PC-I

GOVERNMENT OF PAKISTAN PLANNING COMMISSION

FEASIBILITY STUDIES AND DESIGN OF RAINWATER UNDERGROUND STORAGE FACILITIES IN 11 CITIES OF PUNJAB UNDER PUNJAB CITIES PROGRAM (PCP)

STORMWATER FACILITIES IN KAMOKE CITY

PC-I PROFORMA

Estimated Cost: Rs.104.086 Million

OCTOBER 2023

ENVIRO CONSULT (SMC-PVT) LTD
Environmental Studies, Urban &Rural Development, Water Resources, Water, Sewage and Industrial Waste Treatment.

GOVERNMENT OF PAKISTAN

PLANNING COMMISSION

PC-I FORM

(SOCIAL SECTORS)

1	**Name of the Project**	FEASIBILITY STUDIES AND DESIGN OF RAINWATER UNDERGROUND STORAGE FACILITIES IN 11 CITIES OF PUNJAB UNDER PUNJAB CITIES PROGRAM (PCP) ***"Stormwater Facilities in Kamoke City"***
2	**Location** • **Provide name of District/Province** • **Attach a map of the area clearly indicating project location**	Kamoke is a city in Gujranwala District, Punjab, Pakistan. It is located on the Grand Trunk Road at a distance of 21 km from Gujranwala and 45 km from Lahore. It is located between longitude 31°58′25″N & latitude 74°13′22″E at an elevation of 201 m (659 ft.) from mean sea level. Kamoke is also located at the main Lahore Rawalpindi Railway Line. In some areas of the city, stormwater is accumulated which causes inconvenience to the inhabitants. Under this project, the drainage system has been planned to be constructed to drain of these areas. The location of the area is shown in Drawing No. FSUS/KK/334/01 ***(Annexure-IV)***.
3	**Authority responsible for:**	
i.	**Sponsoring**	World Bank (WB)
ii.	**Execution**	Punjab Municipal Development Funds Company (PMDFC)
iii.	**Operation and Maintenance**	Municipal Committee Office, Kamoke
iv.	**Concerned Federal Ministry**	Not Applicable
4	**Plan Provision**	
	Proposed Allocation	**Rs. 104.086 Million**
5	**Project objectives and its relationship with Sectoral objectives** ➢ **The objectives of the sector / sub sector as indicated in the medium term / five-year plan be reproduced. Indicate objectives of the project and develop a linkage between the proposed project and sectoral objectives**	Urban flooding is one of the serious challenges being faced during the rainy seasons. It usually befalls due to intense rainfalls. It's a complex global phenomenon that stems from the combination of extreme hydrological and metrological events followed by widespread devastation, economic damages and loss of human lives. Unplanned urbanization, population sprawl, transmigration and upsurge of built-up areas with passage of time are primarily causes of inundation and flooding in the cities. Stormwater Management thus has become a major area of concern for the civic agencies, responsible to plan the projects,

		for the collection and disposal of run off generated in the urban areas. This requirement is increasing with every passing day in all over the Pakistan and specifically in the cities of Punjab, having almost flat topography, where the rainwater is accumulated in the relatively low level areas and causes environmental hazards. If the stormwater is not properly drained, it would cause inconvenience, damage, flooding and health risks. It contains pollutants originating from rain, the air or the watershed areas. The most common source of pollutants could be from overflowing sewage (during rain) from the manholes and mixed with stormwater, which contains disease causing organisms. Also if the stormwater is allowed to remain stagnant in urban areas, it would be mosquito habitat, a source of some diseases. Off the 11 cities, Kamoke is the priority city due to devastating effects of the accumulated stormwater in certain areas where water is accumulated and remain stagnant for hours. There flooding prolongs is caused during monsoon season, which normally extends from 1st July to end of September every year. At times, rainfall at Gujranwala Station, a station nears to Kamoke can surprisingly rise upto 173.3 mm as occurred on September 2014 as per Met. Office Data. As a result of such heavy rains, ponding at low lying areas is observed which is consequent to the inadequacy of the existing drainage system incapable to cope with extreme rainfall events. The rainwater takes long time to drain out from the areas due to limited capacity of the sewerage/drainage system. Apropos to above, some of the chronic depression areas like Bholla Peer, specifically the service area, between property line (buildings and G.T road) severely in-undated resulting in disruption in human activities and obstruction in smooth flow of traffic. The location of Bholla Peer of Kamoke City was identified after due deliberations with the concerned stakeholders as critical and significantly important sore point with respect to inadequate drainage arrangements. This area remains flooded with surface runoff for several hours. Keeping in view this critical drainage situation consultant has recommended to rehabilitate/upgradation of the existing stormwater drains from Nadra Office to Saddar Thana and from National CNG to Bhola Peer in the services area corridor to carry wastewater / sewage from the Bholla Peer area and dispose of it in the Ghania Drain in order to reduce the inundation at the sore point. After the rehabilitation, these drains will start to take the runoff generated from the ponding area and the road/streets will be clear for traffic movement etc. The disposal of stormwater will be into the Ghania Drain under gravity. After the study of possible plans to drain of stormwater severely accumulated areas during heavy rains best technical and viable

		option has been recommended to cater stormwater. With the implementation of this project, following objectives will be achieved: • To safeguard public health likely to be affected due to stagnant stormwater in the residential areas, as it contains health hazard organisms. • To protect public and private property which is damaged due to accumulated water in the residential and commercial areas. • To reduce the ponding time and surface runoff; • To facilitate public movement and avoid unsolicited traffic hazards during rainfall. • To improve the environmental conditions of the project areas. In view of above, Punjab Municipal Development Funds Company (PMDFC) has launched this project, titled *"Feasibility Studies and Design of Rainwater Underground Storage Facilities in 11 Cities of Punjab under Punjab Cities Program (PCP)"* which is an integral part of the program of the World Bank funded hybrid program, to strengthen the performance of participating Municipal Committees / Corporation (MCs) in 16 cities in Punjab for the improvement of municipal infrastructure and stormwater drainage system. Under the instant Assignment, upgradation of existing drainage system has been planned to drain of severely ponded areas during rains.
	➢ **In case of revised projects, indicate objectives of the project, if different from original PC-I.**	Not Applicable
6 **i.**	**Description, Justification and Technical Parameters** **Describe the project and indicate existing facilities in the area and justify the establishment of the Project.**	**<u>Description of the Project</u>** The project comprises planning and designing of best technical and viable drainage system to drain of the stormwater, severely accumulated from the areas of Kamoke. The most affected area is Bholla Peer. This project has been launched because the existing sewerage system laid in the city is combined, which carries sewage and limited amount of stormwater, and the drains, wherever these exist are being used with the same principle (for carrying both sewage and stormwater). As a result, the stormwater during rains is accumulated in above mentioned area. The water there remains stagnant for a long period, sometimes for more than 24 hours. Thus seriously creating unhealthy environment and massive traffic jam, disrupting routine activities of the general public, particularly of the residents living in these areas. This

requires that the drainage system of these areas need improvement. The above affected area is shown in Drawing No. FSUS/KK/334/01 ***(Annexure-IV)***.

The instant project has been purposed to reduce the ponding time and provide the better drainage facilities to the public.

The proposed drainage system for Bholla Peer is based on drainage through gravity by the rehabilitation of the existing stormwater drains from Nadra Office to Saddar Thana and from National CNG to Bhola Peer in the services area corridor at present carrying wastewater / sewage from the Bholla Peer area and dispose of it in the Ghania Drain. The Nadra Office to Saddar Thana drain width is 4' and its depth varies from 3' to 4'. During rains, it also carries stormwater runoff generated from watershed area of about 12 acres. Due to non-existent of sewer lines in Bholla Peer, the wastewater generated from this area is discharged in the drain of 4'x3', for onward disposal. As a result, the storm runoff of this area, which is beyond its capacity is accumulated in services area corridor. The other contributing factor to accumulation of water is the choking of drain (National CNG to Bhola Peer) of 4'x3'. This drain is also damaged at different location.

In view of this, the Government of the Punjab / PMDFC intends to provide the drainage facilities in the severely flooded areas including stormwater sewers, drains or underground storage tanks (if found feasible), for the collection of peak runoffs for its use in horticulture purposes or disposal into a nearby drain.

Existing Facilities in Project Area:

In order to arrive at feasible proposed system to drain of stormwater being accumulated in some areas of the city, the understanding of the existing system in general and the system of those areas in particular is very much required.

For the understanding of existing system, field visits were carried out in addition to meetings held with MC and PMDFC concerned officials. The system utilized by the present city population of about 290,411 (year 2023) persons is described hereunder.

1. <u>Sewerage System</u>

The sewer network consisting of RCC sewer pipes ranging from 9" to 42" diameter. Outfall sewers collect sewage from submain and main sewers and conducts it to disposal stations. The city has more than 80% coverage of the sewerage system with mostly served with laterals, discharging in to the main severs. The remaining city is served with open surface drains discharging in to the main sewers and sullage carriers along both sides of G.T Road.

Under normal conditions, the wastewater is directly disposed

		of into the Nullah under gravity but during the rainy season, to avoid the backlash due to rise in the wastewater level in nullah, it is diverted into the wet wells of disposal station. The stations area named as Mari Road Disposal Station and Sharifpura Disposal Station. Some of the sewers, not trunk sewers, are frequently choked and thus are not utilized to their full capacity. The city system is encountering a variety of issues including inadequate capacity, aging infrastructure and blockage of sewers. This results into surcharging of sewers and frequent overflows from the manholes. The sewer network is shown in the "Sewerage Map-Kamoke City (2022-23)" collected from PMDFC. ***2. Drains System*** In cities, there also exists some open drains, which carry sewage in dry season and are overflowed in rainy days when the rainfall intensity and duration exceeds certain limit. The drains are mostly of size 1' x 1' and are typically present on both sides of street. All these drains are clogged with a lots of solid waste thus have significantly reduced their carrying capacity and creates unhealthy living condition and are sources of health hazard, as these may contain disease causing organisms. The locations of these drains are also shown in the above mentioned Map. The entire city has been sub-divided in to two drainage zones, designated as Drainage Area-01 and Drainage Area-02. Major portion of the drainage area-01 is being served by open surface drains, which is served by a sewerage network consisting of RCC sewer pipes ranging from 9" to 30" diameter. The disposal station (Mari road disposal station) serving the Drainage area-01 is non-functional. The location of this disposal station has been converted in to a garbage dump by the nearby localities. The major catchment areas of drainage area-01 are i) Taj Town, ii) Satellite Town, iii) Pak Town and iv) Mohallah Dera Gujjran. Most of the areas of the drainage area-02 are also being served with the open surface drains terminating in to covered drain laid along both sides of G.T Road. The localities along the GT Road having open surface drains are disposing of their wastewater into the covered drain (Nadra Office to Saddar Thana) of 4' x 3' (Fig. 1.1) located along G.T road, close to property line (buildings). There also exist a Drain (National CNG to Bhola Peer) of 4'x3', along G.T road (Fig. 1.2). The drains operate through gravitational flow until it reaches its final disposal (Fig. 1.3 & 1.4). The operations and maintenance of the stormwater drain is the responsibility of the National Highway Authority. Due to O&M deficiencies, the drain is in very poor condition and damaged at various locations (Fig. 1.5 & 1.6).

All the above mentioned figures are attached in ***Annexure-I***.

3. Disposal Stations

The sewage collected through sewer network is discharged into two (02) disposal stations named as Mari Road Disposal Station and Ghania Disposal Station. Presently, there is only one (01) functional disposal station (Ghania) for the disposal of wastewater of the whole city. Total Capacity of the pumps is 40 cusecs with the mean of 04 No. Pumps each of 10 cusecs. The location of these disposal stations is also shown in the Map, Sewerage Map-Kamoke City (2022-23).

Justification of the Project

The flooded areas of Bholla Peer (see *Annexure-I,* **Fig. 1.7**) is located at the lower elevations than the surrounding areas. As a result, stormwater accumulated there and stay there stagnant for hours. During rains, the runoff generated from the area is many times of the dry weather wastewater flow. Thus, the flow generated from the i) stormwater and ii) wastewater flow cannot be carried by the existing Sewerage/Drainage facilities which has limited provision for the stormwater as per prevailing practices.

At Bholla Peer ponding area, there exist two drains (from Nadra Office to Saddar Thana and from National CNG to Bhola Peer) which at present carry wastewater / sewerage from the area, and flows at the edge of road, and disposes it into the Ghania Drain. The drain width is 4' and its depth varies from 3' to 4'. During rains, it also carries stormwater runoff generated from watershed area of about 12 acres. Due to non-existent of sewer lines in Bholla Peer, the wastewater generated from this area is discharged in the drain of 4'x3', for onward disposal. As a result, the storm runoff of this area, which is beyond its capacity is accumulated in services area corridor causing severe ponding. The other contributing factor to accumulation of water is the choking of drain (National CNG to Bhola Peer) of 4'x3', which is parallel to drain from Nadra Office to Saddar Thana. This drain (National CNG to Bhola Peer) is also damaged at different location. As a result, the area is flooded.

In view of above situation, the runoff generated requires to be drained of as early as possible as the stagnant water causes various problems, as mentioned earlier and recreated below:

1) The effective drainage of stormwater from the urban localities specifically from the low lying areas is of extreme importance, particularly in protection against the spread of diseases.
2) The stagnant stormwater, for long time, causes damage to environment in terms of:
    - Damage to the public property like damage of the

		roads. This increases the financial burden to the government agencies for the reconstruction and improvement to restore them to original conditions. • Standing water damage roads and streets causes inconvenience to the residents to perform routine activities which in return effect their income. • The accumulated stormwater during heavy rains enters in the houses of the inhabitants and causes damage to the private property of the public. • If effective drainage system is not provided in the low lying areas, it will increase the poverty due to expenses to be incurred on the repairing of the damaged goods because of rainwater. • The drainage system provided in the areas being flooded during rains will provide opportunity to the inhabitants to maintain their routine commercial activities, which otherwise are affected due to flooding, thus the fear of poverty will be reduced. In view of the above factors, provision of drainage system as designed and discussed herein is fully justified.
ii	**Provide Technical Parameters and discuss Technology aspect of the Project.**	The design of stormwater drainage system is based on Technical Parameters described in ***Annexure-II*** and the technological aspect of the project is briefly discussed hereunder. The stormwater from the severely ponding area will be collected through the existing drains after the rehabilitation, and will be finally disposed of by gravity in the Ghania Drain. The sewerage system will be upgraded by installed buried sewers; and it is being done by the already engaged Consultants. In that case, the existing drain could be dedicated to carry stormwater, and the drain has been studied in this perspective. It was concluded that these drains can be effectively utilized for the drainage of this area, after given improvements as discussed in ***Annexure-III***.
	Provide details of civil works, equipment, machinery and other physical facilities required for the project.	The proposed components of the project comprise civil, electrical & mechanical works are given under: **Sr. No.** / **Item Description** 1. RCC Storm Sewers/Drain • *Drain size, 3.0' * 3.0' Length: 6000 ft.* 2. Restoration Works For the construction of the project system components, the major equipment and machinery required will be the following: Excavator, Dump Trucks, tractor Trolley, Front end loader, Cranes, Concrete Batching Plant, steel reinforcement, cement,

<table>
<tr><td></td><td></td><td>steel, crush, site office and other T&P for safety measures of public and traffic. The detail of system components has been attached as Annexure-III.</td></tr>
<tr><td>7</td><td>Capital cost estimates</td><td>Rs. 104.086 Million
Detail BOQ has been attached as Annexure-V.</td></tr>
<tr><td>ii.</td><td>Basis of determining the capital cost be provided. It includes market survey, schedule rates, estimation on the basis of previous work done etc.</td><td>MRS 2nd Bi-Annual 2023 and Market Rates for Non-MRS Items</td></tr>
<tr><td>vi.</td><td>Phasing of Capital cost.</td><td>FY 2023-24 = Rs. 104.086 Million. Breakdown of phasing of capital cost is hereunder:
<table>
<tr><th>Year</th><th>Amount (Million)</th><th>Work Done</th></tr>
<tr><td>2023 (Ending Dec 2023)</td><td>20.8172</td><td>20%</td></tr>
<tr><td>2024 (Ending Dec 2024)</td><td>83.2688</td><td>80%</td></tr>
</table></td></tr>
<tr><td>8</td><td>Annual operating and maintenance cost after completion of the Project</td><td>Rs. 1.00 Million for 01 year</td></tr>
<tr><td>9</td><td>Demand and Supply Analysis</td><td>Not Applicable.</td></tr>
<tr><td>10</td><td>Financial Plan and Mode of Financing</td><td></td></tr>
<tr><td></td><td>a) Equity:</td><td>Not Applicable.</td></tr>
<tr><td></td><td>b) Debt:
Indicate the local & foreign debt, interest rate, and grace period and repayment period for each loan separately. The loan repayment schedule also be annexed.</td><td>Not Applicable.</td></tr>
<tr><td></td><td>c) Grants:</td><td>Not Applicable.</td></tr>
<tr><td></td><td>d) Weighted cost of capital</td><td>Capital cost is Rs. 104.086 Million</td></tr>
<tr><td>11
i</td><td>Project Benefits and Analysis
Economic benefits</td><td>The project benefits will be in the form of:
– Saving cost on the repair of damages of the roads caused by rainwater ponding.
– Losses of the property of the residents will be saved to greater extent which occurred because of intrusion of</td></tr>
</table>

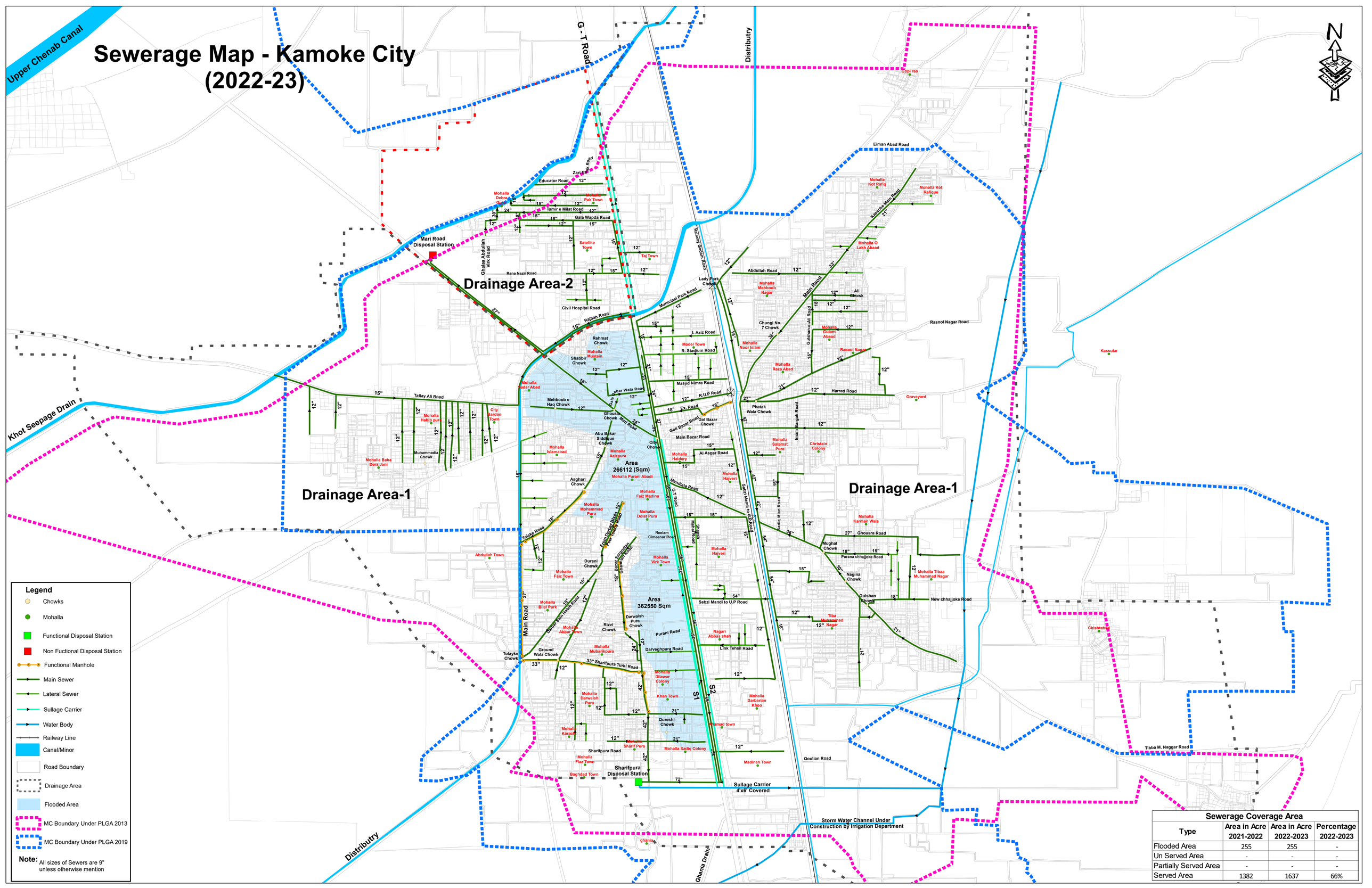
		rainwater in the houses / Shops. – Inundation / chances of ponding will be reduced. – Improvement in environment.
ii.	Social benefits with indicators	Social benefits are usually intangible and not easily quantifiable. However, ❖ Anxiety among public due to ponding of rainwater. ❖ Time Saving of Public ❖ Un-interrupted Traffic Movement There shall be Environmental and health improvement in the project area i.e., improvement in the sanitary and hygienic conditions. Also, water borne diseases shall be reduced. The development of this project shall increase the local public services and infrastructure and employment opportunities shall be generated. Damage of the roads due to ponding shall be controlled and condition of the roads shall be improved. The economic, financial and other benefits have further been discussed in "Economic and Financial Analysis" attached as ***Appendix-A.***
iii	Environmental impact Analysis	Climate change poses many challenges to growth and development. Climate risks are best addressed through increasing adaptive capacity and building resilience techniques which can bring immediate benefits and can also reduce the adverse impacts of climate change. The impact of climate change on the availability of water affects all types of land use and sectors. The water conservation and reuse of water between sectors offers opportunities to (i) expand the traditional (agricultural) water productivity concept and (ii) significantly increase water productivity at the system level. With progressing climate change, integrated water resources management demands for negotiations to improve water use allocations, efficiency, and productivity across economic sectors to address water scarcity and possible water competition. The net impact will be positive. However, for Execution and Operational stages Environmental & Social Screening checklists has been attached as ***Appendix-I.***
12	**Implementation schedule** • **Indicate starting and completion date of the project.** **Item-wise / year-wise implementation schedule in line chart co-related with the phasing of physical activities**	Attached as ***Appendix-II***.

	• **Risk Mitigation Plan** • **Procurement Plan** • **M & E Plan** • **HR management Plan** • **Environmental Management & Monitoring Plan**	Attached as ***Appendix-III.***
13	**Management structure and manpower requirements.**	The skilled staff for the operation and maintenance (O&M) purpose is available with Municipal Corporation. The work shall be executed by the Contractor and the Consultant shall supervise the work of Contractor.
14	**Additional projects /decisions required to maximize socio-economic benefits from the proposed project**	No additional project/work is required except given in PC-I.
15	**Certified that the project proposal has been prepared on the basis of instructions provided by the Planning Commission for the preparation of PC-I for Social Sector projects.**	It is certified that the PC-I is prepared on the basis of instruction provided by the planning Commission for the preparation of PC-I for the Social Sector Project. It is further certified that with the implementation of this project no further intervention will be required in the specified areas.

Prepared by	M/s Enviro Consult (SMC-PVT) LTD (Consultants)	Signatures	
Checked by	Municipal Officer (Infrastructure) Municipal Committee, Kamoke	Signatures	
	Chief Officer Municipal Committee, Kamoke	Signatures	
Vetted by	Senior Program Officer PMDFC	Signatures	
Submitted By	Administrator Municipal Committee Kamoke	Signatures	

Sewerage Map-Kamoke City (2022-23)

Sewerage Map - Kamoke City (2022-23)



Legend

- Chowks
- Mohalla
- Functional Disposal Station
- Non Fuctional Disposal Station
- Functional Manhole
- Main Sewer
- Lateral Sewer
- Sullage Carrier
- Water Body
- Railway Line
- Canal/Minor
- Road Boundary
- Drainage Area
- Flooded Area
- MC Boundary Under PLGA 2013
- MC Boundary Under PLGA 2019

Note: All sizes of Sewers are 9" unless otherwise mention

Sewerage Coverage Area

Type	Area in Acre 2021-2022	Area in Acre 2022-2023	Percentage 2022-2023
Flooded Area	255	255	-
Un Served Area	-	-	-
Partially Served Area	-	-	-
Served Area	1382	1637	66%

PUNJAB MUNICIPAL DEVELOPEMENT FUND COMPANY

PROJECT:

PUNJAB CITIES PROGRAM (PCP)

Map Code 0412040223

Map Version 1.4

DISCLAIMER:

INFORMATION PROVIDED BY MC, PHED & OTHER SOURCES.

Scale: 1:11,000

0 150 300 600 Meters

Date

February 2023

ANNEXURE-I

FIGURES

Fig. 1.1: A view of Drain along GT Road close to property line

Fig. 1.2: A view of Drain along Service Road

Fig. 1.3: A view of Drains falling into Ghania Drain

Fig. 1.4: A view of drains at outfall

Fig. 1.5: A view of Drain clogged with solid waste

Fig. 1.6: A view of Drain, indicating damaged cover slab

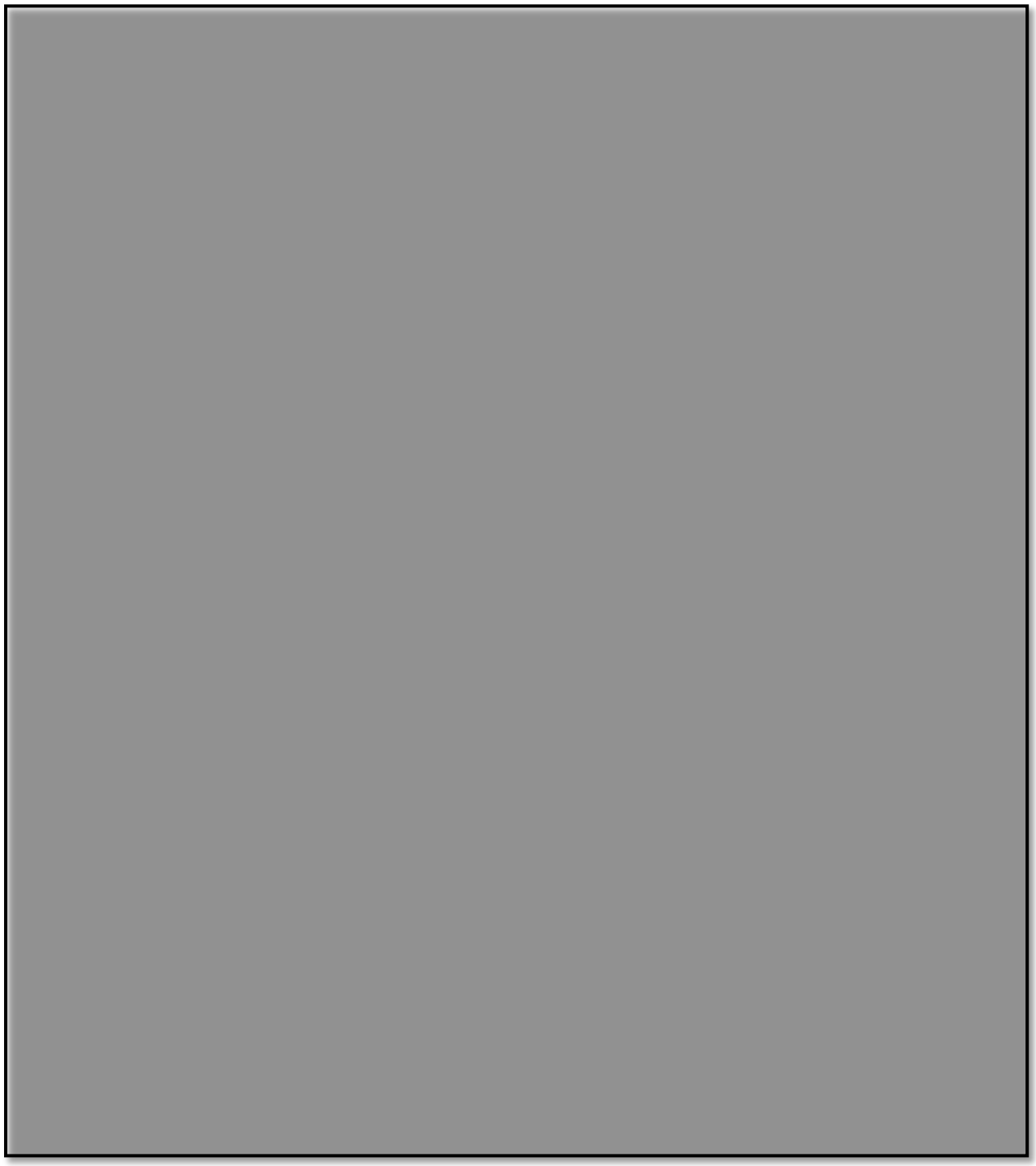


Fig. 1.7: A view of Ponding Area (Bholla Peer)

ANNEXURE-II

TECHNICAL PARAMETERS/CRITERIA

TECHNICAL PARAMETERS / CRITERIA

1 General

Kamoke is a city in Gujranwala District, Punjab and located on the Grand Trunk Road at a distance of 21 km from Gujranwala and 45 km from Lahore. The city avails all the civic amnesties including sewerage/drainage and these have been planned to be updated by the PMDFC through engaging consultants in various sectors. As for stormwater, because of natural available, the city area is mostly drained of under gravity with the exception of some areas, which due to undulating topography, the water is accumulated at some locations, which causes inconvenience to the citizens living around. For the collection and disposal of stormwater from these areas, the drainage system has been proposed based on some technical parameters given hereunder.

Major parameters which affect the sizes of the drainage systems are **a)** rainfall intensity and its duration, **b)** extent of watershed area and its characteristics, **c)** final disposal points and their location/distance from the watershed area, and **d)** detention facilities/storage tanks, incorporated in the design. The values of the parameters, adopted for the design of the system is termed as *"Design Criteria"*. The criteria so adopted is meant to achieve the project objectives.

The detail description on the parameters/criteria is given hereunder.

2 Parameters

2.1 Rainfall

Rainfall is the basic parameter, which determines the flood flows, upon which the stormwater drainage design is based. Rainfall intensity, during a specific period will affect the peak flows generated from the watershed. It varies during rainfall events. Some events produce more intensity, than the others. To arrive at design intensity, it has to be selected from the study and analyses of rainfalls of the previous years. The rainfall data of the Meteorological observatory station at Gujranwala station being its location closet to Kamoke has been collected from the Department. This data has been analyzed to determine the rainfalls at 02 and 05 years return periods generally required for stormwater drainage system.

2.2 Rainfall Analyses

The rainfall data, max day rainfalls of previous years collected from the Meteorological Department has been analyzed to determine the max. day rainfalls at 02 and 05 years return period, at all the observatory stations. Generally, the rainfalls at these return periods are considered for the designing of Urban Drainage System. However, depending upon the availability of funds, and value of city developments, design frequency could be 10 years or more. The analyses to work out rainfalls at return periods, as per applicable Formula (given below), is presented in **P-I**.

$$T_r = \frac{n+1}{m}$$

Where:

T_r : Return Period

n : No. of years of rainfall data

m : Rank number

The maximum daily rains thus worked out are given below:

- Max. Day rainfall for 2 years return period = 103 mm
- Max. Day rainfall for 5 years return period = 145 mm

For the design of proposed drainage system, the rainfall of 05 year return period has been adopted, because the system designed at this rainfall will cater for rainfall in quantitative terms, to be occurred once in 5 years on average i.e., in 50 years, such rains will fall about 10 times or so.

Table P-1

Rainfall Analyses To Work out Return Period Rainfalls Gujranwala Meteorological Observatory Station, a station of maximum rainfall, among nearest station

Sr. No.	Year	Rainfall (mm)	Ranking (m)	Return Period T=n+1/m
1	2014	173.3	1	12.00
2	2022	160.7	2	6.00
3	2013	130	3	4.00
4	2012	123.3	4	3.00
5	2017	107.6	5	2.40
6	2016	102.8	6	2.00
7	2020	94	7	1.71
8	2019	92	8	1.50
9	2015	82	9	1.33
10	2021	81.4	10	1.20
11	2018	80.1	11	1.09

Since above analysis does not provide rainfalls exactly corresponding to 02 and 05 years, these have been interpolated as given below:

i) *Rainfall 2 year return period*

Rainfall at 2 Year = **103 mm**

ii) *Rainfall 5 year return period*

Rainfall at 4 period = 130 mm

Rainfall at 6 period = 160.7 mm

Rainfall at 5 Year = 130+(167.7-130)*(1/2)

= **145 mm**

2.3 Stormwater Peak Flows

Stormwater, surface runoff, is a component of rainfall that runoff from urban surfaces. Its quantity depends upon the nature and characteristics of both the rainfall and the catchment, watershed area. The rainfall component that does not generate runoff are losses due to interception, depression storage, infiltration and evapotranspiration. When the rain falls on a watershed, the stormwater runoff, flows towards stormwater collection/conveyance structures (CS), in the form of sheet flow. Initially, the runoff from the nearest area will enter in CS. Later, as the rainfall continues, the runoff from remote points of the watershed start contributing, i.e., the amount of flow is go on increasing till such time, the runoff from whole watershed area (catchment area) contributes to transform into peak stormwater flows, for that particular rainfall event, rainfall intensity. The peak stormwater flow, thus generated from small areas, upto 1 km^2 can be calculated from the Rational Formula:

Q = CIA

Where:

Q : Flow in ft^3/sec (cusecs)

C : Dimensionless, runoff co-efficient

I : Rainfall Intensity, inches/hour

A : Watershed Area (Catchment Area) in Acres

This rational form involves following assumption:

- Peak flow occurs when the entire watershed is contributing.
- Rainfall intensity is same over the entire watershed.
- Rainfall intensity is uniform till the time, the stormwater from the remote point of the watershed reaches at the inlet of collection/conveyance/storage structure.
- Coefficient of runoff does not change with the rainfall intensity.

2.3.1 Runoff Coefficient, C

Runoff coefficient is the proportion of rainfall falling on the catchment that results in surface runoff. The value “C” depends upon are characteristic such as surface impervious, vegetation on the ground surface and the uses of the catchment area,

like residential and street/road patterns. The coefficient for residential areas where impervious area is proportionally high because of Asphalt or Concrete brick surface streets/roads, varies from 0.7 to 0.95. For the design of the system under this project, the co-efficient of 0.9 has been adopted.

2.3.2 Time of Concentration (TOC)

Time of concentration is the time, when the runoff generated from the whole catchment area reaches at point of concern, stormwater drain or collection tank. At that time peak flow will be developed, and it will remain unchanged till rainfall intensity does not change. For time less than that (time of concentration), the flow generated will be less than peak flow. It is therefore necessary to determine TOC, for the catchment areas under consideration. It depends upon the extent of the area i.e., distance of farther end of the area, surface slope and surface roughness coefficient. The travel time of sheet flow, resulting from runoff can be worked out from the following equation.

$$\boldsymbol{T = \frac{Ku}{I^{0.4}} \left(\frac{n\,L}{\sqrt{S}}\right)^{0.6}}$$ ***Source:*** *Federal Highway Administration, Urban Drainage Design Manual, Equation 3-3, Chapter-3.*

Where:

T	=	Sheet flow travel time, min
n	=	Roughness coefficient (for smooth asphalt, and ordinary concrete lining values is 0.011 & 0.013 respectively)
I	=	Rainfall intensity, inches/hour
S	=	Slope, ft./ft.
L	=	Length in ft.
Ku	=	Empirical coefficient, 0.933

Since, under this project, the travel distance is generally not more than 2000 ft., and the land slope in Kamoke is around 0.5%. The TOC for this slope and 2 inch/hour rainfall as worked out below is **30 min**.

$$\mathrm{T} = \frac{0.933}{(2)^{0.4}} \left(\frac{0.013\,x\,2000}{\sqrt{0.005}}\right)^{0.6}$$

T= 24.48 min, *Say 30 min*

The time of concentration reveals that peak runoff from the catchment areas/sore points, will be generated in about 30 minutes.

2.3.3 Extent of Catchment Area

In Kamoke city, there are some locations, where stormwater is accumulated from the nearby locations, depending upon topography. The extent of the area which generates runoff causing ponding at some location have been determined after carrying out topographic surveys and preparing maps. Maps have been used to identify watershed areas/catchment area, land use, drainage patterns and other topographic features.

The catchment areas which generate the storm water runoff that accumulates/ inundates the depression / sore points have been found from topography levelling of the areas (topographic surveys).

Bholla Peer

- Catchment Area = 12 Acre

2.3.4 Rainfall Intensity

The rainfall intensity is one of the main parameter which affects the stormwater flow. It is defined as the rate of the rainfall, in inches per hour, which falls on the contributing area, catchment area. For the design purpose, the intensity for a particular return period is required. In this regard, the rainfall distribution of max day rainfall of 05 years return period at Gujranwala station was collected from Meteorological Station and it is given in Table P-2 as below:

Table P-2

Max. Day Rainfall Distribution at Gujranwala Meteorological Station

Hours	Distribution as collected from Met. Department	Adopted Distribution, as a proactive approach
	Rainfall, mm(inches)	mm (inches)
0400	5.0 (1.26)	-
0500	101.0 (3.98)	101.0 (3.98)
0600	47.0 (1.85)	48.0 (1.85)
0700	4.2 (0.17)	4.2 (0.17)
0800	0.0	0.0
0900	2 (0.08)	2.0 (0.08)
1000	1 (0.04)	1.0 (0.04)
1100	0.5 (0.02)	-
1200	TRACE	-
1300	-	-
1400	-	-
1500	-	-
1600	-	-
1700	-	-
1800	-	-
1900	-	-
2000	-	-
2100	-	-
2200	-	-
2300	-	-
0000	-	-
0100	-	-
0200	-	-
0300	-	-
Total	**160.7 (6.13)**	**155.2 (6.1)**

2.4 Capacity of Underground Storage Tanks

The major parameters to work out the capacity the underground storage tank are the following:

- Maximum daily rainfall distribution of 5 years Return Period, Table P-2
- Catchment Area, in Acres
- Runoff from catchment area, worked out from formula; Q = CIA
- Ponding Area, in Acres
- Water depth on ponding area
- Capacity of drains/sewers for the disposal of pumped out stormwater. This will also determine the rate of pumping out collected stormwater.

2.5 Components of Underground Storage Tanks

The components and the features of the tanks will be the following:

i. Aesthetic

The tanks will be so designed that the aesthetic of the area is not affected i.e. in case of parks, the top of tank roof will be same as that of original ground levels. Also, provision will be made on the tank roofs, for growing of grass, if it was uprooted during construction.

ii. Screen

Bar screen will be provided at incoming drain, in order to screen out floating matter and large size solid materials.

iii. Stairs

For cleaning purpose, and to check the inside situation of the tank. These will be provided at one side of the tanks, and will be of sufficient width, required for going inside, and removing of silt, if any.

iv. Pump house

A pump house will be provided at suitable location to house the pumps proposed for pumping out the storm water. In this regard, the capacity of pumps will be determined, considering the emptying time, and capacity of storm water receiving body.

2.6 Stormwater Drain/Sewers

For drainage of ponding areas, due to rainfalls, stormwater drains will be designed to carry water and discharge it in the storage tanks or in the water bodies (nullas/rivers). The size of the drains will be worked out to carry peak flows or flows considering clearance time. The design velocity in the drains will not be less than 3.0 ft./sec.

The stormwater sewers will be of RCC material confirming to ASTM Designation of suitable Class to take earth and live loads and if drains are provided, these will have coupled with RCC Slabs of brick masonry walls or RCC.

2.7 Stormwater Grating

For the entry of stormwater in the drains, mild steel grating will be provided at suitable frames in covered drain, at suitable locations such as crossroads, or at 50 to 100 ft. intervals. These will openable at regular intervals too.

2.8 Stormwater Pumps

As discussed earlier, if other options are not feasible to drain of ponding area, the stormwater will be collected at suitable location, to reduce the peak flow in the drainage structures. The collected water will be pumped out at reduced flowrate for the collection of stormwater of subsequent rain. For that pumps, vertical cardan shaft pumps will be installed to reduce the cost of dry well, which otherwise will be required for the installation of horizontal centrifugal pumps.

Capacity of pumps will be decided considering the flow carrying capacity of the water receiving body.

2.9 Pipe Material of Forcemain

The forcemain to carry the pumped out stormwater from the underground tank will be of high density polyethylene (HDPE) material, because of its merits from the other material as given below:

- It is light weight, very durable and very smooth
- Liners and wrapping not required for corrosion protection
- Usually jointing method is thermal but fusion which develops the full strength of the pipe.

The velocity in forcemain to carry and transport stormwater will be between 4.0 and 5.0 ft./sec.

2.9.1 Head Losses in Forcemain

The losses in the forcemains, to work out pumping head Hazen William Formula, with “C” value of 130 will be used.

2.10 Type of Drain

The stormwater drains of RCC or brick masonry to be constructed in the residential and commercial area, will be covered at the top with grating at suitable locations, so that these don not pose any hurdle to traffic.

2.10.1 Flow Velocity

Flow velocity in drains will be worked out by using Manning Formula by adopting Manning “n” value of 0.013.

2.11 Ponding Clearance Time

The stormwater runoff generated from the catchment areas is accumulated at the low level areas and the depth of water increase with the duration of rainfall, in case of inadequate drainage system.

The drainage structures including storage tanks, pumping machinery will be sized in such a way that ponding areas are cleared within minimum possible time at 5 year return period rainfall.

2.12 Structural Design Criteria

The Structural Design will take into account the following:

- Codes and Standards - American and British codes
  - Water Retaining/Hydraulic Structures — ACI 315-01
  - Reinforced Concrete Structures — ACI 318
  - Reinforcing Steel — ASTM A 615
  - Bridges/Culverts — GOP Code of practice for Highway Bridges/ AASHTO
  - Structural Steel — AIDC-ASD
  - Design Loads for Buildings/other — ASCE-05

Structures

- Allowable stresses, in concrete and reinforcement steel
- Minimum concrete cover to reinforcement
  - Temperature and Shrinkage Steel
  - Design Loads
    i) Dead Loads
    ii) Earth Pressure
    iii) Seismic Forces
    iv) Temperature Effects
  - Stability
- Structural Drawings

  Structural drawings will be preparing, including plans, sections and Reinforcement Details.

2.12.1 Mechanical

The design will focus on the piping arrangements for the pumping stations. All mechanical elements will be finalized in coordination with the hydraulic/ process designers. The following drawings will be produced:

- Mechanical drawings:
  - Preparation of pumping stations piping
  - Auxiliary systems

2.12.2 Electrical

The design will focus on the power supply for the pumping stations. All electrical elements will be finalized in coordination with the mechanical designers. The following drawings will be produced:

- Electrical drawings:
  - Preparation of cable routing related to the pumping stations
  - Preparation of associated single line diagrams and load lists

ANNEXURE-III

DETAIL OF SYSTEM COMPONENTS

SYSTEM COMPONENTS - CIVIL WORKS, EQUIPMENT MACHINERY AND OTHER PHYSICAL FACILITIES

1 General

This annexure covers the Design of system components to drain of stormwater severely accumulated from the ponding area of Bholla Peer as discussed earlier. The structures such as sewers, drains have been designed on the bases of technical parameters / criteria discussed in **Annexure-II**.

2 Drainage System

i. As discussed earlier, ponding occurs in the Bholla Peer area and G.T road corridor, opposite to this area (Bholla Peer). In the streets of Bholla Peer, there exist some small size drains which at present carrying sewage and during rains, stormwater also takes its entry. As a matter of principle, the sewage flowing in the drains should be diverted to sewerage system. If this is done, the existing drains can be considered to drain of stormwater.

ii. The existing drain was silted up, and is filled in by solid waste, it appears that removable slabs have not been placed after cleaning (Fig. 1.1, Annexure-I). This has reduced the carrying capacity of the drain. Its top slab is also damaged at a number of places, resulting in reduction in carrying capacity due to entry of solid waste.

iii. The drainage system has been proposed to cater for 05 years return period rainfall, which is 145 mm, worked out from the rainfall of Meteorological Station, Gujranwala.

iv. For the collection and transport of water upto disposal point, there exist two major drains, but even the area is inundated because of local depression in the G.T road corridor.

2.1 Proposed Drainage System

The proposed drainage system of severely affected area (Bholla Peer) is based on drainage through gravity by the rehabilitation of the existing Storm Water drains in the service area corridor at present carry wastewater / sewage from the Bholla Peer

area and disposes it in the Ghania Drain, Annexure-I, Fig. 1.3 & 1.4.

The drain is 4 ft. wide and its depth varies from 3' to 4'. During rains, it also carries stormwater runoff generated from watershed area of about **12 acres**, worked out from topography survey.

Due to non-existent of sewer lines in Bholla Peer, the wastewater generated from this area is also discharged in the drain of 4' x 3', for onward disposal. The storm runoff of this area is accumulated in the corridor area and a part of Bholla Peer, mainly due to improper slope of the corridor and over loading of the drains, due to combined effect of wastewater and stormwater. The other contributing factor to accumulation of water is the choking of drains. The drain is also damaged at different location.

As per further planning the sewerage system will be upgraded by installed buried sewers; and it is being done by the already engaged Consultants.

In that case, this drain could be dedicated to carry stormwater, and the drain has been studied in this perspective. It was concluded that these drains can be effectively utilized for the drainage of this area, after given below improvements.

i. The drain 4'x3' is silted and carries sewage of the catchment area Refer to Figs 1.1 to 1.6, Annexure-I.

ii. The slope of drain is 0.0008 ft./ft. which can carry storm water at a velocity of 3.24 ft./sec, which has carrying capacity 29 cusecs.

iii. The carrying capacity of drain is 29 cusecs (See Section 2.1.1, Design Calculation). The capacity of drain is less as needed for the catchment area of 12 acres. It is observed that if drain is desilted and the levels of the depressed area around Bholla Peer are properly maintained (Drawing No. FSUS/KK/334/03), the stormwater beyond capacity of the drain will be drained of through sheet flow along the service road up to the disposal point at Ghania Drain.

iv. Cleaning, desilting, provision of cover slab and inlet gratings at some locations of the existing Stormwater Drain 4' x 3' is also required to carry the stormwater form the services area corridor.

Please see design calculation in section 2.1.1 of this Annexure. The hydraulic statement of existing drain is given under Table T-1 while the layout plan of existing drain has been shown in Drawing No. FSUS/KK/334/01 while the profiles of existing drain will be included after changing the datum of survey of the drawing provided by the client.

Annexure-III

Table T-1

Hydraulic Statement

Existing Municipal Committee (MC) Drain from Bholla Peer to Disposal Point Near Ghania Drain - Kamoke City

Sewer Line/ Drain	Node No		Length	Catchment Area			Run off Coeff	Rainfall Intensity	Total Storm water Flow	Provision in the Existing System	Balance to be Collected and transported	Drain Size	Area	Peri meter	Manning's Coeff	Required Slope	Fall /Drop	Velocity Running Full	Capacity Running Full	Ground Level		Invert Level		Depth	
	From	To		Online	Previous	Total		I												U/S	D/S	U/S	D/S	u/s	d/s
	(ft)	(ft)	(ft)	Acre	Acre	Acre	C	(in/hr)	(ft^3/sec)	(ft3/sec)	(ft3/sec)	WxH (ft x ft)	(ft^2)	(ft)	n	(ft/ft)	(ft)	(ft/sec)	(ft3/sec)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
A-B Existing (MC Drain)	A	B	**6000**	12	0	12	0.90	4.00	43.20	0.00	43.20	3.0 x 3.0	9.0	9.0	0.013	0.0008	4.80	3.24	29.18	761.42	756.60	757.17	752.37	4.25	4.23

2.1.1 Design Calculation of Drain Sizes

1. Existing MC Drain from Bholla Peer to Disposal Point Near Ghania Drain, Line A-B

Catchment Area = 12 Acres

Stormwater Flow Formula, Q=CIA

Max. Rainfall Intensity for 5 year return period, I=101mm / 3.98 inches, say 4 inch

Runoff Coefficient = 0.9

Flow for Ponding Area, Q = CIA = 0.9 x 4 x12

= 43.2 ft^3/sec

Provision in the Existing System = 0.00 ft^3/sec

Balance to be collected and transported = 43.2 - 0.00

= 43.2 ft^3/sec

Calculation of Drain Size

- Length of drain = 6000 ft.
- Assume RCC Drain Size = 3.0 x 3.0 ft.
- Sectional Area = L x W = 9.0 ft^2
- Perimeter of the Drain = 2D+B = 9.0 ft.
- Slope = $\frac{761.42-756.60}{6000}$ = 0.0008 ft./ft.
- Manning's Coefficient, n = 0.013
- Velocity of Flow, V = $\frac{1.486}{n} R^{2/3} S^{0.5}$

$$= \frac{1.486}{0.013}\left(\frac{A}{P}\right)^{\frac{2}{3}} (0.0008)^{0.5}$$

$$= \frac{1.486}{0.013}\left(\frac{9}{9}\right)^{\frac{2}{3}} (0.0008)^{0.5}$$

$$= 114.31 \times S^{0.5}$$

$$V = 3.24 \text{ ft./sec}$$

- Capacity of Sewer Running full, Q = A x V

= 9.0 x 3.24

= 29.18 ft^3/sec, Vs = 43.2

Invert Levels of Line A-B

Drain Length = 6000 ft.

Drain Size = 3.0 x 3.0 ft.

- U/S Ground Level = 761.42 (from topographic survey)
- D/S Ground Level = 756.60 (from topographic survey)
- U/S Invert Level = 761.42 - 3.0 - 0.75 - 0.5 = 757.17 ft.
- D/S Invert Level = U/S I.L – Fall (Slope x L), 757.17 – (0.0008 x 6000)
  = 752.37 ft.

3 System Components

The components of the system discussed above are summarized below, while their layout plans, and sections are given in drawing FSUS/KK/334/02. As regard the drains/sewers to collect and transport stormwater from ponding area, their worked out sizes are given hereunder.

i. Cleaning and desilting of existing Stormwater Drain
   - From Nadra Office to Saddar Thana : 2500 ft.
   - From National CNG to Bhola Peer : 12000 ft.

ii. Covering : 1500 ft.

iii. Maintain proper slope of the service area : 3500 ft.

4 Cost Estimation

At the Feasibility stage, cost estimation of each option will be carried out for further working to arrive at workable and feasible option. The capital cost estimation will be done on the basis of MRS rates and in case of non-MRS items, the quotations will be collected from the market. On the quoted prices, other expenses such as taxes, overheads installation charges and profits (@20%) will be added to determine the unit rates.

In addition to construction cost, the cost to be incurred on operation and maintenance will also be worked out, as effective O&M is needed to maintain the operational function of the system and to extend its useful working life. As the

drainage systems corrode, erode, clog, collapse and ultimately deteriorate to the point of failure. The O&M will be required to perform following major functions:

- Inspection to check the conditions of the system
- Clearing and blockage clearance
- Rehabilitation, repair, renovation or replacement

The estimated cost is attached as **Annexure-V**.

ANNEXURE-IV

DRAWINGS

N

GHUMANWALA RD.

TO GUJRANWALA

RAILWAY TRACK

G.T. ROAD

CATCHMENT AREA 12 ACRES

PONDING AREA

Mohalla Ghalla Mandi

Mohalla Islamabad

Mohalla Azizpura

Mohalla Haidery

Mohalla Purani Abadi

Mohalla Hajveri

Mohalla Faiz Madina

TO LAHORE

Mohalla Mohammad Pura

Mohalla Dolat Pura

Legend

- CATCHMENT_AREA
- PONDING AREA
- Railway_Tracks(29-05-2015)
- LOCALITIES

EMPLOYER

PUNJAB MUNICIPAL DEVELOPMENT FUND COMPANY
184, SCOTCH CORNER, UPPER MALL, LAHORE

CONSULTANTS

ENVIRO CONSULT (SMC-PVT) LTD
(Formerly Enviro Consult)
Environmental Studies, Urban &Rural Development, Water Resources, Water, Sewage and Industrial Waste Treatment.

PROJECT

FEASIBILITY STUDIES AND DESIGN OF RAINWATER UNDERGROUND STORAGE FACILITIES IN 11 CITIES OF PUNJAB UNDER PUNJAB CITIES PROGRAM (PCP)

ISSUE	DESCRIPTION	DATE	REV	DRN	REC	APRD
	PC-1 DRAWINGS	OCT 2023				

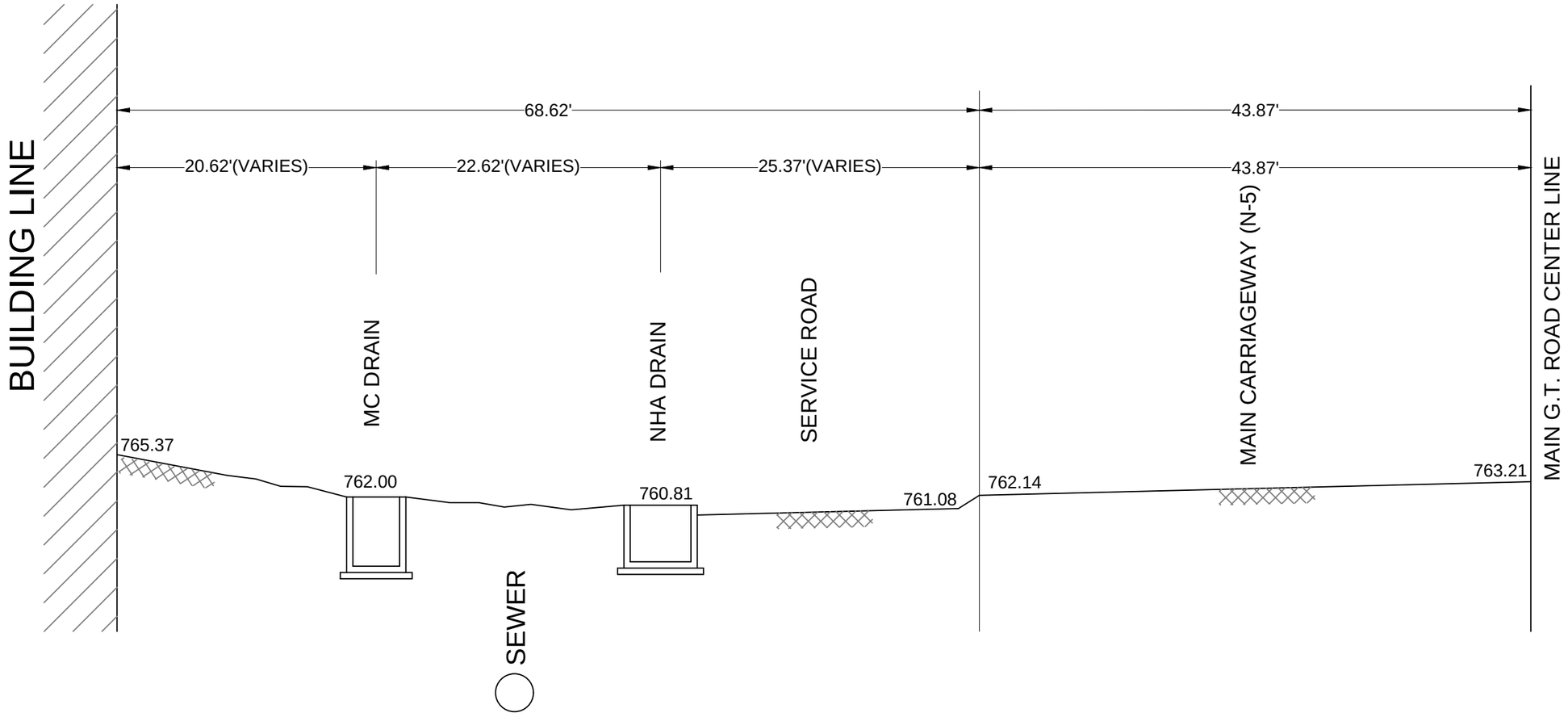
DRAWING TITLE:
LOCATION OF PONDING & CATCHMENT AREAS KAMOKE CITY

SCALE:- 1:4,000

DRAWING NO: **FSUS/KK/334/01**

SHEET (1 OF 1)

ORIGINAL SHEET SIZE A3



CROSS SECTION

EMPLOYER: PUNJAB MUNICIPAL DEVELOPMENT FUND COMPANY	CONSULTANT: ENVIRO CONSULT (SMC-PVT) LTD (Formerly Enviro Consult) Environmental Studies, Urban & Rural Development, Water Resources, Water, Sewage and Industrial Waste Treatment.	PROJECT: FEASIBILITY STUDIES AND DESIGN OF RAINWATER UNDERGROUND STORAGE FACILITIES IN 11 CITIES OF PUNJAB UNDER PUNJAB CITIES PROGRAM (PCP)						
			00	PC-1 DRAWINGS	SEP 2023	0		
			ISSUE	DESCRIPTION	DATE	REV.	DRN.	REC.	APRD.

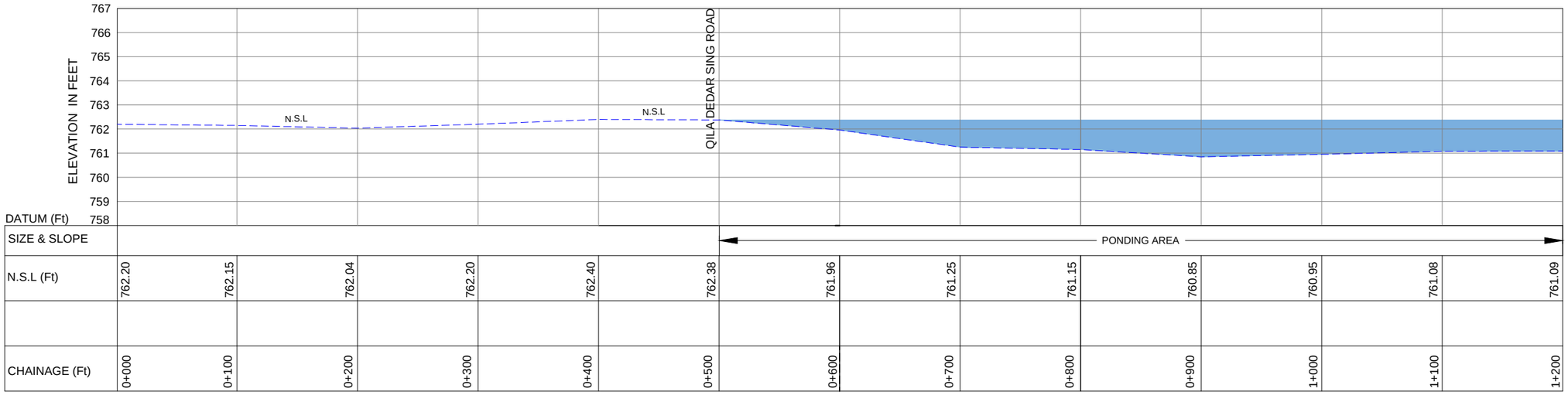
DRAWING TITLE: LOCATION OF EXISTING DRAINS (GRAVITY SYSTEM APPROVED OPTION)

SCALE: 1"=10'

DRAWING NO: FSUS/KK/334/02 CAD

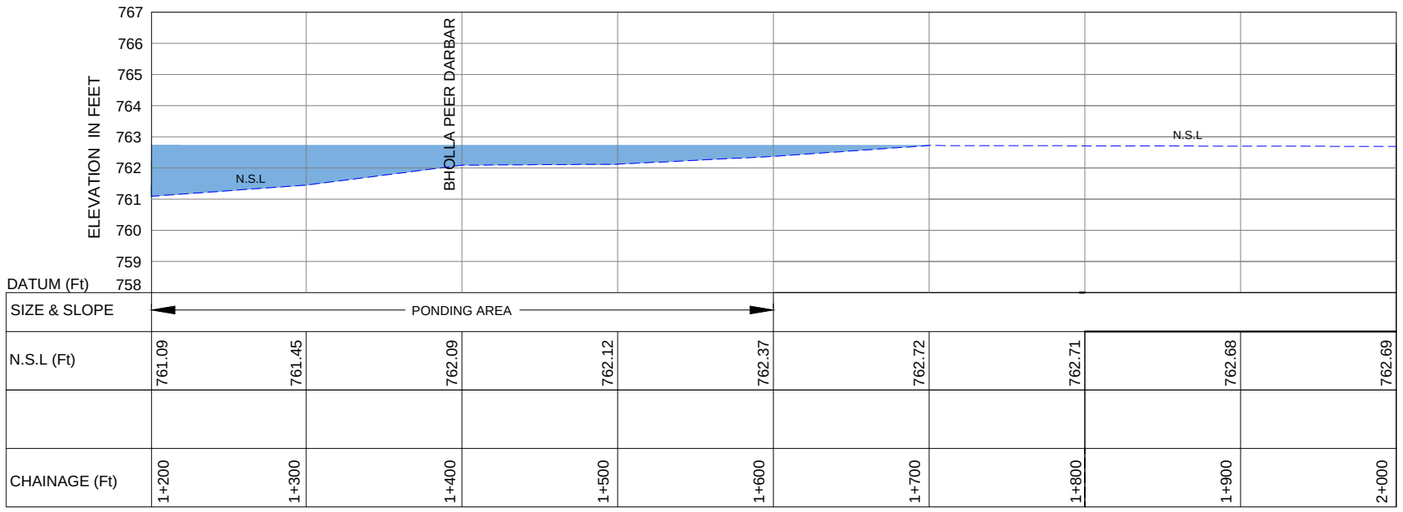
SHEET: (1 OF 1)

ACTUAL SHEET SIZE: A3



DATUM (Ft)	SIZE & SLOPE	N.S.L (Ft)	CHAINAGE (Ft)
		762.20	0+000
		762.15	0+100
		762.04	0+200
		762.20	0+300
		762.40	0+400
		762.38	0+500
	PONDING AREA	761.96	0+600
		761.25	0+700
		761.15	0+800
		760.85	0+900
		760.95	1+000
		761.08	1+100
		761.09	1+200

PONDING AREA PROFILE QILA DEDAR SING ROAD TO DARBAR BHOLLA PEER



DATUM (Ft)	SIZE & SLOPE	N.S.L (Ft)	CHAINAGE (Ft)
		761.09	1+200
		761.45	1+300
		762.09	1+400
		762.12	1+500
		762.37	1+600
	PONDING AREA	762.72	1+700
		762.71	1+800
		762.68	1+900
		762.69	2+000

PONDING AREA PROFILE QILA DEDAR SING ROAD TO DARBAR BHOLLA PEER

EMPLOYER:

HELP BUILD PMDFC HEALTHY CITIES

PUNJAB MUNICIPAL DEVELOPMENT FUND COMPANY

CONSULTANT:

ENVIRO CONSULT (SMC-PVT) LTD
(Formerly Enviro Consult)
Environmental Studies, Urban & Rural Development, Water Resources, Water, Sewage and Industrial Waste Treatment.

PROJECT:

FEASIBILITY STUDIES AND DESIGN OF RAINWATER UNDERGROUND STORAGE FACILITIES IN 11 CITIES OF PUNJAB UNDER PUNJAB CITIES PROGRAM (PCP)

ISSUE	DESCRIPTION	DATE	REV.	DRN.	REC.	APRD.
00	PC-1 DRAWINGS	OCT. 2023	0			

DRAWING TITLE:
PROFILE OF PONDING AREA AT SERVICE AREA CORRIDOR

DRAWING NO: FSUS/KK/334/03 CAD

SHEET: (1 OF 1)

SCALE: VER 1"= 100' HOR 1"= 5'

ACTUAL SHEET SIZE A3

ANNEXURE-V

COST ESTIMATE

DETAILED COST ESTIMATE
FOR
KAMOKE CITY

GENERAL ABSTRACT OF COST.		
Sub Head	**Description.**	**Amount.***(Rs.)*
1	Desilting of Storm Water Drain	5,303,085.00
2	Removeable RCC Slab for missing portion of Storm Water Drain and Repair of damaged portion of drain	9,860,155.53
3	Transition drain between Dinga Nullah and MC Storm Drain	815,101.55
4	Construction of RCC Nullah for replacement of existing sewer along underpass	14,497,901.26
5	PCC for Leveling of area between Storm Water Drains and raising of manhole	33,281,034.32
6	Provision of Dewatering sets for Underpasses (2 nos.)	34,265,000.00
7	ESMP Cost	1,788,000.00
	Total (Rs)	**99,810,277.67**
i	1% Contingencies.	998,102.78
ii	5% PRA (Less sub-head 6).	3,277,263.88
	Grand Total(Rs)	**104,085,644.33**
	Grand Total (Million.)	**104.086**
	Operation and Maintenance Cost (for 1 Year)	1,000,000.00

SUB-HEAD NO. 1

Desilting of Storm Water drain

MRS, 2ND BI-ANNUAL-2023 (01.07.2023 to 31.12.2023) DISTRICT GUJRANWALA

Sr.	Description	Quantity	Rate *(Rs.)*	Unit	Amount *(Rs.)*
1-	**(Ch.21 Item No. 26)** Desilting including disposal of sludge upto one Chain (30 Meters). b) Covered Drain 14500 x 4 x 3 =	174000.00 Cft	2,538.30	%Cft.	4,416,642.00
2-	**(Ch.3 Item No. 17c)** Transportation of surplus mateial & earth all types when the total distance i/c the lead covered in the item of work, is more than 1000ft (300m). c) for every ¼ mile (400 m) additional lead or part thereof, beyond one mile (1.6 Km.) upto 5 mile (8 Km). Qty as per Item No. 1 =	174000.00 Cft	5,094.50	$^{0}/_{00}$Cft	886,443.00
				TOTAL = RS.	***5,303,085.00***

Carried over to General Abstract of Cost

SUB-HEAD NO. 2

Removeable RCC Slab for missing portion of Storm Water Drain and Repair of damaged portion of drain

MRS, 2ND BI-ANNUAL-2023 (01.07.2023 to 31.12.2023) DISTRICT GUJRANWALA

Sr.	Description	Quantity	Rate *(Rs.)*	Unit	Amount *(Rs.)*
	(Ch.6 Item No. 6(a)3-c)				
1-	Providing and laying reinforced cement concrete (including prestressed concrete), using coarse sand and screened graded and washed aggregate, in required shape and design, including forms, moulds, shuttering, lifting, compacting, curing, rendering and finishing exposed surface, complete (but excluding the cost of steel reinforcement, its fabrication and placing in position, etc.):- (a) (i) Reinforced cement concrete in roof slab, beams, columns lintels, girders and other structural members laid in situ or precast laid in position, or prestressed members cast in situ, complete in all respects:- (3) Type C (nominal mix 1: 2: 4)				
	Top Slab 1 x 1500 x 5.00 x 0.50 =	3750.00 Cft	736.6	P.Cft.	2,762,250.00
	(Ch.6 Item No. 11-b)				
2-	Fabrication of mild steel reinforcement for cement concrete, including cutting, bending, laying in position, making joints and fastenings, including cost of binding wire and labour charges for binding of steel reinforcement (also includes removal of rust from bars):- deformed bars. (Grade-60) As per item no. 1 = 3750.00 3750 x 8.816 / 2.204 =	15000.00 Kg	35,109.75	$^{0}/_{0}$Kg	5,266,462.50
	(Ch.6 Item No.5)				
3-	Cement concrete plain i/c placing, compacting, finishing and curing complete. (i/c washing of stone aggregate) (Topping) (1:2:4) 2 x 1500.00 x 0.50 x 0.25 =	375 Sft	44,160.60	%Cft	165,602.25
	(Ch.1 Item No. 1)				
4-	Carriage of 100 Cft. (2.83 cu.m) of all materials like stone aggregate, spawl, kankar lime (unslaked), surkhi, etc. or 150 Cft. (4.25 cu.m) of timber, by truck or by any other means owned by the contractor. (180 Km Sargodha Sikhanwali Quarry) Qty as per Item no. 1 3750 x 0.88 =	3300 Cft	116.49	Cft	384,417.00
5-	Providing and fixing, MS grating (1' x 4") using angle iron frame (L 1-1/2" X 1-1/2" X 3/16") fitted with 1/2" sq. bar welded with frame at 2" c/c complete in all respects. **(N.S)**	180 No.	2,148.00	Each	386,640.00
6-	Providing and fixing Gully Grating with uPVC Pipe (8" dia) **(N.S)**	20 No.	44,739.19	Each	894,783.78
				TOTAL = RS.	***9,860,155.53***

Carried over to General Abstract of Cost

SUB-HEAD NO. 3

Transition Drain between Dinga Nullah and MC Storm Drain

MRS, 2ND BI-ANNUAL-2023 (01.07.2023 to 31.12.2023) DISTRICT GUJRANWALA

Sr.	Description	Quantity	Rate *(Rs.)*	Unit	Amount *(Rs.)*
	(Ch.4 Item No.20)				
1-	Dismantling cement concrete reinforced, separating reinforcement from concrete, cleaning and straightening the same.				
	Walls				
	2 x 30 x 0.5 x 4 =	120 Cft			
	Bottom Slab				
	1 x 30 x 4 x 0.5 =	60 Cft			
	Total =	180 Cft	23,950.10	%Cft	43,110.18
	(Ch.3 Item No.10-i)				
2-	Dismantling lime or cement concrete. a) Dismantling cement concrete 1:4:8 plain				
	30 x 4 x 0.33 =	39.9996 Cft	14,636.15	%Cft	5,854.40
	(Ch.3 Item No.10-i)				
3-	Earth work excavation in open cutting upto 5.00ft depth for storm water channels, drains, sullage drain, in open areas,roads streets lanes including under pinning of walls, and shoring to protect existing works, shuttering and timbering the trenches, dresse to designed level and dimensions, trimming, removal of surface water from trenches and back filling and surplus excavated material disposed of and dressed within 50ft. lead. ordinary				
	30 x 6.50 x 5.000 =	975 Cft	11,833.05	%%Cft	11,537.22
	(Ch.6 Item No.5)				
4-	Cement concrete plain i/c placing, compacting, finishing and curing complete. (i/c washing of stone aggregate)				
	(1:4:8)				
	30 x 5.00 x 0.33 x =	50.00 Cft	44,160.60	%Cft	22,080.08
	(Ch.6 Item No. 6-a-iii-6(a) (i)&(ii))				
5-	Providing and laying reinforced cement concrete (including prestressed concrete), using coarse sand and screened graded and washed aggregate, in required shape and design, including forms, moulds, shuttering, lifting, compacting, curing, rendering and finishing exposed surface, complete (but excluding the cost of steel reinforcement, its fabrication and placing in position, etc.):- (a)(iii) Reinforced cement concrete in slab of rafts / strip foundation, base slab of column and retaining walls; etc and other structural members other than those mentioned in 6(a) (i)&(ii) above not requiring form work (i.e. horizental shuttering) complete in all respects:- (3) Type C (nominal mix 1: 2: 4)				
	Bottom Slab				
	1 x 30.00 x 4.50 x 0.50 =	67.50 Cft	539.85	P.Cft	36,439.88

	(Ch.6 Item No. 6(a)3-c)				
6-	Providing and laying reinforced cement concrete (including prestressed concrete), using coarse sand and screened graded and washed aggregate, in required shape and design, including forms, moulds, shuttering, lifting, compacting, curing, rendering and finishing exposed surface, complete (but excluding the cost of steel reinforcement, its fabrication and placing in position, etc.):- (a) (i) Reinforced cement concrete in roof slab, beams, columns lintels, girders and other structural members laid in situ or precast laid in position, or prestressed members cast in situ, complete in all respects:- (2) Type B (nominal mix 1: 1½: 3)				
	Top Slab				
	1 x 30 x 4.50 x 0.67 =	91.00 Cft			
	Walls				
	2 x 30 x 0.50 x 4.00 =	120.00 Cft			
	Total =	211.00 Cft	736.60	P.Cft	155,422.60
	(Ch.6 Item No. 11-b)				
7-	Fabrication of mild steel reinforcement for cement concrete, including cutting, bending, laying in position, making joints and fastenings, including cost of binding wire and labour charges for binding of steel reinforcement (also includes removal of rust from bars):- deformed bars. (Grade-60)				
	As per item no. 5+6 =	278.50 Cft			
	278.5 x 8.816 / 2.204 =	1114.00 Kg	35,109.75	$^{0}/_{0}$Kg	391,122.62
	(Ch.3 Item No. 17c)				
8-	Transportation of surplus mateial & earth all types when the total distance i/c the lead covered in the item of work, is more than 1000ft (300m). c) for every ¼ mile (400 m) additional lead or part thereof, beyond one mile (1.6 Km.) upto 5 mile (8 Km).				
	Qty as per Item No. 1+2+3 =	1195.00 Cft	5,094.50	$^{0}/_{00}$Cft	6,087.93
	(Ch.9 Item No. 12)				
9-	Two coats of bitumen laid hot using 34 lbs. per %Sft, or 1.72 Kg per square metre over roof and blinded with sand at one Cft. per %Sft. (0.003 cu.m per sq.m)				
	Walls (outer side)				
	2 x 30.00 x 4.500 =	270 Sft	2,750.55	$^{0}/_{0}$Sft	7,426.49
	(Ch.6 Item No. 31A)				
10-	Providing and embedding 10" (250mm) wide PVC water stopper in expansion joints of RCC structures (Retaining walls, water tanks, Slabs) complete in all respect. i) 10"wide 6 mm thick				
	2.00 x 30 =	60 P.Rf	414.45	P.Rft	24,867.00

	(Ch.1 Item No. 1)				
11-	Carriage of 100 Cft. (2.83 cu.m) of all materials like stone aggregate, spawl, kankar lime (unslaked), surkhi, etc. or 150 Cft. (4.25 cu.m) of timber, by truck or by any other means owned by the contractor. (180 Km Sargodha Sikhanwali Quarry)				
	Qty as per Item no. 4				
	50.00 x 0.94 =	46.9995 Cft			
	Qty as per Item no. 5				
	67.5 x 0.88 =	59.4 Cft			
	Qty as per Item no. 6				
	211.0 x 0.84 =	177.24 Cft			
	Total =	283.64 Cft	116.49	Cft	33,041.17
	(Ch.21 Item No. 8)				
12-	Constructing standard gully grating chamber, 3'x2½' (900x750 mm), with chinaware trap as per PHED Drawing STD/PD No. 3 of 1977, complete in all respects.				
		4 No.	19,528.00	Each	78,112.00
				TOTAL = RS.	***815,101.55***

Carried over to General Abstract of Cost

SUB-HEAD NO. 4

Construction of RCC Nullah for replacement of existing sewer along underpass

MRS, 2ND BI-ANNUAL-2023 (01.07.2023 to 31.12.2023) DISTRICT GUJRANWALA

Sr.	Description	Quantity	Rate *(Rs.)*	Unit	Amount *(Rs.)*
	(Ch.3 Item No.10-i)				
1-	Dismantling and removing road metalling.				
	425 x 6.5 x 0.83 =	2292.88 Cft	2,661.10	$^{o}/_{o}$Cft	61,015.70
	(Ch.3 Item No.10-i)				
2-	Earth work excavation in open cutting upto 5.00ft depth for storm water channels, drains, sullage drain, in open areas,roads streets lanes including under pinning of walls, and shoring to protect existing works, shuttering and timbering the trenches, dresse to designed level and dimensions, trimming, removal of surface water from trenches and back filling and surplus excavated material disposed of and dressed within 50ft. lead. ordinary				
	425 x 6.50 x 7.17 =	19807.125 Cft	11,833.05	$^{o}/_{oo}$Cft	234,378.70
	(Ch.4 Item No.31)				
3-	Disjoining R.C.C. pipes inside the trench and dismantling and removing the pipes from the trench and stacking b) 13" to 24" (325 to 600 mm) diameter				
		400 P.ft	70.65	P.Rft	28,260.00
	(Ch.6 Item No.5)				
4-	Cement concrete plain i/c placing, compacting, finishing and curing complete. (i/c washing of stone aggregate) (1:4:8)				
	425 x 6.50 x 0.33 =	911.63 Cft	34,421.40	%Cft	313,794.09
	(Ch.6 Item No. 6-a-iii-6(a) (i)&(ii))				
5-	Providing and laying reinforced cement concrete (including prestressed concrete), using coarse sand and screened graded and washed aggregate, in required shape and design, including forms, moulds, shuttering, lifting, compacting, curing, rendering and finishing exposed surface, complete (but excluding the cost of steel reinforcement, its fabrication and placing in position, etc.):- (a)(iii) Reinforced cement concrete in slab of rafts / strip foundation, base slab of column and retaining walls; etc and other structural members other than those mentioned in 6(a) (i)&(ii) above not requiring form work (i.e. horizontal shuttering) complete in all respects:- (3) Type C (nominal mix 1: 2: 4)				
	Slab (bottom)				
	1 x 425 x 5.50 x 0.67 =	1569.00 Cft	539.85	P.Cft.	847,024.65

	(Ch.6 Item No. 6(a)3-c)					
6-	Providing and laying reinforced cement concrete (including prestressed concrete), using coarse sand and screened graded and washed aggregate, in required shape and design, including forms, moulds, shuttering, lifting, compacting, curing, rendering and finishing exposed surface, complete (but excluding the cost of steel reinforcement, its fabrication and placing in position, etc.):- (a) (i) Reinforced cement concrete in roof slab, beams, columns lintels, girders and other structural members laid in situ or precast laid in position, or prestressed members cast in situ, complete in all respects:- (2) Type B (nominal mix 1: 1½: 3)					
	Top Slab					
	1 x 425 x 5.50 x 0.67 =	1573.00	Cft			
	Walls					
	2 x 425 x 0.75 x 3.50 =	2231.25	Cft			
	Total =	3804.25	Cft	736.6	P.Cft.	2,802,210.55
	(Ch.6 Item No. 11-b)					
7-	Fabrication of mild steel reinforcement for cement concrete, including cutting, bending, laying in position, making joints and fastenings, including cost of binding wire and labour charges for binding of steel					
	1569 + 3804.25 =	5373.25	Cft			
	5373.3 x 8.816 / 2.204 =	21493.00	Kg	35,109.75	$^{0}/_{0}$Kg	7,546,138.57
	(Ch.3 Item No. 17c)					
8-	Transportation of surplus mateial & earth all types when the total distance i/c the lead covered in the item of work, is more than 1000ft (300m). c) for every ¼ mile (400 m) additional lead or part thereof, beyond one mile (1.6 Km.)					
	Qty as per Item No. 1+2 =	22100.00	Cft			
	D/d Qty Rehandled as per Item No.8 (-) =	-2762.5				
	Total =	19337.50	Cft	5,094.50	$^{0}/_{00}$Cft	98,514.89
	(Ch.9 Item No. 12)					
9-	Two coats of bitumen laid hot using 34 lbs. per %Sft, or 1.72 Kg per square metre over roof and blinded with					
	Walls					
	2.00 x 425 x 3.500 =	2975	Sft	4,824.35	$^{0}/_{0}$Sft	143,524.41
	(Ch.3 Item No. 13b + 24a)					
10-	Rehandling of earthwork: (b) upto a lead of 50 ft (15 m). Compaction of earthwork (soft, ordinary or hard soil) :- a) Mixing, moistening earth to optimum moisture content in					
	425.00 x 6.50 x 1.00 =	2762.5		6,230.350	$^{0}/_{00}$Cft	17,211.34
	(Ch.21 Item No.12)					
11-	Restoration of metalled road, on laid service line, including compaction:- a) Carpetted road, with 2" (50 mm) carpet and 10" (250 mm) depth of stone metal for sub-base and base.					
	425.00 x 6.5 =	2762.5	Sft	18,419.85	% Sft	508,848.36

	(Ch.10 Item No.3)				
12-	Supplying and filling sand under floor; or plugging in wells.				
	425.00 x 6.5 x 1.00 =	2762.5 Cft			
	Sides of Drain				
	425.00 x 1.0 x 3.50 =	1487.5 Cft			
	Total =	4250 Cft	3,074.40	$^{0}/_{0}$Cft	130,662.00
	(Ch.6 Item No.31A)				
13-	Providing and embedding 10" (250mm) wide PVC water stopper in expansion joints of RCC structures (Retaining walls, water tanks, Slabs) complete in all respect. i) 10"wide 6 mm thick				
	2.00 x 425.0 =	850 Rft	414.45	P.Rft	352,282.50
	(Ch.1 Item No. 1)				
14-	Carriage of 100 Cft. (2.83 cu.m) of all materials like stone aggregate, spawl, kankar lime (unslaked), surkhi, etc. or 150 Cft. (4.25 cu.m) of timber, by truck or by any other means owned by the contractor. (185 Km Sargodha Sikhanwali Quarry)				
	Qty as per Item no. 4				
	911.63 x 0.94 =	856.9275 Cft			
	Qty as per Item no. 5				
	1569.00 x 0.88 =	1380.72 Cft			
	Qty as per Item no. 6				
	3804.25 x 0.84 =	3195.57 Cft			
	Total =	5433.2175 Cft	116.49	Cft	632,915.51
	(Ch.21 Item No. 8)				
15-	Constructing standard gully grating chamber, 3'x2½' (900x750 mm), with chinaware trap as per PHED Drawing STD/PD No. 3 of 1977, complete in all respects.				
		40 No.	19,528.00	Each	781,120.00
				TOTAL = RS.	***14,497,901.26***

Carried over to General Abstract of Cost

SUB-HEAD NO. 5

PCC for Leveling of area between Storm Water Drains and raising of manhole

MRS, 2ND BI-ANNUAL-2023 (01.07.2023 to 31.12.2023) DISTRICT GUJRANWALA

Sr.	Description	Quantity	Rate *(Rs.)*	Unit	Amount *(Rs.)*
	(Ch.3 Item No.10-i)				
1-	Earth work excavation in open cutting upto 5.00ft depth for storm water channels, drains, sullage drain, in open areas,roads streets lanes including under pinning of walls, and shoring to protect existing works, shuttering and timbering the trenches, dresse to designed level and dimensions, trimming, removal of surface water from trenches and back filling and surplus excavated material disposed of and dressed within 50ft. lead. ordinary				
	3500 x 22.00 x 1.000 =	77000 Cft	11,833.05	$^{0}/_{00}$Cft	911,144.85
	(Ch.3 Item No.17)				
2-	Transportation of surplus mateial & earth all types when the total distance i/c the lead covered in the item of work, is more than 1000ft (300m). c) for every ¼ mile (400 m) additional lead or part thereof, beyond one mile (1.6 Km.) upto 5 mile (8 Km).				
	Qty as per Item No. 1+8 =	77068.00 Cft	5,094.50	$^{0}/_{00}$Cft	392,622.93
	(Ch.3 Item No. 25)				
3-	Compaction of earthwork with power road roller, including ploughing, mixing, moistening earth to optimum moisture content in layers, etc. complete: i) 95% to 100% maximum modified AASHTO dry density.				
	3500.00 x 22.00 x 0.50 =	38500 Cft	1,664.75	$^{0}/_{00}$Cft	64,092.88
	(Ch.18 Item No. 3a				
4-	a) Providing and laying sub-base course of stone product of approved quality and grade, including placing, mixing, spreading and compaction of sub-base material to required depth, camber, grade to achieve 100% maximum modified AASHO dry density, including carriage of all material to site of work except gravel and. aggregate. ii) Crushed stone aggregate				
	1 x 3500 x 22.00 x 0.50 =	38500.00 Cft	23,806.05	$^{0}/_{0}$Cft	9,165,329.25
	(Ch.6 Item No.5)				
5-	Cement concrete plain i/c placing, compacting, finishing and curing complete. (i/c washing of stone aggregate)				
	(1:2:4) 3500 x 22.00 x 0.50 =	38500.00 Cft	44,160.60	%Cft	17,001,831.00
	(Ch.6 Item No. 35)				
6-	Providing and fixing theremopore (foamed polythene) sheet in horizontal and vertical expansion joints. a) 1" (25 mm) thick thermopore sheet				
	At distance of 25 feet 140.00 x 22.00 x 0.50 =	1540.00 Sft	25.20	P. Sft	38,808.00
	(Ch.6 Item No. 32)				
7-	Filling expansion joints with bitumen. sand & saw dust in ratio 1:2:2.				
	140.00 x 22.00 =	3080 Rft	41.35	P.Rft	127,358.00

	(Ch.4 Item No. 19)					
8-	Dismantling lime or cement concrete, under water. c) Dismantling cement concrete 1:2:4 plain					
	3.14 x 2.75 x 0.75 x 0.75 =	4.86	Cft			
	14.00 x 4.86 =	68.00	Cft	14,636.15	$^{0}/_{0}$Cft	9,952.67
	(Ch.7 Item No. 7i)					
9-	Pacca brick work in other than building in 1:3 cement sand mortar other than building up to 10' height.					
	3.14 x 2.75 x 0.75 x 1.00 =	6.48	Cft			
	14.00 x 6.48 =	90.67	Cft	38,206.45	$^{0}/_{0}$Cft	34,640.83
	(Ch.6 Item No.5)					
10-	Cement concrete plain i/c placing, compacting, finishing and curing complete. (i/c washing of stone aggregate) (Manhole top)					
	(1:2:4)					
	3.14 x 2.75 x 0.75 x 0.75 =	4.86	Cft			
	14.00 x 4.86 =	68.00	Cft	44,160.60	%Cft	30,029.48
	(Ch.21 Item No. 16)					
11-	Providing and fixing 6" thick R.C.C. manhole cover with tee shaped C.I. frame of 22" I/d (frame weighing 37.324 Kg. or one maund as per Standard Drawing STD/PD No. 6, of 1977, complete in all respect.					
		14	No.	21,303.35	P.Set	298,246.90
	(Ch.21 Item No. 7)					
12-	Constructing gully grating chamber, 12"x12", (300x300 mm) complete in all respects: a) with C.I. gully trap, weighing 81 lbs. (36.75 Kg.) frame hinged safety type.					
		35	No.	16,282.30	Each.	569,880.50
	(Ch.21 Item No. 8)					
13-	Constructing standard gully grating chamber, 3'x2½' (900x750 mm), with chinaware trap as per PHED Drawing STD/PD No. 3 of 1977, complete in all respects.					
		35	No.	19,527.00	Each.	683,445.00
	(Ch.1 Item No. 1)					
14-	Carriage of 100 Cft. (2.83 cu.m) of all materials like stone aggregate, spawl, kankar lime (unslaked), surkhi, etc. or 150 Cft. (4.25 cu.m) of timber, by truck or by any other means owned by the contractor. (185 Km Sargodha Sikhanwali Quarry)					
	Qty as per Item No. 5 + 10					
	38568.00 x 0.88 =	33939.84	Cft	116.49	Cft	3,953,652.03
					TOTAL = RS.	***33,281,034.32***

Carried over to General Abstract of Cost

SUB-HEAD NO. 6

Provision of Dewatering sets for Underpasses (2 nos.)

MRS, 2ND BI-ANNUAL-2023 (01.07.2023 to 31.12.2023) DISTRICT GUJRANWALA

Sr.	Description	Quantity	Rate *(Rs.)*	Unit	Amount *(Rs.)*
1-	Dewatering sets for underpass of capacity 1 cusecs (fully automatic) Analysis Attached.	2 No.	17,132,500.00	Each	34,265,000.00
				TOTAL = RS.	***34,265,000.00***

Carried over to General Abstract of Cost

RATE ANALYSIS

Rate Analysis

Providing and fixing, MS grating (1' x 4") using angle iron frame (L 1-1/2" X 1-1/2" X 3/16") fitted with 1/2" sq. bar welded with frame at 2" c/c complete in all respects.

Unit= Each

Sr. #	Ref No.	Description	Unit	Qty.	Rate	Amount (Rs.)
1	Ch-25, I-09	Small iron work, such as gusset plates, knees, bends, stirrups, straps, rings, etc. including cutting, drilling, riveting, handling, assembling and fixing; but excluding erection in position.	kg	4.14	501.84	2,077.61
2	Ch-25, I-11	Erection and fitting in position iron trusses, staging of water tanks, etc.	kg	4.14	16.80	69.56
					Total Material Charges (Rs.)	**2,148.00**

Rate Analysis

	Construction of Gully Grating Chambers in City Area							
S No	MRS, Reference		Description of Items	Quantity		Rate	Unit	Amount (PKR)
	Ch	Item						
1	21	8	Constructing standard gully grating chamber, 3'x2½' (900x750 mm), with chinaware trap as per PHED Drawing STD/PD No. 3 of 1977, complete in all respects.					
			=	1	No	19,527.00	1.00	19,527.00
2	3	42.i	Earthwork excavation in open cutting for sewers and manholes as shown in drawings including shuttering and timbering, dressing to correct section and dimensions according to templates and levels, and removing surface water, in all types of soil except shingle, gravel and rock:- i) 0 ft. to 7.0 ft. (0 to 2.10 m) depth					
			1.00 x 10.00 x 1.875 x 4 =	75.00	Cft	15934.55	1000	1,195.09
3	10	3	Supplying and filling sand under floor; or plugging in wells					
			1.00 x 10.00 x 1.875 x 1 =	18.75	Cft			
			D/d of Pipe					
			1 x 3.143 x 0.67 x 0.67 x 0.25 x 10	3.53	Cft			
			Net :- Net quantity :- =	**15.22**	Cft	3074.40	100	468.01
4	19	48-ii	Providing, fixing, testing and commissioning of µ-PVC (Unplasticized Poly vinyl Chloride)sewerage pipe make of Dadex/Popular/Beta or equivalent, plain/socket ended conforming to code EN-1401 of specified SDR (Standard Dimension Ratio)including the cost of special sand Solvents complete in all respect as approved and directed by the Engineer Incharge.					
			(200mm) 8"i/d pipe = 1 x 10.00 =	10	Rft	2334.95	1	23,349.50
5	3	13	Rehandling of earthwork: a) Lead upto a single throw of Kassi, phaorah or shovel complete.					
			Quantity as per iten No. 2.00 = 75.00 x 80 / 100 =	60.00	Cft	3326.40	1000	199.58
			Total cost of 1 No.gully gratting & 8" i/d UPVC connection pipe	**1**	**No**	**Total :-**		**44,739.19**

Rate Analysis for Carriage of Crush Stone

Unit = 100 Cft **Lead = 185 km**

Sr. #	MRS #	Description	Lead (KM)	Rate (Rs.)	Qty	Amount (Rs.)
1	Ch-1, I-1	**Carriage**				
		1st KM	1	338.8	1	338.80
		2nd KM	1	162.05	1	162.05
		3rd KM	1	127.55	1	127.55
		4th KM	1	91.2	1	91.20
		5th KM	1	85.2	1	85.20
		6th KM	1	83.85	1	83.85
		7th KM	1	76.35	1	76.35
		8th KM	1	77.5	1	77.50
		9th KM	1	72.95	1	72.95
		10th KM	1	68.55	1	68.55
		from 11 KM to 200 KM	175	59.80	1	10,465.00
		Total Amount per 100 Cft.				11,649.00
		Total Amount per one Cft.				**116.49**

Rate Analysis for Carriage of Crush Stone (Sub-base)

Unit = 100 Cft **Lead = 185 km**

Sr. #	MRS #	Description	Lead (KM)	Rate (Rs.)	Qty	Amount (Rs.)
1	Ch-18, I-3a	a) Providing and laying sub-base course of stone product of approved quality and grade, including placing, mixing, spreading and compaction of sub-base material to required depth, camber, grade to achieve 100% maximum modified AASHO dry density, including carriage of all material to site of work except gravel and. aggregate. ii) Crushed stone aggregate		9,827.25	1	9827.25
2	Ch-1, I-1	**Carriage**				
		1st KM	1	338.8	1.2	406.56
		2nd KM	1	162.05	1.2	194.46
		3rd KM	1	127.55	1.2	153.06
		4th KM	1	91.2	1.2	109.44
		5th KM	1	85.2	1.2	102.24
		6th KM	1	83.85	1.2	100.62
		7th KM	1	76.35	1.2	91.62
		8th KM	1	77.5	1.2	93.00
		9th KM	1	72.95	1.2	87.54
		10th KM	1	68.55	1.2	82.26
		from 11 KM to 200 KM	175	59.80	1.2	12,558.00
		Total Amount per 100 Cft.				23,806.05
		Total Amount per one Cft.				**238.06**

Rate Analysis for Provision of Dewatering Set

S.No.	Description	Qty	Rate	Unit	Amount (Rs.)
1	Fully Automatic Auto-prime Solid Handling Dewatering Pump Set (Europe, USA, UK, Japan, Australia Origin or equivalent) Minimum 1" (25mm) Solid Handling Capacity Pump Capacity: Min. 1 Cusec and above Standard Construction with SG iron casing SS316 Impeller and Wear plates SS431 Shaft, Fitted with oil cooled mechanical seal of Silicon Carbide capable of running dry for extended periods faces incorporating full automatic compressor priming facility. Suction / Discharge connections 80mm x 80mm respectively (with Bauer Quick Connect Coupler) close coupled with water cooled Diesel Engine having power not less than 13kW and above/18HP and above with RPM upto 2200, Make Perkins/Duetz or equivalent, Electric Start, Battery and Engine Control Panel with shut down protection against high Engine RPM, Low Oil Pressure, High Temperature complete with emergency stop, including suction and delivery pipe. All mounted on a common fabricated steel base with single axle trailer complete with Two jack stands, towing minimum 8 to 10 hours fuel (Quotation Attached)	1	15,575,000.00	Each	15,575,000.00
2	Contractor Profit (10%)				1,557,500.00
	Total				**17,132,500.00**

QUOTATION

TOP WELLS
GOVT. CONTRACTOR
ENGINEER-CONTRACTOR-SUPPLIER

Ref: ENV/LHR-2010/23

ENVIRO CONSULTANT, LAHORE.

Subject: **QUOTATION**

Reference our telecom. Please find below quotation:

No	Description	Qty	Price (Rs.)
1	Fully Automatic Auto-prime Solid Handling Dewatering Pump Set (Europe, USA, UK, Japan, Australia Origin or equivalent) Minimum 3" (75mm) Solid Handling Capacity Pump Capacity: Min. 4 Cusec and above Standard Construction with SG iron casing SS316 Impeller and Wear plates SS431 Shaft, Fitted with oil cooled mechanical seal of Silicon Carbide capable of running dry for extended periods faces incorporating full automatic compressor priming facility. Suction / Discharge connections 150mm x 150mm respectively (with Bauer Quick Connect Coupler) close coupled with water cooled Diesel Engine having power not less than 35kW and above/45HP and above with RPM upto 1900, Make Perkins/Duetz or equivalent, Electric Start, Battery and Engine Control Panel with shut down protection against high Engine RPM, Low Oil Pressure, High Temperature complete with emergency stop. All mounted on a common fabricated steel base with single axle trailer complete with Two jack stands, towing minimum 8 to 10 hours fuel tank pump should be able to develop a minimum head of 20M and flow of 450m3/hr each unit.	1 No.	19,350,000/-
2.	Fully Automatic Auto-prime Solid Handling Dewatering Pump Set (Europe, USA, UK, Japan, Australia Origin or equivalent) Minimum 1.75" (45mm) Solid Handling Capacity Pump Capacity: Min. 2 Cusec and above Standard Construction with SG iron casing SS316 Impeller and Wear plates SS431 Shaft, Fitted with oil cooled mechanical seal of Silicon Carbide capable of running dry for extended periods faces incorporating full automatic compressor priming facility. Suction / Discharge connections 100mm x 100mm respectively (with Bauer Quick Connect Coupler) close coupled with water cooled Diesel Engine having power not less than 25kW and above/30HP and above with RPM upto 2200, Make Perkins/Duetz or equivalent, Electric Start, Battery and Engine Control Panel with shut down protection against high Engine RPM, Low Oil Pressure, High Temperature complete with emergency stop. All mounted on a common fabricated steel base with single axle trailer complete with Two jack stands, towing minimum 8 to 10 hours fuel	1 No.	17,550,000/-
3.	Fully Automatic Auto-prime Solid Handling Dewatering Pump Set (Europe, USA, UK, Japan, Australia Origin or equivalent) Minimum 1" (25mm) Solid Handling Capacity Pump Capacity: Min. 1 Cusec and above Standard Construction with SG iron casing SS316 Impeller and Wear plates SS431 Shaft, Fitted with oil cooled mechanical seal of Silicon Carbide capable of running dry for extended periods faces incorporating full automatic compressor priming facility. Suction / Discharge connections 80mm x 80mm respectively (with Bauer Quick Connect Coupler) close coupled with water cooled Diesel Engine having power not less than 13kW and above/18HP and above with RPM upto 2200, Make Perkins/Duetz or equivalent, Electric Start, Battery and Engine Control Panel with shut down protection against high Engine RPM, Low Oil Pressure, High Temperature complete with emergency stop. All mounted on a common fabricated steel base with single axle trailer complete with Two jack stands, towing minimum 8 to 10 hours fuel	1 No.	15,575,000/-

TOP WELLS

TOP WELLS

20-10-2023

Chief Executive

- Prices are FOR including duty & taxes.
- Delivery 120-Days.
- Quotation Validity: 15-Days.

Mailing Address:
572-D, Canal View Housing Society,
Lahore-Pakistan.

Office Address:
127-Ahbab Colony, Lahore-Pakistan.
Cell: 0300-8442686
Email: topwells123@gmail.com

APPENDIX-I

ENVIRONMENTAL MANAGEMENT & SOCIAL SCREENING

Environmental & Social Screening Checklist

Name of ESFP:	**Hussain Ahmad Siraj**
Name of MC:	**Kamoke**
Sub-Project Sector:	Stormwater Management
Sub-Project Title:	Feasibility Studies and Design of Rainwater Underground Storage Facilities in 11 Cities of Punjab Under Punjab Cities Program (PCP), Stormwater Facilities in Kamoke City
Sub- Project Categorization:	**E-1** **S-1** **E-2** ✓ ESMP will be required **S-2** **E-3** **S-3** ✓
Date of Screening:	**14-10-2023**
Anticipated Project Activities	i. Cleaning and desilting of existing Storm Water Drains. – From National CNG to Bhola Peer : 2500 ft. – From Nadra Office to Saddar Thana : 12000 ft. ii. Covering : 1500 ft. iii. Maintain proper slope of the service area : 3500 ft.
Estimated Cost of Subprojects	Stormwater Facilities in Kamoke City: Rs. 104.086 million
Completion Time/Duration	06 months (14 July 2023 - 14 Jan 2024)
Estimated Labor for Subproject	

Screening Questions	Yes	No	Remarks
A. Project Siting Is the Sub-Project area adjacent to or within any of the following:			
Environmentally sensitive areas?			
Legally protected Area		✓	
Any surface water body (river, canal, stream, lake, wetland) within 250 meters of the proposed sub project[1]		✓	Sewage flowing in 2 drains i.e., from National CNG to Bhola Peer & From Nadra Office to Saddar Thana, both of these drains further merge and dispose of into Daig (saim) Nallah by the proposed scheme
Estuarine		✓	
Special area for protecting biodiversity		✓	
Buffer zone of protected area		✓	
Mangroves Forest		✓	
Man-made forest /game reserve, orchid /crops or any other area of environmental importance		✓	
Socially sensitive /important areas/communities/ people?			
PCRs and or any site of cultural/religious importance (Graveyard, Shrine, Mosque, Church, *Gordwarah*, Temple, Fort, archeological/historical site) within 100 m of the proposed subproject[2]	✓		**Mosques**: -Jamia Masjid Azeem (Adan) -Jamia Masjid Madina -Jamia Saddiqia Ada Wali -Central Imam Gah (Bab-ul-Hawaij Imam Musa Kazmi) -Jamia Masjid Munir **Shrine:** -Darbar Hazrat Bhola Peer No impact is anticipated except noise and smell, which will be managed by implementing mitigation plan of ESMP.
Sensitive receptors (Schools, colleges, hospitals and clinics) within 100 meters of the proposed sub project[3]	✓		**Hospitals:** -Tehsil Headquarter Hospital -Fatima Children and General Hospital **Schools:** -The Smart School -Govt. Girls MC High School No. 01 -Elite International School -Govt. Umair Shaheed High School No. 01 -Pakistan Academy of Sciences **Colleges:** -Govt. Graduate College for Women -Queen College for Girls No impact is anticipated except noise and smell, which will be managed by implementing mitigation plan of ESMP.
Any graveyard of local community (Muslims or Christians)		✓	
Any demographic or socio-economic aspects of the sub-project area that are already vulnerable (e.g., high incidence of marginalized		✓	No demographically or socio-economically vulnerable aspects of the sub-project were observed.

populations, rural-urban migrants, illegal settlements, squatters, ethnic minorities, people with disabilities, people in old age, socially isolated segments[4] of the society and women or children)?			
Already existing infrastructure [5](including public amenities) which may be required to dismantle or may be affected temporarily by any means?		✓	Existing stormwater Drains will only be cleaned and desilted, none of these will be dismantle or negatively affected.
B. Potential Environmental Impacts Will the Sub-Project cause…			
1. Disturbance to habitats/biodiversity of environmentally sensitive or protected areas?		✓	No environmentally sensitive or protected area present.
2. Cutting of trees?		✓	No cutting of trees.
3. Disruption to habitats/biodiversity of surrounding ecosystem/environment?		✓	Project activities involves only cleaning and desilting of sewerage drains and covering of drain therefore no disruption to habitats/biodiversity of surrounding ecosystem/environment is anticipated.
4. Generation of wastewater during construction or operation?	✓		Smell along the existing drains is anticipated. That will be eliminated with the cleaning and desilting of the drains. Anticipated impact will be managed by implementing mitigation plan of ESMP.
5. Pollution of surface water/ground water due to wastewater discharge from construction site or due to direct/indirect disposal of waste water?	✓		Anticipated impact of smell and direct/indirect disposal of waste water will be managed by implementing mitigation plan of ESMP.
6. Alteration of surface water hydrology of waterways resulting in increased sediment in streams/rivers or due to increased soil erosion at construction site?		✓	No surface water body of present nearby.
7. Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?		✓	No surface water body of present nearby.
8. Over pumping of ground water, leading to salinization and ground subsidence?		✓	Sub-project does not involve any pumping of groundwater activity.
9. Serious contamination of soil due to construction works?		✓	Sub-project activities do not involve use of chemical or lubricants, only earth material or sewerage water will be generated. These impacts will be mitigated by suggesting and implementing mitigation measures in the EMP.
10. Aggravation of solid waste problems in the area?		✓	No aggregation of solid waste problem in the area is anticipated.

[1] Ibid.

[2] According to Environmental Assessment Guidelines adopted by Punjab EPA

[3] Ibid.

[4] due to caste, creed, religion or gender e.g. transgender

[5] Sewerage /Drainage system, Water supply lines, tube-wells, WAPDA/Telephone transmission lines/electric poles, Railway tracks, Gas pipelines, Roads, Shops/Plazas, Banks, Industry, Disposal stations etc.

11. Generation of hazardous waste?		✓	No hazardous waste will be generated/used in sub-project activities.
12. Increased air pollution due to sub-project construction and operation?		✓	Sub-project activities are on a small scale therefore no air pollution is anticipated however, adequate mitigation measures such as regular water sprinkling and others will be implemented as per prepared ESMP.
13. Noise and vibration due to sub-project construction or operation?	✓		There will be limited vibration and noise due to sub-project however these anticipated impacts will be managed by implementing mitigation plan of ESMP
14. Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents due to solid/liquid?	✓		Waste water collected after cleaning will be properly and immediately disposed of. Contractor will be directed to take care of waste properly and proper implementation of SOPs. Anticipated impacts will be managed by implementing mitigation plan of ESMP
15. Use of chemicals during construction?		✓	No chemical will be used.
C: Potential Social Impacts Will the Sub-Project cause…			
1. Impairment of historical/cultural areas; disfiguration of landscape or potential loss/damage to Physical Cultural Resources (PCRs)?		✓	No loss/damage is anticipated from sub-project activities. No historical/cultural areas are present in the area. Only a shrine (Darbar Hazrat Bhola Peer) is nearby but no impact is anticipated.
2. Displacement or involuntary resettlement of people? (physical displacement and/or economic displacement) (If "Yes", please also fill Involuntary Resettlement Screening Checklist)		✓	No one will be required to be displace or resettled due to sub-project.
3. Disproportionate impacts on the poor, women and children and or other vulnerable groups [6](mentioned above)?		✓	Sub-project will not cause any negative impact on any of the vulnerable groups. However, local communities will be informed before execution of the project and GRM awareness will be ensured throughout the execution of the sub-project.
4. Temporary impediments in movements of people/transport and animals?	✓		There will be temporary impediment in movement of people/transport but this can be managed/controlled by proper signage/barricading/traffic management in coordination with the local traffic police.
5. Large population influx during sub-project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		✓	Subproject will not cause burden on social infrastructure and services as local labors will be hired who will return to their houses after-day's work. Contractor will be bound to implement EHS and Labor/workers SOPs developed by PMDFC.
6. Social conflicts if workers from other areas are hired?		✓	Social conflict is not anticipated as local labors will be hired.
7. Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and	✓		As it is a small-scale sub-project therefore there will be very limited risk and vulnerability related to occupational health and safety is anticipated. However, implementation of OHS plan and

[6] Women, Children, Women headed households, People in old age, people having disabilities, socially isolated community groups and or people living below the poverty line

radiological hazards during project construction and operation?			Labor/workers SOPs developed by PMDFC, all HSE related incidents will be avoided/minimize/ mitigated.
8. Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	✓		On a very small-scale community health and safety issues are anticipated during transportation of sewerage. Therefore, health and safety SOPs will be implemented. Furthermore, local communities will be informed before execution of the project and GRM awareness will be ensured throughout the execution of the sub-project.
9. Community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	✓		On a very small-scale community safety issues are anticipated during transportation of sewerage and covering of drain. Therefore, through proper usage of warning tape, proper signage, barricading and through work management, community safety risk will be avoided/minimize/ mitigated. Furthermore, local communities will be informed before execution of the project and GRM awareness will be ensured throughout the execution of the sub-project.
10. Any impact on sensitive receptors (mentioned above)		✓	There is no impact anticipated on sensory receptors but only smell during the cleaning and desilting is anticipated. But these impacts will be mitigated by using best practices.
11. Any impact of negative nature on already existing infrastructure including public amenities		✓	No public amenities or infrastructure will be negatively impacted. Existing drains will be cleaned and desilted and covering of drain as per design. There will be no impact of temporary land acquisition for material storage as well.

Prepared By:

Name: Hussain Ahmad Siraj

Signature: 

Date:14-10-2023

Endorsed By:

Name:

Signature:

Date:

Appendix A-Environmental and Social Categorization of Sub-Projects

Using the Environmental and Social Screening Checklist, E & S Categorization of sub-projects of PCP is and will be carried out as following:

For Environmental Category:

E-1 = All those sub-projects having adverse environmental impacts and or those sub-projects that come under Schedule I and II of Pakistan Environment Protection Agency Review of IEE and EIA Regulations 2000 will need to submit **Initial Environmental Examination (IEE)** or **Environmental Impact Assessment (EIA)**[7] report

E-2 = All those sub-projects which will have moderate negative environmental impacts will need to submit **Environmental and Social Management Plans (ESMP)**[8]

E-3 = All those sub-projects which will have no negative environmental impacts will be categorized as E3 and for those, no further process will be required[9] after E &S Screening

For Social Category:

S-1= All those sub-projects having negative social impacts of significant nature on > 40 households and or it require displacement/resettlement of > 40 households for land acquisition, will need to submit Social Assessment (SAR), Social Management Plan (SMP) and Resettlement Action Plan (RAP)

S-2= All those sub-projects having negative social impacts of significant nature on 1 – 40 households and or it require displacement/resettlement of 1- 40 households for land acquisition, will need to submit Social Assessment (SAR), Social Management Plan (SMP) and Abbreviated Resettlement Action Plan (ARAP)

S-3= All those sub-projects having no negative social impacts and or they are not involved in displacement/resettlement of any nature, will be categorized as S3 and No further process will be required after E &S Screening

Appendix B-Important Definitions

1. Environmentally sensitive areas [10]
   Environmentally sensitive areas are landscape elements or places which are vital to the long-term maintenance of biological diversity, soil, water or other natural resources both on the site and in a regional context.
2. Cultural heritage[11]
   - Tangible cultural heritage:
     - movable cultural heritage (paintings, sculptures, coins, manuscripts)
     - immovable cultural heritage (monuments, archaeological sites, and so on)
     - underwater cultural heritage (shipwrecks, underwater ruins and cities)
   - Intangible cultural heritage: oral traditions, performing arts, rituals
3. Wetlands
   - Wetlands are areas where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods of time during the year, including during the growing season.[12]
   - areas of marsh, fen, petal and or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters".[13]

---

[7] .All the social impacts (except those that come under S1 and S2 Category of land acquisition) of E1 Category sub-projects will be covered in IEE/EIA report

[8] .All the social impacts (except those that come under S1 and S2 Category of land acquisition) of E2 Category sub-projects will be covered in the ESMP

[9] .For all those sub-projects which will have no negative environmental impacts and are categorized as E3 but they require construction labor/workers for the execution ,will follow the Environment, Health and Safety SOPs prepared for PCP and they will follow the instructions given by ESM team of PCP

[10] https://www.sciencedirect.com/science/article/abs/pii/0169204694020169

[11] http://www.unesco.org/new/en/culture/themes/illicit-trafficking-of-cultural-property/unesco-database-of-national-cultural-heritage-laws/frequently-asked-questions/definition-of-the-cultural-heritage/

[12] https://www.epa.gov/wetlands/what-wetland

[13] https://www.ramsar.org/sites/default/files/documents/library/info2007-01-e.pdf

4. Buffer zone of protected area

   Areas peripheral to a specific protected area, where restrictions on resource use and special development measures are undertaken in order to enhance the conservation value of the protected area.[14]

5. Special area for protecting biodiversity/ Key Biodiversity Areas (KBA)

   Sites that contribute significantly to the global persistence of biodiversity, in terrestrial, freshwater and marine ecosystems [15]

6. Estuarine

   Area of the mouth of a river where it broadens into the sea, and where fresh and seawater intermingle to produce brackish water. The estuarine environment is very rich in wildlife, particularly aquatic, but it is very vulnerable to damage as a result of human activities.[16]

7. Hazardous substance means-

   (a) A substance or mixture of substance, other than a pesticide as defined in the Agricultural Pesticide Ordinance, 1971 (II of 1971), which, by reason of its chemical activity is toxic, explosive, flammable, corrosive, radioactive or other characteristics causes, or is likely to cause, directly or in combination with other matters, an adverse environmental effect; and

   (b) Any substance which may be prescribed as a hazardous substance;

   Hazardous waste means waste which is or which contains a hazardous substance or which may be prescribed as hazardous waste, and includes hospital waste and nuclear waste; [17]

8. Waste

   Waste means any substance or object which has been, is being or is intended to be, discarded or disposed of, and includes liquid waste, solid waste, waste gases, suspended waste, industrial waste, agricultural waste, nuclear waste, municipal waste, hospital waste, used polyethylene bags and residues from the incineration of all types of waste. [18]

[14] https://www.biodiversitya-z.org/content/buffer-zones.pdf
[15] https://biodiversitya-z.org/content/key-biodiversity-areas-kba
[16] https://biodiversitya-z.org/content/estuary
[17] Punjab Environmental Protection Act 2012
[18] ibid

INVOLUNTARY RESETTLEMENT SCREENING CHECKLIST

Name of ESFP: Hussain Ahmad Siraj

Name of MC: Kamoke

Sub-Project Sector: Stormwater Management

Sub-Project Title: Feasibility Studies and Design of Rainwater Underground Storage Facilities in 11 Cities of Punjab under Punjab Cities Program (PCP), Stormwater Facilities in Kamoke City

Sub- Project Categorization:

S-1

S-2

S-3 ✓

Date of Screening: **14/10/2023**

SECTION 1	Yes	No	Expected	Remarks
Does the project require land acquisition? Yes/No		✓		
If yes, then describe the type of land being acquired from the categories below:		✓		It was confirmed during public consultation.
Has any AED been conducted at the proposed location by the government[1]? Yes/No		✓		
Land (Quantify and describe types of land being acquired in "remarks column".		✓		
Government and LG owned land free of occupation (agriculture or settlement)		✓		
Government or state-owned land (other than LG) free of occupation (agriculture or settlement)		✓		
Private land		✓		
Residential		✓		
Commercial		✓		
Agricultural		✓		
Communal		✓		
Others (specify in "remarks").		✓		
Name of owner/owners and type of ownership document if available.		✓		
If land is being acquired, describe any structures constructed on it		✓		
Land-based assets:		✓		

SECTION 1	Yes	No	Expected	Remarks
Residential structures		✓		
Commercial structures (specify in “remarks”)		✓		
Community structures (specify in “remarks”)		✓		
Agriculture structures (specify in “remarks”)		✓		
Public utilities (specify in “remarks”)		✓		
Others (specify in “remarks”)		✓		
If agricultural land is being acquired, specify the following:		✓		
Agriculture related impacts		✓		
Crops and vegetables (specify types and cropping area in “remarks).		✓		
Trees (specify number and types in “remarks”).		✓		
Others (specify in “remarks”).		✓		
Affected Persons (APs)		✓		
Will any people be displaced from the land when acquired? Yes/No		✓		
Number of APs		✓		
Males		✓		
Females		✓		
Titled land owners		✓		
Tenants and sharecroppers		✓		
Leaseholders		✓		
Agriculture wage laborers		✓		
Encroachers and squatters (specify in remarks column)		✓		
Vulnerable APs (e.g., women headed households, minors and aged, orphans, disabled persons and those below the poverty line). Specify the number and vulnerability in “remarks”.		✓		
Others (specify in “remarks”)		✓		
How will people be affected?		✓		

Prepared By:

Name: Hussain Ahmad Siraj

Signature: 

Date: 14/10/2023

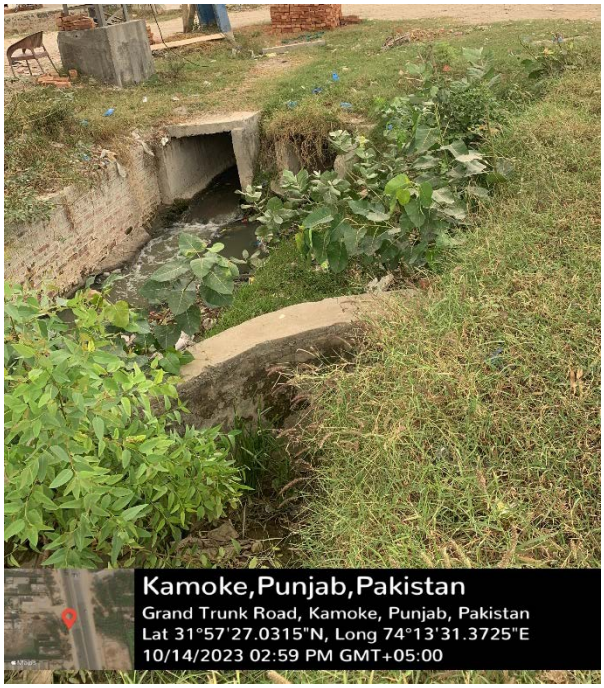
Endorsed By:

Name:

Signature:

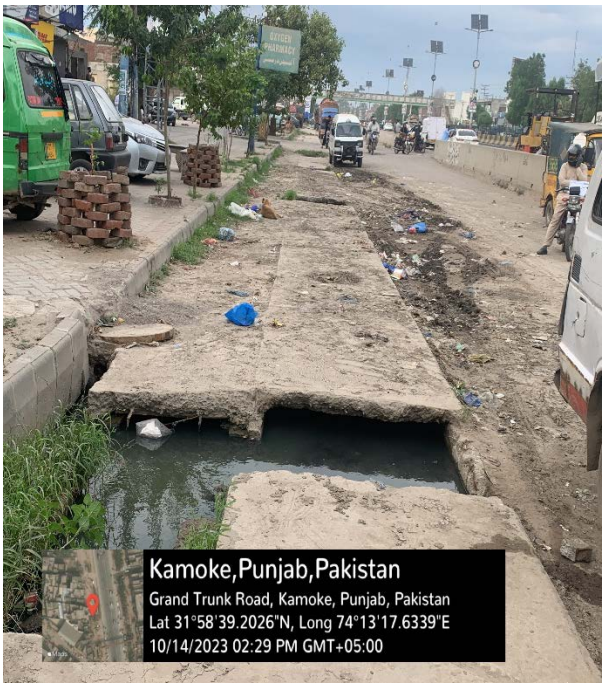
Date:

Pictures of Project Siting



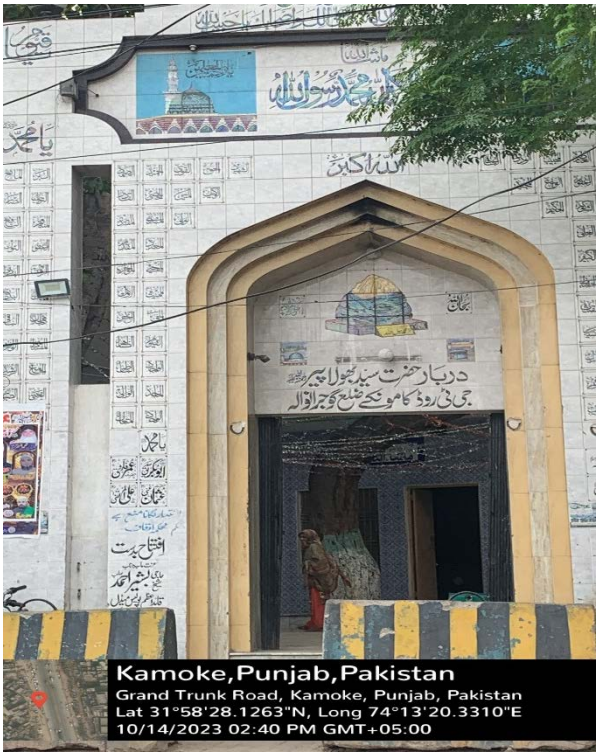
Point where existing drain fall into Saim Nallah which ultimately dispose off into Daig Nullah

Plight condition due to blockage of existing Drain



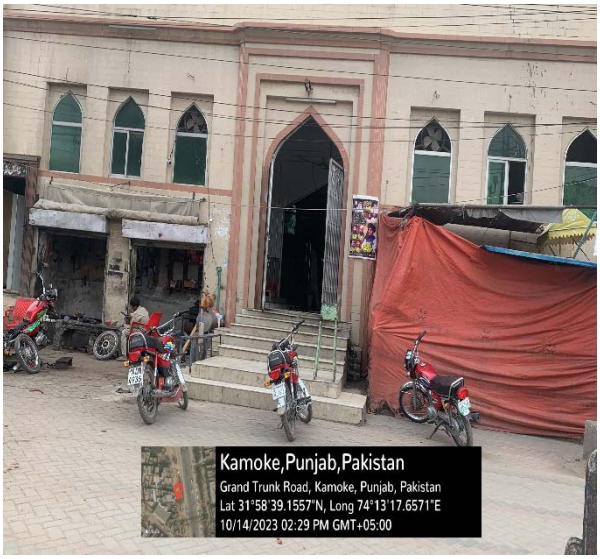
Existing drain without cover and ponding area on the road

Over flow of existing drain



Darbar Hazrat Bhola Peer

Central Imam Gah
(Bab-ul-Hawaij Imam Musa Kazmi)



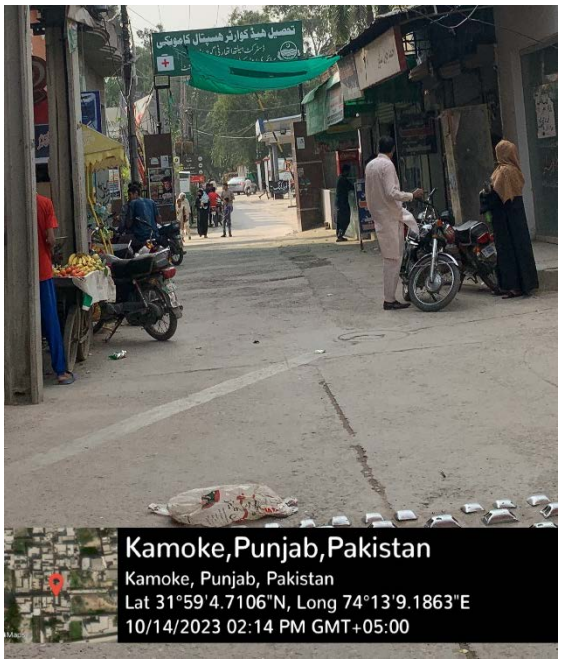
Jamia Saddiqia Ada Wali

Govt. Graduate College for Women, Kamoke

Govt. Girls MC High School No. 01, Kamoke

The Smart School

Fatima Children and General Hospital



Tehsil Headquarter Hospital, Kamoke

Duration of Project: 04 months Estimated labor involved- 20-25			
Item	**Quantity**	**Tentative Cost/Item- Rs./-**	**Total Cost**
A-PPEs			
Face Masks (3 PLY) - box	20	300	6000
Safety Hard Helmets	20	3,000	60000
Safety Shoes	20	3,000	60000
Hand Gloves	20	1,000	20000
Ear Plugs	20	500	10000
Reflective Safety Vest	20	1,000	20000
Safety Goggles	20	500	10000
B-Community Health and Safety			0
First Aid Box Complete	1	10,000	10000
Safety Signs	8	15,000	120000
Safety Cones	20	1,000	20000
Safety Tapes	10	1,500	15000
Portable Delineator with chain	10	2,200	22000
Emergency Portable Lights	5	3,000	15000
Solid Waste Collection Drums with Cover	3	12,000	36000
Fire Fighting Equipment Purchase and refilling	2	10,000	20000
Hiring of Environmental Specialist (for 04 months)	4	98,000	392000
Labor Campsite Management	200,000 L.S		200,000
Water Sprinkling	200,000 L.S		200,000
Social and Behavior Change Campaign	200,000 L.S		200,000
C- Environment Quality Testing			0
Ambient Air Quality-one from each road during construction	4	85000	340000
Noise Quality-one sample from each road during construction	12	1000	12000
Water Quality-one sample from each road during construction	4	22000	88000
Total (PKR)-A+B+C			1788000

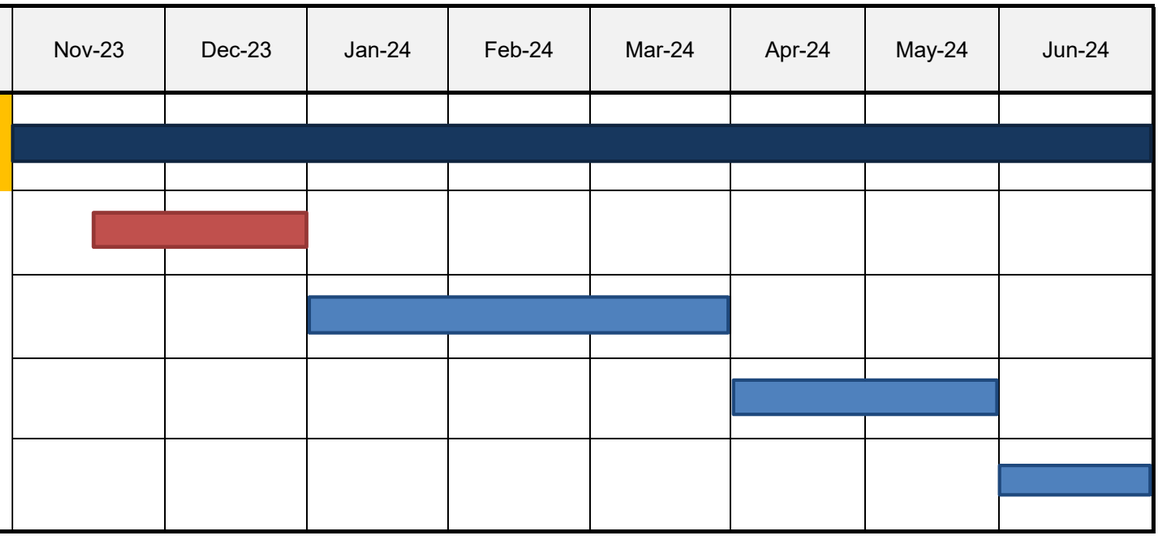
APPENDIX-II

IMPLEMENTATION SCHEDULE

IMPLEMENTATION SCHEDULE

FEASIBILITY STUDIES AND DESIGN OF RAINWATER UNDERGROUND STORAGE FACILITIES IN 11 CITIES OF PUNJAB UNDER PUNJAB CITIES PROGRAM (PCP)

Sr.No	DESCRIPTION	DURATION (DAYS)	START DATE	FINISH DATE
DESIGN OF STORMWATER DRAINAGE FACILITIES IN KAMOKE CITY		**225**	**15/11/2023**	**30/6/2024**
1	Mobilization of Contractores	45	15-Nov-23	31-Dec-23
2	Desilting of Drains	90	1-Jan-24	31-Mar-24
3	Construction of RCC Drain	60	1-Apr-24	31-May-24
4	Restoration Works	30	1-Jun-24	30-Jun-24



APPENDIX-III

HSE & RISK MITIGATION PLAN

PROCUREMENT PLAN

MONITORING AND EVALUATION PLAN

HR PLAN

MONITORING AND REPORTING

HSE & RISK MITIGATION PLAN

HEALTH, SAFETY & ENVIRONMENT PLAN

1. Underground Obstruction

Underground services that have the potential to affect the construction include:

- Underground electricity cables
- Gas mains
- Communication cables
- Water mains
- Sewer mains
- Council drains
- Traffic signal cables

Search would be undertaken to check for major services at least 30 m both upstream and downstream of the proposed works.

2. Trenching & Excavation Safety

Excavation and trenching are among the most hazardous construction operations.

Dangers of Trenching and Excavation

Cave-ins pose the greatest risk and are much more likely than other excavation related accidents to result in worker fatalities. Other potential hazards include falls, falling loads, hazardous atmosphere and incident involving mobile equipment.

Key issues are:

a) Collapse of Excavations

- **Temporary support**-Before digging any trench pit, tunnel or other excavations, decide what temporary support will be required and plan the precautions to be taken. Make sure the equipment and precautions needed (trench, sheets, props, baulks etc.) are available on site before work starts.
- **Battering the excavation sides**-Battering the excavation sides to a safe angle of repose make also save the excavation safer .In granular soils , the angle of slope should be less than the natural angle of repose of the material being excavated. In wet ground, a considerably flatter slope will be required.

b) Falling or Dislodging Material

- **Loose materials**-may fall from spoil heaps into the excavation. Edge protection should include toe boards or other means, such as projecting trench sheets or box sides to protect against falling materials. Head protection should be worn.

- **Undermining other structures**-Check that excavations do not undermine scaffold footings. Buried services or the foundations of nearby buildings or walls. Decide if extra support for the structure is needed before you start. Surveys of the foundations and the advice of the structural engineer may be required.

- **Effect of plant and vehicles**-Do not park plant and vehicles close to the sides of excavations. The extra loadings can make the sides of excavations more likely to collapse.

c) Falling into Excavations

- **Present people from falling**-Edges of excavations should be protected with substantial barriers where people are liable to fall into them achieve this, use: Guard rails and toe boards inserted into the ground immediately next to the supported excavation side, or fabricated guard rails assemblies that connect to the sides of the trench box the support system itself, e.g. using trench box extensions or trench sheets longer than the trench depth.

3. Protect Yourself

Do not enter an unprotected trench! Trenches 5 feet (1.5 meters) deep or greater require a protective system unless the excavation is made entirely in the stable rock. Trenches (6.1 meters) deep or greater require that the protective system be de-signed by a registered professional engineer or be bases on tabulated data prepared and/or approved by a registered professional engineer.

4. Protective Systems

There are different types of protective systems. Sloping involves cutting back the trench wall at an angle inclined away from the excavation. Shoring requires installing aluminum hydraulic or other supports to prevent soil movements and cave-ins. Shielding protects workers by using trenches or other types of supports to prevent soil cave-ins.

Designing a protective system can be complex because you must consider many factors: soil classification, depth of cut, water content of soil, changes due to weather or climate, surcharge loads (e.g., spoil, other materials to be used in the trench) and other operations in the vicinity.

a) General Trenching and Excavation Rules

- Keep heavy equipment away from trench edges.
- Keep surcharge loads at least 2 feet (0.6 meters) from trench edges.
- Know where underground utilities are located.
- Test for low oxygen, hazardous fumes and toxic gasses.
- Inspect trenches at the start of each shift.
- Inspect trenches following a rainstorm.
- Do not work under raised loads.

5. Excavated Materials

All excavated material must be set back at least 2 feet from the excavation area to prevent possible cave-ins. When the proper setback cannot be provided, materials should be hauled away. Excavation equipment should not be operated or stored where it can create a potential cave-in problem.

6. Construction of signposts, barricades and fencing

Barricades that are impenetrable shall be used to separate pedestrians from hazards on all sides of excavations that may be exposed to pedestrians. Use material and methods suitable to site conditions. Signs and fencing material shall not protrude into the clear pathways.

- A-frames used for defining path of travel (not barricading trenches) shall be placed end to end without spacing, shall be connected and maintained to ensure stability to help a person who is blind negotiate the safe path using a cane.
- Caution tape shall not be used by itself to delineate the path of travel or create a barricade.
- Signposts, scaffolding and fencing supports shall be entirely outside the pedestrian path of travel, minimum 4 feet wide and 80” high without obstruction.
- Construction barriers shall be maintained in a sound, neat and clean conditions.

7. Stockpiles

A stockpile must be planned, constructed, used and maintained so that no person working at the workplace is endangered by any instability of the stockpiled material.

The height of an unstable face of a stock pile must not exceed the maximum safe reach of equipment being used to remove material from stockpile.

8. Walkways

A worker must not walk upon the surfaces of structural members that have shear connectors, dowels or other protrusions unless suitable walkways and runways are provided to eliminate the tripping hazard.

9. Water Accumulation

Water must not be allowed to accumulate in excavation if it might affect the stability of the excavation or might endanger workers. Erosion of slopes by surface water must be prevented if workers maybe endangered.

RISK MITIGATION PLAN

A. Risk Identification at Project Initiation Stage

Sr. No.	Risk	Causes/Factors	Effects	Risk Mitigation Plan	Actual Measure and actions taken by respective personal to mitigate the risk till submission of revised PC-I	Person Responsible to take effective measure to mitigate risk	Nature of Risk
Financial Risks							
1	Lack of Funds for Project Execution	No funds from the Government	Time Delay, Project Cost will increase	Approach Provincial Government for funding		Government of Punjab	High
2	Fluctuation of Exchange Rate	Devaluation of Pakistan Currency	Increase in cost	Approach Provincial Government for funding		Government of Punjab	High
Legal/ Regulatory Risks							
3	Legal, Policy and regulatory framework	Obtaining NOCs from relevant government department/authorities	Legal issues may halt or delay project at any stage of the project life cycle	NOCs to be obtained from departments such as irrigation and/or any other relevant department at the planning stage of the project.	Obtaining NOCs to be initiated	PMDFC	Medium
4	Political Risks	Change in government's priorities may affect sustainability of the project	Time delays would impact project cost	Advocate for political commitment		PMDFC	High
5	Temporary Delays	Delay during any phase/stage of the project cycle can causes multiple challenges	Delayed decisions or failure to meet project deadlines may trigger delays in project.	Push for timely decision making by all concerned authorities along will effective monitoring of given deadlines		PMDFC	Medium
6	Execution Mode Risk	Lack of clarity in execution mode would delay in decision making and resultantly will impact the timely planning and execution of the project.	Time delays would impact project cost	Clarity with respect to suitable executions mode is essential to investigate further risks and mitigation plans accordingly		PMDFC	Medium
7	Contract management of contractors / Responsibility of Risk	Lack of understanding/identification of risk ownership may result in multiple challenges during project execution.	Primarily depends on execution mode	Legal and contractual risks should be clearly identified and properly transferred to relevant authorities / personnel/organization at the contract finalization stage		PMDFC	Medium

8	Impact of accident, fire, theft, unpredictable price change	Lack of understanding/identification of risk ownership may result in multiple challenges during project execution.	Primarily depends on execution mode	Estimation errors, estimation uncertainty. Lack of investigation of predictable problems. Inadequate productivity, change control. Poor maintenance, security etc.	Obtaining NOCs already in progress	PMDFC	High

B. Risk Already Mitigated

Sr. No.	Risk	Causes/Factors	Effects	Risk Mitigation Plan	Actual Measure and actions taken by respective personal to mitigate the risk till submission of revised PC-I	Person Responsible to take effective measure to mitigate risk	Nature of Risk
9	electric shock to anyone entering any of the electrical cabinets such as combiner boxes, disconnect switches	Non-availability of continuous energy supply will impact the project execution and supply of water	Loss to life	Untrained individuals should not attempt to inspect, test, or repair any aspect of a PV system due to the potential for injury or death due to electric shock and arc flash	Training and preventive measure to be taken	PMDFC	High
10	Continues supply of material	Non-availability of continuous energy supply will impact the project execution and supply of water	Delay in execution	Energy efficient technology may be used to reduce pressure on exiting energy needs.	Ensure continuous supply of energy through exploring alternate energy source such as solar energy/ fossil fuel	PMDFC	High
11	catastrophic event capable of damaging solar equipment, such as a storm,	Natural disaster	no or reduced output	some sort of insurance that will cover the cost to cleanup and repair	O&M policy to incorporate any breakage or replacement of equipment	PMDFC	High
12	Collection of Tariff by LG&CCD	LG&CCD may collect the required tariff from the community		Methodology for collection of tariff may be revisited	Recommendation for effective tariff collection by consultant may apply	LG&CCD	Medium

13	Heavy rain during Construction	Delay in execution of works	Monsoon and other rainy days may affect the progress.	Fast track work with coordination of met office.	Plan for construction may be developed prior to construction.	PMDFC	Medium

PROCUREMENT PLAN

PROCUREMENT PLAN	
PROCUREMENT STEPS	**FEASIBILITY STUDIES AND DESIGN OF RAINWATER UNDERGROUND STORAGE FACILITIES IN 11 CITIES OF PUNJAB UNDER PUNJAB CITIES PROGRAM (PCP)** ***"Stormwater Facilities in Kamoke City"***
	Estimated Cost: 104.086 Million
Preparation of Bidding Documents	30-Sep-2023
Advertisement of Invitation for Bids / Request for Bids	07-Oct-2023
Bid or Quotation Submission / Opening Date	21-Oct-2023
Completion of Evaluation and Recommendation	03-Nov-2023
Contract Award / work order	12-Nov-2023
Signing of Contract	19-Nov-2023
Contract Completion	23-Nov-2023
Disbursement of payment	29-Nov-2023

MONITORING & EVALUATION PLAN

MONITORING & EVALUATION PLAN

1. Monitoring

Monitoring is the routine to collect data and information on activities and operations (e.g., from customers, markets etc.). Evaluation is then used to analyze the compiled data and to compare the actual results of a business or project against the set strategic plans. Monitoring and Evaluation (M&E) helps an entrepreneur, NGO or government to track how effective and efficient resources are used and whether one is on track to meet its set goals. This tool provides information on how a safe water business can implement and improve its monitoring and evaluation scheme. Hands-on insights are provided through an overview of M&E activities of businesses.

2. Evaluation

Evaluation is used to compare actual project results against strategic plans. Unlike monitoring, evaluation is not done on a routine basis but done at specific times (i.e. monthly, bi-yearly, yearly etc.). Evaluation refers to a range of activities that are undertaken to determine if the project activities had the desired impact. There are several types of evaluations that may be appropriate for social businesses: formative evaluations, outcome evaluations, impact.

3. Monitoring & Evaluation Plan

Monitoring & evaluation plan shall cover all life cycle phases of this development project including planning, approvals, tendering, awards, execution/implementation, completion and finally periodic monitoring after completion which we call evaluation or assessment of expected benefits of the project.

Monitoring & evaluation shall be done within the framework and parameters defined by PMDFC Department for ease of reporting and sharing of information across the departments. Adherence to timelines, quality standards and cost estimates is of prime importance.

All Planning Commission Proforma (PC-I, PC-II, PC-III, PC-IV and PC-V) shall be filled at appropriate stages where possible/required.

In addition to above visiting/monitoring officers should take care of the following:

1) Both quantitative and qualitative aspects of monitoring should be taken into consideration.

2) Physical progress of development projects should be gauged against some measureable targets i.e. work schedule.

3) Pictures, better shall be taken with digital cameras capable of recording dates automatically.

4) The material test results and set of design drawings/profiles shall be made available at site so that quality of material/work at site could be compared with design specifications where possible.

5) Slope of drains, cement sand ratio, workmanship, jointing and backfilling shall be given utmost priority while inspecting sites.

6) Health & safety precautions/measures at work sites shall be observed by each and every contractor at work site to avoid workplace/site hazards.

7) Display of warning sign boards and use of reflective caution tape shall be displayed to barricade/cordoning off trenches at work sites to avoid accidents.

8) The officers and contractors shall ensure that first aid is always accessible for workers at site. However Basic first aid for minor burns, cuts, and falls should be available on site so that the required medical assistance can be provided to the workers immediately when required.

9) Executive Engineer shall ensure the timely completion of the project and must care for the correct filling of the aforementioned proformas at each prescribed level.

➢ Importance of Monitoring & Evaluation Plan:

Monitoring and evaluation (M&E) are important for a safe water businesses in several ways:

- An M&E system helps the entrepreneur to understand the market and customers' needs, to inform the management and adapt business strategies accordingly where needed.
- A well-established M&E system can also help the entrepreneur to determine whether he/she is accomplishing the desired social/health/market impact. This includes monitoring effective and/or continuous use of household water treatment products (HWTS), for instance to apply for carbon finance, to attract social impact investors and/or to meet national /international drinking water quality standards.

HR MANAGEMENT PLAN

HR MANAGEMNET PLAN

1 Introduction

Effective human resource management is a critical component of any project. The Human Resource Plan explains how project processes will be used to make the most effective use of the people assigned to the project.

This plan includes information regarding the following topics:

- Roles and responsibilities of team members throughout the project
- Project organization charts
- Project team training

2 Objectives

The purpose of the Human Resource Plan is to achieve project success by ensuring the appropriate human resources with the necessary skills are acquired, resources are trained if any gaps in skills are identified, team building strategies are clearly defined, and team activities are effectively managed. If used effectively, this plan will serve as a tool to aid in the management of human resource activities throughout the project until closure.

3 Administrative Setup

The administrative setup of the PMDFC Company is comprised of the following sections:

- **Engineering**

  This section comprises engineering professionals providing technical services (design, execution, contract management, monitoring & supervision) for infrastructure projects related to municipal services and assistance to LG & CD Department.

- **Institutional Development (ID)**

  This section is responsible for developing and implementing capacity building initiatives for ULGs, LG & CD Department and PMDFC.

- **Planning**

  This section is responsible for completing urban and infrastructure planning initiatives of PMDFC and LG & CD Department.

- **Finance & Administration (F & A)**

  This section is responsible for the financial (budgeting, accounting, cash management, special account maintenance) and management of day to day administrative affairs of the company.

- **Procurement**

  This section manages the procurement of works, goods and services as per codal formalities.

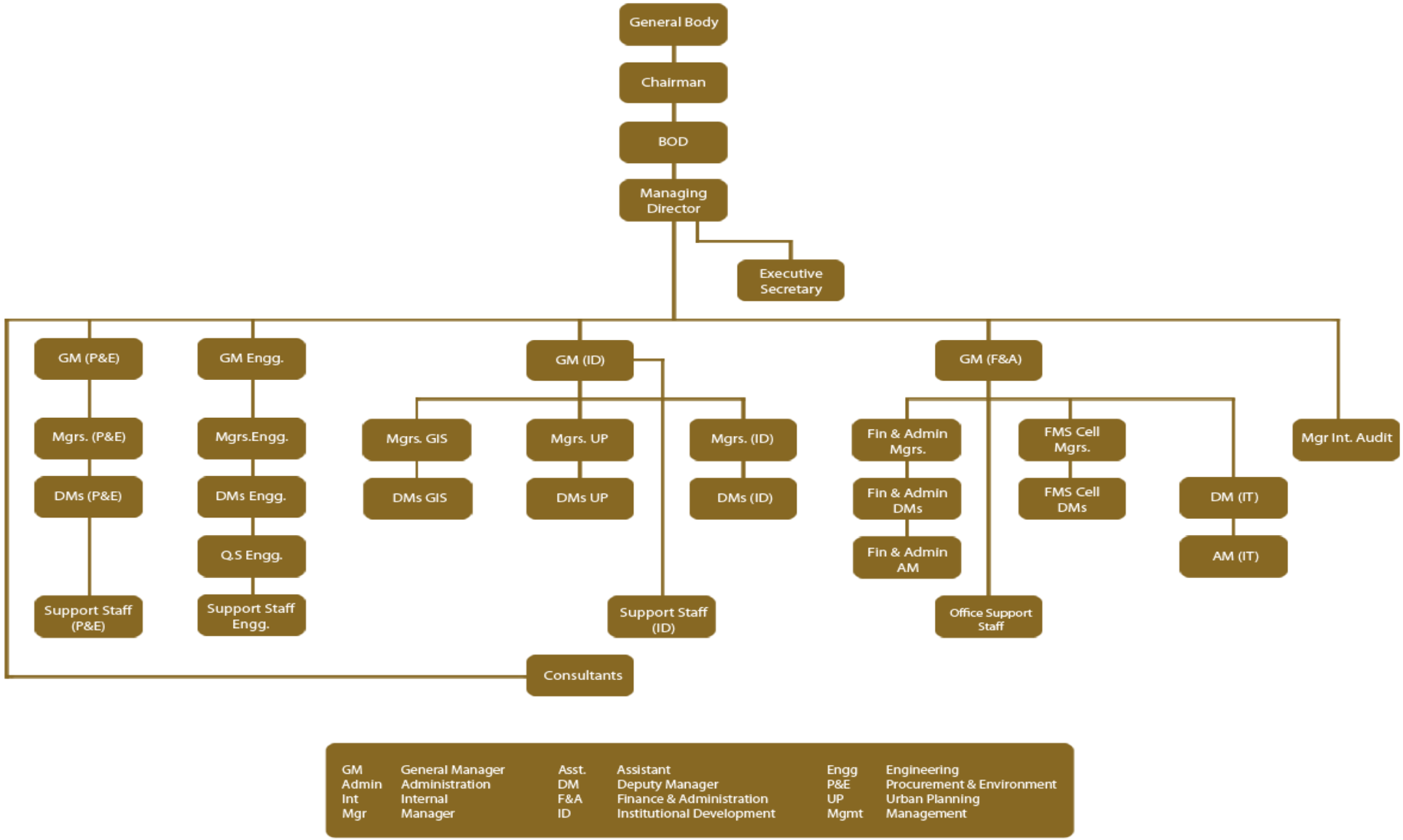
Designation	Grade	Total Number
Managing Director	1	1
General Manager	2	3
Consultant	2	1
Manager	3	12
Deputy Manager	4	7
Assistant Manager	5	0
Auto Cad / IT/Office Assistant	6	3
Computer Operator	6	2
Driver	7	5
Office Boy	7	4
Gatekeeper	7	1
Sweeper	7	2

4 Controlling Authority

The Department (PMDFC) will look after the project as a whole and will take necessary steps to decide to counter all the challenges for the proper execution and finalization of the project.

5 Organization Charts

Following is the organizational chart for the PMDFC.


General Body
Chairman
BOD
Managing Director
Executive Secretary
GM (P&E)
GM Engg.
GM (ID)
GM (F&A)
Mgrs. (P&E)
Mgrs.Engg.
Mgrs. GIS
Mgrs. UP
Mgrs. (ID)
Fin & Admin Mgrs.
FMS Cell Mgrs.
Mgr Int. Audit
DMs (P&E)
DMs Engg.
DMs GIS
DMs UP
DMs (ID)
Fin & Admin DMs
FMS Cell DMs
DM (IT)
Q.S Engg.
Fin & Admin AM
AM (IT)
Support Staff (P&E)
Support Staff Engg.
Support Staff (ID)
Office Support Staff
Consultants
GM General Manager
Admin Administration
Int Internal
Mgr Manager
Asst. Assistant
DM Deputy Manager
F&A Finance & Administration
ID Institutional Development
Engg Engineering
P&E Procurement & Environment
UP Urban Planning
Mgmt Management

6 Employer's (PMDFC) Representative

- The Employer (PMDFC) will appoint an Employer's Representative to act on his behalf under the contract.
- The Employer's Representative shall carry out the duties assigned to him, and shall exercise the authority delegated to him, by the Employer.
- The Employer's representative (Team) may consist of independent consulting engineer who may from time to time assign duties and delegate authority to assistants which may include a resident engineer, and / or independent inspectors appointed to inspect and / or test items of Plant and / or Materials.

7 Project Team Training

7.1 Staff Training

The Executive Engineer will provide a project orientation to the staff assigned to the project. The orientation should include discussions related to the following topics:

- Background of the Project
- Current Status of the Project
- Specific Job Duties and Expectations
- Introduction to the Staff and Consultants
- Overview of the Facility and Infrastructure
- Overview of the Project Processes, including time reporting, attendance, and status meetings

7.2 Performance Reviews

The functional manager will review each team member's assigned work activities at the onset of the project and communicate all expectations of work to be performed. The functional manager will then evaluate each team member throughout the project to evaluate their performance and how effectively they are completing their assigned work. Prior to releasing project resources, the project manager will meet with the appropriate functional manager and provide feedback

on employee project performance. The functional managers will then perform a formal performance review on each team member.

MONITORING

&

REPORTING

MONITORING & REPORTING

Implementation of sub-project will be subjected to both internal and external monitoring. Internal monitoring will be conducted by the PO-ESM assisted by the DPOs-ESM and ESFPs. External monitoring will be assigned to APA firm.

1. Internal Monitoring

Internal monitoring will be carried out routinely by the ESFPs and DPOs-ESM at the MC level under the supervision of PO-ESM and their results will be communicated to the World Bank through the bi-annual and annual Program implementation reports. The monthly reports will be consolidated quarterly in the standard supervision reports to the World Bank. Specific monitoring benchmarks will be:

- ✓ Information. campaign and consultation with APs and locals;
- ✓ People's views and feedback on implementation process of sub-project;
- ✓ Physical progress of development projects will be gauged against measurable targets i.e., work schedule;
- ✓ Health & safety precautions/measures at work sites will be observed by each and every contractor at work site to avoid workplace/site hazards.;
- ✓ Display of warning sign boards and use of reflective caution tape will be displayed to barricade/cordoning off trenches at work sites to avoid accidents and
- ✓ Other relevant aspects.

2. External Monitoring

External monitoring will be carried out twice a year, and its results will be communicated to all concerned APs, CPMT and the World Bank through semi-annual reports. Sub-projects whose implementation timeframe will be under 6 months will be monitored only once. Indicators for External Monitoring tasks include:

- ✓ Review and verify internal monitoring reports prepared by ESFPs and MCs;
- ✓ Review of the socio-economic baseline census information of sub-project community;
- ✓ Identification and selection of impact indicators;
- ✓ Impact assessment through formal and informal surveys with sub-project community;
- ✓ Consultation with locals, concerned officials and community leaders for preparing review report;
- ✓ Assess the resettlement efficiency, effectiveness, impact and sustainability; and
- ✓ Drawing lessons for future sub-project planning, formulation and implementation.

The APA firm will also assess the status of the sub-project affected vulnerable groups (if any) such as female- headed households, disabled/elderly and families below the poverty line. The APA firm will carry out a post implementation evaluation of the sub-project have been attained or not. The benchmark data of socio-economic survey of sub-project affected people conducted during preparation of the sub-project documents will be used to compare the pre and post project conditions. The APA firm will recommend appropriate supplemental assistance for the APs if the outcome of the study may show that the objectives of the sub-project have not been attained.

APPENDIX-A

ECONOMIC AND FINANCIAL ANALYSIS

TABLE - 1

FEASIBILITY STUDIES AND DESIGN OF RAINWATER UNDERGROUND STORAGE FACILITIES IN 11 CITIES OF PUNJAB UNDER PUNJAB CITIES PROPGRAM (PCP)

KAMOKE CITY

SUMMARY OF COST		
Sub Head	**Description.**	**Amount.***(Rs.)*
1	Desilting of Storm Water Drain	5,303,085.000
2	Removeable RCC Slab for missing portion of Stormwater Drain and Repair of damaged portion of drain	9,860,155.530
3	Transition drain between Dinga Nullah and MC Storm Drain	815,101.550
4	Construction of RCC Nullah for replacement of existing sewer along underpass	14,497,901.260
5	PCC for Leveling of area between Storm Water Drains and raising of manhole	33,281,034.320
6	Provision of Dewatering sets for Underpasses (2 nos.)	34,265,000.000
7	ESMP Cost	1,788,000.00
	Total (Rs)	**99,810,277.66**
i	1% Contingencies.	998,102.78
iii	5% PRA (Less Sub Head -6).	3,277,263.88
	Grand Total(Rs)	**104,085,644.32**
	Grand Total (Million.)	**104.086**
	Operation and Maintenance Cost (for 1 Year) (Rs.)	1,000,000.00

TABLE - 02

ECONOMIC ANALYSIS

Rs. Million

Years	Project Economic Costs			Economic Benefits	Net Benefit
	Investment	O&M Cost	Total Cost	Total	
	18.74	0.00	18.74	0.00	-18.74
	74.94	0.00	74.94	0.00	-74.94
1		0.90	0.90	26.13	25.23
2		0.96	0.96	26.54	25.58
3		1.02	1.02	26.95	25.93
4		1.09	1.09	27.37	26.29
5		1.16	1.16	27.80	26.65
6		1.23	1.23	28.24	27.01
7		1.31	1.31	28.68	27.37
8		1.40	1.40	29.13	27.73
9		1.49	1.49	29.59	28.10
10		1.59	1.59	30.05	28.47
11		1.69	1.69	30.52	28.84
12		1.80	1.80	31.00	29.20
13		1.92	1.92	31.49	29.57
14		2.04	2.04	31.98	29.94
15		2.17	2.17	32.48	30.31
16		2.31	2.31	32.99	30.68
17		2.47	2.47	33.51	31.05
18		2.63	2.63	34.04	31.41
19		2.80	2.80	34.57	31.77
20		2.98	2.98	35.11	32.13
21		3.17	3.17	35.66	32.49
22		3.38	3.38	36.22	32.84
23		3.60	3.60	36.79	33.19
24		3.83	3.83	37.37	33.54
25		4.08	4.08	37.95	33.87
26		4.34	4.34	38.55	34.20
27		4.63	4.63	39.15	34.53
28		4.93	4.93	39.77	34.84
29		5.25	5.25	40.39	35.14
30		5.59	5.59	41.02	35.43

SUMMARY OF FINANCIAL INDICES

Benefit/Cost Ratio @ 12.00% discount rate	1.530
EIRR	16.58%
Present worth of Cost	160.730
Present worth of Benefits	245.900
NPV	85.169

TABLE - 03

FINANCIAL ANALYSIS

Rs. Million

Years	Project Economic Costs			Financial Benefits	Net Benefit
	Investment	O&M Cost	Total Cost		(a)
	20.82	-	20.82	-	(20.82)
	83.27	-	83.27	-	(83.27)
1		1.00	1.00	28.37	27.37
2		1.07	1.07	9.36	8.30
3		1.13	1.13	10.12	8.99
4		1.21	1.21	10.94	9.73
5		1.29	1.29	11.83	10.54
6		1.37	1.37	12.79	11.42
7		1.46	1.46	13.82	12.36
8		1.55	1.55	14.94	13.39
9		1.65	1.65	16.15	14.50
10		1.76	1.76	17.46	15.70
11		1.88	1.88	18.87	17.00
12		2.00	2.00	20.40	18.40
13		2.13	2.13	22.06	19.93
14		2.27	2.27	23.84	21.57
15		2.41	2.41	25.77	23.36
16		2.57	2.57	27.86	25.29
17		2.74	2.74	30.12	27.38
18		2.92	2.92	32.56	29.64
19		3.11	3.11	35.19	32.09
20		3.31	3.31	38.05	34.74
21		3.52	3.52	41.13	37.60
22		3.75	3.75	44.46	40.71
23		4.00	4.00	48.06	44.06
24		4.26	4.26	51.95	47.70
25		4.53	4.53	56.16	51.63
26		4.83	4.83	60.71	55.88
27		5.14	5.14	65.63	60.49
28		5.48	5.48	70.94	65.47
29		5.83	5.83	76.69	70.86
30		6.21	6.21	82.90	76.69

SUMMARY OF FINANCIAL INDICES

Benefit/Cost Ratio @ 12.00% discount rate	1.766
FIRR	18.42%
Present worth of Cost	82.901
Present worth of Benefits	99.442
NPV	16.541