REPUBLIC OF INDIA

BANGALORE WATER SUPPLY AND SEWERAGE BOARD

BENGALURU WATER SUPPLY AND SEWERAGE PROJECT (PHASE 3)

IN

THE STATE OF KARNATAKA, INDIA

FINAL REPORT

(Supporting Report)

NOVEMBER 2017

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

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Supporting Report 5.1.1
Details on the Population Projection in Master Plan

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REPORT DETAILS

Title: Master Planning Criteria

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Synopsis:

Current report on Master Planning Criteria (MPC) Report encapsulates key criteria that will be considered while developing water, wastewater and asset management solutions for Bengaluru over a horizon of 35 years.

This report presents the boundary conditions against which a criteria has been selected, and how any particular criteria have an influence over planning of water and wastewater infrastructure of Bengaluru, over a 35 year horizon.

It also presents the effective timeline of a particular planning criteria, stages of actuation and its impact on BWSSB's overall water and wastewater infrastructure planning.

Current report includes the comments provided by the Office of Chief

2 Population Projection and Climate Change

The following section identifies a key planning factor – population projection- that will be used for water demand and wastewater generation estimation under this study, along with impact of climate change on the availability of water resources and on utility performance.

2.1 Introduction

Planning for future water and wastewater infrastructure for a city is not an exact science. It entails identification of factors that are likely to have a significant impact on future water and wastewater demand, and then based on the comparison with growth experience of similar cities, planners can select the most critical influencing factors. **Figure 2-1** presents key factors that influences future water demand and wastewater generation for a growing city.

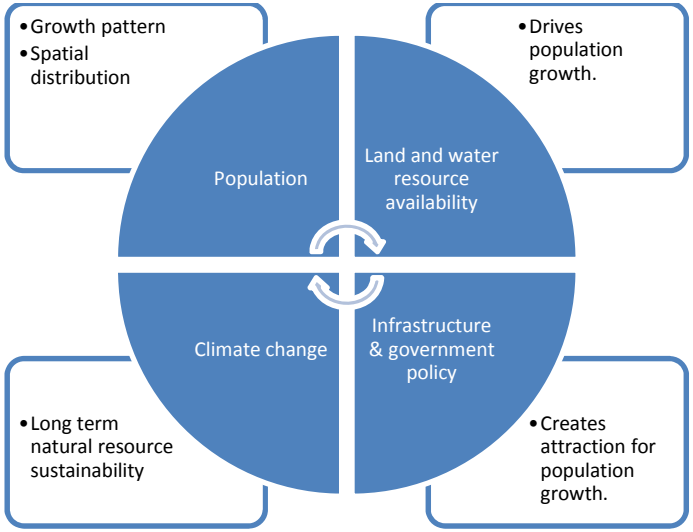

Figure 2-1: Key factors affecting water demand and wastewater generation

This chapter critically examines the influencing factors that are likely to impact the future water demand and wastewater generation potential of Bengaluru city, in the years 2020, 2035 and 2050, in the subsequent sections.

2.2 What prompts population migration to Bengaluru

In order to understand "what prompts population migration to Bengaluru" some of the key contributing factors are listed below.

2.2.1 Fertility Rate

- The average number of children expected to be born per woman in India fell to 2.3 in 2013 as compared to 3.6 in 1991, marking a significant slowdown in population growth,.
- However, India's 2.3 fertility rate is higher than the replacement level fertility of 2.1—the rate at which "a population exactly replaces itself from one generation to the next, without migration."
- Karnataka has been successful in attaining replacement fertility rate, which lead us to migration being the major reason for population growth

2.2.2 Employment

- **General trend for India:** Census 2011 indicates that main reasons for migration into cities for males is employment and for females is marriage.
- **General trend for Bangalore:** Employment has been the key factor for migration.

2.2.3 Employment generating avenues for Bengaluru

- Karnataka State GDP – 7% of India's GDP
- Karnataka attracts 4th highest Foreign Direct Investment in India
- 90,000 acres of land bank available in Karnataka
- Bengaluru ranked as "Best Place to Live and Work for Expats" in India
- Global Investors meet 2010 – MOU signed for 413 projects worth 473,382 crores
- Global Investors meet 2016 – MOU signed for 1,201 projects worth 308,810 crores
- Today, Karnataka is home to more than 80 Fortune 500 companies and more than 700 MNCs.

2.3 What thwarts population migration in Bengaluru

Bengaluru attracts a lot of population primarily due to its good weather and job opportunities, however the two most critical aspects which may become a potential deterrent to population migration are traffic and water.

2.3.1 Water Sources for comparable Indian cities

The below table presents water sources available for three other Indian mega cities as compared with Bengaluru.

Table 2-1: Water sources for metropolitan cities

Particulars	Mumbai Metropolitan Region	National Capital Region	Kolkata Metropolitan Region	Bengaluru
Water resources	• Modak sagar dam, • Tansa lake, • Vihar lake, • Tulsi lake, • Upper vaitarana dam, • Bhatsa dam, • Middle vaitarna dam • Groundwater	• Ganga, • Yamuna, • Beas • Satluj • Ground water	• Ganga • Groundwater	• Cauvery • Groundwater

As could be seen from the table above, Mumbai and Delhi have multiple sources of water, whereas Kolkata and Bengaluru have surface water as their primary source, supplemented by groundwater. However, the Kolkata lies in the proximity of River Ganga and is located in the Ganga's alluvial floodplain that can hold significant amount of groundwater due to its groundwater supporting geology. Whereas in case of Bengaluru, the underlying geology does not support storage of large amount of groundwater. Also, Bengaluru gets water from Cauvery, which is a distant water source.

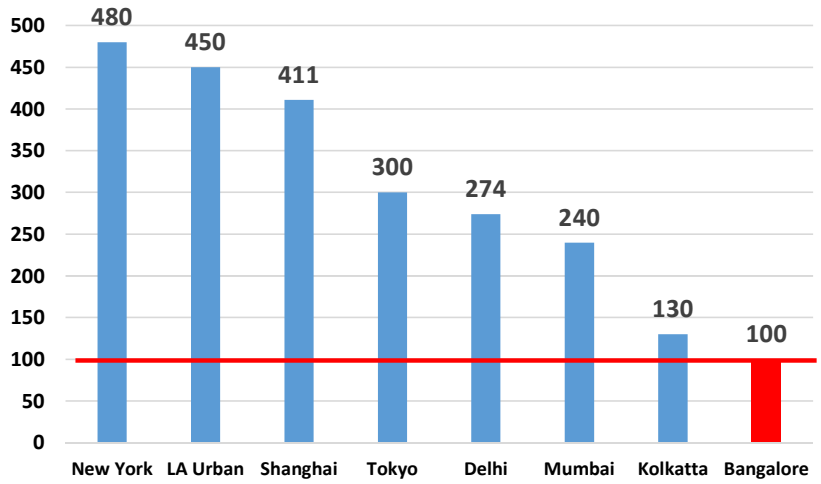

Figure 2-2: Comparison of per capita water supply among various national and international cities

The figure above presents comparison of per capita water supply in Bengaluru as compared with other cities in India and abroad. Bengaluru's litres per capita water supply is lowest.

2.3.2 Vehicles and road infrastructure

Vehicular traffic and traffic congestion are another deterrent which are more than often faced by the commuters. Below figures shows comparison of road length, and number of private vehicles per kilometre length of Bengaluru as compared with other mega cities.

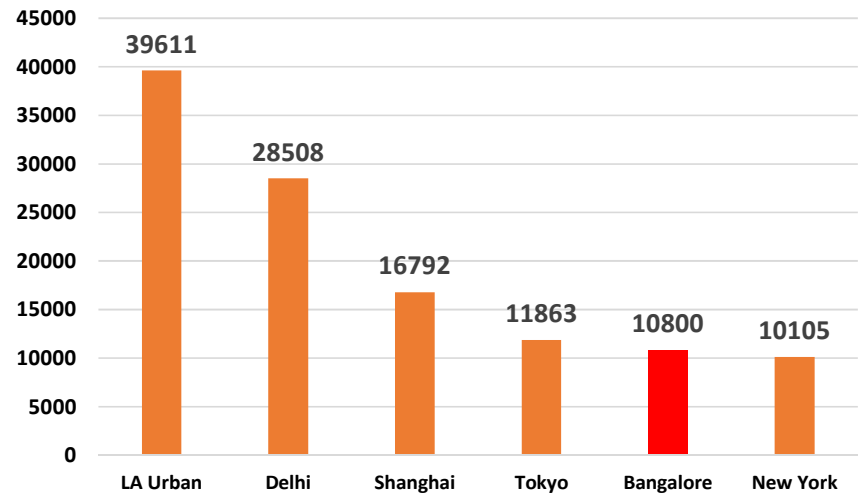

Figure 2-3: Bengaluru road length as compared with other mega cities

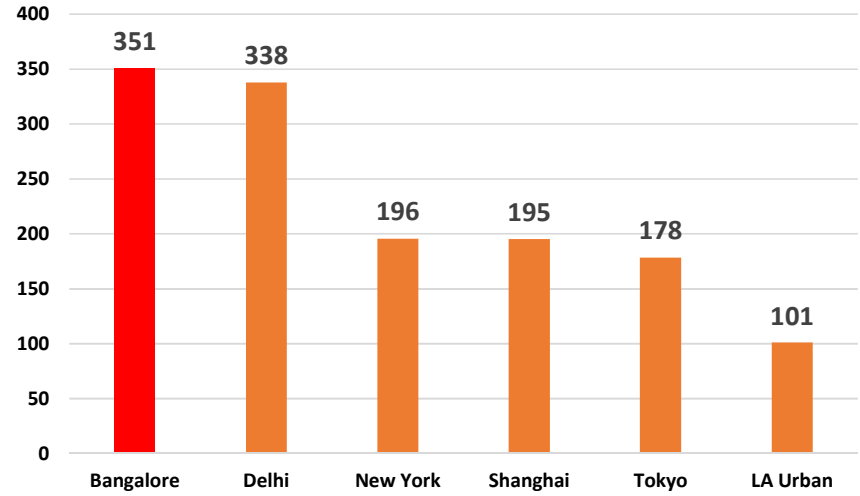

Figure 2-4: Number of private vehicles per kilometre of road length

2.4 Comparative Population Growth in other cities in India

The following **Figure 2-5** presents decadal population growth rate for seven (7) major cities, out of which two (Delhi and Mumbai) are mega cities.

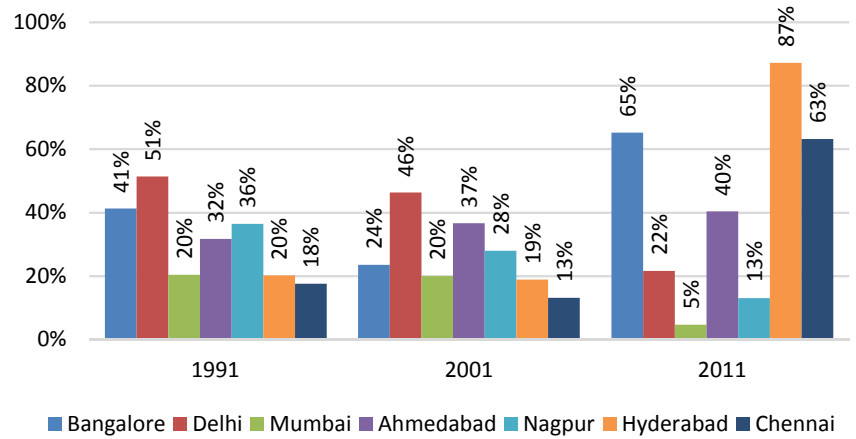

Figure 2-5: Decadal population growth rate for major Indian cities

Some of the key observations from the above figure are:

- Delhi and Mumbai see a decline in growth rate. As is also evident that the cities are now approaching the state where city's infrastructure will not be able to support any more population influx. These cities have started to expand in peripheral metropolitan regions such as National Capital Region around Delhi and Navi Mumbai.
- Ahmedabad, which is another business city, still witnessing some growth, but as compared to the growth it had in the years prior to 1991, it is now trending towards population stabilisation.
- Hyderabad and Chennai see are witnessing growth in past two decades. This is attributed to the state government's effort towards attracting more national and international investments in IT and automobile sectors respectively. Both of cities are now expanding towards the and utilising the expanded

2.5 Comparative Population for other Karnataka major cities

The figure below presents population comparative of 10 largest cities in Karnataka.

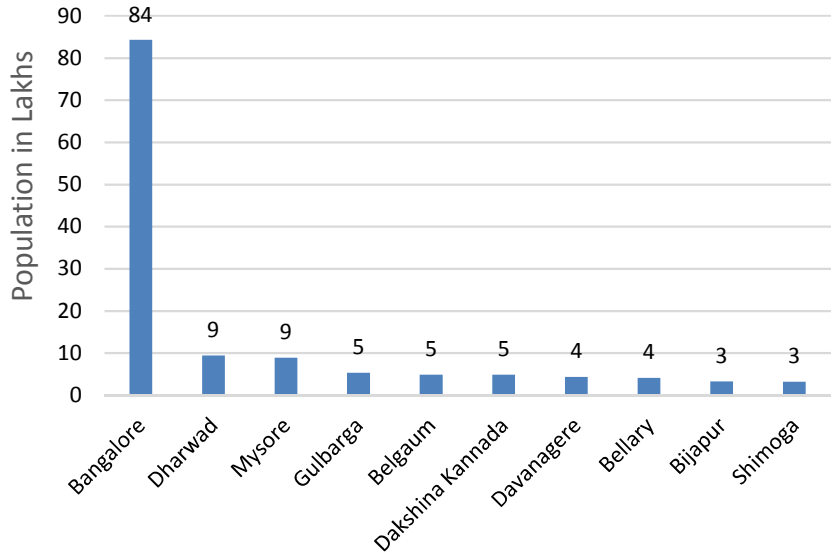

Figure 2-6: Comparative population of 10 biggest cities in Karnataka

The above figure shows the comparison of population for 10 biggest cities in Karnataka. Bengaluru is almost 9 times bigger than 2nd largest city in the state. This population influx is primarily driven by the job

opportunities, better education and health market that this city provides to its citizens.

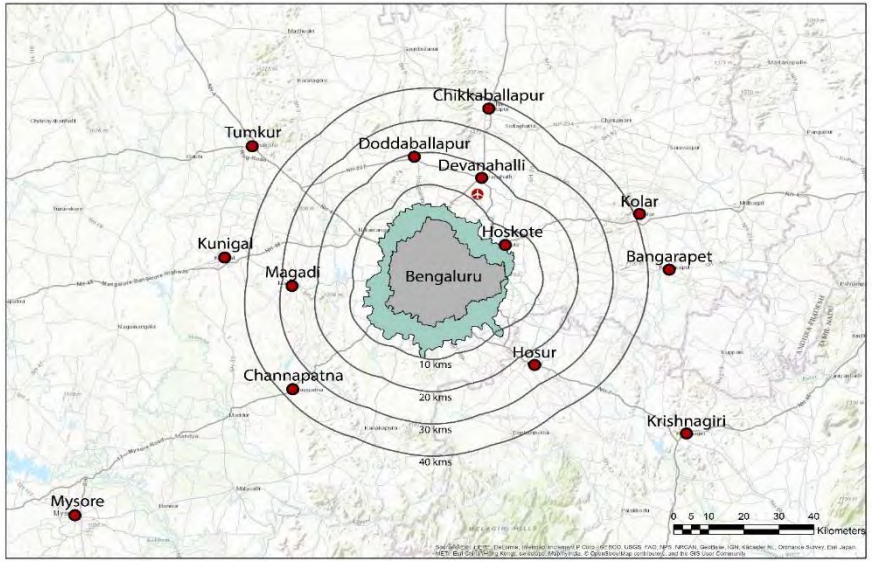

Figure 2-7: Relative locations of other cities from Bengaluru

The above figure shows the relative location of cities in 10 kilometres concentric circles. It represents the potential location of cities that will see population influx from the people who wants to live and work around Bengaluru.

Figure 2-8 presents location of smart cities and the cities identified under Chennai Bengaluru Industrial Corridor (CBIC). These cities could potentially be counter magnets to Bengaluru for attracting population by providing better job opportunities and infrastructure.

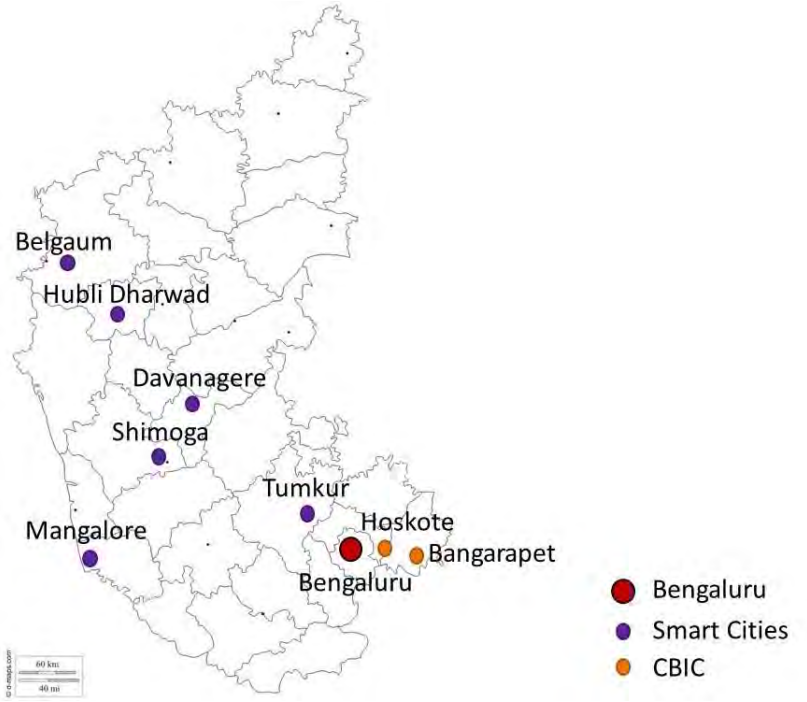

Figure 2-8: Identified cities under CBIC and as Smart Cities

2.6 Population growth in the Core Area of Bengaluru

Area of Bengaluru City within the BBMP limit is around 800 km^2. Bengaluru City can be divided in to two parts; historic core area, which represents the central portion of city. The peripheral area, up to the BBMP boundary, is called the non-core area. In last five decades, the core area has been expanded from 134 km2 in 1971 to 226 km2 in 2011. The **Figure 2-9** below presents population growth within core area from 1961 to 2011.

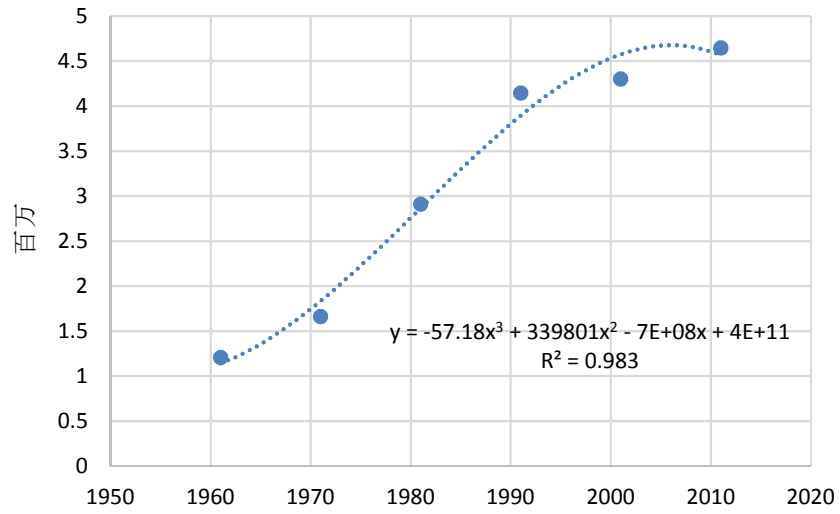

Figure 2-9: Population growth in core area from 1961 to 2011

As could be seen from the above figure, population within core area has been stabilised, and shows a decreasing trend. The core area is well covered with water and wastewater network, but in terms of transportation infrastructure and affordability, people are no moving towards outskirts of the city.

Lately, all the new IT/ITES based establishments and other industries are establishing themselves in the peripheral areas, mostly because of affordability and reducing the travel time for their employees. This is the region which is expected to see maximum population growth in the years to come.

2.7 Population changes expected to 2050

For Bengaluru, the Bangalore Development Authority (BDA) is the statutory body for planning and development of the city. Its mission is "To transform Bangalore to an ideal global destination with high quality infrastructure, better quality of life by ensuring sustainable and planned development based on effective monitoring, regulation, through participatory and innovative approach". BDA undertakes the following planning activities:

- Preparation of development plan for Bangalore.
- Preparation of Scheme Plans.
- Approval of Development Plans for Group Housing and Layouts.
- Approval of building plans.
- Other statutory functions under KTCP Act

BDA also undertakes the following development activities:

- Planning and implementation of schemes to provide for Residential sites, Commercial sites, Industrial sites, Civic Amenity sites, Parks and playgrounds.
- Construction of Commercial complexes.
- Construction of homes for Economically Weaker Sections, Low Income Group, Middle Income Group, High Income Group.
- Development of major infrastructure facilities.

2.7.1 BDA input in current study

BDA is currently preparing the Land Use Master Plan 2031 for Bengaluru, for its jurisdictional area of approximately 1, 300 km^2. The area considered for the current Master Plan study is a subset of this area, and is approximately 800 km^2 in size. **Figure 2-10** shows the relative location of BDA Planning Area and Master Planning area.

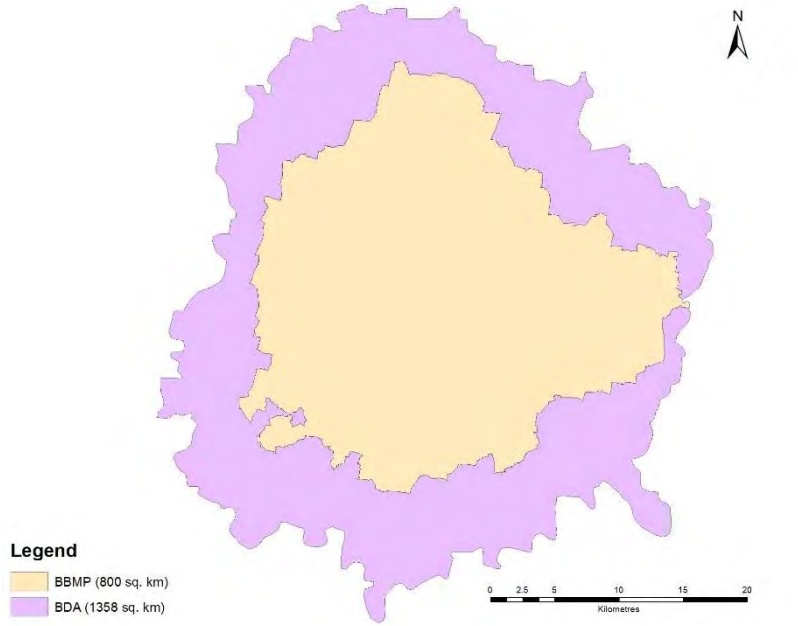

Figure 2-10: Relative location of BDA planning area and Master Planning area

In order to have synergy between BDA's proposed land use plan and current Master Plan study, CH2M, with assistance from BWSSB, contacted BDA for procuring the population projection and proposed land use data. However, BDA cited their inability in sharing the proposed land use information, and also the population distribution information, although the agency shared the total population projection numbers for up to the year 2031 at 5 years interval from 2016, for the entire BDA jurisdictional area.

Having a block population number for an area that is larger than the current study area, without future spatial population distribution and proposed land use, has a very limited utility in terms of generating the future water demand. In order to overcome this challenge, CH2M developed its own strategy for projecting the population figures for the years 2020, 2035 and 2050, based on the proposed infrastructure development projects that are currently ongoing or are likely to be implemented in the next 15 to 20 years[1]. This methodology is explained in subsequent section.

2.7.2 Population projection

With its pleasing climate, connectivity to major Indian cities, an educational and medical facilities hub, and reputation of being the IT capital of India, Bengaluru has been an attractive destination for migration, and has witnessed an unprecedented population growth.

Population of Bengaluru city for the year 2011 is reported close to 8.5 million[2]. As of today, the estimated population for Bengaluru City is close to 10 million[3].

However, such population growth is not perpetual. Future growth of Bengaluru is dependent on a variety of factors such as availability of basic infrastructure like roads, public transport, affordable housing, power, water and sanitation facilities, educational and medical facilities, job opportunities etc.

Consequently, any such infrastructure development project also acts as a "trigger" for spurt in population growth. In absence of any available land use projection details, CH2M team has identified key ongoing and proposed infrastructure projects, which are likely to trigger the population growth up to the year 2050.

[1] Based on the list of proposed infrastructure development projects listed by Karnataka Urban Development Department.
[2] Census of India.
[3] http://www.indiaonlinepages.com/population/bangalore-population.html
http://worldpopulationreview.com/world-cities/bangalore-population/

2.7.3 Key assumptions – population growth

The population growth for any particular ward in Bengaluru is considered under either of two scenarios – without any "triggers" and with "triggers" present. The assumptions for population growth under these two scenarios are further elaborated in the subsequent sub-sections.

2.7.3.1 Absence of any "triggers":

Every city reaches a stage of population saturation. However, the rate of population growth to approach saturation can be different for different stages. For instance, in case of any new infrastructure development, the population influx start increasing when the project is nearing or at completion.

Wards that are not located in close proximity to any growth "triggers" or infrastructure projects are considered as not having any "triggers" for population growth. The growth of population in these wards are primarily driven by natural decadal growth of Bengaluru city from the perspective of birth and death rates[4], with some migration where people are cognisant of extant infrastructural challenges associated with Bengaluru. Based on the population data available, and comparison with the other similar cities in India, the population growth rate considered under this scenario is 2% per 5 years from 2015 to 2050.

2.7.3.2 Presence of "triggers"

Wards that are located in close proximity to any growth "triggers" are considered to experience an increase in population growth beyond the natural growth rate. Key infrastructure development projects that are already under construction or are likely to commence in next 15 to 20 years period[5] are identified as growth "triggers". The following infrastructure development "triggers[6]" have been identified:

- Namma Metro Phase I, and its extension.
- Namma Metro Phase II
- BDA affordable housing scheme
- Peripheral ring road

It is important to note here that the identified "triggers" link major infrastructure and housing projects in the city to population influx, based on their anticipated date of completion. Based on the information available from Government of Karnataka (GoK) Urban Development Department, the following are the key assumptions for project completion dates:

- **By 2020** – Metro Phase I is complete
- **By 2035** – Metro Phase I (Extension) is complete, Metro Phase II is complete, Peripheral Ring Road is complete, 5 new BDA affordable housing sites are complete
- **By 2050** – Metro Phase I and II is complete, development around Peripheral Ring Road, 4 more affordable housing projects by BDA are complete

For each of the catalysts, an associated net residential population density[7] has been assumed. For residential areas, the Floor Area Ratio

[4] at an average of 1.349% per decade

[5] Information available from Urban Development Department, Government of Karnataka.

[6] Please refer to reference section for each of the identified projects.

[7] RMP 2015

(FAR) is directly linked to the population density. This is especially true in areas with a higher demand for residential housing for lower and middle income housing along the metro corridor and for the affordable housing sites proposed by BDA.

The key assumptions for correlation between population density and FAR are as follows:

- A plot measuring one hectare (10,000 m^2) with an FAR of 1.00 would have a built up area of 10,000 m^2.
- On an average, a two-bedroom apartment in Bengaluru would have an area of about 100 m^2, which would translates into 100 houses in the one hectare plot. (Houses would be smaller for EWS and LIG housing)
- Considering an average of 4 people per family, this would mean that the average population density in a 1.00 FAR area would be 400 persons per hectare.

Based on the above assumptions, **Table 2-2** lists the net densities organized by catalyst and projected year:

Table 2-2: Net population densities based on population growth triggers

Catalyst	Resulting net residential population density (people per hectare)		
	2020	2035	2050
Metro Phase I	600 to 800	Natural Growth	Natural Growth
Metro Phase I (Extension)	Natural Growth	400 to 600	800 to 1000
Metro Phase II	Natural Growth	200 to 400	600 to 800
Metro + BDA	Natural Growth	400 to 600	600 to 800
Affordable Housing Scheme			
Metro + Peripheral Ring Road	Natural Growth	400 to 600	800 to 1000
BDA Affordable Housing Scheme (2035)	Natural Growth	150 to 200	200 to 300
BDA Affordable Housing Scheme (2050)	Natural Growth	Natural Growth	200 to 300
Peripheral Ring Road	Natural Growth	100 to 150	150 to 200
No direct catalyst	Natural Growth	Natural Growth	Natural Growth

The following assumption are to be read in reference with the identified densities as listed in the **Table 2-2:**

- Wards with access to metro in the peripheral areas are assigned the highest net density of 800 to 1000 pph,
- Wards in the city, with access to the metro are assigned a final net density of 600 to 800 pph,
- Going by the current trend, it is safe to assume that for extension to Phase I and Phase II of the metro, some impact will be seen in 2035 but the total impact of this phase of the metro will not be seen until 2050,

- While affordable housing projects will have an impact, since they occupy only part of the ward, the overall ward density will not be as high as ward with a metro,
- Wards in the periphery near the peripheral ring road without access to the metro will also see a rise in population, but since there is little public transport connectivity, LIG/EWS housing are unlikely to be built in these areas. Consequently, the assumed net density in pph is lower than wards with metro connectivity.

Figure 2-11 shows the wards affected by the different identified growth "triggers". Further description of each growth trigger is provided in **Section 2.8**.

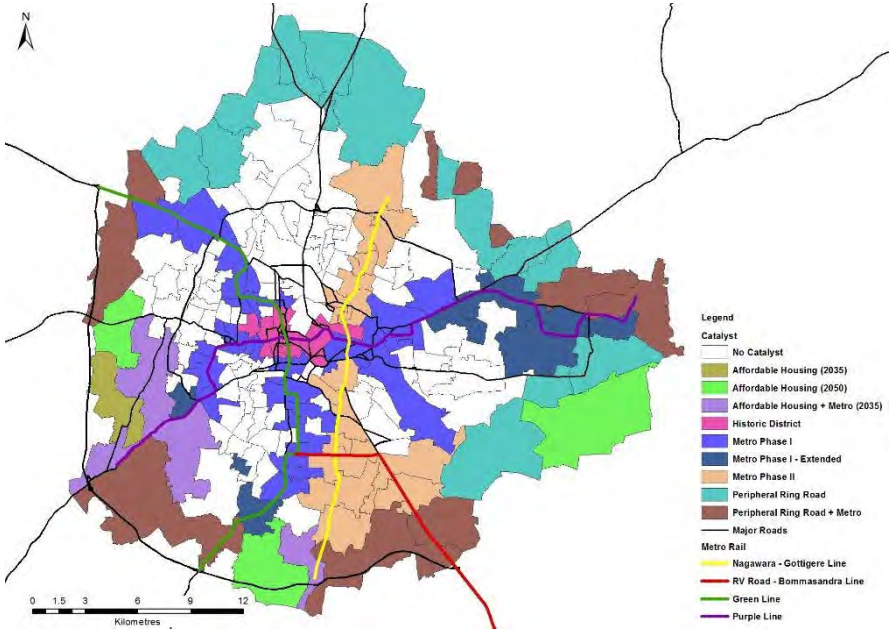

Figure 2-11: Affected wards with all triggers in place

Apart from the triggers listed above, the following factors were also considered:

Presence of commercial/ industrial activity[8] – Wards with a high percentage of commercial/ industrial land are likely to be employment generating wards. For this reason, a "multiplying factor" is applied to these wards.

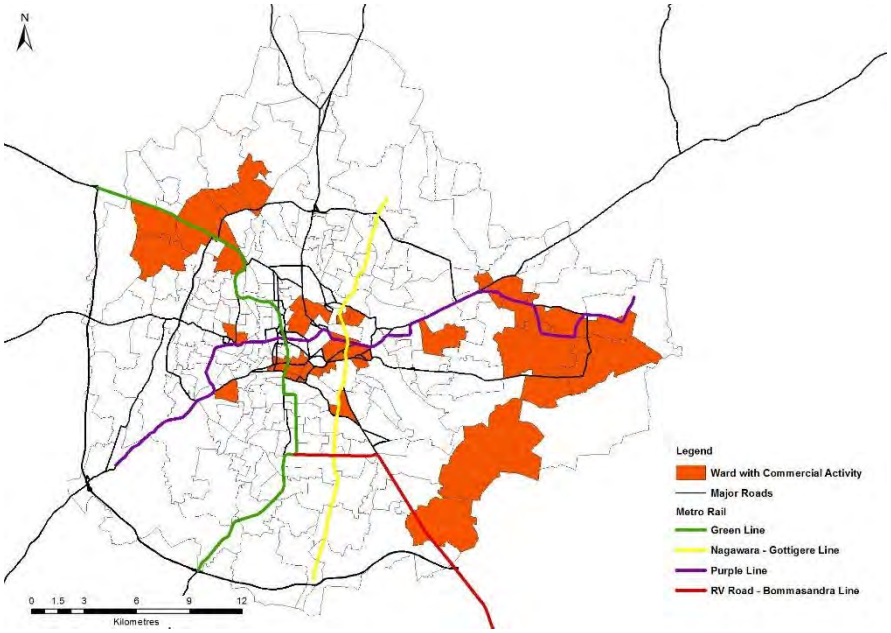

Figure 2-12: Wards with commercial activities

Wards with more than 30% land zoned as commercial/ industrial are given a factor of 1.05 (5% increase).

[8] Source: RMP 2015, BDA

Availability of land[11] – Wards with a high percentage of land currently zoned as agriculture or land that is currently unclassified are likely to see more development in the coming years.

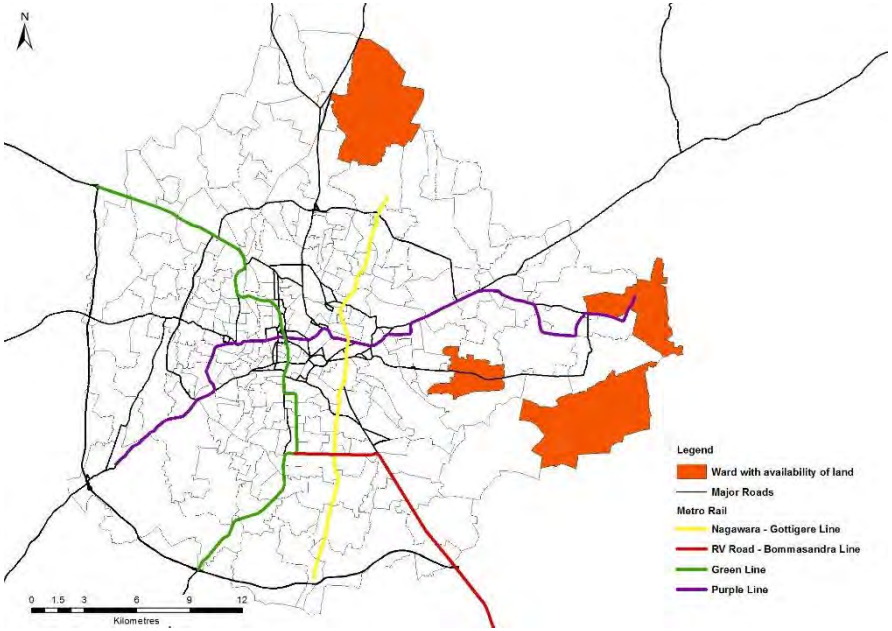

Figure 2-13: Wards with availability of land

Wards with more than 40% land available for development are given a factor of 1.1 (10% increase).

Historic Core – Wards in the inner city Bangalore area have an existing net population density ranging from 560 pph going up to 1270 pph and are least likely to see a high population influx.

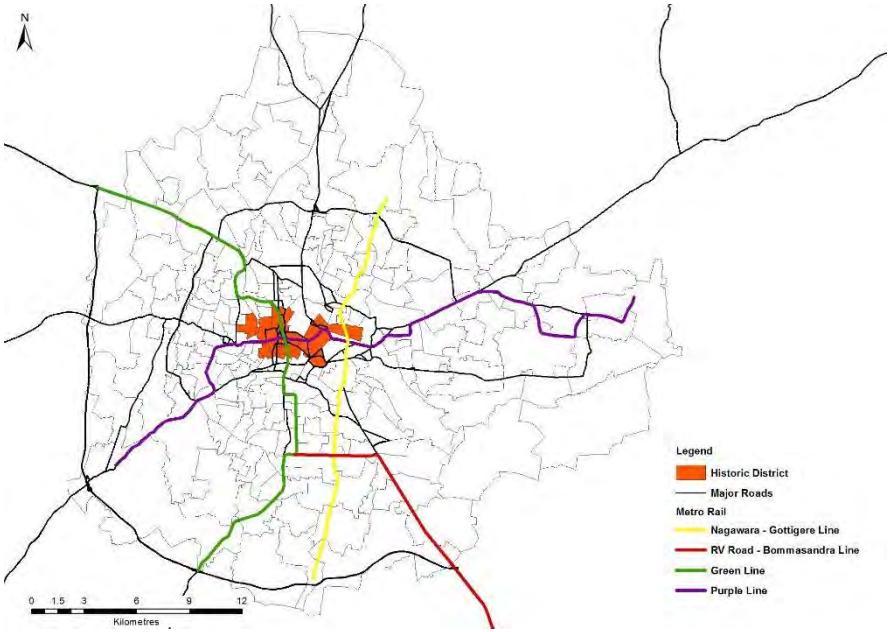

Figure 2-14: Historic core area of Bengaluru

These areas also have a higher concentration of heritage structures, large public parks and huge tracts of government land, making these less likely to redevelop in the near future. For these reasons, these ward are given a factor of 0.95 (5% decrease).

2.8 Description of triggers and identified population densities

This section provides further description of identified population growth triggers and the resulting densities.

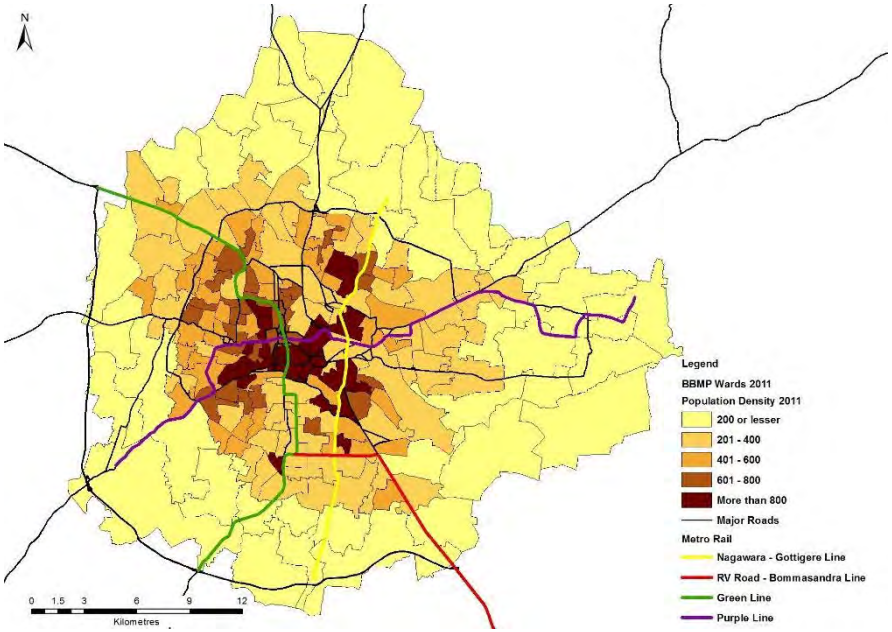

Figure 2-15: 2011 Population density of Bengaluru

Figure 2-15 illustrates 2011 population densities in each of the 198 wards of Bengaluru City. It has been observed that the historic core area of Bengaluru is the densest area. It includes areas such as Chikpete, Kalasipalayam and Majestic, comprising of the old markets and residential areas of historic Bangalore. This area is characterized by a dense network of roads and small plot sizes. The existing net population density in these areas ranges from 560 to 1,270 pph (persons per hectare).

A comparative study of the 2001 and 2011 census reveals that while the central core is the densest, it has not grown at the same rate as the rest of the City. Most of the growth in the last decade in Bengaluru has taken place in and around the peripheral areas.

2.8.1 BDA affordable housing

BDA has proposed affordable housing on the south east and south west corner of city. The housing is likely to be built in two phases. It is assumed that the first phase of affordable housing will be completed and inhabited by 2035 and the second phase will be completed and inhabited by 2050.

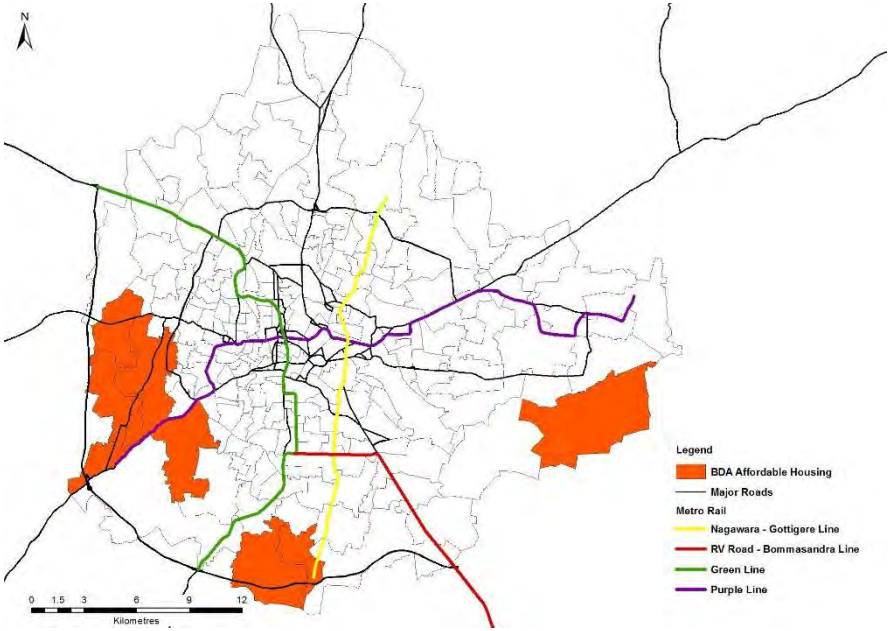

Figure 2-16: Wards affected by BDA's proposed affordable housing

Table 2-3 presents the assumed densities associated with BDA housing schemes.

Table 2-3: Population density for wards affected by BDA's proposed affordable housing

Catalyst	Resulting net residential population density (people per hectare)		
	2020	2035	2050
BDA Affordable Housing Scheme (2035)	Natural Growth	150 to 200	200 to 300
BDA Affordable Housing Scheme (2050)	Natural Growth	Natural Growth	200 to 300

2.8.2 Metro corridor

The development of a Metro corridor is one of the key catalysts for growth in population. As per the UDD Notification (UDD 93 MNJ 2008), all areas within 500m of the metro station will have a separate Development Control Rules (DCR), and fall under Transit Oriented Development (TOD) areas. These areas would receive a higher FAR (Floor Area Ratio) of 4, and are likely to see mixed use development and provision for affordable housing. Owing to these reasons, the wards along the metro line are likely to see a very high influx of population. **Table 2-4** presents the population density for the wards affected by metro corridor expansion.

Table 2-4: Population density for wards along metro corridor extension

Catalyst	Resulting net residential population density (people per hectare)		
	2020	**2035**	**2050**
Metro Phase I	600 to 800	Natural Growth	Natural Growth
Metro Phase I (Extension)	Natural Growth	400 to 600	800 to 1000
Metro Phase II	Natural Growth	200 to 400	600 to 800

Figure 2-17 shows the affected wards by the proposed metro corridor.

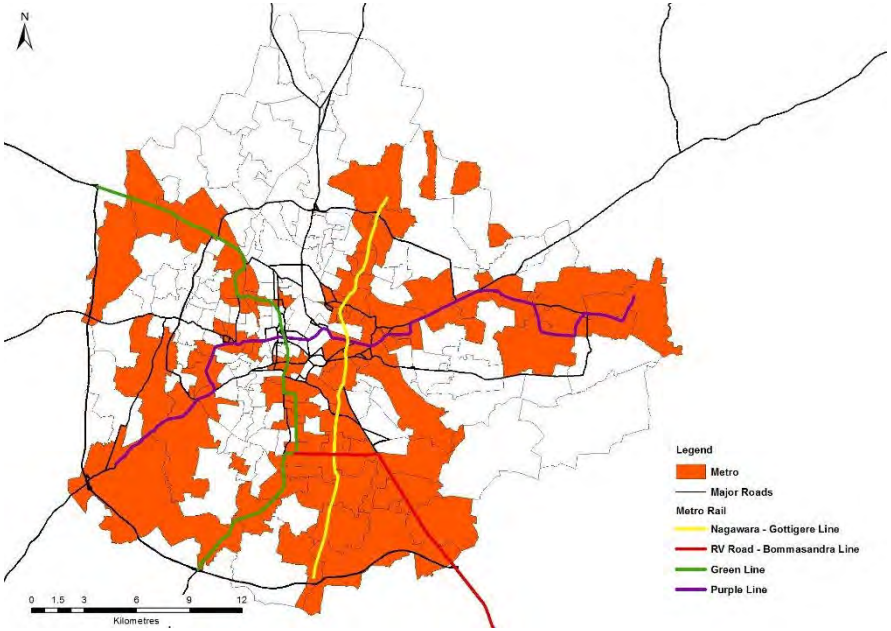

Figure 2-17: Wards along the metro corridor

2.8.3 Peripheral ring road

The proposed peripheral road construction is likely to be partially completed by the year 2035 and fully completed by the year 2050. **Table**

2-5 presents the population density for the wards affected by metro corridor expansion.

Table 2-5: Population density for wards in close proximity of proposed ring road

Catalyst	Resulting net residential population density (people per hectare)		
	2020	**2035**	**2050**
Peripheral Ring Road	Natural Growth	100 to 150	150 to 200

Figure 2-18 shows the affected wards by the construction of peripheral ring road.

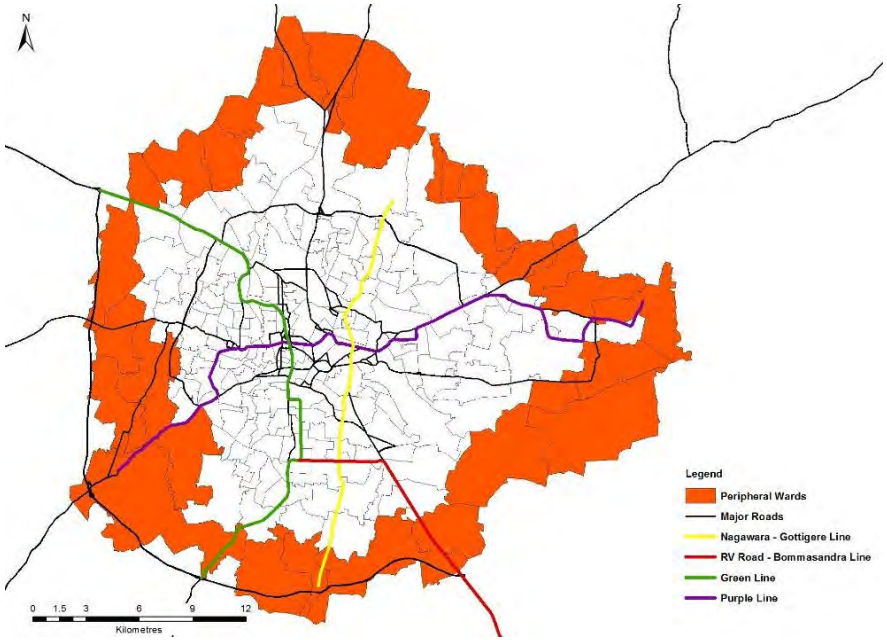

Figure 2-18: Wards affected by peripheral ring road.

2.9 Projected population numbers.

Figure 2-19 to **Figure 2-21** present the changes in population density and the overall impact on future population growth of Bengaluru, with all the triggers in place. All the population figures presented below correspond to high population growth range.

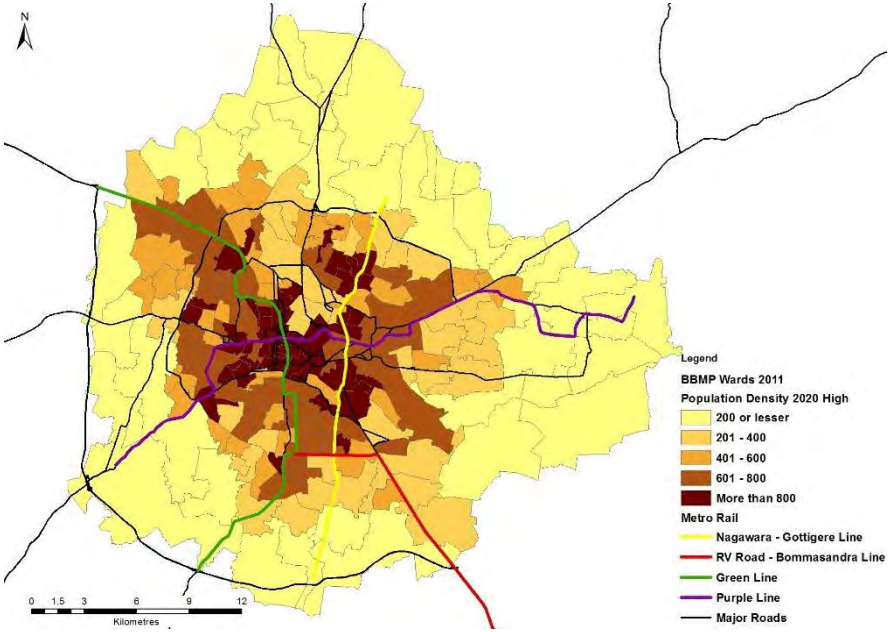

Figure 2-19: Population density for the year 2020 (High Growth)

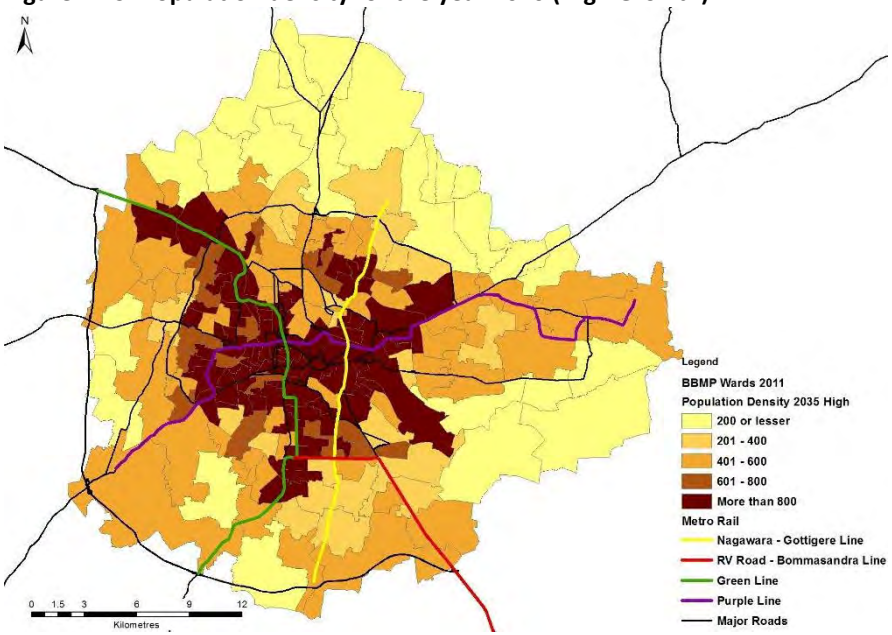

Figure 2-20: Population density for the year 2035 (High Growth)

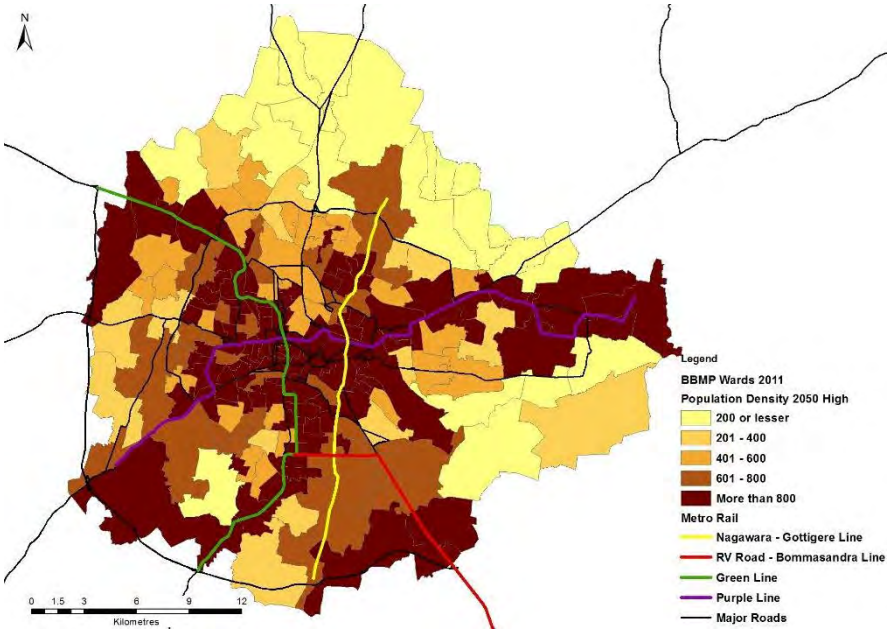

Figure 2-21: Population density for the year 2050 (High Growth)

Figure 2-22 to **Figure 2-24** shows the resulting growth percentages (for high growth scenario) for the wards for years 2020, 2035 and 2050 respectively. As expected the highest growth rates (red, orange and yellow colours) occur in the peripheral areas, where the growth triggers are (see **Figure 2-11**).

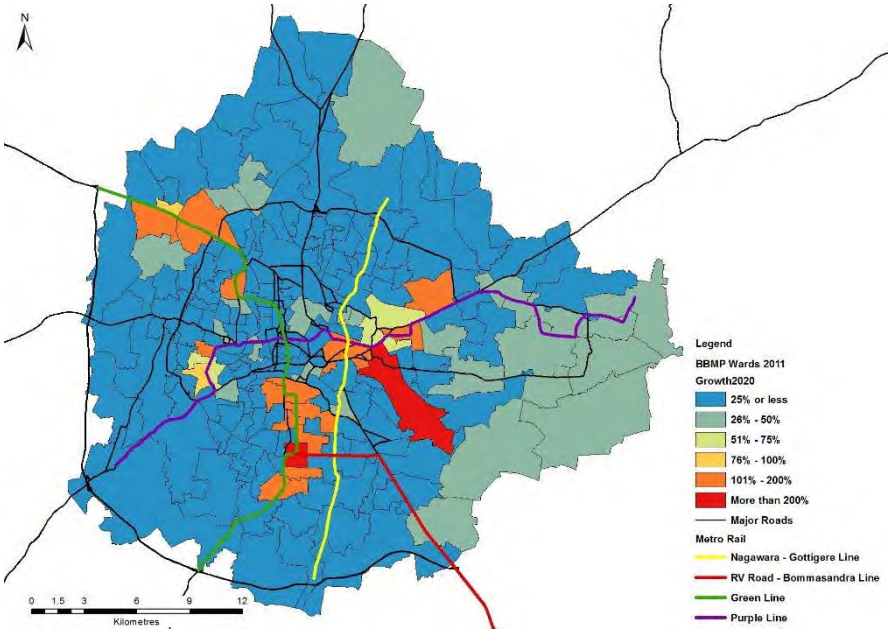

Figure 2-22: Growth %ages for various wards in the year 2020 (High Growth)

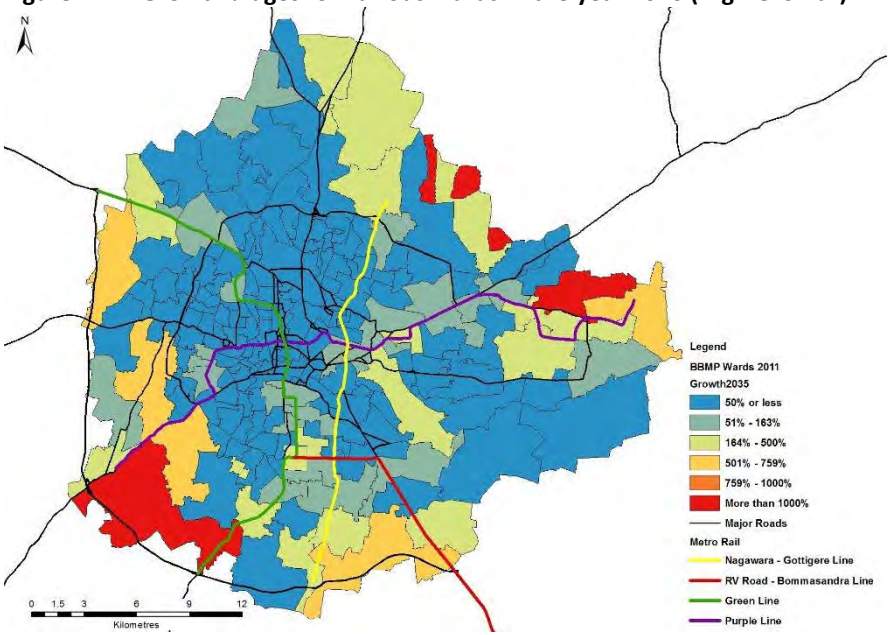

Figure 2-23: Growth %ages for various wards in the year 2035 (High Growth)

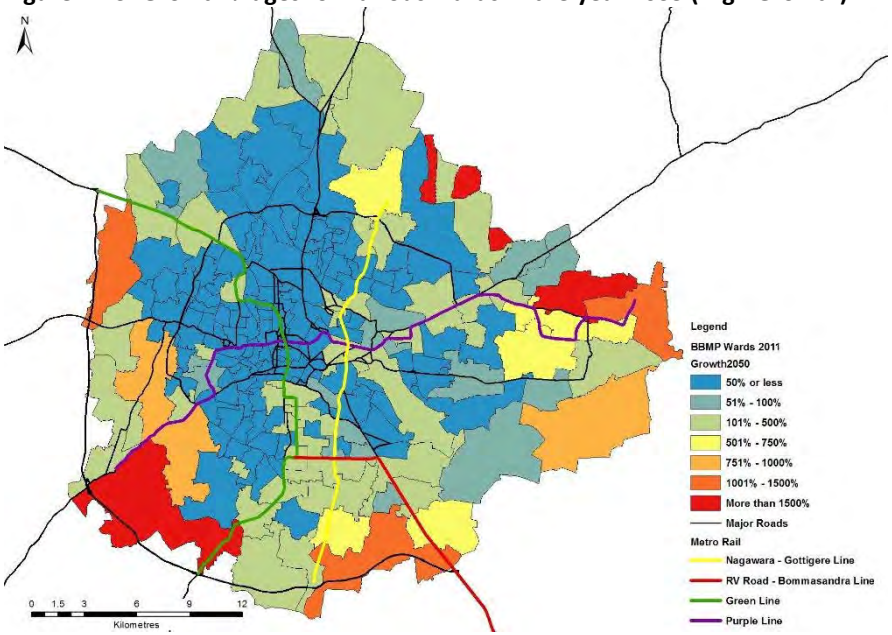

Figure 2-24: Growth %ages for various wards in the year 2050 (High Growth)

Figure 2-25 presents the final population range with all the triggers in place.

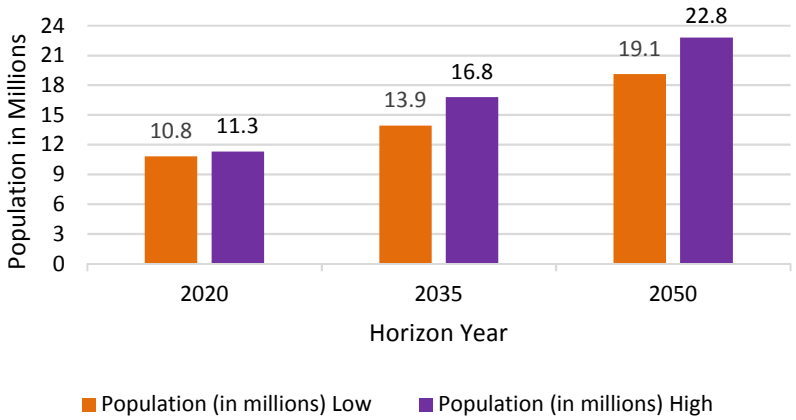

Figure 2-25: Population range (low growth to high growth) for the planning years

2.10 Climate Change Impact on Surface Water Availability to 2050

The following section presents the potential climate change scenarios in terms of precipitation changes and drought frequency for the Cauvery Watershed, and the key aspects considered for building climate change resiliency as part of this Master Plan study.

2.10.1 Potential climate change scenarios for Bengaluru

River Cauvery is the major, and to an extent, only source of water, for meeting Bengaluru's water needs. In recent years, the impact of climate change is becoming more and more prominent, where large number of cities around the world are now experiencing variation in temperature and rainfall, resulting into increased frequency of flooding and drought events. In order to have a secure and sustained water supply for Bengaluru, it is imperative that BWSSB considers potential impacts of climate change in water resources planning, and going forward, equips itself with measures that will help in effectively addressing such challenges. The first step in this direction is to understand the potential changes in rainfall, temperature and frequency of droughts over Cauvery River basin that may be brought about by climate change.

Cauvery basin covers an area of approximately 64,679 square kilometres[9]. **Figure 2-26** below presents the entire basin of Cauvery River; three sub basins highlighted reflect the part of Cauvery Watershed that contributes to KRS Reservoir[10], Kabini Reservoir[11] and to the point of water extraction from Cauvery for Bengaluru. Collectively, this watershed represents the northwest quadrant of Cauvery Watershed, and is approximately 1/4th of the total Cauvery Watershed Area.

Typically, the climate change scenarios for a region are studied with reference to a base year, which according to Intergovernmental Panel on Climate Change (IPCC), is defined as the most recent 30-year climate 'normal' period, and should be adopted as the climatological baseline period in impact and adaptation assessments. As per IPCC standard, the year 1995 represents the baseline year for the thirty year period 1981 to 2010. In the cases of precipitation and temperature modelled the baseline is provided and one future time slice of 2050.

[9](Gosain et al 2006)
[10] On Cauvery River
[11] On Kabini River

Supporting Report 9
Project Needs and Selection of JICA Survey Projects

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Chapter 9 Project Needs and selection of JICA Survey Projects

BWSSB proposed three major projects for JICA assistance. However, a huge cost is required to implement the projects at the same time. Therefore, study on priority projects had been made entailing water balance study. Feasibility of baseline plan with three options for project implementation arrangements was firstly studied considering required cost. Alternative arrangements were studied and finally all project components were divided into two groups for JICA Survey and Indian undertaking projects. These recommendations were the basis for finalization of project implementation arrangements. In this Chapter, a series of study results is included.

9.1 Project Components Proposed by BWSSB

BWSSB proposed three major projects as shown below.

(1) 110 Villages Water Supply and Sewerage Project
(2) CWSS Stage V Project
(3) UFW Reduction and Distribution Improvement Project (Majority of UFW is assumed to be caused by leakage based on the experience in the on-going project, hereinafter "UFW Reduction Project" is used in this chapter)

All projects proposed by BWSSB are to be implemented at the same time to meet present urgent needs/benefits. However, due to their cost requirements, huge areas to be covered and large range of scope of work, priority and/or arrangements for the implementation among them were studied. In view of this, an urgency of the proposed projects is summarized giving priority to water source development followed by the provision of water supply facilities. Sewerage facilities will be required upon completion of water supply systems. The following are conceptual urgency among proposed projects.

- Water source: Water source development is a pre-condition for 110 villages water supply as well as ensuring stable water supply in the BBMP area. Saved leakage water (majority of UFW) derived from the core area can be utilized for 110 villages water supply as a temporary water source. The water shall also be used together with the water to be provided by Stage V Project.
- Water supply facilities for 110 villages shall be constructed upon/before completion of Stage V project
- Sewerage facilities for 110 villages shall be constructed timely with reference to the commencement of water supply services. In the area where water supply pipes and sewers will be installed along the same roads, sewers shall be installed before the construction of water pipe lines for saving the construction cost.

9.2 Baseline Plan for the Implementation of Proposed Projects

In Chapter 6, water balance study was made between water demand and potential supply amount for the BBMP area broken down into core and ULB area, and 110 villages area. Table 9.2.1 shows the outline of the three options.

Table 9.2.1 Outline of Baseline Options for Project Implementation Arrangements

Option	Project Implementation Arrangements
1	JICA assists both of 110 villages Water Supply and Sewerage Project, UFW Reduction Project and CWSS Stage V Project
2	GoK assures implementation of CWSS Stage V Project
3	Water to be saved from UFW Reduction Project in core area shall be utilized for 110 villages water supply. In this regard water balance study shall be made.

(1) Water balance study

Water balance study was conducted for Option 3 in Table 9.2.2 to analyze the feasibility on the utilization of saved water by the reduction of UFW in the core area. BWSSB studied on the water balance in advance to this JICA survey. The following are the comparison between the two studies (BWSSB and JICA Survey).

There are some differences in the manner of calculation between the two studies in the conditions/assumptions and study process as summarized below. However, water balance finally calculated by the respective studies is on the same level for the comparison purpose.

- Water demand projection: In case of BWSSB, present UFW % is assumed to be maintained through the future. On the other hand, JICA Survey considers planned UFW% reducing from present (48% in core/ULB area) to 2049 (16%) for BWSSB service population (subtract served population by individual system using groundwater from administrative population). Water demand served by individual water supply systems which is equivalent to groundwater available (a total of 500 MLD through the future) is added to the demand served by the BWSSB systems.
- In JICA Survey, composition of supplied water from Cauvery River is shown (consumption, UFW saving and UFW), While in BWSSB study, saving water is shown as a part of potential water volume against water demand.
- JICA Survey does not include tertiary treated sewage and rainwater as potential water sources, since such water can’t be used for BWSSB water supply systems.

The following are salient differences between the two studies.

(2) Potential water source available

Tertiary treated sewage and rainwater considered by BWSSB as potential water sources are omitted by JICA Survey, since such water from these sources is not used for BWSSB water supply systems. With regard to UFW saving, BWSSB study estimated saved water by target year comparing with the base UFW% at present, while JICA Survey considered UFW% in the demand projection.

Table 9.2.2 Plan of Alternative Arrangements for the Implementation of Proposed Projects and Conclusions &Recommendations

Water sources for 110 villages		Issue	Solutions			Scope of Work for Proposed Project to be assisted JICA loan	Conclusions and recommendations based on JICA Survey
			Options		Conditions		
A	Cauvery River Stage V Project	Financial source for Stage V Project	Option 1	JICA assists both of 110 villages WS and Sewerage Project, and CWSS Stage V Project	Scope of the Project is subjects to GoJ's approval.	1. 110 Village Water Supply facilities 1.1 Distribution networks with approx. 3,000 km 1.2 Feeder Mains with approx. 200 km 1.3 Over head tanks with 137 nos. 1.4 House connections with 106,000 nos. including meters 1.5 SCADA system 2. 110 Village Sewerage facilities 2.1 STPs with 16 nos. and 129 MLD, 2.2 Trunk and lateral sewers with approx. 3,600 km 2.3 Sewer cleaning machines with 11 nos. 2.4 House connections with 106,000 nos. 3. Stage V, Facilities 3.1 WTP with 775 MLD including coagulation and rapid sand filtration, chlorination 3.2 Clear water reservoirs and Pumping Stations at T. K. Halli, Harohalli and Tataguni, 3.3 GLR with 7 nos. 4. Stage V, Pipelines 4.1 Raw water transmission 4.2 Clear water transmission main with length of approx. 70 km and diameter of 3,000 mm 4.3 City trunk mains 5. UFW Reduction by DMA establishment, distribution, improvement in East, North and South-East within total area of 118 km^2	It is obvious that the construction cost estimated at about 104 billion INRs (JICA survey) is beyond the debt ceiling of GoK, 4309 Crore INRs (43,090 million INRs). Accordingly, it is required to select package components to be undertaken by JICA assistance, and to arrange other funding agencies for executing the other package components.
					Project cost should be less than the debt ceiling of GoK (43090 million=4309 Crore); authorized as of July, 2016		
					BWSSB should include both projects in its Rolling Plan.		
			Option 2	GoK assures implementation of Stage V Project.	GoK should assure implementation of Stage V Project in some way.	1. 110 Village Water Supply 2. 110 Village Sewerage 5. UFW Reduction	The total cost required for the three components is about 63 billion INRs, which is beyond the GoK debt ceiling amount of 43,090 million INRs. Accordingly, there are some sub-options to be studied to reduce the cost to meet the ceiling amount as follows; 1) 110 village sewerage project shall be financed by other agencies, 2) Service coverage shall be reduced both for water supply and sewerage services, 3) Only major facilities shall be included such as OHT, trunk distribution, STPs and trunk sewers.
B	Allocation of saved water (UWF reduction) from core area	Feasibility of the allocation	Option 3	Preparatory survey team assesses the feasibility of the allocation.	GoK should assure the water allocation from Core area to 110 villages in some way.	1. 110 Village Water Supply 2. 110 Village Sewerage 5. UFW Reduction Note: Stage V Project shall be implemented timely.	Water amount to be saved reducing UFW in the core area by 2024 is estimated in assumption of UFW% (from 48% at present to 33% in 2024). Thus, 219 MLD may be utilized for 110 villages water supply (about 65% of the demand in the BWSSB service area). However, from the current achievements reported on the on-going UFW reduction project, there seems to have a risk to ensure the saved water amount. Intentional countermeasures are required for UFW reduction.

(3) Water balance from 2024 to 2049

From the year planned that Stage V Project will be completed (BWSSB; 2022 and JICA Survey 2024), water balance is calculated. BWSSB projected that in 2022 supply amount will exceed water demand, but, from medium term to final target years, supply will be in short with final deficit of 3,175 MLD in 2049. While JICA Survey projected that water balance will be managed up to the year 2034. In the final target year the shortage is less than 1/4 of BWSSB's projection, mainly caused by projected population (about 2/3).

(4) Water saving by the reduction of UFW

In 2024, saved water in the reduction of UFW is calculated with more than 200 MLD in the both studies.

9.3 Study on Alternative Arrangements for the Implementation of Proposed Projects

The study results in this section are those to be refereed to for the selection of priority projects for JICA assistance at the beginning of September, 2016. Baseline alternative plans were firstly studied and additional options were worked out.

9.3.1 Utilization of Saved Water to be Generated in the Core Area for 110 Villages Water Supply as a Temporary Countermeasure in the Medium Term

In case that additional water supply by Stage V project could not be provided on time (before 2024), saved water in the core area may be utilized for 110 villages water supply as a temporary service (even per captita consumption rate may be less than 150 lpcd) at least for medium term period. Needless to say there is another way to use such saved water for the core/ULB area to supplement increasing demand as well as filling present shortages. In application of this arrangement for 110 villages water supply, water supply amount provided for core and ULB area at present shall be at least maintained. It is also self-explanatory to implement leakage reduction (named as UFW reduction in BWSSB related works) projects to cover entire core area, as soon as possible.

Option 3 shown in Table 9.2.2 corresponds to the above mentioned case to use saved water from physical losses which is generated in the core area. Table 9.3.1 presents water balance from 2024 to 2049 in the proposed case (BWSSB study case is also shown as a reference). The following are major assumptions in the JICA Survey.

- Water demand by area: Water demand consists of water consumption and UFW (core /ULB area; 48% at present to 16% in 2049, 110 villages; 16% upon completion of facilities)
- Water sources available: Cauvery River water (a total of 1,460 MLD, from Stage I to IV), groundwater (a total of 500 MLD). No consideration of water supply by Stage V Project.
- Saved water in the core area is used for 110 villages and present supply amount for core/ULB area is assumed to be kept through the future.

Table 9.3.1 Water Balance in case of the Utilization of Saved UFW from Core Area for 110 Villages

Year	Study Source	Area	Demand MLD ①	Supply										Balance between ②-①	Demand/ Supply
				Groundwater (a)	Cauvery					UFW saving (d)	Tertiary Treated Water (e)	Rainwater Harvesting (f)	Total ② =(a)+(b)+(c)+(d)+(e)+(f)		
					CWSS 1-4 (b)				Stage V (c)						
						Current Effective	UFW Saving	UFW							
2022	BWSSB	Core & ULB	2,700	400	1,460				557	250	150	100	2,917	217	
		110 Villages	318	100	0				218				318	0	
		Total	3,018	500	1,460				775	250	150	100	3,235	217	
2024	*JICA Survey*	*Core & ULB*	*1,997*	*400*	*1,241*	*759*		*482*					*1,641*	*-356*	82%
		110 Villages	*338*	*100*	*219*		*219*						*319*	*-19*	94%
		Total	*2,335*	*500*	*1,460*	*759*	*219*	*482*	*0*	*N.A.*	*0*	*0*	*1,960*	*-375*	84%
2034	BWSSB	Core & ULB	3,500	400	1,460				470	300	200	150	2,980	-520	
		110 Villages	480	100	0				305		50	25	480	0	
		Total	3,980	500	1,460				775	300	250	175	3,460	-520	
	JICA Survey	*Core & ULB*	*2,210*	*400*	*1,124*	*759*		*365*					*1,524*	*-686*	69%
		110 Villages	*480*	*100*	*336*		*336*						*436*	*-44*	91%
		Total	*2,690*	*500*	*1,460*	*759*	*336*	*365*	*0*	*N.A.*	*0*	*0*	*1,960*	*-730*	73%
2049	BWSSB	Core & ULB	6,000	400	1,460				215	350	250	150	2,825	-3,175	
		110 Villages	760	100	0				560		50	50	760	0	
		Total	6,760	500	1,460				775	350	300	200	3,585	-3,175	
	JICA Survey	*Core & ULB*	*2,660*	*400*	*993*	*759*		*234*					*1,393*	*-1,267*	52%
		110 Villages	*763*	*100*	*467*		*467*						*567*	*-196*	74%
		Total	*3,423*	*500*	*1,460*	*759*	*467*	*234*	*0*	*N.A.*	*0*	*0*	*1,960*	*-1,463*	57%

Note: N.A.; Not Applicable

1) UFW saving in JICA Survey is calculated:

(UFW saving) = ((Current UFW) - (Planned UFW)) x (Cauvery Stage 1-4)

= (48% - 33%) x (1460) = 219 MLD at 2024

= (48% - 25%) x (1460) = 336 MLD at 2034

= (48% - 16%) x (1460) = 467 MLD at 2049

2) Current UFW is 48 % and 33 % in 2024, 25 % in 2034, 16% in 2049 for JICA Calculation

3) UFW saved water is allocated to 110 villages

Referring to Table 9.3.1, water supply for 110 villages will be provided with a higher satisfaction level, while the shortfall for core/ULB area will become larger than that in case of the provision of Stage V project. Scope of the work for the Option 3 includes the following three components; UFW reduction project, Water Supply and Sewerage for 110 Villages.

9.3.2 Provision of Stage V Project with Financial Assistance either by JICA or State Government

If option 3 can't be adopted, option 1 or 2 (refer to Table 9.2.2) shall be studied as baseline alternatives. The following were issues and problems by each option in the course of the study to decide priority projects.

(1) Option 1: This option covers two major construction projects in addition to UFW (mainly leakage) Reduction project; Water Supply and Sewerage Project for 110 villages, and Stage V Project. As of July, 2016, financial approval from State Government has been made for only water supply and sewerage project for 110 villages with the ceiling amount of 4,309 Crore (43,090 Million) INR as JICA assistance. For the implementation of Stage V Project to expand/augment water supply in the BBMP area using Cauvery River water, capital cost arrangements had not yet been made.

Overall cost for the construction of all proposed components would be beyond 100 billion INR (in the concerned DPRs, 91 billion INR) considering escalation cost and requirements in application of Japanese loan. If the above ceiling amount is kept for this project, reduction of scope of work or cancelation of some components is required to implement as a loan project. In this connection, additional finance by the State Government, especially for Stage V Project is necessary. If the financial assistance from GoK for the implementation of Stage V Project would be determined, scope of work for the two major projects would be further studied considering ceiling amount of both JICA and Indian sides.

(2) Option 2: Proposed two major projects are assumed to financially divide into two sources; Stage V Project for State Government (GoK) and 110 villages Water Supply and Sewerage Project for JICA assistance.

For this Option, if GoK will make a decision for the financial assistance to implement Stage V Project, JICA assistance will be 110 villages water supply and sewerage development together with UFW reduction project. At the beginning of September 2016, the revised DPR for Stage V Project was submitted by BWSSB to GoK.

Under the above transitional situation in the Indian side on the implementation arrangements on baseline plans, the following potential alternatives were enumerated in combination of some component projects. Sub-components are set for Stage V Project and 110 villages Sewerage Project considering magnitude of required cost, packaging and requirement of technical expertise (refer to Table 9.3.2).

Table 9.3.2 Sub-component projects considered in the Proposed Projects

<table>
<tr><th colspan="2">Proposed project</th><th colspan="5">Considered Sub-Components</th></tr>
<tr><td rowspan="3">110 Villages WS & Sewerage</td><td>Water Supply</td><td colspan="5">None</td></tr>
<tr><td rowspan="2">Sewerage</td><td rowspan="2">Case 1</td><td>Major sewerage Facilities (Main sewers, ISPSs and STPs)</td><td rowspan="2">Case 2</td><td>STPs</td></tr>
<tr><td>Lateral sewers /House connections</td><td>Sewerage facilities excepting STPs</td></tr>
<tr><td colspan="2" rowspan="2">Stage V Project</td><td rowspan="2">Case 1</td><td>Major Facilities (Intake, WTP, Surge tank, Transmission PSs and GLRs)</td><td colspan="2" rowspan="2"></td></tr>
<tr><td>Pipelines (conveyance, transmission and trunk main)</td></tr>
<tr><td colspan="2">UFW Reduction</td><td colspan="5">None</td></tr>
</table>

Note: Each proposed project covers all required project components, while sub-components are considered for the two major projects; 110 villages sewerage project and Stage V project.

Table 9.3.3 shows additional options in combination of the above mentioned sub-components.

Table 9.3.3 Options on Priority Projects in combination of Sub-components of Proposed Projects

Alternative Options	Contents of project components	Comments
Option 4-1	Stage V Project	Priority is given water supply
Option 4-2	Stage V Project + 110 villages WS Project	-do-
Option 4-3	110 villages WS Project	-do-
Option 5-1	Stage V Project + Major Facilities for 110 villages Sewerage Project	Combination of Stage V Project and some sewerage facilities for 110 villages
Option 5-2	Stage V Project + STP s for 110 villages Sewerage Project	-do-
Option 6-1	Major Facilities for Stage V Project	Combination of major facilities for Stage V Project and 110 villages some sewerage facilities or UFW reduction project
Option 6-2	Major Facilities for Stage V Project + Major Facilities for 110 villages Sewerage Project	-do-
Option 6-3	Major Facilities for Stage V + STPs for 110 villages Sewerage Project	-do-
Option 6-4	Major Facilities for Stage V Project + UFW Reduction Project	-do-

9.4 Rough Cost Estimate for Alternative Options in use of cost base in the DPRs

9.4.1 Scope of Work for the Proposed Project Considering Sub-components

Proposed three projects are summarized blow as a result of the review of concerned DPRs.

(1) 110 Villages Water Supply and Sewerage Project

As a result of the review of major factors for demand projection in the DPRs, planning parameters were regarded as adequate in general including the assumptions on population projection and per capita water consumption rate. However, minor revisions are made for UFW % (16% as practiced at preset from planned 15%) and per capita sewage generation volume (according to national standard, 132 lpcd from planned 135 lpcd) as well as minor revision of population for a few villages. Some modifications seem not to affect capacity requirements of the facilities, therefore, the scope of work proposed both for water supply and sewerage development for 110 Villages in the DPR is employed in this study.

(2) Stage V Project

Required facilities for the additional water supply supplementing those provided by the four stages of CWSS (up to Stage IV), are reviewed to improve water supply in the BBMP area. The planned scope of work in the DPR for Stage V Project (updated at the beginning of September, 2016) to cover facilities including pipelines from intake to ground reservoir in the city is regarded as adequate.

(3) UFW Reduction Project

The remaining core area which is out of on-going project area for the reduction of UFW is regarded as the priority area for effective countermeasures to save supplied water. The same scope of work for UFW reduction in the DPR is adopted.

For the purpose of cost comparison among alternative options to discuss priority projects, proposed projects are further sub-divided into a total of 5 sub-projects with reference to sub-component projects in Table 9.3.2. Five sub-projects are summarized in Table 9.4.1. Namely, two sub-projects for water supply and sewerage (possible to further sub-divide sewerage requirements) under 110 villages Water Supply and Sewerage Project, and other two sub-projects for the facilities and pipelines/conduits for Stage V Project. In addition to the four sub-projects, UFW reduction Project is considered.

Table 9.4.1 Scope of Work for the Proposed Project

Item	Component	DPR
(1) 110 Villages Water Supply Facilities	Supply amount/facility design amount	760 MLD/ 660 MLD
	1. Distribution	Approx. 3,000 km
	2. Feeder main	Approx. 200 km
	3 Over Head Tank	137 nos
	4. House Connection	106,000 nos including water meter
	5. SCADA System	1 set
(2) 110 Villages Sewerage Facilities	1. Sewage Treatment Plant	16 nos (129 MLD)
	2. Trunk and Lateral Sewer	Approx. 2,600 km
	3. Sewer Cleaning Machines	11 nos
	4. House Connection	106,000 nos

Item	Component	DPR
(3) CWSS Stage V Facilities	1.Water Treatment Plant	Coagulation, Flocculation, Sedimentation, rapid sand filtration and chlorination Capacity 775 MLD
	2. Clear Water Reservoir and Pumping Station at T K Halli, Harohalli and Tataguni	Capacity 775 MLD
	3. City Trunk Mains and Ground Level Reservoirs	7 Nos
(4) CWSS Stage V Pipelines	1. Conveyance (Raw water transmission)	Approx. 10 km Length
	2. Clear Water Transmission Main	Approx. 70 km Length
(5) UFW Reduction	DMA Establishment Distribution Improvement UFW reduction	East, North and South East Total 118 km2

9.4.2 Rough Cost Estimate for the Alternative Options

Without preparation of basic design of the facilities for the proposed projects in this JICA Survey, rough cost for the alternative projects, as discussed in the previous sub-section, was estimated using the direct construction cost studied in the existing DPRs, though there was a possibility of cost increase as experienced in the on-going Phase II project. On the other hand, indirect construction cost was updated/modified to meet the requirements as a loan project. The rough cost by alternative project may be referred to for the study to select priority projects. The following conditions/assumptions on indirect cost are adopted for updating/modification of those in the DPRs.

(1) Assumptions for Common Factors for Indirect Cost Estimate, as JICA Loan Project

1) Price escalation; 3.7 % annually
2) Physical contingency; 5 %
3) PMC (Project Management Consultant) fee; 5 % of direct cost
4) Administration fee; 3 % of direct cost
5) Front end fee; 0.2 % of direct cost

(2) Updating/modification for each sub-project

1) 110 Village Water Supply
   ⇒ The PMC fee of 5 % is applied instead of 1.5 %.
   ⇒ The physical contingency of 5 % is applied instead of 3 %.
   ⇒ The price escalation of 3.7 % annually is applied for 4 year period instead of 6 % annually for 3 year period.

2) 110 Village Sewerage
   ⇒ The PMC fee of 5 % is applied instead of 1.5 %.
   ⇒ The price escalation of 3.7 % is applied for 4 year period instead of 6 % annually for 3 years.

3) 775 MLD WTP and 775 MLD Pump Stations in the Stage V Project and the Raw Water Transmission;
   ⇒ The price escalation of 3.7 % per annum is added for 4 year period, though no escalation percentage is applied in DPR.
   ⇒ The physical contingency of 5 % is applied instead of 10 %.

4) Pipelines such as Clear Water Transmission and City Trunk Mains;
   ⇒ The price escalation of 3.7 % per annum is added for 4 year period, though no escalation percentage is applied in DPR.
   ⇒ The physical contingency of 5 % is applied instead of 10 %.

5) UFW reduction in the three zones; East, South, and South East in a total area of 118 km2;
   ⇒ The price escalation of 3.7 % per annum is applied for 6 year period instead of 15 % for 6 year period.
   ⇒ The physical contingency of 5 % is applied instead of 8 %.
   ⇒ The PMC fee of 5 % is applied instead of 0.75 %.

The cost required covering all sub-projects are shown in Table 9.4.2 with the estimate shown in the DPRs.

9.4.3 Alternative Study for the Selection of JICA Survey Projects

As a result of water balance study for the BBMP area, it was found that about 200 MLD would be available for 110 villages water supply by 2024 using expected water to be saved in the core area through UFW reduction projects (on-gong and planned projects to finally cover entire core area). Although this arrangement may be a temporary countermeasure, but it is effective to expedite water supply services for 110 villages waiting for additional water supply by Stage V Project.

Three baseline options in view of water source availability are presented Table 9.4.3 including rough cost required by option. All options exceed the ceiling amount agreed with GoK as of July, 2016. The required total cost in this study for Option 1 is about 15 % higher than that of DPRs. Needless to say, considerable reduction of scope of work is necessary for Japanese loan assistance to meet this ceiling amount by GoK (Total cost is 2.4 times higher than ceiling amount of 43 billion INR).

While, Options 2 and 3 require same cost. Even for these cases, reduction of scope of work is required in the same reason as Option 1. Other alternative options categorized into three groups are also included in the table for cost comparison purpose (Options 4-1 to Option 6-4; total 9 alternatives).

Table 9.4.2 Updated/Modified Construction Cost for Proposed Projects with DPR estimates

Unit: INR Millions

Scheme	Description	DPR	JICA Survey
CWSS Stage V	Raw Water Pipeline from SBR to NBR(6.3km) :*1	1,054	1,054
	Raw Water Transmission Main from NBR to T K Halli *1		
	Water Treatment Plant at T K Halli *2	2,642	2,642
	Clear Water Reservoir and Pumping Station at T K Halli, Harohalli and Tataguni *2	4,862	4,862
	Clear Water Transmission Main	12,090	12,090
	City Trunk Mains	7,659	7,659
	City Reservoirs	3,087	3,087
	Provision for Land Acqiosition *3	1,850	
	Sub Total	**33,244**	**31,394**
	Additional cost *4	8,711	9,703
	Total Project Cost for CWSS Stage V	**41,955**	**41,097**
UFW Reduction	BILL I - Design and Management	474	474
	BILL II - Physical Works	4,676	4,676
	Taxes @ 15% of Bill I, Bill II (VAT , S.T and labour welfare cess)	772	772
	Sub-Total (1)	**5,922**	**5,922**
	Additional cost *5	1,248	2,218
	Total	**7,170**	**8,140**
110 villages	Water Supply System, IPS & Pumping mains, SCADA	18,687	18,687
	UDG System, ISPS, Pumping mains and Restoration of Drains, Sewer cleaning	11,287	11,287
	Restoration of Roads	7,169	7,169
	Sub-total	**37,143**	**37,143**
	Additional cost *6	13,041	16,896
	Total	**50,184**	**54,039**
Grand Total		**99,309**	**103,275**

Notes 1: The additional raw water pipeline 2750 mm dia. will be laid from the intake at SBR to NBR with a length of 6.3 km for Stage V Project and project for the other additional raw water pipeline from NBR to TK Halli is at the tender stage in a separate project. Notes 2: The Water Treatment Plant at TK Halli and the Clear Water Reservoirs at TK Halli, Tataguni and Horohalli will be constructed for the supply of 775 MLD at one time without phases. Notes 3: The cost for land acquisition is not covered by JICA fund (managed by BWSSB). Notes 4: Supervision expense: 2.5 %, Consultancy expense: 2.5 %, Physical contingency: 5 %, Escalation: 10%, Interest capitalized: 2,062 INR Millions are included in the DPR. Notes 5: Price escalation: 15 %, Physical Contingency: 8 %, PMC: 0.75 % are included in the DPR. Notes 6: Price escalation: 18 %, Physical Contingency: 3 %, PMC: 1.5 % are included in the DPR.

The base line options were firstly studied considering related conditions as of end of July, 2016 as follows:

(1) Ceiling budgetary amount (loan amount) agreed with GoK for 110 villages project implementation; 43 billion INR for JICA assistance

(2) Approval process with GoK for Stage V Project had been under way requiring at least half a year for finalization

The following are initially discussed by concerned parties.

- Application of Option 3: If there is no prospect on timely provision of Stage V Project, water supply for 110 villages shall be implemented by 2024 using UFW saved water in the core area. In addition, within the agreed budget with GoK, UFW Reduction Project and Construction of some sewerage facilities for 110 villages may be included. While, BWSSB shall timely undertake other components to complete water or sewerage systems. In the implementation of this option, BWSSB shall manage on-going UFW reduction project properly and timely, and implement succeeding similar project.

Table 9.4.3 Information for Selection of Priority Project with Options -1/2

Unit: Million INR

Solutions			110 village water supply	110 village sewerage	STPs for 110 village sewerage	Major facilities for 110 village sewerage	Stage V Major Facilities (WTP, Pump Station,	Stage V Pipelines (Raw water transmission, C W transmission and	UFW Reduction	**JICA Survey Cost as of Se pte mbe r 2016**	**DPR Cost**
Options		Conditions									
Option 1	JICA assists both of 110 villages and CWSS Stage V.	It is subjects to GoJ's approval. Project cost should be less than the debt ceiling of GoK (43090 million=4309 Crore) BWSSB should include both projects in Rolling Plan.	33,134	20,905			13,864	27,232	8,140	**103,275**	99,309
Option 2	GoK assures implementation of CWSS Stage V.	GoK should assure implementation of CWSS Stage V in some way.	33,134	20,905					8,140	**62,179**	57,354
Option 3	Preparatory survey team assesses the feasibility of the allocation.	GoK should assure the water allocation from Core area to 110 villages in some way.	33,134	20,905					8,140	**62,179**	57,354
Option 4-1	GoK assures implementation of the components except CWSS Stage V .	GoK should assure implementation of the components except CWSS Stage V.					13,864	27,232		**41,096**	41,955
Option 4-2	GoK assures implementation of the components except CWSS Stage V and 110 village WS.	GoK should assure implementation of the components except CWSS Stage V and 110 village WS in some way.	33,134				13,864	27,232		**74,230**	75,352
Option 4-3	GoK assures implementation of the components except 110 village WS.	GoK should assure implementation of the components except 110 village WS in some way.	33,134							**33,134**	33,398
Option 5-1	GoK assures implementation of the components except CWSS Stage V and major facilities for 110 village Sewerage Project.	GoK should assure implementation of the components except CWSS Stage V and major facilities for 110 village Sewerage Project in some way.				11,228	13,864	27,232		**52,324**	53,273

Table 9.4.4 Information for Selection of Priority Project with Options -2/2

Unit: Million INR

Solutions			110 village water supply	110 village sewerage	STPs for 110 village sewerage	Major facilities for 110 village sewerage	Stage V Major Facilities (WTP, Pump Station, City	Stage V Pipelines (Raw water transmission, C W transmission and	UFW Reduction	**JICA Survey Cost as of Se pte mber 2016**	**DPR Cost**
Options		Conditions									
Option 5-2	GoK assures implementation of the components except CWSS Stage V and STPs for 110 village Sewerage Project.	GoK should assure implementation of the components except CWSS Stage V and STPs for 110 village Sewerage Project in some way.					13,987	27,473		**41,460**	49,090
Option 6-1	GoK assures implementation of the components except major facilities for CWSS Stage V.	GoK should assure implementation of the components except major facilities for CWSS Stage V in some way.					13,987			**13,987**	8,955
Option 6-2	GoK assures implementation of the components except major facilities for CWSS Stage V and major facilities for 110 village Sewerage Project..	GoK should assure implementation of the components except major facilities for CWSS Stage V and major facilities for 110 village Sewerage Project in some way.				11,318	13,987			**25,305**	27,019
Option 6-3	GoK assures implementation of the components except major facilities for CWSS Stage V and STPs for 110 village Sewerage Project..	GoK should assure implementation of the components except major facilities for CWSS Stage V and STPs for 110 village Sewerage Project in some way.					13,987			**13,987**	22,836
Option 6-4	GoK assures implementation of the components except major facilities for CWSS Stage V and UFW Reduction Project..	GoK should assure implementation of the components except major facilities for CWSS Stage V and UFW Reduction Project in some way.					13,987		8,213	**22,200**	22,871

- Application of Option 2; Stage V Project shall be undertaken timely by Indian side to meet the implementation schedule for water supply project for 110 villages. Because of a huge cost required for the Stage V Project, sharing by Japanese loan may be studied for some components as considered in option 4 to 6 (Table 9.3.3).

It was concluded as of end of July, 2016 that under the approval process with GoK for Stage V Project, it was necessary to make clear the following conditions for alternative options. Accordingly, BWSSB made actions to come up with the projects to be implemented using local funds.

⇒ Financial source/s in the Indian side

⇒ Action plan to realize the financial assistance from specific financial sources with schedule.

9.5 Selection of JICA Survey Projects

As a result of alternative study of priority projects, as mentioned above, proposed projects were sorted into two groups employing Option 5-1 in Table 9.3.3 , one for those to prepare preliminary design of facilities by JICA Survey and another to be undertaken by Indian side, as shown below.

- Projects for preparation of preliminary design of the facilities: Stage V Project and major sewerage facilities for 110 villages Sewerage Project
- Projects to be implemented by Indian side: 110 villages Water Supply Project, upstream sewage collection facilities (lateral sewer & House connections) for110 villages Sewerage Project and UFW Reduction Project

Table 9.5.1 summarizes the reasons of the sorting proposed projects into two groups (identifying priority projects for foreign assistance). This arrangement was proposed before finalization of scope of work for JICA Preparatory Survey (at the beginning of September, 2016) in consideration of major three factors; (1) urgency of the component project to catch up the needs affected by rapid population increase in the 110 villages, (2) Availability of local funds for the development of relevant sector in BBMP area and (3) currently practiced financial assistance from GBWASP/KMRP (assistance to ULBs is under way).

Table 9.5.1 Sorted Reasons for Project Implementation

Implementation Arrangements	Projects to be studied / to be undertaken	Reasons
Preliminary Survey	Stage V Project	The Project is a large size with huge cost requirements (difficulty to manage by only local fund). In addition, the Project is very urgent among proposed projects and one time construction is advantageous technically, economically and for the augmentation of services in the entire BBMP area. Revised DPR was submitted to GoK for financial assistance at the beginning of September, 2016.
	Major Facilities for 110 villages Sewerage Project	Need of the introduction of technical expertise for planning/design, construction and O&M of sewerage facilities for maintaining stable and higher quality of effluent discharged from

Implementation Arrangements	Projects to be studied / to be undertaken	Reasons
		STPs Revised proposal in combination of Stage V Project and Sewerage for 110 villages was submitted to GoK for financial assistance.
Undertakings by Indian side	110 villages Water Supply project	Need of immediate water supply: GoK assistance (67% approved in Oct., 2016) and BWSSB BCC Funds (12 Billion INR) can be expected to start work in early 2017. On-going water supply project for LBUs may be referred to. Staged expansion of water supply systems is adoptable without large investment at one time.
	110 villages Sewerage Project	The project can be started during the implementation of Stage V project expecting finance from BBC/ GBWASP / Mega City / AMRUT / GOK.
	UFW Reduction Project	BWSSB has experience in managing UFW Reduction project GoK (approved in Oct., 2016) /BWSSB BCC fund is expected.

BWSSB has initiated financial arrangements for the project components to be undertaken by Indian side. Even if those for sewerage project component, it is possible to get guarantee letter from BWSSB before loan agreement will be made.

Supporting Report 10.1
Available Existing Soil Data for CWSS Stage V and Major Sewerage Facilities

Chapter 10 Scope of Work for JICA Survey Projects

10.1 Existing Soil Data Available for CWSS Stage V

Due to non-availability of permissions to conduct boring tests at the proposed sites for GLRs, STPs and ISPSs till the end of November, 2016, soil survey could not be conducted until then.

The available soil survey data of CWSS Stage IV phase 2 conducted at the locations near the proposed sites are listed in Table 10.1.1 and Figure 10.1.1. These previous soil survey data were referred to in the preliminary design.

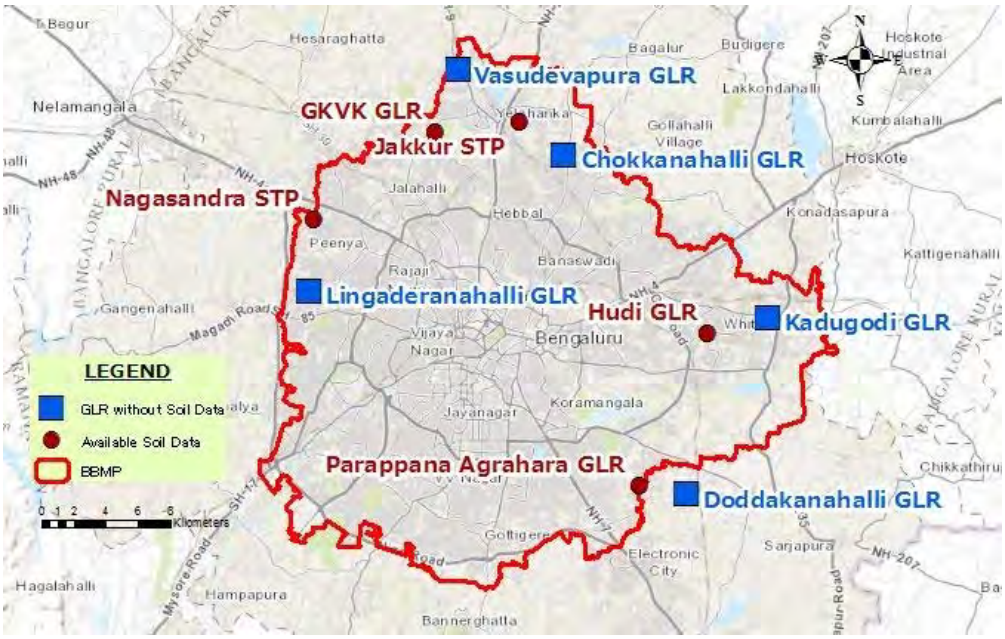
Two (2) proposed GLRs (Gottigere and Singapura) are located at BWSSB's land and the soil survey was conducted during the preparation of DPR for CWSS Stage V and the results were used in the preliminary design.

As mentioned above, soil survey could not be conducted at 4 (Four) proposed GLR sites. A total of twenty four soil data are available, which were surveyed near the proposed GLR sites in the previous CWSS Stages IV phase 2. The data are summarized in to Table 10.1.1 and Figure 10.1.1 shows their locations.

Table 10.1.1 Available Soil Survey Data for GLRs

S/N	Location	Field Test	Total Nos	Notation Remarks	Date of Investigation	Proposed GLR Near by	Reference No. in Supporting Report
1	Hudi GLR	Borehole	2	BH-1, BH-2	July & Sep-2007	Kadugodi	W-01 to W-05
		Trail Pit	1	TP-1			
		Plate Load Test	1	PLT-1			
		Electrical Resistivity Test	1	ERT-1			
2	GKVK GLR	Borehole	2	BH-1, BH-2,	Oct 2007	Vasudevpura Singapur	W-06 to W-10
		Trail Pit	1	TP-1			
		Plate Load Test	1	PLT-1			
		Electrical Resistivity Test	1	ERT-1			
3	Jakkur STP	Borehole	2	BH-1, BH-2,	Sept 2007	Chokkanahalli	W-11 to W-14
		Electrical Resistivity Test	2	ERT-1, ERT-2			
4	Nagasandra STP	Borehole	4	BH-1, BH-2, BH-3,BH-	Aug 2007	Lingaderanahalli	W-15 to W-20
		Plate Load Test	1	PLT-1			
		Electrical Resistivity Test	1	ERT-1,			
5	Parappana Agrahara GLR	Borehole	2	BH-1, BH-2,	Oct 2007	Doddakannahalli	W-21 to W-24
		Plate Load Test	1	PLT-1			
		Electrical Resistivity Test	1	ERT-1,			

Note: BWSSB has selected the existing GLR for proposed Lingderanahalli GLR on 9/Dec/2016, therefore, the soil survey for it could be conducted, but other 4sites were suspended.



Source: JICA Survey Team

Figure 10.1.1 Locations of Proposed GLRs and Available Soil Data of CWSS Stage IV Phase 2

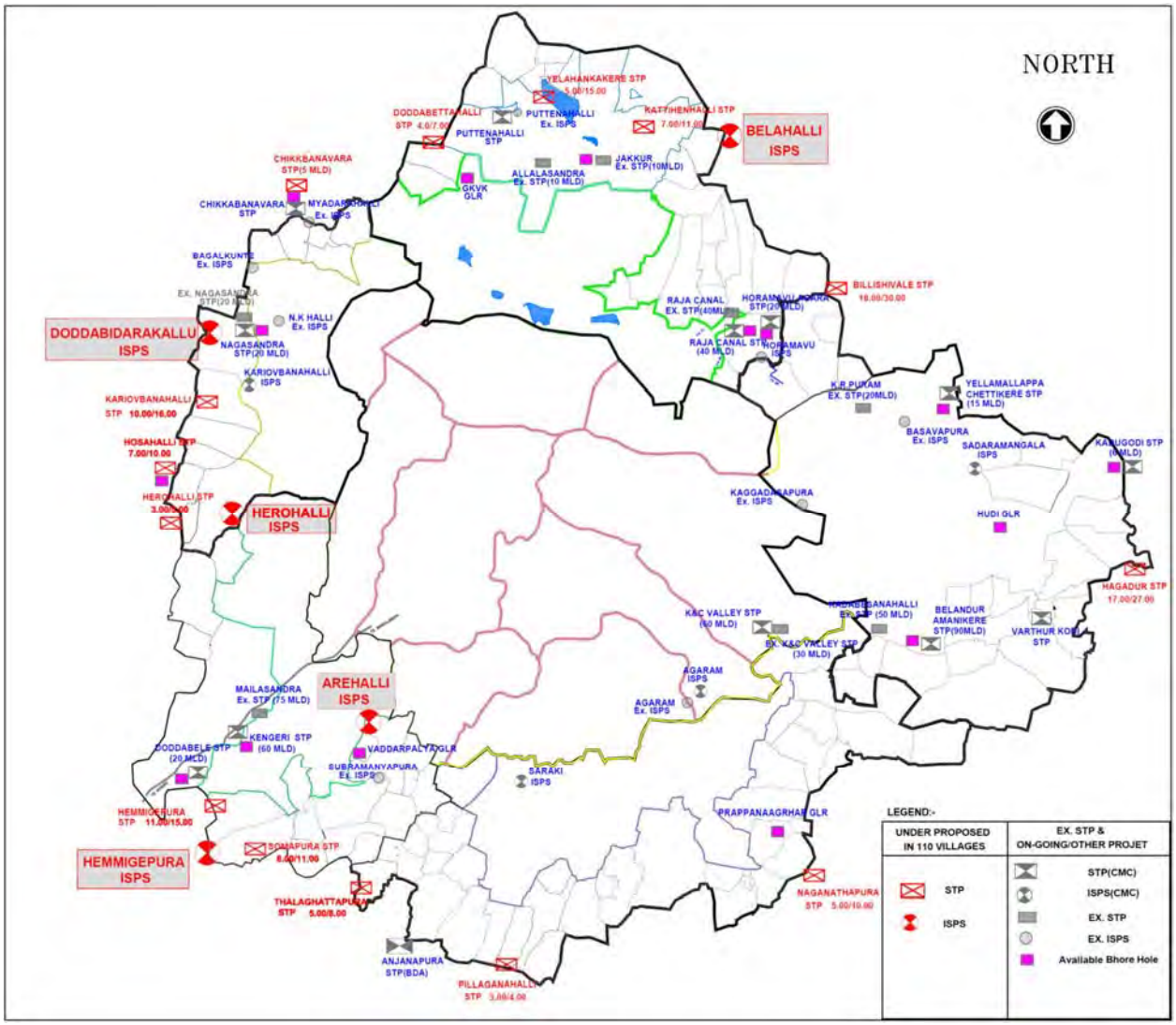
10.2 Existing Soil Data Available for Major Sewerage Facilities

Available soil survey data are summarized in to Table 10.2.1 and Figure 10.2.1.

Table 10.2.1 Available Soil Survey Data for STP and ISPSs

Existing Data (Locations)	Field Test	Qty (No.)	Notation /Remarks	Date of Investigation	Proposed STP & ISPS nearby	Reference No. in Supporting Report
Horamavu Agara STP	Borehole	3	BH-1, BH-2, BH-3	Nov & Dec 2007	4.Bilishivale	S-01 to S-05
	Plate Load Test	1	PLT-1			
	Electrical Resistivity Test	1	ERT-1			
Kachohalli STP	Borehole	3	BH-1, BH-2, BH-3	Jun 2006	13.Kariobavanahalli	S-06 to S-9
					14.Herohalli	
	Electrical Resistivity Test	1	ERT-1		15.Hosahalli	
					E-1.Herohalli ISPS	
Nagasandra STP	Borehole	4	BH-1, BH-2, BH-3, BH-4	Feb 2008	12.Nagasandra	S-10 to S-15
	Test Pit	1	TP-1			
	Electrical Resistivity Test	1	ERT-1		E-2.Doddabidarkallu ISPS	
Chikkabanavara STP	Borehole	2	BH-1, BH-2	Aug 2009	16.Chikkabanavara	S-16 to S-18
	Electrical Resistivity Test	1	ERT-1			
Jakkur STP	Borehole	2	BH-1, BH-2	Nov 2008	1.Jakkur	S-18 to S-22
	Electrical Resistivity Test	2	ERT-1, ERT-2		2.Yelahanka	
GLR at GKVK	Borehole	2	BH-1, BH-2	Oct 2007	3.Doddabettahalli	S-23 to S-27
	Test Pit	1	TP-1			
	Plate load test	1	PLT-1			
	Electrical Resistivity Test	1	ERT-1			
Kadugodi STP	Borehole	3	BH-1, BH-2, BH-3	Dec 2010	B-1.Hagadur ISPS	S-28 to S-31
	Electrical Resistivity Test	1	ERT-1			
Doddabele STP	Borehole	3	BH-1, BH-2, BH-3	Dec 2010	D-2.Hemmigepura ISPS	S-32 to S-35
	Electrical Resistivity Test	1	ERT-1		11.Hemmigepura	
Bellandur Amanikere STP	Borehole	14	BH-1, BH-2, BH-3, BH-4, BH-5 in Northern Area BH-1, BH-2, BH-3, BH-4, BH-5, BH-6, BH-7, BH-8, BH-9 in Southern Area	Oct 2012 and Dec 2012	5.Varthur	S-36 to S-51
	Electrical Resistivity Test	2	ERT-1, ERT-2			
Parappana Agrahara GLR	Borehole	2	BH-1, BH-2,	Oct 2007	C-1.Naganathpura ISPS	S-52 to S-55
	Plate Load Test	1	PLT-1			
	Electrical Resistivity Test	1	ERT-1,			

Source: JICA Survey Team



Source: JICA Survey Team

Figure 10.2.1 Locations of Proposed Sewerage Facilities and Available Soil Data of CWSS Stage IV Phase 2

BORELOG

CLIENT : NJS–MM–TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR WATER SUPPLY WORKS
BORE HOLE NO : BH–1
LOCATION : HOODI

TYPE OF BORING : ROTARY
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : Nil
CASING DEPTH : 1.5m

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS: SEATING BLOWS N1	SPT DETAILS: NO OF BLOWS FOR 2nd 15CM N2	SPT DETAILS: NO OF BLOWS FOR 3rd 15CM N3	SPT DETAILS: N VALUE=N2+N3	ROCK DRILLING: DIA OF CASING IF USED (mm)	ROCK DRILLING: PERCENT CORE RECOVERY	ROCK DRILLING: TYPE OF DRILL BIT USED (TC/DIAMOND)	ROCK DRILLING: DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	ROCK DRILLING: DETAILS OF WATER, SLURRY COLOUR ETC.	ROCK DRILLING: SIZE OF CORE PIECES	ROCK DRILLING: R Q D	ROCK DRILLING: SIZE OF HOLE	ROCK DRILLING: WATER LOSS IF ANY	ROCK DRILLING: IN SITU ROCK TESTS
	Brownish Silty Sand		1.0	24/09	SPT	0.5	SPT1		25/45	3	3	3	6										
			2.0																				
			3.0	25/09	SPT	2.5	SPT2		30/45	14	15	19	34										
	Whitish Grey Hard Rock		4.0		2.8–3.8										100	DC			15+28+43+14=100cm	100	99	Nil	
				26/09																			
			5.0	27/09	3.8–4.8										89	DC			25+4+14+7+3+6+22+8=89cm	61	99	Nil	
			6.0	28/09	4.8–5.8										92	DC			7+3+4+8+7+7+56=92cm	56	99	Nil	

2.8
5.8

TC– TUNGSTEN CARBIDE DC–DIAMOND CORE BIT B–NO OF BLOWS

BOREHOLE TERMINATED AT 5.8m DEPTH

BORELOG

CLIENT : NJS–MM–TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR WATER SUPPLY WORKS
BORE HOLE NO : BH–2
LOCATION : HOODI

TYPE OF BORING : ROTARY
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : Nil
CASING DEPTH : Nil

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS: SEATING BLOWS N1	SPT DETAILS: NO OF BLOWS FOR 2nd 15CM N2	SPT DETAILS: NO OF BLOWS FOR 3rd 15CM N3	SPT DETAILS: N VALUE=N2+N3	ROCK DRILLING: DIA OF CASING IF USED (mm)	ROCK DRILLING: PERCENT CORE RECOVERY	ROCK DRILLING: TYPE OF DRILL BIT USED (TC/DIAMOND)	ROCK DRILLING: DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	ROCK DRILLING: DETAILS OF WATER, SLURRY COLOUR ETC.	ROCK DRILLING: SIZE OF CORE PIECES	ROCK DRILLING: R Q D	ROCK DRILLING: SIZE OF HOLE	ROCK DRILLING: WATER LOSS IF ANY	ROCK DRILLING: IN SITU ROCK TESTS
	Whitish Grey Hard Rock		1.0	25/09	0.0–1.0										90	DC			9+4+6+29+9+33=90cm	62	99	Nil	
			2.0	26/09	1.0–2.2										98	DC			25+14+8+24+47=118cm	98	99	Nil	
			3.0	27/09 28/09	2.2–3.0										78	DC			38+6+19=63cm	71	99	Nil	
	3.0																						

TC– TUNGSTEN CARBIDE DC–DIAMOND CORE BIT B–NO OF BLOWS

BOREHOLE TERMINATED AT 3.0m DEPTH

NJS-MM-TCE CONSORTIUM Annexure-II Final Report Hoody

TRIAL PIT LOG

PROJECT : GEOTECHNICAL INVESTIGATION FOR WATER SUPPLY COMPONENT WORKS
CLIENT : M/S.NJS-MM-TCE CONSORTIUM
LOCATION : HOODY
TRIAL PIT NO. : TP-1

SIZE OF PIT. : 3.0x3.0x0.6m
GWT : Not met
COMMENCEMENT DATE : 25.09.07
COMPLETION DATE : 25.09.07
BACKFILLING DATE : 25.09.07

DEPTH BELOW EGL (m)	SOIL STRATA DESCRIPTION	TYPE OF SAMPLING	LAYER THICKNESS ON EACH FACE				Remarks
			N	S	E	W	
0.10	Brownish Sandy Silt with gravels						
0.20							
0.30							
0.40	Weathered Rock Stratum						
0.50							
0.60							

TP-1 Terminated at 0.6m

SECON Page No.14

PROJECT : Geo-technical Investigations for Water Supply Component V **STARTING DATE OF TESTING** :07-11-2007
CLIENT : NJS-MM-TCE CONSORTIUM **COMPLETION DATE OF TESTING** :08-11-2007
TEST LOCATION : HOODI **SIZE OF PLATE** : 75x75x25cm
SIZE OF PIT :3x3m

PLATE LOAD TEST AS PER IS:1888

SL NO.	LOAD INTENSITY kg/cm^2	TIME IN MIN	DIAL GAUGE DIVISIONS				CUMMULATIVE AVERAGE SETTLEMENT (mm)	REMARKS
			DG I	DG II	DG III	DG IV		
1	0.07	1	29	39	45	32		Loading Cycle Started
		5	31	40	50	35		
		10	31	40	51	35		
		15	31	40	51	35		
		25	32	42	53	36		
		35	33	42	54	37		
		50	33	43	54	38		
		60	35	44	54	39	0.430	
2	0.84	0	100	130	110	115		
		1	107	135	115	122		
		5	112	137	116	125		
		10	114	138	117	125		
		15	116	139	118	125		
		25	117	139	118	126		
		35	118	140	119	127		
		50	119	140	119	127		
		60	120	140	121	127	1.270	
3	1.68	0	210	201	241	201		
		1	230	209	248	207		
		5	240	213	252	209		
		10	249	218	254	212		
		15	250	220	255	213		
		25	253	221	255	216		
		35	255	222	255	216		
		50	257	224	255	216		
		60	258	226	255	217	2.390	

SL NO.	LOAD INTENSITY kg/cm^2	TIME IN MIN	DIAL GAUGE DIVISIONS				CUMMULATIVE AVERAGE SETTLEMENT (mm)	REMARKS
			DG I	DG II	DG III	DG IV		
4	2.52	0	332	361	298	294		
		1	349	370	302	295		
		5	361	380	309	298		
		10	367	385	312	300		
		15	371	388	312	302		
		25	375	391	312	302		
		35	376	393	314	303		
		50	379	395	315	304		
		60	381	396	316	305	3.495	
5	3.36	0	740	749	585	580		
		1	765	760	594	585		
		5	775	770	600	590		
		10	785	780	608	597		
		15	787	782	608	597		
		25	792	785	610	600		
		35	794	787	611	601		
		50	795	790	612	602		
		60	798	791	613	603	7.013	
6	4.20	0	1290	1150	845	855		
		1	1300	1162	852	861		
		5	1308	1171	856	865		
		10	1315	1175	860	870		
		15	1320	1180	863	873		
		25	1325	1184	867	875		
		35	1328	1186	869	878		
		50	1330	1189	870	879		
		60	1332	1190	872	880	10.685	
7	5.04	0	1672	1480	1192	1022		
		1	1692	1509	1205	1040		
		5	1715	1528	1220	1055		
		10	1731	1540	1230	1062		
		15	1738	1542	1233	1065		
		25	1740	1547	1237	1068		
		35	1742	1549	1238	1070		
		50	1745	1551	1239	1072		
		60	1746	1552	1240	1073	14.028	

SL NO.	LOAD INTENSITY kg/cm^2	TIME IN MIN	DIAL GAUGE DIVISIONS				CUMMULATIVE AVERAGE SETTLEMENT (mm)	REMARKS
			DG I	DG II	DG III	DG IV		
8	5.88	0	1945	1810	1430	1291		
		1	1965	1826	1444	1305		
		5	1983	1841	1456	1307		
		10	1993	1850	1464	1312		
		15	1996	1853	1466	1325		
		25	2000	1855	1468	1328		
		35	2002	1858	1470	1330		
		50	2005	1860	1471	1332		
		60	2007	1861	1472	1333	16.683	
9	6.72	0	2220	2156	1760	1550		
		1	2241	2161	1775	1570		
		5	2255	2172	1785	1576		
		10	2261	2176	1796	1584		
		15	2268	2182	1805	1589		
		25	2274	2185	1808	1592		
		35	2279	2191	1811	1599		
		50	2286	2194	1816	1601		
		60	2290	2199	1819	1607	19.788	
10	7.56	0	2420	2388	2129	1840		
		1	2435	2406	2141	1850		
		5	2445	2415	2145	1856		
		10	2452	2421	2152	1860		
		15	2457	2425	2157	1864		
		25	2462	2428	2158	1868		
		35	2467	2431	2159	1869		
		50	2469	2434	2162	1872		
		60	2474	2437	2165	1875	22.378	
11	8.40	0	2654	2615	2341	2180		
		1	2674	2632	2360	2195		
		5	2682	2640	2367	2206		
		10	2692	2647	2374	2210		
		15	2695	2650	2376	2217		
		25	2702	2653	2379	2222		
		35	2705	2657	2382	2230		
		50	2707	2659	2384	2237		
		60	2712	2661	2385	2241	24.998	

SL NO.	LOAD INTENSITY kg/cm^2	TIME IN MIN	DIAL GAUGE DIVISIONS				CUMMULATIVE AVERAGE SETTLEMENT (mm)	REMARKS
			DG I	DG II	DG III	DG IV		
12	9.24	0	2876	2805	2541	2486		
		1	2885	2830	2560	2490		
		5	2893	2840	2567	2499		
		10	2903	2847	2575	2504		
		15	2910	2852	2580	2509		
		25	2915	2858	2584	2514		
		35	2924	2862	2589	2520		
		50	2924	2867	2592	2524		
		60	2929	2868	2594	2531	27.305	
13	10.08	0	2931	2952	2749	2701		
		1	3015	2963	2777	2708		
		5	3031	2980	2790	2715		
		10	3055	2989	2797	2721		
		15	3065	2997	2805	2726		
		25	3075	3003	2809	2732		
		35	3081	3005	2813	2736		
		50	3086	3011	2816	2731		
		60	3091	3016	2819	2734	29.150	

REBOUND READINGS

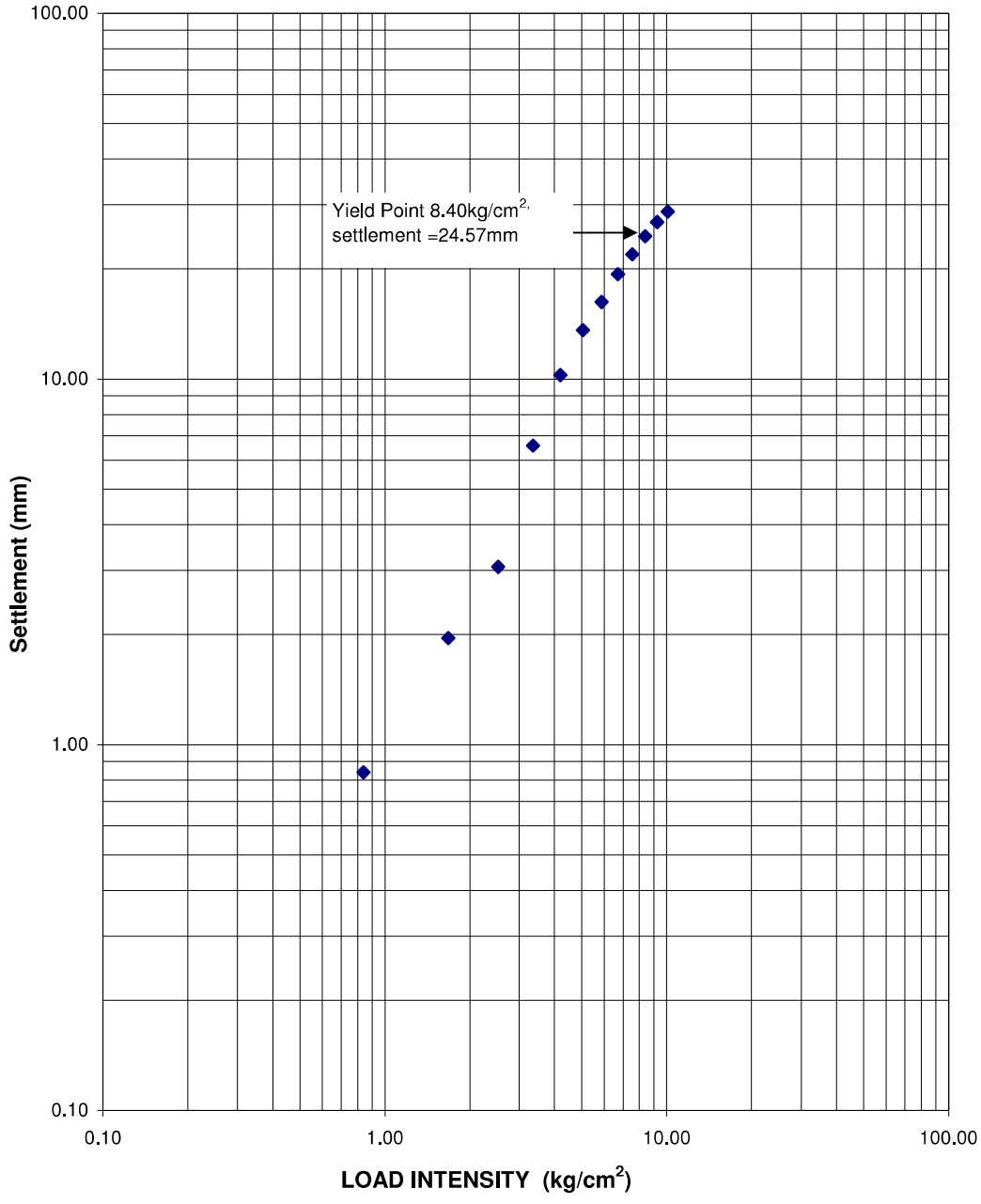
SL NO.	LOAD INTENSITY kg/cm^2	TIME IN MIN	DIAL GAUGE DIVISION				CUMMULATIVE AVERAGE SETTLEMENT (mm)	REMARKS
			DG I	DG II	DG III	DG IV		
1	9.24	1	3091	3016	2819	2734		Unloading cycle started
		5	3091	3016	2819	2734		
		10	3091	3016	2819	2734		
		15	3091	3016	2819	2734	29.150	
2	8.40	1	3091	3016	2819	2734		
		5	3091	3016	2819	2734		
		10	3091	3016	2819	2734		
		15	3091	3016	2819	2734	29.150	
3	7.56	1	3091	3016	2819	2734		
		5	3091	3016	2819	2734		
		10	3091	3016	2819	2734		
		15	3091	3016	2819	2734	29.150	
4	6.72	1	3091	3016	2819	2734		
		5	3091	3016	2819	2734		
		10	3091	3016	2819	2734		
		15	3091	3016	2819	2734	29.150	
5	5.88	1	3091	3016	2819	2734		
		5	3091	3016	2819	2734		
		10	3091	3016	2819	2734		
		15	3091	3016	2819	2734	29.150	
6	5.04	1	3091	3016	2819	2734		
		5	3091	3016	2819	2734		
		10	3091	3016	2819	2734		
		15	3091	3016	2819	2734	29.150	
7	4.20	1	3091	3016	2819	2734		
		5	3091	3016	2819	2734		
		10	3091	3016	2819	2734		
		15	3091	3016	2819	2734	29.150	
8	3.36	1	3082	3016	2812	2730		
		5	3081	3016	2811	2730		
		10	3080	3016	2811	2729		
		15	3080	3016	2811	2729	29.090	
9	2.52	1	2995	3016	2792	2701		
		5	2994	3016	2790	2700		
		10	2993	3016	2789	2699		
		15	2992	3016	2789	2669	28.665	

SL NO.	LOAD INTENSITY kg/cm^2	TIME IN MIN	DIAL GAUGE DIVISION				CUMMULATIVE AVERAGE SETTLEMENT (mm)	REMARKS
			DG I	DG II	DG III	DG IV		
10	1.68	1	2979	3016	2770	2628		
		5	2979	3016	2769	2627		
		10	2978	3015	2769	2626		
		15	2978	3015	2768	2625	28.465	
11	0.84	1	2962	2980	2761	2620		
		5	2958	2978	2757	2624		
		10	2954	2973	2751	2621		
		15	2952	2971	2750	2620	28.233	
12	0.00	1	2871	2851	2729	2658		
		5	2864	2841	2714	2637		
		10	2860	2837	2709	2631		
		15	2856	2832	2704	2628	27.550	

PLATE LOAD TEST : LOAD INTENSITY vs SETTLEMENT CURVE

CLIENT : NJS-MM-TCE CONSORTIUM
PROJECT : GEOTECHNICAL INVESTIGATION FOR WATER SUPPLY COMPONENT WORKS-HOODI
SIZE OF PLATE(mm) :750 x 750 x 25

PLT NO: PLT-1
DEPTH (m) : 1.75m



CLIENT: M/s NJS-MM-TCE CONSORTIUM

PROJECT: Geotechnical Investigation for Water Component Works

ERT NO: 1 **DATE OF COMMENCEMENT**: 23.09.07

LOCATION : HOODY **DATE OF COMPLETION**: 23.09.07

ELECTRICAL RESISTIVITY TEST RESULTS

ERT No	Electrode Spacing "a" (m)	Resistance R (ohm)	Multiplier = 2 πa	Apparent resistivity ρ_a= 2πaR (Ohm-m)	Direction of test and Remarks
ERT-1	1.0	120.000	6.283	753.982	East -West. Dry Land and Rocky
	2.0	55.100	12.566	692.407	
	3.0	54.700	18.850	1031.071	
	5.0	14.570	31.416	457.730	
	10.0	10.650	62.832	669.159	
	15.0	9.590	94.248	903.836	
	1.0	81.000	6.283	508.938	North-South Dry Land and Rocky
	2.0	59.700	12.566	750.212	
	3.0	53.800	18.850	1014.106	
	5.0	15.210	31.416	477.836	
	10.0	11.320	62.832	711.257	
	15.0	9.640	94.248	908.549	

BORELOG

CLIENT : NJS–MM–TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR WATER SUPPLY COMPONENTS
BORE HOLE NO : BH–1
LOCATION : GKVK

TYPE OF BORING : ROTARY
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : Nil
CASING DEPTH : 1.5m

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS: SEATING BLOWS N1	SPT DETAILS: NO OF BLOWS FOR 2nd 15CM N2	SPT DETAILS: NO OF BLOWS FOR 3rd 15CM N3	SPT DETAILS: N VALUE=N2+N3	ROCK DRILLING: DIA OF CASING IF USED (mm)	ROCK DRILLING: PERCENT CORE RECOVERY	ROCK DRILLING: TYPE OF DRILL BIT USED (TC/DIAMOND)	ROCK DRILLING: DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	ROCK DRILLING: DETAILS OF WATER, SLURRY COLOUR ETC.	ROCK DRILLING: SIZE OF CORE PIECES	ROCK DRILLING: R Q D	ROCK DRILLING: SIZE OF HOLE	ROCK DRILLING: WATER LOSS IF ANY	ROCK DRILLING: IN SITU ROCK TESTS
				03/10	DS	0.5	DS																
			1.0																				
	Reddish Sandy Silt with clay Binder				SPT	1.5	SPT1		35/45	7	9	12	21										
			2.0																				
			3.0		UDS	3.0	UDS																
			4.0																				
	4.0 Brownish Yellow Sandy Silt With Clay Binder				SPT	4.5	SPT2		28/45	16	21	22	43										
			5.0																				
			6.0	04/10	UDS	6.0	UDS																
	6.0 Brownish Yellow Sandy Silt With Traces of Clay																						
			7.0																				
			8.0																				
			9.0		SPT	9.0	SPT3		25/45	12	14	21	35										
			10.0		SPT	10.0	SPT4		30/45	13	17	27	44										
	10.0																						

BOREHOLE TERMINATED AT 10.0m DEPTH

BOREHOLE LOG

CLIENT : NJS–MM–TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR WATER SUPPLY COMPONENTS
BORE HOLE NO : BH–2
LOCATION : GKVK

TYPE OF BORING : ROTARY
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : Nil
CASING DEPTH : Nil

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS: SEATING BLOWS N1	SPT DETAILS: NO OF BLOWS FOR 2nd 15CM N2	SPT DETAILS: NO OF BLOWS FOR 3rd 15CM N3	SPT DETAILS: N VALUE=N2+N3	ROCK DRILLING: DIA OF CASING IF USED (mm)	ROCK DRILLING: PERCENT CORE RECOVERY	ROCK DRILLING: TYPE OF DRILL BIT USED (TC/DIAMOND)	ROCK DRILLING: DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	ROCK DRILLING: DETAILS OF WATER, SLURRY COLOUR ETC.	ROCK DRILLING: SIZE OF CORE PIECES	ROCK DRILLING: R Q D	ROCK DRILLING: SIZE OF HOLE	ROCK DRILLING: WATER LOSS IF ANY	ROCK DRILLING: IN SITU ROCK TESTS
				03/10																			
			1.0		SPT	0.5	SPT1		20/45	2	4	5	9										
			2.0		UDS	2.0	UDS																
	Reddish Sandy Silt With Clay Binder		3.0																				
			4.0		SPT	3.5	SPT2		25/45	6	10	12	22										
			5.0		UDS	5.0	UDS																
			6.0																				
	6.0 Brownish Yellow Silty Sand with Traces of Clay		7.0		SPT	6.5	SPT3		30/45	8	11	13	24										
			8.0	03/10																			
			9.0																				
	9.0 Brownish Yellow Highly Weathered Rock		10.0		SPT	9.5	SPT5		Nil	50B/2cm			>100										
	10.0																						

BOREHOLE TERMINATED AT 10.0m DEPTH

TRIAL PIT LOG

PROJECT : GEOTECHNICAL INVESTIGATION FOR WATER SUPPLY COMPONENT WORKS
CLIENT : M/S.NJS-MM-TCE CONSORTIUM
LOCATION : **GKVK**
TRIAL PIT NO. : TP-1

SIZE OF PIT. : 2.0x2.0x3.0m
GWT : Not met
COMMENCEMENT DATE : 19.11.07
COMPLETION DATE : 20.10.07
BACKFILLING DATE 21.11.07

DEPTH BELOW EGL (m)	SOIL STRATA DESCRIPTION	TYPE OF SAMPLING	LAYER THICKNESS ON EACH FACE				Pocket penetrometer reading kg/cm^2	Remarks
			N	S	E	W		
	Reddish Sandy Silt with Clay Binder and gravels							
1.00							0.75	
		BS						
2.00								In Situ density Conducted at 3m Depth Density is 1.71g/cc
3.00		BS						

PROJECT : Geo-technical Investigations for Water Supply Component Works
CLIENT : NJS-MM-TCE CONSORTIUM
TEST LOCATION GKVK

STARTING DATE OF TESTING:20-11-2007
COMPLETION DATE OF TESTING:20-11-2007
SIZE OF PLATE:75x75x2.5cm
SIZE OF PIT:3x3m

PLATE LOAD TEST AS PER IS:1888

SL NO.	LOAD INTENSITY kg/cm^2	TIME IN MIN	DIAL GAUGE DIVISIONS				CUMMULATIVE AVERAGE SETTLEMENT (mm)	REMARKS
			DG I	DG II	DG III	DG IV		
1	0.07	0	0	0	0	0		Loading cycle started
		1	39	30	25	15		
		5	39	30	28	15		
		10	40	30	29	16		
		15	40	30	29	16		
		25	41	30	29	16		
		35	41	30	30	17		
		50	41	30	30	17		
		60	41	30	30	17	0.295	
2	0.84	0	62	71	42	20		
		1	65	72	44	21		
		5	66	72	45	21		
		10	67	73	45	22		
		15	67	73	46	22		
		25	68	73	47	23		
		35	68	73	47	23		
		50	68	74	47	23		
		60	68	74	47	23	0.530	
3	1.68	0	81	96	58	31		
		1	82	97	60	32		
		5	84	97	61	33		
		10	86	97	62	33		
		15	86	97	63	34		
		25	87	97	63	35		
		35	89	98	65	36		
		50	90	99	66	36		
		60	90	99	66	36	0.728	
4	2.52	0	94	141	72	43		
		1	95	144	74	44		
		5	97	145	76	45		
		10	98	146	77	46		
		15	100	146	77	47		
		25	100	148	77	47		
		35	100	148	78	47		
		50	100	149	78	48		
		60	100	149	78	48	0.938	

Secon 20

SL NO.	LOAD INTENSITY kg/cm^2	TIME IN MIN	DIAL GAUGE DIVISIONS				CUMMULATIVE AVERAGE SETTLEMENT (mm)	REMARKS
			DG I	DG II	DG III	DG IV		
5	3.36	0	104	136	84	50		
		1	105	163	86	51		
		5	107	163	89	53		
		10	109	164	91	54		
		15	109	164	92	55		
		25	110	165	92	56		
		35	110	165	93	56		
		50	111	166	94	57		
		60	111	166	94	57	1.070	
6	4.20	0	113	179	99	60		
		1	116	179	100	61		
		5	118	179	103	62		
		10	120	181	104	63		
		15	120	182	106	64		
		25	120	183	107	66		
		35	121	185	108	67		
		50	121	187	108	67		
		60	121	188	108	67	1.210	
7	5.04	0	122	189	111	68		
		1	123	190	112	69		
		5	125	192	115	71		
		10	126	194	117	72		
		15	127	195	118	73		
		25	127	196	118	74		
		35	127	197	118	75		
		50	128	198	120	76		
		60	128	198	120	76	1.305	
8	5.88	0	129	199	123	77		
		1	129	199	125	79		
		5	129	199	126	81		
		10	129	199	127	82		
		15	130	199	128	83		
		25	131	199	128	84		
		35	132	199	129	85		
		50	132	199	130	86		
		60	132	199	131	87	1.373	
9	6.72	0	133	200	133	88		
		1	134	201	134	89		
		5	134	201	136	90		
		10	134	202	138	92		
		15	134	203	139	93		
		25	135	204	140	94		
		35	137	205	141	95		
		50	137	205	141	95		
		60	137	205	141	95	1.445	

SL NO.	LOAD INTENSITY kg/cm^2	TIME IN MIN	DIAL GAUGE DIVISIONS				CUMMULATIVE AVERAGE SETTLEMENT (mm)	REMARKS
			DG I	DG II	DG III	DG IV		
10	7.56	0	138	206	142	97		
		1	138	206	144	99		
		5	138	206	147	101		
		10	138	207	150	106		
		15	139	208	151	108		
		25	140	209	152	109		
		35	141	210	153	109		
		50	141	210	153	109		
		60	141	211	154	110	1.540	
11	8.40	0	142	213	156	113		
		1	142	213	159	116		
		5	142	214	162	120		
		10	142	215	164	123		
		15	143	216	167	124		
		25	144	217	168	125		
		35	144	218	169	126		
		50	145	218	170	127		
		60	145	218	171	128	1.655	
12	9.24	0	146	220	173	130		
		1	147	221	174	132		
		5	148	222	175	134		
		10	148	223	177	135		
		15	149	224	177	136		
		25	150	225	178	137		
		35	150	225	180	140		
		50	151	226	181	141		
		60	152	227	182	142	1.758	
13	10.08	0	160	234	194	167		
		1	161	235	195	168		
		5	163	237	198	171		
		10	164	238	200	175		
		15	165	239	202	178		
		25	166	240	204	180		
		35	168	241	208	182		
		50	169	245	212	183		
		60	170	246	215	184	2.038	

REBOUND READINGS

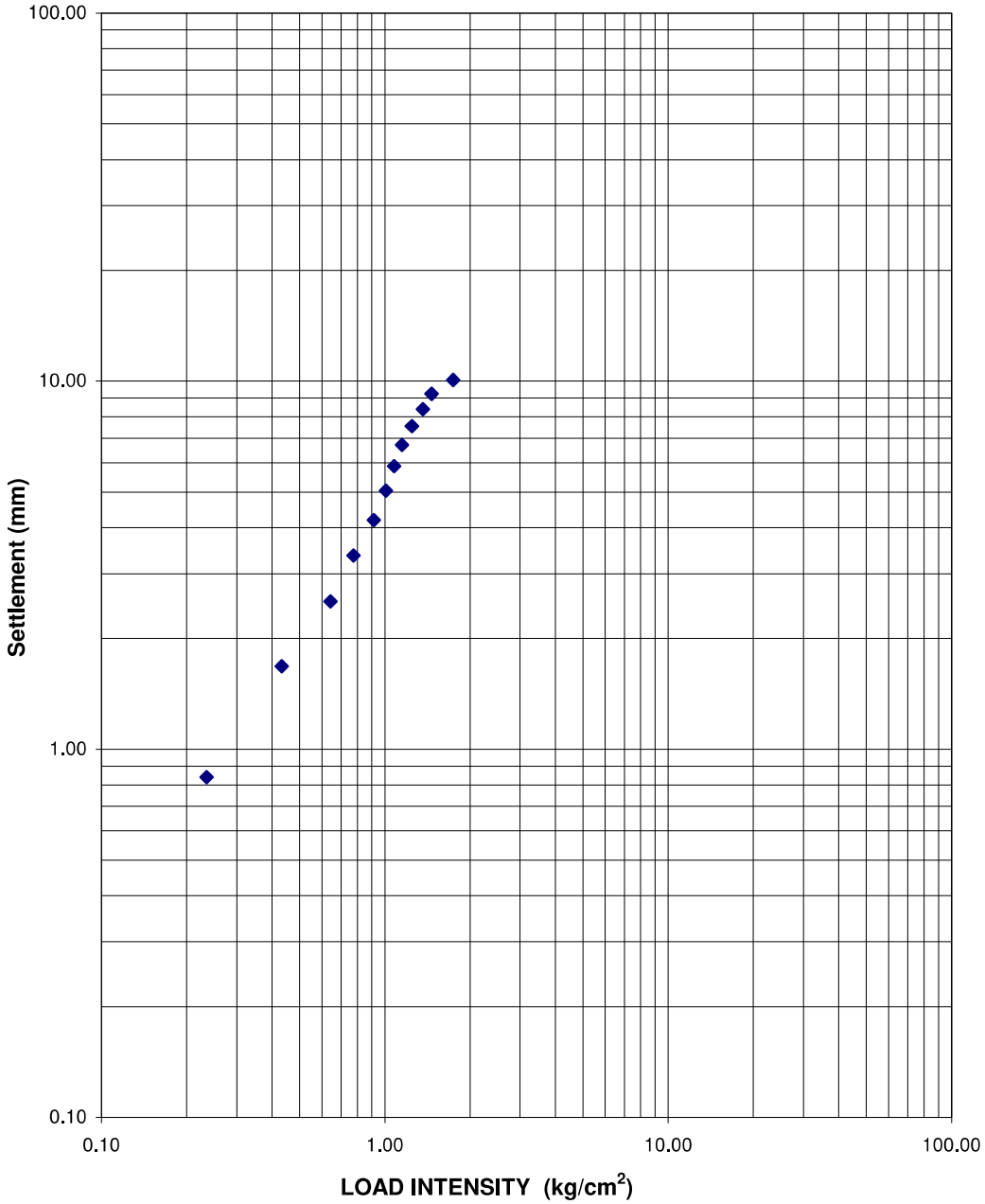
SL NO.	LOAD INTENSITY kg/cm^2	TIME IN MIN	DIAL GAUGE DIVISION				CUMMULATIVE AVERAGE SETTLEMENT (mm)	REMARKS
			DG I	DG II	DG III	DG IV		
1	9.24	1	170	246	215	184		Unloading cycle started
		5	170	246	215	184		
		10	170	246	215	184		
		15	170	246	215	184	2.038	
2	8.40	1	170	246	215	184		
		5	170	246	215	184		
		10	170	246	215	184		
		15	170	246	215	184	2.038	
3	7.56	1	170	246	215	184		
		5	170	246	215	184		
		10	170	246	215	184		
		15	170	246	215	184	2.038	
4	6.72	1	170	246	215	184		
		5	170	246	215	184		
		10	170	246	215	184		
		15	170	246	215	184	2.038	
5	5.88	1	170	246	215	184		
		5	170	246	215	184		
		10	170	246	215	184		
		15	170	246	215	184	2.038	
6	5.04	1	170	246	215	184		
		5	170	246	215	184		
		10	170	246	215	184		
		15	170	246	215	184	2.038	
7	4.20	1	170	246	215	184		
		5	170	246	215	184		
		10	170	246	215	184		
		15	170	246	215	184	2.038	
8	3.36	1	170	246	215	184		
		5	170	246	215	184		
		10	170	246	215	184		
		15	170	246	215	184	2.038	
9	2.52	1	170	246	215	184		
		5	170	246	215	184		
		10	170	246	215	184		
		15	170	246	215	184	2.038	

SL NO.	LOAD INTENSITY kg/cm^2	TIME IN MIN	DIAL GAUGE DIVISION				CUMMULATIVE AVERAGE SETTLEMENT (mm)	REMARKS
			DG I	DG II	DG III	DG IV		
10	1.68	1	168	240	211	181		
		5	167	239	209	179		
		10	167	239	208	178		
		15	167	239	208	178	1.980	
11	0.84	1	160	232	201	171		
		5	158	230	199	169		
		10	157	229	198	168		
		15	157	229	198	168	1.880	
12	0.00	1	149	221	191	160		
		5	148	220	190	157		
		10	147	219	189	156		
		15	146	218	188	155	1.778	
		15	271	459	346	211	1.768	
11	0.84	1	272	460	348	216		
		5	272	460	348	216		
		10	273	461	349	217		
		15	273	461	349	217	3.250	
12	0.00	1	272	460	349	216		
		5	272	460	349	216		
		10	272	460	349	216		
		15	272	460	349	216	3.243	

PLATE LOAD TEST : LOAD INTENSITY vs SETTLEMENT CURVE

CLIENT : NJS-MM-TCE CONSORTIUM
PROJECT : GEOTECHNICAL INVESTIGATION FOR WATER SUPPLY COMPONENT WORKS-GKVK
SIZE OF PLATE(mm) :750 x 750 x 25

PLT NO: PLT-1
DEPTH (m) : 3.0m



CLIENT: M/s NJS-MM-TCE CONSORTIUM
PROJECT: Geotechnical Investigation for Water Components
ERT NO: 1
LOCATION : **GKVK**

DATE OF COMMENCEMENT: 10.10.07
DATE OF COMPLETION :10.10.07

ELECTRICAL RESISTIVITY TEST RESULTS

ERT No	Electrode Spacing "a" (m)	Resistance R (ohm)	Multiplier = 2 πa	Apparent resistivity r_a= 2πaR (Ohm-m)	Direction of test and Remarks
ERT-1	1.0	33.000	6.283	207.345	East-West Dry Land
	2.0	16.140	12.566	202.821	
	3.0	10.790	18.850	203.387	
	5.0	6.270	31.416	196.978	
	10.0	3.260	62.832	204.832	
	15.0	2.700	94.248	254.469	
	1.0	31.300	6.283	196.664	North-South. Dry Land
	2.0	17.570	12.566	220.791	
	3.0	13.160	18.850	248.060	
	5.0	7.340	31.416	230.593	
	10.0	4.250	62.832	267.035	
	15.0	2.940	94.248	277.088	

Secon

Page No: 34

BORELOG

CLIENT : NJS–MM–TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR WATER SUPPLY COMPONENTS
BORE HOLE NO : BH–1
LOCATION : JAKKUR

TYPE OF BORING : ROTARY
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : 0.5m below EGL
CASING DEPTH : 3.0m

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS: SEATING BLOWS N1	SPT DETAILS: NO OF BLOWS FOR 2nd 15CM N2	SPT DETAILS: NO OF BLOWS FOR 3rd 15CM N3	SPT DETAILS: N VALUE=N2+N3	ROCK DRILLING: DIA OF CASING IF USED (mm)	ROCK DRILLING: PERCENT CORE RECOVERY	ROCK DRILLING: TYPE OF DRILL BIT USED (TC/DIAMOND)	ROCK DRILLING: DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	ROCK DRILLING: DETAILS OF WATER, SLURRY COLOUR ETC.	ROCK DRILLING: SIZE OF CORE PIECES	ROCK DRILLING: R Q D	ROCK DRILLING: SIZE OF HOLE	ROCK DRILLING: WATER LOSS IF ANY	ROCK DRILLING: IN SITU ROCK TESTS
	Reddish Brown Sandy Silt with Clay Binder		1.0	07/12	SPT	0.5	SPT1	▽	30/45	2	2	2	4										
	2.3 Brownish Grey Sandy Silt with Clay Binder		2.0		UDS	2.5	UDS																
	4.0 Brownish Grey Highly Weathered Rock		3.0		SPT	4.0	SPT2		43/45	6	7	9	16										
			4.0																				
			5.0		UDS/RS	5.5	UDS/RS																
			6.0																				
			7.0		SPT	7.0	SPT3		44/45	16	36	46	82										
			8.0																				
			9.0	08/12	SPT	8.5	SPT4		42/45	15	32	46	78										
			10.0		SPT	10.0	SPT5		44/45	13	24	40	64										
			11.0																				
			12.0		SPT	11.5	SPT6		38/45	17	40	50	90										
	12.2 Brownish Boulders																						
	12.7 Yellowish Highly Weathered Rock		13.0		SPT	13.0	SPT7		22/26	40	50	50	100										
			14.0																				
			15.0		SPT	14.5	SPT8		14/15	50B/15cm			>100										
	15.1 Yellowish Grey Highly Weathered Rock		16.0		SPT	16.0	SPT9		17/30	40	50B/15cm		>100										
			17.0																				
			18.0		SPT	17.5	SPT10		30/45	40	44	50	94										

BORELOG

CLIENT : NJS–MM–TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR WATER SUPPLY COMPONENTS
BORE HOLE NO : BH–1
LOCATION : JAKKUR

TYPE OF BORING : ROTARY
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : 0.5m below EGL
CASING DEPTH : 3.0m

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS				ROCK DRILLING									
										SEATING BLOWS N1	NO OF BLOWS FOR 2nd 15CM N2	NO OF BLOWS FOR 3rd 15CM N3	N VALUE=N2+N3	DIA OF CASING IF USED (mm)	PERCENT CORE RECOVERY	TYPE OF DRILL BIT USED (TC/DIAMOND)	DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	DETAILS OF WATER, SLURRY COLOUR ETC.	SIZE OF CORE PIECES	R Q D	SIZE OF HOLE	WATER LOSS IF ANY	IN SITU ROCK TESTS
	Yellowish Grey Highly Weathered Rock		19.0	09/12	SPT	19.0	SPT11		9/10	60B/10cm			>100										
			20.0		SPT	0.5	SPT12		20/25	35	100B/10cm		>100										
	20.0																						

– GWT

DC–DIAMOND CORE BIT

BOREHOLE TERMINATED AT 20.0m DEPTH

BOREHOLE

CLIENT : NJS–MM–TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR WATER SUPPLY COMPONENTS
BORE HOLE NO : BH–2
LOCATION : JAKKUR

TYPE OF BORING : ROTARY
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : 0.3m above EGL
CASING DEPTH : 3.0m

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS: SEATING BLOWS N1	SPT DETAILS: NO OF BLOWS FOR 2nd 15CM N2	SPT DETAILS: NO OF BLOWS FOR 3rd 15CM N3	SPT DETAILS: N VALUE=N2+N3	ROCK DRILLING: DIA OF CASING IF USED (mm)	ROCK DRILLING: PERCENT CORE RECOVERY	ROCK DRILLING: TYPE OF DRILL BIT USED (TC/DIAMOND)	ROCK DRILLING: DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	ROCK DRILLING: DETAILS OF WATER, SLURRY COLOUR ETC.	ROCK DRILLING: SIZE OF CORE PIECES	ROCK DRILLING: R Q D	ROCK DRILLING: SIZE OF HOLE	ROCK DRILLING: WATER LOSS IF ANY	ROCK DRILLING: IN SITU ROCK TESTS
	Greyish Brown Sandy Silt with Clay Binder		1.0	07/12	SPT	0.5	SPT1	0.3	29/45	1	1	1	2										
			2.0		SPT	2.0	SPT2		30/45	6	7	8	15										
			3.0		UDS	3.0	UDS																
	Greyish Brown Highly Weathered Rock (3.6)		4.0	08/12	SPT	4.0	SPT3		25/45	10	15	35	50										
			5.0		UDS/RS	5.5	UDS/RS																
			6.0		SPT	6.5	SPT4		28/45	10	19	26	45										
	(6.3)		7.0		UDS/RS	7.5	UDS/RS																
			8.0																				
			9.0		SPT	9.0	SPT5		22/45	20	45	60	105										
	Brownish Boulders (9.3)		10.0																				
			11.0		DS	10.5	DS																
			12.0		DS	10.5	DS																
	Greyish White Highly Weathered Rock (12.7)		13.0		SPT	13.0	SPT6		5/7	100B7cm			>100										
			14.0																				
			15.0	09/12	14.8–15.8										20	DC			6+5+6+3=20cm	Nil	76	Nil	
	Brownish White Moderately Weathered Rock (15.8)		16.0		15.8–16.8										60	DC			10+23+7+10+10=60cm	53	76	Nil	
			17.0		16.8–17.8										51	DC			12+6+5+11+7+10=51cm	33	76	Nil	
			18.0																				

BORELOG

CLIENT : NJS–MM–TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR WATER SUPPLY COMPONENTS
BORE HOLE NO : BH–2
LOCATION : JAKKUR

TYPE OF BORING : ROTARY
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : 0.3m above EGL
CASING DEPTH : 3.0m

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS: SEATING BLOWS N1	SPT DETAILS: NO OF BLOWS FOR 2nd 15CM N2	SPT DETAILS: NO OF BLOWS FOR 3rd 15CM N3	SPT DETAILS: N VALUE=N2+N3	ROCK DRILLING: DIA OF CASING IF USED (mm)	ROCK DRILLING: PERCENT CORE RECOVERY	ROCK DRILLING: TYPE OF DRILL BIT USED (TC/DIAMOND)	ROCK DRILLING: DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	ROCK DRILLING: DETAILS OF WATER, SLURRY COLOUR ETC.	ROCK DRILLING: SIZE OF CORE PIECES	ROCK DRILLING: R Q D	ROCK DRILLING: SIZE OF HOLE	ROCK DRILLING: WATER LOSS IF ANY	ROCK DRILLING: IN SITU ROCK TESTS
	Brownish White Moderately Weathered Rock		19.0	10/12	17.8–20.0										47	DC			77+10+17=104cm	47	76	Nil	
	20.0		20.0																				

– GWT TC– TUNGSTEN CARBIDE DC–DIAMOND CORE BIT RS–REPRESENTATIVE SAMPLE

BOREHOLE TERMINATED AT 20.0m DEPTH

CLIENT: M/s NJS-MM-TCE CONSORTIUM
PROJECT: Geotechnical Investigation for STP, JAKKUR

ELECTRICAL RESISTIVITY TEST RESULTS

ERT NO: 1
LOCATION : Jakkur

DATE OF COMMENCEMENT: 17.11.07
DATE OF COMPLETION: 17.11.07

ERT No	Electrode Spacing "a" (m)	Resistance R (ohm)	Multiplier = 2 πa	Apparent resistivity $\rho_a = 2\pi aR$ (Ohm-m)	Direction of test and Remarks
ERT-1	1.0	4.300	6.283	27.018	East-West
	2.0	1.522	12.566	19.126	
	3.0	0.804	18.850	15.155	
	5.0	0.412	31.416	12.943	
	10.0	0.242	62.832	15.205	
	15.0	0.179	94.248	16.870	

ERT NO: 2
LOCATION : Jakkur

DATE OF COMMENCEMENT: 17.11.07
DATE OF COMPLETION: 17.11.07

ERT No	Electrode Spacing "a" (m)	Resistance R (ohm)	Multiplier = 2 πa	Apparent resistivity $\rho_a = 2\pi aR$ (Ohm-m)	Direction of test and Remarks
ERT-2	1.0	4.280	6.283	26.892	North-West.
	2.0	1.497	12.566	18.812	
	3.0	0.680	18.850	12.818	
	5.0	0.462	31.416	14.514	
	10.0	0.258	62.832	16.211	
	15.0	0.135	94.248	12.723	
	1.0	4.390	6.283	27.583	East-West
	2.0	1.510	12.566	18.975	
	3.0	0.676	18.850	12.742	
	5.0	0.493	31.416	15.488	
	10.0	0.249	62.832	15.645	
	15.0	0.152	94.248	14.326	

BOREHOLE

CLIENT : NJS–MM–TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR WATER SUPPLY COMPONENTS
BORE HOLE NO : BH–1
LOCATION : NAGA SANDRA

TYPE OF BORING : ROTARY
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : Nil
CASING DEPTH : Nil

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS: SEATING BLOWS N1	SPT DETAILS: NO OF BLOWS FOR 2nd 15CM N2	SPT DETAILS: NO OF BLOWS FOR 3rd 15CM N3	SPT DETAILS: N VALUE=N2+N3	ROCK DRILLING: DIA OF CASING IF USED (mm)	ROCK DRILLING: PERCENT CORE RECOVERY	ROCK DRILLING: TYPE OF DRILL BIT USED (TC/DIAMOND)	ROCK DRILLING: DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	ROCK DRILLING: DETAILS OF WATER, SLURRY COLOUR ETC.	ROCK DRILLING: SIZE OF CORE PIECES	ROCK DRILLING: R Q D	ROCK DRILLING: SIZE OF HOLE	ROCK DRILLING: WATER LOSS IF ANY	ROCK DRILLING: IN SITU ROCK TESTS
				05/02	DS	0.5	DS																
			1.0																				
	Brownish Clayey Silt				SPT	1.5	SPT1		35	5	9	12	21										
			2.0																				
			3.0		UDS	3.0	UDS																
			4.0																				
					SPT	4.5	SPT2		R				>100			DC							
	4.3		5.0																				
	Fractured Rock		6.0		SPT	6.0	SPT3		R				>100			DC							
			7.0																				
				06/02	SPT	7.5	SPT4		R				>100			DC							
			8.0																				
	8.5		9.0		SPT	9.0	SPT5		20	35	55	46B/29cm	>100			DC							
	Brownish Highly Weathered Rock		10.0																				
	10.3		11.0		SPT	10.5	SPT6		14	60	100B/14cm		>100			DC							
	Yellowish Brown Highly Weathered Rock		12.0		SPT	12.0	SPT7		Nil				>100			DC							
	12.1		13.0																				
	Fractured Rock		14.0		SPT	13.5	SPT8		Nil				>100			DC							
			15.0		SPT	15.0	SPT9		Nil				>100			DC							
	15.0																						

DC–DIAMOND CORE BIT R=Rebound BOREHOLE TERMINATED AT 15.0m DEPTH

BORELOG

CLIENT : NJS–MM–TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR WATER SUPPLY COMPONENTS
BORE HOLE NO : BH–2
LOCATION : NAGA SANDRA

TYPE OF BORING : ROTARY
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : Nil
CASING DEPTH : 1.0m

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS: SEATING BLOWS N1	SPT DETAILS: NO OF BLOWS FOR 2nd 15CM N2	SPT DETAILS: NO OF BLOWS FOR 3rd 15CM N3	SPT DETAILS: N VALUE=N2+N3	ROCK DRILLING: DIA OF CASING IF USED (mm)	ROCK DRILLING: PERCENT CORE RECOVERY	ROCK DRILLING: TYPE OF DRILL BIT USED (TC/DIAMOND)	ROCK DRILLING: DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	ROCK DRILLING: DETAILS OF WATER, SLURRY COLOUR ETC.	ROCK DRILLING: SIZE OF CORE PIECES	ROCK DRILLING: R Q D	ROCK DRILLING: SIZE OF HOLE	ROCK DRILLING: WATER LOSS IF ANY	ROCK DRILLING: IN SITU ROCK TESTS
				04/02																			
	Brownish Clayey Silt		1.0		DS	0.5	DS																
			2.0		SPT	1.5	SPT1		32	8	9	11	20										
	2.4 Greyish BrownYellow Clayey Silt		3.0		UDS	3.0	UDS																
			4.0		SPT	4.5	SPT2		30	8	10	12	22			TC							
	4.3 Brownish Silty Sand		5.0																				
	5.9 Fractured Rock		6.0	05/02	SPT	6.5	SPT3		Nil	R			>100			TC							
	6.8 Brownish Highly Weathered Rock		7.0																				
			8.0																				
	8.6 Yellowish Highly Weathered Rock		9.0		SPT	9.0	SPT4		18	58	71	30B/22cm	>100			TC							
			10.0																				
	10.3 Greyish Green Highly Weathered Rock		11.0		SPT	10.5	SPT5		10	65	100B/14cm		>100			TC							
			12.0		SPT	12.0	SPT6		WS	80	100B/10cm		>100			TC							
			13.0																				
			14.0		SPT	13.5	SPT7		5	100B/5cm			>100			TC							
			15.0		SPT	15.0	SPT8		2	100B/2cm			>100			TC							
	15.0																						

TC– TUNGSTEN CARBIDE R=Rebound WS–Wash Sample

BOREHOLE TERMINATED AT 15.0m DEPTH

BORELOG

CLIENT : NJS–MM–TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR WATER SUPPLY COMPONENTS
BORE HOLE NO : BH–3
LOCATION : NAGA SANDRA

TYPE OF BORING : ROTARY
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : Nil
CASING DEPTH : Nil

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS: SEATING BLOWS N1	SPT DETAILS: NO OF BLOWS FOR 2nd 15CM N2	SPT DETAILS: NO OF BLOWS FOR 3rd 15CM N3	N VALUE=N2+N3	ROCK DRILLING: DIA OF CASING IF USED (mm)	ROCK DRILLING: PERCENT CORE RECOVERY	ROCK DRILLING: TYPE OF DRILL BIT USED (TC/DIAMOND)	ROCK DRILLING: DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	ROCK DRILLING: DETAILS OF WATER, SLURRY COLOUR ETC.	ROCK DRILLING: SIZE OF CORE PIECES	ROCK DRILLING: R Q D	ROCK DRILLING: SIZE OF HOLE	ROCK DRILLING: WATER LOSS IF ANY	ROCK DRILLING: IN SITU ROCK TESTS
	Brownish Clayey Silt		1.0	05/02	DS	0.5	DS																
			2.0		SPT	1.5	SPT1		30	6	8	11	19										
			3.0		UDS	3.0	UDS																
			4.0																				
	4.4		5.0	06/02	SPT	4.5	SPT2		Nil				>100			DC							
	Fractured Rock		6.0		SPT	6.0	SPT3		Nil				>100			DC							
			7.0																				
			8.0		SPT	7.5	SPT4		Nil				>100			DC							
			9.0		SPT	9.0	SPT5		Nil				>100			DC							
			10.0																				
			11.0	07/02	SPT	10.5	SPT6		Nil				>100			DC							
			12.0		SPT	12.0	SPT7		Nil				>100			DC							
			13.0																				
			14.0		SPT	13.5	SPT8		Nil				>100			DC							
	15.0		15.0		SPT	15.0	SPT9		Nil				>100			DC							

DC–DIAMOND CORE BIT R=Rebound BOREHOLE TERMINATED AT 15.0m DEPTH

BORELOG

CLIENT : NJS–MM–TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR WATER SUPPLY COMPONENTS
BORE HOLE NO : BH–4
LOCATION : NAGA SANDRA

TYPE OF BORING : ROTARY
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : Not Met
CASING DEPTH : 1.5m

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS: SEATING BLOWS N1	SPT DETAILS: NO OF BLOWS FOR 2nd 15CM N2	SPT DETAILS: NO OF BLOWS FOR 3rd 15CM N3	SPT DETAILS: N VALUE=N2+N3	ROCK DRILLING: DIA OF CASING IF USED (mm)	ROCK DRILLING: PERCENT CORE RECOVERY	ROCK DRILLING: TYPE OF DRILL BIT USED (TC/DIAMOND)	ROCK DRILLING: DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	ROCK DRILLING: DETAILS OF WATER, SLURRY COLOUR ETC.	ROCK DRILLING: SIZE OF CORE PIECES	ROCK DRILLING: R Q D	ROCK DRILLING: SIZE OF HOLE	ROCK DRILLING: WATER LOSS IF ANY	ROCK DRILLING: IN SITU ROCK TESTS
	Greyish Black Clayey Silt		1.0	08/02	DS	0.5	DS																
			2.0		SPT	1.5	SPT1		32	8	9	10	19										
			3.0		UDS	3.0	UDS																
			4.0																				
	4.3 Fractured Rock		5.0		SPT	4.5	SPT2		Nil				>100			DC							
			6.0		SPT	6.0	SPT3		Nil				>100			DC							
			7.0																				
	7.5		8.0	08/02	SPT	7.5	SPT4		Nil				>100			DC							

DC–DIAMOND CORE BIT R=Rebound

BOREHOLE TERMINATED AT 7.5m DEPTH

TRIAL PIT LOG

PROJECT : GEOTECHNICAL INVESTIGATION FOR STP WORKS
CLIENT : M/S.NJS-MM-TCE CONSORTIUM
LOCATION : NAGASANDRA
TRIAL PIT NO. : TP-1

SIZE OF PIT. : 3.0x3.0x3.0m
GWT : Not met
COMMENCEMENT DATE : 08.02.08
COMPLETION DATE : 08.02.08
BACKFILLING DATE : 08.02.08

DEPTH BELOW EGL (m)	SOIL STRATA DESCRIPTION	TYPE OF SAMPLING	LAYER THICKNESS ON EACH FACE				Pocket penetrometer reading kg/cm^2	Remarks
			N	S	E	W		
0.50	Brownish Clayey Silt							
1.00							4.50	
1.50								
2.00							2.50	
2.50								
3.00		BS					2.00	

Pit Termnated at 3.00m

CLIENT: M/s NJS-MM-TCE CONSORTIUM
PROJECT: Geotechnical Investigation for STP works
ERT NO: 1
LOCATION : **Nagasandra**

DATE OF COMMENCEMENT: 7.2.08
DATE OF COMPLETION :7.2.08

ELECTRICAL RESISTIVITY TEST RESULTS

ERT No	Electrode Spacing "a" (m)	Resistance R (ohm)	Multiplier = 2 πa	Apparent resistivity r_a= 2πaR (Ohm-m)	Direction of test and Remarks
ERT-1	1.0	5.350	6.283	33.615	Near TP-1,East West
	2.0	1.620	12.566	20.358	
	3.0	0.682	18.850	12.855	
	5.0	0.494	31.416	15.519	
	7.0	0.421	43.982	18.517	
	10.0	0.320	62.832	20.106	
	12.0	0.321	75.398	24.203	
	15.0	0.308	94.248	29.028	
	1.0	4.480	6.283	28.149	East-West
	2.0	1.513	12.566	19.013	
	3.0	0.612	18.850	11.536	
	5.0	0.337	31.416	10.587	
	7.0	0.307	43.982	13.503	
	10.0	0.262	62.832	16.462	
	12.0	0.231	75.398	17.417	
	15.0	0.208	94.248	19.604	

BORELOG

CLIENT : NJS-MM-TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR STP
BORE HOLE NO : BH-1
LOCATION : Horamavu

TYPE OF BORING : ROTARY
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : 0.9m below EGL
CASING DEPTH : Nil

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS: SEATING BLOWS N1	SPT DETAILS: NO OF BLOWS FOR 2nd 15CM N2	SPT DETAILS: NO OF BLOWS FOR 3rd 15CM N3	SPT DETAILS: N VALUE=N2+N3	ROCK DRILLING: DIA OF CASING IF USED (mm)	ROCK DRILLING: PERCENT CORE RECOVERY	ROCK DRILLING: TYPE OF DRILL BIT USED (TC/DIAMOND)	ROCK DRILLING: DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	ROCK DRILLING: DETAILS OF WATER, SLURRY COLOUR ETC.	ROCK DRILLING: SIZE OF CORE PIECES	ROCK DRILLING: R Q D	ROCK DRILLING: SIZE OF HOLE	ROCK DRILLING: WATER LOSS IF ANY	ROCK DRILLING: IN SITU ROCK TESTS
	Brownish Sandy Silt			25/11	SPT	0.5	SPT1		30/45	4	5	6	11										
	0.6		1.0																				
	Greyish Brown Sandy Silt with Clay Binder		2.0																				
			3.0		UDS	2.5	UDS																
			4.0		SPT	4.0	SPT2		37/45	7	9	12	21										
			5.0																				
			6.0		SPT	6.0	SPT3		31/45	10	12	17	29										
	6.0		7.0																				
	Brownish Highly Weathered Rock		8.0		SPT	7.5	SPT4		Nil	50B/10cm			R										
	9.3		9.0		8.3-9.3										Nil	DC				Core Pieces Collected	Nil		Nil	
					9.3-10.7										Nil	DC				Core Pieces Collected	Nil		Nil	
			10.0		10.7-11.7										14	DC				16+8+10=34cm	Nil		Nil	
	Brownish White Moderately Weathered Rock		11.0		11.7-12.7										21	DC				3+6+5=14cm	11		Nil	
			12.0		12.7-13.7										Nil	DC				11+6+4=21cm	Nil		Nil	
			13.0		13.7-14.5										17	DC				Core Pieces Collected	Nil		Nil	
			14.0		14.5-15.0										33	DC				4+5+3+5=17cm	24		Nil	
	14.5		15.0		14.5-15.5										81	DC				10+9+14=33cm	63		Nil	
	Greyish White Hard Rock		16.0		15.5-16.5										102	DC				8+5+10+5+5+38=71cm	93		Nil	
			17.0	01/12	16.5-17.5										104	DC				22+32+9+21+18=102cm	104		Nil	
	17.5		18.0																				

TC- TUNGSTEN CARBIDE DC-DIAMOND CORE BIT R=REBOUND

BOREHOLE TERMINATED AT 17.5m DEPTH

BORELOG

CLIENT : NJS-MM-TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR STP
BORE HOLE NO : BH-2
LOCATION : Horamavu

TYPE OF BORING : ROTARY
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : 0.3m below EGL
CASING DEPTH : 2.0m

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS: SEATING BLOWS N1	SPT DETAILS: NO OF BLOWS FOR 2nd 15CM N2	SPT DETAILS: NO OF BLOWS FOR 3rd 15CM N3	SPT DETAILS: N VALUE=N2+N3	ROCK DRILLING: DIA OF CASING IF USED (mm)	ROCK DRILLING: PERCENT CORE RECOVERY	ROCK DRILLING: TYPE OF DRILL BIT USED (TC/DIAMOND)	ROCK DRILLING: DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	ROCK DRILLING: DETAILS OF WATER, SLURRY COLOUR ETC.	ROCK DRILLING: SIZE OF CORE PIECES	ROCK DRILLING: R Q D	ROCK DRILLING: SIZE OF HOLE	ROCK DRILLING: WATER LOSS IF ANY	ROCK DRILLING: IN SITU ROCK TESTS
	Greyish Brown Sandy Silt with Clay Binder		1.0	14/11	DS	0.5	DS																
					SPT	1.0	SPT1		38/45	2	3	3	6										
			2.0																				
			3.0		UDS	2.5	UDS																
			4.0		SPT	4.0	SPT2		40/45	5	6	10	16										
			5.0	15/11																			
	4.9 Reddish Silty Sand with Traces of Clay		6.0		UDS	5.5	UDS																
	6.7 Brownish Grey Highly Weathered Rock		7.0		SPT	7.0	SPT3		29/45	23	26	32	58										
			8.0	16/11																			
			9.0		SPT	9.0	SPT4		29/45	20B/R			R										
	9.0 Brownish White Moderately Weathered Rock		10.0		9-10										65	DC			2+11+5+10+8+4 +5+5+15=65cm	36		Nil	
			11.0	17/11	10-11										41	DC			26+15=41cm	41		Nil	
	11.0 Greyish White Hard Rock		12.0		11-12										85	DC			38+21+10+7+9=85cm	69		Nil	
			13.0	18/11	12-13.1										86	DC			60+34=94cm	86		Nil	
			14.0	19/11	13.1-14.0										89	DC			31+33+16=80cm	89		Nil	
	14.0																						

TC- TUNGSTEN CARBIDE DC-DIAMOND CORE BIT R=REBOUND

BOREHOLE TERMINATED AT 14.0m DEPTH

BOREHOLE

CLIENT : NJS-MM-TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR STP
BORE HOLE NO : BH-3
LOCATION : Horamavu

TYPE OF BORING : HYDRAULIC
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : 0.5m below EGL
CASING DEPTH : 1.0m

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS: SEATING BLOWS N1	SPT DETAILS: NO OF BLOWS FOR 2nd 15CM N2	SPT DETAILS: NO OF BLOWS FOR 3rd 15CM N3	SPT DETAILS: N VALUE=N2+N3	ROCK DRILLING: DIA OF CASING IF USED (mm)	ROCK DRILLING: PERCENT CORE RECOVERY	ROCK DRILLING: TYPE OF DRILL BIT USED (TC/DIAMOND)	ROCK DRILLING: DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	ROCK DRILLING: DETAILS OF WATER, SLURRY COLOUR ETC.	ROCK DRILLING: SIZE OF CORE PIECES	ROCK DRILLING: R Q D	ROCK DRILLING: SIZE OF HOLE	ROCK DRILLING: WATER LOSS IF ANY	ROCK DRILLING: IN SITU ROCK TESTS
	Brownish Sandy Silt		1.0	20/11	SPT	0.5	SPT1		30/45	2	2	3	5										
	0.8		2.0		SPT	2.0	SPT2		33/45	2	2	3	5										
	Greyish Brown Sandy Silt with Clay Binder		3.0		UDS	3.5	UDS																
			4.0																				
			5.0		SPT	5.0	SPT3		40/45	8	10	12	22										
			6.0																				
	6.5		7.0	21/11	UDS	6.5	UDS																
	Yellowish White Highly Weathered Rock		8.0		SPT	8.0	SPT4		Nil	25B/2cm			>100										
			9.0	22/11																			
			10.0		SPT	9.5	SPT5		5/8	50B/8cm			>100										
	10.2 Whitish Brown Moderately Weathered Rock		11.0		10.2-11.2										56	DC			2+12+8+6+7+7+14= 56cm	26		Nil	
	11.2		12.0		11.2-12.27										100	DC			24+29+54=107cm	100		Nil	
	Greyish White Hard Rock		13.0		12.27-13.18										100	DC			35+30+26=91cm	100		Nil	
			14.0		13.18-14.2										100	DC			10+50+42=102cm	100		Nil	
	14.2		15.0	24/11																			

TC- TUNGSTEN CARBIDE DC-DIAMOND CORE BIT R=REBOUND

BOREHOLE TERMINATED AT 14.2m DEPTH

PROJECT : Geo-technical Investigations for STP
CLIENT : NJS-MM-TCE CONSORTIUM
TEST LOCATION : HORAMAVU

STARTING DATE OF TESTING :26-11-2007
COMPLETION DATE OF TESTING :26-11-2007
SIZE OF PLATE : 75x75x25cm
SIZE OF PIT :3x3x1.5m

PLATE LOAD TEST AS PER IS:1888

SL NO.	LOAD INTENSITY kg/cm^2	TIME IN MIN	DIAL GAUGE DIVISIONS				CUMMULATIVE AVERAGE SETTLEMENT (mm)	REMARKS
			DG I	DG II	DG III	DG IV		
1	0.07	0	0	0	0	0		Loading cycle started
		1	35	25	26	24		
		5	36	25	28	24		
		10	36	25	29	24		
		15	36	25	29	24		
		25	36	25	29	24		
		35	36	25	29	24		
		50	37	27	31	25		
		60	37	27	31	25	0.300	
2	0.84	0	94	107	171	112		
		1	101	118	179	121		
		5	105	122	185	135		
		10	106	124	188	137		
		15	107	125	190	137		
		25	109	128	192	138		
		35	110	128	194	140		
		50	110	129	196	143		
		60	111	130	197	145	1.458	
3	1.68	0	160	206	281	207		
		1	187	214	289	249		
		5	191	216	291	254		
		10	195	221	296	256		
		15	198	225	299	259		
		25	202	227	302	362		
		35	205	230	304	264		
		50	206	231	305	265		
		60	207	232	306	266	2.528	
4	2.52	0	265	294	371	329		
		1	278	301	380	335		
		5	295	315	395	363		
		10	302	322	401	373		
		15	306	325	406	381		
		25	312	330	412	389		
		35	316	334	417	395		
		50	322	338	421	397		
		60	325	341	424	400	3.725	

SL NO.	LOAD INTENSITY kg/cm^2	TIME IN MIN	DIAL GAUGE DIVISIONS				CUMMULATIVE AVERAGE SETTLEMENT (mm)	REMARKS
			DG I	DG II	DG III	DG IV		
5	3.36	0	1080	1100	1180	1160		
		1	1115	1125	1212	1172		
		5	1135	1143	1226	1188		
		10	1145	1152	1233	1199		
		15	1153	1159	1240	1204		
		25	1160	1164	1246	1210		
		35	1165	1170	1248	1214		
		50	1173	1177	1255	1225		
		60	1179	1178	1257	1233	12.118	
6	4.20	0	2350	2380	2355	2295		
		1	2380	2397	2370	2304		
		5	2410	2427	2394	2320		
		10	2416	2431	2399	2329		
		15	2422	2434	2404	2341		
		25	2430	2444	2410	2348		
		35	2434	2448	2417	2354		
		50	2440	2451	2420	2358		
		60	2443	2453	2424	2363	24.208	
7	5.04	0	3890	3723	3645	3511		
		1	3922	3741	3663	3523		
		5	3948	3762	3682	3538		
		10	3954	3767	3688	3547		
		15	3961	3775	3696	3555		
		25	3964	3778	3700	3558		
		35	3968	3779	3708	3561		
		50	3971	3782	3714	3564		
		60	3972	3783	3716	3567	37.595	
8	5.88	0	4974	4886	4838	4801		
		1	4986	4896	4841	4816		
		5	4997	4899	4849	4827		
		10	5001	4903	4856	4831		
		15	5008	4911	4864	4839		
		25	5012	4916	4869	4842		
		35	5016	4920	4873	4847		
		50	5027	4931	4885	4859		
		60	5029	4933	4857	4863	49.205	

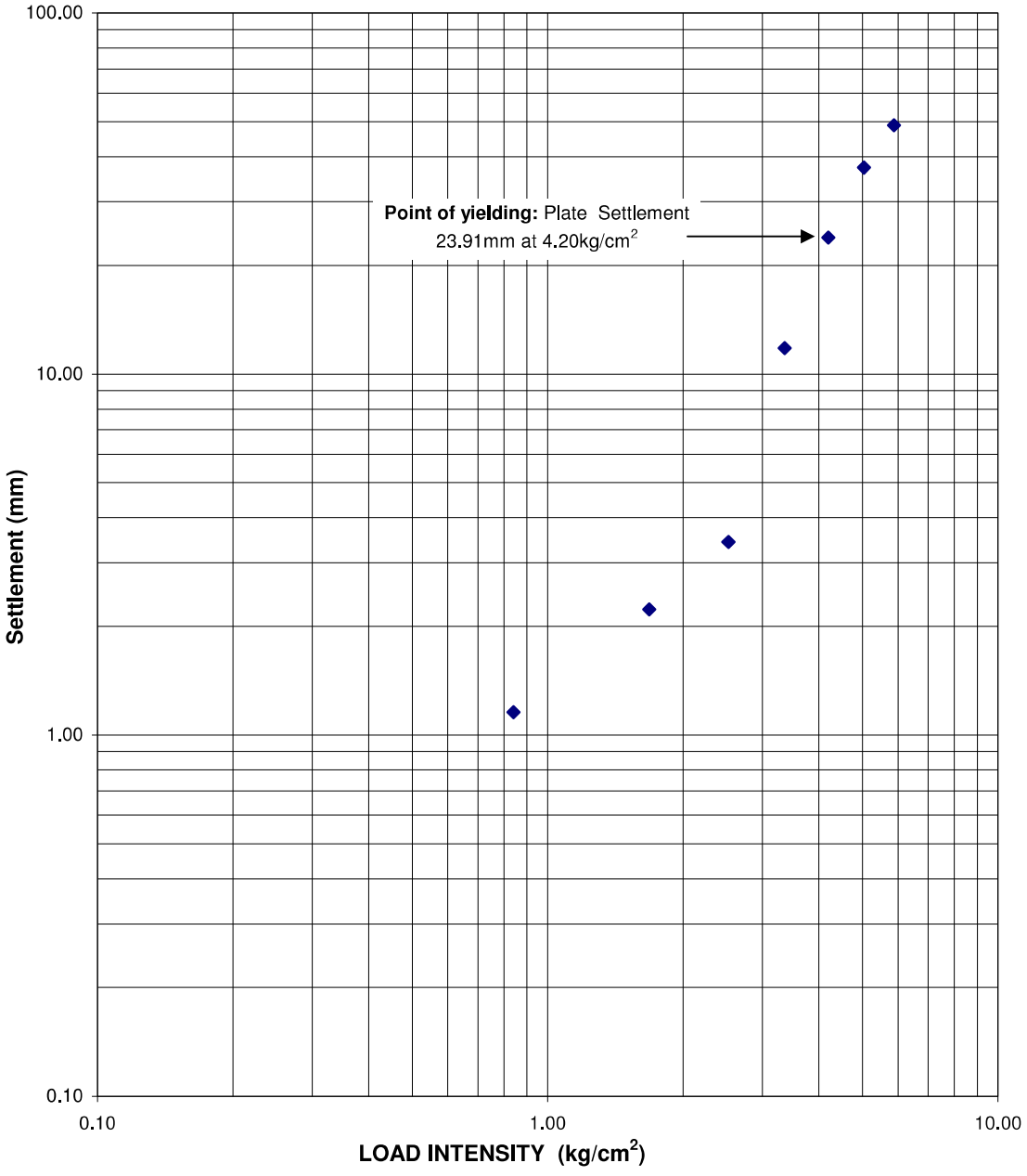
REBOUND READINGS

SL NO.	LOAD INTENSITY kg/cm^2	TIME IN MIN	DIAL GAUGE DIVISION				CUMMULATIVE AVERAGE SETTLEMENT (mm)	REMARKS
			DG I	DG II	DG III	DG IV		
1	5.04	1	5029	4933	4857	4863		Unloading cycle started
		5	5029	4933	4857	4863		
		10	5029	4933	4857	4863		
		15	5029	4933	4857	4863	49.205	
2	4.20	1	5029	4933	4857	4863		
		5	5029	4933	4857	4863		
		10	5029	4933	4857	4863		
		15	5029	4933	4857	4863	49.205	
3	3.36	1	5029	4933	4857	4863		
		5	5029	4933	4857	4863		
		10	5029	4933	4857	4863		
		15	5029	4933	4857	4863	49.205	
4	2.52	1	5029	4933	4857	4863		
		5	5029	4933	4857	4863		
		10	5029	4933	4857	4863		
		15	5029	4933	4857	4863	49.205	
5	1.68	1	5020	4923	4846	4851		
		5	5018	4920	4841	4846		
		10	5017	4919	4840	4845		
		15	5017	4919	4840	4844	49.050	
6	0.84	1	4922	4897	4818	4816		
		5	4984	4890	4808	4811		
		10	4984	4890	4808	4811		
		15	4983	4889	4806	4807	48.713	
7	0.00	1	4776	4679	4514	4584		
		5	4771	4673	4507	4573		
		10	4764	4667	4501	4568		
		15	4762	4665	4497	4564	46.220	

PLATE LOAD TEST : LOAD INTENSITY vs SETTLEMENT CURVE

CLIENT : NJS-MM-TCE CONSORTIUM
PROJECT : GEOTECHNICAL INVESTIGATION FOR STP HORAMAVU
SIZE OF PLATE(mm) :750 x 750 x 25

PLT NO: PLT-1
DEPTH (m) : 1.5m



CLIENT: M/s NJS-MM-TCE CONSORTIUM

PROJECT: Geotechnical Investigation for STP

ERT NO: 1(Electrical Substation) **DATE OF COMMENCEMENT**: 17.11.07

LOCATION : Horamavu **DATE OF COMPLETION** :17.11.07

ELECTRICAL RESISTIVITY TEST RESULTS

ERT No	Electrode Spacing "a" (m)	Resistance R (ohm)	Multiplier = 2 πa	Apparent resistivity r_a= 2πaR (Ohm-m)	Direction of test and Remarks
ERT-1	1.0	8.010	6.283	50.328	East-West.
	2.0	1.470	12.566	18.473	
	3.0	0.698	18.850	13.157	
	5.0	0.423	31.416	13.289	
	10.0	0.234	62.832	14.703	
	15.0	0.365	94.248	34.400	
	1.0	8.190	6.283	51.459	North-South
	2.0	1.525	12.566	19.164	
	3.0	0.710	18.850	13.383	
	5.0	0.451	31.416	14.169	
	10.0	0.285	62.832	17.907	
	15.0	0.321	94.248	30.254	

NJS-MM-TCE Consortium 12 Kachohalli STP

BORE LOG

PROJECT: GEOTECH INVESTIGATIONS FOR KACHOHALLI STP
BH No and LOCATION : BH-2,KACHOHALLI STP
CLIENT : NJS-MM-TCE CONSORTIUM

TYPE OF BORING : ROTARY
BORE HOLE DIA. : 150mm/Nx
GWT : 1.5m
CASING DEPTH : Nil
DATE OF COMMENCEMENT : 29.06.08
DATE OF COMPLETION : 30.06.08

DEPTH BELOW EGL (m)	SUB- SOIL CLASSIFICATION	TYPE OF SAMPLING	STANDARD PENETRATION TEST NO. OF BLOWS FOR				ROCK DRILLING		REMARKS
			FIRST 15 cm (N_1)	NEXT 15 cm (N_2)	NEXT 15 cm (N_3)	'N'-VALUE ($N_2 + N_3$)	CR (%)	RQD (%)	
1.00	Reddish Brown Clayey Silt (Stratified with Sand)	DS							
2.00		SPT	3	3	4	7			
3.00		UDS							TC Bit used : 4.5 to 5.5m
4.00		SPT	50B/15cm			>100			Diamond Bit used : 5.5 to 9.5m
5.00	Whitish Highly Weathered Rock								
6.00	Greyish White Moderately Weathered Rock	Run I	5.5-6.5m				Nil	Nil	Broken Cores
7.00		Run II	6.5-7.5m				48	20	5+5+4+5+9+20=48cm
8.00		Run III	7.5-8.5m				47	27	9+8+3+15+12=47cm
9.00	Greyish White Hard Rock	Run IV	8.5-9.5m				72	52	16+9+6+5+18+18 =72cm

SPT = STANDARD PENETRATION TEST
B: NO OF BLOWS
DS = DISTURBED SAMPLE

BH-2 Terminated at 9.5m

UDS Undisturbed Sample

SECON PRIVATE LIMITED

BORE LOG

PROJECT: GEOTECH INVESTIGATIONS FOR KACHOHALLI STP
BH No and LOCATION : BH-1,KACHOHALLI STP
CLIENT : NJS-MM-TCE CONSORTIUM

TYPE OF BORING : ROTARY
BORE HOLE DIA. : 150mm/Nx
GWT : 1.2m
CASING DEPTH : Nil
DATE OF COMMENCEMENT : 21.06.08
DATE OF COMPLETION : 25.06.08

DEPTH BELOW EGL (m)	SUB- SOIL CLASSIFICATION	TYPE OF SAMPLING	STANDARD PENETRATION TEST NO. OF BLOWS FOR				ROCK DRILLING		REMARKS
			FIRST 15 cm (N_1)	NEXT 15 cm (N_2)	NEXT 15 cm (N_3)	'N'-VALUE ($N_2 + N_3$)	CR (%)	RQD (%)	
1.00	Reddish Brown Clayey Silt (Stratified with sand)	DS							
2.00		SPT	4	5	7	12			
3.00		UDS							
4.00		SPT	4	5	8	13			
5.00	Brownish Black Clayey Silt (Stratified with sand)	UDS/RS							
6.00									
7.00	Greyish Yellow Highly Weathered Rock	SPT	50B/10cm			>100			TC Bit used : 6.5 to 8m Diamond Bit used : 8.0 to 12.0m
8.00									
9.00	Greyish Moderately Weathered Rock	Run I	8.0 -9.0m				Nil	Nil	Broken Cores
10.00		Run II	9.0-10.0m				75	Nil	8+7+7+4+3+5+4+7+5 +4+2+5+4+7=75cm
11.00		Run III	10.0-11.0m				83	49	3+9+4+7+6+11+5+18 +20=83cm
12.00	Greyish Hard Rock	Run IV	11.0-12.0m				92	71	11+25+5+6+10+23 +12=92cm

SPT = STANDARD PENETRATION TEST
B: NO OF BLOWS
DS = DISTURBED SAMPLE

BH-1 Terminated at 12.0m

UDS Undisturbed Sample
UDS/RS : Representative Sample

SECON PRIVATE LIMITED

BORE LOG

PROJECT: GEOTECH INVESTIGATIONS FOR KACHOHALLI STP
BH No and LOCATION : BH-3,KACHOHALLI STP
CLIENT : NJS-MM-TCE CONSORTIUM

TYPE OF BORING : ROTARY
BORE HOLE DIA. : 150mm/Nx
GWT : 1.2m
CASING DEPTH : Nil
DATE OF COMMENCEMENT : 29.06.08
DATE OF COMPLETION : 30.06.08

DEPTH BELOW EGL (m)	SUB- SOIL CLASSIFICATION	TYPE OF SAMPLING	STANDARD PENETRATION TEST NO. OF BLOWS FOR				ROCK DRILLING		REMARKS
			FIRST 15 cm (N_1)	NEXT 15 cm (N_2)	NEXT 15 cm (N_3)	'N'-VALUE ($N_2 + N_3$)	CR (%)	RQD (%)	
1.00	Reddish Brown/Brownish Clayey Silt (Stratified with Sand)	DS							
2.00		SPT	6	9	12	21			
3.00		UDS							TC Bit used : 6.0 to 9.0m
4.00		SPT	50B/15cm			>100			
5.00	Yellowish Grey/Greyish Brown Highly Weathered Rock								Diamond Bit used: 9.0-11.0m
6.00		SPT	50B/10cm			>100			
7.00		SPT	50B/R			>100			
8.00									
9.00									
10.00	Greyish White Moderately Weathered Rock	Run I	9.0 -10.0m				Nil	Nil	Broken Cores recovered
11.00		Run III	10.0-11.0m				27	10	5+5+3+4+10=27cm

SPT = STANDARD PENETRATION TEST
B: NO OF BLOWS
DS = DISTURBED SAMPLE
UDS Undisturbed Sample
R Refusal

BH-3 Terminated at 11.0m

SECON PRIVATE LIMITED

CLIENT: M/s NJS-MM-TCE CONSORTIUM

PROJECT: Geotechnical Investigation for Kachohalli STP

ERT NO: 1 **DATE OF COMMENCEMENT**: 25.06.08

LOCATION : **Kachohalli STP** **DATE OF COMPLETION**: 25.06.08

Coordinates : I 768005, E:1438061

ELECTRICAL RESISTIVITY TEST RESULTS

ERT No	Electrode Spacing "a" (m)	Resistance R (ohm)	Multiplier = 2 πa	Apparent resistivity r_a= 2πaR (Ohm-m)	Direction of test and Remarks
ERT-1	1.0	6.100	6.283	38.327	East-West
	2.0	1.858	12.566	23.348	
	3.0	0.855	18.850	16.116	
	5.0	0.556	31.416	17.467	
	7.0	0.520	43.982	22.871	
	10.0	0.520	62.832	32.673	
	12.0	0.499	75.398	37.624	
	15.0	0.493	94.248	46.464	
	1.0	7.790	6.283	48.946	North-South
	2.0	1.591	12.566	19.993	
	3.0	0.895	18.850	16.870	
	5.0	0.600	31.416	18.850	
	7.0	0.540	43.982	23.750	
	10.0	0.561	62.832	35.249	
	12.0	0.539	75.398	40.640	
	15.0	0.507	94.248	47.784	

BOREHOLE

CLIENT : NJS–MM–TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR WATER SUPPLY COMPONENTS
BORE HOLE NO : BH–1
LOCATION : NAGA SANDRA

TYPE OF BORING : ROTARY
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : Nil
CASING DEPTH : Nil

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS: SEATING BLOWS N1	SPT DETAILS: NO OF BLOWS FOR 2nd 15CM N2	SPT DETAILS: NO OF BLOWS FOR 3rd 15CM N3	SPT DETAILS: N VALUE=N2+N3	ROCK DRILLING: DIA OF CASING IF USED (mm)	ROCK DRILLING: PERCENT CORE RECOVERY	ROCK DRILLING: TYPE OF DRILL BIT USED (TC/DIAMOND)	ROCK DRILLING: DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	ROCK DRILLING: DETAILS OF WATER, SLURRY COLOUR ETC.	ROCK DRILLING: SIZE OF CORE PIECES	ROCK DRILLING: R Q D	ROCK DRILLING: SIZE OF HOLE	ROCK DRILLING: WATER LOSS IF ANY	ROCK DRILLING: IN SITU ROCK TESTS
				05/02	DS	0.5	DS																
			1.0		SPT	1.5	SPT1		35	5	9	12	21										
	Brownish Clayey Silt		2.0																				
			3.0		UDS	3.0	UDS																
			4.0																				
	4.3				SPT	4.5	SPT2		R				>100			DC							
	Fractured Rock		5.0																				
			6.0		SPT	6.0	SPT3		R				>100			DC							
			7.0																				
				06/02	SPT	7.5	SPT4		R				>100			DC							
			8.0																				
	8.5		9.0		SPT	9.0	SPT5		20	35	55	46B/29cm	>100			DC							
	Brownish Highly Weathered Rock		10.0																				
	10.3				SPT	10.5	SPT6		14	60	100B/14cm		>100			DC							
	Yellowish Brown Highly Weathered Rock		11.0																				
			12.0		SPT	12.0	SPT7		Nil				>100			DC							
	12.1																						
	Fractured Rock		13.0		SPT	13.5	SPT8		Nil				>100			DC							
			14.0																				
			15.0		SPT	15.0	SPT9		Nil				>100			DC							
	15.0																						

DC–DIAMOND CORE BIT R=Rebound BOREHOLE TERMINATED AT 15.0m DEPTH

BORELOG

CLIENT : NJS–MM–TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR WATER SUPPLY COMPONENTS
BORE HOLE NO : BH–2
LOCATION : NAGA SANDRA

TYPE OF BORING : ROTARY
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : Nil
CASING DEPTH : 1.0m

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS: SEATING BLOWS N1	SPT DETAILS: NO OF BLOWS FOR 2nd 15CM N2	SPT DETAILS: NO OF BLOWS FOR 3rd 15CM N3	SPT DETAILS: N VALUE=N2+N3	ROCK DRILLING: DIA OF CASING IF USED (mm)	ROCK DRILLING: PERCENT CORE RECOVERY	ROCK DRILLING: TYPE OF DRILL BIT USED (TC/DIAMOND)	ROCK DRILLING: DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	ROCK DRILLING: DETAILS OF WATER, SLURRY COLOUR ETC.	ROCK DRILLING: SIZE OF CORE PIECES	ROCK DRILLING: R Q D	ROCK DRILLING: SIZE OF HOLE	ROCK DRILLING: WATER LOSS IF ANY	ROCK DRILLING: IN SITU ROCK TESTS
				04/02																			
	Brownish Clayey Silt		1.0		DS	0.5	DS																
			2.0		SPT	1.5	SPT1		32	8	9	11	20										
	2.4 Greyish BrownYellow Clayey Silt		3.0		UDS	3.0	UDS																
			4.0																				
	4.3 Brownish Silty Sand		5.0		SPT	4.5	SPT2		30	8	10	12	22			TC							
	5.9 Fractured Rock		6.0	05/02	SPT	6.5	SPT3		Nil	R			>100			TC							
	6.8 Brownish Highly Weathered Rock		7.0																				
			8.0																				
	8.6 Yellowish Highly Weathered Rock		9.0		SPT	9.0	SPT4		18	58	71	30B/22cm	>100			TC							
			10.0																				
	10.3 Greyish Green Highly Weathered Rock		11.0		SPT	10.5	SPT5		10	65	100B/14cm		>100			TC							
			12.0		SPT	12.0	SPT6		WS	80	100B/10cm		>100			TC							
			13.0																				
			14.0		SPT	13.5	SPT7		5	100B/5cm			>100			TC							
			15.0		SPT	15.0	SPT8		2	100B/2cm			>100			TC							
	15.0																						

TC– TUNGSTEN CARBIDE R=Rebound WS–Wash Sample

BOREHOLE TERMINATED AT 15.0m DEPTH

BOREHOLE

CLIENT : NJS–MM–TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR WATER SUPPLY COMPONENTS
BORE HOLE NO : BH–3
LOCATION : NAGA SANDRA

TYPE OF BORING : ROTARY
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : Nil
CASING DEPTH : Nil

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS: SEATING BLOWS N1	SPT DETAILS: NO OF BLOWS FOR 2nd 15CM N2	SPT DETAILS: NO OF BLOWS FOR 3rd 15CM N3	N VALUE=N2+N3	ROCK DRILLING: DIA OF CASING IF USED (mm)	ROCK DRILLING: PERCENT CORE RECOVERY	ROCK DRILLING: TYPE OF DRILL BIT USED (TC/DIAMOND)	ROCK DRILLING: DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	ROCK DRILLING: DETAILS OF WATER, SLURRY COLOUR ETC.	ROCK DRILLING: SIZE OF CORE PIECES	ROCK DRILLING: R Q D	ROCK DRILLING: SIZE OF HOLE	ROCK DRILLING: WATER LOSS IF ANY	ROCK DRILLING: IN SITU ROCK TESTS
	Brownish Clayey Silt		1.0	05/02	DS	0.5	DS																
			2.0		SPT	1.5	SPT1		30	6	8	11	19										
			3.0		UDS	3.0	UDS																
			4.0																				
	4.4		5.0	06/02	SPT	4.5	SPT2		Nil				>100			DC							
	Fractured Rock		6.0		SPT	6.0	SPT3		Nil				>100			DC							
			7.0																				
			8.0		SPT	7.5	SPT4		Nil				>100			DC							
			9.0		SPT	9.0	SPT5		Nil				>100			DC							
			10.0																				
			11.0	07/02	SPT	10.5	SPT6		Nil				>100			DC							
			12.0		SPT	12.0	SPT7		Nil				>100			DC							
			13.0																				
			14.0		SPT	13.5	SPT8		Nil				>100			DC							
	15.0		15.0		SPT	15.0	SPT9		Nil				>100			DC							

DC–DIAMOND CORE BIT R=Rebound BOREHOLE TERMINATED AT 15.0m DEPTH

BOREHOLE

CLIENT : NJS–MM–TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR WATER SUPPLY COMPONENTS
BORE HOLE NO : BH–4
LOCATION : NAGA SANDRA

TYPE OF BORING : ROTARY
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : Not Met
CASING DEPTH : 1.5m

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS: SEATING BLOWS N1	SPT DETAILS: NO OF BLOWS FOR 2nd 15CM N2	SPT DETAILS: NO OF BLOWS FOR 3rd 15CM N3	SPT DETAILS: N VALUE=N2+N3	ROCK DRILLING: DIA OF CASING IF USED (mm)	ROCK DRILLING: PERCENT CORE RECOVERY	ROCK DRILLING: TYPE OF DRILL BIT USED (TC/DIAMOND)	ROCK DRILLING: DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	ROCK DRILLING: DETAILS OF WATER, SLURRY COLOUR ETC.	ROCK DRILLING: SIZE OF CORE PIECES	ROCK DRILLING: R Q D	ROCK DRILLING: SIZE OF HOLE	ROCK DRILLING: WATER LOSS IF ANY	ROCK DRILLING: IN SITU ROCK TESTS
	Greyish Black Clayey Silt		1.0	08/02	DS	0.5	DS																
			2.0		SPT	1.5	SPT1		32	8	9	10	19										
			3.0		UDS	3.0	UDS																
			4.0																				
	4.3 Fractured Rock		5.0		SPT	4.5	SPT2		Nil				>100			DC							
			6.0		SPT	6.0	SPT3		Nil				>100			DC							
			7.0																				
	7.5		8.0	08/02	SPT	7.5	SPT4		Nil				>100			DC							

DC–DIAMOND CORE BIT R=Rebound

BOREHOLE TERMINATED AT 7.5m DEPTH

TRIAL PIT LOG

PROJECT : GEOTECHNICAL INVESTIGATION FOR STP WORKS
CLIENT : M/S.NJS-MM-TCE CONSORTIUM
LOCATION : NAGASANDRA
TRIAL PIT NO. : TP-1

SIZE OF PIT. : 3.0x3.0x3.0m
GWT : Not met
COMMENCEMENT DATE : 08.02.08
COMPLETION DATE : 08.02.08
BACKFILLING DATE : 08.02.08

DEPTH BELOW EGL (m)	SOIL STRATA DESCRIPTION	TYPE OF SAMPLING	LAYER THICKNESS ON EACH FACE				Pocket penetrometer reading kg/cm^2	Remarks
			N	S	E	W		
0.50	Brownish Clayey Silt							
1.00							4.50	
1.50								
2.00							2.50	
2.50								
3.00		BS					2.00	

Pit Termnated at 3.00m

CLIENT: M/s NJS-MM-TCE CONSORTIUM
PROJECT: Geotechnical Investigation for STP works
ERT NO: 1
LOCATION : **Nagasandra**

DATE OF COMMENCEMENT: 7.2.08
DATE OF COMPLETION :7.2.08

ELECTRICAL RESISTIVITY TEST RESULTS

ERT No	Electrode Spacing "a" (m)	Resistance R (ohm)	Multiplier = 2 πa	Apparent resistivity r_a= 2πaR (Ohm-m)	Direction of test and Remarks
ERT-1	1.0	5.350	6.283	33.615	Near TP-1,East West
	2.0	1.620	12.566	20.358	
	3.0	0.682	18.850	12.855	
	5.0	0.494	31.416	15.519	
	7.0	0.421	43.982	18.517	
	10.0	0.320	62.832	20.106	
	12.0	0.321	75.398	24.203	
	15.0	0.308	94.248	29.028	
	1.0	4.480	6.283	28.149	East-West
	2.0	1.513	12.566	19.013	
	3.0	0.612	18.850	11.536	
	5.0	0.337	31.416	10.587	
	7.0	0.307	43.982	13.503	
	10.0	0.262	62.832	16.462	
	12.0	0.231	75.398	17.417	
	15.0	0.208	94.248	19.604	

BORE LOG

PROJECT : GEOTECH INVESTIGATION FOR PROPOSED ISPS
CLIENT : NJS-MM-TCE CONSORTIUM
BH NO. : BH 1
LOCATION : ISPS at CHIKKABANAVARA (C.B.VARA)

TYPE OF BORING : ROTARY
BORE HOLE DIA. : 150mm/76mm
GWT : Not met
CASING : 2.70m
COMMENCED : 22.08.09
COMPLETED : 22.08.09

DEPTH BELOW EGL (m)	SOIL/ROCK CLASSIFICATION	TYPE OF SAMPLING	STANDARD PENETRATION TEST NO. OF BLOWS FOR				ROCK DRILLING		REMARKS
			FIRST 15 cm (N_1)	NEXT 15 cm (N_2)	NEXT 15 cm (N_3)	'N'-VALUE ($N_2 + N_3$)	CR (%)	RQD (%)	
1.00	Brownish Silty Sand	DS							
		SPT	5	5	6	11			
2.00	Greyish Brown Clayey Silt / Sand								
3.00		UDS							
4.00									
		SPT	6	7	12	19			
5.00									
6.00		SPT	100B/3cm			>100			
7.00	Brownish white Very Dense Sandy gravels	SPT	10	18	26	44			
8.00	Greyish white highly weathered rock								
9.00		SPT	11	24	35	59			
10.00		SPT	40	50B/17cm		>100			

SPT = STANDARD PENETRATION TEST **BH 1 Terminated at 10.00m** GWT: GROUND WATER TABLE
B: NO OF BLOWS EGL: EXISTING GROUND LEVEL BH: BOREHOLE
DS: DISTURBED SAMPLE **SECON PRIVATE LIMITED**

NJS-MM-TCE CONSORTIUM

BORE LOG

PROJECT : GEOTECH INVESTIGATION FOR PROPOSED ISPS
CLIENT : NJS-MM-TCE CONSORTIUM
BH NO. : BH 2
LOCATION : ISPS at CHIKKABANAVARA (C.B.VARA)

TYPE OF BORING : ROTARY
BORE HOLE DIA. : 150mm/76mm
GWT : 3.00m
CASING : -
COMMENCED : 23.08.09
COMPLETED : 24.08.09

DEPTH BELOW EGL (m)	SOIL/ROCK CLASSIFICATION	TYPE OF SAMPLING	STANDARD PENETRATION TEST NO. OF BLOWS FOR FIRST 15 cm (N_1)	NEXT 15 cm (N_2)	NEXT 15 cm (N_3)	'N'-VALUE ($N_2 + N_3$)	ROCK DRILLING CR (%)	ROCK DRILLING RQD (%)	REMARKS
1.00	Brownish Silty Sand	DS							
		SPT	4	7	9	16			
2.00									
3.00	Greyish Brown Clayey Silt / Sand	UDS							
4.00		SPT	5	7	11	18			T.C. Bit used from 5.70 to 8.8m depth
5.00									
6.00	5.7	SPT	R			>100			
7.00	Brownish white Highly weathered rock	SPT	100B/4cm			>100			Diamond Bit used from 8.80 to 15.0m depth
8.00									
9.00		SPT	R			>100			
10.00		SPT	R			>100			
11.00									
12.00	Greyish Brown Highly weathered rock	SPT	100B/11cm			>100			
13.00		SPT	100B/10cm			>100			
14.00									
15.00		SPT	100B/12cm			>100			

SPT = STANDARD PENETRATION TEST
B: NO OF BLOWS
DS: DISTURBED SAMPLE

BH 2 Terminated at 15.00m

EGL: EXISTING GROUND LEVEL
UDS: UNDISTURBED SAMPLE

GWT: GROUND WATER TABLE
BH: BOREHOLE
SECON PRIVATE LIMITED

CLIENT: M/s NJS-MM-TCE CONSORTIUM **DATE OF COMMENCEMENT**: 26.08.09

PROJECT: Geotech Investigation for ISPS, C B Vara **DATE OF COMPLETION**: 26.08.09

ELECTRICAL RESISTIVITY TEST RESULTS

ERT No	Electrode Spacing "a" (m)	Resistance R (ohm)	Multiplier = 2πa	Apparent resistivity $\rho_a = 2\pi aR$ (Ohm-m)	Direction of test and Remarks
ERT-1	1.00	4.910	6.283	30.850	East-West
	2.00	2.450	12.566	30.788	
	3.00	1.660	18.850	31.290	
	5.00	0.890	31.416	27.960	
	10.00	0.550	62.832	34.558	
	15.00	0.325	94.248	30.631	
	1.00	4.890	6.283	30.725	North-South
	2.00	3.880	12.566	48.758	
	3.00	1.475	18.850	27.803	
	5.00	0.600	31.416	18.850	
	10.00	0.280	62.832	17.593	
	15.00	0.375	94.248	35.343	

BORELOG

CLIENT : NJS–MM–TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR WATER SUPPLY COMPONENTS
BORE HOLE NO : BH–1
LOCATION : JAKKUR

TYPE OF BORING : ROTARY
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : 0.5m below EGL
CASING DEPTH : 3.0m

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS				ROCK DRILLING									
										SEATING BLOWS N1	NO OF BLOWS FOR 2nd 15CM N2	NO OF BLOWS FOR 3rd 15CM N3	N VALUE=N2+N3	DIA OF CASING IF USED (mm)	PERCENT CORE RECOVERY	TYPE OF DRILL BIT USED (TC/DIAMOND)	DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	DETAILS OF WATER, SLURRY COLOUR ETC.	SIZE OF CORE PIECES	R Q D	SIZE OF HOLE	WATER LOSS IF ANY	IN SITU ROCK TESTS
	Reddish Brown Sandy Silt with Clay Binder		1.0	07/12	SPT	0.5	SPT1	▽	30/45	2	2	2	4										
	2.3 Brownish Grey Sandy Silt with Clay Binder		2.0		UDS	2.5	UDS																
	4.0 Brownish Grey Highly Weathered Rock		3.0		SPT	4.0	SPT2		43/45	6	7	9	16										
			4.0																				
			5.0		UDS/RS	5.5	UDS/RS																
			6.0																				
			7.0		SPT	7.0	SPT3		44/45	16	36	46	82										
			8.0																				
			9.0	08/12	SPT	8.5	SPT4		42/45	15	32	46	78										
			10.0		SPT	10.0	SPT5		44/45	13	24	40	64										
			11.0																				
			12.0		SPT	11.5	SPT6		38/45	17	40	50	90										
	12.2 Brownish Boulders																						
	12.7 Yellowish Highly Weathered Rock		13.0		SPT	13.0	SPT7		22/26	40	50	50	100										
			14.0																				
			15.0		SPT	14.5	SPT8		14/15	50B/15cm			>100										
	15.1 Yellowish Grey Highly Weathered Rock		16.0		SPT	16.0	SPT9		17/30	40	50B/15cm		>100										
			17.0																				
			18.0		SPT	17.5	SPT10		30/45	40	44	50	94										

BORELOG

CLIENT : NJS–MM–TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR WATER SUPPLY COMPONENTS
BORE HOLE NO : BH–1
LOCATION : JAKKUR

TYPE OF BORING : ROTARY
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : 0.5m below EGL
CASING DEPTH : 3.0m

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS				ROCK DRILLING									
										SEATING BLOWS N1	NO OF BLOWS FOR 2nd 15CM N2	NO OF BLOWS FOR 3rd 15CM N3	N VALUE=N2+N3	DIA OF CASING IF USED (mm)	PERCENT CORE RECOVERY	TYPE OF DRILL BIT USED (TC/DIAMOND)	DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	DETAILS OF WATER, SLURRY COLOUR ETC.	SIZE OF CORE PIECES	R Q D	SIZE OF HOLE	WATER LOSS IF ANY	IN SITU ROCK TESTS
	Yellowish Grey Highly Weathered Rock		19.0	09/12	SPT	19.0	SPT11		9/10	60B/10cm			>100										
			20.0		SPT	0.5	SPT12		20/25	35	100B/10cm		>100										
	20.0																						

– GWT

DC–DIAMOND CORE BIT

BOREHOLE TERMINATED AT 20.0m DEPTH

BORELOG

CLIENT : NJS–MM–TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR WATER SUPPLY COMPONENTS
BORE HOLE NO : BH–2
LOCATION : JAKKUR

TYPE OF BORING : ROTARY
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : 0.3m above EGL
CASING DEPTH : 3.0m

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS: SEATING BLOWS N1	SPT DETAILS: NO OF BLOWS FOR 2nd 15CM N2	SPT DETAILS: NO OF BLOWS FOR 3rd 15CM N3	SPT DETAILS: N VALUE=N2+N3	ROCK DRILLING: DIA OF CASING IF USED (mm)	ROCK DRILLING: PERCENT CORE RECOVERY	ROCK DRILLING: TYPE OF DRILL BIT USED (TC/DIAMOND)	ROCK DRILLING: DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	ROCK DRILLING: DETAILS OF WATER, SLURRY COLOUR ETC.	ROCK DRILLING: SIZE OF CORE PIECES	ROCK DRILLING: R Q D	ROCK DRILLING: SIZE OF HOLE	ROCK DRILLING: WATER LOSS IF ANY	ROCK DRILLING: IN SITU ROCK TESTS
	Greyish Brown Sandy Silt with Clay Binder		1.0	07/12	SPT	0.5	SPT1	0.3	29/45	1	1	1	2										
			2.0		SPT	2.0	SPT2		30/45	6	7	8	15										
			3.0		UDS	3.0	UDS																
	3.6 Greyish Brown Highly Weathered Rock		4.0		SPT	4.0	SPT3		25/45	10	15	35	50										
			5.0	08/12																			
			6.0		UDS/RS	5.5	UDS/RS																
	6.3		7.0		SPT	6.5	SPT4		28/45	10	19	26	45										
			8.0		UDS/RS	7.5	UDS/RS																
	9.3 Brownish Boulders		9.0		SPT	9.0	SPT5		22/45	20	45	60	105										
			10.0																				
			11.0		DS	10.5	DS																
			12.0		DS	10.5	DS																
	12.7 Greyish White Highly Weathered Rock		13.0		SPT	13.0	SPT6		5/7	100B7cm			>100										
			14.0																				
			15.0	09/12	14.8–15.8										20	DC			6+5+6+3=20cm	Nil	76	Nil	
			16.0		15.8–16.8										60	DC			10+23+7+10+10=60cm	53	76	Nil	
	15.8 Brownish White Moderately Weathered Rock		17.0		16.8–17.8										51	DC			12+6+5+11+7+10=51cm	33	76	Nil	
			18.0																				

BORELOG

CLIENT : NJS–MM–TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR WATER SUPPLY COMPONENTS
BORE HOLE NO : BH–2
LOCATION : JAKKUR

TYPE OF BORING : ROTARY
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : 0.3m above EGL
CASING DEPTH : 3.0m

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS: SEATING BLOWS N1	SPT DETAILS: NO OF BLOWS FOR 2nd 15CM N2	SPT DETAILS: NO OF BLOWS FOR 3rd 15CM N3	SPT DETAILS: N VALUE=N2+N3	ROCK DRILLING: DIA OF CASING IF USED (mm)	ROCK DRILLING: PERCENT CORE RECOVERY	ROCK DRILLING: TYPE OF DRILL BIT USED (TC/DIAMOND)	ROCK DRILLING: DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	ROCK DRILLING: DETAILS OF WATER, SLURRY COLOUR ETC.	ROCK DRILLING: SIZE OF CORE PIECES	ROCK DRILLING: R Q D	ROCK DRILLING: SIZE OF HOLE	ROCK DRILLING: WATER LOSS IF ANY	ROCK DRILLING: IN SITU ROCK TESTS
	Brownish White Moderately Weathered Rock		19.0	10/12	17.8–20.0										47	DC			77+10+17=104cm	47	76	Nil	
	20.0		20.0																				

– GWT TC– TUNGSTEN CARBIDE DC–DIAMOND CORE BIT RS–REPRESENTATIVE SAMPLE

BOREHOLE TERMINATED AT 20.0m DEPTH

CLIENT: M/s NJS-MM-TCE CONSORTIUM
PROJECT: Geotechnical Investigation for STP, JAKKUR

ELECTRICAL RESISTIVITY TEST RESULTS

ERT NO: 1
LOCATION : Jakkur

DATE OF COMMENCEMENT: 17.11.07
DATE OF COMPLETION: 17.11.07

ERT No	Electrode Spacing "a" (m)	Resistance R (ohm)	Multiplier = 2 πa	Apparent resistivity $\rho_a = 2\pi aR$ (Ohm-m)	Direction of test and Remarks
ERT-1	1.0	4.300	6.283	27.018	East-West
	2.0	1.522	12.566	19.126	
	3.0	0.804	18.850	15.155	
	5.0	0.412	31.416	12.943	
	10.0	0.242	62.832	15.205	
	15.0	0.179	94.248	16.870	

ERT NO: 2
LOCATION : Jakkur

DATE OF COMMENCEMENT: 17.11.07
DATE OF COMPLETION: 17.11.07

ERT No	Electrode Spacing "a" (m)	Resistance R (ohm)	Multiplier = 2 πa	Apparent resistivity $\rho_a = 2\pi aR$ (Ohm-m)	Direction of test and Remarks
ERT-2	1.0	4.280	6.283	26.892	North-West.
	2.0	1.497	12.566	18.812	
	3.0	0.680	18.850	12.818	
	5.0	0.462	31.416	14.514	
	10.0	0.258	62.832	16.211	
	15.0	0.135	94.248	12.723	
	1.0	4.390	6.283	27.583	East-West
	2.0	1.510	12.566	18.975	
	3.0	0.676	18.850	12.742	
	5.0	0.493	31.416	15.488	
	10.0	0.249	62.832	15.645	
	15.0	0.152	94.248	14.326	

BORELOG

CLIENT : NJS–MM–TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR WATER SUPPLY COMPONENTS
BORE HOLE NO : BH–1
LOCATION : GKVK

TYPE OF BORING : ROTARY
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : Nil
CASING DEPTH : 1.5m

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS: SEATING BLOWS N1	SPT DETAILS: NO OF BLOWS FOR 2nd 15CM N2	SPT DETAILS: NO OF BLOWS FOR 3rd 15CM N3	SPT DETAILS: N VALUE=N2+N3	ROCK DRILLING: DIA OF CASING IF USED (mm)	ROCK DRILLING: PERCENT CORE RECOVERY	ROCK DRILLING: TYPE OF DRILL BIT USED (TC/DIAMOND)	ROCK DRILLING: DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	ROCK DRILLING: DETAILS OF WATER, SLURRY COLOUR ETC.	ROCK DRILLING: SIZE OF CORE PIECES	ROCK DRILLING: R Q D	ROCK DRILLING: SIZE OF HOLE	ROCK DRILLING: WATER LOSS IF ANY	ROCK DRILLING: IN SITU ROCK TESTS
	Reddish Sandy Silt with clay Binder		1.0	03/10	DS	0.5	DS																
			2.0		SPT	1.5	SPT1		35/45	7	9	12	21										
			3.0		UDS	3.0	UDS																
			4.0																				
	4.0 Brownish Yellow Sandy Silt With Clay Binder		5.0		SPT	4.5	SPT2		28/45	16	21	22	43										
			6.0	04/10	UDS	6.0	UDS																
	6.0 Brownish Yellow Sandy Silt With Traces of Clay		7.0																				
			8.0																				
			9.0		SPT	9.0	SPT3		25/45	12	14	21	35										
			10.0		SPT	10.0	SPT4		30/45	13	17	27	44										
	10.0																						

BOREHOLE TERMINATED AT 10.0m DEPTH

BORELOG

CLIENT : NJS–MM–TCE CONSORTIUM,BANGALORE
PROJECT : GEOTECHNICAL INVESTIGATIONS FOR WATER SUPPLY COMPONENTS
BORE HOLE NO : BH–2
LOCATION : GKVK

TYPE OF BORING : ROTARY
BOREHOLE DIA : 150mm/Nx Size
GWT FROM EGL : Nil
CASING DEPTH : Nil

SYMBOLIC REPRESENTATION	ENGINEERING CLASSIFICATION	ELEVATION IN (m)	DEPTH IN (m) BELOW REFERENCE	DATE OF BORING & SAMPLING	NATURE OF SAMPLING	DEPTH OF SAMPLE BELOW REFERENCE LEVEL	SAMPLE REF NO	LEVEL OF WATER TABLE/L.W.L	RECOVERY FOR SOIL SAMPLE	SPT DETAILS: SEATING BLOWS N1	SPT DETAILS: NO OF BLOWS FOR 2nd 15CM N2	SPT DETAILS: NO OF BLOWS FOR 3rd 15CM N3	SPT DETAILS: N VALUE=N2+N3	ROCK DRILLING: DIA OF CASING IF USED (mm)	ROCK DRILLING: PERCENT CORE RECOVERY	ROCK DRILLING: TYPE OF DRILL BIT USED (TC/DIAMOND)	ROCK DRILLING: DESCRIPTION OF CORE ROCK TYPE COLOUR DEGREE OF WEATHERING JOINT	ROCK DRILLING: DETAILS OF WATER, SLURRY COLOUR ETC.	ROCK DRILLING: SIZE OF CORE PIECES	ROCK DRILLING: R Q D	ROCK DRILLING: SIZE OF HOLE	ROCK DRILLING: WATER LOSS IF ANY	ROCK DRILLING: IN SITU ROCK TESTS
				03/10																			
			1.0		SPT	0.5	SPT1		20/45	2	4	5	9										
			2.0		UDS	2.0	UDS																
	Reddish Sandy Silt With Clay Binder		3.0																				
			4.0		SPT	3.5	SPT2		25/45	6	10	12	22										
			5.0		UDS	5.0	UDS																
			6.0																				
	6.0 Brownish Yellow Silty Sand with Traces of Clay		7.0		SPT	6.5	SPT3		30/45	8	11	13	24										
			8.0	03/10																			
			9.0																				
	9.0 Brownish Yellow Highly Weathered Rock		10.0		SPT	9.5	SPT5		Nil	50B/2cm			>100										
	10.0																						

BOREHOLE TERMINATED AT 10.0m DEPTH

TRIAL PIT LOG

PROJECT : GEOTECHNICAL INVESTIGATION FOR WATER SUPPLY COMPONENT WORKS
CLIENT : M/S.NJS-MM-TCE CONSORTIUM
LOCATION : **GKVK**
TRIAL PIT NO. : TP-1

SIZE OF PIT. : 2.0x2.0x3.0m
GWT : Not met
COMMENCEMENT DATE : 19.11.07
COMPLETION DATE : 20.10.07
BACKFILLING DATE 21.11.07

DEPTH BELOW EGL (m)	SOIL STRATA DESCRIPTION	TYPE OF SAMPLING	LAYER THICKNESS ON EACH FACE				Pocket penetrometer reading kg/cm^2	Remarks
			N	S	E	W		
	Reddish Sandy Silt with Clay Binder and gravels							
1.00							0.75	
		BS						
2.00								In Situ density Conducted at 3m Depth Density is 1.71g/cc
3.00		BS						

PROJECT : Geo-technical Investigations for Water Supply Component Works
CLIENT : NJS-MM-TCE CONSORTIUM
TEST LOCATION GKVK

STARTING DATE OF TESTING:20-11-2007
COMPLETION DATE OF TESTING:20-11-2007
SIZE OF PLATE:75x75x2.5cm
SIZE OF PIT:3x3m

PLATE LOAD TEST AS PER IS:1888

SL NO.	LOAD INTENSITY kg/cm^2	TIME IN MIN	DIAL GAUGE DIVISIONS				CUMMULATIVE AVERAGE SETTLEMENT (mm)	REMARKS
			DG I	DG II	DG III	DG IV		
1	0.07	0	0	0	0	0		Loading cycle started
		1	39	30	25	15		
		5	39	30	28	15		
		10	40	30	29	16		
		15	40	30	29	16		
		25	41	30	29	16		
		35	41	30	30	17		
		50	41	30	30	17		
		60	41	30	30	17	0.295	
2	0.84	0	62	71	42	20		
		1	65	72	44	21		
		5	66	72	45	21		
		10	67	73	45	22		
		15	67	73	46	22		
		25	68	73	47	23		
		35	68	73	47	23		
		50	68	74	47	23		
		60	68	74	47	23	0.530	
3	1.68	0	81	96	58	31		
		1	82	97	60	32		
		5	84	97	61	33		
		10	86	97	62	33		
		15	86	97	63	34		
		25	87	97	63	35		
		35	89	98	65	36		
		50	90	99	66	36		
		60	90	99	66	36	0.728	
4	2.52	0	94	141	72	43		
		1	95	144	74	44		
		5	97	145	76	45		
		10	98	146	77	46		
		15	100	146	77	47		
		25	100	148	77	47		
		35	100	148	78	47		
		50	100	149	78	48		
		60	100	149	78	48	0.938	

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SL NO.	LOAD INTENSITY kg/cm^2	TIME IN MIN	DIAL GAUGE DIVISIONS				CUMMULATIVE AVERAGE SETTLEMENT (mm)	REMARKS
			DG I	DG II	DG III	DG IV		
5	3.36	0	104	136	84	50		
		1	105	163	86	51		
		5	107	163	89	53		
		10	109	164	91	54		
		15	109	164	92	55		
		25	110	165	92	56		
		35	110	165	93	56		
		50	111	166	94	57		
		60	111	166	94	57	1.070	
6	4.20	0	113	179	99	60		
		1	116	179	100	61		
		5	118	179	103	62		
		10	120	181	104	63		
		15	120	182	106	64		
		25	120	183	107	66		
		35	121	185	108	67		
		50	121	187	108	67		
		60	121	188	108	67	1.210	
7	5.04	0	122	189	111	68		
		1	123	190	112	69		
		5	125	192	115	71		
		10	126	194	117	72		
		15	127	195	118	73		
		25	127	196	118	74		
		35	127	197	118	75		
		50	128	198	120	76		
		60	128	198	120	76	1.305	
8	5.88	0	129	199	123	77		
		1	129	199	125	79		
		5	129	199	126	81		
		10	129	199	127	82		
		15	130	199	128	83		
		25	131	199	128	84		
		35	132	199	129	85		
		50	132	199	130	86		
		60	132	199	131	87	1.373	
9	6.72	0	133	200	133	88		
		1	134	201	134	89		
		5	134	201	136	90		
		10	134	202	138	92		
		15	134	203	139	93		
		25	135	204	140	94		
		35	137	205	141	95		
		50	137	205	141	95		
		60	137	205	141	95	1.445	

SL NO.	LOAD INTENSITY kg/cm^2	TIME IN MIN	DIAL GAUGE DIVISIONS				CUMMULATIVE AVERAGE SETTLEMENT (mm)	REMARKS
			DG I	DG II	DG III	DG IV		
10	7.56	0	138	206	142	97		
		1	138	206	144	99		
		5	138	206	147	101		
		10	138	207	150	106		
		15	139	208	151	108		
		25	140	209	152	109		
		35	141	210	153	109		
		50	141	210	153	109		
		60	141	211	154	110	1.540	
11	8.40	0	142	213	156	113		
		1	142	213	159	116		
		5	142	214	162	120		
		10	142	215	164	123		
		15	143	216	167	124		
		25	144	217	168	125		
		35	144	218	169	126		
		50	145	218	170	127		
		60	145	218	171	128	1.655	
12	9.24	0	146	220	173	130		
		1	147	221	174	132		
		5	148	222	175	134		
		10	148	223	177	135		
		15	149	224	177	136		
		25	150	225	178	137		
		35	150	225	180	140		
		50	151	226	181	141		
		60	152	227	182	142	1.758	
13	10.08	0	160	234	194	167		
		1	161	235	195	168		
		5	163	237	198	171		
		10	164	238	200	175		
		15	165	239	202	178		
		25	166	240	204	180		
		35	168	241	208	182		
		50	169	245	212	183		
		60	170	246	215	184	2.038	

REBOUND READINGS

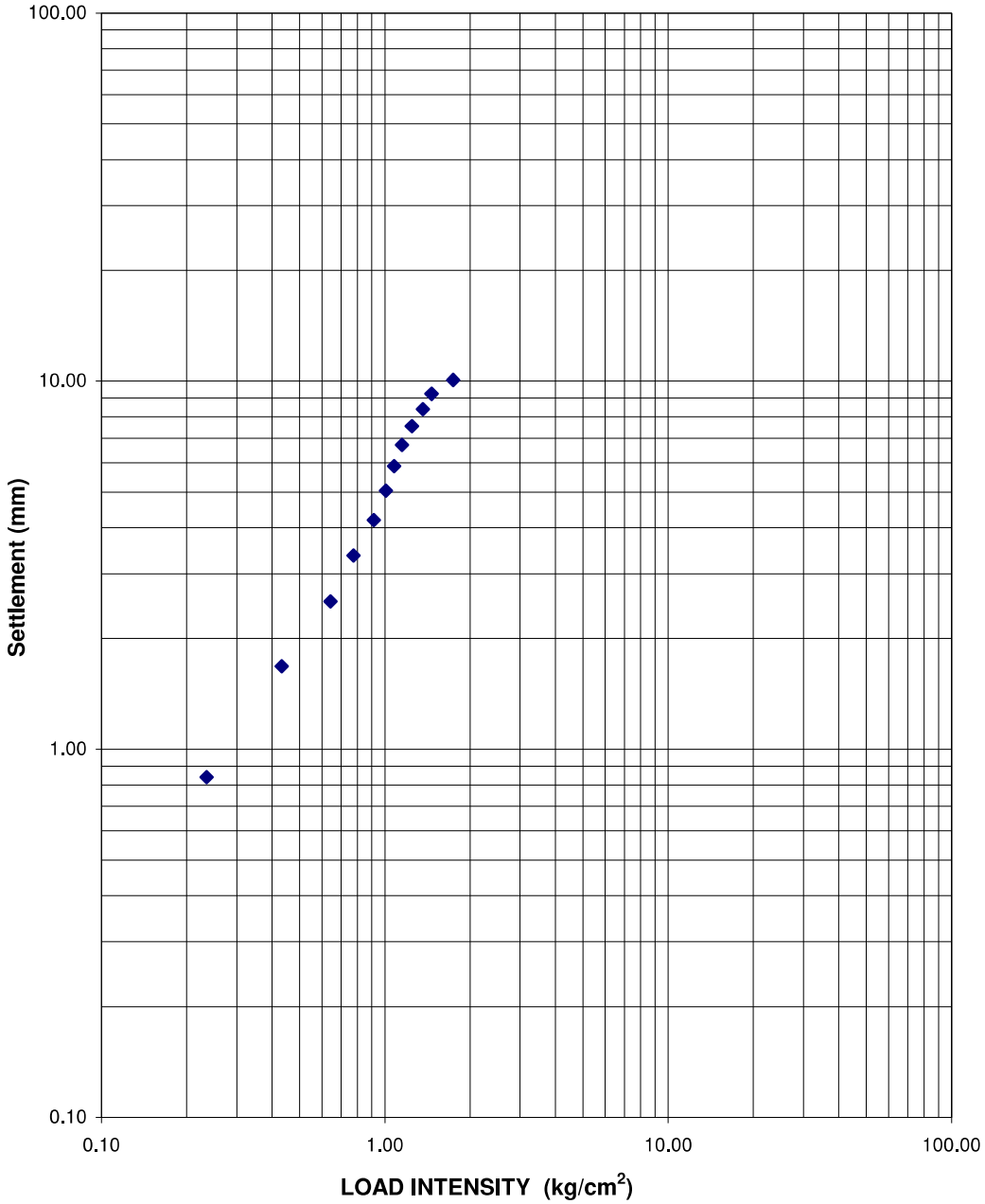
SL NO.	LOAD INTENSITY kg/cm^2	TIME IN MIN	DIAL GAUGE DIVISION				CUMMULATIVE AVERAGE SETTLEMENT (mm)	REMARKS
			DG I	DG II	DG III	DG IV		
1	9.24	1	170	246	215	184		Unloading cycle started
		5	170	246	215	184		
		10	170	246	215	184		
		15	170	246	215	184	2.038	
2	8.40	1	170	246	215	184		
		5	170	246	215	184		
		10	170	246	215	184		
		15	170	246	215	184	2.038	
3	7.56	1	170	246	215	184		
		5	170	246	215	184		
		10	170	246	215	184		
		15	170	246	215	184	2.038	
4	6.72	1	170	246	215	184		
		5	170	246	215	184		
		10	170	246	215	184		
		15	170	246	215	184	2.038	
5	5.88	1	170	246	215	184		
		5	170	246	215	184		
		10	170	246	215	184		
		15	170	246	215	184	2.038	
6	5.04	1	170	246	215	184		
		5	170	246	215	184		
		10	170	246	215	184		
		15	170	246	215	184	2.038	
7	4.20	1	170	246	215	184		
		5	170	246	215	184		
		10	170	246	215	184		
		15	170	246	215	184	2.038	
8	3.36	1	170	246	215	184		
		5	170	246	215	184		
		10	170	246	215	184		
		15	170	246	215	184	2.038	
9	2.52	1	170	246	215	184		
		5	170	246	215	184		
		10	170	246	215	184		
		15	170	246	215	184	2.038	

SL NO.	LOAD INTENSITY kg/cm^2	TIME IN MIN	DIAL GAUGE DIVISION				CUMMULATIVE AVERAGE SETTLEMENT (mm)	REMARKS
			DG I	DG II	DG III	DG IV		
10	1.68	1	168	240	211	181		
		5	167	239	209	179		
		10	167	239	208	178		
		15	167	239	208	178	1.980	
11	0.84	1	160	232	201	171		
		5	158	230	199	169		
		10	157	229	198	168		
		15	157	229	198	168	1.880	
12	0.00	1	149	221	191	160		
		5	148	220	190	157		
		10	147	219	189	156		
		15	146	218	188	155	1.778	
		15	271	459	346	211	1.768	
11	0.84	1	272	460	348	216		
		5	272	460	348	216		
		10	273	461	349	217		
		15	273	461	349	217	3.250	
12	0.00	1	272	460	349	216		
		5	272	460	349	216		
		10	272	460	349	216		
		15	272	460	349	216	3.243	

PLATE LOAD TEST : LOAD INTENSITY vs SETTLEMENT CURVE

CLIENT : NJS-MM-TCE CONSORTIUM
PROJECT : GEOTECHNICAL INVESTIGATION FOR WATER SUPPLY COMPONENT WORKS-GKVK
SIZE OF PLATE(mm) :750 x 750 x 25

PLT NO: PLT-1
DEPTH (m) : 3.0m



CLIENT: M/s NJS-MM-TCE CONSORTIUM
PROJECT: Geotechnical Investigation for Water Components
ERT NO: 1
LOCATION : **GKVK**

DATE OF COMMENCEMENT: 10.10.07
DATE OF COMPLETION :10.10.07

ELECTRICAL RESISTIVITY TEST RESULTS

ERT No	Electrode Spacing "a" (m)	Resistance R (ohm)	Multiplier = 2 πa	Apparent resistivity r_a= 2πaR (Ohm-m)	Direction of test and Remarks
ERT-1	1.0	33.000	6.283	207.345	East-West Dry Land
	2.0	16.140	12.566	202.821	
	3.0	10.790	18.850	203.387	
	5.0	6.270	31.416	196.978	
	10.0	3.260	62.832	204.832	
	15.0	2.700	94.248	254.469	
	1.0	31.300	6.283	196.664	North-South. Dry Land
	2.0	17.570	12.566	220.791	
	3.0	13.160	18.850	248.060	
	5.0	7.340	31.416	230.593	
	10.0	4.250	62.832	267.035	
	15.0	2.940	94.248	277.088	

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ANNEXURE II

ENGINEERING BORELOG

Client: NJS-MM-TCE Consortium
Borehole No : BH 1
Project : Soil Investigations for Kadugodi STP
Location : Kadugodi STP

Size of Borehole : 150mm
Ground water table (m) : 1.00m
Commenced : 28.12.10
Completed : 28.12.10

Description of Soil /Rock Stratum	Layer thickness (m)	Depth (m)	Legend	Sample	SPT TEST, number of blows recorded			N Value = N_2+N_3	Drilling in corable rock		Remarks
					1st 15cm	2nd 15cm	3rd 15cm		CR (%)	RQD (%)	
					N_1	N_2	N_3				
Top Soil -Blackish clayey sand with silt & vegetal cover	1.5	0.5 1.5		DS SPT	3	4	7	11			
Greyish Brown clayey silt	3.0	3.0 4.5		UDS SPT	8	15	20	35			
Greyish brown dense sandy silt with clay binder	1.5	6.0		SPT	35	40B/ 2cm	R	>100			Less sample
Greyish /Pale Brownish completely weathered rock	2.0	8.0		SPT	48B/ 2cm	R		>100			Wash sample

SPT=Standard penetration test
DS= Disturbed Sample
0.0 to 8.0m , soil cutter used
RQD = Rock Quality designation
CR = Core recovery

Geotechnical Investigations for STP at Kadugodi

ENGINEERING BORELOG

Client: NJS-MM-TCE Consortium
Borehole No : BH 2
Project : Soil Investigations for Kadugodi STP
Location : Kadugodi STP

Size of Borehole : 150mm/Nx
Ground water table (m) : 1.00m
Commenced : 30.12.10
Completed : 31.12.10

Description of Soil /Rock Stratum	Layer thickness (m)	Depth (m)	Legend	Sample	SPT TEST, number of blows recorded			N Value = N_2+N_3	Drilling in corable rock		Remarks
					1st 15cm	2nd 15cm	3rd 15cm		CR (%)	RQD (%)	
					N_1	N_2	N_3				
Brownish yellow clayey silt		0.5		DS							
		1.5		UDS							
		3.0		SPT	3	4	4	8			
		4.5		SPT	4	5	6	11			
	6.0	6.0		SPT	6	7	7	14			
Blackish /Greyish sandy silt with clay binder		7.5		SPT	7	9	10	19			
		9.0		SPT	8	10	13	23			
		10.5		SPT	10	13	15	28			
	6.0	12.0		SPT	15	15	18	33			
Brownish completely weathered rock		13.5		SPT	35	40B/ 3cm	R	>100			Less sample
	3.0	15.0		SPT	55B/ <5cm	R		>100			Wash sample

SPT=Standard penetration test
0.0 to 12.0m , soil cutter used
12.0-15.0m , TC Bits used

DS= Disturbed Sample
RQD = Rock Quality designation

CR = Core recovery

Geotechnical Investigations for STP at Kadugodi

ENGINEERING BORELOG

Client: NJS-MM-TCE Consortium
Borehole No : BH 3
Project : Soil Investigations for Kadugodi STP
Location : Kadugodi STP

Size of Borehole : 150mm/Nx
Ground water table (m) : 1.00m
Commenced : 31.12.10
Completed : 1.01.11

Description of Soil /Rock Stratum	Layer thickness (m)	Depth (m)	Legend	Sample	SPT TEST, number of blows recorded			N Value = N_2+N_3	Drilling in corable rock		Remarks
					1st 15cm	2nd 15cm	3rd 15cm		CR (%)	RQD (%)	
					N_1	N_2	N_3				
Brownish grey clayey silt with gravels		0.5		DS							
		1.5		SPT	3	4	7	11			
		3.0		UDS							
	4.5	4.5		SPT	6	10	15	25			
Greyish Brown /yellow dense sandy silt with clay binder		6.0		SPT	14	18	22	40			
		7.5		SPT	16	20	25	45			
	4.5	9.0		SPT	35	40B/ 3cm	R	>100			Less sample
Brownish completely weathered rock	1.0	10.0		SPT	50	55B/ 1cm	R	>100			Less sample

SPT=Standard penetration test
0.0 to 10.0m , soil cutter used
DS= Disturbed Sample
RQD = Rock Quality designation
CR = Core recovery

Geotechnical Investigation
for STP at Kadugodi

Annexure III

ELECTRICAL RESISTIVITY BY WENNER's 4 ELECTRODE METHOD, FIELD TABULATIONS & COMPUTATIONS

Client NJS-MM-TCE Consortium

Project Soil Investigations for Kadugodi STP

Test Location ERT-1, Near BH-2

Test No	Electrode spacing a,m	Resistance R (Ohm) = V/I	Multiplier k= 2 πa	Apparent resistivity = KR (ohm-m)	Direction
(1)	(2)	(3)	(4)	(5) =((3)*(4)	(6)
ERT-1 Near BH-2	0.5	2.120	3.142	6.66	North-South
	1.0	1.259	6.283	7.91	
	1.5	1.114	9.425	10.50	
	2.0	1.009	12.566	12.68	
	3.0	0.876	18.850	16.51	
	4.0	0.478	25.133	12.01	
	5.0	0.288	31.416	9.05	
	7.0	0.256	43.982	11.26	
	10.0	0.223	62.832	14.01	
	12.0	0.219	75.398	16.51	
	15.0	0.219	94.248	20.64	
	17.0	0.214	106.814	22.86	
	20.0	0.198	125.664	24.88	
	0.5	1.397	3.142	4.39	East -West
	1.0	1.030	6.283	6.47	
	1.5	1.010	9.425	9.52	
	2.0	0.746	12.566	9.37	
	3.0	0.400	18.850	7.54	
	4.0	0.384	25.133	9.65	
	5.0	0.343	31.416	10.78	
	7.0	0.316	43.982	13.90	
	10.0	0.297	62.832	18.66	
	12.0	0.289	75.398	21.79	
	15.0	0.280	94.248	26.39	
	17.0	0.274	106.814	29.27	
	20.0	0.269	125.664	33.80	

NJS-MM-TCE Consortium

ANNEXURE II

ENGINEERING BORELOG

Client: NJS-MM-TCE Consortium
Borehole No : BH 1
Project : Soil Investigations for Doddabele STP
Location : Doddabele STP

Size of Borehole : 150mm/Nx
Ground water table (m) : Not met
Commenced : 2.12.10
Completed : 3.12.10

Description of Soil /Rock Stratum	Layer thickness (m)	Depth (m)	Legend	Sample	SPT TEST, number of blows recorded			N Value = N_2+N_3	Drilling in corable rock		Remarks/ Rock Core dimensions in centimetre
					1st 15cm	2nd 15cm	3rd 15cm		CR (%)	RQD (%)	
					N_1	N_2	N_3				
Reddish brown clayey sand with gravels	1.5	0.5 1.5		DS SPT	22	37	22	59			
Pale Brownish white completely weathered rock with black patches	1.5	3.0		SPT	34B	R		>100			Less sample
Blackish Brown /white higly weathered rock (refusal strata, wash samples)	3.0	4.0 5.0 6.0		Wash Samples	R R R						Coarse grained samples
Whitish Brown /Pnk fractured rock (with evidence of intense weathering along discontinuities)	9.0	7.5		Run I	6.00 to 7.50m				<10	Nil	Broken cores
		9.0		Run II	7.50 to 9.00m				<10	Nil	Broken cores
		10.5		Run III	9.00 to 10.50m				<10	Nil	Broken cores
		12.0		Run IV	10.50 to 12.00m				<10	Nil	Fractured and broken cores
		13.5		Run V	12.00 to 13.50m				<10	Nil	Broken cores
		15.0		Run VI	13.00 to 15.00m				10	9	14cm piece+ Broken cores

SPT=Standard penetration test
DS= Disturbed Sample
0.0 to 4.0m , soil cutter used
RQD = Rock Quality designation
CR = Core recovery
4.0 to 6.0m , TC Bits used
6.0 to 15.0m, Diamond bits used

NJS-MM-TCE Consortium

ENGINEERING BORELOG

Client: NJS-MM-TCE Consortium
Borehole No : BH 2
Project : Soil Investigations for Doddabele STP
Location : Doddabele STP

Size of Borehole : 150mm/Nx
Ground water table (m) : Not met
Commenced : 30.11.10
Completed : 1.12.10

Description of Soil /Rock Stratum	Layer thickness (m)	Depth (m)	Legend	Sample	SPT TEST, number of blows recorded			N Value = N_2+N_3	Drilling in corable rock		Remarks/ Rock Core dimensions in centimetre
					1st 15cm	2nd 15cm	3rd 15cm		CR (%)	RQD (%)	
					N_1	N_2	N_3				
Brownish red sandy silt	1.5	0.5 1.5		DS SPT	32	31B/3cm		>100			
Pale Brownish white /greenish completely weathered rock with black patches	1.5	3.0		SPT	33B/3cm			>100			Limited sample
Blackish Brown /white higly weathered rock	2.5	4.0 5.5		Run I Run II	3.50 to 4.00m 4.00 to 5.50m				<10 <10	Nil Nil	Broken cores 2 Broken cores <5cm
Blackish jointed & fractured rock (*with evidence of intense weathering along discontinuities*)	4.5	7.0 8.5 10.0		Run III Run IV Run V	5.50m to 7.00m 7.00 to 8.50m 8.50 to 10.00m				25 25 25	Nil Nil 7	Heavily weathered & broken cores 10*cm + Broken cores

SPT=Standard penetration test
0.0 to 1.5m , soil cutter used
1.5 to 3.5m , TC Bits used

DS= Disturbed Sample
RQD = Rock Quality designation
3.5 to 10.0m, Diamond bits used

CR = Core recovery
* Fractured

NJS-MM-TCE Consortium

ENGINEERING BORELOG

Client: NJS-MM-TCE Consortium
Borehole No : BH 3
Project : Soil Investigations for Doddabele STP
Location : Doddabele STP

Size of Borehole : 150mm/Nx
Ground water table (m) : Not met
Commenced : 01.12.10
Completed : 2.12.10

Description of Soil /Rock Stratum	Layer thickness (m)	Depth (m)	Legend	Sample	SPT TEST, number of blows recorded			N Value = N_2+N_3	Drilling in corable rock		Remarks/ Rock Core dimensions in centimetre
					1st 15cm	2nd 15cm	3rd 15cm		CR (%)	RQD (%)	
					N_1	N_2	N_3				
Pale brownish clayey sand	1.5	0.5 1.5		DS SPT	23	25	27	52			
Pale greenish black completely weathered rock	2.0	3.5		SPT	R			>100	Nil	Nil	Wash samples
Blackish / Brownish white disintegrated /fractured rock (*Refusal strata, wash samples*)		4.5		SPT	R			>100	Nil	Nil	Wash samples
		6.0		SPT	R			>100	Nil	Nil	Wash samples
	4.0	7.5		SPT	R			>100	Nil	Nil	Wash samples
Blackish Jointed & fractured rock with evidence of *intense to moderate weathering*		9.0		Run I	7.50 to 9.00m				15	7	2+4+3+3+10*=22cm
	2.5	10.0		Run II	9.00 to 10.00m				27	27	15+12=27cm

SPT=Standard penetration test
0.0 to 3.5m , soil cutter used
3.5 to 7.5m , TC Bits used

DS= Disturbed Sample
RQD = Rock Quality designation
7.5 to 10.0m, Diamond bits used

CR = Core recovery

NJS-MM-TCE Consortium Annexure III

ELECTRICAL RESISTIVITY BY WENNER's 4 ELECTRODE METHOD, FIELD TABULATIONS & COMPUTATIONS

Client NJS-MM-TCE Consortium

Project Soil Investigations for Doddabele STP

Test Location ERT-1, Near BH-1

Test No	Electrode spacing a,m	Resistance R (Ohm) = V/I	Multiplier K= 2 πa	Apparent resistivity = KR (ohm-m)	Direction
(1)	(2)	(3)	(4)	(5) =((3)*(4)	(6)
ERT-1	1.0	90.0	6.283	565.49	East-West
	2.0	2.23	12.566	28.02	
	3.0	2.01	18.850	37.89	
	5.0	1.102	31.416	34.62	
	10.0	0.756	62.832	47.50	
	15.0	0.672	94.248	63.33	
	1.0	9.62	6.283	60.44	North-South
	2.0	3.43	12.566	43.10	
	3.0	2.17	18.850	40.90	
	5.0	1.333	31.416	41.88	
	10.0	0.702	62.832	44.11	
	15.0	0.639	94.248	60.22	

Annexure II

NORTHERN AREA (Approach from Varthur Side)

BORELOG

Consultants NJS-MM-TCE

Borehole No : BH 1

Project : Soil Investigations for BWSSB's Proposed STP, Bellandur Ammanaikere

Location : Northern Area

Size of Borehole : 150mm/Nx

Ground water level in borehole* (m) : 1.00m

Commenced :12.10.12

Completed : 15.10.12

Description of Soil /Rock Stratum	Layer thickness (m)	Depth (m)	Sub-soil stratification	Legend	Sample	SPT TEST, number of blows recorded			N Value = N_2+N_3	Drilling in corable rock using Nx size Diamond Bits		Remarks/Rock piece dimensions in cm
						1st 15cm	2nd 15cm	3rd 15cm		CR (%)	RQD (%)	
						N_1	N_2	N_3				
Brownish clayey silt	0.5	0.5	**Soil overburden**		DS							Top Soil
Greyish brown silty sand with clay binder		1.5			SPT	3	3	4	7			
		3.0			UDS							
	4.0	4.5			SPT	47B/2cm	R		>100			*REFUSAL /ROCK STRATA*
Greyish white /brown highly weathered rock	1.0	5.5	**Weathered rock**		BRC					40	Nil	**Broken cores total =40cm**
Geyish white jointed hard rock		6.5	**Intact Rock**		RC					99	90	17+18+5+4+55=99cm
		7.5			RC					99	99	99cm
		8.5			RC					87	45	11+11+8+8+4+5+2+8+10 + 6+15=87cm
	4.0	**9.5(T)**			RC					80	80	80cm

Consultants NJS-MM-TCE

Size of Borehole : 150mm/Nx

Borehole No : BH 2

Ground water level in borehole*(m) : 1.00m

Project : Soil Investigations for BWSSB's Proposed STP, Bellandur Ammanaikere

Commenced : 16.10.12

Location : Northern Area

Completed : 18.10.12

Description of Soil /Rock Stratum	Layer thickness (m)	Depth (m)	Sub-soil stratification	Legend	Sample	SPT TEST, number of blows recorded			N Value = N_2+N_3	Drilling in corable rock using Nx size Diamond Bits		Remarks/Rock piece dimensions in cm
						1st 15cm	2nd 15cm	3rd 15cm				
						N_1	N_2	N_3		CR (%)	RQD (%)	
Reddish Brownish clayey silt	0.5	0.5	**Soil overburden**		DS							Top Soil
Greyish brown sandy silt with clay binder		1.5			SPT	1	3	6	9			
		2.0			UDS							
		3.0										
	4.0	4.5			SPT	10	12	13	12			***REFUSAL /ROCK STRATA***
Greyish white /brown highly weathered rock	0.5	5.0	**Weathered rock**		BRC					<10	Nil	Broken cores , 2pieces
Greyish white /brown moderately weathered rock		6.25			BRC					27	21	2+14+6+12=34cm
	2.5	7.5			BRC					33	13	4+5++7**+10+2=31 cm
Geyish white jointed hard rock	1.0	**8.5(T)**	**Intact Rock**		RC					71	71	18+43+10 =71 cm

**Fractured

Consultants NJS-MM-TCE

Borehole No : BH 3

Project : Soil Investigations for BWSSB's Proposed STP, Bellandur Ammanaikere

Location : Northern Area

Size of Borehole : 150mm/Nx

Ground water level in borehole*(m) : Water Logged

Commenced : 19.10.12

Completed : 20.10.12

Description of Soil /Rock Stratum	Layer thickness (m)	Depth (m)	Sub-soil stratification	Legend	Sample	SPT TEST, number of blows recorded			N Value = N_2+N_3	Drilling in corable rock using Nx size Diamond Bits		Remarks/Rock piece dimensions in cm
						1st 15cm	2nd 15cm	3rd 15cm		CR (%)	RQD (%)	
						N_1	N_2	N_3				
Greyish brown clayey silt	0.5	0.5	**Soil overburden**		DS							
Greyish brown silty sand with clay binder		1.5			SPT	2	4	4	8			
		3.0			UDS							
		4.5			SPT	5	9	14	23			
	5.5	6.0			SPT	21	37B/3cm	R	>100			***REFUSAL STRATA***
Greyish / Brownish completely weathered rock		7.5	**Weathered rock**		SPT	41B/3cm	R		>100			**TC bits used**
		9.0			WS					Nil	Nil	
		10.5			WS					Nil	Nil	
		12.0			WS					Nil	Nil	
		13.5			WS					Nil	Nil	
	9.0	**15.0(T)**			WS					Nil	Nil	

Consultants NJS-MM-TCE

Size of Borehole : 150mm/Nx

Borehole No : BH 4

Ground water level in borehole* (m) : 2.00m

Project : Soil Investigations for BWSSB's Proposed STP, Bellandur Ammanaikere

Commenced : 20.10.12

Location : Northern Area

Completed : 22.10.12

Description of Soil /Rock Stratum	Layer thickness (m)	Depth (m)	Sub-soil stratification	Legend	Sample	SPT TEST, number of blows recorded			N Value = N_2+N_3	Drilling in corable rock using Nx size Diamond Bits		Remarks/Rock piece dimensions in cm
						1st 15cm	2nd 15cm	3rd 15cm		CR (%)	RQD (%)	
						N_1	N_2	N_3				
Brownish grey clayey silt	0.5	0.5			DS							Top Soil
Greyish brown silty sand with clay binder		1.5	**Soil overburden**		SPT	3	6	6	12			
		3.0			SPT	11	14	21	35			
	4.0	4.5			SPT	27	41B/5cm	R	>100			***REFUSAL /ROCK STRATA***
Brownish grey completely weathered rock	2.0	6.0 6.5	**Weathered rock**		SPT	48B/5vm	R		>100			
Brownish white highly to moderately weathered rock		7.5			BRC					24	10	10+6+8=24cm
		8.5			BRC					25	10	10cm +Broken cores total 25cm
	3.0	9.5			BRC					25	Nil	Broken Cores total to 25cm
Geyish white jointed hard rock	1.0	**10.5(T)**	**Intact Rock**		RC					37	32	32**+5=37cm

**Fractured

Consultants NJS-MM-TCE

Size of Borehole : 150mm/Nx

Borehole No : BH 5

Ground water level in borehole* (m) : Rains Occurred

Project : Soil Investigations for BWSSB's Proposed STP, Bellandur Ammanaikere

Commenced : 28.10.12

Location : Northern Area

Completed : 29.10.12

Description of Soil /Rock Stratum	Layer thickness (m)	Depth (m)	Sub-soil stratification	Legend	Sample	SPT TEST, number of blows recorded			N Value = N_2+N_3	Drilling in corable rock using Nx size Diamond Bits		Remarks/Rock piece dimensions in cm
						1st 15cm	2nd 15cm	3rd 15cm				
						N_1	N_2	N_3		CR (%)	RQD (%)	
Reddish Brown clayey silt	0.5	0.5			DS							Top Soil
Brownish grey clayey Silt		1.5			SPT	2	2	3	5			
		3.0			SPT	1	2	4	6			
		4.5			SPT	3	4	5	9			
		6.0	**Soil overburden**		SPT	5	5	6	11			
		7.5			SPT	6	7	7	14			
	7.0	9.0			SPT	4	6	6	12			
Greyish clayey /silty sand		10.5			SPT	4	7	8	15			
		12.0			SPT	8	8	8	16			
	4.5	13.5			SPT	60B/2cm	R		>100			***REFUSAL STRATA***
Greyish white completely weathered rock	1.5	**15.0(T)**	**Weathered rock**		SPT	65B/3cm	R		>100			**TC bits used**

B= Number of blows R= Refusal /Rebound WS= Wash sample T-Termination depth UDS=Undisturbed sample RC=Rock Cores , CR>10%

WRC= Weathered rock cores SPT =Standard Penetration test DS= Disturbed sample CR=Core recovery RQD=Rock quality designation

*Water levels correspond to level recorded 24 hours after borehole completion

SOUTHERN AREA (Approach from Panathur Side)

BORELOG

Consultants NJS-MM-TCE

Borehole No : BH 1'

Project : Soil Investigations for BWSSB's Proposed STP, Bellandur Ammanaikere

Location : Southern Area

Size of Borehole : 150mm/Nx

Ground water level in borehole* (m) : < 0.5m

Commenced :13.12.12

Completed : 14.12.12

Description of Soil /Rock Stratum	Layer thickness (m)	Depth (m)	Sub-soil stratification	Legend	Sample	SPT TEST, number of blows recorded			N Value = N_2+N_3	Drilling in corable rock using Nx size Diamond Bits		Remarks/Rock piece dimensions in cm
						1st 15cm	2nd 15cm	3rd 15cm		CR (%)	RQD (%)	
						N_1	N_2	N_3				
Brownish clayey silt	0.5	0.5	**Soil overburden**		DS							Top Soil
Greyish brown clayey silt		1.5			SPT	2	3	3	6			
		3.0			UDS							
	4.0	4.5			SPT	4	5	7	12			
Greyish brown silty sand with clay binder		6.0			SPT	5	7	8	15			
	3.0	7.5			SPT	50B/2cm	R		>100			***REFUSAL STRATA***
Brownish completely weathered rock		9.0	**Weathered rock**		SPT	50B/R			>100			
		10.5			WS					Nil	Nil	
		12.0			WS					Nil	Nil	
	7.5	**15.0(T)**			WS					Nil	Nil	

Consultants NJS-MM-TCE

Size of Borehole : 150mm/Nx

Borehole No : BH 2'

Ground water level in borehole* (m) : < 0.5m

Project : Soil Investigations for BWSSB's Proposed STP, Bellandur Ammanaikere

Commenced : 14.12.12

Location : Southern Area

Completed : 15.12.12

Description of Soil /Rock Stratum	Layer thickness (m)	Depth (m)	Sub-soil stratification	Legend	Sample	SPT TEST, number of blows recorded			N Value = N_2+N_3	Drilling in corable rock using Nx size Diamond Bits		Remarks/Rock piece dimensions in cm
						1st 15cm	2nd 15cm	3rd 15cm		CR (%)	RQD (%)	
						N_1	N_2	N_3				
Greyish brown clayey silt	0.5	0.5	**Soil overburden**		DS							Top Soil
Greyish brown clayey silt		1.5			SPT	2	2	3	5			
		3.0			SPT	3	4	4	8			
	4.0	4.5			UDS							
Brownish sandy Silt with clay binder		6.0			SPT	4	4	5	9			
		7.5			SPT	5	9	12	21			
	4.5	9.0			SPT	50B/3cm	R		>100			***REFUSAL STRATA***
Brownish white completely weathered rock		10.5	**Weathered rock**		SPT	50B/R			>100			
		12.0			WS					Nil	Nil	
		13.5			WS					Nil	Nil	
	6.0	**15.0(T)**			WS					Nil	Nil	

Consultants NJS-MM-TCE

Size of Borehole : 150mm/Nx

Borehole No : BH 3'

Ground water level in borehole* (m) : < 0.5m

Project : Soil Investigations for BWSSB's Proposed STP, Bellandur Ammanaikere

Commenced : 19.12.12

Location : Southern Area

Completed : 21.12.12

Description of Soil /Rock Stratum	Layer thickness (m)	Depth (m)	Sub-soil stratification	Legend	Sample	SPT TEST, number of blows recorded			N Value = N_2+N_3	Drilling in corable rock using Nx size Diamond Bits		Remarks/Rock piece dimensions in cm
						1st 15cm	2nd 15cm	3rd 15cm		CR (%)	RQD (%)	
						N_1	N_2	N_3				
Greyish black clayey silt	0.5	0.5			DS							Top Soil
		1.5			SPT	3	4	6	10			
		3.0			UDS							
Greyish brown sandy silt with clay binder		4.5	**Soil overburden**		SPT	6	7	9	16			
		6.0			SPT	6	9	13	22			
	7.0	7.5			SPT	46	50B/4cm	R	>100			***REFUSAL STRATA***
		9.0			SPT	50B/3cm	R		>100			
		10.5			SPT	50B/R			>100			
		12.0			WS					Nil	Nil	
Yellowish/Pale white completely weathered rock		13.5			WS					Nil	Nil	
		15.0	**Weathered rock**		WS					Nil	Nil	
		16.5			WS					Nil	Nil	
	10.5	18.0			WS					Nil	Nil	
Greyish brown white highly weathered rock		19.5			BRC					<10	Nil	Broken rock cores
	3.0	**21.0(T)**			BRC					<10	Nil	Broken rock cores

Consultants NJS-MM-TCE

Size of Borehole : 150mm/Nx

Borehole No : BH 4'

Ground water level in borehole* (m) : Water Logged

Project : Soil Investigations for BWSSB's Proposed STP, Bellandur Ammanaikere

Commenced : 23.12.12

Location : Southern Area

Completed : 24.12.12

Description of Soil /Rock Stratum	Layer thickness (m)	Depth (m)	Sub-soil stratification	Legend	Sample	SPT TEST, number of blows recorded			N Value = N_2+N_3	Drilling in corable rock using Nx size Diamond Bits		Remarks/Rock piece dimensions in cm
						1st 15cm	2nd 15cm	3rd 15cm		CR (%)	RQD (%)	
						N_1	N_2	N_3				
Greyish black clayey silt	0.5	0.5			DS							Top Soil and slushy
Greyish brown sandy silt with clay binder		1.5	**Soil overburden**		SPT	1	2	3	5			
		3.0			SPT	5	9	10	19			
		4.5			UDS							
		6.0			SPT	6	10	15	25			
	7.0	7.5			SPT	50B/3cm	R		>100			***REFUSAL STRATA***
Greyish to Brownish white completely weathered rock		9.0	**Weathered rock**		SPT	50B/R			>100			
		10.5			SPT	50B/R			>100			
		12.0			WS					Nil	Nil	
		13.5			WS					Nil	Nil	
	7.5	**15.0(T)**			WS					Nil	Nil	

Consultants NJS-MM-TCE

Size of Borehole : 150mm/Nx

Borehole No : BH 5'

Ground water level in borehole* (m) : Water Logged

Project : Soil Investigations for BWSSB's Proposed STP, Bellandur Ammanaikere

Commenced : 28.10.12

Location : Southern Area

Completed : 29.10.12

Description of Soil /Rock Stratum	Layer thickness (m)	Depth (m)	Sub-soil stratification	Legend	Sample	SPT TEST, number of blows recorded			N Value = N_2+N_3	Drilling in corable rock using Nx size Diamond Bits		Remarks/Rock piece dimensions in cm
						1st 15cm	2nd 15cm	3rd 15cm		CR (%)	RQD (%)	
						N_1	N_2	N_3				
Greyish black clayey silt	0.5	0.5			DS							Top Soil and slushy
Greyish brown sandy silt with clay binder		1.5	**Soil overburden**		SPT	1	2	2	4			
		3.0			SPT	4	7	11	18			
		4.5			SPT	5	9	16	25			
	5.5	6.0			SPT	27	39B/5cm	R	>100			***REFUSAL STRATA***
Greyish black to Brownish white completely weathered rock		7.5	**Weathered rock**		SPT	50B/3cm	R		>100			
		9.0			SPT	50B/3cm	R		>100			
		10.5			WS					Nil	Nil	
		12.0			WS					Nil	Nil	
		13.5			WS					Nil	Nil	
		15.0			WS					Nil	Nil	
		16.5			WS					Nil	Nil	
		18.0			WS					Nil	Nil	
	14.0	**20.0(T)**			WS					Nil	Nil	

Consultants NJS-MM-TCE

Size of Borehole : 150mm/Nx

Borehole No : BH 6'

Ground water level in borehole* (m) : < 0.5m

Project : Soil Investigations for BWSSB's Proposed STP, Bellandur Ammanaikere

Commenced : 29.12.12

Location : Southern Area

Completed : 31.12.12

Description of Soil /Rock Stratum	Layer thickness (m)	Depth (m)	Sub-soil stratification	Legend	Sample	SPT TEST, number of blows recorded			N Value = N_2+N_3	Drilling in corable rock using Nx size Diamond Bits		Remarks/Rock piece dimensions in cm
						1st 15cm	2nd 15cm	3rd 15cm		CR (%)	RQD (%)	
						N_1	N_2	N_3				
Greyish black clayey silt	0.5	0.5	**Soil overburden**		DS							Top Soil and slushy
Greyish sandy silt with clay binder		1.5			SPT	1	2	2	4			
		3.0			SPT	2	2	3	5			
		4.5			SPT	2	2	3	5			
	5.5	6.0			SPT	28	45B/3cm	R	>100			***REFUSAL STRATA***
Greenish grey /black completely weathered rock		7.5	**Weathered rock**		SPT	53B/4cm	R		>100			
		9.0			BRC					<10	Nil	Broken rock cores
	4.5	10.5			WS					Nil	Nil	
Greenish /greyish white completely weathered rock		12.0			WS					Nil	Nil	
	3.0	13.5			WS					Nil	Nil	
Brownish white completely weathered rock		15.0			BRC					<10	Nil	Broken rock cores
	3.0	16.5			WS					Nil	Nil	
Blackish /Greenish white highly weathered rock		17.5			BRC					<10	Nil	Broken rock cores
		19.0			BRC					<10	Nil	Broken rock cores
	3.5	**20.0(T)**			BRC					<10	Nil	Broken rock cores

Consultants NJS-MM-TCE

Size of Borehole : 150mm/Nx

Borehole No : BH 7'

Ground water level in borehole* (m) : < 0.5m

Project : Soil Investigations for BWSSB's Proposed STP, Bellandur Ammanaikere

Commenced : 05.01.13

Location : Southern Area

Completed : 06.01.13

Description of Soil /Rock Stratum	Layer thickness (m)	Depth (m)	Sub-soil stratification	Legend	Sample	SPT TEST, number of blows recorded			N Value = N_2+N_3	Drilling in corable rock using Nx size Diamond Bits		Remarks/Rock piece dimensions in cm
						1st 15cm	2nd 15cm	3rd 15cm		CR (%)	RQD (%)	
						N_1	N_2	N_3				
Greyish brown sandy silt with gravels	0.5	0.5	Soil overburden		DS							Top Soil
Greyish brown clayey silt		1.5			SPT	2	3	5	8			
		3.0			SPT	4	6	8	14			
		4.5			SPT	5	9	14	23			
	5.5	6.0			SPT	39	48B/3cm	R	>100			*REFUSAL STRATA*
Greenish white completely weathered rock		7.5	Weathered rock		SPT	53B/3cm	R		>100			
		9.0			WS					Nil	Nil	
	4.5	10.5			WS					Nil	Nil	
Greenish /greyish white completely weathered rock					WS					Nil	Nil	
	0.5	11.0			BRC					<20	Nil	Broken rock cores
Greyish white Jointed Hard Rock		12.0	Intact Rock		RC					53	53	53cm
	2.0	**13.0(T)**			RC					96	96	96cm

Consultants NJS-MM-TCE

Size of Borehole : 150mm/Nx

Borehole No : BH 8'

Ground water level in borehole* (m) : 2.00m

Project : Soil Investigations for BWSSB's Proposed STP, Bellandur Ammanaikere

Commenced : 06.01.13

Location : Southern Area

Completed : 07.01.13

Description of Soil /Rock Stratum	Layer thickness (m)	Depth (m)	Sub-soil stratification	Legend	Sample	SPT TEST, number of blows recorded			N Value = N_2+N_3	Drilling in corable rock using Nx size Diamond Bits		Remarks/Rock piece dimensions in cm
						1st 15cm	2nd 15cm	3rd 15cm		CR (%)	RQD (%)	
						N_1	N_2	N_3				
Reddish brown sandy silt with gravels	0.5	0.5	**Soil overburden**		DS							Top Soil
Greyish to reddish brown sandy silt with clay binder		1.5			SPT	4	6	10	16			
		3.0			SPT	12	16	20	36			
	4.0	4.5			SPT	32	57B/2cm	R	>100			***REFUSAL STRATA***
Yellowish brown completely weathered rock		6.0	**Weathered rock**		WS					Nil	Nil	
	2.5	7.0										
Whitish /greyish brown highly weathered rock	1.0	8.0								<20	Nil	Broken rock cores
Whitish /greyish brown moderately weathered rock		9.5	**Intact Rock**		RC					74	57	8+12+12+8*+10*+24+38=112cm
		10.5			RC					58	49	5+2+2+18+19+12.5=58cm
	4.0	**12.0(T)**			RC					60	60	36+24=60cm

Consultants NJS-MM-TCE

Size of Borehole : 150mm/Nx

Borehole No : BH 9'

Ground water level in borehole* (m) : < 0.5m

Project : Soil Investigations for BWSSB's Proposed STP, Bellandur Ammanaikere

Commenced : 07.01.13

Location : Southern Area

Completed : 08.01.13

Description of Soil /Rock Stratum	Layer thickness (m)	Depth (m)	Sub-soil stratification	Legend	Sample	SPT TEST, number of blows recorded			N Value = N_2+N_3	Drilling in corable rock using Nx size Diamond Bits		Remarks/Rock piece dimensions in cm
						1st 15cm	2nd 15cm	3rd 15cm		CR (%)	RQD (%)	
						N_1	N_2	N_3				
Greyish brown clayey silt	0.5	0.5	**Soil overburden**		DS							Top Soil and slushy
Greyish brown sandy silt with clay binder		1.5			SPT	2	3	3	6			
		3.0			SPT	6	10	19	29			
		4.5			SPT	5	8	11	19			
	5.5	6.0			SPT	35	47B/4cm	R	>100			***REFUSAL STRATA***
Greyish white /brown completely weathered rock		7.5	**Weathered rock**		SPT	55B/3cm	R		>100			
		9.0			WS					Nil	Nil	
		10.5			WS					Nil	Nil	
		12.0			WS					Nil	Nil	
		13.5			WS					Nil	Nil	
	9.0	**15.0(T)**			WS					Nil	Nil	

B= Number of blows R= Refusal /Rebound WS= Wash sample T-Termination depth UDS=Undisturbed sample RC=Rock Cores , CR>10%

WRC= Weathered rock cores SPT =Standard Penetration test DS= Disturbed sample CR=Core recovery RQD=Rock quality designation

*Water levels correspond to level recorded 24 hours after borehole completion

Test No	Electrode spacing a,m	Resistance R (Ohm) = V/I	Multiplier k= 2 πa	Soil resistivity = KR (ohm-m)	Direction
(1)	(2)	(3)	(4)	(5) =((3)*(4)	(6)
Northern Area ERT-1 (In between BH-1 and 2, Beyond 10m spacing area is waterlogged	1.0	1.252	6.283	7.87	North-South
	2.0	0.774	12.566	9.73	
	5.0	0.702	31.416	22.05	
	10.0	0.643	62.832	40.40	
	1.0	1.933	6.283	12.15	East -West
	2.0	1.162	12.566	14.60	
	5.0	0.710	31.416	22.31	
	10.0	0.660	62.832	41.47	

Test No	Electrode spacing a,m	Resistance R (Ohm) = V/I	Multiplier k= 2 πa	Soil resistivity = KR (ohm-m)	Direction
(1)	(2)	(3)	(4)	(5) =((3)*(4)	(6)
Southern Area ERT-2 (In between BH-9' and KMRP Trunk Sewer),	1.0	4.629	6.283	29.08	North-South
	2.0	1.633	12.566	20.52	
	5.0	0.702	31.416	22.05	
	10.0	0.499	62.832	31.35	
	15.0	0.508	94.248	47.88	
	1.0	2.200	6.283	13.82	East -West
	2.0	1.612	12.566	20.26	
	5.0	0.663	31.416	20.83	
	10.0	0.493	62.832	30.98	
	15.0	0.505	94.248	47.60	

Supporting Report 10.2.1
Population Projection and Sewage Flow for 110 Villages

110 Village - Bytrayanapura

No	Villge	Area	2011	Population / Growth Rate→			4.38	4.38	4.38	4.38	4.38	4.38	4.38
		(Sq Km)	(Census)	2019	2034	2049	2011	2012	2013	2014	2015	2016	2017
1	Anantha Pura	1.30	7,049	9,932	17,212	27,274	7,049	7,358	7,680	8,016	8,367	8,733	9,116
2	Doddabetthalli	1.61	12,171	17,150	29,722	47,097	12,171	12,704	13,260	13,841	14,447	15,080	15,741
3	Chikkabetthalli	2.00	17,790	25,067	43,439	68,834	17,790	18,569	19,382	20,231	21,117	22,042	23,007
4	Harohalli	3.00	9,548	13,454	23,316	36,946	9,548	9,966	10,403	10,858	11,334	11,830	12,348
5	Kenchnehalli	0.81	4,858	6,846	11,863	18,798	4,858	5,071	5,293	5,525	5,767	6,020	6,284
6	Govindapura	0.79	3,084	4,345	7,529	11,932	3,084	3,219	3,360	3,507	3,661	3,821	3,988
7	Vasudvapura	0.58	372	524	910	1,444	372	388	405	423	442	461	481
8	Manchenhalli	1.00	263	372	644	1,021	263	275	287	300	313	327	341
9	Kattigenahalli	5.00	20,312	28,622	49,601	78,599	20,312	21,202	22,131	23,100	24,112	25,168	26,270
10	Srinivasapura	1.00	2,322	3,273	5,674	8,991	2,322	2,424	2,530	2,641	2,757	2,878	3,004
11	Bellhalli	2.36	2,922	4,119	7,138	11,312	2,922	3,050	3,184	3,323	3,469	3,621	3,780
12	Tirumenhalli	1.72	1,255	1,768	3,063	4,854	1,255	1,310	1,367	1,427	1,490	1,555	1,623
13	Chokkanahalli	0.60	2,554	3,600	6,237	9,882	2,554	2,666	2,783	2,905	3,032	3,165	3,304
14	Dasrahalli	2.35	14,405	20,299	35,175	55,737	14,405	15,036	15,695	16,382	17,100	17,849	18,631
15	Rachnehalli	2.85	9,359	13,188	22,854	36,216	9,359	9,769	10,197	10,644	11,110	11,597	12,105
16	Thanisandra	4.00	40,857	57,571	99,769	158,096	40,857	42,647	44,515	46,465	48,500	50,624	52,841
17	Chalakere	1.76	34,287	48,314	83,724	132,670	34,287	35,789	37,357	38,993	40,701	42,484	44,345
18	Horamavau Agara	4.00	17,307	24,386	42,260	66,969	17,307	18,065	18,856	19,682	20,544	21,444	22,383
19	Amani Byaratahikane	0.00	699	985	1,706	2,702	699	730	762	795	830	866	904
20	Geddalahalli	1.00	7,792	10,979	19,026	30,149	7,792	8,133	8,489	8,861	9,249	9,654	10,077
21	Kottanur Narayanpura	1.00	7,205	10,153	17,596	27,883	7,205	7,521	7,850	8,194	8,553	8,928	9,319
22	Kottanur	8.00	8,560	12,062	20,901	33,120	8,560	8,935	9,326	9,735	10,161	10,606	11,071
23	N Naganehalli	1.14	1,941	2,735	4,739	7,510	1,941	2,026	2,115	2,207	2,304	2,405	2,510
24	Kylasanahalli	2.57	5,609	7,904	13,698	21,706	5,609	5,855	6,111	6,379	6,658	6,950	7,254
25	Byrathi	2.35	6,979	9,835	17,047	27,015	6,979	7,285	7,604	7,937	8,285	8,648	9,027
26	Bilishivalli	2.21	3,710	5,227	9,061	14,359	3,710	3,872	4,042	4,219	4,404	4,597	4,798
	SUB TOTAL-2	**55.004**	**243,210**	**342,710**	**593,904**	**941,116**	**243,210**	**253,865**	**264,984**	**276,590**	**288,707**	**301,353**	**314,552**

110 Village - Bytrayanapura

No	Villge	4.38	4.38	4.38	4.38	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
		2018	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
1	Anantha Pura	9,515	9,932	10,367	10,821	11,227	11,648	12,085	12,538	13,008	13,496	14,002	14,527
2	Doddabetthalli	16,430	17,150	17,901	18,685	19,386	20,113	20,867	21,650	22,462	23,304	24,178	25,085
3	Chikkabetthalli	24,015	25,067	26,165	27,311	28,335	29,398	30,500	31,644	32,831	34,062	35,339	36,664
4	Harohalli	12,889	13,454	14,043	14,658	15,208	15,778	16,370	16,984	17,621	18,282	18,968	19,679
5	Kenchnehalli	6,559	6,846	7,146	7,459	7,739	8,029	8,330	8,642	8,966	9,302	9,651	10,013
6	Govindapura	4,163	4,345	4,535	4,734	4,912	5,096	5,287	5,485	5,691	5,904	6,125	6,355
7	Vasudvapura	502	524	547	571	592	614	637	661	686	712	739	767
8	Manchenhalli	356	372	388	405	420	436	452	469	487	505	524	544
9	Kattigenahalli	27,421	28,622	29,876	31,185	32,354	33,567	34,826	36,132	37,487	38,893	40,351	41,864
10	Srinivasapura	3,136	3,273	3,416	3,566	3,700	3,839	3,983	4,132	4,287	4,448	4,615	4,788
11	Bellhalli	3,946	4,119	4,299	4,487	4,655	4,830	5,011	5,199	5,394	5,596	5,806	6,024
12	Tirumenhalli	1,694	1,768	1,845	1,926	1,998	2,073	2,151	2,232	2,316	2,403	2,493	2,586
13	Chokkanahalli	3,449	3,600	3,758	3,923	4,070	4,223	4,381	4,545	4,715	4,892	5,075	5,265
14	Dasrahalli	19,447	20,299	21,188	22,116	22,945	23,805	24,698	25,624	26,585	27,582	28,616	29,689
15	Rachnehalli	12,635	13,188	13,766	14,369	14,908	15,467	16,047	16,649	17,273	17,921	18,593	19,290
16	Thanisandra	55,155	57,571	60,093	62,725	65,077	67,517	70,049	72,676	75,401	78,229	81,163	84,207
17	Chalakere	46,287	48,314	50,430	52,639	54,613	56,661	58,786	60,990	63,277	65,650	68,112	70,666
18	Horamavau Agara	23,363	24,386	25,454	26,569	27,565	28,599	29,671	30,784	31,938	33,136	34,379	35,668
19	Amani Byaratahikane	944	985	1,028	1,073	1,113	1,155	1,198	1,243	1,290	1,338	1,388	1,440
20	Geddalahalli	10,518	10,979	11,460	11,962	12,411	12,876	13,359	13,860	14,380	14,919	15,478	16,058
21	Kottanur Narayanpura	9,727	10,153	10,598	11,062	11,477	11,907	12,354	12,817	13,298	13,797	14,314	14,851
22	Kottanur	11,556	12,062	12,590	13,141	13,634	14,145	14,675	15,225	15,796	16,388	17,003	17,641
23	N Naganehalli	2,620	2,735	2,855	2,980	3,092	3,208	3,328	3,453	3,582	3,716	3,855	4,000
24	Kylasanahalli	7,572	7,904	8,250	8,611	8,934	9,269	9,617	9,978	10,352	10,740	11,143	11,561
25	Byrathi	9,422	9,835	10,266	10,716	11,118	11,535	11,968	12,417	12,883	13,366	13,867	14,387
26	Bilishivalli	5,008	5,227	5,456	5,695	5,909	6,131	6,361	6,600	6,848	7,105	7,371	7,647
	SUB TOTAL-2	**328,329**	**342,710**	**357,720**	**373,389**	**387,392**	**401,919**	**416,991**	**432,629**	**448,854**	**465,686**	**483,148**	**501,266**

110 Village - Bytrayanapura

No	Villge	3.75	3.75	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25
		2030	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**
1	Anantha Pura	15,072	15,637	16,145	16,670	17,212	17,771	18,349	18,945	19,561	20,197	20,853	21,531
2	Doddabetthalli	26,026	27,002	27,880	28,786	29,722	30,688	31,685	32,715	33,778	34,876	36,009	37,179
3	Chikkabetthalli	38,039	39,465	40,748	42,072	43,439	44,851	46,309	47,814	49,368	50,972	52,629	54,339
4	Harohalli	20,417	21,183	21,871	22,582	23,316	24,074	24,856	25,664	26,498	27,359	28,248	29,166
5	Kenchnehalli	10,388	10,778	11,128	11,490	11,863	12,249	12,647	13,058	13,482	13,920	14,372	14,839
6	Govindapura	6,593	6,840	7,062	7,292	7,529	7,774	8,027	8,288	8,557	8,835	9,122	9,418
7	Vasudvapura	796	826	853	881	910	940	971	1,003	1,036	1,070	1,105	1,141
8	Manchenhalli	564	585	604	624	644	665	687	709	732	756	781	806
9	Kattigenahalli	43,434	45,063	46,528	48,040	49,601	51,213	52,877	54,596	56,370	58,202	60,094	62,047
10	Srinivasapura	4,968	5,154	5,322	5,495	5,674	5,858	6,048	6,245	6,448	6,658	6,874	7,097
11	Bellhalli	6,250	6,484	6,695	6,913	7,138	7,370	7,610	7,857	8,112	8,376	8,648	8,929
12	Tirumenhalli	2,683	2,784	2,874	2,967	3,063	3,163	3,266	3,372	3,482	3,595	3,712	3,833
13	Chokkanahalli	5,462	5,667	5,851	6,041	6,237	6,440	6,649	6,865	7,088	7,318	7,556	7,802
14	Dasrahalli	30,802	31,957	32,996	34,068	35,175	36,318	37,498	38,717	39,975	41,274	42,615	44,000
15	Rachnehalli	20,013	20,763	21,438	22,135	22,854	23,597	24,364	25,156	25,974	26,818	27,690	28,590
16	Thanisandra	87,365	90,641	93,587	96,629	99,769	103,011	106,359	109,816	113,385	117,070	120,875	124,803
17	Chalakere	73,316	76,065	78,537	81,089	83,724	86,445	89,254	92,155	95,150	98,242	101,435	104,732
18	Horamavau Agara	37,006	38,394	39,642	40,930	42,260	43,633	45,051	46,515	48,027	49,588	51,200	52,864
19	Amani Byaratahikane	1,494	1,550	1,600	1,652	1,706	1,761	1,818	1,877	1,938	2,001	2,066	2,133
20	Geddalahalli	16,660	17,285	17,847	18,427	19,026	19,644	20,282	20,941	21,622	22,325	23,051	23,800
21	Kottanur Narayanpura	15,408	15,986	16,506	17,042	17,596	18,168	18,758	19,368	19,997	20,647	21,318	22,011
22	Kottanur	18,303	18,989	19,606	20,243	20,901	21,580	22,281	23,005	23,753	24,525	25,322	26,145
23	N Naganehalli	4,150	4,306	4,446	4,590	4,739	4,893	5,052	5,216	5,386	5,561	5,742	5,929
24	Kylasanahalli	11,995	12,445	12,849	13,267	13,698	14,143	14,603	15,078	15,568	16,074	16,596	17,135
25	Byrathi	14,927	15,487	15,990	16,510	17,047	17,601	18,173	18,764	19,374	20,004	20,654	21,325
26	Bilishivalli	7,934	8,232	8,500	8,776	9,061	9,355	9,659	9,973	10,297	10,632	10,978	11,335
	SUB TOTAL-2	**520,065**	**539,568**	**557,105**	**575,211**	**593,904**	**613,205**	**633,133**	**653,712**	**674,958**	**696,895**	**719,545**	**742,929**

110 Village - Bytrayanapura

No	Villge	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
		2042	**2043**	**2044**	**2045**	**2046**	**2047**	**2048**	**2049**	**2050**	**2051**
1	Anantha Pura	22,177	22,842	23,527	24,233	24,960	25,709	26,480	27,274	28,092	28,935
2	Doddabetthalli	38,294	39,443	40,626	41,845	43,100	44,393	45,725	47,097	48,510	49,965
3	Chikkabetthalli	55,969	57,648	59,377	61,158	62,993	64,883	66,829	68,834	70,899	73,026
4	Harohalli	30,041	30,942	31,870	32,826	33,811	34,825	35,870	36,946	38,054	39,196
5	Kenchnehalli	15,284	15,743	16,215	16,701	17,202	17,718	18,250	18,798	19,362	19,943
6	Govindapura	9,701	9,992	10,292	10,601	10,919	11,247	11,584	11,932	12,290	12,659
7	Vasudvapura	1,175	1,210	1,246	1,283	1,321	1,361	1,402	1,444	1,487	1,532
8	Manchenhalli	830	855	881	907	934	962	991	1,021	1,052	1,084
9	Kattigenahalli	63,908	65,825	67,800	69,834	71,929	74,087	76,310	78,599	80,957	83,386
10	Srinivasapura	7,310	7,529	7,755	7,988	8,228	8,475	8,729	8,991	9,261	9,539
11	Bellhalli	9,197	9,473	9,757	10,050	10,352	10,663	10,983	11,312	11,651	12,001
12	Tirumenhalli	3,948	4,066	4,188	4,314	4,443	4,576	4,713	4,854	5,000	5,150
13	Chokkanahalli	8,036	8,277	8,525	8,781	9,044	9,315	9,594	9,882	10,178	10,483
14	Dasrahalli	45,320	46,680	48,080	49,522	51,008	52,538	54,114	55,737	57,409	59,131
15	Rachnehalli	29,448	30,331	31,241	32,178	33,143	34,137	35,161	36,216	37,302	38,421
16	Thanisandra	128,547	132,403	136,375	140,466	144,680	149,020	153,491	158,096	162,839	167,724
17	Chalakere	107,874	111,110	114,443	117,876	121,412	125,054	128,806	132,670	136,650	140,750
18	Horamavau Agara	54,450	56,084	57,767	59,500	61,285	63,124	65,018	66,969	68,978	71,047
19	Amani Byaratahikane	2,197	2,263	2,331	2,401	2,473	2,547	2,623	2,702	2,783	2,866
20	Geddalahalli	24,514	25,249	26,006	26,786	27,590	28,418	29,271	30,149	31,053	31,985
21	Kottanur Narayanpura	22,671	23,351	24,052	24,774	25,517	26,283	27,071	27,883	28,719	29,581
22	Kottanur	26,929	27,737	28,569	29,426	30,309	31,218	32,155	33,120	34,114	35,137
23	N Naganehalli	6,107	6,290	6,479	6,673	6,873	7,079	7,291	7,510	7,735	7,967
24	Kylasanahalli	17,649	18,178	18,723	19,285	19,864	20,460	21,074	21,706	22,357	23,028
25	Byrathi	21,965	22,624	23,303	24,002	24,722	25,464	26,228	27,015	27,825	28,660
26	Bilishivalli	11,675	12,025	12,386	12,758	13,141	13,535	13,941	14,359	14,790	15,234
	SUB TOTAL-2	**765,216**	**788,170**	**811,814**	**836,168**	**861,253**	**887,091**	**913,704**	**941,116**	**969,347**	**998,430**

110 Village - Mahadevpura

No	Village	Area	2011	Population / Growth Rate→			4.38	4.38	4.38	4.38	4.38	4.38	4.38
		(Sq Km)	(Census)	2019	2034	2049	2011	2012	2013	2014	2015	2016	2017
1	Balagere	1.82	3,862	5,442	9,431	14,944	3862	4,031	4,208	4,392	4,584	4,785	4,995
2	Bellanduramanikere (B) (P)	2.63	470	662	1,148	1,819	470	491	512	535	558	582	608
3	Belthur	1	26,380	37,172	64,417	102,077	26380	27,535	28,741	30,000	31,314	32,686	34,118
4	Channasandra	2.08	23,913	33,696	58,393	92,531	23913	24,960	26,054	27,195	28,386	29,629	30,927
5	Devarabeesanahalli	2	7,757	10,930	18,942	30,016	7757	8,097	8,451	8,822	9,208	9,611	10,032
6	Gunjur	7.93	9,380	13,217	22,905	36,296	9380	9,791	10,220	10,667	11,135	11,622	12,131
7	Hagadur	0.004	21,445	30,218	52,366	82,981	21445	22,384	23,365	24,388	25,456	26,571	27,735
8	Kadabeesanahalli	1	3,711	5,229	9,062	14,360	3711	3,874	4,043	4,220	4,405	4,598	4,799
9	Kariyammana Agrahara	1	3,482	4,906	8,503	13,474	3482	3,635	3,794	3,960	4,133	4,314	4,503
10	Kadugodi Plantation	3.79	12,555	17,691	30,658	48,581	12555	13,105	13,679	14,278	14,903	15,556	16,238
11	Khanekandya (B)	0.003	470	662	1,148	1,819	470	491	512	535	558	582	608
12	Kumbena Agrahar (P)	1.36	2,416	3,404	5,900	9,349	2416	2,522	2,632	2,748	2,868	2,994	3,125
13	Nagondhalli	2.22	2,846	4,010	6,950	11,013	2846	2,971	3,101	3,237	3,378	3,526	3,681
14	Panathur	3.05	6,148	8,663	15,013	23,790	6148	6,417	6,698	6,992	7,298	7,618	7,951
15	Ramagondanahalli	1	6,056	8,533	14,788	23,434	6056	6,321	6,598	6,887	7,189	7,504	7,832
16	Siddapura	1	3,247	4,575	7,929	12,564	3247	3,389	3,538	3,693	3,854	4,023	4,199
17	Sorahunise	2.23	8,811	12,415	21,515	34,094	8811	9,197	9,600	10,020	10,459	10,917	11,395
18	Tubarahalli	2	25,093	35,358	61,274	97,097	25093	26,192	27,339	28,537	29,787	31,091	32,453
19	Varthur	4.67	19,063	26,861	46,550	73,764	19063	19,898	20,769	21,679	22,629	23,620	24,654
20	Kalkere	5	16,865	23,764	41,182	65,259	16865	17,604	18,375	19,180	20,020	20,896	21,812
21	Horamavu	3.25	10,425	14,690	25,457	40,339	10425	10,882	11,358	11,856	12,375	12,917	13,483
22	K.Channasandra	1	7,805	10,998	19,059	30,201	7805	8,147	8,504	8,876	9,265	9,671	10,094
23	Varanasi	1	3,271	4,609	7,987	12,657	3271	3,414	3,564	3,720	3,883	4,053	4,230
	SUB TOTAL-2	**51.037**	**225,471**	**317,705**	**550,577**	**872,459**	**225,471**	**235,347**	**245,655**	**256,414**	**267,645**	**279,368**	**291,605**

110 Village - Mahadevpura

No	Village	4.38	4.38	4.38	4.38	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
		2018	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
1	Balagere	5,214	5,442	5,680	5,929	6,151	6,382	6,621	6,870	7,127	7,395	7,672	7,960
2	Bellanduramanikere (B) (P)	634	662	691	722	749	777	806	836	867	900	934	969
3	Belthur	35,612	37,172	38,800	40,499	42,018	43,594	45,228	46,925	48,684	50,510	52,404	54,369
4	Channasandra	32,282	33,696	35,171	36,712	38,089	39,517	40,999	42,536	44,131	45,786	47,503	49,285
5	Devarabeesanahalli	10,472	10,930	11,409	11,909	12,355	12,819	13,299	13,798	14,316	14,852	15,409	15,987
6	Gunjur	12,663	13,217	13,796	14,400	14,940	15,501	16,082	16,685	17,311	17,960	18,633	19,332
7	Hagadur	28,950	30,218	31,541	32,923	34,158	35,438	36,767	38,146	39,577	41,061	42,601	44,198
8	Kadabeesanahalli	5,010	5,229	5,458	5,697	5,911	6,133	6,363	6,601	6,849	7,105	7,372	7,648
9	Kariyammana Agrahara	4,701	4,906	5,121	5,346	5,546	5,754	5,970	6,194	6,426	6,667	6,917	7,176
10	Kadugodi Plantation	16,949	17,691	18,466	19,275	19,998	20,748	21,526	22,333	23,170	24,039	24,941	25,876
11	Khanekandya (B)	634	662	691	722	749	777	806	836	867	900	934	969
12	Kumbena Agrahar (P)	3,262	3,404	3,553	3,709	3,848	3,993	4,142	4,298	4,459	4,626	4,799	4,979
13	Nagondhalli	3,842	4,010	4,186	4,369	4,533	4,703	4,879	5,062	5,252	5,449	5,654	5,866
14	Panathur	8,300	8,663	9,043	9,439	9,793	10,160	10,541	10,936	11,346	11,772	12,213	12,671
15	Ramagondanahalli	8,175	8,533	8,907	9,297	9,646	10,008	10,383	10,772	11,176	11,595	12,030	12,481
16	Siddapura	4,383	4,575	4,776	4,985	5,172	5,366	5,567	5,776	5,992	6,217	6,450	6,692
17	Sorahunise	11,895	12,415	12,959	13,527	14,034	14,560	15,106	15,673	16,261	16,870	17,503	18,159
18	Tubarahalli	33,875	35,358	36,907	38,523	39,968	41,467	43,022	44,635	46,309	48,046	49,847	51,717
19	Varthur	25,734	26,861	28,038	29,266	30,364	31,502	32,683	33,909	35,181	36,500	37,869	39,289
20	Kalkere	22,767	23,764	24,805	25,892	26,863	27,870	28,915	29,999	31,124	32,291	33,502	34,759
21	Horamavu	14,073	14,690	15,333	16,005	16,605	17,228	17,874	18,544	19,239	19,961	20,709	21,486
22	K.Channasandra	10,536	10,998	11,480	11,982	12,432	12,898	13,382	13,883	14,404	14,944	15,505	16,086
23	Varanasi	4,416	4,609	4,811	5,022	5,210	5,405	5,608	5,818	6,037	6,263	6,498	6,742
	SUB TOTAL-2	**304,377**	**317,709**	**331,624**	**346,149**	**359,130**	**372,597**	**386,570**	**401,066**	**416,106**	**431,710**	**447,899**	**464,695**

110 Village - Mahadevpura

No	Village	3.75	3.75	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25
		2030	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**
1	Balagere	8,258	8,568	8,846	9,134	9,431	9,737	10,053	10,380	10,718	11,066	11,426	11,797
2	Bellanduramanikere (B) (P)	1,005	1,043	1,077	1,112	1,148	1,185	1,223	1,263	1,304	1,347	1,390	1,436
3	Belthur	56,408	58,523	60,425	62,389	64,417	66,510	68,672	70,904	73,208	75,587	78,044	80,580
4	Channasandra	51,133	53,050	54,774	56,555	58,393	60,290	62,250	64,273	66,362	68,519	70,745	73,045
5	Devarabeesanahalli	16,587	17,209	17,768	18,345	18,942	19,557	20,193	20,849	21,527	22,226	22,949	23,695
6	Gunjur	20,057	20,809	21,486	22,184	22,905	23,649	24,418	25,211	26,031	26,877	27,750	28,652
7	Hagadur	45,856	47,575	49,121	50,718	52,366	54,068	55,825	57,640	59,513	61,447	63,444	65,506
8	Kadabeesanahalli	7,935	8,233	8,500	8,777	9,062	9,356	9,660	9,974	10,299	10,633	10,979	11,336
9	Kariyammana Agrahara	7,446	7,725	7,976	8,235	8,503	8,779	9,064	9,359	9,663	9,977	10,301	10,636
10	Kadugodi Plantation	26,846	27,853	28,758	29,693	30,658	31,654	32,683	33,745	34,842	35,974	37,143	38,351
11	Khanekandya (B)	1,005	1,043	1,077	1,112	1,148	1,185	1,223	1,263	1,304	1,347	1,390	1,436
12	Kumbena Agrahar (P)	5,166	5,360	5,534	5,714	5,900	6,091	6,289	6,494	6,705	6,923	7,148	7,380
13	Nagondhalli	6,086	6,314	6,519	6,731	6,950	7,175	7,409	7,649	7,898	8,155	8,420	8,693
14	Panathur	13,146	13,639	14,082	14,540	15,013	15,501	16,004	16,524	17,062	17,616	18,189	18,780
15	Ramagondanahalli	12,949	13,435	13,872	14,323	14,788	15,269	15,765	16,277	16,806	17,352	17,916	18,499
16	Siddapura	6,943	7,203	7,437	7,679	7,929	8,186	8,453	8,727	9,011	9,304	9,606	9,918
17	Sorahunise	18,840	19,547	20,182	20,838	21,515	22,215	22,937	23,682	24,452	25,246	26,067	26,914
18	Tubarahalli	53,656	55,668	57,477	59,345	61,274	63,265	65,322	67,445	69,637	71,900	74,236	76,649
19	Varthur	40,762	42,291	43,665	45,084	46,550	48,062	49,624	51,237	52,902	54,622	56,397	58,230
20	Kalkere	36,062	37,415	38,631	39,886	41,182	42,521	43,903	45,329	46,803	48,324	49,894	51,516
21	Horamavu	22,292	23,128	23,879	24,655	25,457	26,284	27,138	28,020	28,931	29,871	30,842	31,844
22	K.Channasandra	16,689	17,315	17,878	18,459	19,059	19,678	20,318	20,978	21,660	22,364	23,091	23,841
23	Varanasi	6,994	7,257	7,492	7,736	7,987	8,247	8,515	8,792	9,077	9,372	9,677	9,992
	SUB TOTAL-2	**482,122**	**500,201**	**516,458**	**533,243**	**550,573**	**568,467**	**586,942**	**606,017**	**625,713**	**646,049**	**667,045**	**688,724**

110 Village - Mahadevpura

No	Village	3	3	3	3	3	3	3	3	3	3
		2042	**2043**	**2044**	**2045**	**2046**	**2047**	**2048**	**2049**	**2050**	**2051**
1	Balagere	12,151	12,515	12,891	13,277	13,676	14,086	14,509	14,944	15,392	15,854
2	Bellanduramanikere (B) (P)	1,479	1,523	1,569	1,616	1,664	1,714	1,766	1,819	1,873	1,929
3	Belthur	82,998	85,488	88,052	90,694	93,415	96,217	99,104	102,077	105,139	108,293
4	Channasandra	75,236	77,493	79,818	82,212	84,679	87,219	89,836	92,531	95,307	98,166
5	Devarabeesanahalli	24,405	25,138	25,892	26,668	27,468	28,293	29,141	30,016	30,916	31,843
6	Gunjur	29,512	30,397	31,309	32,248	33,216	34,212	35,239	36,296	37,385	38,506
7	Hagadur	67,471	69,495	71,580	73,728	75,939	78,218	80,564	82,981	85,470	88,034
8	Kadabeesanahalli	11,676	12,026	12,387	12,758	13,141	13,535	13,941	14,360	14,790	15,234
9	Kariyammana Agrahara	10,955	11,284	11,622	11,971	12,330	12,700	13,081	13,474	13,878	14,294
10	Kadugodi Plantation	39,501	40,686	41,907	43,164	44,459	45,793	47,166	48,581	50,039	51,540
11	Khanekandya (B)	1,479	1,523	1,569	1,616	1,664	1,714	1,766	1,819	1,873	1,929
12	Kumbena Agrahar (P)	7,601	7,829	8,064	8,306	8,555	8,812	9,076	9,349	9,629	9,918
13	Nagondhalli	8,954	9,223	9,500	9,784	10,078	10,380	10,692	11,013	11,343	11,683
14	Panathur	19,343	19,923	20,521	21,137	21,771	22,424	23,097	23,790	24,503	25,238
15	Ramagondanahalli	19,054	19,625	20,214	20,820	21,445	22,088	22,751	23,434	24,137	24,861
16	Siddapura	10,216	10,522	10,838	11,163	11,498	11,843	12,198	12,564	12,941	13,329
17	Sorahunise	27,722	28,553	29,410	30,292	31,201	32,137	33,101	34,094	35,117	36,170
18	Tubarahalli	78,949	81,317	83,757	86,269	88,857	91,523	94,269	97,097	100,010	103,010
19	Varthur	59,977	61,776	63,629	65,538	67,504	69,530	71,615	73,764	75,977	78,256
20	Kalkere	53,061	54,653	56,293	57,982	59,721	61,513	63,358	65,259	67,217	69,233
21	Horamavu	32,800	33,784	34,797	35,841	36,916	38,024	39,164	40,339	41,549	42,796
22	K.Channasandra	24,556	25,293	26,052	26,833	27,638	28,468	29,322	30,201	31,107	32,041
23	Varanasi	10,291	10,600	10,918	11,246	11,583	11,930	12,288	12,657	13,037	13,428
	SUB TOTAL-2	**709,386**	**730,667**	**752,587**	**775,165**	**798,420**	**822,373**	**847,044**	**872,455**	**898,629**	**925,588**

110 Village - Bommanahalli

No	Village	Area (Sq Km)	2011 (Census)	Population / Growth Rate→ 2019	2034	2049	4.38 2011	4.38 2012	4.38 2013	4.38 2014	4.38 2015	4.38 2016	4.38 2017
1	Alahalli	2	18,768	26,446	45,829	72,622	18,768	19,590	20,448	21,344	22,279	23,254	24,273
2	Ambalipura	1.06	2,907	4,096	7,099	11,249	2,907	3,034	3,167	3,306	3,451	3,602	3,760
3	Anjanapura	3	5,830	8,215	14,236	22,559	5,830	6,085	6,352	6,630	6,921	7,224	7,540
4	Basapura	1	2,140	3,015	5,226	8,281	2,140	2,234	2,332	2,434	2,540	2,652	2,768
5	Basavanapura	2	6,972	9,824	17,025	26,978	6,972	7,277	7,596	7,929	8,276	8,639	9,017
6	Beguru	8	35,837	50,498	87,510	138,670	35,837	37,407	39,045	40,755	42,540	44,404	46,348
7	Bellandur	2	17,021	23,984	41,563	65,862	17,021	17,767	18,545	19,357	20,205	21,090	22,013
8	Chandrashekarapura	1	631	889	1,541	2,442	631	659	687	718	749	782	816
9	Doddakallasandra	3	5,797	8,168	14,156	22,431	5,797	6,051	6,316	6,593	6,881	7,183	7,497
10	Gollahalli	3	6,977	9,831	17,037	26,997	6,977	7,283	7,602	7,935	8,282	8,645	9,023
11	Gottigere	3	15,366	21,652	37,522	59,458	15,366	16,039	16,742	17,475	18,240	19,039	19,873
12	Haraluru	2.65	5,726	8,068	13,982	22,157	5,726	5,977	6,239	6,512	6,797	7,095	7,406
13	Junnasandra	0.87	3,830	5,397	9,352	14,820	3,830	3,998	4,173	4,356	4,546	4,746	4,953
14	Kaikondranahalli	1.03	6,282	8,852	15,340	24,308	6,282	6,557	6,844	7,144	7,457	7,784	8,125
15	Kalenaagrahara	1	5,252	7,401	12,825	20,322	5,252	5,482	5,722	5,973	6,234	6,507	6,792
16	Kambathahalli	2	2,952	4,160	7,208	11,423	2,952	3,081	3,216	3,357	3,504	3,658	3,818
17	Kammanahalli	3	11,125	15,676	27,166	43,048	11,125	11,612	12,121	12,652	13,206	13,784	14,388
18	Kasavanahalli	2.49	5,767	8,126	14,082	22,315	5,767	6,020	6,283	6,558	6,846	7,146	7,459
19	Kudlu	3.36	35,405	49,889	86,455	136,999	35,405	36,956	38,574	40,264	42,028	43,868	45,790
20	Parappana Agrahara	3	12,093	17,040	29,530	46,794	12,093	12,623	13,176	13,753	14,355	14,984	15,640
21	Pillaganahalli	2	3,803	5,359	9,286	14,716	3,803	3,970	4,143	4,325	4,514	4,712	4,918
22	Raghuvanahalli	1	1,956	2,756	4,776	7,569	1,956	2,042	2,131	2,224	2,322	2,424	2,530
23	Talaghattapura	0	11,259	15,865	27,493	43,566	11,259	11,752	12,267	12,804	13,365	13,950	14,561
24	Thippasandra	1	1,280	1,804	3,126	4,953	1,280	1,336	1,395	1,456	1,519	1,586	1,655
25	Vajarahalli	1	6,867	9,676	16,768	26,572	6,867	7,168	7,482	7,809	8,151	8,509	8,881
26	Yelenahalli	2	1,562	2,201	3,814	6,044	1,562	1,630	1,702	1,776	1,854	1,935	2,020
27	Bharathena Agrahara	1	1,205	1,698	2,942	4,663	1,205	1,258	1,313	1,370	1,430	1,493	1,558
28	Bhoganahalli	0.008	2,756	3,883	6,730	10,664	2,756	2,877	3,003	3,134	3,272	3,415	3,564
29	Chikkabelandur	1.75	6,799	9,580	16,602	26,309	6,799	7,097	7,408	7,732	8,071	8,424	8,793
30	Chikkathoguru	2	3,609	5,085	8,813	13,965	3,609	3,767	3,932	4,104	4,284	4,472	4,668
31	Doddakannahalli	1.93	13,872	19,547	33,874	53,677	13,872	14,480	15,114	15,776	16,467	17,188	17,941
32	Doddathoguru	0.12	14,481	20,405	35,361	56,034	14,481	15,115	15,777	16,468	17,190	17,943	18,728
33	Naganathapura	2	9,049	12,751	22,097	35,015	9,049	9,445	9,859	10,291	10,742	11,212	11,703
Total		**64.268**	**285,176**	**401,837**	**696,366**	**1,103,482**	**285,176**	**297,667**	**310,705**	**324,313**	**338,518**	**353,345**	**368,822**

110 Village - Bommanahalli

No	Village	4.38 2018	4.38 2019	4.38 2020	4.38 2021	3.75 2022	3.75 2023	3.75 2024	3.75 2025	3.75 2026	3.75 2027	3.75 2028	3.75 2029
1	Alahalli	25,336	26,446	27,604	28,813	29,894	31,015	32,178	33,384	34,636	35,935	37,283	38,681
2	Ambalipura	3,924	4,096	4,276	4,463	4,630	4,804	4,984	5,171	5,365	5,566	5,775	5,991
3	Anjanapura	7,870	8,215	8,575	8,950	9,286	9,634	9,996	10,370	10,759	11,163	11,581	12,016
4	Basapura	2,889	3,015	3,148	3,285	3,409	3,536	3,669	3,807	3,949	4,097	4,251	4,411
5	Basavanapura	9,412	9,824	10,254	10,704	11,105	11,521	11,953	12,402	12,867	13,349	13,850	14,369
6	Beguru	48,379	50,498	52,709	55,018	57,081	59,222	61,443	63,747	66,137	68,617	71,190	73,860
7	Bellandur	22,978	23,984	25,035	26,131	27,111	28,128	29,182	30,277	31,412	32,590	33,812	35,080
8	Chandrashekarapura	852	889	928	969	1,005	1,043	1,082	1,122	1,165	1,208	1,253	1,300
9	Doddakallasandra	7,826	8,168	8,526	8,900	9,233	9,580	9,939	10,312	10,698	11,100	11,516	11,948
10	Gollahalli	9,419	9,831	10,262	10,711	11,113	11,530	11,962	12,411	12,876	13,359	13,860	14,380
11	Gottigere	20,743	21,652	22,600	23,590	24,475	25,393	26,345	27,333	28,358	29,421	30,525	31,669
12	Haraluru	7,730	8,068	8,422	8,791	9,120	9,462	9,817	10,185	10,567	10,964	11,375	11,801
13	Junnasandra	5,170	5,397	5,633	5,880	6,100	6,329	6,567	6,813	7,068	7,333	7,608	7,894
14	Kaikondranahalli	8,480	8,852	9,240	9,644	10,006	10,381	10,770	11,174	11,593	12,028	12,479	12,947
15	Kalenaagrahara	7,090	7,401	7,725	8,063	8,365	8,679	9,005	9,342	9,693	10,056	10,433	10,824
16	Kambathahalli	3,985	4,160	4,342	4,532	4,702	4,878	5,061	5,251	5,448	5,652	5,864	6,084
17	Kammanahalli	15,018	15,676	16,363	17,079	17,720	18,384	19,074	19,789	20,531	21,301	22,100	22,929
18	Kasavanahalli	7,785	8,126	8,482	8,854	9,186	9,530	9,888	10,258	10,643	11,042	11,456	11,886
19	Kudlu	47,795	49,889	52,074	54,355	56,393	58,508	60,702	62,978	65,340	67,790	70,332	72,970
20	Parappana Agrahara	16,325	17,040	17,786	18,566	19,262	19,984	20,733	21,511	22,318	23,155	24,023	24,924
21	Pillaganahalli	5,134	5,359	5,593	5,838	6,057	6,285	6,520	6,765	7,018	7,282	7,555	7,838
22	Raghuvanahalli	2,641	2,756	2,877	3,003	3,116	3,232	3,354	3,479	3,610	3,745	3,886	4,031
23	Talaghattapura	15,199	15,865	16,560	17,285	17,933	18,606	19,304	20,027	20,778	21,558	22,366	23,205
24	Thippasandra	1,728	1,804	1,883	1,965	2,039	2,115	2,195	2,277	2,362	2,451	2,543	2,638
25	Vajarahalli	9,270	9,676	10,100	10,542	10,938	11,348	11,773	12,215	12,673	13,148	13,641	14,153
26	Yelenahalli	2,109	2,201	2,297	2,398	2,488	2,581	2,678	2,778	2,883	2,991	3,103	3,219
27	Bharathena Agrahara	1,627	1,698	1,772	1,850	1,919	1,991	2,066	2,143	2,224	2,307	2,394	2,484
28	Bhoganahalli	3,720	3,883	4,054	4,231	4,390	4,554	4,725	4,902	5,086	5,277	5,475	5,680
29	Chikkabelandur	9,178	9,580	10,000	10,438	10,829	11,236	11,657	12,094	12,548	13,018	13,506	14,013
30	Chikkathoguru	4,872	5,085	5,308	5,541	5,748	5,964	6,188	6,420	6,660	6,910	7,169	7,438
31	Doddakannahalli	18,727	19,547	20,403	21,297	22,095	22,924	23,784	24,675	25,601	26,561	27,557	28,590
32	Doddathoguru	19,549	20,405	21,299	22,232	23,065	23,930	24,828	25,759	26,725	27,727	28,767	29,845
33	Naganathapura	12,216	12,751	13,309	13,892	14,413	14,954	15,515	16,096	16,700	17,326	17,976	18,650
Total		**384,976**	**401,838**	**419,439**	**437,810**	**454,228**	**471,262**	**488,934**	**507,269**	**526,292**	**546,028**	**566,504**	**587,747**

110 Village - Bommanahalli

No	Village	3.75	3.75	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25
		2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
1	Alahalli	40,131	41,636	42,989	44,387	45,829	47,319	48,856	50,444	52,084	53,776	55,524	57,329
2	Ambalipura	6,216	6,449	6,659	6,875	7,099	7,329	7,567	7,813	8,067	8,330	8,600	8,880
3	Anjanapura	12,466	12,934	13,354	13,788	14,236	14,699	15,177	15,670	16,179	16,705	17,248	17,808
4	Basapura	4,576	4,748	4,902	5,061	5,226	5,395	5,571	5,752	5,939	6,132	6,331	6,537
5	Basavanapura	14,908	15,467	15,970	16,489	17,025	17,578	18,149	18,739	19,348	19,977	20,626	21,297
6	Beguru	76,630	79,503	82,087	84,755	87,510	90,354	93,290	96,322	99,453	102,685	106,022	109,468
7	Bellandur	36,396	37,761	38,988	40,255	41,563	42,914	44,309	45,749	47,236	48,771	50,356	51,992
8	Chandrashekarapura	1,349	1,400	1,445	1,492	1,541	1,591	1,643	1,696	1,751	1,808	1,867	1,927
9	Doddakallasandra	12,396	12,860	13,278	13,710	14,156	14,616	15,091	15,581	16,087	16,610	17,150	17,708
10	Gollahalli	14,919	15,478	15,981	16,501	17,037	17,591	18,162	18,753	19,362	19,991	20,641	21,312
11	Gottigere	32,857	34,089	35,197	36,341	37,522	38,741	40,000	41,300	42,643	44,029	45,460	46,937
12	Haraluru	12,244	12,703	13,116	13,542	13,982	14,437	14,906	15,390	15,890	16,407	16,940	17,491
13	Junnasandra	8,190	8,497	8,773	9,058	9,352	9,656	9,970	10,294	10,629	10,974	11,331	11,699
14	Kaikondranahalli	13,433	13,936	14,389	14,857	15,340	15,838	16,353	16,885	17,433	18,000	18,585	19,189
15	Kalenaagrahara	11,230	11,651	12,030	12,421	12,825	13,242	13,672	14,116	14,575	15,049	15,538	16,043
16	Kambathahalli	6,312	6,549	6,762	6,982	7,208	7,443	7,685	7,934	8,192	8,458	8,733	9,017
17	Kammanahalli	23,788	24,681	25,483	26,311	27,166	28,049	28,960	29,902	30,873	31,877	32,913	33,982
18	Kasavanahalli	12,331	12,794	13,210	13,639	14,082	14,540	15,013	15,500	16,004	16,524	17,061	17,616
19	Kudlu	75,706	78,545	81,098	83,733	86,455	89,265	92,166	95,161	98,254	101,447	104,744	108,148
20	Parappana Agrahara	25,858	26,828	27,700	28,600	29,530	30,489	31,480	32,503	33,560	34,650	35,777	36,939
21	Pillaganahalli	8,132	8,437	8,711	8,994	9,286	9,588	9,900	10,222	10,554	10,897	11,251	11,617
22	Raghuvanahalli	4,182	4,339	4,480	4,626	4,776	4,932	5,092	5,257	5,428	5,605	5,787	5,975
23	Talaghattapura	24,075	24,978	25,790	26,628	27,493	28,387	29,309	30,262	31,245	32,261	33,309	34,392
24	Thippasandra	2,737	2,840	2,932	3,027	3,126	3,227	3,332	3,440	3,552	3,668	3,787	3,910
25	Vajarahalli	14,684	15,234	15,729	16,241	16,768	17,313	17,876	18,457	19,057	19,676	20,316	20,976
26	Yelenahalli	3,340	3,465	3,578	3,694	3,814	3,938	4,066	4,198	4,335	4,476	4,621	4,771
27	Bharathena Agrahara	2,577	2,673	2,760	2,850	2,942	3,038	3,137	3,239	3,344	3,453	3,565	3,681
28	Bhoganahalli	5,893	6,114	6,313	6,518	6,730	6,949	7,174	7,408	7,648	7,897	8,153	8,418
29	Chikkabelandur	14,538	15,083	15,574	16,080	16,602	17,142	17,699	18,274	18,868	19,481	20,115	20,768
30	Chikkathoguru	7,717	8,006	8,267	8,535	8,813	9,099	9,395	9,700	10,015	10,341	10,677	11,024
31	Doddakannahalli	29,662	30,775	31,775	32,808	33,874	34,975	36,111	37,285	38,497	39,748	41,040	42,373
32	Doddathoguru	30,965	32,126	33,170	34,248	35,361	36,510	37,697	38,922	40,187	41,493	42,841	44,234
33	Naganathapura	19,349	20,075	20,727	21,401	22,097	22,815	23,556	24,322	25,112	25,928	26,771	27,641
Total		**609,788**	**632,655**	**653,216**	**674,446**	**696,365**	**718,997**	**742,365**	**766,491**	**791,402**	**817,123**	**843,679**	**871,099**

110 Village - Bommanahalli

No	Village	3 2042	3 2043	3 2044	3 2045	3 2046	3 2047	3 2048	3 2049	3 2050	3 2051
1	Alahalli	59,049	60,820	62,645	64,524	66,460	68,454	70,507	72,622	74,801	77,045
2	Ambalipura	9,146	9,421	9,703	9,994	10,294	10,603	10,921	11,249	11,586	11,934
3	Anjanapura	18,343	18,893	19,460	20,043	20,645	21,264	21,902	22,559	23,236	23,933
4	Basapura	6,733	6,935	7,143	7,357	7,578	7,805	8,039	8,281	8,529	8,785
5	Basavanapura	21,936	22,594	23,271	23,970	24,689	25,429	26,192	26,978	27,787	28,621
6	Beguru	112,752	116,134	119,618	123,207	126,903	130,710	134,632	138,670	142,831	147,116
7	Bellandur	53,552	55,159	56,813	58,518	60,273	62,082	63,944	65,862	67,838	69,873
8	Chandrashekarapura	1,985	2,045	2,106	2,169	2,234	2,301	2,371	2,442	2,515	2,590
9	Doddakallasandra	18,239	18,786	19,349	19,930	20,528	21,144	21,778	22,431	23,104	23,797
10	Gollahalli	21,951	22,610	23,288	23,987	24,706	25,448	26,211	26,997	27,807	28,641
11	Gottigere	48,345	49,795	51,289	52,828	54,413	56,045	57,727	59,458	61,242	63,079
12	Haraluru	18,015	18,556	19,113	19,686	20,276	20,885	21,511	22,157	22,821	23,506
13	Junnasandra	12,050	12,412	12,784	13,167	13,562	13,969	14,388	14,820	15,265	15,723
14	Kaikondranahalli	19,765	20,358	20,968	21,597	22,245	22,913	23,600	24,308	25,037	25,788
15	Kalenaagrahara	16,524	17,020	17,530	18,056	18,598	19,156	19,731	20,322	20,932	21,560
16	Kambathahalli	9,288	9,566	9,853	10,149	10,453	10,767	11,090	11,423	11,765	12,118
17	Kammanahalli	35,002	36,052	37,134	38,248	39,395	40,577	41,794	43,048	44,339	45,670
18	Kasavanahalli	18,144	18,689	19,249	19,827	20,422	21,034	21,665	22,315	22,985	23,674
19	Kudlu	111,393	114,734	118,176	121,722	125,373	129,135	133,009	136,999	141,109	145,342
20	Parappana Agrahara	38,047	39,189	40,365	41,576	42,823	44,107	45,431	46,794	48,197	49,643
21	Pillaganahalli	11,965	12,324	12,694	13,075	13,467	13,871	14,287	14,716	15,157	15,612
22	Raghuvanahalli	6,154	6,339	6,529	6,725	6,926	7,134	7,348	7,569	7,796	8,030
23	Talaghattapura	35,424	36,486	37,581	38,708	39,869	41,066	42,298	43,566	44,873	46,220
24	Thippasandra	4,027	4,148	4,272	4,401	4,533	4,669	4,809	4,953	5,102	5,255
25	Vajarahalli	21,605	22,253	22,921	23,609	24,317	25,046	25,798	26,572	27,369	28,190
26	Yelenahalli	4,914	5,062	5,214	5,370	5,531	5,697	5,868	6,044	6,225	6,412
27	Bharathena Agrahara	3,791	3,905	4,022	4,143	4,267	4,395	4,527	4,663	4,803	4,947
28	Bhoganahalli	8,671	8,931	9,199	9,475	9,759	10,052	10,354	10,664	10,984	11,314
29	Chikkabelandur	21,391	22,033	22,694	23,375	24,076	24,798	25,542	26,309	27,098	27,911
30	Chikkathoguru	11,355	11,695	12,046	12,408	12,780	13,163	13,558	13,965	14,384	14,815
31	Doddakannahalli	43,645	44,954	46,303	47,692	49,122	50,596	52,114	53,677	55,288	56,946
32	Doddathoguru	45,561	46,928	48,335	49,785	51,279	52,817	54,402	56,034	57,715	59,446
33	Naganathapura	28,470	29,324	30,204	31,110	32,044	33,005	33,995	35,015	36,065	37,147
Total		**897,232**	**924,149**	**951,873**	**980,430**	**1,009,843**	**1,040,138**	**1,071,342**	**1,103,482**	**1,136,587**	**1,170,684**

110 Village - R.R. Nagar

No	Village	Area (Sq Km)	2011 (Census)	Population / Growth Rate→ 2019	2034	2049	4.38 2011	4.38 2012	4.38 2013	4.38 2014	4.38 2015	4.38 2016	4.38 2017
1	Vasanthapura	1.2	30,921	43,570	75,505	119,648	30921	32,275	33,689	35,165	36,705	38,312	39,991
2	Ullalu	4	21,994	30,991	53,707	85,105	21994	22,957	23,963	25,012	26,108	27,252	28,445
3	Sonnenhalli	2	2,889	4,071	7,055	11,179	2889	3,016	3,148	3,285	3,429	3,580	3,736
4	Ganakallu	1.33	7,452	10,501	18,197	28,835	7452	7,778	8,119	8,475	8,846	9,233	9,638
5	Hemmeigepura	4.58	4,961	54,561	89,005	126,708	4961	11,161	17,361	23,561	29,761	35,961	42,161
6	Somapura	1.61	1,358	34,000	51,000	80,505	1358	5,438	9,519	13,599	17,679	21,759	25,840
7	Varahasandra	1.07	1,434	2,021	3,502	5,549	1434	1,497	1,562	1,631	1,702	1,777	1,855
8	Manavarthkavalu	1.35	1,062	1,496	2,593	4,109	1062	1,109	1,157	1,208	1,261	1,316	1,373
9	Lingdernahalli	1.34	1,874	2,641	4,576	7,251	1874	1,956	2,042	2,131	2,225	2,322	2,424
10	Hosahalli	0.8	3,716	5,236	9,074	14,379	3716	3,879	4,049	4,226	4,411	4,604	4,806
11	Arehalli	1.31	7,457	10,508	18,209	28,855	7457	7,784	8,125	8,480	8,852	9,240	9,644
12	Vaddarpalya	1.25	1,873	2,639	4,574	7,248	1873	1,955	2,041	2,130	2,223	2,321	2,422
13	Uttrahalli	2.85	27,312	38,485	66,693	105,683	27312	28,508	29,757	31,060	32,421	33,841	35,323
14	Subramanyapura	0.68	12,569	17,711	30,692	48,635	12569	13,120	13,694	14,294	14,920	15,574	16,256
15	Gubbullalu	1.87	5,602	7,894	13,679	21,677	5602	5,847	6,103	6,371	6,650	6,941	7,245
16	Turahalli	2.9	2,187	3,082	5,340	8,463	2187	2,283	2,383	2,487	2,596	2,710	2,828
17	Giddakonenhalli	1.28	31,103	43,827	75,950	120,352	31103	32,465	33,887	35,372	36,921	38,538	40,226
Total =		**31.42**	**165,764**	**313,233**	**529,351**	**824,181**	**165764**	**183,028**	**200,598**	**218,487**	**236,709**	**255,279**	**274,213**

Hemmeigepura	Changed as population added due to BDA Development. Straightline interpolation
Somapura	Changed as population added due to BDA Development. Straightline interpolation

5	Hemmeigepura	4.58	4961	6,990	12,114	19,196	4961	5,178	5,405	5,642	5,889	6,147	6,416
				6,990	12,114	19,196	1.0312						
	BDA Development - Deposit Contribution basis for sewer			47,571	76,891	107,512	1.0226		-	-	-	-	-
				54,561	89,005	126,708	1.0238						
6	Somapura	1.61	1358	1,914	3,316	5,255	1358	1,417	1,480	1,544	1,612	1,683	1,756
				1,914	3,316	5,255							
	BDA Development - Deposit Contribution basis for sewer			32,086	47,684	75,250							
				34,000	51,000	80,505							

110 Village - R.R. Nagar

No	Village	4.38 2018	4.38 2019	4.38 2020	4.38 2021	3.75 2022	3.75 2023	3.75 2024	3.75 2025	3.75 2026	3.75 2027	3.75 2028	3.75 2029
1	Vasanthapura	41,742	43,570	45,479	47,471	49,251	51,098	53,014	55,002	57,065	59,205	61,425	63,728
2	Ullalu	29,691	30,991	32,349	33,766	35,032	36,346	37,709	39,123	40,590	42,112	43,691	45,330
3	Sonnenhalli	3,900	4,071	4,249	4,435	4,602	4,774	4,953	5,139	5,332	5,532	5,739	5,954
4	Ganakallu	10,060	10,501	10,960	11,441	11,870	12,315	12,776	13,256	13,753	14,268	14,803	15,359
5	Hemmeigepura	48,361	54,561	56,857.27	59,153.53	61,449.80	63,746.07	66,042.33	68,338.60	70,634.87	72,931.13	75,227.40	77,523.67
6	Somapura	29,920	34,000	35,133.33	36,266.67	37,400.00	38,533.33	39,666.67	40,800.00	41,933.33	43,066.67	44,200.00	45,333.33
7	Varahasandra	1,936	2,021	2,109	2,202	2,284	2,370	2,459	2,551	2,646	2,746	2,849	2,955
8	Manavarthkavalu	1,434	1,496	1,562	1,630	1,692	1,755	1,821	1,889	1,960	2,033	2,110	2,189
9	Lingdernahalli	2,530	2,641	2,756	2,877	2,985	3,097	3,213	3,333	3,458	3,588	3,723	3,862
10	Hosahalli	5,016	5,236	5,466	5,705	5,919	6,141	6,371	6,610	6,858	7,115	7,382	7,659
11	Arehalli	10,067	10,508	10,968	11,448	11,878	12,323	12,785	13,264	13,762	14,278	14,813	15,369
12	Vaddarpalya	2,528	2,639	2,755	2,875	2,983	3,095	3,211	3,332	3,457	3,586	3,721	3,860
13	Uttrahalli	36,870	38,485	40,171	41,930	43,503	45,134	46,826	48,582	50,404	52,294	54,255	56,290
14	Subramanyapura	16,968	17,711	18,487	19,296	20,020	20,771	21,550	22,358	23,196	24,066	24,968	25,905
15	Gubbullalu	7,562	7,894	8,239	8,600	8,923	9,257	9,605	9,965	10,338	10,726	11,128	11,546
16	Turahalli	2,952	3,082	3,217	3,358	3,483	3,614	3,750	3,890	4,036	4,187	4,344	4,507
17	Giddakonenhalli	41,988	43,827	45,747	47,750	49,541	51,399	53,326	55,326	57,401	59,553	61,786	64,103
Total =		**293,525**	**313,233**	**326,503**	**340,205**	**352,814**	**365,767**	**379,077**	**392,758**	**406,824**	**421,288**	**436,166**	**451,473**

Hemmeigepura
Somapura

5	Hemmeigepura	6,697	6,990	7,297	7,616	7,902	8,198	8,506	8,825	9,156	9,499	9,855	10,225
	BDA Development - Deposit Contribution basis for sewer	-	-	-	-	-	-	-	-	-	-	-	-
6	Somapura	1,833	1,914	1,997	2,085	2,163	2,244	2,328	2,416	2,506	2,600	2,698	2,799
	BDA Development - Deposit Contribution basis for sewer												

110 Village - R.R. Nagar

No	Village	3.75 2030	3.75 2031	3.25 2032	3.25 2033	3.25 2034	3.25 2035	3.25 2036	3.25 2037	3.25 2038	3.25 2039	3.25 2040	3.25 2041
1	Vasanthapura	66,118	68,597	70,827	73,129	75,505	77,959	80,493	83,109	85,810	88,599	91,478	94,451
2	Ullalu	47,029	48,793	50,379	52,016	53,707	55,452	57,254	59,115	61,036	63,020	65,068	67,183
3	Sonnenhalli	6,178	6,409	6,617	6,833	7,055	7,284	7,521	7,765	8,017	8,278	8,547	8,825
4	Ganakallu	15,935	16,532	17,069	17,624	18,197	18,788	19,399	20,029	20,680	21,352	22,046	22,763
5	Hemmeigepura	79,819.93	82,116.20	84,412.47	86,708.73	89,005.00	91,519	94,032	96,546	99,059	101,573	104,086	106,600
6	Somapura	46,466.67	47,600.00	48,733.33	49,866.67	51,000	52,967	54,934	56,901	58,868	60,835	62,802	64,769
7	Varahasandra	3,066	3,181	3,285	3,391	3,502	3,615	3,733	3,854	3,980	4,109	4,242	4,380
8	Manavarthkavalu	2,271	2,356	2,433	2,512	2,593	2,678	2,765	2,854	2,947	3,043	3,142	3,244
9	Lingdernahalli	4,007	4,157	4,293	4,432	4,576	4,725	4,878	5,037	5,201	5,370	5,544	5,724
10	Hosahalli	7,946	8,244	8,512	8,788	9,074	9,369	9,673	9,988	10,312	10,648	10,994	11,351
11	Arehalli	15,945	16,543	17,081	17,636	18,209	18,801	19,412	20,043	20,694	21,367	22,061	22,778
12	Vaddarpalya	4,005	4,155	4,290	4,430	4,574	4,722	4,876	5,034	5,198	5,367	5,541	5,721
13	Uttrahalli	58,401	60,591	62,560	64,593	66,693	68,860	71,098	73,409	75,795	78,258	80,801	83,427
14	Subramanyapura	26,876	27,884	28,790	29,726	30,692	31,689	32,719	33,783	34,881	36,014	37,185	38,393
15	Gubbullalu	11,979	12,428	12,832	13,249	13,679	14,124	14,583	15,057	15,546	16,052	16,573	17,112
16	Turahalli	4,676	4,852	5,009	5,172	5,340	5,514	5,693	5,878	6,069	6,266	6,470	6,680
17	Giddakonenhalli	66,507	69,001	71,244	73,559	75,950	78,418	80,967	83,598	86,315	89,120	92,017	95,007
Total =		**467,226**	**483,440**	**498,366**	**513,665**	**529,350**	**546,485**	**564,030**	**582,000**	**600,409**	**619,270**	**638,599**	**658,410**

Hemmeigepura
Somapura

5	Hemmeigepura	10,608	11,006	11,364	11,733	12,114	12,508	12,914	13,334	13,767	14,215	14,677	15,154
	BDA Development - Deposit Contribution basis for sewer	-	-	-	-	-	-	-	-	-	-	-	-
6	Somapura	2,904	3,013	3,111	3,212	3,316	3,424	3,535	3,650	3,769	3,891	4,018	4,148
	BDA Development - Deposit Contribution basis for sewer												

110 Village - R.R. Nagar

No	Village	3 2042	3 2043	3 2044	3 2045	3 2046	3 2047	3 2048	3 2049	3 2050	3 2051
1	Vasanthapura	97,285	100,203	103,210	106,306	109,495	112,780	116,163	119,648	123,238	126,935
2	Ullalu	69,198	71,274	73,413	75,615	77,883	80,220	82,627	85,105	87,658	90,288
3	Sonnenhalli	9,089	9,362	9,643	9,932	10,230	10,537	10,853	11,179	11,514	11,860
4	Ganakallu	23,446	24,149	24,874	25,620	26,388	27,180	27,995	28,835	29,700	30,591
5	Hemmeigepura	109,113	111,627	114,140	116,654	119,167	121,681	124,194	126,708	130,509	134,425
6	Somapura	66,736	68,703	70,670	72,637	74,604	76,571	78,538	80,505	82,920	85,408
7	Varahasandra	4,512	4,647	4,786	4,930	5,078	5,230	5,387	5,549	5,715	5,887
8	Manavarthkavalu	3,341	3,442	3,545	3,651	3,761	3,873	3,990	4,109	4,233	4,360
9	Lingdernahalli	5,896	6,073	6,255	6,443	6,636	6,835	7,040	7,251	7,469	7,693
10	Hosahalli	11,691	12,042	12,403	12,776	13,159	13,554	13,960	14,379	14,810	15,255
11	Arehalli	23,462	24,165	24,890	25,637	26,406	27,198	28,014	28,855	29,720	30,612
12	Vaddarpalya	5,893	6,070	6,252	6,439	6,633	6,831	7,036	7,248	7,465	7,689
13	Uttrahalli	85,930	88,508	91,163	93,898	96,715	99,617	102,605	105,683	108,854	112,119
14	Subramanyapura	39,545	40,731	41,953	43,212	44,508	45,844	47,219	48,635	50,095	51,597
15	Gubbullalu	17,625	18,154	18,699	19,260	19,837	20,432	21,045	21,677	22,327	22,997
16	Turahalli	6,881	7,087	7,300	7,519	7,744	7,977	8,216	8,463	8,716	8,978
17	Giddakonenhalli	97,857	100,793	103,817	106,932	110,139	113,444	116,847	120,352	123,963	127,682
Total =		**677,501**	**697,032**	**717,013**	**737,460**	**758,385**	**779,804**	**801,731**	**824,182**	**848,907**	**874,375**

Hemmeigepura
Somapura

5	Hemmeigepura	15,608	16,077	16,559	17,056	17,567	18,095	18,637	19,196	19,772	20,366
	BDA Development - Deposit Contribution basis for sewer	-	-	-	-	-	-	-	-	-	-
6	Somapura	4,273	4,401	4,533	4,669	4,809	4,953	5,102	5,255	5,412	5,575
	BDA Development - Deposit Contribution basis for sewer										

110 Village - Dasarahalli

No	Village	Area (Sq Km)	2011 (Census)	Population / Growth Rate→ 2019	2034	2049	4.38 2011	4.38 2012	4.38 2013	4.38 2014	4.38 2015	4.38 2016	4.38 2017
1	Abbigere	2	8,980	12,654	21,928	34,748	8,980	9,373	9,784	10,212	10,660	11,127	11,614
2	Chikkasandra	2	9,976	14,058	24,360	38,602	9,976	10,413	10,869	11,345	11,842	12,361	12,902
3	Shettihalli	2	7,248	10,214	17,699	28,046	7,248	7,565	7,897	8,243	8,604	8,981	9,374
4	Sidedahalli	1	31,302	44,108	76,436	121,122	31,302	32,673	34,104	35,598	37,157	38,785	40,483
5	Kariobanhalli	4	25,107	35,378	61,308	97,151	25,107	26,207	27,355	28,553	29,803	31,109	32,471
6	Handrahalli	2	12,553	17,689	30,653	48,574	12,553	13,103	13,677	14,276	14,901	15,554	16,235
7	Myadarahalli	1	1,692	2,385	4,132	6,547	1,692	1,766	1,843	1,924	2,008	2,096	2,188
8	Doddabidarakallu	3.5	25,113	35,387	61,323	97,174	25,113	26,213	27,361	28,559	29,810	31,116	32,479
9	Lingadeeranahalli (B)	1	6,276	8,844	15,325	24,285	6,276	6,551	6,838	7,137	7,450	7,776	8,117
10	Herohalli	4.5	62,207	87,656	151,902	240,709	62,207	64,932	67,776	70,744	73,843	77,077	80,453
11	Hosahalli	0.51	3,201	4,511	7,816	12,386	3,201	3,341	3,488	3,640	3,800	3,966	4,140
Total =		**23.51**	**193,655**	**272,884**	**472,882**	**749,344**	**193,655**	**202,137**	**210,991**	**220,232**	**229,878**	**239,947**	**250,457**

110 Village - Dasarahalli

No	Village	4.38 2018	4.38 2019	4.38 2020	4.38 2021	3.75 2022	3.75 2023	3.75 2024	3.75 2025	3.75 2026	3.75 2027	3.75 2028	3.75 2029
1	Abbigere	12,123	12,654	13,208	13,786	14,303	14,840	15,396	15,974	16,573	17,194	17,839	18,508
2	Chikkasandra	13,467	14,057	14,673	15,315	15,890	16,486	17,104	17,745	18,411	19,101	19,817	20,561
3	Shettihalli	9,785	10,213	10,660	11,127	11,545	11,978	12,427	12,893	13,376	13,878	14,398	14,938
4	Sidedahalli	42,256	44,107	46,039	48,056	49,858	51,727	53,667	55,680	57,768	59,934	62,182	64,513
5	Kariobanhalli	33,893	35,378	36,928	38,545	39,990	41,490	43,046	44,660	46,335	48,072	49,875	51,746
6	Handrahalli	16,946	17,688	18,463	19,272	19,994	20,744	21,522	22,329	23,167	24,035	24,937	25,872
7	Myadarahalli	2,284	2,384	2,489	2,598	2,695	2,796	2,901	3,010	3,123	3,240	3,361	3,487
8	Doddabidarakallu	33,902	35,386	36,936	38,554	40,000	41,500	43,056	44,671	46,346	48,084	49,887	51,758
9	Lingadeeranahalli (B)	8,472	8,843	9,231	9,635	9,996	10,371	10,760	11,164	11,582	12,017	12,467	12,935
10	Herohalli	83,977	87,655	91,494	95,502	99,083	102,799	106,654	110,653	114,803	119,108	123,575	128,209
11	Hosahalli	4,321	4,510	4,708	4,914	5,099	5,290	5,488	5,694	5,907	6,129	6,359	6,597
Total =		**261,427**	**272,877**	**284,829**	**297,305**	**308,454**	**320,021**	**332,021**	**344,472**	**357,390**	**370,792**	**384,697**	**399,123**

110 Village - Dasarahalli

No	Village	3.75 2030	3.75 2031	3.25 2032	3.25 2033	3.25 2034	3.25 2035	3.25 2036	3.25 2037	3.25 2038	3.25 2039	3.25 2040	3.25 2041
1	Abbigere	19,202	19,922	20,569	21,238	21,928	22,641	23,377	24,136	24,921	25,731	26,567	27,430
2	Chikkasandra	21,332	22,131	22,851	23,593	24,360	25,152	25,969	26,813	27,685	28,585	29,514	30,473
3	Shettihalli	15,498	16,079	16,602	17,142	17,699	18,274	18,868	19,481	20,114	20,768	21,443	22,140
4	Sidedahalli	66,933	69,443	71,699	74,030	76,436	78,920	81,485	84,133	86,867	89,691	92,605	95,615
5	Kariobanhalli	53,686	55,699	57,509	59,378	61,308	63,301	65,358	67,482	69,675	71,940	74,278	76,692
6	Handrahalli	26,842	27,848	28,754	29,688	30,653	31,649	32,678	33,740	34,836	35,968	37,137	38,344
7	Myadarahalli	3,618	3,754	3,876	4,002	4,132	4,266	4,405	4,548	4,696	4,848	5,006	5,168
8	Doddabidarakallu	53,699	55,712	57,523	59,393	61,323	63,316	65,374	67,498	69,692	71,957	74,296	76,710
9	Lingadeeranahalli (B)	13,420	13,923	14,376	14,843	15,325	15,823	16,338	16,869	17,417	17,983	18,567	19,171
10	Herohalli	133,016	138,004	142,490	147,121	151,902	156,839	161,936	167,199	172,633	178,244	184,036	190,018
11	Hosahalli	6,845	7,101	7,332	7,570	7,816	8,070	8,333	8,604	8,883	9,172	9,470	9,778
Total =		**414,090**	**429,618**	**443,581**	**457,997**	**472,882**	**488,251**	**504,119**	**520,503**	**537,419**	**554,885**	**572,919**	**591,539**

110 Village - Dasarahalli

No	Village	3 2042	3 2043	3 2044	3 2045	3 2046	3 2047	3 2048	3 2049	3 2050	3 2051
1	Abbigere	28,253	29,101	29,974	30,873	31,799	32,753	33,736	34,748	35,790	36,864
2	Chikkasandra	31,387	32,328	33,298	34,297	35,326	36,386	37,478	38,602	39,760	40,953
3	Shettihalli	22,804	23,488	24,193	24,918	25,666	26,436	27,229	28,046	28,887	29,754
4	Sidedahalli	98,484	101,438	104,481	107,616	110,844	114,169	117,595	121,122	124,756	128,499
5	Kariobanhalli	78,993	81,362	83,803	86,317	88,907	91,574	94,321	97,151	100,066	103,067
6	Handrahalli	39,495	40,680	41,900	43,157	44,452	45,785	47,159	48,574	50,031	51,532
7	Myadarahalli	5,323	5,483	5,648	5,817	5,992	6,171	6,356	6,547	6,744	6,946
8	Doddabidarakallu	79,012	81,382	83,823	86,338	88,928	91,596	94,344	97,174	100,089	103,092
9	Lingadeeranahalli (B)	19,746	20,338	20,948	21,577	22,224	22,891	23,578	24,285	25,013	25,764
10	Herohalli	195,718	201,590	207,637	213,866	220,282	226,891	233,698	240,709	247,930	255,368
11	Hosahalli	10,071	10,373	10,684	11,005	11,335	11,675	12,025	12,386	12,758	13,141
Total =		**609,285**	**627,564**	**646,391**	**665,782**	**685,756**	**706,328**	**727,518**	**749,344**	**771,824**	**794,979**

Zone		STP		Sewage Flow (MLD)		Sewage Flow in DPR (MLD)		Defference (MLD)	
No	Name	No	Name	2034	2049	2034	2049	2034	2049
1	Bytrayanapura	1	Kattigenahalli	6.5	10.3	7.0	11.0	-0.5	-0.7
		2	Yelahankakere	5.8	9.2	5.0	15.0	0.8	-5.8
		3	Doddabettahalli	6.3	10.0	4.0	7.0	2.3	3.0
		4	Bilishivalli	16.8	26.6	18.0	30.0	-1.2	-3.4
		17	Puttenahalli	2.3	3.6				
		18	Jakkur	2.1	3.3				
		19	Horamavu	3.3	5.3				
		20	Allalasandra	0.0	0.0				
		21	Raja Canal	43.6	69.1				
2	Mahadevpura	5	Hagadur	14.6	23.1	17.0	27.0	-2.5	-3.9
		22	Varthur Kodi	16.5	26.2				
		23	Amanikere	80.8	128.0				
		24	Kadugodi	14.7	23.4				
		25	Yellamalappa Chetty	0.0	0.0				
		26	Kadabesanahalli	0.0	0.0				
		27	K R Puram	0.1	0.2				
3	Bommanahalli	6	Naganathapura	8.1	12.8	5.0	10.0	3.1	2.8
		7	Pillaganahalli	3.5	5.5	3.0	4.0	0.5	1.5
		8	Talaghattapura	4.8	7.6	5.0	8.0	-0.2	-0.4
		27	Anjanapura	18.1	28.7				
4	R.R.Nagar	9	Somapura	7.3	11.5	8.0	11.0	-0.7	0.5
		10	Hemigepura 1	7.0	11.2	13.0	20.0	-6.0	-8.9
		11	Hemigepura 2	5.1	8.1	11.0	15.0	-5.9	-7.0
		29	Doddabele	64.6	102.4				
		30	Kengeri	0.0	0.0				
5	Dasarahalli	12	Doddabidarakallu	8.0	12.7	8.0	13.0	0.0	-0.3
		13	Kariobavanahalli	9.9	15.7	10.0	16.0	-0.1	-0.3
		14	Herohalli	2.9	4.6	3.0	5.0	-0.1	-0.4
		15	Hosahalli	5.8	9.2	7.0	10.0	-1.2	-0.8
		16	Chikkabanavara 2	8.9	14.1	5.0	5.0	3.9	9.1
		31	Chikkabanavara	3.3	5.2				
		32	Nagasandra	12.7	20.1				
Total				383	607	129	207	-8	-15
Sub-total (16 STPs)				121	192	129	207	-8	-15

No	STP Name	Capacity in MLD 2034	Capacity in MLD 2049
1	Kattigenahalli	7.0	11.0
2	Yelahankakere	5.0	15.0
3	Doddabettahalli	4.0	7.0
4	Bilishivale	18.0	30.0
5	Hagadur	17.0	27.0
6	Naganathapura	5.0	10.0
7	Pillaganahalli	3.0	4.0
8	Talaghattapura	5.0	8.0
9	Sompura	8.0	11.0
10	Hemigepura 1	13.0	20.0
11	Hemigepura 2	11.0	15.0
12	Daddabidarakallu	8.0	13.0
13	Kariovbanahalli	10.0	16.0
14	Herohalli	3.0	5.0
15	Hosahalli	7.0	10.0
16	Chikkabanavar	5.0	5.0
		129.0	

Bytrayanapura Zone STP Detials

STP FLOW CAPACITY (MLD)

No	Village	Connection of Main Sewer	Population		Conecting STP	Remarks
			Year 2034	Year 2049		
1	Anantha Pura	O-1 Connecting to C-8 of Yelahanka ULB	7,945	12,589	Puttenahalli STP	
		O-2 Connecting to Existing TS for ULB	9,123	14,455		
		Total	**17,068**	**27,044**		
2	Doddabetthalli	O-1 Connecting to Proposed STP	15,476	24,522	Doddabetthalli STP	
		O-2 Connecting to Proposed STP	13,997	22,179		
		Total	**29,473**	**46,701**		From Village No 3
3	Chikkabetthalli	Doddabettahalli	4,519	7,160	Doddabetthalli STP	To Village No 2
		Doddabettahalli	9,885	15,663		To Village No 2
		Dodddabettahalli	3,756	5,951		To Village No 2
		O-4 Connecting to MH-1 of TS-821 (ULB)	24,915	39,481	Chikkabanavar STP	Excess Flow goes to Chikkabanavara 2 STP
		Total	**43,075**	**68,255**		
4	Harohalli	O-1 Connecting to MH-1 of TS-121	15,946	25,268	Yelahanka STP	
		O-2 Connecting to MH-32 of TS-121	1,973	3,126		
		O-3 Connecting to MH-37 of TS-121	5,201	8,241		
		Total	**23,120**	**36,635**		
				0		
5	Kenchnehalli	O-3 Connecting to MH-53 of TS-121	3,157	5,002	Yelahanka STP	
		O-1 Connecting to MH-42 of TS-121	2,486	3,939		
		O-2 Connecting to MH-48 of TS-121	6,120	9,699		
		Total	**11,763**	**18,640**		
6	Govindapura	121	6,448	10,219	Yelahanka STP	
		O-2 Connecting to MH-1 of Vasudevpura	1,023	1,621		To Village No 7, and again come back to Village No 6
		Total	**7,471**	**11,840**		Village No.8
7	Vasudvapura	O-1 Connecting to Mh-75 of Govindapura	902	1,432	Yelahanka STP	To Village No 6
		Total	**902**	**1,432**		From Village No.6
8	Manchenhalli	O-1 Connecting to MH-82 of Govindapura	639	1,012	Yelahanka STP	
		Total	**639**	**1,012**		To Village No 6
9	Kattigenahalli	O-1 Connecting to Proposed STP	49185	77,938	Kattigenahalli STP	
		Total	**49185**	**77,938**		
10	Srinivasapura	All the village goes to ULB Area (Ex-Jakkur STP) in "Green Belt Project"	**5626**	**8,915**	Ex-Jakkur STP	Lateral System Considered in ULB Project
11	Bellhalli	O-1 of MH-58 Connecting to Proposed ISPS	4889	7,749	EX-Jakkur STP	
		MH-157 Connecting to Proposed ISPS	2189	3,468		
		Total	**7078**	**11,217**		To Village No 12
12	Tirumenhalli	O-1 (MH-21 of C-10 Yelahanka ULB)	2,040	3,233	EX-Jakkur STP	
		O-2 (MH-35 of C-10 yelahanka ULB)	693	1,098		
		O-3 Connecting to MH-49 of Chokkanahalli	304	482		To Village No 13
		Total	**3,037**	**4,813**		From Village No 11
13	Chokkanahalli	O-1(MH -35 of C-10 Yelahanka ULB)	3,181	5,039	Raja Canal STP	
		O-2 (MH-549 of C-29 of Bytrayanapura ULB)	1,673	2,651		
		O-3 Connecting to MH-1 of TS-224	1,331	2,109		
		Total	**6,185**	**9,799**		From Village No 12

1.BYT

No	Village	Connection of Main Sewer	Population		Conecting STP	Remarks
			Year 2034	Year 2049		
14	Dasrahalli	O-1 TO MH-58 OF C-21(ULB)	141	223		
		O-2 TO MH-57 OF C-21(ULB)	157	249		
		O-3 TO MH-56 OF C-21(ULB)	169	268		
		O-4 TO MH-55 OF C-21(ULB)	197	312		
		O-5 TO MH-54 OF C-21(ULB)	218	345		
		O-6 to MH-52 of C-21(ULB)	238	377		
		O-7 to MH-51 of C-21(ULB)	147	233		
		O-8 to MH-50 of C-21(ULB)	90	143		
		O-9 to MH-49 of C-21(ULB)	286	453		
		O-10 to MH-48 of C-21(ULB)	147	233		
		O-11 to MH-240 of C-21(ULB)	691	1,095		
		O-12 to MH-236 of C-21(ULB)	129	204	Raja Canal STP	
		O-13 to MH-235 of C-21(ULB)	187	296		
		O-14 to MH-234 of C-21(ULB)	330	523		
		O-15 to MH-151 of C-25 (ULB)	1,099	1,741		
		O-16 to MH-102 of TS-222 (ULB)	3,024	4,791		
		O-17 to MH-111 of TS-222 (ULB)	706	1,119		
		O-18 to MH-112 of TS-222 (ULB)	275	436		
		O-19 to MH-113 of TS-222 (ULB)	305	483		
		O-20 to MH-114 of TS-222 (ULB)	1,896	3,004		
		O-21 to MH-116 of TS-222 (ULB)	4,175	6,615		
		O-22 to MH-128 of TS-222 (ULB)	3,824	6,059		
		O-23 to MH-102 of TS-222 (ULB)	11,247	17,824		
		O-24 to MH-132 of TS-222 (ULB)	477	756		
		O-25 to MH-134 of TS-222 (ULB)	528	837		
		O-26 TO MH-201 OF TS-221 (ULB)	138	219		
		O-27 TO MH-202 OF TS-221 (ULB)	136	215		
		O-28 TO MH-203 OF TS-221 (ULB)	133	211		
		O-29 TO MH-204 OF TS-221 (ULB)	123	195		
		O-30 TO MH-209 OF TS-221 (ULB)	754	1,195		
		O-31 TO MH-210 OF TS-221 (ULB)	233	369		
		O-32 TO MH-217 OF TS-221 (ULB)	342	542	Raja Canal STP	
		O-33 TO MH-832 OF C-24 (ULB)	834	1,321		
		O-34 TO MH-842 OF C-24 (ULB)	231	366		
		O-35 TO MH-845 OF C-24 (ULB)	229	363		
		O-36 TO MH-846 OF C-24 (ULB)	124	196		
		O-37 TO MH-94 OF C-24 (ULB)	240	380		
		O-38 to MH-704 OF C24 (ULB)	325	515		
		O-39 to MH-707 of C-24 (ULB)	219	347		
		O-40 to MH-710 of C-24 (ULB)	136	215		
		Total	**34880**	**55,268**		
15	Rachnehalli	O-1 CONNECTING TO MH-213 OF TS-222 (ULB)	19,980	31,661		
		O-2 CONNECTING TO MH-4 OF TS-223 (ULB)	2,172	3,442	Raja Canal STP	
		O-3 CONNECTING TO MH-290 OF THANISANDRA-P2 (ULB)	510	808		To Village No 16
		Total	**22,662**	**35,911**		From Village No 16

1.BYT

No	Village	Connection of Main Sewer	Population		Conecting STP	Remarks
			Year 2034	Year 2049		
16	Part-1	O-1 (Connecting to MH-1 Nagenahalli)	387	613		To Village No 23
		O-2 (Connecting to Mh-17 of Nagenahalli)	618	979		To Village No 23
		O-3 (Connecting to MH-23 of Nagenahalli)	1,433	2,271		To Village No 23
		O-4(Connecting to Mh-59 of Nagenahalli)	3,816	6,046		To Village No 23
		O-5 (Connecting to Mh-35 of K. Narayanpura)	4,728	7,491		To Village No 21
		O-6(Connecting to MH-80 of K.Narayanpura Village)	15,020	23,799		To Village No 21
		O-7 (Connecting to Mh-574 of Thanisandra-P2		0		Double count reduction
		O-8 (Connecting to MH-1193 of Rachenhalli Village)	677	1,073	Raja Canal STP (Phase-1)	To Village No 15
	Part-2	(ULB)	18,860	29,883		
		(ULB)	38,085	60,356		
		(ULB)	245	388		
		(ULB)	3,411	5,405		
		O-5 Connecting to MH-44 of TS-223 (ULB)	2,666	4,224		
		O-6 Connecting to MH-45 of TS-223 (ULB)	399	632		
		O-7 Connecting to MH-2 of TS-226 (ULB)	2,354	3,730		
		GEDDALAHALLI	1,905	3,018		To Village No 20
		GEDDALAHALLI	366	580		To Village No 20
		GEDDALAHALLI	2,142	3,394		To Village No 20
		GEDDALAHALLI	1,820	2,884		To Village No 20
		Total	**98,932**	**156,766**		From Village No 15
17	Chalakere	TS-25 (ULB)	5,497	8,710		
		TS-25 (ULB)	3,912	6,199		
		TS-25 (ULB)	3,141	4,977		
		TS-25 (ULB)	4,512	7,149		
		TS-25 (ULB)	49,955	79,159	Raja Canal STP (Phase-1)	
		TS-25 (ULB)	2,340	3,708		
		TS-25 (ULB)	2,226	3,527		
		TS-25 (ULB)	2,359	3,738		
		TS-25 (ULB)	2,008	3,182		
		TS-25 (ULB)	529	838		
		TS-25 (ULB)	6,543	10,367		
		Total	**83,022**	**131,554**		From Village No 18
18	Agara	228	4,881	7,734		
		228	7,569	11,993	Bilishivalli STP	
		TS-228	22,517	35,684		
		TS-228	920	1,458		
		O-5 Connecting to Raja Canal STP (ULB)	1,252	1,984		
		O-6 to MH-467 of Chalkere	3,319	5,259	Rajacanal STP	To Village No 17
		O-7 to MH-471 of Chalkere	1,447	2,293		
		Total	**41,905**	**66,405**	66,405	
19	Amani Byaratahikane		**1692**	**2,679**	Raja Canal STP	Present Open Land
20	Geddalahalli	O-1 CONNNECT TO MH-76 of TS-224 (ULB)	7,537	11,942		Excess Flow goes to Horamav STP
		(ULB)	134	212	Raja Canal STP	Ditto
		(ULB)	191	303		Ditto
		(ULB)	298	472		Ditto
		(ULB)	867	1,374		Ditto
		(ULB)	9,839	15,592		Ditto
		Total	**18,866**	**29,895**		From Village No 16

1.BYT

No	Village	Connection of Main Sewer	Population		Conecting STP	Remarks
			Year 2034	Year 2049		
21	Narayanpura	O-1 connecting to MH-47of TS 224 (ULB)	1,526	2,418		Horamav STP
		O-2 Connecting MH-50of TS 224 (ULB)	2,072	3,283	RajaCanal STP	Ditto
		O-3 to connect MH-73 of TS 224 (ULB)	13,890	22,011		Ditto
		Total	**17,488**	**27,711**		and No 23
22	Kottanur	O-1 to connect to MH-44 of TS 224 (ULB)	3,468	5,495		Horamav STP
		O-2 conectt to MH-50 OF TS 224 (ULB)	2,949	4,673	Rajacanal STP	Ditto
		O-3 Connecting to MH-62 of TS-224 (ULB)	929	1,472		Ditto
		O-4 Connecting to MH-66 of TS-224 (ULB)	857	1,358		Ditto
		O-5 conecting to MH-76 of TS 224 (ULB)	12,523	19,843		Ditto
		Total	**20,726**	**32,841**		
23	N Naganehalli	O-1 Connecting to Mh-1 of K.Narayanpura	4,037	6,397	Horamavu	To Village No 21
		O-2 Connecting to MH-34 of TS-224 (ULB)	662	1,050		Excess Flow goes to Horamav STP
		Total	**4,699**	**7,447**		From Village No 16
24	Kylasanahalli	228	13,583	21,523	Bilishivalli STP	
		Total	**13,583**	**21,523**		From Village No 26
25	Byrathi	O-1 CONNECTING TO MH-37 OF TS224	3,881	6,149	Bilishivalli ST	
		O-2 Connecting to MH-90 of TS-224	13,023	20,639		
		Total	**16,904**	**26,788**	26,788	
26	Bilishivalli	O-1 Connecting TO Proposed STP	8,190	12,978	Bilishivalli ST	
		O-2 Connecting to MH-79 of Kylasanahalli	795	1,260		To Village No 24
		Total	**8,985**	**14,238**		

1.BYT

Mahadevpura Zone STP Detials

STP FLOW CAPACITY (MLD)

No	Village	Connection of Main Sewer	Population		Conecting STP	Remarks
			2034	2049		
1	Balagere	O-2 Connecting to Mh-71 of TS-4213 (ULB)	1,997	3,174	Belandur Amanikere STP	Under Construction CWSS IV-Phase-2
		O-3 Connecting to MH-1 OF VARTHUR	7,355	11,692	Varthur STP	To Village No 19 Proposed under other project
		Total	**9,352**	**14,866**		From Village No.6, No.14 and No.19
2	Bellanduramanikere (B) (P)	Open Land	1,138	1,809	Belandur amanikere	To be developped Open Land
3	Belthur & Kumbenaagrahar	O-1ONNECTING TO MH-84 OF SUB MAIN FROM SADARMANGLA	214	340	Kadugodi STP	Under Construction CWSS IV-Phase-2
		O-2 CONNECTING TO MH-89 OF SADARMANGALA SUB MAIN	34,577	54,964		Taking ULB Population
		O-3 CONNECTING TO MH-122 OF SADARMANGALA SUB MAIN	20,734	32,959		
		O-4 CONNECTING TO MH-1 OF Submain-3	8,351	13,275		
		Total	**63,876**	**101,537**		From ULB
Mahadevapura (ULB)		From ULB (Inflow)	11,557	**18,371**		To VIllage No 3
4	Channasandra	O-1 Connecting to MH-1 of TS-328	53,927	85,722	Hagadur STP	
		O-3 Connecting to Mh-243 of Nagondanahalli	3,976	6,320		To Village No 13
		Total	**57,903**	**92,043**		
5	Devarabeesanahalli	O-1Connecting to Bhoganhalli MH-173	12,023	19,112	Belandur Amanikere STP	By Manhole PS to MH24
		O-2 Connecting to MH-24 of TS-4213 (ULB)	5,916	9,404		From Manhole PS
		O-3 Connecting to MH-1 of Karyammana Agrahara	510	811		Under Construction CWSS IV-Phase-2
		O-4 Connecting to MH-12 of Kadabisanahalli	878	1,396		To Village No 8
		Total	**18,783**	**29,857**		From Zone 3 Village No 31
6	Gunjur	O-1 CONNECTING TO MH-165 OF BALAGERE	**22,713**	**36,105**	Varthur STP	From Zone 3 Village No 29 and To Village No 1

2.MAH

No	Village	Connection of Main Sewer	Population		Conecting STP	Remarks
			2034	2049		
7	Hagadur	O-1 TO SUB MAIN 4 OF PACKAGE 3C (ULB)	208	331	Belandur Amanikere STP	Under Construction CWSS IV-Phase-2
		O-2 TO SUB MAIN 4 OF PACKAGE 3C (ULB)	384	610		
		O-3 TO SUB MAIN 4 OF PACKAGE 3C (ULB)	513	815		
		O-4 TO SUB MAIN 4 OF PACKAGE 3C (ULB)	4,789	7,613		
		O-5 TO SUB MAIN 4 OF PACKAGE 3C (ULB)	270	429		
		O-6 TO SUB MAIN 4 OF PACKAGE 3C (ULB)	282	448		
		O-7 TO SUB MAIN 4 OF PACKAGE 3C (ULB)	243	386		
		O-8 TO SUB MAIN 4 OF PACKAGE 3C (ULB)	180	286		
		O-8A TO SUB MAIN 4 OF PACKAGE 3C (ULB)	299	475		
		O-9 TO SUB MAIN 4 OF PACKAGE 3C (ULB)	246	391		
		O-10 TO SUB MAIN 4 OF PACKAGE 3C (ULB)	333	529		
		O-11 to MH-11 of TS-324	2,778	4,416	Hagadur STP	
		O-12 to MH-25 of TS-324	1,124	1,787		
		O-13 to Mh-29 of TS-324	1,066	1,695		
		O-13 to MH-47 of TS-324	40,477	64,342		
		Total	**51,927**	**82,543**		From Village No 13
8	Kadabisanahalli	O-1 Connecting to MH-120 of Panathur	3,956	6,288	Belandur Amanikere STP	Under Construction CWSS IV-Phase-2
		O-3 Connecting to MH-88 of Kariyammana Agrahara	1,633	2,596		
		O-4 Connecting to MH-58 of ts-4213 ULB	3,397	5,400		
		Total	**8,986**	**14,284**		From Village No 5 and No 14
9	Kayammana Agrahara	O-1C-MH-48-TS-4213 of ULB	8,432	13,404	Amanikere STP	Under Construction CWSS IV-Phase-2
		Total	**8,432**	**13,404**		Inflow from No 8 and No 9
10	Kadugodi Plantation	O-1 connecting to MH-271 C-34 of Mahadevpura ULB	**30,401**	**48,325**	Kadugodi STP	
11	Khanekandya (B)	Open Land	**1,138**	**1,809**	Belandur Amanikere STP	Open Land (Under Construction CWSS IV-Phase-2)
12	Belthur & Kumbenaagraha	Refer to SL No 3	**5,850**	**9,299**		Considered as Village No 3
13	Nagondhalli	O-1 to MH-333 of Haggadur	813	1,292	Hagadur STP	To Village No 7
		O-2 to MH-345 of Haggadur	452	718		To Village No 7
		O-3 connecting to MH-29 of TS-328	324	515		
		O-4 connecting to MH-40 TS-328	5,303	8,430		
		Total	**6,892**	**10,956**		Inflow from No 4

2.MAH

No	Village	Connection of Main Sewer	Population		Conecting STP	Remarks
			2034	2049		
14	Panathur	O-1 Connectting MH-201 of Balegere	10,430	16,580	Belandur Amanikere STP	From Bom
		O-2 Connecting to MH-45 of Kadabisanahalli	536	852		To Village No 8
		O-3 Connecting to MH-65 of TS-4213 (ULB)	3,921	6,233		Under Construction CWSS IV-Phase-2
		Total	**14,887**	**23,664**		Inflow from Zone 3 No 28 and Village No
15	Ramagondanahalli	O-1 to connect MH-50 Siddapura	10,963	17,427	Belandur Amanikere STP	To Village No 16
		O-2 to connect TS-4213 (ULB)	2,568	4,082		Under Construction CWSS IV-Phase-2
		O-3 to connect TS -4213 (ULB)	1,133	1,801		
		Total	**14,664**	**23,310**		
16	Siddapura	O-1 CONNECTING TO MH-83 OF TS-4213 (ULB)	3,113	4,948	Belandur Amanikere STP	Under Construction CWSS IV-Phase-2
		O-2 CONNECTING TO MH-35 TS-322 OF (ULB)	1,476	2,346		
		O-3 CONNECTING TO MH-45 OF TS-322 (ULB)	1,196	1,901		
		O-4 CONNECTING TO MH-50 OF TS-322 (ULB)	1,008	1,602		
		O-5 CONNECTING TO MH-80 OF TS-4213(ULB)	1,069	1,699		
		Total	**7,862**	**12,497**		From Village No 15
17	Sorahunise	O-1 CONNECTING TO MH-78 OF VARTHUR	16,946	26,937	Varthur STP	To Village No 19
		O-2 CONNECTING TO Varthur STP directly	4,388	6,975		Other Project
		Total	**21,334**	**33,913**		
18	Tubarahalli	O-1 connecting MH-64 of TS-4213 (ULB)	60,760	96,584	Belandur Amanikere STP	Under Construction CWSS IV-Phase-2
		Total	**60,760**	**96,584**		
19	Varthur	O-1 CONNECTING To VARTHUR STP	44,808	71,227	Varthur STP	Other Project
		O-3 CONNECTING TO MH-53 OF BALAGERE	1,351	2,148		
		Total	**46,159**	**73,374**		From No 17 and No 1

2.MAH

No	Village	Connection of Main Sewer	Population		Conecting STP	Remarks
			2034	2049		
20	Kalkere	0-1 T0 connecting TS-228	24,164	38,411	Bilishivalli STP	
		O-3 T0 Connecting TS-228	254	404		
		O-4 T0 Connecting TS-228	2,553	4,058		
		O-5 T0 Connecting TS-228	260	413		
		O-6 T0 Connecting TS-228	260	413		
		O-7 T0 Connecting TS-228	258	410		
		O-8 T0 Connecting TS-228	259	412		
		O-9 T0 Connecting TS-228	258	410		
		O-10 T0 Connecting TS-228	265	421		
		O-11 T0 Connecting TS-228	272	432		
		O-12 T0 Connecting TS-228	1,284	2,041		
		O-13 TO MH-131 OF VARANASI	441	701		To Village No 23
		O-14 TO MH-165 OF VARANSI	384	610		To Village No 23
		O-14TO MH OF 154 OF VARANASI	412	655		To Village No 23
		O-16 TO MH-430 OF VARANASI	1,103	1,753		To Village No 23
		O-17 TO MH-437 OF VARANASI	1,957	3,111		To Village No 23
		O-18 TO MH-98 OF K. CHANNASANDRA	990	1,574		To Village No 22
		OF-2 T0 TS-228	5,462	8,682		
		Total	**40,836**	**64,913**		From Village No 22

2.MAH

No	Village	Connection of Main Sewer	Population		Conecting STP	Remarks
			2034	2049		
21	Horamavu	O-1 Connecting to MH-F3 of EX-TS-26 (ULB)	7,976	12,679	Horamavu STP	
		O-2 Connecting to MH-F4 of EX-TS-26 (ULB)	82	130		
		O-3 Connecting to MH-F6 of EX-TS-26 (ULB)	93	148		
		O-4 Connecting to MH-F8 of EX-TS-26 (ULB)	49	78		
		O-5 Connecting to MH-F9 of EX-TS-26 (ULB)	47	75		
		O-6 Connecting to MH-F12 of EX-TS-26 (ULB)	42	67		
		O-7 Connecting to MH-F15 of EX-TS-26 (ULB)	52	83		
		O-8 Connecting to MH-F16 of EX-TS-26 (ULB)	51	81		
		O-9 Connecting to MH-F17 of EX-TS-26 (ULB)	35	56		
		O-10 Connecting to MH-F18 of EX-TS-26 (ULB)	5,761	9,158		
		O-11 Connecting to MH-F23 of EX-TS-26 (ULB)	51	81		
		O-12 Connecting to MH-F27 of EX-TS-26 (ULB)	4,996	7,942		
		O-13 Connecting to MH-F35 of EX-TS-26 (ULB)	328	521		
		O-14 Connecting to MH-F40 of EX-TS-26 (ULB)	958	1,523		
		O-15 Connecting to MH-F48 of EX-TS-26 (ULB)	4,722	7,506		
		Total	**25,243**	**40,126**		
22	K.Channasandra	O-1 CONNECTING TO MH-86 TS-228	2,714	4,314	Bilishivalli STP	
		O-2 CONNECTING TO MH-89 TS-228	6,050	9,617		
		O-3 Connecting to MH-81 of Kalkere	462	734		To Village No 20
		O-4 Connecting to MH-82 ofKalkere	459	730		To Village No 20
		O-5 Connecting to MH-89 of Kelkere	126	200		To Village No 20
		O-6 Connecting to MH-90 of Kalkere	1,349	2,144		To Village No 20
		O-7 Connecting to MH -533 of Kalkere	4,504	7,160		To Village No 20
		O-8 Connecting to MH-74 of Varanasi	3,235	5,142		To Village No 23
		Total	**18,899**	**30,042**		From Village No 20 and No 23
23	Varanasi	O-1 Connecting to Mh-278 of K.Channasandra)	7,198	11,442	Bilishivalli STP	To Village No 22
		O-2 Connecting to MH-2 of C-9 of KRP (ULB)	291	463	K R puram	
		O-3 CONNECTING TO MH-85 OF C-9 of KRP (ULB)	329	523		
		O-4 (Connecting to Mh-61 of C-9 of KRP (ULB)	102	162		
		Total	**7,920**	**12,590**		Inflow from No 20 and No 22

2.MAH

Bommanahalli Zone STP Detials

STP FLOW CAPACITY (MLD)

No	Village	Connection of Main Sewer	Population		Conecting STP	Remarks
			2034	2049		
1	Alahalli-1 (Part-1	O-1 Connecting to MH-4 Of alahalli part-2	8,639	13,733	Anjanapura STP (BDA Proposed)	To Alahalli (Part-2)
		O-2 Connecting to MH-51 of Gollahalli	23,817	37,860		To village No 10
	Alahalli-1 (Part-2	O-1 Connecting to MH-1 of TS-429	2,140	3,402		From Alahalli (Part-1)
		O-2 Connecting to MH-5 of TS-429	1,249	1,985		
		O-3 Connecting to MH-7 of TS-429	3,357	5,336		
		O-4 Connectiong to MH-15 of TS-429	6,242	9,922		
		Total	**45,444**	**72,238**		
2	Ambalipura	O-1 Connecting to MH-325 of Belandur	1,347	2,141	Belandur Amanikere STP	To Village No 7
		O-2 Connecting to MH-1 of Kaikondanahalli	1,569	2,494		To Village No 14
		O-3 Connecting to Ex. TS of Iblur	4,123	6,554		Under Construction CWSS IV-Phase-2
		Total	**7,039**	**11,189**		From Village No 18
3	Anjanapura	O-1 Connecting to MH-22 of TS-430	846	1,345	Anjanapura STP (BDA Proposed)	
		O-2 TO MH-186 OF GOLHALLI	1,077	1,712		To Village No 10
		O-3 Connecting to MH-1 of TS-431	5,240	8,330		
		O-4 CONNECTING TO MH-19 OF TS-429	6,954	11,054		
		Total	**14,117**	**22,440**		
4	Basapura	O-1 connecting to MH-39 of Beguru	5,010	7,964	Belandur Amanikere	To Village No 6
		O-2 Connectig to MH-313 Of Chikkaathogur	172	273	Naganathapura STP	
		Total	**5,182**	**8,237**		From Village No 30
5	Basavanapura	O-1 CONNECTING TO MH-77 OF GOTTIG	16,882	26,836	Belandur Amanikere STP	To Village No 11 (Under Construction CWSS IV-Phase-2)
		Total	**16,882**	**26,836**		
6	Beguru	O-1 Connecting to TS-422 (ULB) (ULB)	6,559	10,426	Belandur Amanikere STP	Under Construction CWSS IV-Phase-2
		O-2 Connecting to TS-422 (ULB)	7,504	11,928		
		O-3 TO MH-25 OF TS-422 (ULB)	7,280	11,572		
		O-4 TO MH-37 OF TS-422 (ULB)	571	908		
		O-5 TO MH-44 OF TS-422 (ULB)	1,683	2,675		
		O-6 TO MH-45 OF TS-422 (ULB)	33,378	53,058		
		O-7 TO MH-50OF TS-422 (ULB)	9,930	15,785		
		O-8 TO SUBMAIN 1 OF 4D PACKAGE (ULB	369	587		
		O-9 TO SUBMAIN 1 OF 4D PACKAGE (ULB	401	637		
		O-10 TO SUBMAIN 1 OF 4D PACKAGE (UL	270	429		
		O-11 TO SUBMAIN 1 OF 4D PACKAGE (UL	155	246		
		O-12 SUBMAIN 1 OF 4D PACKAGE (ULB)	222	353		
		O-13 TO SUBMAIN 1 OF 4D PACKAGE (UL	229	364		
		O-14 SUBMAIN 1 OF 4D PACKAGE (ULB)	236	375		
		O-15 TO SUBMAIN 1 OF 4D PACKAGE (ULE	137	218		
		O-16 SUBMAIN 1 OF 4D PACKAGE (ULB)	237	377		
		O-17 TO SUBMAIN 1 OF 4D PACKAGE (ULE	237	377		
		O-18 SUBMAIN 1 OF 4D PACKAGE (ULB)	778	1,237		
		O-19 TO SUBMAIN 1 OF 4D PACKAGE (ULE	240	382		
		O-20 Connecting to TS-422 (ULB)	222	353		
		O-21 CONNECTING TO TS-422 (ULB)	753	1,197		
		O-22 CONNECTING TO TS-422 (ULB)	2,085	3,314		
		O-23 CONNECTING TO TS-422 (ULB)	158	251		
		O-24 CONNECTING TO TS-422 (ULB)	158	251		
		O-25 CONNECTING TO TS-422 (ULB)	400	636		
		O-26 CONNECTING TO TS-422 (ULB)	1,250	1,987		
		O-27 CONNECTING TO TS-422 (ULB)	1,598	2,540		
		O-28 Connecting to C-9 OF Bommanahalli	471	749		
		O-29C0nnecting toMH-22of C-10 Of Bommanahalli(ULB)	8,111	12,893		
		O-30 connecting to C-9 of	362	575		
		O-31 Connecting to MH- 174 OF Yellenahalli(ULB)	792	1,259		To Village No 26
		Total	**86,776**	**137,939**		From Village No 4

3.BOM

No	Village	Connection of Main Sewer	Populations		Conecting STP	Remarks
			2034	2049		
7	Bellandur	O-1 MH-200 of TS-426	1,350	2,146	Belandur amanikere STP	Under Construction CWSS IV-Phase-2
		O-2 MH-207 of TS-426	1,444	2,295		
		O-3 MH-212 of TS-426	31,795	50,541		
		O-4 MH-240 of Kaikondanahalli	6,625	10,531		To Village No 14
		Total	**41,214**	**65,514**		From Village No 2
8	Chandrashekara pura	ULB **Total**	**1,528**	**2,429**	No Development	To Village No 17
9	Doddakallasandra	O-1 Connecting to Vasanthapura in R R Nag	6,065	9,641	Doddabele STP	
		O-2 Connecting to MH-92 of Raghuvanahalli	1,012	1,609	Anjanapura STP (BDA Proposed)	To Village No 22
		O-3 Connecting to MH-16 TS-428	5,539	8,805		
		O-4 Connecting to MH-1 of TS-428	1,421	2,259		
		Total	**14,037**	**22,313**		
10	Gollahalli	O-1 connecting to MH-13 of TS-430	918	1,459	Anjanapura STP (BDA Proposed)	
		O-2 connecting to MH-15 of TS-430	83	132		
		O-3 Connecting to MH-16 of TS-430	108	172		
		O-4 connecting to MH-17 of TS-430	86	137		
		O-5 Connecting to MH-18 of TS-430	76	121		
		O-6 Connecting to MH-22 of TS-430	34,209	54,379		
		O-7 connecting to MH-23 of TS-430	88	140		
		O-8 Connecting to MH-24 of TS-430	91	145		
		O-9 Connecting to MH-26 of TS-430	414	658		
		O-10 Connecting to MH-27 of TS-430	239	380		
		O-11 Connecting to Mh-28 of TS-430	135	215		
		O-12 Connecting to MH-30 of TS-430	1,263	2,008		
		O-13 Connecting to MH-34 of TS-430	4,078	6,482		
		Total	**16,894**	**26,855**		From Village No 1 and No 3
11	Gottigere-1	O-1 connecting to MH-56 ofpillaganahalli	2,988	4,750	Pilaganahalli STP	
		O-2 Connecting to MH-105 of pilaganahalli	2,410	3,831		
		O-3 mh-178 OF pilaganahalli	1,122	1,784		
		O-4 MH-204 of pillaganhalli	44	70		
		O-5 MH-272 of Pillganahalli	80	127		
		O-6 MH-265 of Pillaganahalli	83	132		
		O-7 MH-259 of Pillganahalli	95	151		
		O-8 MH-253 of Pillaganahalli	107	170		
		O-9 MH-248 of Pillaganahalli	108	172		
		O-10 To MH-243 of Pillaganahalli	112	178		
		O-11 MH-227 of Pillaganahalli	3,144	4,998		
		Total	**10,293**	**16,362**		To Village No 21
	Gottigere-2	O-1 Connecting to MH-23 of kalena agrahara	92	146	Belandur Amanikere STP	To Village No 15
		O-2 Connecting to MH-25 of kalena agrahara	99	157		To Village No 15
		O-3 connecting to MH-591 of kammanahalli	793	1,261		Under Construction CWSS IV-Phase-2
		O-4 Connecting to MH-97 OF Kalena agraha	25,930	41,218		To Village No 15
		Total	**26,914**	**42,782**		
		Sub-Total (Gottigere-1 and Gottigere-2)	37,207	**59,144**		From Village No 5, No 15 and No 21
12	Haralur	O-1 Connecting to MH-80 of TS-426	11,962	19,015	Belandur amanikere STP	
		O-2 Connecting to MH-81 of TS-426	688	1,094		
		O-3 Connecting to MH-96 of TS-426	1,215	1,931		
		Total	**13,865**	**22,040**		
13	Junnasandra	O-1 Connecting to MH-173 of Kaikondranah	9,274	14,742	Belandur Amanikere STP	From Village No 18
		Total	**9,274**	**14,742**		To Village No 14
14	Kaikondranahalli	O-1 Connecting to MH-142 of TS-426	1,024	1,628	Belandur amanikere STP	Under Construction CWSS IV-Phase-2
		O-2 connecting to MH-152 OF TS-426	1,525	2,424		
		O-3 Connecting to MH-155 TS-426	1,942	3,087		
		O-4 Connecting to MH-163 of TS-426	3,560	5,659		
		O-5 CONNECTING T0 MH-180 OF TS-426	6,042	9,604		
		O-6 Connecting to MH-183 of TS-426	1,541	2,450		
		Total	**15,634**	**24,852**		From Village No 2, No 7, No13 and No 31

3.BOM

No	Village	Connection of Main Sewer	Populations		Conecting STP	Remarks
			2034	2049		
15	Kalenaagrahara	O-1 connecting to MH-482 gottigere part 2	12,717	20,215	Belandur Amanikere STP	From Village No 11 and To Village No 11
		Total	**12,717**	**20,215**		Under Construction CWSS IV-Phase-2
16	Kambathahalli	O-1 Connecting to MH-1 of TS-430	7,148	11,362	Anjanapura STP	From Village No 21
		Total	**7,148**	**11,362**		BDA Proposed
17	Kammanahalli &	O-1 Connecting MH-1 of TS-421	26,938	42,821	Belandur Amanikere STP	Under Construction CWSS IV-Phase-2
		Total	**26,938**	**42,821**		From Village No 8 and No 21
18	Kasavanahalli	O-1 CONNECTING MH-65 OF AMBILIPURA	418	664	Belandur Amanikere STP	Under Construction CWSS IV-Phase-2
		O-2 CONNECTING MH-115 TS-426	688	1,094		
		O-3 CONNECTING MH-125 ofTS-426	563	895		
		O-4 CONNECTING MH-127 of TS-426	278	442		
		O-5 CONNECTING MH-130 of TS-426	323	513		
		O-6 -CONNECTING MH-133 TS-426	696	1,106		
		O-7 CONNECTING TO MH-1 OF JUNNASANDRA	3,719	5,912		To Village No 13
		O-8 CONNECTING to MH-26 of KAIKONDNAHALLI	2,714	4,314		To Village No 14
		O-9 CONNECTING MH-31 of KAIKONDANAHALLI	431	685		To Village No 14
		O-10 CONNECTING MH-163 of KAIKONDANAHLLI	1,943	3,089		To Village No 14
		O-11 Connecting to MH-8 of	2,191	3,483		To Village No 14
		Total	**13,964**	**22,197**		
19	Kudlu	O-1 CONNECTING C-21 OF BOMMANHALLI (ULB)	2,435	3,871	Belandur amanikere STP	Under Construction CWSS IV-Phase-2
		O-2 CONNECTING C-21 OF BOMMANHALLI (ULB)	802	1,275		
		O-3 CONNECTING C-21 OF BOMMANHALLI (ULB)	1,075	1,709		
		O-4CONNECTING C-21 OF BOMMANHALLI (ULB)	433	688		
		O-5 CONNECTING C-21 OF BOMMANHALLI (ULB)	1,509	2,399		
		O-6 connecting to Sub main of Bommanahalli (ULB)	7,012	11,146		
		O-7 Connecting to Mh-45 of TS-426	38,165	60,667		
		O-8 Connecting to MH-56 of TS426	18,674	29,684		
		O-9 Connecting to MH-62 of TS-426	15,860	25,211		
		O-10 Connecting to C-14 of Bommanahalli	7,354	11,690		
		Total	**85,730**	**136,276**		From Village No 20
20	arappana Agraha	O-1 Connecting to MH-1 TS-426	6,218	9,884	Belandur amanikere STP	Under Construction CWSS IV-Phase-2
		O-2 Connecting to MH-5 TS-426	2,816	4,476		
		O-3 Connecting to MH-9 TS-426	1,916	3,046		
		O-4 Connectig to MH-18 TS-426	5,858	9,312		
		O-5 Connecting to MH-20 TS-426	966	1,536		
		O-6 Connectig to MH-22 TS-426	1,457	2,316		
		O-7 Connecting to MH-500 kudlu	2,445	3,887		To Village No 19
		O-8 connecting to MH-274 KUDLU	1,107	1,760		To Village No 19
		O-9 Connectying to Mh-36 of C-20 of Bommanahalli	2,462	3,914		
		O-10 Connecting to MH-566 Kudlu	4,037	6,417		To Village No 19
		Total	**29,282**	**46,547**		

3.BOM

No	Village	Connection of Main Sewer	Population		Conecting STP	Remarks
			2034	2049		
21	Pillaganahalli	O-1 Connecting to Proposed STP	15,817	25,143	Pillaganahalli STP	
		O-2 Connecting to MH-99 of Gottigere-2	1,914	3,042	Belandur amanikere STP (Under	To Village No 11
		O-3 CONNECTING TO MH-65 of Gottigere-2	937	1,489		To Village No 11
		O-4 Connecting to MH-1 of Kembathalli	833	1,324	Anjanapura STP (BDA Proposed)	To Village No 16
		Total	**9,208**	**14,637**		From Village No 11
22	Raghuvanahalli	O-1 Connecting to MH-34 of TS-428	3,908	6,212	Vathur STP	BDA Proposed
		O-2 Connecting to MH-29 of TS-428	828	1,316		
		Total	**4,736**	**7,528**		From Village No 9
23	Talaghattapura	O-3 Connectining to Talaghttapura	27,262	43,336	Thalaghattapura STP	
		Total	**27,262**	**43,336**		
24	Thippasandra	O-1 connecting to MH-33 Of TS-428	3,100	4,928	Anjanapura STP (BDA Proposed)	
		Total	**3,100**	**4,928**		
25	Vajarahalli	O-1 CONNECTING TO MH-67 OF PROP T	16,627	26,430	Anjanapura STP (BDA Proposed)	
		Total	**16,627**	**26,430**		
26	Yelenahalli	O-1 Connecting to MH-272 0F C-9 of Bomm	3,267	5,193	Belandur Amanikere STP	Under Construction CWSS IV-Phase-2
		O-2 Connecting to MH-57 of Kammanahalli	469	746		To Village No 17
		O-3 Connecting to MH-281 of Kammanahalli	46	73		To Village No 17
		Total	**3,782**	**6,012**		From Village No 6
27	harathena Agraha	O-1 Connecting to MH-58 TS-427	5,850	9,299	Naganathapura STP	
		O-2 Connecting to MH-74 of C-20 of Bommanahalli ULB	123	196		
		O-3 Connecting to MH-1 Parapana agrahara	277	440	Belandur Amanikere STP	Under Construction CWSS IV-Phase-2
		O-4 Connecting to MH-49 of TS-427	9,748	15,495	Naganathapura STP	
		O-5 Connecting to mh-59 TS-427	406	645		
		O-6 CONNECTING MH-80 OF TS-427	1,406	2,235		
		Total	**2,917**	**4,637**		From Village No 30
28	Bhoganahalli	O-1 CONNECTING TO MH-307 OF PANAT	6,674	10,609	Belandur Amanikere STP	Under Construction CWSS IV-Phase-2
		Total	**6,674**	**10,609**		
29	Chikkabelandur	O-1 CONNECTING TO MH-231 OF GUNJU	19,688	31,296	r Kodi (Other I	To Zone 2 Village No
		Total	**16,463**	**26,170**		From Village No 31

3.BOM

No	Village	Connection of Main Sewer	Population		Conecting STP	Remarks
			2034	2049		
30 & 32	Chikkathoguru & Doddathoguru	O-1 Connecting to MH-1 of TS-427	2,375	3,775	Naganathapura STP	
		O-2Connecting to MH-29 TS-427	7,943	12,626		
		O-3 Connectig to MH-34 TS-427	2,095	3,330		
		O-4 Connecting to MH-103 Basapura	3,313	5,266	Belandur Amanikere STP	To Village No 4
		O-5 Connecting to Mh-12 of Basapura	9,951	15,818		To Village No 4
		O-6 Connecting to Mh-10 of Basapura	856	1,361		To Village No 4
		O-7 Connecting to Mh-6 of Basapura	629	1,000		To Village No 4
		O-8 Connecting to MH-189 of	9,644	15,330	Naganathapura STP	To Village No 27
		O-9 connecting to MH-11	1,574	2,502		To Village No 27
		O-10 Connecting to MH-1 of	3,076	4,890		To Village No 27
		O-11 Connecting to MH-1 of	599	952		To Village No 27
		O-12 connecting to MH-110 of C-20 (BOMMANAHALLI ULB)	876	1,392	Belandur amanikere STP	Under Construction CWSS IV-Phase-2
		O-13 connecting to MH-110 of C-20 (BOMMANAHALLI ULB)	872	1,386		
		Total	**43,803**	**69,629**		
31	Doddakannahalli	O-1 Connecting to MH-171 of	5,226	8,307	Belandur amanikere STP (Under	To Village No 14
		O-2 Connecting to MH-172 of	19,823	31,511		To Village No 14
		O-3 Connecting to MH-37 of Devarabishanahalli	544	865		To Zone 2 Village No 5
		O-4 Connecting to MH-1 of Chikkabelandur	3,225	5,126	Varthur Kodi (Other	To Village No 29
		O-5 Connecting to MH-245 of Kaikondanaha	4,772	7,586	Belandur Amanikere STP	Under Construction CWSS IV-Phase-2
		Total	**33,590**	**53,395**		
33	Naganathapura	O-1 CONNECTING MH-88 OF TS-427	3,007	4,780	Naganathapura STP	
		O-2 CONNECTING MH-96 OF TS-427	8,885	14,124		
		O-3 CONNECTING TO NAGANATHPURA	4,318	6,864		
		O-4 CONNECTING TO MH-1 OF PARAPPA	1,125	1,788	Belandur Amanikere STP	Under Construction CWSS IV-Phase-2
		O-5 CONNECTING MH-21 OF PARAPPAN	858	1,364		
		O-6 CONNECTING TO MH-29 OF PARAPI	1,254	1,993		
		O-7 CONNECTINGTO MH-332 OF PARAP	1,282	2,038		
		O-8 CONNECTING TP MH-312 OF PARAP	296	471		
		O-9 CONNECTING TO MH-251 PARAPPA	887	1,410		
		Total	**21,912**	**34,831**		

3.BOM

R.R. Nagar Zone STP FLOW CAPACITY (MLD)

STP FLOW CAPACITY (MLD)

No	Village	Connection of Main Sewer	Population		Conecting STP	Remarks
			2034	2049		
1	Vasanthapura	O-1 Connecting to MH-Q40B EX TS-52A	17,530	27,576	Doddabele STP Under Construction (Phase-II)	
		O-2 Connecting to Q-47 of EX TS-52A	10,657	16,765		
		O-3 Connecting to MH-131 of	11,937	18,778		To village No 14
		O-4 Connecting to MH-126 of	3,317	5,218		To village No 14
		O-5 Connectimng to MH-303 of Gubbullalu	5,772	9,080		To village No 15
		O-6 Connecting to MH-294 of Gubullalu	4,422	6,956		To village No 15
		O-7 Connecting to MH-197	7,921	12,461		To village No 14
		O-8 Connecting to MH-Q87of TS-52B	2,450	3,854		
		O-9 Connecting to MH-Q101 of TS-52B	10,258	16,137		
		O-10 Connecting to Q-63 of TS-52A	608	956		
		Total	**74,872**	**117,781**		
2	Ullalu		53,256	83,777	Doddabele	Lateral System Considered in BDA
		Total	**53,256**	**83,777**		
3	Sonnenhalli		**6,996**	**11,005**	Doddabele	Considered in BDA Project
4	Ganakallu	O-1 connectin to MH-133 of TS-521	18,044	28,385	Doddabele STP	Under Construction (Phase-II)
		Total	**18,044**	**28,385**		
5	Hemmeigepura	O-1 Connecting to Hemmigerepura STP-1	7,939	12,489	Heemigepura -2 STP	Only Village Population considered BDA Development Population is not
		O-2 Connecting to MH-48 of Varahasandra	3,409	5,363		
		Total	**88,258**	**138,839**		76,910 from BDA BSK 6th stage
		From BDA Development area 1	38,455	60,494	Heemigepura -1 STP	To Village No 5 BDA BSK 6th stage
		From BDA Development area 2	38,455	60,494	Heemigepura -2 STP	To Village No 5 BDA BSK 6th stage
6	Somapura	110 Village	**50,572**	**79,555**	Somapura STP	Lateral System Considered in BDA Project
7	Varasandra	O-1 connecting to Hemmigepura STP-1	3,473	5,463	Heemigepura -1 STP	
		Total	**3,473**	**5,463**		
8	Manavarthkavalu		**2,571**	**4,044**	Doddabele STP	Lateral System Considered in BDA Project
9	Lingderanahalli		**4,538**	**7,139**	Somapura STP	Lateral System Considered in BDA Project
10	Hosahalli	O-1 Connecting to Thalagattapura STP	8,998	14,155	Thalaghattapura STP	
		Total	**8,998**	**14,155**		
11& 12	Arehalli/Vaddarpalya	O-1 connecting to MH -1271 of uttarahalli	8,559	13,464	Doddabele STP Under Construction (Phase-II)	
		O-2 Connecting to Prop Arehalli ISPS (mh-19 of this network)	2,088	3,285		
		O-3 Connecting to MH-1052 of Uttarahalli	2,809	4,419		To Village No 13
		O-4 connecting to MH-689 Of uttahahalli	901	1,417		To Village No 13
		O-5 Connecting to ISPS pumped to MH-153	8,235	12,954		
		Total	**22,592**	**35,539**		From ULB Population 1210

4.RR.N

No	Village	Connection of Main Sewer	Population		Conecting STP	Remarks
			2034	2049		
13	Uttrahalli	O-1 Connecting to MH-46 of TS-521	2,834	4,458	Doddabele STP Under Construction (Phase-II)	
		O-2 Connecting to MH-35 of TS-521	5,577	8,773		
		O-3 Connecting to MH-38 of TS521	624	982		
		O-4 connecting to MH-306 of arehalli	302	475		To Village No 11
		O-5 connecting to MH-303 of arehalli	138	217		To Village No 11
		O-6 Connecting toR-13 of TS-53-A	5,036	7,922		
		O-7 Connecting to MH-R-25 of TS-53A	1,457	2,292		
		O-8 Connecting to MH-R26 of TS-53A	53	83		
		O-9 Connecting to MH-R19 of TS-53A	2,637	4,148		
		O-10 Connecting to MH-R20 of TS-53A	65	102		
		O-11 Connecting to MH-R32 of TS-53A	257	404		
		O-12 Connecting to MH-R21 of TS-53A	49	77		
		O-13 Connecting to MH-R22 of TS-53A	72	113		
		O-14 Connecting to MH-R28 of TS-53A	149	234		
		O-15 Connecting to MH-R29 of TS-53A	16,243	25,552		
		O-16 Connecting to MH-R30 of TS-53A	50	79		
		O-17 Connecting to MH-R49 of TS-53A	240	378		
		O-18 Connecting to MH-R54 of TS-53A	126	198		
		O-19 Connecting to MH-R57 of TS-53A	491	772		
		O-20 Connecting to MH-R64 of TS-53A	4,199	6,605		
		O-21 Connecting to MH-R72 of TS-53A	4,756	7,482		
		O-22 Connecting to MH-R11 of TS-53A	3,260	5,128		
		O-23 Connecting to MH-R61 of TS-53A	991	1,559		
		O-24 Connecting to MH-R39 of TS-53A	7,521	11,831		
		O-25 Connecting to MH-R55 of TS-53A	113	178		
		O-26 Connecting to MH-R56 of TS-53A	110	173		
		O-27 Connecting to MH-R45 of TS-53A	1,859	2,924		
		O-28 Connecting to MH-R14 of TS-53A	141	222		
		O-29 Connecting to MH-45 of TS-521	7,534	11,852		
		Total	**66,884**	**105,215**		From Village No 11 and No 14, To ULB 5,599 People
14	Subramanyapura	O-1 Connecting to MH-1542 of Uttarahalli	13,107	20,619	Doddabele STP Under Construction (Phase-II)	To Village No 13
		O-2 Connecting to MH-275 of	1,102	1,734		
		O-3 CONNECING TO MH-325 of UTTARAHALLI	921	1,449		To Village No 13
		O-4 Connecting to MH-369 ofuttarahalli	14,188	22,319		To Village No 13
		O-5 connecting to MH-344 of uttarahalli	1,374	2,161		To Village No 13
		Total	**30,692**	**48,282**		From Village No 1 and No 15
15	Gubbullalu	O-1 connecting to MH-17 of Turahalli	9,257	14,562	Doddabele STP Under Construction	To village No.16
		O-2 Connecting to MH- 88 of Thurahalli	262	412		To village No.16
		O-3 Connecting to MH-60 of	4,169	6,558		
		Total	**13,688**	**21,533**		
16	Turahalli	O-1 CONNECTING TO MH-65 OF TS-521 OF RR NAGAR CMC	2,211	3,478	Doddabele STP Under Construction (Phase-II)	
		O-2 CONNECTING TO MH-14 of TS-521 OF RR NAGAR CMC	1,081	1,701		
		O-3 Connecting to NH-135 of TS-521	214	337		
		O-4 Connecting to MH-32 of TS-521	200	315		
		O-5 Connecting to MH-26 of TS 521	1,634	2,570		
		Total	**5,340**	**8,400**		From Village No 15
17	Giddakonenhalli	O-1 Connectiong to Doddabele STP	**75,950**	**119,477**	Doddabele STP Under Construction (Phase-II)	Lateral System Considered in BDA Project

4.RR.N

Dasarahalli Zone STP FLOW CAPACITY (MLD)

STP FLOW CAPACITY (MLD)

No	Village	Connection of Main Sewer	Population		Conecting STP	Remarks
			2034	2049		
1	Abbigere	O-1 connecting to MH-102 of myadarahalli	3,320	5,277	Chikkabanavara 2 STP	To Village No 5
		O-2 connecting to mh-36 of ts-821 A	419	666		
		O-3 connecting to mh-40 of ts-821A	130	207		
		O-4 connecting to mh-43 of ts-821A	141	224		
		O-5 Connecting to Mh-48 of ts-821A	96	153		
		O-6 connecting to mh-24 of ts-821	1,429	2,272		
		O-7 Connecting to mh-34 of ts-821	154	245		
		O-8 connecting to mh-35 of ts-821	145	230		
		O-9 connecting to mh-36 of ts-821	139	221		
		O-10 connecting to mh-37 of ts-821	224	356		
		O-11 connecting to mh-38 of ts-821	94	149		
		O-12 connecting to mh-39 of ts-821	71	113		
		O-13 connecting to mh-40 of ts-821	99	157		
		O-14 connecting to mh-41 of ts-821	133	211		
		O-15 connecting to mh-42 of ts-821	7,117	11,313		
		O-16 connecting to mh-43 of ts-821	135	215		
		O-17 connecting to mh-44 of ts-821	97	154		
		O-18 connecting to mh-45 of ts-821	96	153		
		O-19 connecting to mh-52 of ts-821	7,705	12,248		
		Total	**21,744**	**34,564**		
2	Chikkasandra	O-1 (Connecting to MH-36 of TS-823)	14,095	22,405	Chikkabanavara 2 STP	
		O-2 (Connecting to MH-45 of TS-823)	1,419	2,256		
		O-4 Connecting to Chikkabanavara ISPS	1,495	2,376		
		O-5 Connecting to Chikkabanavara ISPS	6,622	10,526		
		O-6 Connecting to out let of TS-823	525	835		
		Total	**24,156**	**38,398**		

5.DAS

No	Village	Connection of Main Sewer	Population		Conecting STP	Remarks
			2034	2049		
3	Shettihalli	O-1(Connecting to MH-36 of TS-823)	8,353	13,278	Chikkabanavara 2 STP	
		O-2(Connecting to MH-15 of TS-823)	3,113	4,948		
		O-3(Connecting to MH-10 of EX TS-83)	315	501		
		O-4 (Connecting to MH-11 TS-823)	1,176	1,869		
		O-5(Connecting to MH-34 of TS-823)	4,593	7,301		
		Total	**17,550**	**27,897**		
4	Sidedahalli	O-2 (Connecting to Ex- Bagalkunte ISPS)	75,795	120,484	Nagasandra STP	
		Total	**75,795**	**120,484**		
5	Myadarahalli	O-1 Connecting MH-43 of TS-823	875	1,391	Chikkabanavara 2 STP	
		O-2 cONNECTING TO MH-45 OF TS-823)	215	342		
		O-3 Connecting to Mh-39 of TS-823	233	370		From Village No 1
		O-4 Connecting to Mh-43 of TS-823	82	130		
		O-5 Connecting to Mh-45 of TS-823	506	804		
		O-6 Connecting to Mh-46 of TS-823	88	140		
		O-7 Connecting to Mh-47 of TS-823	722	1,148		
		O-8Connecting to Mh-48 of TS-823	74	118		
		O-9 Connecting to Mh-49 of TS-823	64	102		
		O-10 Connecting to Mh-50 of TS-823	225	358		
		O-11 Connecting to Mh-53 of TS-823	115	183		
		O-12 Connecting to Mh-54 of TS-823	72	114		
		O-13 Connecting to Mh-55 of TS-823	75	119		
		O-14 Connecting to Mh-56 of TS-823	59	94		
		O-15 Connecting to Mh-57 of TS-823	60	95		
		O-16 Connecting to Mh-58 of TS-823	51	81		
		O-17 Connecting to Mh-59 of TS-823	42	67		
		O-18 Connecting to Mh-60 of TS-823	120	191		
		O-19 Connecting to Mh-37 of TS-823	88	140		
		O-20 MH-67 of TS-823	331	526		
		Total	**4,097**	**6,513**		From Village No 1

5.DAS

No	Village	Connection of Main Sewer	Population		Conecting STP	Remarks
			2034	2049		
6	Kariobanhalli	O-1 Connecting to MH-17 of TS-722	3,207	5,098	Nagasandra STP	
		O-2 Connecting to MH-21 of TS-722	5,623	8,938		
		O-3 Connecting to MH-37 of TS-722	4,462	7,093		
		O-4 Connecting to MH-31 of TS-722	633	1,006		
		O-5 Connecting to MH-46of TS-722	6,363	10,115		
		O-6 connecting to MH-699 of handrahalli	18,003	28,618	Kariobavanahalli STP	
		O-7 Connecting to MH-811 of Handrahalli	787	1,251		
		O-8 Connecting to MH-298 Handrahalli	2,428	3,860		
		O-9 Connecting to Proposed STP	19,288	30,660		
		Total	**60,794**	**96,638**		From Village No 7
7	Handrahalli	O-1 Connecting to MH-414 of Kariobanahalli	23,542	37,422	Kariobavanahalli STP	To Village No 6
		O-2 Connecting to MH-391 of	4,210	6,692	Hosahalli STP	To Village No 9
		O-3 Connecting to MH -318 of Lingaderanahalli	2,644	4,203		To Village No 9
		Total	**30,396**	**48,317**		From Village No 6 and ULB
	Dasarahalli	From Chatchment 20 of 7-B package ULB	10,779	**17,134**		To Village No 7
8	Doddabidarakallu	O-1 Connecting to Proposed STP	49,167	78,156	Doddabidarkallu STP	
		O-2 Connecting to Proposed STP	11,641	18,505		
		Total	**60,808**	**96,660**		
9	Lingadeeranahalli (B)	O-1 Connecting to MH-41 of Hosahalli	15,196	24,156	Hosahalli STP	To Village No 10
		Total	**15,196**	**24,156**		From Village No 7 and No 11
10	Hosahalli	O-1 Conecting to Hosahalli STP	6,672	10,606	Hosahalli STP	
		O-2 Ccnnecting to MH-2110 of Herohalli	113	180		To Village No 11
		O-3 connecting to MH-2118 of Herohalli	965	1,534		To Village No 11
		Total	**7,750**	**12,319**		From Village No 9 and No 11

5.DAS

No	Village	Connection of Main Sewer	Population		Conecting STP	Remarks
			2034	2049		
11	Herohalli	O-1 Connecting to MH-1 OF TS-621	1,928	3,065	Doddabele STP	Under Construction Phase-2
		O-2 Connecting to Mh-20 of TS-621	33,188	52,756		
		O-3 Connecting to Mh-17 of TS-621	2,795	4,443		
		O-4 Connecting to MH-16 of TS-621	188	299		
		O-5 Connecting to Mh-22 of TS-621	937	1,489		
		O-6 Connecting to Mh-21 of TS-621	437	695		
		O-7 Connecting to Mh-28 of TS-621	18,949	30,121		
		O-8 Connecting to Mh-35 of TS-621	1,211	1,925		
		O-9 Connecting to Mh-36 of TS-621	94	149		
		O-10 Connecting to Mh-37 of TS-621	163	259		
		O-11 Connecting to Mh-41 of TS-621	116	184		
		O-12 Connecting to Mh-42 of TS-621	242	385		
		O-13 Connecting to Mh-43 of TS-621	236	375		
		O-14 Connecting to Mh-45 of TS-621	17,402	27,662		
		O-15 Connecting to MH-464 of Lingaderanahalli	202	321	Hosahalli STP	To Village No 9
		O-16 Connecting TO MH-463 OF Lingaderanahalli	260	413		To Village No 9
		O-17 Connecting to Mh-180 of Hosahalli	1,499	2,383		To Village No 10
		O-18 Connecting to MH-14 of TS-621	153	243	Doddabele STP	Under Construction Phase-2
		O-19 Connecting to Mh-46 of TS-621	10,656	16,939		
		O-20 Connecting to Mh-50 of TS-621	123	196		
		O-21 Connecting to Mh-51 of TS-621	119	189		
		O-22 Connecting to Mh-52 of TS-621	403	641		
		O-23 Connecting to Mh-56 of TS-621	631	1,003		
		O-24 Connecting to Mh-57 of TS-621	315	501		
		O-25 Connecting to Mh-58 of TS-621	490	779		
		O-26 Connecting to Mh-59 of TS-621	1,596	2,537		
		O-27 Connecting to Mh-60 of TS-621	1,129	1,795		
		O-28 Connecting to Proposed STP	22,107	35,141	Herohalli STP	
		O-29 Connecting to Mh-77 of TS-621	9,210	14,640	Doddabele STP	Under Construction Phase-2
		O-30 Connecting to MH-228 of Hosahalli	5,087	8,086	Hosahalli STP	To Village No 10
		O-31 Connecting to Mh-335 of Hosahalli	1,938	3,081		To Village No 10
		O-32 Connecting to Mh-18 of TS-621	276	439	Doddabele STP	Under Construction Phase-2
		O-33 Connecting to MH-32 of TS-621	391	622		
		O-34 Connecting to Mh-78 of TS-621	7,256	11,534		
		O-35 Connecting to ISPS&connecting to MH-831	3,521	5,597	Doddabele STP	Under Construction Phase-2
		O-36 Connecting to MH-1 Hosahalli	5,379	8,550	Hosahalli STP	To Village No 10
		Total	**150,627**	**239,437**		From Village No 9

5.DAS