WATER AND SANITATION AGENCY, GUJRANWALA
GUJRANWALA DEVELOPMENT AUTHORITY
ISLAMIC REPUBLIC OF PAKISTAN

PREPARATORY SURVEY REPORT
ON
THE PROJECT FOR UPGRADING OF MECHANICAL SYSTEM FOR SEWERAGE AND DRAINAGE SERVICES IN GUJRANWALA
IN
THE ISLAMIC REPUBLIC OF PAKISTAN

JUNE 2014

JAPAN INTERNATIONAL COOPERATION AGENCY
CTI ENGINEERING INTERNATIONAL CO., LTD.

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PREFACE

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to CTI Engineering International Co., Ltd.

The survey team held a series of discussions with the officials concerned of the Government of Pakistan, and conducted field investigations. As a result of further studies in Japan, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Pakistan for their close cooperation extended to the survey team.

June 2014

Masami FUWA
Director General
Global Environmental Department
Japan International Cooperation Agency

Summary

1. Overview of the Country

According to Pakistan Economic Survey 2012-13, the country has a population of 184 million in its territory of 796,000 km^2 (about twice as large as Japan). The land is topographically classified into three (3) patterns; Balochistan plateau in the southwest, Indus plain along the Indus and highlands in the north. The northernmost areas are formed by steep mountains such as Hindukushi, Karakoram, Himalaya mountains.

Pakistan belongs to subtropical climate except for mountainous area in the northern part, and the annual rainfall is estimated at 130 mm in the southeast and southwest of the country, whereas it represents relatively high in the northern area and the annual precipitation in Punjab Province is approximately 500 mm.

According to the IMF report, real GDP of Pakistan is estimated at 210 billion US dollars in February 2012, and GNI per capita is 1,368 US dollar. Pakistan has achieved relatively high economic growth with its real GDP standing at 3.6 %. However, it is important to note that inflation rate and unemployment rate also remain at high level with 7.5% and 5.9% respectively so that the price stabilization is one of the economic policy challenges that Pakistan is currently facing.

With regard to the industrial structure, the tertiary industry is predominant accounting for 58%, and the primary and the secondary industries are showing 21% each (JETRO report, 2013). In addition to the expansion of fiscal deficit, there have been negative impact on the country's economy such as decrease in foreign reserve by the external debts return and sluggish operation in manufacturing industry due to the lack of energy. Nonetheless, the production of the large-scale manufacturing industry is steadily growing, and 3% of increase was achieved over last year in mining industry as well as construction industry. However, despite the fact that there are a lot of development demands, the constant fiscal deficit forces the country's economy to largely depend on foreign assistance. As the debt problem becomes serious, the budget is under control as a result of limiting development expenditure, and this situation will cause impediment for the infrastructure development.

2. Background of the Project

Infrastructure improvement in Gujranwala City is outstandingly delayed compared to that of Lahore, the provincial capital of Punjab. However, based on the Integrated Development Plan of Gujranwala setting 2040 as the target year, WASA conducted a feasibility study for the improvement of sewerage and drainage system in 2010. This study emphasizes the necessity for the implementation of various schemes such as rehabilitation of disposal stations and improvement of the sewerage network system as well as the rainwater drainage system. It also proposes some options for the type and scale of

sewerage treatment plant. The improvement of urban environment is urgently required to cope with the increase of population and rapid urbanization.

WASA has been devoting itself to the development of sewerage system in an effort to increase the coverage rate. So far, pumps have been installed at the disposal stations with financial assistance from the Government of Punjab, aiming to upgrade the drainage capacity of the system. Removal of sludge and garbage from the existing facilities have been carried out as a part of maintenance service, but this activity has to depend on manual labor, which is incapable of performing effective work because of the lack of mechanical equipment.

In the feasibility study, improvement of the rainwater drainage system is proposed in such a way that conduits having enough drainage capacity should be constructed along the city's main roads. However, under the present circumstances, the proposal seems to be still a long way to the implementation. Hence, besides the use of mobile pumps or suction machines, cleaning and de-silting of waterways will certainly help recover the function of the drainage system in future.

In view of the above situation, the Project is to install or replace disposal pumps as well as cleaning/de-silting equipment to upgrade existing sewerage and drainage capacity in Gujranwala City with the aim of reducing inundation damages.

This Project is not to make fundamental improvement of sewerage and drainage network but to retrieve and upgrade discharge volume of the existing drainage facilities, and will contribute to the improvement of the network in future. It will also serve to enhance the number of connections to the sewerage and drainage system, and consequently to the increase of sewerage coverage rate.

3. Result of the Outline of the Project

In response to the request of Pakistani Government, JICA dispatched the study team from 1st September to 1st October 2013 to confirm the necessity and emergency of the requested project. The study teams analyzed the survey result in Japan and decided the target area, scale, efficiency and validity of the project. According to those output, the study team prepared the report and explained to the Pakistani side from 9th to 19th February 2014. After the discussions, both sides agreed the basic design of the project.

The outline of the project and the request of Pakistani side is shown below.

Requested Item	Outline of the Project
Cleaning/De-silting Equipment	
(Sludge Removal Equipment)	
Suction machine 6 units, Clamshell 1 unit: Excavator 3 units	Water jet cleaner: 2 units; Suction machine: 4 units, Wheel-typed clamshell: 1 unit, Wheel-type excavator: 2 units, Winch machine: 7 sets
(Transportation Equipment)	
Dump truck: 6 units, Track crane: 1 unit, Monitoring truck: 18 units, Motor cycle : 20 units	Dump truck (2- ton): 6 units, ,Dump truck (4-ton): 4 units, Pick-up truck: 3 units
(Other Equipment)	
Safety equipment: 1 unit, Monitoring soft system 1 unit, Communication equipment: 1 unit, Garage and storeroom: 1 unit, Traction type dewatering pump: 20 units: Winch machine: 12 units, Repair shop: 1 unit, Suction pump: 1 unit	Traction type dewatering pump (small size): 12 units, Traction type dewatering pump (large size): 3 units, Safety equipment: 1 set
Disposal Station	
Sewage pump 14 units: Generator 22 units	Procurement and installation of 14 units of pumps and 6 units of generators for 8 disposal stations and procurement (without installation)of additional 8 units of generators for 8 disposal stations

With regard to the cleaning/de-silting equipment, the specifications and number of units will be selected according to the following conditions:

- The equipment shall be used for cleaning/de-silting sewer pipes and drains installed in the area under the control of WASA,
- The cleaning/de-silting period is scheduled to be 3 years after the supply of equipment to WASA, that will be 2019,
- For cleaning drains, backhoe will be used for excavating sludge and sediment and clamshell for removing floating materials,
- For cleaning sewer pipes, based on pre-conditions such as 40% of solid deposit ratio and 257 annual operation days, the following equipment will be deployed according to the pipe size;
  - Less than 15 inches of pipes: water jet cleaner (small) + vacuum truck (small)
  - 18 – 24 inches of pipes: winch machine + dump truck (small)
  - 27 – 33 inches of pipes: water jet cleaner (large) + vacuum truck (small)
  - 36 – 60 inches of pipes: manpower + vacuum truck (large)
- Work safety for sewer men shall be taken into consideration.

As a result of analysis and discussions, the required number of equipment, usage and main specifications of each have been determined as follows

Equipment	Use	Number	Specifications
Water Jet Cleaner (Small Size)	Cleaning of sewage pipe	2	Tank capacity : more than 4.0m^3 Maximum delivery pressure: more than 200kg/cm^2
Suction Machine (Small Size)	Cleaning of sewage pipe Cleaning of sewage drain/ culvert	4	Tank capacity: more than 4.0m^3 Maximum delivery pressure: more than -0.93kg/cm^2
Wheel Type Clamshell (Middle Size)	Cleaning of sewage drain	1	Bucket capacity : 0.3 to 0.4 m^3
Wheel Type Excavator (Middle Size)	Cleaning of sewage drain	2	Bucket capacity : pileup 0.45 m^3
Dump Truck (Small Size)	Cleaning of sewage drain, sewage pipe and culvert	6	2 tons truck: designed to prevent scattering of sludge from the truck deck
Dump Truck (Middle Size)	Cleaning of sewage drain	4	4 tons truck: designed to prevent scattering of sludge from the truck deck
Pickup Truck	Carry dewatering pump (small size) and labor	3	-Maximum capacity : m ore than 1 ton -Maximum capacity of person :2 Driving: 4×2
Safety Equipment	Cleaning of sewage pipe/ culvert	1	Equipment for gas protection, helmet and other safety equipment
Traction Type Dewatering Pump (Small Size)	Trouble-shooting about flow capacity Cleaning of sewage drain	12	Pump capacity : 2cusec (3.4 m^3/min)
Winch Machine	Cleaning of sewage pipe	7	Diameter 18", 21", 24" with bucket
Traction Type Dewatering Pump (Large Size))	During breakdown of pumping system	3	Pump capacity: 5.3cusec (9.2 m^3/min)

The conditions and specifications of the pumps (either new installation or replacement) for the requested eight disposal stations are shown below:

- WASA's request is put on high priority for the reason that this project aims to improve the existing disposal stations,
- Expansion of disposal station building is out of scope of the project,
- Target coverage rate (Pump Discharge Capacity / Inflow of Existing Sewer) will be 150%,
- Vacant space is available for new pump installation,
- Pump deterioration is determined by site survey and installation year, and
- The maximum velocity of the existing suction pipe will be 4m/s

According to those result, the specifications and the number of pumps will be determined as follows;

Power outage often occurs in all over Pakistan including Gujranwala so generator has been already installed in some disposal stations. The specifications of generator and its total number of units for the eight disposal stations have been carefully studied taking account of the availability of existing

generators. The Table below presents the results together with the required number of pumps. These pumps and generators will include the installation of equipment under Japan's Grant Aid.

Besides the disposal stations mentioned above, there are 14 stations run by WASA, and some of them do not own any generator so that pump operation will be stopped during power outage. To improve these situations, the request also includes the procurement of generator for such disposal stations. As a result of the study, it has been decided to install a generator in eight other disposal stations. In this regard, electric wire and switchboard will also be supplied together with generator, but the install work will be undertaken by Pakistani side.

Installation of Disposal Pump and Generator						Installation of Generagor		
Name	Disposal Pump			Generator		Name	Number (unit)	Capacity (kVA)
	Number (unit)	Discharge (cusec)	New /Replace	Number (Unit)	Capacity (kVA)			
①Alam Chowk No. 2	1	10	New	1	200	⑨Abu Bakar Park	1	150
②Khayali Room No. 1	1	20	Replace	-	-	⑩Garjakh	1	150
③Nowshera Sansi	4	10	New	-	-	⑪Jinnah Road Under Pass	1	100
④People Colony	2	10	New	1	200	⑫Kashmir Colony	1	100
⑤PMU	1	10	New	1	200	⑬Khayali Pump Room No.2	1	200
⑥Rajkot Room No. 2	1	15	Replace	-	-	⑭Model Town	1	100
Rajkot Room No. 3	2	10	New	1	200	⑮Nowshera Road	1	200
⑦Samanabad	1	10	New	1	150	⑯Zahid Colony	1	100
⑧Mughalpura	1	4	Replace	1	100			
Total	14			6		Total	8	

4. Period and Estimated Cost of the Project

The project is to be implemented under Japan's Grant Aid after the conclusion of Exchange of Notes between the Japanese Government and Pakistani Government. The total period for the project implementation is as 26 months. The necessary period from tender to detail design, manufacturing, delivery and handover is shown below:

- Consultant's contract – preparation of tender documents – tendering – contractor's contract (5 months)
- Contractor's contract handover of cleaning/de-silting equipment (13 months)
- Arrival of pump equipment – manufacturing – delivery/transport – arrival – installation – handover of disposal pumps (21 months)

Out of the total project cost, Pakistani side will bear 17,870 thousand yen.

5. Result of the Outline of the Project

Relevance

- The project is considered as part of urban environmental improvement and will benefit about 1.7 million citizens of Gujranwala (*) directly or indirectly including the poor.

  (*) Sewerage coverage rate in Gujranwala city is 68%

- The project is expected to comply with urgent problems about sewerage and rainwater drainage and will contribute to the improvement of sanitary environment in the city.

- The improvement of flow capacity of sewer pipes/drains as well as upgrading of the capacity of the disposal stations are required as a result of the feasibility study conducted in 2010, which is based on integrated master plan for Gujranwala up to the design year 2040, and this project is envisaged to involve one of the components of the integrated plan for sewerage and drainage system, and

- Machinery/equipment required for the amelioration of sewerage and drainage system has been supplied under Japan's Grant Aid for Lahore and Faisalabad. Likewise, this project will contribute to the improvement of urban hygiene environment in compliance with the priority sector of the Japanese policy of foreign assistance, which is so called ensuring human right and improving social infrastructure.

Effectiveness

(1) Quantitative Effect

a) Upgrading of Drainage Capacity of Disposal Stations

Classification	Without Project	With Project
Drainage capacity (m^3/s)	12.0	15.6

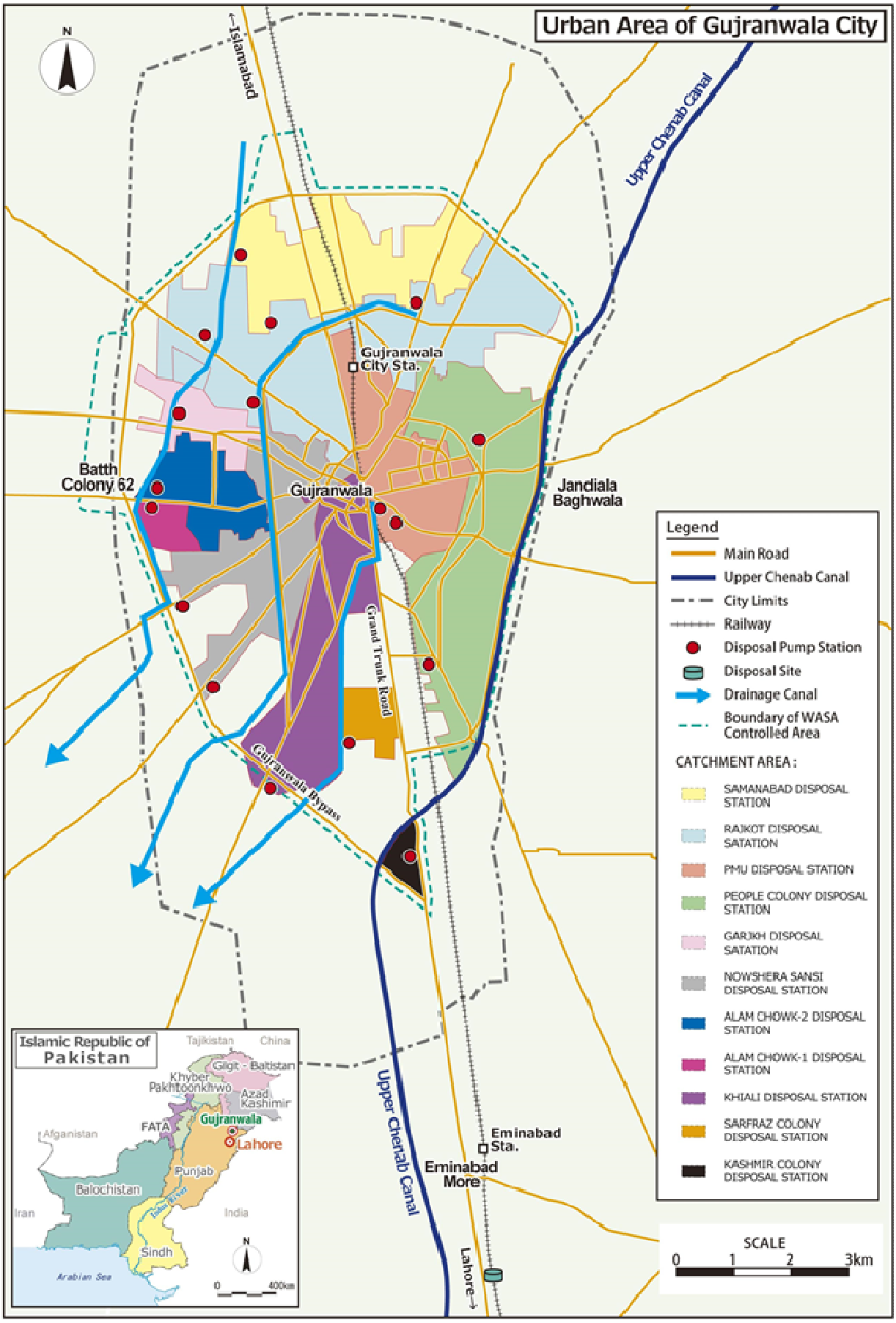
b) Disposal Pump Operation by Generator in Case of Power Outage

Classification	Without Project	With Project
Drainage capacity (m^3/s)	3.25	8.18
Drainage ratio by generator (%)	26.4	52.6

(2) Qualitative Effect

- As a result of removal of sludge and garbage from sewer pipes and drains, wastewater discharge capacity will be retrieved or improved.

- Urban environment will be improved by solving sanitary problems caused by clogging of sewerage pipes and exposing excavated sludge on the road.
- Living environment will be improved for the people residing in the depressions or low-lying lands as a result of shortening of ponding time, and it may cause quick recovery of business activities.
- People’s complaints about sewerage and drainage will be reduced.
- Work environment will be largely improved for sewermen by providing proper safety equipment.



Location Map

Table of Contents

List of Tables

List of Figures

Abbreviations

A/P	;	Authorization to Pay
B/A	;	Banking Arrangement
CDWP	;	Central Development Working Party
E/N	;	Exchange of Notes
EAD	;	Economic Affairs Division
ECNEC	;	Executive Committee of National Economic Council
EIA	;	Environmental Impact Assessment
EOJ	;	Embassy of Japan in Pakistan
F/S	;	Feasibility Study
GA	;	Grant Agreement
GEPCO	;	Gujranwala Electricity Company
GOJ	;	Government of Japan
GOP	;	Government of Pakistan
HUD&PHED	;	Housing, Urban Development and Public Health Engineering Department
IEE	;	Initial Environmental Examination
ISO	;	International Organization for Standardization
JIS	;	Japanese Industrial Standards
JEC	;	Japanese Electro-technical Committee
JEM	;	The Japan Electrical Manufacturers' Association
M/D	;	Minutes of Discussions
ODA	;	Official Development Assistance
PC-1	;	Planning Commission-1
P&D	;	Planning and Development Department
PMD	;	Pakistan Metrological Department
Rs	;	Pakistan Rupee
VAT	;	Value Added Tax
WASA	;	Water and Sanitation Agency in Gujranwala

CHAPTER 1
BACKGROUND OF THE PROJECT

1-1 Current Situation and Issues

The population of Gujranwala City is estimated at 1.7 million (2010). The infrastructure of the city has not been developed to cope with population growth. The sewerage system, in particular, has increasingly degraded due to deterioration and the insufficient capacity of relevant facilities because it has been operating for nearly 40 years since its installation in the 1970's. Although the drainage system for rainwater has improved in recent years, the design would not allow drastic drainage capacity improvement, so that inundation situations in monsoon season remain almost unchanged.

The Water and Sanitation Agency in Gujranwala (hereinafter referred to as "WASA") is the agency responsible for the operation and maintenance of the sewerage and drainage system. However, it spends most of the time taking actions in response to over 10,000 complaints from the residents a year about the blockage of sewer pipes, wastewater overflow, damaged manhole, floods, etc. Therefore, time is not available to take full-scale measures for the improvement of the present situation. Further details are as discussed below.

1-1-1 Sewerage

Currently, there exist 22 disposal stations (including 2 underpass stations) with a total length of 451 km of sewers spread over 11 drainage basins in the city. Sewage discharged from the 11 disposal stations located in the lower basins goes into the 3 main drains extending from the northeast to the southwest of the city (refer to Figure 1-1). Problems often occur due to the deterioration of sewerage facilities aggravated by the expansion of service areas with population increase. However, it is hardly practicable to review and implement the overall network plan due to budgetary constrain

As far as disposal stations are concerned, drainage pumps function poorly due to mechanical trouble or deterioration of their drainage capacity. In addition, because of the lack of back-up generator, these pumps often stop due to frequent power outage.

As for the sewers, the flow capacity of pipes became lower because of accumulation of silt, sediment, sludge or garbage. Cleaning/de-silting of sewer pipes executed manually in most cases is poorly efficient, resulting in ineffective work and insufficient security management for workers. WASA owns only a limited number of equipment unlike Lahore and Faisalabad, so that more attention is necessary for their present conditions. For example, the work efficiency of water-jet cleaners is low, and trucks and mobile pumps are already over or near their economic service life. Moreover, some other equipment have stopped functioning due to the high use frequency, and are now under repair. Furthermore, (1) WASA has no equipment to transport sludge and garbage removed from the drains; (2) WASA charters a rickshaw for pulling a mobile pump of nearly 200 kg; and (3) some equipment such as excavators are used not only for cleaning sewers and drains but also for repairing water supply pipes.

In view of the above, the issues that require further discussion and consideration are as follows:

- Upgrading of drainage capacity with proper system prepared for the operation during power outage;
- Procurement of effective cleaning/de-silting equipment for the improvement of work environment;
- Provision and arrangement of proper equipment based on the cleaning/de-silting plan; and
- Preparation of cleaning/de-silting plan and its early implementation.

1-1-2 Rainwater Drainage System

In recent years, side ditches and conduits along roads have been improved to drain rainwater (refer to Figure 1-2). However, there are still many places where roads are inundated in monsoon season because of insufficient capacity of these drainage facilities (refer to Figure 1-3). Besides, rainwater drains do not connect to the sewerage system. The land of Gujranwala has a gentle slant of 1/2000 to 1/4000 from the northeast to the southwest, so that rainwater flows down by gravity to the main drains through ditches and conduits. Although inundation occurs in many places of the city in monsoon season, it would be drained in a couple of

hours. However, for the depressions or low lands, the situation becomes worse since it remains inundated for 8 to 48 hours. There are no flood records of the Chenab Canal.

For the depressions or low-lying lands where rainwater becomes stagnant without outflow to the conduits, mobile pumps or suction machines to discharge water to the nearby drains are mobilized, and for other areas vulnerable to inundation, manholes of the sewerage are temporarily opened to drain rainwater.

Considering the above, the main issues are as summarized below:

- Provision of equipment for minimizing ponding time at the areas vulnerable to inundation; and
- Provision of equipment for the removal of sludge and sediment from the drains with the aim of upgrading the drainage capacity.

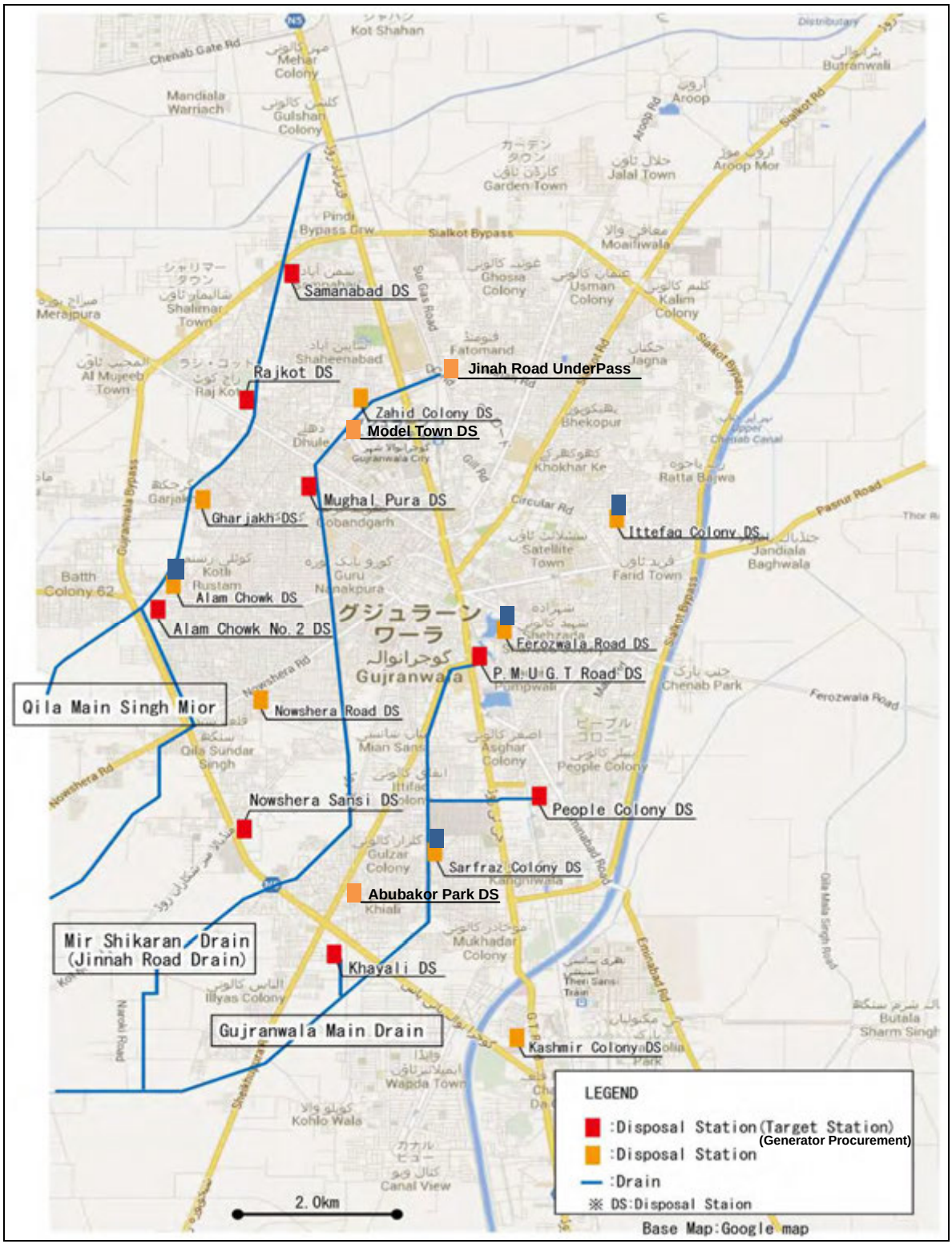


Figure 1-1 Location Map of Main Disposal Stations in Gujranwala City

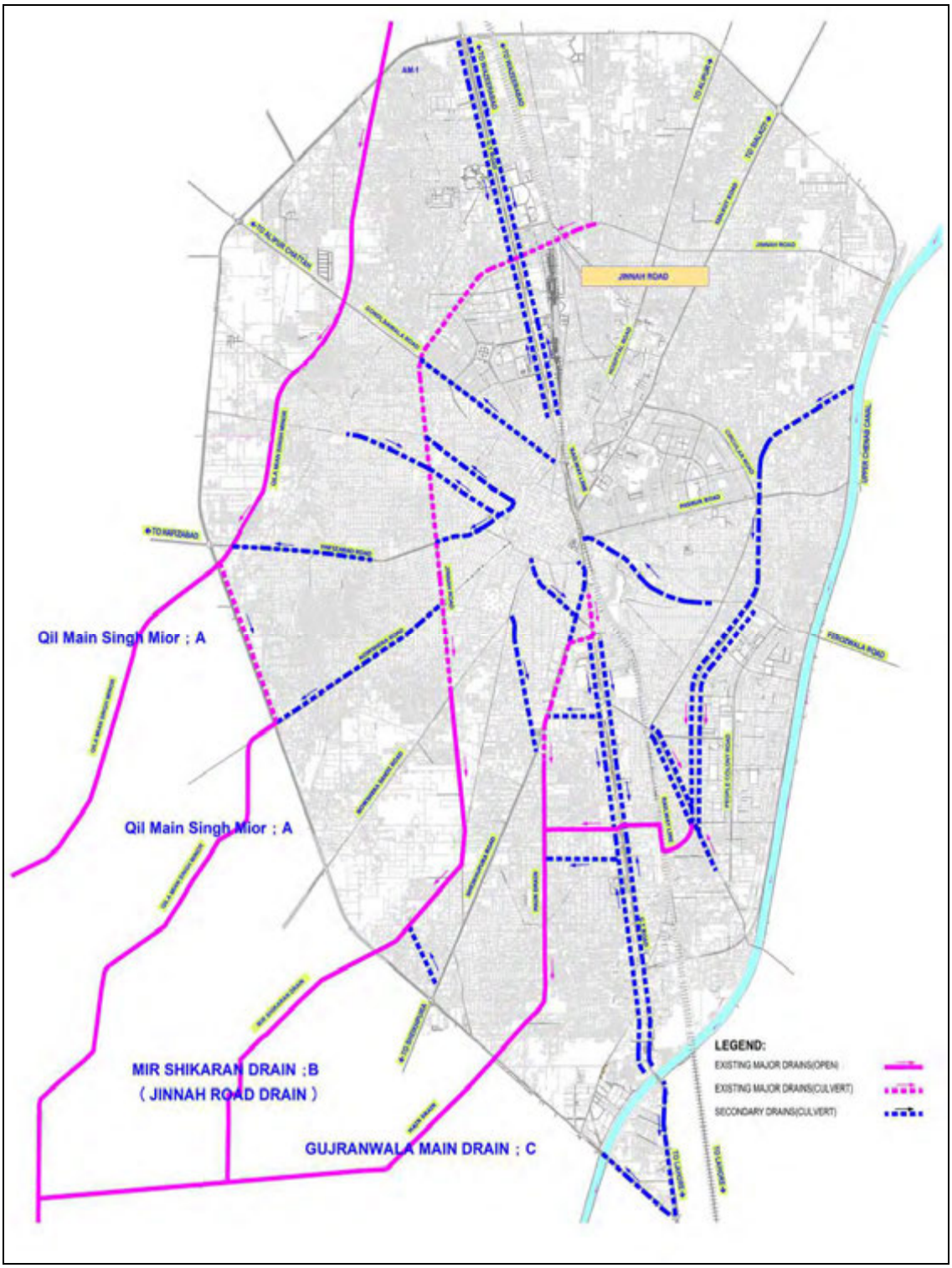


Figure 1-2 Location Map of Main Drainage Systems in Gujranwala City

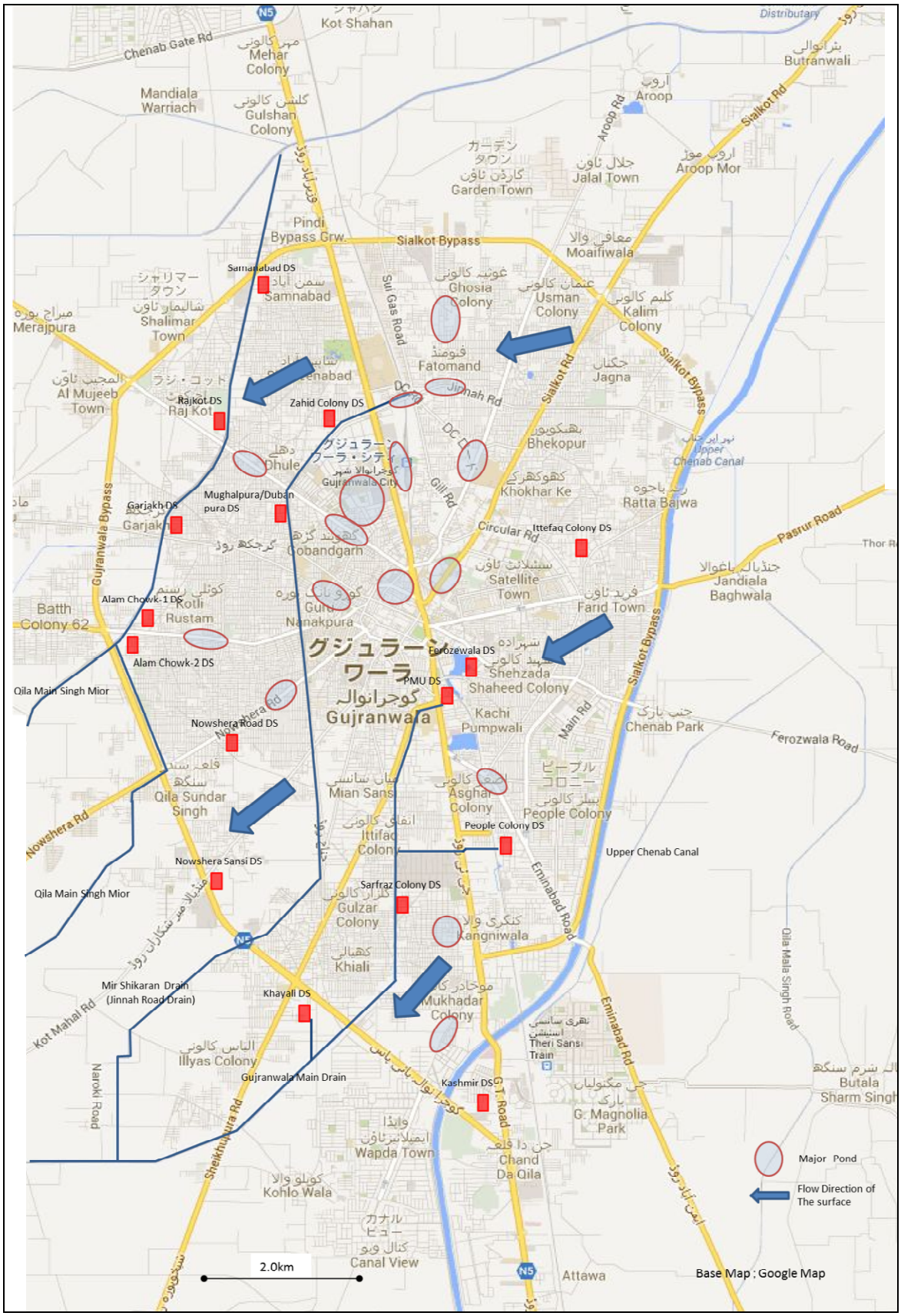


Figure 1-3 Location Map of Ponding Areas in Gujranwala City

1-2 Natural Conditions

Rainfall observation in Gujranwala started in October 2010 by WASA followed by PMD (Pakistan Metrological Department) in July 2013. However, available data are limited to those of monsoon season. The location of Meteological Stations in the north of Pakistan is shown in Figure 1-4, and those located near Gujranwala are Jehlum, Sialkot in the north and Lahore in the south.

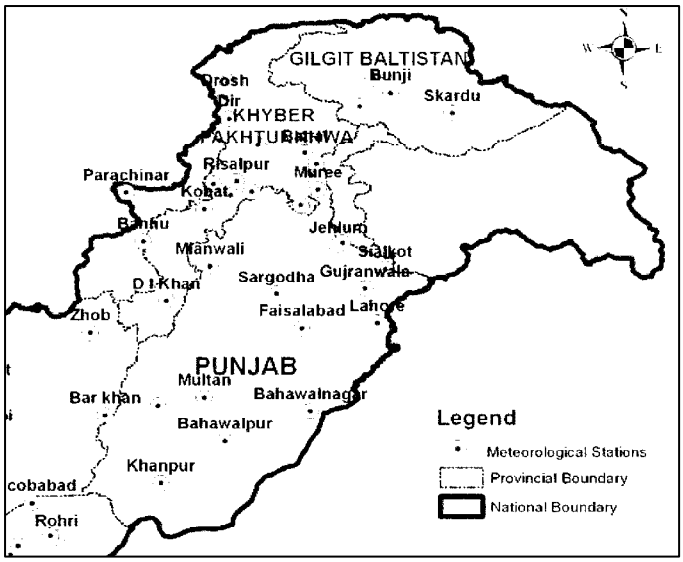


Figure 1-4 Metrological Stations in the Northern Parts of Pakistan

Annual rainfall in Pakistan tends to increase in the northern area. The annual mean rainfall from 2000 to 2010 in Jehlum and Lahore are 804mm and 555mm respectively. Gujranwala is likely to have more rainfall compared to Lahore as it is located between the above two cities. The rainfall in monsoon season is estimated at 70 to 80% of the annual precipitation, and it should be noted that rainfall in June is increasing as the recent trend.

Table 1-1 presents rainfall data of Gujranwala city for the recent 3 years compared to those of Lahore. For monsoon period, Gujranwala had more rainfall than Lahore in 2010 and 2012, on the contrary, Lahore had more in 2011.

Table 1-1 Monthly Rainfall of Lahore and Gujranwala City

(Unit: mm/month)

Month	2010		2011		2012	
	Lahore	Gujranwala	Lahore	Gujranwala	Lahore	Gujranwala
Jan	0.0		0.0		6.9	
Feb	9.4.		31.5		10.4	
Mar	5.3		1.0		35.3	
Apr	2.5		21.1		14.2	
May	7.1		50.3		13.2	
Jun	4.8		218.4	82.0	34.5	38.0
Jul	107.7	368.0	333.8	242.0	185.2	144.0
Aug	119.6	183.0	137.4	110.0	213.9	321.0
Sep	88.4	65.0	29.0	168.0	20.8	95.0
Oct	0.0		0.0		57.7	
Nov	0.0		0.0		0.0	
Dec	15.0		18.5		16.5	
Total	359.9	616.0	841.0	602.0	608.6	598.0

Source；Pakistan Meteorological Department and WASA

In Gujranwala, the rainfall is less than 1000 mm.throughout the year, but continuous rains have been recorded at 231mm from July 20 to 22, 2010, 122mm on September 1, 2011 and 410mm from August 11 to 16, 2013, and each causing inundation in the city streets.

Gujranwala belongs to steppe climate but also affected by desert climate. In summer season from April to September, the climate is warm with the maximum temperature of 40℃ and minmum 27℃, while winter season from November to May, weather is mild with the temperature from 5℃ to 19℃ and its average is 15℃.

1-3 Environmental and Social Considerations

This project is classified as Category C according to JICA Guideline for Environmental and Social Considerations. From the characteritics of the project, it seems that undesirable impact on enviroment and society will be extremely small. However, Initial Environmental Examination (IEE) is required following Environmental Protection Act 1997 in Pakistan so WASA will be ready for the implementation of IEE by the end of May 2014.

CHAPTER 2
CONTENTS OF THE PROJECT

2-1 Basic Concept of the Project

2-1-1 Overall Goal and Project Purpose

Infrastructure improvement in Gujranwala City is outstandingly delayed compared to that of Lahore, the provincial capital of Punjab. However, based on the Integrated Development Plan of Gujranwala setting 2040 as the target year, WASA, together with the Planning and Development Department of the Government of Punjab, conducted a feasibility study for the improvement of sewerage and drainage system in 2010. This study describes the technical views and analysis with emphasis on the necessity for implementation of various schemes such as rehabilitation of disposal stations and improvement of the sewerage network system as well as the rainwater drainage system. It also proposes some options for the type and scale of sewerage treatment plant. The coverage rates of water and sewerage were 30% and 68% respectively in the service areas of WASA, so that the improvement of urban environment is urgently required to cope with the increase of population and rapid urbanization.

WASA has been devoting itself to the development of sewerage system in an effort to increase the coverage rate. So far, pumps have been installed at the disposal stations with financial assistance from the Government of Punjab, aiming to upgrade the drainage capacity of the system. Removal of sludge and garbage from the existing facilities have been carried out as a part of maintenance service, but this activity has to depend on manual labor, which is incapable of performing effective work because of the lack of mechanical equipment.

In the feasibility study, improvement of the rainwater drainage system is proposed in such a way that conduits having enough drainage capacity should be constructed along the city's main roads. However, under the present circumstances, the proposal seems to be still a long way to implementation. Hence, besides the use of mobile pumps or suction machines as mentioned in Section 1-1-2, cleaning and de-silting of waterways will certainly help recover the function of the drainage system in future.

In view of the above situation, the Project aims to upgrade the drainage capacity of the eight (8) disposal stations in addition to the supply of proper equipment/machinery to retrieve the function of the existing sewer pipes and drains, which may result in the reduction of inundation time in monsoon season.

2-1-2 Project Components

To achieve the aim mentioned above, appropriate equipment or machinery will be required for cleaning the sewer pipes and drains. In addition, the disposal stations will need installation of new pumps, or the existing pumps replaced with new ones, in order to upgrade their drainage capacity. Thus, complaints of the residents about stench generated from wastewater or inundation are expected to decrease and, consequently, will contribute to the improvement of urban as well as sanitary environment.

From the above considerations, this grant aid project is envisaged to include the procurement of equipment for WASA, which is urgently required for the cleaning of pipes and drains, transportation of sludge and dewatering. It shall also include the procurement and installation or replacement of fourteen (14) units of pumps with six (6) units of generators for the eight (8) disposal stations. Furthermore, technical assistance has to be provided to prepare a systematic operation plan and to enhance sustainable management. Table 2-1 summarizes the project components.

Table 2-1 Project Components under Japan's Grant Aid

Classification	Contents
Cleaning/De-silting Equipment	
Sludge Removal Equipment	Water jet cleaner: 2 units; Suction machine: 4 units; Wheel-typed clamshell: 1 unit; Wheel-type excavator: 2 units, Winch machine: 7 sets
Transportation Equipment	Dump truck (2- ton): 6 units; Dump truck (4-ton): 4 units; Pick-up truck: 3 units
Other Equipment	Traction type dewatering pump (small size): 12 units, Traction type dewatering pump (large size): 3 units, Safety equipment: 1 set
Disposal Station	
Drainage pump and appurtenant facilities	Supply and installation of 14 units of pumps and 6 units of generators for 8 disposal stations and supply (without installation)of additional 8 units of generators for 8 disposal stations
Technical Assistance	Planning for sewerage cleaning, operation and management

2-2 Outline Design of the Japanese Assistance

2-2-1 Design Policy

1) Basic Policy

Based on the request of the Pakistan side and the result of preparatory survey, the equipment plan has to be carefully examined and defined in order to upgrade the capacity of disposal pumps, sewer pipes and drains. The basic policy for designing the type of equipment and its grade is discussed below.

a) Drainage Capability of Existing Disposal Stations for Improvement

Table 2-2 shows the hourly peak flow of each disposal station calculated on the basis of population in the target area and the diameter of sewer connected to the receiving well.

Table 2-2 Hourly Peak Flow of Each Disposal Station

Station Name	Target Area			Inflow of Existing Sewer		Capacity of Existing Pump			Cover Rate (= **B/A**)
	Area (km^2)	Population (Number)	Hourly Peak Flow (Plan) (cusec)	Diameter (mm)	Inflow Ability **(A)** (cusec)	Disposal Pump (cusec)	Maximum Discharge Capacity **(B)** (cusec)	Installation Year	
①Alam Chowk No. 2	3.34	128,026	26.3	1050 1 pipe	20	10 2 sets	20	2011	100%
②Khayali	6.06	302,564	47.2	1500 1 pipe	40	10 5 sets 15 1 set	65	2010 Unknown	163%
③Nowshera Sansi	3.68	120,090	32.9	1500 1 pipe	52	10 4 sets	40	1999	77%
④People Colony	8.06	398,420	62.1	・1350 1 pipe ・1200 1 pipe	71	10 9 sets	90	1995～2004	127%
⑤PMU	4.95	204,995	36.7	1050 2 pipes	42	10 4 sets	40	2000	95%
⑥Rajkot	10.94	602,071	99.6	1500 2 pipes	115	10 6 sets 15 1 set	75	2004 Unknown	65%
⑦Samanabad	5.36	288,861	45	1350 1 pipe	40	10 1 set	10	2011	25%
⑧Mughalpura	—	—	—	600 1 pipe	4.5	Temporary pump operation	0	2007	0%

Notes : (1) Area, population and hourly peak flow (Plan) based on the Feasibility Report, May 2010 (i.e., the F/S Report)
(2) Hourly peak flows of target area based on basic unit, 40gcd (181 lit/day/person) as shown in the F/S Report).
(3) Inflow of rainwater is not counted in hourly peak flow because of different system.
(4) Inflow abilities are based on the result shown in the F/S Report. In case of no mention, it is calculated by Manning's Formula, n=0.012 as roughness coefficient, and 0.8 as value of "fluid depth/pipe diameter".
(5) Flow Unit: 1cusec (ft^3/sec)≒1.7m^3/min

For planning, the Inflow capacity (A) calculated from the diameter of sewer connected to the disposal station (see Table 2-2) is used as the index of hourly peak flow. The hourly peak flows calculated from the population in the target areas, which are mentioned in the F/S Report as the planning horizon up to 2040, are treated for reference. In consideration of field survey results, the determination of number of pumps and capacity that should be renewed or updated is carried out based on the following conditions:

- In consideration of the margin of hourly peak flow and no spare pump in disposal stations, the coverage rate of 150% is used as the target of improvement. The index specified as the margin rate in the "Sewerage Facilities Plan and Design Guideline and Explanation, Japan Sewerage Works Association" is 50% of maximum flow rate. Therefore, 150% as target is preferable.
- Drainage capacity is improved in consideration of installation year (deterioration) of existing pump equipment, and the request of WASA.

b) Maximum Design Capacity of Inflow for Sewer

If the flow velocity in pipe becomes fast, vibration will occur at pumps or pipes by allowing air from the receiving tank into the pump. Furthermore, cavitation will occur at the impeller of pump, so that the service life of pump and pipes is reduced. Therefore, the allowable pump discharge capacity shall be determined by the diameter of suction pipe. The "Sewerage Facilities Plan and Design Guideline and Explanation, Japan Sewerage Works Association" defines to be 3m/s as the maximum design velocity.

The velocity of 300mm suction pipe used at existing pump stations is 4.0m/sec. This velocity is extremely higher than 3m/sec, which is defined as the recommended velocity in Japan. However, this velocity of 4m/sec is used in the long run at many disposal stations, and significant troubles have never occurred at pump bearings, pipes and foundation. Therefore, 4m/sec as the maximum velocity of suction pipe is applied to the design flow of pumps. Table 2-3 shows the design flow for each diameter.

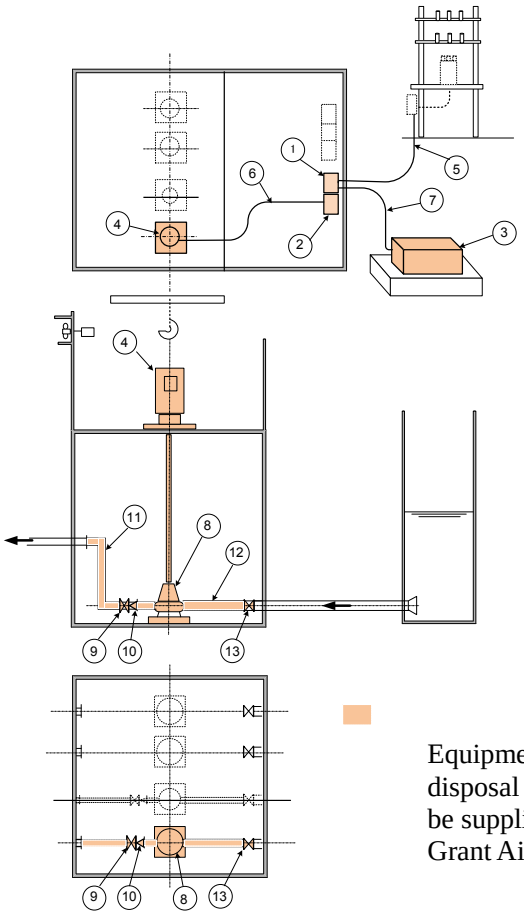
Table 2-3 Design Velocity and Velocity of Existing Suction Pipe

Existing Suction Pipe			Design	
Diameter (mm)	Flow (cusec)	Velocity (m/sec)	Flow (cusec)	Velocity (m/sec)
200	5	4.50	4	3.60
300	10	4.00	10	4.00
400	15	3.38	15	3.38
450	15	2.67	20	3.56

Note: Flow Unit: 1cusec (ft^3/sec) ≒ 1.7m^3/min

c) Composition of Equipment Procured for Disposal Stations

Figure **2-1** shows the composition of equipment, which will be supplied by the Japanese side for the disposal stations as agreed upon with WASA. However, should the generator be already provided with enough capacity to operate the half of disposal pumps, the new generator will not be provided for such disposal stations.



No.	Equipment
1	Incoming Panel
2	Pump starter Panel
3	Diesel Generator
4	Motor
5	Incoming cable
6	Power Cable
7	Generator Cable
8	Pump
9	Discharge Valve
10	Check Valve
11	Discharge Pipe
12	Suction Pipe
13	Suction Valve

Figure 2-1 Composition of Equipment for Disposal Stations under the Project

d) Determination of Generator's Rated Capacity

The allowable voltage drop rate of 30% is assumed for the determination of generator rated capacity because the rated capacity of generators operating 75kW motors is 150kVA and, generally, generator manufacturers use the voltage drop rate of 20% to 30%. Therefore, the rated capacity of all generators is to be calculated based on the 30% voltage drop rate.

Since the starting method of all existing motors is the closed-star-delta, the capacity of generators is determined based on this starting method. Since the new substations of disposal stations are not connected to the existing power supply line, the new generators for new pumps will serve as the operation of new pumps only. The generators shall have the capacity to operate 50% or more of the total number of pumps in accordance with the proposal shown in the F/S Report.

e) Improvement of Flow Capacity for Sewers and Drains

Despite the fact that water jet cleaner was listed in the original request of the Government of Pakistan, it was removed from the list before the start of preparatory survey and no longer listed ever since, even in the Minutes of Discussions. WASA owns five water jet cleaners, but two of them are currently under repair. The field survey confirmed that the existing machines have a problem about work efficiency due to the insufficiency of water pressure, so that in this project, these machines will be mobilized to use in assistance of human power for cleaning of 27-33 inches of sewer pipes.

If high water pressure is available, it is desirable to include the new machine of jet cleaner in the above list, since it may be useful to clean small size of sewer pipes. In Gujranwala, sewers of less than 24 inches in diameter are predominant accounting for about 75% (refer to Table 2-4), and

blocking of drainage often occurs in such small sewers as branch pipes. Referring to the case of Lahore, it should be planned to use the water jet cleaner for the cleaning/de-silting for 6-15 inches of sewers, which account for 45% of all sewers laid in the city.

Table 2-4 Breakdown of Existing Sewer Pipes in Gujranwala

Diameter		Length (km)				Percentage
inch	mm	Zone-I	Zone-II	Zone-III	Total	
6	152	2.558	1.871	2.963	7.392	1.6%
9	229	10.883	10.625	9.665	31.173	6.9%
12	305	32.409	34.559	33.352	100.320	22.2%
15	381	20.582	16.850	30.785	68.217	15.1%
18	457	19.364	18.250	15.258	52.872	11.7%
21	533	20.652	11.859	13.680	46.191	10.2%
24	610	14.250	8.820	11.350	34.420	7.6%
27	686	4.339	5.325	5.896	15.560	3.4%
30	762	8.696	8.655	9.554	26.905	6.0%
33	838	0.000	0.000	0.000	0.000	0.0%
36	914	3.659	7.250	8.200	19.109	4.2%
42	1,067	2.774	4.570	3.580	10.924	2.4%
48	1,219	6.402	5.890	7.358	19.650	4.4%
54	1,372	1.174	4.560	4.250	9.984	2.2%
60	1,524	0.000	5.850	2.890	8.740	1.9%
Total		**147.742**	**144.934**	**158.781**	**451.457**	**100.0%**

Source: WASA 2013

For the selection of cleaning/de-silting equipment and determining the number of units, the following items are considered to meet local conditions:

- Introduction of proper mechanical system to improve work efficiency as well as security of workers engaged in cleaning/de-silting for sewer pipes and manholes;
- Selection of smaller size of equipment possible to enable effective performance in narrow streets since there are many roads of about 3 meters in width.
- Selection of equipment which is fuel-efficient, easy in maintenance and control and environmental friendly; and
- Use of traction type dewatering pump as a preventive measure to control wastewater overflow from manhole, particularly, for the areas where sewer pipes are deteriorated and of insufficient capacity.

2) Policy for Natural Conditions

The terrain of Gujranwala inclines gently to the southwest direction from the northeast. Since the main drainage system is established along this terrain, natural drainage is possible except for some areas. Annual precipitation can be called semi-arid land at about 600 mm. Rainfall is concentrated in the monsoon season from July to September, accounting for about 70% of the total rainfall. Generally, since the drainage capacity of roads in the city area is low, inundation occurs even in not so heavy rainfall. It is about 20 cm in depth in many areas (vehicles are passable) and lasts for about 2 hours. However, in lowland area it will last for about 8 to 48 hours forming a pond in the monsoon season. In recent years, daily rainfall of over 100mm has been recorded. As a result, the area becomes inundated for a long time, so that some mitigation measures will need to be considered for equipment planning. In addition, it is important to note that the monsoon period shall be avoided for the installation of pumping equipment in the disposal stations.

3) Policy for Socio-Economic Conditions

The planning target of The Master Planning is up to 2040. Under this target year, the F/S report indicates the annual population growth rate of Gujranwala. It is estimated at 2.9% from 2010 to 2020, and 2.6% from 2020 to 2040. Consequently, these rates shall be taken into account for reference only and not be used for planning.

4) Environmental and Social Considerations

The project site is limited to the area under the jurisdiction of WASA. There is no element to generate social friction such as land acquisition, house replacement or resettlement for the implementation of this project. However, the disposal site for sludge and dredged materials will need to be carefully considered for the project. In this regard, WASA plans to use solid waste disposal site of the city, which is actually under the control of the District Office. For use, it is necessary to obtain a formal agreement with the District Office or City Government.

To know the fact that liquid waste is generated every day, the disposal stations are constantly playing an important role as a prerequisite urban infrastructure. Therefore, special care will need to be taken for the installation or replacement of drainage pumps without complete stop of wastewater discharge.

5) Policy for Equipment Procurement

It is envisaged that equipment procurement will be divided into two lots. Lot one is to procure pumping equipment including its installation works in the disposal stations and all generators, and will be conducted by general competitive bidding for Japanese pump manufacturers, and another lot is to procure cleaning/de-silting equipment through the same bidding system for Japanese trading firms or manufacturers. All generators, regardless of whether or not the installation is included, shall be procured as the pumping equipment. All bidders shall be required to establish after-sale service system.

Basically, equipment shall be selected from Japanese-made products. Japanese-made products include equipment/machinery produced in third countries by a Japanese corporation with more than 50% shareholdings and under Japanese quality control system.

However, should the number of manufacturers be limited to only one for a certain equipment, procurement from a third country shall be accepted on condition that the quality of product is equal to or more than the Japanese-made product.

6) Policy for the Practical Use of Local Engineer/Company

If the local engineer or company will carry out mechanical and electrical works in the disposal stations, a Japanese engineer shall be dispatched from the pump manufacturer to supervise installation works.

7) Policy for Operation and Maintenance

WASA is planning to create a sewerage section by reorganizing the two existing engineering sections and staff members will be arranged to engage in the management and operation of sewerage facilities. Therefore, the sewerage section will be responsible for the operation and maintenance of all cleaning/de-silting equipment. In the meantime, each branch office headed by a Deputy Director or Assistant Director will be in charge of daily operation and maintenance of the disposal stations.

WASA has no repair shop for the maintenance of equipment, so that the outsourcing system is employed when major failure occurs. In this regard, a local repair company is selected through bidding. This system will remain unchanged. However, after-sale service should be locally available for the establishment of sustainable operation and maintenance system. Furthermore, technical specifications of the existing equipment and management capacity of WASA shall be taken into account for the selection of pumps.

8) Policy for Equipment Planning

WASA's manpower management system and capacity should be definitely taken into consideration for determining equipment plan, and equipment should be carefully selected in order that WASA will be able to make proper management and maintenance by itself. Basically, technical specifications of the

equipment will have no noticeable difference from those of the existing equipment owned by WASA and therefore, should be easily acceptable by the local personnel.

Quality of the drainage pumping system should be the same as in Japan, considering the natural conditions of the project area, which is high-temperature and humidity. Design standard of the equipment should be selected from ISO, JIS, JEC, or JEM. With reference to the pump materials, impeller, shaft, casing liner and sleeve should be of stainless steel with high resistance to corrosion. Switchgear should be of self-standing and dust-proof type.

As for cleaning/de-silting equipment, it is necessary to consider road width and environment for determining the scale and grade. Cleaning/de-silting equipment will be selected from the viewpoint of safety and work efficiency as it will be used in combination with transportation equipment and human power according to diameter of sewer pipes and drains. Further details on the use of equipment are discussed below.

a) Water-Jet Cleaner

Water jet cleaners shall be suitable for cleaning/de-silting small diameter pipes (6 to 15 inches). WASA owns 5 units of this machine (2 of them are under repair) which are of approximately 50 kg/cm^2 as discharge pressure. Although each machine is mobilized for 4 to 5 days a week, the work is not making much progress due to the lack of water pressure. Since Japanese-made water-jet cleaners are designed to give 200 kg/cm^2 as the maximum water pressure, which is 3 to 4 times as much as WASA's machine, it has been decided as the most appropriate equipment for cleaning small-scale sewers.

However, small diameter pipes and conduits are predominant in WASA's service area. Therefore, the new jet cleaner could be equipped with the same tank capacity (approximately 4.0m3) as the existing one, but shall be able to go through the narrow streets, because cleaning work within a specified period could not be completed with the existing jet cleaners.

b) Suction Machine

Generally, a suction machine is mobilized to work together with the water jet cleaner, so that this machine will be frequently used. Usually, the water jet cleaner is used to crush the obstructing solid sludge with water pressure, and then the liquefied sludge is sucked by the suction machine and immediately discharged to the attached tank. Basically, this method is environmental-friendly because the road can be kept clean without being polluted by removed materials and wastewater and no stench is generated as a nuisance to the residents. In addition, the suction machine is available for cleaning concrete drains since it will be used for sucking sediment or sludge after removing floating materials manually. The proposed machine shall be equipped with almost the same tank capacity as the existing one ($4.0m^3$) because it will be mobilized as a combined equipment for the water jet cleaner which is capable of working in narrow streets.

c) Clamshell

Open drains crossing bridges are usually narrow, and these parts tend to gather refuse or garbage easily and consequently obstructing the flow. To improve the gravity flow, the clamshell is the appropriate equipment to remove such floating materials. Considering the narrow roads along the open drains of generally 7 m in width, it is desirable that the clamshell should be medium-sized wheel type rather than the crawler type. Bucket capacity should be $0.3m^3$ to $0.4m^3$ and attachable to the wheel type clamshell.

d) Excavator

WASA owns two (2) units of wheel type excavators (one small and one large) mainly used for the construction and/or repair of water supply pipe, and practically it is not used for cleaning/de-silting drains. The excavator is expected to improve the flow capacity by removing sludge or sediment from the open drains. This machine should be medium-sized wheel-type for the same reason as mentioned for Clamshell. Bucket capacity should be approximately $0.45m^3$ and attachable to the machine.

e) Dump Truck

Dump Truck is an important item to convey sludge, sediment and garbage removed from sewer pipes and drains to the waste disposal site. For cleaning wide-open drains, 4t-class dump trucks will be deployed as a combined equipment for clamshell or excavator with the aim of improving work efficiency. For cleaning narrow drains or conduits, 2t-class dump trucks will be mobilized to transport floating materials to the disposal site after being removed manually. Such small size dump trucks will be used also for transporting sludge raked out by winch machine.

f) Pickup Truck

Currently, the traction type of dewatering pump is pulled by Rickshaw, which is commonly used as public transportation for the residents. However, it will be hardly practicable to tow the proposed dewatering pumps due to their heavy weight and may be inappropriate for emergency use during flooding of roads. From the above considerations, pickup truck is required to pull the traction type of dewatering pump. The truck should be small size vehicle with enough capacity for towing pump.

g) Safety Equipment

The safety equipment will definitely provide better working conditions for cleaning drains and sewers. Therefore, it will be necessary to prepare the minimum required equipment or tools such as waterproof plug, gas detector, ladder, ventilator, rubber boots (waist-high waders) and so on.

h) Traction type Dewatering Pump (Small Size)

The existing sewers in the city are full of water in almost all conditions in daytime, and in some areas, there may be more water discharging into sewer pipes than the flow capacity, which may cause overflowing of liquid waste from manholes, from which residents' complaints arise. The purpose of the traction type of dewatering pump is to take excessive water from trouble-making sewer route and discharge it to another drain route using the manhole. This pump will also be used for temporary drainage at narrow drains and conduits as well as for the drainage of road inundation. The capacity of this equipment shall be equal to or more than the existing one (18.5kW), and it should be designed to be pulled by pickup truck for the mobilization.

i) Winch Machine

So far, WASA has no practical experience to work with winch machines (2 winches + 1 bucket). However, in Lahore, winch machines are used for cleaning/de-silting 18 to 24 inches of sewer pipes. Cleaning work is carried out in such a way that an engine-driven winch is installed at opposite manholes and wire with bucket is introduced into the sewer pipe through the manhole to scrape out the deposited sludge and garbage. The operation will be carried out with manual labor so that it does not consume much fuel and hence considered as an appropriate technology with locally available operation system. The grade and scale of this equipment will be based on the winch machine, which is actually being used in Lahore.

j) Traction Type Dewatering Pump (large size)

WASA owns one vehicle-mounted engine-driven drainage pump for emergency use in the disposal stations during power outage and breakdown of disposal pumps. However, it does not have enough capacity and not a self-priming type. Power generation facility will be installed at the disposal station under this project to make sure that half or more number in total pumps will be operated in case of power outage. However, if unpredictable problems occur due to the lack of drainage capacity, this equipment will be mobilized for emergency use. In addition, this pump could also be used for drainage when a road is inundated for a long time.

Based on the policy mentioned above, the present conditions and measures to be taken under the project (equipment procurement) are as summarized in Figure 2-2.

9) Policy for Implementation Schedule

The work schedule until the completion of the project contains designing, manufacturing, transportation to the site of procured equipment, and installation work and taking-over of the pump equipment

installed in the disposal station. The period required for the preparation of tender documents up to the selection of the Contractor through tendering will be 6 months after the conclusion of Exchange of Notes. With regard to the scheduled period from the time of signing contract with the Contractor to handover of the equipment at site will be 13 months for cleaning/de-silting equipment (Lot 1) and 21 months for pumps (Lot 2).

In case that equipment is to be transported from Karachi by land, transportation during the monsoon season from July to September shall be avoided because of possibility of troubles by flooding. Moreover, since the inflow to disposal stations increases in this period, it will be difficult to stop the operation of existing pumps, so that work efficiency should be taken into consideration for the preparation of work schedule to fit such rainy conditions.

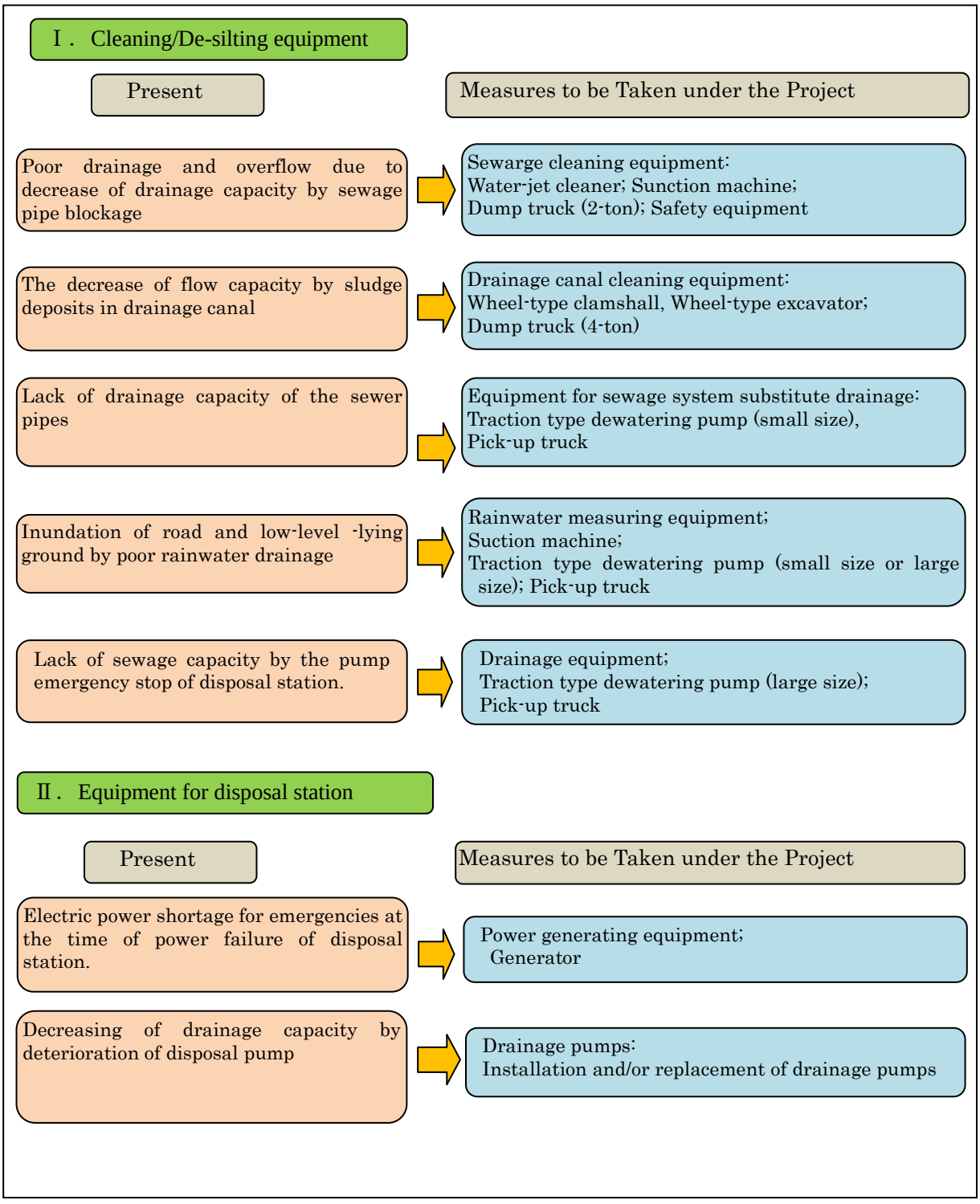


Figure 2-2 Present Conditions and Measures to be Taken under the Project

2-2-2 Basic Plan (Equipment Plan)

2-2-2-1 Overall Plan

1) Classification of Equipment According to the Usage

Based on the situation discussed above, the necessary equipment is classified according to the use as listed in Table 2-5.

Table 2-5 Classification of Equipment According to the Usage

Category	Equipment	Use
Common Equipment (Cleaning, rainwater sewage)	Water jet cleaner	Cleaning of sewage pipe
	Suction machine	Cleaning of sewage pipe/Unlined canal, Inundation countermeasure
	Clamshell (Wheel-Type)	Cleaning of unlined canal (Removal of flotage)
	Excavator (Wheel-Type)	Cleaning of unlined canal (Excavation of sludge)
	Dump Truck (Middle Size)	Cleaning of Sewage Pipe
	Dump Truck (Small Size)	Cleaning of Sewage Pipe and Culvert
	Pickup Truck	Carry sewage pump, equipment and labor
	Safety Equipment	Cleaning of sewage pipe
	Traction Type Dewatering Pump (Small Size)	Adjustment of water flow in sewage pipe and inundation countermeasure
	Winch Machine	Cleaning of sewage pipe
	Traction Type Dewatering Pump (Large Size)	Countermeasure for lack of pumping system capacity and inundation
	Power Generation Facility	Emergency power generation
Sewage Pumping System	Sewage Pump	Sewage drainage
	Power Generation Facility	Emergency power generation

2) Storage and Management

WASA currently possesses five (5) equipment yards. The yard called “People Colony”, which is the largest among the 5 yards (60m×140m), has been selected as the equipment yard for this project. People Colony has good accessibility from main roads and is well situated in the area. Therefore, it will be used not only as parking space with garage and storage for spare parts but also as workshop for the maintenance and management of equipment. This site is surrounded by fence and an elevated tank located at the center of the area. Part of the plot is currently used as storage but most of the area is unused.

3) Condition of Disposal Stations

All disposal stations are located on flat land with good accessibility and electricity. There is a vacant space for the construction of new pump next to the existing pump in the disposal station. There are no cranes, so that it is necessary to use a temporary lifting device to install the new equipment. WASA will be responsible for laying necessary pipes in case there are no discharge pipes from the new pump room. Suction pipes for new sewage pumping system have been laid out and sewerage flow has been examined, although the valve was not fully opened.

2-2-2-2 Disposal Station

1) Requests and Basic Plan

Table 2-6 shows the overall analysis results of drainage capacity of existing disposal stations. WASA’s request and priority ranks have been confirmed during the site survey.

- WASA’s request is put on high priority aiming to improve the existing disposal stations.
- Expansion of disposal station building is out of scope for the project.
- Target Coverage Rate (Pump Discharge Capacity / Inflow of Existing Sewer) is 150%.
- Vacant space is available for new pump installation.
- Deterioration rate is determined by site survey and installation year.
- Maximum velocity of suction pipe is to be 4m/sec as the design flow of pumps

Table 2-6 Comparison of WASA's Request and Basic Plan

Station Name	Inflow of Existing Sewer (cusec)	Existing Disposal Station			Request				Basic Plan		
		Operating Pump (cusec)	Total Discharge Flow (cusec)	Cover Rate (%)	Requested Pumps	Priority	Total Discharge Flow (cusec)	Cover Rate (%)	Proposed Pumps	Total Discharge Flow (cusec)	Cover Rate (%)
①Alam Chowk Room No. 2	20	10×2sets	20	100	10×1set Addition	8	30	150	10×1set Addition	30	150
②Khayali Room No. 1	40	10×1set 15×1set	65	163	25×1set Replace	10	85	213	20×1set Replace	70	175
Khayali Room Room No. 2		10×2sets			No request				N/A		
Khayali Room No. 3		10×2sets			10×1set Addition	3			No addition		
③Nowshera Sansi	52	10×4sets	40	77	10×4sets Replace	2	40	77	10×4sets Replace	40	77
④People Colony Room No. 1	71	10×4sets	90	127	No request		125	176	N/A	110	155
People Colony Room No. 2		10×4sets			10×1set Addition	11			No addition		
People Colony Room No. 3		10×1set			25×1set Addition	4			10×2set Addition		
⑤PMU Room No. 1	42	10×2sets	40	95	10×1set Addition	5	50	119	10×1set Addition	50	119
PMU Room No. 2		10×2sets			No request				N/A		
⑥Rajkot Room No. 1	115	10×4sets	75	65	No request		120	104	N/A	95	83
Rajkot Room No. 2		15×1set 10×1set			25×2sets Replace	9			15×1set Replace		
Rajkot Room No. 3		10×1set			10×2sets Addition	1			10×2sets Addition		
⑦Samanabad	40	10×1set	10	25	10×1set Addition	7	20	50	10×1set Addition	20	50
⑧Mughalpura	4.5	Break-down	0	0	5×1 set Replace	6	5	111	4×1set Replace	4	89

Note: Flow unit, 1cusec (ft^3/sec)≒ 1.7m^3/min

2) Justification for the Determination of Basic Plan

Table 2-7 shows justifications for the determination of basic plan, and as a conclusion, the basic plan for the proposed disposal stations is as illustrated in Figure 2-3.

Table 2-7 Justification for the Determination of Basic Plan

Name of Station	Justifications
①Alam Chowk No. 2	There is a space for one additional pump of 10cusec. The coverage rate after extension is improved to 150%.
②Khayali	Since the present coverage rate is as high as 175%, there is no necessity for extension of one 10cusec pump as requested. However, 15cusec pump in Pump Room No. 1 is preferred to be replaced because of remarkable superannuated pumps (the construction year is unknown). However, since the diameter of the existing suction pipe is 450 mm, it shall be replaced with 20cusec instead of 25cusec requested by WASA.
③Nowshera Sansi	Four sets of the existing pumps were installed in 1999, and since superannuation of facilities is remarkable, all the pumps are to be replaced according to WASA's request. Although the present coverage rate is as low as 77%, it is impossible to install new pumps because there is no extension space.
④People Colony	The extension of 25cusec pump required by WASA is difficult because there is no suction pipe of 500 mm diameter for corresponding to 25cusec flow capacity. Although the present coverage rate is as high as 127%, two 10cusec pumps are expanded in the free space of Pump Room No. 3 because the four existing pumps installed in 2004 are remarkably in unfavorable conditions due to noise and vibration. However, these pumps operation will continue after improvement. The coverage rate after extension is improved to 155%.
⑤PMU	There is a space for extension of one 10cusec requested by WASA. After extension, the coverage rate is improved 119%.
⑥Rajkot	There is no suction pipe for the 25cusec pump required, but since there is one 400mm suction pipe, it is possible to install one 15cusec pump instead of 25cusec. Furthermore, the extension of two 10cusec pumps is planned in Pump Room No. 3 in accordance with WASA's request. Although the cover rate improved is as low as 83%, it is impossible to improve beyond this rate because of no extension space. (The pump room constructed in 1975 cannot be used. Moreover, it is impossible to install a new pump in Pump Room No. 3 because the space is blocked out by the existing stairs.)
⑦Samanabad	One 10cusec pump is extended in accordance with WASA's request, and the cover rate is improved to 50% in consequence. Although the improved coverage rate is as low as 50%, the quantity of sewer that flows into the disposal station is expected to be low at present because most of the sewage is flowing into the Rajkot station positioned at lower level than Samanabad. Therefore, 50% is a sufficient coverage rate at present. In the future, it is necessary to extend.
⑧Mughalpura	Although WASA's request is 5cusec, one 4cusec pump instead of the broken 5cusec pump is replaced. Since the size of existing suction pipe is 200mm, it is impossible to select 5cusec pump because the velocity inside suction pipe is very high (4.5m/s). There is no extension space. It is impossible to improve to 100% of cover rate.

3) Specifications of Equipment at each Disposal Station

Table 2-8 shows the specifications of equipment at each disposal station.

Table 2-8 Specifications of Equipment at Each Disposal Station

No.	Equipment	Specifications
1	Pump	Vertical, mixed flow volute pump (2-floor type)
2	Motor	Vertical, totally enclosed, squirrel cage type, induction motor 380V, 50Hz, F class Insulation, B-rise, IP54
3	Suction Valve	Hand operated, rising stem type, sluice gate valve
4	Discharge Valve	Hand operated, rising stem type, sluice gate valve
5	Check Valve	Non- slam type, swing check valve
6	Pipes	Epoxy painted steel pipe
7	Low Voltage Switchgear	Incoming panel and motor starter panel
8	Cable Materials	Cable materials, conduit pipes, and cable clamp materials for low voltage
9	Diesel Generator Unit	Radiator-cooling, diesel engine generator with weatherproof steel bonnet, cell motor starter and hand operated switching panel

Note: Not all disposal pump stations are supplied with generator unit. Details are shown in 4) Diesel Generator Unit.

Existing Pump | Replacement | New Pump | Space for New

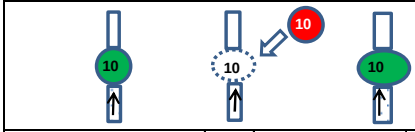
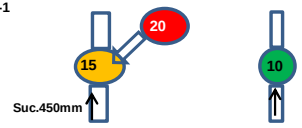
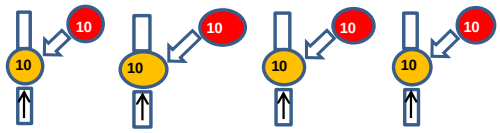
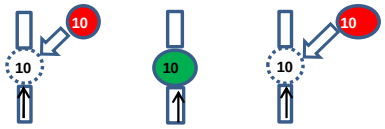
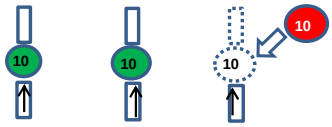
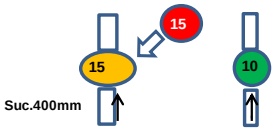
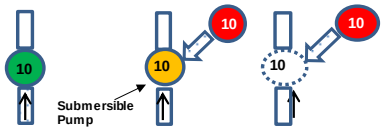
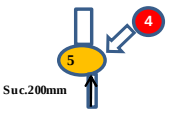
Disposal Station Name	Request Q'ty	Request Flow (cusec)	Basic Plan Q'ty	Basic Plan Flow (cusec)	Remarks
① Alam Chowk No.2	1	10	1	10	• One pump to be expanded. • 200kVA substation to be constructed for new pump by Pakistani side. • 200kVA generator to be supplied and installed by Japanese side.
					
② Khayali	1	10	0		• One pump to be replaced.
	1	25	1	20	
Room-1 					
③ Nowshera Sansi	4	10	4	10	• Four pumps to be replaced.
					
④ People Colony	1	10	2	10	• Two pumps to be expanded. • 200kVA substation to be constructed for new pumps by Pakistani side. • 200kVA generator to be supplied and installed by Japanese side.
	1	25	0		
Room-3 					
⑤ PMU	1	10	1	10	• One pump to be expanded. • One discharge pipeline (300mm) to be constructed by Pakistani side. • 200kVA substation to be constructed for new pump by Pakistani side. • 200kVA generator to be supplied and installed by Japanese side.
Room No.1 					
⑥ Rajkot	2	25	1	15	• One pump to be replaced. • 200kVA substation to be constructed for new pump by Pakistani side.
	2	10	2	10	
Room-2 					
Room-3 					• One addition and one replacement • 200kVA generator to be supplied and installed by Japanese side.
⑦ Samanabad	1	10	1	10	• One pump expanded.. • One discharge pipeline (300mm) to be constructed by Pakistan side. • 150kVA generator to be supplied and installed by Japanese side.
					
⑧ Mughalpura	1	5	1	4	• One pump to be replaced. • 100kVA generator to be supplied and installed by Japanese side.
					

Figure 2-3 Basic Plan for the Proposed Disposal Stations

4) Diesel Generator Unit

Table 2-9 shows the necessary capacity of diesel generator to operate the motors.

Table 2-9 Calculation Result of Generator Capacity

Motor Rating	Quantity to be operated	Necessary Generator Capacity
37kW	1 set	100kVA
65kW/75kW	1 set	150kVA
65kW/75kW	2 sets	200kVA

a) Diesel Generator Unit (Without Installation)

Table 2-10 shows comparisons of WASA's request and the proposed basic plan.

The cover rate by the new generators that operate motors is improved to 50% or more.

Table 2-10 WASA's Request and Basic Plan of Diesel Generator Unit

Station Name	Existing		WASA's Request		Basic Plan		Cover rate of Diesel Generator = **(B) / (A)**
	(A) Quantity of Motor	Quantity of Generator	Motor to be operated by generator	Quantity of Generator	**(B)** Motors Operated	Capacity of Generator	
Abu Bakar Park	75kW×2	0	75kW×1	150kVA	75kW×1	150kVA	50%
Garjakh	75kW×2	0	75kW×1	150kVA	75kW×1	150kVA	50%
Jinnah Road Under Pass	22kW**x**1 37kW×1	0	37kW×1	100kVA	37kW×1	100kVA	50%
Kashmir Colony	37kW×2	0	37kW×1	100kVA	37kW×1	100kVA	50%
Khayali Pump Room No.2 and New room	75kWx4	0	75kW×2	300kVA	75kW×2	200kVA	50%
Model Town	37kW×1	0	37kW×1	100kVA	37kW×1	100kVA	100%
Nowshera Road	75kW×3	0	75kW×2	300kVA	75kW×2	200kVA	66%
Zahid Colony	15kW x1 37kW×1	0	37kW×1	100kVA	37kW×1	100kVA	50%

Note: Cover rate of diesel generator means the number of motors that are operable by the generator divided by the total number of motors.

b) Diesel Generator Unit (With Installation)

The cover ratio of diesel generators is improved to more than 50% as shown in Table 2-11.

In People Colony disposal station, four (4) sets in eight (8) pump sets in the station can be operated by existing diesel generator unit and new and the drainage cover rate is as high as 155% as shown in Table 2-6. Therefore, a new diesel generator is not planned for Pump Room No. 2.

Table 2-11 WASA's Request and Basic Plan of Diesel Generator (With Installation)

Station Name	Existing		(A) Total Quantity after Improvement	WASA's Request		Basic Plan		Cover Rate by Generator = (B) / (A)	Increased flow rate by new generators (cusec)
	Quantity of Motor	Quantity of Generator		Motor to be Operated	Capacity of Generator	(B) Motor to be Operated	Required Generator		
①Alam Chowk No. 2	75kW×2	0	75kWx3	75kW×1	150kVA	75kW×2	200kVAx1	66%	20
②Khayali Room No. 1	75kWx1 100kWx1	200kVAx1	75kWx1 132kWx1	N/A	N/A	N/A	N/A	(50%)	
③Nowshera Sansi	75kWx4	300kVAx1	65kWx4	65kW×2	300kVA	N/A	N/A	(50%)	
④People Colony Room No. 1	75kWx4	300kVAx1	-	N/A	N/A	N/A	N/A	(50%)	20
People Colony Room No. 2	75kW×3	0	-	N/A	N/A	N/A	N/A	0%	
People Colony Room No. 3	75kWx1	0	65kWx2 75kWx1	65kWx2	300kVA	65kW×2	200kVAx1	66%	
⑤PMU Room No. 1	75kWx2	0	75kWx2 65kWx1	75kW×2	300kVA	75kW×2	200kVAx1	66%	20
PMU Room No. 2	75kWx2	300kVAx1	-	N/A	N/A	N/A	N/A	(100%)	
⑥Rajkot Room No. 1	75kWx4	300kVAx1	-	N/A	N/A	N/A	N/A	(50%)	20
Rajkot Room No. 2	75kWx1 100kWx1	300kVAx1	75kWx1 100kWx1	75kWx1 100kWx1	300kVA	N/A	N/A	(100%)	
Rajkot Room No. 3	75kW×1	0	75kWx1 65kWx2	75kW×2	300kVA	65kW×2	200kVAx1	66%	
⑦Samanabad	75kWx1	0	75kWx1 65kWx1	75kW×1	150kVA	65kW×1	150kVAx1	50%	10
⑧Mughalpura	37kW	0	37kWx1	37kW×1	100kVA	37kW×1	100kVAx1	100%	4

Notes: (1) Cover rate of generator means the ratio of quantity of motor that can be operated by the generator.
(2) Since the new generator will not be installed, the cover rate with ( ) means the present rate.

5) Spare Parts for Equipment

There is no workshop in WASA at present. Only easy maintenance work is possible. Repair companies in Lahore undertake servicing according to WASA's request in case of breakdown. Therefore, spare parts and consumable parts are classified as follows. The spare parts and consumable parts are procured for 2-year operation period.

a) Consumable Parts for the Maintenance of Equipment

Table 2-12 shows the consumable parts for maintenance work.

Table 2-12 Consumable Parts for Maintenance Work

Part Name	Quantity
Gland packing	3 sets per each pump
Consumable parts for intermediate shaft couplings	1 set per each coupling
Fuses and lamps, etc. for switchgear	1 set for 2 years
Bolts, nuts and gaskets for pipe and pumps	5% of all
Consumable parts for diesel generator	1 set for 2 years

b) Spare Parts Required for the Maintenance Work at Repair Shop

For repair work in a repair shop, WASA needs to keep spare parts in order to avoid inferior quality parts and/or to save delivery time from manufactures for emergency use.

Table 2-13 Spare Parts Required at Repair Shop

Name of Part	Quantity of Part
Pump Impeller	1set for each pump
Casing Liner	1set for each pump
Pump Sleeve	1set for each pump
Rotating part (Shaft, impeller, sleeve, intermediate shaft coupling, etc.)	1set for each disposal station
Bearings for pump and motor	1set for each pump 1set for each motor

2-2-2-3 Cleaning/De-silting Equipment

The equipment except those to be procured for disposal stations is categorized as cleaning and other equipment, which does not require installation works. Items are divided into the sewer cleaning plan, drainage canal cleaning plan and other equipment plans, and examined for the scope of required equipment each.

1) Cleaning Plan for Sewer Pipes

a) Basic Conditions

Basic conditions of cleaning plan for sewage system are as shown below:

1. Initial Duration for Cleaning
   Based on the request of WASA, 3 years after the supply of equipment, that means cleaning will be completed in 2019.
2. Target Culvert for Cleaning
   All culverts under the beltway.
3. Method of Cleaning in Each Diameter.
   (Lahore - WASA Type) ・Less than 15 inch and 27 to 33 inch: Water jet cleaner
   ・18 to 24 inch : Winch machine
   ・More than 36 inch : Human power
4. Solid Deposit Ratio
   According to the field survey conducted at 100 locations, there is no trend of sediment thickness due to pipe diameter (Pipe sedimentation rate). The average percentage in field survey was 38%. Therefore, 40% will be applied for the project.
5. Annual Work Operation Days
   365days/ 1.35-(30-4)/2=257 days
   (1.35: JICA Design and Estimation Manual)
   (It is assumed that manpower capacity will be reduced to 50 % during Ramadan).

b) Result of Planning

Sewage cleaning plan is determined on the conditions shown above and standard work rates for sewage pipes by diameter according to the “Guideline of Sewage Maintenance and Management 2011’’ in Japan. Generally, high pressure water jet cleaner is mobilized to work together with the water truck and suction machine. However, as water trucks are not available in WASA, the possible work rate is calculated at 40% less than the standards of Japan. In addition, if the capacity of the water jet cleaner is low, possible work rate is further reduced to 20% or less. From the above considerations, the possible work rates of the brand new equipment (water jet cleaner) and existing one are set at 60% and 40% of the Japanese standards.

The sewerage cleaning plan is shown in Table 2-14. The cleaning work will be completed within 3 years after the supply of equipment to WASA. The number of equipment presents the required number of units of cleaning equipment /machinery in bold letters.

Table 2-14 Cleaning Plan for Sewer Pipe/Culvert

Diameter		Cleaning Equipment	Length of Sewage Pipe (m)		Diameter in Each Equipment (mm)		Number of Equipment	Possible Work Rate (m)		Duration	
inch	mm		Each Diameter	Each Equipment	Each Diameter	Each Equipment		Per unit	Total	day	Year
6	152	**Water Jet Cleaner (Small)** + Suction Machine (Small)	7,392	207,102	318	300	2※	74	370	560	2.2
9	229		31,173								
12	305		100,320				2	111			
15	381		68,217								
18	457	**Winch Machine** + Dump Truck (Small)	52,872	133,483	526	500	7 pairs	34	238	561	2.2
21	533		46,191								
24	610		34,420								
27	686	**Water Jet Cleaner (Large)** + Suction Machine (Small)	15,560	42,465	735	700	3※	20	60	708	2.8
30	762		26,905								
33	838		0								
36	914	Human Power + **Suction Machine (Large)**	19,109	68,407	1,189	1,200	3※	24	72	950	3.7
42	1,067		10,924								
48	1,219		19,650								
54	1,372		9,984								
60	1,524		8,740								

* Existing Equipment

Dump track (small) for cleaning 18 to 24 inches pipes is used for the transportation of removed sludge.

Suction machines (small) for cleaning 27 to 33 inches sewer pipes will be mobilized from the existing equipment used for the cleaning of drains in daytime.

2) Cleaning Plan for Drains

a) Basic Conditions

Basic conditions of cleaning plan for drains are shown below.

1. Initial Duration for Cleaning Work
   3 years after the supply of equipment to WASA, i.e. the cleaning will be completed in 2019.
2. Targeted drain for cleaning
   Main drainage in the bypass road.
3. Cleaning Method for Targeted Drain:
   - For unlined drain, excavated by excavator and gather soil by dump truck (small or middle size). Floating materials in drain are scooped by clamshell and gathered by dump truck (small Size).
   - For concrete drain, shutdown the target zone by sandbag, scoop floating materials by human power and carry by dump truck. The garbage will be gathered by dump truck and soil deposits will be gathered by suction machine.

4. Amount of Deposit:
Figure 2-4 shows the cross section of the drain. Sludge with soil settles at the bottom of the drain. Unlined drains need over-breakage as shown in the same figure.

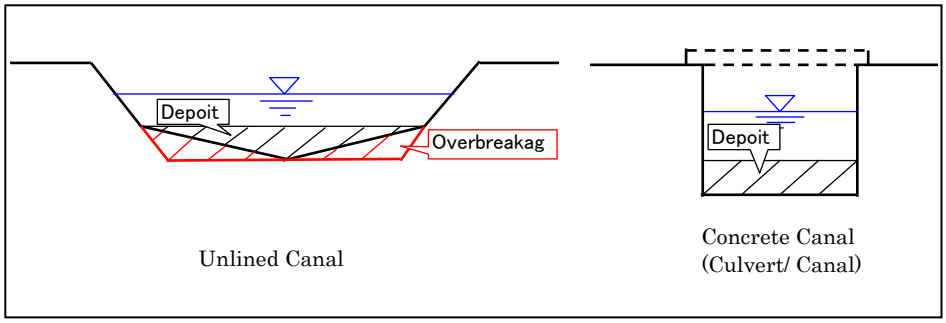


Figure 2-4 Cross-Section of the Typical Drain

Table 2-15 shows an outline of a sewage drain and Table 2-16 shows the amount of sediment calculated for each drain. The total amount of sediment at unlined drain (6.5km) is 23,747m^3 and for the concrete drain (16.4km), it is 8,544m^3.

5. Annual Working Days

No work is planned during monsoon season because water levels will rise.

9 months × 25 days/month = 225 days

Table 2-15 Outline of Existing Drains

	Name of Drain	Location	Sewage Type	Structural Type	Distance (km)	Gradient	General Size (m)	
							Width	Depth
A	Qila Main Singh Minor	Upper	Canal	Unlined	5.5	1/2200	6.5/5.0	1.2
		Lower	Culvert	Concrete	1.8	1/900	2.0	1.5
B	Mir Shikaran Drain	Upper	Culvert	Concrete	5.5	1/1800	1.4	1.5
		Lower	Canal	Concrete	3.1	1/1800	1.5	1.5
C	Gujranwala Main Drain	Upper	Culvert	Concrete	1.6	1/1200	1.9	1.9
		Middle (Upper)	Canal	Concrete	0.9	1/1200	1.9	2.4
		Middle (Lower)	Canal	Unlined	0.7	1/1200	10.0/5.0	1.9
		Lower	Canal	Concrete	2.0	1/1600	2.4	2.5
	Ditto (Branch Drain)	Upper (Upper)	Canal	Concrete	0.4	1/500	1.5	1.5
		Upper (Lower)	Culvert	Concrete	0.5	1/500	1.4	1.4
		Middle	Canal	Concrete	0.6	1/500	1.8	2.2
		Lower	Canal	Unlined	0.3	1/500	7.0/3.0	1.6

Note: The width of unlined canal is upper width / bottom width.

Table 2-16 Estimated Amount of Sediment in Drains

	Name of Drain	Location	Sewage Type	Structural Type	Distance(km)	Amount of Deposit (m^3)	Remarks
A	Qila Main Singh Minor	Upper	Canal	Unlined	5.5	19,989	Include over-breakage
		Lower	Culvert	Concrete	1.8	865	
B	Mir Shikaran Drain	Upper	Culvert	Concrete	5.5	2,626	
		Lower	Canal	Concrete	3.1	910	
C	Gujranwala Main Drain	Upper	Culvert	Concrete	1.6	942	
		Middle (Upper)	Canal	Concrete	0.9	613	
		Middle (Lower)	Canal	Unlined	0.7	3,556	Include over-breakage
		Lower	Canal	Concrete	2.0	1,746	
	Ditto (Branch Drain	Upper (Upper)	Canal	Concrete	0.4	170	
		Upper (Lower)	Culvert	Concrete	0.5	210	
		Middle	Canal	Concrete	0.6	462	Include over-breakage
		Lower	Canal	Unlined	0.3	202	

b) Result of Planning

The cleaning plan for drains depends on the conditions shown above and the standard work rates in accordance with the "Manual of Unit Price in Standard Construction (Japan)" and the "Manual of Maintenance and Estimation for Sewage Construction (Japan)". Daily work rates for equipment are shown below:

1. Wheel Type Excavator (Middle Size): $20m^3$/day

Equation: $Q = 3600 \times q \times f \times E / Cm$

$Q = q_0 \times K$

Q	Amount of deposit for excavation and pick up, per hour operation (Quantity of Natural Soil)	(m^3/hr)	4.0
q	Amount of deposit for excavation and pick up, per cycle operation (Quantity of Natural Soil)	(m^3)	0.34
q_0	Standard bucket capacity for flat pile (Quantity of Natural Soil)	(m^3)	0.35
K	Bucket coefficient		0.98
f	Bulking factor		1
E	Work efficiency (Include submerged excavation)		0.4
Cm	Necessary time per 1 cycle (Wheel-Type)	(sec)	120
T	Real operation time	(hr/ day)	5
Q'	Amount of deposit for excavation and pick up, per day (Quantity of Natural Soil)	(m^3/hr)	5

2. Dump Truck (Middle Size): $7.8m^3$/day

Dump Truck (Small Size): $3.6m^3$/day

Equation: $Q = 60 \times q \times f \times E / Cm$

$Cm = \beta x L + \alpha$

			4ton Truck	2ton Truck
Q:	Amount of deposit for excavation and pick up, per hour operation (Quantity of Natural Soil) m^3/hr	(m^3/hr)	1.3	0.6
γ:	Weight of Unit Volume (Solid)	(ton/m^3)	1.5	1.5
q:	Carrying Capacity	(m^3)	2.6	1.3
f	Bulking factor		1	1
E	Work efficiency		0.9	0.9
Cm	Necessary time per cycle	(min)	106	106
β	Coefficient of conveyance		4.8	4.8
L	Distance for conveyance	(km)	20	20
α	Coefficient for distance of carrying and other works	(min)	10	10
T	Real operation time	(hr/day)	6	6
Q'	Amount of deposit for excavation and pick up, per day (Quantity of Natural Soil)	(m^3/hr)	7.8	3.6

From the equation shown above, 2 middle size trucks and 1 small size dump truck will be required to operate 1 excavator.

3. Vacuum Truck (Small Size): 4.5m^3/day
   Equation: Q' = Q / n

Q	Capacity of Tank	(m^3)	4.5
t1	Duration for aspiration (Include the duration for human works)	(hr)	2
t2	Duration carrying per cycle (same as dump)	(hr)	2
t3	Duration per cycle (= t1+t2)	(hr)	4
T	Real operation time	(hr)	4
n	Number of Cycles per day (=T/t3)		1
Q'	Disposal volume per day	(m^3/day)	4.5

Note: The detour of drainage will be done before vacuum in the target area.

Table 2-17 shows the cleaning plan for drains that will be scheduled to complete in approximately 3 years. Equipment that affects the work rates is shown in bold letter.

Table 2-17 Cleaning Plan for Drains

Structural Type	Target Material	Equipment	Disposal Volume (m^3)	Possible Work Rate (m^3)		Necessary Duration	
			Total	1 group	Total	Day	Year
Unlined Drain	Deposited material	(**1 Middle Size Excavator** + 2 middle size dump truck + 1 small size dump truck) x 2 groups	23,747	20.0	40	594	2.6
	Flotage	(1 Middle Size Clamshell + 1 Small size dump truck) x 1 group	—	Start working before dredging after the monsoon season			
Concrete Drain	Deposited material	(**1 Vacuum Truck** + 1 Sewage pump) x 3 groups	8,544	4.5	14	610	2.7
	Garbage	(Human Power + Small size dump truck) x 3 groups	—	Start working before disposal of waste in 3 areas.			

3) Plan of Other Facilities

The basis of number of equipment described in the equipment plan (cleaning/rainwater sewage) is as follows.

a) Pickup Truck

One pickup truck is provided to each zone for emergency and inundation.

b) Safety Equipment

Safety equipment is provided in lump sum and distributed to each zone.

c) Traction/Suction Type Engine Sewage Pump (Small Size)

The equipment is to be used not only for sewage cleaning but also during low flow in the sewage system and inundation. In addition, 11 pumps out of 14 lower capacity pumps need renewal. Therefore, 4 pumps are to be installed in each zone, or 7 pumps in total will be available including the 3 existing pumps.

d) Traction/Suction Type Engine Sewage Pump (Large Size)

The equipment procured for each zone is to be used during breakdown of sewage pumping system or road inundation. The existing pump is kept as a reserve because it is not a suction type and its capacity is small.

4) Quantity and Specifications of Cleaning/de-silting Equipment

The specification and number of cleaning/de-silting equipment is shown in Table 2-18

Table 2-18 Required Number of Units and Specifications of Cleaning/De-silting Equipment

Equipment	Use	Necessary Number			Specifications	Remarks
		Total	Existing	New		
High-Pressure Washing Truck (Small Size)	Cleaning of sewage pipe	4	2	2	Capacity of Tank : more than 4.0m^3 Maximum Delivery Pressure: More than 200kg/cm^2	-Reference: : Table 2-14
High-Pressure Washing Truck (Large Size)	Cleaning of sewage pipe	3	3	0	-	-Reference: Table 2-14
Vacuum Truck (Small Size)	Cleaning of sewage pipe	7	3	4	Tank Capacity: More than 4.0m^3 Maximum Delivery Pressure: More than -0.93kg/cm^2	-Reference: Table 2-14 and Table 2-17 -Prepare 3 trucks for night work
	Cleaning of sewage canal/ culvert	(3)				
Vacuum Truck (Large Size)	Cleaning of sewage pipe	3	3	0	-	-Reference: Table2-14
Wheel Type Clamshell (Middle Size)	Cleaning of sewage canal	1	0	1	Capacity of Bucket: 0.3 to 0.4 m^3	-Reference: Table 2-17
Wheel Type Excavator (Middle Size)	Cleaning of sewage canal	2	0	2	Capacity of bucket: pileup 0.45 m^3	-Reference: Table 2-17
Dump Truck (Small Size)	Cleaning of Sewage Canal, sewage pipe and culvert	6	0	6	2 tons Truck: Prevent fly of Sludge	-Reference: Table 2-14 and Table 2-17
Dump Truck (Middle Size)	Cleaning of Sewage Canal	4	0	4	4 tons Truck: Prevent fly of Sludge	-Reference Table 2-17 -Carry the Sewage Pump (Large Size)
Pickup Truck	Carry Pump (Small Size) and labor	3	0	3	-Maximum Capacity : More than 1 ton -Maximum capacity of person :2 Driving: 4×2	1 Truck in each zone
Safety Equipment	Cleaning of Sewage pipe/ culvert	1	0	1	Equipment for Gas, Safety Equipment	Distribute to 3 areas
Traction/ Suction Type Engine Sewage Pump (Small Size)	Increase of Flow Capacity	21	9※	12	Pumping Capacity : 2cusec (3.4 m^3/min)	-3 pump will be used in ordinary time -Reference: Table 2-17
	Cleaning of Sewage Canal	(3)				
Winch Machine	Cleaning of Sewage pipe	7 pairs	0	7 pairs	Diameter 18", 21", 24" with bucket	-1 unit includes 2 trucks -Reference: Table 2-14
Traction/ Suction Type Engine Sewage Pump (Large Size))	During breakdown of pumping system	3	0	3	Pumping Capacity: 5.3cusec (9.2 m^3/min)	

Note: There are 20 units of existing pump (34HP: 3units, 25HP: 3units, 14HP-14units), but most of the 14HP (Total: 11 Units) will be renewed.

5) Plan of Parking Yard

In the Technical Notes agreed and signed between WASA and the JICA study team, out of five existing stations for equipment (Table 2-19), People Colony located in Zone I (refer to Figure 2-5) was selected as the cleaning/de-silting equipment yard. WASA is planning to construct a garage and storage facility for

spare parts at the common equipment yard. However, it is desirable to keep pick-up trucks, traction type dewatering pumps and safety equipment in each zone to make quick response in case of emergency, and it will lead to the prevention of massive loss of spare parts so these equipment will be stored in the respective stations or storage facilities. The layout plan will be proposed to WASA as a technical guidance service.

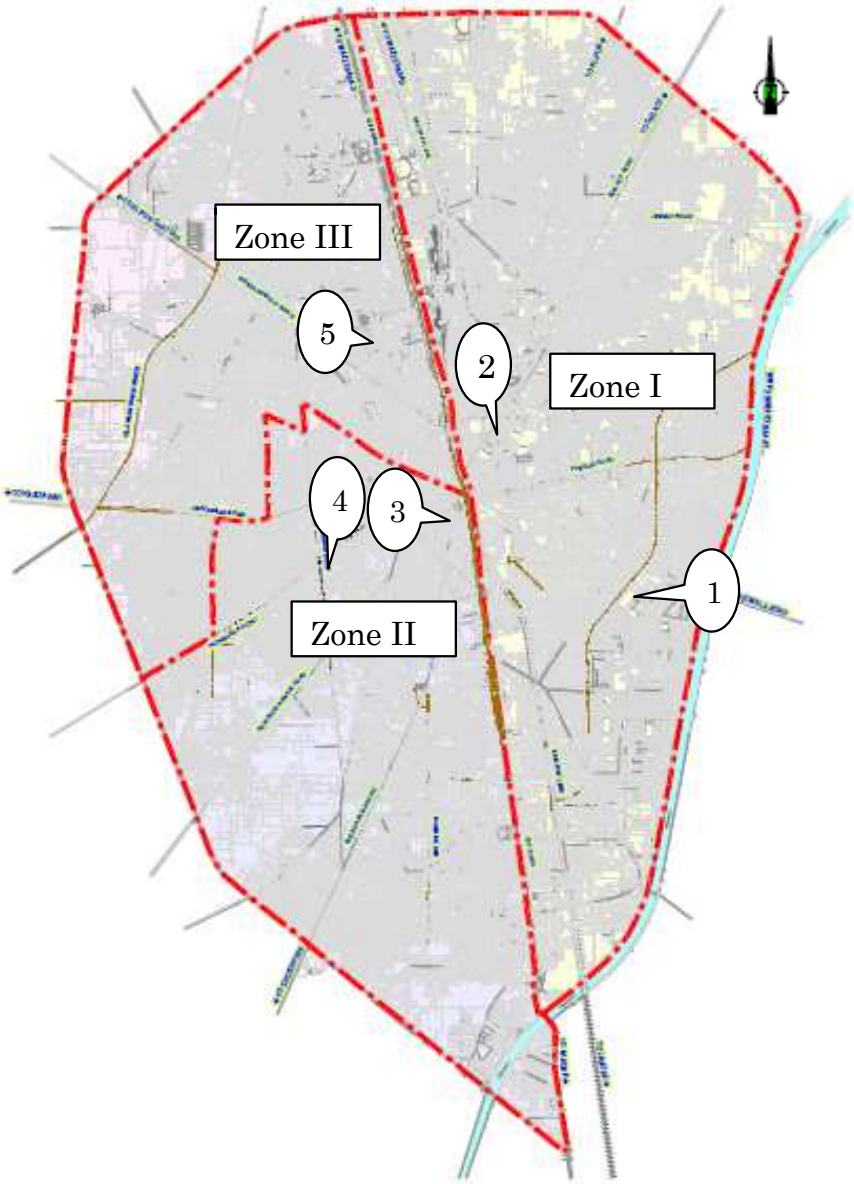


Figure 2-5 Location of WASA Parking Yards

Table 2-19 Existing Parking Yards for Equipment

Item No.	Zone	Location	Situation of Equipment Station		
			Size	Situation of Station	Use
1	I	People Colony	60m × 140m	Ground/Gravel	Recommended by WASA (Empty space)
2		Liagat Bagh OHR	35m × 40m	Ground	Existing Equipment Station
3	II	Sheranwala Bagh OHR	30m × 40m	Block paving	Existing Equipment Station
4		Nawshera Road OHR	40m × 95m	Ground	Existing Equipment Station
5	III	Model Town OHR	20m × 30m	Block paving	Existing Equipment Station

OHR: Elevated Tank

2-2-3 Outline of Design Drawings

The drawings with main dimensions of the equipment installed in the proposed disposal stations are attached to the Appendices of this report. Table 2-20 shows the list of drawings.

Table 2-20 List of Drawings

Drawing No.	Drawing Title
SAT-1001	Alam Chowk No. 2, Installation Drawing
SAT-1002	Khayali, Pump Room No. 1, Installation Drawing
SAT-1003	Nowshera Sansi, Installation Drawing
SAT-1004	People Colony, Pump Room No. 3, Installation Drawing
SAT-1005	PMU, Room No. 1, Installation Drawing
SAT-1006	Rajkot, Room No. 2, Installation Drawing
SAT-1007	Rajkot, Room No. 3, Installation Drawing
SAT-1008	Samanabad, Installation Drawing
SAT-1009	Mughal Pulra, Installation Drawing

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

1) Procurement Policy

The project will procure cleaning/de-silting equipment and equipment for disposal stations including generators. The cleaning/de-silting equipment shall be delivered to designated locations in Gujranwala to confirm their functions before they are handed over to WASA. Procurement of equipment for disposal stations requires a thorough quality and process control of inspection of site conditions, design, manufacturing, transport and installation of equipment. Further, the contractor(s) of disposal pump manufacture should conduct an operation check to assure qualities of equipment after installation. The procurement is divided into lots of cleaning/de-silting equipment and disposal pump station equipment including all generators.

The requirement of equipment procurement includes operational stability as well as availability of spare parts in Pakistan. In terms of vehicle and equipment, Japanese products are generally used in Pakistan; therefore, the items are procured from Japan with few exceptions. A third country procurement is permitted from suppliers whose more than 50% of shares are held by Japanese shareholders with quality control performed according to Japanese standards.

Winch machines are not manufactured in Japan; therefore, they shall be procured in Pakistan where they are produced in factories at Lahore and Gujranwala.

The recent JICA projects implemented in Faisalabad and Lahore adopted the control panel, electric cable and pipes procured in Pakistan. The Pakistani manufacturers of control panel and pipes maintain

the same quality control and technology as Japanese manufacturers. Cables from other countries are readily available with various sizes and quantities at the markets in Pakistan. Therefore, these materials may be procured in Japan or Pakistan.

Judging from the fact that there is only one manufacturer in Japan for the traction type of dewatering pump, and there is only one company available in Pakistan to deal with wheel-type clamshell and excavator, the third country may be considered as an option for the procurement of these equipment after due consideration.

Manufacturer's engineers shall provide instructions for the initial operation of equipment. The management of cleaning/de-silting equipment is planned by a soft comportment program so as for the equipment to operate efficiently.

2) Installation Policy

The supply of equipment such as pumps, motors, switchgears, diesel generator units, valves and pipes includes installation work.

The installation schedule is planned in consideration of the following works that will be carried out in the recipient country:

- The reinforcement of existing supporting beams for motors and intermediate bearings;
- Removal of foundation of existing equipment (if any);
- Purchase and installation of substations including transformers; and
- Purchase and installation of pipes outside pump rooms (if any).

The installation of pump equipment shall be carried out with minimal impact on the operation of existing pumps taking account of work efficiency during monsoon period from July to September.

2-2-4-2 Implementation Conditions

1) Inland Transportation and Customs Clearance

The equipment transported from Japan will be unloaded at the Karachi Port. Inland transportation from Karachi to Gujranwala (1200km) is the responsibility of the Japanese side. Although there are two ways for customs clearance, one is at Karachi and the other one is at Lahore dry port, which is situated 80 km away from Gujranwala, Lahore is selected for the project because of time consuming administration for customs clearance in Sind Province. The means of inland transportation from Karachi to Lahore and Gujranwala has to be determined in consultation with WASA to ensure security.

2) Installation Work of Pumps

When it is necessary to interrupt the existing power supply for the installation work, the interruption period should be shortened as much as possible. The period required for designing, manufacturing and transportation of pump equipment will need to be carefully considered in procurement schedule at the beginning of the project implementation in order to timely carry out the work from one process to another. The duration of procurement should be minimized through the efficient transport system to the eight (8) pumping stations.

a) Preliminary Works before Installation

The following preliminary works are to be implemented:

- To dispatch the installation and inspection engineers to the sites;
- To establish the site office;
- To prepare the storage plant, working space for temporary assembly, power source, and plumbing equipment for the construction work;
- To confirm the benchmark; and
- To prepare temporary hoist facilities.

b) Temporary Closure of Inlet Pipes

When the existing inlet valves are to be replaced with new ones, the inlet pipes shall be temporarily closed to stop the flow of water. Therefore, the most appropriate method shall be planned to minimize the impacts on operation of existing pumps.

c) Wiring Works

The cables from substations to the incoming panels in pump rooms are to be lain in underground conduit pipes. For drawing cables into the pump rooms, a hole at the wall of each pump room is to be bored, and the wall hole shall be sealed after wiring.

Although the cables to an electric motor from a pump panel are to be lain under the floor, if this is impossible, the cables may be lain in conduit pipes above the floor, avoiding obstruction as much as possible.

d) Construction of Pump Concrete Foundations

The existing concrete foundations of removed equipment will be taken out by WASA. The Contractor shall construct the foundations of suitable sizes for new equipment before carrying the pump equipment into the pump rooms.

2-2-4-3 Scope of Works

1) Division of Tasks at the Disposal Stations

With regard to the equipment to be installed at each disposal station, Table 2-21 shows the share of responsibilities between the Japanese side and the Pakistani side.

Table 2-21 Share of Responsibilities between the Japanese Side and the Pakistani Side at Disposal Stations

Tasks and Responsibilities of the Japanese Side	Tasks and Responsibilities of the Pakistani Side
• Installation of pump equipment • Construction of foundation for pumps, valves and pipes • Installation and foundation construction of diesel generator unit • Installation of pipes inside pump rooms and connection with existing pipes • Installation of motors and switchgears, and cable works • Cable works between substation and incoming panel • Commissioning works and trial operation after installation	• Procurement and installation of substation • Removal of existing equipment and cleaning • Demolition of foundation • Space arrangement for diesel generator unit • Supply and installation of suction and discharge pipes outside pump room • Reinforcement of crossbeams for fixing motors • Reinforcement of crossbeams for fixing bearings of pump intermediate shaft • Civil works (Excavation, civil works and reinforcement of building frame if needed) • Temporary storage space for equipment • Reinforcement of stairs in pump rooms • Newly fixing and repairing of ventilation fans

2) Division of Tasks and Responsibilities for Diesel Generator Units without Installation Works

Table 2-22 shows the share of responsibilities between the Japanese side and the Pakistani side for diesel generator units without installation works.

Table 2-22 Share of Responsibilities between the Japanese Side and the Pakistani Side for Diesel Generator Units without Installation Works

Tasks and Responsibilities of the Japanese Side	Tasks and Responsibilities of the Japanese Side
• Procurement of diesel generator unit • Procurement of power cables, 20m, between generator and power switching panel • Procurement of power switching panel	• Concrete foundation construction • Installation works • Installation of power switching panel • Wiring works • Sunshade roof installation/construction

2-2-4-4 Consultant Supervision

1) Consultant's Supervision Plan

a) Contents of Work

The consultant will supervise the scheduling and quality control of procured equipment by the contractor, and shall confirm that the equipment is working appropriately at hand over. The consultant supervision work will consist as follows:

i. Discussion with the contractor
ii. Examination at factory and before shipment, management of the examinations
iii. Discussion with WASA and other agencies concerned in the Pakistani side
iv. Confirmation of Pakistani side responsibilities
v. Confirmation of procurement equipment situation
vi. Confirmation of Customs Clearance and its follow up
vii. Examination of equipment at handover
viii. Issue of Certification
ix. Submission of report

b) Supervision Organization of Procurement and Installation

The Japanese personnel for supervision consist of (1) Project Manager; (2) Procurement Equipment Planner 1 (de-silting equipment); and (3) Procurement Equipment Planner 2 (disposal pump). The Pakistani personnel consist of (1) Procurement Equipment Engineer and (2) Mechanical Engineer. The roles of each side are as follows.

Table 2-23 List of Consultant's Supervision Personnel and their Work Contents

Member	Grade	Job Description	Dispatch	In Pakistan (M/M)
Project Manager	2	▪ Dispatched at the final stage of the project, he will analyze and confirm the situation of de-silting equipment and disposal pumps (0.25MM), carries out appropriate instructions pertaining to the results (0.25), and reports the results to the Pakistani side (0.25), and completes the project.	Final stage of the Project	0.75
Procurement Equipment Planner 1 (De-silting Equipment)	3	▪ Dispatched at the arrival of equipment, he will confirm the progress of Pakistani responsibilities, carries out pre-discussion with WASA, supervises procurement conditions, test operation, instruction of initial operation, inspection and handover. • Performs inspection of the equipment at the factory in Japan before shipment to Pakistan. • Performs warranty inspection of de-silting equipment after 1 year of handover in Pakistan.	1. From arrival of equipment up to handover 2. Under manufacturing, before shipment (in Japan) 3. After 1 year of handover	1: 1.50 3: 0.20
Procurement Equipment Planner 2 (Pump)	3	▪ Dispatched at the arrival of equipment, he will confirm the progress of Pakistani responsibilities, carries out pre-discussion with WASA, supervises the pump installations and procurement conditions, test operation, instruction of initial operation, inspection and handover. ▪ Performs warranty inspection of disposal pumps after 1 year of handover in Pakistan.	1. From arrival of equipment up to handover 2. After 1 year of handover	1: 9.75 2: 0.20
Procurement Supervisor	Pakistani	▪ He will assist the Procurement Equipment Planner 1 (de-silting equipment) in technical quality and schedule control.	Same as Procurement Equipment Planner 1	1.00
Mechanical Engineer	Pakistani	▪ He will assist the Procurement Equipment Planner 2 (Pump) in technical quality and schedule control.		8.00

2) Plan of Procurement Management by the Contractor

The Project is divided into two lots: the procurement of cleaning/de-silting equipment and the procurement and installation of equipment for disposal stations. Test operation, instruction of initial operation, handover and installation of equipment for disposal stations are performed by the qualified personnel of the Contractor.

As shown in the Table 2-24, Contractor's Personnel No. (1), (2) and (3) will be responsible for the procurement of cleaning/de-silting equipment and Personnel No. (4), (5), (6), (7) and (8) will be in charge of the procurement and installation of disposal pumps.

Table 2-24 Contractor's Personnel to be Engaged in Procurement Management for De-silting Equipment

	Personnel	Grade	Job Description	M/M
(1)	Procurement Engineer	3	1. He is responsible for Lot 1. At first, he will be dispatched to Pakistan for the Customs Clearance. After that, he will manage the procurement of de-silting equipment, kick-off meeting, negotiation with the Pakistani side, quality and schedule controls, test operation, instruction of initial operation and handover. 2. He will attend the inspection of equipment at the factory in Japan before shipment to Pakistan. 3. He will attend the warranty inspection of de-silting equipment after 1 year of handover in Pakistan.	1: 1.50 2: 0.10 3: 0.20
(2)	Equipment (Water jet cleaner and Suction machine)	3	He will carry out adjustments, test operation, instruction of initial operation of water jet cleaner and suction machine, and on-the-job-training on the management to WASA Engineer(s): 1. Discussion at workshop, open package (0.25MM) 2. Test operation, adjustment (0.25MM) 3. Instruction of initial operation, handover for each zone (3 zones: 0.25x3)	1.25
(3)	Equipment (heavy duty machines)	3	He will carry out adjustments, test operation, instruction on initial operation of excavator, clamshell, dump truck, and on the job training of management to WASA Engineer 1.Discussion at workshop, open package (0.25MM) 2.Test operation, adjustment (0.25MM) 3.Instruction of initial operation, handover for each zone (3 zone 0.25x3)	1.25
(4)	Installation of pumps	3	1. He will be responsible for Lot 2. At first, he will be dispatched to Pakistan for the Customs Clearance. After that, he will manage the procurement and installation of disposal pump, kick-off meeting, negotiation with the Pakistani side, quality and schedule control, test operation, instruction of initial operation, and handover. 2. He will attend inspections of equipment at the factory in Japan before shipment to Pakistan. 3. He will attend the warranty inspection of de-silting equipment after 1 year handover in Pakistan	1: 9.75 2: 0.10 3: 0.20
(5)	Electrical Engineer	4	He will carry out the final confirmation, adjustment, test operation, instruction of initial operation, and confirmation of quality of installation of transformer, wiring to receiving panel installed by the Pakistan side. In the case of disposal stations with procured generators, the installation and wiring are to be performed by the Pakistan side, but he will provide advice on the installation and wiring.	3.00
(6)	Mechanical Engineer	Pakistani	As the resident engineers working during the installation of pumps, they will carry out quality and schedule control of pumps, pipes, electricity, and adjustment, test operation and, finally, provide instructions on initial operation to the WASA engineers.	9.75
(7)	Piping Engineer			9.75
(8)	Electrical Engineer			5.50

2-2-4-5 Quality Control Plan

The consultant will discuss the details of equipment specifications and methods of quality control with each manufacturer before manufacture. Equipment is to be examined at the factory before shipment to Pakistan, quantities confirmed and assurances of quality and performance obtained. The packing method shall also be confirmed to make sure that no damage is inflicted during transportation. The carriage method of inland transportation and its schedule, especially, is to be submitted by the contractor for confirmation and approval.

Table 2-25 Quality Control of Equipment

Items	Quality Control Items
Water jet machine	Pump pressure, flow rate, tank capacity, leakage, condition of vehicle driving
Suction machine	Pump vacuum pressure, situation of sludge suction, tank capacity, leakage, condition of vehicle driving
Wheel-typed clamshell	Confirmation of operation of arm, bucket, etc., pulling up design load, leakage of hydraulic oil, condition of vehicle driving
Wheel-typed excavator	
Dump trucks	Carriage size, leakage of hydraulic oil, condition of vehicle driving
Pickup truck	
Safety equipment	Confirmation of operation about blower, toxic gas detector, visual examination about body high boots, helmets, ladder, etc.
Winch machine	Confirmation of winch speed, bucket size, wire length
Traction type dewatering pumps	Confirmation of pump operational condition
Generator	Confirmation of voltage, current, heating by actual loading operation
Disposal pump	Confirmation of vibration, heating, pressure after stable operation

Equipment is to be stored at appropriate places not exposed to high temperature, direct sunlight and dusty condition. The contractor shall always manage their storage and anywhere. If any defect is found during test operation of equipment, the contractor shall repair or rectify them immediately and shall be prepared for such cases. The items of quality control of equipment are based on specifications; the items are as shown in Table 2-25. The confirmations are to be performed by the consultant and the contractor before handover and expiration of the warranty period.

2-2-4-6 Procurement Plan

As mentioned in Subsection 2-4-1, equipment will be procured mainly in Japan for such reasons as shown in Table 2-26.

Table 2-26 Reasons for the Determination of Country of Origin

Items	Origin	Reasons
Water jet machine	Japan	The bodies are built and manufactured in Pakistan, but the machines are not directly driven by the truck's engine. They are driven by an auxiliary engine that is inferior to the Japanese one in quality and performance. The spare parts are purchased from vehicle makers or Pakistani building body manufacturer
Suction machine	Japan	
Wheel-typed clamshell	Japan, Third Country	There is only one company for procurement in Pakistan. Japanese and third country manufacture shall be examined to compare them and finally decide on the country of origin.
Wheel-typed excavator	Japan, Third Country	
Dump truck	Japan	Most of the dump trucks in Pakistan are Japanese ones manufactured by makers of good reputation. The spare parts can be procured easily in Pakistan.
Pickup truck	Japan, Third Country	Even if Japanese models, most pickup trucks are manufactured in overseas factories of local corporations.
Safety equipment	Japan	Water plugs, body high boots, blowers and toxic gas detectors are difficult to obtain in Pakistan; therefore, they shall be procured in Japan.
Winch machine	Pakistan	This machine is not manufactured in Japan. Lahore WASA is using locally made ones procured in Pakistan.
Traction type dewatering pump	Japan, Third Country	There is only one company manufacturing this equipment in Japan. Japanese and third country ones are to be examined and compared to finally decide on the origin.
Generator	Japan	Blackout occurs frequently in Pakistan, using generator many times, therefore which should be high quality product.
Disposal pump	Japan	Existing disposal pumps in WASA are using Pakistan made by a European company. However, their life span is short and they frequently malfunction. Therefore, they shall be procured in Japan.

2-2-4-7 Operational Guidance Plan

WASA is presently using water jet cleaners, suction machines, etc., but does not have experience on the operation of winch machines and wheel-type clamshells. Since most of the equipment is to be procured in Japan, lectures on initial operation shall be performed for WASA staff to enable them use the equipment effectively.

As for disposal pumps and generators, operational guidance may be not necessary, but it is important to provide guidance for daily maintenance and changing of consumables. Further details for the instruction on initial operation and management are as shown in Table 2-27.

Table 2-27 Instruction on Initial Operation and Management

Item	Instruction items and its method
Water-jet machine	Sludge deposits in sewer pipes are washed into the manhole by the water-jet machine and then sucked and removed by the suction machine as instructed by the Japanese manufacturer's engineer.
Suction machine	
Wheel-type clamshell	Sludge deposits in the drainage canal are de-silted to the truck by the clamshell or the excavator and then transported to the dumpsite as instructed by the Japanese manufacturer's engineer.
Wheel-type excavator	
Dump truck	
Pickup truck	Instruction not needed
Safety equipment	The method of using the water stopper/plug, blower and toxic gas detector are to be instructed by the contractor.
Winch machine	Since Lahore WASA is using this machine, Lahore WASA shall provide the instruction on its use.
Traction type dewatering pump	It will be the first time for WASA to use the pumps, so that the contractor shall provide instruction on their use.
Generator	After installation of the pumps, keeping records of operation and periodical inspection, malfunction and repair are to be instructed by the contractor.
Disposal pump	

2-2-4-8 Soft Component (Technical Assistance) Plan

1) Background

With a view to upgrading the existing sewerage and drainage system in Gujranwala City, the project is to supply WASA with equipment/machinery necessary for cleaning sewers and drains and also, for increasing the capacity of disposal stations to help improve the hygienic environment of the city.

WASA will enhance its structural capacity to cope with the project implementation by reorganizing the two existing engineering sections; one will be newly created for the operation and management of sewerage services and the other will be exclusively for water supply services. Approximately 400 persons will be assigned to the sewerage section and 170 persons to the water supply section. Basically, the project will be managed by the existing staff and manpower, and there is no schedule to recruit new workforce.

Equipment owned by WASA such as water jet machines, suction machines and excavators are frequently used, so there will be no need to provide technical assistance for operation method about such type of equipment. One of the main problems that WASA faces at present is the malfunction of sewerage system mainly caused by the blockage of sewer pipes, so WASA workers have to spend most of the time on this issue to deal with complaints from the residents. They are trained in order to quickly respond to such complaints or requests, but the work is inefficiently performed because it resorts to manual operation due to the lack of equipment and machinery. Under these circumstances, WASA is required to turn in active posture from complaint-based passive posture and intends to remove trouble-making sources in advance by taking pre-emptive actions. It means that should the equipment be procured under the present project, they should be mobilized for efficient use to clean sewer pipes and drains on a regular basis. However, it is important to note that WASA is not experienced in preparing a sewerage cleaning plan taking account of appropriate combination of machines, so that one Japanese expert in this field is requested at the initial stage of the project implementation to provide technical guidance service.

In response to the request, soft component will be introduced in the project to provide technical assistance, which consists of two components; namely, preparation of sewerage cleaning plan and establishment of operation and management system for the cleaning activity. This is expected to be a tool for overcoming difficulties that lie ahead and will contribute to the project with sustainable effects.

2) Objectives

To help improve hygiene environment of Gujranwala City by upgrading sewerage and drainage system, objectives of the technical assistance are as follows:

- To prepare an efficient work plan for cleaning and de-silting sewerage and drainage by use of machines; and
- To establish sustainable operation and management system for cleaning/de-silting work.

3) Outputs (Direct Effects)

The technical assistance service will be provided for WASA counterpart personnel in the fields of work planning and operation and management for cleaning/de-silting activities. The following effects are expected after the completion of such services.

a) Work plan for cleaning sewerage and drainage

- To develop capacity of WASA personnel (Deputy Director, Assistant Directors and Sub-engineers) as a result of acquiring technical knowledge on planning work.

b) Operation and management plan for cleaning activity

- To develop capacity of WASA personnel (Deputy Director and Assistant Directors) as a result of acquiring knowledge on operation and management system through practical cleaning activities.

4) Confirmation of Outputs

At the time of completion of the technical assistance, the above outputs can be confirmed by the following ways.

a) Work plan for cleaning sewerage and drainage

- Accuracy of cleaning/de-silting plan on monthly and annual basis (based on confirmation of daily work volume, operation time, removed volume of sludge, etc.).

b) Operation and management plan for cleaning activity

- Understanding of the manual's description on mechanical inspection, maintenance and repair (checklist, daily report, monthly report, etc.).
- Understanding of manual for safety control and rules regarding cleaning/de-silting..

5) Activities (Inputs)

As previously mentioned, WASA is supposed to create a new Direction to deal with sewerage services and will dedicate itself to the task of cleaning sewer pipes and drains. However, due to the lack of practical experience in planning of cleaning work by use of machines and equipment, one Japanese expert will be assigned to assist WASA in preparing the cleaning and de-silting plan. Thus, he is expected to promote a smooth takeoff for the project. Basically, his assigned work is to prepare and review the overall cleaning plan in joint effort with counterpart personnel (Deputy Director and Assistant Directors). For the implementation, Sub-engineers will join in the meeting to determine the work method as well as management plan. The operation and management system for the cleaning activities is as illustrated in Figure 2-6.

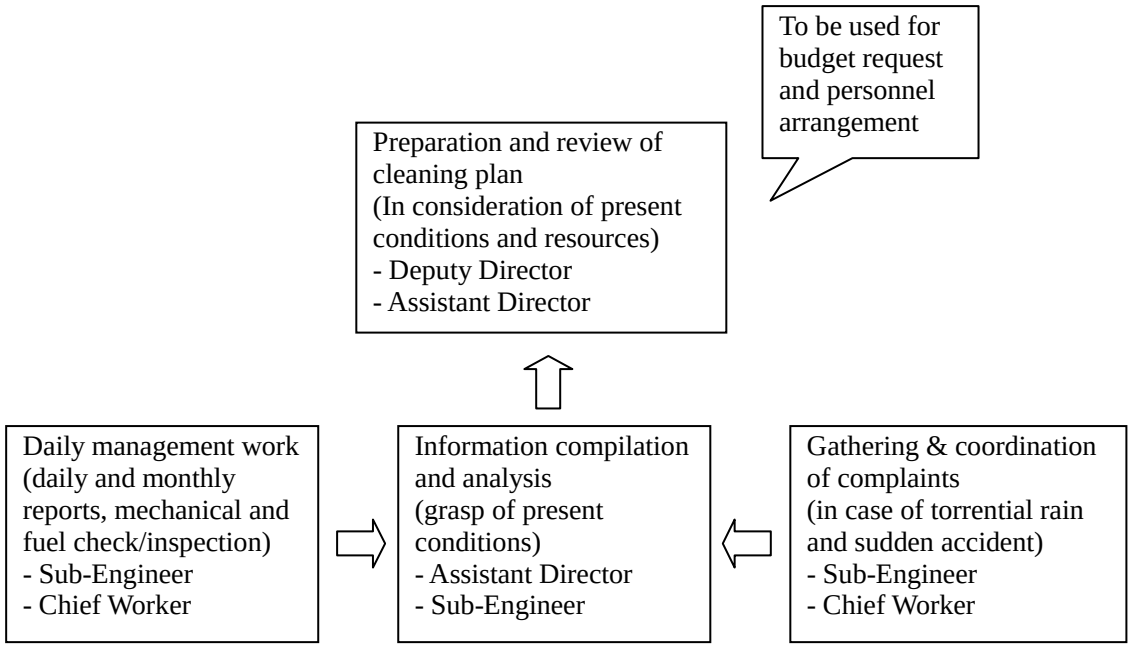


Figure 2-6 Operation and Management System for Sewerage Cleaning Activities

From the above considerations, the required work for the Japanese expert will include the following:

(a) Assuming that the equipment is supplied under the project, the cleaning plan will need be prepared by setting a target year taking account of effective use of machines and human resources of WASA (in collaboration with Deputy Director and Assistant Directors). The equipment is supposed to be used in the following way:

- Although water jet cleaners will be deployed to clean small-sized pipes (less than 15 inches of diameter) and medium-sized pipes (less than 36 inches of diameter), effective work is hardly implemented due to poor performance. However, this situation will improve by the use of high-performance Japanese products, and work efficiency can be further raised if the water-jet cleaners are used in combination with suction machines.
- For cleaning medium-sized pipes (18-24 inches of diameter), winch machines will be used as a locally adaptable method. The work is performed by the combination of machines and manpower.
- For cleaning large-sized pipes (more than 42 inches of diameter), basically, the work is carried out by manpower as in the past, but suction machine can be deployed to remove sludge from manhole.
- For cleaning earth drain, an excavator and dump trucks will be used to dredge sediment or sludge, whereas clamshell will be employed to remove massive floating materials from the drains. For cleaning narrow concrete-made drains, the excavator is hardly deployable but suction machine can be used after floating materials have been properly removed manually.

(b) Based on the above scheme, annual and quarterly-based work schedule will be prepared together with work performance plan and should be fed back for review if some problems are found in the implementation stage. The work will be carried out in collaboration with the Assistant Director and the Sub-engineer. Further details are given as follows:

- Cleaning areas will be decided based on present conditions of sewerage facilities and number of complaints from the residents, and total work volume will need to be estimated as well.
- Daily-based work volume will be calculated from the available manpower, working time, type of equipment/machinery to be employed.
- Yearly and quarterly-based cleaning plan will be prepared taking account of Ramadan period and time required for sudden accidents.
- Work will be implemented according to the above plan and schedule and will need to be reviewed when unexpected incidents occur or special instruction is given to determine priority areas.

(c) In a joint effort between the Deputy Director and the Assistant Director, the operation and management system will be established as follows:

- To confirm chain of command of the organization with allocation of responsibilities for persons in charge of operation and management sections.
- To determine reporting system for both daily and monthly reports, it will be required in such a way that the output of cleaning activities can be assessed in quantitative way (e.g., volume of removed sludge).
- To prepare a manual showing the procedure and method of daily check and inspection for the equipment and fuel in terms of quality control.

For the assessment of project effect, a monitoring system will be established as follows (the work will be carried out by the Assistant Director together with the Sub-engineer).

- Besides WASA headquarters, complaints from the residents are received in three branch offices, so that the idea is to establish systematical method of compiling and sorting the complaints according to the type and contents.
- Monitoring sites will be selected from flood-prone areas that may occur in monsoon period in order to record and analyze the result of ponding area, depth and time at the heavy rainfall.

The consultant to be assigned for the above work will serve his expertise for a period of two (2) months.

6) Method of Service to be Rendered

Technical assistance for planning of cleaning activity as well as operation/management will be provided by the Japanese consultant for the following reasons:

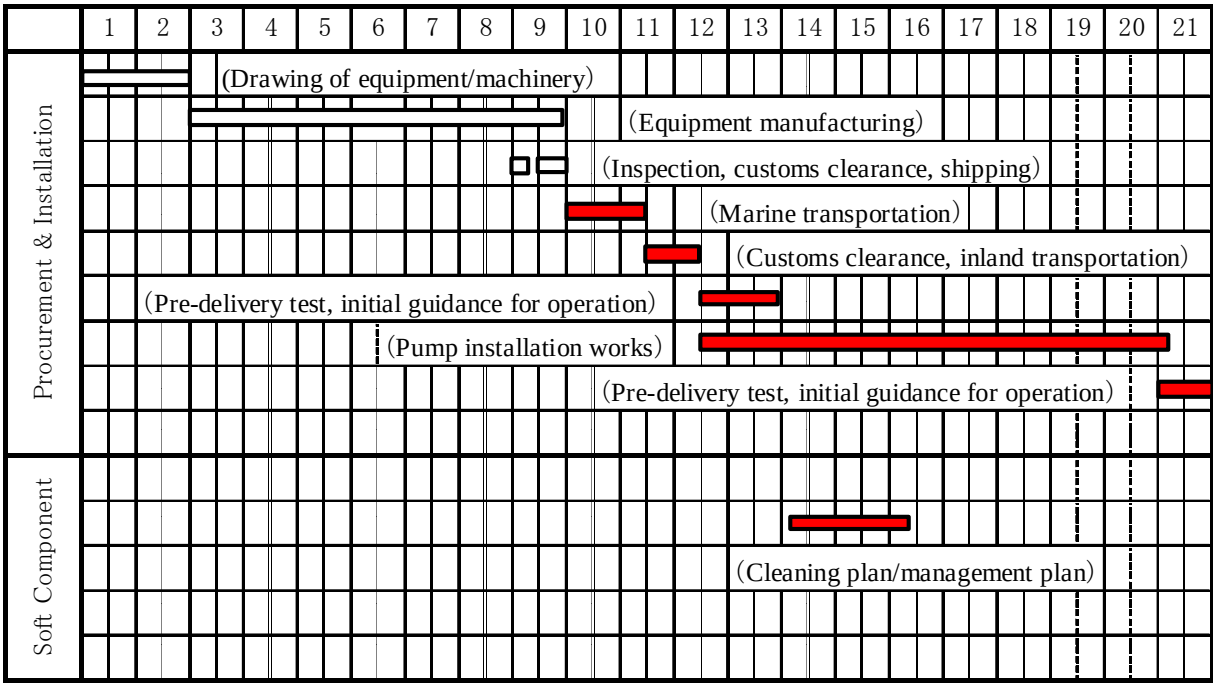
- Experts specialized in planning and operation/management for sewage and drainage system are not easily available in Pakistan.
- There is a shortage of qualified engineers to strictly manage de-silting and drainage works in WASA.
- Since there is no donor in Pakistan in the sector of sewage and drainage except Japan, experts are not available from a third country.

7) Implementation Schedule of Soft Component

This project will be implemented under the grant aid scheme of the Japanese Government after the Exchange of Notes (E/N) and Grant Agreement (G/A) have been duly signed between the Government of Japan and the Government of Pakistan. The total period required for detailed design including tender administration will be six (6) months from the conclusion of E/N and G/A, whereas for manufacturing, procurement and installation of equipment will be 21 months after signing contract with the Contractor. With regard to service period for soft component, it is scheduled for two (2) months.

The Consultant to be assigned for the soft component is scheduled to arrive at the beginning of June 2016, and will start preparing the cleaning/de-silting plan soon after prior meeting with authorities of WASA. However, it shall be carried out after the inspection for delivery of the equipment, and the new Direction responsible for the management of sewerage should be established in WASA with appropriate personnel to be engaged in operation and management. The plan will need to be prepared prior to the start of cleaning activity, so that persons like the Director and Assistant Director will be able to learn the procedure and method through the planning process.

Table 2-28 Implementation Schedule for Soft Component



8) Output Materials

Output materials are as follows:

a) Sewerage and drainage cleaning plan

- Annual and monthly cleaning plan (work schedule, work performance plan, equipment deployment plan, etc.)

b) Operation and management plan

- Manual for check and inspection of equipment
- Manual for safety control
- Operation and management records (daily report and monthly report)
- Monitoring system (number of complaints from the residents, contents of grievance, ponding conditions).

9) Responsibility of the Pakistani Side

Although WASA is an agency responsible for operation and management of water supply service and sewerage service, its management system is not specifically divided into two service sections to deal with their respective routines. Due to the lack of specialists in the field of sewerage management, medium and long term plan has never been prepared to cope with urban development, so WASA intends to strengthen its management capacity by establishing sewerage Direction under the leadership of the Director assisted by the Deputy Director and some nominated Assistant Directors. However, if technical assistance is not provided, the cleaning activity will remain inefficient since the response-to-complaint pattern is likely to continue.

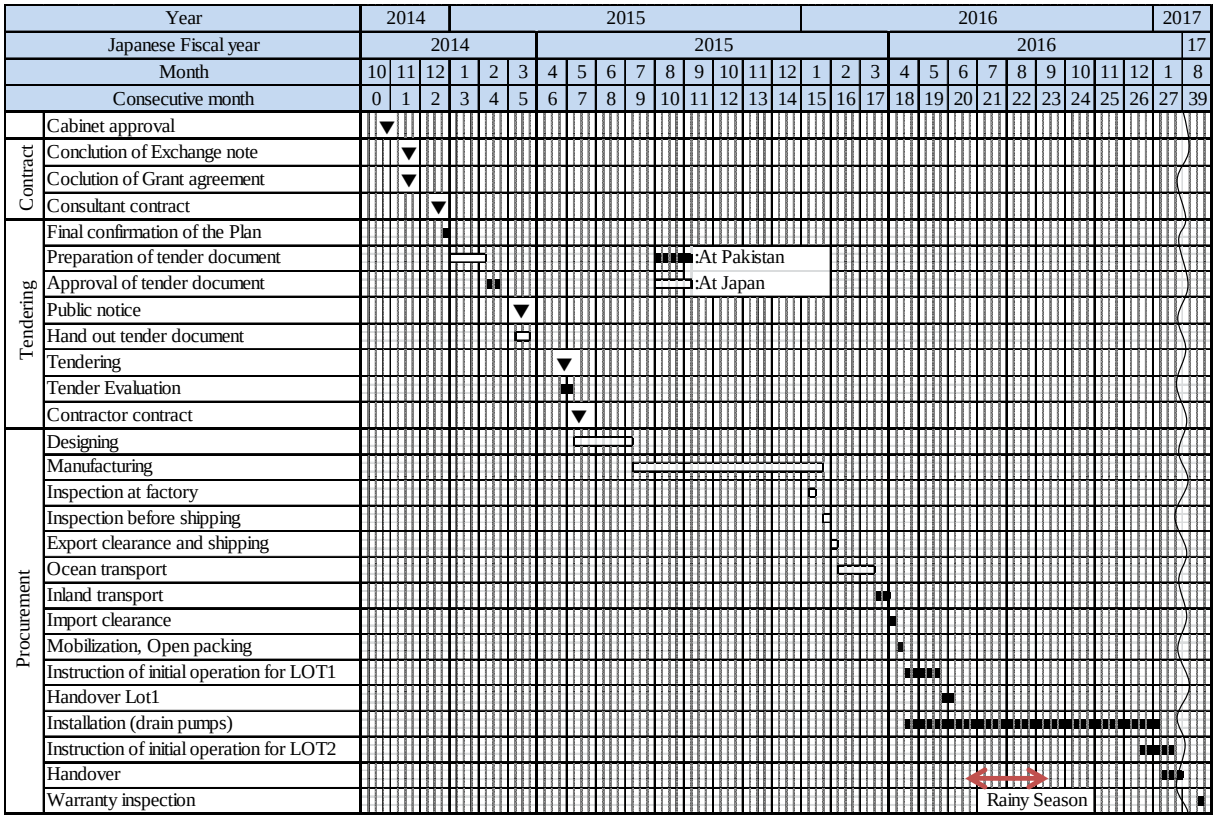
From the above considerations, WASA is required to create sewerage Direction with staff arrangement before launching soft component. It will be a pre-requisite for WASA to carry out activities of soft component. It is desirable that WASA should pay particular attention to the selection of counterpart personnel to join in technical assistance programs. They must be competent enough to learn management expertise from the Japanese specialist, and are expected to serve as the brain for sustainable development of WASA.

2-2-4-9 Implementation Schedule

The project is to be performed after the conclusion of an Exchange of Notes between the Japanese and Pakistani governments. The necessary months for the project is as listed below. The de-silting equipment will be handed over after implementation of test operation and instruction of initial operation, and the disposal pumps will be after the installation. The implementation schedule is as shown in Table 2-29.

- Consultant's Contract - Preparation of Tender Documents – Tendering – Selection of Contractor(s) and Contract (5 months),
- Contractor's Contract for Cleaning/De-silting Equipment - Manufacturing – Transport – Arrival at Site – Handover of Equipment (13 months),
- Contractor's Contract for Pumps - Manufacturing - Transport – Arrival at Site – Installation - Handover of Disposal Pumps (21 months),

Table 2-29 Implementation Schedule



The project period is 2 years from E/N conclusion to the completion of the project, and 3 years to the completion of warranty.

2-3 Obligations of Recipient Country

2-3-1 Procedure of Undertaking Required to the Pakistani Side

Based on the Minutes of Discussions agreed in the preparatory survey between the JICA Study Team and the Pakistani side, the undertakings required to the Pakistani side for the smooth implementation of the Project are as follows:

- To secure safety by any means of people concerned during implementation of the Project on condition that the Grant-Aid by the Government of Japan is carried out;
- To bear the advising commission of the Authorization to Pay (A/P) and payment commission to the Japanese bank for banking services based on the Banking Arrangement (B/A);
- To ensure prompt unloading and Customs clearance at the port of disembarkation in Pakistan and tax exemption of the equipment purchased under the Grant-Aid;
- To arrange the acquisition of visa and other formalities that may be necessary for the entry of Japanese nationals into Pakistan and stay therein for the performance of the work;
- To exempt Japanese nationals from taxes including Value-Added-Tax (VAT), General Sales Tax (GST), Customs duties, and any other taxes and fiscal levies which may be imposed in Pakistan with respect to the supply of products and services under the Project, and to take necessary procedures for tax exemption;
- To provide data and information necessary for the Project,

- To secure land and to clear, level and reclaim the sites when needed;
- To maintain and use the equipment properly and effectively with all expenses necessary for the operation and maintenance;
- To bear all expenses, other than those to be borne by the Grant-Aid necessary for the transportation and installation of the equipment; and

To use the equipment exclusively for the Project, and shall not be re-exported from Pakistan

2-3-2 Responsible of Pakistani Side

The Pakistani side will assume responsibility for the following works:

- To provide office space for the Consultant and the Contractor at WASA's facility or building for the period of project implementation;
- To bear the electric bills during the test run and initial operation guidance;
- To rehabilitate and maintain access roads to each pumping station if needed during the project period;
- To carry out repair work of the pump house and piping work, and to install transformer for providing electric power supply system in the disposal station;
- To shoulder foundation and wiring works required for the installation of generators with sunshade device;
- To bear all works and expenses necessary for disassembly, transportation, relocation, recycle and reuse or disposal of dismantled equipment, such as pump and its accessories;
- To provide parking area for the equipment with storage warehouse and administration office for spare parts;
- To secure appropriate land to dispose sludge and garbage removed by the cleaning work for the sewerage and drainage; and
- To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities to the project site.

2-4 Project Operation Plan

For the Project's implementation, WASA will reform the two existing engineering sections (Engineering and O&M) to establish the Water Supply Section and the Sewerage Section. The equipment to be procured under this Grant-Aid will be managed at the parking lot of People Colony under the responsibility of the Sewerage Section. The parking lot shall have the function as garage for minor repairs, and the Deputy Director or the Assistant Director will be in charge of the washing of equipment and oil change. WASA divided its service area into 3 zones and it owns a branch office without a repair shop in each zone. Therefore, in case of large-scale repair or overhaul, the work is outsourced to a local company. This system is followed for equipment to be procured under this project.

As far as manpower is concerned, there are 395 personnel available in the Sewerage Section, including temporary employees, which may be enough to perform proper operation and maintenance. WASA is prepared for a quick response to the complaints of residents, but this is nothing short of defensive actions that will not lead to drastic improvement of the present conditions and hence pre-emptive measures will definitely need to be taken in normal time. In this sense, this project is consistent with the development strategy and will help break through the situation.

Based on the annual cleaning plan for sewers and drains, the Director of the Sewerage Section will instruct the Deputy Director and the Assistant Director to develop a de-silting operation program every month. In this respect, it is important to discuss with persons concerned and share the information regarding equipment

operation scheme as well as manpower arrangement schedule. The Assistant Director of each branch office shall take the initiative in operating the work, and the Sub-engineer shall be in charge of the field works which may be carried out by a given number of teams.

As to the disposal stations, the Deputy Director or the Assistant Director responsible for the management of each branch office will take charge of operation and maintenance (refer to Table 2-30). From the experience on the existing pump operation, the system is likely to be the same as it used to be.

Table 2-30 Operation and Maintenance System for Disposal Stations

Service Area	Person in Charge	Disposal Station
Zone I	Deputy Director or Assistant Director I	People Colony, PMU
Zone II	Deputy Director or Assistant Director II	Khayali, Nowshera Road, Nowshera Sansi
Zone III	Deputy Director or Assistant Director III	Alam Chowk No.2, Garjakh, Rajkot, Samanabad, Mughalpma

2-5 Project Cost Estimation

2-5-1 Initial Cost

The initial cost to be shouldered by the Pakistani side is estimated at 17.87 million yen. The details are shown in Table 2-31.

Table 2-31 Responsibility of Pakistani Side

Items	Amount (Million Rs)	Conversion| (Million JPY)
Related disposal pump Installation	**13.3**	**14.76**
Receiving electrical facilities	4.8	5.33
Removal of existing pump	1.0	1.11
Delivery pipe installation	3.0	3.33
Reinforcement and renewal	4.5	5.00
Procured generator installation	**2.8**	**3.11**
Basement	0.8	0.89
Wiring	0.8	0.89
Installation of exchange panel	0.4	0.44
Shade roof	0.8	0.89
Total	**16.1**	**17.87**

Conditions of Cost Estimation

1. Time of Cost Estimation : October 2013
2. Exchange Rate : USD 1.00 = JPY 99.93
   : Rs 1.00 = JPY 1.11
3. Procurement and Installation Period: Refer to Table 2-29
4. Others: The cost estimation is based on the Japanese Grant Aid System.

2-5-2 Operation and Maintenance Cost

Annual Management and Operation and Maintenance (O&M) Costs of equipment to be procured under the project are classified as follows:

(1) Operation cost for de-silting equipment (refer to Table 2-32)

(2) Electrical cost for disposal pumps operation (refer to Table 2-33)

(3) Fuel cost for generators' operation (refer to Table 2-34)

WASA will not increase the number of staff members and hence the wage cost will not increase. The management and operation and maintenance costs are 32 million Rs for item (1), 19 millon Rs for item (2), and 28 million Rs for item (3). Therefore, the total amount is estimated at 79 million Rs, which will account for about 19% of WASA's 2013 budget.

1) Operation Cost for Cleaning /De-silting Equipment

The operation hours and annual working days are calculated based on the cleaning plan of WASA. As noted, the number of staff will not increase; therefore, the cost incurred is only the cost of fuel as shown in Table 2-32. The annual cost will be 32 million Rs.

Table 2-32 Annual Operation Cost for Cleaning/De-silting Equipment

(Unit:Rs)

Equipment	Usage	①	②	③=①x②	④	⑤=③x④	⑥	⑦=⑤x⑥	⑧	⑨=⑦x⑧
		Fuel consumption per hour	operational hour per day	Fuel consumption per day	annual working days	annual fuel consumption per each	Number of procurement	Annual fuel consumption	Diesel unit price	Annual fuel cost
		litter/hr	hr/day	litter/day	day/year	litter/year/each	each	litter/year	RS/litter	RS/year
Water jet cleaner	To clean sewer pipe	5.9	6	35.4	*1 257	9,098	2	18,196	102	1,855,951
Suction machine	To clean sewer pipe	7.6	6	45.6	*1 257	11,719	4	46,877	102	4,781,434
Wheel typed cram shell	To clean drains	11.0	6	66	*3 75	4,950	1	4,950	102	504,900
Wheel typed backhoe	To clean drains	15.0	6	90	*2 225	20,250	2	40,500	102	4,131,000
Dump truck (2ton)	To clean drains (In day time)	4.4	6	26.4	*1 257	6,785	6	40,709	102	4,152,298
Dump truck (2ton)	To clean drains (In night time)	4.4	6	26.4	*2 225	5,940	6	35,640	102	3,635,280
Dump truck (4ton)	To clean drains	6.8	6	40.8	*2 225	9,180	4	36,720	102	3,745,440
Pickup truck	For emergency uses	2.6	4	10.4	*4 270	2,808	3	8,424	102	859,248
Safety equipment										0
Traction type dewatering pump (small size)	For emergency uses	3.5	3	10.5	*5 144	1,507	12	18,084	102	1,844,554
Winch machine	To clean sewer pipe	4.8	6	28.8	*1 257	7,402	7	51,811	102	5,284,742
Traction type dewatering pump (large size)	For emergency uses	33.9	3	101.7	*6 48	4,882	3	14,645	102	1,493,770
Total										32,288,617

①Fuel Consumption: According to sewerage facilities maintenance guideline and the depreciation table of construction equipment
④Annual working days are follows:
*1：Sewer pipe cleaning period
*2：Dranainege canal cleaning period
*3：above 2 x 1/3
*4：working days（365/1.35）
*5：3day/week x48weeks
*6：1day/week x48weeks

2) Operation Cost for Disposal Pumps

The cost of pump operation consists of the electricity consumption from GEPCO (Gujranwala Electric Power Corporation) and fuel for generators. According to WASA, the average operation of pumps is 10 hours/day, however, should the operation by generator be considered by reducing 2 hours for power

outage, it shall be 8 hours/day as shown in Table 2-33. Thus, the annual cost will be approximately 19 million RS.

Table 2-33 Annual Operation Cost for Disposal Pump (Electricity Cost)

①	②	③	④	⑤=②x③x④	⑥=⑤x365	⑦	⑧=⑥x⑦
Flow Rate	Out put	Unit	Operation Hour per Day	Electric Power per Day	Annual Electric Power	Unit Price	Annual Electric Cost
cusec	kw	ea.	hrs/day	kwh/day	kwh/year	RS/kwh	RS/year
5	37	0	10	0	0	14	0
10	65	7	8	3,640	1,328,600	14	18,600,400
15	100	0	10	0	0	14	0
20	132	0	10	0	0	14	0
Total							18,600,400

3) Operation Cost for Generators

Power failures occur as frequent as 5-6 times a day in Gujranwala City, and the total duration can be about 8-9 hours a day. The operation of generators depends on peak hour and capacity of drainage tank. Without monsoon season, blackouts do not occur frequently. Considering these situations, annual average operation time is anticipated to be 2 hours per day. Consequently, the generator operation cost is as shown in Table 2-34. The annual cost is around 28 million Rs.

Table 2-34 Annual Operation Cost for Generators (Fuel Cost)

①	②	③	④	⑤=②x③x④	⑥=⑤x365	⑦	⑧=⑥x⑦
Out-put	Unit	Operation Hour per Day	Fuel Consumption per Hour	Fuel Consumption per Day	Annual Fuel Consumption	Diesel Unit Price	Annual Fuel Cost
(KVA)	(ea.)	(hr/day)	(liter/hr)	(liter/day)	(liter/year)	(Rs/liter)	(Rs/year)
100	5	2	20	200	73,000	102	7,446,000
150	3	2	23	138	50,370	102	5,137,740
300	6	2	34	408	148,920	102	15,189,840
Total							27,773,580

Apart from the above electricity charges and fuel, repair and maintenance costs need to be included in O/M cost. It will not accrue for the first year and the second year as spare parts are available under the Grant Aid. However, from the third year after the implementation, WASA will need to estimate 15 million Rs/year in addition to the annual cost of 2012/13, making the total of 52 million Rs for repair and maintenance.

From the above considerations, annual O/M costs compared to the last 3 years are presented in Table 2-35. As the World Bank financial assistance will be provided to WASA from the fiscal year 2013/14, the total of 433 million Rs is allocated for O/M costs, and this budget scale will be enough to cover the required amount of 365 million Rs for the first year of the implementation stage (2015/16). Judging from the fact that WASA is dealing with other activity (water supply services), some additional amount will need to be included in its annual budget taking account of the price hike. Thus, it is desirable that O/M costs will amount to 496 million Rs for the first year, followed by 530 million Rs and 568 million Rs for the second and the third years.

Table 2-35 Annual O/M Costs Compared to the Past Years

(Unit: million Rs)

Item	Past years			Implementation years		
	2010/11	2011/12	2012/13	1st. year	2nd. year	3rd. year
Electricity	128	146	159	178	178	178
POL	16	17	27	87	87	87
Repair	11	16	37	37	37	52
Total	155	179	223	302 (365)	302 (389)	317 (434)

Note: Figures in parenthesis include 6.5% of price escalation per year

The O/M costs for the past three years account for 48 to 53% of the total general budget, but it will be increased to 64~65% from the fiscal year 2013/14 as a result of the financial assistance from the World Bank. To cope with the introduction of mechanical system, more budget allocation will be definitely required for proper operation and maintenance of the equipment and facilities. However, it could be possible to allocate the estimated O/M costs for the project. Prospective transition of WASA's annual budget and O/M costs toward the project implementation is as illustrated in Figure 2-7.

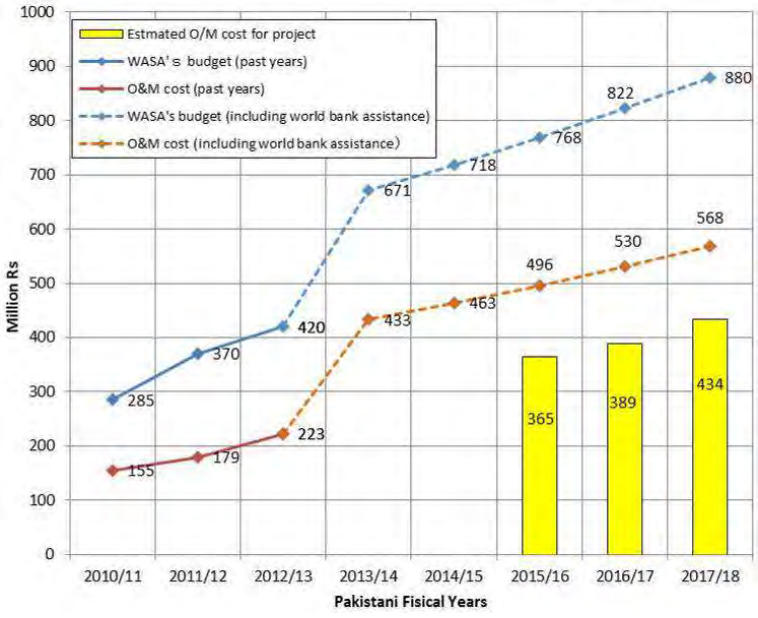


Figure 2-7 Transition of WASA's Annual Budget and O&M Costs

CHAPTER 3
PROJECT EVALUATION

3-1 Preconditions

The Pakistan side is required to take the following measures as preconditions for the smooth project implementation:

- To complete PC-1 procedure in an effort to obtain approval of CDWP and ECNEC without delay,
- To take necessary budgetary steps for carrying out their responsible works,
- To ensure prompt customs clearance and tax exemption for the equipment to be supplied under the Grant-Aid, and
- To arrange the acquisition of visa and other formalities that may be necessary for the entry of Japanese nationals into Pakistan and stay therein for the performance of the work.

3-2 Necessary Inputs by Recipient Country

The Pakistani side is required to carry out the following works as necessary input items for producing project effect:

- To implement works in the disposal stations such as removal of old pump facilities, piping work and installation of transformer, provide office space for the Consultant and the Contractor at WASA's facility or building for the period of project implementation;
- To bear foundation work, wiring and sunshade device for the installation of generators,
- To provide parking area for the equipment and storage warehouse with administration office for spare parts, To rehabilitate and maintain access roads to each pumping station if needed during the project period;
- To secure disposal site for sludge and garbage removed by the cleaning of sewerage and drainage, and
- To establish proper operation and management system with competent personnel to deal with sewerage and drainage services.

3-3 Important Assumptions

The project effect may be restricted by the following external conditions:

- Public security of the country as well as project area is not worsened, and
- Financial situation of WASA and Government of the Punjab will not turn extremely worse than now.

3-4 Project Evaluation

3-4-1 Relevance

- The project is considered as part of urban environmental improvement and will benefit about 1.7 million citizens of Gujranwala (*) directly or indirectly including the poor,
  (*) Sewerage coverage rate in Gujranwala city is 68%
- The project is expected to comply with urgent problems about sewerage and rainwater drainage and will contribute to the improvement of sanitary environment in the city,
- The improvement of flow capacity of sewer pipes/drains as well as upgrading of the capacity of the disposal stations are required as a result of the feasibility study conducted in 2010, which is based on integrated master plan for Gujranwala up to the design year 2040, and this

project is envisaged to involve one of the components of the integrated plan for sewerage and drainage system, and

- Machinery/equipment required for the amelioration of sewerage and drainage system has been supplied under Japan's Grant Aid for Lahore and Faisalabad. Likewise, this project will contribute to the improvement of urban hygiene environment in compliance with the priority sector of the Japanese policy of foreign assistance, which is so called ensuring human right and improving social infrastructure.

3-4-2 Effectiveness

1) Quantitative Effect

a) Upgrading of Drainage Capacity of Disposal Stations

Classification	Without Project	With Project
Drainage capacity (m^3/s)	12.0	15.6

b) Disposal Pump Operation by Generator in Case of Power Outage

Classification	Without Project	With Project
Drainage capacity (m^3/s)	3.25	8.18
Drainage ratio by generator (%)	26.4	52.6

2) Qualitative Effect

- As a result of removal of sludge and garbage from sewer pipes and drains, wastewater discharge capacity will be retrieved or improved,
- Urban environment will be improved by solving sanitary problems caused by clogging of sewerage pipes and exposing excavated sludge on the road,
- Living environment will be improved for the people residing in the depressions or low-lying lands as a result of shortening of ponding time, and it may cause quick recovery of business activities,
- People's complaints about sewerage and drainage will be reduced, and
- Work environment will be largely improved for sewermen by providing proper safety equipment.

[Appendices]

1. Member List of the JICA Study Team

(1) Preparatory Survey for the Outline Design

Name	Designation	Affiliation
1) Mr. Minoru MIYASAKA	Team Leader	Senior Advisor to the Director General Global Environment Dept., JICA
2) Mr. Hideaki MATSUMOTO	Cooperation Planning	Deputy Director, Disaster Management Div 1, Global Environment Dept., JICA
3) Mr. Kazuyoshi KAGEYAMA	Chief Consultant/ Sewerage and Drainage Planning 1	CTI Engineering International Co., Ltd
4) Mr. Kazuo MIZUKOSHI	Equipment Planning 1	CTI Engineering International Co., Ltd
5) Mr. Shuji SATO	Equipment Planning 2	CTI Engineering International Co., Ltd
6) Mr. Takashi ONO	Hydrology/ Sewerage and Drainage Planning 2	CTI Engineering International Co., Ltd
7) Mr. Yusuke ANDO	Quantity Survey and Procurement Planning 1	CTI Engineering International Co., Ltd
8) Mr. Shunsuke HORI	Quantity Survey and Procurement Planning 2/ Coordinator	CTI Engineering International Co., Ltd

(2) Confirmation of reassignment

Name	Designation	Affiliation
1) Mr. Yusuke ANDO	Quantity Survey and Procurement Planning 1	CTI Engineering International Co., Ltd

(3) Explanation on Draft Outline Design Report

Name	Designation	Affiliation
1) Mr. Hideaki MATSUMOTO	Cooperation Planning	Deputy Director, Disaster Management Div 1, Global Environment Dept., JICA
2) Mr. Yoshikazu KAGEYAMA	Chief Consultant/ Sewerage and Drainage Planning 1	CTI Engineering International Co., Ltd
3) Mr. Shuji SATO	Equipment Planning 2	CTI Engineering International Co., Ltd

Study Schedule

(1) Preparatory Survey for the Outline Design

No.	Date	Day	Activity					
			Mr.Miyasaka	Mr. Matsumoto	Mr. Kageyama Mr.Sato	Mr.Ono	Mr. Mizukoshi	Mr. Ando Mr. Hori
1	9/1	Sun						TYO-> BKK-> LHR
2	9/2	Mon						Meeting with WASA Gujranwala(G-WASA), Site Survey
3	9/3	Tue						
4	9/4	Wed						
5	9/5	Thu						Meeting with Local Consultants
6	9/6	Fri						Data Arrangement, Meeting with Local Subcontractors
7	9/7	Sat						
8	9/8	Sun			TYO -> BKK -> LHR			
9	9/9	Mon	TYO ->BKK -> ISB	TYO ->BKK -> LHR	Internal Meeting Mr.Kageyama, Mr.Mizukoshi and Mr.Hori: WASA Lahore(L-WASA) Mr.Ono, Mr.Sato and Mr.Ando: Site Survey G-WASA			
10	9/10	Tue	Meeting at JICA Pakistan Office	Joint Discussion about Inception Report in Lahore with Planning and Development Department(P&D), Housing Urban Development and Public Health Engineering Department(HUD&PHED), Urban Unit of P&D Department(UU), Gujranwala Development Authority(GDA) and G-WASA, Internal Meeting				
11	9/11	Wed	ISB -> LHR	Site Survey, Joint Meeting about M/M with G-WASA and GDA				
12	9/12	Thu	Joint Discussion about M/M with HUD&PHED, UU, GDA and G-WASA Submission to Final M/M to P&D			Site Survey Meeting with G-WASA		
13	9/13	Fri	Joint Signing of M/M with P&D, HUD&PHED, UU, GDA, G-WASA			Site Survey Internal Meeting with Mr.Kageyama and Mr.Sato		
14	9/14	Sat	LHR -> ISB			Data Arrangement		
15	9/15	Sun	Data Arrangement					
16	9/16	Mon	Signing of M/M with EAD Report to EOJ and JICA Pakistan Office Mr.Miyasaka and Mr.Matsumoto: ISB -> BKK Mr.Kageyama and Mr.Sato: ISB ->LHR			Site Survey		
17	9/17	Tue	BKK -> TYO		Internal Meeting, Meeting with G-WASA, Site Survey			
18	9/18	Wed			Site Survey			
19	9/19	Thu						
20	9/20	Fri						
21	9/21	Sat						
22	9/22	Sun			Data Arrangement			
23	9/23	Mon			Site Survey			
24	9/24	Tue			Site Survey, Mr.Mizukoshi: LHR ->BKK			
25	9/25	Wed			Site Survey		BKK ->TYO	Site Survey
26	9/26	Thu						
27	9/27	Fri						
28	9/28	Sat			Singing of T/N with G-WASA			
29	9/29	Sun			LHR -> ISB			Data Arrangement
30	9/30	Mon			Report to EOJ and JICA Pakistan ISB -> BKK			Site Survey LHR -> BKK
31	10/1	Tue			BKK -> TYO			BKK -> TYO

(2) Confirmation of reassignment

2013			Mr.Yusuke ANDO Quantity Survey 1/Procurement Planning 1
1	24 Nov	Sun	Tokyo --> Bangkok --> Lahore (by Thai Airway)
2	25 Nov	Mon	Lahore --> Gujranwala, The surveys data confirmation
3	26 Nov	Tue	Lahore --> Gujranwala, The surveys data confirmation
4	27 Nov	Wed	Lahore --> Gujranwala, The surveys data confirmation
5	28 Nov	Thu	Lahore --> Gujranwala, The surveys data confirmation, Lahore --> Bangkok
6	29 Nov	Fri	Bangkok-->Tokyo

(3) Explanation on Draft Basic Design Report

No.	Date		Mission Leader Hideaki MATSUMOTO	Chief Consultant Kazuyoshi KAGEYAMA	Equipment Planning 2 Shuji SATO
1	2014/2/9	Sun		Tokyo/Narita ⇒ Lahore	
2	2014/2/10	Mon	Tokyo/Haneda ⇒ Dubai	Site Survey Meeting with GWASA	Tokyo/Narita ⇒ Lahore
3	2014/2/11	Tue	Dubai⇒Lahore（1:40） Meeting with GWASA	Meeting with LWASA Meeting with GWASA	
4	2014/2/012	Wed	Meeting with HUD&PHED, GWASA, GDA and P&D in Lahore		
5	2014/2/13	Thu	Meeting with HUD&PHED, GWASA, GDA and P&D in Lahore and Gujranwala		
6	2014/2/14	Fri	Signature of M/D in Lahore (HUD&PHED, GWASA, GDA, P&D, HUDPH)		
7	2014/2/15	Sat	Lahore（3:20） ⇒ Dubai	Documentation in Lahore	
8	2014/2/16	Sun	Dubai ⇒ Tokyo/Haneda(0:01）	Lahore ⇒ Islamabad	
9	2014/2/17	Mon		Signature (EAD) EOJ, JICA Office Islamabad ⇒ Tokyo/Narita	
10	2014/2/18	Wed		Tokyo/Narita	

List of Parties Concerned in the Recipient Country

Name	Position	Affiliation
Water and Sanitation Agency (WASA), Gujranwala		
Mr. Khalid Bashir Butt	Deputy Managing Director	Engineering (Promoted to MD)
Mr. Fida Hussain	Director, Chairman	Engineering
Mr. Ghlam Murtaza	Deputy Director	Engineering III
Mr. Muhammad Tausef	Assistant Director	Engineering II
Mr. Maqsood Anjum Rana	Assistant Director	Finance
Mr. Syed Nadeem Hassan	Head Draftsman	
Gujranwala Development Authority		
Mr. Syed Hasan Raza Jafri	Director General	(plural offices)
Gujranwala District Office		
Mr. Sh Fazal Mahmood	Executive District Officer Municipal Services	
Mr. Tariq Mahmood Tariq	Executive District Officer Finance & Planning	
Government of the Punjab		
Mr. Arif Anwar Baloch	Secretary	Planning & Development Department (PDD)
Mr. Waseem Mukhtar	Secretary	Housing Urban Development and Public Health Engineering Department (HUD/PHED)
Mr. Muazzam Jamil	Deputy Secretary (Urban Development)	HUD/PHED
Dr. Iftikhar Amjad	Deputy Secretary	Economic Affairs Division
Mr. Amjatd Duraiz	Chief (ECA)	PDD
Mr. Sohail Akhtar	Senior Chief (Urban Development)	PDD
Mrs. Bushra Aman	Member(P&D)	
Embassy of Japan		
Mr. Naoki KAMOSHIDA	Counsellor	
Mr. Yuichi KURODA	First Secretary	
Mr. Ryusei KAWASAKI	First Secretary	
JICA Pakistan Office		
Mr. Tomoharu OHTAKE	Chief Representative	
Mr. Ken KATO	Senior Representative	
Mr. Tomohiro AZEGAMI	Representative	
Mr. Satoshi HAMANO	Representative	
Mr. Mahmood A. Jilani	Deputy Resident Representative/Chief Program Officer	

MINUTES OF DISCUSSIONS
PREPARATORY SURVEY (BASIC DESIGN)
ON
THE PROJECT FOR UPGRADING OF MECHANICAL SYSTEM FOR SEWERAGE AND DRAINAGE SERVICES IN GUJRANWALA
IN
THE ISLAMIC REPUBLIC OF PAKISTAN

In response to a request from the Government of the Islamic Republic of Pakistan (hereinafter referred to as "Pakistan"), the Government of Japan decided to conduct a Preparatory Survey (Basic Design) on the Project for Upgrading of Mechanical System for Sewerage and Drainage Services in Gujranwala (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Pakistan the Preparatory Survey Team (hereinafter referred to as "the Team"), which is headed by Minoru MIYASAKA, JICA, and is scheduled to stay in the country from September 9 to 16, 2013.

The Team held discussions with the officials concerned of the Government of Pakistan and conducted a field survey at the survey area.

In the course of discussions and field survey, both parties confirmed the main items described in the attached sheets. The Team will proceed to further works and prepare the preparatory survey report.

Lahore, September 13, 2013

Mr. Minoru Miyasaka
Leader
Preparatory Survey Team
Japan International Cooperation Agency

Mr. Khalid Bashir Butt
Deputy Managing Director
Water and Sanitation Agency
Gujranwala

Mr. Syed Hasan Raza Jafri
Director General, Gujranwala
Development Authority

Mr. Arif Anwar Baloch
Secretary
Planning & Development Department
Government of the Punjab

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

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

ATTACHMENT

1. Objective of the Project

The objective of the Project is to recover capacity of sewerage and drainage system and mitigate the damage at inundated areas in Gujranwala through replacement and provision of new equipments and machineries.

2. Contents of the Inception Report

The Team explained the Inception Report to the Pakistani side. Pakistani side agreed and accepted the contents of the Inception Report.

3. Project title

Both sides agreed to the Project title as "The Project for Upgrading of Mechanical System for Sewerage and Drainage Services in Gujranwala".

4. Project sites

The sites of the Project are located in Gujranwala as shown in **Annex-1.**

5. Responsible and Implementing Authority

The responsible and implementing authorities for the Project are as follows.

Responsible Authority: Housing Urban Development and Public Health Engineering Department, Government of the Punjab

Implementing Authority: Water and Sanitation Agency (WASA), Gujranwala

The organization chart is shown in **Annex-2.**

6. Items requested by the Government of Pakistan

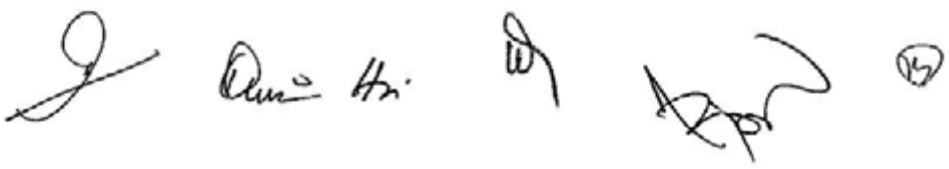
After the discussions, the items described in **Annex-3** were finally requested by the Pakistani side.

The both sides confirmed that the appropriateness of the request would be examined in accordance with the further studies and analysis in Japan and the final components of the Project would be proposed by the Japanese sides and mutually agreed by the both sides

7. Japan's Grant Aid Scheme

7-1. The Pakistani side understands the Japan's Grant Aid Scheme explained by the Team, as described in **Annex-4.**

7-2. The Pakistani side will take the necessary measures, as described in **Attachment 2 for Annex-4**, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.



8. Schedule of the Survey and PC-1 procedure

Schedule of the preparatory survey (hereinafter referred to as "the Survey") is attached as **Annex-5.**

The Pakistani side agreed to formulate PC-1 with referring to information of the Project from the Japanese side. The Pakistani side agreed on key actions with timetable as described below. The Japanese side explained that timely implementation of these actions were crucial for the Government of Japan to make a commitment of grant aid for the Project. Pakistani side agreed to monitor and expedite the progress with reference to the plan.

✓ Present – End of September 2013:	Preparatory survey in Pakistan by consultant members
✓ October - End of December 2013:	Analysis in Japan such as designing, cost estimation, etc. Additional field survey in November if necessary
✓ End of December 2013:	Submission of advance document of the draft preparatory survey report
✓ Early in January 2014:	Dispatch of a mission to explain the draft preparatory survey report (Provision of necessary information for PC-1 procedure by the Japanese side)
✓ Late January 2014	Submission of PC-1 from Housing Urban Development and Public Health Engineering Department to Planning and Development Department for clearance
✓ February 2014:	Submission of PC-1 to Planning Commission
✓ End of March 2014:	Approval of PC-1 by Central Development Party (CDWP) and if necessary Executive Committee of National Economic Council (ECNEC)
✓ June 2014:	Submission of the Final Report

9. Other relevant issues

9-1. Undertakings of the Pakistani Side for the Survey

In response to the request by the Team, Pakistani side agreed to arrange following items:

(1) To provide the Team with available relevant data, information and materials necessary for the execution of the Study.

(2) To prepare the answers for the Questionnaire presented by the Team.

(3) To assign full-time counterparts from WASA Gujranwala to the Team during their stay in Pakistan, to play the following roles as the coordinator to the Team;

- To make the appointments, set up the meetings with the authorities, departments and all other factories and firms whatever the Team intends to visit.
- To attend all the site surveys and any other visiting place with the Team and to make any convenience on accommodation, working room with A/C, adequate transportation, getting the permissions if required, etc.
- To assist and to advise the Team for their collection of data and information as

much as possible.

(4) To secure the permission to take photographs and enter into private properties and restricted areas for the Team for proper execution of the Survey, if necessary.

(5) To take any measures deemed necessary to secure the safety of the members of the Team.

(6) To make arrangements to allow the Team to bring back to Japan any necessary data, maps and materials related to the Survey, subject to approval by the Government of Pakistan, in order to analyze the Project and prepare the reports.

9-2. Security arrangement

The Government of Pakistan will take all possible measures to secure the safety for the concerned people during the Survey and implementation of the Project on condition that the Grant Aid by the Government of Japan is extended to the Project.

9-3. Tax Exemption

The tax exemption including Value Added Tax (VAT), custom duty, and any other taxes and fiscal levies in Pakistan which is to be arisen from the Project activities shall be ensured by the Government of Pakistan. The Government of Pakistan shall take necessary procedures for tax exemption.

9-4. Initial Environmental Examinations (IEE)

Both sides agreed that the Pakistani side would complete necessary procedure of IEE by end of December 2013 in accordance with "the Environmental Protection Act 1997" of Pakistan, if required.

9-5. Clearance of Existing Facilities

Both sides confirmed that clearance of existing facilities and disposal of the waste are undertakings of the Government of Pakistan.

9-6. Disposal of Dredged Materials

Both sides agreed that the Pakistani side will be responsible for the disposal of dredged materials and solid waste removed from sewerage and drainage channels at the site identified by WASA Gujranwala.

9-7. Parking Yard for Equipment

Both sides agreed that the Pakistani side will secure parking yard for equipment to be provided under Japan's Grant Aid and installation of office and storage house for spare parts.

9-8. Country in which equipment made

The Team explained that the equipment of this project will be basically selected among Japanese-made product(s). Japanese-made product(s) include equipment/machinery produced under the Japanese quality control in the third countries by the manufacturer which is owned by the Japanese corporation with more than 50% shareholdings. If Pakistani side has a concrete idea of equipment which may be exceptions to the condition mentioned above, Pakistani side inform of their idea and its advantages to the Team by the end of this mission (the end of September). The Pakistani side agreed on the explanation and condition of the Team.

9-9. Selection of Equipment

Both sides agreed that the Project component such as specifications, number of the equipment and origin of the products would be decided based on survey result, considering justification, relevance, the request of the Pakistani side and the policy of the Japanese Government.

9-10. Capacity of pumping station

The Team explained that capacity of pumping station will be decided considering the capacity of each of component of drainage system mentioned below, and Pakistani side agreed on it.

- Diameter of the suction pipe and flow velocity of the pipe
- Discharge capacity of the canal where the pumping station discharges water
- Capacity to collecting water from the catchment area
- Capacity or possibility of budgetary arrangement of Pakistani side

9-11. Incidental Facilities in the area of Pumping Station

Both sides agreed that basically incidental facilities of pumping stations such as house(s), water supply, and electricity system in the area of pumping station will not be included in the Project component and reparation or restoration of those facilities will be responsibility of the Pakistani side. However it will be included in the Project for those facilities which the Team finds it unavoidable as a component of the pumping system, and it will be explained the result of the Survey at the second mission as described in term 8.

9-12. Temporary Stop of Pumping Machinery

Pakistani side agreed that pumping machinery of disposal pump station will be temporary stopped during renewing the pumping machine.

9-13. Soft Component (Technical Assistance)

The Team explained that the initial guidance for operation and maintenance of the equipment and machineries could be included in the Project to support smooth operation.

Necessity and contents of the support will be examined during the Survey.

9-14. Confidentiality of the Project

The Team explained that the preparatory survey report to be prepared at the end of the Survey would be disclosed to the public in principle in Japan. However, the Team also explained that a confidential part which might affect bidding process such as cost estimation should be kept undisclosed until the bidding has been completed.

9-15. Visibility of the Project

The Pakistani side affirmed the following measures to be taken in order to enhance publicity of the Project:

(a) Mass media sources
(b) Brochures
(c) Banners

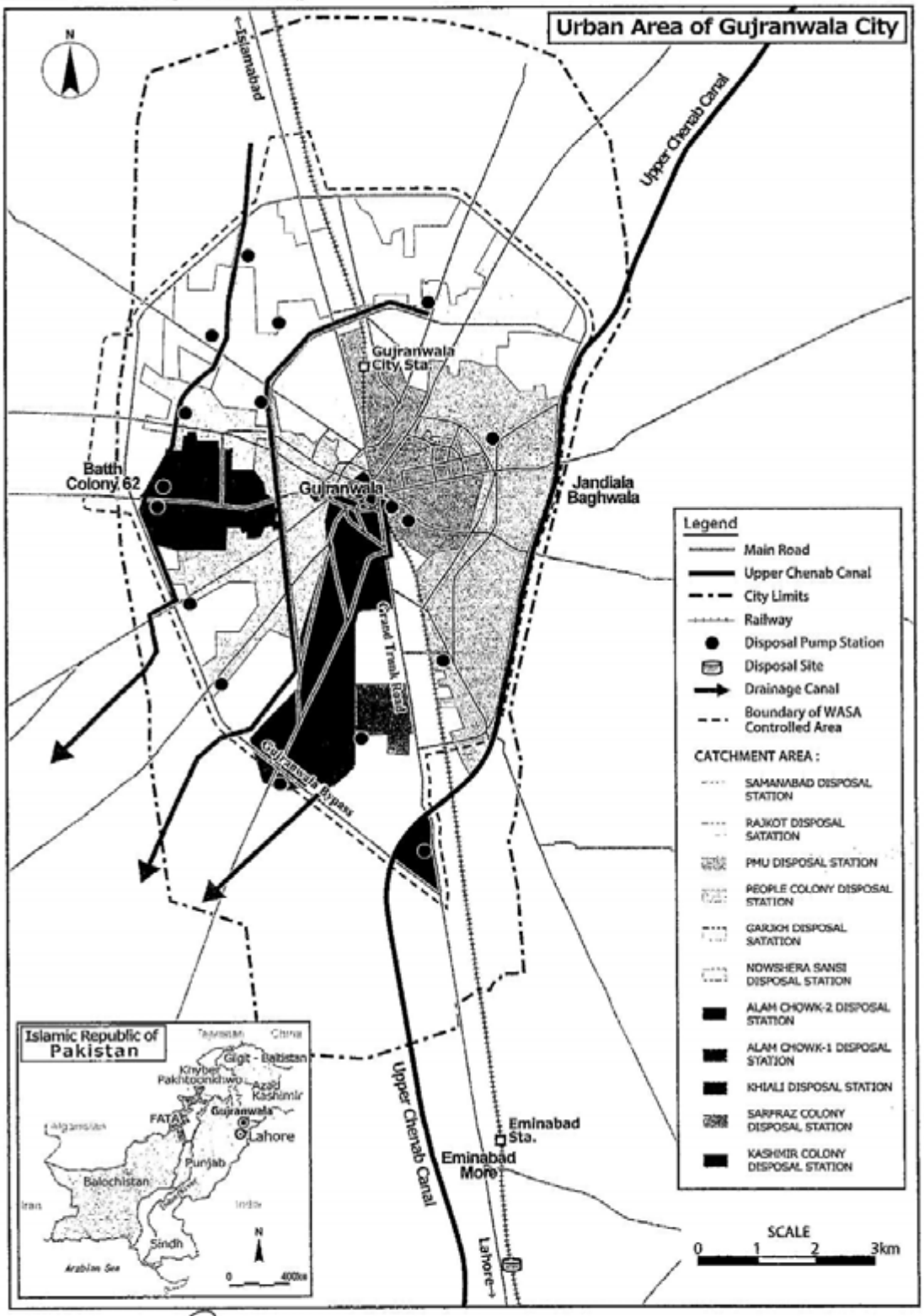
9-16. Public awareness

Both sides agreed that the Pakistani side would take necessary actions including awareness campaign to refrain the public disposing of solid waste in the open channels.

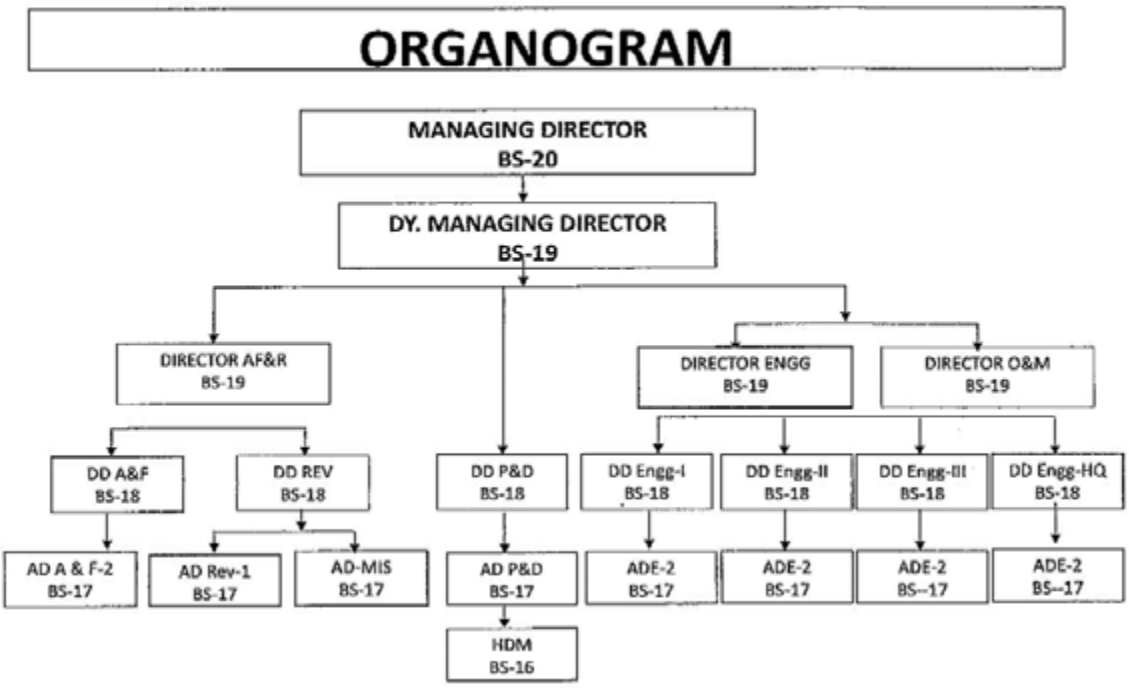
Annex-1 Project Sites Map
Annex-2 Organization Chart (WASA Gujranwala)
Annex-3 Items Requested by the Pakistani Side
Annex-4 Japan's Grant Aid Scheme
Attachment 1 for Annex-4 Flowchart of Japan's Grant Aid Procedure
Attachment 2 for Annex-4 Major Undertakings to be taken by each Government
Annex-5 Survey Schedule

6

Annex-1 Project Sites Map



Annex-2 Organization Chart (WASA Gujranwala)



Annex-3 Items Requested by the Pakistani Side

No.	Contents
1	Suction machine
2	Dragliner (Clamshell)
3	Wheel Excavator
4	Dump Truck
5	Pick-up Truck
6	Safety Equipment
7	Garage, Work Station, Store, equipment etc. (Pakistani side)
8	Dewatering Sets (portable)
9	Winch Machines
10	Generators (100KVA, 150KVA, 300KVA)
11	Equipment Workshop (Pakistani side)
12	Vehicle Mounted Self Priming Dewatering Pump
13	Pumping Machinery

Annex-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 part of this realignment, JICA was reborn on October 1, 2008. After the reborn 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 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.

10

(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 pledge 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 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)

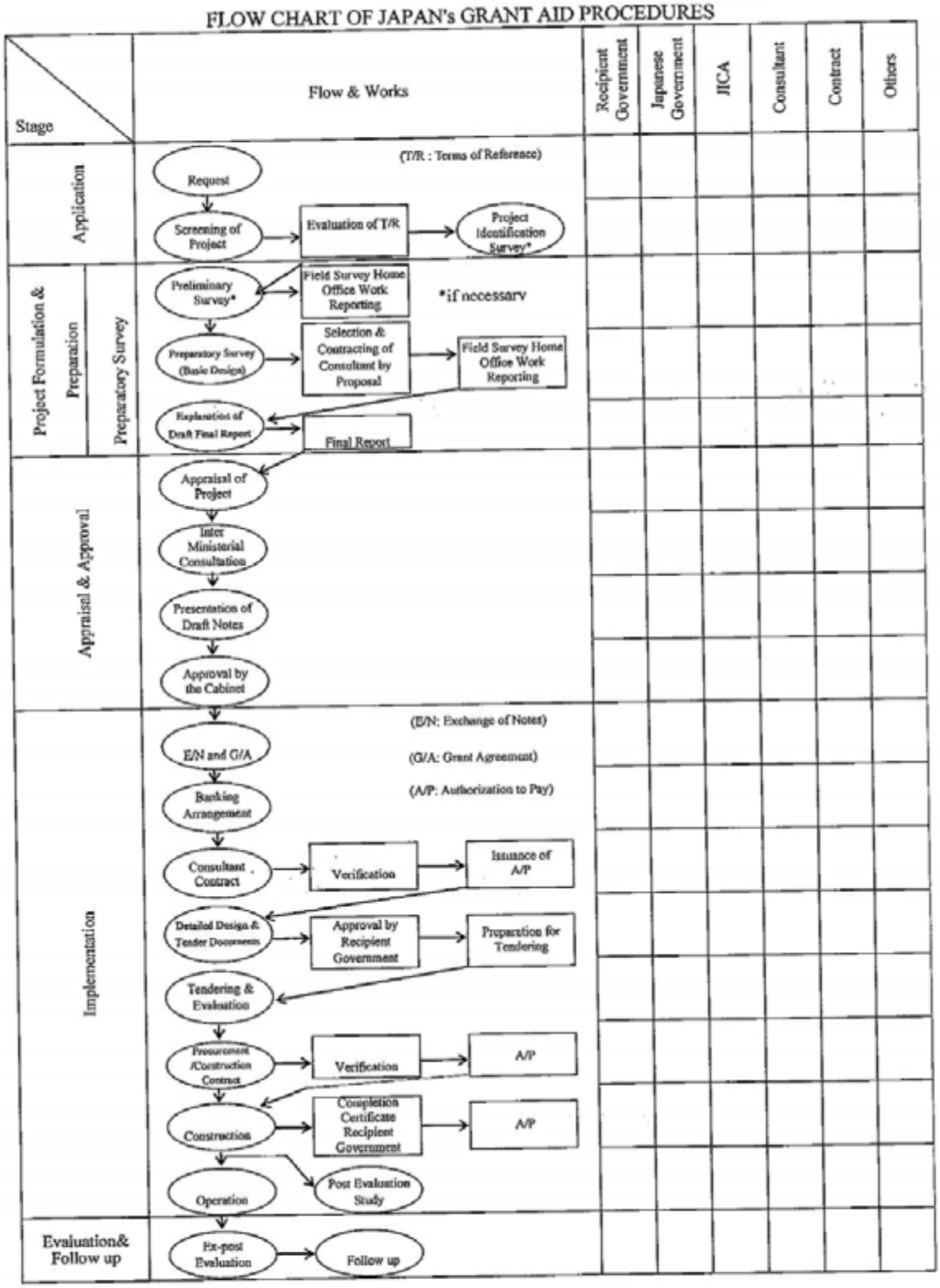
The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions to the Bank.

(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-4

FLOW CHART OF JAPAN's GRANT AID PROCEDURES



13

Attachment 2 for Annex-4

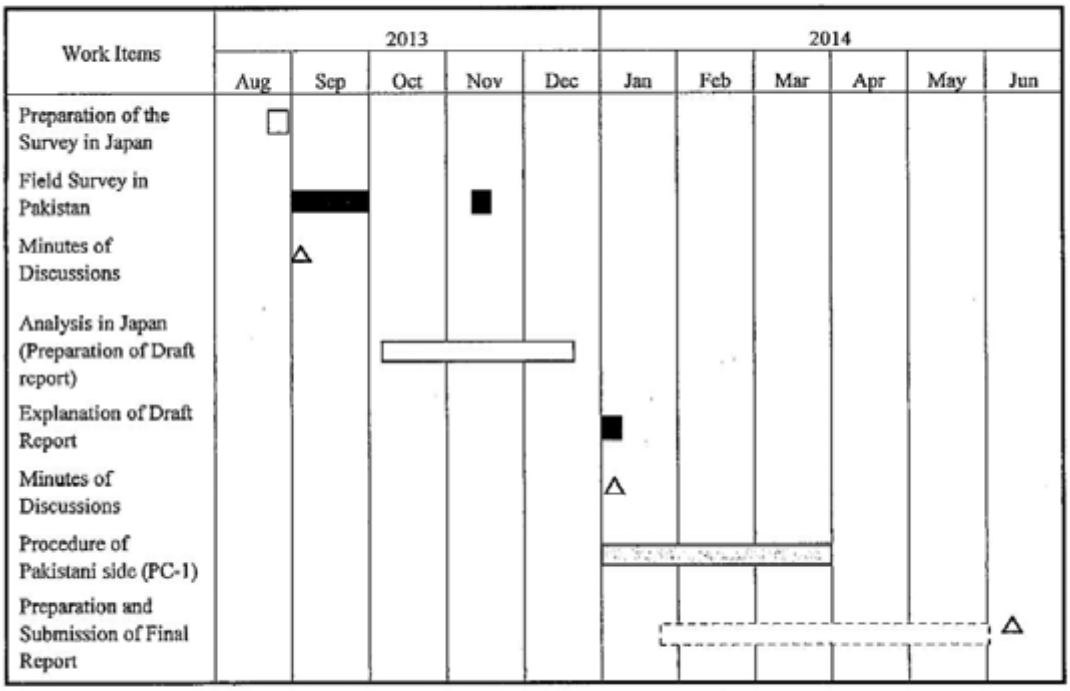
MAJOR UNDERTAKINGS TO BE TAKEN BY EACH GOVERNMENT

No	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure land		●
2	To clear, level and reclaim the sites when needed		●
3	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities		
	1) Electricity		
	a. The distributing line to the sites		●
	b. The drop wiring and internal wiring within the sites	(●)	(●)
	c. The main circuit breaker and transformer	(●)	(●)
	2) Water Supply		
	a. The city water distribution main to the sites		●
	b. The supply system within the sites (receiving and elevated tanks)	●	
	3) Drainage		
	a. The city drainage main (for storm sewer and others to the sites)		●
	b. The drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the sites		●
4	To bear the following commissions to the Japanese foreign exchange banking service based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
5	To ensure 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 sites	(●)	(●)
6	To accord Japanese nationals whose service 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.		●
7	To exempt Japanese nationals engaged in the Project 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 contracts engaged in the Project.		●
8	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		●
9	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)

14

Annex-5: Survey Schedule



15

Soft Component (Technical Assistance) Plan

1) Background

With a view to upgrading the existing sewerage and drainage system in Gujranwala City, the project is to supply WASA with equipment/machinery necessary for cleaning sewers and drains and also, for increasing the capacity of disposal stations to help improve the hygienic environment of the city.

WASA will enhance its structural capacity to cope with the project implementation by reorganizing the two existing engineering sections; one will be newly created for the operation and management of sewerage services and the other will be exclusively for water supply services. Approximately 400 persons will be assigned to the sewerage section and 170 persons to the water supply section. Basically, the project will be managed by the existing staff and manpower, and there is no schedule to recruit new workforce.

Equipment owned by WASA such as water jet machines, suction machines and excavators are frequently used, so there will be no need to provide technical assistance for operation method about such type of equipment. One of the main problems that WASA faces at present is the malfunction of sewerage system mainly caused by the blockage of sewer pipes, so WASA workers have to spend most of the time on this issue to deal with complaints from the residents. They are trained in order to quickly respond to such complaints or requests, but the work is inefficiently performed because it resorts to manual operation due to the lack of equipment and machinery. Under these circumstances, WASA is required to turn in active posture from complaint-based passive posture and intends to remove trouble-making sources in advance by taking pre-emptive actions. It means that should the equipment be procured under the present project, they should be mobilized for efficient use to clean sewer pipes and drains on a regular basis. However, it is important to note that WASA is not experienced in preparing a sewerage cleaning plan taking account of appropriate combination of machines, so that one Japanese expert in this field is requested at the initial stage of the project implementation to provide technical guidance service.

In response to the request, soft component will be introduced in the project to provide technical assistance, which consists of two components; namely, preparation of sewerage cleaning plan and establishment of operation and management system for the cleaning activity. This is expected to be a tool for overcoming difficulties that lie ahead and will contribute to the project with sustainable effects.

2) Objectives

To help improve hygiene environment of Gujranwala City by upgrading sewerage and drainage system, objectives of the technical assistance are as follows:

- To prepare an efficient work plan for cleaning and de-silting sewerage and drainage by use of machines; and
- To establish sustainable operation and management system for cleaning/de-silting work.

3) Outputs (Direct Effects)

The technical assistance service will be provided for WASA counterpart personnel in the fields of work planning and operation and management for cleaning/de-silting activities. The following effects are expected after the completion of such services.

a) Work plan for cleaning sewerage and drainage

- To develop capacity of WASA personnel (Deputy Director, Assistant Directors and Sub-engineers) as a result of acquiring technical knowledge on planning work.

b) Operation and management plan for cleaning activity

- To develop capacity of WASA personnel (Deputy Director and Assistant Directors) as a result of acquiring knowledge on operation and management system through practical cleaning activities.

4) Confirmation of Outputs

At the time of completion of the technical assistance, the above outputs can be confirmed by the following ways.

a) Work plan for cleaning sewerage and drainage

- Accuracy of cleaning/de-silting plan on monthly and annual basis (based on confirmation of daily work volume, operation time, removed volume of sludge, etc.).

b) Operation and management plan for cleaning activity

- Understanding of the manual's description on mechanical inspection, maintenance and repair (checklist, daily report, monthly report, etc.).
- Understanding of manual for safety control and rules regarding cleaning/de-silting..

5) Activities (Inputs)

As previously mentioned, WASA is supposed to create a new Direction to deal with sewerage services and will dedicate itself to the task of cleaning sewer pipes and drains. However, due to the lack of practical experience in planning of cleaning work by use of machines and equipment, one Japanese expert will be assigned to assist WASA in preparing the cleaning and de-silting plan. Thus, he is expected to promote a smooth takeoff for the project. Basically, his assigned work is to prepare and review the overall cleaning plan in joint effort with counterpart personnel (Deputy Director and Assistant Directors). For the implementation, Sub-engineers will join in the meeting to determine the work method as well as management plan. The operation and management system for the cleaning activities is as illustrated in Figure1.

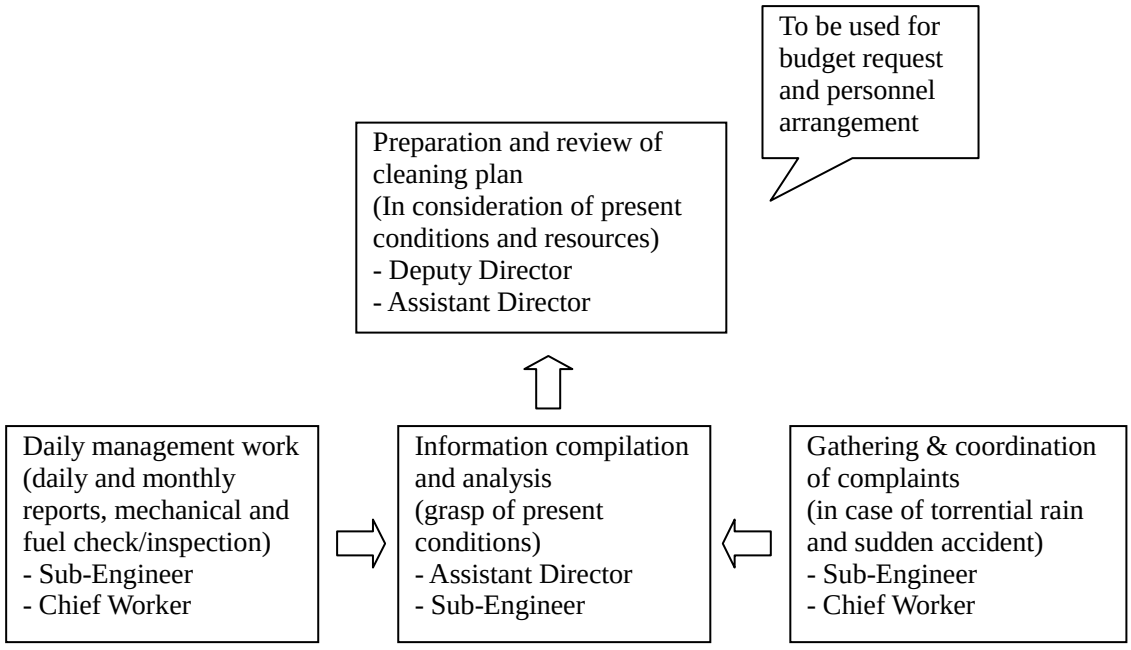


Figure 1 Operation and Management System for Sewerage Cleaning Activities

From the above considerations, the required work for the Japanese expert will include the following:

(a) Assuming that the equipment is supplied under the project, the cleaning plan will need be prepared by setting a target year taking account of effective use of machines and human resources of WASA (in collaboration with Deputy Director and Assistant Directors). The equipment is supposed to be used in the following way:

- Although water jet cleaners will be deployed to clean small-sized pipes (less than 15 inches of diameter) and medium-sized pipes (less than 36 inches of diameter), effective work is hardly implemented due to poor performance. However, this situation will improve by the use of high-performance Japanese products, and work efficiency can be further raised if the water-jet cleaners are used in combination with suction machines.
- For cleaning medium-sized pipes (18-24 inches of diameter), winch machines will be used as a locally adaptable method. The work is performed by the combination of machines and manpower.
- For cleaning large-sized pipes (more than 42 inches of diameter), basically, the work is carried out by manpower as in the past, but suction machine can be deployed to remove sludge from manhole.
- For cleaning earth drain, an excavator and dump trucks will be used to dredge sediment or sludge, whereas clamshell will be employed to remove massive floating materials from the drains. For cleaning narrow concrete-made drains, the excavator is hardly deployable but suction machine can be used after floating materials have been properly removed manually.

(b) Based on the above scheme, annual and quarterly-based work schedule will be prepared together with work performance plan and should be fed back for review if some problems are found in the implementation stage. The work will be carried out in collaboration with the Assistant Director and the Sub-engineer. Further details are given as follows:

- Cleaning areas will be decided based on present conditions of sewerage facilities and number of complaints from the residents, and total work volume will need to be estimated as well.
- Daily-based work volume will be calculated from the available manpower, working time, type of equipment/machinery to be employed.
- Yearly and quarterly-based cleaning plan will be prepared taking account of Ramadan period and time required for sudden accidents.
- Work will be implemented according to the above plan and schedule and will need to be reviewed when unexpected incidents occur or special instruction is given to determine priority areas.

(c) In a joint effort between the Deputy Director and the Assistant Director, the operation and management system will be established as follows:

- To confirm chain of command of the organization with allocation of responsibilities for persons in charge of operation and management sections.
- To determine reporting system for both daily and monthly reports, it will be required in such a way that the output of cleaning activities can be assessed in quantitative way (e.g., volume of removed sludge).
- To prepare a manual showing the procedure and method of daily check and inspection for the equipment and fuel in terms of quality control.

For the assessment of project effect, a monitoring system will be established as follows (the work will be carried out by the Assistant Director together with the Sub-engineer).

- Besides WASA headquarters, complaints from the residents are received in three branch offices, so that the idea is to establish systematical method of compiling and sorting the complaints according to the type and contents.
- Monitoring sites will be selected from flood-prone areas that may occur in monsoon period in order to record and analyze the result of ponding area, depth and time at the heavy rainfall.

The consultant to be assigned for the above work will serve his expertise for a period of two (2) months.

6) Method of Service to be Rendered

Technical assistance for planning of cleaning activity as well as operation/management will be provided by the Japanese consultant for the following reasons:

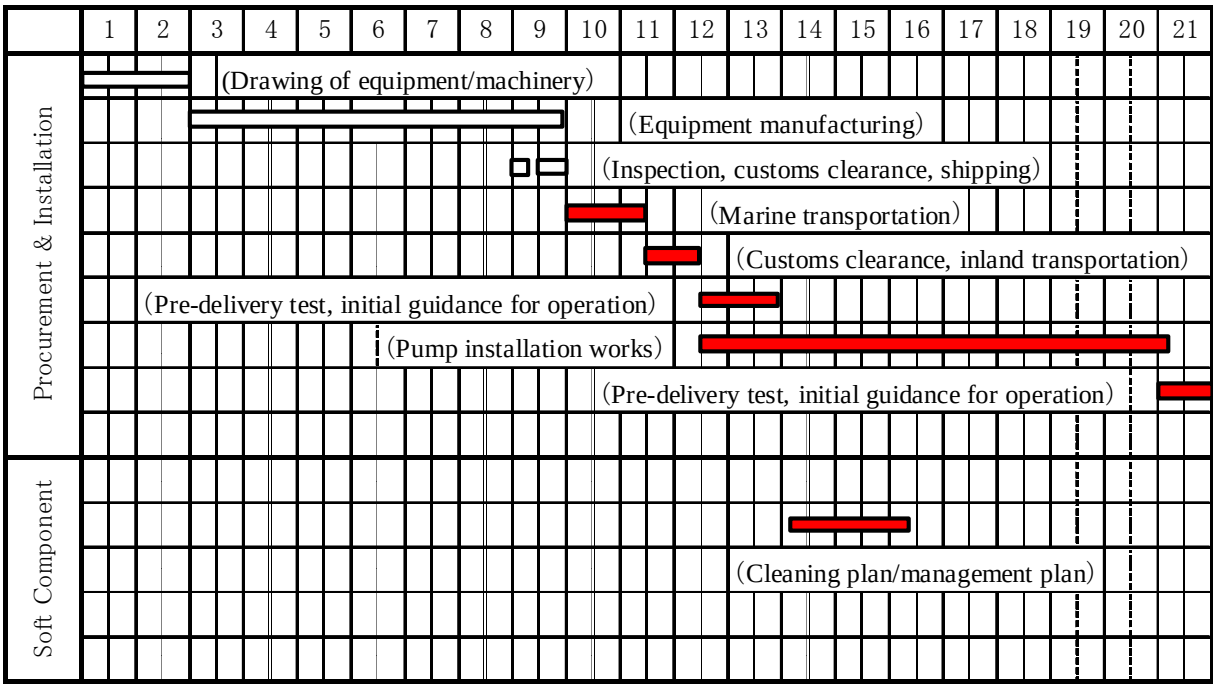
- Experts specialized in planning and operation/management for sewage and drainage system are not easily available in Pakistan.
- There is a shortage of qualified engineers to strictly manage de-silting and drainage works in WASA.
- Since there is no donor in Pakistan in the sector of sewage and drainage except Japan, experts are not available from a third country.

7) Implementation Schedule of Soft Component

This project will be implemented under the grant aid scheme of the Japanese Government after the Exchange of Notes (E/N) and Grant Agreement (G/A) have been duly signed between the Government of Japan and the Government of Pakistan. The total period required for detailed design including tender administration will be six (6) months from the conclusion of E/N and G/A, whereas for manufacturing, procurement and installation of equipment will be 21 months. With regard to service period for soft component, it is scheduled for two (2) months.

The Consultant to be assigned for the soft component is scheduled to arrive at the beginning of June 2016, and will start preparing the cleaning/de-silting plan soon after prior meeting with authorities of WASA. However, it should be carried out after the inspection for delivery of the equipment, and the new Direction responsible for the management of sewerage should be established in WASA with appropriate personnel to be engaged in operation and management. The plan will need to be prepared prior to the start of cleaning activity, so that persons like the Director and Assistant Director will be able to learn the procedure and method through the planning process.

Table 1 Implementation Schedule of Soft Component



8) Output Materials

Output materials are as follows:

a) Sewerage and drainage cleaning plan

- Annual and monthly cleaning plan (work schedule, work performance plan, equipment deployment plan, etc.)

b) Operation and management plan

- Manual for check and inspection of equipment
- Manual for safety control
- Operation and management records (daily report and monthly report)
- Monitoring system (number of complaints from the residents, contents of grievance, ponding conditions).

9) Responsibility of the Pakistan Side

Although WASA is an agency responsible for operation and management of water supply service and sewerage service, its management system is not specifically divided into two service sections to deal with their respective routines. Due to the lack of specialists in the field of sewerage management, medium and long term plan has never been prepared to cope with urban development, so WASA intends to strengthen its management capacity by establishing sewerage Direction under the leadership of the Director assisted by the Deputy Director and some nominated Assistant Directors. However, if technical assistance is not provided, the cleaning activity will remain inefficient since the response-to-complaint pattern is likely to continue.

From the above considerations, WASA is required to create sewerage Direction with staff arrangement before launching soft component. It will be a pre-requisite for WASA to carry out activities of soft component. It is desirable that WASA should pay particular attention to the selection of counterpart personnel to join in technical assistance programs. They must be competent enough to learn

management expertise from the Japanese specialist, and are expected to serve as the brain for sustainable development of WASA

The Project for Upgrading of Mechanical System for Sewerage and Drainage Service in Gujranwala in The Islamic Republic of Pakistan
CTI Engineering International Co., Ltd. (JICA Study Team)

TECHNICAL NOTE

Based on the Minutes of Discussions for the preparatory survey for the captioned Project signed between the Pakistani side and Japanese side on September 13, 2013, the field study in Pakistan was completed in close cooperation between JICA study team and competent personnel of the Water and Sanitation Agency (WASA) of Gujranwala.

In the course of the study, technical issues have been discussed with WASA for the Project to be implemented under the Japan's Grant Aid, and both parties confirmed the main items described in the attached sheet.

Gujranwala, September 27, 2013

Kazuyoshi Kageyama
Chief of Consultants
JICA Study Team
CTI Engineering International Co.,Ltd.

27.9.13

Khalid Bashir Butt
Deputy Managing Director
Water & Sanitation Agency
Gujranwala

1. Equipment to be provided under Japan's Grant Aid.

Principally, all equipment/machinery requested by the Pakistani side shall be Japanese products except for winching machines which may be locally available.

As a result of field study and discussions with WASA counterpart personnel, JICA study team has carefully examined the importance of the equipment to implement retrieval works for the drainage and sewerage and submitted to WASA a list of the equipment with priority as determined in accordance with the effectiveness and efficiency (see Table below). WASA agreed with the team about the list and priority.

Although high pressure water jet cleaner was not listed as an item of the requested equipment in Minutes of Discussions, it is desirable to include this machine in the above list as it may be useful to clean small size of sewer pipes.

Equipment	Specifications	Priority level
Water jet cleaner	Under consideration	B
Suction machine	Under consideration	A
Clamshell	Under consideration	A
Wheel excavator	Under consideration	A
Dump truck	Under consideration	A
Pick-up truck	Under consideration	B
Safety equipment	Under consideration	B
Dewatering sets (potable)	Under consideration	A
Winch machines	Bucket attached	A
Generator	100 KVA, 150KVA, 300KVA	A
Self priming dewatering pump	Vehicle-mounted type	B
Pumping machine	10 Cusec, 25 Cusec	A

(Note) A: First priority, B: Second priority

2. Installation of pump and generator for the Disposal Station

Pumps and generators to be installed in the Disposal Stations are both prioritized to provide tools for further study and discussions (**see Attachment-1 and 2),** and the location and number of units will be determined in Tokyo after due consideration.

As for the installation of pumps, some technical judgment has been made as an outcome of the field study as illustrated in **Attachment-3.** However, there still be pending issues to finalize the basic design.

3. Construction of new parking yard for the equipment.

WASA will construct the garage for equipment/machinery at People's Colony with a proper store house to keep spare parts in custody. The area is approximately 60m x 140m and currently unused.

4. Share of work responsibility.

The share of work responsibility or work demarcation for the installation of pump(s) in the Disposal Stations was determined as presented in the drawing attached hereto (**see Attachment-4**). Basically, works to be undertaken by the Japanese side shall be limited to the installation of pump machine, cable from the transformer, and its appurtenant facilities in pump house, and other relevant tasks including civil works shall be carried out under the responsibility of the Pakistani side.

With regard to the installation of generator, the share of responsibility between Japanese side and Pakistani side shall be as shown in the following Table.

Facilities	Japanese side	Pakistani side
Diesel generator unit	✔	
Construction of foundation		✔
Cable	✔	
Cable connection		✔
Sun shade		✔
Switching panel of commercial and generator power	✔	
Other necessary works for the installation of generator		✔

5. Final disposal site of dredged materials.

In discussion with the District Office of Gujranwala, it is confirmed that WASA is allowed to use Chianwaali open dumping site for the disposal of materials dredged or removed from the drains or sewerage pipes.

6. Enhancement of WASA's organization

It is confirmed that WASA will enhance its structural capacity to cope with the project implementation by splitting engineering sector into two Directions, one is exclusively to deal with sewerage and other with water supply.

7. Request for technical guidance services under the Grant Aid (Soft Component).

One Japanese expert is requested to provide technical guidance services at the initial stage of the project implementation for the establishment of systematic cleaning operation system.

8. Environmental study

If initial environmental study is required, it shall be conducted by the Pakistani side in an effort to obtain Non Objective Certificate from the Punjab Environmental Protection Agency by the end of December 2013.

9. Use of web site for information dissemination to the public.

As an activity of the public awareness campaign, WASA will use its own web site for information dissemination to the public. In this regard, one person specialized in this field will be placed in WASA in near future to manage the system and to update information from time to time. Information required shall include clean campaign activities, cleaning work schedule, grievance redress, etc.

The public awareness campaign will be conducted in coordination with solid waste management section of the District Office particularly to focus on school children.

Attachment -1 Request of Survey for Disposal Stations

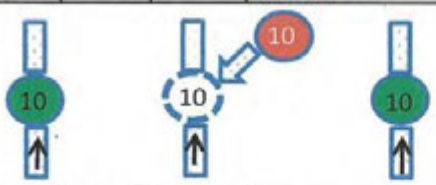
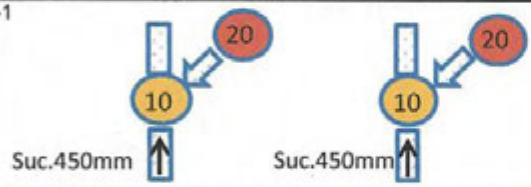
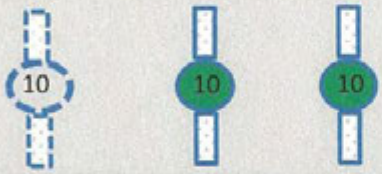
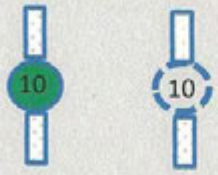
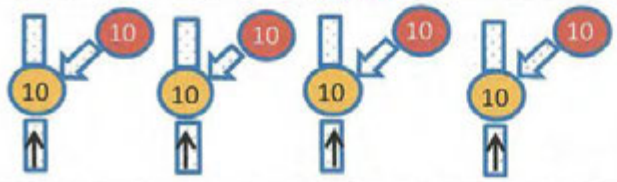
Dispersal Station Name	Existing Pump		Request			Priority of Request	Installed Year	Pump Operation hour/each	Assumed Max.Incoming Sewerage (Requested)	Max. Dispersal Capacity at Present	Pump Diameter Pressure	Incoming Sewer Diameter	Pump Diameter		Motor	Pump Speed
	Number	Flow	Number	Flow	Replace or Addition											
		(cusec)		(cusec)			Month/Year	(hrs./day)	Flow (cusec)	Flow (cusec)	Head (m)	(inch)	Suc. (mm)	Dis. (mm)	(HP)	(min^{-1})
Alam Chowk No.2	2	10	1	10	Addition	8	2011	12	29	20	15	54"	300	300	100	960
Garjakh	2	10	Cancel (NO space)				2008	12	35	20	15	42"	300	300		960
	1	5										24"x2				960
Khayali	4	10	1	10	Addition	10	2009	18	60	40 (15cusec : Abandon)	15	60"	400x2 300x2	400x2 300x2	135x2 190x2	960
	2	15	1	25	Replace	3	1965				15		450	450		960
Nowshera Road	3	10	Cancel				2008	10	29	30	15	42"	300	300		960
Nowshera Sansi	4	10	4	10	Replace	2	2000	20	50	40	15	60"	300	300	100	960
People Colony	8	10	1	10	Replace	11	1998	20	124	80	15	54"x2	300	300	100	960
			1	25	Addition	4	-				15		300	300		960
PMU	5	10	1	10	Addition	5	2000	18	58	50	15	42"x2	300	300	100	960
Rajkot	8	10	2	10	Addition	9	2004	20	156	90	15	60"	400x2 300x6	400x2 300x6	100	960
	2	15(?)	2	25	Replace	1	1965				15		450	450		960
Samanabad	1	10	1	10	Addition	7	2011	10	30	10	15	54"	300	300	100	960
Mughalpma	1	5	1	5	Replace	6	2007	12	10	5	12	24"	200	200	60	960
		Total	16													

Attachment-2 Request of Survey for Diesel Generator Units

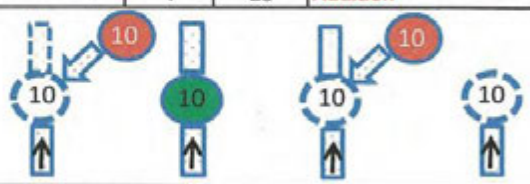
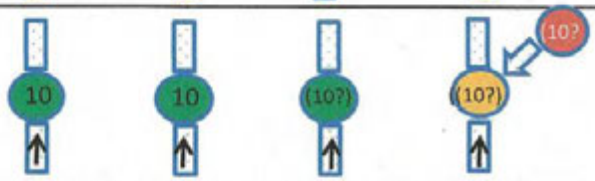
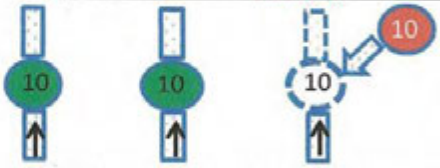
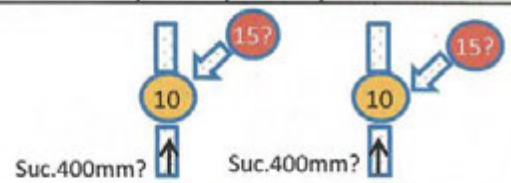
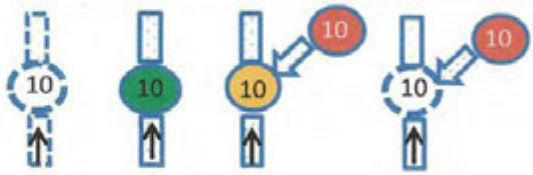
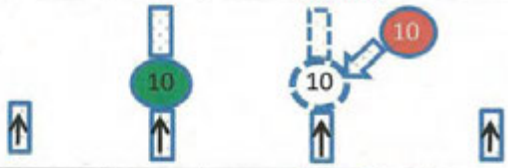
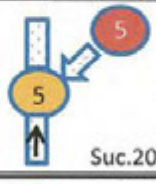
No.	Station Name	Number of Generator Requested			Frequency of Electricity Failure a day	Motor	Quantity of Motor Started by Generator	Total Quantity of Motor in Station	Motor Starter Method	Priority of Request	Voltage	Installation Space for Generator at Existing Site
		100kVA	150kVA	300kVA		(kW)			Direct? or Star-Delta?		(V)	---(m)x---(m)
1	Abu Bakar Park	0	1	0	14	75	1	2	Star-Delta	11	440	available
2	Alam Chowk No.2	0	1	0	11	75	1	2	Star-Delta	12	440	available
3	Garjakh	0	1	0	11	75	1	3	Star-Delta	8	440	available
4	Jinnah Road U/P	1	0	0	10	37	1	2	Star-Delta	9	440	available
5	Kashmir Colony	1	0	0	14	37	1	2	Star-Delta	10	440	available
6	Khayali	0	0	1	15	75	2	6	Star-Delta	6	440	available
7	Model Town	1	0	0	11	37	1	1	Star-Delta	13	440	available
8	Mughalpura	1	0	0	11	37	1	3	Star-Delta	7	440	available
9	Nowshera Road	0	0	1	10	75	2	3	Star-Delta	5	440	available
10	Nowshera Sansi	0	0	1	12	75	2	4	Star-Delta	4	440	available
11	People Colony	0	0	1	10	75	2	8	Star-Delta	3	440	available
12	PMU	0	0	1	10	75	2	5	Star-Delta	2	440	available
13	Rajkot	0	0	2	10	75	4	11	Star-Delta	1	440	available
14	Samanabad	0	1	0	12	75	1	1	Star-Delta	14	440	available
15	Baghwala	1	0	0	12	37	1	2	Star-Delta	15	440	available
		5	4	7								

Attachment-3 RESULT OF EXAMINATIONS

Existing Pump　Replacement　New Pump　Space for New

Dispersal Station Name	Request Number	Request Flow (cusec)	Result	NOTE
Alam Chowk No.2	1	10	1 set x 10cusec Addition	Possible to install one new 10cusec pump at existing space. There are existing pipe of suction and discharge for new pump. **Transformer for new motor(75kW) is required.**
				
Garjakh	2	10	Cancel	There is two pump rooms in the station. Two horizontal pumps is installed in one pump room, and it is difficult to refurbish. Another room has no space for new pump. **Therefore, not recommended.**
				
Khayali	1 1	10 25	Room-1: 2 sets x 20cusec Replace, New Room: Cancel	Two existing pumps can be changed to new 20 cusec pumps because of having 450mm suction diameter. **Transformer for new motor(132kWx2) is required.**
Room-1 				
New Pump Room 				There is space for new 10 cusec pump, but there are not pipelines of suction and discharge. **Therefore, not recommended to renew because construction cost is very expensive.**
Nowshera Road	1	10	Cancel	According to FEASIBILITY REPORT, this disposal station will be used as standby and to be operated during rains if required. Therefore requirement is canceled.
				
Nowshera Sansi	4	10	4sets x 10cusec Replace	Existing 4 pump sets are changed to new pumps because of very old pumps.
				

2013/9/27　1/2

Dispersal Station Name	Request Number	Request Flow (cusec)	Result	NOTE
People Colony	1	10	2sets x 10cusec + 1set	
	1	25	Addition	
Room-2 				It is possible to install two new 10cusec pumps, but necessary to construct a new discharge pipeline. There is no space for No.4 pump. Transformer for new motor(75kW) is required.
Room-3 				Under examination.
PMU	1	10	1set x 10 cusec	
			Addition	
				There is space for one new 10 cusec pump, but it is necessary to construct a discharge pipe line. Transformer for new motor(75kW) is required.
Rajkot	2	10	Pending	Pump capacity will be decided based on the result of survey. Pumps installed in room-2 are selected instead of pumps installed in 1965 for replace because of unclear condition of suction and discharge pipelines. Transformer for new motors is required.
	2	25	Under examination	
Room-2 				
Room-3 				One 10cusec pump can be installed at the space of a submersible pump installed tentatively, and also there is space for one additional pump. Transformer for new motor(75kWx2) is required.
Samanabad	1	10	1set x 10 cusec	
			Addition	
				It is possible to install one new 10cusec pump, but necessary to construct a new discharge pipeline. Transformer for new motor(75kW) is required.
Mughalpura	1	5	1set x 5cusec	
			Replace	
				One 5cusec pump is replaced.

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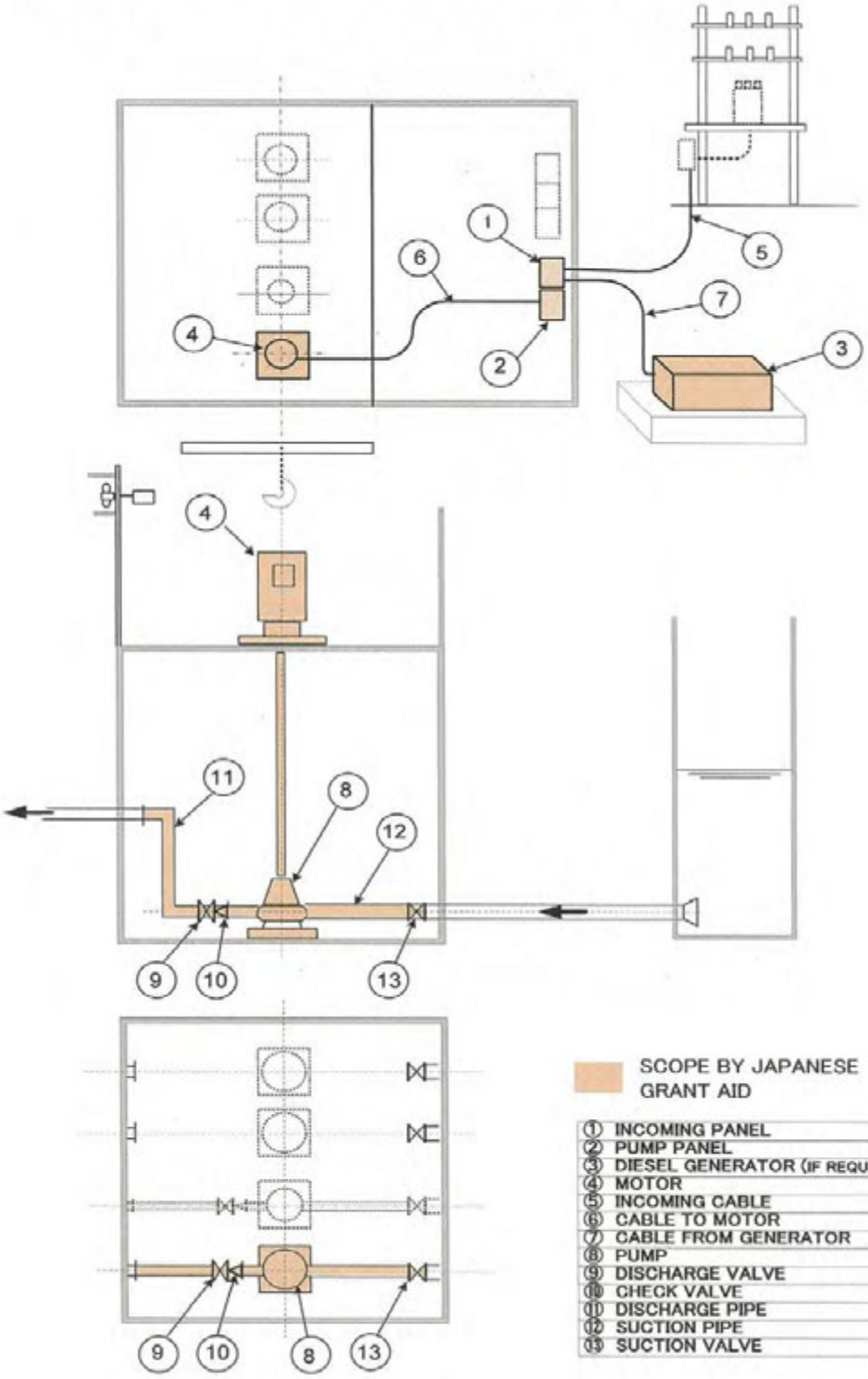
Attachment-4 SCOPE BY JAPANESE GRANT AID



27-Sep-13

MINUTES OF DISCUSSIONS
PREPARATORY SURVEY
ON
THE PROJECT FOR UPGRADING OF MECHANICAL SYSTEM FOR SEWERAGE AND DRAINAGE SERVICES IN GUJRANWALA
IN
THE ISLAMIC REPUBLIC OF PAKISTAN

In response to a request from the Government of the Islamic Republic of Pakistan (hereinafter referred to as "Pakistan"), the Government of Japan decided to conduct the Preparatory Survey (hereinafter referred to as "the Survey") on the Project for Upgrading of Mechanical System for Sewerage and Drainage Services in Gujranwala (hereinafter referred to as "the Project") and entrusted the survey to Japan International Cooperation Agency (hereinafter referred to as "JICA"). JICA sent the Preparatory Survey Team for the Inception Report, which is headed by Mr. Minoru Miyasaka, from 1 to 30 September 2013 and from 24 to 29 November 2013. The said Preparatory Survey Team held discussions with the officials concerned of the Project and conducted a field survey of the concerned area. During the course of discussions and field survey, both parties confirmed the main items and signed the Minutes of Discussions of the Inception Report of the Survey on 13 September 2013.

According to the Minutes of Discussions above, JICA conducted series of field surveys and discussions with related organization, and finally prepared the draft report of the Survey. In order to explain / consult the Housing Urban Development and Public Health Engineering Department of the Government of Punjab, Pakistan on the components of the draft report, JICA sent the Draft Report Explanation Team (hereinafter referred to as "the Team"), headed by Mr. Hideaki Matsumoto, from 9 to 17 February 2014.

As a result of the discussions, both parties confirmed the items described on the attached sheets.

Lahore, 13 February 2014

Mr. Hideaki Matsumoto Leader Preparatory Survey Team Japan International Cooperation Agency	Mr. Khalid Bashir Butt Managing Director Water and Sanitation Agency Gujranwala	Mr. Syed Hasan Raza Jafri Director General, Gujranwala Development Authority
Mr. Arif Anwar Baloch Secretary Planning & Development Department Government of the Punjab	Mr. Waseem Mukhtar Secretary Housing Urban Development and Public Health Engineering Department Government of the Punjab	Mr. Shahid Amed Vakil Deputy Secretary Economic Affairs Division Government of Pakistan

ATTACHMENT

1. Components of the Draft Report

Pakistani side agreed and accepted in principle the components of the Draft Report explained by the Team. The components of the Project are shown in Annex-1. JICA will finalize the Final Report according to the comments from Pakistani side.

2. Tentative Schedule of the Project

The Team explained and Pakistani side agreed with the tentative implementation schedule as shown in Annex-2.

3. Confidentiality of the Project

3-1 Detailed Specification

Both sides confirmed all the information related to the Project including technical specifications and drawings and other technical information shall not be released to any other party(ies) before the signing of all the Contract(s) for the Project.

3-2 Project Cost Estimate

Both sides confirmed that the Project Cost Estimate as shown in Annex-3 should never be duplicated in any form nor disclosed to any other part(ies) before the signing of all the Contract(s) for the Project. This confidentiality of the estimated project cost is necessary to ensure fairness of the tender procedure.

4. Budget allocation by the Pakistani side

Pakistani side agreed to allocate necessary budget for initial investment and operation and maintenance as recurrent cost as shown in Annex-3. The Team also explained that these cost estimations are subject to change since these are provisional and need to be examined further.

5. Undertakings by Pakistani side

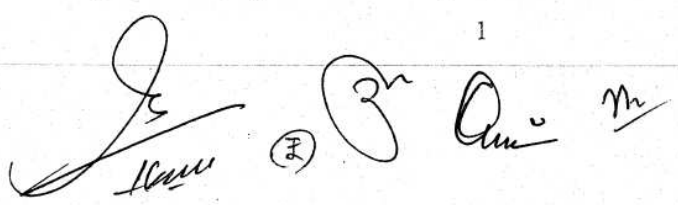
Both side confirmed that measures mentioned in Annex-4 shall be undertaken by Pakistani side for the implementation of the Project.

6. Waste Management

Both sides confirmed that disposal of the waste is the undertaking of the Government of Pakistan.

7. Schedule of procedure of PC-1

The Japanese side explained that timely implementation of PC-1 procedure is crucial for the



Government of Japan to make a commitment of grant in aid for the Project. The Pakistani side agreed on key actions for PC-1 procedure with timetable as described below. Pakistani side also agreed to monitor and expedite the progress with reference to the plan.

✓ Early March 2014	Submission of PC-1 from Housing Urban Development and Public Health Engineering Department to Planning and Development Department for clearance
✓ Early April 2014:	Submission of PC-1 to Planning Commission, Government of Pakistan
✓ End of May 2014:	Approval of PC-1 by Central Development Working Party (CDWP) and if necessary Executive Committee of National Economic Council (ECNEC)

Delay in approval of PC-1 may cause cost over run of the Project.

8. Initial Environmental Examinations (IEE)

Pakistani side agreed to complete necessary procedure of IEE by the end of May 2014 in accordance with "the Environmental Protection Act 1997" of Pakistan, if required.

9. Country to procure the equipment

The Team explained that the equipment of this project will be basically procured from Japan. The Team further explained, however, that third country will be included to procure some of equipment because of availability, competency, etc. The Pakistani side agreed on the explanation by the Team.

10. Temporary Stop of Pumping Machinery

Pakistani side agreed that pumping machinery of disposal pump station will be temporarily stopped during renewing the pumping machine. Pakistani side understood that normally temporary stop will be one to two days, but it would be more than that in case unforeseen situation happened.

Annex-1: Components of the Project
Annex-2: Tentative Implementation Schedule
Annex-3: Project Cost Estimation
Annex-4: Major Undertakings to be taken by Government of Pakistan.

Related Document to the Minutes of Discussions: Draft Report of the Preparatory Survey

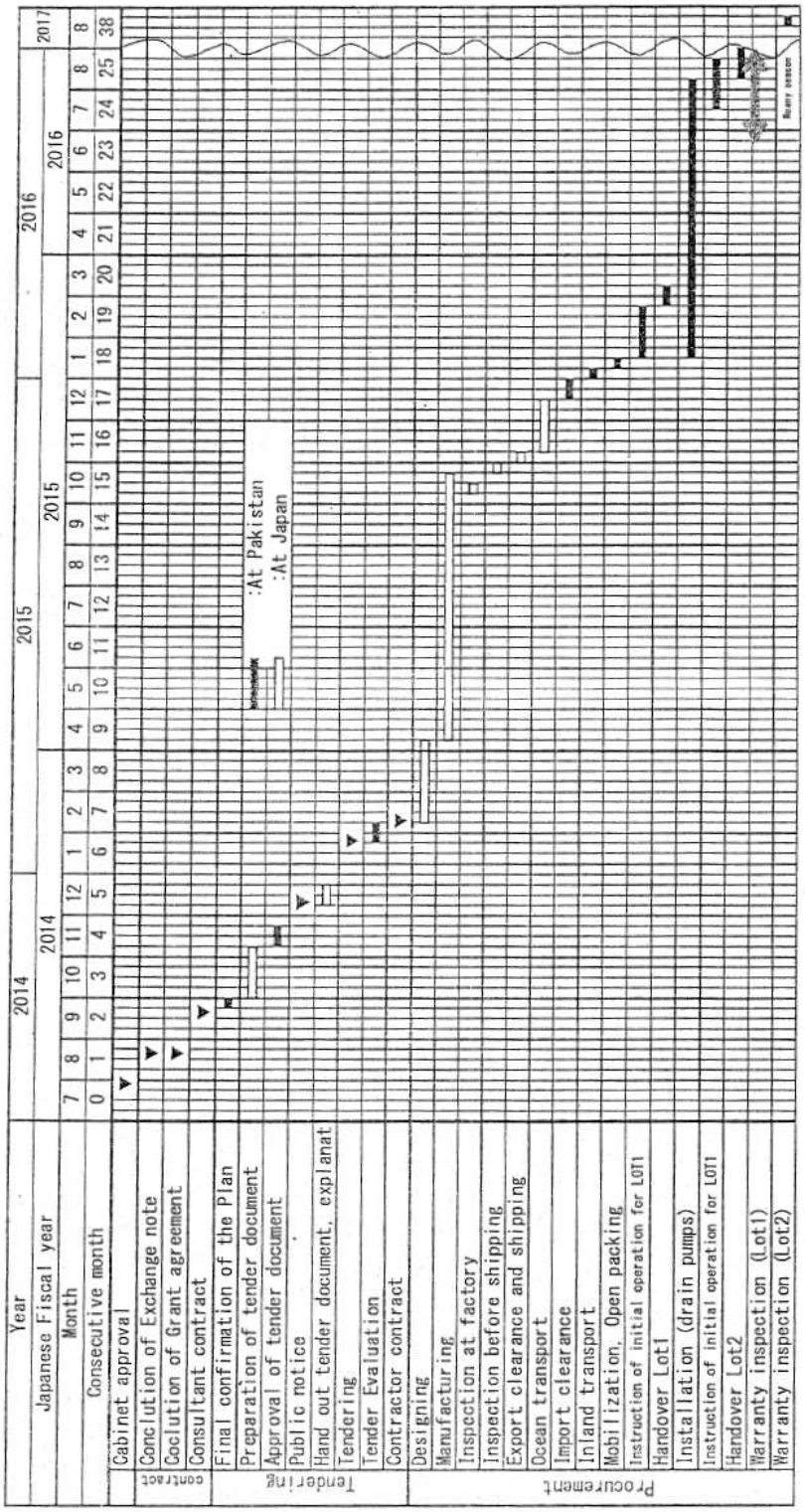
Annex-1

Components of the Project

Classification	Contents	Number of Units
Cleaning/desilting equipment		
Sludge removal equipment	Water jet cleaner	2
	Suction machine	4
	Wheel-typed clamshell	1
	Wheel-typed excavator	2
	Winch machine	7 sets
Transportation equipment	Dump truck (2-ton)	6
	Dump truck (4-ton)	4
	Pick-up truck	3
Other equipment	Traction type dewatering pump(small)	12
		3
	Traction type dewatering pump(large)	1 package
	Safety equipment	
Disposal station		
Drainage pump and appurtenant facilities	Drainage pump	14
	Generator(with installation)	6
	Generator(without installation)	8
Soft component		
Technical assistance	Planning for sewerage cleaning	2 months
	Operation and management	

Annex-2

Tentative Implementation Schedule



Annex-2 - 1

Annex-3

Project Cost Estimation

1. Project Cost to be borne by Japan's Grant Aid
   Total Project Cost: Approx. 1,012 Million JP Yen

Category	Million JPY
Equipment Procurement, Installation and Trainings Cost	958
Consultant's Supervision Fee (including Soft Component)	54
Total	1,012

2. Project Cost to be borne by Pakistani Side
   Total Project Cost: 16.1 Million Rs (approx. 17.9 Million JP Yen)

Items	Million Rs
Installation of disposal pumps	13.3
Electrical Works	4.8
Removal of existing pumps	1.0
Providing/ Installation of Delivery Pipe	3.0
Providing/ Fixing Steel Girders	4.5
Installation of generator	2.8
Foundation	0.8
Wiring	0.8
Installation of exchange panel	0.4
Roof Shade	0.8
Total	16.1

Applied Exchange Rate:

As of October 2013 USD 1.00 = JPY 99.93
Rs 1.00 = JPY 1.11

3. Recurrent Estimate Cost to be borne by Pakistani Side

	Project Implementation Stage		
	1st. year	2nd. year	3rd. year
O/M cost (Million Rs.) Estimate by the Team	79	79	94

Annex-3 - 1

Annex-4

Major Undertakings to be taken by Government of Pakistan

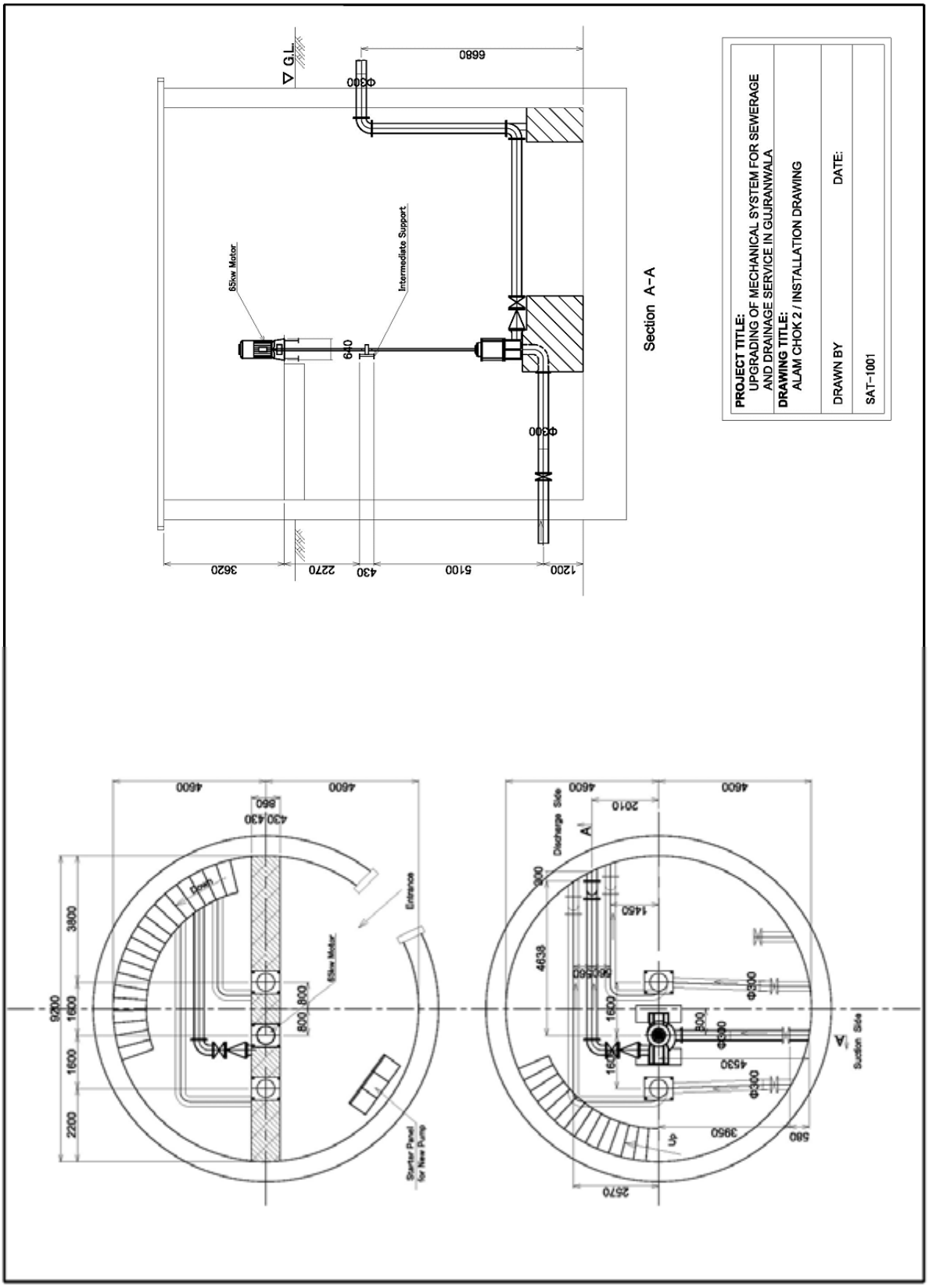
No	Items
1	To secure land
	1) Parking lot for the equipment/machinery
	2) Final disposal site for dredged or removed materials
2	To clear, level and reclaim the sites when needed
3	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities
	1) Electricity
	a. The distributing line to the sites
	b. The main circuit breaker and transformer
	2) Water Supply
	a. The city water distribution main to the sites
	3) Drainage
	a. The city drainage main (for storm sewer and others to the sites)
	b. The drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the sites
4	To provide preparatory works for each disposal station
	1) Procurement and installation of substations
	2) Removal of existing equipment and cleaning
	3) Demolish of foundations
	4) Space arrangement for diesel generator units
	5) Supply and installation of suction and discharge pipes outside pump rooms
	6) Reinforcement of crossbeams for fixing motors
	7) Reinforcement of crossbeams for fixing shaft bearings
	8) Excavation, civil works and reinforcement of building frame
	9) Temporary storage space for equipment
	10) Reinforcement of stairs in pump rooms
	11) Newly fixing and repairing of ventilation fans
5	To provide preparatory works for diesel generators (installation not included under the Grant Aid)
	1) Concrete foundations construction
	2) Installation works
	3) Fixing of power switching panels
	4) Wiring works
	5) Sunshade roofs installation/construction
6	To bear the following commissions to the Japanese foreign exchange banking service based upon the B/A
	1) Advising commission of A/P
	2) Payment commission
7	To ensure unloading and customs clearance at the port of disembarkation in recipient country
	1) Tax exemption and customs clearance of the products at the portof disembarkation
8	To accord Japanese nationals whose service 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.
9	To exempt Japanese nationals engaged in the Project 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 contracts engaged in the Project.
10	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid
11	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

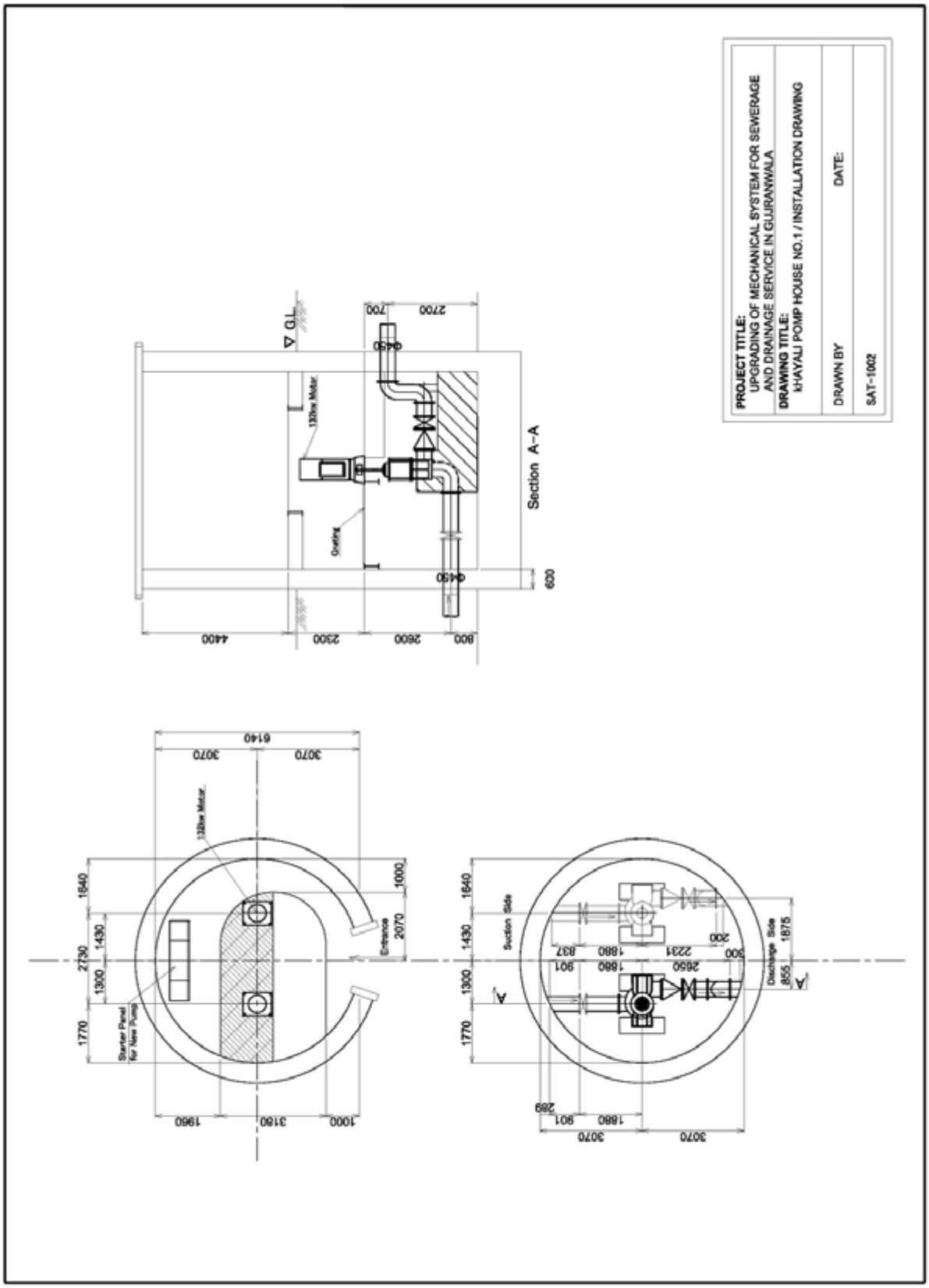
(B/A: Banking Arrangement, A/P: Authorization to Pay)

Annex-4 - 1

Outline Design Drawing List

Drawing No.	Drawing Title
SAT-1001	Alam Chowk No.2, Installation Drawing
SAT-1002	Khayali, Pump Room No.1, Installation Drawing
SAT-1003	Nowshera Sansi, Installation Drawing
SAT-1004	People Colony, Pump Room No.3, Installation Drawing
SAT-1005	PMU, Room No.1, Installation Drawing
SAT-1006	Rajkot, Room No.2, Installation Drawing
SAT-1007	Rajkot, Room No.3, Installation Drawing
SAT-1008	Samanabad, Installation Drawing
SAT-1009	Mughal Pulra, Installation Drawing


PROJECT TITLE:
UPGRADING OF MECHANICAL SYSTEM FOR SEWERAGE AND DRAINAGE SERVICE IN GUJRANWALA
DRAWING TITLE:
ALAM CHOK 2 / INSTALLATION DRAWING
DRAWN BY
DATE:
SAT-1001
Section A-A
GL
65kw Motor
Intermediate Support
Suction Side
Discharge Side
Entrance
Starter Panel for New Pump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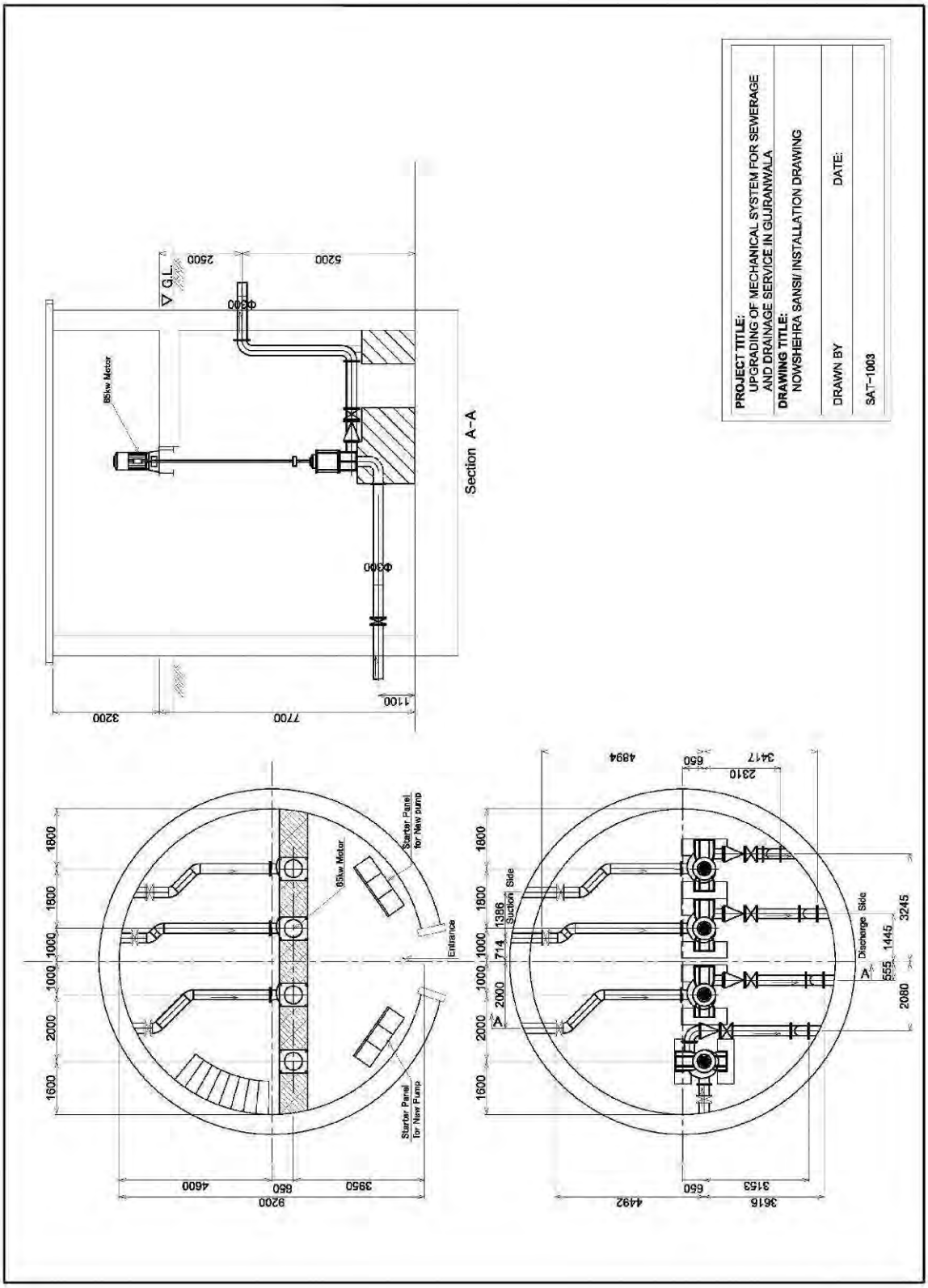
UPGRADING OF MECHANICAL SYSTEM FOR SEWERAGE AND DRAINAGE SERVICE IN GUJRANWALA
DRAWING TITLE:
K'HAYALI POMP HOUSE NO.1 / INSTALLATION DRAWING
DRAWN BY
DATE:
SAT-1002
Section A-A
G.L
2700
700
600
4400
2300
2600
800
6140
3070
1640
1430
2730
1300
1770
1000
2070
Entrance
1860
3160
Suction Side
Discharge Side
1875
855
2650
2234
1880
837
901
200
289
3070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DRAWING TITLE:
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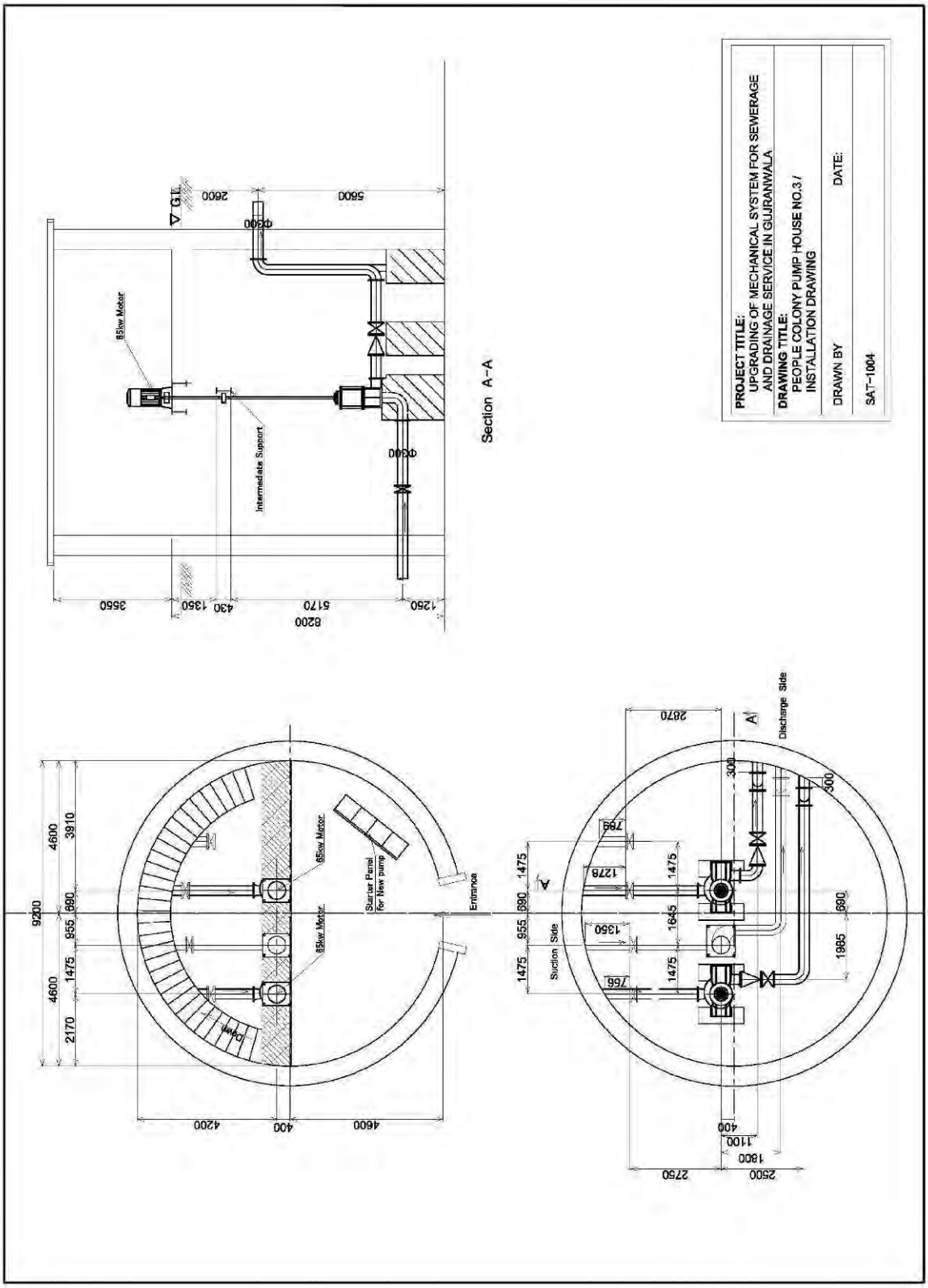
DRAWN BY
DATE:
SAT-1003
Section A-A
G.L
2600
5200
Φ300
85kw Motor
Φ300
1100
3200
7700
Starter Panel for New pump
85kw Motor
Entrance
Starter Panel for New Pump
1800
1800
1000
1000
2000
1600
4600
860
3950
9200
4894
660
3417
2310
Suction Side
1386
714
2000
A
Discharge Side
3245
1445
555
2080
660
3153
4492
3616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UPGRADING OF MECHANICAL SYSTEM FOR SEWERAGE AND DRAINAGE SERVICE IN GUJRANWALA
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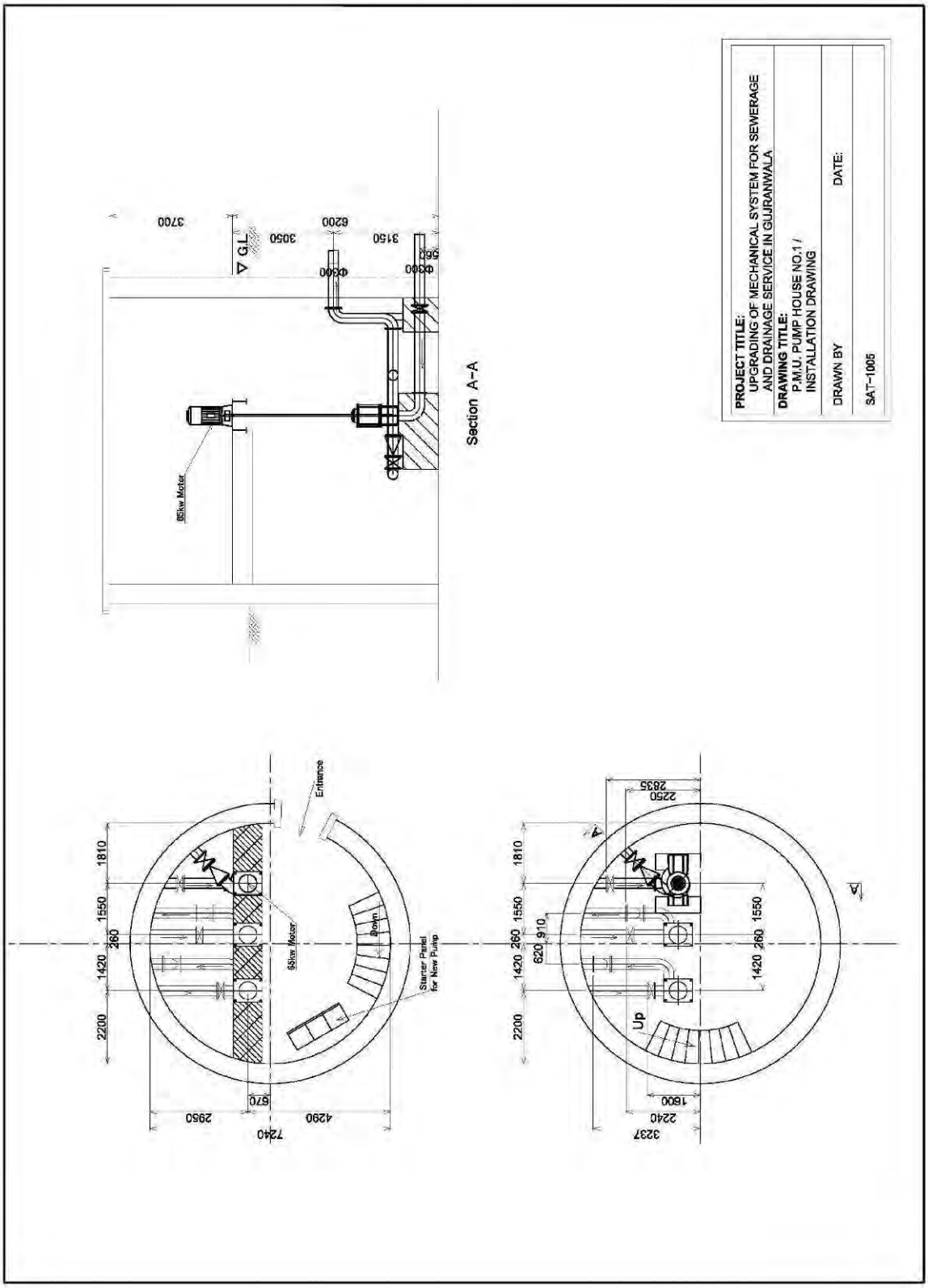
PEOPLE COLONY PUMP HOUSE NO.3 / INSTALLATION DRAWING
DRAWN BY
DATE:
SAT-1004
Section A-A
85kw Motor
Intermediate Support
Starter Panel for New pump
Entrance
Suction Side
Discharge Side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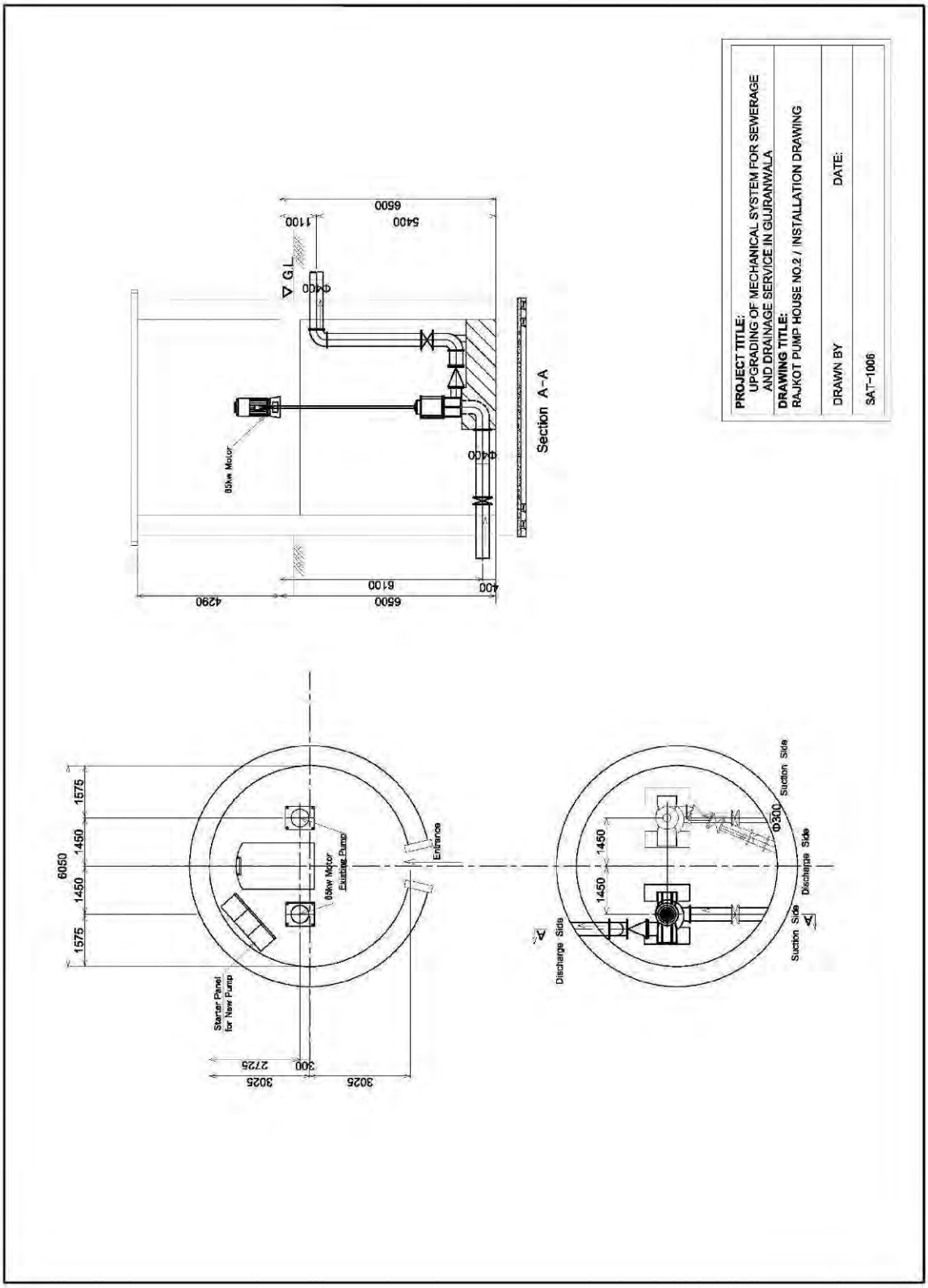
UPGRADING OF MECHANICAL SYSTEM FOR SEWERAGE AND DRAINAGE SERVICE IN GUJRANWALA
DRAWING TITLE:
P.M.U. PUMP HOUSE NO.1 / INSTALLATION DRAWING
DRAWN BY
DATE:
SAT-1005
Section A-A
GL
3700
3050
6200
3150
Φ300
Φ300
95kw Motor
Entrance
95kw Motor
Room
Starter Panel for New Pump
1810
1550
260
1420
2200
570
2950
4290
7240
2835
2250
910
620
1600
2240
3237
Up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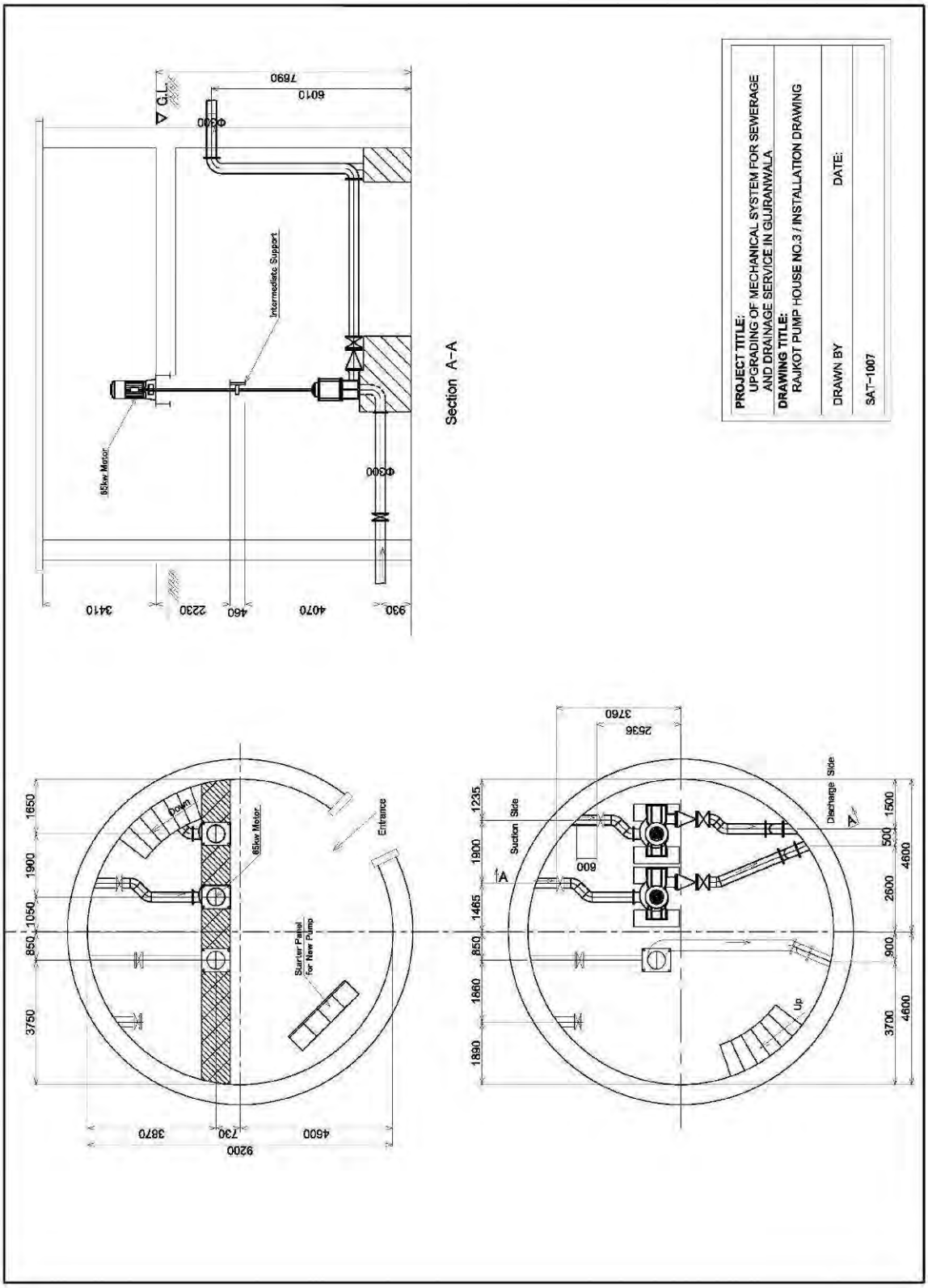
UPGRADING OF MECHANICAL SYSTEM FOR SEWERAGE AND DRAINAGE SERVICE IN GUJRANWALA
DRAWING TITLE:
RAJKOT PUMP HOUSE NO.2 / INSTALLATION DRAWING
DRAWN BY
DATE:
SAT-1006
Section A-A
G.L
Φ400
85kw Motor
6500
5400
1100
6100
400
4290
Existing Pump
Entrance
Starter Panel for New Pump
6050
1575
1450
1450
1575
3025
2725
300
Suction Side
Discharge Side
Φ300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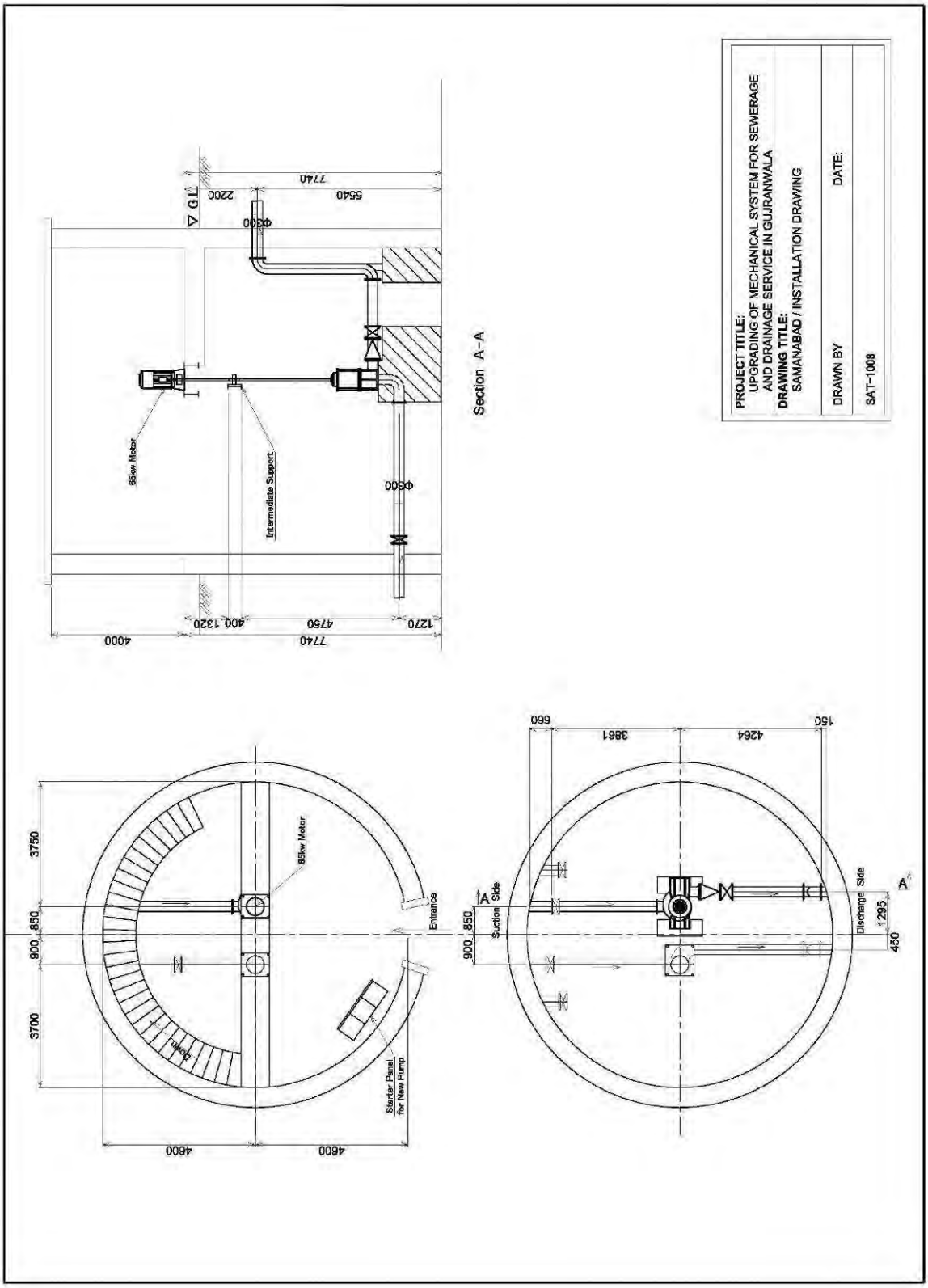
UPGRADING OF MECHANICAL SYSTEM FOR SEWERAGE AND DRAINAGE SERVICE IN GUJRANWALA
DRAWING TITLE:
RAJKOT PUMP HOUSE NO.3 / INSTALLATION DRAWING
DRAWN BY
DATE:
SAT-1007
Section A-A
G.L
7890
6010
Φ300
Intermediate Support
85kw Motor
Φ300
930
4070
460
2230
3410
Suction Side
Discharge Side
600
2536
3760
1235
1900
1465
850
1660
1890
1500
500
2600
900
3700
4600
4600
Up
Down
85kw Motor
Entrance
Starter Panel for New Pump
1650
1900
1050
850
3750
9200
4600
730
3870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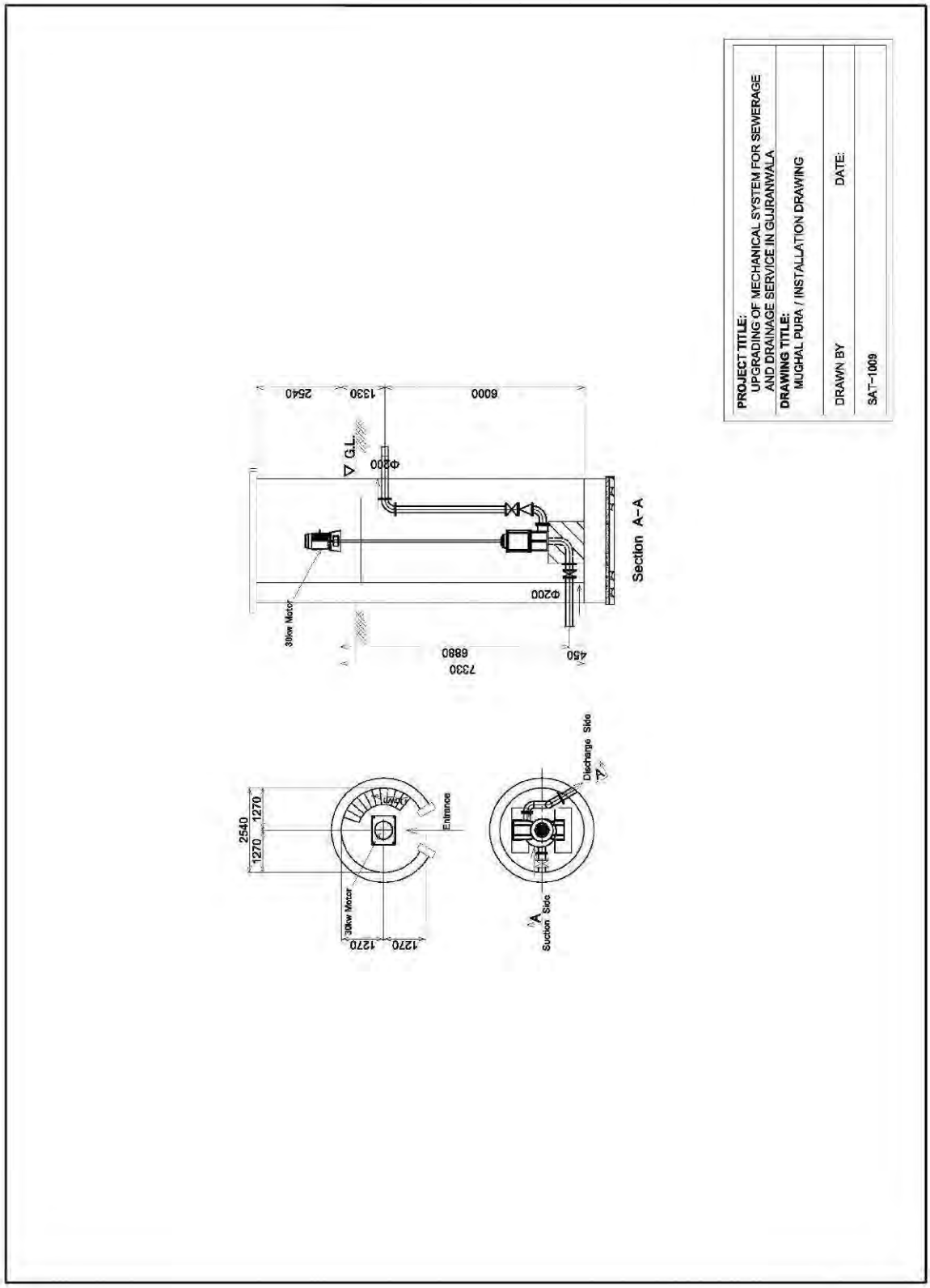
UPGRADING OF MECHANICAL SYSTEM FOR SEWERAGE AND DRAINAGE SERVICE IN GUJRANWALA
DRAWING TITLE:
SAMANABAD / INSTALLATION DRAWING
DRAWN BY
DATE:
SAT-1008
Section A-A
G L
2200
5540
7740
Φ300
85kw Motor
Intermediate Support
Φ300
1270
4750
400
1320
4000
7740
660
150
3861
4264
3750
850
900
3700
85kw Motor
Entrance
Suction Side
Discharge Side
1295
450
Starter Panel for New Pump
4600
4600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UPGRADING OF MECHANICAL SYSTEM FOR SEWERAGE AND DRAINAGE SERVICE IN GUJRANWALA
DRAWING TITLE:
MUGHAL PURA / INSTALLATION DRAWING
DRAWN BY
DATE:
SAT-1009
2540
1330
6000
G.L
Φ200
Section A-A
30kw Motor
Φ200
6880
7330
450
2540
1270
1270
Entrance
30kw Motor
1270
1270
Discharge Side
A
A
Suction Side

Equipped with pump, hose and nozzle to remove sludge/sediment from sewer pipes with high water pressure.

Water Jet Cleaner

Equipped with pump and hose to suck sludge collected in manholes.

Suction Machine

Wheel type machine equipped with clamshell-typed bucket to remove floating materials in open drains.

Clamshell

Wheel type excavator equipped with bucket to dredge sludge and sediment from the bottom of open drains.

Excavator

To transport sludge and garbage removed by clamshell, excavator and winch machine to the disposal site.

Dump Truck (2t & 4t)

To pull traction type dewatering pump and winch machine, and also to transport field workers and equipment.

Pickup Truck

Refer to the following page for further details.

Safety Equipment

Used to drain excessive water from one sewer to another as a temporary bypass in case of blocking pipes or trouble of disposal pumps.

Traction Type Dewatering Pump

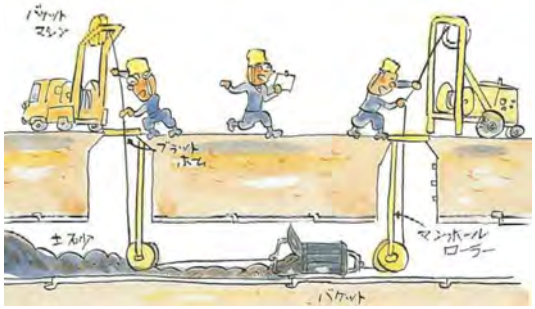
Details are given below.

Winch Machine

<u>Operation method of winch machine</u>

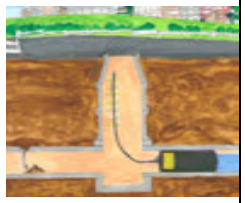
Engine-driven winch is installed on both side of manhole and insert the wire with bucket in sewer pipe through manhole to scrape out the deposited sludge and garbage.

Besides US and India, this machine has been used in Lahore in Pakistan but no longer used in Japan.



Safety Equipment

Item	Air Blower	Hose for Air Blower	Portable Generator	Ladder	Safety Barricade	Gas Detector
Photo						
Purpose	Ventilation for manholes	Ventilation for manholes	Power supply for air blower and work light	To climb up and down for manhole and sewerage work	To protect men from falling down to manhole	To ensure working conditions in manhole and pump house
Spec.	Corrosion proof	Corrosion proof	With inverter		With light reflection material	Oxgen and H2S detectable
Quantity	3	3	3	6	12	3

Item	Water Stop Plug	Work Light	Flashlight for Vehicle Guide	Goggles	Helmet	Waist-high Waders
Photo						
Purpose	To stop water inflow during sewerage work	Lighting for manholes	To guide and control vehicles for night work	To protect eyes of sewermen	To protect head of all workers	To ensure safety work in manhole or sewer pipes
Spec.	φ300-1000 air injection type	LED, with battery	For dry cell	Water proof, wearable with helmet		Waist-high or chest-high
Quantity	6	12	12	250	250	250

Item	Rubber Gloves	Vest for Night Work	Safety Belt	Work Environment for Sewermen	
Photo					As of October 2013, 236 persons which accounts for over 40% of all WASA staff members are reportedly sewer men. They dedicate themselves to the task of cleaning sewer pipes mainly at night. However, they are facing a great danger as work environment is quite undesirable due to oxygen deficiency or outbreak of hydrogen sulfide (H_2S). Considering the above, safety equipment is definitely important for sewermen to improve thier work environment.
Purpose	To protect arm from touching wastewater	To ensure safety for night work	Prevention of falling at deep manhole	Sewer men naked to the waist work in manholes to remove sludge, sediment and garbage from the sewer pipes	
Spec.	Arm protection and oil proof	Light color cloth with light reflection material	Rope: more than 1 meter long		
Quantity	250	12	25		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