Detailed Estimate
of
Composite WSS
For
Sustainability & Quality
in
Jorhat, Jorhat Central and Jorhat North West Development Block
of
Jorhat District
under
World Bank assisted RWSSP –LS, Assam

CONTENTS

EXECUTIVE SUMMARY :

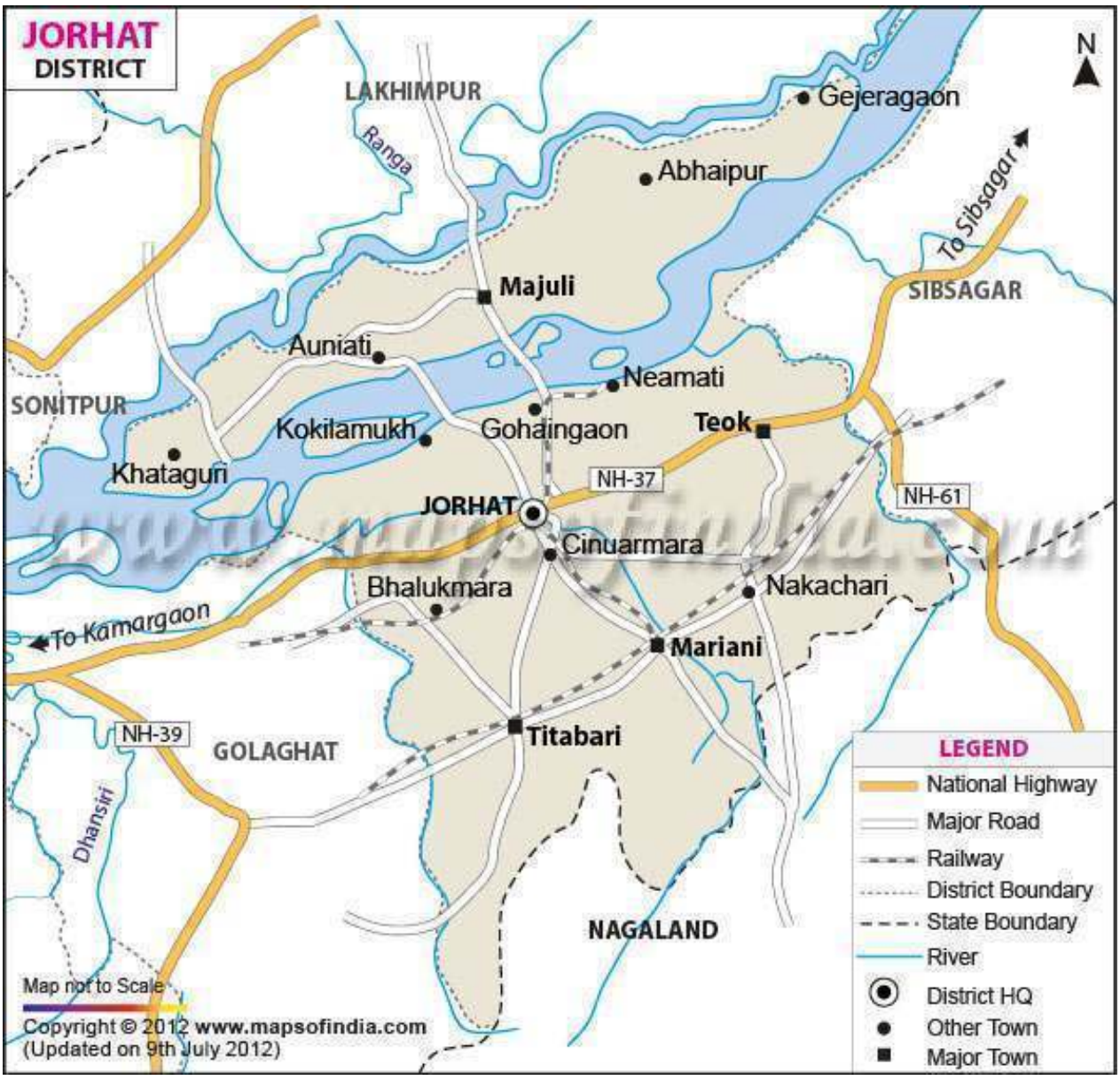
1. Name of the Scheme	:	Composite Water Supply Scheme for sustainability & Quality in Jorhat, Jorhat Central and Jorhat North West Development Block of Jorhat District
2. Name of the programme	:	World Bank Assisted RWSS – LIS Projects in Assam.
3. Location	:	Jorhat District, Assam.
4. Area to be covered	:	The area to be covered by the project is complete area of Jorhat, Jorhat Central and Jorhat North West Development Block of Jorhat District spanning between North latitude $94^0$5' to $94^0$25' and East longitude $26^0$36' to $26^0$53'. All total 1045 Habitations in 163 villages of 33 GPs of these three development block shall be benifited by the project.
5. Existing water supply facilities	:	Out of total 1045 habitations proposed to be covered by the scheme, 728 are partially covered habitations as compared to 317 covered. The project area has 130 PWSS out of which 43 have already completed their design life and 49 more are on the verge of crossing the design life. As a consequence these schemes are already due for a major overhaul.
6. Water quality issues in the project area	:	The quality affected habitation in the project area is a follows : (i) Iron Affected : 270 (ii) Arsenic affected : 46 (iii) Fluoride affected : 1 It is seen from the above that the project area has a considerable water quality problem which could take a turn for the worse in the future has been the experience in other states.
7. Ground water potential in the project area	:	Seasonal depletion of water table causes the private sources to run dry during which period they have to depend on ponds which are contaminated. Hence the proposed scheme will greatly help in addressing health issues.

8. Increase of service level	:	There are already 9544 house connections in the project area and hence it can be safely assumed that more people will come forward to avail house connection if round the clock water supply is provided on a sustained basis at 70 LPCD as envisaged. Further since the area is located in the suburbs of Jorhat town the inhabitants are relatively affluent and will have aspirations for improvement in quality of life which will translate to increase in house connections.
9. Design period	:	The project is designed for a period of 30 years, i.e., from the year 2015 to 2045.
10. Design Population to be served	:	(a) 2011 YSR Population – 279765 souls. (b) On commissioning in 2015 AD – 299112 souls. (c) After 10 years of commissioning in 2025 AD – 349962 souls (d) After 20 years of commissioning in 2035 AD – 409455 souls (e) After 30 years of commissioning in 2045 AD – 479062 souls
11. Proposed Rate of supply	:	70 lpcd .
12. Total Demand of Water	:	Total demand for the project area at Different stages are : • On commissioning in 2015 AD: 24.1 MLD • After 10 Years in 2025 AD : 28.2 MLD. • After 20 Years in 2035 AD : 33.0 MLD. • After 30 Years in 2045 AD : 38.6 MLD.
13. Source of water	:	Surface sources, proposed to be tapped from the mighty river Brahmaputra. Water from this source river shall be tapped at Nimatighat .
14. Discharge of the source river	:	Average Run-off of River Brahmaputra in lean period is 6570.09 cumec and in monsoon period is 25039.84 cumec.
15. Total length of Raw Water Pumping Main	:	6530.0 Rm. From Intake station. The raw water main shall be of DI Class K9 pipe of dia 700 mm with inside cement mortar lighting.

16. Type of treatment		Since source of water for the proposed project is surface water to be tapped from rivers, treatment process having facilities for Sedimentation - Aeration – Coagulation – flocculation – Filtration, followed by Disinfection is proposed. Along with the treatment plant there shall be a quality monitoring laboratory. The treatment plant shall be operated for 20 hours a day.
17. Storage of treated water	:	For collecting the treated water from the Rapid sand filter and to facilitate pumping of clear water to different service reservoir, one underground clear water sump of capacity 2000 Cum. is proposed along with the treatment plant to cater about 1 hour retention.
18. Elevated Service Reservoir	:	All total 42 Nos. of different capacity elevated service reservoirs spreading over the project area is proposed.

19. Conveyance of treated Water	:	Treated water from the underground clear water sump at treatment plant shall be fed to the different ESR through common header type clear water pumping main. There shall be three different route for this purposes as listed below: • Route – I : different required diameter DI S.S. Class K7 Clear water pumping main for Route - I (for 21 ESRs of Jorhat Block) including all necessary valves & specials, valve chamber, supporting structures, anchor / thrust block etc., complete. • Route – II : different required diameter DI S.S. Class K7 Clear water pumping main for Route - II (for 15 ESRs of Jorhat North West Block) including all necessary valves & specials, valve chamber, supporting structures, anchor / thrust block etc., complete. • Route – III : different required diameter DI S.S. Clear water pumping main for Route - III (for 6 ESRs of Jorhat Central Block) including all necessary valves & specials, valve chamber, supporting structures, anchor / thrust block etc., complete. • From the ESR, clear water to the different constituent distribution pipe network shall be under gravity through 150 mm dia DI Class K7 pipe with inside cement mortar lining.
20. Electrical power requirement	:	Total Electrical Power Requirement for raw & clear water pumping, as well as to run the agitator drive motors etc. of the treatment plants and for internal & compound lighting of the respective intake site & the treatment plant location is calculated as 2000.0 KW.
21. Estimated Project cost	:	Rs. 242.68 (Rupees two hundred forty two point six eight) crore only.
22. Per capita cost	:	• On commissioning (2015)AD : Rs. 8194.34 • After 10 Years (2025) AD : Rs. 7003.71 • After 20 Years (2035) AD : Rs. 5986.07 • After 30 Years (2045) AD : Rs. 5116.30
23. Execution authority	:	Public Health Engineering Department, Assam.

DISTRICT MAP



CHAPTER – I : INTRODUCTION

1.1 Background:

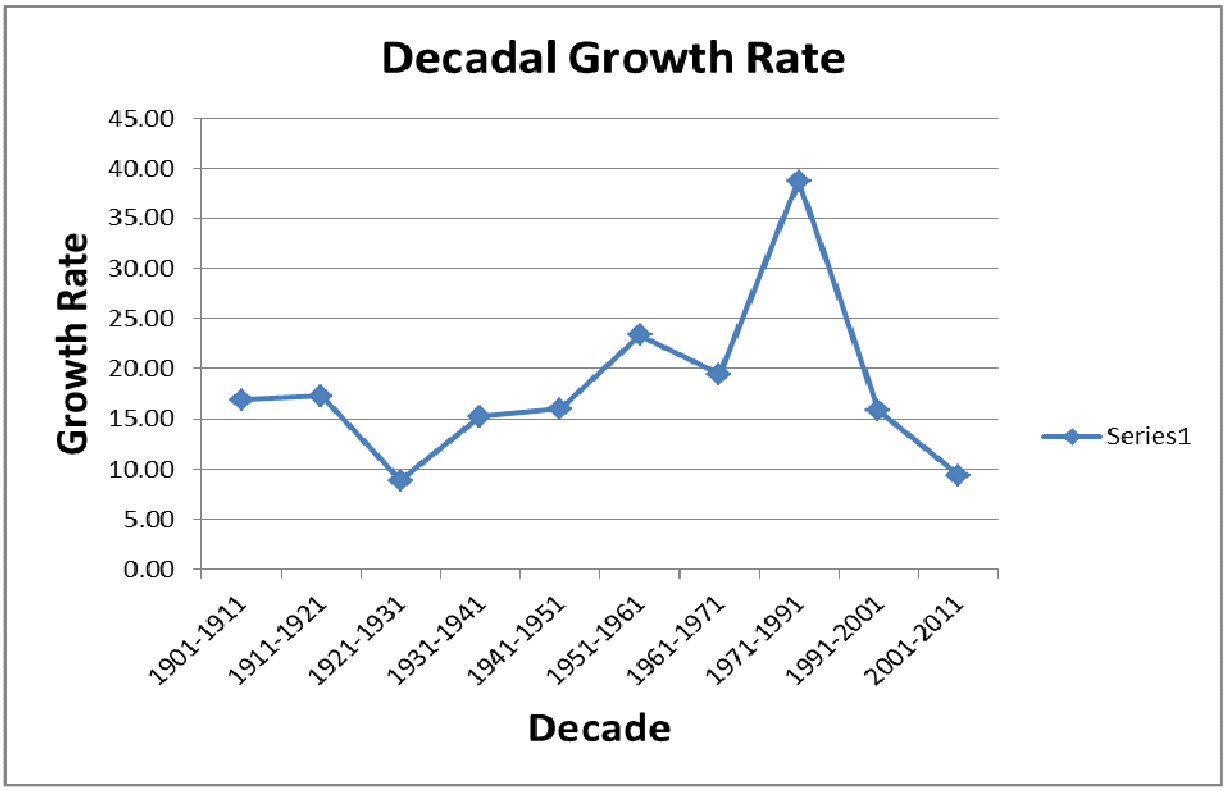
The Government of Assam is going to implement the World Bank assisted Rural Water Supply & Sanitation Project in Jorhat district for providing potable drinking water to the villagers in 24/ 7 models, in assistance with World Bank. This Detailed Project Report on the proposed scheme is prepared by incorporating the comments / observations on the preliminary report and discussions at various levels at different forums.

The Rural Water Supply Scheme in Jorhat District will cover the habitations of Jorhat, Jorhat Central and Jorhat North West Development Block of Jorhat District. Population under the project area is **279765 souls as per 2011** census and projected with 17% overall decadal growth as such the decadal growth in the last decade shows abnormal growth in urban population.

The decadal growth of the decade 2001-2011 in urban area and rural area of Jorhat district are 28.16% and 5.29% and overall decadal growth is 9.21%. The decadal population growth in urban areas seems to be abnormally higher than the state overall. Hence, in order to rationalize the matter, the state overall growth rate i.e. 17% is considered in forecasting the design stage population.

Though 130 nos. existing water supply are in service, most of them have outlived their design period. Seasonal depletion of ground water and water quality problem in shallow depth tube wells creates a gap in between demand and supply of water.

Year	Growth Rate
1901-1911	16.90
1911-1921	17.26
1921-1931	8.86
1931-1941	15.27
1941-1951	15.98
1951-1961	23.36
1961-1971	19.47
1971-1991	38.76
1991-2001	15.83
2001-2011	9.37



River Brahmaputra is flowing by the side of the command area which has substantial surface flow throughout the year to draw required quantity of water for the proposed water supply scheme even in the lean period. As per the report collected from the Water Resource Department, Guwahati, the average discharge in lean period 6570.09 cumec and in monsoon period is 25039.84 cumec. (Report copy appended). Intake arrangement with floating barge has been considered for withdrawal of raw water from river Brahmaputra.

hus, this project is programmed to build a sustainable Large Multi-villages Piped water supply scheme, withdrawing water from the same, to serve a cluster of 163 nos. villages under Jorhat, Jorhat Central and Jorhat North West Development Block for the horizon period 2045.

1.0 Project Objectives:

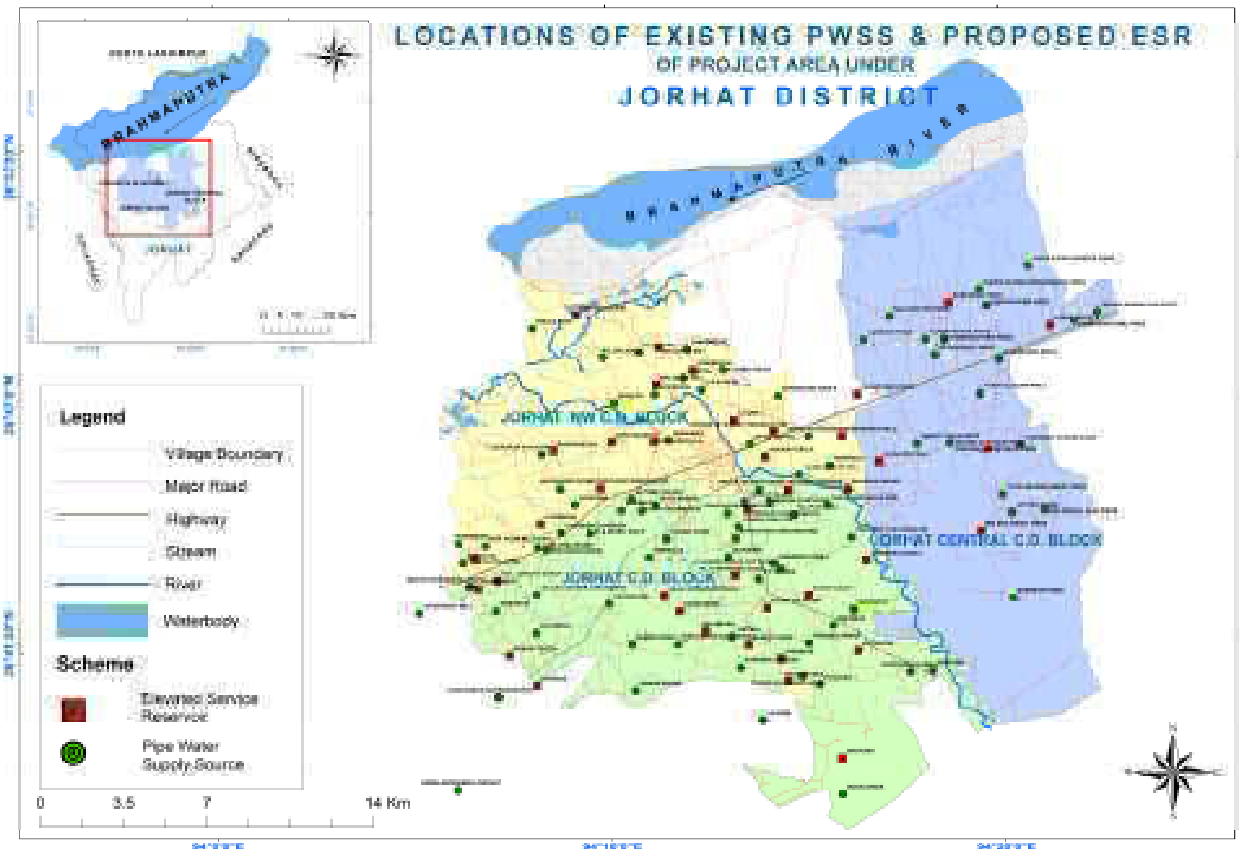
The project implementation objective is to improve rural water supply and sanitation services through progressive decentralization, community participation and enhanced accountability. The objective of the project is also to augment the capacity of the water supply arrangement of Jorhat district so as to bridge the existing gap between demand and supply and to adequately meet the projected need of the area to be covered till the year 2045. The proposed scheme will have provision for supply of water through house connection besides a few street hydrants for the benefit of the low income groups.

1.2 Project area:

District: Jorhat
District Head quarters: Jorhat
Geographical Position:
North Latitude: 94° 5' - 94° 25'
East Longitude: 26° 36' - 26° 53'
Distances from major locations:
District Headquarters at Jorhat : 15 km
State capital, Guwahati : 293 Km
Nearest airport: Rowriah, Jorhat 3 km
The project area lies in Jorhat, Jorhat Central and Jorhat North West Development Block of Jorhat District and bounded in four directions as below:
North: Lakhimpur District,
South: Nagaland State,
East: Sivasagar District,
West: Golaghat District.

1.3 Land availability:

Govt. land is available for execution of the scheme at the intake point as well as for all intra-village ESRs'and WTP of respective area. The proposal for allotment of Govt. land has been moved to the District Land Advisory Board and document shall be produced after approval.



1.4 Communication:

The project area is well connected by National Highway & State Highway and also by railway with District HQ and State with the state Capital and rest of the country.

1.5 District Profile:

Jorhat district is one of the 27 districts of Assam state in north-eastern India. Earlier Jorhat was a sub-division of undivided Sibsagar district. In 1983 Jorhat was carved out of Sibsagar District and was made a separate district. The civil sub-division under Sibsagar district at Jorhat was formed in 1869. This great place was declared as administration head quarter of the undivided Sibsagar district in 1911. It is ranked **2** in terms of literacy rate out of total 27 districts of Assam. On the north of the district, the river Brahmaputra forms the largest riverine island of the world, Majuli, spreading over 924.6 km², with a population of about 1.50 lakh. There are six Assam Legislative Assembly constituencies in this district: Dergaon, Jorhat, Titabor, Mariani, Teok, and Majuli. Dergaon is in the Kaliabor Lok Sabha constituency, Majuli is in the Lakhimpur Lok Sabha constituency, whilst the other four are in the Jorhat Lok Sabha constituency. Jorhat district occupies an area of 2,852 square kilometres (1,101 sq mi). In 1997 Jorhat district became home to the Gibbon Wildlife Sanctuary, which has an area of 21 km^2 (8.1 sq mi). There are about 135 tea gardens, including out gardens, and the predominant field crop is rice, with per capita food grain production of 205 kg per annum. The district is bounded by Lakhimpur district on north, Nagaland state on the south, Sivasagar on the east and Golaghat on the west.

The Hoollongapar Gibbon Sanctuary derives from a patch of forest once part of the Hollongapar Reserve Forest in the civil district of Jorhat in Assam. It was named after its dominant tree species, Hollong or Dipterocarpus macrocarpus. It extends to Dissoi Valley Reserve Forest, Dissoi Reserve Forest and Tiru Hill Reserve Forest. 219 species of birds such as India pied hornbill, owl, eagle, osprey, hill myna, kalij pheasant and white winged wood duck are found in the area. Several types of reptiles such as Indian python, common monitor lizard, tortoise, India tent turtle and Indian cobra are recorded.

1.6 Sector Background:

The National Rural Drinking Water Programme (NRDWP) of the Government of India emphasizes the involvement of Panchayati Raj Institutions (PRIs) and communities in planning, implementing and managing drinking water supply schemes. States are incentivized to hand over management of their schemes to PRIs. Funds for sustainability of schemes are provided on a 100% central share basis. A separate component of support activities to fund Information Education and Communications (IEC), Human Resources Development (HRD), Management Information Systems (MIS), Water Quality Monitoring and Surveillance and other support activities has been introduced. Recently, as part of the NRDWP, the state departments responsible for drinking water supply and sanitation have prepared their long term strategic plan (2011-2022) for ensuring drinking water security to all rural households. The strategic plans

aim to cover 90% of households with piped water and at least 80% of households with tap connections during this period. This forward looking strategy supports the creation of an enabling environment for the Panchayati Raj Institutions, SHG and local communities to manage rural drinking water sources and systems. The strategy emphasizes achieving water security through decentralized governance with oversight and regulation, participatory planning and implementation of sources and schemes. Capacity building programs will be required for communities to monitor and prudently use their water resources. Sustainable service delivery mechanisms are a central feature of the program, with State institutions or Zilla Panchayats implementing and managing large multi-village schemes, delivering bulk water to villages in water stressed areas, and GPs implementing and managing in-village and intra-Panchayat schemes. The strategy highlights source sustainability measures, water quality safety, monitoring and surveillance, service agreements with operators, convergence of different development programs, and building professional capacity at all levels.

The lagging states in terms of piped water coverage, viz. Assam faces constraints in institutional and technical capacity at the state, district, block and GP levels for implementing sustainable rural water supply projects. The constraints are in terms of institutional capacity for involving communities and Panchayats in planning, implementing and managing their own drinking water supply schemes, and technical capacity of the State Rural Water Supply Departments for supporting and implementing the decentralization program. Also, operations and maintenance of existing schemes is not satisfactory, resulting in non-functionality of many schemes. Further, the States face issues of water quality affected habitations that require supply of water from distant safe sources.

Key Elements of the RWSS Program for Lagging States

The RWSS Program for Lagging States program will be a separate component of NRDWP focusing on lagging states with different allocation criteria and funding components, but implemented within the framework of NRDWP, supporting the following key elements of the reform program:

- Placing GPs and communities in the central role, supported by higher levels of PRIs, the State government and the local non-governmental and private sector, for facilitating, planning, implementing, monitoring and providing a range of O&M back-up services.
- Using sustainable, community or local government managed models for intra-GP RWSS schemes and using State-PRI partnership models for multi-GP schemes.
- Putting water resources security as a core theme of the new model, including increased community management of scarce resources.
- Moving the RWSS sector to recovery of at least 50% O&M and replacement costs and initiating contribution to capital costs keeping affordability and inclusiveness in mind. .
- Moving towards metered household connections, with 24/7 water supply where feasible, as a basic level of service.
- Promoting professionalized service provision management models, and/or back-up support functions, for the different market segments (simple/small single

village/GP schemes; large single village/GP schemes; multi village/GP schemes).

- Integrating water supply and sanitation, with effective sanitation promotion programs for achieving “clean villages”.
- Establishing M&E systems with independent reviews and social audits.

The Government of India had approached the World Bank for assistance on a National Project for the lagging states particularly Assam, Uttar Pradesh, Jharkhand and Bihar. The project will bring about positive health and environmental benefits through supply of 'safe' drinking water and creation of sanitary conditions in the village. The project will have programmes related to improved water quality monitoring, health and hygiene education as well as ground water recharge for water supply source protection.

1.7 Project Rationale:

The project area of Jorhat District is in shortage of drinking water. A substantial quantum of 130 nos. existing Rural PWSS has outlived their design period and the service level has drastically come down from even 40 lpcd. The burgeoning population has aggravated the situation and the prospect of growth in commercial activities is likely to make the position grimmer. In the habitations Jorhat, Jorhat Central and Jorhat North West Development Block of Jorhat District, multi village rural water supply scheme is essential for following reasons:

1. Quality problem of existing sources.
2. Sustainability of existing ground water based sources is cynical and effective Ground Water Recharge is not possible.
3. Going for individual treatment plant to each habitation is not being viable both financially and operationally.

It is a well-known fact that Surface water as source of drinking water is costly due to comprehensive treatment required when supplied in small scale but is economical on large scale.

The report of the economic survey conducted in the project area reveals that majority of the inhabitants of the area are willing to pay for getting individual house hold water supply connection and monthly tarrif fixed thereof provided 70 lpcd water is supplied to them for 24 / 7 in a sustainable manner. People of the locality are very much cautious about ground water contamination.

In the context of the above, and water being a very basic need, the Public Health Engineering Department, Government of Assam has decided to go for a Large Multi Village Rural Water Supply Scheme in Jorhat District under World Bank Assisted RWSS-LIS project in Assam.

1.8 Demography:

According to the 2011 census Jorhat district has a population of 1,091,295. This gives it a ranking of 419th in India (out of a total of 640). The district has a population

density of 383 inhabitants per square kilometre (990 /sq mi). The decadal population growth of the decade 2001-2011 in Jorhat district was 9.21%.The decadal growth seems to be abnormally high and hence the project population is projected by taking into account of the state overall decadal growth i.e. 17%.

Jorhat has a sex ratio of 956 females for every 1000 males and a literacy rate of 83.42%. The district has SC and ST population of 7.61% and 12.09% respectively of the total population. However, the Majuli Sub-Division has a tribal population of 70% who are primarily "Misings". As per census 2011, the density of Jorhat district for 2011 is 383 people per sq. km. In 2001, Jorhat district density was at 350 people per sq. km. The primary language of Jorhat and the entire state of Assam is Assamese. Other languages spoken include Aiton, which with approximately 1500 speakers is closely related to Shan and written in the Burmese script.

1.9 Economy:

Jorhat was the headquarter of trade during Ahom rule. Tea is the major industry in Jorhat. From the time of the British rule, Jorhat has been the centre for tea production. Jorhat is called the tea capital of the world for possessing several tea gardens. There are about 135 tea gardens in Jorhat. Tea contributes a huge amount to the economy of the state. The economy of Jorhat follows the system of export and import. Pulses, mustard oil, tobacco, cement, chemical and drugs etc are imported to Jorhat while the export items are tea, jute, oil and forest produce etc. There are a number of cottage and small scale industries in Jorhat. Furniture making, bamboo work, jewellery work, textile, manufacture of non metallic mineral product, manufacture of paper and paper product are the main sources of economy.

1.10 Geology:

The total geographical area of Jorhat District is 2.8 lakh ha. Out of this, about 1.19 lakh ha is the net cropped area. Forest occupies significant area 0.22 lakh ha. The recent alluvial soils of recent rivers are light grey to dark grey in colour and are confined to the flood plain area adjacent to the Brahmaputra River and its tributaries. The older alluvial soil is sandy loam to silt and clay-loam. It is light yellowish brown to light brown in colour. The pH is 4.5 to 6.0. Being acidic in nature, these soils are suitable for tea plantation. The soils of the district are characterized by organic matter and available phosphorus and low potash. The soils in the southern parts are residual in origin, derived from the semi-consolidated rocks underlying these areas.

1.11 Climate:

The climate of the district is classified as mesothermal wet climate with forest type of vegetation. January is the coldest month with temperature of 6.1°C. July and August are the hottest period with average monthly temperature of about 29 °C. The average relative humidity in a year is 78.7 per cent. The average annual rainfall for last ten years from1998 to 2007 has been computed to be 1,867.08 mm. The amount of rainfall increases from south west to north east.

1.12 1.11 Hydrogeology :

The area is underlain by unconsolidated alluvial sediments of the Quaternary age, which can be differentiated into i) Older and ii) Younger alluvium. The Older alluvium occupies the upland areas with sediments of oxidized and relatively compact nature, while the Younger alluvium occurs along the low-lying tracts of the area along the river courses (Plate II). The southern part of the area, adjacent to the Naga hill range is covered by surficial blanket of clay, belonging to Younger alluvium and probably has been derived from the adjacent hills which are composed of the rocks of Tertiary age. Ground water in the district occurs under water table to semi-confined conditions in the near surface horizon and in the suitable horizon, under semi-confined to confined conditions. Depth to water level in the water table zone varies from 0.41 to 3.07 m bgl in the pre-monsoon period and 0.56 to 3.41 m bgl during post-monsoon period. Panel diagram prepared based on available sub-surface data indicates that in the central parts, three to four prolific aquifer system exist down to explored depth of 300 m(Plate III).In the vicinity of Brahmaputra River, five to six aquifer systems with limited thickness exist within the depth range of 400 m. In the southern parts, the aquifer system fades out due to mixing of finer particles of sand and clay leading to decrease in thickness of aquifer system. The geometry of the aquifer system varies widely. In the north eastern and north western parts, the thickness of the aquifer increases and clear sand beds exists. Throughout the district, varied thickness of clay beds overlying and underlying the aquifer system exist. The thickness of the clay beds increases southwards i.e. towards Titabar where it attains a maximum thickness of 103 m. The predominance of clay formation in the depth of 30 to 50 m poses problem in storage of ground water in the district, however, local variation in the existence of very limited thickness of sand beds mixed with clay performing as conduits of ground water is also observed. The world's largest inland island 'Majuli' is located in the eastern parts of the district. The area is very much suitable for construction of ground water abstraction structures for discharges ranging from 100 to 300 m3/hr. Ground water occurs under water table conditions. Water table is shallow and rests within 4 m bgl. Central Ground Water Board has carried out exploratory drilling activities in various hydrogeological situations by deploying appropriate drilling Rigs in Jorhat district of Assam. The Board has drilled 18 exploratory wells in Jorhat district, out of which, three wells are abandoned and thirteen wells are under operation. The range of drilling depth varies from 79.72 to 457.30 m bgl with the discharge of 8 to 211.44 m3/ hr. Low duty shallow TWs are also feasible and have been constructed in the district. The yield of the tube wells varies from 30 to 35 m3/ hr and it irrigates about 3.5 ha.

Chapter-2 : Detailed scheme Report (DSR):

The detailed project report is formulated for the large multi village rural water supply scheme in Jorhat, Jorhat Central and Jorhat North West Development Block of Jorhat District covering the habitations of all the blocks after getting the habitations and the proposed scheme network fully surveyed with the Total station survey and maps in Auto CAD showing the layout, existing features of PWSS components and the proposed features of PWSS components.

The location of proposed new ESRs have been identified at locations Suitable and as required as per Design. The alignment & Layout plan was prepared based on the detailed survey conducted in the project area. The longitudinal levels were taken along the proposed alignment. In every village the Ground Level (GL) and Lowest Water Level (LWL) for ESRs were taken.

The Hydraulic Designs were done by using LOOP Software for the best suited design for the individual habitations and the overall Extension Scheme. Based on the Outputs of Designs the detailed estimate for the proposed water supply scheme, components were prepared covering the following Components of Multi Village Scheme

i. Intake arrangement with floating barge at Brahmaputra River. Water from this source river shall be tapped at Nimatighat.
ii. 28.2 MLD water treatment plant
iii. Sump of 2000 KL Capacity at Treatment Plant.
iv. Providing ESR of Capacity ranging from 70 KL to 625 KL with 16 m staging at 42 different locations.
v. Providing motors at intake point for Pumping main.
vi. Leading Mains from TP to ESRs in individual villages
vii. ESRs in Villages
viii. Distribution system in the intra- villages.
ix. House service connections/Public stand posts.
x. Valves and valve pits etc.
xi. Other relevant Components

2.1: Existing water supply facilities:

Out of total 1045 habitations proposed to be covered by the scheme, 728 are partially covered habitations as compared to 317 covered. The project area has 130 PWSS out of which 43 have already completed their design life and 49 more are on the verge of crossing the design life. As a consequence these schemes are already due for a major overhaul.

2.2: Water quality issues in the project area:

The quality affected habitation in the project area is a follows:

- Iron Affected : 270
- Arsenic affected : 46
- Fluoride affected : 1

It is seen from the above that the project area has a considerable water quality problem which could take a turn for the worse in the future has been the experience in other states.

2.3: Design period :

The project is designed for a period of 30 years, i.e., from 2015 to 2045.

2.4 : Design Population to be served:

(a) 2011 YSR Population – 279765 souls.

(b) On commissioning in 2015 AD – 299112 souls.

(c) After 10 years of commissioning in 2025 AD – 349962 souls

(d) After 20 years of commissioning in 2035 AD – 409455 souls

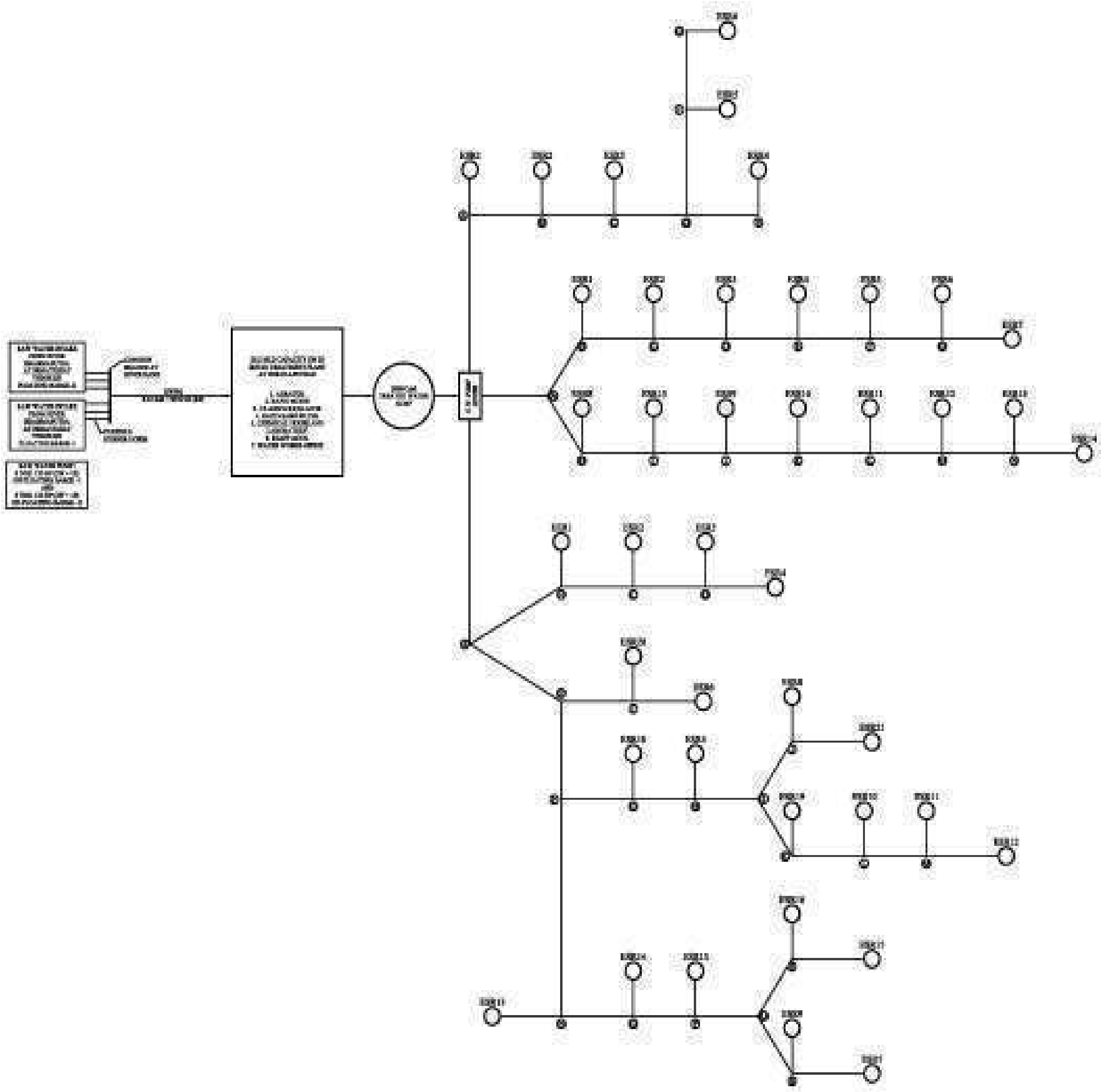
(e) After 30 years of commissioning in 2045 AD – 479062 souls

2.5 : Proposed Rate of supply : 70 lpcd .

2.6 : Total Demand of Water :

Total demands for the project area at Different stages are:

- On commissioning in 2015 AD: 24.1 MLD
- After 10 Years in 2025 AD: 28.2 MLD.
- After 20 Years in 2035 AD: 33.0 MLD.
- After 30 Years in 2045 AD: 38.6 MLD.



SUMMARY OF PIPE IN DIFFERENT ROUTE

CLEAR WATER MAIN ROUTE - I :

[illegible]

CLEAR WATER MAIN ROUTE - II :

[illegible]

CLEAR WATER MAIN ROUTE - III :

[illegible]

CLEAR WATER PUMP SETS :

FOR CLEAR WATER MAIN ROUTE - I :

[illegible]

FOR CLEAR WATER MAIN ROUTE - II :

[illegible]

FOR CLEAR WATER MAIN ROUTE - III :

[illegible]

COMPOSITE WATER SUPPLY SCHEME FOR
QUALITY & SUSTAINABILITY
IN JORHAT, JORHAT CENTRAL & JORHAT NORTH WEST
DEVELOPMENT BLOCK OF JORHAT DISTRICT

SCHEMATIC DIAGRAM FOR CLEAR WATER PUMPING MAI[illegible]

D:\16-07-13(WORLD BANK)\DPR Final RSC (FROM CD)\1 Final DPR_(24.07.2013)\FINAL DPR JORHAT WSS 30.07.13\3 Drawings\

CHAPTER-3 : DESIGIN DETAILS

3.1 General :

The water supply system has been planned as per the standard norms to ensure adequate & sufficient water supply for the proposed layout. Design parameters used have been adopted according to the guidelines provided in CPHEEO manual. The water distribution network is being designed with and LOOP Software.

The present proposed Scheme is designed to cover all streets and localities of the habitation with safe dependable local be pumped into ESR proposed within the habitation through pumping main and from the ESR, the water will be supplied to the end users through Gravity main (distribution main) with a ferrule provision outside each house, to enable the households to get their house hold connection through the GPWSC concerned.

3.2 Norms for water supply:

Norms adopted for water supply as per CPHEEO norms.

3.3 Water Requirement:

The water requirement has been estimated for the total estimated prospective population projected for the year 2025. The Per capita requirement has been Considered as 70 LPCD.

3.4 Per Capita Demand:

As per engineering matrices set for the implementation of Composite Water Supply Scheme for sustainability & Quality in Jorhat, Jorhat Central and Jorhat North West Development Block of Jorhat District, per captia demand will be 70 litres. (70 LPCD).

The approximate activity-wise break-up is considered as follows:

Activity	Quantity (LPCD)
Drinking	5
Cooking	5
Bathing	30
Washing utensils & house	10
Washing Cloths	10
Ablution	10
Total	70

3.5 Source:

It is proposed to draw raw water from the river Brahmaputra having sufficient run-off. The following report was collected from the CWC, Nimatighat, Jorhat:

- Name : Nimatighat
- Latitude : $26^0$52'0" (N)
- Longitude : $94^0$13'0" (E)
- Main River Basin : Brahmaputra having average discharge in lean period 6570.09 cumec and in monsoon period 25039.84 cumec.
- Tributary : Kokila
- Catchment Area : 3,59,500 sq.km up to site.
- Zero of Gauge : Direct Water level
- Bank : Left
- Mode of Observation : Hourly in Monsoon & 3 Hourly in Non Monsoon.
- Date of start of observation (Gauge) : 15.05.1969
- Warning level : 84.04 Mtr
- Danger level : 85.04 Mtr
- High Flood level (HFL) : 87.37 Mtr on 11.07.1991
- Normal Flood level : 87.25 Mtr

Map showing intake point at Nimatighat

Another option of intake point is kept open at Kokilamukh located at a distance of 4.00 km downstream from Nimatighat in case of the stability of the existing spur cannot be ascertained from concerned authority.

3.6 Design period:

The project is designed for a period of 30 years, i.e., from 2015 to 2045.

3.7 Population Projection:

The decadal growth method as prescribed in the CPHEEO manual is used. The decadal population growth of the decade 2001-2011 in Jorhat district was 9.21%. The decadal growth seems to be abnormally high; hence the state overall growth rate i.e. 17% is considered for projection purpose.

3.8 Design Population to be served :

After 30 years of commissioning in 2045 AD – 479062 souls.

3.9 Proposed Rate of supply: 70 lpcd.

3.10 Total Demand of Water:

Total demands for the project area at Different stages are:

- On commissioning in 2015 AD: 24.1 MLD
- After 10 Years in 2025 AD: 28.2 MLD.
- After 20 Years in 2035 AD: 33.0 MLD.
- After 30 Years in 2045 AD: 38.6 MLD.

3.11 Raw Water Pumping Main:

The Raw Water Main shall be of DI Class K9 pipe of dia 700 mm with inside cement mortar lining for a total length of 6530.00 RM. from Intake point (Nimatighat) at river Brahmaputra. The Design for economic dia. of Raw Water Pumping Main along with matching capacity of Raw Water Pump Set is shown in the design part in **Annexure - C**.

3.12 Raw water quality:

The Laboratory test report of raw water is given below:

Source : River Brahmaputra ,Location:Nimatighat

Parameters						
Date of testing	Turbidity in NTU	TDS in ppm	P^H	Fe in ppm	Total Alkalinity in ppm	Total Chloride in ppm
13.5.2013	402	60	7.12	0.28	52	4
18.3.2013	125	55	7.01	0.20	72	4

3.13 Type of treatment:

Since source of water for the proposed project is surface water to be tapped from river Brahmaputra, conventional treatment process having facilities for Aeration – Coagulation – flocculation – Filtration, followed by Disinfection is proposed. Along with the treatment plant there shall be a quality monitoring laboratory. The treatment plant shall be operated for 20 hours a day as per the engineering matrix fixed by WB Technical consultants.

3.14 Storage of treated water:

For collecting the treated water from the Rapid sand filter and to facilitate pumping of clear water to different service reservoir, one underground clear water sump of capacity 2000 Cum. is proposed along with the treatment plant to cater about 1 hour retention.

3.15 Elevated Service Reservoir (ESR):

All total 42 Nos. Elevated service reservoirs spreading over the project area is proposed. Total capacity of all these 42 ESR shall be 10485.0 Cum.

3.16 Conveyance of treated Water :

Treated water from the underground clear water sump at treatment plant shall be fed to the different ESR through common header type clear water pumping main. There shall be three different routes for this purposes as listed below:

- Supplying, laying, jointing, testing and commissioning of different assorted diameter DI S.S. (Class K7) Clear water pumping main of approximate total

length 133430 Rm. (in three different route) including all necessary earth work valves & specials, valve chamber, supporting structures, anchor / thrust block etc., all complete.

- From the ESR, clear water to the different constituent distribution pipe network shall be under gravity through required diameter DI Class K7 pipe with inside Cement Mortar lining.

The Design for different Clear Water Pumping Main is shown in **Annexure – C**.

3.17 Electrical power requirement :

Total Electrical Power Requirement for raw & clear water pumping, as well as to run the agitator drive motors etc. of the treatment plants and for internal & compound lighting of the respective intake site & the treatment plant location is calculated as 2000.0 KW.

3.18 Estimated Project cost :

Rs. 242.68 (Rupees two hundred forty two point six eight) crore only.

3.19 Per Capita Cost:

- On commissioning (2015)AD : Rs. 8194.34
- After 10 Years (2025) AD : Rs. 7003.71
- After 20 Years (2035) AD : Rs. 5986.07
- After 30 Years (2045) AD : Rs. 5116.30

3.20 Executing Authority:

Public Health Engineering Department, Assam.

3.21 Improvements to the Sanitation System:

It is also in principle proposed to improve total sanitation system in the habitation duly utilizing the funds sanctioned under World Bank assistance. Efforts will be made to -

- Ensure 100% IHHL construction in BPL and APL houses for the entire habitation in order to prevent open defection in the village premises.
- Ensure safe solid waste disposal system in the entire habitation as per SWM Guidelines G.O.I.

CHAPTER-4 : COST ESTIMATE

4.1 Rates:

The Total Project cost has been arrived based on the Revised Standard Data of government of Assam. The basic rates for the rate analysis are taken from the APWD Schedule of Rates for the year 2010-11 and APHED Schedule of Rates for the year 2008-09 of Government of Assam. The provision of price escalation is made to arrive at the current prices for estimating purpose.

4.2 Estimate Components:

The MVS Scheme is proposed with by providing all the facilities detailed below

Raw water Intake System comprising of:

a) M.S. Floating Barge with all necessary mooring materials & lifesaving equipment; tying arrangement; Over Head gantry Crane etc.
b) RCC Single Storied Utility cum Operator's Room at River bank of Intake Point
c) River bank Protection Work at Intake Point
d) Approach Road to Intake Point from the nearby public road
e) Land Development & Security Wall at Intake Station
f) Twin Assam Type accommodation at Intake Location for 1 (one) No. Pump Operator and 1 (one) No. Chowkider
g) Dedicated Power Line to Intake including Substation
h) Captive Power Generator at Intake Station.

Raw Water Pumping Machinery and other accessories comprising of:

a) Raw Water Pumping machinery in the Intake barge including all necessary Electrical and other installation works.
b) Manifold type Common Header at river bank for the raw water Main and Flexible hoses for connecting the same with the barge including campus
c) Illumination at intake location.

Raw Water Conveying Main:

a) Supplying, laying, jointing, testing and commissioning of 700 mm dia DI S.S. Raw Water Pumping Main including all necessary valves & specials, valve chamber, supporting structures, anchor / thrust block etc., complete.

Water Treatment Plant comprising of:

a) Design and Construction of Complete Water Treatment Plant of capacity 28.2 MLD (in 20 hours of operation) with suitable design in conformity with the CPHEEO Manual having provision for Sedimentation, Aeration, Coagulation, Rapid Mixing, Clariflocculation & Filtration followed by disinfection, including all Mechanical and Electrical Installation Work suitable for automated operation of the plant, Provision for Back Washing, Laboratory Facility, all internal connection

& by-pass piping system including provision for one Water Works Office and for Storage accommodation.

b) Construction of 20, 00,000.0 ltrs. Capacity RCC Under Ground Treated Water Sump in 2 (two) compartment and with a suction pit for pumps having provision for all inlet, outlet & overflow arrangement; mechanical type water level indicator; Air Vent Pipe; Men Hole with Cover; CI Lugs inside the sump etc. , complete
c) Land Development & Security Wall at Treatment Plant Location.
d) Twin Assam Type accommodation at Treatment Plant Location for 1 (one) No. Pump Operator and 1 (one) No. Chowkider.
e) Internal Road / Path etc.; Landscaping & Arboriculture including Compound Illumination in the treatment plant site
f) Approach Road to Treatment Plant Site from the nearby public road.
g) Dedicated Power Line to Treatment Plant including Substation.
h) Captive Power Generator at Treatment Plant.

Clear Water Pumping System comprising of:

a) Clear Water Pumping machinery at the treatment plant for the entire Clear water feeder route including all necessary electrical and other installation works.
b) Clear Water Pump House at Treatment Plant Location.
c) Manifold type Common Header for the Clear water main of Different Route and RCC Pump foundation.

Clear Water Conveying Main comprising of:

a) Supplying, laying, jointing, testing and commissioning of different required diameter DI S.S. Clear water pumping main for Route - I (for 21 ESRs of Jorhat Block) including all necessary valves & specials, valve chamber, supporting structures, anchor / thrust block etc., complete
b) Supplying, laying, jointing , testing and commissioning of different required diameter DI S.S. Clear water pumping main for Route - II (for 15 ESRs of Jorhat North West Block) including all necessary valves & specials, valve chamber, supporting structures, anchor / thrust block etc., complete
c) Supplying, laying, jointing , testing and commissioning of different required diameter DI S.S. Clear water pumping main for Route - III (for 6 ESRs of Jorhat Central Block) including all necessary valves & specials, valve chamber, supporting structures, anchor / thrust block etc., complete

Elevated Service Reservoir comprising of:

a) Construction of 42 (forty two) elevated service reservoirs of capacities: 350, 400, 300, 260, 310, 330, 260, 370, 240, 400, 90, 200, 220, 170, 130, 90, 150, 120, 190, 240, 160, 330, 70, 490, 330, 625, 550, 240, 330, 110, 260, 320, 230, 300, 220, 160, 220, 90, 90, 190, 210, 240 Cum with suitable foundation, including all necessary inlet/outlet etc. piping arrangement, control valves amenable to motorised operation, water level indicator, Lightening arrestor, solar power system (including 5

years maintenance contract), security wall, signboard, landscaping, & arboriculture etc.

b) Approach Road to all ESR Location.

Distribution System comprising of:

a) Laying of DI Feeder Main from respective ESR to the concerned Distribution network.
b) Extension, Renovation, Augmentation of the existing Distribution network.
c) House connection comprising of saddle piece, 10.0 m. PPR Pipe, Ferrule Cock etc.

Water meter with 5 year maintenance contract comprising of:

a) Supplying and fixing of Bulk Water meter.
b) Supplying and fixing of Domestic Water meter.

Auto Control System comprising of SCADA

Provision towards Contingencies:

Necessary provision is made in this estimate for contingencies like Survey, Soil investigation and Geo physical investigation of source etc.

4.3 Cost Of The Project :

The proposals as outlined have been worked out into detailed cost. The cost for the proposed MVS Scheme covering each and every element component necessary for taking up the work and completing the Scheme have been considered. Details of the various Subcomponents have been worked out in detailed annexed at **Annexure - E**.

4.5 Annexures :

Annexure-A: Name of GP and respective villages to be covered by the project.
Annexure-B: Population of habitations to be covered with Population projection and Calculation of water demand.
Annexure-C: Calculation of economic diameter Raw water Pumping Main & pump capacity for Raw water as well as design for Common Header type Clear Water Conveying Main & Capacity requirement of respective Pump sets.
Annexure-D: Hydraulic Design for 28.2 MLD Treatment Plant in 20 hours operation.
Annexure-E: Abstract of Cost.
Annexure-F: Water quality report of river Brahmaputra.
Annexure-G: Disaster Management practices.
Annexure-H: Environmental data sheet and EMF.
Annexure-I: Annual maintenance cost sheet.
Annexure-J: Capacity of Sump.
Annexure-K: Sub Soil Data.

Annexure -A

World Bank supported RWSS - LS Project in Jorhat District : GP & Village under Jorhat Development Block

Block Name	Panchayat Name	Village Name
1 Jorhat	1 Baghchung Charaibahi	1 Kamalaboria N.C.
		2 No.1 Chowdang
		3 Sekonodhora
	2 Cinamara	1 Chinamara Grant
		2 Toklai Chah Bagan
	3 Dakhin Charaibahi	1 Baghmora Gaon
		2 Bhakat Cheuni
		3 Charingia Gaon
		4 Gandhia Gaon
		5 Majgaon
	4 Dakhin Pub Namoni Charaibahi	1 Bamun Gaon
		2 Dakhin Hatichungi
		3 Gohain Gaon
		4 Kohar Gaon
		5 Kumar Gaon
		6 No.2 Chowdang Gaon
		7 Uttar Hatichungi
	5 Dakhin Karanga	1 Deka Gaon
		2 Dewaguri Chapori
		3 Gharpholia Gaon
		4 Gojpuria Gaon
		5 Hatichungi Moran Gaon
		6 Katanipar Gaon
		7 Kukurapohia Ouguria G
		8 Rangajan Gaon
	6 Dakhin Katani Bagisha	1 Borsaikota Grant
		2 Dhekiajuli T.E.
		3 Kharikatia Grant
		4 Sokalani Habi No.1
	7 Karanga	1 Hazarigaon
		2 Kamar Hajarika Gaon
		3 Kathkatia Gaon
		4 Katoni Gaon
		5 Lujania Gaon.
		6 Na-Pamua Chawdang Gao
		7 Raidang Kamar Gaon
	8 Khongia	1 Charaibahi Gaon
		2 Khangia Gaon
		3 Sonari
	9 Madhya Katani	1 Doklongia T.E.
		2 Katanibari T.E. Kathalguri
	10 Madhya Khongia	1 Bahek Gaon
		2 Dahotia Baruah
		3 Dhekalia Borsaikia
		4 Kuhiar Boria
	11 Madhya Namoni Charaibahi G.P	1 Borbheta Chapori
		2 Chutiakari
		3 Rongai Habi Gaon.
		4 Rongajan Grant
		5 Sensowa Gaon
	12 Panichukuwa	1 Ajan Bamun Gaon
		2 Pani Chakua

Block Name	Panchayat Name	Village Name
1 Jorhat	13 Uttar Garmur	1 Dulia Gaon
		2 Kumar Koibortta Gaon
	14 Uttar Garmur Bagisha	1 2 No. 64 Grant
		2 Baghdora
		3 Mumuria
	15 Uttar Khongia	1 Chaliha Gaon
		2 Charingia
		3 Goria Habi Gaon
	16 Uttar Namoni Charaibahi	1 Bam Chuck
		2 Hazari Gaon
		3 Nowsolia Gaon
		4 Pakhimari Habi Chuck
		5 Sonari Gaon

World Bank supported RWSS - LS Project in Jorhat District : GP & Village under Jorhat Central Development Block

Block Name	Panchayat Name	Village Name
2 Jorhat Central	1 Chowkhat Hatigarh	1 Bam-Dhekia Khowa
		2 Borkhalia Gaon
		3 Bormoinaparia Gaon
		4 Bormukali Pathar
		5 Dagar Chowk
		6 Dhekia Khowa Gaon
		7 Garia Habi
		8 Gayan Gaon
		9 Khahuani Bamun Gaon
		10 Khator Pather
		11 Metali Gaon
		12 Sorumona Poria
		13 Tinikuria Dhekia Khow
	2 Gohain Fesual	1 Changmai Gohain Gaon
		2 Gohain Handique Gaon
		3 Goria Cha Bagisa
		4 No.1 Fesualkhat Gaon
		5 Norahiloidori Gaon
		6 Tinikunia Ghorpholia
	3 Holongapara Bagan	1 Meleng Grant
		2 No. 78 Meleng Grant
	4 Jotokia	1 5 No. Janghal Block
		2 Duorapar Grant
		3 Hatichungi Grant
		4 Holongapar Grant
		5 Jotokia
		6 Kaliapani Grant
		7 No. 4 Janghal Block
		8 No.2 Fesual Khat Gaon
	5 Kakajan	1 Alichiga Pathar
		2 Bam-Kukurachowa
		3 Bongaon
		4 Da-Kukura Chowa
		5 Dhari Gaon
		6 Mohkhuti
		7 Sonari Bhorolua Chuck
	6 Meleng Bali Chapori	1 Bali Chapari Gaon
		2 Barapaik Gaon
		3 Borkhat Gaon
		4 Burha Gaon
		5 Chowtang Gaon
		6 Kopora Dhora Gaon
		7 Nemati Chapori
		8 No.2 Ghar Pholia Gaon
		9 Pakhimora Gaon
		10 Somar Gaon
	7 Pachim Holongapara	1 Bhakat Gaon
		2 Dulakakhoria
		3 Gharfallia Gaon
		4 Hatichungi Grant
		5 Meteli Gaon

World Bank supported RWSS - LS Project in Jorhat District : GP & Village under Jorhat North West Development Block

Block Name	Panchayat Name	Village Name
3 Jorhat North West	1 Baligaon	1 Borghop Chapari
		2 Deka Satra Bhakei
		3 Duboroni Pathar
		4 Khangia Gaon
		5 Khutiapota
		6 Mitha Amtol
		7 Nahatia Gaon
		8 No. 2 Pahumora
		9 No.1 Miri Gaon
		10 No.1 Pahumora
		11 No.2 Miri Gaon
	2 Charingia	1 Borahom Gaon
		2 Borahom Katoni
		3 Charingia Gaon
		4 Puroni Matisatra Koib
	3 Dhekorgorah	1 Dhekorgorha
		2 Sarucharai Gharphalia
		3 Sensowa Gaon
	4 Madhya Sarucharai G.P.	1 Gayan Gaon
		2 Kuhum Jugunia
		3 Malow Khat
		4 Malow Pam Gaon
		5 Sarucharai Bagan
		6 Sarucharai No.2
	5 Nowboicha	1 Dulia Gaon
		2 Na-Kari Brahmin Gaon
		3 Nowboisa Gaon
	6 Pachim Charigaon	1 Chengeligaon
		2 Gohain Tekela
		3 Kalakhowa
	7 Pachim Sarucharai	1 Bhatemora Gaon
		2 Borbheti Gaon
		3 Majia Bhetia
		4 Porbotia Gaon
		5 Randhanijan
		6 Rowraiajan Gaon
		7 Tingtingia
	8 Pub- Sarucharai	1 Bohotia
		2 Kamalaboria
		3 Sarbaibandha
	9 Pub-Charigaon	1 Aliamukhia Gaon
		2 No.2 Bamun Gaon
		3 Nowsalia
	10 Rajahowli	1 Desaikash Bamun Gaon
		2 Koibatra Gaon
		3 Raja Howli Gaon
		4 Rajotia

Annexure - B

World Bank supported RWSS - LS Project in Jorhat District : GP & Village under Jorhat Development Block

Block Name	Panchayat Name	Village Name	Habitation Name	Present Popl			
				SC	ST	Gen	Total
1 Jorhat	1 Baghchung Charaibahi	1 Kamalaboria N.C.	1 Baishya Chuck	0	0	814	814
			2 Green Land	0	0	243	243
			3 Habi Chuck	0	0	925	925
			4 Kamalabaria Gaon	60	24	534	618
			5 Phukonor Chuck	0	0	230	230
			6 Seujpur	0	0	200	200
			7 Sukafa Nagar	0	0	334	334
		2 No.1 Chowdang	1 1 No. Chuowdang Gaon	0	0	738	738
			2 Baghchung Gaon	0	0	1020	1020
			3 Baghchung Block	0	0	306	306
			4 Chinamora	0	79	620	699
			5 Kebang Gaon	0	67	750	817
			6 Lichubari	137	0	679	816
			7 Sadar	120	0	647	767
		3 Sekonodhora	1 Bahbari	55	65	421	541
			2 Barichowa Chuck	0	0	1008	1008
			3 Bhola Kakoti Path	0	0	225	225
			4 Bishnupur	0	0	430	430
			5 Chandan Nagar	0	0	690	690
			6 Club Road	45	310	496	851
			7 Hazarika Chuck	0	0	282	282
			8 Lakheswar Path (A)	0	0	210	210
			9 Lakheswar Path (B)	0	0	220	220
			10 Lakhi Nagar	0	0	480	480
			11 Na-Ali (B)	0	0	345	345
			12 Na-Ali (A)	0	0	452	452
			13 Nachani Chuck	0	0	236	236
			14 Nachoni Chuck (B)	0	0	294	294
			15 Pachim Bongalpukhuri	0	0	772	772
			16 Pub- Bongalpukhuri	23	0	390	413
			17 Rajabari	0	0	857	857
			18 Sat- Sangh Bihar	0	0	207	207
			19 Sekonidhora Gaon	0	0	205	205
			20 Suruj Nagar	0	0	365	365

Block Name	Panchayat Name	Village Name	Habitation Name	Present Popl			
				SC	ST	Gen	Total
1 Jorhat	2 Cinamara	1 Chinamara Grant	1 Bahbari Basti	61	0	265	326
			2 Cinamara Madhya Line	0	0	999	999
			3 Cinamara Milon Path	22	0	1006	1028
			4 Dhubi Line	25	0	1085	1110
			5 Jyoti Nagar	43	0	773	816
			6 Labour Line	0	0	743	743
			7 Rup Nagar	0	97	1927	2024
			8 Sadar Line	0	0	1992	1992
			9 Usanti Nagar	0	0	1422	1422
		2 Toklai Chah Bagan	1 Bapuji Path	0	0	224	224
			2 Budha Mondir	0	0	377	377
			3 Chowdang Mati	0	55	303	358
			4 Chowla Line	83	24	190	297
			5 Cinamora Bagisha Chuck	0	0	434	434
			6 Hulapara Line	0	0	229	229
			7 Mission Compound	0	0	607	607
			8 Rup- Nagar	49	0	349	398
			9 Sadar	0	0	308	308
			10 Sukafa Path	0	0	156	156
			11 Tocklai Purana Line	0	0	279	279

Block Name	Panchayat Name	Village Name	Habitation Name	Present Popl			
				SC	ST	Gen	Total
1 Jorhat	3 Dakhin Charaibahi	1 Baghmora Gaon	1 Baghchung Bagisha Line Chowdang Chuck	0	0	92	92
			2 Baghchung Chuck	0	0	25	25
			3 Baghmuria Gaon	0	9	101	110
			4 Burha Chuck	0	0	51	51
			5 Dakhin Timtimia Chuck	0	0	133	133
			6 Dheki Chuck	0	0	102	102
			7 Gaon Burha Chuck	0	0	52	52
			8 Gerela Chowdang Chuck	0	0	22	22
			9 Hati Chowdang Chuck	0	10	42	52
			10 Jakhalpara Chowdang Chuck	0	26	108	134
			11 Latif Nagar Chowdang Chuck	0	10	71	81
			12 Madhya Baghmuria Chuck	0	19	94	113
			13 Madhya Jakhalpara Chowdang Chuck	0	18	84	102
			14 Mohori Chuck	0	7	85	92
			15 Na-Ghar Chowdang Chuck	0	0	104	104
			16 Nam Timtimia Chuck	0	0	134	134
			17 Namoni Kebang Chowdang Chuck	0	10	92	102
			18 Oguri Chowdang Chuck	0	0	108	108
			19 Timtimia Chuck	0	0	72	72
			20 Ujoni Baghchung Chowdang Chuck	0	0	18	18
			21 Ujoni Baghmoria Chowdang Chuck	0	0	92	92
		2 Bhakat Cheuni	1 Bhakat Cheuni	0	0	69	69
			2 Charingia Chuck	0	0	191	191
			3 Dhowa Phondia Chuck	0	0	602	602
			4 Dohotia Chuck	0	0	207	207
			5 Kebang Chuck	0	0	528	528
			6 Media Chuck	0	0	451	451
			7 Tintingia Chuk	0	0	354	354
		3 Charingia Gaon	1 Charingia	0	0	108	108
			2 Dhekiajuli Chuck	0	0	85	85
			3 Neogor Chuck	0	0	130	130
			4 Timtimia Chuck	0	0	107	107
			5 Tungkhungia Chuck	0	0	213	213
			6 Uttar Charingia Chuck	0	0	121	121

Block Name	Panchayat Name	Village Name	Habitation Name	Present Popl			
				SC	ST	Gen	Total
1 Jorhat	3 Dakhin Charaibahi	4 Gandhia Gaon	1 Chekoni Chuck	0	0	112	112
			2 Gandhia Gaon	0	0	100	100
			3 Halowa Chuck	0	0	98	98
			4 Namoni Chuck	0	0	106	106
			5 Ujoni Chuck	0	0	130	130
		5 Majgaon	1 Gaonbura Chuck	0	10	88	98
			2 Gondhia Chuck	0	0	102	102
			3 Kathimora Chuck	0	0	102	102
			4 Maj Gayan Gaon	0	0	87	87
			5 Majgaon Hima Chuck	0	0	123	123
			6 Ujoni Chuck	0	0	105	105
	4 Dakhin Pub Namoni Charaiba	1 Bamun Gaon	1 Bamun Gaon	0	0	447	447
			2 Bayenor Chuck	9	0	95	104
			3 Bota Chuck	0	0	128	128
			4 Charaibahi Muslim Chuck	0	0	117	117
			5 Gaonburha Chuck	0	0	85	85
			6 Na-Khongia Chuck	0	0	52	52
			7 Napam Khator Chuck	0	0	225	225
		2 Dakhin Hatichungi	1 Dakhin Hati Chungi Chikari Chuck	0	0	99	99
			2 Gaonburha Chuck	0	10	88	98
			3 Handique Chuck	0	7	95	102
			4 Major Chuck	0	0	98	98
			5 Namoni Chuck	0	9	98	107
			6 Noi - Chuck	0	0	99	99
			7 Ujoni Chuck	0	0	125	125
		3 Gohain Gaon	1 Ali Chapori Chuck	0	0	157	157
			2 Chapori Chuck	0	0	163	163
			3 Dulia Gaon	0	0	230	230
			4 Gohain Gaon	0	0	149	149
			5 Kumar Chowdang Chuck	0	0	495	495
			6 Kumar Gaon	0	0	122	122
			7 Musolman Chuck	0	0	427	427

Block Name	Panchayat Name	Village Name	Habitation Name	Present Popl			
				SC	ST	Gen	Total
1 Jorhat	4 Dakhin Pub Namoni Charaiba	4 Kohar Gaon	1 Bora Chuck	0	0	163	163
			2 Boria Chuck	0	0	283	283
			3 Chipahi Chuck	0	0	207	207
			4 Kohar Gaon	0	0	314	314
			5 Moutor Chuck	0	0	107	107
			6 Namoni Kohar Gaon	0	0	139	139
			7 Namoni Konwar Chuck	0	0	68	68
			8 Ujoni Kohar Gaon	0	0	160	160
			9 Ujoni Konwar Chuck	0	0	87	87
		5 Kumar Gaon	1 Chowdang Chuck	0	0	108	108
			2 Kumar Gaon	0	0	90	90
			3 Madhya Chuk	0	0	110	110
			4 Namoni Kumar Chuck	0	0	77	77
			5 Ujoni Kumar Chuck	0	0	112	112
		6 No.2 Chowdang Gaon	1 Bazor Chuck	0	0	126	126
			2 Chetia Gaon	0	0	685	685
			3 Nam Baghmuria	0	0	306	306
			4 Nam Jamuguri Gaon	0	14	468	482
			5 No.2 Chowdang Gaon	0	0	143	143
			6 Pan Giria Gaon	0	0	214	214
			7 Ujoni Jamuguri Gaon	0	0	306	306
			8 Ulutolia Gaon	0	0	194	194
		7 Uttar Hatichungi	1 Bhelua Chuck	0	0	45	45
			2 Borsoola Chuck	0	0	106	106
			3 Kalaboria Chuck	0	7	94	101
			4 Kolong Chuck	0	0	103	103
			5 Kumar Chowdang Chuck	0	9	36	45
			6 Na-Ali Chuck	0	0	49	49
			7 Uttar Hatichungi Bejor	0	9	94	103
	5 Dakhin Karanga	1 Deka Gaon	1 Deka Chuck	0	0	34	34
			2 Doklongia	0	0	54	54
			3 Gogoi Chuck	0	0	55	55
			4 Kalandhi Chuck	0	0	57	57
			5 Moran Chuck	0	0	54	54
			6 Naghoria Chuck	0	0	54	54
			7 Phukon Chuck	0	0	56	56
			8 Rajkhowa Chuck	0	0	53	53

Block Name	Panchayat Name	Village Name	Habitation Name	Present Popl			
				SC	ST	Gen	Total
1 Jorhat	5 Dakhin Karanga	2 Dewaguri Chapori	1 Arabari	0	0	241	241
			2 Dewaguri Chapori	0	0	266	266
			3 Gohain Chuck	0	0	252	252
			4 Hatigarh Line	0	0	326	326
			5 Jakarua	0	0	179	179
			6 Rongajan Chuck	0	0	237	237
		3 Gharpholia Gaon	1 Bora Chuck	0	0	54	54
			2 Gharphalia	0	0	152	152
			3 Gohain Chuck	0	0	134	134
		4 Gojpuria Gaon	1 Bharali Chuck	0	0	123	123
			2 Dhekial Chuck	0	0	114	114
			3 Gojpuria	0	0	187	187
			4 Major Chuck	0	0	92	92
			5 Neog Chuck	0	0	88	88
			6 Raidangia	0	0	98	98
			7 Saikota Chuck	0	0	122	122
		5 Hatichungi Moran Gaon	1 Chamua Chuck	0	0	284	284
			2 Hati Barua	0	0	150	150
			3 Moran Gaon	0	0	162	162
			4 Na-Mantara Chuck	0	0	122	122
			5 Phukon Chuck	0	0	193	193
		6 Katanipar Gaon	1 Deoram Chuck	0	0	61	61
			2 Habi Chuck	0	0	63	63
			3 Katanipar	0	0	60	60
			4 Major Chuck	0	0	60	60
			5 Munia Chuck	0	0	65	65
			6 Naga Chuck	0	0	65	65
			7 Zalahu Chuck	0	0	65	65
		7 Kukurapohia Ouguria G	1 Karani Chuck	0	0	201	201
			2 Kukurapohia	0	0	200	200
			3 Ouguri	0	0	186	186
		8 Rangajan Gaon	1 Rangajan	0	0	36	36
			2 Ujani Chuck	0	0	35	35
			3 Rangajan Grant	0	0	34	34

Block Name	Panchayat Name	Village Name	Habitation Name	Present Popl			
				SC	ST	Gen	Total
1 Jorhat	6 Dakhin Katani Bagisha	1 Borsaikota Grant	1 Borsaikota 1 No. Line	0	0	866	866
			2 Soikota Bagisha Line	0	0	955	955
			3 Soikota Natun Line	0	0	711	711
		2 Dhekiajuli T.E.	1 12 No. Line	0	0	317	317
			2 16 No. Line	0	0	312	312
			3 3 No. Line	0	0	509	509
			4 Gandhi Basti	0	0	276	276
			5 Katani Basti	0	0	281	281
			6 Khar Line	0	0	465	465
		3 Kharikatia Grant	1 Kharikatia Line	0	0	1042	1042
			2 Kharikatia Purana Line	0	0	964	964
			3 Natun Mati	0	0	987	987
		4 Sokalani Habi No.1	1 Factory Line	0	0	305	305
			2 Hospital Line	0	0	248	248
			3 Soykota Line	0	0	271	271
	7 Karanga	1 Hazarigaon	1 Hazarigaon	0	0	61	61
			2 Major Chuck	0	0	82	82
			3 Namoni Chuck	0	0	64	64
			4 Tapar Chuck	0	0	77	77
		2 Kamar Hajarika Gaon	1 Hazarika Gaon	0	0	641	641
			2 Karaga Jania	0	0	578	578
		3 Kathkatia Gaon	1 Bhuyan Basti	0	0	68	68
			2 Boria Bosti	0	0	111	111
			3 Gohain Chuck	0	0	139	139
			4 Handique Chuck	0	0	153	153
			5 Kathkatia	0	0	114	114
			6 Muslim Chuck	0	0	117	117
		4 Katoni Gaon	1 Bamun Chuck	0	0	266	266
			2 Bosa Chuck	0	0	258	258
			3 F.C.I. Chuck	7	0	173	180
			4 Katoni Chuck	0	0	366	366
			5 Muslim Chuck	0	0	207	207
			6 Ujani Kabang	0	24	171	195

Block Name	Panchayat Name	Village Name	Habitation Name	Present Popl			
				SC	ST	Gen	Total
1 Jorhat	7 Karanga	5 Lujania Gaon.	1 Godha Chuck.	0	0	71	71
			2 Ozgar Chuck.	0	0	87	87
			3 Saikata Chuck.	0	0	88	88
			4 Ujani Lujania Chuck.	0	0	71	71
		6 Na-Pamua Chawdang Gao	1 Kubar Chuck	0	0	169	169
			2 Napam Chuck	0	0	219	219
			3 Padua Chuck	0	0	125	125
			4 Thikardar Chuck	0	0	326	326
			5 Ujani Chuck	0	0	190	190
		7 Raidang Kamar Gaon	1 Bhorali Chuck	0	0	100	100
			2 Debera	0	0	90	90
			3 Kamar Chuck	0	0	166	166
			4 Pubarun	0	0	117	117
			5 Raidungia	0	0	164	164
			6 Rasaiya	0	0	211	211
			7 Tangar Chuck	0	0	162	162
	8 Khongia	1 Khangia Gaon	1 Abisar Chuck	68	0	85	153
			2 Bahman Chuck	0	0	101	101
			3 Bheta Chuck	0	0	271	271
			4 Boral Chuck	0	0	92	92
			5 Bosa Chuck	0	0	98	98
			6 Dhapang Chuck	0	0	99	99
			7 Dohotia Bora Chuck.	0	0	92	92
			8 Dohotia Chapori Chuck.	0	0	94	94
			9 Dohotia Neog Chuck.	0	0	102	102
			10 Dohotia Phukanar Chuck.	0	0	153	153
			11 Gasur Chuck	0	0	122	122
			12 Goriakona (Part-I)	0	0	20	20
			13 Goriakona (Part-Ii)	0	0	245	245
			14 Halwa Chuck	0	0	102	102
			15 Maidam Chuck	0	0	71	71
			16 Nakakuwa (Part-Ii)	0	0	155	155
			17 Nakakuwa (Part-I)	0	0	153	153
			18 Nara-Borah Chuck	0	0	71	71
			19 Neog Chuck	0	0	163	163
			20 Senapati Chuck	0	0	102	102
			21 Tekela Chuck	60	0	98	158
			22 Tingrimora Kumar Gaon	0	0	248	248
			23 Tinkupar Chuck	0	0	262	262

Block Name	Panchayat Name	Village Name	Habitation Name	Present Popl			
				SC	ST	Gen	Total
1 Jorhat	8 Khongia	2 Charaibahi Gaon	1 Bhogabora Chuck	0	0	31	31
			2 Boiragi Chuck	0	0	31	31
			3 Bor -Namghar Chuck	0	0	20	20
			4 Charaibahi Major Chuck	0	0	26	26
			5 Kati Chuck	0	0	148	148
			6 Khatar Chuck	0	0	165	165
			7 Muslim Chuck	0	0	85	85
			8 Rajkhowa Chuck	0	0	31	31
		3 Sonari	1 2 No. Sonari Chuck	85	0	122	207
			2 Bezjor Bakar Chuck	0	0	153	153
			3 Darabdhara Chuck	0	0	218	218
			4 Hazarika Chuck	0	0	153	153
			5 Pakhimari Gaon	255	0	201	456
			6 Sonari Chuck	0	0	184	184
	9 Madhya Katani	1 Doklongia T.E.	1 4 No. Line	149	0	0	149
			2 Apiling Chirg Line	0	0	388	388
			3 Bor Line	0	0	971	971
			4 Chowra Basti	0	0	601	601
			5 Haligaon Purana Basti	0	0	288	288
			6 K. K. Line	0	0	396	396
		2 Katanibari T.E. Kathalguri	1 1 No. Line	0	0	97	97
			2 11 No. Line	0	0	54	54
			3 Babu Line	0	0	104	104
			4 Bor Line	0	0	106	106
			5 Hospital Line	0	0	156	156
			6 Kadam Line	0	0	136	136
			7 Pukhuri Line	0	0	122	122
	10 Madhya Khongia	1 Bahek Gaon	1 Bahek -Chuck No.1	106	0	298	404
			2 Bahek Chuck No.2	0	0	97	97
			3 Bazor Chuck	0	0	107	107
			4 Gurujonia Chuck	0	0	163	163
			5 Katoniar Chuck	0	0	173	173
			6 Keot Chuck	68	0	85	153
			7 Muslim Gaon	70	0	85	155

Block Name	Panchayat Name	Village Name	Habitation Name	Present Popl			
				SC	ST	Gen	Total
1 Jorhat	10 Madhya Khongia	2 Dahotia Baruah	1 1 No. Dohotia Gaon	0	0	738	738
			2 2 No. Dohotia Gaon	0	0	559	559
			3 Boruah Gaon	0	0	677	677
			4 Gurujonia Gaon	0	0	286	286
			5 Kolagaon	0	0	558	558
			6 Kothal Kumar Gaon	0	0	300	300
			7 Lakhutia Gaon	0	0	241	241
			8 Mohar Gaon	0	0	650	650
		3 Dhekalia Borsaikia	1 Adhyapak Kumar Chuck	0	0	71	71
			2 Borsaikia	0	0	107	107
			3 Borthakur Chuck	0	0	71	71
			4 Boruah Chuck	0	0	20	20
			5 Chariali Kalita Chuck	0	0	61	61
			6 Dhekelia Bamun Chuck	0	0	326	326
			7 Dhekelia Kakoti Chuck	0	0	71	71
			8 Dhekelia Kalita Chuck	0	0	177	177
			9 Dhekelia Neog Chuck	0	0	168	168
			10 Dhekelia Tini -Ali	0	0	105	105
			11 Dibuwal Chuck	0	0	109	109
			12 Feta Chuck	0	0	61	61
			13 Hallow Chuck	0	0	122	122
			14 Hazarika Chuck	0	0	92	92
			15 Lakhutia Chuck	0	0	97	97
			16 Lehetia	0	0	61	61
			17 Phukanor Bheta	0	0	150	150
			18 Pichuar Chuck	0	0	107	107
			19 Puruhit Chuck	0	0	78	78
		4 Kuhiar Boria	1 1 No. Chaliha Chuck	0	0	104	104
			2 Bamun Chuck	0	0	92	92
			3 Darongia Chuck	0	0	557	557
			4 Jalukia Satra	0	0	71	71
			5 Kalyanpur	50	0	121	171
			6 Komar Chuck	0	0	71	71
			7 Mudoi Chuck	0	0	122	122
			8 Napamua Natun Mati	58	0	85	143
			9 Ojha- Chuck	0	0	92	92
			10 Pathak Chuck	0	0	306	306

Block Name	Panchayat Name	Village Name	Habitation Name	Present Popl			
				SC	ST	Gen	Total
	11 Madhya Namoni Charaibahi	1 Borbheta Chapori	1 Borbheta Chapori.	5	15	269	289
			2 Danish Nagar.	0	0	79	79
			3 Jamuguri Part - 1	0	0	272	272
			4 Lichubari Chuck.	0	0	308	308
			5 Manik Nagar.	0	0	182	182
			6 Namuna Bagan.	0	0	205	205
			7 Pathakar Chuck.	0	0	210	210
			8 Praja Line.	0	0	205	205
		2 Chutiakari	1 Baghar Chuck	0	0	39	39
			2 Bhakotar Chuck	0	0	212	212
			3 Chutiakari Gaon	61	30	88	179
			4 Holia Gaon	0	0	54	54
			5 Mihali Chuck	0	0	176	176
			6 Namoni Habungia	0	0	143	143
			7 Saikia Chuck	0	0	120	120
			8 Ujani Habungia	0	0	136	136
		3 Rongai Habi Gaon.	1 Bauri Chuck.	0	0	201	201
			2 Goswami Chuck.	0	0	250	250
			3 Habi Miri Cuchk.	0	0	231	231
			4 Rongai Chapori Chuck.	0	0	274	274
			5 Rongai Habi Gaon.	0	0	388	388
			6 Roroia Dholi Line.	0	0	278	278
		4 Rongajan Grant	1 Rongajan Grant	0	0	121	121
		5 Sensowa Gaon	1 2 No. Sensua	0	0	368	368
			2 Borbheta Chapori	0	0	216	216
			3 Borbheta Kanchan Nagar	0	0	159	159
			4 Cheuni Gaon	103	24	1011	1138
			5 Christan Patti	0	0	350	350
			6 Habi Chuck	0	0	148	148
			7 Sensua Gaon	210	84	1087	1381
			8 Sensua Pub	0	0	195	195

Block Name	Panchayat Name	Village Name	Habitation Name	Present Popl			
				SC	ST	Gen	Total
1 Jorhat	12 Panichukuwa	1 Ajan Bamun Gaon	1 Azan Gaon	0	0	143	143
			2 Bamun Gaon	0	0	738	738
			3 Bhadeswar Path Chuck	0	0	60	60
			4 Chalikhowa	60	0	134	194
			5 Charanga Chuck	0	0	92	92
			6 Neog Chuck	0	0	71	71
			7 Tilikiam	0	0	97	97
		2 Pani Chakua	1 Amtol Road Chuck	0	0	277	277
			2 Baghar Chuck	257	0	511	768
			3 Bharali Road Chuck	0	0	357	357
			4 Dhali Kumar Gaon	514	0	581	1095
			5 Hazarika Chuck	105	0	357	462
			6 Noi - Chuck	542	0	542	1084
			7 Panichukuwa	519	0	1198	1717
			8 Panichukuwa Tilikiam	0	0	262	262
			9 Pulunwabari Gazing	0	0	189	189
			10 Purana Namghar Chuck	200	0	254	454
			11 Sara-Chowa	196	0	477	673
			12 Saruhuj	0	0	525	525
			13 Tagar Road Chuck	0	0	185	185
			14 Ujani Dhali (A.T. Road) Chuck	167	0	271	438
	13 Uttar Garmur	1 Dulia Gaon	1 Bonua Basti	0	0	268	268
			2 Gowla Basti	15	0	151	166
			3 Habi Chuck	0	0	180	180
			4 Itabhota	0	7	128	135
			5 Karpung Puli	0	34	129	163
			6 Major Chuck	0	0	227	227
			7 Napam (Part-Ii)	0	0	200	200
			8 Napam Gaon	0	0	143	143
			9 Sankarpur	0	0	388	388
			10 Ujani Chuck No.2	0	0	343	343
			11 Ujoni Chuck	0	0	385	385

Block Name	Panchayat Name	Village Name	Habitation Name	Present Popl			
				SC	ST	Gen	Total
1 Jorhat	13 Uttar Garmur	2 Kumar Koibortta Gaon	1 Gaon Bura Chuck	0	0	486	486
			2 Garmur Satra	0	0	732	732
			3 Ita-Khuli	214	45	840	1099
			4 J.E.C. Road	0	0	670	670
			5 Kalayanpur	270	0	0	270
			6 Koibortta Chuck	255	0	29	284
			7 Koibortta Chuck	401	0	310	711
			8 Nepali Basti	24	0	379	403
			9 Sankarpur	0	35	615	650
			10 Srimantapur	0	0	958	958
			11 Ujani Kumar Koibortta	580	0	205	785
	14 Uttar Garmur Bagisha	1 2 No. 64 Grant	1 Hospital Line	0	0	1027	1027
			2 Hulia Gaon Bor-Line	0	0	975	975
			3 Kurkani	0	0	1265	1265
			4 Mondir Line	0	0	1031	1031
		2 Baghdora	1 Baba Line	0	0	163	163
			2 Bagh Dhora- (Ii)	0	0	347	347
			3 Baghdhora	0	0	108	108
			4 Kalithani Line	0	0	111	111
			5 Murmuria Poka Line	0	0	184	184
		3 Mumuria	1 1 No. Bor- Line	0	0	250	250
			2 27 No. Poka Line	0	0	149	149
			3 28 No. Maji Line	0	0	211	211
			4 Bahbari Line	0	0	320	320
			5 Natun Line	15	0	111	126
			6 Purana Line	0	0	520	520
			7 Showra Line	0	0	303	303

Block Name	Panchayat Name	Village Name	Habitation Name	Present Popl			
				SC	ST	Gen	Total
1 Jorhat	15 Uttar Khongia	1 Chaliha Gaon	1 Bishnupur No.1	0	0	31	31
			2 Bishnupur No.2	0	0	262	262
			3 C.R.P.F. Camp Site	0	0	509	509
			4 Chaliaha Chapori	17	0	24	41
			5 Chaliaha Chuck	17	0	44	61
			6 Chaliaha Gaon	145	0	477	622
			7 Chutia -Kari Chuck	0	0	262	262
			8 Kuchor Chuck	0	0	77	77
			9 M.E.S. Site	0	0	262	262
			10 Naltoli	0	0	105	105
			11 Railway Coloney Site	0	0	509	509
			12 Rowraiah Chari Ali Chuck	0	0	26	26
			13 Shama Coloney	0	0	491	491
			14 Shiv Coloney	0	0	46	46
		2 Charingia	1 Charingia A.T. Road Chuck	0	0	107	107
			2 Chilakura Basti	0	0	260	260
			3 Haturi Chuck	0	0	179	179
			4 Maheli Basti	0	0	153	153
			5 Milan Nagar	0	0	103	103
			6 Milanpur	9	0	83	92
			7 Talenga Line	0	0	193	193

Block Name	Panchayat Name	Village Name	Habitation Name	Present Popl			
				SC	ST	Gen	Total
1 Jorhat	15 Uttar Khongia	3 Goria Habi Gaon	1 Bahbari Line No.1	0	0	163	163
			2 Bahbari Line No.2	0	0	102	102
			3 Durga Mondir Line	0	0	249	249
			4 Homeguard Training Centre Chuck	0	0	71	71
			5 Maheli Basti	0	0	357	357
			6 Natun Line No.1	0	0	133	133
			7 Natun Line No.2	0	0	128	128
			8 Natun Line No.3	0	0	124	124
			9 Susan Chuck	0	0	105	105
			10 Talenga Line	0	0	204	204
	16 Uttar Namoni Charaibahi	1 Bam Chuck	1 Bam-Chuck Gaon	116	10	3256	3382
		2 Hazari Gaon	1 Chirotia Gaon	0	0	383	383
			2 Ghila Jugania Gaon	44	0	1023	1067
			3 Hazarigaon	0	0	957	957
			4 Pokimuri Gondhya Gaon	33	0	988	1021
		3 Nowsolia Gaon	1 Bijoy Nagar	0	18	495	513
			2 D.S.T. Coloney Chuck	0	27	320	347
			3 Debeswar Bora Path Chuck	0	0	570	570
			4 Dhanbari Chapori Chuck	0	0	427	427
			5 East Nowsolia	43	153	355	551
			6 Kathal Basti Chuck	60	0	565	625
			7 Nandanpur	0	17	488	505
			8 Panachayat Office Thakur Basti Chuck	0	0	372	372
			9 Ramdhari Coloney -B	0	0	884	884
			10 West Nowsolia	53	30	961	1044
		4 Pakhimari Habi Chuck	1 Lahingia Chuck	0	0	104	104
			2 Musalman Chuck	0	0	357	357
			3 Na-Ali Chuck	0	0	128	128
			4 Pakimuri Habi Chuck	0	0	224	224
			5 Re-Habilated Chuck	0	0	108	108
		5 Sonari Gaon	1 Indra Pratha	0	0	228	228
			2 Kharagorua Chuck	34	23	547	604
			3 Kharagoruah Sonari Sonjug Path Chuck	22	9	312	343
			4 Neogar Chuck	0	0	513	513
			5 Parijat Nagar	0	0	205	205
			6 Porbotia Chuck	0	0	286	286
			7 Raidongia Chuck	0	0	439	439
			8 Sonali Nagar	0	0	434	434
			9 Tekela Chuck	0	0	343	343

World Bank supported RWSS - LS Project in Jorhat District : GP & Village under Jorhat Central Development Block								
Block Name	Panchayat Name	Village Name	Habitation Name			Present Popl		
					SC	ST	Gen	Total
2 Jorhat Central	1 Chowkhat Hatigarh	1 Bam-Dhekia Khowa	1	Hamdia Chuck	0	0	492	492
			2	Kath Gaon	14	7	273	294
		2 Borkhalia Gaon	1	Bamun Gaon	0	0	278	278
			2	Borkhelia	0	0	458	458
			3	Chamakar Chuck	0	0	192	192
			4	Doloi Gaon	0	0	434	434
			5	Ghorpara Chuck	0	0	162	162
			6	Jakai Chuck	0	0	66	66
			7	Kumar Gaon	0	0	115	115
			8	Lahkor Gaon	0	0	327	327
		3 Bormoinaparia Gaon	1	Guwala Chuck	0	0	390	390
			2	Komar Chuck	0	0	119	119
			3	Kuchar Chuck	0	0	139	139
			4	Moinapuria Chuck	0	0	235	235
			5	Natun Meleng	271	0	0	271
			6	Neog Chuck	0	0	76	76
			7	Rongapani Chuck	0	0	33	33
		4 Bormukali Pathar	1	1 No. Missing Gaon	0	34	0	34
			2	2 No. Missing Gaon	0	40	0	40
		5 Dagar Chowk	1	Chipahikhula	0	0	60	60
			2	Dagar Chuck	0	0	273	273
		6 Dhekia Khowa Gaon	1	Atoi Chuck	0	0	54	54
			2	Da-Dhekia Khowa	0	0	139	139
			3	Lukumoi Chuck	0	0	339	339
			4	Tamuli Chuck	0	0	41	41
		7 Garia Habi	1	Ali Kush	0	0	201	201
			2	Garia Habi	0	0	115	115
		8 Gayan Gaon	1	Bhokot Chuck	0	0	136	136
			2	Gayan Chuck	15	0	97	112
			3	Gohain Chuck	0	0	180	180
			4	Hiloidari Chuck	0	0	85	85

Block Name	Panchayat Name	Village Name	Habitation Name		Present Popl			
					SC	ST	Gen	Total
2 Jorhat Central	1 Chowkhat Hatigarh	9 Khahuani Bamun Gaon	1	Khohuoni Bamun	0	0	284	284
		10 Khator Pather	1	Khator Pather	0	0	38	38
		11 Metali Gaon	1	Boropike	0	0	198	198
			2	Gohain Chuck	32	0	112	144
			3	Lahdoi Garh	0	0	73	73
			4	Metali Chuck	0	0	179	179
		12 Sorumona Poria	1	Nowboisha Chuck	0	0	276	276
			2	Sarumoinapuria	25	0	589	614
		13 Tinikuria Dhekia Khow	1	Bhabi Chuck	0	0	91	91
			2	Da-Chuck	0	0	157	157
			3	Dagar Chuck	0	0	54	54
			4	Junai Chuck	0	0	216	216
			5	Major Chuck	0	0	325	325
			6	Neog Chuck	0	0	97	97
			7	Pathok Chuck	0	0	100	100
			8	Saikia Chuck	0	0	129	129
			9	Tinikuria Dhekiakhowa	0	0	298	298
	2 Gohain Fesual	1 Changmai Gohain Gaon	1	Ali Chuck	0	0	220	220
			2	Bhula Handique Chuck	0	0	181	181
			3	Bongali Chuck	0	0	237	237
			4	Borfoidia Chuck	0	0	204	204
			5	Borgohain Chuck	0	0	500	500
			6	Changmai Chuck	0	0	272	272
			7	Goria Chah	0	0	174	174
			8	Phoni Mohori Chuck	0	0	179	179
			9	Salal- Bari Basti	0	0	238	238
			10	Sarufoidia Chuck	0	0	195	195

Block Name	Panchayat Name	Village Name	Habitation Name		Present Popl			
					SC	ST	Gen	Total
2 Jorhat Central	2 Gohain Fesual	2 Gohain Handique Gaon	1	Ali Chuck	8	0	289	297
			2	Borfoidia Chuck	0	0	47	47
			3	Bormedhi Chuck	5	20	35	60
			4	Changmai Chuck	0	0	194	194
			5	Chapaguri Basti	0	0	56	56
			6	Handique Chuck	0	0	173	173
			7	Medhi Chuck	0	0	141	141
			8	Naribhoga Chuck	5	16	28	49
			9	Sarufoidia Chuck	0	0	216	216
			10	Urang Chuck	0	0	203	203
		3 Goria Cha Bagisa	1	Garia Chah Bagicha (Basti)	0	0	166	166
			2	Kamal Pur Basti	0	0	150	150
			3	Salal Bari Basti	14	5	28	47
			4	Turi Basti	0	0	126	126
		4 No.1 Fesualkhat Gaon	1	Boidiha 3 No. Line	0	0	167	167
			2	Hingh Bolia	0	0	367	367
			3	Medhi Chuck	0	0	243	243
			4	No. 1 Fesual Gaon	0	0	276	276
		5 Norahiloidori Gaon	1	Bam Dhekiakhowa	0	0	209	209
			2	Bor Medhi Chuck	0	0	298	298
			3	Kohar Chuck	0	0	111	111
			4	Lahdoigarh Chuck	0	0	116	116
			5	Metali Chuck	0	0	116	116
			6	Molia Chuck	0	0	330	330
			7	Mout Chuck	0	0	147	147
			8	Nara Hiloidari	0	0	380	380
			9	Panitola Chuck	0	0	267	267
		6 Tinikunia Ghorpholia	1	Ghorphalia Chuck	0	0	286	286
			2	Tinikuria Ghorphalia	0	0	173	173
	3 Holongapara Bagan	1 Meleng Grant	1	4 No. Jotokia Ward	0	0	1153	1153
			2	5 No. Jotokia Ward	0	0	969	969
			3	6 No. Changchowa Basti	0	0	921	921
			4	7 No. Hindubari	121	0	2060	2181
			5	8 No. Christan Basti	0	0	1469	1469

Block Name	Panchayat Name	Village Name	Habitation Name		Present Popl			
					SC	ST	Gen	Total
2 Jorhat Central	3 Holongapara Bagan	2 No. 78 Meleng Grant	1	1 No. Itabhata	0	0	99	99
			2	10 No. Meleng Munda Basti	0	0	79	79
			3	2 No. 5 & 11 Line	0	0	95	95
			4	3 No. Balijan	0	0	145	145
			5	9 No. Tinikuria	0	0	85	85
	4 Jotokia	1 5 No. Janghal Block	1	No.5 Janghal Block	0	0	196	196
		2 Duorapar Grant	1	No. 1 Madhupur Kaliapani Gaon	0	0	244	244
			2	No.2 Madhupur	0	0	253	253
			3	No.3 Madhupur	0	0	310	310
			4	No.4 Lakhipur	0	0	315	315
		3 Hatichungi Grant	1	No.1 Line	59	0	82	141
			2	No.2 Line	0	0	129	129
			3	No.3 Line	0	0	105	105
			4	No.4 Line	0	0	115	115
			5	No.5 Line	0	0	81	81
			6	No.6 Line	0	0	61	61
			7	No.7 Line	0	0	31	31
		4 Holongapar Grant	1	Bhogpur	0	0	143	143
			2	Gobinpur	0	0	219	219
			3	Gojpuria	0	0	145	145
			4	Mura Basti	0	0	203	203
			5	Holongapar Forest Reserve	9	0	22	31
		5 Jotokia	1	Bharali Chuck	0	0	190	190
			2	Bogorai Gaon Ali Chuck	0	0	138	138
			3	Jotokia Ali Chuck	0	0	291	291
			4	Kuja Chuck	0	0	74	74
			5	Namoni Chuck	0	0	198	198
			6	Pathokar Chuck	0	0	288	288

Block Name	Panchayat Name	Village Name	Habitation Name		Present Popl			
					SC	ST	Gen	Total
2 Jorhat Central	4 Jotokia	6 Kaliapani Grant	1	No.1 Dighal Line	0	0	300	300
			2	No.2 Joypuria Line	0	0	193	193
			3	No.3 Staff Line	0	0	164	164
			4	No.4 Ting Line	0	0	296	296
			5	No.5 Ouria Line	0	0	209	209
			6	No.6 Christan Line	0	0	208	208
			7	No.7 Natun Mati Line	0	0	323	323
			8	No.8 Mounda Line	0	0	140	140
		7 No. 4 Janghal Block	1	No.4 Janghal Block	0	0	103	103
		8 No.2 Fesual Khat Gaon	1	Hingibolia Moran Chuck	0	0	126	126
			2	Hingibolia Pitol Chuck	0	0	207	207
			3	Major Chuck	0	0	286	286
			4	Molia Chuck	0	0	244	244
			5	No. 160 Natun Matai	0	0	134	134
			6	Rajkhowa Chuck	0	0	303	303
	5 Kakajan	1 Alichiga Pathar	1	Ali Chiga	0	16	42	58
		2 Bam-Kukurachowa	1	Ali Chuck	0	0	292	292
			2	Bam-Kukurachowa	0	0	318	318
			3	Boruah Chuck	0	0	112	112
			4	Major Chuck	0	0	247	247
			5	Muslim Bongaon	0	0	358	358
		3 Bongaon	1	Ali Chuck	0	0	310	310
			2	Bongaon Chuck	0	0	642	642
			3	Bongaon Tinikuria	14	0	80	94
			4	Hazarika Chuck	0	0	149	149
			5	Kakoti Chuck	0	0	100	100
			6	Kapahtoli	86	0	0	86
			7	Maj -Bongal	0	0	91	91
			8	Nalogua Chuck	0	0	82	82
		4 Da-Kukura Chowa	1	Da- Kukura Chowa	0	0	535	535
			2	Goruwal Chungi	530	0	0	530
		5 Dhari Gaon	1	Dhari Gaon	0	0	257	257
			2	Dhari Gaon Koiborta	361	0	0	361
		6 Mohkhuti	1	Mohkhuti	32	0	0	32

Block Name	Panchayat Name	Village Name	Habitation Name		Present Popl			
					SC	ST	Gen	Total
2 Jorhat Central	5 Kakajan	7 Sonari Bhorolua Chuck	1	Ali Chuck	0	0	156	156
			2	Fotika Chiga	0	0	111	111
			3	Komar Chuck	0	0	419	419
			4	Majgaon	0	0	418	418
			5	Medhi Chuck	0	0	126	126
			6	Monai Pool	0	0	130	130
			7	Muslim Da-Gaon	0	0	726	726
			8	Pukhuriporia	0	0	140	140
			9	Sonari Bhorolua Chuck	0	0	439	439
			10	Sonari Gaon	0	0	411	411
	6 Meleng Bali Chapori	1 Bali Chapari Gaon	1	Bamun Gaon Chuck	0	0	73	73
			2	Bhotar Chuck	0	0	233	233
			3	Dakhin Bhounga	0	0	167	167
			4	Dangoria Ali & Na-Bari Chuck	0	0	123	123
			5	Holia Chuck	0	0	107	107
			6	Kalita Chuck	0	0	75	75
			7	Ladoigarh	0	0	235	235
			8	Major Chuck	0	0	246	246
			9	Patal Khunda Chuck	0	0	124	124
			10	Potia Chuck	0	0	183	183
			11	Puzari Chuck	0	0	204	204
			12	Robi Das Chuck	0	0	80	80
			13	Rongoli Ticka Cuck	0	0	86	86
			14	Sarutakala	0	0	80	80
			15	Uttar Goroguri	96	0	9	105
		2 Barapaik Gaon	1	Baropike Bali Chapori Chuck	0	0	63	63
			2	Baropike Path	0	0	68	68
			3	Na-Ali Chuck	0	0	29	29
		3 Borkhat Gaon	1	Borborua Chuck	0	0	68	68
			2	Kalita Chuck	0	0	111	111
			3	Pathali Ali Chuck	0	0	46	46
			4	Pokamura Chuck	0	0	102	102
			5	Saikia Chuck	0	0	116	116

Block Name	Panchayat Name	Village Name	Habitation Name		Present Popl			
					SC	ST	Gen	Total
2 Jorhat Central	6 Meleng Bali Chapori	4 Burha Gaon	1	Baghjan Chuck	0	0	37	37
			2	Bura Gaon Chuck	0	0	40	40
			3	Hatigarh Chuck	0	0	51	51
			4	Khunda Chuck	0	0	26	26
		5 Chowtang Gaon	1	Akhoi Bari Dhoba Chuck	0	0	112	112
			2	Baghjan & Sukan Chira	0	0	146	146
			3	Bakali Chuck	0	0	80	80
			4	Bali Chapori	0	0	92	92
			5	Barghar Parial Chuck	0	0	92	92
			6	Barua Chuck	0	0	47	47
			7	Baruah Chuck	0	0	61	61
			8	Dahah Chuck	0	0	31	31
			9	Dakhin Bhohat Chuck	0	0	31	31
			10	Dakhin Garaguri	184	0	0	184
			11	Deka Somua	122	0	88	210
			12	Difflo	0	0	33	33
			13	Gohain Chuck	0	0	35	35
			14	Katiram Chuck	0	0	122	122
			15	Maju Parial Chuck	0	0	148	148
			16	Pachoni Chuck	0	0	103	103
			17	Pachoni Chuck (2)	22	0	18	40
			18	Saikia Chuck	0	0	71	71
			19	Saru Parial Chuck	0	0	57	57
			20	Sonari Gaon	0	0	128	128
		6 Kopora Dhora Gaon	1	Dangaria Ali Maj Part	0	0	25	25
			2	Dangaria Ali Chuck	0	0	51	51
			3	Kaparadhar Medhi Chuck	0	0	61	61
			4	Madhuban Chuck	0	0	42	42
			5	Natun Lakar	0	0	53	53
			6	Sudahuna Chuck	0	0	500	500
			7	Tinikunia Chuck	0	0	46	46

Block Name	Panchayat Name	Village Name	Habitation Name		Present Popl			
					SC	ST	Gen	Total
2 Jorhat Central	6 Meleng Bali Chapori	7 Nemati Chapori	1	Lakhibari.	0	0	281	281
			2	Major Chuck.	0	0	111	111
			3	Nabari	0	0	110	110
			4	Nakatoni.	0	0	190	190
			5	No.1 Gharphalia.	0	0	156	156
			6	Pathar Chuck	0	0	102	102
			7	Rocka Chuck.	0	0	116	116
		8 No.2 Ghar Pholia Gaon	1	Buraghar Chuck	0	0	139	139
			2	Chilajori Kamar	0	0	231	231
			3	Chowali Ali Chuck	0	0	179	179
			4	Dulakhoria	0	0	134	134
			5	Holi Chuck	0	0	116	116
			6	Mantara Chuck	0	0	149	149
			7	Nawholia	0	0	218	218
			8	Neog Chuck	0	0	128	128
			9	Roumana Chuck	0	0	101	101
		9 Pakhimora Gaon	1	1 No. Pakhimoria	32	0	145	177
			2	2 No. Pakhimoria	0	0	170	170
			3	Bam Mudoi Chuck	0	0	111	111
			4	Boruah Chuck	0	0	51	51
			5	Dongoria Tool	0	0	76	76
			6	Na-Bari Chuck	0	0	71	71
			7	Natun Meleng Chuck	317	0	0	317
			8	Purani Meleng Chuck	225	0	0	225
		10 Somar Gaon	1	Akhoiboria Chuck	0	0	122	122
			2	Allonar Chuck	0	0	149	149
			3	Bakala Chuck	0	0	103	103
			4	Basa Pather Boroguri	0	0	343	343
			5	Boroguri	0	0	162	162
			6	Hatigarh Bagan	0	0	98	98
			7	Hilakhonda Chuck	22	0	70	92
			8	Komar Gaon	0	0	104	104
			9	Samar Chuck (Noholia)	0	0	147	147

Block Name	Panchayat Name	Village Name	Habitation Name		Present Popl			
					SC	ST	Gen	Total
2 Jorhat Central	7 Pachim Holongapara	1 Bhakat Gaon	1	Bhakat Gaon	0	9	468	477
			2	Chinatoli	0	0	114	114
			3	Jadav Pur Ganihi Gaon	46	11	530	587
			4	Jogi Bhata	0	0	486	486
			5	Rampur	12	337	898	1247
			6	Sotai Bagan	0	0	502	502
			7	Sotai Bhakat Kachari Gaon	0	74	4	78
		2 Dulakakhoria	1	Borbora Chuck	0	0	213	213
			2	Boruah Chuck	0	0	195	195
			3	Dulakakhoria	0	0	219	219
			4	Mazi Chuck	0	0	194	194
			5	Medhi Chuck	0	0	241	241
		3 Gharfallia Gaon	1	Haahkhowa Chuck	0	0	102	102
			2	Kaphadhara	0	0	311	311
			3	Manuramar Chuck	0	0	105	105
			4	Mithaiwala Chuck	0	0	83	83
			5	O - Guri Chuck	0	0	325	325
			6	Sotai Gharphalia	0	0	173	173
			7	Uttar Dulakhoria	0	0	167	167
		4 Hatichungi Grant	1	Ahotguri	0	0	60	60
			2	Baghmoria	0	0	222	222
			3	Borkhelia	0	0	97	97
			4	Habichuck Dakhin Hatichungi Gaon	0	0	233	233
			5	Kuchia Chuck	0	0	116	116
			6	Lekhakor Chuck	0	0	258	258
			7	Majukhelia	0	0	171	171
			8	Mallow Gaon	0	0	244	244
			9	Moina Bheta	0	0	88	88

Block Name	Panchayat Name	Village Name	Habitation Name		Present Popl			
					SC	ST	Gen	Total
2 Jorhat Central	8 Pachim Holongapara	5 Meteli Gaon	1	Baghjan Garfollia	0	0	123	123
			2	Bhakatar Chuck	0	0	105	105
			3	Chanijan Meteli	0	0	178	178
			4	Chanijan Bar Line	0	0	289	289
			5	Chanijan 3 No. Line	0	17	98	115
			6	Mothrapur	0	0	97	97
			7	Mout Chapori	0	0	140	140
			8	Mout Gaon	0	0	171	171

World Bank supported RWSS - LS Project in Jorhat District : GP & Village under Jorhat North West Development Block								
Block Name	Panchayat Name	Village Name	Habitation Name		Present Popl			
					SC	ST	Gen	Total
3 Jorhat North West	1 Baligaon	1 Borghop Chapari	1	Borghap Chapori	0	0	16	16
		2 Deka Satra Bhakei	1	Deka Satra	4	0	37	41
		3 Duboroni Pathar	1	Aruna Bharali Chuck	160	0	8	168
			2	Dobaroni Pathar	0	0	156	156
			3	Ganasotika	29	0	129	158
		4 Khangia Gaon	1	Balibat Chuck	0	0	84	84
			2	Bhati Chuck	0	0	196	196
			3	Bora Chapori	0	0	32	32
			4	Chari Ali Chuck	0	0	48	48
			5	Khutia Pota Chuck	0	0	15	15
			6	Neog Chuck	0	0	73	73
			7	Sarala Chuck	0	0	106	106
			8	Ujani Chuburi	0	0	131	131
			9	Ujani Khongia	0	0	120	120
			10	Ujoni Khongia Ali -Chuck	0	0	261	261
		5 Khutiapota	1	Abugmora Chari-Ali Chuck	0	0	68	68
			2	Ahina Chuck	60	0	0	60
			3	Bejor Chuck	0	0	70	70
			4	Bhodai Chuck	0	0	111	111
			5	Bhuyan Basti	57	0	75	132
			6	Gaonburha Chuck	137	0	0	137
			7	Hadam Chuck	50	0	0	50
			8	Hazarika Chuck	120	0	0	120
			9	Khilikhowa	118	0	0	118
			10	Kolai Chuck	0	0	68	68
			11	Konpai Chuck	135	0	0	135
			12	Marbat Chuch	0	0	211	211
			13	Mondal Chuck	0	0	19	19
			14	Phedella Chuck	111	0	0	111
			15	Raja Chuck	214	0	0	214

Block Name	Panchayat Name	Village Name	Habitation Name		Present Popl			
					SC	ST	Gen	Total
3 Jorhat North West	1 Baligaon	6 Mitha Amtol	1	Mitha Amtol	0	0	201	201
			2	Nahotia Ona Chapori	0	9	257	266
		7 Nahatia Gaon	1	Bogari Chuck	0	0	108	108
			2	Gaonburha Chuck	0	0	78	78
			3	Na-Hotia	5	0	95	100
			4	Na-Jan Khona	185	0	0	185
			5	Na-Pam	0	0	175	175
			6	Bhabali Chuck	0	0	349	349
			7	Na Bali Gaon	0	0	267	267
			8	Natun Bali Gaon	0	0	140	140
			9	Niz-Bali Gaon (2nd Part)	0	0	252	252
			10	Toko Gaon	0	0	88	88
		8 No. 2 Pahumora	1	2 No Pahumra	0	0	62	62
		9 No.1 Miri Gaon	1	1 No. Miri Gaon(Kartik Chapori)	9	0	40	49
		10 No.1 Pahumora	1	1 No. Pahumora	0	0	112	112
		11 No.2 Miri Gaon	1	Mirigaon No.2	0	3	44	47
	2 Charingia	1 Borahom Gaon	1	Bor Ahom Gaon	0	0	445	445
		2 Borahom Katoni	1	Bor Ahom Katani	0	0	403	403
			2	Melengial Chuck	0	0	245	245
		3 Charingia Gaon	1	Bagan Basti	0	0	281	281
			2	Baruah Chuck	0	0	200	200
			3	Bejor Chuck	0	0	39	39
			4	Bez Gaon	0	0	213	213
			5	Borah Chuck	0	0	175	175
			6	Charingia	0	0	175	175
			7	Dhapkata	0	0	194	194
			8	Lakhi Nagar	0	0	106	106
			9	Muslim Gaon	0	0	67	67
			10	Nagayan Chuck	0	0	116	116
			11	Neog Chuck (North)	0	0	184	184
			12	Neog Chuck (North)	10	0	155	165
			13	Panimora	0	0	65	65
			14	Pub- Melengial Chuck	0	0	116	116
			15	Sarbani Satra	30	0	145	175
			16	Saruhuge (Part)	1496	0	201	1697
			17	Telia Chuck	0	0	97	97

Block Name	Panchayat Name	Village Name	Habitation Name		Present Popl			
					SC	ST	Gen	Total
3 Jorhat North West	2 Charingia	4 Puroni Matisatra Koib	1	Ali Chuck	365	0	153	518
			2	Borhuge	1252	0	0	1252
			3	Derkuria	835	0	0	835
			4	Habi Chuck	194	0	0	194
			5	Purani Mati Satra.	24	0	94	118
			6	Puranimati	37	0	138	175
			7	Puranimati Santipur (Chetia Bari Bagan	30	0	30	60
			8	Sarachowa	0	0	145	145
			9	Saruhuge (Part)	394	0	0	394
	3 Dhekorgorah	1 Dhekorgorha	1	Dulia Gaon	0	0	442	442
			2	Gual Gaon	0	0	439	439
			3	Kamar Gaon	0	0	810	810
			4	Monaimaji	0	0	346	346
			5	Monaimaji Bamun Chuck	0	0	674	674
			6	Monaimaji Hatimuri Chuck	0	0	549	549
			7	Monaimaji Lehu Chuck	0	0	287	287
			8	Neog Chuck	0	0	345	345
			9	Rajguru	0	0	532	532
			10	Sarucharai Khat Koiborta	262	0	0	262
		2 Sarucharai Gharphalia	1	Boragi Chuck	0	0	97	97
			2	Boragibari	0	0	213	213
			3	Dhani Medhi Chuck	0	0	292	292
			4	Gharphalia Gaon	0	0	437	437
			5	Raja Khat	36	0	353	389
			6	Sarucharai Kuli Line	0	0	228	228
		3 Sensowa Gaon	1	Deka Chuck	0	0	278	278
			2	Gual Gaon	0	0	320	320
			3	Pizzali Chuck	0	0	332	332
			4	Sensua Koibortta	198	0	0	198
	4 Madhya Sarucharai G.P.	1 Gayan Gaon	1	Chutia Chuck	0	0	175	175
			2	Da-Gayan	0	0	320	320
			3	Dhenu Chuck	0	0	234	234
			4	Kalita Chuck	0	0	145	145
			5	Namoni Gayan	0	0	252	252
			6	Ujani Gayan	0	0	359	359

Block Name	Panchayat Name	Village Name	Habitation Name		Present Popl			
					SC	ST	Gen	Total
3 Jorhat North West	4 Madhya Sarucharai G.P.	2 Kuhum Jugunia	1	Gowal Chuck	0	0	64	64
			2	Kalita Chuck	0	0	104	104
			3	Kuhum Jugania	0	0	491	491
		3 Malow Khat	1	Bej-Gaon	0	0	199	199
			2	Bogoriguri 11 No. Grant	25	0	178	203
			3	Gogoi Chuck	0	0	145	145
			4	Koiborta Chuck	242	0	10	252
			5	Muktiar Chuck	0	0	123	123
			6	Na-Charaibahi Chuck	103	0	744	847
			7	Pourdar Chuck	18	0	96	114
		4 Malow Pam Gaon	1	Babaji Chuck	0	0	237	237
			2	Darabdhora Chuck	0	0	165	165
			3	Gogoi Chuck	0	0	272	272
			4	Saikia Chuck	0	0	236	236
		5 Sarucharai Bagan	1	Madhabpur	233	0	196	429
			2	Sarucharai Grant	0	0	398	398
		6 Sarucharai No.2	1	Jadav Pur	396	0	0	396
			2	Porbotia Grant	0	0	339	339
			3	Sarucharai Grant	0	0	711	711
	5 Nowboicha	1 Dulia Gaon	1	Desoi Nagar	0	0	386	386
			2	Dulia Gaon	0	0	211	211
			3	Moria Gaon	0	0	240	240
			4	Pathokor Chuck	0	0	68	68
			5	Saikia Chuck	0	0	97	97
		2 Na-Kari Brahmin Gaon	1	Borbora Tekeal	555	3	408	966
			2	Khajuriguri	0	0	363	363
			3	Na-Kari Brahmin Chuck	0	0	607	607
			4	Puzari Chuck	0	0	348	348

Block Name	Panchayat Name	Village Name	Habitation Name		Present Popl			
					SC	ST	Gen	Total
3 Jorhat North West	5 Nowboicha	3 Nowboisa Gaon	1	Akal -Soria Chuck	0	0	120	120
			2	Boidia Chuck	0	0	397	397
			3	Bora Chuck	0	0	500	500
			4	Disoi Nagar	0	0	730	730
			5	Goronia Chuck	0	0	247	247
			6	Kochor Chuck	0	0	502	502
			7	Koliani	101	0	0	101
			8	Lakhimi Khat	0	0	871	871
			9	Noi Chuck	0	0	103	103
			10	Nowboicha	0	0	451	451
			11	Puzari Chuck	0	0	344	344
			12	Saikia Chuck	0	0	97	97
			13	Sundor Chuck	0	0	322	322
	6 Pachim Charigaon	1 Chengeligaon	1	Chengeli Gaon	0	0	665	665
			2	Chengeligaon Pachim	0	0	307	307
			3	Cheuni Ali Kan	0	0	268	268
			4	Kalia Gaon Part	0	0	200	200
			5	Kenduguri Pub.	0	0	386	386
			6	Tepai Jakhoria	0	0	213	213
			7	Zakharia	0	0	220	220
		2 Gohain Tekela	1	Bhati Chuck	0	0	301	301
			2	Chandoi Tekela	0	0	630	630
			3	Gohai Tekela	11	0	436	447
			4	Logua Bora	0	0	258	258
			5	Major Chuck	0	0	483	483
			6	Suoni Gaon	0	3	253	256

Block Name	Panchayat Name	Village Name	Habitation Name		Present Popl			
					SC	ST	Gen	Total
3 Jorhat North West	6 Pachim Charigaon	3 Kalakhowa	1	Bebejia Chuck	0	0	78	78
			2	Bharali Chuck	0	0	209	209
			3	Hati Boruah	0	0	326	326
			4	Kalakhowa	0	0	252	252
			5	Kalia Chuck	0	0	276	276
			6	Kandori Chuck	0	0	200	200
			7	Lekhokor Chuck	0	0	213	213
			8	Murkota Chuck	0	0	89	89
			9	Pepera Chuck (Jyotipur)	0	0	209	209
			10	Pub Kalakhowa	0	0	275	275
			11	Santipur	0	0	145	145
			12	Seujipur	0	0	105	105
			13	Sokai Mukhia	0	0	220	220
	7 Pachim Sarucharai	1 Bhatemora Gaon	1	Ali Chuck	0	0	156	156
			2	Ali Kash Chuck	0	0	71	71
			3	Bamun Chuck	0	0	61	61
			4	Damari Chuck	33	0	379	412
			5	Deka Chuck	0	0	437	437
			6	Junaki Nagar	0	0	78	78
			7	Kalyanpur Baruah Chuck	0	0	115	115
			8	Kamar Chuck	10	0	320	330
			9	Khound Chuck	0	0	170	170
			10	Nedhai Borah Chuck	0	0	310	310
			11	Pulibor Chuck	0	0	37	37
			12	Purana Chuck	0	0	111	111
			13	Puzari Chuck	0	0	194	194
			14	Rawsolia Chuck	0	0	122	122
			15	Sarucharai Tini-Ali	0	0	28	28
			16	Tamul Nukhwa Chuck	0	0	51	51
			17	Tamuli Chuck	0	0	73	73
		2 Borbheti Gaon	1	Borbheti	15	0	185	200
		3 Majia Bhetia	1	Majia Bheti	51	0	64	115

Block Name	Panchayat Name	Village Name	Habitation Name		Present Popl			
					SC	ST	Gen	Total
3 Jorhat North West	7 Pachim Sarucharai	4 Porbotia Gaon	1	Bakori Chuck	0	0	390	390
			2	Bhakot Hati Chuck	0	0	206	206
			3	Bhihali Chuk	0	0	155	155
			4	Chapori Chuck	0	0	131	131
			5	Sahpuria Kalita Chuck	0	0	679	679
			6	Sahpuria Kusar Chuck	0	0	977	977
			7	Soda Chuck	20	0	180	200
			8	Ujani Chuck	12	0	231	243
		5 Randhanijan	1	1 No. Randhanijan	0	0	315	315
			2	2 No. Randhanijan	887	0	0	887
			3	Randhanijan Missing Gaon	0	76	0	76
		6 Rowraiajan Gaon	1	Raw Rai Jan	0	0	228	228
		7 Tingtingia	1	Bheti Chuck	48	0	62	110
			2	Kathoni Chuck Tintingia	78	0	139	217
	8 Pub- Sarucharai	1 Bohotia	1	Bohotia Chalia Chuck	0	0	292	292
			2	Bohotia Gual Gaon	0	0	428	428
			3	Bohotia Neog Chuck	0	0	1204	1204
			4	Krishna Bhandar	0	0	357	357
			5	Tarajan Gayan Gaon	0	0	634	634
			6	Tarajan Smashan	0	0	394	394
		2 Kamalaboria	1	Choladhara	0	0	443	443
			2	Choladhara Jonaki Nagar	0	0	99	99
			3	Choladhara Madhuban	0	0	213	213
			4	Choladhara Sastipith	0	0	194	194
			5	Choladhara Sowmarpith	0	0	505	505
			6	Kamalaboria	0	0	487	487
			7	Malow Ali-Rajatia	0	0	893	893

Block Name	Panchayat Name	Village Name	Habitation Name		Present Popl			
					SC	ST	Gen	Total
3 Jorhat North West	8 Pub- Sarucharai	3 Sarbaibandha	1	Chakihat	34	0	329	363
			2	Dakhin Sarbaibondha	75	0	312	387
			3	Dimaruguri Kalita Chuck	0	0	196	196
			4	Dimaruguria Botali Chuck	0	0	170	170
			5	Dimaruguria Changpota Chuck	0	0	312	312
			6	Dimaruguria Sarbaibondha	0	0	203	203
			7	Krishna Nagar	61	0	1053	1114
			8	Monai Maji	0	0	687	687
	9 Pub-Charigaon	1 Aliamukhia Gaon	1	A.T. Road Can (Ni)	0	0	214	214
			2	Ailamukhia	0	0	65	65
			3	Deowdia	0	0	104	104
			4	Dewal Chuck	0	0	118	118
			5	Garsowa	0	0	65	65
			6	Maj- Gaon	0	0	615	615
			7	Seuj -Nagar	0	0	104	104
			8	Sologuri	0	0	74	74
		2 No.2 Bamun Gaon	1	Bamungaon No.2	0	0	233	233
			2	Barhoi Chuck	0	0	392	392
			3	Bora Chuck	0	0	366	366
			4	Borbora Chuck	18	0	978	996
			5	Charingia Chuck	0	0	607	607
			6	Gandhia Chuck	0	0	390	390
			7	Gosain Chuck	0	0	915	915
			8	Janporia Chuck	0	0	568	568
			9	Manik Boruah Chuck	0	0	511	511
			10	Saikia Chuck	0	0	357	357

Block Name	Panchayat Name	Village Name	Habitation Name		Present Popl			
					SC	ST	Gen	Total
3 Jorhat North West	9 Pub-Charigaon	3 Nowsalia	1	Bamunar Chuck	0	0	152	152
			2	Baskar Nagar	303	0	394	697
			3	Gubor Chuck	0	0	85	85
			4	Komar Chuck	0	0	70	70
			5	Namoni Dokotia Chuck	0	0	172	172
			6	Natun Sonari Chuck (Ni)	0	3	254	257
			7	Nowholia	0	0	72	72
			8	Sologuri Chuck	0	0	51	51
			9	Sonari Chuck	0	0	252	252
			10	Upor Dokotia Chuck	0	0	342	342
	10 Rajahowli	1 Desaikash Bamun Gaon	1	Disoikash	51	0	869	920
			2	Koroka Toli	0	0	745	745
		2 Koibatra Gaon	1	Gonasotika	0	0	393	393
			2	Hukimora	0	0	105	105
			3	Jankhona	291	0	288	579
			4	Kakila Mukh	0	0	66	66
			5	Kathkotia	0	0	192	192
			6	Kola Chuck	197	6	464	667
			7	Muslim Mout	0	0	175	175
			8	Napamua	0	0	201	201
			9	Rongdoi Koiborta	449	0	8	457
			10	Salkara Duba Tokoru Chuck	0	0	187	187
			11	Saru Mout	0	0	228	228
		3 Raja Howli Gaon	1	Jankhona Chuck	561	0	0	561
			2	Kolioni	496	0	0	496
			3	Noi Chuck	30	0	220	250
			4	Rajahowli	92	0	399	491
			5	Rajahowli Sarmah Chuck	0	0	111	111
			6	Rajahowli Sonari Chuck	52	0	276	328
			7	Tokoru Gaon	64	0	199	263

Block Name	Panchayat Name	Village Name	Habitation Name		Present Popl			
					SC	ST	Gen	Total
3 Jorhat North West	10 Rajahowli	4 Rajotia	1	Bansabari Satra	0	0	63	63
			2	Bonia Chuck	71	0	0	71
			3	Dakhin Sonari	0	0	131	131
			4	Katiramar Chuck	250	0	0	250
			5	Lekharu Chuck	0	0	138	138
			6	Nakari Chuck	0	0	349	349
			7	Pachim Disoi Nagar	0	0	125	125
			8	Rajotia	0	0	412	412

Population Projection :

Population in 2011 AD :

A)	Jorhat Development Block :	141947
B)	Jorhat Central Development Block :	58021
C)	Jorhat North West Development Block :	79797
Therefore, total population of the Project area in 2011 :		279765

Decadal Growth Rate : 17 %
Therefore, Annual; Growth Rate : 1.7 %

Present Population in 2013 = 279765 + 279765 x 0.034 = 289277 Souls
The project shall be commissioned in 2015 AD.
Therefore,
Population in the Year of commissioning (2015) :
= 289277 + 289277 x 0.034 = 299112 Souls
Population after 10 Years of commissioning in (2025) = :
= 299112 + 299112 x 1.17 = 349962 Souls
Population after 15 Years of commissioning in (2030) :
= 349962 + 349962 x 0.085 = 379708 Souls
Population after 30 Years of commissioning in (2045) :
= 409455 + 409455 x 1.17 = 479062 Souls

Water Demand for Design of the Water Treatment Plant:

Rate of Supply = 70 lpcd.
Losses = 5 % Production Loss + 10 % Transmission Loss, Total 15 %

Daily Requirement of Water at various stages

a) In the Year of commissioning in (2015) :	24078550.48 Ltr	24.1 MLD
b) After 10 Years of commissioning in (2025) :	28171904.06 Ltr	28.2 MLD
c) After 15 Years of commissioning in (2030) :	30566515.91 Ltr	30.6 MLD
d) After 30 Years of commissioning in (2045) :	38564519.47 Ltr	38.6 MLD

DETAILED DESIGN OF CW PUMPING MAIN FROM TREATMENT PLANT TO RESPECTIVE ESR FOR ROUTE NO. - I (JORHAT BLOCK)

Present population 2011	=	1,16,145	soul	Working period		=	20 hr
Population at installation 2015	=	1,20,094	soul	Head available at TP Site		=	80 m
Design population 2030	=	1,52,453	soul	Minimum terminal head		=	20 m
Design population 2045	=	1,92,344	soul	RL OF TP SITE		=	63.25 m
Rate of supply	=	70	LPCD	Hydraulic level at service reservoir		=	80 + RL m
Rate of supply with wastage	=	77	LPCD			=	143.25 m
Peak flow factor	=	1		Design value of 'C'	DI	=	140
Peak flow in LPM	=	0.064166667	x design population		PVC & AC	=	140

Line	Present population on the line	Present population to be served	Design population on the the	Design polulation to be served by	Length of line (m)	Peak flow (LPM)	Pipe dia				Head loss for 1000 m (m)	Total head loss	Hydraulic level (m)	RL (m)	Terminal head (m)	Remarks
							DI	AC	PVC							
									OD	ID						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
TP - A	0	116145	0	192344	3150	12342.07	450				2.96	9.32	133.93	64.38	69.55	
A-B	0	27085	0	44855	540	2878.17	200				10.35	5.59	128.34	64.69	63.65	
B-ESR1	5545	5545	9183	9183	150	589.24	100				16.06	2.41	125.93	64.93	61.00	ESR1
B-C	0	21540	0	35672	2840	2288.93	200				6.77	19.23	109.11	65.05	44.06	
C-ESR2	7890	7890	13066	13066	100	838.43	100				30.85	3.09	106.03	65.59	40.44	ESR2
C-D	0	13650	0	22605	390	1450.51	150				11.82	4.61	104.50	64.87	39.63	
D-ESR3	5120	5120	8479	8479	1850	544.07	150				1.92	3.55	100.95	66.54	34.41	ESR3
D-ESR4	8530	8530	14126	14126	2980	906.43	150				4.95	14.75	89.75	66.30	23.45	ESR4
A-E	0	89060	0	147489	4070	9463.90	400				3.21	13.06	120.86	64.12	56.74	
E-T	0	17600	0	29147	1060	1870.25	200				4.66	4.94	115.92	65.61	50.31	
T-ESR20	13330	13330	22075	22075	2240	1416.50	150				11.31	25.33	90.59	65.59	25.00	ESR20
T-ESR6	4270	4270	7071	7071	4490	453.75	150				1.37	6.15	109.77	67.01	42.76	ESR6
E-F	0	71460	0	118343	370	7593.65	350				4.09	1.51	119.35	64.07	55.28	
F-G	0	42445	0	70292	1540	4510.39	350				1.56	2.40	116.95	64.77	52.18	
G-ESR18	10450	10450	17306	17306	200	1110.46	100				51.92	10.38	106.56	64.98	41.58	ESR18
G-H	0	31995	0	52986	1760	3399.93	300				1.96	3.45	113.50	65.84	47.66	
H-ESR5	1920	1920	3180	3180	1830	204.03	100				2.25	4.12	109.38	66.39	42.99	ESR5
H-I	0	30075	0	49806	1780	3195.90	300				1.74	3.10	110.40	65.39	45.01	
I-J	0	15355	0	25429	1590	1631.69	200				3.62	5.76	104.64	66.08	38.56	
J-ESR8	3625	3625	6003	6003	250	385.21	100				7.31	1.83	102.82	66.30	36.52	ESR8
J-ESR21	11730	11730	19426	19426	2170	1246.48	150				8.92	19.36	85.29	65.83	19.46	ESR21
I-K	0	14720	0	24377	1170	1564.21	200				3.35	3.92	100.72	65.52	35.20	
K-ESR19	7040	7040	11659	11659	150	748.10	100				24.98	3.75	96.98	66.77	30.21	ESR19
K-L	0	7680	0	12719	1460	816.11	150				4.07	5.94	94.78	66.27	28.51	
L-ESR10	1920	1920	3180	3180	470	204.03	100				2.25	1.06	93.72	66.54	27.18	ESR10
L-M	0	5760	0	9539	1520	612.08	150				2.39	3.63	91.15	66.32	24.83	
M-ESR11	3200	3200	5299	5299	250	340.05	100				5.80	1.45	89.70	64.41	25.29	ESR11
M-ESR12	2560	2560	4240	4240	1490	272.04	100				3.84	5.72	85.43	66.02	19.41	ESR12

F-N	0	29015	0	48051	5100	3083.26	300				1.63	8.31	111.04	65.54	45.50	
N-ESR13	4055	4055	6715	6715	520	430.90	100				8.99	4.67	106.36	65.88	40.48	ESR13
N-O	0	24960	0	41335	860	2652.36	250				3.00	2.58	108.46	65.47	42.99	
O-ESR14	5120	5120	8479	8479	260	544.07	100				13.85	3.60	104.85	65.65	39.20	ESR14
O-P	0	19840	0	32856	510	2108.28	250				1.96	1.00	107.46	65.30	42.16	
P-ESR15	3415	3415	5655	5655	280	362.89	100				6.54	1.83	105.62	65.41	40.21	ESR15
P-Q	0	16425	0	27201	5980	1745.39	250				1.38	8.25	99.20	65.26	33.94	
Q-R	0	8960	0	14838	1180	952.13	150				5.42	6.40	92.81	64.29	28.52	
R-ESR16	7040	7040	11659	11659	270	748.10	100				24.98	6.74	86.06	64.55	21.51	ESR16
R-ESR17	1920	1920	3180	3180	390	204.03	100				2.25	0.88	91.93	64.65	27.28	ESR17
Q-S	0	7465	0	12363	760	793.26	150				3.86	2.93	96.27	65.98	30.29	
S-ESR7	4690	4690	7767	7767	470	498.38	100				11.78	5.54	90.73	64.48	26.25	ESR7
S-ESR9	2775	2775	4596	4596	410	294.88	100				4.46	1.83	94.44	65.56	28.88	ESR9
Total	**116145**				**58850.00**											

Summary of pipe dia and length

0.00

Dia (mm)	Length (m)
500	0.00
450	3150.00
400	4070.00
350	1910.00
300	8640.00
250	7350.00
200	7200.00
150	19040.00
100	7490.00
Total	**58850.00**

Design of Clear Water Pump Set

(i) Total Daily Demand in 2030 = 11738899.4 LPD

(ii) Total Hourly Demand = 586944.97 LPH

(iii) Total Demand Per Minute = 9782.42 LPM

(iv) Total Head of Pump = 80 M

$$\text{HP Reqd.} = \frac{9782.42 \times 80}{4500 \times 0.7}$$

= 248.44 **HP**

provide 3 Nos. pump (2W + 1S) of capacity = 125.00 HP each

For BoQ Purpose, let us have 3 Pump Set, each giving 81.5 lps against a total head of 80.0 m

DETAILED DESIGN OF CW PUMPING MAIN FROM TREATMENT PLANT TO RESPECTIVE ESR FOR ROUTE NO. - II (JORHAT NORTH WEST BLOCK)

Present population 2013	=	66,340	soul	Working period		=	20	hr
Population at installation 2015	=	68,596	soul	Head available at TP Site		=	70	m
Design population 2030	=	87,079	soul	Minimum terminal head		=	20	m
Design population 2045	=	1,09,864	soul	RL OF TP SITE		=	63.25	m
Rate of supply	=	70	LPCD	Hydraulic level at service reservoir		=	70 + RL	m
Rate of supply with wastage	=	77	LPCD			=	133.25	m
Peak flow factor	=	1		Design value of 'C'	DI	=	140	
Peak flow in LPM	=	0.064166667	x design population		PVC & AC	=	140	

Line	Present population on the line	Present population to be served	Design population on the the	Design polulation to be served by	Length of line (m)	Peak flow (LPM)	Pipe dia				Head loss for 1000 m (m)	Total head loss	Hydraulic level (m)	RL (m)	Terminal head (m)	Remarks
							DI	AC	PVC							
									OD	ID						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
TP - A	0	66340	0	109864	9250	7049.58	400				1.86	17.21	116.05	63.25	52.80	
A-B	0	38185	0	63237	2910	4057.70	300				2.71	7.89	108.16	64.15	44.01	
B-ESR1	5120	5120	8479	8479	100	544.07	100				13.85	1.39	106.77	63.70	43.07	ESR 1
B-C	0	33065	0	54758	3120	3513.63	300				2.08	6.49	101.67	63.76	37.91	
C-ESR2	7040	7040	11659	11659	100	748.10	100				24.98	2.50	99.17	63.94	35.23	ESR 2
C-D	0	26025	0	43099	1160	2765.53	300				1.33	1.54	100.13	63.88	36.25	
D-ESR3	2350	2350	3892	3892	150	249.72	100				3.28	0.49	99.63	64.41	35.22	ESR 3
D-E	0	23675	0	39207	1050	2515.81	250				2.72	2.86	97.27	64.03	33.24	
E-ESR4	5545	5545	9183	9183	200	589.24	100				16.06	3.21	94.06	63.89	30.17	ESR 4
E-F	0	18130	0	30025	2840	1926.57	250				1.66	4.71	92.56	63.97	28.59	
F-ESR5	6825	6825	11303	11303	300	725.25	100				23.59	7.08	85.48	63.46	22.02	ESR 5
F-G	0	11305	0	18722	1150	1201.32	200				2.05	2.36	90.20	63.72	26.48	
G-ESR6	4905	4905	8123	8123	1260	521.23	150				1.78	2.24	87.96	64.17	23.79	ESR 6
G-ESR7	6400	6400	10599	10599	1590	680.09	150				2.91	4.63	85.57	64.41	21.16	ESR7
A-H		28155	0	46627	3690	2991.87	300				1.54	5.68	110.36	64.17	46.19	
H-ESR8	4690	4690	7767	7767	200	498.38	100				11.78	2.36	108.01	63.51	44.50	ESR 8
H-I	0	23465	0	38860	1760	2493.49	300				1.10	1.94	108.43	64.53	43.90	
I-ESR15	2985	2985	4943	4943	1230	317.20	100				5.10	6.27	102.15	65.59	36.56	ESR 15
I-J	0	20480	0	33916	910	2176.29	250				2.08	1.89	106.53	64.93	41.60	
J-ESR9	3415	3415	5655	5655	200	362.89	100				6.54	1.31	105.23	64.17	41.06	ESR9
J-K	0	17065	0	28261	2935	1813.40	250				1.48	4.34	102.19	65.60	36.59	
K-ESR10	4690	4690	7767	7767	250	498.38	100				11.78	2.95	99.24	64.41	34.83	ESR 10
K-L	0	12375	0	20494	1125	1315.02	200				2.43	2.73	99.46	65.22	34.24	

L-ESR11	1920	1920	3180	3180	1570	204.03	100				2.25	3.53	95.92	65.12	30.80	ESR 11
L-M		10455	0	17314	1065	1110.99	200				1.78	1.90	97.56	64.17	33.39	
M-ESR12	1920	1920	3180	3180	815	204.03	100				2.25	1.83	95.73	65.83	29.90	ESR 12
M-N	0	8535	0	14135	1330	906.97	150				4.95	6.58	90.98	65.77	25.21	
N-ESR13	4055	4055	6715	6715	920	430.90	150				1.25	1.15	89.83	64.41	25.42	ESR 13
N-ESR14	4480	4480	7419	7419	3840	476.06	150				1.50	5.76	85.22	65.12	20.10	ESR 14
Total	**66340**				**47020**											

0

Summary of pipe dia and length

Dia (mm)	Length (m)
450	0.00
400	9250.00
350	0.00
300	12640.00
250	7735.00
200	3340.00
150	8940.00
100	5115.00
Total	**47020.00**

Design of Clear Water Pump Set

(i) Total Daily Demand in 2030 = 6705054.79 LPD

(ii) Total Hourly Demand = 335252.74 LPH

(iii) Total Demand Per Minute = 5587.55 LPM

(iv) Total Head of Pump = 70 M

$$\text{HP Reqd.} = \frac{5587.55 \times 70}{4500 \times 0.7}$$

= 124.17 HP

provide 3 Nos. pump (2W + 1S) of capacity = 75.00 HP each

For BoQ Purpose, let us have 3 Pump Set, each giving 46.6 lps against a total head of 70.0 m

DETAILED DESIGN OF CW PUMPING MAIN FROM TREATMENT PLANT TO RESPECTIVE ESR FOR ROUTE NO. - III (CENTRAL JORHAT BLOCK)

Present population 2013	=	41,590	soul	Working period		=	20	hr
Population at installation 2015	=	43,004	soul	Head available at TP Site		=	70	m
Design population 2030	=	54,592	soul	Minimum terminal head		=	20	m
Design population 2045	=	68,876	soul	RL OF TP SITE		=	63.25	m
Rate of supply	=	70	LPCD	Hydraulic level at service reservoir		=	70 + RL	m
Rate of supply with wastage	=	77	LPCD			=	133.25	m
Peak flow factor	=	1		Design value of 'C'	DI	=	140	
Peak flow in LPM	=	0.064166667	x design population		PVC & AC	=	140	

Line	Present population on the line	Present population to be served	Design population on the the	Design polulation to be served by	Length of line (m)	Peak flow (LPM)	Pipe dia				Head loss for 1000 m (m)	Total head loss (m)	Hydraulic level (m)	RL (m)	Terminal head (m)	Remarks
							DI	AC	PVC							
									OD	ID						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
TP - A	0	41590	0	68876	7600.00	4419.53	350				1.50	11.4000	121.85	64.65	57.20	
A-ESR1	7465	7465	12363	12363	1250.00	793.26	100				27.85	34.8125	87.04	65.12	21.92	ESR-1
A-B	0	34125	0	56513	2370.00	3626.27	300				2.20	5.2140	116.64	64.22	52.42	
B-ESR2	8530	8530	14126	14126	2100.00	906.43	150				4.95	10.3950	106.24	64.41	41.83	ESR-2
B-C	0	25595	0	42387	2450.00	2719.84	250				3.15	7.7175	108.92	64.87	44.05	
C-ESR3	6400	6400	10599	10599	1150.00	680.09	100				20.94	24.0810	84.84	65.17	19.67	ESR-3
C-D	0	19195	0	31788	1180.00	2039.74	200				5.47	6.4546	102.46	65.72	36.74	
D-E	0	5545	0	9183	1100.00	589.24	200				0.55	0.6050	101.86	65.72	36.14	
E-ESR4	5545	5545	9183	9183	970.00	589.24	100				16.06	15.5782	86.89	66.08	20.81	ESR-4
D-F	0	13650	0	22605	2190.00	1450.51	200				2.91	6.3729	95.49	66.57	28.92	
F-ESR5	6610	6610	10947	10947	1780.00	702.41	150				3.09	5.5002	89.99	66.77	23.22	ESR-5
F-G	0	7040	0	11659	1870.00	748.10	200				0.85	1.5895	93.90	66.12	27.78	
G-ESR6	7040	7040	11659	11659	1550.00	748.10	150				3.47	5.3785	88.52	65.59	22.93	ESR-6
Total	**41590**				**27560.00**											

0

Summary of pipe dia and length

Dia (mm)	Length (m)
350	7600.00
300	6000.00
250	2190.00
200	2970.00
150	5430.00
100	3370.00
Total	**27560.00**

Design of Clear Water Pump Set

(i) Total Daily Demand in 2030 = 4203545.8 LPD

(ii) Total Hourly Demand = 210177.29 LPH

(iii) Total Demand Per Minute = 3502.95 LPM

(iv) Total Head of Pump = 70 M

$$\text{HP Reqd.} = \frac{3502.95 \times 70}{4500 \times 0.7}$$

= 77.84 HP

provide 3 Nos. pump (2W + 1S) of capacity = 50.00 HP each

For BoQ Purpose, let us have 3 Pump Set, each giving 29.19 lps against a total head of 70.0 m

Annexure - C

CALCULATION OF ECONOMIC DIAMETER OF RAW WATER PUMPING MAIN AND PUMP FOR COMPOSITE WATER SUPPLY SCHEME FOR QUALITY AND SUSTAINABILITY IN JORHAT, JORHAT CENTRAL AND JOIRHAT NORTH WEST DEVELOPMEMNT BLOCK OF JORHAT DISTRICT UNDER WORLD BANK ASSISTED RWSS - LS PROGRAMME IN ASSAM.

HYDRAULIC & PUMP DATA			
1) Water requirement :			
a) Initial stage in the year	2015 AD =	24.10	MLD
b) Intermediate stage in the y	2030 AD =	30.60	MLD
c) Ultimate stage in the year	2045 AD =	38.60	MLD
2) Length of the pumping main =		6530.0	Meter
3) Static head for pump =		18	Meter
4) Design Period =		30.0	Years
5) Combined efficiency of pump & motor =		70	%
6) Cost of pumping unit (per KW) =		7000.00	Rs. / KW.
7) Interest Rate =		10.0	%
8) Life of elctrical motor & pump =		15	Years
9) Electrical energy charges =		6.4	Rs. / Unit
10) Pumping Hours =		20	Hours
11) Residual Head =		1.0	Meter

PIPE DATA					
DIA	TYPE	CLASS	HWC VALUE	RATE Rs./ meter	Remark
400	DI	K9	140	5537	This rates are departmentaly accepted rate for various on-going NRDWP Schemes of APHED
450	DI	K9	140	6588	
500	DI	K9	140	7733	
600	DI	K9	140	10058	
700	DI	K9	140	12977	
750	DI	K9	140	14603	
800	DI	K9	140	15928	
900	DI	K9	140	19295	
1000	DI	K9	140	23792	

TABLE - 1 : GENERAL		
	1st. 15 years	**2nd. 15 Years**
1) Discharge at Installatiom =	24.10 MLD	30.60 MLD
2) Discharge at the end of 15 years	30.60 MLD	38.60 MLD
3) Average discharge =	27.35 MLD	34.60 MLD
4) Average hours of pumping for average discharge =	17.9 Hours	17.9 Hours
5) KW required at the said efficiency of pumping sets =	5.95 *H1	7.51 *H1
6) Annual cost (Rs.) of electrical energy =	41785.4 *kw1	41906.09 *kw2

TABLE - 2 : VELOCITY AND HEAD LOSS FOR DIFFERENT PIPE SIZES & DIFFERENT PIPE MATERIALS

Pipe size in mm.	Pipe materials	Frictional Head Loss Per 1000 meter		Velocity in Meter / Sec.		Total Head Loss (in meter) for **6530.00** meter length of pipe line including the static head **18.00** meter and residual head of **1.00** meter.						Pipe size in mm.	Pipe materials
		1st. Stage flow	2nd. Stage	1st. Stage flow	2nd. Stage flow	1st. Stage flow			2nd. Stage flow				
						Frictional Loss	Other Losses (10 %)	Total Loss, H1	Frictional Loss	Other Losses (10 %)	Total Loss, H2		
400	DI	20.15	30.97	3.3838	4.2684	131.56	13.16	163.71	202.26	20.23	241.49	400	DI
450	DI	11.35	17.45	2.6736	3.3726	74.12	7.41	100.54	113.96	11.40	144.36	450	DI
500	DI	6.79	10.45	2.1656	2.7318	44.37	4.44	67.81	68.22	6.82	94.04	500	DI
600	DI	2.80	4.30	1.5039	1.8971	18.26	1.83	39.08	28.07	2.81	49.87	600	DI
700	**DI**	**1.32**	**2.03**	**1.1049**	**1.3938**	**8.62**	**0.86**	**28.48**	**13.25**	**1.32**	**33.57**	**700**	**DI**
750	DI	0.94	1.45	0.9625	1.2141	6.16	0.62	25.77	9.47	0.95	29.41	750	DI
800	DI	0.69	1.06	0.8459	1.0671	4.50	0.45	23.95	6.91	0.69	26.60	800	DI
900	DI	0.39	0.60	0.6684	0.8431	2.53	0.25	21.79	3.90	0.39	23.28	900	DI
1000	DI	0.23	0.36	0.5414	0.6829	1.52	0.15	20.67	2.33	0.23	21.56	1000	DI

TABLE - 3 : KILOWATTS & COST OF PUMP SETS REQUIRED FOR DIFFERENT PIPE SIZES & MATERIALS ALONG WITH RESPECTIVE PIPE COST

Sl. No.	Diameter of Pipe	Type of Pipe Material	1st. Stage flow of **30.60** million ltr./day			2nd. Stage flow of **38.60** million ltr./day			Cost of Pipe per unit length in Rs.	Total Cost of **6530.0** meter long pipe line in Thousand Rupees	Diameter of Pipe	Type of Pipe Material	Class of Pipe
			Total Head in meter (H1)	KW1 Required with 50 % standby	Pump cost @ Rs. **7000.00** Per KW (Ths. Rs.)	Total Head in meter (H1) h2	KW2 Required with 50 % standby	Pump cost @ 7000.00 Per KW (Ths. Rs.)					
1	400	DI	163.71	1462	10232	241.49	2720	19039	5537	36157	400	DI	K9
2	450	DI	100.54	898	6283	144.36	1626	11381	6588	43020	450	DI	K9
3	500	DI	67.81	605	4238	94.04	1059	7414	7733	50496	500	DI	K9
4	600	DI	39.08	349	2443	49.87	562	3932	10058	65679	600	DI	K9
5	**700**	**DI**	**28.48**	**254**	**1780**	**33.57**	**378**	**2647**	**12977**	**84740**	**700**	**DI**	**K9**
6	750	DI	25.77	230	1611	29.41	331	2319	14603	95358	750	DI	K9
7	800	DI	23.95	214	1497	26.60	300	2097	15928	104010	800	DI	K9
8	900	DI	21.79	195	1362	23.28	262	1836	19295	125996	900	DI	K9
9	1000	DI	20.67	185	1292	21.56	243	1700	23792	155362	1000	DI	K9

TABLE - 4 : COMPARATIVE STATEMENT OF OVERALL STRUCTURE OF PUMPING MAIN FOR DIFFERENT PIPE SIZES & DIFFERENT PIPE MATERIALS

Diameter of Pipe	Type of Pipe Material	Class of Pipe	1st. Stage flow of **30.60** million ltr./day			Capitalised Total Cost in Thousand Rupees	2nd. Stage flow of **38.60** million ltr./day			Initial investment for pump & Annual Energy cost in Thousand Rupees	Grand total of Capitalised cost for 30 years in Thousand Rupees	Diameter of Pipe	Type of Pipe Material
			Cost of Pump sets in Thousand Rupees	Annual Energy cost in Thousand Rupees	Capitalised Energy cost in Thousand Rupees		Cost of Pump sets in Thousand Rupees	Annual Energy cost in Thousand Rupees	Capitalised Energy cost in Thousand Rupees				
400	DI	K9	10232	40718	309708	319940	19039	75985	577946	142914	499010	400	DI
450	DI	K9	6283	25006	190194	196477	11381	45423	345490	85432	324929	450	DI
500	DI	K9	4238	16865	128276	132514	7414	29589	225059	55652	238662	500	DI
600	DI	K9	2443	9721	73935	76378	3932	15693	119365	29516	171573	600	DI
700	**DI**	**K9**	**1780**	**7083**	**53875**	**55655**	**2647**	**10564**	**80348**	**19868**	**160263**	**700**	**DI**
750	DI	K9	1611	6410	48757	50368	2319	9255	70394	17407	163133	750	DI
800	DI	K9	1497	5956	45301	46798	2097	8371	63672	15745	166552	800	DI
900	DI	K9	1362	5419	41216	42578	1836	7327	55727	13780	182354	900	DI
1000	DI	K9	1292	5141	39100	40392	1700	6785	51610	12762	208516	1000	DI

Check for Surge Pressure

SL No	Pipe Size in mm	Type of pipe	Class of pipe	Wall thickness in mm	E value for pipe in kg/m^2	Velocity in 1st. Stage	Velocity in 2nd. Stage	velocity of Pr. Wave "C " in 1st. Stage	velocity of Pr. Wave "C " in 2st. Stage	Hmax in 1st. Stage	Hmax in 2nd. Stage	Max. Total head with line pressure	Allowable head (including surge)	Remarks
1	400	DI	K9	8.1	1.7E+10	3.4	4.3	1126.1	1126.1	388.4	490.0	731.5	510	Unsafe
2	450	DI		8.5	1.7E+10	2.7	3.4	1111.2	1111.2	302.8	382.0	526.4	480	Unsafe
3	500	DI		9.0	1.7E+10	2.2	2.7	1100.6	1100.6	243.0	306.5	400.5	460	Unsafe
4	600	DI		9.9	1.7E+10	1.5	1.9	1080.9	1080.9	165.7	209.0	258.9	430	Safe
5	**700**	**DI**		**10.8**	**1.7E+10**	**1.1**	**1.4**	**1065.3**	**1065.3**	**120.0**	**151.4**	**184.9**	**410**	**Safe**
6	750	DI		11.3	1.7E+10	1.0	1.2	1059.7	1059.7	104.0	131.2	160.6	390	Safe
7	800	DI		11.7	1.7E+10	0.8	1.1	1052.6	1052.6	90.8	114.5	141.1	380	Safe
8	900	DI		12.6	1.7E+10	0.7	0.8	1042.1	1042.1	71.0	89.6	112.9	370	Safe
9	1000	DI		13.5	1.7E+10	0.5	0.7	1033.3	1033.3	57.0	71.9	93.5	360	Safe
10	400	DI	K7	6.3	1.7E+10	3.4	4.3	1070.2	1070.2	369.1	465.6	707.1	125	Unsafe
11	450	DI		6.6	1.7E+10	2.7	3.4	1053.3	1053.3	287.1	362.1	506.5	125	Unsafe
12	500	DI		7	1.7E+10	2.2	2.7	1042.1	1042.1	230.1	290.2	384.2	125	Unsafe
13	600	DI		7.7	1.7E+10	1.5	1.9	1020.8	1020.8	156.5	197.4	247.3	125	Unsafe
14	**700**	**DI**		**9**	**1.7E+10**	**1.1**	**1.4**	**1021.2**	**1021.2**	**115.0**	**145.1**	**178.7**	**125**	**Unsafe**
15	750	DI		9.7	1.7E+10	1.0	1.2	1022.7	1022.7	100.3	126.6	156.0	125	Unsafe
16	800	DI		10.4	1.7E+10	0.8	1.1	1024.0	1024.0	88.3	111.4	138.0	150	Unsafe
17	900	DI		11.2	1.7E+10	0.7	0.8	1013.1	1013.1	69.0	87.1	110.4	150	Safe
18	1000	DI		12	1.7E+10	0.5	0.7	1003.9	1003.9	55.4	69.9	91.5	150	Safe

Therefore,

1. With this set of condiditions, economic diameter of raw water pumping main = 700 mm dia. DI (K9) pipe
2. Required capacity of pump with 50 % provision = 254.0 KW. = 340.48 HP Say, 375.0 HP.
3. Let Us Provide 34 Nos of Raw Water Pump (2 W + 1 S) of capacity = 125 HP Each

ANNEXURE - D

HYDRAULIC DESIGN AND UNIT SIZING OF VARIOUS UNIT OF 28.2 MLD CAPACITY WATER TREATMENT PLANT IN 20 HOURS OF OPERATION

Capacity of the Treatment plant = 28.20 MLD.

Operating hours of the Plant = 20.0 hours

Therefore, hourly rate of treatment = 1410.0 Cu.m.

Since, hourly rate of treatment is very high, we propose to make twin units for aerator, rapid mixer and clariflocculator.

Hence, hourly rate of flow for each of these three units shall be 705.0 Cu.m.

Now, the unit size of various system component of the scheme are as below :

1. The Aerator :

Since raw water is from surface source and does not contain much minerals viz. iron, manganese etc., cascade type aerator is proposed for the scheme. In cascade aerators water is allowed to flow downwards after spreading over inclined thin sheets and the turbulence is secured by allowing the water to pass through a series of steps ranging from 4 to 6 nos. As per CPHEEO manual, space requirement of the aerator varies from 0.015 to 0.045 m^2 /m^3/hour.

1.1 Influent Pipe Size :

Water from the River Intake shall directly come to the aerator through the raw water main. Therefore, a velocity of 0.8 m/sec is assumed in the influent pipe.

Rate of flow in the influent pipe = 705.0 Cu.m/hour.

= 0.196 Cu.m./sec.

With0.80 m/sec velocity, C/S area of the pipe required is

= 0.245 Sq.m.

Therefore, required dia of the influent pipe = 0.558 m.

Let us provide 600 mm dia DI pipe as aerator Inlet.

1.2 Aeration Deck Size :

In our case, we propose for 2 aerator with hourly rate of flow of 705.0 m^3/ hour, per aerator. Providing a space of 0.020 m^2 /m^3/hour for the purpose, space required in the aerator deck is, 705.0 x 0.025 = 14.375 Sq.m. Let us provide a cascade aerator of overall inner diameter 6.25 m. with 7 steps.

2. Rapid Mix Unit (Flash mixer) :

To help in formation of micro floc with resultant utilization of chemical coagulant preventing localization of concentration and premature formation of hydroxides which leads to less efficient utilization of the coagulant and for rapid & uniform dispersion throughout the volume of water, mechanical type rapid mix unit is proposed.

In our case,

No. of Flash Mixer = 1

Therefore, design flow to be treated= 705.0 m^3/hour.

Detention time = 30 sec. (range – 20 to 60 sec.)

Ratio of height to dia = 1.5:1 (range – 1:1 to 3:1)

Dimension of the tank is given by,

Volume = Flow x detention time

$$= \left(\frac{705.0}{60 \times 60} \right) \times 30 = 5.875 \ M^3.$$

For a ratio of 1.5 : 1 for tank height to diameter, sizes of the tank shall be,

$$\left(\pi/4 \times D^2 \right) \times 1.5 \ D = 5.875 \ m^3$$

$$\therefore \ D = 1.705 \text{ m, say, } 2.0 \text{ m.}$$

And height, H = 1.5 D = 3.0 m.

With a free board of 0.3 m., the total height of the rapid mixing tank shall be 3.3 m.

To match with the level of raw water channel and to maintain the required hydraulic gradient between various units of the treatment plant, suitable staging may have to provide for the flash mixer.

3. Clariflocculator :

The Clariflocculator is proposed to eliminate the alum floc developed in the flash mixer and to get clarified water to minimize the load on the filter unit and thus obviate the necessity of frequent back washing. We propose a circular Clariflocculator having vertical paddles. The water enters through a central influent pipe and is fed to the flocculation zone through ports. The effluent from flocculation zone passes below the partition wall dividing the flocculator portion and the clarifier portion. The clarified effluent is collected by a peripheral effluent launder. For our case, we are to design the Clariflocculator size for the following data :

Desired average outflow from Clariflocculator

$$= 705.0 \ M^3/\text{hour}$$

Detention period = 30 minute.

Average value of velocity gradient, G = 40 S^{-1}.

Now, considering a velocity of 0.8 m/sec, influent pipe diameter required is,

$$= \sqrt{\frac{705.0}{60 \times 60} \times \frac{1}{0.8} \times \frac{4}{\pi}} = 0.558 \text{ m.},$$

Let us provide a influent pipe of diameter, 600 mm.

Now, Volume of the flocculator

= (705.0 / 60) x 30 = 352.50 m^3

(Considering 30 sec detention)

Providing a water depth of 4.5 m., area of the flocculator required = 78.33 m^2

Let D_f be the diameter of the flocculator and D_p be the influent pipe diameter.

Then, $\frac{\pi}{4} \times (D_f^2 - D_p^2) = 78.33 \text{ m}^2$,

Since D_p = 600+350x2=1300 mm, therefore, D_f =10.07 m.

Let us provide a tank of 10.0 m. for flocculation zone.

For designing the Clarifier, let us assume a surface overflow rate of 60 $m^3/m^2/day$

Therefore, surface area of the clarifier required

$$= \frac{705.0 \times 20}{60} = 235.0 \text{ m}^2.$$

Let D_c be the diameter of the clarifier, and D_f be the outer diameter of the flocculator. Considering 250 thick wall for flocculator zone, outer diameter of the flocculator, D_f = 10.5 m.

Then, $\frac{\pi}{4} \times (D_c^2 - D_f^2) = 235.0\ m^2$,

Since D_f = 9.5 m., therefore, D_c =19.98 m.

Let us provide a tank of 20.0 m. for clarifier zone.

Now, length of the weir = π x 20 = 62.80 m.

Therefore, weir loading

$= \frac{705.0 \times 20}{62.80} = 224.35 m^3/day/m < 300 m^3/day.m.$, O.K.

4. The Filter Unit :

As the raw water shall be discharged at atmospheric pressure at the outlet of the aerator, the aerated water shall travel under gravity to other units of the treatment plant. Therefore, instead of pressure filter, we propose a rapid sand filter for the purpose.

For rapid sand gravity filters, standard rate of filtration as prescribed in the said Manual is 4.8 to 6.0 m^3/m^2/hour. Since ours is a plant of high capacity having hourly requirement of 1410.0 Cu.m, using an average limit of 5.0 m^3/m^2/hour, space required for the filter bed is worked out as 282.0 m^2 for a average outflow of 1410.0 m^3 per hour. For having flexibility of use, if we provide 8 (eight) beds, area of each bed required is 35.35 m^2. Applying a length to width ratio of 1.25:1, the size of each bed shall be 5.11 m. x 6.27 m.

Let us provide a rapid sand filter unit having eight beds of size 5.0 m. x 6.0 m. each. Therefore, area available for filtration = 5.0 x 6.0 x 8 bed =240.0 Sq.m., giving a filtration rate of 5.875 m^3/m^2/hour, which is well within the range.

The Overall size of the building accommodating the filter units shall be kept more than this for accommodating the raw water and back wash water gutters; operating gallery; rate of flow controller; filtered water channel; Chlorine Dozer; and, air compressor etc.

5. Chemical dosing, disinfection etc.:

For chemical dosing (lime alum solution etc.) to the raw water; to add disinfecting chemicals (mostly bleaching powder); and, to monitor the quality of both raw & clear water, one laboratory cum chemical house shall be provided along with the treatment plant. This laboratory cum chemical house shall accommodate the storage of chemicals, chemical solution preparation tanks, and the quality-monitoring laboratory. In addition, the clear water pump room shall also be provided in the same building. The plinth area of each floor of the double storied chemical house, laboratory and clear water pump house building shall be 84.0 Sq.m.

6. Back Wash Water:

Requirement of Back wash water @ 600 ltr. per Sq.m. per minute for 10 minutes shall be 1,80,000.0 liters. This shall be accommodated in a RCC Tank over the Chemical House.

Annexure - E

DETAILED ESTIMATE FOR PROPOSED RWSS - LS PROJECTS IN ASSAM

ABSTRACT OF COST FOR COMPOSITE WSS FOR SUSTAINABILITY & QUALITY IN JORHAT, JORHAT CENTRAL & , JORHAT NORTH WEST DEVELOPMENT BLOCK OF JORHAT DISTRICT

Sl. No.	Major Item of Works	Amount
1	**Raw water Intake System**	
1.1	M.S. Floating Barge with all necessarry mooring materials & life saving equipment; tying arrangement; Over Head gantry Crane etc. (2 Nos.)	Rs.34,15,800.00
1.2	RCC Single Storied Utility cum Operator's Room at River bank of Intake Point	Rs.9,41,150.00
1.3	River bank Protection Work at Intake Point	Rs.45,81,950.00
1.4	Approach Road to Intake Point from the nearby public road	Rs.58,18,020.00
1.5	Land Development & Security Wall For Intake Station	Rs.22,50,900.00
1.6	Twin Assam Type Staff Quarter at Intake Location for 1 (one) No. Pump Operator and 1 (one) No. Chowkider	Rs.11,03,720.00
1.7	Dedicated Power Line to Intake including Substation	Rs.62,73,850.00
1.8	Captive Power Generator at Intake	Rs.1,17,52,000.00
2	**Raw Water Pumping Machinery and other accessories**	
2.1	Raw Water Pumping machinery in the Intake barge including all necessary electrical and other installation works (Two complete sets for installation on two nos. separate barge)	Rs.1,17,62,190.00
2.2	Manifold type Common Header at river bank for the raw water main and flexible hoses for connecting the same with the barge including campus illumination at intake location	Rs.37,88,910.00
3	**Raw Water Conveying Main**	
3.1	Supplying, laying, jointing, testing and commissioning of 700 mm dia DI S.S. raw water pumping main including all necessary valves & specials, valve chamber, supporting structures, anchor / thrust block etc., complete	Rs.18,50,22,005.00

Sl. No.	Major Item of Works	Amount
4	**Water Treatment Plant**	
4.1	Design and Construction of Complete Water Treatment Plant of capacity 28.2 MLD (in 20 hours of operation) with suitable design in conformity with the CPHEEO Manual having provision for Aeration, Coagulation, Rapid Mixing, Clariflocculation & Filtration followed by disinfection, including all Mechanical and Electrical Installation Work suitable for automated operation of the plant, Provision for Back Washing, Laboratory Facility, all internal connection & by-pass piping system, all complete, as directed and specified. (Note : The TP shall inclued provision for one Water Works Office and for Storage Accn.)	Rs.6,10,01,691.00
4.2	Construction of 2 (two) Nos. 10,00,000.0 ltrs. (each) Capacity RCC Under Ground Treated Water Sump in 2 (two) compartment and with a suction pit for pumps having provision for all inlet, outlet & overflow arrangement; mechanical type water level indicator; Air Vent Pipe; Men Hole with Cover; CI Lugs inside the sump etc. , complete	Rs.1,27,88,100.00
4.3	Land Development & Security Wall at Treatment Plant Location	Rs.67,69,100.00
4.4	Twin Assam Type Staff Quarter at Treatment Plant Location for 1 (one) No. Pump Operator and 1 (one) No. Chowkider	Rs.11,03,720.00
4.5	Internal Road / Path etc.; Landscaping & Arboriculture including Compound Illumination in the treatment plant site	Rs.16,86,900.00
4.6	Approach Road to Treatment Plant Site from the nearby public road	Rs.90,80,910.00
4.7	Dedicated Power Line to Treatment Plant including Substation	Rs.82,81,020.00
4.8	Captive Power Generator at Treatment Plant	Rs.1,17,52,000.00

Sl. No.	Major Item of Works	Amount
5	**Clear Water Pumping System**	
5.1	Clear Water Pumping machinery at the treatment plant for all the Clear water feeder route including all necessary electrical and other installation works	Rs.1,25,22,750.00
5.2	Clear Water Pump House at Treatment Plant Location	Rs.14,81,100.00
5.3	Manifold type Common Header for the Clear water main of Different Route and RCC Pump Foundation	Rs.6,24,500.00
6	**Clear Water Conveying Main**	
6.1	Supplying, laying, jointing, testing and commissioning of different required diameter DI S.S. Class K7 Clear water pumping main for Route - I (for 21 ESRs of Jorhat Block) including all necessary valves & specials, valve chamber, supporting structures, anchor / thrust block etc., complete	Rs.24,46,93,500.00
6.2	Supplying, laying, jointing , testing and commissioning of different required diameter DI S.S. Class K7 Clear water pumping main for Route - II (for 15 ESRs of Jorhat North West Block) including all necessary valves & specials, valve chamber, supporting structures, anchor / thrust block etc., complete	Rs.21,38,85,850.00
6.3	Supplying, laying, jointing , testing and commissioning of different required diameter DI S.S. Clear water pumping main for Route - III (for 6 ESRs of Jorhat Central Block) including all necessary valves & specials, valve chamber, supporting structures, anchor / thrust block etc., complete	Rs.11,96,48,355.00
7	**Elevated Service Reservoir**	
7.1	Construction of 42 (forty two) elevated service reservoirs of following capacity with suitable foundation, including all necessary inlet/outlet etc. piping arrangement, control valves amenable to motorised operation, water level indicator, lightening aerestor, solar power system, security wall, signboard, landscapping, & arboriculture etc., all complete	

Sl. No.	Major Item of Works	Amount
	In Jorhat Central Block :	
7.1.1	ESR No. 1 : 350 Cu.m.	Rs.83,41,421.00
7.1.2	ESR No. 2 : 400 Cu.m.	Rs.89,93,363.00
7.1.3	ESR No. 3 : 300 Cu.m.	Rs.74,63,266.00
7.1.4	ESR No. 4: 260 Cu.m.	Rs.65,37,727.00
7.1.5	ESR No. 5 : 310 Cu.m.	Rs.76,40,619.00
7.1.6	ESR No. 6 : 330 Cu.m.	Rs.79,90,372.00
	In Jorhat Block :	
7.1.7	ESR No. 1 : 260 Cu.m.	Rs.65,37,727.00
7.1.8	ESR No. 2 : 370 Cu.m.	Rs.85,58,362.00
7.1.9	ESR No. 3 : 240 Cu.m.	Rs.61,69,927.00
7.1.10	ESR No. 4: 400 Cu.m.	Rs.89,93,363.00
7.1.11	ESR No. 5 : 90 Cu.m.	Rs.37,50,899.00
7.1.12	ESR No. 6 : 200 Cu.m.	Rs.58,92,721.00
7.1.13	ESR No. 7 : 220 Cu.m.	Rs.60,59,375.00
7.1.14	ESR No. 8 : 170 Cu.m.	Rs.51,71,048.00
7.1.15	ESR No. 9 : 130 Cu.m.	Rs.44,66,994.00
7.1.16	ESR No. 10 : 90 Cu.m.	Rs.37,50,899.00
7.1.17	ESR No. 11 : 150 Cu.m.	Rs.48,23,115.00
7.1.18	ESR No. 12 : 120 Cu.m.	Rs.43,03,760.00
7.1.19	ESR No. 13 : 190 Cu.m.	Rs.56,51,495.00
7.1.20	ESR No. 14 : 240 Cu.m.	Rs.61,69,927.00
7.1.21	ESR No. 15 : 160 Cu.m.	Rs.48,95,606.00
7.1.22	ESR No. 16 : 330 Cu.m.	Rs.79,90,372.00
7.1.23	ESR No. 17 : 70 Cu.m.	Rs.36,21,681.00
7.1.24	ESR No. 18 : 490 Cu.m.	Rs.1,05,83,426.00
7.1.25	ESR No. 19 : 330 Cu.m.	Rs.79,90,372.00
7.1.26	ESR No. 20 : 625 Cu.m.	Rs.1,27,68,798.00
7.1.27	ESR No. 21 : 550 Cu.m.	Rs.1,16,21,714.00
	In Jorhat North West Block :	
7.1.28	ESR No. 1 : 240 Cu.m.	Rs.61,69,927.00
7.1.29	ESR No. 2 : 330 Cu.m.	Rs.79,90,372.00
7.1.30	ESR No. 3 : 110 Cu.m.	Rs.41,72,185.00
7.1.31	ESR No. 4: 260 Cu.m.	Rs.65,37,727.00
7.1.32	ESR No. 5 : 320 Cu.m.	Rs.78,11,268.00
7.1.33	ESR No. 6 : 230 Cu.m.	Rs.60,87,708.00
7.1.34	ESR No. 7 : 300 Cu.m.	Rs.74,63,266.00
7.1.35	ESR No. 8 : 220 Cu.m.	Rs.60,59,375.00
7.1.36	ESR No. 9 : 160 Cu.m.	Rs.48,95,606.00
7.1.37	ESR No. 10 : 220 Cu.m.	Rs.60,59,375.00
7.1.38	ESR No. 11 : 90 Cu.m.	Rs.37,50,899.00
7.1.39	ESR No. 12 : 90 Cu.m.	Rs.37,50,899.00
7.1.40	ESR No. 13 : 190 Cu.m.	Rs.56,51,495.00
7.1.41	ESR No. 14 : 210 Cu.m.	Rs.59,74,961.00
7.1.42	ESR No. 15 : 140 Cu.m.	Rs.46,64,149.00
7.2	Approach Road to ESR Locations	Rs.1,54,16,950.00

Sl. No.	Major Item of Works	Amount
8	**Distribution System**	
8.1	DI Feeder Main from respevtive ESR to the concerned Distribution network	Rs.25,15,65,372.00
8.2	Extension, Renovation, Augmentation of the existing Distribution network	Rs.71,16,71,713.09
8.3	House connection comprising of shaddle piece, 10.0 m. PPR Pipe, Ferruule Cock etc.	Rs.9,79,05,930.00
9	**Water meter with 5 year maintanence contract**	
9.1	Bulk Water meter	Rs.1,42,69,645.00
9.2	Domestic Water meter	Rs.9,83,09,250.00
10	**Auto Control System**	
10.1	SCADA for auto control of the complete system	Rs.2,18,13,830.00
	Total =	**Rs.2,42,67,60,242.09**

Annexure - F

DISTRICT LEVEL LABORATORY (PHE) JORHAT DIVISION

JORHAT, ASSAM

Water Analysis Report Of Brahmaputra River (Nimatighat)

01. Name of Collector : Dhruba Nazin, SIA. 02. Date of Collection : 13-5-2013

03. Date of Despatch : 13-5-2013 04. Date of Testing : 13-5-2013

05. Type of Source : River.

06. Type of Analysis : Physical [✓] Chemical [✓] Bacteriological [ ]

Parameter Name	Desirable-Permissible Limit Limit	Results		Remarks
01. Turbidity	5.0-10	402	NTU	
02. TDS	500-2000	60	mg/lt	
03. pH Value	6.5-8.5	7.12		
04. Iron as Fe	0.3-1.0	0.28	mg/lt	
05. Hardness as $CaCO_3$	300-600	—	mg/lt	
06. Calcium as $CaCO_3$	75-200	—	mg/lt	
07. Magnesium as Mg	30-150	—	mg/lt	
08. Total Alkalinity as $CaCO_3$	200-600	52	mg/lt	
09. Chloride as Cl	250-1000	4	mg/lt	
10. Nitrate as NO_3	45 (No relaxation)	—	mg/lt	
11. Sulphate as SO_4	200-400	—	mg/lt	
12. Residual Chlorine	0.2-0.5	—	mg/lt	
13. Arsenic	0.05 (No relaxation)	—	mg/lt	
14. Fluoride	1.0-1.5	—	mg/lt	
15. JAR Test		—	mg/lt	

16. BACTERIOLOGICAL TEST :

RESULT	COLIFORM	ECOLI	RESULT
a) Excellent	No Coliforms/100 ml	Nil	.....
b) Satisfactory	1-2 Coliforms/100 ml	Nil	.....
c) Suspicious	3-10 Coliforms/100 ml	Nil	.....
d) Unsatisfactory	above 10 Coliforms/100 ml	Nil	.....

ADVICE : .....

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Asstt. Chemist/Analyst
District Level Laboratory, Jorhat

Exe. Executive Engineer (PHE)
Jorhat Sub-Division Jorhat

Assistant Chemist
I/C District Level Laboratory
District Level Laboratory, Jorhat
(PHE) Jorhat Division

DISTRICT LEVEL LABORATORY (PHE) JORHAT DIVISION

JORHAT, ASSAM

Water Analysis Report Of Brahmaputra River (Ko Kilamukh)

01. Name of Collector : Dhruba Nazin, S.A.
02. Date of Collection : 13-5-2013
03. Date of Despatch : 13-5-2013
04. Date of Testing : 13-5-2013
05. Type of Source : River
06. Type of Analysis : Physical [—] Chemical [—] Bacteriological [ ]

Parameter Name	Desirable-Permissible Limit Limit	Results		Remarks
01. Turbidity	5.0 - 10	394	NTU	
02. TDS	500 - 2000	62	mg/lt	
03. pH Value	6.5 - 8.5	7.14		
04. Iron as Fe	0.3 - 1.0	0.28	mg/lt	
05. Hardness as $CaCO_3$	300 - 600	—	mg/lt	
06. Calcium as $CaCO_3$	75 - 200	—	mg/lt	
07. Magnesium as Mg	30 - 150	—	mg/lt	
08. Total Alkalinity as $CaCO_3$	200 - 600	54	mg/lt	
09. Chloride as Cl	250 - 1000	6	mg/lt	
10. Nitrate as NO_3	45 (No relaxation)	—	mg/lt	
11. Sulphate as SO_4	200 - 400	—	mg/lt	
12. Residual Chlorine	0.2 - 0.5	—	mg/lt	
13. Arsenic	0.05 (No relaxation)	—	mg/lt	
14. Fluoride	1.0 - 1.5	—	mg/lt	
15. JAR Test		—	mg/lt	

16. **BACTERIOLOGICAL TEST :**

RESULT	COLIFORM	ECOLI	RESULT
a) Excellent	No Coliforms/100 ml	Nil	.....
b) Satisfactory	1-2 Coliforms/100 ml	Nil	.....
c) Suspicious	3-10 Coliforms/100 ml	Nil	.....
d) Unsatisfactory	above 10 Coliforms/100 ml	Nil	.....

ADVICE : .....

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Asstt. Chemist/Analyst
District Level Laboratory, Jorhat

District Level Laboratory, Jorhat

DISTRICT LEVEL LABORATORY (PHE) JORHAT DIVISION

JORHAT, ASSAM

Water Analysis Report Of Brahmaputra River, Kokilamukh Stan no. 8

01. Name of Collector : Staff of Laboratory
02. Date of Collection : 18-3-2013
03. Date of Despatch : 18-3-2013
04. Date of Testing : 18-3-2013
05. Type of Source : River
06. Type of Analysis : Physical [—] Chemical [—] Bacteriological [ ]

Parameter Name	Desirable-Permissible Limit Limit	Results		Remarks
01. Turbidity	5.0 - 10	90.5	NTU	
02. TDS	500 - 2000	60	mg/lt	
03. pH Value	6.5 - 8.5	7.01		
04. Iron as Fe	0.3 - 1.0	0.2	mg/lt	
05. Hardness as $CaCO_3$	300 - 600	—	mg/lt	
06. Calcium as $CaCO_3$	75 - 200	—	mg/lt	
07. Magnesium as Mg	30 - 150	—	mg/lt	
08. Total Alkalinity as $CaCO_3$	200 - 600	60	mg/lt	
09. Chloride as Cl	250 - 1000	4	mg/lt	
10. Nitrate as NO_3	45 (No relaxation)	—	mg/lt	
11. Sulphate as SO_4	200 - 400	—	mg/lt	
12. Residual Chlorine	0.2 - 0.5	—	mg/lt	
13. Arsenic	0.05 (No relaxation)	—	mg/lt	
14. Fluoride	1.0 - 1.5	—	mg/lt	
15. JAR Test		—	mg/lt	

16. BACTERIOLOGICAL TEST :

RESULT	COLIFORM	ECOLI	RESULT
a) Excellent	No Coliforms/100 ml	Nil	.....
b) Satisfactory	1-2 Coliforms/100 ml	Nil	.....
c) Suspicious	3-10 Coliforms/100 ml	Nil	.....
d) Unsatisfactory	above 10 Coliforms/100 ml	Nil	.....

ADVICE : .....

.....

Asstt. Chemist/Analyst
District Level Laboratory, Jorhat

Asstt. Executive Engineer (PHE)
Jorhat Sub-Division, Jorhat

Assistant Chemist
I/C District Level Laboratory
(PHE) Jorhat Division
District Level Laboratory, Jorhat

DISTRICT LEVEL LABORATORY (PHE) JORHAT DIVISION

JORHAT, ASSAM

Water Analysis Report Of Brahmaputra River, Nimatighat, Jorhat

01. Name of Collector : Staff of Laboratory.
02. Date of Collection : 18-3-2013
03. Date of Despatch : 18-3-2013
04. Date of Testing : 18-3-2013
05. Type of Source : River.
06. Type of Analysis : Physical [~] Chemical [~] Bacteriological [ ]

Parameter Name	Desirable-Permissible Limit Limit	Results		Remarks
01. Turbidity	5.0 - 10	125	NTU	
02. TDS	500 - 2000	55	mg/lt	
03. pH Value	6.5 - 8.5	7.01		
04. Iron as Fe	0.3 - 1.0	0.2	mg/lt	
05. Hardness as $CaCO_3$	300 - 600	–	mg/lt	
06. Calcium as $CaCO_3$	75 - 200	–	mg/lt	
07. Magnesium as Mg	30 - 150	–	mg/lt	
08. Total Alkalinity as $CaCO_3$	200 - 600	72	mg/lt	
09. Chloride as Cl	250 - 1000	4	mg/lt	
10. Nitrate as NO_3	45 (No relaxation)	–	mg/lt	
11. Sulphate as SO_4	200 - 400	–	mg/lt	
12. Residual Chlorine	0.2 - 0.5	–	mg/lt	
13. Arsenic	0.05 (No relaxation)	–	mg/lt	
14. Fluoride	1.0 - 1.5	–	mg/lt	
15. JAR Test		–	mg/lt	

16. **BACTERIOLOGICAL TEST :**

RESULT	COLIFORM	ECOLI	RESULT
a) Excellent	No Coliforms/100 ml	Nil	.....
b) Satisfactory	1-2 Coliforms/100 ml	Nil	.....
c) Suspicious	3-10 Coliforms/100 ml	Nil	.....
d) Unsatisfactory	above 10 Coliforms/100 ml	Nil	.....

ADVICE : .....

.....

Asstt. Chemist/Analyst
District Level Laboratory, Jorhat

Astt. Executive Engineer (PHE)
Jorhat Sub-Division, Jorhat

Assistant Chemist
I/C District Level Laboratory
District Level Laboratory, Jorhat

ANNEXUR – G

DISASTER MANAGEMENT PRACTICES IN PHED, ASSAM.

The very concept of disaster management is embedded in the departmental activity of Engineering Departments. In some cases only additional quick response and mitigation planning is required.

Disaster Management in Conceptual Stage:

The preventive measures of disasters are enforced in Engineering Departments in the form Codes, Byelaws etc in concept preparation stage and planning of an engineering project e.g. National Building Code of India (SP7), Building byelaws of local administrative bodies etc. At this stage itself evacuation plans during disaster, access for rescue / firefighting teams and facilities required fight such untoward incidents are worked out.

Disaster Management in Design Stage:

During design stage, all possible loads structures have to bear during its service life is taken in to account. Here, in the design process Importance Factor, Factor of Safety etc based on the degree of losses in case of failure, degree of vulnerability are taken in to account. For this there are clear guide lines set by Bureau of Indian Standards (BIS) in the form of codes of practices e.g. IS:875 for Loads (Dead Loads, Live Loads, Wind Loads) to be considered during design. There are also codes for design of Concrete Structures (IS:456), Steel Structures (IS:800) etc.

Disaster Management in Construction Stage:

There are guidelines for stages of construction, tests for assessment of strength of supporting structures to overcome any probable disaster. There are also Rules set by administrative authority for safety of workers, compulsory use of safety gadgets like apron, goggles, helmets, safety belt etc. and availability of First Aid facilities.

Disaster Management through Rehabilitation and Retrofitting of Structures:

There are Handbooks on Repair and Rehabilitation of structures published by Govt. agencies to overcome disaster from old and damaged structures. There is also handbook on Seismic Retrofit of buildings to support structures which were designed without considering the seismic forces properly.

Disaster Management during service life of Structures:

This includes inspection and structural safety assessment of structures at regular interval, regulating the intended use of structures to avoid overloading etc. For this there is scope for improvement by setting norms, capacity development through training, putting alert system to invite joint effort all departments working on it.

Annexure-H

Environmental Data Sheet (EDS) for Water Supply Schemes

Name of Scheme: Composite Water Supply Scheme for Sustainability and Quality in Jorhat, Jorhat-Central and Jorhat-North West Development Block of Jorhat District.

S. No.	Description	Particulars	Remarks
GENERAL			
1.	Name of Habitation(s)	1045 Nos. (List annexed)	
2.	Name of Gram Panchayat(s)	33 Nos. (List annexed)	
3.	Name of Block(s)	Jorhat, Jorhat-Central and Jorhat-North West	
4.	Name of District	Jorhat	
5.	Population (present)	289277 (2013 AD)	
6.	Total water demand (Litres per day)	23.30 MLD in 2013 AD	
7.	Present water supply (Litres per day)	6.99 MLD in 2013 AD	
8.	Present classification of habitation (s)	Partially Covered	
9.	Problem with present water supply	GWT depletion, Iron contamination, Arsenic contamination, Less supply level.	
10.	Net demand of water from the proposed source (Litres/day)	28.2 MLD	
11.	Type of source	Surface water	
12.	Type of scheme	Multi Village Scheme (MVS)	
13.	Is De-fluoridation/ RO planned?	No	
LOCATION			
14.	Where is the source located?	On Brahmaputra river	
15.	Has a sanitary survey of the source location been done? Enclose the report of the sanitary survey, conduct this survey as per the ECOP given in the Sanitary Survey of Water Supply Sources in the EMF.	No, Raw Water Quality test report enclosed.	
16.	Is any component of the scheme located in a forest area? If yes, obtain permission in writing from the Forest Department. Legal status of forest: Area of forest land involved:	No	
17.	Is the source is near (within 5 km) any ecologically sensitive area (National Parks, Wildlife Sanctuaries, Game Reserves, Bio-spheres, etc.)? Avoid the sensitive areas. If not possible, obtain permission in writing from the Forest Department and follow mitigation measures as suggested by the Forest Department.	No	
18.	Is any historical/ archaeological/ protected monument located within 300 m distance? If yes, give details of monument: Name of Monument: Status of Monument: Distance from site:	No	

19.	Are any trees likely to be cut at the location for construction of the scheme? If yes, mention the number of trees per each species. Obtain permission in writing from the Forest Department.	No	
20.	Have approved/ legal sources been identified for the construction materials (sand, aggregate, bricks, etc.) If yes, mention details of sources identified for each material.	Already taken care of as per Assam PWD building schedule of rates 2010-11 including	
21.	What is the amount of construction waste likely to be generated? Have appropriate sites been identified for disposal of construction waste? If yes, mention details of disposal sites; name of site, present land use and distance from work site, etc. for each site.	The contractor will be liable to clear the construction waste, if any.	
IN CASE OF SURFACE WATER SOURCE			
LOCATION			
22.	Will there be any significant land disturbance resulting in erosion, subsidence and instability?	No	
23.	Will the scheme involve alteration of natural drainage? If yes, indicate the measures for the drainage.	No	
24.	What is the distance of the source from the nearest sewage or industrial effluent disposal point. Please give details such as distance, location, upstream/ downstream, etc.	NA	
SUSTAINABILITY			
25.	Is the expected safe yield from the source greater than water demand?	Yes	
WATER QUALITY			
26.	What is the Turbidity of raw water (NTU)? (Enclose water quality test report)	Raw Water Quality test report as enclosed.	
27.	Is this source within 100 m from the nearest sewage/industrial effluent disposal point (disposal into the surface water source)?	No	
28.	Is there any chemical impurity present? If yes, furnish the details. (Enclose water quality test report)	No	
29.	What is the frequency planned for testing water for bacteriological contamination? (should be 1 every month)	Every day, There shall be a full-fledged water quality testing laboratory in the treatment plant.	
30.	What is the frequency planned for testing water for physical and chemical contamination? (should be 4 times/year)	Every 3 month	
31.	What is the frequency planned for testing residual chlorine? (should be once every day)	Every day	
32.	What is the frequency planned for sanitary inspection by VWSC? (should be 12 times/year)	Every month	
33.	What is the frequency planned for sanitary inspection by Dept.? (should be 2 times /year if population serviced is less than 5000; should be 24-48 times /year if population serviced is between 5000-20000)	36-48 times /year	
WATER TREATMENT			
34.	What is the method of water treatment proposed?	Aeration,Coagulation,Floccula	

		tion,Filtration,Disinfection.	
35.	What is the capacity of treatment plant?	28.2 MLD	
36.	Will the proposed treatment bring water quality to the desirable limits?	Yes	
37.	What is the quantity of backwash water generated per day?	350 Cum, Which will again be recycled.	
38.	What is the quantity of sludge generated per day? How will the sludge and other residue from the water treatment plant be disposed?		

Category of Scheme: Category 1 / Category II

Category I	**Category II**
1. SVS with source in shallow aquifer in safe and semi-crtitical zone 2. SVS with source in deep aquifer located in safe zone of exploitation 3. SVS with perennial surface water source requiring slow sand filtration only	1.SVSs/MVSs with shallow groundwater source located in either critical or over exploitation zones of groundwater exploitation and deep groundwater source in semi-critical and over exploited zones 2. SVSs/MVSs with sources located at or nearer (within 1 km) to natural habitats/sensitive ecosystem such as National Park / Wildlife Sanctuaries (Seek Forest Department permission) 3. SVSs/MVSs with the water quality at the source is not treatable with conventional treatment, and involves special treatment/RO treatment. 4. MVSs with surface water source requiring treatment

EDS filled and Categorization done by:

Signature		
Name		
Designation	District Environment Expert	Executive Engineer
Date		

Environment Management Plan (EMP)

Name of Scheme: Composite Water Supply Scheme for Sustainability and Quality in Jorhat, Jorhat-Central and Jorhat-North West Development Block of Jorhat District.

S. No ...	Identified negative impacts on environment	Actions to be taken to mitigate (remove/reduce) negative impacts	Time frame	Responsible agencies	Reference of Coverage in bid document	Cost of activities
Site and Construction Related Aspects						
1	Extraction of materials from illegal or inappropriate locations.	• Verify suitability of all material sources and obtain approval of Project Authority. • List the approved quarry sites and sources:	Approval to be secured before construction.	• List of approved sources for materials to be made available Project Authority • Material to be sourced from approved sources by Contractor.		NA
2	Disposal of construction waste at inappropriate locations.	• Reuse the construction waste as much as possible. • Verify appropriateness of all construction waste disposal sites and obtain approval of Project Authority • List the approved disposal sites:	Approval to be secured before construction.	• List of approved disposal sites to be made available by Project Authority • Construction waste to be disposed at approved sites by Contractor.		NA
3	Dust pollution due to excavation.	• All earth work in habitation areas will be protected to minimize generation of dust. • Sprinkling of water on construction sites in habitation areas using water tanker as and when necessary during dry weather.	During construction phase.	Contractor.		NA
4	Risk of improper management of archaeological chance finds	All fossils, coins, articles of value of antiquity, structures and other remains or things of geological or archaeological interest discovered on the site shall be the property of the Government and shall be dealt with as per provisions of the relevant legislations. The contractor will take reasonable precautions to prevent his workmen or any other persons from removing and/or damaging any such article or thing. He	During construction phase.	Contractor.		NA

		will, immediately upon discovery thereof and before removal acquaint the Project Authority of such discovery and carry out the given instructions for dealing with the same, waiting which all work shall be stopped. The Project Authority will seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence the work in the site.				
5	Improper disposal of dewatered water.	• Do not let out dewatered water onto the road or into nearby water bodies. • Dewatered water is to be disposed into appropriate drains or disposal sites.	During construction phase.	Contractor.		NA
6	Risk of accidents and occupational health impacts.	Implement Health and Safety measures including: (a) excluding public from the site (including setting up barricades and warning signs) (b) ensuring all workers are provided with and use Personal Protective Equipment including: helmet, gloves and gumboots at concreting locations, nose mask at dust producing areas, safety belt during work at height, hearing protection at noise producing locations; (c) documentation of work-related accidents; (d) First Aid box shall be easily accessible throughout the site; (e) Provide supplies of potable drinking water at labour camp and work site. (f) Provide toilet facility at labour camp	During construction phase.	Contractor.		NA
7	Risk of improper clearance and restoration of construction sites.	On completion of the works, all temporary structures will be cleared away, all rubbish cleared, borrow pits, trenches, etc., filled/levelled and effectively sealed off and the site left clean and tidy, at the contractor' s expenses, to the satisfaction the Project Authority.	During construction phase.	Contractor.		NA

Water Supply Related Aspects						
8	Risk of poor water quality	Ensure that raw water quality and selected water treatment technology are appropriate to bring the water to desirable limits.	During scheme design.	Project Director		NA
		Ensure that water quality testing is undertaken regularly (test for residual chlorine – daily, test of bacteriological parameters – monthly, test of physical/chemical parameters – once in 3 months) and a record of the test results is maintained for a representative set of samples (including samples from clean water outlet at WTP, samples from chief and branch mains and samples from end of distribution system).	During O & M phase.	As per contract agreement		NA
9	Improper disposal of backwash water from WTP	Integrate system for reuse / recycling of backwash water into design of WTP.	During scheme design.	Project Director		NA
10	Improper disposal of sludge from WTP	Integrate system for proper disposal of sludge into design of WTP.	During scheme design.	Project Director		NA

NOTE: Based on above prepare a detailed EMP with Cost. The screening and EMP should be part of DPR and later RFP.

EMP prepared by:

Name: ……., Designation: Environment Expert, Signature: ……

Name: ……., Designation: Executive Engineer, Signature: ……

Date: ……

EMF of Jorhat Project

None of the components of the Jorhat Project is located in any forest area, moreover, the source is sufficiently away from historical/archaeological monuments, ecologically sensitive areas such as, National Park, Wild Life Sanctuaries, bio-spheres etc. As all of the units are proposed in our existing premises or so, there is no scope of felling of existing trees. As per trend, there is no significant erosion, landslide, subsidence around the surface water source and along the distribution network. The construction and laying activities are so planned that nowhere, the natural drainage would be affected. In the upstream of the source, no industrial effluent is discharged into the river source .There seems to be no potential environmental threat to the project area.

All the mitigation measures like- i) River Shore lining, ii) Water Treatment Plant and iii) Water Quality etc. are integrated in the DPR as a part of Environmental management.

Annexure-I

ANNUAL OPERATION AND MAINTENANCE COST FOR JORHAT, JORHAT CENTRAL AND JORHAT NORTH WEST WSS

Sl No.	Description	Qty	Unit	Rate (Rs.)	Amount
A)	Salary & Wages				
i)	Superintendent / Manager (AEE)	1	No.	50000	50000.00
ii)	Asst Supervisor/ Junior Manager(JE)	1	No.	25000	25000.00
iii)	Operator = 3 Nos. at Intake + 6 Nos. at TP	9	Nos.	15000	135000.00
	Electrician / Mechanic = 3 Nos.	3	Nos.	15000	45000.00
iv)	Helper / fitter = 3 Nos. at Intake + 4 Nos. at TP + 8 Nos. for Raw & Clear Water Main	15	Nos.	12000	180000.00
v)	Watchman =1 No. at Intake + 1 No. at TP + 42 Nos. for ESR	44	Nos.	12000	528000.00
B)	Energy Charges:				
i)	Power charge, considering average 18 hours availability of power @ Rs. 5.15 perKWH	503550	KWH	5.15	2593282.50
ii)	Electricity Duty @ Rs. 0.10 per KWH	503550	KWH	0.10	50355.00
iii)	Fixed Electricity Charge @ Rs. 125.00 per KVA per month	2000.0	KVA	125.00	250000.00
C)	Fuel Charge for balance 2 hours				
i)	For Intake station	24618	KWH	13.37	329093.42
ii)	For Treatment Plant	24618	KWH	13.37	329093.42
D)	Chemicals				
	i) Lime				54990.00
	ii) Alum				180028.80
	iii) Bleaching Powder				77155.20
E)	Maintenance of bulk water supply (except roads & buildings)., @ 0.05 % of the respective Capital Cost				618553.90
F)	Maintenance of Intra Village Water Supply @ 0.05 % of the respective Capital Cost				557991.32
Total monthly O&M Cost = Rs.					6003543.57
Therefore, Annual O& M Cost = Rs.					**72042522.82**
Hence, Cost of production of 1 KL Water = Rs.					**8.16**

Annexure – J

CAPACITY OF UNDER GROUND CLEAR WATER SUMP

For collecting and storage of the treated water coming out from the filter unit, and to facilitate pumping of treated water to the elevated service reservoirs, underground sump is provided. Retention capacity of the underground sump is generally provided as ½ to 2 hour production of the sump. Therefore, in this particular case, the capacity requirement of the sump is ranging between 705.0 to 2820.0 Cu.m.

Let us provide a sump of capacity 2000.0 Cu.m.

Annexure - P

Summary of Sub Soil Investigation Report for the Proposed World Bank Assisted RWSS – LS Projects in Assam : Composite Water Supply Scheme for Quality and Sustainability in Jorhat, Jorhat Central & Jorhat North West Development Block of Jorhat District.

Sl. No.	Name of Structure	Location	Safe Bearing Capacity of Soil at 2.0 m. below existing G.L. (in MT / m2	R.L. of existing G.L.
1.	Treatment Plant		Non seismic net safe soil pressure : 6.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
2.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
3.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
4.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
5.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	

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Summary of Sub Soil Investigation Report for the Proposed World Bank Assisted RWSS – LS Projects in Assam : Composite Water Supply Scheme for Quality and Sustainability in Jorhat, Jorhat Central & Jorhat North West Development Block of Jorhat District.

Sl. No.	Name of Structure	Location	Safe Bearing Capacity of Soil at 2.0 m. below existing G.L. (in MT / m2	R.L. of existing G.L.
6.	Elevated Service Reservoir		Non seismic net safe soil pressure : 6.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
7.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
8.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
9.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
10.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	

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Summary of Sub Soil Investigation Report for the Proposed World Bank Assisted RWSS – LS Projects in Assam : Composite Water Supply Scheme for Quality and Sustainability in Jorhat, Jorhat Central & Jorhat North West Development Block of Jorhat District.

Sl. No.	Name of Structure	Location	Safe Bearing Capacity of Soil at 2.0 m. below existing G.L. (in MT / m2	R.L. of existing G.L.
11.	Elevated Service Reservoir		Non seismic net safe soil pressure : 6.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
12.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
13.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
14.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
15.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	

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Summary of Sub Soil Investigation Report for the Proposed World Bank Assisted RWSS – LS Projects in Assam : Composite Water Supply Scheme for Quality and Sustainability in Jorhat, Jorhat Central & Jorhat North West Development Block of Jorhat District.

Sl. No.	Name of Structure	Location	Safe Bearing Capacity of Soil at 2.0 m. below existing G.L. (in MT / m2	R.L. of existing G.L.
16.	Elevated Service Reservoir		Non seismic net safe soil pressure : 6.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
17.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
18.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
19.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
20.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	

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Summary of Sub Soil Investigation Report for the Proposed World Bank Assisted RWSS – LS Projects in Assam : Composite Water Supply Scheme for Quality and Sustainability in Jorhat, Jorhat Central & Jorhat North West Development Block of Jorhat District.

Sl. No.	Name of Structure	Location	Safe Bearing Capacity of Soil at 2.0 m. below existing G.L. (in MT / m2	R.L. of existing G.L.
21.	Elevated Service Reservoir		Non seismic net safe soil pressure : 6.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
22.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
23.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
24.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
25.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	

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Summary of Sub Soil Investigation Report for the Proposed World Bank Assisted RWSS – LS Projects in Assam : Composite Water Supply Scheme for Quality and Sustainability in Jorhat, Jorhat Central & Jorhat North West Development Block of Jorhat District.

Sl. No.	Name of Structure	Location	Safe Bearing Capacity of Soil at 2.0 m. below existing G.L. (in MT / m2	R.L. of existing G.L.
26.	Elevated Service Reservoir		Non seismic net safe soil pressure : 6.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
27.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
28.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
29.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
30.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	

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Summary of Sub Soil Investigation Report for the Proposed World Bank Assisted RWSS – LS Projects in Assam : Composite Water Supply Scheme for Quality and Sustainability in Jorhat, Jorhat Central & Jorhat North West Development Block of Jorhat District.

Sl. No.	Name of Structure	Location	Safe Bearing Capacity of Soil at 2.0 m. below existing G.L. (in MT / m2	R.L. of existing G.L.
31.	Elevated Service Reservoir		Non seismic net safe soil pressure : 6.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
32.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
33.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
34.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
35.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	

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Summary of Sub Soil Investigation Report for the Proposed World Bank Assisted RWSS – LS Projects in Assam : Composite Water Supply Scheme for Quality and Sustainability in Jorhat, Jorhat Central & Jorhat North West Development Block of Jorhat District.

Sl. No.	Name of Structure	Location	Safe Bearing Capacity of Soil at 2.0 m. below existing G.L. (in MT / m2	R.L. of existing G.L.
36.	Elevated Service Reservoir		Non seismic net safe soil pressure : 6.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
37.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
38.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
39.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
40.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	

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Summary of Sub Soil Investigation Report for the Proposed World Bank Assisted RWSS – LS Projects in Assam : Composite Water Supply Scheme for Quality and Sustainability in Jorhat, Jorhat Central & Jorhat North West Development Block of Jorhat District.

Sl. No.	Name of Structure	Location	Safe Bearing Capacity of Soil at 2.0 m. below existing G.L. (in MT / m2	R.L. of existing G.L.
41.	Elevated Service Reservoir		Non seismic net safe soil pressure : 6.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
42.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	
43.	Elevated Service Reservoir		Non seismic net safe soil pressure : 9.50 T / m2 Seismic net safe soil pressure : 11.88 T / m2	