987	2
51	Block No.6 Sector-A-II Township	Industrial Area	1996	4
52	Block No.4 Sector-A-II Township	Industrial Area	1993	4
53	Baba Farid Colony	Industrial Area	1996	4
54	Mian Fazal Haq Colony	Industrial Area	1999	4
55	B-Block Gulsahn-E-Ravi	Islampura	1998	4
56	Rifle Range	Islampura	1992	4

Sr. NO.	Name of Tubewell	Sub Divisions	Years of Installation	Designed Capacity (cfs)
57	Bilal Park Shamnagar	Islampura	1992	4
58	A-Block Gulsahn-e-Ravi	Islampura	1998	4
59	Nonarian	Islampura	1997	4
60	Sodiwal Quarter	Islampura	1993	4
61	Jaffria Colony	Islampura	1990	4
62	Rewaz Gardan	Islampura	1991	4
63	Sanda Patwar Khana	Islampura	1997	4
64	Raj Garh Office	Islampura	1978	4
65	National Town Sandha	Islampura	1996	4
66	Rustam Park	Islampura	1993	4
67	E-I Johar Town	Johar Town	2004	2
68	A-III Johar Town	Johar Town	1985	3
69	A-Block Johar town	Johar Town	2001	4
70	Mustafa Town	Johar Town	1997	4
71	Kanji House Misri Shah	Misri Shah	1998	4
72	D-Block China Scheme (Gujjar Pura)	Misri Shah	1993	4
73	Jinah Park	Misri Shah	1996	4
74	Faiz Bagh	Misri Shah	1998	2
75	Shadman Market	Mozang	1990	4
76	Katcha Temple Road (Abid Market)	Mozang	2004	2
77	Awa Phari	Mozang	1992	4
78	Shah Shamas Qari	Mozang	1987	2
79	Faseeh Road	Mozang	2002	4
80	Shadman-I Rehmania Park	Mozang	1995	4
81	Sui Gas Engine Lytton Road	Mozang	1986	4
82	Shah Jamal.	Mozang	1993	4
83	Shadman Mental Reservoir	Mozang	1978	4
84	Sadi Park.	Mozang	1994	4
85	Jail Road (Lahore Collage)	Mozang	1992	2
86	Mujahidabad	Mughalpura	1997	4
87	Angori Bagh Scheme-II	Mughalpura	2001	2
88	Daras Barey Mian	Mughalpura	1997	4
89	Kotli Pir Abdur Rehman	Mughalpura	2001	4
90	Punj Pir	Mughalpura	1991	4
91	Sansi Quarter	Mughalpura	1996	4
92	Gulshan Park	Mughalpura	1993	4
93	Shah Kamal	Mughalpura	1998	4
94	Lal Pul Fayyaz Park	Mughalpura	1998	4
95	Seher Road	Mughalpura	2003	2
96	Achant Garh	Mughalpura	2003	2
97	Canal Bridge	Mustafabad	1995	4
98	Gulistan Colony	Mustafabad	1995	4
99	Dev Samaj Road (Commisioner Office)	Ravi Road	1998	4
100	Islampura	Ravi Road	1991	4
101	Mohni Road Salmat Mohalla	Ravi Road	1998	4
102	Bilal Ganj	Ravi Road	1993	4
103	Yasir Road	Ravi Road	1987	4
104	Sardar Chapal	Ravi Road	1993	4
105	M.C High School Sanda	Ravi Road	1997	4
106	Karim Park Old	Ravi Road	1990	4
107	Akram Park, Bund Road	Ravi Road	1990	2
108	Ibrahim Road	Ravi Road	1992	4
109	Main Out Fall No.1	Ravi Road	1992	4
110	E-Block Sabzazar	Sabzazar	1987	2
111	K-Block Sabzazar	Sabzazar	1987	2
112	B-Block Sabzazar	Sabzazar	2002	2
113	A-Block Sabzazar	Sabzazar	1997	2
114	D-Block Sabzazar	Sabzazar	1987	2

8

Sr. NO.	Name of Tubewell	Sub Divisions	Years of Installation	Designed Capacity (cfs)
115	N-Block,Samanabad	Samanabad	1995	4
116	Ittehad Colony Samanbad	Samanabad	1996	4
117	Pir Buddan Shah Dholanwal	Samanabad	1991	4
118	Juggian Shahab Din	Samanabad	1997	4
119	Children Park	Shadbagh	1985	2
120	Yasrab Colony	Shadbagh	1994	4
121	Taj Pura Ground	Shadbagh	1995	4
122	Shahab Stadium (Fazal pura)	Shadbagh	1998	4
123	Chah Miran (Old)	Shadbagh	1995	4
124	Shadbagh well Centre-I	Shadbagh	1995	4
125	Shadbagh well Centre-II	Shadbagh	1995	4
126	Shadbagh well Centre-IV	Shadbagh	1995	4
127	Shish Mehal Road	Shadbagh	1994	4
128	Majeed Park Shahdara UC-6.	Shahdara	1997	2
129	Takia Khusrianwala Shahdara UC-6	Shahdara	1989	4
130	G.T.Road Shahdara	Shahdara	1990	4
131	Saeed Park.	Shahdara	1998	4
132	Paracha Colony	Shahdara	1995	2
133	Latif Park.	Shahdara	1993	2
134	Ghazi Muhala Children Park	Shimla Hill	1986	4
135	Larex colony	Shimla Hill	2004	2
136	Tegore Park	Shimla Hill	1992	4
137	Scotch Cornor / Upper Mall	Shimla Hill	2002	4
138	Muhammad Nagar.	Shimla Hill	1990	4
139	Baghay Shah	Shimla Hill	1986	2
140	Habib Ullah Road	Shimla Hill	1997	4
141	Ahmad Block	Garden Town	2004	2
142	E-Block, Tajpura	Tajpura	1987	2
143	Ghaziabad Bus Stop	Tajpura	1980	4
144	A-Block Tajpura	Tajpura	1986	2
145	Jorrey Pull	Tajpura	1992	4
146	Q-Block Model Town EXT	Township	1986	4
147	S-Block Model Town Ext.	Township	1996	4

Table 2 EXISTING OVER-HEAD RESERVOIRS IN THE SERVICE AREA OF LAHORE WASA

Sr. No.	DESCRIPTION	SUB DIVISION	CAPACITY (GALLONS)	CAPACITY (m3)
1	Langey Mandi (Pani Wala Talab)	City	1,000,000	4,546
2	Chowk Na-Khuda, Misri Shah	Misri Shah	50,000	227
3	ShadBagh	Misri Shah	50,000	227
4	Wassan Pura	Misri Shah	50,000	227
5	Gujjar Pura	Misri Shah	50,000	227
6	Baghbanpura SDO Office	Baghbanpura	50,000	227
7	Mustafabad SDO Office	Muslafabad	50,000	227
8	Upper Mall Scheme, XEN East Office	Muslafabad	50,000	227
9	Ghari Shahu	Muslafabad	50,000	227
10	Qila-.Muhammadi (Qila Lachman Singh)	Ravi Road	50,000	227
11	Timber Market	Ravi Road	50,000	227
12	Fruit market	Ravi Road	50,000	227
13	Rewaz Garden	Islampura	50,000	227
14	Krishan Nagar SDO Office	Islampura	50,000	227
15	Sham Nagar	Islampura	50,000	227
16	Main market, Samanabad	Samanabad	50,000	227
17	Doongi Ground near Musjid Khizra	Samanabad	50,000	227
18	Sodiwal	Samanabad	50,000	227
19	Chenab Block	Allama Iqbal Town	100,000	455
20	Ravi Block	Allama Iqbal Town	100,000	455
21	F & V Market	Allama Iqbal Town	100,000	455
22	H- Block, Sabzazar	Allama Iqbal Town	100,000	455
23	F - Block, Sabzazar	Allama Iqbal Town	100,000	455
24	Mohlanwal	Allama Iqbal Town	30,000	136
25	Shah Jamal	Ichra	50,000	227
26	Rehmanpura	Ichra	50,000	227
27	Main Bazar, Ichra	Ichra	50,000	227
28	Shadman-I	Ichra	100,000	455
29	Shadman-II	Ichra	100,000	455
30	A-Block Muslim Town	Ichra	100,000	455
31	Zafar Ali Road	Gulberg	50,000	227
32	Main Gulberg	Gulberg	50,000	227
33	B- Block Gulberg II	Gulberg	30,000	136
34	T- Block Gulberg	Gulberg	50,000	227
35	A- Block Gulberg III	Gulberg	50,000	227
36	C- Block Gulberg III	Gulberg	50,000	227
37	D- Block Gulberg HI	Gulberg	50,000	227
38	E- Block Gulberg HI	Gulberg	50,000	227
39	B- Block Gulberg II	Gulberg	50,000	227
40	FCC Block Gulberg	Gulberg	50,000	227
41	IMP Block Gulberg III	Gulberg	50,000	227
42	Nishtar Colony	Gulberg	50,000	227
43	A- Block M.A. Johar Town	Garden Town	100,000	455
44	Block G-4 M.A. Johar Town	Garden Town	100,000	455
45	F- Block M.A. Johar Town	Garden Town	100,000	455
46	Block R-3 MA Johar Town	Garden Town	100,000	455
47	Trade Center MA Johar Town	Garden Town	100,000	455
48	Tanki No.1 Pindi Stop Industrial Area	Garden Town	50,000	227
49	Gawala Colony	Garden Town	30,000	136
50	Tanki No.2 Block No. P B-1 Township	Township	50,000	227
51	Tanki No.3 Block No. P B-1 Township	Township	150,000	682
52	Tanki No.4 Sector 0-1	Green Town	250,000	1,137
	Total Reservoir Capacity		4,440,000	20,184

Source: Lahore WASA

Appendix 2

ATTENDANT LIST

<Pakistani Side>

Lahore Water and Sanitation Agency (Lahore WASA)

Dr. Javed Iqbal	Managing Director
Mr. Syed Iqtidar Ali Shah	Deputy Managing Director (O&M)
Mr. Aftab Ahmad	Deputy Managing Director (Eng.)
Mr. Shakeel Ahmed Kashmiri	Director (P&E)
Ms. Naheed Gul Baloch	Director (Finance)
Mr. Muhammad Arif Saeed Butt	Director (Hydrology)
Mr. Fakhar Hayat	Deputy Director (Social Mobilisation)
Mr. M. Naveed Mazhar	Senior Engineer (Mech.)
Mr. Muhammad Rafiq	Executive Engineer (Electricity)
Ms. Zanab Abbas	Chemist

Lahore Development Authority (LDA)

Mr. Ahad Khan Cheema	Director General

Housing Urban Development and Public Health Engineering Department (HUD&PHED), Government of Punjab

Mr. Shahid Latif	Additional Secretary (Tech.)
Mr. Muazzam Jamil	Deputy Secretary

Planning and Development Department (P&D), Government of Punjab

Mr. Arif Anwar Baloch	Secretary
Mr. Muhammad Ajmal	Asstt. Chief (UD)
Mr. Khalid Sultan	Chief (ECA)
Ms. Mariyam Shahab	Planning Officer (UD-II)
Ms. Bushra Aman	

The Urban Unit, Planning and Development Department (P&D), Government of Punjab

Dr. Kiran Farhan	Sr. SWM Specialist
Mr. Farhat Saeed	Sr. GIS Especailist

Economic Affairs Division (EAD)

Dr. Iftikhar Amjad	Deputy Secretary

<Japanese Side>

Mr. Yoshiki Omura	Leader of the Preparatory Study Team / Senior Advisor
Dr. Yuji Maruo	Groundwater Management Specialist / Senior Advisor
Mr. Hidetake Aoki	Planning Management / Staff of JICA Headquarter
Mr. Ikuo Miwa	Chief consultant of the Outline Design / Water Supply Planner
Mr. Shin-ichi Osaka	Mechanical Equipment Specialist
Dr. Kenji Takayanagi	Groundwater Management Specialist

Appendix 3

TENTATIVE SCHEDULE

Year	2013							2014							
Month	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8
Preparation in Japan															
Work in Pakistan															
Work in Japan															
Explanation of the draft of Outline Design Survey report															
Preparation of the Outline Design Survey report															
Report	*1)							*2)							*3)

*1) IC/R: Inception Report
*2) DOD/R: Draft of Outline Design Report
*3) F/R: Final Report

Appendix 4

JAPAN'S GRANT AID SCHEME

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on the law and the decision of the Government of Japan (hereinafter referred to as "the GOJ"), JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

The Japanese Grant Aid is conducted as follows-

- Preparatory Survey (hereinafter referred to as "the Survey")
  - The Survey conducted by JICA
- Appraisal &Approval
  - Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Determination of Implementation
  - The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
  - Agreement concluded between JICA and a recipient country
- Implementation
  - Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Survey is to provide a basic document necessary for the appraisal of the Project by JICA and the GOJ. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed on by both parties concerning the basic concept of the Project.
- Preparation of a basic design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures are

necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

(2) Selection of Consultants
For smooth implementation of the Survey, JICA uses (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey
The Report on the Survey is reviewed by JICA, and after the appropriateness of the Project is confirmed, JICA recommends the GOJ to appraise the implementation of the Project.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A
After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be signed between the GOJ and the Government of the recipient country to make a plead for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants
The consultant firm(s) used for the Survey will be recommended by JICA to the recipient country to also work on the Project's implementation after the E/N and the G/A, in order to maintain technical consistency.

(3) Eligible source country
Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) Necessity of "Verification"
The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country
In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex.

(6) "Proper Use"
The Government of the recipient country is required to maintain and use the facilities constructed and the equipment purchased under the Grant Aid properly and effectively and

to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"
The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)
The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions to the Bank.

(10) Social and Environmental Considerations
A recipient country must ensure the social and environmental considerations for the Project and must follow the environmental regulation of the recipient country and JICA socio-environmental guidelines.

(End)

Annex

Major Undertakings to be taken by Each Government

NO	Items	To be covered by the Grant	To be covered by Recipient side
1	To secure land		•
2	To clear, level and reclaim the site when needed		•
3	To construct gates and fences in and around the site		•
4	To construct the parking lot		•
5	To construct roads		
	1) Within the site	•	
	2) Outside the site		•
6	To construct the building	•	
7	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities		
	1)Electricity		
	a.The distributing line to the site		•
	b.The drop wiring and internal wiring within the site	•	
	c.The main circuit breaker and transformer	•	
	2)Water Supply		
	a.The city water distribution main to the site		•
	b.The supply system within the site (receiving and/or elevated tanks)	•	
	3)Drainage		
	a.The city drainage main (for storm, sewer and others) to the site		•
	b.The drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the site	•	
	4)Gas Supply		
	a.The city gas main to the site		•
	b.The gas supply system within the site	•	
	5)Telephone System		
	a.The telephone trunk line to the main distribution frame / panel (MDF) of the building		•
	b.The MDF and the extension after the frame / panel	•	
	6)Furniture and Equipment		
	a.General furniture		•
	b.Project equipment	•	
8	To bear the following commissions to a bank of Japan for the banking services based upon the B/A		
	1) Advising commission of A/P		•
	2) Payment commission		•
9	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country		
	1) Marine(Air) transportation of the products from Japan to the recipient country	•	
	2) Tax exemption and customs clearance of the products at the port of disembarkation		•
	3) Internal transportation from the port of disembarkation to the project site	(•)	(•)
10	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		•
11	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract		•
12	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		•
13	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for construction of the facilities as well as for the transportation and installation of the equipment		•

B/A: Banking Arrangement, A/P: Authorization to pay

(2) Minutes of Discussion (August 27, 2013)

MINUTES OF DISCUSSIONS
ON THE PREPARATORY SURVEY FOR THE OUTLINE DESIGN SURVEY
ON THE PROJECT FOR ENERGY SAVING IN WATER SUPPLY SYSTEM
IN LAHORE
IN THE ISLAMIC REPUBLIC OF PAKISTAN

Lahore, August 27, 2013

Dr. Javed Iqbal
Managing Director
Water and Sanitation Agency
Lahore Development Authority

Mr. Yoshiki Omura
Leader,
Preparatory Survey Team for Outline Design Survey,
Japan International Cooperation Agency

Mr. Ahad Khan Cheema
Director General
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Mr. Waseem Mukhtar
Secretary
Housing Urban Development and Public Health Engineering Department,
Government of Punjab

Mr. Arif Anwar Baloch
Secretary
Planning and Development Department,
Government of Punjab

The Japan International Cooperation Agency (hereinafter referred to as "JICA") sent the second Preparatory Survey Team (hereinafter referred to as "the Team") for the Outline Design Survey on THE PROJECT for ENERGY SAVING IN WATER SUPPLY SYSTEM IN LAHORE (hereinafter referred to as "the Project") to the Islamic Republic of Pakistan (hereinafter referred to as "Pakistan") from August 18 to October 1, 2013.

The present Minutes of Discussions are prepared in connection with the previous Minutes of Discussions signed on the 3rd of July, 2013.

The Team held a series of discussions with relevant organizations on the results based on the first stage of the survey, and both sides confirmed the items described on the main points discussed in the Appendix.

It should be noted that implementation of the Outline Design Survey does not imply any decision or commitment by JICA to extend its grant for the Project at this stage.

Appendix: Main Points Discussed

Appendix

MAIN POINTS DISCUSSED

1. Management improvement

The Team mentioned referring THE PUNJAB DRINKING WATER POLICY that the government of Punjab was conducting Institutional Reform Program in the Urban Water Service Providing Government Agencies in order to not only improve service delivery but also address allied issues such as rationalization of tariff, improvement in management of organization and introduction of performance monitoring systems so as to ensure that the WASAs are transformed into a progressive; accountable and financially viable institution by the year 2016.

The Team pointed out that the operational loss had recently been increasing as the total operational expenditure had grown as shown in annex 1. The Team explained that the Project would contribute to cost reduction by a technical approach for reduction of energy consumption by replacement of pumps, but it was still necessary for WASA to make efforts to reduce operational expenditure and rationalize water tariff to improve the financial status.

2. Number of tubewells targeted for the Outline Design

The Team mentioned that the number of tubewells targeted for the Outline Design would be less than 105 due to severity of lowering of groundwater level and arsenic concentration of water sources. The Pakistani side explained that it's a replacement of outlived tubewells and the quantity targeted is absolute to meet with the existing requirement. As regards arsenic concentration, it was clarified that water supply system is interconnected and only 4-5 % of the water production is being used for drinking purposes. In order to provide contamination and arsenic free water to the citizens of Lahore, WASA installed 100 water filtration plants at source, through funding from the Government of the Punjab, where required.

The Team requested the Pakistani side to submit the available supporting documents to the Team by 5th September, 2013 such as the concept and design of the plant, the distribution map of deployed 100 arsenic filtration plants, the performance records of the plants, the future deployment plan, and any document which guarantees that consumers drink only filtrated water. The Pakstani side agreed to submit them. If any additional data were required by the Team, the Pakistani side will submit them by 28th September, 2013.

3. Specification of pumps to be installed for replaced tubewells

The Team explained that the specification of pumps to be installed would reflect the result of pumping yield survey at the tubewells and sustainable optimum abstraction, which might be the present yield or even less, in order to avoid an acceleration of lowering groundwater level. The Pakistani side requested the Team to consider turbine as well as submersible-motor pumps keeping in view depleting of water level. The Team explained that due to maintenance issues and no availability of local expertise it does not recommend submersible-motor pumps. The Pakistani side suggested for providing extra

submersible-motor pumps as standby arrangement to meet with repair and maintenance issues.

The Team found that current issues with turbine pumps were caused by burning of ground motors due to the frequent power outages and voltage fluctuation. The Team also found that submersible-motor pumps could not be repaired locally, if any motor problem happened due to electricity power. Therefore the Team proposed to continue use of turbine pumps of optimum specifications for sustainable operation for the Project.

The Pakistani side understood the Team's finding and conclusion. The Pakistani side requested provision of spare ground motors for backup during repair time. The Team agreed to consider it.

4. Energy audit instruments

The Team explained that JICA had recognized that necessity of energy audit activity for enhancement of energy efficiency by the energy management cell and would consider proposing installation of a set of energy audit instruments. The Pakistani side explained that WASA has constituted energy audit team comprising electrical and mechanical graduate engineers. Presently, WASA has more than 600 installations as such one set of energy audit system will not meet with the current requirement. The Pakistani side requested the Team to provide at least two sets enabling WASA to carry out proper energy audit of the installations. The Team agreed to consider it.

5. Solar power system

The Team studied installation of solar power system (photovoltaic generation) as a pilot project with comparing among alternatives of on-grid, off-grid and hybrid systems with reliability of power supply, and economic and financial aspects. As a result of initial analysis of investment recovery, the Team explained that the initial installation cost is 187 million yens for operation of one 4 cusec tubewell and return period is 99 years for capital investment, whereas expected lifetime is only 20 years for solar panels. Based on this, the Team concluded that this uneconomical proposal is not feasible as shown in Annex 2. The Pakistani side agreed to it..

6. Laboratory and analytical instruments

The Team explained that upgrading the WASA laboratory would require not only installation of precision equipment but also analytical practice of chemists and supporting staff for both operation and maintenance, and continuous supply of reagents and consumables. On the other hand, the Team pointed out availability of academic and private laboratories which provide services of analysis at reasonable charge. The Team recommended WASA to outsource testing of some parameters such as Arsenic and pesticide / herbicide. Therefore the Team concluded to exclude a construction of a laboratory and provision of water quality analysis equipment and others from the project components. The Pakistani side explained that the parameters like arsenic are already carried out through the Punjab University and the Engineering University Lahore. The tests are being carried out periodically due to presence of arsenic in water and heavy expenditures are being incurred. WASA has experts to carry out such tests and again requested the Team to consider their demand for provision of ICP (Inductive Couple Plasma) equipment for WASA laboratory to enhance its capacity.

The Team reiterated its conclusion due to the above condition and recommended WASA to outsource the testing. The Pakistani side agreed to it.

7. Possibility of procurement from the third countries

The Pakistani side agreed that there would be a possibility of procurement from other than Japan or Pakistan due to such reasons as availability of products, easiness and cost in both countries, and some other reasons. The Team explained that it is clearly mentioned in the relevant paragraph of Grant Agreement, which would be signed by both sides after an approval of the Project by the Japanese government as quoted below and also in the item 3. Japan's Grant Aid Scheme (3) of the Appendix 4 of the Minutes of Discussions signed on the 3rd of July, 2013.

Grant Agreement

Article 3 Use of the Grant

(1) The Grant shall be used by the Government of the Islamic Republic of Pakistan properly and exclusively for the purchase of such products of Japan or the Islamic Republic of Pakistan and such services of Japanese or Pakistani nationals necessary for the implementation of the Project as listed below (The term "nationals" whenever used in the G/A means Japanese physical persons or Japanese juridical persons controlled by Japanese physical persons in the case of Japanese nationals and Pakistani physical or juridical persons controlled by Pakistani physical persons in the case of Pakistani nationals.):

(a)equipment and services necessary for the procurement and the installation thereof;

(b)services necessary for the transportation of the products referred to in (a) above to ports in the Islamic Republic of Pakistan and those for internal transportation therein; and

(c)services necessary for the training in operating the equipment referred to in (a) above and the guidance in managing the equipment referred to in (a) above .

(2) Notwithstanding the provisions of sub-paragraph (1) above, when JICA and the Authority deem it necessary, the Grant may be used for the purchase of the products of the kind referred to in (a) of sub-paragraph (1) above, which are products of countries other than Japan or the Islamic Republic of Pakistan and the services of the kind referred to in (a),(b) and (c) of sub-paragraph (1) above, which are services of nationals of countries other than Japan or the Islamic Republic of Pakistan.

5

Annex

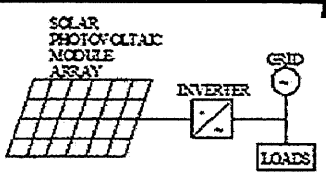
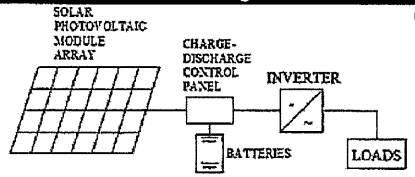
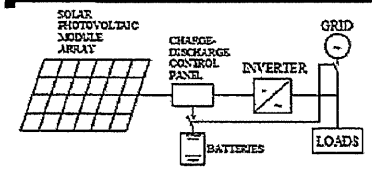
Table Finacial Status of WASA

		FY 2005/06	FY 2006/07	FY 2007/08	FY 2008/09	FY 2009/10	FY 2010/11	FY 2011/12	FY 2012/13
Number of Tubewells	(nos.)	400	405	417	424	460	462	474	474
Water Production	(MGD)	340	350	360	379	335	338	357	362
Accounted for Water	(MGD)	214	220	227	243	271	264	266	271
Unaccounted for Water	(MGD)	126	130	133	136	164	125	131	108
Number of Metered Connections	(nos.)	237,752	267,484	273,600	291,502	314,564	352,877	368,753	401,276
Number of Unmetered Connections	(nos.)	301,097	287,789	274,359	289,560	266,116	232,220	229,103	208,042
Water Charges + Connection Fee	(Rs. Mil.)	874	907	935	1,016	1,075	1,114	1,236	1,305
Sewerage Charges + Connection Fee	(Rs. Mil.)	612	660	705	747	770	860	878	944
UIP Tax Share in lieu of drainage	(Rs. Mil.)	467	289	360	403	399	513	569	926
Miscellaneous Income	(Rs. Mil.)	169	314	554	837	377	110	134	133
Total Operating Revenue	**(Rs. Mil.)**	**2,122**	**2,170**	**2,554**	**3,003**	**2,621**	**2,597**	**2,757**	**3,308**
Salaries and Benefits	(Rs. Mil.)	652	725	852	1,027	1,164	1,351	1,761	1,933
Repair and Maintenance	(Rs. Mil.)	315	406	553	645	675	416	559	978
Light, Power and Energy	(Rs. Mil.)	1,083	977	1,050	1,265	1,503	2,068	2,491	2,954
Other Expenses	(Rs. Mil.)	55	81	87	63	95	50	97	104
Total Operating Expenses	**(Rs. Mil.)**	**2,105**	**2,189**	**2,552**	**3,000**	**3,437**	**3,945**	**4,908**	**5,979**
Operating Profit (Loss)	(Rs. Mil.)	17	(19)	2	(2)	(816)	(1,348)	(2,151)	(2,671)
Operating Profit (Loss) B/F	(Rs. Mil.)	2	19	-	2	-	(816)	56	694
Subsidy by the Government	(Rs. Mil.)	-	-	-	-	-	2,229	2,779	2,179
Cumulative Surplus (Deficit)	(Rs. Mil.)	19	-	2	-	(816)	36	694	192
Collection - Current Demand	(Rs. Mil.)	1,251	1,295	1,357	1,448	1,485	1,568	1,693	1,787
Collection out of Arrears	(Rs. Mil.)	235	272	283	315	360	405	421	463
Total Collection in Fiscal Year	(Rs. Mil.)	1,486	1,567	1,640	1,763	1,845	1,973	2,114	2,250
Arrears Balance - Current	(Rs. Mil.)	383	375	395	375	408			
Arrears Balance B/F	(Rs. Mil.)	1,548	1,659	1,754	1,831	1,846			
Cumulative Arrears	(Rs. Mil.)	1,931	2,034	2,148	2,206	2,254			
Source		(1)	(1)	(1)	(1)	(2)	(2)	(2)	(2)

(1) "Six Year Business Plan (FY 2010/11 to FY 2015/16)", December 2010, JICA Loan Expert
(2) Division of Finance, WASA

Annex 2

Alternatives of Solar PV Generation System

Description	Alternative a) On-grid	Alternative b) Off-grid	Alternative c) Hybrid of On and Off-grid
System Configuration			
Outline and Characteristics	1) Solar PV Generation DC Power is converted to AC and synchronized with grid to feed power to the loads within the plant. 2) Solar PV Power Generation system will cover the loads within the plant in cooperation with the grid. 3) Generated solar power can be fully consumed to 100% level in the plant. 4) Grid can function like as batteries to the solar power system. It results in making the system economically. 5) Grid power failure trips off the solar power system to guarantee the system safety. It interrupts power supply to the loads within the plant.	1) Solar PV generation system has to cover all the loads within the plant. 2) Applicable to the facilities remotely located from power distribution line. 3) Grid power failure does not impact to the plant. Suitable as an emergency power source. 4) Applicable to road sign and street lightings even in case the grid power is available in the vicinity. 5) Initial, operation and maintenance cost are extremely high.	1) Solar PV generating power can be used efficiently under normal conditions, while the limited loads can be powered by the Solar PV generation system during grid power failure. 2) Generated solar power can be fully consumed to 100% level under normal conditions. 3) Suitable as emergency power source. 4) Initial, operation and maintenance costs are higher than alternative a .
Installation Cost	J Yen 187,200,000 for the system with 190 kW solar PV module panels to drive the 110 kW pump motor	J Yen 28,656,100,000 for the system to drive the 110 kW pump motor	J Yen 726,600,000 for the system with 684 kW solar PV module panels to drive the 110 kW pump motor
Overall Evaluation	Most reliable power supply system and most economical among the three alternatives.	Impractical due to the extremely high cost.	Reliable power supply system but more expensive than alternative a.

Financial Analysis of Solar PV Generation System

The solar PV generation system has been studied in terms of the financial sustainability based on the alternative a) of on-grid system, which has been recommended because of its practical system configuration.

Basic parameters

- Motor output rating for driving 4 cusec well pump : 110 kW (150 HP)
- Solar PV generation system rating for driving 110 kW motor: 190 kW
- Irradiation flux rate has been calculated in a manner of weighing average for nine years from 2004 to 2012 through the data from the Lahore Meteorological Agency.
- Total consumed electricity energy;
  - ✓ Ep = 100 kW x 16 hours/day x 365 days = 584,000 kWh/Year
- Total generated electricity energy by the solar PV generation system ;
  - ✓ Es = Irradiation flux rate, 1,578,885 kWh/m^2 x solar photovoltaic panel area, 1359 m^2 x energy converting factor, 0.1 x system de-rating factor, 0.7 = 155,199 kWh/Year
- Total amount of the electricity bill is estimated as per the tariff and regulation of LESCO as follows;
  - ✓ Maximum demand : 100 kW
  - ✓ Fixed charge: : Maximum demand in kW x 200 Rs/month x 12 months
  - ✓ Energy charge for peak timing : Total power in kWh supplied by LESCO x 13 Rs
  - ✓ Energy charge for off-peak timing : Total power in kWh supplied by LESCO x 8 Rs
  - ✓ Taxes : Energy charge x 0.18

The results of the study on the sustainability/suitability of the solar PV generation system to the project from the financial aspect are shown on the Table 2.

Study on Recovery of Initial Investment for Solar PV Generation System

Description	Case 1: Without Solar PV Generation System	Case 2: With Solar PV Generation System
Initial installation cost for 190 kW solar PV generation system	-	Rs 187,200,000.-
Yearly consumed electricity energy	584,000 kWh/yr (100 kWx16 hrs x365 days)	584,000 kWh/yr (100 kWx16 hrs x365 days)
Irradiation flux rate	-	1,578,885 kWh//m^2/yr
Electricity energy supplied by solar PV generation system		150,199 kWh/yr (Irradiation flux rate, 1,578,885 kWh/m^2 x solar PV panel area, 1,359 m^2 x energy converting factor, 0.1 x system de-rating factor, 0.7)
Electricity energy supplied by LESCO	584,000 kWh/yr	433,801 kWh/yr (584,000 – 150,199)
Electricity bill payable to LESCO	Rs. 6,626,360.- /yr	Rs. 4,734,938.- /yr
Balance of electricity bill		Rs. -1,891,422.-
Expected lifetime of solar PV generation system		20 years
Balance of bill for 20 years		Rs. 37,828,440.-
Number of years required to recover the initial investment for the solar PV generation system		99 years

Results of Financial Study

- It is deemed not to be practical in the financial assessment as shown in Table 2, since it takes 99 years to recover the initial investment for the solar PV generation system from the balance of the electricity charges payable to LESCO in the manner of a simple calculation method.
- The initial investment for the solar PV generation system will be accumulated forever without recovering due to its replacement requirement every 20 years.

(2) Minutes of Discussion (March 6, 2014)

MINUTES OF DISCUSSIONS
ON THE PREPARATORY SURVEY FOR THE OUTLINE DESIGN STUDY
ON THE PROJECT FOR ENERGY SAVING IN WATER SUPPLY SYSTEM
IN LAHORE
IN THE ISLAMIC REPUBLIC OF PAKISTAN
(EXPLANATION OF THE DRAFT REPORT)

Lahore, March 6, 2014

Dr. Javed Iqbal
Managing Director
Water and Sanitation Agency
Lahore Development Authority

Mr. Hidetake Aoki
Leader,
Preparatory Survey Team for Outline Design Study,
Japan International Cooperation Agency

for Mr. Ahad Khan Cheema
Director General
Lahore Development Authority

for Mr. Waseem Mukhtar
Secretary
Housing Urban Development and Public
Health Engineering Department,
Government of Punjab

Mr. Arif Anwar Baloch
Secretary
Planning and Development Department,
Government of Punjab

Mr. Shahid Amed Vakil
Deputy Secretary
Economic Affairs Division,
Government of Pakistan

The Japan International Cooperation Agency (hereinafter referred to as "JICA") has conducted the Preparatory Survey for the Outline Design Study on THE PROJECT FOR ENERGY SAVING IN WATER SUPPLY SYSTEM IN LAHORE (hereinafter referred to as "the Project"). Through discussions, field surveys, and technical examination of the study results in Japan, JICA prepared a draft final report of the survey.

In order to explain and to consult with the Government of the Islamic Republic of Pakistan (hereinafter referred to as "Pakistan") on the components of the draft final report, JICA dispatched to Pakistan the Draft Final Report Explanation Team (hereinafter referred to as "the Team"), headed by Mr. Hidetake Aoki, Deputy Director, Water Resources Management Division 1, Global Environment Department, JICA from the 3rd to the 7th of March 2014.

As a result of discussions, both sides confirmed the main items described in the attached sheet.

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ATTACHMENT

1. Components of the Draft Final Report

The Pakistani side agreed and accepted in principle the components of the draft final report explained by the Team. The Project sites map and components of the Project are respectively shown in Annex-1 and Annex-2. The 105 proposed tubewells are listed in Annex-3.

2. Responsible and implementation agency

2-1). The Responsible Agency is the Housing Urban Development and Public Health Engineering Department, Government of Punjab (hereinafter referred to as "HUD&PHED").

2-2). The Implementing Agency is the Water and Sanitation Agency, Lahore Development Authority (hereinafter referred to as "Lahore WASA").

3. Submission of the Final Report

JICA will complete the final report in accordance with the confirmed items and send it to the Government of Pakistan in August 2014.

4. Japan's Grant Aid Scheme

4-1). The Pakistani side understood the Japan's Grant Aid Scheme explained by the Team, as described in Attachment 1 for Annex-6.

4-2). The Pakistani side will take the necessary measures, as described in Attachment 2 for Annex-6, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

5. Other Relevant Issues

5-1) Project cost estimation and fairness

The Team explained to the Pakistani side the estimated project cost as attached in Annex-4. Both sides confirmed that this cost estimation is provisional and would be examined further by the Government of Japan for its final approval. Furthermore, both sides confirmed that this project cost estimation is CONFIDENTIAL, and should never be duplicated in any forms or released to any other parties until the relevant contracts are awarded by the Government of Pakistan, in order to secure fairness of tender procedure.

5-2) Necessary budget to be covered by the Pakistani side

The Japanese side explained necessary project cost to be covered by the Pakistani side as attached in Annex-4. The Pakistani side agreed to secure necessary budget in order to bear necessary annual operation and maintenance cost.

5-3) Tax Exemption

The both sides confirmed that the tax exemption including Value Added Tax (VAT), customs duty, and any other taxes and fiscal levies in Pakistan, which is to be imposed in relation to the Project activities, will be ensured by the Pakistani side. Lahore WASA will take any necessary procedures for tax exemption, and in case that tax exemption is not secured, the cost of tax will be borne by Lahore WASA.

5-4) Undertakings of the Pakistani side

The Team explained to the Pakistani side its undertakings as listed in Attachment 2 for Annex-6 and the Pakistani side understood and agreed to execute them. The following items are to be emphasized:

1) Approval procedure of Planning Commission-1 for the Project

The Pakistani side explained that Lahore WASA would prepare and submit a planning commission-1 (PC-1) document to HUD&PHED and PC-1 needs to be approved by the Executive Committee of National Economic Council (ECNEC), the Government of Pakistan by the end of September 2014. The Pakistani side agreed to take necessary procedures to secure its approval.

2) Installation of filtration plants for proposed tubewells with high arsenic concentration

a) Considering water quality especially of arsenic concentration in well water, the provisional value is 0.01 mg/l according to the WHO guidelines for drinking-water quality. Therefore the Team strongly recommended to adopt the WHO guidelines for the Project. The Pakistani side explained that the government of Punjab had the policy of supplying water with appropriate quality and installing water filtration plants for arsenic removal.

b) In the case that a water quality test after construction of each tubewell proves arsenic concentration of not lower than 0.01 mg/l, Lahore WASA needs to install a filtration plant and to construct a connection pipe from the tubewell to the plant. After the completion of construction of the plant, the tubewell will be inaugurated. Both sides agreed that Lahore WASA would take necessary procedures to secure its budget.

c) Adsorption capability of an arsenic filtration material will be deteriorated due to age and it needs to be replaced periodically. Lahore WASA agreed to coordinate a budget allocation in order to contract continuously for maintenance of filtration plants.

d) Lahore WASA agreed to conduct dissemination for the water users to use water for drinking and cooking purposes from public faucets with arsenic filtration plants separately from other usage. The Team emphasized that it was important that the water users know very well a risk to drink water contaminated with high arsenic concentration and which source of water to drink and cook, even under the situation of having an access for water through private faucets at their home.

3) Procedure of Initial Environmental Examination (IEE)

The Pakistani side agreed to complete necessary procedure of IEE by the end of January 2015 in

accordance with "the Environmental Protection Act 2013" of the Punjab province.

4) Technical assistance ("Soft Component") of the Project

Both sides confirmed that the technical assistance on the effective measurement and analysis of the operation of the tubewell pump stations was designed as a soft component of the Project. To secure the effectiveness of the soft component, Lahore WASA agreed to assign competent and appropriate staff who can acquire the necessary skills and knowledge to apply to their job.

5) Land Acquisition

Lahore WASA repeated that it was confirmed that all the proposed tubewell sites were in public properties and there was no additional process to be taken to acquire them for the construction of tubewells. Both sides agreed that the Pakistani side would take necessary procedures to acquire land for the sites of the Project, if required.

5-5) Specification of Pumps

The Team explained that the motor protection system would activate and the pumps would stop functioning in order to avoid motor burning under the inappropriate voltage due to power fluctuation, so that water supply would discontinue. The Pakistani side understood the importance of the protection system and prolonging their functioning life.

5-6) Substitution of the proposed tubewells

Lahore WASA explained that the Pakistani side had already constructed new tubewells due to emergency measure during the preparatory survey and requested to substitute them for ones in the candidate list. Both sides confirmed that the 18 tubewells to be excluded from the Project and ones to be included in. Furthermore, the Pakistani side requested the proposed tubewells to be substituted for ones in the list as categorized in D in Annex-3, in case that the Pakistani side reconstructs them in the implementation stage of the Project.

Lahore WASA requested that the tubewells excluded from the Project in the process of selection of tubewells based on the exclusion criteria be remained as the tubewells for substitution. The Team explained that both sides had agreed the exclusion criteria with the Minutes of Discussions signed on July 3rd, 2013 and needed to respect the process in principle. Lahore WASA mentioned to consult with JICA for further consideration of substitution when the condition was cleared.

5-7) Plan of measurement and analysis of operation of the tubewell pump stations

Both sides agreed that Lahore WASA would prepare a plan and conduct activities to measure and analyze the operation of tubewell pump stations with the energy audit equipment in order to maximize energy efficiency.

5-8) Maintenance of tubewells

Both sides agreed that Lahore WASA would start activities to prolong functioning life of tubewells, such as flushing tubeswells at the early stage before their yield reduced much.

5-9) Management improvement

The Team mentioned referring THE PUNJAB DRINKING WATER POLICY that the government

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of Punjab was conducting Institutional Reform Program in the Urban Water Service Providing Government Agencies in order to not only improve service delivery but also address allied issues such as introduction of metered rate system, rationalization of tariff, improvement of tariff collection rate, improvement in management of organization and introduction of performance monitoring systems so as to ensure that the WASAs are transformed into a progressive; accountable and financially viable institution by the year 2016.

The Team pointed out that the operational loss had recently been increasing as the total operational expenditure had grown as shown in Annex-5. The Team explained that the Project would contribute to cost reduction by a technical approach for reduction of energy consumption by replacement of pumps, but it was still necessary for Lahore WASA to make efforts to reduce operational expenditure and for the Government of Punjab to rationalize water tariff or deliver a subsidy to improve the financial status.

5-10) Progress of Feasibility Study for surface water induction

The Pakistani side explained the progress of "The Feasibility Study for Surface Water Induction and Construction of Water Treatment Plant, Lahore (PC-II)", that technical proposals had already been received from 11 applicants and waiting for their opening, and followed by the consultant selection. The study period is set for four months.

Annex-1 Project Sites map
Annex-2 Components of the Project
Annex-3 List of tubewells proposed for the project
Annex-4 Project cost to be borne by each government
Annex-5 Financial status of Lahore WASA
Annex-6 Japan's Grant Aid Scheme

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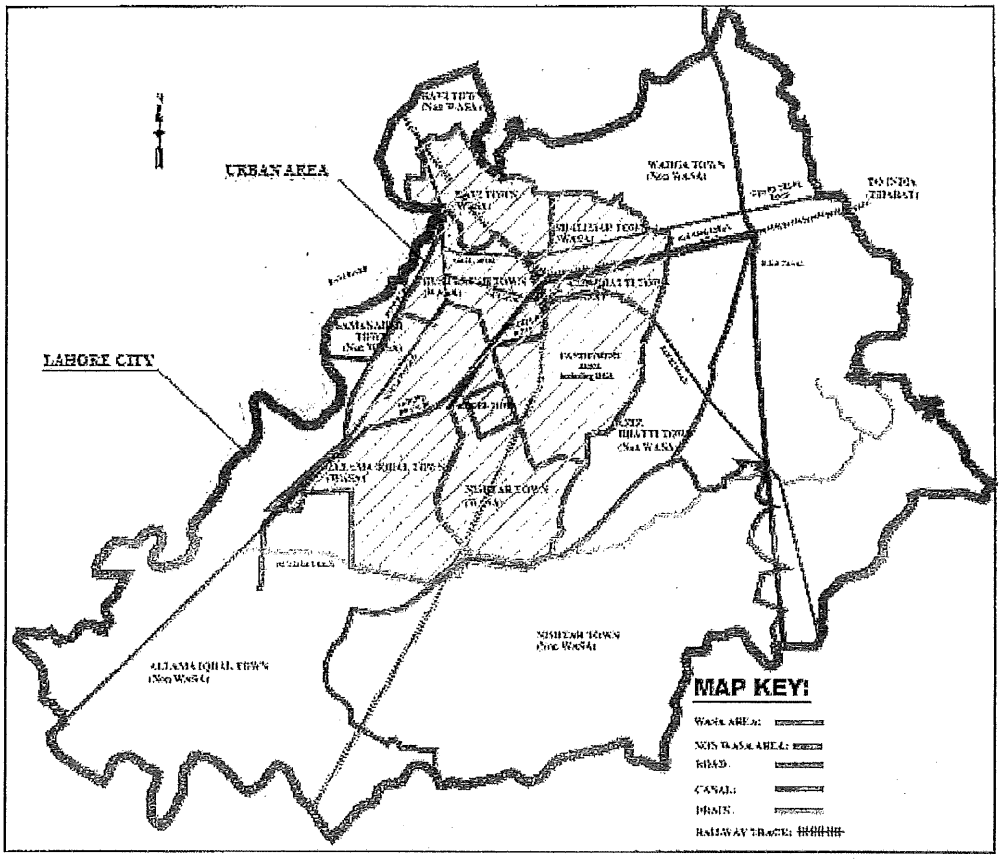
Annex- 1



PROJECT SITES MAP

Annex- 2

COMPONENTS OF THE PROJECT

Category	Contents
1) Construction Works	1) Civil and Building (a) Tubewell construction: 105 locations ・ Tubewell (Capacity: 5.1~6.8m³/min, Design SWL in 2031: GL shallower than -65m): 95 wells ・ Tubewell (Capacity: 3.4m³/min, Design SWL in 2031: GL deeper than -65m) : 10 wells Note: It is assumed that a filtration plant will be installed at a tubewell with an arsenic concentration of above 0.02 mg/L by WASA. (b) Tubewell Pumping Station Building: 105 locations ・ Tubewell Pumping Station (Brick, Floor area: approx. 31.5 m² with furniture) (c) Connection Pipe Installation ・ HDPEφ200~φ300: 105 locations 2) Mechanical/Electrical Equipment Installation (a) Tubewell Pump ・ Tubewell pump (Discharge: 6.8m³/min, Head: 57/51/47m, Output: 90/75kW): 35units ・ Tubewell pump (Discharge: 5.1m³/min, Head: 66/64/62m, Output: 90/75kW): 60 units ・ Tubewell pump (Discharge: 3.4m³/min, Head: 64m, Output: 55kW): 10 units (b) Pump Accessories ・ Valve (check valve, sluice valve, air valve), Turbine type flow meter, Piping, etc.: 105 locations ・ Disinfection equipment (storage tank, diaphragm pump): 105 locations ・ Motor as stand-by (90/75/55kW): One (1) unit for each town ・ Chainblock: One (1) unit for each town (c) Electrical Equipment ・ Power Control panel (for 90/75/55kW): 105panels ・ Wiring: 105 locations ・ Water level meter: 10 units ・ Spare parts: One (1) set for each town
2) Procurement of Equipment	Energy audit instruments: Two (2) sets for each ・ Power analyzer ・ Portable flow meter (ultrasonic) ・ Pressure logger ・ Portable level meter ・ Tachometer ・ Thermo meter (Laser) ・ Vibration meter ・ Lap-top computer
3) Soft Component	Subject: Energy Audit No. of Trainees: Approx. 15 persons ・ Result 1: Energy audit of pumping stations ・ Result 2: Proper O&M plan using energy audit ・ Result 3: Rehabilitation and replacement plan
4) Consulting Services	・ Detailed design ・ Bidding assistance ・ Construction supervision

Note: JICA estimated the project cost by the Japanese Grant Aid based on the proposed tubewell list before substitution as described in 5-6), so that it is subject to modify.

Annex- 3

LIST OF TUBEWELLS PROPOSED FOR THE PROJECT

Cate-gory	Priority	Location of A Filtration Plant	Sub-Division	Install. Year	Design Capacity (cfs)	As. Conc,. (ug/L)
A (16)	1	A-Block Gulsahn-e-Ravi	Islampura	1998	4	9
	2	Rashi Bhawan (Pathi Ground)	Anarkali	2002	2	12
	3	Q-Block Model Town EXT	Township	1986	4	15
	4	Mustafa Town	Johar Town	1997	4	16
	5	Chomala	City	2005	2	20
	6	Block No.6 Sector-A-II Township	Industrial Area	1996	4	20
	7	A-Block Tajpura	Tajpura	1986	2	21
	8	A-III Johar Town	Johar Town	1985	3	23
	9	Shah Kamal	Mughalpura	1998	4	23
	10	Taj Pura Ground	Shadbagh	1995	4	23
	11	Abdul Karim Road (Mela Ram Park)	Anarkali	2003	2	26
	12	National Town Sandha (at Jhangir Park)	Islampura	1996	4	30
	13	Takia Khusrianwala Shahdara	Shahdara	1989	4	33
	14	Ali Park	City	1998	4	34
	15	Seher Road	Mughalpura	2003	2	44
	16	Latif Park (Abandoned)	Shahdara	1993	2	59
B (4)	17	Circular Road (Guru Argum Nagar)	Anarkali	1988	4	5
	18	Sardar Chapal	Ravi Road	1993	4	6
	19	Shish Mehal Road (at Nazmabad.)	Shadbagh	1994	4	6
	20	S-Block Model Town Ext.	Township	1996	4	9
C (85)	21	D-Block Sabzazar	Sabzazar	1987	2	10
	22	Rustam Park	Islampura	1993	4	15
	23	Raheem Road Data Nagar	Data Nagar	1998	4	16
	24	D-II Block-IV	Green Town	1997	4	16
	25	Sanda Patwar Khana	Islampura	1997	4	16
	26	Nisar Scheme Qila Gujjar Singh	Anarkali	1996	4	17
	27	Sadi Park.	Mozang	1994	4	18
	28	Tanki No.4 Township (Abandoned)	Green Town	1985	1	19
	29	Tanki No.3 Township (No motor)	Green Town	1985	1	19
	30	C-Block Muslim Town	Ichra	1998	4	19
	31	Faseeh Road	Mozang	2002	4	19
	32	Shah Jamal.	Mozang	1993	4	19
	33	Kotli Pir Abdur Rehman	Mughalpura	2001	4	19
	34	Shahab Stadium (Fazal pura)	Shadbagh	1998	4	19
	35	Huma Block	A.I.T	2002	4	20
	36	Fareed Colony Printing Press	Industrial Area	1999	4	20
	37	Children Park	Shadbagh	1985	2	20
	38	Henry Key (Old)	Gulberg	1986	2	21
	39	Block No.4 Sector-A-II Township	Industrial Area	1993	4	21
	40	Canal Bridge	Mustafabad	1995	4	21
	41	Scotch Corner / Upper Mall	Shimla Hill	2002	4	21
	42	Ghaziabad Bus Stop	Tajpura	1980	4	21
	43	Siddique Pura	Data Nagar	1995	4	22
	44	Gawala Colony No.1	Green Town	1993	2	22

Cate-gory	Priority	Location of A Filtration Plant	Sub-Division	Install. Year	Design Capacity (cfs)	As. Conc,. (ug/L)
	45	WASA Head Office (at FCC Block.)	Gulberg	1996	4	22
	46	Nishtar Colony	Industrial Area	1987	2	22
	47	Rifle Range	Islampura	1992	4	22
	48	Gulshan Park	Mughalpura	1993	4	22
	49	Gulistan Colony	Mustafabad	1995	4	22
	50	Ibrahim Road	Ravi Road	1992	4	22
	51	Jorrey Pull	Tajpura	1992	4	22
	52	Dhobi Mandi	Anarkali	2004	2	23
	53	B-Block Gulsahn-E-Ravi	Islampura	1998	4	23
	54	Jaffria Colony	Islampura	1990	4	23
	55	Sui Gas Engine Lytton Road (at Kot Adullah Shah)	Mozang	1986	4	23
	56	Jail Road (Lahore Collage)	Mozang	1992	2	23
	57	K-Block Sabzazar	Sabzazar	1987	2	23
	58	Muhammad Nagar.	Shimla Hill	1990	4	23
	59	Pak Block	A.I.T	1986	4	24
	60	Hussain Park	Data Nagar	2002	4	24
	61	M-Block Gulberg (at Gupel Nagac P-Bk.)	Gulberg	1997	4	24
	62	Bilal Park Shamnagar	Islampura	1992	4	24
	63	E-I Johar Town	Johar Town	2004	2	24
	64	D-Block China Scheme (Gujjar Pura)	Misri Shah	1993	4	24
	65	Achant Garh	Mughalpura	2003	2	24
C	66	Ittehad Colony Samanbad	Samanabad	1996	4	24
(85)	67	Shadbagh Well Centre-IV	Shadbagh	1995	4	24
	68	Tegore Park	Shimla Hill	1992	4	24
	69	Jahanzaib Block	A.I.T	1986	4	25
	70	Hilton Hotel (at Mason Road.)	Anarkali	1977	4	25
	71	Madhu Lal Hussain	Baghbanpura	1999	4	25
	72	Lal Pul Fayyaz Park	Mughalpura	1998	4	25
	73	Pir Buddan Shah Dholanwal	Samanabad	1991	4	25
	74	Queens Road	Mozang	1992	4	26
	75	Punj Pir	Mughalpura	1991	4	26
	76	E-Block Sabzazar	Sabzazar	1987	2	26
	77	N-Block,Samanabad	Samanabad	1995	4	26
	78	Milap Street	Baghbanpura	1996	4	27
	79	A-Block Muslim Town	Icchra	1993	4	27
	80	Sodiwal Quarter	Islampura	1993	4	27
	81	Rewaz Gardan	Islampura	1991	4	27
	82	Shah Shamas Qari (at Patyala House.)	Mozang	1987	2	27
	83	Mohni Road Salmat Mohalla	Ravi Road	1998	4	27
	84	Shah Gohar Abad	Baghbanpura	1992	4	28
	85	Shadbagh Well Centre-I	Shadbagh	1995	4	28
	86	Kanji House Misri Shah	Misri Shah	1998	4	29
	87	Sansi Quarter	Mughalpura	1996	4	29
	88	Sabzi Mandi (F&V Market)	City	1993	4	30
	89	Daras Barey Mian	Mughalpura	1997	4	30
	90	Saeed Park	Shahdara	1998	4	30

Cate-gory	Priority	Location of A Filtration Plant	Sub-Division	Install. Year	Design Capacity (cfs)	As. Conc,. (ug/L)
C (85)	91	Angori Bagh Scheme-II	Mughalpura	2001	2	31
	92	MC High School Sanda	Ravi Road	1997	4	31
	93	Dev Samaj Road (Commisioner Office)	Ravi Road	1998	4	32
	94	Ahmad Block	Garden Town	2004	2	32
	95	Katcha Temple Road (Abid Market)	Mozang	2004	2	33
	96	Shadman-I Rehmania Park	Mozang	1995	4	33
	97	Neelam Block	A.I.T	2007	4	34
	98	Iqbal Park-I	City	1998	4	34
	99	Yasrab Colony	Shadbagh	1994	4	34
	100	Shadbagh Well Centre-II	Shadbagh	1995	4	34
	101	A-Block Sabzazar	Sabzazar	1997	2	37
	102	Islampura	Ravi Road	1991	4	38
	103	Iqbal Partk Fort (Not sampled)	City	2002	4	39
	104	Iqbal Park-II (Abandoned)	City	1998	4	39
	105	Mujahidabad (Not sampled)	Mughalpura	1997	4	39

Tubewells for Substitution

D (7)	106	Shadman Mental Reservoir	Mozang	1978	4	40
	107	G.T.Road Shahdara	Shahdara	1990	4	41
	108	Paracha Colony	Shahdara	1995	2	43
	109	Farrukh Abad Disposal	Farrukhabad	1998	4	44
	110	Raj Garh Office	Islampura	1978	4	45
	111	Jia Musa	Farrukhabad	2003	2	54
	112	Majeed Park Shahdara	Shahdara	1997	2	106

Note: Priority is given to tubewells with lower arsenic concentration

Category A: Tubewells with an existing filtration plant

Category B: Tubewells with an arsenic concentration of lower than 0.01 mg/L

Category C: Tubewells that WASA will install a filtration plant

Category D: Tubewells for substitution in case of emergent replacement

LIST OF ADDITIONAL TUBEWELLS REQUESTED FOR SUBSTITUTION

No.	Location	Sub-District	Installation Year	Design Capacity (cfs)	As Conc. (µg/L)	Criterion for Exclusion
1	Sardar Chapar	Ravi Road	1993	4	6	Land availability
2	Mian Fazal Haq Colony	Industrial Area	1999	4	15	Land availability
3	Bilal Ganj	Ravi Road	1993	4	20	Limited site space
4	Zafar Ali Road / Jail Road	Gulberg	1996	4	21	Limited site space
5	Baba Farid Colony	Industrial Area	1996	4	24	Land availability
6	Ghazi Muhala Children Park	Shimula Hill	1986	4	25	Obstacle
7	Chah Miran (Old)	Shadbagh	1995	4	26	Limited site space
8	Nonarian	Islampura	1987	4	27	Obstacle
9	Juggian Shahab Din	Samanabad	1997	4	27	Obstacle
10	Dhobi Ghat	Bagbanpura	1998	4	29	Limited site space
11	Akram Park, Bund Road	Ravi Road	1990	2	31	Drainage availability

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Annex- 4

Confidential

PROJECT COST TO BE BORNE BY EACH GOVERNMENT

1. Project Cost by the Japanese Grant Aid

Total Project Cost to be borne by Japan Grant Aid: Approximately JPY 2,294.5 Million.

Constructions and Procurement of equipment (JPY 2,115.1 Million)
Soft Component (JPY 6.1Million)
Detailed Design and Construction Supervision (JPY 173.3 Million)

2. Project Cost by the Pakistani Government

Total Project Cost to be borne by the Pakistani Government: Approximately JPY 463.0 Million. (equivalent to approx. PKR474.6 Million).

Banking arrangement
Contribution to LESCO for power receiving and transformation
Installation of filtration plants

(Applied conversion rate: PKR 1 = JPY 0.9756)

Note: JICA estimated the project cost by the Japanese Grant Aid based on the proposed tubewell list before substitution as described in 5-6), so that it is subject to modify.

The construction cost of 53 filtration plants are included in this estimation, but depending on the water quality test at tubewells completed, the above cost may be increased due to the construction of additional filtration plants.

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Table Finacial Status of WASA

		FY 2005/06	FY 2006/07	FY 2007/08	FY 2008/09	FY 2009/10	FY 2010/11	FY 2011/12	FY 2012/13
Number of Tubewells	(nos.)	452	435	417	474	460	462	474	474
Water Production	(MGD)	340	360	360	379	335	388	397	362
Accounted for Water	(MGD)	214	230	227	243	271	264	266	271
Unaccounted for Water	(MGD)	126	130	133	136	164	125	131	108
Number of Metered Connections	(nos.)	237,752	257,454	273,620	291,502	314,564	352,877	366,753	401,276
Number of Unmetered Connections	(nos.)	301,067	287,756	274,359	269,560	246,116	232,220	229,103	209,012
Water Charges + Connection Fee	(Rs. Mil.)	874	807	935	1,016	1,075	1,114	1,238	1,305
Sewerage Charges + Connection Fee	(Rs. Mil.)	812	850	705	747	770	853	878	941
UIP Tax Share in lieu of drainage	(Rs. Mil.)	467	238	350	403	309	513	509	923
Miscellaneous Income	(Rs. Mil.)	169	394	554	837	377	140	134	133
Total Operating Revenue	**(Rs. Mil.)**	**2,122**	**2,170**	**2,564**	**3,003**	**2,621**	**2,597**	**2,757**	**3,300**
Salaries and Benefits	(Rs. Mil.)	552	725	852	1,027	1,154	1,351	1,761	1,933
Repair and Maintenance	(Rs. Mil.)	315	405	553	645	675	416	559	878
Light, Power and Energy	(Rs. Mil.)	1,053	977	1,050	1,255	1,533	2,085	2,481	2,964
Other Expenses	(Rs. Mil.)	55	51	87	53	85	90	87	104
Total Operating Expenses	**(Rs. Mil.)**	**2,105**	**2,189**	**2,552**	**3,005**	**3,437**	**3,945**	**4,908**	**5,879**
Operating Profit (Loss)	(Rs. Mil.)	17	(19)	2	(2)	(816)	(1,348)	(2,151)	(2,579)
Operating Profit (Loss) B/F	(Rs. Mil.)	2	19	-	2	-	(816)	56	694
Subsidy by the Government	**(Rs. Mil.)**	-	-	-	-	-	**2,220**	**2,779**	**2,179**
Cumulative Surplus (Deficit)	**(Rs. Mil.)**	**19**	-	**2**	-	**(820)**	**56**	**604**	**102**
Collection - Current Demand	(Rs. Mil.)	1,251	1,285	1,357	1,448	1,485	1,568	1,693	1,757
Collection out of Arrears	(Rs. Mil.)	235	272	283	315	360	405	421	493
Total Collection in Fiscal Year	**(Rs. Mil.)**	**1,486**	**1,557**	**1,640**	**1,763**	**1,845**	**1,973**	**2,114**	**2,250**
Arrears Balance - Current	(Rs. Mil.)	383	375	395	375	408			
Arrears Balance B/F	(Rs. Mil.)	1,548	1,659	1,751	1,831	1,846			
Cumulative Arrears	**(Rs. Mil.)**	**1,931**	**2,034**	**2,146**	**2,206**	**2,254**			
Source		(1)	(1)	(1)	(1)	(2)	(2)	(2)	(2)

(1) "Six Year Business Plan (FY 2010/11 to FY 2015/16)", December 2010, JICA Loan Expert

(2) Division of Finance, WASA

Annex- 6

Japan's Grant Aid Scheme

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as part of this realignment, JICA was re-organized on October 1, 2008. After the re-organization of JICA, following the decision of the GOJ, Grant Aid for General Project is extended by JICA.

Grant Aid is non-reimbursable fund to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures (Attachment 1)

Japanese Grant Aid is conducted as follows:

- Preparatory Survey (hereinafter referred to as "the Survey")
  - The Survey conducted by JICA
- Appraisal & Approval
  - -Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Determination of Implementation
  - -The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
  - -Agreement concluded between JICA and a recipient country
- Implementation
  - -Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Survey is to provide a basic document necessary for the appraisal of the Project by JICA and the GOJ. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed on by both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Outline Design of the Project is confirmed considering the guidelines of the Japan's Grant Aid scheme.

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JICA requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA uses (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

The Report on the Survey is reviewed by JICA, and after the appropriateness of the Project is confirmed, JICA recommends the GOJ to appraise the implementation of the Project.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the E/N will be singed between the GOJ and the Government of the recipient country to make a plead for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

The consultant firm(s) used for the Survey will be recommended by JICA to the recipient country to also work on the Project's implementation after the E/N and the G/A, in order to maintain technical consistency.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

(4) Necessity of "Verification"

The Government of recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Attachment 2

(6) Proper Use

The Government of recipient country is required to maintain and use the facilities

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constructed and the equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

(7) Export and Re-export

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

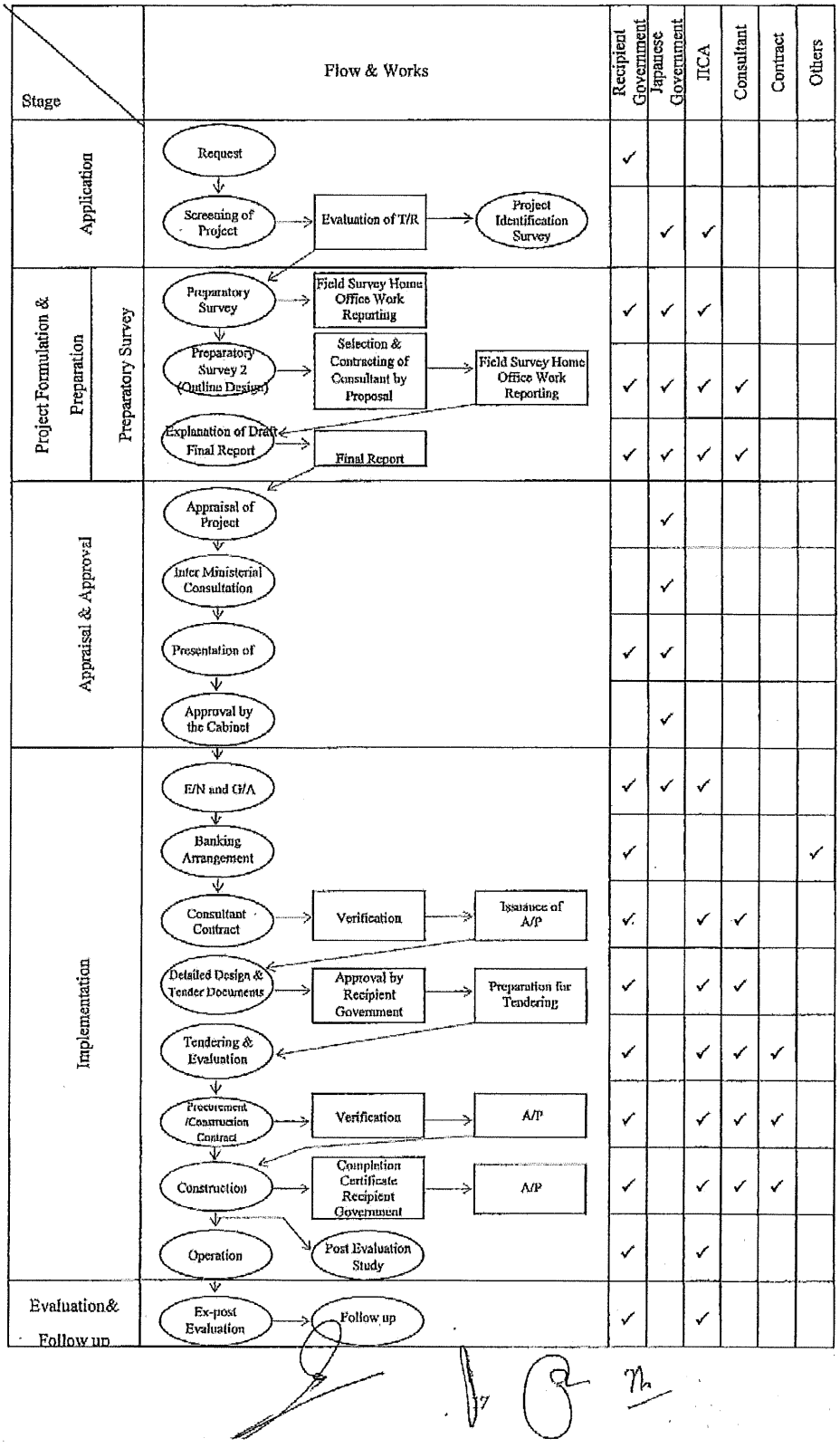
The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions to the Bank.

(10) Social and Environmental Considerations

A recipient country must ensure the social and environmental considerations for the Project and must follow the environmental regulation of the recipient country and JICA socio-environmental guideline.

Attachment 1 for Annex- 6

FLOW CHART OF JAPAN's GRANT AID PROCEDURES



Attachment 2 for Annex-6

Major Undertakings to be taken by Pakistani Government

NO	Items	To be covered by the Grant	To be covered by Recipient side
1	To secure land		•
2	To clear, level and reclaim the site when needed	•	
3	To construct gates and fences in and around the site (if required)		•
4	To construct the parking lot (if required)	•	
5	To construct access roads		
	1) Within the site	•	
	2) Outside the site	• (base course)	• (asphalt)
6	To construct the building	•	
7	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities		
	1)Electricity		
	a. The distributing line to the site		•
	b. The drop wiring and internal wiring within the site	•	
	c. The main circuit breaker and transformer		•
	2)Water Supply		
	a. The municipal water service pipe to the site		•
	b. The supply system within the site	•	
	3)Drainage		
	a. The municipal drainage main (for storm, sewer and others) to the site	N/A	N/A
	b. The drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the site	N/A	N/A
	4)Gas Supply		
	a. The municipal gas main to the site	N/A	N/A
	b. The gas supply system within the site	N/A	N/A
	5)Telephone System		
	a. The telephone trunk line to the main distribution frame / panel (MDF) of the building	N/A	N/A
	b. The MDF and the extension after the frame / panel	N/A	N/A
	6)Furniture and Equipment		
	a. General furniture	N/A	N/A
	b. Project equipment	•	
8	To bear the following commissions to a bank of Japan for the banking		

NO	Items	To be covered by the Grant	To be covered by Recipient side
	services based upon the B/A		
	1) Advising commission of A/P		•
	2) Payment commission		•
9	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country		
	1) Marine (Air) transportation of the products from Japan to the recipient country	•	
	2) Tax exemption and customs clearance of the products at the port of disembarkation		•
	3) Internal transportation from the port of disembarkation to the project site	•	
10	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		•
11	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract		•
12	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		•
13	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for construction of the facilities as well as for the transportation and installation of the equipment		•

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

(4) Letter from WASA (November 8, 2013 on Shamlot)

WATER & SANITATION AGENCY (LDA)
ZAHOOR ELAHI ROAD, LAHORE.
Ph# 35750946, 35757425 Ext. 18

To,

Mr. Aslam Khokhar
Advisor-JICA Study Team,
Lahore.

No.DMD(E) / 1434-37 Dated: 08.11.2013

SUBJECT: **JICA STUDY FOR ENERGY SAVING PROJECT/CONFIRMATION OF TUBEWELL SITES.**

Ref: No. MAK/ST/2013/29 dated 30.10.2013.

Following is the reply of Questions of JICA Study Team:-

a)	Who is the real owner of a "Shamlot", the government or the community?	It is government land.
b)	When a new Tubewell would be constructed at a "Shamlot", what kind of procedures would be required to change the land ownership from the private (or the community) to WASA including any payments to be made?	It being a Government land, there is no requirement of transfer of ownership to WASA, no procedure will be involved and WASA will not have to make any payment.

Best regards.

(Aftab Ahmad)
DY. MANAGING DIRECTOR (ENGG)
WASA, LDA, LAHORE.

CC:

1. Director P&E, WASA, LDA, Lahore.
2. Director WWT, WASA, LDA, Lahore.
3. PS to MD-WASA, Lahore.

(5) Letter from WASA (November 26, 2013 on PC-1 Submission)

WATER AND SANITATION AGENCY (LDA)
ZAHOOR ELAHI ROAD, BLOCK-B, GULBERG-II
Phone No. *35750946-5757425(Ext. 18)*

To,

The Deputy Secretary (UD),
HUD & PHE Department,
WASA, LDA, Lahore.

No.DMD(E)/1544-46
Dated:26.11.2013

Subject: **PC-I FOR PERFORMA FOR DEVELOPMENT PROJECTS FOR SUPPLY / INSTALLATION OF 100-NOS. WATER FILTRATION PLANT FOR ARSENIC REMOVAL.**

Please find enclosed herewith 02-copies of the above noted subject scheme amounting to Rs.424.304 Million for the signature of Secretary HUD&PHE Department for onward transmission to P&D Department for further necessary action.

(Aftab Ahmad)
DY. MANAGING DIRECTOR (ENGG)
WASA, LDA, LAHORE

Cc:
1. Managing Director, WASA, LDA, Lahore.
2. Director (WWT), WASA, LDA, Lahore

Letter 2013

(6) Letter from WASA (January 28, 2014 on Acceptance of Project Conditions-1)

WATER AND SANITATION AGENCY (LDA)
ZAHOOR ELAHI ROAD, BLOCK-B, GULBERG-II
Phone No. *35750946-5757425(Ext.18)*

No: DMD(E)/ 265-68
Dated: 28 - 01 -2014

To,

Mr. M. Aslam Khokhar,
Advisor,
JICA Study Team.

Subject: **PRELIMINARY INFORMATION ON THE PROJECT OF REPLACEMENT OF TUBEWELLS OF WASA**

Ref: No.MAK/ST/2013/33 dated: 19.12.2013

Thank you very much for preliminary information's on the project of replacement of Tubewells. WASA's response is as follows:

1) **Status of PC-I of Filtration Plants**

The PC-I for installation of 100 No. Filtration Plants has been submitted to P&D Department and is under process of approval.

2) **JICA Mission**

WASA will welcome JICA mission as per schedule.

3) **Project Schedule**

WASA has the feeling that period for detailed design & Completion is too long. WASA will appreciate if completion period be reduced to 12 months instead of 19 months.

WASA expects that JICA would agree for not reducing the No. of Tube Wells.

4) **Algorithm for Project 105 No. Tubewells**

WASA agrees with algorithm for 105 No. tubewells adopted for selection of tubewells and supplementing tubewells from Table-6 in accordance with priorities.

(Ch. Aftab Ahmad)
DY. MANAGING DIRECTOR (ENGG)
WASA, LDA, LAHORE

Cc:

1. Managing Director, WASA, LDA.
2. Director Hydrology, WASA, LDA,
3. Director (WWT), WASA, LDA

(7) Letter from WASA (February 10, 2014 on Acceptance of Project Conditions-2)

WATER AND SANITATION AGENCY (LDA)

ZAHOOR ELAHI ROAD, GULBERG-II, LAHORE.

Phone # 5750946-5757425 Ext.25

****

To,

Mr. Ikou Miwa

JICA Study Team,

Tokyo Japan

No.DMD(E)/379-82

Dated: 10-02-14

Subject: **PRELIMINARY INFORMATION ON THE PROJECT OF REPLACEMENT OF TUBEWELLS OF WASA**

Your ref no.MAK/ST/2014/01 dated 2-2-14

In continuation to this office letter no.DMD (E)/265-68 dated 28-1-14. It is hereby informed that WASA understands the viewpoint of JICA study team regarding preconditions for tubewell and filtration plant installation.

It is hereby confirmed that:

1. WASA will install 60 Filtration Plants in collaboration with JICA at the locations mentioned in the Group D.
2. WASA will install additional Filtration Plants, when an Arsenic Concentration would be above 0.020 mg/L in the water quality test at the time of completion of tubewells which showed Arsenic Concentration of less than 0.020 mg/L at the JICA survey in July, 2013.

With best regards

(Aftab Ahmad)

Dy. Managing Director (Engg)

WASA, LDA, LAHORE

CC:

1. Managing Director, WASA, LDA, Lahore
2. Director (P&E), WASA, LDA, Lahore
3. Mr. Aslam Khokhar, Advisor JICA Study Team, Lahore

(8) Letter from WASA (April 7, 2014 on Acceptance of 105Tubewells and 14 Substitutions

WATER AND SANITATION AGENCY (LDA)
ZAHOOR ELAHI ROAD, BLOCK-B, GULBERG-II
Phone No. *35750946-5757425(Ext.18)*

.....

To,

Mr. Aslam Khokhar,
Advisor,
JICA Study Team.

No.DMD(E)/773-77
Dated: 07.04.2014

Subject: **TUBEWELLS FOR THE PROJECT OF ENERGY SAVING IN WATER SUPPLY SYSTEM IN LAHORE.**

Please refer to your letter No. MAK/ST/2014/11 dated 02.04.2014

WASA has gone through the Revised Annex-3 consisting of the followings:

i.) List of 105 Tubewells proposed for the Project.
ii.) List of 5 Tubewells for substitution.
iii.) List of 9 additional Tubewells for substitution.

WASA accepts the Revised Annex-3 and agrees its substitution in the Minutes of Discussion signed on March 6, 2014.

(Aftab Ahmad)
DY. MANAGING DIRECTOR (ENGG)
WASA, LDA, LAHORE

Cc:
1. Managing Director, WASA, LDA, Lahore.
2. Mr. Ikuo Miwa, JICA Study Team, Tokyo Japan.
3. Director (P&E), WASA, LDA, Lahore.
4. Director Hydrology, WASA, LDA, Lahore.

Letter from Survey Team Quoted in WASA's Letter on April 7, 2014

JICA STUDY TEAM

ENERGY SAVING IN WATER SUPPLY SYSTEM PROJECT

MAK/ST/2014/11

Dated April 2, 2104

Mr. Shakeel Ahmad Kashmiri,

Director Planning & Evaluation,

WASA- LDA, Lahore.

Subject: **Tubewells for the Project of Energy Saving in Water Supply System in Lahore**

Reference: No. DMD (E)/686-90/dated March 22, 2014

Dear Mr. Kashmiri,

This is in continuation of my email on the above captioned subject

Keeping in view the information provided vide above referred letter, Mr. Ikuo Miwa of the JICA Study Team has prepared and forwarded a Revised Annex-3 meant for substitution in the Minutes of Discussions signed on March 6, 2014. As requested by Mr. Miwa, the Revised Annex-3 is attached herewith for the kind perusal and a very early response of WASA communicating their acceptance of the same in the form of a letter to be included in the Final Report.

It is clarified that in the Revised Annex-3, the components of "Tubewells for substitution" differ from those shown in the letter of WASA due to the selection of tubewells for the Project under the idea: the **lower the Arsenic Concentration, the higher the priority.** Email of Mr. Miwa dated 1 April is attached.

With kindest regards,

(M Aslam Khokhar)

Advisor-JICA Study Team

Cc.

1. Managing Director, WASA-LDA, Lahore.
2. Deputy Managing Director (Engineering), WASA-LDA, Lahore.
3. Mr. Ikuo Miwa, JICA Study Team, Tokyo, Japan.

Annex-3

LIST OF TUBEWELLS PROPOSED FOR THE PROJECT

	Priority	Location of A Filtration Plant	Sub-Division	Install. Year	Design Capacity (cfs)	As. Conc,. (ug/L)
A (13)	1	A-Block Gulsahn-e-Ravi	Islampura	1998	4	9
	2	Rashi Bhawan (Pathi Ground)	Anarkali	2002	2	12
	3	Q-Block Model Town EXT	Township	1986	4	15
	4	Mustafa Town	Johar Town	1997	4	16
	5	Chomala	City	2005	2	20
	6	Block No.6 Sector-A-II Township	Industrial Area	1996	4	20
	7	A-Block Tajpura	Tajpura	1986	2	21
	8	Shah Kamal	Mughalpura	1998	4	23
	9	Taj Pura Ground	Shadbagh	1995	4	23
	10	Abdul Karim Road (Mela Ram Park)	Anarkali	2003	2	26
	11	National Town Sandha (at Jhangir Park)	Islampura	1996	4	30
	12	Takia Khusrianwala Shahdara	Shahdara	1989	4	33
	13	Ali Park	City	1998	4	34
B (4)	14	Circular Road (Guru Argum Nagar)	Anarkali	1988	4	5
	15	Sardar Chapal	Ravi Road	1993	4	6
	16	Shish Mehal Road (at Nazmabad.)	Shadbagh	1994	4	6
	17	S-Block Model Town Ext.	Township	1996	4	9
C (88)	18	D-Block Sabzazar	Sabzazar	1987	2	10
	19	Rustam Park	Islampura	1993	4	15
	20	Raheem Road Data Nagar	Data Nagar	1998	4	16
	21	D-II Block-IV	Green Town	1997	4	16
	22	Sanda Patwar Khana	Islampura	1997	4	16
	23	Nisar Scheme Qila Gujjar Singh	Anarkali	1996	4	17
	24	Sadi Park.	Mozang	1994	4	18
	25	Tanki No.4 Township (Abandoned)	Green Town	1985	1	19
	26	Tanki No.3 Township (No motor)	Green Town	1985	1	19
	27	C-Block Muslim Town	Icchra	1998	4	19
	28	Faseeh Road	Mozang	2002	4	19
	29	Shah Jamal.	Mozang	1993	4	19
	30	Kotli Pir Abdur Rehman	Mughalpura	2001	4	19
	31	Shahab Stadium (Fazal pura)	Shadbagh	1998	4	19
	32	Huma Block	A.I.T	2002	4	20
	33	Fareed Colony Printing Press	Industrial Area	1999	4	20
	34	Children Park	Shadbagh	1985	2	20
	35	Henry Key (Old)	Gulberg	1986	2	21
	36	Block No.4 Sector-A-II Township	Industrial Area	1993	4	21
	37	Canal Bridge	Mustafabad	1995	4	21
	38	Scotch Corner / Upper Mall	Shimla Hill	2002	4	21
	39	Ghaziabad Bus Stop	Tajpura	1980	4	21

	Priority	Location of A Filtration Plant	Sub-Division	Install. Year	Design Capacity (cfs)	As. Conc,. (ug/L)
	40	Siddique Pura	Data Nagar	1995	4	22
	41	Gawala Colony No.1	Green Town	1993	2	22
	42	WASA Head Office (at FCC Block.)	Gulberg	1996	4	22
	43	Nishtar Colony	Industrial Area	1987	2	22
	44	Rifle Range	Islampura	1992	4	22
	45	Gulshan Park	Mughalpura	1993	4	22
	46	Gulistan Colony	Mustafabad	1995	4	22
	47	Ibrahim Road	Ravi Road	1992	4	22
	48	Jorrey Pull	Tajpura	1992	4	22
	49	Dhobi Mandi	Anarkali	2004	2	23
	50	B-Block Gulsahn-E-Ravi	Islampura	1998	4	23
	51	Jaffria Colony	Islampura	1990	4	23
	52	Sui Gas Engine Lytton Road (at Kot Adullah Shah)	Mozang	1986	4	23
	53	Jail Road (Lahore Collage)	Mozang	1992	2	23
	54	K-Block Sabzazar	Sabzazar	1987	2	23
	55	Muhammad Nagar,	Shimla Hill	1990	4	23
	56	Pak Block	A.I.T	1986	4	24
	57	Hussain Park	Data Nagar	2002	4	24
	58	M-Block Gulberg (at Gupel Nagae P-Bk.)	Gulberg	1997	4	24
	59	Bilal Park Shamnagar	Islampura	1992	4	24
	60	E-I Johar Town	Johar Town	2004	2	24
	61	D-Block China Scheme (Gujjar Pura)	Misri Shah	1993	4	24
	62	Achant Garh	Mughalpura	2003	2	24
	63	Ittehad Colony Samanbad	Samanabad	1996	4	24
	64	Shadbagh Well Centre-IV	Shadbagh	1995	4	24
	65	Tegore Park	Shimla Hill	1992	4	24
	66	Jahanzaib Block	A.I.T	1986	4	25
	67	Hilton Hotel (at Mason Road.)	Anarkali	1977	4	25
	68	Madhu Lal Hussain	Baghbanpura	1999	4	25
	69	Lal Pul Fayyaz Park	Mughalpura	1998	4	25
	70	Pir Buddan Shah Dholanwal	Samanabad	1991	4	25
	71	Queens Road	Mozang	1992	4	26
	72	Punj Pir	Mughalpura	1991	4	26
	73	E-Block Sabzazar	Sabzazar	1987	2	26
	74	N-Block,Samanabad	Samanabad	1995	4	26
	75	Milap Street	Baghbanpura	1996	4	27
	76	A-Block Muslim Town	Ichra	1993	4	27
	77	Sodiwal Quarter	Islampura	1993	4	27
	78	Rewaz Gardan	Islampura	1991	4	27
	79	Shah Shamas Qari (at Patyala House.)	Mozang	1987	2	27

	Priority	Location of A Filtration Plant	Sub-Division	Install. Year	Design Capacity (cfs)	As. Conc,. (ug/L)
	80	Mohni Road Salmat Mohalla	Ravi Road	1998	4	27
	81	Shah Gohar Abad	Baghbanpura	1992	4	28
	82	Shadbagh Well Centre-I	Shadbagh	1995	4	28
	83	Kanji House Misri Shah	Misri Shah	1998	4	29
	84	Sansi Quarter	Mughalpura	1996	4	29
	85	Sabzi Mandi (F&V Market)	City	1993	4	30
	86	Saeed Park.	Shahdara	1998	4	30
	87	Angori Bagh Scheme-II	Mughalpura	2001	2	31
	88	MC High School Sanda	Ravi Road	1997	4	31
	89	Habib Ullah Road	Shimla Hill	1997	4	31
	90	Dev Samaj Road (Commisioner Office)	Ravi Road	1998	4	32
	91	Ahmad Block	Garden Town	2004	2	32
	92	Katcha Temple Road (Abid Market)	Mozang	2004	2	33
	93	Shadman-I Rehmania Park	Mozang	1995	4	33
	94	Neelam Block	A.I.T	2007	4	34
	95	Iqbal Park-I	City	1998	4	34
	96	Yasrab Colony	Shadbagh	1994	4	34
	97	Shadbagh Well Centre-II	Shadbagh	1995	4	34
	98	A-Block Sabzazar	Sabzazar	1997	2	37
	99	Islampura	Ravi Road	1991	4	38
	100	Iqbal Partk Fort (Not sampled)	City	2002	4	39
	101	Iqbal Park-II (Abandoned)	City	1998	4	39
	102	Mujahidabad (Not sampled)	Mughalpura	1997	4	39
	103	Shadman Mental Reservoir	Mozang	1978	4	40
	104	G.T.Road Shahdara	Shahdara	1990	4	41
	105	Farrukh Abad Disposal	Farrukhabad	1998	4	44

Tubewells for Substitution

D (5)	106	Seher Road	Mughalpura	2003	2	44
	107	Raj Garh Office	Islampura	1978	4	45
	108	Jia Musa	Farrukhabad	2003	2	54
	109	Latif Park (Abandoned)	Shahdara	1993	2	59
	110	Majeed Park Shahdara	Shahdara	1997	2	106

Note: Priority is given to tubewells with lower arsenic concentration

Category A: Tubewells with an existing filtration plant

Category B: Tubewells with an arsenic concentration of lower than 0.01 mg/L

Category C: Tubewells that WASA will install a filtration plant

Category D: Tubewells for substitution in case of emergent replacement

LIST OF ADDITIONAL TUBEWELLS FOR SUBSTIYUTION

Sr. No.	Location	Sub-District	Installation Year	Design Capacity (cfs)	As Conc. (µg/L)	Cause for Exclusion
1	Mian Fazal Haq Colony	Industrial Area	1999	4	15	Land availability
2	Bilal Ganji	Ravi Road	1993	4	20	Limited space
3	Zafar Ali Road / Jail Road	Gulberg	1996	4	21	Limited space
4	Baba Farid Colony	Industrial Area	1996	4	24	Land availability
5	Ghazi Muhala Children Park	Shimla Hill	1986	4	25	Obstacle
6	Nonarian	Islampura	1997	4	27	Obstacle
7	Juggian Shahab Din	Samanabad	1997	4	27	Obstacle
8	Dhobi Ghat.	Baghbanpura	1998	4	29	Limited space
9	Akram Park, Bund Road	Ravi Road	1990	2	47	Drainage availability

(9) Minutes of Meeting (September 16, 2013 on Contribution to LESCO)

MINUTES OF MEETING ON POWER SUPPLY/DISTRIBUTION CONDITIONS AT PROPOSED TUBEWELLS UNDER JICA GRANT AID PROJECT.

Date: 16 September 2013

Venue: WASA Head office, 2nd floor, Engr. Chaudry Aftab Ahmed's room

Attendance:

WASA

Engr. Chaudry Aftab Ahmed, Deputy Managing Director (Engineering)

JICA Study Team

1. Mr. Akio Natsui
2. Mr. Muhammad Aslam Khokhar

Mr. A. Natsui explained that the Study Team had a meeting with LESCO on 12 September, 2013 and discussed the power supply/distribution conditions relating to providing and installation of equipment at the proposed Tubewell sites. In the discussion with LESCO, responsible parties were identified i.e. LESCO or Consumer with regard to equipment cost and installation cost of each item.

LESCO informed that installation of the following items will be carried out by LESCO while the cost of material and equipment will be borne by the consumer:-

a) Overhead Line Extension to Proposed Sites and Incoming Poles.
b) Transformers.
c) Metering devices of PCT and the meters including kWh meter, kVARh Meter etc.

Mr. A. Natsui highlighted as to which part of the cost to be borne by the consumer would be provided by WASA (Pakistan side) and which part would be financed by the Project (Japan side).

Mr. A. Natsui referred to the similar project of JICA in Faisalabad as a sample of the JICA grant aid project to decide the issues about the responsibilities of WASA (Pakistan side) or Project (Japan side) for providing and installation cost of the items pertaining to the power supply/distribution to the Tubewell sites. He informed that the installations of items a), b) and c) as mentioned above were carried out by Faisalabad Electric Supply Co. Ltd., while the cost of those items were borne by Faisalabad-WASA. Mr. Natsui concluded that the same principle would be followed in case of the Installation of Tubewells in WASA-Lahore under JICA grant aid Project.

Engineer Ch. Aftab Ahmed responded that there would be no objection from Lahore WASA to bear the cost for abovementioned items a), b) and c) for electrification at the proposed Tubewell sites, if JICA applies the concept of the Faisalabad case to the Lahore project.

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It was, eventually, agreed and confirmed in the meeting that the responsible parties for activities with respect to the power supply/distribution to the proposed Tubewell sites are as follows:-

No.	Description	Installation	Cost of equipment	Cost of installation	Maintenance
a.	Overhead Line Extension to Proposed Sites and Incoming Pole	LESCO	WASA (Pakistan side)		LESCO
b.	Transformer with cut-out switch (link fuse), 11/0.415 kV, 50 Hz, oil-immersed, outdoor,	LESCO	WASA (Pakistan side)		LESCO
c.	Metering device of PCT and meters including kWh meter, kVARh meter etc.	LESCO	WASA (Pakistan side)		LESCO
d.	Incoming cable after the metering device	Project	Project (Japan side)		WASA

Engineer Chaudry Aftab Ahmed
Deputy Managing Director (Engineering)
Water and Sanitation Agency (WASA)

Mr. Akio Natsui
Electrical Engineer
JICA Study Team

5. Soft Component Plan

1. Background

Project for Energy Saving in Water Supply System in Lahore in Pakistan is aimed to support realising sustainable and stable water supply in Lahore through recovering the lowered well production and improving operational efficiency by replacing the deteriorated tubewell pump stations. This project composes of construction of new 105 tubewell pump stations and supply instrument for energy audit.

1) Current Condition

All water supplying in Lahore relies on ground water. Therefore major portion of expenses of water supply operation is spending for installation of tubewell pumps and electricity to operate the pumps.

The tubewell pump stations requested for the rehabilitation are constructed in 1997 and after, mainly in 1990's. The pumps are lowered their production and required more energy to operate, due to the deterioration, and the operational cost has been increased. In recent years, shortage of electricity is getting more severe due to economic development and population increase, and urban areas in Lahore electricity is supplied only about 14 hours in a day by planned power-cut. Rising of electricity charge and fuel coat for generators hit WASA's financial operation. WASA can cover only 55 % of their operation cost by water/sewerage charges, and the electricity/fuel cost reached to 45 % of WASA's all expenses in 2012. Therefore reduction of the electricity cost is the most urgent problem.

2) Necessity of Soft Component

This project will contribute to improve efficiency of energy consumption for water supply operation, but still it is important to monitor operation continuously, and to understand the operational efficiency of the pumps and motors, then to judge the necessity of repair/replacement. Currently Energy Control Unit in charge of energy audit measure the current of operating pumps, but it is not sufficient to monitor operational efficiency of the pumps and motors. In this situation, it is necessary to implement technical assistance by this soft component for engineers in Energy Control Unit to enforce the capacity of energy auditing in order to continuously achieve efficient pump operation and reduce electricity cost.

2. Target of Soft Component

This soft component is to assist establishing one of targets of water supply operation, energy efficient operation, by knowledge/technology transfer for energy audit for tubewell pump stations which are the most important water supply facility in Lahore.

Therefore, in this soft component, energy audit equipment supplying in this project will be utilized to monitor operational conditions of the pump stations, to analyse the date and to improve their operation and maintenance and then achieve efficient operation. Moreover, this soft component supports to prepare implementation plan for efficient operation, rehabilitation and replacement, and WASA independently to promote and establish energy efficient operation.

3. Results of Soft Component

Soft component "Energy Audit" is expected the following achievement.

- WASA's employees in Energy Control Unit and maintenance teams properly understand the operation and energy consumption in pump stations, implement adequate and efficient operation and maintenance, and establish rehabilitation and replacement plans.

4. Assessment of Achievement

Table-1 shows the results and its assessment of the achievement of this soft component. Trainer will uses achievement checklist and assess the trainees' understanding of the knowledge and technology.

Table-1 Results and Assessment of Achievement

Results	Assessment of Achievement
Result 1 Energy audit of pump stations can be properly implemented using energy audit equipment.	・Confirm the understanding of trainees by questions and answers on topics lectures ・Confirm the understanding of trainees by actual measurement of data required for energy audit using the equipment (Judgments will be made using the checklists)
Result 2 Proper operation and maintenance will be planned and implemented using energy audit.	・Confirm the understanding by calculating/analyzing data collected by energy audit equipment ・WASA trainees by themselves establish efficient operation plans for the pump stations
Result 3 Implementation plan will be established for efficient operation, rehabilitation and replacement..	・WASA trainees by themselves establish rehabilitation and replacement plans for the pump stations.

5. Activities of Soft Component

Soft component will be direct-assistant type in Lahore by two water supply consultants (Japanese consultant: mechanical and electrical engineers). The assignment will be 2.63 man-months including a preparation work in Japan. Local engineer will be also engaged in assisting Japanese engineers for 1.63 months. The activities are shown in **Table-2**.

Table-2 Activities of Soft Component

Results	Technology/ Field	Current Technology and Required Technology	Activities	Method	Input	Report
Result 1 Energy audit of pump stations can be properly implemented using energy audit equipment.	**Technology:** - tubewell pumping, water distribution, operation, maintenance, energy audit **Field:** - mechanical, electrical	・It is necessary to improve operational efficiency of tubewell pump stations in order to reduce the electricity cost and improve WASA's operation. ・However, no sufficient measure was taken to improve efficiency and reduce electricity cost, due to lack of technology and fund. ・Energy, hydraulic/electricity energy, energy audit and efficiency of pump operation shall be understood and data collection and analysis shall be implemented.	◇Function of tubewell pump stations and distribution system ◇Pump operation and its flow, pressure, water level etc. ◇Energy audit ◇Use of energy audit equipment ◇Measuring of pump operation **[Training item]** Function of tubewell pump stations and distribution system, energy audit and use of its equipment	- Classroom Training - OJT at Pumping Stations	- Mechanical/Electrical engineers (Japanese consultant) Planning/preparation/implementation/reporting Mechanical: 1.07 M/M Electrical: 0.73 M/M - Engineer (Pakistani) Engineer: 0.87M/M	・Energy audit analysis manual ・Energy audit measuring log sheet ・Energy audit report ・operation improvement plan for existing pump station
Result 2 Proper operation and maintenance will be planned and implemented using energy audit.		・Methods to improve efficiency of pump operation and reduce electricity cost are not identified and taken. ・Energy audit shall be understood and efficient pump operation shall be implemented.	◇Analysis of energy audit measurement ◇Problems of current pump operation ◇Improvement plan for efficient pump operation **[Training item]** Analysis method for energy audit, identifying operational problems, planning of efficient pump operation			
Result 3 Implementation plan will be established for efficient operation, rehabilitation and replacement.	**Technology:** - tubewell pumping, water distribution, operation, maintenance, energy audit **Field:** - mechanical	・Particular measures to improve pump operation cannot be planned due to lack of technology. ・Energy audit shall be understood and pump improvement plans shall be established.	◇Study of the existing stations for improvement ◇Rehabilitation and replacement plans for the existing stations **[Training item]** Investigation of the existing stations, Planning for rehabilitation and replacement	- Classroom Training - OJT at Pumping Stations	- Mechanical engineers (Japanese consultant) Planning/preparation/implementation/reporting Mechanical: 0.83 M/M - Engineer (Pakistani) Engineer: 0.76M/M	・・Rehabilitation /replacement plan for existing stations ・Soft component completion report

Note: Target group shall be M&E Engineers/ Mechanic / Electrician /Labour (total : 15 WASA's employees).
Soft component shall be im plemented from April 2016 to September 201

6. Procurement of Resources for Soft Component

Soft component will be implemented through direct-assistant by two Japanese consultants with assistance of Pakistani consultant, because the technology of energy audit is hardly implemented by the Pakistani consultant alone.

7. Procurement of Resources for Soft Component

Soft component will be implemented after the contract signed and energy audit equipment supplied at site. (from April 2016 to September 2016, 7 months after the contract signed and for 6 months) It starts by planning and scheduling of the soft component implementation in Japan.

In Lahore, the necessity of energy audit for Lahore WASA shall be explained at first and training materials for use of energy audit equipment and data collection shall be prepared. Using the materials, training shall be implemented in classroom and at site, so WASA employees can be collect all necessary data and analyse the data by themselves. By analysing the data, factors of insufficient pump operation shall be identified and improvement plan shall be established. After this training, WASA will collect operational data for ten existing pump stations. The consultant working for construction supervision shall confirm the progress and the consultant in Japan shall advise by e-mail, if necessary.

Confirming data collected and analysed by WASA, WASA's capacity will be improved and be more stable. Also, using the results, technical assistant shall be implemented for improvement of pump operation and rehabilitation/replacement plans, if they need.

Implementation Schedule of Soft Component is shown in **Table-3**

Table-3 Implementation Schedule of Soft Component

	Engineer	2015					
		April	May	June	July	August	September
Result 1 Energy audit of pump stations	Mech.	4 days		28 days			
Result 2 Proper O&M plan using energy audit	Elect.			22 days			
Result 3 rehabilitation and replacement plan	Mech.					18 days	
Reporting	Mech.						7 days
Data Collection (by WASA)							
Report Submission			▲ Training Manuals				▲ Completion Report

In Japan
In Pakistan

8. Reports/Manuals for Soft Component

Table-4 shows reports/manuals prepared in soft component and their submission date. Energy audit manual will be fully utilized energy audit equipment manuals and explains relation of the equipment and data requirement for energy audit etc.

Table-4 Reports/Manuals

Item	Reports/Manuals	Contents	Submission	Page
Manual	Energy audit data collection manual	- Use of audit equipment - Installation to pumps - Data collection	May, 2016	50
	Energy audit data analysis manual	- Relation of data collected - Electricity energy - Hydraulic energy - Energy efficiency	May, 2016	20
Record	Energy audit data sheet	- Collected data	May, 2016	10
Report	Energy audit report	- Result of energy audit	May, 2016	15
	Existing Pump Station Operation Improvement Plan	- Result of energy audit - Problems of exist pump stations - Operation improvement plan	September, 2016	15
	Rehabilitation/Replacement Plan	- Result of energy audit - Problems of exist pump stations - Rehabilitation/Replacement Plan	September, 2016	15
	Completion Report (both Japanese and Pakistani sides)	- Plan and actual - Result/Achievement - Impact effected to result/ achievement - Lesson learned and suggestions etc. for sustaining and developing the results - Reports/Manuals	September, 2016	30

9. Pakistani Responsibility

The followings are Pakistani responsibility for the implementation of soft component.

◇Providing trainees, facilities and materials required

◇All cost for trainees, facilities and materials required

◇All necessary manpower, materials, etc. required for continuous energy audit activities.

6. Reference

(1) Results of Water Quality Test at 147 Tubewells Surveyed

Sr. No.	Name ofTubewell	pH	Temp. (°C)	EC (μS/cm)	Cl (mg/L)	T-Fe (mg/L)	Mn (mg/L)	F (mg/L)	As (mg/L)	NO2 (mg/L)	NO3 (mg/L)	T-Coli. (cfu/100mL)	F-Coli. (cfu/100mL)
	Pakistan Drinking Water Standards	**6.5-8.5**	**-**	**-**	**<250**	**-**	**<0.5**	**<1.5**	**<50**	**<50**	**<3**	**0**	**0**
	WHO Drinking Water Standards	**6.5-8.5**	**-**	**-**	**250**	**0.3**	**0.5**	**1.5**	**10**	**50**	**3**	**0**	**0**
1	Huma Block	8.0	30	752	53	0.05	<0.05	0.08	20	0.023	<0.003	NIL	NIL
2	Neelam block	7.6	30	1,185	71	0.16	0.1	0.1	34	0.013	<0.003	5	NIL
3	Pak Block	8.2	32	405	12	0.06	<0.05	0.13	24	0.027	<0.003	3	NIL
4	Jahanzaib Block	8.2	31	383	16	0.07	0.03	0.07	25	0.006	<0.003	NIL	NIL
5	Ravi Block	8.2	32	468	31	0.06	0.06	0.08	23	<0.003	<0.003	NIL	NIL
6	Abdul karim Road (Mela Ram Park)	7.6	27	1,542	150	0.28	0.13	0.10	26	0.026	<0.003	NIL	NIL
7	Nisar Scheme Qila Gujjar Singh	7.7	22	1,119	99	0.22	0.10	0.23	17	0.007	<0.003	NIL	NIL
8	Dhobi Mandi	7.9	24	724	43.4	0.68	0.14	0.097	23	0.003	0.034	NIL	NIL
9	Patiala Ground	7.6	26	1,579	224	1.1	0.12	0.12	< 5	0.007	0.09	NIL	NIL
10	Rashi Bhawan (Pathi Ground)	7.7	26	1,792	187	0.38	0.13	0.22	12	0.01	0.11	NIL	NIL
11	Circular Road Guru Argum Nagar)	7.7	23	1,635	108	0.04	0.2	0.13	<5	1.2	11	3	1
12	Hilton Hotel (Sampled at Mason Road.)	7.6	16	1,021	70	0.13	<0.05	0.16	25	0.007	0.19	NIL	NIL
13	Royal Park	7.8	24	1,080	88.7	0.21	0.078	0.023	17	0.003	<0.003	NIL	NIL
14	Suraya Jabeen Park	7.5	29	1,167	57	0.23	0.065	0.18	33	0.056	0.047	NIL	NIL
15	Salamatpura Takkia (Village)	7.8	32	828	17	0.08	<0.05	0.25	24	0.014	<0.003	NIL	NIL
16	Shah Gohar Abad	8.0	31	528	12	0.08	<0.05	0.14	28	<0.003	<0.003	NIL	NIL
17	Milap Street	7.9	32	532	17	0.08	<0.05	0.11	27	0.009	<0.003	NIL	NIL
18	Dhobi Ghat.	7.9	31	629	14	0.09	<0.05	0.16	29	0.007	<0.003	NIL	NIL
19	Madhu Lal Hussain	7.9	32	486	12	0.03	<0.05	0.19	25	0.019	<0.003	76	NIL
20	Iqbal Park-I	8.0	30	306	8	0.07	<0.05	0.24	34	<0.003	<0.003	NIL	NIL
21	Iqbal Park-III	7.9	28	394	16	0.05	<0.05	0.20	39	0.035	0.004	NIL	NIL
22	Chomala	8.0	29	316	12	0.06	<0.05	0.26	20	<0.003	<0.003	2	NIL
23	Iqbal Partk fort	-	-	-	-	-	-	-	-	-	-	-	-
24	Sabzi Mandi	7.8	29	414	18	0.05	<0.05	0.17	30	<0.003	0.003	12	NIL
25	Sharanwala Gate	7.9	30	347	10	0.07	0.05	0.20	32	<0.003	<0.003	NIL	NIL

Sr. No.	Name ofTubewell	pH	Temp. (°C)	EC (µS/cm)	Cl (mg/L)	T-Fe (mg/L)	Mn (mg/L)	F (mg/L)	As (mg/L)	NO2 (mg/L)	NO3 (mg/L)	T-Coli. (cfu/100mL)	F-Coli. (cfu/100mL)
	Pakistan Drinking Water Standards	**6.5-8.5**	-	-	**<250**	-	**<0.5**	**<1.5**	**<50**	**<50**	**<3**	**0**	**0**
	WHO Drinking Water Standards	**6.5-8.5**	-	-	**250**	**0.3**	**0.5**	**1.5**	**10**	**50**	**3**	**0**	**0**
26	Ali Park	8.1	27	368	12	0.04	<0.05	0.16	34	<0.003	0.014	NIL	NIL
27	Iqbal Park-II	-	-	-	-	-	-	-	-	-	-	-	-
28	Raheem Road Data Nagar	7.5	26	892	55	0.14	0.08	0.14	16	<0.003	0.04	NIL	NIL
29	Khokhar Road No.III	7.8	24	323	10	0.07	0.06	0.17	29	0.049	<0.003	NIL	NIL
30	Hussain Park	7.8	18	509	18	0.08	<0.05	0.29	24	<0.003	0.015	NIL	NIL
31	Siddique Pura	7.9	26	282	8	0.06	<0.05	0.22	22	0.035	<0.003	NIL	NIL
32	Jia Musa	7.7	25	467	25	0.10	0.07	0.14	54	<0.003	<0.003	NIL	NIL
33	Latif Chowk(Wandala Road)	7.6	29	587	20	0.17	0.07	0.11	68	<0.003	0.11	1	NIL
34	Farrukh Abad Disposal	7.8	25	457	27	0.09	0.06	0.11	44	0.017	0.05	NIL	NIL
35	3-D-I	8.1	35	569	20	0.02	<0.05	0.16	16	<0.003	<0.003	NIL	NIL
36	D-I Block-III	-	-	-	-	-	-	-	-	-	-	-	-
37	D-II Block-IV	8.1	34	584	20	0.02	<0.05	0.13	16	<0.003	<0.003	NIL	NIL
38	Tanki No.4 Township	-	-	-	-	-	-	-	-	-	-	-	-
39	Tanki No.3 Township	-	-	-	-	-	-	-	-	-	-	-	-
40	Gawala Colony No.1	7.7	31	1,279	34	0.04	<0.05	0.29	22	<0.003	<0.003	NIL	NIL
41	Henry Key (Old)	7.8	32	933	30	0.12	0.04	0.24	21	<0.003	<0.003	NIL	NIL
42	Zafar Ali Road/Jail Road	8.1	34	603	22	0.05	0.03	0.20	21	<0.003	<0.003	NIL	NIL
43	M-Block Gulberg	7.6	18	920	25	0.10	<0.05	0.24	24	<0.003	<0.003	NIL	NIL
44	WASA Head Office	7.5	19	932	25	0.12	<0.05	0.19	22	<0.003	<0.003	NIL	NIL
45	B-I Block Gulberg (A-Block Gulberg)	7.8	31	930	28	0.07	<0.05	0.24	17	0.029	<0.003	NIL	NIL
46	Mehboob Park, Ichra	7.5	31	1,047	47	0.18	0.07	0.18	27	<0.003	<0.003	NIL	NIL
47	A-Block Muslim Town	7.8	31	446	10	0.02	<0.05	0.15	27	<0.003	<0.003	NIL	NIL
48	C-Block Muslim Town	8.0	31	587	20	<0.02	<0.05	0.18	19	<0.003	<0.003	NIL	NIL
49	Fareed Colony Printing Press	7.6	28	1,212	30	0.07	<0.05	0.11	20	0.096	0.21	NIL	NIL
50	Nishtar Colony	7.7	30	821	30	0.03	<0.05	0.17	22	<0.003	<0.003	NIL	NIL
51	Block No.6 Sector-A-II Township	7.8	30	605	20	1.0	<0.05	0.09	20	<0.003	<0.003	NIL	NIL
52	Block No.4 Sector-A-II Township	7.8	31	594	20	0.07	<0.05	0.11	21	<0.003	<0.003	NIL	NIL
53	Baba Farid Colony	7.6	29	1,398	49	0.05	<0.05	0.16	24	0.021	<0.003	NIL	NIL
54	Mian Fazal Haq Colony	7.8	26	1,135	39	0.05	<0.05	0.13	15	<0.003	<0.003	27	8

Sr. No.	Name ofTubewell	pH	Temp. (°C)	EC (µS/cm)	Cl (mg/L)	T-Fe (mg/L)	Mn (mg/L)	F (mg/L)	As (mg/L)	NO2 (mg/L)	NO3 (mg/L)	T-Coli. (cfu/100mL)	F-Coli. (cfu/100mL)
	Pakistan Drinking Water Standards	**6.5-8.5**	**-**	**-**	**<250**	**-**	**<0.5**	**<1.5**	**<50**	**<50**	**<3**	**0**	**0**
	WHO Drinking Water Standards	**6.5-8.5**	**-**	**-**	**250**	**0.3**	**0.5**	**1.5**	**10**	**50**	**3**	**0**	**0**
55	B-Block Gulsahn-E-Ravi	7.8	28	433	18	0.09	<0.05	0.13	23	<0.003	0.037	NIL	NIL
56	Rifle Range	7.8	29	646	37	0.13	0.08	0.16	22	<0.003	0.03	NIL	NIL
57	Bilal Park Shamnagar	7.6	30	710	35	0.12	0.07	0.10	24	<0.003	0.04	NIL	NIL
58	A-Block Gulsahn-e-Ravi	7.6	27	610	37	0.11	<0.05	0.17	9	<0.003	<0.003	NIL	NIL
59	Nonarian	7.6	29	628	59	0.05	<0.05	0.20	27	<0.003	0.04	NIL	NIL
60	Sodiwal Quarter	7.9	32	650	61	0.05	<0.05	0.26	27	<0.003	<0.003	NIL	NIL
61	Jaffria Colony	7.8	28	500	31	0.05	<0.05	0.30	23	<0.003	<0.003	NIL	NIL
62	Rewaz Gardan	7.6	27	986	63	0.13	0.09	0.12	27	<0.003	0.05	NIL	NIL
63	Sanda Patwar Khana	7.7	28	356	12	0.05	<0.05	0.05	16	<0.003	<0.003	12	3
64	Raj Garh Office	7.7	34	1,100	70	3.8	0.15	0.08	45	0.005	0.25	NIL	NIL
65	National Town Sandha	7.5	32	536	25	0.03	0.28	0.15	30	0.22	<0.003	NIL	NIL
66	Rustam Park	7.7	30	633	47	0.02	<0.05	0.28	15	0.015	0.013	1	NIL
67	E-I Johar Town	8.1	29	584	15	0.04	<0.05	0.37	24	<0.003	<0.003	NIL	NIL
68	A-III Johar Town	8.1	30	568	15	0.08	<0.05	0.24	23	<0.003	<0.003	NIL	NIL
69	A-Block Johar town	8.2	29	512	15	<0.02	<0.05	0.24	20	<0.003	<0.003	NIL	NIL
70	Mustafa Town	8.1	28	379	10	0.02	<0.05	0.16	16	0.024	<0.003	NIL	NIL
71	Kanji House Misri Shah	7.7	32	562	31	0.17	<0.05	0.27	29	0.057	0.017	NIL	NIL
72	D-Block China Scheme (Gujjar Pura)	7.9	32	443	14	0.06	<0.05	0.28	24	<0.003	0.018	16	14
73	Jinah Park	7.8	30	824	67	0.12	0.06	0.29	23	0.019	0.019	2	1
74	Faiz Bagh	7.4	28	831	59	0.10	0.07	0.19	23	0.054	0.02	NIL	NIL
75	Shadman Market	7.8	32	629	20	0.03	<0.05	0.17	16	<0.003	0.02	NIL	NIL
76	Katcha Temple Road (Abid Market)	7.7	32	1,736	215	0.15	0.10	0.16	33	<0.003	0.13	3	NIL
77	Awa Phari	7.9	32	1,032	126	0.08	0.09	0.14	26	<0.003	0.04	NIL	NIL
78	Shah Shamas Qari	7.9	32	586	18	0.05	<0.05	0.25	27	<0.003	<0.003	NIL	NIL
79	Faseeh Road	7.8	32	1,131	116	0.53	<0.05	0.17	19	0.006	0.22	35	21
80	Shadman-I Rehmania Park	7.8	30	545	20	0.03	<0.05	0.14	33	<0.003	0.04	1	1
81	Sui Gas Engine Lytton Road	7.8	30	829	74	0.08	0.07	0.26	23	<0.003	<0.003	NIL	NIL
82	Shah Jamal.	7.8	32	534	14	0.03	<0.05	0.20	19	0.16	<0.003	NIL	NIL
83	Shadman Mental Reservoir	7.5	31	1,032	28	0.18	0.07	0.12	40	<0.003	0.12	NIL	NIL
84	Sadi Park.	7.8	32	753	86	0.09	0.05	0.29	18	<0.003	<0.003	27	2

Sr. No.	Name ofTubewell	pH	Temp. (°C)	EC (µS/cm)	Cl (mg/L)	T-Fe (mg/L)	Mn (mg/L)	F (mg/L)	As (mg/L)	NO2 (mg/L)	NO3 (mg/L)	T-Coli. (cfu/100mL)	F-Coli. (cfu/100mL)
	Pakistan Drinking Water Standards	**6.5-8.5**	-	-	**<250**	-	**<0.5**	**<1.5**	**<50**	**<50**	**<3**	**0**	**0**
	WHO Drinking Water Standards	**6.5-8.5**	-	-	**250**	**0.3**	**0.5**	**1.5**	**10**	**50**	**3**	**0**	**0**
85	Jail Road (Lahore Collage)	7.8	30	762	35	0.07	<0.05	0.26	23	0.031	0.026	3	1
86	Mujahidabad	-	-	-	-	-	-	-	-	-	-	-	-
87	Angori Bagh Scheme-II	7.7	29	1,123	51	0.09	0.07	0.11	31	0.007	<0.003	NIL	NIL
88	Daras Barey Mian	7.7	31	1,201	45	0.08	<0.05	0.15	30	0.009	0.09	NIL	NIL
89	Kotli Pir Abdur Rehman	7.8	28	580	7	0.24	<0.05	0.10	19	0.18	<0.003	NIL	NIL
90	Punj Pir	8.1	32	526	18	0.05	<0.05	0.06	26	<0.003	<0.003	8	2
91	Sansi Quarter	7.9	30	629	20	0.08	<0.05	0.07	29	<0.003	<0.003	NIL	NIL
92	Gulshan Park	8.0	26	554	17	0.06	<0.05	0.16	22	0.018	<0.003	NIL	NIL
93	Shah Kamal	7.6	30	942	34	0.28	0.06	0.33	23	0.024	<0.003	NIL	NIL
94	Lal Pul Fayyaz Park	7.9	31	638	16	0.05	0.04	0.10	25	<0.003	<0.003	NIL	NIL
95	Seher Road	7.7	30	960	37	0.22	0.07	0.12	44	<0.003	<0.003	NIL	NIL
96	Achant Garh	7.8	28	818	47	0.24	0.07	0.11	24	<0.003	<0.003	NIL	NIL
97	Canal Bridge	7.7	31	623	20	0.08	<0.05	0.18	21	<0.003	<0.003	NIL	NIL
98	Gulistan Colony	7.7	30	564	16	0.05	<0.05	0.20	22	<0.003	<0.003	NIL	NIL
99	Dev Samaj Road (Commisioner Office)	7.8	28	526	26	0.08	0.07	0.16	32	<0.003	0.035	NIL	NIL
100	Islampura	8.0	28	364	14	0.06	<0.05	0.23	38	<0.003	0.16	NIL	NIL
101	Mohni Road Salmat Mohalla	8.0	21	350	10	0.04	<0.05	0.18	27	<0.003	<0.003	NIL	NIL
102	Bilal Ganj	7.8	20	293	8	0.03	<0.05	0.17	20	<0.003	<0.003	7	2
103	Yasir Road	7.7	23	328	8	<0.02	<0.05	0.24	26	<0.003	<0.003	NIL	NIL
104	Sardar Chapal	7.8	24	329	8	0.04	0.21	0.25	6	<0.003	<0.003	18	7
105	M.C High School Sanda	7.8	28	435	18	0.08	<0.05	0.26	31	0.057	0.013	NIL	NIL
106	Karim Park Old	8.0	20	390	12	0.04	<0.05	0.20	31	<0.003	<0.003	1	NIL
107	Akram Park, Bund Road	7.8	20	368	14	0.05	<0.05	0.12	47	<0.003	<0.003	NIL	NIL
108	Ibrahim Road	7.9	19	325	10	0.05	0.06	0.20	22	<0.003	0.090	NIL	NIL
109	Main Out Fall No.1	8.1	29	342	6	0.05	<0.05	0.26	33	<0.003	0.033	NIL	NIL
110	E-Block Sabzazar	8.2	30	303	8	0.04	<0.05	0.31	26	<0.003	<0.003	NIL	NIL
111	K-Block Sabzazar	7.9	27	357	10	0.06	<0.05	0.27	23	<0.003	<0.003	NIL	NIL
112	B-Block Sabzazar	7.5	28	874	57	0.16	0.08	0.21	27	<0.003	<0.003	NIL	NIL
113	A-Block Sabzazar	7.5	26	967	59	0.07	0.06	0.19	37	<0.003	<0.003	NIL	NIL
114	D-Block Sabzazar	7.9	36	322	8	0.05	<0.05	0.29	10	<0.003	<0.003	NIL	NIL

Sr. No.	Name ofTubewell	pH	Temp. (°C)	EC (µS/cm)	Cl (mg/L)	T-Fe (mg/L)	Mn (mg/L)	F (mg/L)	As (mg/L)	NO2 (mg/L)	NO3 (mg/L)	T-Coli. (cfu/100mL)	F-Coli. (cfu/100mL)
	Pakistan Drinking Water Standards	**6.5-8.5**	-	-	**<250**	-	**<0.5**	**<1.5**	**<50**	**<50**	**<3**	**0**	**0**
	WHO Drinking Water Standards	**6.5-8.5**	-	-	**250**	**0.3**	**0.5**	**1.5**	**10**	**50**	**3**	**0**	**0**
115	N-Block,Samanabad	7.9	32	561	37	0.06	<0.05	0.13	26	<0.003	<0.003	NIL	NIL
116	Ittehad Colony Samanbad	7.8	32	380	18	0.03	<0.05	0.15	24	<0.003	<0.003	NIL	NIL
117	Pir Buddan Shah Dholanwal	7.9	32	442	24	0.04	<0.05	0.15	25	<0.003	<0.003	NIL	NIL
118	Juggian Shahab Din	7.9	31	373	16	0.03	<0.05	0.15	27	<0.003	<0.003	NIL	NIL
119	Children Park	7.9	28	322	14	0.06	<0.05	0.21	20	<0.003	<0.003	7	NIL
120	Yasrab Colony	8.0	30	383	16	0.07	<0.05	0.17	34	0.005	<0.003	NIL	NIL
121	Taj Pura Ground	7.7	32	529	30	0.12	0.07	0.15	23	0.004	<0.003	2	NIL
122	Shahab Stadium (Fazal pura)	7.9	29	434	28	0.06	<0.05	0.15	19	0.009	<0.003	4	1
123	Chah Miran (Old)	7.9	29	388	16	0.04	0.06	0.34	26	0.040	<0.003	NIL	NIL
124	Shadbagh well Centre-I	8.0	30	279	6	<0.02	<0.05	0.13	28	0.019	<0.003	NIL	NIL
125	Shadbagh well Centre-II	8.0	29	291	8	0.06	0.05	0.09	34	0.005	<0.003	NIL	NIL
126	Shadbagh well Centre-IV	8.0	28	285	10	0.08	0.05	0.15	24	<0.003	<0.003	1	NIL
127	Shish Mehal Road	7.7	25	549	31	0.14	0.07	0.18	6	<0.003	<0.003	NIL	NIL
128	Majeed Park Shahdara UC-6.	7.6	28	492	28	0.05	<0.05	0.13	106	0.007	0.063	NIL	NIL
129	Takia Khusrianwala Shahdara UC-6	7.8	28	300	6	0.03	<0.05	0.18	33	0.006	0.061	5	2
130	G.T.Road Shahdara	7.8	30	476	26	0.03	<0.05	0.14	41	<0.003	0.048	6	NIL
131	Saeed Park.	7.8	28	374	16	0.03	0.08	0.15	30	0.009	0.029	NIL	NIL
132	Paracha Colony	7.7	29	496	26	0.10	0.07	0.10	43	<0.003	0.24	2	1
133	Latif Park.	-	-	-	-	-	-	-	-	-	-	-	-
134	Ghazi Muhala Children Park	7.6	30	761	32	0.11	0.07	0.13	25	<0.003	0.20	49	NIL
135	Larex colony	7.9	32	529	20	0.04	<0.05	0.24	27	<0.003	0.04	NIL	NIL
136	Tegore Park	8.0	30	1,152	124	0.16	0.09	0.10	24	<0.003	0.065	1	NIL
137	Scotch Cornor / Upper Mall	7.6	23	456	12	0.04	<0.05	0.25	21	<0.003	<0.003	NIL	NIL
138	Muhammad Nagar.	7.7	31	668	75	0.02	<0.05	0.16	23	0.006	0.03	NIL	NIL
139	Baghay Shah	7.5	28	1,040	49	0.10	<0.05	0.21	24	<0.003	0.068	1	NIL
140	Habib Ullah Road	8.0	29	561	20	0.04	<0.05	0.15	31	<0.003	0.93	NIL	NIL
141	Ahmad Block	7.6	30	706	18	0.11	0.05	0.15	32	<0.003	<0.003	NIL	NIL
142	E-Block, Tajpura	7.8	30	784	20	0.04	<0.05	0.24	16	0.038	0.270	6	2
143	Ghaziabad Bus Stop	8.0	31	611	16	<0.02	<0.05	0.13	21	<0.003	<0.003	NIL	NIL
144	A-Block Tajpura	7.9	31	595	14	0.07	<0.05	0.15	21	<0.003	<0.003	NIL	NIL

Sr. No.	Name ofTubewell	pH	Temp. (°C)	EC (µS/cm)	Cl (mg/L)	T-Fe (mg/L)	Mn (mg/L)	F (mg/L)	As (mg/L)	NO2 (mg/L)	NO3 (mg/L)	T-Coli. (cfu/100mL)	F-Coli. (cfu/100mL)
	Pakistan Drinking Water Standards	**6.5-8.5**	-	-	**<250**	-	**<0.5**	**<1.5**	**<50**	**<50**	**<3**	**0**	**0**
	WHO Drinking Water Standards	**6.5-8.5**	-	-	**250**	**0.3**	**0.5**	**1.5**	**10**	**50**	**3**	**0**	**0**
145	Jorrey Pull	7.7	31	856	26	<0.02	<0.05	0.20	22	0.006	<0.003	58	5
146	Q-Block Model Town EXT	7.4	28	1,231	59	0.12	<0.05	0.13	15	<0.003	0.28	NIL	NIL
147	S-Block Model Town Ext.	7.7	29	1,026	39	0.15	0.09	0.15	9	<0.003	<0.003	NIL	NIL

(2) Results of Actual Measurement of Discharge, Water Level, etc. at 147 Tubewells Surveyed

Well No	Name of TW	Survey Date	Flow (L/min)				Velocity (m/s)				Water Level (m)			Pressure (Psi or Kg/cm^2)	Current (A)	Voltage (V)	Sand Discharge (50 ppm)	Specification			Operation Time (Hours)	Remark
			Operation	0 min	15 min	30 min	Operation	0 min	15 min	30 min	0 min	15 min	30 min					Pump (cfs)	Motor (HP)	Transform er (KVA)		
1	Huma Block	13-07-2013	O	2565	2620	1710	O	0.78	0.80	0.76	33.5			0.5 Bar/10 Psi	123	438	NIL	4	150	200	12	Electrical panel is not working. Ampere meter and volt meter are out of order.
2	Neelam Block	13-07-2013	O	3774	3809	3585	×	0.86	0.87	0.82					145.7	389	NIL	4	150	200	12	No holes. Gland leakage and also leakage from water supply pipe.
3	Pak Block	13-07-2013	O	1742	1966	2190	×	0.40	0.45	0.50	38.5				102.9	400	NIL	4	150	200	14	Dynamic water level could not measure due to air suction, gland leak and flange pipe.
4	Jahanzaib Block	15-07-2013	O	4050	3768	3828	×	1.30	1.24	1.26	35.5			0.5 Bar/10 Psi	116.9	343	NIL	4	150	200	12	Electric panel is not working. Air suction & flange problem.
5	Ravi Block	13-07-2013	O	6754	7161	7564	×	2.22	2.39	2.42				0.5 Bar/10 Psi	105	384	NIL	4	150	200	15	Chlorine injecting device is not available. Holes not available for measurement of water level.
6	Abdul Krim Road (Mela Ram Park)	15-07-2013	O	1672	1712	1699	O	0.85	0.87	0.86	38.15	51.5			66.5	400	NIL	2	80	100	16	Chlorine injecting device is there but not operational. Chlorine injected daily with manual process.
7	Nisr Scheme Qil Gujjar Singh	16-07-2013	O	5106	4923	5041	×	1.68	1.62	1.65	38.21				160	410	NIL	4	150	200	14	Chlorine is present but chlorine injecting device is damaged. Gland leakage.
8	Dhobi Mandi	16-07-2013	O	1528	1478	1535	×	0.77	0.75	0.78	32.33				67.9	398	NIL	2	80	200	12	Chlorine injecting device is out of order. Chlorine is not available. Air suction & flange problem.
9	Patiala Ground	16-07-2013	O	2212	2309	2333	×	0.73	0.76	0.77	36.31				83.9	347	NIL	2	80	100	14	Air suction, flange problem & gland leakage. Chlorine injecting device not available. No chlorine is available for manual injecting.
10	Rashi Bhawan (Pthi Ground)	16-07-2013	O	2651	2836	2790	×	1.34	1.44	1.41	36.93				83.1	410	NIL	2	80	100	16	Gland leakage & flange problem. Chlorine is present but chlorine injecting device is out of order.
11	Circular Road Guru Argum Nagar	16-07-2013	O	3045	3083	2818	×	1.00	1.01	0.93	36.67				132.6	366	NIL	4	150	200	12	Chlorine injecting device is out of order. Chlorine is not available. Air suction, gland leakage & flange problem.
12	Hilton Hotel	16-07-2013	×				×				39.7											Pump station closed since last 2 years but tube well operator was present at site.
13	Royal Park	16-07-2013	O	3874	3971	3931	×	1.27	1.30	1.29	34.65				187.2	397	NIL	4	150	200	14	Chlorine injecting device is out of order. Chlorine is available for manual injecting. Gland leakage & flange problem.
14	Sunaya Jabeen Park	16-07-2013	O	4101	4101	4101	×	1.35	1.35	1.35	39.8			0.3 Bar/6 Psi	84	380	NIL	4	150	200	15	Chlorine injection device is not operational. No manual chlorination process. Air suction, gland leakage & flange problem.
15	Salamatpura Takkia (Village)	17-07-2013	O	3709	1071	3509	×	1.22	0.35	1.12					74	371	NIL	4	150	200	20	No holes. Chlorine injection device is not operational. Drum is use for manual chlorination. Ampere meter is not operational. Air suction, gland leakage & flange problem.
16	Shah Gobar Abad	16-07-2013	O	3883	3883	3883	×	1.28	1.28	1.28	29.5				80	333	NIL	4	150	200	11	Chlorine injection device is not operational. Drums are available for manual chlorination but chlorine is not available. Air suction, gland leakage & flange problem.
17	Milap Street	16-07-2013	O				×				39.9				66		NIL	4	150	200	17	Flow could not possible because pipe is buried in earth. Air suction, gland leakage & flange problem. Volts could not possible because electric wires are connected directly. Chlorine injection device is not available. Volt meter & ampere meters are out of order.
18	Dhobi Ghat	17-07-2013	O	3115	3115	3115	×	10.23	10.23	10.23					41	423	NIL	4	150	200	18	No holes. Air suction, gland leakage & flange problem. Chlorine injection device is not operational. Drum is in use for manual chlorination. Both volts and ampere meters are not operational.
19	Madhu Lal Hussain	16-07-2013	O	5307	5479	5323	×	1.74	1.30	1.75	37.2				96	382	NIL	4	150	200	20	Chlorine injection device is not operational. Drums are available for manual chlorination but chlorine is not available. Both ampere & volts meters are out of order. Air suction, gland leakage & flange problem
20	Iqbal Park-I	19-07-2013	×				×															Tube well is closed since many years.
21	Iqbal Park-III	19-07-2013	O	2585	3564	2970	×	0.85	1.17	0.98	25.2				77	394	NIL	4	150	200	16	Chlorine injection device is not functional. No manual chlorination. Electric panel is in worse condition. Air suction, flange problem, gland leakage.

(2) Results of Actual Measurement of Discharge, Water Level, etc. at 147 Tubewells Surveyed

Well No	Name of TW	Survey Date	Flow (L/min)				Velocity (m/s)				Water Level (m)			Pressure (Psi or Kg/cm^2)	Current (A)	Voltage (V)	Sand Discharge (50 ppm)	Specification			Operation Time (Hours)	Remark
			Operation	0 min	15 min	30 min	Operation	0 min	15 min	30 min	0 min	15 min	30 min					Pump (cfs)	Motor (HP)	Transformer (KVA)		
22	Chomala	19-07-2013	O	12847	12847	12847	×	6.51	6.51	6.51					49	231	NIL	4	80	100	20	No holes. Chlorine injection device is not functional. No manual chlorination. Electric panel is in worse condition. Air suction, flange problem, gland leakage.
23	Iqbal Park fort (Shahe Qila)	19-07-2013	O	1992	2351	2351	×	0.65	0.77	0.77	28.35				54	419	NIL	4	150	200	16	Chlorine injection device is not functional. Drum is there fore manual chlorination bus no chlorine available Ampere meter is out of order. Air suction, flange problem, gland leakage.
24	Sabzi Mandi	19-07-2013	O	3626	3780	3690	O	1.19	1.22	1.20	23.35				75	376	NIL	4	150	200	14	Chlorine injection device is not functional. Air suction, flange problem, gland leakage.
25	Sharanwala Gate	19-07-2013	O	1551	3672	3672	×	0.51	1.21	1.21	29.4				62	353	NIL	4	150	200	13	Chlorine injection device is not functional. Drum is there fore manual chlorination bus no chlorine available Ampere meter is out of order. Electric panel in worse condition. Air suction, flange problem, gland leakage.
26	Ali Park	19-07-2013	×				O															Tube well is closed since many days.
27	Iqbal Park-II	19-07-2013	×				×															Tube well is close since 2 years.
28	Raheem Road Data Nagar	22-07-2013	O	765	801	746	×	0.25	0.26	0.25	34.2	37.13			34	377	NIL	2	80	200	16	Chlorine injection device is not functional. Drum is in used for manual chlorination. Both volts & ampere meters are out of order. Electric panel condition is bad.
29	Khokhar Road No. III	22-07-2013	O				×										NIL	4	150	200	15	No holes. Flow could possible due to pipe buried in earth. Air suction, gland leakage & flange problem. Electric panel and wires are not in good condition.
30	Hussain Park	22-07-2013	O				×				20.35							2	80	200	14	Tube well is closed due to electric fault since 20.07.2013. Chlorine injection device is not functional. Drum is in used for manual chlorination. Both volts & ampere meters are out of order.
31	Siddique Pura	19-07-2013	O				×				24.3	36.55			88	399	NIL	4	150	200	13	False reading observed due to heavy pressure of air (air leakage). Chlorine injection device is not functional. Drum is in use for manual chlorination. Both volt meter and ampere meter is out of order.
32	Jia Musa	18-07-2013	O	1981	2193	2270	×	1.00	1.11	1.17	15.3				48	372	NIL	2	80	100	18	Air suction, gland leakage & flange problem. Chlorine device is not functional. Drum is in use for manual chlorination but no chlorine available. Both volts & ampere meters are out of order.
33	Latif Chowk (Wandala Road)	18-07-2013	O	2629	2816	2968	×	0.86	0.93	0.93	14				56	373	NIL	4	150	200	15	Chlorine device is not functional. Drum is in use for manual chlorination but no chlorine available. Both volts & ampere meters are out of order. Air suction, gland leakage & flange problem.
34	Farrukh Abad	18-07-2013	×				×				16.8	37.13						4	150	200	12	Not operational. Motor is not present due to mechanical fault. Chlorine injection device is not functional. Drum is in used for manual chlorination. Electric panel is out of order since 26.07.2013.
35	3-D-I	18-07-2013	O	5296	4896	4424	×	1.15	1.64	1.45	37.4						NIL	4	150	200	12	Chlorine device is not available. Manual chlorination process. Flange problem.
36	D-I Block-III (3-D-2)	19-07-2013	O	7109	7028	7139	×	2.33	2.33	2.34	36.73				210	371	NIL	4	150	200	14	Chlorine is being injected manually. Flange problem.
37	D-II Block-III (4-D-2)	19-07-2013	O				×								69	400	NIL	2	80	100		No holes. Flow meter / reading could not take due to heavy vibration in pipe. Flange problem. no chlorine process
38	Tanki No.4 Township	19-07-2013	×				×															Tube well demolished and converted into public park.
39	Tanki No.3 Township	19-07-2013	×				×															No holes. Not operational. No motor, no pump, no transformer & no operator at site.
40	Gawala Colony No.1	16-07-2013	O	4918	4735	4757	×	2.49	2.40	2.41	26.83				97	311	NIL	2	80	100	12	Flange problem.

(2) Results of Actual Measurement of Discharge, Water Level, etc. at 147 Tubewells Surveyed

Well No	Name of TW	Survey Date	Flow (L/min)				Velocity (m/s)				Water Level (m)			Pressure (Psi or Kg/cm^2)	Current (A)	Voltage (V)	Sand Discharge (50 ppm)	Specification			Operation Time (Hours)	Remark
			Operation	0 min	15 min	30 min	Operation	0 min	15 min	30 min	0 min	15 min	30 min					Pump (cfs)	Motor (HP)	Transformer (KVA)		
41	Henry Key (Old)	11.07.2013	O	3565	4168	4075	×				40.97			0.75 Bar/12 Psi	67	401	NIL	2	80	100	17	Water leakage from pump. Flange problem.
42	Zafr Ali Road/Jail Road	15.07.2013	O	3299	3188	3124	×	1.08	1.47	1.34	43.9	47.5	47.1		74	376	NIL	2	80	100	13	No chlorine injecting device available.
43	M-Block Gulberg	15.07.2013	×				×				38.6											Pump house is being used as a store. Pump is not operational. Control panel not available. No pump, no motor & no transformer.
44	WASA Head Office	15.07.2013	×				×															No holes. Pump house is being used as an office. No motor, no pump & no transformer.
45	B-I Block Gulberg (A-Block Gulberg)	15.07.2013	O				×				43.7				100	390	NIL	4	150	200	13	No space on pipe on horizontal line. There was no space for flow meter, so we put the flow meter on inclined line i.e. at 45. Variation in current observed. Flange problem.
46	Mehboob Park, Ichra	13.07.2013	O	2505	2571	2532	×	0.82	0.87	0.83	38.5	47.5			100	414	NIL	4	150	200	17	Chlorine injector out of order.
47	A-Block Muslim Town	11.07.2013	O	3433	5520	4904	×	0.75	1.26	1.14	44.2	48.1	47.1		118.8	399	NIL	4	150	200	12	No chlorine available. Ampere meter not working. Voltage meter not working. Pressure gauge not available.
48	C-Block Muslim Town	11.07.2013	O	5279	5283	5289	×				45.46	52.16	52.18	1 Bar/15 Psi	83	370	NIL	4	150	200	12	Panel voltage problem. Manual chlorine tank. No meter gauge installed.
49	Fareed Colony Printing Press	20.07.2013	O				×				38.6				161	393	NIL	4	150	200	15	Could not get the reading due to extra vibration in pipe. Air suction & flange problem. Chlorine is being injected manually.
50	Nishtar Colony	20.07.2013	O	4994	4259	4495	×	2.19	2.16	2.36	26.2				94	418	NIL	2	80	100	16	Chlorine device is not available. Chlorine is being injected manually. Flange problem.
51	Block No.6 Sector-A-II Township	16.07.2013	O	6708	6616	6665	×	2.20	2.17	2.19	41.7				150	411	NIL	4	150	200	12	Dynamic level could not take due to wire stuck in flange. Flange problem.
52	Block No. 4 Sector-A-II Township	16.07.2013	O	3730	3960	3885	×	1.23	1.30	1.28	34.4				64	402	NIL	4	150	200	14	Dynamic level could not take due to gland leakage. Flange problem & gland leakage.
53	Baba Fruid Colony	16.07.2013	O	6735	6397	6441	×	2.21	2.10	2.12					180	390	NIL	4	150	200	16	No holes. Variation in ampere and voltage observed.
54	Mian Fazal Haq Colony	20.07.2013	O	6442	6537	5854	×	2.12	2.15	1.21	34.4				126	392	NIL	4	150	200	15	Chlorine device is not available. Chlorine is being injected manually. Flange problem.
55	B-Block Gulshn-E-Ravi	18.07.2013	O	2016	2248	2341	×	0.69	0.74	0.77	28.1	42.6			66.6	373	NIL	2	80	200	14	Chlorine device is not functional. Manual chlorination process adopted. Both volts & ampere meters are not functional.
56	Rifle Range	18.07.2013	O	5783	6117	5934	×	1.90	2.01	1.95	30.5				151.2	0.87	NIL	4	150	200	12	Chlorine device is not present. No manual chlorination. Both volts & ampere meters are not functional. Flange problem & gland leakage.
57	Bilal Park Shaamnagar	18.07.2013	O	3492	3230	3266	×	1.15	1.06	1.07	29.6				163.3	381	NIL	4	150	200	18	Chlorine device is not present. No manual chlorination. Both volts & ampere meters are not functional. Flange problem & gland leakage.
58	A-Block Gulshn-e-Ravi	18.07.2013	O	2735	3409	3074	×	0.90	1.12	1.01	29.8	38.2			111.2	392	NIL	4	150	200	15	Chlorine device is not functional. Manual chlorination process adopted. Both volts & ampere meters are not functional.
59	Nonarian	18.07.2013	O	5905	5145	5327	×	1.94	1.69	1.75	29.6	39.3			129.8	394	NIL	4	150	200	13	Chlorine device is not functional. Manual chlorination process adopted. Both volts & ampere meters are not functional.
60	Sodiwal Quarter	19.07.2013	O	2137	2179	2100	×	0.76	0.72	0.69					113.4	400	NIL	4	150	200	12	No holes. Chlorine device is not functional. Main switch is out of order. Air suction, flange problem & gland leakage.
61	Jaffria Colony	19.07.2013	O	5069	6212	5998	×	0.66	2.04	1.97	29.3				149.1	395	NIL	4	150	200	13	Chlorine device is not functional. Both volts & ampere meters are not functional. Flange problem & gland leakage.

(2) Results of Actual Measurement of Discharge, Water Level, etc. at 147 Tubewells Surveyed

Well No	Name of TW	Survey Date	Flow (L/min)				Velocity (m/s)				Water Level (m)			Pressure (Psi or Kg/cm^2)	Current (A)	Voltage (V)	Sand Discharge (50 ppm)	Specification			Operation Time (Hours)	Remark
			Operation	0 min	15 min	30 min	Operation	0 min	15 min	30 min	0 min	15 min	30 min					Pump (efs)	Motor (HP)	Transformer (KVA)		
62	Rewaz Garden	18.07.2013	O				O				30.6				133.1	368	NIL	4	150	200	21	Flow could not measured due to non availability of space on pipe for fixing of transducers. Flange problem & gland leakage. Both volts & ampere meters are not functional. Service line damaged (repaired temporary).
63	Sanda Patwar Khana	18.07.2013	O	5788	4123	4336	×	1.90	1.35	1.42	23.5				119	394	NIL	4	150	200	13	Chlorine device is not functional. Manual chlorination process adopted Both volts & ampere meters are not functional. Air suction, flange problem & gland leakage
64	Raj Garh Office	18.07.2013	O				×				29.3				46.4	362	NIL	2	80	100	13	Flow could not measured due to non availability of space on pipe for fixing of transducers. Flange problem & gland leakage. Both volts & ampere meters are not functional. Service line damaged (repaired temporary).
65	National Town Sandha	19.07.2013	×				×											4		200		.
66	Rustam Park	18.07.2013	O	2439	3951	3859	×	0.80	1.30	1.27	28.7				186.1	383	NIL	4	150	200	16	Chlorine device is not functional. Manual chlorination process adopted. Both volts & ampere meters are not functional. Flange problem & gland leakage.
67	E-I Johor Town	17.07.2013	O				×				36.5				90.7	344	NIL	2	80	100	15	No space available for fixing of flow meter. Gland leakage & flange problem. Chlorine device is out of order.
68	A-III Johar Town	17.07.2013	O	187	0	96	×	0.06	0.00	0.03	30.5				72.2	402	> 50 PPM	4	150	200	12	In flow air along with water observed. Vibration observed in pipe. Variation in current observed. Manual chlorine injecting process. Flange problem.
69	A-Block Johar Town	17.07.2013	O				×				36.3				72.2	414	NIL	4	150	200	8	Flow could not take due to extra ordinary air mixing with water. Heavy vibration observed. Flange problem.
70	Mustafa Town	20.07.2013	×				×				30.7									200		Pump not operational, no motor, no pump & no transformer.
71	Kanji House Misri Shah	22.07.2013	O	3623	3078	3078	×	1.19	1.01	1.01	37.1	43.3			80	328	NIL	4	150	200	13	Chlorine injection device is not functional. Drum is in used for manual chlorination. Both volts & ampere meters are out of order.
72	D-Block China Scheme (Gujjar Pura)	22.07.2013	O	6328	6440	5773	×	2.08	2.12	1.90					90	373	NIL	4	150	200	16	No holes. Chlorine injection device is not functional. Drum is in used for manual chlorination. Both volts & ampere meters are out of order. Flange problem & gland leakage.
73	Jinah Park	22.07.2013	O	3078	2856	3078	×	1.01	0.97	1.01					94	363	NIL	4	150	200	18	No holes. Chlorine injection device is not functional. No manual chlorination. Air suction, flange problem & gland leakage.
74	Faiz Bagh	22.07.2013	×				×															Tube well is closed since 5 years. No pump, no motor, no transformer.
75	Shdman Market	12.07.2013	O	2162	2159	2079	×				5.44				69	405	NIL	4	80	100	24	Flange problem.
76	Katch Temple Road (Abid Market)	12.07.2013	O	7342	7052	7135	×	0.38							55	380	NIL	2	80	100	13	No holes. Chlorine device is installed but chlorine is not available. No measurement hole available for dynamic water level.
77	Awa Phari (Queens Road)	16.07.2013	O	2651	2836	2790	O	1.34	1.44	1.41	36.93				83.1	410	NIL	2	80	100	16	Chlorine is present but chlorine injecting device is out of order. Flange problem & gland leakage.
78	Shah Shamas Qari	13.07.2013	×				×				39.3							2	80	100		Tube well is closed. Motor is out of order. Chlorine injecting device is not available. Drum is available but there is no chlorine.
79	Faseeh Road	13.07.2013	O	4069	4171	4270	×	1.34	1.36	1.42	35.2	44.5			128	366	NIL	2	150	200	14	Electric panel is not working.
80	Shadman-I Rehmania Park	12.07.2013	O	2397			×	0.79			44.2				71	415	NIL	2	80	100	17	Due to extra vibration only first reading could have.
81	Sui Gas Engine Lytton Road	12.07.2013	×				×														12	Pump not operational due to non availability of motor. No electrical panel installed. No transformer installed.

(2) Results of Actual Measurement of Discharge, Water Level, etc. at 147 Tubewells Surveyed

Well No	Name of TW	Survey Date	Flow (L/min)				Velocity (m/s)				Water Level (m)			Pressure (Psi or Kg/cm^2)	Current (A)	Voltage (V)	Sand Discharge (50 ppm)	Specification			Operation Time (Hours)	Remark
			Operation	0 min	15 min	30 min	Operation	0 min	15 min	30 min	0 min	15 min	30 min					Pump (cfs)	Motor (HP)	Transformer (KVA)		
82	Shah Jamal	12.07.2013	O	5292	5241	5220	×	1.70	1.20	1.10	43.9	49.01			117	412	NIL	4	150	200	20	No chlorine injector available. Volt meter not working.
83	Shadman Mental Reservoir	12.07.2013	O	4241	4228	4244	×				44.2				30	415	NIL	2	80	100	10	Chlorine injecting device is not available. Both voltmeter and ampere meters are out of order.
84	Sadi Park	12.07.2013	O	1168	1614	1968	×	0.38	0.58	0.65	31.3	44.45	44.65		58.8	364	NIL	2	80	100	13	Electrical panel not working & pressure gauge not present.
85	Jail Road (Lahore College)	12.07.2013	×				×				43.6							4	150	200	12	Pump is not operational since 3 days. No chlorine available, ampere meter not working, voltage meter not working, & pressure gauge not available
86	Mujahidabad (SDO Office)	17.07.2013	O				×								64	384	NIL	4	150	200	18	No holes. Flow could not possible because there is no space available for fixing transducers on pipe. Chlorine injection device is not operational. Drum is in used for manual chlorination. Both volts and ampere meters are not operational.
87	Angori Bagh Scheme-II	17.07.2013	O	1140	1356	1356	O	0.58	0.69	0.69				0.75Bar/12 Psi	37	396	NIL	2	80	100	15	No holes. Chlorine injection device is not available. No chlorine used. Both volts and ampere meters are not operational. Air suction, gland leakage & flange problem.
88	Dams Barey Main	16.07.2013	O	2634	2634	2634	×	8.65	8.65	8.65	41.1				66	365	NIL	4	150	200	17	Chlorine injection device is not available. No chlorine used. Air suction, gland leakage & flange problem.
89	Kotli Pir Abdur Rehman	17.07.2013	×				×				40	44.5			39	366	NIL	4	150	200	17	Flow could not be measured due to mechanical fault in motor (rod broken). Chlorine injection device is not operational. Drum is in use for manual chlorination.
90	Purj Pir	15.07.2013	O	3725	3642	3823	×	1.22	1.20	1.26	39.8				61	397	NIL	2	80	100	21	Chlorine injection device is not available. No manual chlorination process available. Ampere meter is out of order. Air suction, gland leakage & flange problem.
91	Sansi Quarter	16.07.2013	O	6053	6217	6090	×	1.99	2.04	2.00	40.9			0.75 Bar/12 Psi	101	347	NIL	4	150	200	14	Chlorine injection device is not available. No chlorine used. Ampere meter is out of order. Air suction, gland leakage & flange problem.
92	Gulshan Park	17.07.2013	O				×								86	394	NIL	4	150	200	24	Flow could not measure due to no suitable place available for fixing of flow meter. Chlorine injection device is not available. No manual chlorination. no holes.
93	Shah Kamal	17.07.2013	O	3287	3287	3287	×	10.00	10.80	10.80	35.8				69	402	NIL	4	150	200	11	Chlorine injection device is not available. No chlorine used. Air suction, gland leakage & flange problem.
94	Lal Pul Fayyaz Park	17.07.2013	O				×								71	370	NIL	4	150	200	24	False reading observed due to air in pipe. Air suction, gland leakage & flange problem. Chlorine injection device is not operational. Drum is in used for manual chlorination. Both volts and ampere meters are not operational.
95	Seher Road	16.07.2013	O	652	652	652	O	0.33	0.33	0.33					67	419	NIL	4	150	200	12	No holes. Chlorine injection device is not operational. No manual chlorination process. Volt meter & ampere meters are out of order. Air suction, gland leakage & flange problem.
96	Achant Garh	16.07.2013	O	2685	2492	2659	×	1.36	1.28	1.35				0.25 Bar/5 Psi	49	407	> 50 PPM	2	80	100	19	No holes. Chlorine injection device is not operational. Drums are in use for manual chlorination. Water is dirty as dust and sand particles are present. Air suction, gland leakage & flange problem.
97	Canal Bridge	15.07.2013	O	3211	2857	2745	×	1.05	0.94	0.90	40.8	47.9	46.5	0.25 Bar/50 Psi	47	387	NIL	2	80	100	16	Volts & ampere meters are out of order. Chlorine injection device is available but not operational. Drums are in use for chlorination purpose.
98	Gulistan Colony	15.07.2013	O	2864	2864	2891	×	0.94	0.94	0.96	40.15				66	361	NIL	4	150	200	18	Air suction problem. Chlorine injection device not available. Drum is available for manual chlorination.

(2) Results of Actual Measurement of Discharge, Water Level, etc. at 147 Tubewells Surveyed

Well No	Name of TW	Survey Date	Flow (L/min)				Velocity (m/s)				Water Level (m)			Pressure (Psi or Kg/cm^2)	Current (A)	Voltage (V)	Sand Discharge (50 ppm)	Specification			Operation Time (Hours)	Remark
			Operation	0 min	15 min	30 min	Operation	0 min	15 min	30 min	0 min	15 min	30 min					Pump (efs)	Motor (HP)	Transformer (KVA)		
99	Dev Samaj Road (Communication Office)	20.07.2013	O	5925	5489	5985	×	1.95	1.30	1.97	30.6	42			92	366	NIL	4	150	200	16	Chlorine injection device is not functional. Drum is in used for manual chlorination. No light, no fan installed.
100	Islampura	20.07.2013	O				×								79	369	NIL	4	150	200	16	No holes. No space available on pipe for fixing of transducers. Air suction, flange problem & gland leakage. Chlorine injection device is not functional. Drum is in used for manual chlorination. Both ampere and volt meters are out of order.
101	Mohni Road Salmat Mohalla	20.07.2013	O	3547	3547	3547	×	1.17	1.17	1.17					88	395	NIL	4	150	200	22	No holes. Chlorine injection device is not functional. Drum is in use for manual chlorination. Ampere meter is out of order. Air suction, flange problem & gland leakage.
102	Bilal Ganj																					Well no. 102 & 104 consider as one site.
103	Yasin Road	20.07.2013	O				O								46		NIL	2	80	100		No holes. Flow could possible due to pipe buried in earth. Air suction, flange problem & gland leakage. Chlorine injection device is not functional. Drum is in use for manual chlorination. Both volts & ampere meters are out of order. Water leakage from roof water falls on motor and wires. No operator present.
104	Sardar Chapel	20.07.2013	O				O				29.1				57		NIL	4	150	200	14	False reading observed due to heavy air leakage. Air suction, flange problem & gland leakage. Chlorine injection device is not functional. Chlorine is not available (drum is present). Both ampere and volt meters are out of order. Electric panel was locked.
105	M. C. High School Sanda	20.07.2013	O	2973	2890	3156	×	0.98	0.95	1.04	26.7	45.45			82	381	NIL	4	150	200	14	Chlorine injection device is not functional. Drum is in used for manual chlorination but chlorine is not available. Both ampere and volt meters are out of order.
106	Karim Park Old	20.07.2013	O	2413	1791	1586	×	1.22	0.91	0.80					34	336	NIL	2	80	200	18	No holes. Chlorine injection device is not functional. No manual chlorination. Both volts & ampere meters are s out of order. Air suction, flange problem & gland leakage.
107	Akram Park, Bund Road	20.07.2013	O				×				23.1	42.2			22	365	NIL	2	80	100	13	Flow could possible due to pipe buried in earth. Chlorine injection device is not functional. No manual chlorination. Both ampere and volt meters are out of order. Well room and motor is below to road level. No light & no fan installed.
108	Ibrahim Road	20.07.2013	O	3605	3655	3705	×	1.18	1.20	1.22	26.5				57		NIL	2	80	200	14	Chlorine injection device is not functional. Chlorine is not available (drum is present). Both ampere and volt meters are out of order. Air suction, flange problem & gland leakage. Electric connectors not available.
109	Main Out Fall No. 1	20.07.2013	O	3396	3092	3396	×	1.12	1.05	1.12					68	348	NIL	4	150	200	12	No holes. Chlorine injection device is not functional. Drum is in used for manual chlorination. Both ampere and volt meters are out of order. Air suction, flange problem & gland leakage.
110	E-Block Sabzazar	13.07.2013	×				×							1.1 Bar/16 Psi				2	80	100	17	Pump station is not operational because of electric panel fault. Static water level could not be measured due to wire stuck in flange. Chlorine injecting device is available but not operational due to non availability of chlorine.
111	K-Block Sabzazar	13.07.2013	O	6315	7259	6510	×	2.07	21.20	2.05	21.2			1.3 Bar/19 Psi	70	350	NIL	2	80	100	15	Chlorine injection device is available but not operational. Drum is used for chlorination but no chlorine available.

(2) Results of Actual Measurement of Discharge, Water Level, etc. at 147 Tubewells Surveyed

Well No	Name of TW	Survey Date	Flow (L/min)				Velocity (m/s)				Water Level (m)			Pressure (Psi or Kg/cm^2)	Current (A)	Voltage (V)	Sand Discharge (50 ppm)	Specification			Operation Time (Hours)	Remark
			Operation	0 min	15 min	30 min	Operation	0 min	15 min	30 min	0 min	15 min	30 min					Pump (cfs)	Motor (HP)	Transformer (KVA)		
112	B-Block Sabzazar	13.07.2013	O	4091	3518	4045	×	2.00	1.97	2.05				1 Bar/15 Psi	60	315	NIL	2	80	100	10	No holes. No measurement hole available for water level measurement. Chlorine injection device and pressure gauge is out of order. Drum has been used for chlorination but no chlorine available. Ampere meter and volt meter are out of order.
113	A-Block Sabzazar	13.07.2013	O	3948	4148	3907	×	2.00	2.10	1.98					75	400	NIL	2	80	200	14	No holes.
114	D-Block Sabzazar	13.07.2013	O	2890	2400	4068	×	1.46	0.79	1.34					84	376	NIL	2	80	200	15	No holes. Variation in voltage observed during operation.
115	N-Block, Samanabad	15.07.2013	O	1848	2112	2288	×	0.42	0.48	0.52	36.5	43.7	43.9		150	410	NIL	4	150	200	13	Air suction & gland leakage problem. Chlorine injecting machine is not available. Chlorine is not available for manual injecting.
116	Ittehad Colony Samanbad	15.07.2013	O	4588	4241	4360	×	1.51	1.39	1.37	35.9			1 Bar/15 Psi	158.9	377	NIL	4	150	200	11	Electric panel is not working. Flange problem.
117	Pir Buddan Shah Dholanwal	15.07.2013	O				×				30.5	40.1	40.2	0.5 Bar/10 Psi	136.9	418	NIL	4	150	200	15	No space available for fixing of flow meter. Gland leakage is present. Chlorine injecting machine is not working. Chlorine is not available for manual injecting.
118	Jugginn Shahab Din	15.07.2013	O	6684	6577	6120	×	2.20	2.16	2.01	28.7	38.2	38.3	0.4 Bar/5 Psi	141.1	390	NIL	4	150	200	15	Electric panel is not working.
119	Children Park	17.07.2013	O	3704	4645	4250	×	1.22	1.53	1.40	41.37				156	400	NIL	4	150	200	12	Chlorine injecting device not available. No manual chlorination process. Both volts and ampere meters are not operational. Flange problem & gland leakage.
120	Yasrab Colony	22.07.2013	O	5874	6316	5941	×	1.93	2.07	1.95					163	362	NIL	4	150	200	13	No holes. Chlorine device is not available. No chlorination. Both volts & ampere meters are out of order. Flange problem & gland leakage.
121	Taj Pura Ground	20.07.2013	O	5680	5718	5722	×	1.87	1.88	1.88					175.4	379	NIL	4	150	200	15	No holes. Chlorine device is not available. Manual chlorination. Both volts & ampere meters are out of order. Air suction, flange problem & gland leakage.
122	Shahab Stadium (Fazal pura)	22.07.2013	O	5437	5152	5243	×	1.79	1.69	1.72	36.5	46.2			141.7	371	NIL	4	150	200	12	Chlorine device is not available. No chlorination. Both volts & ampere meters are out of order.
123	Chah Miran (Old)	22.07.2013	O	3369	2815	3458	×	1.11	0.92	1.05	36.5				116.5	399	NIL	4	150	200	16	Chlorine device is not available. Manual chlorination. Both volts & ampere meters are out of order. Flange problem & gland leakage.
124	Shdbagh well Center-I	20.07.2013	O	4691	4465	4720	×	1.54	1.47	1.59	20.85				173.9	388	NIL	4	150	200	16	Chlorine device is not available. Manual chlorination. Both ampere & volts meter are out of order. Air suction, flange problem & gland leakage.
125	Shdbagh well Center-II	22.07.2013	O	7542	6466	7015	×	2.48	2.12	2.30					162.7	405	NIL	4	150	200	13	No holes. Chlorine device is not available. Drum is in use for manual chlorination. Both volts & ampere meters are out of order. Flange problem & gland leakage.
126	Shdbagh well Center-IV	20.07.2013	O	6670	6777	6532	O	2.19	2.23	2.15	22.75				165	395	NIL	4	150	200	14	Chlorine device is not available. Manual chlorination. Flange problem & gland leakage.
127	Shish Mehal Road	20.07.2013	×				×															Tube well is closed since 2 years. No pump, no motor & no transformer.
128	Majeed Park Shahdara UC-6	18.07.2013	O	2024	3718	2301	×	1.03	1.88	1.17	13				12	365	NIL	2	60	50	18	Chlorine device is not available. No manual chlorination. Both volts & ampere meters are out of order. There is fault in main switch of panel. Flange problem, gland leakage & air suction.

(2) Results of Actual Measurement of Discharge, Water Level, etc. at 147 Tubewells Surveyed

Well No	Name of TW	Survey Date	Flow (L/min)				Velocity (m/s)				Water Level (m)			Pressure (Psi or Kg/cm^2)	Current (A)	Voltage (V)	Sand Discharge (50 ppm)	Specification			Operation Time (Hours)	Remark
			Operation	0 min	15 min	30 min	Operation	0 min	15 min	30 min	0 min	15 min	30 min					Pump (cfs)	Motor (HP)	Transform er (KVA)		
129	Takia Khusrianwala Shahdara UC-6	18.07.2013	O				×				15.3	32.3			44	376	NIL	2	80	200	22	False reading observed due to heavy pressure of air (air leakage). Chlorine device is not available. Drum is in use for manual chlorination. Both volts & ampere meters are out of order.
130	G.T. Road Shahdara	18.07.2013	O	3780	4649	4336	×	1.24	1.53	1.42	12.3				56	376	NIL	2	80	100	19	Chlorine device is not functional. Ampere meters is out of order. Air suction, gland leakage & flange problem.
131	Saeed Park	18.07.2013	O	3937	3937	3937	×	1.29	1.29	1.29	18				58	347	NIL	4	150	200	16	Chlorine device is not operational. Drum is in use for manual chlorination. Both volts & ampere meters are out of order. Flange problem, gland leakage & air suction.
132	Paracha Colony	18.07.2013	O				×				13.3	29.15			32	365	NIL	2	60	50		Flow could measured due to heavy. Vibration in pipe. chlorine device is not available. No manual chlorination. Both volts & ampere meters are out of order.
133	Latif Park	18.07.2013	×				×				13											Tube well is closed sine 2½ years. No motor, no pump & no transformer.
134	Ghazi Muhala Children Park	17.07.2013	O	3704	4645	4250	×	1.22	1.53	1.40	41.37				156	400	NIL	4	150	200	12	Chlorine injecting device not available. No manual chlorination process. Both volts and ampere meters are not operational. Flange problem & gland leakage.
135	Larex Colony	17.07.2013	O	3296	3443	3383	×	1.67	1.74	1.71	41.15				98	397	NIL	2	80	100	12	Chlorine injecting device not available. No manual chlorination process. Both volts and ampere meters are not operational. Flange problem & gland leakage.
136	Tegore Park	17.07.2013	O	3229	3105	3196	×	1.06	1.02	1.05	38.95	42.39	42.45		111.6	401	NIL	4	150	200	15	Chlorine injecting device not available. No manual chlorination process. Both volts and ampere meters are not operational.
137	Scotch Corner/Upper Mall	17.07.2013	O	2387	2165	2225	O	0.78	0.71	0.73	43.8				122	391	NIL	4	150	200		Chlorine device is not available. No manual chlorination. Both volts & ampere meters are out of order. Air suction, flange problem & gland leakage.
138	Muhammad Nagar	17.07.2013	O	2685	3372	3209	×	0.88	1.11	1.05	39.21				137.6	410	NIL	4	150	200	15	Chlorine injecting device not available. No manual chlorination process. Flange problem & gland leakage.
139	Baghay Shah	17.07.2013	O	2955	2629	2753	×	1.50	1.33	1.39	39.5				70	380	NIL	2	80	100	10	Chlorine injecting device not available. Gate valve is broken. Flange problem & gland leakage.
140	Habib Ullah Road	17.07.2013	O	4198	1031	1576	×	1.38	0.34	0.52	42.4				151.6	390	NIL	4	150	200	15	Chlorine injecting device not available. No chlorine is available for manual injecting. Ampere meter is not working. Abnormal sound is present in motor. Electric panel is not working. Main power switch is damaged. Air suction, flange problem & gland leakage.
141	Ahmad Block	11.07.2013	O	2540	2543	2758	×	0.81	0.87	0.93	43.4				71	403	NIL	2	80	100	13	No chlorine / injecting device available. Flange problem.
142	E-Block, Tajpura	15.07.2013	×				×				34.2							2	80	N/A	10	Pump not operational due to transformer burnt at morning 10:00. Chlorine injection device not available. No manual chlorination available. Both volt meter and ampere meter are out of order.
143	Ghaziabad Bus Stop	15.07.2013	O	2815	2819	2819	O	0.93	0.93	0.93					62	391	NIL	4	150	200	10	No holes. Chlorine injection device not available. Drum is available for manual chlorination but chlorine is not available. Electric panel is out of order. Air suction, flange problem & gland leakage.
144	A-Block Tajpura	15.07.2013	O	1717	1501	1466	×	0.32	0.76	0.24					96	377	NIL	2	80	100	19	Holes are not available for water level measurement. Chlorine injection device is out of order. Drum is available for manual chlorination. Ampere meter is out of order.

(2) Results of Actual Measurement of Discharge, Water Level, etc. at 147 Tubewells Surveyed

Well No	Name of TW	Survey Date	Flow (L/min)				Velocity (m/s)				Water Level (m)			Pressure (Psi or Kg/cm^2)	Current (A)	Voltage (V)	Sand Discharge (50 ppm)	Specification			Operation Time (Hours)	Remark
			Operation	0 min	15 min	30 min	Operation	0 min	15 min	30 min	0 min	15 min	30 min					Pump (cfs)	Motor (HP)	Transformer (KVA)		
145	Jorrey Pull	15.07.2013	○				×								93	388	NIL	4	150	200	11	No holes. Flow cannot be measured because pipe is buried in earth. Air suction, flange problem & gland leakage. Chlorine injection device is available but is not operational. Drum is in use for manual chlorination.
146	Q-Block Model Town EXT	19.07.2013	○	3300	3411	3385	×	1.69	1.73	1.70	37.4				100	369	NIL	2	80	100		Chlorine is being injected manually. Flange problem.
147	S-Block Model Town Ext.	19.07.2013	×				○											4	150	200		Pump is not operational. Could not measure due to closing of holes.

Note: This description include the contents such as with or without of chlorine injector apparatus, replacement land with ownership, and reason of no DWL.

(3) Comparison of Power Consumption between Existing and Proposed T/Ws

g	9.8	m/s^2
ρ	1000.0	kg/m^3
Motor Efficiency	90.0	%

Sr No	Name of TW	Sub Divisions	Existing Tubewell								Proposed Tubewell										
			Years of Installation	Specification			Operation Time (Hours)	Water (m^3/hr)	Power Consump (kWH)	Unit Consump. (kWH/m^3)	Proposed Capacity (cfs)	Required Total Head (m)	Design Total Head (m)	Motor Rating (kW)	Dynamic Water Level (G.L-m)	Actual Capacity (m^3/h)	Bowl Efficiency (%)	Pump Efficiency (%)	Motor Output (kW)	Power Consump (kWH)	Unit Consump. (kWH/m3)
				Pump (cfs)	Motor (HP)	Transformer (KVA)															
1	Huma Block	A.I.T	2002	4	150	200	12	103	53.25	0.519	3	54	62	90	45-55	370	83.5	81.0	67.1	74.6	0.202
2	Neelam Block	A.I.T	2007	4	150	200					3	56	62	90	45-55	360	84.1	81.6	67.3	74.7	0.208
3	Pak Block	A.I.T	1986	4	150	200	14	131	50.64	0.385	3	59	62	90	45-55	340	84.4	81.9	66.7	74.1	0.218
4	Jahanzaib Block	A.I.T	1986	4	150	200	12	230	38.73	0.169	3	56	62	90	45-55	365	83.9	81.4	68.4	76.0	0.208
6	Abdul Karim Road (Mela Ram Park)	Anarkali	2003	2	80	100	16	102	36.37	0.357	3	59	62	90	55-65	340	84.4	81.9	66.7	74.1	0.218
7	Nisar Scheme Qila Gujjar Singh	Anarkali	1996	4	150	200	14	302	88.56	0.293	3	59	62	90	45-55	340	84.4	81.9	66.7	74.1	0.218
8	Dhobi Mandi	Anarkali	2004	2	80	200	12	92	37.50	0.407	3	53	62	90	45-55	380	83.2	80.7	67.9	75.5	0.199
10	Rashi Bhawan (Pathi Ground)	Anarkali	2002	2	80	100	16	167	43.73	0.261	3	57	62	90	45-55	350	84.4	81.9	66.3	73.7	0.211
11	Circular Road (Guru Argum Nagar)	Anarkali	1988	4	150	200	12	169	96.46	0.571	3	57	62	90	45-55	350	84.4	81.9	66.3	73.7	0.211
12	Hilton Hotel (Sampled at Mason Road.)	Anarkali	1977	4	-	-					3	60	62	90	55-65	336	84.4	81.9	67.0	74.5	0.222
16	Shah Gohar Abad	Baghbanpura	1992	4	150	200	11	233	115.61	0.496	3	50	62	90	55-65	400	82.1	79.6	68.4	76.0	0.190
17	Mitap Street	Baghbanpura	1996	4	150	200					3	60	62	90	55-65	336	84.4	81.9	67.0	74.5	0.222
19	Madhu Lal Hussain	Baghbanpura	1999	4	150	200	20	319	77.29	0.242	3	58	62	90	45-55	344	84.4	81.9	66.3	73.7	0.214
20	Iqbal Park-I	City	1998	4	-	-					4	57	57	90	35-45	408	0.0	80.0	79.1	87.9	0.216
22	Chomala	City	2005	4	80	100					3	57	62	90	0	350	84.4	81.9	66.3	73.7	0.211
23	Iqbal Park Fort (Impossible Sampling)	City	2002	4	150	200					4	49	51	90	35-45	410	79.0	76.5	71.5	79.4	0.194
24	Sabzi Mandi	City	1993	4	150	200	14	221	45.12	0.204	4	44	47	75	15-35	434	80.0	77.5	67.1	74.5	0.172
26	Ali Park	City	1998	4	-	-					4	57	57	90	35-45	408	82.5	80.0	79.1	87.9	0.216
27	Iqbal Park-II (Abandoned)	City	1998	4	-	-					4	57	57	90	35-45	408	82.5	80.0	79.1	87.9	0.216
28	Raheem Road Data Nagar	Data Nagar	1998	2	80	200	15	45	30.86	0.689	3	55	62	90	45-55	360	83.8	81.3	66.3	73.7	0.205
30	Hussain Park	Data Nagar	2002	2	80	200					4	41	47	75	35-45	358	78.0	75.5	52.9	58.8	0.164
31	Siddique Pura	Data Nagar	1995	4	150	200					4	45	47	75	35-45	424	81.8	79.3	65.5	72.8	0.172
34	Farrukh Abad Disposal	Farrukhabad	1998	4	150	200					4	37	47	75	15-35	480	73.0	70.5	68.6	76.2	0.159
37	D-II Block-IV	Green Town	1997	2	80	100					3	55	62	90	55-65	360	83.8	81.3	66.3	73.7	0.205
38	Tanki No.4 Township (Abandoned)	Green Town	1985	1	-	-					3	55	62	90	55-65	360	83.8	81.3	66.3	73.7	0.205
39	Tanki No.3 Township (No motor)	Green Town	1985	1	-	-					3	55	62	90	45-55	360	83.8	81.3	66.3	73.7	0.205
40	Gawala Colony No.1	Green Town	1993	2	80	100	12	285	35.59	0.125	3	47	62	90	45-55	418	80.0	77.5	69.0	76.7	0.183
41	Henry Key (Old)	Gulberg	1986	2	80	100	17	245	44.45	0.182	3	61	62	90	45-55	320	83.9	81.4	65.3	72.5	0.227
43	M-Block Gulberg (Sampled at Gupel Nagae P-Block.)	Gulberg	1997	4	-	-					3	59	62	90	45-55	340	84.4	81.9	66.7	74.1	0.218
44	WASA Head Office (Samled at FCC Block.)	Gulberg	1996	4	-	-					3	64	64	90	55-65	306	83.2	80.7	66.1	73.4	0.240
47	A-Block Muslim Town	Icchra	1993	4	150	200	12	294	31.78	0.108	3	65	66	90	55-65	310	75.5	73.5	74.6	82.9	0.267
48	C-Block Muslim Town	Icchra	1998	4	150	200	12	317	43.86	0.138	3	66	66	90	55-65	306	75.4	73.4	74.9	83.2	0.272
49	Fareed Colony Printing Press	Industrial Area	1999	4	150	200					3	59	62	90	45-55	340	84.4	81.9	66.7	74.1	0.218
50	Nishtar Colony	Industrial Area	1987	2	80	100	16	270	68.16	0.253	3	47	62	90	45-55	414	80.0	77.5	68.3	75.9	0.183
51	Block No.6 Sector-A-II Township	Industrial Area	1996	4	150	200	12	400	114.74	0.287	3	62	62	90	45-55	320	82.8	80.3	67.3	74.7	0.234
52	Block No.4 Sector-A-II Township	Industrial Area	1993	4	150	200	14	233	62.43	0.268	3	55	62	90	45-55	360	83.8	81.3	66.3	73.7	0.205
55	B-Block Gulshan-E-Ravi	Islampura	1998	2	80	200	14	140	114.41	0.815	4	49	51	90	35-45	420	79.8	77.3	72.5	80.5	0.192
56	Rifle Range	Islampura	1992	4	150	200	12	356	105.25	0.296	4	51	51	90	35-45	408	80.0	77.5	73.1	81.2	0.199
57	Bilal Park Shamnagar	Islampura	1992	4	150	200	18	196	64.32	0.328	4	50	51	90	35-45	418	80.0	77.5	73.4	81.6	0.195
58	A-Block Gulshan-e-Ravi	Islampura	1998	4	150	200	15	184	119.57	0.648	4	50	51	90	35-45	418	80.0	77.5	73.4	81.6	0.195
60	Sodiwal Quarter	Islampura	1993	4	150	200	12	126	53.70	0.426	4	49	51	90	35-45	420	79.8	77.3	72.5	80.5	0.192
61	Jaffria Colony	Islampura	1990	4	150	200	13	360	96.57	0.268	4	50	51	90	35-45	418	80.0	77.5	73.4	81.6	0.195
62	Rewaz Gardan	Islampura	1991	4	150	200					4	51	51	90	35-45	408	80.0	77.5	73.1	81.2	0.199
63	Sanda Patwar Khana	Islampura	1997	4	150	200	13	260	92.80	0.357	4	44	47	75	35-45	434	80.0	77.5	67.1	74.5	0.172
65	National Town Sandha (Sampled at Jhangir Park.)	Islampura	1995	4	-	200					4	49	51	90	35-45	420	79.8	77.3	72.5	80.5	0.192

(3) Comparison of Power Consumption between Existing and Proposed T/Ws

g	9.8	m/s^2
ρ	1000.0	kg/m^3
Motor Efficiency	90.0	%

Sr. No.	Name of TW	Sub Divisions	Existing Tubewell								Proposed Tubewell										
			Years of Installation	Specification			Operation Time (Hours)	Water (m^3/hr)	Power Consump (kWH)	Unit Consump. (kWH/m^3)	Proposed Capacity (cfs)	Required Total Head (m)	Design Total Head (m)	Motor Rating (kW)	Dynamic Water Level (G.L-m)	Actual Capacity (m^3/h)	Bowl Efficiency (%)	Pump Efficiency (%)	Motor Output (kW)	Power Consump (kWH).	Unit Consump. (kWH/m3)
				Pump (cfs)	Motor (HP)	Transformer (KVA)															
66	Rustam Park	Islampura	1993	4	150	200	16	232	145.51	0.628	4	49	51	90	35-45	420	79.8	77.3	72.5	80.5	0.192
67	E-I Johar Town	Johar Town	2004	2	80	100					3	57	62	90	45-55	350	84.4	81.9	66.3	73.7	0.211
70	Mustafa Town	Johar Town	1997	4	-	-					3	51	62	90	55-65	396	82.5	80.0	68.7	76.4	0.193
71	Kanji House Misri Shah	Misri Shah	1998	4	150	200	13	185	148.31	0.803	3	58	62	90	45-55	342	84.4	81.9	65.9	73.3	0.214
72	D-Block China Scheme (Gujjar Pura)	Misri Shah	1993	4	150	200	16	346	122.67	0.354	4	49	51	90	35-45	420	79.8	77.3	72.5	80.5	0.192
76	Katcha Temple Road (Abid Market)	Mozang	2004	2	80	160					3	58	62	90	55-65	348	84.4	81.9	67.1	74.5	0.214
77	Queens Road	Mozang	1992	2	80	100	16	167	33.32	0.199	3	57	62	90	45-55	350	84.4	81.9	66.3	73.7	0.211
78	Shah Shamas Qari (Sampled at Patyala House.)	Mozang	1987	2	80	100					3	60	62	90	55-65	338	84.2	81.7	67.6	75.1	0.222
79	Faseeh Road	Mozang	2002	2	150	200	14	256	105.31	0.411	3	56	62	90	45-55	365	83.9	81.4	68.4	76.0	0.208
80	Shadman-I Rehmania Park	Mozang	1995	4	80	100					3	65	66	90	55-65	310	74.5	72.0	76.2	84.6	0.273
81	Sui Gas Engine Lytton Road (Sampled at Kot Adullah Shah.)	Mozang	1986	4	-	-					3	55	62	90	45-55	360	83.8	81.3	66.3	73.7	0.205
82	Shah Jamal.	Mozang	1993	4	150	200	20	313	66.41	0.212	3	64	64	90	55-65	306	83.2	80.7	66.1	73.4	0.240
83	Shadman Mentat Reservoir	Mozang	1978	4	80	100					3	65	66	90	55-65	310	74.5	72.0	76.2	84.6	0.273
84	Sadi Park.	Mozang	1994	2	80	100	13	118	107.48	0.910	3	52	62	90	45-55	382	82.8	80.3	67.3	74.8	0.196
85	Jail Road (Lahore Collage)	Mozang	1992	4	150	200					3	64	64	90	55-65	306	83.2	80.7	66.1	73.4	0.240
86	Mujahidabad (Sampling Impossible)	Mughalpura	1997	4	150	200					2	58	64	75	65<	205	74.5	72.0	45.0	49.9	0.244
87	Angori Bagh Scheme-II	Mughalpura	2001	2	80	100					3	58	62	90	55-65	438	84.5	82.0	84.3	93.7	0.214
89	Kotli Pir Abdur Rehman	Mughalpura	2001	4	150	200					2	60	64	75	65<	204	75.0	72.5	46.0	51.1	0.250
90	Punj Pir	Mughalpura	1991	2	80	100	21	229	78.06	0.340	3	60	62	90	45-55	338	84.2	81.7	67.6	75.1	0.222
91	Sansi Quarter	Mughalpura	1996	4	150	200	14	365	97.10	0.266	2	61	64	75	65<	204	75.0	72.5	46.7	51.9	0.254
92	Gulshan Park	Mughalpura	1993	4	150	200					3	61	62	90	45-55	320	83.9	81.4	65.3	72.5	0.227
93	Shah Kamal	Mughalpura	1998	4	150	200	11	197	92.09	0.467	2	56	64	75	65<	210	73.0	70.5	45.4	50.5	0.240
94	Lal Pul Fayyaz Park	Mughalpura	1998	4	150	200					2	60	64	75	65<	204	75.0	72.5	46.0	51.1	0.250
96	Achant Garh	Mughalpura	2003	2	80	100					3	60	62	90	55-65	338	84.2	81.7	67.6	75.1	0.222
97	Canal Bridge	Mustafabad	1995	2	80	100	16	165	44.64	0.271	2	61	64	75	65<	204	75.0	72.5	46.7	51.9	0.254
98	Gulistan Colony	Mustafabad	1995	4	150	200	18	173	42.98	0.248	2	61	64	75	65<	204	75.0	72.5	46.7	51.9	0.254
99	Dev Samaj Road (Commisioner Office)	Ravi Road	1998	4	150	200					4	51	51	90	35-45	408	-	78.0	72.6	80.7	0.198
100	Islampura	Ravi Road	1991	4	150	200					4	47	47	75	35-45	408	-	80.0	65.3	72.5	0.178
101	Mohni Road Salmat Mohalla	Ravi Road	1998	4	150	200	22	213	51.75	0.243	4	49	51	90	35-45	420	79.8	77.3	72.5	80.5	0.192
104	Sardar Chapal	Ravi Road	1993	4	150	200					4	50	51	90	35-45	418	80.0	77.5	73.4	81.6	0.195
105	MC High School Sanda	Ravi Road	1997	4	150	200					4	47	47	75	35-45	408	-	80.0	65.3	72.5	0.178
108	Ibrahim Road	Ravi Road	1992	2	80	200					4	47	47	75	35-45	408	82.5	80.0	65.3	72.5	0.178
110	E-Block Sabzazar	Sabzazar	1987	2	80	100					4	38	47	75	15-35	474	76.0	73.5	66.7	74.1	0.156
111	K-Block Sabzazar	Sabzazar	1987	2	80	100	15	391	71.72	0.184	4	42	47	75	15-35	450	79.0	76.5	67.3	74.7	0.166
113	A-Block Sabzazar	Sabzazar	1997	2	80	200					4	45	47	75	35-45	420	81.9	79.4	64.8	72.0	0.171
114	D-Block Sabzazar	Sabzazar	1987	2	80	200	15	244	61.13	0.250	4	43	47	75	15-35	440	79.8	77.3	66.6	74.0	0.168
115	N-Block,Samanabad	Samanabad	1995	4	150	200	13	137	82.91	0.604	3	57	62	90	45-55	350	84.4	81.9	66.3	73.7	0.211
116	Ittehad Colony Samanbad	Samanabad	1996	4	150	200					3	56	62	90	45-55	365	83.9	81.4	68.4	76.0	0.208
117	Pir Buddan Shah Dholanwal	Samanabad	1991	4	150	200					4	51	51	90	35-45	408	80.0	77.5	73.1	81.2	0.199
119	Children Park	Shadbagh	1985	4	150	200	12	255	29.51	0.116	4	41	47	75	35-45	450	79.0	76.5	65.7	72.9	0.162
120	Yasrab Colony	Shadbagh	1994	4	150	200					4	45	47	75	35-45	420	81.9	79.4	64.8	72.0	0.171
121	Taj Pura Ground	Shadbagh	1995	4	150	200	15	343	105.66	0.308	4	50	51	90	35-45	418	80.0	77.5	73.4	81.6	0.195
122	Shahab Stadium (Fazal pura)	Shadbagh	1998	4	150	200	12	315	96.21	0.306	4	57	57	90	35-45	408	82.6	80.1	79.0	87.8	0.215
124	Shadbagh Well Centre-I	Shadbagh	1995	4	150	200	16	283	90.12	0.318	4	41	47	75	35-45	460	78.0	75.5	68.0	75.6	0.164

(3) Comparison of Power Consumption between Existing and Proposed T/Ws

g	9.8	m/s^2
ρ	1000.0	kg/m^3
Motor Efficiency	90.0	%

Sr. No.	Name of TW	Sub Divisions	Existing Tubewell								Proposed Tubewell										
			Years of Installation	Specification			Operation Time (Hours)	Water (m^3/hr)	Power Consump (kWH)	Unit Consump. (kWH/m^3)	Proposed Capacity (cfs)	Required Total Head (m)	Design Total Head (m)	Motor Rating (kW)	Dynamic Water Level (G.L-m)	Actual Capacity (m^3/h)	Bowl Efficiency (%)	Pump Efficiency (%)	Motor Output (kW)	Power Consump (kWH)	Unit Consump (kWH/m3)
				Pump (cfs)	Motor (HP)	Transformer (KVA)															
125	Shadbagh Well Centre-II	Shadbagh	1995	4	150	200					4	40	47	75	35-45	465	77.8	75.3	67.2	74.7	0.161
126	Shadbagh Well Centre-IV	Shadbagh	1995	4	150	200	14	392	114.96	0.293	4	43	47	75	35-45	440	79.8	77.3	66.6	74.0	0.168
127	Shish Mehal Road (Sampled at Nazmabad.)	Shadbagh	1994	4	-	-					4	47	47	75	35-45	408	82.5	80.0	65.3	72.5	0.178
129	Takia Khusiarwala Shahdara UC-6	Shahdara	1989	2	80	200					4	36	47	75	15-35	490	71.0	68.5	70.1	77.9	0.159
130	G.T.Road Shahdara	Shahdara	1990	4	80	100					4	36	47	75	15-35	490	71.0	68.5	70.1	77.9	0.159
131	Saeed Park.	Shahdara	1998	4	150	200	16	236	55.64	0.236	4	38	47	75	15-35	474	76.0	73.5	66.7	74.1	0.156
136	Tegore Park	Shimla Hill	1992	4	150	200	15	192	68.29	0.356	3	59	62	90	45-55	340	84.4	81.9	66.7	74.1	0.218
137	Scotch Corner / Upper Mall	Shimla Hill	2002	4	150	200	15	134	34.90	0.261	2	64	64	75	65<	194	76.8	74.3	45.5	50.5	0.261
138	Muhammad Nagar.	Shimla Hill	1990	4	150	200	15	193	39.24	0.204	3	60	62	90	45-55	338	84.2	81.7	67.6	75.1	0.222
140	Habib Ullah Road	Shimla Hill	1997	4	150	200					3	63	64	90	45-55	310	-	82.5	64.4	71.6	0.231
141	Ahmad Block	Garden Town	2004	2	80	100					3	64	64	90	55-65	306	-	82.0	65.0	72.2	0.236
143	Ghaziabad Bus Stop	Tajpura	1980	4	150	200	10	169	69.82	0.413	3	60	62	90	55-65	338	84.2	81.7	67.6	75.1	0.222
144	A-Block Tajpura	Tajpura	1986	2	80	100	19	88	47.23	0.537	2	60	64	75	65<	204	75.0	72.5	46.0	51.1	0.250
145	Jorrey Pul	Tajpura	1992	4	150	200					3	53	62	90	45-55	380	83.2	80.7	67.9	75.5	0.199
146	Q-Block Model Town EXT	Township	1986	2	80	100	15	203	38.84	0.191	3	58	62	90	45-55	342	84.4	81.9	65.9	73.3	0.214
147	S-Block Model Town Ext.	Township	1996	4	150	200					3	60	62	90	55-65	338	84.2	81.7	67.6	75.1	0.222
	Average / Total			**356**			**14.6**	**12,317**	**3,903.55**	**0.317**	**347**				**Total**	**38491**				**7790.8**	**0.202**
							54		**No. of Data**	**54**										**No. of Data**	**105**

7. WASAFiltration Plant

Capacity:	4 m^3/hr (96 m^3/day)
Process:	Rapid sand filtration + Activated carbon adsorption + Adsorption by granular ferric hydroxide (GFH) foe arsenic removal + Ultra filtration
Criteria:	Tubewells with an arsenic concentration of above 20 µg/L
Storage:	400 L
Cost:	Approx. Rs.2,000,000 per unit
Area Req.:	12 ft × 12 ft
No. of Units :	100 units to be installed for two years from 2012 to 2013 78 units already in operation WASA will submit PC-1 for installation of another 100 units
O&M:	Contracted with KSB for three years (31/10/2012~31/10/2015)
Remarks:	Replacement requirement of media every three yearas due to deterioration of adsorption capacity

Source: Tribune dated July 22, 2012, July 30, 2012, & October 1, 2012)

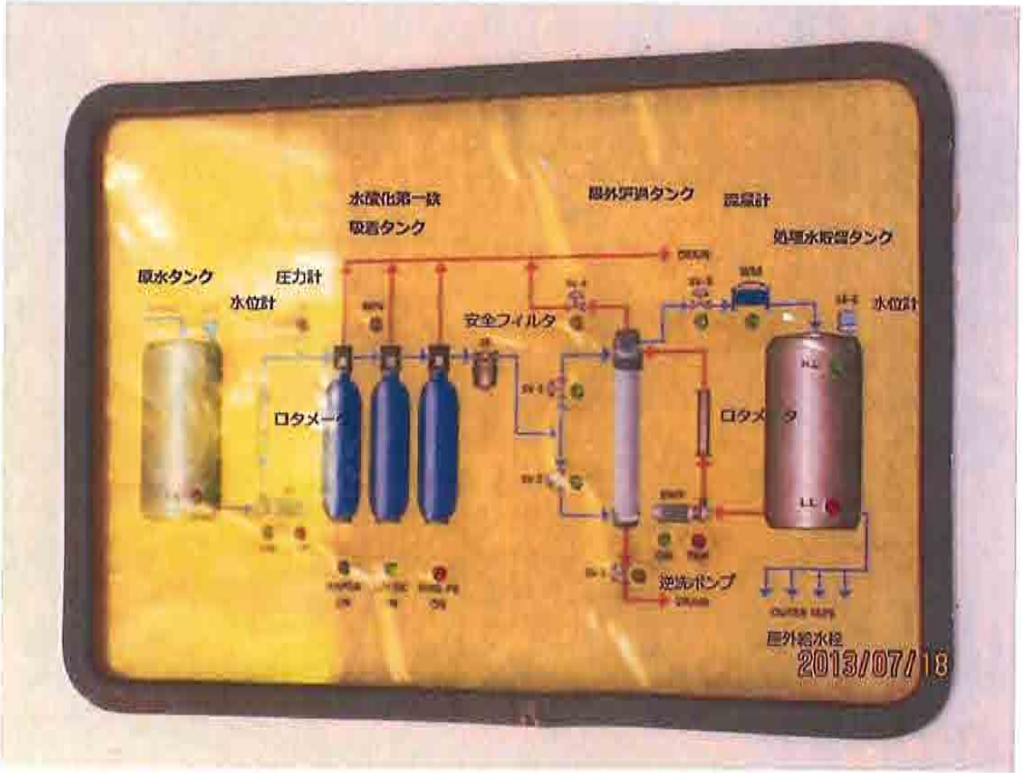


Figure 6-1 Flowsheet of A filtration Plant

Filtration Plant

Center : Control Panel
Left : Adsorption Tank,
Right : Effluent Storage Tank

Raw Water Tank

Adsorption Unit

Ultra Filtration Unit (1)

Ultra Filtration Unit (2)

Public Faucet with a filtration Plant (1)

Public Faucet with a filtration Plant (2)

Table 7-1 List of Filtration Plants (Lot 1)

Sr. No.	PP	Location of Filtration Plant	Sub-Division	As by PUIC (µg/L)
1	137	Faisal Park, Shahdra	Farkhabad	41.6
2	137	Latif Chowk, Shahdra	Farkhabad	40.6
3	137	Aziz Colony, Chatha Park	Farkhabad	62.6
4	138	Iqbal Park No.2, Lari Adda	Ravi Town	69.3
5	138	Fruit and Vegetable Market	Ravi Town	68.9
6	138	Qila Mohammadi, City	Ravi Town	36.9
7	139	Corporation Colony	Krishan Nagar	79.7
8	139	Shafiqabad Bajri Adda, City	Krishan Nagar	42.2
9	140	Patiala Ground	Artarkali	67.0
10	140	Kot Abdullah Shah, Mozang	Mozang	8.2
11	141	Cattle Park, Urdu Bazar	Artarkali	49.5
12	141	Elahi Park, Tajpura	Shadbagh	10.4
13	141	Main Park Wassanpura (Taj Pura Ground)	Shadbagh	21.7
14	141	Railway Road, Technical College	Artarkali	31.5
15	141	Chah Meeran, Shadbagh	Shadbagh	21.7
16	141	Kohlu Ghar, Sheranwala Gate	Data Nagar	62.5
17	142	Ali Park No.I, Badshai Masjad	Ravi Town	49.2
18	142	Mohala Chomala Park	Ravi Town	43.0
19	142	Kacha Nisbat Road	Artarkali	38.3
20	142	Sheran Wala Gate, Cify	Ravi Town	38.4
21	142	Moori Gate, City	Ravi Town	44.0
22	142	Adda Crown Bus	Artarkali	32.8
23	142	Jhanda Chowk, Lohari (Lohari Gate)	City	35.3
24	142	Rishi Bawan, Pathi Ground	Artarkali	22.5
25	143	Hamad Colony Park	Shadbagh	36.0
26	143	NabiBux Park, Shadbagh	Shadbagh	24.4
27	143	B-1, Gujjar Pura	Misri Shah	32.1
28	144	Sehar Road near Shalimar Hospital	Mughal Pura	49.2
29	144	Jamshed Park, Singhpura	Misri Shah	25.9
30	145	Momin Pura	Baghban Pura	45.7
31	145	Fateh Ghar, Mughalpura	Mughal Pura	27.5
32	145	Dhobi Ghat, Mughalpura	Baghban Pura	33.6
33	146	Jhangir Road, Mughalpura	Mughal Pura	82.8
34	146	Iqbal Park, Ghaziabad	Taj Pura	22.2
35	146	Dryport, Mughalpura	Mustafabad	13.1
36	147	Jamilabad, Near Begumpura Stop	Mughal Pura	42.5
37	148	Rahat Park, Nadeem Shaheed Road	Ichra	49.5
38	148	Wahdat Road, Opp. Lahore Broast	Ichra	48.5
39	149	National Town Rajghar	Krishan Nagar	84.1
40	149	A-Block, Gulshan-e-Ravi	Krishan Nagar	29.9
41	150	H-2 Block, Sabzazar	Sabzazar	48.7
42	151	Campus View Town (New)	Ichra	47.8
43	151	A-III, Johar Town	Ichra	23.0
44	152	Nisar Art, Gulberg	Gulberg	34.9
45	154	Block No. 6-A-II, Township	Industrial Area	67.2
46	156	3-C-I, Township	Green Town	41.7
47	157	Ghazi Abad, Main Bazar A-Block	Taj Pura	166.9
48	160	Mustafa Town, Wahdat Road	Ichra	44.6
49	160	Ali Razabad, Raiwind Road		
50	153	Ashiana Housing Scheme		

Table 7-2 List of Filtration Plants (Lot 2)

Sr. No.	PP	Location of Filtration Plant	Sub-division	As by PUIC (µg/L)
51		E-Block, Tajpura	Tajpura	20.4
52		Soling Road, Tajpura	Tajpura	16.7
53		A-Block, Tajpura	Tajpura	30.6
54		Takia Khusrianwala	Shahdra	32.8
55		Old Bus Stop Shahdra	Shahdra	
56		Qazi Park, Shahdra	Shahdra	42.1
57		Gulshan-e-Shalimar	Baghban Pura	22.1
58		Maskeen Pura	Mughalpura	18.4
59		Shadman Market	Mozang	29.5
60		Babu Sabu	Krishan Nagar	15.1
61		Usman Block, New Garden Town	Garden Town	36.8
62		Meela Ram Park (Abdul Karrim Road)	Altarikali	29.5
63		Akbari Gate	City	34.2
64		Yaki Gate (Nawaz Sharif Hospital)	City	29.1
65		Krishna Gali, Gwalmandi (Gowal Mandi)	Altarikali	21.2
66		Ahatta Thanedaran	Misri Shah	17.4
67		Sheran Wala Blind School	City	38.4
68		J-3, Johar Town	Ichra	30.7
69		Jinnah Park	Misri Shah	19.5
70		D-Block, Faisal Town	Garden Town	29.8
71		Qilla Muhammadi-II	City	36.9
72		G-Block, Sabzazar	Sabzazar	29.1
73		Shah kamal Road	Ichra	24.6
74		Hamoon Shah Park	Mozang/Ichra?	-
75		Nonarian	Krishan Nagar	43.2
76		Hunza Block	Iqbal Town	31.8
77		1-B-II, Township	Green Town	38.2
78		Pani Wala Tatab	Krishan Nagar	3.1
79		Nehru Park	Ravi Road	15.5
80		Dholanwal		
81		Shah Alam Fawara Chowk	City	22.2
82		Gawal Mandi College for Women	Altarikali	21.2
83		Main Outfall	Ravi Road	24.3
84		Lahore Zoo		
85		Khizarabad Govt. Girls Middle School		
86		5-C-II, Green Town	Green Town	32.5
87		Q-Block, Model Town	Gulberg	4.3
88		Salamat Pura Tubewell No.5	Baghban Pura	26.1
89		Qalandar Pura	Mhghalpura	28.7
90		Karim Park	Ravi Road	40.4
91		Rehmat Flour Mill	Ravi Road	35.5
92		Children Park, Gari Shahu	Shimla Hills	23.2
93		2-C-II, Green Town	Green Town	25.4
94		Qilla Tibba Khazana		
95		(Not yet fixed)		
96		(Not yet fixed)		
97		(Not yet fixed)		
98		(Not yet fixed)		
99		(Not yet fixed)		
100		(Not yet fixed)		

Note: Filration plants (Sr. Nos. 5, 19, 52, 55, 67, 71, 78, 80, 84, 85, 94) are not installed for tubewells.

Table 7-3 Performance at a Filtation Plant

Sr. No.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Parameters		Temp. (℃)	pH	Color	Odor	Taste	Turbidity (NTU)	TDS (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	T-Hardness (mg/L as $CACO_3$)	T-Alkalinity (mg/L as $CACO_3$)	Chlorides (mg/L)	Electric Conductivity (μS/cm)	Arsenic (μg/L)	Coliform (cfu/100mL)	Sampling Date
WHO Limits		-	6.5 - 9.5	Colorless	Odorless	Tasteless	5 - 25	500 - 1,500	75 - 200	50 - 150	100 - 500	-	200 - 400	-	10	No colony	
Rahat Park	Inf.	35	8.0	Colorless	Odorless	Tasteless	1.2	435	32	8	110	180	45	620	31.9	0	13/06/2012
Ichra	Eff.	35	7.9	Colorless	Odorless	Tasteless	0.4	430	30	8	110	180	44	618	1.6	0	
Jahangir Road	Inf.	37	7.4	Colorless	Odorless	Tasteless	1.0	510	40	3	110	200	55	730	48.2	0	15/06/2012
Mughalpura	Eff.	37	7.5	Colorless	Odorless	Tasteless	0.3	500	26	12	115	190	46	615	5.3	0	
Sehar Road	Inf.	37	8.0	Colorless	Odorless	Tasteless	0.9	740	44	23	200	290	60	1,060	51.1	0	16/06/2012
Mughalpura	Eff.	37	7.5	Colorless	Odorless	Tasteless	0.3	730	40	25	200	270	65	1,040	4.3	0	
A-III Johar Town	Inf.	31	7.7	Colorless	Odorless	Tasteless	2.1	455	24	12	110	120	56	650	51.9	0	30/08/2012
Ichra	Eff.	31	7.6	Colorless	Odorless	Tasteless	0.2	440	22	12	105	115	54	630	0.1	0	
Faisal Park	Inf.	31	8.2	Colorless	Odorless	Tasteless	1.9	332	24	30	180	160	46	460	31.5	16	31/08/2012
Mughalpura	Eff.	30	8.0	Colorless	Odorless	Tasteless	0.3	340	26	30	184	166	48	490	1.7	0	
Nabi Bukhsh Park	Inf.	32	7.7	Colorless	Odorless	Tasteless	2.6	399	56	10	190	180	65	570	46.3	0	05/09/2012
Shadbagh	Eff.	32	7.6	Colorless	Odorless	Tasteless		106	54	13	190	180	70	580	10.0	0	
Aziz Colony	Inf.	22	7.9	Colorless	Odorless	Tasteless	3.2	581	88	25	320	300	81	830	56.2	0	16/11/2012
Farukhabad	Eff.	20	7.7	Colorless	Odorless	Tasteless	0.2	574	92	15	290	280	93	820	Nil	0	
Jamshed Park	Inf.	22	7.8	Colorless	Odorless	Tasteless	2.7	364	36	15	140	140	41	520	47.8	6	16/11/2012
Misri Shah	Eff.	22	7.6	Colorless	Odorless	Tasteless	0.3	357	38	18	146	148	46	510	Nil	0	

Table 7-4 KSB Quarterly Water Quality Test Results (January 2014)

Sr. No.	Lab Code	Date of Sample	Location of Tube Well/Site Address	Date of Analysis	Bacteriological Analysis Result		Chemical Analysis Results	
					Total Coliforms (cfu/100 ml)	Remarks	Arsenic (µg/L)	Remarks
1	KSB/01/14/01	21.01.2014	Qalandar Pura	22.01.2014	Not Detected	O.K	3	O.K
2	KSB/01/14/02	21.01.2014	Taj Pura NearWassan Pura Main Park	22.01.2014	Not Detected	O.K	2	O.K
3	KSB/01/14/03	21.01.2014	Solang Road Tajpura	22.01.2014	Not Detected	O.K	3	O.K
4	KSB/01/14/04	21.01.2014	E-Block Taj Pura	22.01.2014	Not Detected	O.K	3	O.K
5	KSB/01/14/05	21.01.2014	A- Block Tajpura	22.01.2014	Not Detected	O.K	Not Detected	O.K
6	KSB/01/14/06	21.01.2014	New Butt Chowk Amina Mosque	22.01.2014	Not Detected	O.K	1	O.K
7	KSB/01/14/07	21.01.2014	Dry Port Mughal Pura	22.01.2014	Not Detected	O.K	Not Detected	O.K
8	KSB/01/14/08	21.01.2014	Jahangir Road Mughal Pura Bridge	22.01.2014	Not Detected	O.K	2	O.K
9	KSB/01/14/09	21.01.2014	Shah Kamal Mughal Pure	22.01.2014	Not Detected	O.K	Not Detected	O.K
10	KSB/01/14/10	21.01.2014	Maskeen Pura	22.01.2014	Not Detected	O.K	2	O.K
11	KSB/01/14/11	21.01.2014	Fath-e- Garh	22.01.2014	Not Detected	O.K	4	O.K
12	KSB/01/14/12	21.01.2014	Salamat Pure Tubewell # 5	22.01.2014	Not Detected	O.K	Not Detected	O.K
13	KSB/01/14/13	21.01.2014	Gulshan Shalimar Park	22.01.2014	Not Detected	O.K	Not Detected	O.K
14	KSB/01/14/14	21.01.2014	Mooman Pura	22.01.2014	Not Detected	O.K	1	O.K
15	KSB/01/14/15	21.01.2014	Khulo Gar	22.01.2014	Not Detected	O.K	3	O.K
16	KSB/01/14/16	21.01.2014	Elahi Park Tajpura	22.01.2014	Not Detected	O.K	Not Detected	O.K
17	KSB/01/14/17	21.01.2014	Ahatha Thanderan Misree Shah	22.01.2014	Not Detected	O.K	Not Detected	O.K
18	KSB/01/14/18	21.01.2014	Main ParkTaj Pura	22.01.2014	Not Detected	O.K	2	O.K
19	KSB/01/14/19	21.01.2014	Hamad Colony Shad Bagh	22.01.2014	Not Detected	O.K	2	O.K
20	KSB/01/14/20	21.01.2014	Nabi Baukash Park Shad Bagh	22.01.2014	Not Detected	O.K	3	O.K
21	KSB/01/14/21	21.01.2014	Jamshaid Park Singhpura	22.01.2014	Not Detected	O.K	4	O.K
22	KSB/01/14/22	21.01.2014	Dhobi Ghat	22.01.2014	Not Detected	O.K	3	O.K
23	KSB/01/14/23	21.01.2014	Qila Teba	22.01.2014	Not Detected	O.K	Not Detected	O.K
24	KSB/01/14/24	21.01.2014	Govt Girls Middle School Khizarabad	22.01.2014	Not Detected	O.K	Not Detected	O.K
25	KSB/01/14/25	22.01.2014	Adda Crown Bus	24.01.2014	Not Detected	O.K	6	O.K
26	KSB/01/14/26	22.01.2014	Sheran Wala Gate (Blind School)	24.01.2014	Not Detected	O.K	Not Detected	O.K
27	KSB/01/14/27	22.01.2014	Yakki Gate (Nawaz Shareef Hospital)	24.01.2014	Not Detected	O.K	5	O.K
28	KSB/01/14/28	22.01.2014	Cattle Park, City District Girls School	24.01.2014	Not Detected	O.K	4	O.K
29	KSB/01/14/29	22.01.2014	Mori Gate	24.01.2014	Not Detected	O.K	3	O.K
30	KSB/01/14/30	22.01.2014	Faisal Park Shahdra	24.01.2014	Not Detected	O.K	5	O.K
31	KSB/01/14/31	22.01.2014	Latif Chowk Shahdra	24.01.2014	Not Detected	O.K	5	O.K
32	KSB/01/14/32	22.01.2014	Aziz Colony Chatha Park Shahdra	24.01.2014	Not Detected	O.K	3	O.K
33	KSB/01/14/33	22.01.2014	Takia Khusrianwala Shahdra	24.01.2014	Not Detected	O.K	5	O.K
34	KSB/01/14/34	22.01.2014	Ali Park PTCL Exchange	24.01.2014	Not Detected	O.K	5	O.K
35	KSB/01/14/35	22.01.2014	Pani Wala Talab	24.01.2014	Not Detected	O.K	Not Detected	O.K
36	KSB/01/14/36	22.01.2014	Shah Alam Market	24.01.2014	Not Detected	O.K	3	O.K
37	KSB/01/14/37	22.01.2014	Sheranwala Gate	24.01.2014	Not Detected	O.K	2	O.K
38	KSB/01/14/38	23.01.2014	Nisar ART	24.01.2014	Not Detected	O.K	Not Detected	O.K
39	KSB/01/14/39	23.01.2014	Shadman Market	24.01.2014	Not Detected	O.K	1	O.K
40	KSB/01/14/40	23.01.2014	Lahore Zoo	24.01.2014	Not Detected	O.K	2	O.K
41	KSB/01/14/41	23.01.2014	Mozang Adda	24.01.2014	Not Detected	O.K	4	O.K
42	KSB/01/14/42	23.01.2014	Hammon Shah Park	24.01.2014	Not Detected	O.K	5	O.K
43	KSB/01/14/43	23.01.2014	Jahangir Town (National Park Kacha Sanda)	24.01.2014	Not Detected	O.K	1	O.K
44	KSB/01/14/44	23.01.2014	Corporation Colony	24.01.2014	Not Detected	O.K	3	O.K
45	KSB/01/14/45	23.01.2014	Nehru Park	24.01.2014	Not Detected	O.K	5	O.K
46	KSB/01/14/46	23.01.2014	Main Outfall	24.01.2014	Not Detected	O.K	2	O.K
47	KSB/01/14/47	23.01.2014	A-Block Gulshan-e-Ravi	24.01.2014	Not Detected	O.K	3	O.K
48	KSB/01/14/48	23.01.2014	Nonarian	24.01.2014	Not Detected	O.K	Not Detected	O.K
49	KSB/01/14/49	23.01.2014	Babu Sabu	24.01.2014	Not Detected	O.K	4	O.K
50	KSB/01/14/50	23.01.2014	Jhugian Shahabudin	24.01.2014	Not Detected	O.K	Not Detected	O.K
51	KSB/01/14/51	23.01.2014	Dholanwall	24.01.2014	Not Detected	O.K	1	O.K
52	KSB/01/14/52	23.01.2014	G-Block Sabzazar	24.01.2014	Not Detected	O.K	4	O.K
53	KSB/01/14/53	23.01.2014	H-Block Sa bzazar	24.01.2014	Not Detected	O.K	5	O.K
54	KSB/01/14/54	23.01.2014	Hunza Block Iqbal Town (AIT)	24.01.2014	Not Detected	O.K	Not Detected	O.K
55	KSB/01/14/55	23.01.2014	Mustafa Town Wahadat Road	24.01.2014	Not Detected	O.K	3	O.K
56	KSB/01/14/56	23.01.2014	Wahadat Road Near Lahore Broast	24.01.2014	Not Detected	O.K	4	O.K
57	KSB/01/14/57	24.01.2014	Railway Road Near Technical College	28.01.2014	Not Detected	O.K	Not Detected	O.K
58	KSB/01/14/58	24.01.2014	Lohari Gate	28.01.2014	Not Detected	O.K	2	O.K
59	KSB/01/14/59	24.01.2014	Children Park Ghari Shahu	28.01.2014	Not Detected	O.K	Not Detected	O.K
60	KSB/01/14/60	24.01.2014	Patiala Ground	28.01.2014	Not Detected	O.K	4	O.K
61	KSB/01/14/61	24.01.2014	Kacha Nisbat Road	28.01.2014	Not Detected	O.K	3	O.K
62	KSB/01/14/62	24.01.2014	Mela Ram Patwar Khana	28.01.2014	Not Detected	O.K	2	O.K
63	KSB/01/14/63	24.01.2014	Rishi Bhawan Pati Ground	28.01.2014	Not Detected	O.K	Not Detected	O.K
64	KSB/01/14/64	24.01.2014	Gawal Mandi College for Women	28.01.2014	Not Detected	O.K	4	O.K
65	KSB/01/14/65	24.01.2014	Krishna Gali Gawal Mandi	28.01.2014	Not Detected	O.K	4	O.K
66	KSB/01/14/66	24.01.2014	Chah Meeran	28.01.2014	Not Detected	O.K	Not Detected	O.K
67	KSB/01/14/67	24.01.2014	B-1 Gujjar Pura China Scheme	28.01.2014	Not Detected	O.K	3	O.K
68	KSB/01/14/68	24.01.2014	Jamelabad	28.01.2014	Not Detected	O.K	2	O.K
69	KSB/01/14/69	25.01.2014	Fruit & Vegetable Market	28.01.2014	Not Detected	O.K	3	O.K
70	KSB/01/14/70	25.01.2014	Rehmat Flour Mills	28.01.2014	Not Detected	O.K	2	O.K
71	KSB/01/14/71	25.01.2014	Shafiqabad Bajri Adda	28.01.2014	Not Detected	O.K	Not Detected	O.K
72	KSB/01/14/72	25.01.2014	Iqbal Park No. 2 Sport Ground	28.01.2014	Not Detected	O.K	2	O.K
73	KSB/01/14/73	25.01.2014	Qila Muhammadi-I	28.01.2014	Not Detected	O.K	Not Detected	O.K
74	KSB/01/14/74	25.01.2014	Qila Muhammadi- II	28.01.2014	Not Detected	O.K	Not Detected	O.K
75	KSB/01/14/75	25.01.2014	Chomala	28.01.2014	Not Detected	O.K	Not Detected	O.K
76	KSB/01/14/76	25.01.2014	Qazi Park Shahdra	28.01.2014	Not Detected	O.K	4	O.K

Table 7-4 KSB Quarterly Water Quality Test Results (January 2014)

Sr. No.	Lab Code	Date of Sample	Location of Tube Well/Site Address	Date of Analysis	Bacteriological Analysis Result		Chemical Analysis Results	
					Total Coliforms (cfu/100 ml)	Remarks	Arsenic (µg/L)	Remarks
77	KSB/01/14/77	25.01.2014	Rahat Park Aavia Chowk	28.01.2014	Not Detected	O.K	Not Detected	O.K
78	KSB/01/14/78	27.01.2014	O-Block Model Town	28.01.2014	Not Detected	O.K	3	O.K
79	KSB/01/14/79	27.01.2014	D-Block Faisal Town	28.01.2014	Not Detected	O.K	2	O.K
80	KSB/01/14/80	27.01.2014	Ali Raza Abad	28.01.2014	Not Detected	O.K	Not Detected	O.K
81	KSB/01/14/81	27.01.2014	Karim Park	28.01.2014	Not Detected	O.K	4	O.K
82	KSB/01/14/82	27.01.2014	Ashiayana Scheme	28.01.2014	Not Detected	O.K	5	O.K
84	KSB/01/14/84	27.01.2014	Block No. 6 A-II Township	28.01.2014	Not Detected	O.K	Not Detected	O.K
85	KSB/01/14/85	27.01.2014	1-B-1 I-Townshi p	28.01.2014	Not Detected	O.K	2	O.K
86	KSB/01/14/86	27.01.2014	Campus View (Near JoharTown)	28.01.2014	Not Detected	O.K	Not Detected	O.K
87	KSB/01/14/87	27.01.2014	A-3 JoharTown	28.01.2014	Not Detected	O.K	2	O.K
88	KSB/01/14/88	27.01.2014	J-3 JoharTown	28.01.2014	Not Detected	O.K	3	O.K
89	KSB/01/14/89	27.01.2014	Usman Block New Garden Town	28.01.2014	Not Detected	O.K	2	O.K
90	KSB/01/14/90	27.01.2014	5C-2 Green Town	28.01.2014	Not Detected	O.K	3	O.K
91	KSB/01/14/91	27.01.2014	2C-2 Green Town	28.01.2014	Not Detected	O.K	5	O.K

As (µg/L)	No. of Data
6	1
5	10
4	12
3	18
2	17
1	5
Not Detected	27
Total	90

Table 7-5 Water Consumption by Filration Plant

Sr. No.	Location / Address	Water Consumption Per Month (Liters)														
		Total Water Consumed	2012 End	2013												2014
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
1	National Town Raj Gath	6,428,000	2,920,000	380,000	380,000	395,000	410,000	625,000	437,000	-	-	140,000	165,000	184,000	222,000	170,000
2	Corporation Colony	6,631,000	1,903,000	224,000	248,000	336,000	1,328,000	282,000	28,000	256,000	390,000	439,000	433,000	316,000	217,000	231,000
3	Patiala Ground	582,000	119,500	46,500	34,000	40,000	40,000	47,000	23,000	132,000	19,000	12,000	11,000	6,000	30,000	22,000
4	Block No. 6-A-II Township	4,009,000	1,077,000	101,000	92,000	158,000	209,000	535,000	146,000	315,000	277,000	301,000	238,000	208,000	175,000	177,000
5	Ali Park No.I. Near PTCL Exchange	802,000	193,000	95,000	80,000	57,000	38,000	7,000	16,000	38,000	45,000	55,000	54,000	55,000	31,000	38,000
6	Iqbal Park No.2 Sports Ground	1,591,000	493,000	62,000	65,000	91,000	110,000	119,000	118,000	162,000	46,000	89,000	67,000	54,000	79,000	36,000
7	Jhangir Road near Mughal Pura Bridge	6,564,000	2,198,000	250,000	202,000	302,000	388,000	405,000	363,000	472,000	409,000	406,000	313,000	301,000	312,000	243,000
8	Ghazi Abad New Butt Chowk	3,994,000	1,003,000	121,000	125,000	190,000	229,000	340,000	364,000	359,000	327,000	242,000	201,000	186,000	158,000	149,000
9	H-2 Block Sabzazar	3,487,000	711,000	89,000	88,000	171,000	80,000	224,000	573,000	260,000	241,000	287,000	253,000	184,000	170,000	156,000
10	Rahat Park Aavia Chowk	3,230,000	677,000	76,000	74,000	78,000	180,000	408,000	150,000	155,000	222,000	246,000	327,000	239,000	223,000	175,000
11	Wahdat Road near Lahore Broast	2,392,000	642,000	66,000	71,000	99,000	90,000	242,000	249,000	183,000	136,000	174,000	137,000	99,000	107,000	97,000
12	Campus View Town (New) Johar Town	3,677,000	869,000	106,000	98,000	98,000	112,000	125,000	627,000	329,000	246,000	306,000	241,000	200,000	170,000	150,000
13	Sehar Road near Shalimar Hospital	488,000	232,000	4,000	12,000	-	-	-	30,000	38,000	35,000	40,000	38,000	18,000	14,000	27,000
14	Elahi Park, Tajpura	3,474,000	1,245,000	113,000	105,000	133,000	293,000	555,000	107,000	119,000	205,000	186,000	99,000	114,000	129,000	71,000
15	Main Park Wasan Pura Tajpura	2,470,000	765,000	76,000	82,000	133,000	170,000	127,000	202,000	151,000	119,000	154,000	141,000	119,000	121,000	110,000
16	Chomala	1,899,000	220,000	66,000	64,000	131,000	133,000	218,000	209,000	191,000	139,000	160,000	137,000	64,000	93,000	74,000
17	Nisar Art Gulberg	3,678,000	708,000	75,000	92,000	200,000	300,000	337,000	118,000	485,000	284,000	242,000	275,000	225,000	174,000	163,000
18	Mustafa Town, Wahdat Road	4,972,000	2,030,000	133,000	115,000	180,000	258,000	257,000	214,000	455,000	259,000	259,000	223,000	186,000	204,000	199,000
19	Mooman Pura	4,175,000	1,041,000	153,000	127,000	167,000	303,000	320,000	367,000	308,000	305,000	233,000	217,000	230,000	200,000	204,000
20	Hamad Colony Park	6,829,000	2,434,000	221,000	262,000	296,000	334,000	389,000	420,000	433,000	489,000	422,000	317,000	266,000	267,000	279,000
21	Kacha Nisbat Road	4,404,000	1,162,000	131,000	132,000	210,000	365,000	362,000	200,000	388,000	415,000	280,000	240,000	194,000	172,000	155,000
22	Cattle Park near Urdu Bazar	1,325,000	244,000	85,000	64,000	80,000	29,000	92,000	86,000	106,000	64,000	80,000	95,000	101,000	109,000	90,000
23	3 C-1 Township	4,198,000	549,000	84,000	103,000	156,000	238,000	233,000	595,000	458,000	408,000	431,000	287,000	229,000	203,000	224,000
24	Aziz Colony Chatha Park	2,186,000	219,000	115,000	98,000	201,000	194,000	150,000	153,000	263,000	219,000	224,000	171,000	61,000	32,000	86,000
25	Jamilabad	1,529,000	585,000	75,000	63,000	80,000	87,000	139,000	94,000	90,000	57,000	59,000	49,000	46,000	47,000	58,000
26	Fruit and Vegetable Market	1,497,000	100,000	54,000	31,000	68,000	112,000	109,000	201,000	95,000	120,000	195,000	173,000	87,000	62,000	90,000
27	Fatah Gharh	6,718,000	1,274,000	200,000	186,000	222,000	405,000	600,000	630,000	568,000	482,000	514,000	448,000	446,000	398,000	345,000
28	Nabi Buklush Park Shad Bagh	7,785,000	2,354,000	247,000	237,000	249,000	371,000	580,000	740,000	477,000	498,000	526,000	502,000	334,000	336,000	334,000
29	Railway Road	2,009,000	294,000	95,000	75,000	120,000	154,000	220,000	197,000	144,000	105,000	142,000	121,000	126,000	116,000	100,000
30	Sheran Wala Gate	1,055,000	155,000	100,000	41,000	93,000	95,000	64,000	68,000	85,000	46,000	161,000	55,000	35,000	17,000	40,000
31	Faisal Park Shahdra	2,045,000	408,000	225,000	44,000	85,000	88,000	103,000	139,000	116,000	111,000	105,000	236,000	269,000	47,000	69,000
32	Lalif Ohowk Shahdra	769,000	286,000	23,000	16,000	42,000	19,000	12,000	56,000	37,000	64,000	46,000	27,000	20,000	114,000	7,000
33	Moori Gate	1,575,000	115,000	49,000	38,000	68,000	58,000	72,000	52,000	49,000	183,000	33,000	497,000	266,000	75,000	20,000
34	Ali Razabad, Raiwind road	1,145,000	351,000	54,000	60,000	84,000	91,000	73,000	66,000	58,000	76,000	80,000	78,000	56,000	12,000	6,000
35	Iqbal Park Ghaziabad	2,709,000	346,000	114,000	97,000	177,000	193,000	300,000	247,000	255,000	165,000	221,000	185,000	180,000	141,000	88,000
36	Dry Port Mughal Pura	2,634,000	686,000	91,000	82,000	128,000	146,000	232,000	216,000	214,000	164,000	181,000	155,000	123,000	116,000	100,000
37	Rishi Bawan, Pathi Ground	786,000	95,000	51,000	63,000	51,000	31,000	26,000	23,000	75,000	56,000	60,000	66,000	67,000	54,000	68,000
38	Qila Mohammadi	805,000	107,000	41,000	33,000	66,000	79,000	86,000	133,000	27,000	27,000	56,000	56,000	27,000	35,000	32,000
39	A-III, Johar Town	4,522,000	489,000	101,000	78,000	241,000	286,000	683,000	220,000	304,000	470,000	423,000	352,000	322,000	290,000	263,000
40	A- Block Gulshan-e-Ravi	5,837,000	1,232,000	172,000	181,000	330,000	329,000	369,000	597,000	455,000	429,000	430,000	331,000	381,000	302,000	299,000
41	Chah Meeran	757,000	104,000	23,000	26,000	64,000	83,000	81,000	59,000	62,000	72,000	49,000	29,000	30,000	34,000	41,000
42	Dhobi Ghat	2,820,000	589,000	136,000	140,000	237,000	250,000	300,000	179,000	39,000	19,000	253,000	269,000	256,000	112,000	41,000
43	Shafiqabad Bajri Adda	1,391,000	250,000	36,000	64,000	130,000	140,000	147,000	192,000	123,000	68,000	43,000	59,000	38,000	38,000	63,000
44	Kot Abdullah Shah, Mazang Abad	2,119,000	274,000	94,000	84,000	125,000	248,000	96,000	183,000	132,000	129,000	130,000	178,000	150,000	139,000	157,000
45	B-1 Gujar Pura, China Scheme	3,703,000	748,000	20,000	133,000	297,000	300,000	223,000	316,000	315,000	160,000	281,000	332,000	200,000	200,000	178,000
46	Kohlu Ghar	1,226,000	58,000	50,000	43,000	81,000	128,000	198,000	127,000	132,000	62,000	72,000	50,000	59,000	87,000	79,000
47	Adda Crown Bus	2,708,000	340,000	106,000	90,000	124,000	200,000	335,000	193,000	232,000	186,000	232,000	188,000	164,000	164,000	154,000
48	Jameshaid Park Singh Pura New	2,590,000	65,000	58,000	62,000	89,000	115,000	248,000	323,000	290,000	275,000	263,000	241,000	205,000	189,000	167,000
49	Lohari Gate	1,601,000	135,000	89,000	130,000	109,000	140,000	96,000	103,000	265,000	107,000	111,000	116,000	89,000	52,000	59,000
50	Ashyiana Scheme	1,283,000	69,000	19,000	81,000	72,000	67,000	75,000	69,000	62,000	243,000	135,000	88,000	135,000	94,000	74,000
51	Shadman Market	343,000				22,000	26,000	28,000	43,000	22,000	33,000	40,000	33,000	31,000	43,000	22,000
52	Usman Block, New Garden Town	1,116,000				55,000	98,000	66,000	87,000	85,000	76,000	69,000	75,000	105,000	321,000	79,000
53	E- Block Tajpura	823,000				67,000	126,000	164,000	121,000	54,000	-	-	33,000	117,000	91,000	50,000

Table 7-5 Water Consumption by Filration Plant

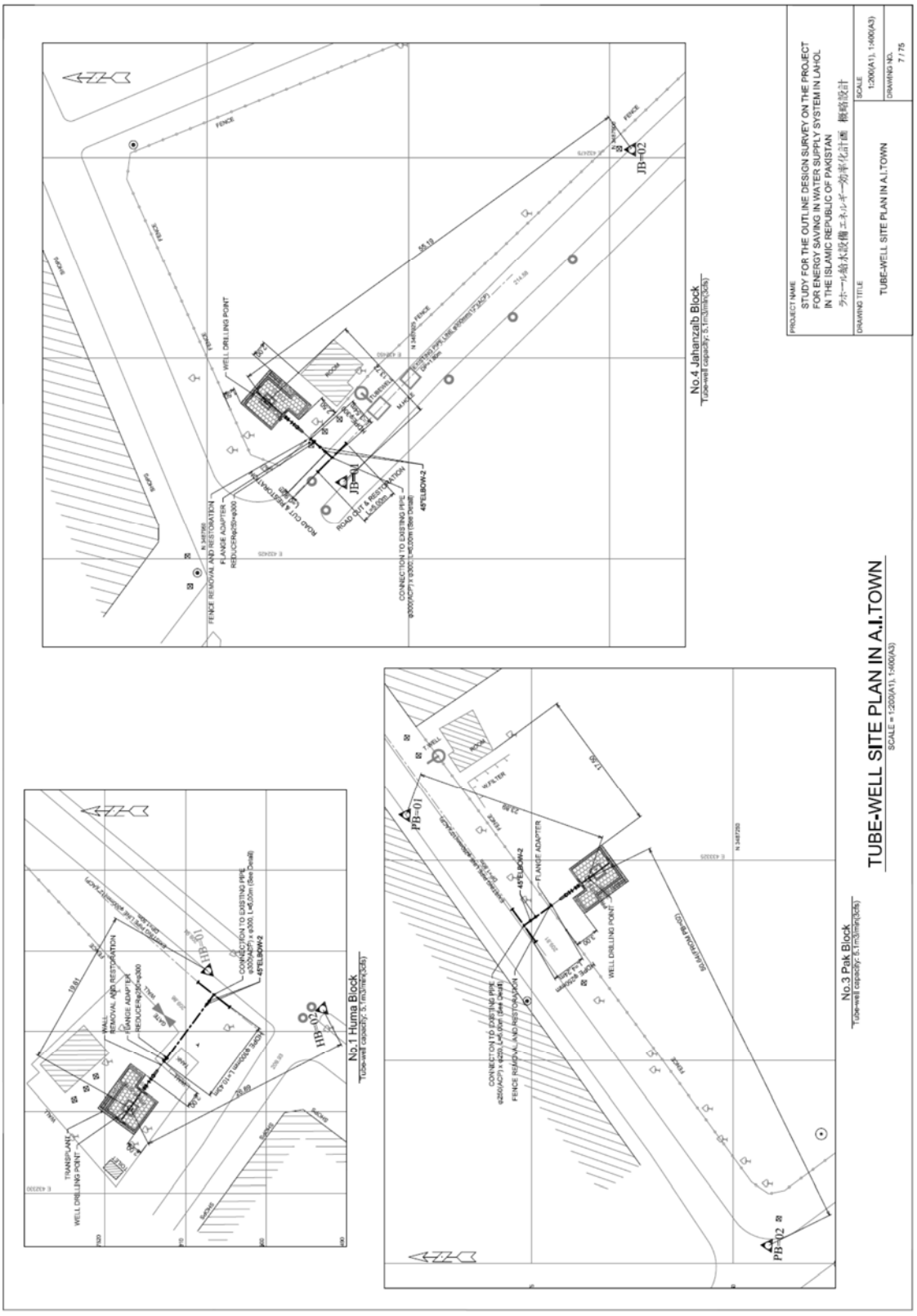
Sr. No.	Location / Address	Water Consumption Per Month (Liters)														
		Total Water Consumed	2012 End	2013												2014
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
54	Maskeen Pura Tajpura	2,460,000				86,000	212,000	125,000	259,000	235,000	271,000	310,000	139,000	395,000	230,000	198,000
55	Nonarian	2,427,000				59,000	298,000	338,000	215,000	265,000	217,000	271,000	212,000	175,000	176,000	201,000
56	Dholanwal	1,326,000				23,000	79,000	127,000	116,000	120,000	134,000	150,000	206,000	143,000	123,000	105,000
57	Soling Road Tajpura	1,890,000				18,000	138,000	227,000	180,000	155,000	192,000	365,000	205,000	120,000	157,000	133,000
58	Hunza Block AIT	1,566,000					59,000	144,000	176,000	155,000	37,000	359,000	185,000	189,000	137,000	125,000
59	1-B-II Township	1,651,000					42,000	128,000	88,000	236,000	204,000	242,000	209,000	227,000	136,000	139,000
60	Mela Ram, Patwar Khana	1,286,000					31,000	128,000	145,000	251,000	132,000	139,000	127,000	114,000	115,000	104,000
61	Babu Sabo	1,458,000					23,000	122,000	149,000	271,000	160,000	171,000	175,000	151,000	149,000	87,000
62	Gulshan-e-Shalimar Park	925,000					19,000	63,000	74,000	79,000	206,000	113,000	124,000	103,000	77,000	67,000
63	Hamoon Shah Park	629,000					9,000	64,000	64,000	75,000	58,000	75,000	80,000	77,000	61,000	66,000
64	Pari Wala Talab	534,000					11,000	71,000	73,000	97,000	50,000	59,000	51,000	43,000	38,000	41,000
65	Takia Khusrianwala Shahdra	2,285,000					47,000	249,000	197,000	311,000	286,000	275,000	246,000	224,000	250,000	200,000
66	Shahkamal Road T/W Mujahidabad	1,346,000					7,000	186,000	114,000	164,000	147,000	224,000	160,000	133,000	119,000	92,000
67	Gawal Mandi Collenge for Women	298,000					4,000	37,000	32,000	40,000	31,000	44,000	36,000	24,000	20,000	30,000
68	Akbali Gate	772,000					27,000	114,000	96,000	89,000	104,000	88,000	58,000	83,000	55,000	58,000
69	Shah Alam Market Fawala Chowk	1,176,000					56,000	146,000	107,000	156,000	113,000	145,000	128,000	97,000	109,000	119,000
70	Nehru Park	2,071,000					31,000	252,000	90,000	147,000	320,000	307,000	256,000	278,000	192,000	198,000
71	Main Outfall	2,353,000						262,000	295,000	243,000	362,000	378,000	311,000	221,000	169,000	112,000
72	Ahata Tanedaran	1,033,000						45,000	88,000	127,000	147,000	153,000	141,000	129,000	100,000	103,000
73	Khizrabad	421,000							83,000	79,000	66,000	31,000	77,000	35,000	33,000	17,000
74	5 C-II Green Town	611,000							61,000	48,000	83,000	110,000	97,000	69,000	73,000	70,000
75	Lahore Zoo	177,000								15,000	41,000	28,000	32,000	19,000	23,000	19,000
76	Krishna Gali Gawal Mandi	216,000								33,000	9,000	42,000	44,000	30,000	27,000	31,000
77	A-Block Tajipura	1,234,000								12,000	132,000	289,000	251,000	242,000	172,000	136,000
78	Salamat Pura Tubewell No.5	1,206,000									71,000	160,000	311,000	263,000	237,000	164,000
79	Qila Muhaimnadi-II	171,000									26,000	18,000	37,000	43,000	38,000	9,000
80	G-Block Subzazar	358,000									5,000	35,000	114,000	66,000	67,000	71,000
81	Qurandar Pura	209,000										31,000	38,000	54,000	49,000	37,000
82	Q-Block Model Town Ext.	716,000										19,000	151,000	177,000	155,000	214,000
83	D-Block Faisal Town	223,000										10,000	52,000	55,000	61,000	45,000
84	NawazShrif Hospital, Yaki Gate	302,000										15,000	43,000	42,000	132,000	70,000
85	Qila Tiba Khazena	169,000										7,000	28,000	50,000	35,000	49,000
86	2 C-2 Green Town	348,000										8,000	104,000	96,000	73,000	67,000
87	Sheranwali Blind School	87,000											3,000	19,000	32,000	33,000
88	Jhaggian Shahabudin	335,000											10,000	139,000	80,000	106,000
89	Rehmat Flour Mill	103,000											8,000	32,000	34,000	29,000
90	Karim Park	11,000													1,000	10,000
91	Qazi Park Shahdra	103,000													63,000	40,000
92	J-3 Johal Town	59,000													25,000	34,000
93	Children Park, Ghari Shahu	143,000													69,000	74,000
94	Old Bus Stop Shahdra	11,000														11,000
	Total (m^3/month)	**184,084**	**35,164**	**5,196**	**4,991**	**7,664**	**11,389**	**14,952**	**14,171**	**14,321**	**13,386**	**14,989**	**14,151**	**12,560**	**11,230**	**9,921**
	No. of Days per Month			31	28	31	30	31	30	31	31	30	31	30	31	31
	Total (m^3/day)			**168**	**178**	**247**	**380**	**482**	**472**	**462**	**432**	**500**	**456**	**419**	**362**	**320**
	No of Tubewells in Operation			50	50	57	70	72	74	77	80	86	89	89	93	94
	Total (m^3/month/tubewell)			**104**	**100**	**134**	**163**	**208**	**192**	**186**	**167**	**174**	**159**	**141**	**121**	**106**
				3	4	4	5	7	6	6	5	6	5	5	4	3
	Served Population (2 Lpcd) (pop.)			**84,000**	**89,000**	**123,500**	**190,000**	**241,000**	**236,000**	**231,000**	**216,000**	**250,000**	**228,000**	**209,500**	**181,000**	**160,000**
	Served Population (5 Lpcd) (pop.)			**33,600**	**35,600**	**49,400**	**76,000**	**96,400**	**94,400**	**92,400**	**86,400**	**100,000**	**91,200**	**83,800**	**72,400**	**64,000**
	Served Population (10 Lpcd) (pop.)			**16,800**	**17,800**	**24,700**	**38,000**	**48,200**	**47,200**	**46,200**	**43,200**	**50,000**	**45,600**	**41,900**	**36,200**	**32,000**

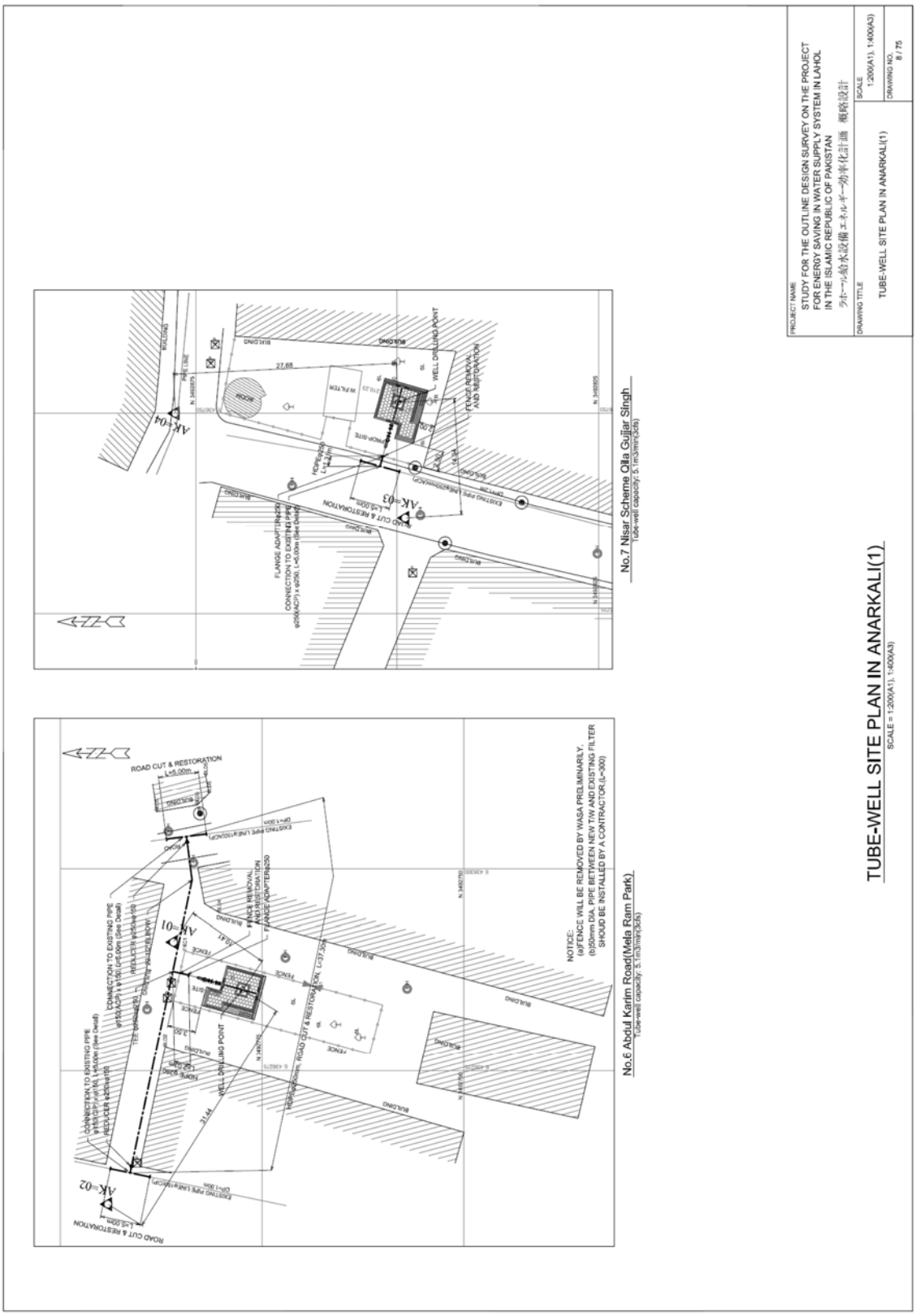
	No.1-50 Total (m^3/month)	147,103	35,164	5,196	4,991	7,334	10,046	11,866	11,218	10,757	9,673	10,209	9,561	7,950	6,883	6,256

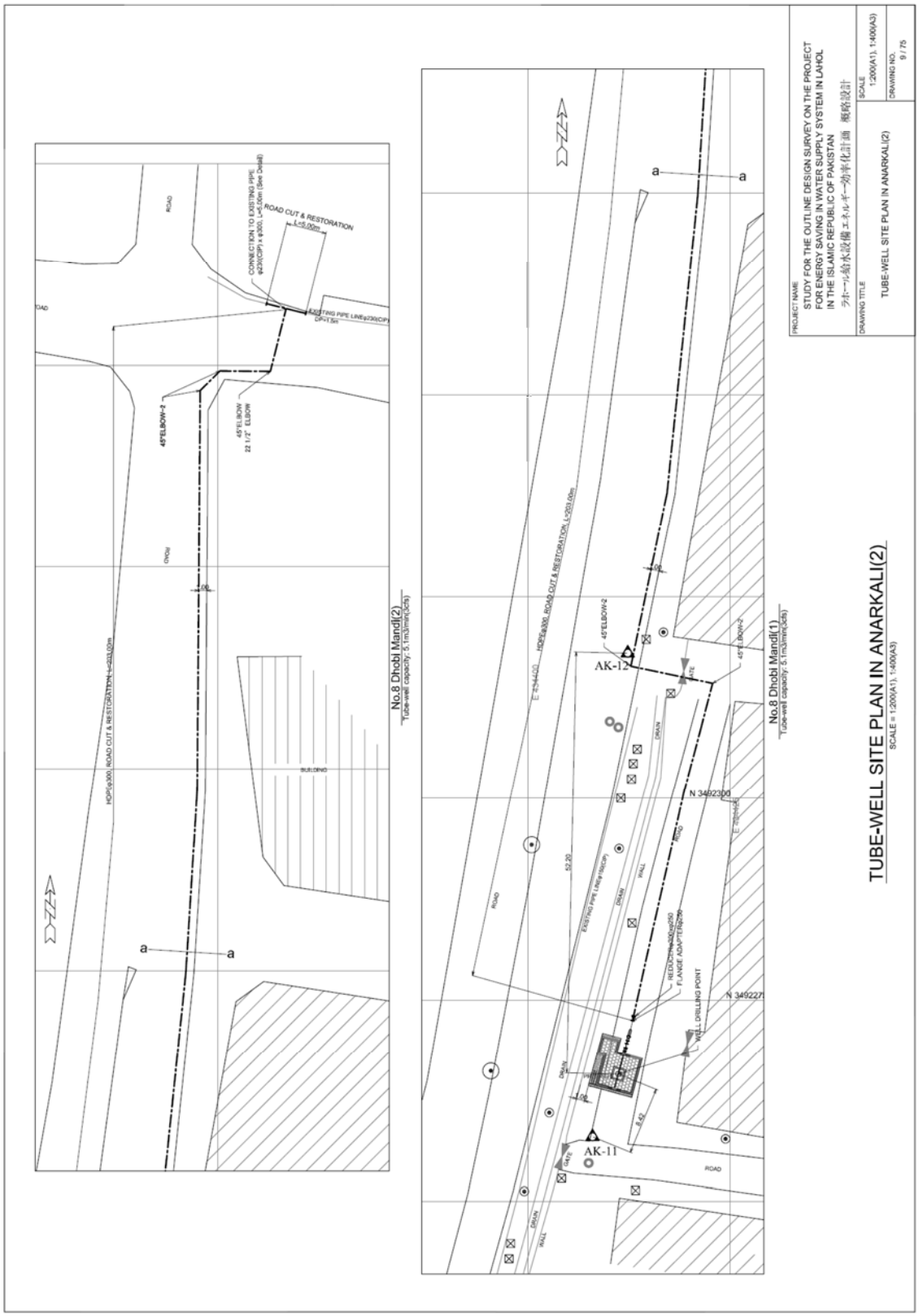
Table 7-5 Water Consumption by Filration Plant

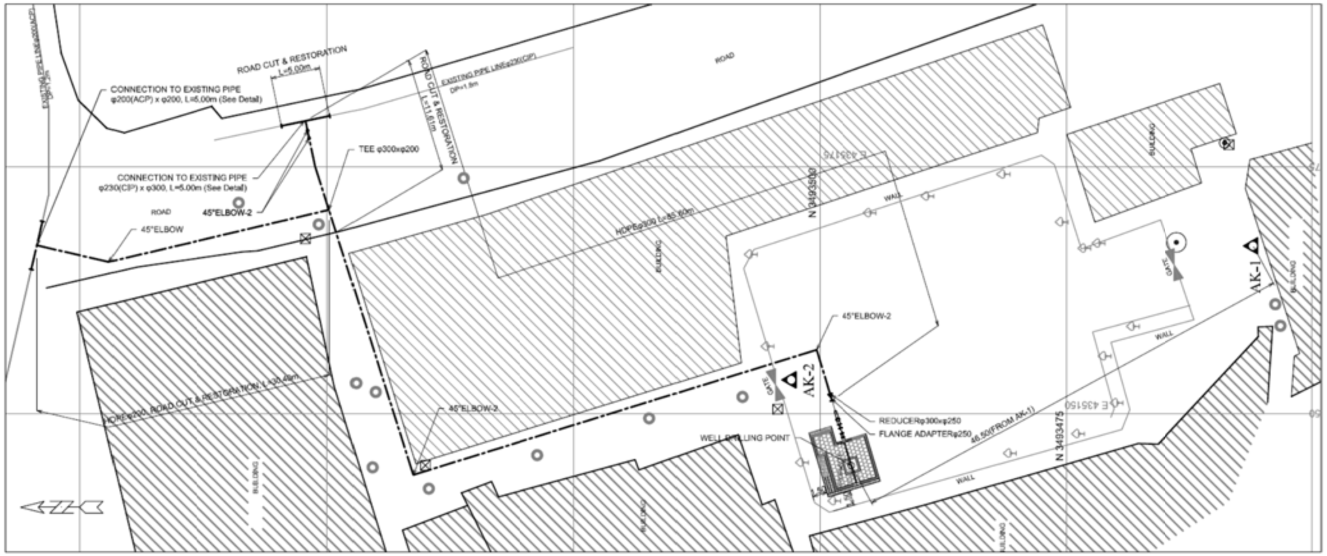
Sr. No.	Location / Address	Water Consumption Per Month (Liters)														
		Total Water Consumed	2012 End	2013												2014
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
	No. of Days per Month			31	28	31	30	31	30	31	31	30	31	30	31	31
	No.1-50 Total (m^3/day)			168	178	237	335	383	374	347	312	340	308	265	222	202
	No.51-94 Total (m^3/month)	36,981	0	0	0	330	1,343	3,086	2,953	3,564	3,713	4,780	4,590	4,610	4,347	3,665
	No. of Days per Month			31	28	31	30	31	30	31	31	30	31	30	31	31
	No.51-94 Total (m^3/day)			0	0	11	45	100	98	115	120	159	148	154	140	118

8 Site Plan


TUBE-WELL SITE PLAN IN A.I.TOWN
SCALE = 1:200(A1), 1:400(A3)
No.4 Jahanzaib Block
No.1 Huma Block
No.3 Pak Block
PROJECT NAME
STUDY FOR THE OUTLINE DESIGN SURVEY ON THE PROJECT FOR ENERGY SAVING IN WATER SUPPLY SYSTEM IN LAHOL IN THE ISLAMIC REPUBLIC OF PAKISTAN
DRAWING TITLE
TUBE-WELL SITE PLAN IN A.I.TOWN
SCALE
1:200(A1), 1:400(A3)
DRAWING NO.
7 / 75


PROJECT NAME
STUDY FOR THE OUTLINE DESIGN SURVEY ON THE PROJECT FOR ENERGY SAVING IN WATER SUPPLY SYSTEM IN LAHOL IN THE ISLAMIC REPUBLIC OF PAKISTAN
プロ一ル給水設備エネルギー効率化計画 概略設計
DRAWING TITLE
TUBE-WELL SITE PLAN IN ANARKALI(1)
SCALE
1:200(A1), 1:400(A3)
DRAWING NO.
8 / 75
TUBE-WELL SITE PLAN IN ANARKALI(1)
SCALE = 1:200(A1), 1:400(A3)
No.7 Nisar Scheme Olla Gujjar Singh
Tube-well capacity: 5.1m3/min(3cts)
No.6 Abdul Karim Road(Mela Ram Park)
Tube-well capacity: 5.1m3/min(3cts)
ROAD CUT & RESTORATION
WELL DRILLING POINT
FENCE REMOVAL AND RESTORATION
NOTICE:
(a)FENCE WILL BE REMOVED BY WASA PRILIMINARILY.
(b)50mm DIA. PIPE BETWEEN NEW T/W AND EXISTING FILTER SHOUD BE INSTALLED BY A CONTRACTOR.(L=300)


TUBE-WELL SITE PLAN IN ANARKALI(2)
SCALE = 1:200(A1), 1:400(A3)
No.8 Dhobi Mandi(2)
Tube-well capacity: 5.1m3/min(Qdis)
No.8 Dhobi Mandi(1)
Tube-well capacity: 5.1m3/min(Qdis)
AK-12
AK-11
N 3492300
N 3492270
ROAD CUT & RESTORATION
45°ELBOW-2
WELL DRILLING POINT
ROAD
DRAIN
WALL
PROJECT NAME
STUDY FOR THE OUTLINE DESIGN SURVEY ON THE PROJECT FOR ENERGY SAVING IN WATER SUPPLY SYSTEM IN LAHOL IN THE ISLAMIC REPUBLIC OF PAKISTAN
DRAWING TITLE
TUBE-WELL SITE PLAN IN ANARKALI(2)
SCALE
1:200(A1), 1:400(A3)
DRAWING NO.
9 / 75



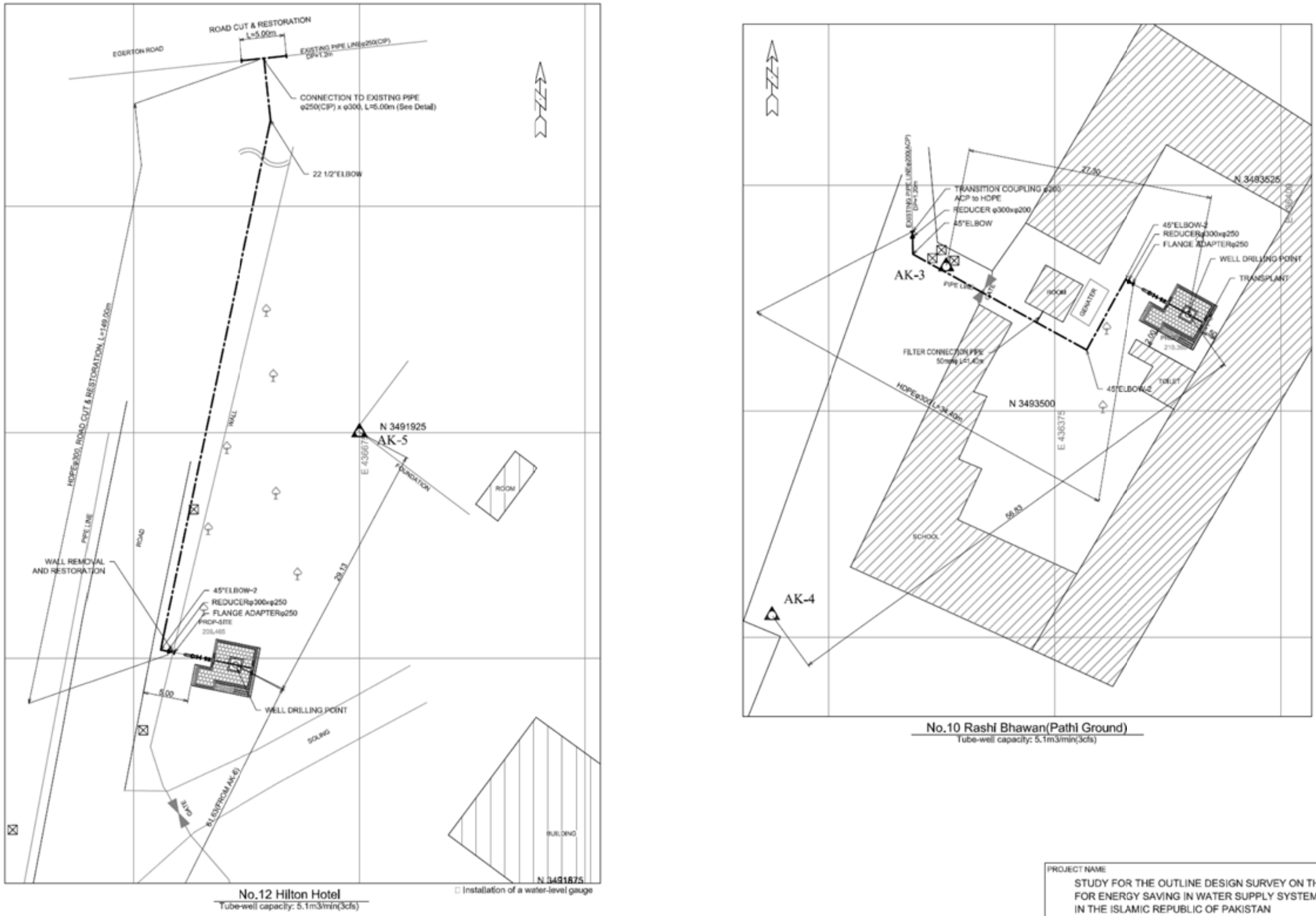
No.11 Circular Road(Guru Argum Nagar)

Tube-well capacity: 5.1m3/min(3cfs)

TUBE-WELL SITE PLAN IN ANARKALI(3)

SCALE = 1:200(A1), 1:400(A3)

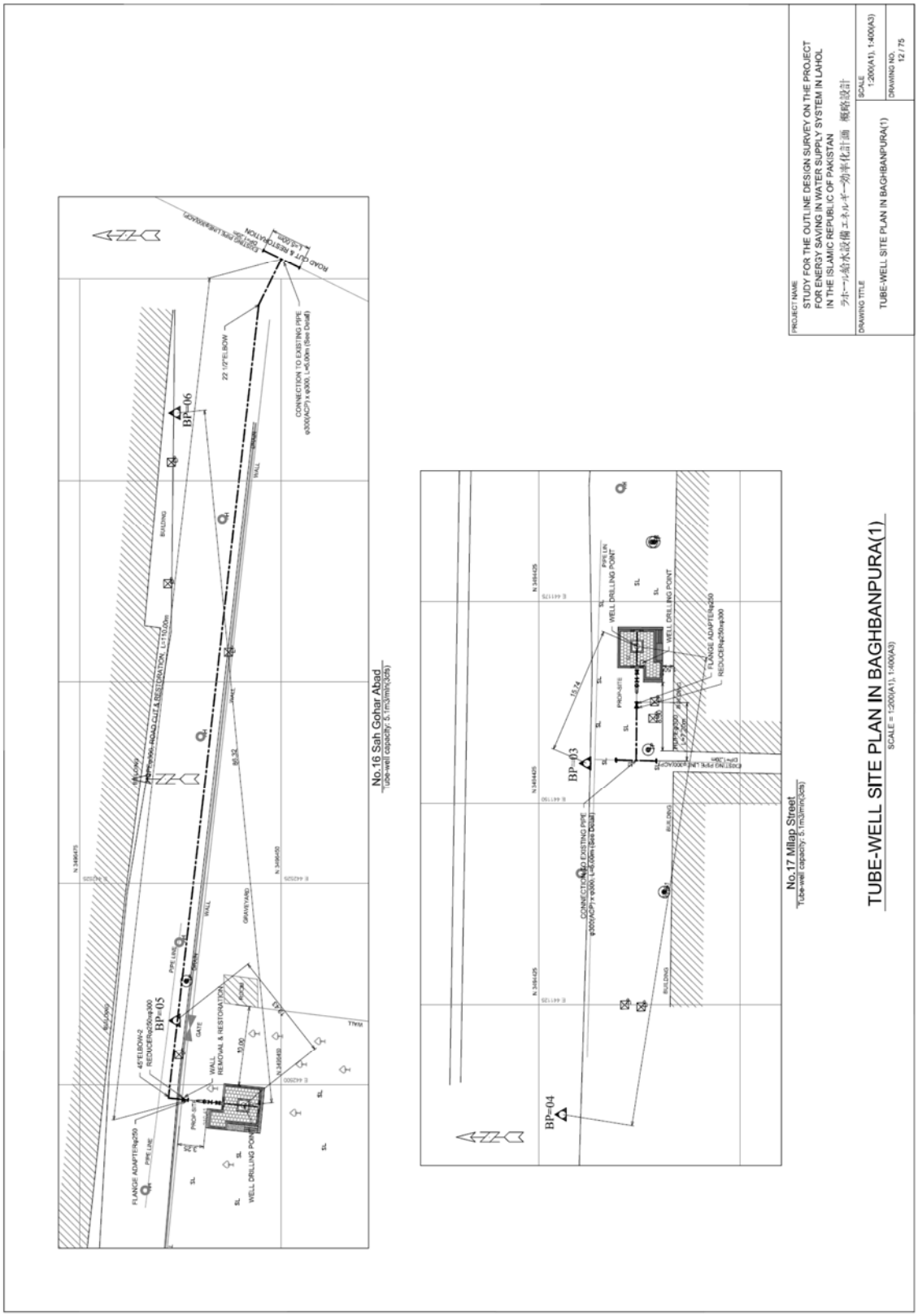
PROJECT NAME STUDY FOR THE OUTLINE DESIGN SURVEY ON THE PROJECT FOR ENERGY SAVING IN WATER SUPPLY SYSTEM IN LAHOL IN THE ISLAMIC REPUBLIC OF PAKISTAN ラホール給水設備エネルギー効率化計画 概略設計	
DRAWING TITLE TUBE-WELL SITE PLAN IN ANARKALI(3)	SCALE 1:200(A1), 1:400(A3) DRAWING NO. 10 / 75

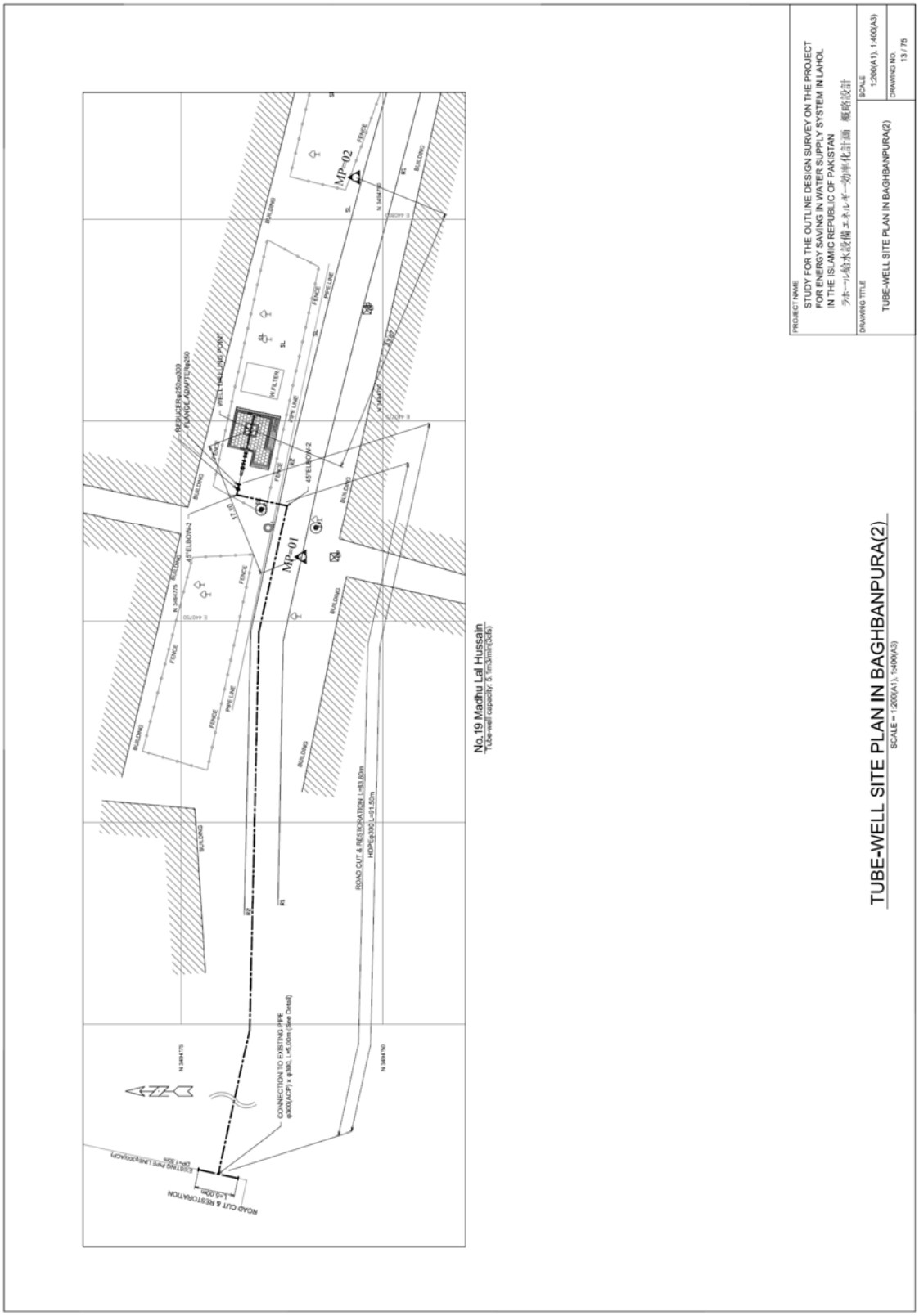


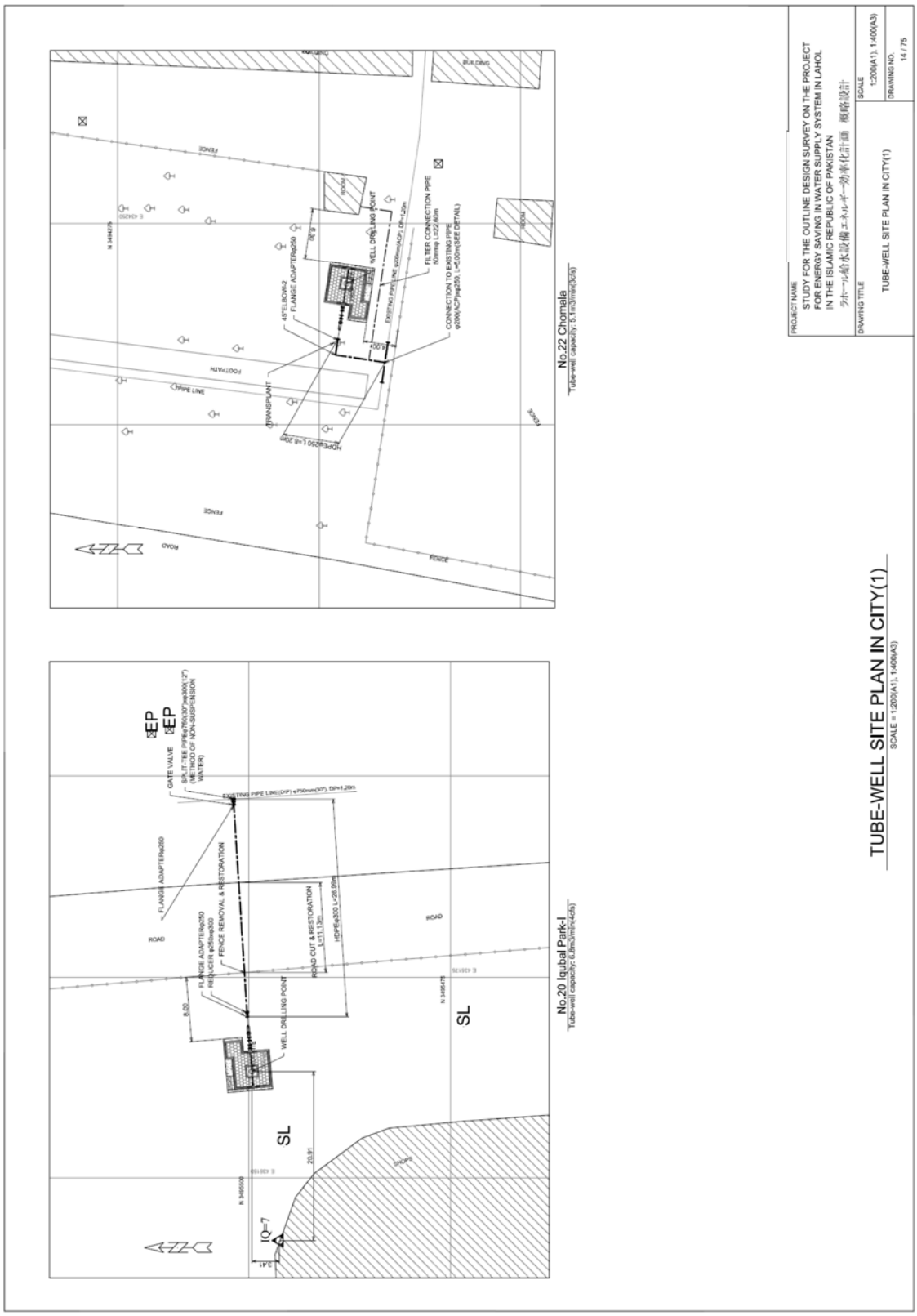
TUBE-WELL SITE PLAN IN ANARKALI(4)

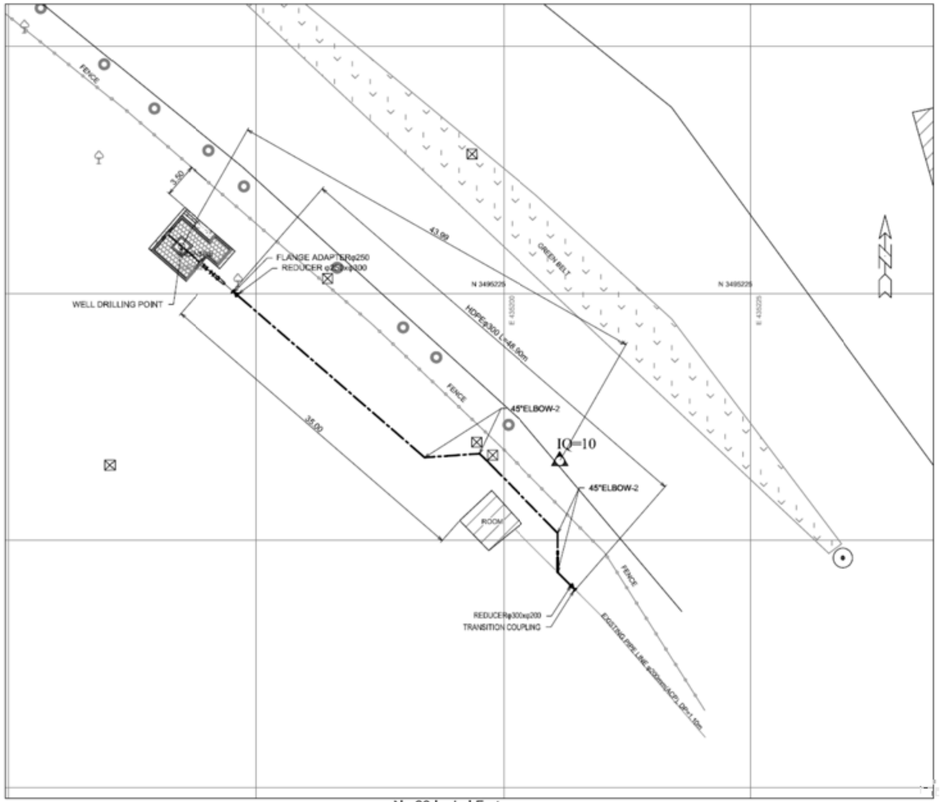
SCALE = 1:200(A1), 1:400(A3)

PROJECT NAME	
STUDY FOR THE OUTLINE DESIGN SURVEY ON THE PROJECT FOR ENERGY SAVING IN WATER SUPPLY SYSTEM IN LAHOL IN THE ISLAMIC REPUBLIC OF PAKISTAN ラホール給水設備エネルギー効率化計画 概略設計	
DRAWING TITLE: TUBE-WELL SITE PLAN IN ANARKALI(4)	SCALE: 1:200(A1), 1:400(A3) DRAWING NO. 11 / 75


PROJECT NAME
STUDY FOR THE OUTLINE DESIGN SURVEY ON THE PROJECT FOR ENERGY SAVING IN WATER SUPPLY SYSTEM IN LAHOL IN THE ISLAMIC REPUBLIC OF PAKISTAN
DRAWING TITLE
TUBE-WELL SITE PLAN IN BAGHBANPURA(1)
SCALE
1:200(A1), 1:400(A3)
DRAWING NO.
12 / 75
TUBE-WELL SITE PLAN IN BAGHBANPURA(1)
SCALE = 1:200(A1), 1:400(A3)
No.16 Sah Gohar Abad
Tube-well capacity: 5.1m3/min(306)
No.17 Mllap Street
Tube-well capacity: 5.1m3/min(306)
BP-03
BP-04
BP-05
BP-06
WELL DRILLING POINT
PROP-SITE
PIPE LINE
CONNECTION TO EXISTING PIPE
FLANGE ADAPTER
REDUCER
45°ELBOW-2
22 1/2°ELBOW
GATE
WALL
BUILDING
GRAVEYARD


PROJECT NAME
STUDY FOR THE OUTLINE DESIGN SURVEY ON THE PROJECT FOR ENERGY SAVING IN WATER SUPPLY SYSTEM IN LAHOL IN THE ISLAMIC REPUBLIC OF PAKISTAN
ラホール給水設備エネルギー効率化計画 概略設計
DRAWING TITLE
TUBE-WELL SITE PLAN IN BAGHBANPURA(2)
SCALE
1:200(A1), 1:400(A3)
DRAWING NO.
13 / 75
TUBE-WELL SITE PLAN IN BAGHBANPURA(2)
SCALE = 1:200(A1), 1:400(A3)
No.19 Madhu Lal Hussain
Tube-well capacity: 3.1m3/min(30dis)
MP-01
MP-02
BUILDING
FENCE
PIPE LINE
ROAD CUT & RESTORATION
CONNECTION TO EXISTING PIPE


TUBE-WELL SITE PLAN IN CITY(1)
SCALE = 1:200(A1), 1:400(A3)
No.22 Chomala
Tube-well capacity: 5.1m3/min(305)
No.20 Iqubal Park-I
Tube-well capacity: 6.8m3/min(408)
PROJECT NAME
STUDY FOR THE OUTLINE DESIGN SURVEY ON THE PROJECT FOR ENERGY SAVING IN WATER SUPPLY SYSTEM IN LAHOL IN THE ISLAMIC REPUBLIC OF PAKISTAN
DRAWING TITLE
TUBE-WELL SITE PLAN IN CITY(1)
SCALE
1:200(A1), 1:400(A3)
DRAWING NO.
14 / 75



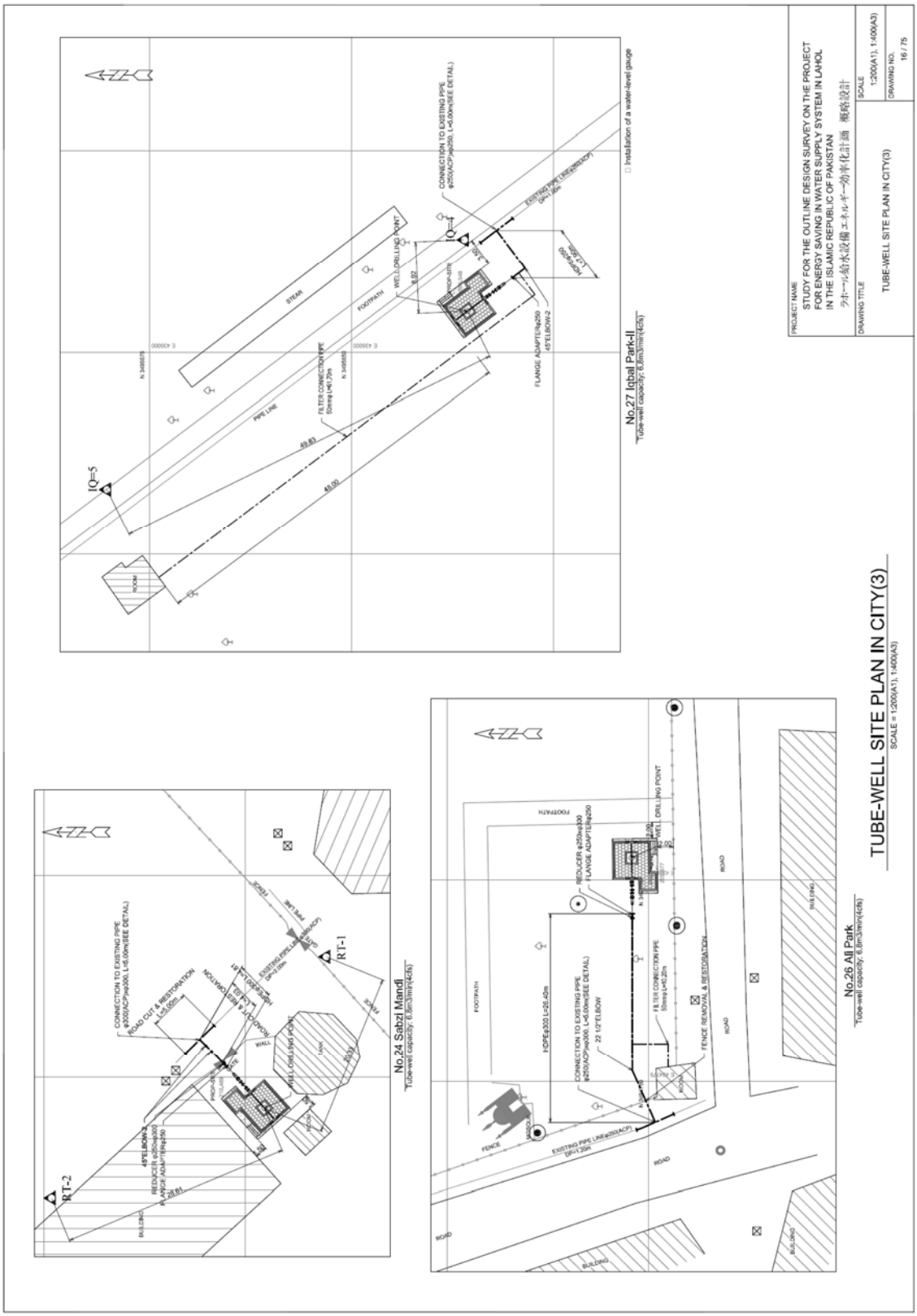
No.23 Iqubal Fort

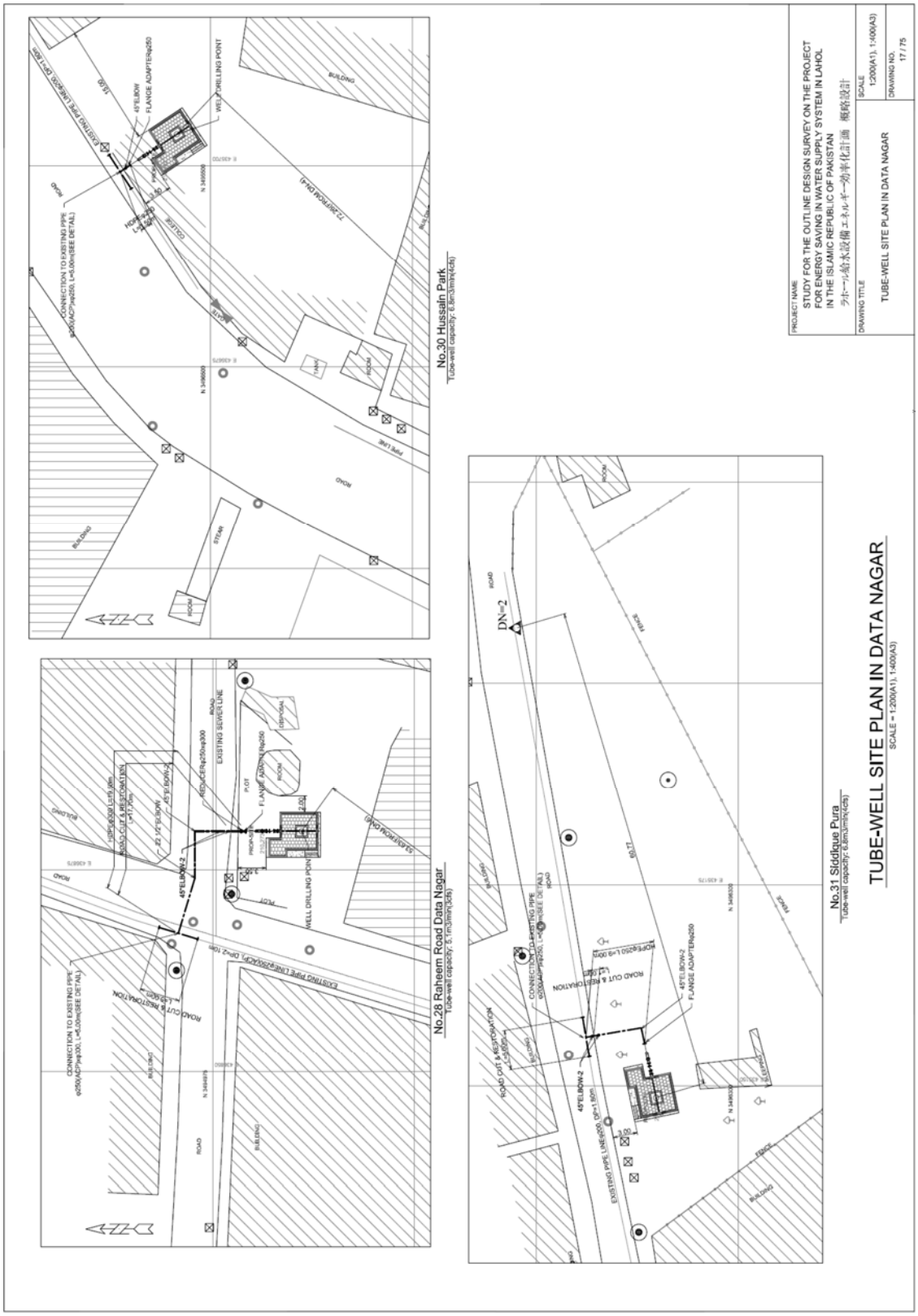
Tube-well capacity: 6.8m3/min(4cfs)

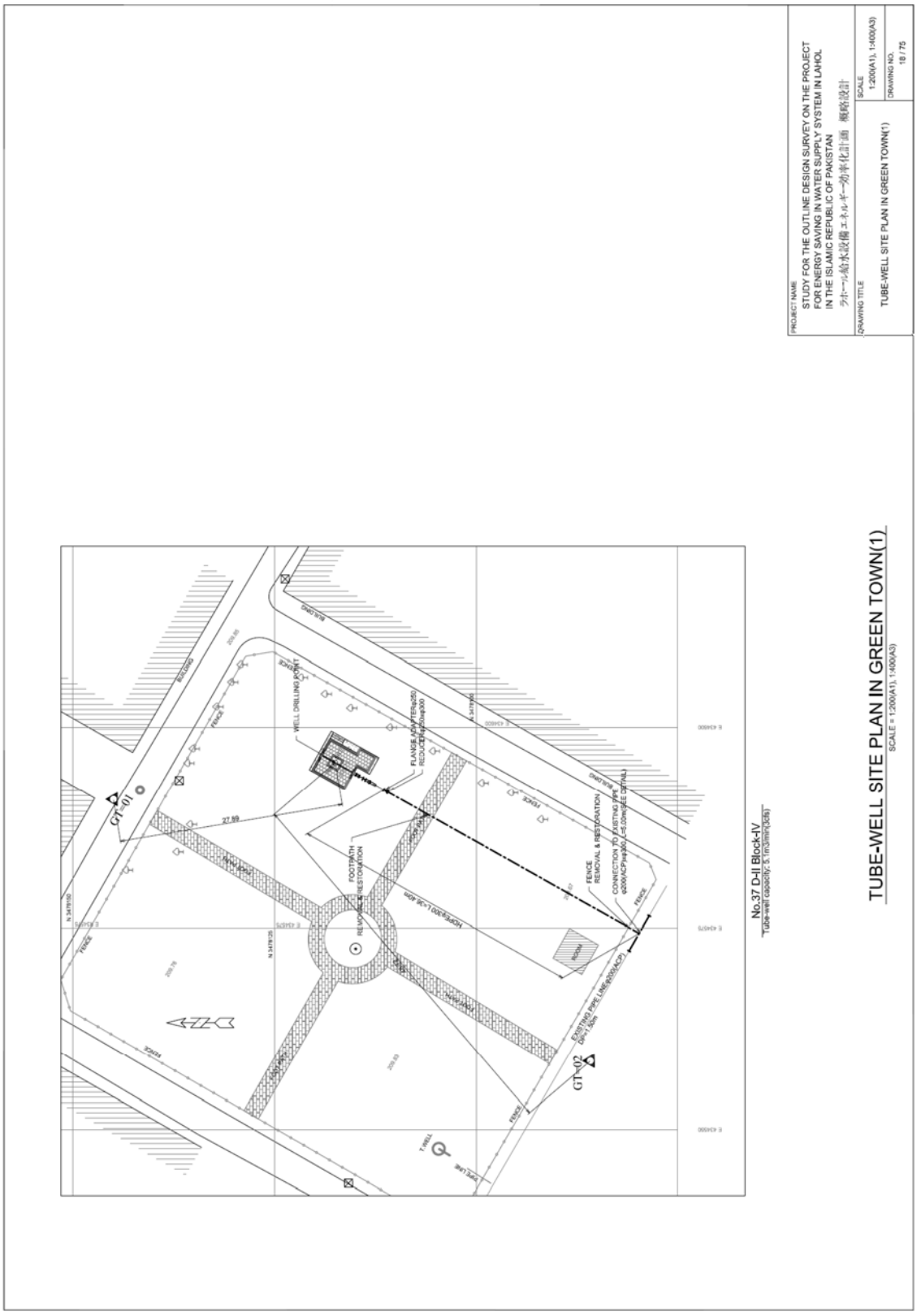
TUBE-WELL SITE PLAN IN CITY(2)

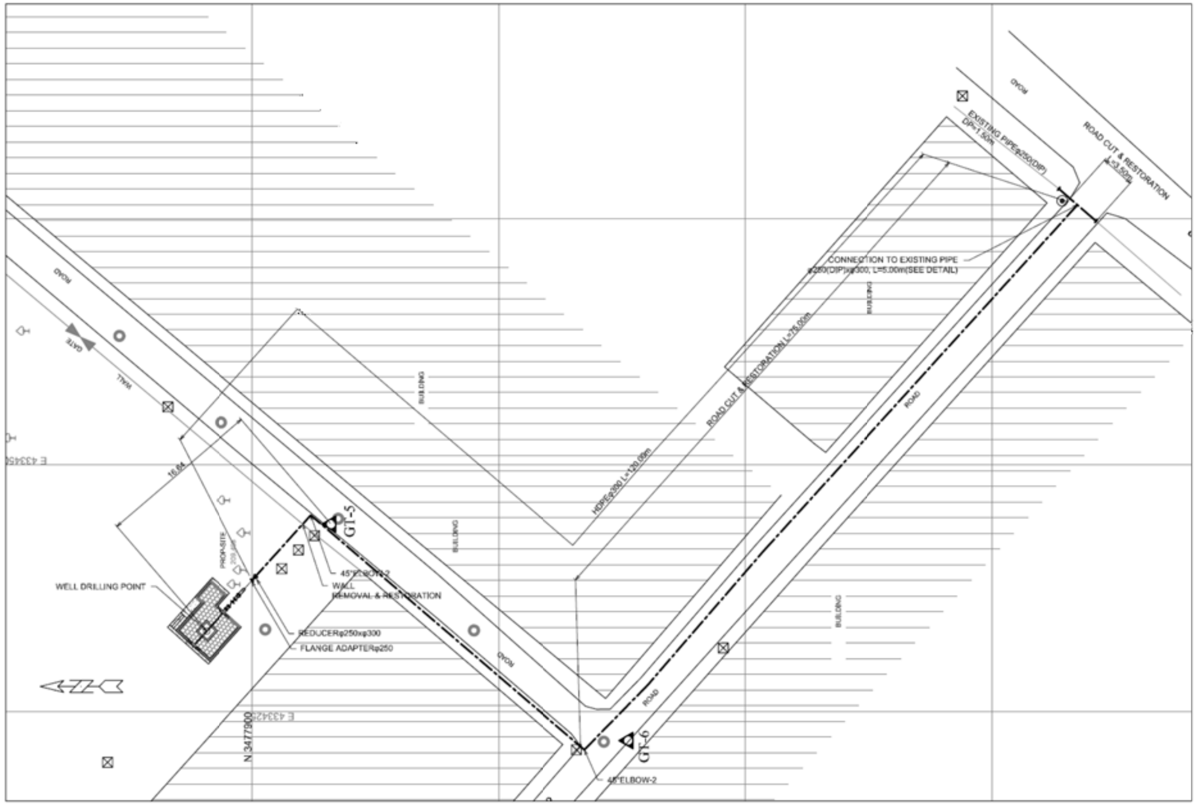
SCALE = 1:200(A1), 1:400(A3)

PROJECT NAME	
STUDY FOR THE OUTLINE DESIGN SURVEY ON THE PROJECT FOR ENERGY SAVING IN WATER SUPPLY SYSTEM IN LAHOL IN THE ISLAMIC REPUBLIC OF PAKISTAN ラホール給水設備エネルギー効率化計画 概略設計	
DRAWING TITLE	SCALE 1:200(A1), 1:400(A3)
TUBE-WELL SITE PLAN IN CITY(2)	DRAWING NO. 15 / 75


TUBE-WELL SITE PLAN IN CITY(3)
SCALE = 1:200(A1), 1:400(A3)
No.27 Iqbal Park-II
Tube-well capacity: 6.8m3/min(408)
No.24 Sabzi Mandi
Tube-well capacity: 6.8m3/min(408)
No.26 Ali Park
Tube-well capacity: 6.8m3/min(408)
STUDY FOR THE OUTLINE DESIGN SURVEY ON THE PROJECT FOR ENERGY SAVING IN WATER SUPPLY SYSTEM IN LAHOL IN THE ISLAMIC REPUBLIC OF PAKISTAN
TUBE-WELL SITE PLAN IN CITY(3)
SCALE 1:200(A1), 1:400(A3)
DRAWING NO. 16 / 75


TUBE-WELL SITE PLAN IN DATA NAGAR
SCALE = 1:200(A1), 1:400(A3)
No.30 Hussain Park
No.28 Raheem Road Data Nagar
No.31 Siddique Pura
PROJECT NAME
STUDY FOR THE OUTLINE DESIGN SURVEY ON THE PROJECT FOR ENERGY SAVING IN WATER SUPPLY SYSTEM IN LAHOL IN THE ISLAMIC REPUBLIC OF PAKISTAN
DRAWING TITLE
TUBE-WELL SITE PLAN IN DATA NAGAR
SCALE 1:200(A1), 1:400(A3)
DRAWING NO. 17 / 75


PROJECT NAME
STUDY FOR THE OUTLINE DESIGN SURVEY ON THE PROJECT FOR ENERGY SAVING IN WATER SUPPLY SYSTEM IN LAHOL IN THE ISLAMIC REPUBLIC OF PAKISTAN
ラホール給水設備エネルギー効率化計画 概略設計
DRAWING TITLE
TUBE-WELL SITE PLAN IN GREEN TOWN(1)
SCALE
1:200(A1), 1:400(A3)
DRAWING NO.
18 / 75
TUBE-WELL SITE PLAN IN GREEN TOWN(1)
SCALE = 1:200(A1), 1:400(A3)
No.37 D-II Block-IV
Tube-well capacity: 5.1m3/min(306t/h)
GT-01
GT-02
WELL DRILLING POINT
FOOTPATH REMOVAL & RESTORATION
FENCE REMOVAL & RESTORATION
CONNECTION TO EXISTING PIPE
EXISTING PIPE LINE
ROAD
FENCE
TUBE-WELL



No.38 Tanki No.4 Township

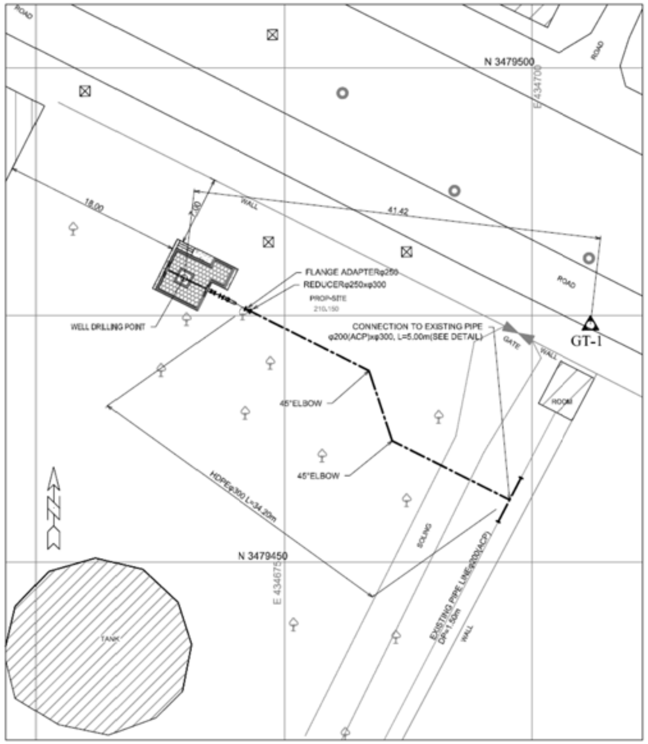
Tube-well capacity: 5.1m3/min(3cfs)

□ Installation of a water-level gauge

TUBE-WELL SITE PLAN IN GREEN TOWN(2)

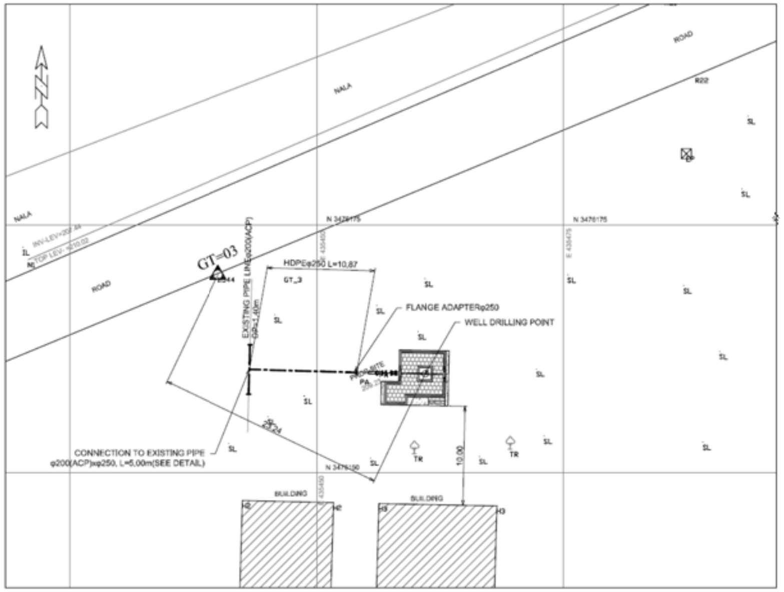
SCALE = 1:200(A1), 1:400(A3)

PROJECT NAME	
STUDY FOR THE OUTLINE DESIGN SURVEY ON THE PROJECT FOR ENERGY SAVING IN WATER SUPPLY SYSTEM IN LAHOL IN THE ISLAMIC REPUBLIC OF PAKISTAN ラホール給水設備エネルギー効率化計画 概略設計	
DRAWING TITLE	SCALE
TUBE-WELL SITE PLAN IN GREEN TOWN(2)	1:200(A1), 1:400(A3)
	DRAWING NO.
	19 / 75



No.39 Tanki No.3 Township

Tube-well capacity: 5.1m3/min(3cfs)



No.40 Gawala Colony No.1

Tube-well capacity: 5.1m3/min(3cfs)

TUBE-WELL SITE PLAN IN GREEN TOWN(3)

SCALE = 1:200(A1), 1:400(A3)

PROJECT NAME STUDY FOR THE OUTLINE DESIGN SURVEY ON THE PROJECT FOR ENERGY SAVING IN WATER SUPPLY SYSTEM IN LAHOL IN THE ISLAMIC REPUBLIC OF PAKISTAN ラホール給水設備エネルギー効率化計画　概略設計	
DRAWING TITLE TUBE-WELL SITE PLAN IN GREEN TOWN(3)	SCALE 1:200(A1), 1:400(A3) DRAWING NO. 20 / 75