

Initial Environmental Examination

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Prepared by Guwahati Development Department & Urban Development Department,
Government of Assam for the Asian Development Bank

The initial environmental examination is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

Preface

During June 2011 ADB TA team finalized draft Initial Environmental Examination (IEE) for Dibrugarh Solid Waste Management package

for Tranche 1 loan processing. That report is already disclosed in ADB website.

During detail project stage subproject components are detailed and scope of the project is more focused. At the same time, EIA report is prepared for environment clearance as per National Rule and after generation of base line environment data. That information is included in present report.

Hence the present report is “revised and updated report” where detail locations, components, consultation, base line environment are included. State Environment Impact Assessment Authority of Assam recently granted Environment Clearance for the project.

WEIGHTS AND MEASURES

cm	–	centimeter
dbA	–	decibels
dia.	–	diameter
ha	–	Hectare
kg	–	kilogram
km	–	kilometer
l	–	liter
m	–	Meter
m ²	–	square meter
m ³	–	cubic meter
mg/l	–	Milligrams per liter
ml	–	milliliter
MLD	–	million liters per day
mm	–	millimeter
sq. km.	–	square kilometers
sq. m.	–	square meters
µg/m ³	–	micrograms per cubic meter

In preparing any country program or strategy, financing any project, or by making any designation of or reference to a particular territory or geographic area in this document, the Asian Development Bank does not intend to make any judgments as to the legal or other status of any territory or area.

ABBREVIATIONS

ADB	-	Asian Development Bank
BRT	-	Bus Rapid Transit
CTO	-	Consent to Operate
DMB	-	Dibrugarh Municipal Board
DSC	-	Design and Supervision Consultant
EARF	-	Environmental Assessment and Review Framework
EMP	-	Environmental Management Plan
GDD	-	Guwahati Development Department
GRM	-	Grievance Redress Mechanism
IEE	-	Initial Environmental Examination
MFF	-	Multi tranche Financing Facility
PIU	-	Project Implementation Unit
SPS	-	Safeguards Policy Statement
UDD	-	Urban Development Department

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EXECUTIVE SUMMARY

1. The Assam Urban Infrastructure Investment Program is a key urban infrastructure initiative of the Government of Assam), and aims to improve the urban environment and quality of life in the cities of Guwahati and Dibrugarh through the delivery of improved water supply, sanitation, solid waste management (SWM), drainage infrastructure, and a sustainable urban transport system such as a Bus Rapid Transit (BRT) corridor. The Program uses a Multi-tranche Financing Facility (MFF) modality and to be implemented over a 6-year period from 2012 to 2017. Investments under the MFF will be delivered in two tranches. For Guwahati these included water supply, sewerage, and transportation while for Dibrugarh included drainage, solid waste management and basic services for the poor were identified.
2. The major outputs of the Program include: (i) for Guwahati, improved water supply, sanitation, and urban transport through a BRT corridor; and (ii) for Dibrugarh, improved drainage, and comprehensive SWM.
3. The Government of Assam's Guwahati Development Department (GDD) is the executing agency. A state-level PMU, headed by Project Director (PD), established as the Implementing Agency which will be in-charge of overall execution and technical supervision, monitoring, and financial control of all activities under the project. Project Implementation Units (PIUs) dedicated exclusively to the project set up in Guwahati and Dibrugarh. The PIUs will be headed by a senior technical officer and assisted by qualified and experienced officers seconded from ULBs, finance and other line departments. The PIUs will be responsible for the day-to-day activities of project implementation in the field and will be under the direct administrative control of the PMU.
4. The PMU will have Safeguards Compliance and Monitoring Unit (PMU SCMU) to ensure mitigation of negative environmental and social impacts due to the subproject, if any. The PMU SCMU will have a Safeguards Officer (PMU SO). The PMU assisted by the Project Management Consultant Safeguards Specialist (PMC SS). The PIUs will each have an Environment Officer (EO) and Resettlement Officer (RO) who will be responsible for implementation of the Initial Environmental Examination (IEE)/Environmental Management Plan (EMP) and the Resettlement Plan (RP) respectively. An Environment Specialist as part of the Design and Supervision Consultant (DSC) team is to assist the PIUs in updating the IEE during detailed design stage and monitoring of the subproject's EMP during the construction stage. ADB will review and approve all final IEEs prior to award of contract.
5. ADB requires the consideration of environmental issues in all aspects of its operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. According to the SPS, initial environmental examination report is prepared and updated for Dibrugarh Solid waste management sub project under Tranche 1.
6. This Initial Environmental Examination (IEE) has been updated (Initially prepared in June 2011) for Dibrugarh Solid Waste Management Subproject which covers, (i) improvement of collection efficiencies, both primary and secondary; (ii) improvement in the existing system - transportation facilities; and (iii) improvement of treatment and disposal of wastes through development of 60 TPD Landfill Site and 100 TPD processing plant at Ghoramara village Dibrugarh within 1.91 ha land
7. Construction work is likely to commence in 2016 and will be completed within 750 days.
8. The subproject is listed in the EIA Notification of 2006 "Schedule of Projects Requiring Prior Environmental Clearance" thus Environment Clearance (EC) is required. As per Schedule, Dibrugarh solid waste management project is considered as Category 'B'. EC will be obtained from the Department of Environment and Forest Govt. of Assam. Organization recognized by National Accreditation Board of Education and Training/Quality Council of India (NABET/QCI) has been engaged for preparation of Environment Impact Assessment (EIA) Report and followed by Environment Clearance (EC). EC is obtained from State Environment Impact Assessment Authority, Assam on 21st

September 2015. EC is accorded subject to specific and general conditions as mentioned in environment clearance letter.

9. The environmental and public health benefits of the project include reduced risks of soil and water contamination and microbial and vector and water borne diseases from improved solid waste management. The site for the landfill is located in vacant undeveloped private lands which already acquired by the government. There are no protected areas, critical habitat and eco sensitive areas, wetlands, mangroves, or estuaries within 10 kilometer (km) radius of the site. The site is at least 500 meters (m) from the nearest inhabited areas. Trees, vegetation (mostly shrubs and grasses), and animals those commonly found in built-up areas. Though proposed landfill site lies in flood plains of Sessa River, but there would be no major impacts to the river water quality expected due to application of environment management plan and mitigation measures. The protection measures have been worked out in the design which includes construction of retaining wall along the bank of the river, and provision of a 100 m wide green buffer along the boundary of the site abutting the river.

10. The process described in this document has assessed the environmental impacts of the subproject. Potential negative impacts were identified during construction and operation of the improved infrastructure. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result some measures have already been included in the designs of the infrastructure.

11. Regardless of these there will still be impacts on the environment when the infrastructure is built and when it is operating. During the construction phase, impacts mainly arise from (i) need to dispose significant quantities of waste soil from the projects and (ii) disturbance of residents, traffic by the construction work. These are common impacts of construction in urban areas, and there are well developed methods for their mitigation. Once the system is operating, most facilities will operate with routine maintenance, which should not significantly affect the environment. It is proposed that the 100-m wide green buffer to be developed by planting tall trees of endemic species. The subproject will also employ in the workforce people who live in the vicinity in the longer term to maintain and operate the new facilities.

12. An Environmental Management Plan (EMP) is proposed as part of this IEE which includes (i) mitigation measures for significant environmental impacts during implementation; (ii) an environmental monitoring program, and the responsible entities for mitigation, monitoring, and reporting; (iii) public consultation and information disclosure; and (iv) a grievance redress mechanism. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. A number of impacts and their significance have already been reduced by amending the designs.

13. Mitigation will be assured by a program of environmental monitoring to be conducted during construction stages. The environmental monitoring program will ensure that all measures are implemented, and will determine whether the environment is protected as intended. It will include observations on- and off-site, document checks, and interviews with workers and beneficiaries. Any requirements for remedial action will be reported to the ADB.

14. The stakeholders were involved in developing the IEE through discussions on site and public consultation after which views expressed were incorporated into the IEE and the planning and development of the subproject. For the benefit of the community the summary IEE will be translated in Assamese and made available at: (i) ULB office; (ii) District Magistrate Office; and, (iii) PMU; and (iv) PIUs. Hard copies of the IEE will be kept in public locations accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. Electronic version of the IEE will be placed in the official website of the PMU/State Government and the official website of ADB after approval of the IEE by Government and ADB. The PMU will issue Notification on the locality-wise start date of implementation of the subproject. The notice will be issued by the PMU in local newspapers one month ahead of the implementation works. Copies of the IEE will be kept in the PMU and PIU offices and will be distributed to any person willing to consult the IEE.

15. Therefore the proposed subproject is unlikely to cause significant adverse impacts. The potential adverse impacts that are associated with design, construction, and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures.

16. Based on the findings of the IEE, the classification of the Subproject as Category B is confirmed, and no further special study or detailed environmental impact assessment (EIA) needs to be undertaken to comply with ADB SPS (2009). Only for compliance against National Rule Environment Clearance is required.

I. INTRODUCTION

A. Background

17. The Assam Urban Infrastructure Investment Program is a key urban infrastructure initiative of the Government of Assam, and aims to improve the urban environment and quality of life in the cities of Guwahati and Dibrugarh through the delivery of improved water supply, sanitation, solid waste management (SWM), drainage infrastructure, and a sustainable urban transport system such as a Bus Rapid Transit (BRT) corridor. The Program uses a Multi-tranche Financing Facility (MFF) modality and to be implemented over a 6-year period from 2012 to 2017. Investments under the MFF will be delivered in two tranches. For Guwahati these included water supply, sewerage, and transportation while for Dibrugarh included drainage, solid waste management and basic services for the poor were identified. Geographical location of Assam is shown in **Figure 1** below. **Figure 2** shows the Dibrugarh city map.

18. ADB requires the consideration of environmental issues in all aspects of its operations, and the requirements for environmental assessment are described in ADB's *Safeguard Policy Statement (SPS, 2009)*.

19. ADB classified the subproject as environment Category B and accordingly initial environmental examination (IEE) is required for all subprojects. This IEE has been prepared for Dibrugarh Solid Waste Management subproject which covers, (i) improvement of solid waste collection efficiencies, both primary and secondary; (ii) improvement in the existing system - transportation facilities; and (iii) improvement of treatment and disposal of wastes through development of 60 TPD Landfill Site and 100 TPD processing plant at Ghoramara village Dibrugarh within 1.91 ha land

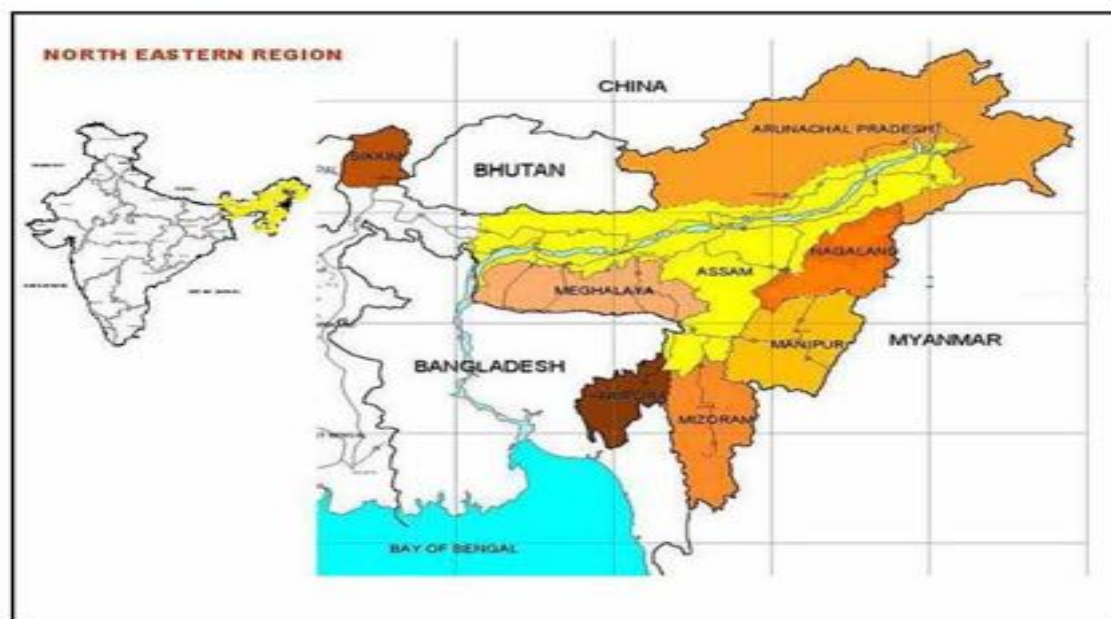


Figure 1: Geographical location of Assam in North East Region



Figure 2: Dibrugarh City Map

B. Environmental Compliance Requirements

1. ADB Safeguard Policy Statement (SPS, 2009)

20. ADB requires the consideration of environmental issues in all aspects of its operations, and the requirements for environmental assessment are described in ADB SPS, 2009. This states that ADB requires environmental assessment of all project loans, program loans, sector loans, sector development program loans, and loans involving financial intermediaries, and private sector loans.

21. **Screening and Categorization.** The nature of the environmental assessment required for a project depends on the significance of its environmental impacts, which are related to the type and location of the project, the sensitivity, scale, nature and magnitude of its potential impacts, and the availability of cost-effective mitigation measures. Projects are screened for their expected environmental impacts are assigned to one of the following four categories:

- (i) **Category A.** Projects could have significant adverse environmental impacts. An EIA is required to address significant impacts.
- (ii) **Category B.** Projects could have some adverse environmental impacts, but of lesser degree or significance than those in category A. An IEE is required to determine whether significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report.
- (iii) **Category C.** Projects are unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are reviewed.
- (iv) **Category FI.** Projects involve a credit line through a financial intermediary or an equity investment in a financial intermediary. The financial intermediary must apply an environmental management system, unless all Projects will result in insignificant impacts.

22. **Environmental Management Plan.** An EMP which addresses the potential impacts and risks identified by the environmental assessment shall be prepared. The level of detail and complexity of the EMP and the priority of the identified measures and actions will be commensurate with the subproject's impact and risks.

23. **Public Disclosure.** ADB will post the following safeguard documents on its website so affected

people, other stakeholders, and the general public can provide meaningful inputs into the subproject design and implementation:

- (i) For environmental category A projects, draft EIA report at least 120 days before Board consideration.
- (ii) Final or updated IEE upon receipt; and
- (iii) Environmental Monitoring Reports submitted by PMU during subproject implementation upon receipt.

24. The above is to meet the requirements of ADB's Public Communication Policy 2011.

C. Government of India and State of Assam Requirements

25. The implementation of the subprojects will be governed by GoI and State of Assam environmental acts, rules, regulations, and standards. These regulations impose restrictions on the activities to minimize/mitigate likely impacts on the environment. It is the responsibility of the project executing and implementing agencies to ensure subprojects are consistent with the legal framework, whether national, state or municipal/local. In addition, subprojects shall also be consistent with ADB SPS. The following legislations are applicable to the subproject:

- (i) Environmental (Protection) Act of 1986, its rules and amendments;
- (ii) Environmental Impact Assessment (EIA) Notification of 2006;
- (iii) Water (Prevention and Control of Pollution) Act of 1974, its Rules, and amendments;
- (iv) Air (Prevention and Control of Pollution) Act of 1981, its Rules and amendments;
- (v) Central Pollution Control Board (CPCB) Environmental Standards;
- (vi) Wildlife (Protection) Act of 1972, its Rules and amendments;
- (vii) Indian Forest Act of 1927;
- (viii) Forest (Conservation) Act of 1980, its Rules and amendments;
- (ix) Assam Forest Regulation of 1891;
- (x) Assam Forest Policy of 2004;
- (xi) Guidelines for Diversion of Forest Lands for Non-Forest Purpose under the Forest (Conservation) Act of 1980;
- (xii) Ancient Monuments and Archaeological Sites and Remains Rules of 1959; and
- (xiii) Land Acquisition, Rehabilitation and Resettlement Act, 2013

26. Key standards include those related to drinking water quality, air quality, effluent discharge, and protected areas. Compliance is required in all stages of the subproject including design, construction, and operation and maintenance.

27. The GoI laws cover the occupational health and safety of employees working only in factories and mines. However, the Constitution of India has provisions to ensure that the health and well-being of all employees are protected and the State has the duty to ensure protection. For this subproject, the mitigation measures were based on the World Bank Environmental, Health, and Safety (EHS) Guidelines.

D. Environmental Assessment Requirements

28. The GoI Environmental Impact Assessment (EIA) Notification of 2006 requires environmental clearance (EC) for certain defined activities/projects. This Notification classifies the projects/activities that require EC into 'A' and 'B' categories depending on the impact potential and/or scale of subproject.

For both category projects, prior EC is mandatory before any construction work, or preparation of land except for securing the land, is started. Clearance provisions are as follows: Category 'A' projects requires prior Environmental Clearance" from the GoI Ministry of Environment and Forest (MoEF); Category 'B' projects requires prior Environmental Clearance" from the State Environmental Impact Assessment Authority (SEIAA).

29. This Notification provides that, any project or activity specified in Category B will be treated as Category A, if located in whole or in part within 10 km from the boundary of: (i) protected areas notified under the Wild Life (Protection) Act, 1972, (ii) critically polluted areas as notified by the Central Pollution Control Board (CPCB) from time to time, (iii) notified Eco sensitive areas, and (iv) inter-state boundaries and international boundaries.

30. The subproject is listed in the EIA Notification of 2006 "Schedule of Projects Requiring Prior Environmental Clearance" thus Environment Clearance (EC) is required. As per Schedule, Dibrugarh solid waste management project is considered as Category 'B'. EC needs to be obtained from the Department of Environment and Forest Govt. of Assam. Organization recognized by National Accreditation Board of Education and Training/Quality Council of India (NABET/QCI) has been engaged for preparation of Environment Impact Assessment (EIA) Report and followed by Environment Clearance (EC).). EC is obtained from State Environment Impact Assessment Authority, Assam on 21st September 2015. EC is accorded subject to specific and general conditions as mentioned in environment clearance letter.

31. **Appendix 1** shows step wise Environment Clearance process. **Appendix 2** shows EC letter from State Environment Impact Assessment Authority, Assam and specific & general conditions.

32. Compliance statement against EC condition authenticated by Dibrugarh Municipal Board is attached as **Appendix 3**. There is an issue on shifting of L. P. School nearby the landfill site. Project Director AUJIP already requested Deputy Commissioner Dibrugarh for shifting arrangement of L. P. School before commencement of work. Letter is attached as **Appendix 4**.

E. National Legal Requirements

33. **Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments.** Any component of the Subproject having potential to generate sewage or trade effluent will come under the purview of the Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments. Such projects have to obtain Consent for Establishment (CFE) under Section 25 of the Act from Assam Pollution Control Board (APCB) before starting implementation and Consent to Operate (CTO) before commissioning. The Water Act also requires the occupier of such subprojects to take measures for abating the possible pollution of receiving water bodies. The following subprojects require CFE and CTO from Assam Pollution Control Board (APCB).

- (i) Municipal Solid Waste Management facilities;
- (ii) New or augmentation of water treatment plants; and
- (iii) New or augmentation of sewerage treatment plants.

34. **Air (Prevention and Control of Pollution) Act of 1981, Rules of 1982 and amendments.** The subprojects having potential to emit air pollutants into the atmosphere have to obtain CFE under Section 21 of the Air (Prevention and Control of Pollution) Act of 1981 from APCB before starting implementation and CTO before commissioning the subproject. The occupier of the subproject/ facility has the responsibility to adopt necessary air pollution control measures for abating air pollution. The following require CFE and CTO from APCB: (i) diesel generators; and (ii) hot mix plants, wet mix plants, stone crushers etc, if installed for construction.

35. Emissions and discharges shall comply with standards notified by the CPCB. **Appendix 5** provides applicable standards for effluents, receiving water bodies, air quality, water quality and noise levels.

36. Municipal Solid Waste (Management and Handling) Rules of 2000. Gol notified Municipal Solid waste (Management and Handling) Rules of 2000 (MSWMHR) in exercise of the powers conferred by Sections 3,6, and 25 of the Environment (Protection) Act (1986) with the objective of regulating the management and handling of the municipal solid waste. Under the Rules, the municipal authority is required to take all steps to ensure that the municipal solid wastes generated in their jurisdiction are handled and disposed of without causing any adverse impact on human health or environment. The municipal authority or an operator of a facility shall obtain authorization for setting up waste processing and disposal facility (including landfills) from APCB.

37. Forest Legislations. GoA makes rules under the Indian Forest Act to regulate activities like cutting of trees and removal of forest produce; clearing or breaking up of land for cultivation or any other purpose; and for protection and management of any portion of protected forest. Cutting of trees in non-forest land, irrespective of land ownership, also requires permission from the State Forest and Environment Department. Afforestation to the extent of three trees per each tree felled is mandatory. The subproject site is located at semi urban area and will not encroach on any reserve forest/protected area thus forest clearance is not required. Also no tree felling will be required.

38. Ancient Monuments and Archaeological Sites and Remains Rules, of 1959. The Rules designate areas within a radius of 100 meters (m) and 300 m from the “protected property” as “protected area” and “controlled area” respectively. Protected property includes the site, remains, and monuments protected by Archaeological Survey of India or the State Department of Archaeology. For the subproject, there are no Archaeologically Protected Areas within Dibrugarh.

39. The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013. The Act shall come into force on January 1, 2014 as notified by the Central Government. The Act will replace the Land Acquisition Act, 1894, a nearly 120-year-old law enacted during British rule and lays emphasis on Rehabilitation & Resettlement in cases of land acquisition. Private land acquisition is guided by the provisions and procedures under this Act. Before the acquisition of any land, the Government is required to consult the concerned Panchayat or Municipal Corporation and carry out a Social Impact Assessment in consultation with them. The Act provides a transparent process for land acquisition for industrialization, development of essential infrastructural facilities and urbanization by giving adequate financial compensation to the affected people. For the subproject, private land acquisition is required. Land acquisition process has been completed. Details are disclosed in Resettlement Plan for the said project.

II. DESCRIPTION OF SUBPROJECT

A. Present Solid Waste Management Scenario & Need for the Subproject

40. The Dibrugarh Municipal Board (DMB) is responsible for managing solid waste within the municipal limits while the rest of the Dibrugarh Municipal Planning Area (DMPA) is presently not covered. Major sources generating municipal solid wastes in Dibrugarh are the households, commercial establishments, institutions, markets, street sweeping, and construction / demolition activities. No recorded estimations on total waste generation are available with DMB. As per study carried out by Dibrugarh Municipal Board, approx. 69.72 TPD of MSW is generated from the Dibrugarh Municipal Board area in year 2011 and with the existing infrastructure & facility Dibrugarh Municipal Board is able to lift only 50% of waste per day. The present waste collection frequency is very irregular and inadequate. Wastes are not segregated at source and are a mixture of inert, recyclable and bio-degradable matters. Assam Medical College has the only bio-medical waste treatment facility, with an incinerator of capacity 50 kilograms (kg)/hr. Dibrugarh Municipal Board provides facility to other health care establishment on chargeable basis. At present only nine tractor trailers and one truck are involved for collection of wastes, which are insufficient and moreover those vehicles are parked within the Dibrugarh Municipal Board office premises as there is no garage and repair facility of these vehicles. The DMB has added a cesspool cleaner of 3000 liter capacity. The present disposal site is located at

Maizan, Barsuikiya Gaon. The dumping site is 6 km away from the city and measures an area of 1.2 ha. The dumping site is located on the banks of the river Brahmaputra. Leachate generated from the dumping site finds its way into the river and also percolates into ground water. Due to this there is a potential scope to pollute the adjacent surface water and groundwater system and accordingly Assam Pollution Control Board (APCB) has issued a closure notification to this dumpsite. The quantity of proposed solid waste generation up to 2046 including projected generation of bio-degradable, recyclable, inert, compostable and landfill materials in DMPA area are appended in **Appendix 6**. Present characteristic of municipal solid waste is enclosed in **Appendix 6**.

41. The following key issues were identified:

- (i) Need of an extensive public awareness campaign and initiate house-to-house collection and waste segregation for a sample cluster of households;
- (ii) Need to improve collection system efficiency.
- (iii) The unscientific method for disposal of solid waste at the dumping ground should be stopped and the biodegradable organic fraction should be processed;
- (iv) Non-biodegradable fraction and rejects from processing units should be disposed off by sanitary landfill method.

42. The photo illustration of the existing disposal site at Maijan and present status of storage and disposal are appended in **Appendix 7**.

43. Thus to provide a healthy & quality environment for living, it is required to develop an efficient solid waste management system. Proposed Municipal Solid Waste Management Facility will be designed taking care of increasing population. Facilities will be designed on the basis of projected population. Waste from residential area will be collected through door to door collection system. Daily sweeping of roads & cleaning of drains will be carried out. Waste will be lifted from temporary waste collection points as per designed waste collection & transportation plan, i.e. before reaching the filling capacity of waste storage container. Waste will be treated & disposed-off in a scientific manner as per *MSW (Management & Handling) Rules, 2000*.

B. Description of the Subproject

44. The physical investments would include, apart from installing of a solid waste management system in conformance to the Municipal Solid Waste Management and Handling Rules (MSWMHR), an extensive capacity building and awareness program. The capacity building resulting from the subproject implementation, in terms of the institutional setup and exposure to good subproject implementation practices shall provide a strong base towards the implementation of the master plan for the sector. The urgent improvement needs identified based on situation assessment and consultations include: (i) improvement of collection efficiencies, both primary and secondary; (ii) improvement in the existing system - transportation facilities; and, (iii) treatment and disposal of wastes in accordance with MSWMHR. The subproject components would then comprise the following (**Table 1**).

Table 1: Description of the Dibrugarh Solid Waste management Subproject Components

Subproject components	Description
Improvement of collection efficiencies-primary	<ul style="list-style-type: none"> ▪ The existing bins will be retained since they are recently installed. ▪ 100 numbers of 1100 liter capacity HDPE mobile garbage bins will be provided for facilitating better collection. ▪ 100 numbers of 50 liter capacity pole mounted litter bins will be provided in different areas of DMB; ▪ 200 nos. of push type hand cart with 6 containers of 30 liter capacity hand bucket will be provided for collecting segregated waste.

Improvement in the existing system-transportation facilities	<ul style="list-style-type: none"> ▪ 30 nos. of Garbage tipper vehicles for house to house collection and ▪ 7 nos. of compactor vehicles for secondary transportation. ▪ 1 poclain and 1JCB will be procured. ▪ 1 Buldozer for disposal site and composting operation. ▪ 1 electronic weighbridge for improved vehicle management
Treatment and disposal of wastes SLF in two phases. 2016-2031 phase.1 2032-2046 Phase.2	<ul style="list-style-type: none"> ▪ A new sanitary landfill site is to be developed at a 30-hectare (ha) vacant land in Gora Mora Village. ▪ For initial phase of development of sanitary landfill facility, 1.91 ha has been considered. ▪ One compost plant has been planned at that area. ▪ The compost plant rejects shall be disposed off at the sanitary landfill site. ▪ The facilities and components of the proposed landfill site are as follows: <ul style="list-style-type: none"> - approach road with road signs and bridge at entry and exist - fencing and compound wall with gate -internal roads - administrative unit, laboratory and first aid center -electromechanical weigh bridge (40 metric ton capacity) - computerized weigh room and record keeping room - guards room - garage, fire protection unit and store room for equipment and machinery - lighting arrangement - sub-station building - community toilet - washing bay with washing unit - leachate treatment facility - green belt and buffer plantation zone - reservoir for drinking water and washing facility at ground water level const. of bore well. - Retaining wall for flood protection along the landfill site. -Providing impermeable of clay/amended sol -providing geo membrane of 1.5 mm thickness.
Others	<ul style="list-style-type: none"> ▪ A detailed feasibility study of composting operations, with the objective of exploring opportunities of attracting private sector investment; ▪ Preparation of community awareness materials and implementation of a community awareness and consultation campaign through non-government organizations (NGOs) and community-based organizations (CBOs); and, ▪ Capacity building, operational and institutional development initiatives.

45. **Sanitary Landfill.** A sanitary landfill site with composting facilities is proposed at a site about 8.0 km from center of Dibrugarh town. The Dibrugarh Municipal Board (DMB) has acquired the land of 28.81 ha for solid waste disposal site. The proposed site, although situated near small; Sessa stream, with proper technological approach adopted as recommended in the Municipal Solid Waste (Management & Handling) Rules, 2000, the site is deemed sufficient for its landfill purpose and a much needed improvement over the existing unscientific dumping conditions of the city, currently maintains. At present, out of 28.81 ha of land available for SWM project only 1.91 ha will be used for Integrated Solid Waste Management Facility for Phase-1 activity and 2.7 ha for Phase-2 activity. The SWM facility site will be suitably developed by the DMB for solid waste treatment and disposal facilities.

46. The integrated solid waste management facility comprising of the followings:

- Adequate area and volume available at SWM site at present to receive and fill-up solid waste materials for a period about 30 years with expected height of about 10 meters for phase-1 activity and 16 meters for phase-2 activity. Since sanitary landfill site is located near Sessa stream, proper retaining walls are being constructed for protecting compost plant, other infrastructure facilities and landfill site.
- Adequate land within the SWM site should be made available for leachate collection and treatment facilities.
- Provision for administrative block, operator room, garage, parking place, and other related infrastructures should be provided.
- Proper site for locating compost plant with all the essential components of the plant and required infrastructure facilities.

47. The SWM Dibrugarh project will be developed into a land fill and composting facility. It is proposed to develop a 100 TPD compost plant along with sanitary landfill as an integrated facility. The compost plant with other infrastructure facilities will require about 0.8 ha of area for a life span of 20 years. The compost plant and landfill will be developed in conformity to the Solid Waste Management & Handling-Rules, 2000 Government of India. The landfill site proposed to be developed in 1.91 ha (Phase-1 activity). The administrative building, operators room, garages, and other infrastructures have been proposed keeping in view the terrain and land suitability as per the requirement. The approximate distance of Sessa stream course from the landfill site is about 100 m. The project site is adequately protected from flooding by constructing retaining wall all around the site. Suitable measures have been proposed to prevent ground water and surface water pollution.

48. **Landfill Design.** The sanitary landfill site consists of waste filling area and infrastructure support facilities. The support infrastructure (i.e., the access road, equipment shelters, weighing bridge, demarcation of landfill areas for stockpiling cover materials, and liner material, drainage facilities, leachate collection, and compost facilities) will be located in the layout. Grading required for landfill development will produce excavate which will be safely stockpiled and used as cover material for the landfill operations. In order to avoid surface and groundwater contamination, the excavated site is lined with natural clay of about 900 mm thick and 1.5 mm thick HDPE geo-membranes.

49. **Leachate Collection and Treatment.** A schematic diagram of leachate control mechanism at sanitary landfill site is shown in **Figure 3**. Leachate collection lateral pipes should be provided above the membranes in 300 mm thick silt sand. The 150 mm collection pipes shall be provided at a spacing of 20 m c/c. Perforations would be laid at a slope of 1 in 100. Header pipes will be provided connecting up to the leachate holding tank.

50. Land utilization status for MSW Management facility is shown in **Table 2**.

51. **Figure 4, 5** shows location of landfill site, 10 km buffer zone in and around landfill site respectively and **Figure 6** shows layout plan and general drawing for landfill and treatment facility at Ghoramara, Dibrugarh.

52. Proposed sanitary landfill site location is shown in **Appendix 7**.

Table 2: Land utilization for Sanitary landfill and other components

Sl no	Land Utilization for Different components	Area in Ha.
1	Sanitary Landfill Area (Phase-1)	1.91
2	Compost Plant Area with other facility	0.80
3	Leachate Treatment Plant Area	0.57
4	Raw Waste Storing Yard and other components of processing unit	1.11
5	Internal Road, facility – building	1.62

Sl no	Land Utilization for Different components	Area in Ha.
6	Green Belt Development Area	1.85
	Total	7.86
7	Sanitary Landfill Area (Phase-2)	2.70
	Grand Total	10.56

(Source: DPR, Solid Waste Management)

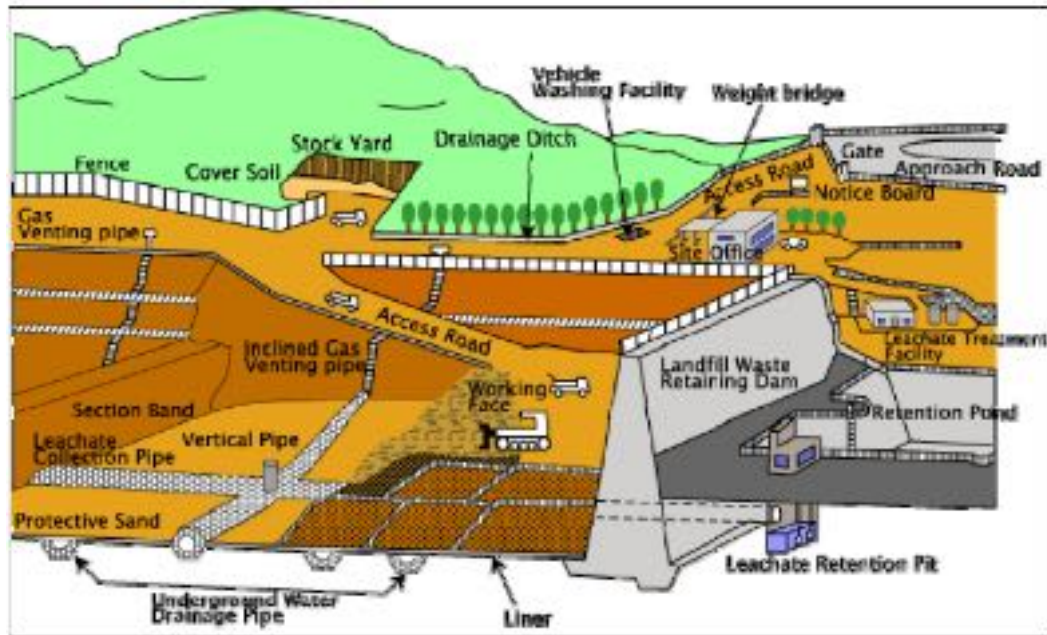


Figure 3: Anatomy of the Sanitary Landfill

(Source: DPR, Solid Waste Management)

C. Implementation Schedule

53. Construction work is likely to commence in 2016 and will be completed within 750 days from starting of the activities considered in the project.

D. Subproject Benefits

54. The solid waste management subproject will be beneficial to the citizens of Dibrugarh as it will provide better environmental conditions. The benefits to be accrued are manifold: (i) reduction in unhygienic conditions resulting in cleaner surroundings; (ii) reduction in choking of drains and streams; (iii) reduction in vulnerability to diseases; (iv) utilization of waste to useful resources; (v) reduction in the hazards of pollution of surface water and groundwater through uncontained leachate; (vi) increase in collection and transportation efficiencies; (vii) increase in geographical coverage of waste collection; and (viii) improved quality of life.

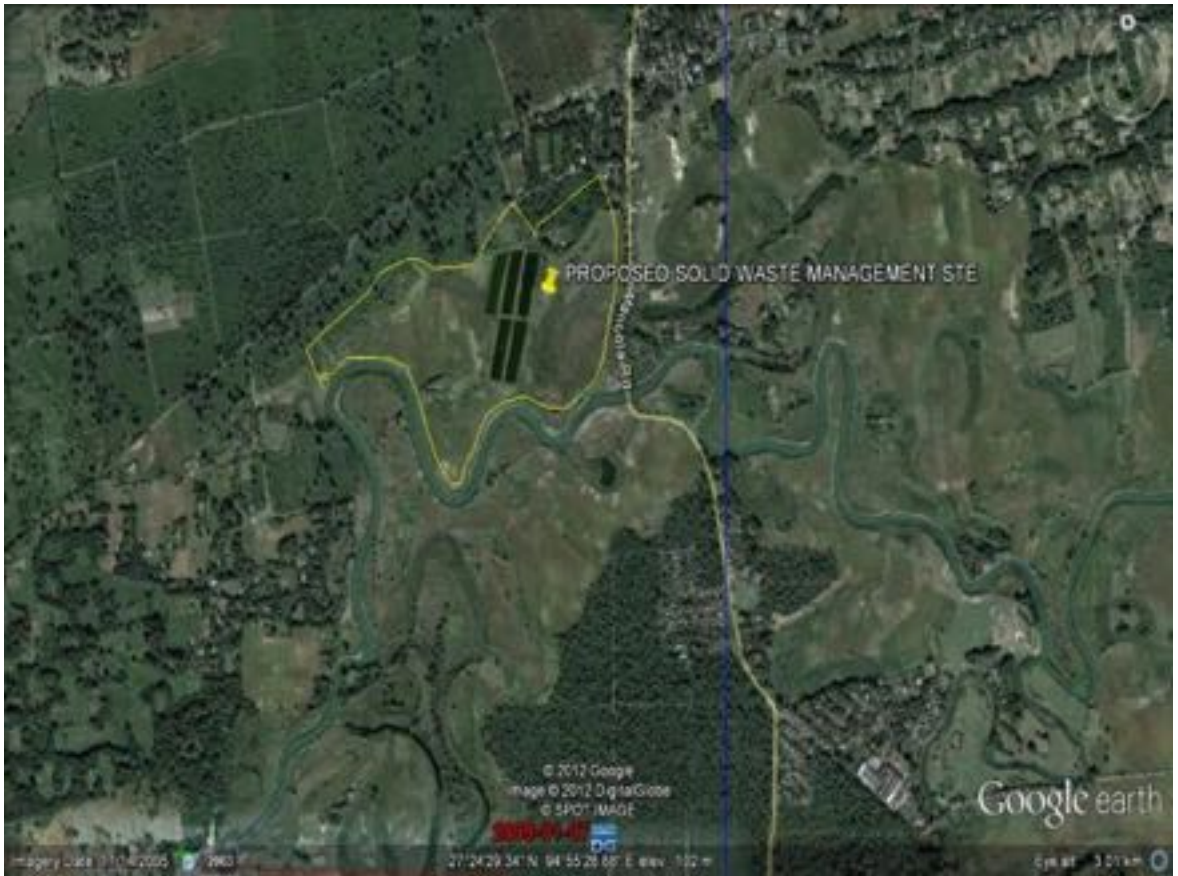


Figure 4: Map showing location of landfill site

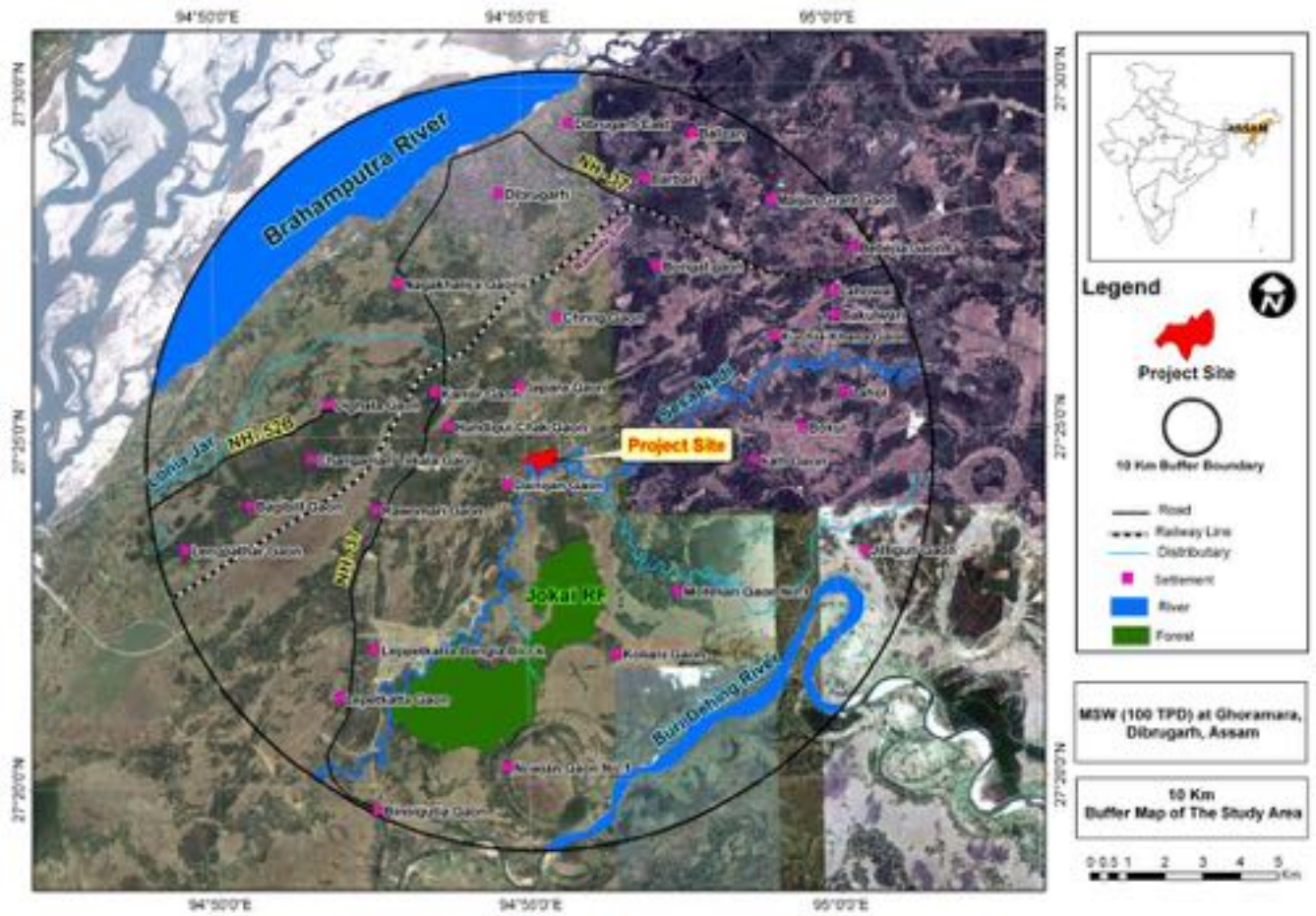


Figure 5: Buffer map of study area – project site

III. DESCRIPTION OF THE ENVIRONMENT

A. Physical Features

1. Location

55. Dibrugarh lies along the southern bank of the Brahmaputra River, falling on 27.26°N latitude and 94.35° E longitude. Dibrugarh is linked with rest of India through the National Highway 37 (NH-37). The town is situated at 104 m above the mean sea level. The physical characteristic of the district is constituted by a variety of elements such as flood plain, *beels* and swamps, occasional highlands and foothills of the Barail Range. The gradient of the district is from south-east to north-west.

56. The area may be divided into three distinct physiographic zones stretching parallel to the Brahmaputra River. These are: (i) the active floodplain and 'charland', (ii) the middle plain; and (iii) the southern foothills. The highly meandered course of the BurhiDhing here has left cut off as many as 40 wetlands in the form of ox-bow lakes and swamps. The foothill zone on the other hand consists of isolated hillocks interspersed with plain embankment extending into the Naga Hills. The high grounds of this zone composed mostly lateritic soils are covered by tea gardens or dense forests. Geographical location of Dibrugarh district in state of Assam is shown in **Figure 7** and map of Dibrugarh district is depicted in **Figure 8**.

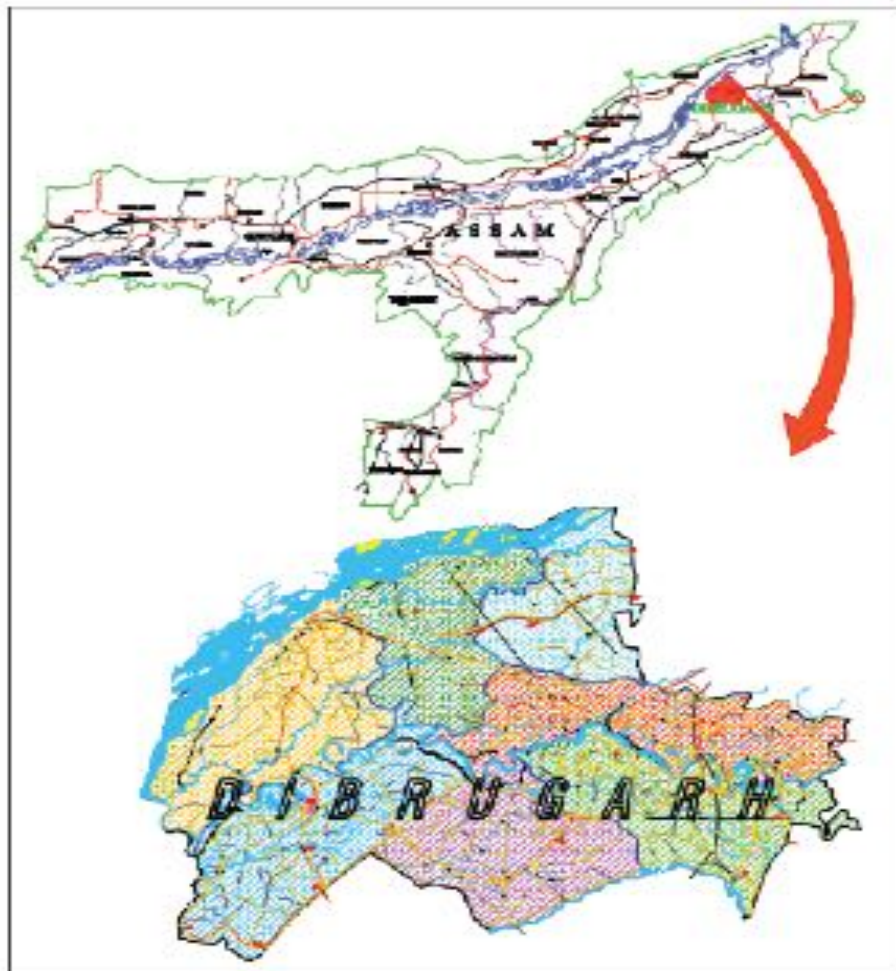


Figure 7: Geographical Location of Dibrugarh

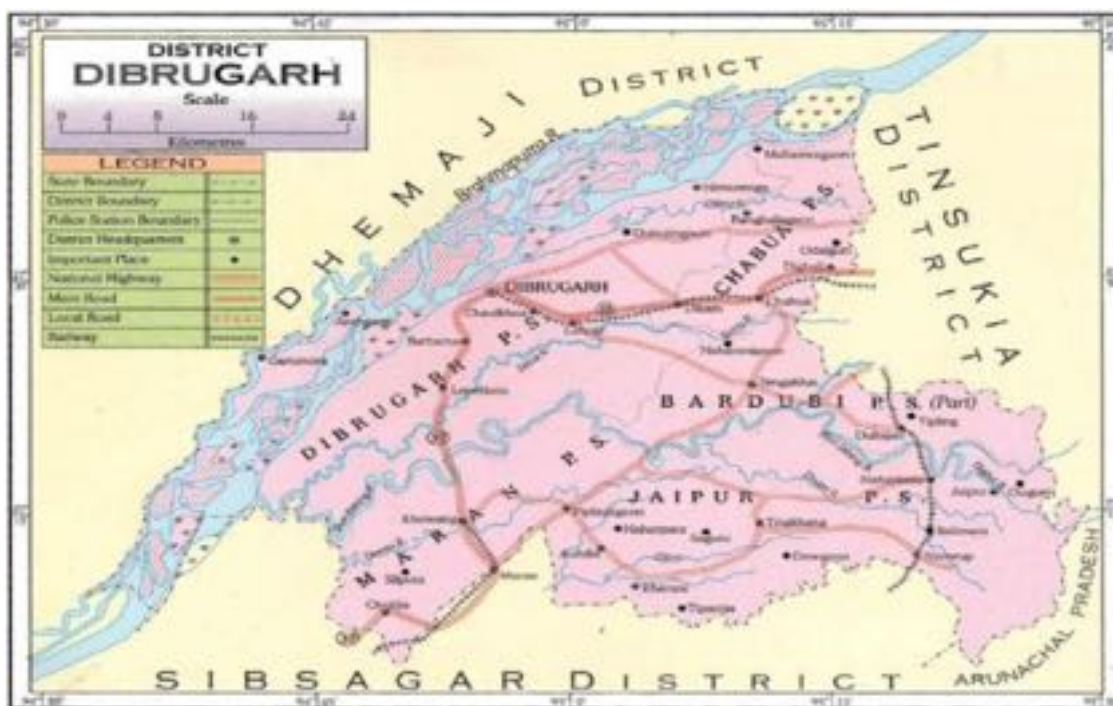


Figure 8: Dibrugarh District map

1. Climate

57. The Dibrugarh district is situated in the north-eastern part of Assam. It occupies 3, 54,500 hectares of area which accounts for 4.52 per cent area of the state. The district is situated in the humid sub-tropical region and is therefore characterized by heavy rainfall and high humidity. The cold season starts from the beginning of December and ends by the midst of February. This is followed by a period of moderate temperature up to the beginning of May. The hottest months of the year are June, July and August when the heat coupled with high humidity make the climate enervating and unhealthy.

- ✓ The average temperature in Dibrugarh district, Assam, India is 23.44°C.
- ✓ The warmest average max/ high temperature is 35.32°C in May, June, July, August & September.
- ✓ The coolest average min/ low temperature is 6.23°C in December, January & February

58. Dibrugarh town experiences subtropical monsoon climate with mild winter, warm and humid summer. The winter is from November to February, summer is from March to May and monsoon is from June to October. Rainfall in the town is frequent but for short span. The average annual rainfall is around 2400 mm over 172 rainy days in a year. The average annual temperature in Dibrugarh town is 23.9°C while the temperature varies between 7° to 35°C. The average humidity of the region is 74%. Winds are of moderate velocity, from the south-to-south-east direction for most of the time. Month wise average climatic condition of Dibrugarh town in shown in **Table 3**.

Table 3: Month wise average climate data of Dibrugarh

Climate data for Dibrugarh													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Record high °C (°F)	28.4 (83.1)	30.6 (87.1)	34.3 (93.7)	35.7 (96.3)	36.4 (97.5)	37.6 (99.7)	36.5 (97.7)	36.6 (97.9)	38.0 (100.4)	35.4 (95.7)	32.3 (90.1)	29.5 (85.1)	38 (100.4)
Average high °C (°F)	22.7 (72.9)	23.9 (75)	26.6 (79.9)	27.9 (82.2)	29.5 (85.1)	30.9 (87.6)	31.0 (87.8)	31.6 (88.9)	30.7 (87.3)	29.6 (85.3)	27.1 (80.8)	24.1 (75.4)	27.97 (82.35)

Average low °C (°F)	9.2 (48.6)	12.3 (54.1)	15.7 (60.3)	18.7 (65.7)	21.8 (71.2)	24.0 (75.2)	24.6 (76.3)	24.8 (76.6)	23.8 (74.8)	20.6 (69.1)	14.7 (58.5)	9.9 (49.8)	18.34 (65.02)
Record low °C (°F)	0.8 (33.4)	5.2 (41.4)	7.9 (46.2)	12.6 (54.7)	14.2 (57.6)	19.5 (67.1)	20.4 (68.7)	20.9 (69.6)	19.7 (67.5)	13.1 (55.6)	6.3 (43.3)	4.0 (39.2)	0.8 (33.4)
Rainfall mm (inches)	31.4 (1.236)	79.6 (3.134)	108.5 (4.272)	217.9 (8.579)	315.4 (12.417)	421.7 (16.602)	521.6 (20.535)	437.4 (17.22)	331.9 (13.067)	140.3 (5.524)	24.8 (0.976)	17.7 (0.697)	2,648.2 (104.259)
Avg. rainy days	5.4	9.2	11.9	16.8	17.4	21.3	25.4	20.7	18.5	10.3	3.9	3.4	164.2
% humidity	80	74	68	75	76	81	85	82	85	83	81	82	79.3

Source: Dibrugarh, From Wikipedia, the free encyclopedia

59. The latest meteorological data from the nearest IMD station at Dibrugarh is procured for the period March-May 2014; those data may be representative of the climatic conditions for the project site in general. The monthly mean values of the various meteorological parameters for the period of March-May 2014 are presented in **Table 4**. A brief description of the data related to the temperature, rainfall, and other weather phenomena are described in the following paragraphs.

Table 4: Meteorological Data (March-May, 2014)

Month	Mean Temperature			Rainfall Pattern in the last five years	
	Highest in the Month	Lowest in the Month	Mean	Maximum Rainfall	Average Rain Fall
	°C	°C	°C	mm	mm
March	31.6	11.6	21.6	-	100.64
April	33	14.9	23.95	-	263.34
May	35	18	26.5	-	257.7

60. **Temperature-** The mean monthly maximum temperature 26.5⁰ C and mean monthly minimum temperature 21.6⁰C.

61. **Rainfall -**The District Rainfall in the map shown below is the averages of Rainfall for the past five years.

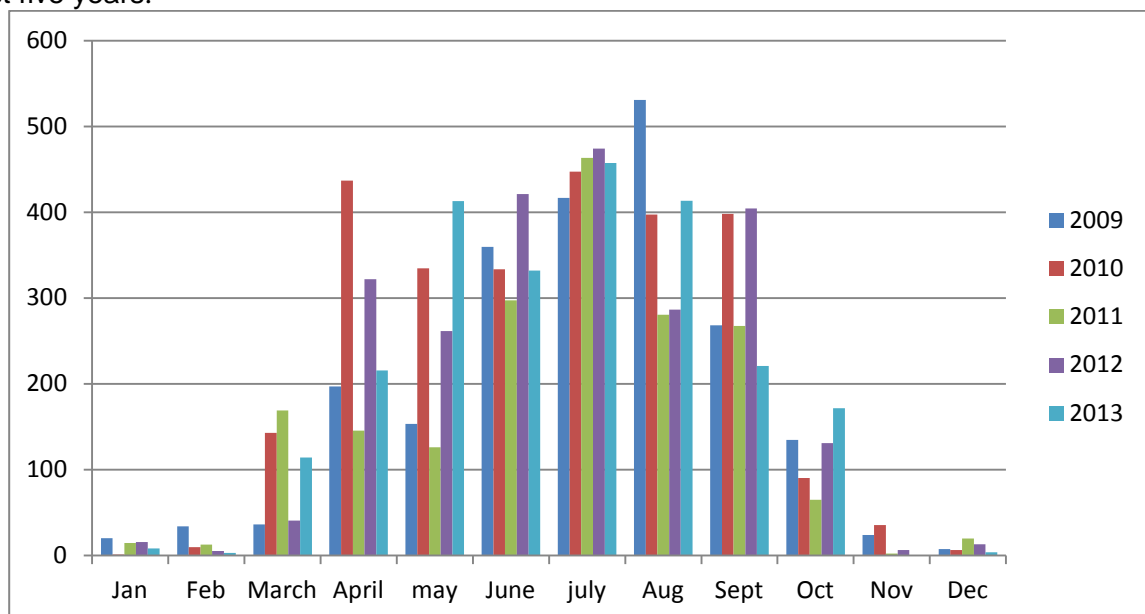


Figure 9: District Rainfall pattern or the last five years

62. **Wind Pattern-** The wind-rose diagram for pre monsoon season has been generated on the basis of daily wind speed and direction data. During these months the wind directions was towards NE to SW respectively. The frequency of occurrence of wind in various speed categories was calculated on the basis of total number of observations recorded in that particular wind speed category during the study period, the wind rose and wind pattern analysis are given below (**Figure 10**).

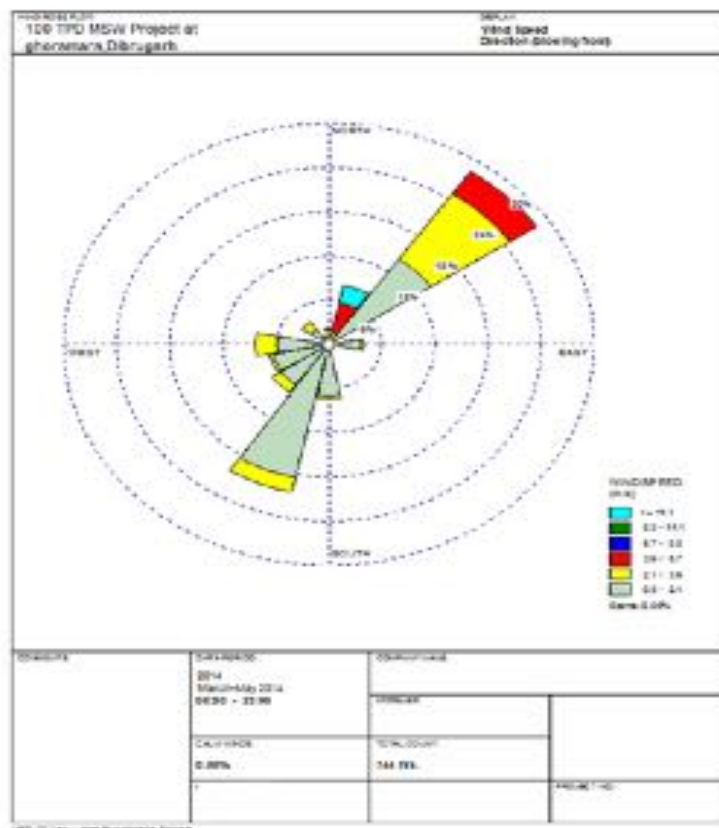


Figure 10: Wind Rose Diagram during March-May, 2014

2. Flood status

63. The rainfall pattern of the town is of variable nature. Sometimes the maximum rainfall occurs within the monsoon. It may also occur as isolated or after a continuous lesser intensity of rainfall. Heavy rainfall lashes the town in every monsoon. At present the drainage system is not working efficiently, the town is frequently flooded with the overland runoff produce by such rainfall. A critical situation occurred in 1998 in which whole town was flooded. **Table 5** shows the status in 1998 and days of flooding of the town. **Figure 11** shows flood prone area of Dibrugarh.

Table 5: Flooding Data

Aspect	Data	Remarks
Days of Flooding	10 days	August 1998 where the entire city was under knee deep or waist deep water
Days of Flooding	8 days	July, 2001
Days of Flooding	12 days	August and September 2002
Days of Flooding	9 days	August, 2004
Days of Flooding	12 days	July, 2007
Days of Flooding	15 days	August and September 2002
Days of Flooding	14 days	July, 2012

Source: DMB



Figure 11: Flood Prone areas of Dibrugarh Municipal Board

3. Geology

64. The Brahmaputra Valley in this district is of a nature of a “ramp valley” developed during the simultaneous upheavals of the Himalayas on the north and northeast and the Patkai ranges on the south and southeast. Thick group of sedimentary rocks between Eocene and Pleistocene are exposed mainly along the foot hills bordering the southern boundary of this district. Thick alluvial deposits belonging to sub-recent and recent periods covered the eastern part of the district and the valley of the Brahmaputra River.

4. Seismicity

65. The entire North Eastern Region has been placed in the severe-most zone (Zone V) of the seismic hazard map of India published by Bureau of Indian Standard (BIS). Earthquakes are generally shallow but some intermediate focus events have also occurred. The earthquake in 1950 led to major alteration of the course of Brahmaputra River and resulting in the erosion of a large chunk Dibrugarh.

5. Soils

66. The soils of Dibrugarh are the products of the fluvial processes of the Brahmaputra River and its tributaries. The plains are composed of new and old alluvium. The new alluvium varying mostly from clayey to sandy loam in texture and is slightly acidic in reaction with its pH value varies from 5.5 to 9.0. The old alluvium on the other hand occurs in the upper and middle parts of the valleys and is more acidic in nature. It occurs in Joypur, Tipling, Kheremia and Tengakhat mouzas in the form of terrace deposits. These deposits contain alternating beds of pebbles, gravel or boulder with loose sand and clays. The soil is mainly of alluvial origin consisting of sand and clay in varying proportions. The soil supports extensively the growth of tea and rice.

67. The composite soil sample was collected from the proposed landfill site and was analyzed for characterization. The locations of the monitoring sites are depicted in **Table 6** and the result of the monitoring & analysis is presented in the **Appendix 8**.

Table 6: Soil Quality Monitoring Locations

Locations	Locations Code	Distance	Direction
Proposed site	AAQ-1	-	-
TaorGaon	AAQ-2	2.72 km	NE
SutaBogpar	AAQ-3	3.23 km	ENE
NijKhanikarGaon	AAQ-4	1.28 km	ESE
Dulia Gaon	AAQ-5	2.17 km	SW

(Source: Primary data generation, EIA Report 2014)

68. On the basis of physical analysis of the soil of the study area, soil varies from sandy clam loam of project site to loam, clay loam and clay other monitoring site.

- Electrical Conductivity of the soil measured is 364-657 $\mu\text{mhos/cm}$
- The value of Magnesium was in the range 241-436 mg/kg.
- The value of Calcium was in the range of 1765-2214 mg/g.
- The value of potassium was in the range of 79-125mg/g.
- The soil shows a pH range of 6.69-7.52, which is slightly neutral to basic probably due to presence of oxides and hydroxides of the basic metals in moderate amount.

6. Surface waters

69. The Brahmaputra River within Assam is almost 700 km. long with more than 100 tributaries. Brahmaputra, the major natural feature in Dibrugarh, has a total length of 95 km and average width of around 10 km in Dibrugarh. After the 1950 great earthquake, Dibru River which was the main tributary to Brahmaputra was merged with its master stream. Now, Maijan stream, a tributary of the former Dibru has also become a tributary to Brahmaputra. Other tributaries include (i) BuriDihing River flowing from almost east to west through Dibrugarh; (ii) Digboi, Tingrai, Tipling, Telpani, Deherang and Sessa in the north bank; and (iii) Tipam and Disam in the south bank.

70. The Assam Pollution Control Board (APCB), under the National Water Quality Monitoring Program and Monitoring of Indian National Aquatic Resources, carries out continuous water quality monitoring. For this purpose the APCB has identified ten monitoring points along Brahmaputra River. Currently data is available from the chemical analysis done by the Central Pollution Control Board (CPCB). Chemical analysis of the surface water of the river Brahmaputra shows that the surface water quality of the river is fairly good in Dibrugarh. All the parameters are within permissible limit. The River water sample analyses report is shown in Table 7.

Table 7: Brahmaputra River Water Quality at Dibrugarh (Location Brahmaputra River Maijan, Dibrugarh)

Parameters	Value
pH	7.2
Temperature (Degree cent)	19
Conductivity ($\mu\text{mho/cm}$)	146
Turbidity (NTU)	8.2
DO	8.00
T-Hardness as CaCO_3	64.00
Calcium as Ca	46.00
Magnesium as Mg	18.00
Chloride as Cl	8.00
Sulphate as SO_4	14.6
Nitrate as NO_3	0.5
Fluoride As F	0.1
Total Dissolved Solids	98.0
BOD	1.2
COD	4.4
TOTAL Kjeldal Nitrogen	1.7
Ammonia Nitrogen	0.2
Sodium	4.5
Total fixed Solid	28.0
Total suspended solid	14.0
Phosphorus	5.0
Boron	0.0
Potassium	0.8
Percent Sodium	0.0
SAR	0.1

Parameters	Value
P-Alkalinity	0.0
Total Alkalinity	82.0
Total Coliform (MPN/100 ml)	2700
Fecal Coliform (MPN/100 ml)	Nil

All values in mg/l unless stated otherwise

Date of sample collection: 04.04.2013

Source: Assam Pollution Control Board

71. To evaluate the characteristics of surface and ground water in the landfill site area, a water quality survey study has been undertaken. The water quality at the site and other locations inside the 5 km impact zone was monitored during March 2014 to May 2014. The locations of the monitoring sites are depicted in **Table 8** and the result of the monitoring & analysis is presented in the **Appendix 8**.

Table 8: Location of Water Sampling Sites

Location No.	Sampling Locations
SW – 1	Sessa River (upstream) of SLF
SW – 2	Sessa River (downstream) of SLF
SW – 3	Nala Near Dainijan Gaon
SW – 4	Brahmaputra River(upstream)
SW – 5	Brahmaputra River(Downstream)

(Source: Primary data generation, EIA Report 2014)

72. The details of observation from results are given below:

- Surface water is slightly alkaline and its pH value varies from 7.09-7.82.
- The total chlorides were observed in the range 15-142 mg/l,
- The concentration of Magnesium was observed in the range 27-90 mg/l.
- The concentration of sulphate was observed in the range 8-54 mg/l.
- BOD of water samples varies 2-12 mg/l.
- The concentration of Nitrate was observed in the range 0.3-3.1mg/l.

73. The above results shows that water is suitable for drinking purpose only after chemical and biological treatment. So, it comes under C category as per water quality standards.

7. Hydrogeology and Groundwater quality

74. Groundwater is the primary source of water supply in the district for drinking as well as agriculture purpose. Groundwater in the major part of the district occurs as localized, disconnected aquifer bodies under favorable geohydrological conditions such as in channel and alluvial terraces of river valleys, joints, fractures and fissures of crystalline and met sedimentary rocks. The occurrence and movement of groundwater depend not only on the nature of the litho units and the nature of the interspaces, but also on the degree of interconnection between them, the vertical and aerial extension of joints, faults and shear zones and the local and regional geomorphology. Groundwater emergences as springs and seepages under favorable physiographic conditions such as in gently sloping areas, broad valleys of river sand along the litho logical contacts.

75. The depth of the groundwater table in Dibrugarh in both pre-monsoon and post-monsoon seasons range between 2 to 6 m with net seasonal fluctuations ranging between 1 and 2 m. The groundwater is being used by the people of Dibrugarh Master Plan Area (DMPA) for daily needs including for drinking and irrigation purposes prior to independence, which indicates its suitability.

76. To evaluate the characteristics of ground water in the area, a water quality survey study has been undertaken. The water quality at the site and other locations inside the 5 km impact zone was monitored during March 2014 to May 2014. The locations of the monitoring sites are depicted in **Table 9** and the result of the monitoring & analysis is presented in the **Appendix 8**.

Table 9: Location of Ground Water Sampling Sites

Location No.	Sampling Locations
GW – 1	From Tube well near the site
GW – 2	From Tube well at Taor Gaon
GW – 3	From tube well at Suta Bogpur
GW – 4	From tube well at Nej Khanikor Gaon
GW – 5	From tube well at Dulia Gaon

(Source: Primary data generation, EIA Report 2014)

77. Result of Ground Water analysis shows that,

- The total dissolved solids were observed in the range 208 to 260 mg/l.
- The total hardness, as CaCO₃ was observed in the range of 141 to 181 mg/l.
- The concentrations of calcium observed in the range 34 to 41 mg/l, which is within the limit of 200 mg/l and the concentrations of magnesium was observed in the range 13 to 17 mg/l.
- The concentration of chloride was observed in the range 22 to 50 mg/l.
- The concentrations of sulphate were observed in the range 12 to 22 mg/l, which is below the desirable limit of 200 mg/l.
- The concentrations of nitrate were observed in the range 2 to 5mg/l.
- The concentrations of zinc and cyanide are observed in the range of 0.01 to 0.05 mg/l and <0.01 mg/l, respectively which are well within the desirable limit.

78. It is concluded that the ground water at the site is safe for use as potable water. All the parameters are within the permissible limit. There is no alternative source of drinking water. So this water can be used as drinking purpose.

7. Ambient air quality

79. The ambient air quality has been monitored by Assam Pollution Control Board within Dibrugarh for particulate matter less than 10 micron (PM₁₀) suspended particulate matters (SPM), sulfur dioxide (SO₂) and nitrogen oxides (NOx) levels. Ambient air quality at all the monitoring stations is within the permissible limits. The analysis report of ambient air quality is given below.

Table 10: Ambient Air Quality of Dibrugarh

Date	SO ₂ µgm/m ³	NOx µgm/m ³	PM ₁₀ µgm/m ³	SPM µgm/m ³
04.01.13	6.50	13.75	95.50	161
08.01.13	5.50	13.00	41.00	134
11.01.13	6.00	14.00	51.50	133
16.01.13	6.00	13.25	80.00	210
19.01.13	7.25	14.30	39.50	166
29.01.13	6.75	15.50	12.20	188
14.02.13	6.00	16.50	82.00	143.5
16.02.13	6.25	18.00	118.50	190
22.0.13	7.25	16.50	76.00	126
05.03.13	8.00	14.50	171.00	295
08.03.13	6.50	17.00	196.00	297
12.03.13	9.00	17.25	206.00	377

Date	SO ₂ µgm/m ³	NO _x µgm/m ³	PM ₁₀ µgm/m ³	SPM µgm/m ³
25.04.13	5.00	14.25	50.00	116
27.04.13	5.75	13.25	37.00	109
30.04.13	6.50	17.00	59.00	133
Limit as per CPCB Norm	80.00	80.00	100.00	

Source: Assam Pollution Control Board

80. The ambient air quality at the proposed landfill site and four other locations within the 5 km impact zone was monitored during March, 2014 to May, 2014.

81. The baseline status of the ambient air quality has been established through field monitoring data on particulate matters (PM_{2.5}), Particulate Matter (PM₁₀), Sulphur Di-Oxide (SO₂), oxides of nitrogen (NO₂), Carbon monoxide & Ozone (ground level) at five locations within the study area. The location of the monitoring stations with reference to the proposed project site is given below.

Table 11: Ambient Air Quality Monitoring Locations

Locations	Locations Code	Distance	Direction
Proposed site	AAQ-1	-	-
Taor Gaon	AAQ-2	2.72 km	NE
Suta Bogpar	AAQ-3	3.23 km	ENE
Nij Khanikar Gaon	AAQ-4	1.28 km	ESE
Dulia Gaon	AAQ-5	2.17 km	SW

(Source: Primary data generation, EIA Report 2014)

82. Ambient air quality monitoring was carried out with a frequency of 24 hourly basis at all five locations. Results are discussed below.

83. **Respirable Particulate Matter (PM_{2.5})**. The values of Respirable Particulate Matter (PM_{2.5}) in study area are presented in **Table 12**. The maximum, minimum and average values of PM_{2.5} observed at the project area were in the range 34.2 – 37.6 µgm/m³, 23.8 – 28.3 µgm/m³ and 29.4 – 32.5 µgm/m³ respectively.

Table 12: Ambient Air Quality with Respect to PM_{2.5}

Concentration in µgm/m ³						
Location	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	NAAQS*
Min	28.3	23.8	24.5	27.7	27.7	60
Max	34.2	37.2	37.2	37.6	37.6	60
Avg.	30.3	29.4	31.5	32.5	31.1	60
98 percentile	33.6	36.0	36.6	36.7	36.6	60

*NAAQS: National Ambient Air Quality Standards

(Source: Primary data generation, EIA Report 2014)

84. **Respirable Particulate Matter (PM₁₀)**. The values of Respirable Particulate Matter (PM₁₀) in study area are presented in **Table 13**. The maximum, minimum and average values of PM₁₀ observed at the project area were in the range 71.4-84.1 µgm/m³, 50.8-67.5 µgm/m³ and 60.2-78.0 µgm/m³ respectively.

Table 13: Ambient Air Quality with Respect to PM₁₀

Concentration in µgm/m ³						
Location	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	NAAQS*
Min	57.2	50.8	60.6	67.5	61.3	100

Max	71.4	76.3	80.1	84.1	80.3	100
Avg	63.7	60.2	71.7	78.0	71.5	100
98 percentile	70.8	75.6	79.8	83.8	79.7	100

*NAAQS: National Ambient Air Quality Standards

(Source: Primary data generation, EIA Report 2014)

85. **Sulphur Dioxide (SO₂)**. The values of Sulphur Dioxide in study area are presented in **Table 14**. The seasonal maximum, minimum and average values of SO₂ observed at the project site were in the range 5.3-6.5 µg/m³, <5.0-5.2µg/m³, 5.2-5.7µg/m³ respectively.

Table 14: Ambient Air Quality with Respect to SO₂

Concentration in µg/m ³						
Location	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	NAAQS*
Min	5.2	<5.0	<5.0	<5.0	<5.0	80
Max	6.5	5.8	5.7	5.4	5.3	80
Avg	5.7	5.3	5.2	5.2	5.2	80
98 percentile	6.4	5.7	5.6	5.4	5.3	80

*NAAQS: National Ambient Air Quality Standards

(Source: Primary data generation, EIA Report 2014)

86. **Oxides of Nitrogen (NO₂)**. The values of oxides of nitrogen in study area are presented in **Table 15**. The seasonal maximum, minimum and average values of NO₂ observed at the project site were in the range 16.3-20.3 µg/m³, 9.8-12.4 µg/m³ and 12.6-14.6 µg/m³ respectively.

Table 15: Ambient Air Quality with Respect to NO₂

Concentration in µg/m ³						
Location	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	NAAQS*
Min	12.4	11.8	10.4	9.8	11.3	80
Max	18.3	19.6	16.3	20.3	19.6	80
Avg	14.6	14.1	12.6	13.7	14.5	80
98 percentile	17.7	18.2	15.4	19.5	18.1	80

*NAAQS: National Ambient Air Quality Standards

87. **Carbon Monoxide (CO)**. The values of carbon monoxide in the study area are presented in **Table 16**. The seasonal maximum, minimum and average values of CO observed at the project site were in the range 520-550 µg/m³, 370-400 µg/m³ and 445-482 µg/m³ respectively.

Table 16: Ambient Air Quality with Respect to CO

Concentration in µg/m ³						
Location	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	NAAQS*
Min	400	390	370	370	380	4000
Max	530	530	520	520	550	4000
Avg	468	455	445	455	482	4000
98 percentile	525	525	515	520	550	4000

*NAAQS: National Ambient Air Quality Standards

(Source: Primary data generation, EIA Report 2014)

88. **Ozone (O₃)**. The values of ozone in study area are presented in **Table 17**. The seasonal maximum, minimum and average values of ozone observed at the project site were 21.3-26.3 µg/m³, 20.0-21.8 µg/m³ and 21.0-23.0 µg/m³ respectively.

Table 17: Ambient Air Quality with Respect to Ozone

Concentration in $\mu\text{g}/\text{m}^3$						
Location	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	NAAQS*
Min	21.8	21.5	20.0	18.9	17.8	180
Max	25.3	26.3	24.1	24.1	21.3	180
Avg	22.3	23.0	21.5	21.0	19.2	180
98 percentile	24.9	25.3	23.4	23.6	20.9	180

*NAAQS: National Ambient Air Quality Standard

(Source: Primary data generation, EIA Report 2014)

89. All ambient air quality parameters are within the National Ambient Air Quality stipulated standards.

8. Ambient noise levels

90. The day and night time noise level measurement was carried out by Assam Pollution Control board (APCB). Result shows that at residential zone the noise level is slightly higher side (particularly during night). However in commercial and silence zone the noise level is comparatively high. The noise level analysis report is given below.

Table 18: Ambient Noise Level at Dibrugarh

Date	Location	Noise Level in leq dB(A)		Limit as per Noise Pollution(Regulation and Control)Rules 2000 Leq dB(A)	
		Day	Night	Day	Night
29.10.13	C-Goli (Residential)	50	46	55	45
29.10.13	H.S.Road Commercial	68	67	65	55
29.10.13	College, Hospital	54	47	50	40

Source: Assam Pollution Control Board

91. A preliminary survey was undertaken to identify the major noise generating sources in the project area. The noise survey was conducted to assess the background noise levels in different zones. The sampling locations are given in **Table 19**.

Table 19: Noise Level Monitoring Stations in the Study Area

S. No.	Location	Location Code
1.	Project Site	NQ 1
2.	Entry of the Project Site	NQ 2
3.	NH-52B(3.3Km NW)	NQ 3
4.	Japara Gaon(Near Project Site)	NQ 4
5.	DU Health Center	NQ 5

(Source: Primary data generation, EIA Report 2014)

92. The noise data compiled on noise levels is given in **Table 20**. It can be seen that the night time Leq varies from 48.2 to 53.1 dB (A) and the daytime Leq (Ld) varies from 38.4 to 43.5 dB (A) within the study area. Values are within the standard.

Table 20: Results of Noise Level Monitoring in the Study Area

Noise Quality data March 2014						
S.No.	PROJECT SITE	ZONE	LIMIT (as per CPCB Guidelines), Leq, dB(A)		Observed value Leq, dB(A)	
			DAY*	NIGHT*	DAY*	NIGHT*
1	Project Site	Industrial	75	70	51.6	42.5

Noise Quality data March 2014						
S.No.	PROJECT SITE	ZONE	LIMIT (as per CPCB Guidelines), Leq, dB(A)		Observed value Leq, dB(A)	
			DAY*	NIGHT*	DAY*	NIGHT*
		Area				
2	Entry of the Project Site	Industrial Area	75	70	50.6	41.2
3	NH-52B (3.3Km NW)	Residential Area	55	45	53.1	43.5
4	Japara Gaon (Near Project Site)	Residential Area	55	45	51.2	40.3
5	DU Health Center	Silence Zone	50	40	48.2	38.4
*	Day time	(6.00AM TO 10.00PM)				
*	Night time	(10.00PM TO 6.00AM)				

(Source: Primary data generation, EIA Report 2014)

B. Ecological Features

1. Protected Areas and Reserve Forests

93. The Dibru-Saikhowa National Park in Dibrugarh (located about 50 km from the subproject site) is a priority protected area also considered under the Biodiversity Conservation Priority Project (BCPP) and has an area of 340 square kilometers (sq km). DihingPatkai Wildlife Sanctuary which has an area of around 111 sq km is also present but both the national park and the sanctuary are a far distance from the subproject site, and do not trigger the any specific government environmental rules. No impacts to these protected areas will occur.

94. There are five reserved forests existing in Dibrugarh district. Details on name and extent of the each reserved forest are given in **Table 21**. Jakai Reserved Forest is located 2.5 km south of proposed landfill site. No impacts to these areas will occur due to project activity.

Table 21: Reserved Forests in Dibrugarh

Sr. No.	Name of Reserved Forest	Area (sq km)
1.	Dihingmukh	47.27
2.	Jakai	18.47
3.	Jaypur	84.61
4.	Namdang	18.57
5.	Telpani	13.31

Source: District Forest Office

2. Wetlands

95. There are no Ramsar wetlands or notified wetlands in the Dibrugarh district. However, Dibrugarh district has a large number of low lying areas and some of them have developed into lakes and water bodies. Larger water bodies are popularly known as *beels*. None of these water bodies are ecologically sensitive and mostly serve as backyard fishing ponds to the residents in rural areas. There are around 40 large water bodies (*beels*) existing within the district. **Table 22** gives description of the *beels*. No wetlands are located within project influence area.

Table 22: Wetlands in Dibrugarh

Sr. No.	Location	Wetland no.	Name
1.	Larua	12	Bhangamukh, Morisuti, Rongabeel I, KutuhaBorbeel, Kawaimaribeel, Garudhoria, Alichiga, Chahjan, Larua, Rongabeel II, Chaparabeel, Nowjan
2.	Lengri	6	Merbeel, Chenimari, Hakoibeel, Desangbeel, Garuhara, Choichigabeel

Sr. No.	Location	Wetland no.	Name
3.	Tengakhat	5	Bherekibeel, Ghulong, Nalanibeel, Bali beel, Dhonibeel
4.	Kheremia	5	Bherekibeel, Ghulong, Nalanibeel, Bali beel, Dhonibeel
5.	Sassani	5	Merbeel, Godhabeel, Singibeel, Disam, GolaDisang
6.	Joypur	3	Lakhutipotabeel, Longharibeel, Kaliapainbeel
7.	Mancotta	2	Borbeel, Bahuguwa
8.	Moran	1	Jaliyanibeel
9.	Bogdung	1	Sarujan

3. Flora and Fauna

96. Flora and fauna in the subproject are those commonly found in urban and built-up areas. There are no recorded endangered or critical species in the area. There are around 1690 nos. of trees, plant, creeper plants in the acquired land as per the evaluation made by the District Authority while acquiring the land. Out of which there are around 685 nos. of trees. At Ghoramara proposed landfill active site there will be no tree felling will be required other than removing of shrubs, grasses etc. The scientific name of all the above are given in the **Table 23** below.

Table 23: Type of Trees

Common Name	Scientific name
Gooseberry Tree	<i>Phylanthusembilica</i>
Cactus	<i>Opuntiaficusindica</i>
Mango	<i>Mangiferaindica</i>
Satinay Tree	<i>Syncarpiahillii</i>
Beetle nut	<i>Areca catachu</i>
Guava	<i>Psidiumguajava</i>
Goomar Teak Tree	<i>Gmelinaarborea</i>
Lebeck Tree	<i>Albizalebbek</i>
Banyan tree	<i>Ficusbenghalensis</i>
Lemon Tree	<i>Citrus limon</i>
Jahazi banana	<i>Dwarf cavendish</i>
Taro plant	<i>Colocasiaesculenta</i>
Chilli plant	<i>Capsicum annum</i>
Papaya tree	<i>Carica papaya</i>
Sugarcane	<i>Saccharumofficinarum</i>
Pomegranate	<i>Punicagranatum</i>
Pear tree	<i>Pyruspyrifolia</i>
Curry leave tree	<i>Murrayakoenigii</i>
Jack fruit	<i>Artocarpusheterophyllus</i>
Pomelo tree	<i>Citrus maxima</i>
Berry tree	<i>Syzygiumcumini</i>
Shagwan tree	<i>Tectonagrandis</i>
Agar wood tree	<i>Aquilariamaliccensis</i>
Katsura tree	<i>Cercidiphyllumjaponicum</i>
Bamboo tree	<i>Bambusa vulgaris</i>

Common Name	Scientific name
Sundari tree	<i>Heritiera littoralis</i>
Coral tree	<i>Erythrina senegalensis</i>
Fig tree	<i>Ficus carica</i>
Yam plant	<i>Dioscorea sp</i>
Black berry tree	<i>Rubus villosus</i>
Lytchi tree	<i>Litchi chinensis</i>
India lilac	<i>Melia azadirach</i>
Babul tree	<i>Acacia nilotica</i>
Sonaru tree	<i>Casia fistula</i>
Ghost pepper plant	<i>Capsicum frutescens</i>
Pulse tree	<i>Leguminosa esp</i>
Turmeric	<i>Curcuma domestica</i>
Tamarin	<i>Tamarindus indica</i>
Potato	<i>Solanum tuberosum</i>
Koron tree	<i>Hernandia ovigera</i>
Nafafu	<i>Clerodendrum infortunatum</i>
Rose mallow	<i>Hibiscus moscheutos</i>
Water spinach	<i>Ipomoea aquatica</i>

(Source: Site observation)

C. Economic Development

1. Existing land use

97. Residential land use accounts for nearly two-thirds of the presently developed area. The public and semi-public functions including the institutional uses, account for another 15% highlighting the significance of Dibrugarh as an administrative, health care and educational destination in Assam. The land use pattern reflects the relative inadequacy of land for various uses. Land under commercial and industrial use is relatively low, industrial activities are almost non-existent. The city also suffers from lack of recreational area, although land form of the city and its suitability as a place of tourist attraction will justify a claim for higher proportion of land under recreation. A key consideration that would guide future development within the DMPA is the fact that about 20% of this area is under tea estates.

98. Land use pattern within Dibrugarh Municipal Planning Area beyond the master plan are as per the **Table 24** below.

Table 24: Area as per Land use Pattern

Zone No.	Pattern	Area (ha)	Total area (ha)
I	Residential	127.83	796.11
	Commercial / Public & semi public	102.31	
	Industrial	0.00	
	Paddy field	101.37	
	Tea estate	464.58	
II	Residential	90.81	158.15
	Commercial /public & semi public	60.93	
	Industrial	4.04	
	Paddy field	2.36	
III	Residential	61.15	85.46
	Commercial	24.30	
IV	Residential	29.13	61.51
	Commercial /public & semi public	13.88	

Zone No.	Pattern	Area (ha)	Total area (ha)
	Paddy field	18.49	
V	Residential	32.77	74.99
	Commercial /public & semi public	42.22	
VI	Residential	199.73	215.80
	Commercial /public & semi public	16.07	
VII	Residential	1085.41	1858.19
	Commercial / Public & semi public	162.09	
	Tea estate	229.38	
	Paddy field	303.11	
	Industrial	48.03	
	Govt. Land	7.41	
	Extra	20.59	
VIII	Commercial / Public & semi public	232.99	638.36
	Govt land	9.39	
	Paddy field	395.97	
IX	Tea estate	1774.01	6912.44
	Village	1070.03	
	Paddy field	2997.05	
	Low lying	1071.34	
	Total Area		10801.04

(Source: DPR Landfill site by SMEC, 2009)

99. The residential use of land increased significantly in Dibrugarh city. There has also been notable growth in commercial, industrial and public service land use. The existing Land use within the study area is calculated and mentioned in the table below. **Figure 12** shows pie chart showing land use within the study area. Land use / land cover map shows in **Figure 13**.

Table 25: Existing Land use within Study area – landfill site (10km radius)

Land use	Area (Ha)
Settlement	5334.11
River	2818.47
Open Scrub	357.25
Forest area	1187.44
Agriculture	23983.29
Vegetation	61.49
Open/waste land	241.65
Total	33983.70

(Source: Primary data generation, EIA Report 2014)

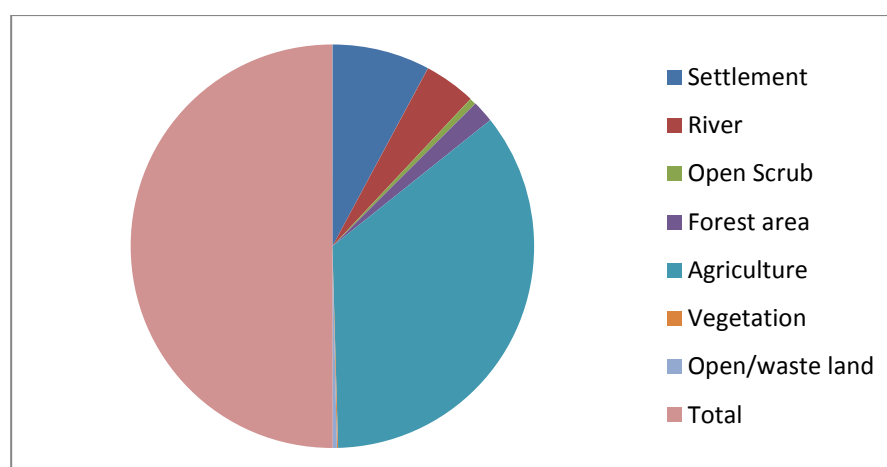


Figure 12: Pie chart showing Land use within Study Area (10 km radius)

(Source: EIA Report 2014)

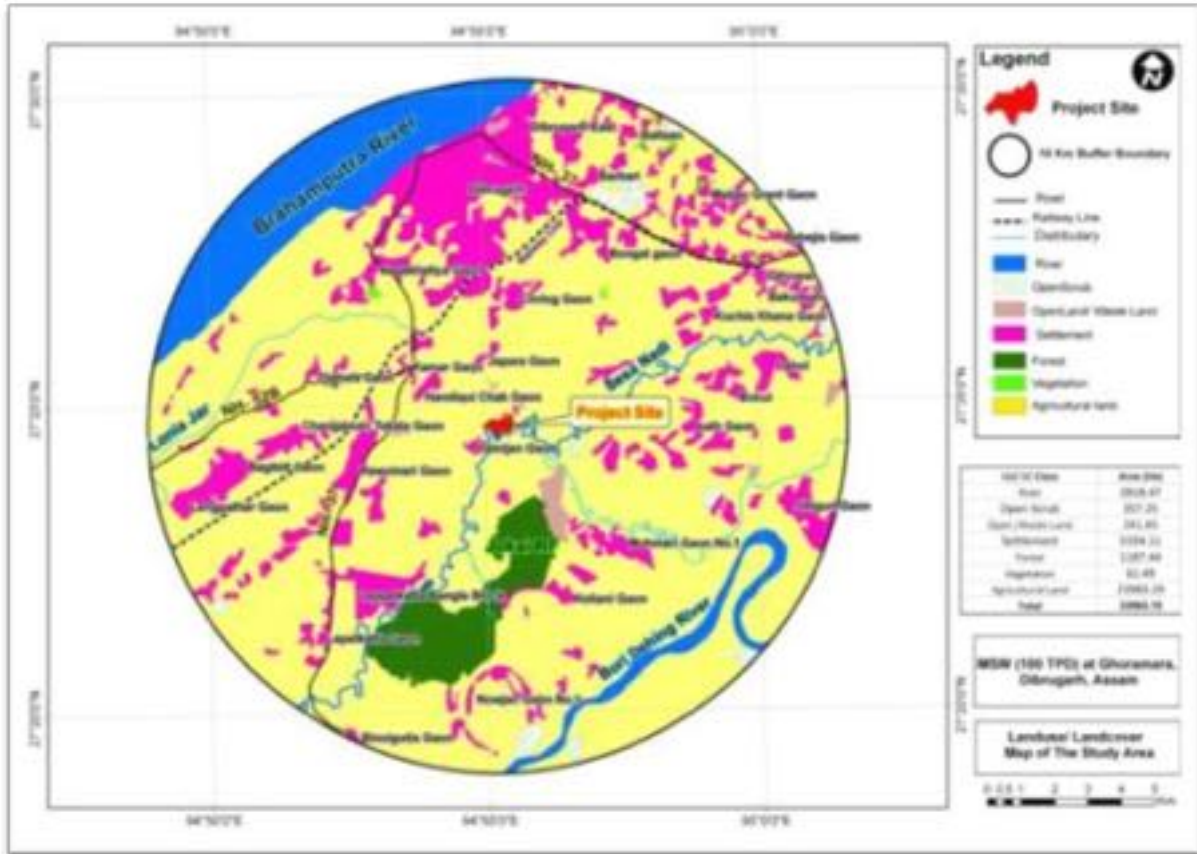


Figure 13: Existing Land use within Study Area (10 km radius)

(Source: EIA Report 2014)

2. Industry

100. Dibrugarh has the world's largest area covered by tea gardens. Tea processing industries are significant in the district. Within the planning area there are around five tea factories. Among the other industries there are some rice, saw mills and other light manufacturing industries.

101. The region is also rich in natural oil. The oldest running oil refinery in the world is situated in Digboi. The entire district has many oil and natural gas rigs owned by the Oil India Limited and Oil and Natural Gas Commission.

3. Trade and Commerce

102. Dibrugarh is the second most important commercial town in upper Assam after Tinsukia. Most of the trading activities related to packaging and distribution of tea within the country and abroad. Although there are a number commercial establishments existing in the heart of the town but there is no organized market within the planning area. As per the draft master plan there are around 9,000 commercial establishments in and around Dibrugarh town. Socio-economic surveys conducted in the town show a major chunk of the population engaged in trade, commerce, and office work.

4. Physical infrastructure

103. **Water Supply.** Dibrugarh town, till date, does not have a potable water supply system. Ring wells and tube wells are the only sources of water supply. Since the water table is very high throughout the year, the residents receive water from shallow depths (less than 3 m). Consultations with the communities and discussions indicate that boiling of water prior to consumption is a common and prevalent practice. The level of awareness, as observed during the consultations and site visits, on the need for a potable water supply was negligible.

104. **Sewerage and Sanitation.** There is no sewerage system at Dibrugarh town and a major portion of the town does not have an access to proper sanitation facilities. The wastes are discharged either by individual septic tanks or directly into drains and water bodies, which ultimately find its way in to the DTP drain which falls in river Sessa and thereby polluting water body.

105. **Solid Waste Management.** The daily waste generated in Dibrugarh is about 70 Metric Ton. The main waste generating sources are household, institutional, hospitals; marketplace and industries. As on date only 40-50% of the total waste is collected. The main generators of the solid waste are the five markets in the city. It accounts for almost 50% of the total solid waste generated. There is one slaughterhouse at Kalibari which also generates bio-degradable waste. These wastes are dumped along with solid waste on the streets. Dibrugarh Municipal Board has six tractors tailors, one tripper truck for collection of waste. The wastes collected are dumped on the river bank at Maijan area.

106. **Drainage.** Dibrugarh, located on the south bank of river Dibru, a tributary of the river Brahmaputra, is vulnerable to recurrent flooding. Huge sediment load of Brahmaputra has resulted in continuous deposition of silt in the bed which has raised its level significantly. This has worsened the drainage system as water level of Brahmaputra has risen considerably. At present, the level of Dibrugarh town is 1.5m below the bed level of Brahmaputra.

107. **Transportation System.** Dibrugarh is located on the major corridors of movement in Assam. Being a second largest town in Assam after Guwahati it is a center of major political, administrative, cultural and commercial activities. Dibrugarh is situated on the Assam-Dibrugarh-Tinsukhia (NH-37). The surface communication with the rest of the country is only by NH-37, which connects Dibrugarh with Sibsagar, Guwahati and other towns of Assam. Some major district roads also connect Dibrugarh with other parts of the State.

108. The primary road network of Dibrugarh town comprises of regional links such as Tarun Ram Phukar Road, Mancotta Road, Navin Ch. Bordoloi Road, AT road as well as other roads like Circuit House Road, Boroloi road, Cantonment Road. The total length of road network is about 82 km long in the town. NH-37 passes through the town and is the lifeline for traffic movement. There is no distinct hierarchy of roads. About 50% of the road length is revealed to have RoW of 5m and 30% of the road length has more than or equal to 7 m RoW. High congestion is seen in some of the traffic nodes due to improper road geometry.

D. Social and Cultural Resources

1. Population

109. The Dibrugarh Municipal Board (DMB) area (town core of the Dibrugarh Municipal Planning Area, DMPA) has seen rapid increase in the population since its inception. During the time of the setting up of the town by the British in 1873, Dibrugarh had a population of about 3,870 persons. **Table 26** below shows the population projection until 2046 for DMB and DMPA respectively

Table 26: Population under DMB and DMPA – 2011 TO 2046

SL No.	Area	CENSUS		PROJECTIONS			
		2011	2013	2016	2026	2036	2046
1	DMB	138661	144716	154297	191059	236579	292944
2	Outside DMB	60536	63184	67403	83941	103421	128056
3	DMPA	199197	207900	221700	275000	340000	421000

(Source-census data for the year 2011 followed by Average Annual Growth Rate Method)

110. According to the 2011 census Dibrugarh district has a population of 1,327,748. The district has a population density of 393 inhabitants per square kilometre (1,020 /sq mi). Its population

growth rate over the decade 2001-2011 was 12.04%. Dibrugarh has a sex ratio of 952 females for every 1000 males, and a literacy rate of 76.22%.

111. As of the 2011 India census, Dibrugarh city had a population of 154,019. Males constituted 54% of the population and females 46%. The sex ratio of Dibrugarh city was 925 per 1000 males. Total literates in Dibrugarh city are 113,822, of which 60,782 are males and 53,040 are females. Therefore, the average literacy rate of Dibrugarh is 89.5%, which is higher than the national average literacy rate.

2. Social Characteristics

112. The town social characteristics have been studied with respect to place of birth, age structure, caste religion and social groups. The Socio Economic Survey (SES) results show that more than 95% of the persons are from Dibrugarh and 3.73% from other parts of Assam.

113. The people residing in Dibrugarh town are predominantly Hindus (86.39 %), followed by Muslims (10%). In terms of caste and tribes, 50 % of the population belongs to general category followed by 31.81 % in the scheduled caste and 3.61 % in scheduled tribe and other backward classes forming 14.46% of the population.

114. Social characteristics of population in the planning area are observed to be homogenous between those within municipal limits and outside municipal limits. The overall literacy rate in Dibrugarh town is 89.22 percent. As per the 2001 census about 123,016 persons are literate in Dibrugarh Urban area. The female literacy in the urban area is 87.6 percent and the male literacy stands at 90.6 percent.

3. Poverty Levels

115. The percent of households below poverty level is observed to be 3.3% in Dibrugarh town. Social conditions of this population is further analyzed and found that: (i) only 14% of population below poverty line has access to drinking water supply; and (ii) only 22% of those below poverty line have the facility for sewage disposal.

116. There are 19 slums existing in Dibrugarh with a population of around 27% of the population of Dibrugarh municipal area lives in slum according to 2001 census.

IV. ANTICIPATED IMPACTS AND MITIGATION MEASURES

117. This section of the IEE reviews possible subproject-related impacts, in order to identify issues requiring further attention and screen out issues of no relevance. The ADB SPS (2009) requires that impacts and risks will be analyzed during pre-construction, construction, and operational stages in the context of the subproject's area of influence. As defined previously, the primary impacts from this subproject will result from (i) landfill and treatment facilities; (ii) main routes/intersections which will be traversed by construction vehicles; and (iii) quarries and borrow pits as sources of construction materials. The secondary impact areas are: (i) entire Dibrugarh area outside of the delineated primary impact area; and (ii) entire Dibrugarh district in terms of over-all environmental improvement.

118. The ADB Rapid Environmental Assessment Checklist for Urban Development was used to screen the drainage subproject for environmental impacts and to determine the scope of the IEE investigation. The completed Checklist is found in **Appendix 9**. All the proposed subproject components will interact physically with the environment.

119. In the case of this subproject the following are observed: (i) most of the individual elements are relatively small and involve straightforward construction and operation, so impacts will be mainly localized and not greatly significant; (ii) most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving excavation and earth movements; and (iii) partly being located in the built-up area of Dibrugarh town, will not cause direct impact on biodiversity values. The subproject involved private land acquisition, for which a separate Resettlement Plan was prepared.

A. Pre -construction – Location and Design

1. Location

120. Location impacts include on-site biophysical array and encroachment / impact either directly or indirectly on adjacent environments. It also includes the impacts on the people who might lose their homes or livelihoods due to the subproject activities. The subproject components have been proposed on lands acquired and already owned by the government. A separate RP was prepared in accordance with the Land Acquisition Act and ADB SPS to guide the acquisition of the privately-owned lands for the landfill site.

121. The River Sessa flows near the landfill site from the west and south and may cause flooding of the site and erosion. A retaining wall was designed along the site adjacent to the river to: (i) protect the site in event of floods; (ii) channelize the flow of the stream and control bank erosion; (iii) minimize potential waste inflow from the landfill site into the stream; and (iv) stabilize the landfill site, in the event of any subsidence.

122. Drainage from surrounding land can enter the site. A band drain around the landfill site has been included in the design to trap the runoff from road and surrounding land entering the site and cause flooding. Moreover the project site would be suitable leveled and embankments would be constructed in such a manner that under no circumstances the storm water from outside area can enter the project site.

123. Site selection of construction work camps, stockpile areas, storage areas, and disposal areas. Priority is to locate these near the subproject locations. However, if it is deemed necessary to locate elsewhere, sites to be considered will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems. Residential areas will not be considered for setting up camps to protect the human environment (i.e., to curb accident risks, health risks due to air and water pollution and dust, and noise, and to prevent social conflicts, shortages of amenities, and crime). Extreme care will be taken to avoid disposals near the water bodies, swamps, or in areas which will inconvenience the community. All locations would be included in the design specifications and on plan drawings.

124. Site selection of sources of materials. Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution. Material requirements are not high due to the small scale of works and re-utilization of excavated material from the site itself however to mitigate the potential environmental impacts, locations of quarry sites and borrow pits (for loose material other than stones) would be included in the design specifications and on plan drawings. Priority would be sites already permitted by Mining Department. It will be the construction contractor's responsibility to verify the suitability of all material sources and to obtain the approval of authority.

125. Security. The boundary walls will be marked and a billboard will be placed at the gate and at conspicuous locations in the landfill site to indicate that unauthorized access, illegal dumping, burning, and squatting are prohibited. Security will be provided to ensure that illegal dumping, theft, and unauthorized access do not happen.

126. Traffic Investigation. Traffic investigations will be conducted to identify peak traffic volume as well as the quality of existing roads near the landfill. The influence of increased heavy vehicle traffic due to landfilling will be analyzed with a view to widening the existing road. Adequate transport management plan would be in place for uninterrupted traffic flow. Roads will be designed to provide adequate turning and dumping areas to accommodate delivery by all types of vehicles.

2. Design

127. For disposal of MSW Semi-Aerobic landfill system will be developed. Landfill layout designed to cater landfill as per MSW (M&H) Rules 2000. The landfill design life used for the subproject comprises of an 'active' period of 30 years and 'closure and post-closure' period for which the landfill will be monitored and maintained will be 25 years after the 'active period' is

completed.

128. The sanitary landfill will include following features: Section Embankment, Disposal ground, Leachate Collection and Removal System, Municipal Solid Waste Inspection area, Storm Water drainage system, Green belt/buffer area/lawns, Boundary wall, Weigh Bridge, Leachate Treatment plant, Gas collection system if required, water supply system, Quality control laboratory, Boundary wall and Fencing, Roads and street lighting, Office block, Shed for machinery storage and parking, vehicle washing platform and other basic amenities.

129. Design impacts pertain to: (i) landfilling activities leading to alterations of drainage pattern of the site; (ii) contamination of soil, surface and ground water resources from leachate produced during operation phase; (iii) flooding of the site due to proximity to Sessa River; and (iv) absence of any drainage arrangements transfer stations leading to wash waters stagnating around the site resulting to unsanitary conditions.

130. 1.5 mm thick HDPE geo-membranes liner will be provided on the top of the 900 mm thick clay liner to prevent and damaging impact in surrounding area and to prevent water infiltration.

131. **Landfill.** The landfill design and management emphasize prevention of any nuisance, leachate formation minimization, reducing emission and also minimizing air, water and land pollution.. A buffer zone of no-development will be maintained around landfill site. DMB will declare a no-development buffer zone around the landfill site and the same would be incorporated in the town planning department land use plans. The design incorporate the aspects of site drainage thus ensuring that site preparation and landfilling activities in no way causes any alteration of drainage pattern. Overall drainage of the site has been designed to avoid flooding and drain the site as soon as possible.

132. The proposed landfill site lies in flood plains of Sessa River. A retaining wall and perimeter bund have been incorporated in the design. These are rock/concrete block structures which will be built on the slopes where the erosion of the base foundation threatens the landfill site. These structures will also ensure that river water course during peak flows will not enter the landfill site.

133. The design of the landfill considered production of leachate during operation stage can potentially contaminate soil, surface and groundwater resources. Thus, the landfill will be lined and a leachate collection system through leachate pipes and pits is included to mitigate the impacts associated with leachate generation. The leachate pit around the landfill site will also prevent runoff from entering the landfill site. Leachate collection, treatment and removal system would be developed for effective collection of leachate without contamination of ground water. All components of the leachate collection system would have sufficient strength to support the weight of the overlying waste, cover system and post closure loadings as well as stresses from operating equipment. The collected leachate will be re-circulated to the active parts of the cells or let to be evaporated. Recirculation of the leachate will have two beneficial effects: (i) the process of landfill stabilization is accelerated and (ii) the constituents of the leachate are attenuated by the biological, chemical and physical changes occurring with the landfill.

134. The landfill gas will be generated as a product of waste biodegradation. Methane and carbon dioxide are the principal gases produced from the anaerobic decomposition of the biodegradable organic waste components in the solid waste. When methane is present in the air in concentrations between 5 and 15 percent, it is explosive. Because only limited amounts of oxygen are present in a landfill when methane concentrations reach this critical level, there is little danger that the landfill will explode. However, methane mixtures in the explosive range can form if landfill gas migrates off-site and mixes with air. Published data on landfill gas quality in India is not available. The rate and quantity of gas generation with time, is difficult to predict. Gas control within the landfill site will involve the following features: (i) a containment system which encloses the gas within the site and prevents migration outside the landfill, (ii) a system (passive or active) for collecting and removing landfill gas from within the landfill and in particular from the perimeter of the landfill; (iii) a system for flaring or utilizing the collected gas with adequate back-up facilities. Landfill gas monitoring will be adopted at the landfill site and remedial measure (such as flaring) undertaken if the gas concentrations are above acceptable limits.

135. The landfill will be operated in phases¹ because it will allow the progressive use of the landfill area, such that at any given time a part of the site may have a final cover, a part being actively filled, a part being prepared to receive waste, and a part undisturbed. Within each phase an imaginary cell shall be earmarked by the engineer in-charge to accommodate the quality of waste received during the day and repeat the same so that at least 1 m height of waste can be built and the bulldozer can operate. This cell division shall be extended in half the area of the landfill, earmarked for a period of 6 months in a year. The total filling may be envisaged to 2 m in a 6-month period and with simultaneous compaction, the total thickness would reduce to about 1 m. Thus in a 6-month time a layer shall be laid on the approximate area of 1 hectare and an intermediate cover of about 300 millimeter (mm) shall be laid and periodic compaction shall be adhered to. This intermediate cover will prevent any emission of nuisance odors; keep away from birds and infestation of rodent and vermin.

136. For smooth landfill operation following design components have been considered,

- landfill site will be fenced and monitoring of incoming vehicles or other modes of transportation will be done from gate
- Landfill site will be well protected to prevent entry of unauthorized persons and stray animals.
- At landfill approach and other internal roads will be constructed
- The landfill site will have wastes inspection facility to monitor wastes brought in for landfill, office facility for record keeping and shelter for keeping equipment and machinery including pollution monitoring equipments.
- Weigh bridge will be provided to measure quantity of waste brought at landfill site
- Fire protection equipments and other facilities as may be required will be provided.
- Utilities such as drinking water (preferably bathing facilities for workers) and lighting arrangements for easy landfill operations when carried out in night hours will be provided as per design

137. **Compost Facility.** As per compost plant design segregated waste will be sent to compost plant. Windrow composting would be set up under waste processing unit Aerobic composting is proposed. Anaerobic composting requires a longer time for stabilization of the material and hence requires larger land space. Whereas in aerobic composting, (i) aerobic microorganisms oxidize organic compounds to carbon dioxide, nitrite and nitrate; (ii) requires less land space; (iii) no odorous gases are generated; and, (iv) it is environment friendly and safe.

138. As per compost plant design all sections (waste receiving platform, Windrow platform, monsoon shed, Preparatory section, curing area, refinement section, quality check Area, godown) would be provided in compost plant

139. Leachate generation in the compost plant will not lead to over flow, as the process is an exothermic process. On the contrary, water needs to be added to maintain the moisture level. However in the initial stages of decomposition (within the first 10 days) excessive water may leach out from the windrows. This contains nutrients and need to be collected and used for improving the quality of end compost. All around the initial windrows, a 2-3 inch thick bed of absorbent material will be spread. Initially sawdust or other similar absorbent material can be used. Later, on the third rejection from the processing plant, which contains lots of organic matter having absorbent properties can be used. This will absorb the leachate and once saturated can be collected and spread over the windrows and fresh bed may be laid around the windrows.

140. Adequate buffer zone would be provided around compost plant and landfill facility. Washing

¹ The term 'phase' describes the sub-area of the landfill. A 'phase' consists of cells, lifts, daily cover, intermediate cover, liner and leachate collection facility, gas control facility and final cover over the sub-area. Each phase is typically designed for a period of 12 months. Phases are generally filled from the base to the final/intermediate cover and capped within this period leaving a temporary un-restored sloping face

platform will also be provided at treatment and disposal facility sites and waste water will be treated before discharge and conforming standard of CPCB. Also adequate roof shed and concrete platform/roof would be provided at compost plant's different section.

141. Design Coverage and Service Level Improvement. At present only 50% of the population is covered by the waste collection system. The subproject envisages atleast 95% coverage of the town. The service level improvement is ensured to be constant throughout the design period of the subproject.

142. Landfill Operations and Maintenance Manual. The landfill needs to be operated in a uniform manner so its integrity is maintained and utmost environmental protection is maintained. The Landfill Operations and Maintenance (O&M) Manual will be prepared as part of the subproject by the design consultant team to detail the operational procedures to be followed and implemented to ensure compliance with the intended construction and operation standards. Its purpose (**Appendix 10**) includes: (i) provide information on the basic components of the landfill; (ii) familiarize the Operator with the various containment units and environmental control/monitoring systems; (iii) familiarize the Operator with the general operational phasing or sequencing of waste filling; (iv) provide basic engineering controls for the landfill construction in conformance to design requirements; (v) provide basic information on the type and purpose of the landfill heavy equipment and their maintenance requirements; (vi) provide instruction on daily waste filling operations including load inspection procedures, spreading and compaction of waste, and application of cover; (vii) provide procedures for operating under inclement or wet weather operations; (viii) provide general procedures for emergency response and management; (ix) provide a detailed description of environmental monitoring and inspections; and (x) familiarize the Operator with safety procedures related to landfill operations.

143. Environmental Monitoring Program. The following baseline parameters will be monitored prior to construction of the landfill:

- (i) Ground Water Quality— Monitoring wells will be set up to monitor leakage leachate into ground water. 4 monitoring wells would be set up at each site to monitor ground water flow in all possible directions. The monitoring wells will be located in consultation with district administration/PHED.
- (ii) Surface Water Quality—minimum of 3 samples from a stream/storm water drain analysed on a monthly basis and for parameters relevant for wastewater drains;
- (iii) Landfill Gas—sampling and analysis for methane, hydrogen sulphide and other gases on a monthly basis;
- (iv) Dust—particulate matter less than 10 microns (PM10) and 2.5 microns (PM 2.5) monitoring on a monthly basis, specifically at noon, during hot, dry and windy days;
- (v) Odor—monthly analysis at the site and at 200-m intervals from the landfill boundary to the nearest inhabited zone;
- (vi) Noise—Peak noise analysis at the site and nearby inhabited zone on a monthly basis; and
- (vii) Vegetative Cover—vegetative mapping on a seasonal basis.

144. Screening of Wastes Received. Pre- processing / screening area is designed to store entire MSW. Waste acceptance and screening procedures will be part of the Landfill O&M Manual to ensure that the site does not accept wastes that are prohibited from entry. Battery wastes, E-wastes & Hazardous wastes will be not mixed with MSW. Those will be collected separately and dispose to hazardous waste disposal site as per Environment Protection (E. P) 1986 and Hazardous waste handling rules. Signs will be prominently displayed at the point of entry to clearly indicate the types of wastes that are allowed and those that are not to be accepted. Pre-processing area would be consist of permanent roof shed over platform, partition wall for protection against wind and noise, concrete platform, weighbridge facility, Waste loading, Waste segregation and Waste shredding facilities etc.

145. **Post-Closure Usage.** Once used up to its full capacity the landfill will be closed and rehabilitated. Establishment of permanent structures will not be allowed on any part of the closed landfill as decomposition of the underlying waste and release of gases will lead to settling of the ground.

146. **Climate Change.** Dibrugarh will make a significant contribution to reducing the impact of its solid wastes, in terms of reducing greenhouse emissions, predominantly through the avoidance of landfill gases through composting and management of landfill gases.

147. During construction specific conditions and compliance (**Appendix 3**) as per SEIAA, Assam are considered.

B. Construction Impacts

148. Construction impacts are associated with site cleaning, earth works, physical construction related materials movements and works, machinery, vehicles and workers. It also includes the erosion, dust, noise, traffic congestion and waste production associated with the construction activities.

149. Construction of the subproject components involves quite simple techniques of civil work, which will not have any impacts on the environment. These anticipated impacts are temporary and for short duration. Physical impacts will be reduced by the method of working and scheduling of work, whereby the subproject components will be (i) constructed by small teams working at a time; and (iii) any excavation done near sensitive area like school, religious places and house will be protected as per standard norms².

150. **Sources of Materials.** Significant amount of gravel, sand, and cement will be required for this subproject. The construction contractor will be required to:

- Use material sources permitted by government;
- Verify suitability of all material sources and obtain approval of Design and Supervision Consultant (DSC); and
- Submit to DSC on a monthly basis documentation of sources of materials.

151. **Air Quality.** It is most certain that work will be conducted during dry season, so there is potential for generation of dust from the excavation of dry soil, backfilling, and transportation to disposal, and from the import and storage of large quantities of aggregates and other construction material. Therefore, it is important that this large quantity of soil will be handled and disposed of without causing further impacts on air quality, which already shows presence of high levels of particulate matter in the town. Emissions from construction vehicles, equipment, and machinery used for excavation and construction will induce impacts on the air quality in the construction sites. Anticipated impacts include dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons) but temporary and during construction activities only. To mitigate the impacts, construction contractors will be required to:

- Prevent/minimize dust generation by removing the waste soil immediately from the site
- Construction material, particularly sand/gravel for trench bedding, shall be brought as and when required; minimize on-site storage
- Consult with DSC on the designated areas for stockpiling of clay, soils, gravel, and other construction materials;
- Excavate the foundations at the same time as the access roads (if needed) are

²Occupational Health and Safety of employees working only in factories and mines have been specifically covered in GOI laws. However, the Constitution of India has provisions to ensure that the health and well-being of all employees are protected and the State has the duty to ensure protection. For this subproject, the mitigation measures were based on the World Bank Environmental, Health, and Safety (EHS) Guidelines.

built so that dug material is used immediately, avoiding the need to stockpile on site;

- Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather;
- Use tarpaulins to cover sand and other loose material when transported by trucks; and
- Fit all heavy equipment and machinery with air pollution control devices which are operating correctly.

152. Surface Water Quality. Dibrugarh receives high intensity rains during monsoons and there are a number of natural and man-made drainage channels criss-crossing the town. Runoff from the excavated areas and material and waste soil stocks likely to contain silt, and this silt runoff will deteriorate the water bodies. This impact will however be considered only during rainy season. These potential impacts are temporary and short-term duration only and to ensure these are mitigated, construction contractor will be required to:

- Avoid excavation activities during monsoon. Ensure that works complete before onset of monsoon
- Minimize on-site storage of waste soil materials
- Avoid stockpiling of earth especially during the monsoon season unless covered by tarpaulins or plastic sheets;
- Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with DSC on designated disposal areas;
- Place storage areas for fuels and lubricants away from any drainage leading to water bodies;
- Dispose any wastes generated by construction activities in designated sites; and
- Conduct surface water quality inspection according to the Environmental Management Plan (EMP).

153. Noise Levels. Construction works will be on settlements/residences, along and near schools, and areas with small-scale businesses. The sensitive receptors are the general population in these areas. Increase in noise level may be caused by excavation equipment, and the transportation of equipment, materials, and people. Impact is negative, short-term, and reversible by mitigation measures. The construction contractor will be required to:

- Plan activities in consultation with DSC so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance;
- Require horns not be used unless it is necessary to warn other road users or animals of the vehicle's approach;
- Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor; and
- Maintain maximum sound levels not exceeding 80 decibels (dbA) when measured at a distance of 10 m or more from the vehicle/s.

154. Existing Infrastructure and Facilities. Excavation works can damage existing infrastructure located alongside roads. It is therefore important that construction contractors will be required to:

- Obtain from DSC the list of affected utilities and operators;
- Prepare a contingency plan to include actions to be done in case of unintentional interruption of services

155. Landscape and Aesthetics. The construction works will produce excavated earth, excess construction materials, and solid waste such as removed concrete, wood, trees and plants, packaging materials, empty containers, spoils, oils, lubricants, and other similar items. Improper disposal may further affect topography, water quality, soil quality and sensitive areas. These impacts are negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

- Prepare and implement Waste Management List;
- Avoid stockpiling of excavated soil;
- Coordinate with DMB for beneficial uses of excavated materials or immediately dispose to designated areas;
- Recover used oil and lubricants and reuse or remove from the sites;
- Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;
- Remove all wreckage, rubbish, or temporary structures which are no longer required; and
- Request DSC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.

156. Accessibility. Hauling of construction materials and operation of equipment on-site can cause traffic problems. Potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be required to:

- Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites;
- Schedule transport and hauling activities during non-peak hours;
- Locate entry and exit points in areas where there is low potential for traffic congestion;
- Keep the site free from all unnecessary obstructions;
- Drive vehicles in a considerate manner;
- Coordinate with Dibrugarh Traffic Department for temporary road diversions and with for provision of traffic aids if transportation activities cannot be avoided during peak hours; and
- Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.

157. Terrestrial flora and fauna. Preliminary survey shows that there will be no requirement of felling of trees for construction of landfill site. Detail of plant species shown in **Table 23**. Buffer zone plantation of trees will be done as per mitigation measures.

158. Social and Cultural Resources. The subproject components will be located in government-owned land. Construction works will impede the access of residents to specific site in limited cases. The potential impacts are negative and moderate but short-term and temporary. The construction contractor will be required to:

- Plan activities in consultation with DSC so that construction works are conducted during periods of the day which will result in least disturbance;
- Expedite construction works near sensitive/ critical areas to minimize any access disturbances;
- Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.

159. Socio-Economic – Income. The subproject components will be located more or less in

government-owned land with minimum private land acquisition. Construction works will impede the access of residents to specific site in limited cases. The potential impacts are negative and moderate but short-term and temporary. The construction contractor will be required to:

- Leave spaces for access between mounds of silt;
- Provide walkways and metal sheets where required to maintain access across for people and vehicles;
- Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools;
- Consult businesses and institutions regarding operating hours and factoring this in work schedules; and
- Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.

160. Labour & Employment. Manpower will be required during the construction stage. This can result to generation of contractual employment and increase in local revenue. Thus potential impact is positive and long-term. The construction contractor will be required to:

- Employ majority of the labour force, or to the maximum extent, local persons within the 2-km immediate area if manpower is available; and
- If available, secure construction materials from local market.

161. Occupational Health and Safety. Workers need to be mindful of the occupational hazards which can arise from excavation works. Potential impacts are negative and long-term but reversible by mitigation measures. World bank Environmental, Health, and Safety (EHS) Guidelines - EHS Guidelines for water & sanitation will be followed(<http://www.ifc.org/wps/wcm/connect/e22c050048855ae0875cd76a6515bb18/Final%2B-%2BWater%2Band%2BSanitation.pdf?MOD=AJPERE>). The construction contractor will be required to:

- Develop and implement site-specific Health and Safety (H&S) Plan³ which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment particularly helmet, gumboot, hand gloves and nose mask; (c) H&S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;
- Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;
- Provide medical insurance coverage for workers;
- Secure all installations from unauthorized intrusion and accident risks;
- Provide supplies of potable drinking water;
- Provide clean eating areas where workers are not exposed to hazardous or noxious substances;
- Provide H&S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;
- Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted;
- Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;

³ For this subproject, the Construction Contractor may follow the World Bank EHS Guidelines

- Ensure moving equipment is outfitted with audible back-up alarms;
- Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; and
- Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.

162. Work Camps. Operation of work camps can cause temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants. Potential impacts are negative but short-term and reversible by mitigation measures. Consultation with respective design engineers revealed that it is unlikely that work camps are required for this subproject. In the case that it will be needed, the construction contractor will be required to:

- Consult with DSC before locating subproject offices, sheds, and construction plants;
- Minimize removal of vegetation and disallow cutting of trees;
- Provide water and sanitation facilities for employees;
- Prohibit employees from cutting of trees for firewood;
- Train employees in the storage and handling of materials which can potentially cause soil contamination;
- Recover used oil and lubricants and reuse or remove from the site;
- Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;
- Remove all wreckage, rubbish, or temporary structures which are no longer required; and
- Request DSC to report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.

163. Community Health and Safety. Hazards posed to the public, specifically in high pedestrian areas may include traffic accidents and vehicle collision with pedestrians. In most of the cases location of project sites at isolated area, hence health and safety risk to community is the minimum. Potential impact is negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

- Plan routes to avoid times of peak-pedestrian activities.
- Liaise with DSC in identifying risk areas on route cards/maps.
- Maintain regularly the vehicles and use of manufacturer-approved Parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.
- Provide road signs and flag persons to warn of dangerous conditions, in case of location near the road.

164. Social and Cultural Resources. For this subproject, excavation will occur at specific isolated location, so it could be that there is a low risk of such impacts. Nevertheless, the construction contractor will be required to:

- Stop work immediately to allow further investigation if any finds are suspected
- Inform DSC if a find is suspected, and take any action they require ensuring its

removal or protection in situ; and

- Request DSC or any authorized person with archaeological/historical field training to observe excavation

C. Operation and Maintenance (O&M) impacts

1. Mode of Operation

165. **Management.** DMB will be responsible for management and implementation of the solid waste management system, and will distribute bins to households in the town for temporary waste storage. This will be supported by a public education campaign, and capacity building for primary collection through which citizens will be requested to segregate their biodegradable and general domestic waste into separate bins, and will be informed about the waste collection and management system. Under the sub project 50000 numbers 25-litre household dustbins is to be provided for the residents for segregation of waste at source (biodegradable and non-biodegradable). At proposed landfill facility it is ensured that only the residual inert material and rejects of compost plant, sewer silt will be disposed.

166. **Storage & Collection.** Covered storage facility/ bins have been procured by DMB and used presently. Waste will be not stored in open atmosphere and bins will be placed at common place so aesthetically accept by local people. DMB will introduce door-to-door primary waste collection throughout the town by the NGO hired under the Program. Mobile garbage bins will collect waste from each household on a regular cycle every day or every two or three days, and the segregated waste will be deposited into separate storage bins in the locality. Waste will also be removed from bins in slums and from litter bins in the streets, and debris from street sweeping and drain de-silting will also be deposited into the municipal storage bins. These will be removed daily by purpose-made vehicles, and two empty bins will be replaced at each site.

167. **Transportation.** Full containers will be transported to the landfill and deposit the waste in the landfill area. The waste transported at landfill facility will be reported with date, time, waste quality etc. and these will be recorded

168. **Disposal.** Waste for landfilling will be moved into position in the currently-used cell by bulldozer and backhoe, and reduced in volume by a compactor vehicle. All waste will be covered by soil at the end of each day, and by a thicker layer of topsoil at the end of each year, when one cell will be closed and another will begin.

169. Excavated soil of the new trench adjacent to the active trench will be used for daily, intermediate, and final soil cover. As far as possible, permeable and porous sand types will be used for daily cover to ensure easy spreading and compaction of the solid wastes, stabilize the landfill waste layers as well as not hindering the waste decomposition process. Porous cover soil is not suitable for preventing bad odor from dispersing, Therefore when such types of soils are used, the cover layers shall be made thins as possible so as to prevent the soil from becoming anaerobic. For immediate soil cover, clayey soil is suitable to prevent gases from dispersing or rainwater from seeping into the waste layers. However, if the area is to be used as a foundation for roads, then crusher stones are recommended as covering materials. The final soil cover shall be resistant to corrosion by rainwater, low permeability and suitable for plants.

170. Suitable design slope will be maintained in the sanitary landfill. An intermediate liner would be provided before onset of monsoon. The final cover will be laid as per construction requirements and MSW regulations to enhance surface drainage, minimize infiltration, vegetation and control the release of the landfill gases.

171. **Appendix 3** shows specific conditions with compliance from DMB as given by SEIAA for operation of landfill facility and compost plant.

2. Anticipated Environmental Impacts and Mitigation Measures

172. The greatest physical impacts from the operating system will occur at the landfill, where decomposing waste will rise to an eventual height of up to 4 m above ground level, which will alter the appearance and topography of the site.

173. Flooding. The landfill design includes specific measures to ensure the site is protected from flooding incidences specifically during the monsoon period. DMB will ensure drainage system is always free from litter; integrity and stability of the retaining wall and bund are regularly monitored. Any breach will be immediately repaired.

174. Leachate Control. The landfill design includes measures to collect leachate and prevent pollution of surface and groundwater. The collected liquid will be re-circulated in the active cells of the landfill.

175. Dust Control. On-site dust will be controlled by use of water truck. Water will be used for dust control only in those areas where no potential for creating leachate exists (such as access roads located outside the refuse filling area). In addition to watering, DMB will use the following methods to control dust: Placement of daily, intermediate and final cover over the waste routinely

- The main access road to the active landfill modules is paved over native ground.
- Continuous attention is given to proper maintenance of haul roads.
- Water spray or dust palliative will be applied on soli covered work areas when conditions may result in fugitive dust.
- Planting and maintenance of vegetation on closed fill slopes.

176. Specific dust control measures may be implemented within the active landfill area, if necessary. The options will be:

- Dust control within the Landfill Footprint (Active Areas) — temporary access roads within the landfill footprint will be watered, as required, to prevent dust problems.
- Dust control outside landfill footprint — permanent concrete or asphalt and gravel or rock-surfaced roads outside the landfill footprint will be watered periodically to mitigate dust. Soil surfaced roads will require more frequent watering.
- Using Leachate for Dust Control — leachate may be used for dust control depending on its concentration. However, leachate will only be used on daily cover or waste within the landfill footprint.

177. Litter Control. If waste is collected regularly from houses, litter bins and elsewhere and the storage bins are emptied daily as intended, there should be no direct impacts on the physical environment. DMB will attempt to minimize windblown or dropped materials on-site. The sites will be checked daily for waste that has been blown or fallen from the collection vehicles. Ditches will be kept clear of litter material to maintain hydraulic properties and will be checked weekly unless the site conditions require a greater frequency. Waste collectors will be instructed to cover loads and vehicles with improper covered loads will be reprimanded. Public roads adjacent to the site will be checked daily for waste materials. The right-of-way within 2-km in either direction will be checked periodically for windblown or spilled materials.

178. Vector Control. The main concern is that if vectors are allowed to thrive in landfills, diseases could pose a threat to human health and/or the environment. Poorly-managed landfills can cause negative ecological impacts by allowing the development of large colonies of scavenging birds, rodents and other vermin, which can then be a nuisance and health hazard in nearby communities, and can reach pest levels on surrounding agricultural land. DMB will operate the landfill in a manner that it will not be a haven for rodents and insects. Special attention will be given to maintenance of daily, intermediate, and final soil cover as well as to proper drainage. In the event that rodent, bird and/or insect activity becomes apparent, supplemental vector control measures may need to be initiated.

- Rodent control. Rats and mice are problems at many landfills. Rats and mice will be controlled by placement of daily cover. An important step is to get rid of waste piles and places where these vectors can live. Setting traps is also a common way to

determine if rats and mice are present at the landfill. By tracking the results of the trapping of, one can determine not only if there is a problem with rats and/or mice, but also whether or not the problem is increasing. If determined that the landfill has a problem with rats and mice, mitigation measures will include (a) using grain poison however care must be taken that other animals (such as protected birds) do not ingest it; (b) using cover soil to eliminate much food source; (c) using traps to reduce the number of rats and mice; and (d) removing or covering exposed refuse.

- Fly control. Flies are problem for landfill that receive large amount of putrescible wastes, especially if the waste is not completely covered at the end of each working day. The simplest way to avoid having a fly problem at the landfill is to cover all garbage with layer of soil at the end of each working day. The compost generated from the compost facility can be used for this purpose

179. Odor Control. Odors at landfill are often results of refuse that is being unloaded or is improperly covered. During landfill operation, daily and intermediate cover placement will help control odor. When highly odorous loads are received, they will be covered immediately with soil. To control odors from in-place refuse (from decomposition of old waste), integrity of soil cover material over all existing wastes will be maintained. Refuse compaction will also help control odor. Planting trees, shrubs, flowers, and other vegetation around the perimeter of the landfill will help mitigate some of the landfill odor.

180. As an additional safeguard, contractors will be required to hose out each bin once it is emptied at the disposal station to ensure that residual waste is not left in replaced bins to decompose over the long term.

181. The design also includes measures to maintain an orderly appearance at the site and to prevent the liberation of excessive odor, as deposited waste will be covered with soil after compaction at the end of each day; and when a cell is closed at the end of each year, a thicker layer of topsoil will be applied to effectively seal the completed area. Simple tube vents will be inserted into the material to allow the escape of methane and other gases produced by the decomposition process, and equipment will be provided for automatic monitoring of such gases, so that additional measures such as controlled flaring can be adopted if necessary.

182. Noise Abatement. Ambient noise level would not exceed the permissible limit. The noise associated with the operation of the landfill will be decreased by fitting all equipment with sound dampening devices (such as mufflers) and keeping the vehicles in good working conditions. Maintenance of the vehicles and equipment will be conducted periodically in accordance with the Landfill O&M Manual.

183. Periodic Routine Inspections. DMB will maintain the individual facilities and the waste management system and ensure that it will be kept in good working order in accordance to the Landfill O&M Manual. DMB will also ensure that no waste will accumulate in streets and on open ground. The actual stability of landfill will be tested at regular interval.

184. Traffic Control. Operating the waste management system will impact traffic and transportation as there will be more heavy vehicles on the roads in and around the town, collecting and transporting the storage bins and transferring waste to the landfill. This will be mitigated by conducting these collections early in the day (when traffic is light) as much as possible. All internal roads would be concreted/ pitched. Proper lighting and proper pathway inside the premises would be constructed to ensure safe vehicular movement. Vehicles would conform to pollution under control (PUC) norms. Proper housekeeping will be maintained within the premises.

185. Ecology. There can be small ecological gains as well as improvements in the appearance of such sites if trees are planted on and around completed waste cells so this should be done. Given the sandy soil and low rainfall of the area such planting may need to be supported by the application of fertilizer from the composting plant and the use of an artificial watering regime.

186. Green belt will be developed atleast 33% of the land area for proposed project to be covered by plantation.

187. Economic Development. Business and small industry in the town should operate more efficiently if their waste is removed speedily and efficiently, so there should be small economic gains once the system is in place. The main economic benefit will be obtained by the companies that are involved in operating the waste management system, either in partnership with the Municipality via private sector schemes or through direct employment.

188. Social and Cultural Resources. The main beneficiaries of the improved system of waste management will be the citizens of the town, whose general environment, and in some cases living conditions, will be improved considerably. The unsightly mounds of garbage should no longer be evident in the town, and the attendant appearance, smell and public health risk should be removed.

189. There will also be socio-economic benefits for people who are able to gain employment with companies involved in operating the system, or with the Municipality, who will need to increase their manpower.

190. Occupational Health and Safety. It is important that employees understand the risks they may be exposed to. DMB will at least tell them: (i) the likely exposure and the risks; (ii) what DMB is doing to control risks and exposures; (iii) where and how people can obtain protection; (iv) how to report defects in protection and control equipment; and (v) what they shall do to minimize the risk, such as the proper way to use protection and other control equipment, how to look after it and store it, and where to use it. This information will be given in a way the employee can be expected to understand (for example special arrangements might need to be made if the employee does not understand English or cannot read). Workers will be provided with adequate personal protective equipment (PPE) as per proposal and sanitation facilities. Occupational health surveillance of the workers will be done on a regular basis and records maintained as per the factories act. World bank Environmental, Health, and Safety (EHS) Guidelines - EHS Guidelines for water & sanitation will also be followed (<http://www.ifc.org/wps/wcm/connect/e22c050048855ae0875cd76a6515bb18/Final%2B-%2BWater%2Band%2BSanitation.pdf?MOD=AJPERE>).

191. Community Health and Safety. Vehicles will be fitted with highly audible reversing alarms and mirrors to avoid accidents to local communities. Vehicles should maintain low speeds through congested areas and residential and school zones. These will be checked at least daily and maintained in good working order. Only authorized and competent workers will be allowed to operate the vehicles. Collection routes will be planned to avoid times of high-pedestrian activities. DMB will liaise with communities to position collection points in safe positions and/or collect at quiet times. DMB will also identify high-risk areas on route cards/maps and access pedestrianized areas such as markets and schools during quiet hours.

D. Cumulative Impact Assessment

192. The cumulative impact assessment (CIA) examined the interaction between the subproject's residual effects (i.e., those effects that remain after mitigation measures have been applied) and those associated with other past, existing and reasonably foreseeable future projects or activities. The subproject's potential cumulative effects were considered with respect to Valued Components (VCs) in the categories of environmental and socio-economic in the following areas:

- Of any potential residual subproject effects that may occur incrementally over time;
- Consideration of other known relevant projects or activities within the specified study area boundaries, even if not directly related to the subproject;
- Potential overlapping impacts that may occur due to other developments, even if not directly related to the proposed subproject; and
- Future developments that is reasonably foreseeable and sufficiently certain to proceed.

193. The subproject IEE has identified the VCs as air quality, water (surface and groundwater)

quality, noise, traffic management, social-economic and socio-community, and human health. There are no foreseeable projects that will overlap with the subproject. The spatial boundary of the subproject is the area along the alignment and the existing ROWs. The temporal boundary can be considered as the whole DMPA.

194. Air quality effects will occur during construction. Consequently, although emissions of common air contaminants (CAC) and fugitive dust may be elevated in proximity to active work sites, this impact will be short-term and localized to the immediate vicinity of the area. Greenhouse Gas (GHG) emissions may increase as a result of the subproject activities (i.e., vehicle and equipment operation, concrete production, disposal of excavated material, landfilling of residual wastes). Given the subproject's relatively minor contribution to CAC and GHG emissions during construction, the overall significance rating of both these potential residual effects is considered to be negligible.

195. During construction noise levels in the immediate proximity of most work sites are expected to increase. The duration of this exposure will be relatively brief. This exposure represents a temporary, localized, adverse residual effect of low to moderate significance for affected receptors. While building damage due to ground vibrations is unlikely, there may be annoyance to spatially located receptors during construction.

196. Land use/traffic management concerns will occur spatially during construction. During construction, site-specific mitigation measures will be implemented to address temporary disruptions to land use and access in the vicinity of the alignment such as road and sidewalk closures, traffic delays and detours, parking modifications, and increased volumes of construction-related traffic. There should be improved traffic movement along the alignment once construction is completed. Since the subproject will be built in developed land, it will not conflict with existing or planned land use. However, following improvement in infrastructures and services, added residential developments, commercial and business facilities and increased densities are expected to develop and enhance the subproject area. This can be considered a long-term cumulative benefit of the subproject, as living conditions would be improved.

197. Adverse impacts such as localized disruption of vehicle traffic and pedestrian movements in areas of transportation route, and elevated particulate matter emissions in proximity to work sites, elevated noise and vibration levels and visual impacts will occur during construction. These short-term effects will be mitigated by providing alternate travel routes or alternating traffic movements and, where possible, access to businesses, schools and residences. However, upon completion of construction the socio-community will benefit from the project. This is considered a long-term cumulative benefit.

198. No adverse residual effects to human health will occur as a result of subproject construction or operation. While exposure to elevated noise levels and fugitive dust and CAC emissions will occur in proximity to subproject work sites during construction, due to their short-term, localized nature, these effects are expected to be minor and insignificant with no measurable effects on human health.

199. Therefore the subproject operations will benefit the general public by contributing to the long-term environmental improvement and community livability in Dibrugarh.

V. INSTITUTIONAL ARRANGEMENTS AND RESPONSIBILITY

A. Implementation Arrangements

200. The Government of Assam's Guwahati Development Department (GDD) will be the executing agency. A state-level PMU, headed by a full-time Project Director, will be established as the implementing agency which will be in-charge of overall execution and technical supervision, monitoring, and financial control of all activities under the project.

201. Project Implementation Units (PIUs) dedicated exclusively to the project would be set up in Guwahati and Dibrugarh. The PIUs will be headed by a senior technical officer and assisted by qualified and experienced officers seconded from ULBs, finance and other line departments.

The PIUs will be responsible for the day-to-day activities of project implementation in the field and will be under the direct administrative control of the PMU. The PIU in Guwahati will have synergies and a coordination mechanism with the PIUs for JNNURM and JICA projects.

202. The PMU will have a Safeguards Compliance and Monitoring Unit (PMU SCMU) to ensure mitigation of any environmental and social impacts due to the subproject. The PMU SCMU will have a Safeguards Officer (PMU SO) who will have the following responsibilities: (i) address environmental and social safeguards issues; (ii) implement of the EARF/RF/IPF; (iii) monitor physical and on-physical activities under the Project; (iv) monitor implementation of safeguards plans; (v) guide the PIUs as and when necessary; and (vi) endorse/submit periodic monitoring reports⁴ received from PMC to the PMU PD, who will then submit these to ADB. The PMU will seek Government of Assam's clearance for submission and disclosure of the environmental and social monitoring report to ADB. It will also coordinate with national and state agencies to resolve inter-departmental issues, if any.

203. The PMU assisted by PMC Safeguards Specialist (PMC SS). The PMC SS will (i) review and finalize all reports in consultation with the PMU SO; (ii) provide project management support, (iii) assure the technical quality of design and construction, (iv) prepare EIA/IEE/RP/IPP reports; and (iv) provide advice on policy reforms. In addition, the PMC ES will assist the PMU on the procurement needs and other project implementation aspects and shall play a central role in ensuring capacity building on environmental management of the PMU, contractors, and line departments through capacity development support and training.

204. The PIUs will each have an Environment Officer and Resettlement Officer who will be responsible for implementation of the EMP in each EIA/IEE and the RP/IPP respectively. Both officers will undertake surveys and record their observations throughout the construction period to ensure that safeguards and mitigation measures are provided as intended. Both will be responsible for (i) implementing and monitoring safeguards compliance activities, public relations activities, gender mainstreaming activities and community participation activities; (ii) obtaining statutory clearances and obtaining NOCs from government agencies /other entities and entering into agreements with them for use of their land; and (iii) coordinating for obtaining any clearances with related State and National agencies.

205. Environment Specialists also appointed as part of the DSC teams to (i) update the existing IEEs in the detailed design stage; (ii) assist in the monitoring of EMP during construction stage; and (iii) prepare EIAs/IEEs for new subprojects, where required to comply with national law and/or ADB procedure. **Figure 14** shows the implementation arrangement for environment and resettlement safeguards.

⁴ The monitoring report will focus on the progress of implementation of the IEE/EIA and EARF, RP/RF and IPP/IPF, issues encountered and measures adopted, follow-up actions required, if any, as well as the status of compliance with subproject selection criteria, and relevant loan covenants.

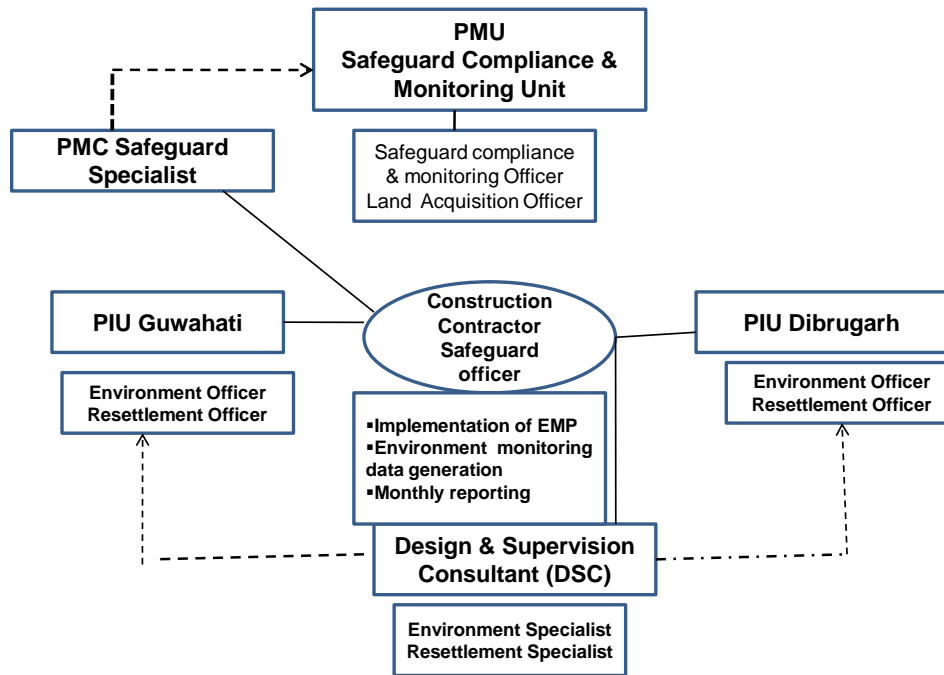


Figure 14: Safeguards Institutional Arrangement

B. Monitoring and Reporting

206. The PMU will monitor and measure the progress of EMP implementation. The monitoring activities will be corresponding with the Project's risks and impacts and will be identified in the EIAs/IEEs for the subprojects. In addition to recording information of the work, deviation of work components from original scope, the PMU and PIUs will undertake site inspections and document review to verify compliance with the EMP and progress toward the final outcome.

207. DSC will submit monthly monitoring and implementation reports to PIU, who will take follow-up actions, if necessary. PIU will submit the quarterly monitoring and implementation reports to PMU who will then submit to the PD. The PMU will submit semi-annual monitoring reports to ADB. The suggested monitoring report format is in **Appendix 11**. Project budgets will reflect the costs of monitoring and reporting requirements. For projects likely to have significant adverse environmental impacts during operation, reporting will continue at the minimum on an annual basis. Monitoring reports will be posted in a location accessible to the public.

208. ADB will review project performance against the EA's commitments as agreed in the legal documents. The extent of ADB's monitoring and supervision activities will be commensurate with the Project's risks and impacts. Monitoring and supervising of social and environmental safeguards will be integrated into the project performance management system.

209. ADB will monitor projects on an ongoing basis until a project completion report is issued. ADB will carry out the following monitoring actions to supervise project implementation:

- ✓ conduct periodic site visits for projects with adverse environmental or social impacts;
- ✓ conduct supervision missions with detailed review by ADB's safeguard

specialists/officers or consultants for projects with significant adverse social or environmental impacts:

- ✓ review the periodic monitoring reports submitted by EA to ensure that adverse impacts and risks are mitigated as planned and as agreed with ADB;
- ✓ work with EA to rectify to the extent possible any failures to comply with their safeguard commitments, as covenanted in the legal agreements, and exercise remedies to re-establish compliance as appropriate; and
- ✓ prepare a project completion report that assesses whether the objective and desired outcomes of the safeguard plans have been achieved, taking into account the baseline conditions and the results of monitoring.

C. Institutional Capacity

210. There is low capacity to implement projects in accordance with ADB safeguard requirements in both project cities. The ULBs do not have environmental/social safeguards personnel, capacity to handle environmental/IR/IP impacts, gender and vulnerability issues. The PMC will be responsible for training of PMU and PIUs staff on aspects such as environmental planning/resettlement planning/implementation, social protection and gender, including the specific recording, reporting and disclosure requirements.

211. The PMC safeguards specialist and DSC environmental specialist will provide the basic training required for environmental awareness and management in accordance with both ADB and government requirements. Specific modules customized for the available skill set shall be devised after assessing the capabilities of the target participants and the requirements of the Project. The entire training will cover basic principles of environmental assessment and management; mitigation plans and programs, implementation techniques, monitoring methods and tools. Typical modules that will be present for the training session would be as follows: (i) sensitization; (ii) introduction to environment and environmental considerations in urban development projects; (iii) review of IEEs and Integration into the subproject detailed design; (iv) improved coordination within Nodal Departments; (v) monitoring and reporting system. The proposed training program along with the frequency of sessions is presented in **Table 27**. DSC's Safeguard specialist will be available at Dibrugarh on continuous basis. PMC's and PMU's Environment safeguard specialist will be visited to site atleast once in a month.

Table 27: Training Program for Environmental Management

Program	Description	Participants	Form of Training	Duration/ Location	Conducting Agency
A. Pre-Construction Stage					
Sensitization Workshop/ Before awarding of contract - March 2016	Introduction to Environment: <ul style="list-style-type: none"> ✓ Basic Concept of environment ✓ Environmental Regulations and Statutory requirements as per Government of India and ADB 	Secretaries, Chief Engineer, Superintendent Engineers of PWD, PHED and UDD, the Development Commissioner, Chairman, CEO of DMB and Project Director (PD) and PIUs Environmental Officers (EOs)	Workshop	½ Working Day	Project Management Consultant Safeguards Specialist (PMC SS) and DSC Environmental Specialist (DSC ES)
Session I					

Program	Description	Participants	Form of Training	Duration/ Location	Conducting Agency
Module I	<p>Introduction to Environment:</p> <ul style="list-style-type: none"> ✓ Basic Concept of environment ✓ Environmental Regulations and Statutory requirements as per Government of India and ADB 	Engineers of PWD, PHED and UDD, ULBs, PMU (Technical Unit) and PIUs EOs	Lecture	¼ Working Day	PMC SS and DSC ES
Module II	<p>Environmental Considerations in Urban Development Projects:</p> <ul style="list-style-type: none"> ✓ Environmental components affected by urban development in construction and operation stages ✓ Activities causing pollution during construction and operation stages ✓ Environmental Management Good Practices in Urban Infrastructure Projects 	Engineers of PWD, PHED and UDD, ULBs, PMU (Technical Unit) and PIUs EOs	Workshop	¼ Working Day	PMC SS and DSC ES
Module III	<p>Review of IEE and its Integration into Designs:</p> <ul style="list-style-type: none"> ✓ IEE Methodology ✓ Environmental Provisions in the EMPs ✓ Implementation Arrangements ✓ Methodology of Assessment of Pollution Monitoring ✓ Methodology for site selection of borrow areas, waste disposal 	Engineers of PWD, PHED and UDD, ULBs, PMU (Technical Unit) and PIUs EOs	Lecture and Field Visit	½ Working Day	PMC SS and DSC ES
Module IV	<p>Improved Coordination with other Departments:</p> <ul style="list-style-type: none"> ✓ Overview of the Project ✓ Environmental and Social Impacts ✓ Statutory Permissions ✓ Procedural Requirements ✓ Cooperation and Coordination with other Departments. 	Engineers of PWD, PHED and UDD, ULBs, PMU (Technical Unit) and PIUs EOs	Lecture / Interactive Sessions	½ Working Day	PMC SS and DSC ES

Program	Description	Participants	Form of Training	Duration/ Location	Conducting Agency
Module V	Special Issues in the Project ✓ Bio-Diversity Assessment and Conservation ✓ Geomorphological Assessment and Slope Protection ✓ Statutory Permissions– Procedural Requirements ✓ Consultation and Counseling	Engineers of PWD, PHED and UDD, ULBs, PMU (Technical Unit) and PIUs EOs	Lecture	½ Working Day	PMC SS and DSC ES
B. Construction Stage					
Session II – Expected just before construction – May 2016					
Module VI	Role during Construction ✓ Roles and Responsibilities of officials/ contractors/ consultants towards protection of environment ✓ Implementation Arrangements ✓ Monitoring mechanisms	Engineers of PWD, PHED and UDD, ULBs, PMU (Technical Unit) and PIUs EOs	Lecture / Interactive Sessions	½ Working Day	PMC SS and DSC ES
Module VII	Monitoring and Reporting System	PMU (Technical Unit) and PIUs EOs	Lecture / Interactive Sessions	½ Working Day	PMC SS and DSC ES

Notes: APCB – Assam Pollution Control Board; CFE – Consent for Establishment, CFO – Consent for Operation, DFO – Divisional Forest Officer, DSC – Design and Supervision Consultant, EAC - Environmental Appraisal Committee, EARF – Environmental Assessment and Review Framework, EC – Environmental Clearance, EIA – Environmental Impact Assessment, EMP – Environmental Management Plan, FAM – Facility Administration Memorandum, IEE – Initial Environmental Examination, MoEF – Ministry of Environment and Forest, NOC – No Objection Certificate, PHED - Public Health Engineering Department, PIU - Public Implementation Unit, PMC - Project Management Consultants, PMU - Program Management Unit, PWD - REA – Rapid Environmental Assessment, SEAC – State Environment Assessment Committee, SEIAA – State Environment Impact Assessment Authority, STP – sewage treatment plant, TOR – Terms of Reference, UDD - Urban Development Department, ULB - Urban Local Body

VI. GRIEVANCE REDRESS MECHANISM

212.A project-specific grievance redress mechanism (GRM) will be established to receive, evaluate and facilitate the resolution of affected people's concerns, complaints and grievances about the social and environmental performance at the level of the Project. The GRM will aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project. The grievance redress mechanism and procedure is depicted in **Figure 15** below. The project-specific GRM is not intended to bypass the government's own redress process; rather it is intended to address affected people's concerns and complaints promptly, making it readily accessible to all segments of the affected people and is scaled to the risks and impacts of the project.

213.The PMU and PIUs will make the public aware of the GRM through public awareness campaigns. Grievances can be filed in writing using the Complaint Register and Complaint Forms (**Appendix 12**) or by phone with any member of the PMU or PIU. The contact phone number of the respective PIUs and the PMU will serve as a hotline for complaints and will be publicized through the media and placed on notice boards outside their offices and at

construction sites. The safeguard documents made available to the public in an accessible version will include information on the GRM and will be widely disseminated throughout the corridor by the safeguards officers in the PMU and PIUs with support from the NGO engaged to implement the C&P.

214. Grievance Redress mechanism and committee has been set up for AUJIP on 1st July 2015.

215. First tier of GRM. The PIU is the first tier of GRM which offers the fastest and most accessible mechanism for resolution of grievances. The Resettlement Officer and Environmental Officer in each PIU will be designated as the key officers for grievance redress. Resolution of complaints will be done within seven working (7) days. At this stage, the Resettlement Officer and Environmental Officer will inform the PMU's Safeguards Compliance and Monitoring Unit (SCMU) for additional support and guidance in grievance redress matters. Investigation of grievances will involve site visits and consultations with relevant parties (e.g., affected persons, contractors, traffic police, etc.). Grievances will be documented and personal details (name, address, date of complaint, etc.) will be included unless anonymity is requested. A tracking number will be assigned for each grievance, including the following elements:

- (i) Initial grievance sheet (including the description of the grievance) with an acknowledgement of receipt given to the complainant when the complaint is registered;
- (ii) Grievance monitoring sheet with actions taken (investigation, corrective measures); and
- (iii) Closure sheet, one copy of which will be handed to the complainant after he/she has agreed to the resolution and signed-off.

216. The updated register of grievances and complaints will be available to the public at the PIU office, construction sites, and other key public offices along the project corridor. Should the grievance remain unresolved it will be escalated to the second tier.

217. Second Tier of GRM. The Resettlement Officer and Environmental Officer in each PIU will activate the second tier of GRM by referring the unresolved issue (with written documentation) to the PMU's Safeguards Compliance and Monitoring Unit who will pass unresolved complaints upward to the Grievance Redress Committee (GRC).⁵ A hearing will be called with the GRC, if necessary, where the affected person can present his/her concern/issues. The process will facilitate resolution through mediation. The local GRC will meet as necessary when there are grievances to be addressed. The local GRC will suggest corrective measures at the field level and assign clear responsibilities for implementing its decision within fifteen (15) working days. The contractor will have observer status on GRC. If unsatisfied with the decision, the existence of the GRC will not impede the complainant's access to the Government's judicial or administrative remedies.

218. The PMU SCMU officers will be responsible for processing and placing all papers before the GRC, maintaining database of complaints, recording decisions, issuing minutes of the meetings and monitoring to see that formal orders are issued and the decisions carried out.

219. Third tier of GRM. In the event that a grievance cannot be resolved directly by the PIUs

⁵ The GRC will consist of the following persons: (i) Project Director; (ii) representative of the affected person(s); (iv) representative of the local Deputy Commissioners office (land); and (v) representative of APCB (for environmental- related grievances). The functions of the local GRC are as follows: (i) resolve problems quickly and provide support to affected persons arising from various environmental issues and including dust, noise, utilities, power and water supply, waste disposal, traffic interference and public safety as well as social and resettlement related issues such as land acquisition (temporary or permanent); asset acquisition; and eligibility for entitlements, compensation and assistance; (ii) reconfirm grievances of displaced persons, categorize and prioritize them and aim to provide solutions within a month; (iii) report to the aggrieved parties about developments regarding their grievances and decisions of the GRC.

(first tier) or GRC (second tier), the affected person can seek alternative redress through the union Parishad or ward committees or in the appropriate court of law. The PIUs or GRC will be kept informed by the district, municipal or national authority.

220. The safeguard monitoring reports will include the following aspects pertaining to progress on grievances: (i) number of cases registered with the GRC, level of jurisdiction (first, second and third tiers), number of hearings held, decisions made, and the status of pending cases; and (ii) lists of cases in process and already decided upon may be prepared with details such as Name, ID with unique serial number, date of notice, date of application, date of hearing, decisions, remarks, actions taken to resolve issues, and status of grievance (i.e., open, closed, pending).

221. **Costs:** All costs involved in resolving the complaints (meetings, consultations, communication and reporting / information dissemination) will be borne by the PMU.

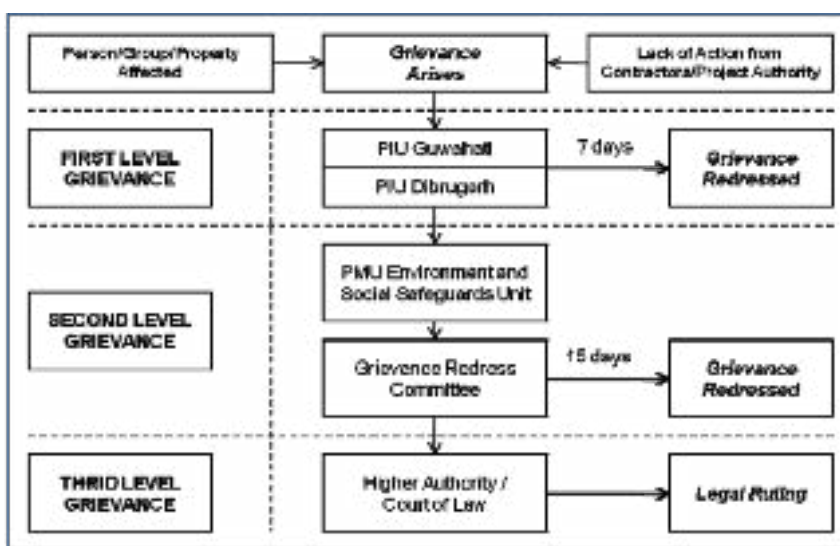


Figure 15: Grievance Redress Mechanism

VII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Process for Consultation

222. Detailed consultations were held with the local community and the representatives from DMB. These consultations provide input for finalization of the project components as well as helps in understanding the need of the stakeholders for incorporation in the subproject components. The following stakeholders were consulted:

- (i) Officials of various Government Departments,
- (ii) Community people of slums
- (iii) Elected representatives and technical staff from Dibrugarh municipal Board
- (iv) Ward commissioner of the respective ward.
- (v) Local communities of different wards

223. The tools for consultation included formal meetings, structured discussions, focus group discussions apart from questionnaire administered for a sample population. These consultations included specific discussions on issues pertaining to need for improvement of solid waste management in the city.

224. The details of primary consultations held in Dibrugarh are presented in **Table 28** and **29**.

Table 28: Details of Consultations During Subproject Preparation(2012)

Locality	Present Situation/Issues Identified	Quality of service	Perceptions/Awareness on SWM	Willingness to Pay for Service
Sejpur/Ward no-1	Insufficient dustbins/community bin leads to dumping of waste on road side and into drains, water bodies and in other low-lying area. Scarcity of service and irregular waste collection on monthly basis Choking of drains leads to Water stagnation and Creating Hygienic problem as well as health Hazards.	Not satisfactory	Very few are aware of Improper waste storage facility can leads to health impact.	Willing to cooperate for the improved SWM service.
Nizkadamoni/ Ward no-2	Waste dumped on road side and into the drain. No source segregation is practiced. Scarcity of service and irregular waste collection mostly on monthly basis. Choking of drains results in Water logging and contamination as well as health Hazards.	Very poor	Awareness level on SWM is moderate. Health Hazard is also reported.	Willing to participate for a proper source collection and segregation practice.
Lachit Nagar/ ward no-4	Solid waste collection is limited along main roads. Disposal of waste on road and into the drain. Collection points are open and scattered. Irregular waste collection service from DMB. Frequency of collection is only 2-3 times in month.	Poor	Awareness on impacts of poor SWM on health	Willing to cooperate fully for the improved SWM service
ChringChopari/ ward no-6	Absence of proper Dustbins/ community bin leads to dumping of waste on roads and drains. Scarcity of service and irregular waste collection by DMB, Waste collection frequency only 1-2 times in a month.	Poor	Awareness level of the people is good but in the absence of proper bins and irregular service wastes are allowed to be dumped along roads and on drains.	Most of the participants are willing to cooperate for the improved service.
Loharpatty/ Ward no-10	NGO's are working in this ward on behalf of DMB for collection of solid waste Waste collected only along main roads.	Moderate	Awareness level about indiscriminate dumping and associated health impact is moderate.	Few participant asked for an improved service and willing to pay for the same if waste are collected regularly
New market/Ward no-11	In some area NGO's are involved for SWM. DMB service is regular for the specific market area. Absence of proper dustbins/ community bin leads to dumping of waste on roads and on drains.	Poor	Community is aware of the need of an improved SWM and impacts of solid waste on health and surrounding environment.	Most of the participants are eager to cooperate for the improved service and Willing to pay for SWM.

Locality	Present Situation/Issues Identified	Quality of service	Perceptions/Awareness on SWM	Willingness to Pay for Service
Middle Choukidung/ Ward no-14	Wastes are dumped on an open space and no source segregation is practiced. Waste clearing frequency is once in a week.	Poor	Awareness level of the people is moderate regarding solid waste Management.	Can't afford to pay for an improved service.
Kahalimari/ ward no-15	Dumping of waste on roads and on drains, leads to choking of drains DMB's waste collection service is very irregular. Frequency of waste collection is 1-2 times in a month.	poor	Community aware of the need of an improved SWM	Participants are unsure about the improved SWM but few of them willing to pay for improved service.
Graham Bazar slum area/ Ward no-17	Irregular waste collection service from DMB. Collection points located along main roads only	Very poor	Awareness regarding ill impacts of SWM is poor.	Can't afford to pay for an improved service.
Nalipool/ Ward no-	Absence of Dustbins/ community bin leads to dumping of waste on roads and side and into drains and in other low-lying area. Collection frequency is once or twice in a month	Poor	Community is aware of the need of an improved SWM	Most of the participants are willing to cooperate for the improved service.
Paltan Bazar/ Ward no-22	SW collection is limited along main roads. However collection frequency is only 1-2 times a month. Wastes are scattered	Very poor	Awareness level on SWM is there.	Willing to contribute for an improved service only if the system shows good results.

Table 29: Results of Consultations with NGOs

NGO	Present Activity related to SWM	Willing to participate in SWM	Likely involvement in the Project
Goodwill Foundation	Presently organizing community waste clearing from road side	Shown eagerness towards participating in door to door collection, and awareness generation program	Organizing house to house waste collection, awareness campaign, educates people about the ill effects of poor SWM.

225. Recently public consultation has been carried out during preparation of EIA and updation of IEE report. **Appendix 13** shows the detail consultation and list of public attended in consultation meetings. Public hearing meeting note for EIA study is also enclosed in **Appendix 13**.

226. As per SPS 2009 meaningful consultation is a process that (i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle; (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.

227. Summary of recently consultation done at local level and during public hearing is given below.

Issues/ Concern from public	Consideration id design and action
Awareness of the landfill project at Dibrugarh	The community was aware of the project through the DMB They have been in touch with the Deputy Commissioner (DC) regularly for understanding the development.
Local people have raised the concern to the DC that if the sanitary landfill not maintained it will cause a serious health hazard to all the villages surrounding it.	After construction contractor will operate landfill for 5 years. After that DMB will either engage new O & M or manage by their own. There is no question of non maintenance of landfill
Present dumping and perception of local people	Presently all waste is dumped in the nearby open area, which create health problem. New scientific landfill will improve the situation
Regarding forest area nearby	There is no forest area nearby the proposed landfill.
As per local people - proposed landfill will affect school, religious places and residential area	No religious places nearby and no chance of impact. L.P. school nearby the landfill will be shifted No residential area, historical area etc. nearby the project site. Moreover monitoring will be done during construction and operation phases
Probability of air and water pollution from the proposed project	Air quality monitoring will be conducted during construction and operation phases. Dust suppression measures will be maintained. River protection work planned to restrict water pollution from garbage. River water quality will be tested during construction and operation
Drainage problem at the project area	Villager informed that there is no drainage problem in and around their village
Requirement of tree felling due to project activity	No tree felling is required. In case of tree felling permission will be obtained from concerned dept.

B. Future Consultation and Disclosure

228. The public consultation shall be a continuous process and will continue in future during subproject implementation. The DSC will be appointed to handle this key aspect of the program, who will conduct a wide range of activities in relation to all subprojects in each town, to ensure that the needs and concerns of stakeholders are registered, and are addressed in subproject design, construction or operation where appropriate. The program of activities include the following:

- (i) Public meetings with affected communities to discuss and plan work program and allow issues to be raised and addressed once construction has started
- (ii) Smaller-scale meetings to discuss and plan construction work with individual communities to reduce disturbance and other impacts, and provide a mechanism through which stakeholders can participate in subproject monitoring and evaluation.

229. Future consultation details are given below.

Consultation Module	Frequency/ time frame	Target participants	Conducting agency	Fund
• During construction – Use of PPE and community safety as per requirement	Atleast quarterly throughout the construction period	Construction team Local – nearby	Safety officer of contractor Environment	Contractor

Consultation Module	Frequency/ time frame	Target participants	Conducting agency	Fund
<ul style="list-style-type: none"> - Safety issues related to construction phase - Air, noise, water pollution - Transportation of construction material and impact on local environment through transportation route - Tree felling - Impact on any sensitive receptors 		residence Any impacted receptor	Expert of PMU, Environment safeguard specialist of PMC and DSC, Construction Manager of DSC	
<ul style="list-style-type: none"> • During operation <ul style="list-style-type: none"> - Involvement of local public and awareness related to waste segregation, collection and transportation and disposal - Quality of ground water nearby - Maintenance of Hygienic environment at landfill site and process/ treatment unit - Buffer zone in and around landfill operation - Marketability of compost including local use in tea garden - Chances of river water pollution or not - Air, noise, water environment - Transportation route of waste materials 	Atleast quarterly throughout the operation period	Local – nearby residence Any impacted receptor Operator DMB staff involved in landfill operation	Environment Expert of PMU, Environment safeguard specialist of PMC and DSC, Construction Manager of DSC, Project Manager of Operator	PMU project fund

230. For the benefit of the community the summary IEE and EMP will be translated in Assamese and made available at: (i) ULB office; (ii) District Magistrate Office; and, (iii) PMU; and (iv) PIUs. Hard copies of the IEE will be kept in public locations accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. Electronic version of the IEE will be placed in the official website of the PMU/State Government and the official website of ADB after approval of the IEE by Government and ADB. The PMU will issue Notification on the locality-wise start date of implementation of the subproject. The notice will be issued by the PMU in local newspapers one month ahead of the implementation works. Copies of the IEE will be kept in the PMU and PIU offices and will be distributed to any person willing to consult the IEE.

VIII. ENVIRONMENTAL MANAGEMENT PLAN

A. Environmental Mitigation and Monitoring Program

231. The potential impacts identified and assessed and the mitigation measures formulated to minimize those impacts to acceptable levels identified in the earlier sections are summarized in the following tables. The table also delegates the responsibility of implementing mitigation to various agencies involved in the program implemented as listed above.

232. As part of the preparation of the application for EC from MoEF the following baseline parameters must be established for a one year period prior to construction of a landfill:

- (i) Ground water Quality: Minimum of 4 samples from each aquifer analyzed in monthly basis for drinking water quality parameters.
- (ii) Surface Water Quality: Minimum of 3 samples from a stream/storm water drain analysed on a monthly basis and for parameters relevant for wastewater drains.
- (iii) Landfill Gas: Sampling and analysis for methane, hydrogen sulfide and other gases on a monthly basis.
- (iv) Dust: particle size less than 10 microns (PM10) monitoring on a monthly basis, specifically at noon, during hot, dry, windy days.
- (v) Odor: Monthly analysis at the site and at 200 m intervals from the landfill boundary to the nearest inhabited zone.
- (vi) Noise: Peak noise analysis at the site and nearby inhabited zone on a monthly basis.
- (vii) Vegetative Cover: Vegetative mapping on a seasonal basis

Table 30: Anticipated Impact and Mitigation Measures–Pre-construction Stage

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
Environmental clearances	Non-compliance with National Laws	(i) Environmental Clearance under EIA Notification (ii) Consent to Establish under Water (Prevention and Control of Pollution) Act (iii) Consent to Establish under Air (Prevention and Control of Pollution) Act (iv) Authorization for setting up waste processing and disposal facility from Assam Pollution Control Board (v) Tree-cutting (if any) permit from the Forest Department	PMU and PIU with assistance from DSC	(i) Environmental Clearance (ii) Consent to Establish (Water) (iii) Consent to Establish (Air) (iv) Authorization for setting up waste processing and disposal facility; (v) Tree-cutting Permit, if necessary
Security	Unauthorized access, illegal dumping, burning, and squatting	The boundary walls will be marked and a billboard will be placed at the gate and at conspicuous locations in the landfill site. Security will be provided to ensure that illegal dumping, theft, and unauthorized access do not happen.	PMU, PIU, and DSC	Boundary walls around landfill site
Traffic Investigation	Increased heavy vehicular traffic due to landfilling	Conduct investigation to determine peak traffic volume Adequate transport management plan would be in place for uninterrupted traffic flow. Roads will be designed to provide adequate turning and	PMU, PIU, and DSC	Traffic volume projections during Operations Transport Management Plan Road design criteria

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		dumping areas to accommodate delivery by all types of vehicles.		
Landfill design consideration	(i) landfilling activities leading to alterations of drainage pattern of the site; (ii) contamination of soil, surface and ground water resources from leachate produced during operation phase; (iii) flooding of the site due to proximity to Sessa River; and (iv) absence of any drainage arrangements transfer stations leading to wash waters stagnating around the site resulting to unsanitary conditions.	The landfill design and management emphasize prevention of any nuisance, leachate formation minimization, flood mitigation measures for 100 year flood, reducing emission and also minimizing air, water and land pollution. The project site would be suitable leveled and embankments would be constructed in such a manner that under no circumstances the storm water from outside area can enter the project site. All components of the leachate collection system would have sufficient strength to support the weight of the overlying waste, cover system and post closure loadings as well as stresses from operating equipment.	DSC	(i) drainage system (ii) flood protection (iii) leachate collection and treatment (iv) landfill gas venting (v) landfill liner (vi) vector control and pest management
Compost Facility Design Considerations	(i) incomplete decomposition of organic wastes; (ii) leachate generation from initial stages of decomposition, (iii) failure of compost plant due to mixed waste (iv) odour impact in and around compost plant	(i) Consideration of aerobic process for Organic decomposition; and (ii) ensure sufficient availability of absorbent materials such as saw dust (iii) segregated waste will be sent to compost plant., (iv) buffer zone would be provided as per design to minimize the odour and transport of bio aerosols along downwind of the facility.	PMU, PIU, and DSC	(i) process for composting (ii) list of absorbent materials to be made available during operation
Locational Consideration	Habitation within 500 m from the landfill boundaries	Declaration of "No-Development Buffer Zone" after the landfill location is finalised	PMU, PIU, and DSC	"No-Development Buffer Zone" declared
Social and Cultural Resources	Ground disturbance can uncover and damage archaeological and historical remains	(i) Consult DMB to obtain an expert assessment of the archaeological potential of the site; (ii) Consider alternatives if the site is found to be of high risk; (iii) Include state and local archaeological, cultural and historical authorities, and interest groups in consultation forums as project stakeholders so that their expertise can be made available; and (iv) Develop a protocol for use by	PMU, PIU, and DSC	Chance Finds Protocol

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		the construction contractors in conducting any excavation work, to ensure that any chance finds are recognised and measures are taken to ensure they are protected and conserved.		
Construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas	Disruption to traffic flow and sensitive receptors	(i) Prioritize areas within or nearest possible vacant space in the subproject location; (ii) If it is deemed necessary to locate elsewhere, consider sites that will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems; (iii) Do not consider residential areas; (iv) Take extreme care in selecting sites to avoid direct disposal to water body which will inconvenience the community.	PMU, PIU, and DSC to determine locations prior to award of construction contracts.	List of selected sites for construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.
Sources of Materials	Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution.	(i) Prioritize sites already permitted by the Mining Department; (ii) If other sites are necessary, inform construction contractor that it is their responsibility to verify the suitability of all material sources and to obtain the approval of PMU and (iii) If additional quarries will be required after construction is started, inform construction contractor to obtain a written approval from PMU/PIU	PMU, PIU, and DSC to prepare list of approved quarry sites and sources of materials	(i) List of approved quarry sites and sources of materials; (ii) Bid document to include requirement for verification of suitability of sources and permit for additional quarry sites if necessary.
Landfill Operations Manual	Landfill integrity is not maintained	(i) Prepare Operations and Maintenance (O&M) Manual	PMU, PIU, and DSC	(i) O&M Manual
Environmental Monitoring Program	Non-compliance with Municipal Solid Waste Management and Handling Rules	(i) conduct one (1) year baseline surveys of groundwater quality, surface water quality, landfill gas, dust, odor, noise, and vegetative cover	PMU, PIU, and DSC	(i) baseline survey results for one (1) year

DSC =Design Supervision Consultant, PMU =Project Management Unit; PIU =Project Implementation Unit

Table 31: Anticipated Impacts and Mitigation Measures–Construction Stage

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
Sources of Materials	Extraction of rocks and material may cause ground instability	(i) Use quarry sites and sources permitted by government; (ii) Verify suitability	Construction Contractor	Construction Contractor documentation

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		<p>of all material sources and obtain approval of PMU/PIU;</p> <p>(iii) If additional quarries will be required after construction has started, obtain written approval from PMU/PIU; and;</p> <p>(iv) Submit to DSC on a monthly basis documentation of sources of materials.</p>		
Air Quality	<p>Emissions from construction vehicles, equipment, and machinery used for excavation and construction resulting to dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons)</p>	<p>(i) Consult with PMU/PIU/DSC on the designated areas for stockpiling of clay, soils, gravel, and other construction materials;</p> <p>(ii) Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather;</p> <p>(iii) Use tarpaulins to cover sand and other loose material when transported by trucks; and</p> <p>(iv) Fit all heavy equipment and machinery with air pollution control devices which are operating correctly.</p>	Construction Contractor	<p>(i) Location of stockpiles;</p> <p>(ii) Complaints from sensitive receptors; (iii) Heavy equipment and machinery with air pollution control devices</p>
Surface water quality	<p>Mobilization of settled silt materials, run-off from stockpiled materials, and chemical contamination from fuels and lubricants during construction works can contaminate nearby surface (river) water quality.</p>	<p>(i) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;</p> <p>(ii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with PMU/PIU/DSC on designated disposal areas;</p> <p>(iii) Place storage areas for fuels and lubricants away from any drainage leading to water bodies;</p> <p>(v) Dispose any wastes generated by construction activities in designated sites;</p>	Construction Contractor	<p>(i) Areas for stockpiles, storage of fuels and lubricants and waste materials; (ii) Number of silt traps installed along drainages leading to water bodies;</p> <p>(iii) Records of surface water quality inspection;</p> <p>(iv) Effectiveness of water management measures</p>

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		and (vi) Conduct surface quality inspection according to the Environmental Management Plan (EMP).		
Noise Levels	Increase in noise level due to earth-moving and excavation equipment, and the transportation of equipment, materials, and people	(i) Plan activities in consultation with PMU/PIU/DSC so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance; (ii) Require horns not be used unless it is necessary to warn other road users of the vehicle's approach; (iii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Use of silencers in noise-producing equipment and sound barriers;
Existing Infrastructure and Facilities	Disruption of service and damage to Existing infrastructure at specified project location	(i) Obtain from PMU/PIU/DSC the list of affected utilities and operators if any; (ii) Prepare a contingency plan to include actions to be done in case of unintentional interruption of service	Construction Contractor	Existing Utilities Contingency Plan
Landscape and Aesthetics	Solid wastes as well as excess construction materials	(i) Prepare and implement Waste Management Plan; (ii) Avoid stockpiling of excess excavated soils; (ii) Coordinate with DMB for beneficial uses of excess excavated soils or immediately dispose to designated areas; (iv) Recover used oil and lubricants and reuse or remove from the sites; (v) Manage solid waste according to	Construction Contractor	(i) Waste Management List; (ii) Complaints from sensitive receptors; (iii) PMU/PIU/DSC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		<p>the following preference hierarchy: reuse, recycling and disposal to designated areas;</p> <p>(vi) Remove all wreckage, rubbish; and</p> <p>(vii) Request PMU/PIU/DSC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.</p>		
Accessibility	Traffic problems and conflicts near project locations and haul road	<p>(i) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites;</p> <p>(ii) Schedule transport and hauling activities during non-peak hours;</p> <p>(iii) Locate entry and exit points in areas where there is low potential for traffic congestion;</p> <p>(iv) Keep the site free from all unnecessary obstructions;</p> <p>(v) Drive vehicles in a considerate manner;</p> <p>(vi) Coordinate with Dibrugarh Municipal Traffic Office for temporary road diversions and with for provision of traffic aids if transportation activities cannot be avoided during peak hours;</p> <p>(vii) Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints</p>	Construction Contractor	<p>(i) Traffic Management Strategy;</p> <p>(ii) Complaints from sensitive receptors; (iii) Number of signages placed at subproject location.</p>
Socio-Economic - Employment	Generation of contractual employment and increase in local	(i) Employ at least 50% of the labor force, or to the maximum extent,	Construction Contractor	<p>(i) Employment records;</p> <p>(ii) records of</p>

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
	revenue	local persons within the 2-km immediate area if manpower is available; and (ii) Secure construction materials from local market		sources of materials
Occupational Health and Safety	Occupational hazards which can arise during work	(i) Develop and implement site-specific Health and Safety (H&S) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment like helmet, gumboot, safety belt, gloves, nose musk and ear plugs; (c) H&S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents; (ii) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site; (iii) Provide medical insurance coverage for workers; (iv) Secure all installations from unauthorized intrusion and accident risks; (v) Provide supplies of potable drinking water; (vi) Provide clean eating areas where workers are not exposed to hazardous or noxious substances; (vii) Provide H&S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at	Construction Contractor	(i) Site-specific Health and Safety (H&S) Plan; (ii) Equipped first-aid stations; (iii) Medical insurance coverage for workers; (iv) Number of accidents; (v) Supplies of potable drinking water; (vi) Clean eating areas where workers are not exposed to hazardous or noxious substances; (vii) record of H&S orientation trainings (viii) personal protective equipments; (ix) % of moving equipment outfitted with audible back-up alarms; (xi) sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		<p>the site, personal protective protection, and preventing injuring to fellow workers;</p> <p>(viii) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted;</p> <p>(ix) Ensure moving equipment is outfitted with audible back-up alarms;</p> <p>(x) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; and</p> <p>(xi) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.</p>		
Community Health and Safety.	Traffic accidents and vehicle collision with pedestrians during material and waste transportation .	<p>(i) Plan routes to avoid times of peak-pedestrian activities.</p> <p>(ii) Liaise with PMU/PIU/DSC in identifying high-risk areas on route cards/maps.</p> <p>(iii) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents</p>	Construction Contractor	<p>(i) Traffic Management Plan;</p> <p>(ii) Complaints from sensitive receptors</p>

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		caused by equipment malfunction or premature failure. (iv) Provide road signs and flag persons to warn.		
Work Camps (if needed)	Temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants	(i) Consult with PMU/PIU/DSC before locating project offices, sheds, and construction plants; (ii) Minimize removal of vegetation and disallow cutting of trees; (iii) Provide water and sanitation facilities for employees; (iv) Prohibit employees from poaching wildlife and cutting of trees for firewood; (v) Train employees in the storage and handling of materials which can potentially cause soil contamination; (vi) Recover used oil and lubricants and reuse or remove from the site; (vii) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; (viii) Remove all wreckage, rubbish, or temporary structures which are no longer required; and (ix) Request PMU/PIU/ DSC to report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Water and sanitation facilities for employees; and (iii) PMU/PIU/DSC report in writing that the camp has been vacated and restored to pre-project conditions
Social and Cultural Resources	Risk of archaeological chance finds	(i) Strictly follow the protocol for chance finds in any excavation work; (ii) Request PMU/PIU/DSC or any authorized person with	Construction Contractor	Records of chance finds

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		archaeological field training to observe excavation; (iii) Stop work immediately to allow further investigation if any finds are suspected; and (iv) Inform PMU/PIU/DSC if a find is suspected, and take any action they require ensuring its removal or protection in situ.		

DSC = Design Supervision Management Consultant, H&S = health and safety, RPM = respirable particulate matter, PMU = Project Management Unit; PIU = Project Implementation Unit; SPM = suspended particulate matter, DMB = Dibrugarh Municipal Board

Table 32: Anticipated Impacts and Mitigation Measures–Operation & Maintenance stage

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
Leachate Control	surface, groundwater contamination	Re-circulate leachate to the active parts of the landfill 1.5 mm thick HDPE geo-membranes liner will be provided on the top of the 900 mm thick clay liner to prevent and damaging impact in surrounding area and to prevent water infiltration.	DMB and O&M Contractors	All leachate re-circulated Liner at landfill cell
Dust Control	increased PM10 level	(i) Placement of daily, intermediate, and final cover over the waste routinely; (ii) The main access road to the active landfill modules is paved over native ground; (iii) Continuous attention is given to proper maintenance of haul roads; (iv) Water spray or dust palliative will be applied on soil-covered work areas when conditions may result in fugitive dust; and (v) Planting and maintenance of vegetation on closed fill slopes.	DMB and O&M Contractors	(i) Records available
Dust Control – Specific	increased PM10 level	(i) Dust control within the Landfill Footprint (Active Areas) –	DMB and O&M Contractors	(i) Records available

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		<p>temporary access roads within the landfill footprint will be watered, as required, to prevent dust problems;</p> <p>(ii) Dust control outside landfill footprint – permanent concrete or asphalt and gravel or rock-surfaced roads outside the landfill footprint will be watered periodically to mitigate dust. Soil surfaced roads will require more frequent watering; and</p> <p>(iii) Using Leachate for Dust Control – leachate may be used for dust control depending on its concentration. However, leachate will only be used on daily cover or waste within the landfill footprint.</p>		
Litter Control	Clogging of drains, unsightly environment	<p>(i) Minimize windblown or dropped materials on-site;</p> <p>(ii) Daily check for waste that has been blown or fallen from the collection vehicles;</p> <p>(iii) Clear drains of litter material; (iv) Instruct waste collectors to cover loads and vehicles;</p> <p>(v) Reprimand waste collectors with uncovered loads</p>	DMB and O&M Contractors	(i) Records available
Vector control	threat to human health and/or the environment	(i) Develop Rodent and Fly Control Plan	DMB and O&M Contractors	Rodents and Flies Control Plan included in O&M Manual
Odour Control	nuisance to sensitive receptors	<p>(i) Cover daily and immediately waste materials with soil;</p> <p>(ii) Maintain integrity of soil cover material of covered wastes;</p> <p>(iii) Plant trees, shrubs, flowers, and other vegetation</p> <p>(iv) Hose each bin once it is</p>	DMB and O&M Contractors	<p>(i) Odour Control Plan included in O&M Manual;</p> <p>(ii) complaints from sensitive receptors</p>

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		emptied; (v) Ensure that residual waste is not left in bins and allowed to decompose for a long period of time		
Noise Abatement	nuisance to sensitive receptors	(i) Fit all equipment with sound dampening devices (such as mufflers); (ii) Keep vehicles in good working conditions; (iii) Maintain vehicles and equipment periodically	DMB and O&M Contractors	(i) Noise Abatement Plan included in O&M Manual; (ii) complaints from sensitive receptors; (iii) Records of Periodic Maintenance available
Occupational Health and Safety	Adverse impacts on the appearance of surrounding environment and exposure of workers to hazardous debris	DMB will at least tell them: (i) The likely exposure and the risks; (ii) What DMB is doing to control risks and exposures; (iii) Where and how people can obtain protection; (iv) How to report defects in protection and control equipment; and (v) What they shall do to minimize the risk, such as the proper way to use protection (PPE) and other control equipment, how to look after it and store it, and where to use it. This information will be given in a way the employee can be expected to understand (for example special arrangements might need to be made if the employee does not understand English or cannot read).	DMB and O&M Contractors	(i) Records of training available; (ii) H&S Plan included in O&MH&S
Community Health and Safety	Vehicle movements cause deaths and some of the most serious accidents.	(i) Fit vehicles with highly audible reversing alarms and mirrors and check at least daily and maintained in good working order. (ii) Allow only authorized and	DMB and O&M Contractors	(i) Records available

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		<p>competent workers to operate the vehicles;</p> <p>(iii) Plan collection routes to avoid times of high-pedestrian activities.</p> <p>(iv) Liaise with communities to position collection points in safe positions and/or collect at quiet times;</p> <p>(v) Identify high-risk areas on route cards/maps and access pedestrianized areas such as business areas during quiet hours.</p> <p>(vi) All internal roads would be concreted/pitched. Proper lighting and proper pathway inside the premises would be constructed to ensure safe vehicular movement. Vehicles would conform to pollution under control (PUC) norms. Proper housekeeping will be maintained within the premises.</p>		

H&S = health and safety, O&M = operation and maintenance;, DMB = Dibrugarh Municipal Board

Table 33: Pre-construction Environmental Monitoring Program

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Baseline Environmental location Condition – Groundwater Quality	Subproject DSC	DSC/ Contractor	Minimum of 4 samples from each aquifer analysed in monthly basis for drinking quality parameters- in and around the landfill sites – observation wells will be constructed	Ground water sample collection and analyses by in-house laboratory or accredited 3 rd party laboratory.	GOI BIS Drinking Water Quality Standards	Monthly for one year prior to start of construction work.	PMU/PIU
Baseline Environmental location Condition – Surface water Quality	Subproject location and; Upstream and Downstream of landfill site	DSC/ Contractor	Minimum of 3 samples from a stream (Sessa) analysed a monthly basis and for parameters relevant for wastewater drains. Location of River Sessa is shown in Google map attached as Appendix - 14	Surface water sample collection and analyses by in-house laboratory or accredited 3 rd party laboratory.	GOI BIS Drinking Water Quality Standards	Monthly for one year prior to start of construction work.	PMU/PIU
Baseline Environmental location Condition – Landfill Gas	Subproject location	DSC/ Contractor	sampling and analysis for methane, hydrogen sulphide and other gases on a monthly basis	Gas sample collection and analyses by in-house laboratory or accredited 3 rd party laboratory	GoI National Ambient Air Quality Standards.	Monthly for one year prior to start of construction work.	PMU/PIU
Baseline Environmental location	Subproject location	DSC/ Contractor	Particulate matter less than 10 microns (PM10) monitoring in	Air sample collection and analysis by in-	GoI National Ambient Air Quality	Monthly for one year prior to start of	PMU/PIU

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Condition – Dust			a monthly basis, specifically at noon, during hot, dry and wind days. Location of air quality monitoring is shown in Google map attached as Appendix - 14	house laboratory or accredited 3rd party laboratory	Standards	construction work.	
Baseline Environmental location Condition – Noise	Subproject location	DSC/ Contractor	Monthly analysis at the site and at 200-m intervals from the landfill boundary to the nearest inhabited zone. Location of noise level (same sites for air quality plus additional in and around landfill) monitoring is shown in Google map attached as Appendix - 14	Noise meter reading by in-house laboratory or accredited 3rd party laboratory	GoI National Ambient Air Quality Standards.	Monthly for one year prior to start of construction work.	PMU/PIU
Baseline Environmental location Condition – vegetative Cover	Subproject location	DSC/ Contractor	Vegetative mapping a seasonal basis.	Survey and mapping	No standards values will be used as baseline.	Seasonal basis for one year prior to start of construction work.	PMU/PIU
Environmental clearances	As per the site requirement	PMU/PIU and DSC	(i) Environmental Clearances (ii) Consent to Establish (Water) (iii) Consent to	Checking of Records	✓ No violations of EC/ Consents to Establish/tree-cutting permit	Once prior to construction and once before	PMU/PIU

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
			Establish (Air) (iv) Authorization for setting up waste processing and disposal facility (v) Tree-cutting Permit, if necessary		✓ Three trees planted for every tree cut.	completion works.	
Security	Landfill site	DSC	Boundary walls around the landfill site.	Checking of Records	Inclusion of boundary walls.	Once	PMU/PIU
Traffic Investigation	(i) In and around DMB; (ii) Access road to landfill site.	DSC	Traffic volume projections during operations Transport management plan for uninterrupted traffic flow. Designed Roads provide adequate turning and dumping areas to accommodate delivery by all types of vehicles.	Checking of Records Visual observation	No significant increase in traffic due to collection vehicles	Once prior to construction and once before completion works.	PMU/PIU
Landfill design consideration	Not applicable	DSC	(i) Drainage system (ii) Flood protection, construction of embankment (iii) Leachate collection, strength of components for	Checking of Records	Gol Municipal Solid Waste (Management and handling Rules)	As needed during detailed design	PMU/PIU

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
			leachate collection, (iv) Landfill gas venting (v) Landfill liner and (vi) Vector control and pest management.				
Compost facility	Landfill site	PMU/PIU and DSC	(i) Process for composting (ii) List of absorbent materials to be made available during operation. (iii) Buffer zone plantation (iv) Availability of segregated waste	Checking Records of	GoI Municipal Solid Waste (Management and handling Rules)	As needed during detailed design	PMU/PIU
Location consideration	Not applicable	DSC	“No-Development Buffer Zone” declared	Checking Records of	Declaration papers	Once	PMU/PIU
Social and Cultural Resources	As per site requirement	DSC	Chance Finds Protocol	Checking Records of	Chance Finds Protocol provided to construction contractors prior to commencement of activities	Once	PMU/PIU
Construction work campus, hot	As per site requirement	DSC to determine locations	List of selected for	Checking Records of	List of selected for	Once	PMU/PIU

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
mix plants, stockpile areas, storage areas, and disposal areas.		prior to award of construction contracts.	construction work campus, hot mix plants, stockpile areas, storage areas, and disposal areas.		construction work campus, hot mix plants, stockpile areas, storage areas, and disposal areas provided to construction contractors prior to commencement of works.		
Sources of Materials	As per site requirement	DSC to prepare list of approved quarry sites and sources of materials.	(i) List of approved quarry sites and sources of materials. (ii) Bid document to include requirement for verification of suitability of sources and permit for additional quarry sites if necessary.	Checking of Records	(i) List of approved quarry sites and sources of materials provided to construction contractors. (ii) Bid document included requirement for verification of suitability of sources and permit for additional quarry sites if necessary	Once	PMU/PIU
Landfill Operations Manual	As per site requirement	DSC	(i) O&M Manual	Checking of Records	Prior to commissioning of landfill	Once	PMU/PIU

DSC = Design Supervision Management Consultant, O&M = operation and maintenance, PMU = Project Management Unit; PIU = Project Implementation Unit

Table 34: Construction Environmental Monitoring Program

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Sources of Materials	Quarries and sources of materials	Construction Contractor	Construction Contractor documentation	(i) Checking of records; (ii) visual inspection of sites	(i) Sites are permitted; (ii) Report submitted by construction contractor monthly (until such time there is excavation work)	Monthly submission for construction contractor As needed for DSC	DSC
Air Quality	Construction sites and areas designated for stockpiling of materials	Construction Contractor	(i) Location of stockpiles; (ii) complaints from sensitive receptors; (iii) heavy equipment and machinery with air pollution control devices Probable locations shown in Google map in Appendix 14	(i) Checking of records; (ii) visual inspection of sites	(i) Stockpiles on designated areas only; (ii) complaints from sensitive receptors satisfactorily addressed; (iii) air pollution control devices working properly	Monthly for checking records	DSC in coordination with Pollution Control Board

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Surface Water Quality	(i) Construction sites; (ii) areas for stockpiles, storage of fuels and lubricants and waste materials;	Construction Contractor	(i) Areas for stockpiles, storage of fuels and lubricants and waste materials; (ii) number of silt traps installed along drainages leading to water bodies; (iii) records of surface water quality inspection; (iv) effectiveness of water management measures In addition water sample from Sessa river nearby sanitary landfill	visual inspection	(i) Designated areas only; (ii) silt traps installed and functioning; (iii) no noticeable increase in suspended solids and silt from construction activities	Monthly	DSC in coordination with Pollution Control Board
Noise Levels	(i) Construction sites; (ii) areas for stockpiles, storage of fuels and lubricants and waste materials; (iii) work camps	Construction Contractor	(i) Complaints from sensitive receptors; (ii) use of silencers in noise-producing equipment and sound barriers Probable locations shown in Google map in Appendix 14	(i) Checking of records; (ii) visual inspection	(i) Complaints from sensitive receptors satisfactorily addressed; (ii) silencers in noise-producing equipment functioning as design; and (iii) sound barriers installed where necessary	Monthly	DSC in coordination with Pollution Control Board
Existing Utilities and Infrastructure	Construction sites	Construction Contractor	(i) Existing Utilities Contingency Plan	(i) Checking of records; (ii) visual inspection	Implementation according to Utilities Contingency Plan	As needed	DSC

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Landscape and Aesthetics	(i) Construction sites; (ii) areas for stockpiles, storage of fuels and lubricants and waste materials; (iii) work camps	Construction Contractor	(i) Waste Management List; (ii) complaints from sensitive receptors; (iii) PMU/PIU/DSC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.	(i) Checking of records; (ii) visual inspection	(i) No accumulation of solid wastes on-site; (ii) implementation of Waste Management Plan; (iii) complaints from sensitive receptors satisfactorily addressed.	Monthly	DSC
Accessibility	(i) Construction sites; (ii) traffic haul road	Construction Contractor	(i) Traffic Management Strategy; (ii) complaints from sensitive receptors; (iii) number of signages placed at subproject location.	Visual inspection	(i) Implementation of Traffic Management Strategy, if required; (ii) complaints from sensitive receptors satisfactorily addressed; (iii) signages visible and located in designated areas	Monthly	DSC
Socio-Economic - employment	Construction sites	Construction Contractor	i) Employment records; (ii) records of sources of materials	Checking of records	Number of employees from Dibrugarh equal or greater than 50% of total workforce	Quarterly	DSC
Occupational Health and Safety	construction sites	Construction Contractor	(i) Site-specific Health and Safety (H&S) Plan; (ii) Equipped first-aid stations; (iii) Medical insurance coverage for	(i) Checking of records; (ii) visual inspection	(i) Implementation of H&S plan; (ii) number of work-related accidents; (iii) % usage of personal protective equipment; (iv) number of first-aid	Quarterly	DSC

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
			workers; (iv) Number of accidents; (v) Supplies of potable drinking water; (vi) Clean eating areas where workers are not exposed to hazardous or noxious substances; (vii) record of H&S orientation trainings (viii) personal protective equipments; (ix) % of moving equipment outfitted with audible back-up alarms; (x) sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal.		stations, frequency of potable water delivery, provision of clean eating area, and number of sign boards are according to approved plan; and (v) % of moving equipment outfitted with audible back-up alarms		
Community Health and Safety	Construction sites	Construction Contractor	(i) Traffic Management strategy ; (ii) complaints	Visual inspection	(i) Implementation of Traffic Management strategy; (ii) complaints from	Quarterly	DSC

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
			from sensitive receptors		sensitive receptors satisfactorily addressed		
Work Camps	Work camps	Construction Contractor	(i) Complaints from sensitive receptors; (ii) water and sanitation facilities for employees; and (iii) PMU/PIU/DSC report in writing that the camp has been vacated and restored to pre-project conditions	Visual inspection	(i) Designated areas only; (ii) complaints from sensitive receptors satisfactorily addressed	Quarterly	DSC

BOD = biological oxygen demand, DSC = Design Supervision Management Consultant, H&S = health and safety, RPM = respirable particulate matter, GOI= Government of India, SPM = suspended particulate matter; PMU = Project Management Unit; PIU = Project Implementation Unit

Table 35: Operation and Maintenance Environmental Monitoring Program

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Leachate Control	Landfill site and service area	O&M Contractor, DMB	(i) Records available. Availability of liner	Checking of relevant records	Complaints from sensitive receptors satisfactorily addressed	As needed	DMB
Dust Control	Landfill site and service area	O&M Contractor, DMB	(i) Records available	Checking of relevant records	Complaints from sensitive receptors satisfactorily addressed	As needed	DMB
Litter Control	Landfill site	O&M	(i) Records	Checking of	Complaints from	As needed	DMB

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
		Contractor, DMB	available	relevant records	sensitive receptors satisfactorily addressed		
Vermin Control	Landfill site	O&M Contractor, DMB	Rodents and Flies Control Plan included in O&M Manual	Checking of O&M Manual	Complaints from sensitive receptors satisfactorily addressed	As needed	DMB
Odour Control	Landfill site	O&M Contractor, DMB	(i) Odour Control Plan included in O&M Manual; (ii) Complaints from sensitive receptors	Checking of O&M Manual	Complaints from sensitive receptors satisfactorily addressed	As needed	DMB
Noise Abatement	Landfill site and service area	O&M Contractor, DMB	(i) Noise Abatement Plan included in O&M Manual; (ii) Complaints from sensitive receptors (iii) Records of Periodic Maintenance available.	Checking of O&M Manual		As needed	DMB
Occupational Health and Safety	Landfill site and service area	O&M Contractor, DMB	(i) Records of training available; (ii) H&S Plan included in O&M	Checking of records and training module	(i) Complaints from sensitive receptors satisfactorily	As needed	DMB

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Community Health and Safety	Landfill site and service area	O&M Contractor, DMB	(i) Records available (ii) Safety during traffic movement	Checking of records	(i) Complaints from sensitive receptors satisfactorily	As needed	DMB
Water Quality	(i) Landfill waste water; (ii) nearby water bodies	DMB in coordination with APCB and O&M Contractors	(i) Inland parameters: colour and odour, suspended solids, particle size of suspended solids, pH value, temperature, oil and grease, total residual chlorine, ammonical nitrogen, total Kjeldahl nitrogen, free ammonia, biochemical oxygen demand, chemical oxygen demand, heavy metals, cyanide, fluoride, dissolved phosphates, sulfide and phenolic compounds.	Sample collection and laboratory analyses	Government of India Standards for Discharges to Inland Waters and Land for Irrigation	Quarterly or as prescribed by CPCB	DMB

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
			(ii) Land for Irrigation: colour and odor, suspended solids, pH value, oil and grease, biochemical oxygen demand, arsenic, and cyanide				

CPCB = Central Pollution Control Board; O&M = operation and maintenance, DMB = Dibrugarh Municipal Board, PMU = Project Management Unit

B. Environmental Management Plan Costs

233. The costs associated with design mitigation measures are covered under the DSC package, along with supervision costs. No cutting of trees is required and if tree-cutting is necessary the proposed mitigation measure include planting and maintaining of three trees for each tree felled.

234. There are construction stage impacts identified. The potential adverse environmental impacts related to the construction period can be minimized by the proposed mitigation measures and environmentally sound engineering and construction practices. The construction related mitigation measures provided reflect standard construction practices such as water sprinkling to arrest dust generation, clearing of excess soil, etc., which will be incorporated into the construction contractor's contractual agreements. Therefore there will be no additional costs of environmental management. The operation phase mitigation measures reflect good operating practices, which will be the responsibility of operation agency, therefore there are no additional costs.

235. The monitoring proposed during construction mainly includes site inspections and informal discussions with workers and local people and this will be the responsibility of PMU and PIU with the assistance of DSC, costs of which are part of project management. The air quality, surface water quality, and noise level monitoring of construction phase will be conducted by the contractor, and are included as part of the contractor's package.

236. The monitoring proposed during operations is part of over-all DMB management of the landfill site thus no additional budget from the subproject is required.

Table 36: Estimated Cost for EMP Implementation

Component	Description	Number	Cost Unit per	Cost (INR)	Source of Funds
Environmental Assessment report and clearance	Tranche 1: Landfill	As per contract		20,00,000.00	PMU Cost
Consent for Establishment (landfill)	Lump sum	As per pollution control norm		200,100.00	PMU Cost
Consent for Operation (landfill)	Lump sum	As per pollution control norm		100,100.00	PMU Cost
Tree plantation	Afforestation	About 500 trees	600/-	3,00,000.00	Project Management cost/ PMU
Public consultations and information disclosure during implementation	Information disclosure and consultations during preconstruction and construction phase.	As required	Lump sum	80,000.00	By contractor
Dust Suppression at subproject sites	Application of dust suppression measures during construction phase.	As required	Lump sum	80,000.00	By contractor
Air- Pre Construction and Construction phase	Once before start of construction works at 3 sites as identified by	54	9,000 per sample	4,86,000.00	By contractor

Component	Description	Number	Cost Unit (INR)	per	Cost (INR)	Source of Funds
	DSC. Continued monthly for construction period Probable locations shown in Google map in Appendix 14					
Noise- Pre construction and Construction phase	Once before start of construction works at 3 sites as identified by DSC. Continued monthly for construction period Probable locations shown in Google map in Appendix 14	54	1,000	per sample	54,000.00	By contractor
Water quality - Pre construction and Construction phase	From ground water source and river water before starting of construction, then continue for entire construction period Observation well will be constructed in and around landfill Surface water from Sessa River	Say 80 samples	10,000.00		8,00,000.00	By contractor
Air- Operation phase	Continued monthly for operation – defect liability period Probable locations shown in Google map in Appendix xxx	27	9,000	per sample	2,43,000.00	By contractor
Noise- Operation phase	Continued monthly for operation – defect liability period Probable locations shown in Google map in Appendix 14	27	1,000	per sample	27,000.00	By contractor
Water quality - Operation phase	Continued monthly for operation –	Say 40 samples	10,000.00		4,00,000.00	By contractor

Component	Description	Number	Cost per Unit (INR)	Cost (INR)	Source of Funds
	defect liability period Observation well will be constructed in and around landfill Surface water from Sessa River				
Capacity building – workshop & training	Lump sum	-	1,00,000.00	1,00,000.00	PMU Cost
Total (Rupees forty eight lakh seventy thousand two hundred only)				48,70,200.00	

IX. FINDINGS & RECOMMENDATIONS

237. The process described in this document has assessed the environmental impacts of all elements of the infrastructure proposed under the Dibrugarh Solid Waste Management Subproject. Potential negative impacts were identified in relation to construction and operation of the improved infrastructure, but no impacts were identified as being due to either the subproject design or location. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result some measures have already been included in the designs for the infrastructure. This means that the number of impacts and their significance has already been reduced by amending the design.

238. Regardless of these, there will still be impacts on the environment when the infrastructure is being constructed and when it is operating. This is mainly because of the invasive nature of excavation work; because the secondary storage facilities (waste bins) are located in the town, some parts of which are densely populated. The potential adverse environmental impacts related to the construction period can be minimized by the proposed mitigation measures and environmentally sound engineering and construction practices. The recommended contract clauses for the construction contractors are attached as **Appendix 15**.

239. Once the system is operating, it will be important that Dibrugarh Municipal Board maintains the facilities and the waste management system as a whole in proper working order, because the town environment will deteriorate rapidly from waste accumulation if the system begins to fail. The subproject will provide capacity building, public education and financial support to ensure continuation of the operating system.

240. The main impacts of the operating waste management system will be beneficial as the general environment of the town will improve considerably as mounds of garbage are no longer evident and the appearance, smell and public health of the area improves as a result. Some people will also gain socio-economically from being engaged to operate the system, or in the expanded Municipality manpower.

241. Mitigation will be assured by a program of environmental monitoring conducted during construction and operation to ensure that all measures are implemented, and to determine whether the environment is protected as intended. This will include observations on- and off-site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the PMU/PIU. There will also be a longer-term survey to monitor the expected improvements in the town environment from the improved solid waste management.

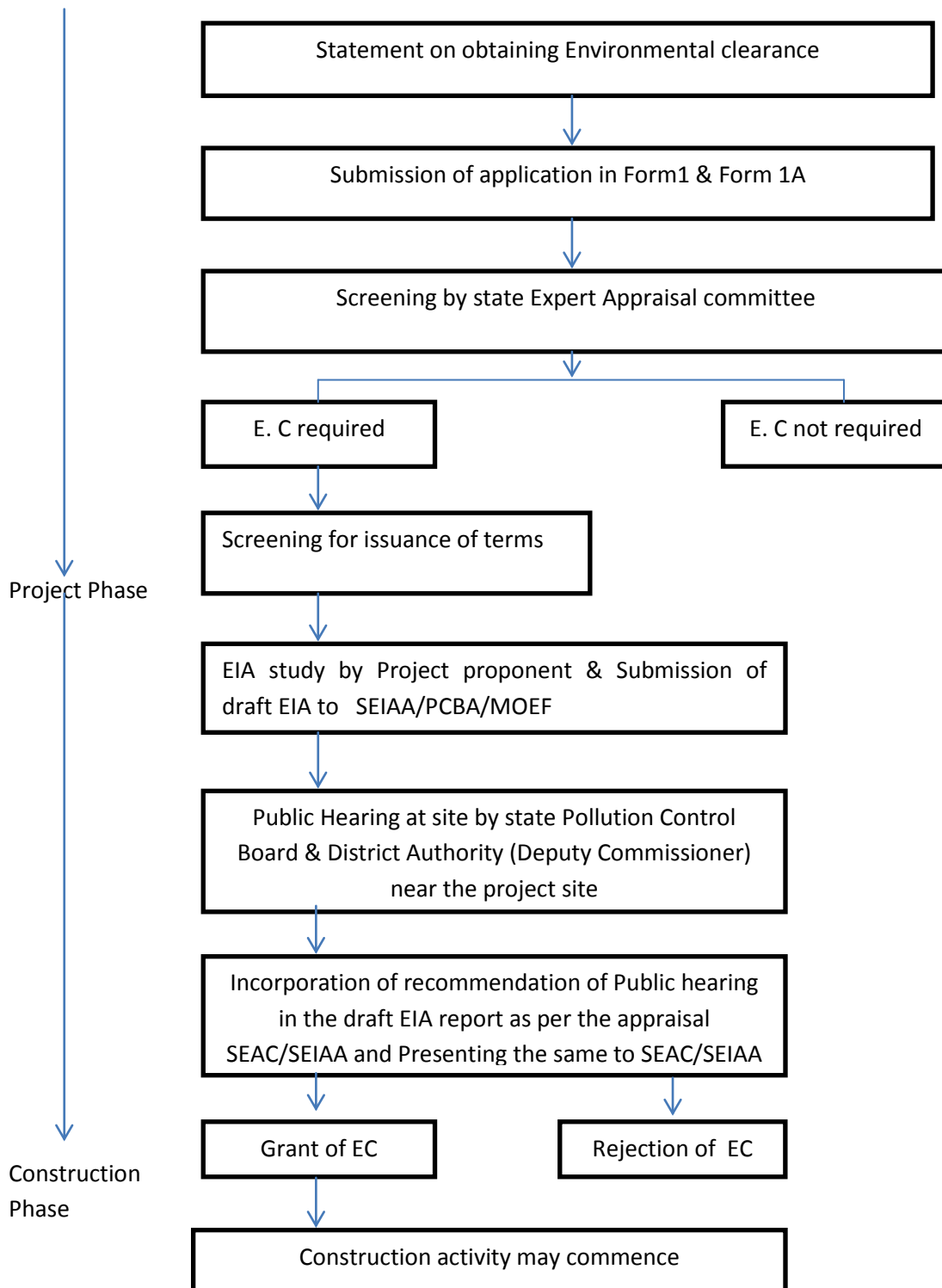
242. Finally, stakeholders were involved in developing the IEE through face-to-face discussions on site and a large public meeting held in the town, after which views expressed were incorporated into the IEE and the planning and development of the subproject. The IEE will be made available at public locations in the town and will be disclosed to a wider audience via the ADB website. The consultation process will be continued and expanded during project implementation and stakeholders will be ensured to be engaged in the subproject and have the opportunity to participate in its development and implementation.

X. CONCLUSIONS


243. The subproject is unlikely to cause significant adverse impacts. The potential adverse impacts that are associated with design, construction, and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures.


244. Based on the findings of the IEE, the classification of the Subproject as Category "B" is confirmed, and no further special study or detailed environmental impact assessment needs to be undertaken to comply with ADB SPS (2009).

Environment Clearance Process – Govt. India



Environmental Clearance from SEIAA Assam


GOVT. OF ASSAM
OFFICE OF THE STATE ENVIRONMENT IMPACT ASSESSMENT AUTHORITY, ASSAM
BAMUNIMAIDAM, GUWAHATI-21


20/9/15

No. SEIAA.27/2015/EC/56/265 Date: Guwahati the 21st September 2015

To,
✓ The Project Director,
Assam Urban Infrastructure Investment Program (AUHIP)
Guwahati Development Department
3rd Floor, Tripti Tower, Ganeshguri, Guwahati-05

Subj: - Proposal for establishment of 100 TPD Municipal Solid Waste Processing Facility (MSWPF) for Dibrugarh city at Village- Ghoramara, Dibrugarh West Revenue Circle, Dibrugarh, Assam; Regarding-Environmental Clearance.

Sir,

This has a reference to your application No. ADB/AUIIP/SW/9/2014/34 dated 03/07/2013 and subsequent communications for Environmental Clearance for the establishment of 100 TPD MSWPF for Dibrugarh city at VIL- Ghoramara, Dibrugarh West Revenue Circle, Dibrugarh, Assam.

The proposal has been examined and processed in accordance with EIA notification, 2006 and its amendment thereof.

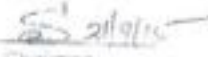
The inter-alia of the project is to development and establishment of 100 TPD Processing Plant and 60 MT Sanitary Landfill site and allied works. The proposed project site has an area of 28.81 ha. Project site will comprise of compost Plant, an engineered Sanitary landfill, leachate treatment plant, raw waste shorting yard and ancillary facilities. The proposed land area use for landfill and other components has been 7.86 ha in 1st phase and 2.7 ha of land fill area have been proposed for 2nd phase. Adequate area and volume available at SWM site at present to receive & fill up Solid waste materials for a period of 30 yrs with expected height of about 10 mts. for 1st phase activity and 16 mts. for phase-2 activity. As the Sessa stream is passing nearby the proposed landfill site, proper retaining walls are being constructed for protecting waste arises from compost plant, other infrastructure facilities & landfill site. Adequate land within the SWM site shall be made available for leachate collection & treatment facilities. The occupier of the MSWPF, Dibrugarh agreed upon to follow and implementation of rules prescribed in the MSW (Management & Handling) Rules 2000 and guidelines prescribed in the Technical Guidance of Manual on Common Municipal Solid Waste Management facilities published by MoEF, Govt. of India. Presently per capita generation of MSW in Dibrugarh metropolitan Area (DMPA) has been considered as 0.350 kg/ day (2011 & 2013) and projected generation will be 2016- 0.362 kg/ day, 2026-0.412 kg/ day, 2036-0.462 kg/ day 2046- 0.512 kg/ day. House to house collection of MSW has been proposed alongwith segregation of wastes at source. Water requirement will be 7 KLD during construction and 2 KLD will be during operation surface water from Sessa stream will be used. The proposed MSW composting unit has been comprised with four stages in scientific treatment & processing of bio- solid waste through controlled accelerated bio conversion technology. The proposed area for green belt development has been 1.85 ha. Post closure plan has also been proposed following MSW (Management & handling) Rules 2000. Power requirement is 1.5 MW for the proposed MSW processing facility. DG sets will be provided for backup electricity supply during power failure and necessary control measure will be followed as per rule. Landfill gas collection system will be provided for collection of gases & will then be collected in a tank and will be flared. Total cost of the project is 48.49 Crores.

The proposal has been examined & processed in accordance with EIA notification 2006 and its amendments thereof. The members of the SEIAA & SEAC, Assam has been examined & scrutinized the documents of the proposal and found that the project falls under schedule 7 (1) and considered as B1 category of EIA notification 2006. Accordingly TOR has been recommended for preparation of EIA & EMP Report.

Public hearing and public consultation was held on 17/12/2014 & 22/07/2015 respectively.

Subsequently final EIA/ EMP Report have been submitted alongwith minutes of Public Hearing/ public consultation to SEIAA, Assam. The project proponent has appraised the project proposal in the meeting of SEIAA & SEAC, Assam held on 29/08/2015. The Members of the Committees recommended the proposal for issuance of Environmental Clearance incorporating some of the pertinent points related to the project.

Based on the recommendation of the Committees, the SEIAA, Assam accords Environmental Clearance to the project as mentioned above under the provision of EIA notification 2006 and its


Chairman
SEIAA, Assam

subsequent amendments issued under Environment Protection Act 1986 subject to compliance of following specific and general conditions.

A. Specific Condition:

I. Construction and design stage:

1. House to house collection/ community bin collection/ collection of waste from slums and squatters/ commercial/ official complexes shall be organized by DMB.
2. Bio- medical waste, horticulture waste, construction debris, hazardous waste, dairy waste shall be managed separately as per the provision of existing rules & regulations.
3. As proposed, adequate link routes are to be developed for proper collection of Municipal Solid Waste (MSW) from various source locations and for smooth transportation of the same to the identified treatment/ disposal facilities.
4. Color coded bins shall be provided at every house hold and source segregation shall be ensured.
5. The waste receptacles and the garbage lifting machineries should conform to each other.
6. Manpower should be planned in such a manner that collection and transport of waste is achieved up to desired level.
7. Waste from slaughter houses, meat & fish markets, fruits & vegetable markets which are biodegradable in nature shall be managed to make use of such waste scientifically.
8. Waste (garbage, dry leaves) shall not be burnt.
9. Stray animals shall not be allowed to move around waste storage facilities and shall be managed in accordance with the State laws.
10. The municipal authority shall notify waste collection schedule and likely method to be adopted for public benefit in the town.
11. The MSW shall be sent to the treatment facility after collection. Secondary collection point (SCPs) shall be constructed. Adequate storage facilities and hygienic conditions are to be provided in SCPs.
12. The Municipal authority shall undertake phased program to ensure community participation in waste segregation.

II. Storage of MSW:

1. Municipal authority shall establish and maintain storage facilities in such a manner as they do not create unhygienic and in-sanitary condition around it.
2. Storage facilities to be set up by municipal authority or any other agency shall be so designed that wastes stored are not exposed to open atmosphere and shall be aesthetically acceptable and user-friendly.
3. Storage facilities or bins shall have easy to operate for handling, transfer & transportation of waste. Bins for storage of biodegradable waste shall be green, storage of recyclable shall be white and for storage of other waste shall be black.
4. Manual handling of waste shall be prohibited.

III. Waste Treatment Facility:

1. Segregated organic waste shall be sent to the compost plant in covered manner as proposed.
2. Window composting shall be conducted for stabilizing the organic portion of the waste.
3. The composting plants at treatment facilities shall have waste receiving platform, Window platform, Monsoon shed, Preparatory section, curing area, refinement section, quality check Area, godown. Each section should be constructed with the general requirement proposed in the report.
4. Receiving platform of concrete slab covered with shed will be provided for further segregation and maintaining waste before sending to window area. Gutters to collect leachate will be provided on the platform and leachate will be drained into and stored in the leachate pit (s). Leachate will be finally brought for treatment and discharge.
5. Fence and Buffer zone will be provided surrounding the transfer section/ compost plant. Water taps will be provided for daily cleaning and treatment shall be done for the cleaning waste water properly to comply the standard as prescribed by CPCB/ MoEF.
6. Adequate roof shed and concrete platform/ roof should be provided to all sections.
7. Access to loaders should be ensured.
8. Ambient air quality monitoring will be carried out during operation period and report shall be made available to public.

IV. Pre-processing area:

1. The size and design of the pre-processing area should be adequate for proper storage of incoming MSW.


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DCMA, Anantnag

2. Pre-processing area should consist of permanent roof shed over platform, partition wall for protection against wind and noise, concrete platform, Weighbridge facility, Waste loading, Waste segregation (if required) and Waste shredding facilities etc. Access to loaders should be ensured.
3. Recyclables will be segregated into 5 categories (papers, plastics, rubbers, metals and glasses) and placed in the respective containers and routed through appropriate vendors. Non- recyclables will be sent to landfill site.
4. Battery wastes, E- wastes & Hazardous wastes shall be handled & disposed as per respective rules framed under E.P. Act 1986.

V. Processing area:

1. The processing area comprises of mass composting and curing activity.
2. Adequate residence time should be provided for compostable waste in mass window. The platform should be constructed with adequate strength, structural stability and drainage provisions.
3. Proper space is required for easy movement of loader or operation of vehicle.
4. The mass composting pad surface and curing area is paved to avoid erosion from runoff. Grading the surface of the pad to meet the optimal slope will also help to prevent erosion by allowing smooth drainage.
5. This facility will be equipped with hopper, feeding conveyor, dual trammel, reject conveyor and transfer conveyor. The under sizes digested material including manure will be conveyed by transfer conveyor to curing area and rejects shall be conveyed by trolley to transfer station.
6. Digested material will be stacked in the curing area to remove moisture from digested material for effective screening and to protect the digested material from rain. Moisture shall be measured.
7. Adequate drainage at composting facilities should be provided in order to prevent water logging.

VI. Post processing area:

1. The post processing area at composting facilities shall be used for screening, size reduction and blending operations for compost, conducting tests to ensure quality of compost, preparing compost for market and also for storing the compost.
2. Proper vibro-screen, density separator shall be installed to segregates metals, pebbles, sand and all undigested materials.
3. Adequate storage capacities should be incorporated into site designs for composting facilities. Backup storage and disposal capacity should also be ready to accommodate demand of seasonal markets.
4. Buffer zone should be provided to minimize the odour and transport of bio aerosols along downwind of the facility.
5. Sprinklers/ water spraying facility should be installed in order to reduce the dust generation at site during the construction work.
6. On site road leading to the tipping and storage areas should be paved or graveled roads to accommodate movement of large vehicles even during adverse weather conditions. Roads shall be designed to provide adequate space for turning. The roads at dumping areas should be designed to accommodate delivery by all types of vehicles.
7. Inert materials and rejects of compost shall be transported to landfill site.
8. Ventilation arrangement should be ensured in case of close siding.

VII. Sanitary Landfill Facility:

1. Semi- Aerobic landfill system shall be constructed as proposed.
2. The Sanitary landfill shall include following features: Section Embankment, Disposal ground, Leachate Collection & Removal System, Municipal Solid Waste Inspection area, Storm water drainage system, Green belt/ buffer area/ lawns, Boundary wall, Weigh Bridge, Leachate Treatment Plant, Gas collection system if required, Water supply System, Quality control laboratory, Boundary Wall and fencing, Roads and Street lighting, Office Block, Shed for machinery storage and parking, vehicle washing platform and other basic amenities.
3. Landfill layout should be designed to cater landfill as per MSW (M& H) Rules 2000 and guidelines prescribed by CPCB/ MoEF for 30 years as mentioned in EIA report.
4. The Landfill should be designed in line with MSW Rules, 2000 having minimum environmental impact.
5. The landfill should be developed in two phases.
6. The landfill should be of the capacity to handle 60 MT waste in 1st phased as proposed.
7. Adequate bottom liner system and top liner system shall be provided. Appropriate thickness of the HDPE liner for the bottom liner as well as top liner system shall be provided to prevent and damaging impact in surrounding area and to prevent water infiltration.


 S. Sathya
 SEIAA, Astoria

8. The coefficient of permeability as proposed should be used as guiding factor.
9. Leachate produced from infiltration of water percolated through the dumped waste layers will be collected in a pond (aeration pond) through properly sized perforated pipes (main leachate pipes and branch leachate pipes) embedded in graded gravels/ boulders as filter material.
10. The drainage should be designed with special care to avoid any overflow.
11. Leachate collection, treatment & removal system should be developed for effective collection of leachate and reducing the risk of contamination of ground water.
12. Daily cell cover is to be provided as per the norms.
14. As per the Municipal Solid Waste (Management & Handling) Rules 2000, DMB should declare a no-development buffer zone around the landfill site and the same should be incorporated in the town planning department land use plans.

VIII. Facilities at the site:

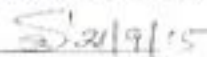
1. A buffer zone of no- development shall be maintained around landfill site and shall be incorporated in the Town Planning Department's land-use plans.
2. Landfill site shall be fenced or hedged and provided with proper gate to monitor incoming vehicles or other modes of transportation.
3. The landfill site shall be well protected to prevent entry of unauthorized persons and stray animals.
4. Approach and other internal roads for free movement of vehicles and other machinery shall exist at the landfill site.
5. The landfill site shall have wastes inspection facility to monitor wastes brought in for landfill, office facility for record keeping and shelter for keeping equipment and machinery including pollution monitoring equipments.
6. Provisions like weigh bridge to measure quantity of waste brought at landfill site, fire protection equipments and other facilities as may be required shall be provided.
7. Utilities such as drinking water (preferably bathing facilities for workers) and lighting arrangements for easy landfill operations when carried out in night hours shall be provided.
8. Safety provisions including health inspections of workers at landfill site shall be periodically made.

IX. Leachate Collection, Treatment & Removal System:

1. Suitable bottom liner system shall be provided with adequate slope towards the leachate collection pipes.
2. As proposed, HDPE pipes with adequate strength, diameter should be laid at suitable slope and spacing for leachate collection.
3. Perforated drainage pipes shall be provided for rapid transport of fluids. Adequate slope and spacing should be provided.
4. These pipes should be of good quality HDPE with appropriate pressure- specification and perforations.
5. RCC collection sump shall be constructed.
6. Leachate shall be treated in the leachate treatment plant and disposed or re-used in landscaping after compliance of the standards prescribed by CPCB/ MoEF.
7. The component that is most vulnerable to compressive strength failure is the drainage layer piping. Leachate collection system piping can fail by excessive deflection which may lead to bucking or collapse. All components of the leachate collection system must have sufficient strength to support the weight of the overlying waste, cover system and post closure loadings as well as stresses from operating equipment.
8. The depth of the drainage layer around the pipe should be deeper than the diameter of the pipe. The pipe should be placed in trenches to provide the extra depth. In addition, the trench serves as a sump for leachate collection.
9. As pipe can be susceptible to particulate and biological clogging similar to drainage layer material regular maintenance should be ensured.

X. Storm water collection and drainage system:

1. Storm water drainage system should be designed to minimize the leachate generation and to prevent contamination of surface water through runoff from dumpsite. The storm water should not be allowed to enter the active cell of the landfill. Stagnation must be avoided. Storm water from the site will be collected in a detention pond prior disposal.
2. The project site should be suitable leveled and embankments should be constructed in such a manner that under no circumstances the storm water from outside area can enter the project site or the project site runoff inundates surrounding road or adjoining area located nearby.


Chairman
SEIAA, Assam

XI. Transport and other conditions:

1. Adequate Buffer zone should be provided to minimize the transport of odour and bio aerosols downwind of the facility.
2. Adequate transport management plan should be in place for uninterrupted traffic flow. Roads shall be designed to provide adequate turning and dumping areas to accommodate delivery by all types of vehicles.
3. On site roads should be paved or graveled roads leading to the tipping area and storage areas to accommodate movement of large vehicles during adverse weather conditions.
4. Adequate lighting should be provided in streets and working areas for ensuring operation and security.

B. Specific Conditions- For Operation Stage:

I. Collection and Transport system:

The collection and transportation is the responsibility of the ULB as per the DPR/ EIA Report. The garbage lifting crews should be provided with shovels, long handled brooms for collection and transfer of waste. They should also be provided with protective wears. The equipments as prescribed in EIA Report should be provided.

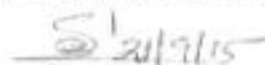
1. All the vehicles that shall be used for transportation of MSW from Processing facility to Landfill site must have suitable tracking system.
2. All vehicles will be fitted with fire extinguishers and first aid kit.
3. Medical checkups of drivers and other field staff would be carried out from time to time.
4. During transportation the container shall remain closed from all side and shall be opened at the time of disposal of the waste only. Each container should be inspected at least once in a week for any leakage spillage problem.
5. The transporter shall be made aware about the type of wastes and quantities.

II. Segregation and reuse of Recycling Materials:

1. Recyclables will be segregated at compost plant as well as at transfer station.
2. Wastes other than biodegradable and recyclables after segregation will go to landfill as per specifications of Schedule III of MSW (M&H) Rules 2000.
3. As proposed manual segregation of recyclable material (paper, glass, plastics, rubber and metal) will take place at the transfer station platform. Recyclable material will be segregated by adequate number of workers equipped with all safety tools and equipment.

III. Operation at composting plants:

1. Daily log of MSW handled in the facilities should be recorded and kept in place.
2. Weighbridge should be used for quantification of waste. Weighbridges should be calibrated by independent agency on regular basis.
3. The number of vehicles, number of trips by each vehicle, quantity of waste transported should be recorded at all facilities.
4. The organic solid waste shall be stabilized through microbial action.
5. As proposed window shall be turned twice a week for oxygenation. Active composting shall be followed by curing at bunker for adequate time period as and when required.
6. In the mass window, adequate moisture content is to be maintained throughout the fermented cycle.
7. Waste should be stacked in adequately spaced rows.
8. Ground compaction and leveling shall be provided in the area occupied by the composting bunkers, curing pad and roads.
9. Water shall be supplied to the piles to maintain the desired moisture content. Any leachate or runoff from the piles will be collected and treated or added back to a batch of incoming MSW to increase its moisture content.
10. Quality control shall be ensured for physical, chemical and biological parameters. On site laboratory facility should be provided with skilled manpower.
11. Finished product shall be packed in HDPE bags or poly bags.
12. In order to ensure safe application of compost the specification for compost quality shall be met as prescribed MSW (M&H) Rules 2000.
13. Necessary precautions shall be taken to minimize nuisance of odour, flies, rodents, bird menace and fire hazard.
14. Ambient air quality monitoring shall be regularly carried out particularly for checking odour nuisance at down-wind direction on the boundary of processing plant.


Chairman
SEIAA, Assam

15. Routine operation and maintenance scheme should be complemented by Emergency Response Protocol (ERP) to carry out emergency repairs and damage controls.
16. The compost and leachate should comply with quality standards proposed in MSW rules.
17. Buffer zone should be provided to minimize the odour and transport of bio aerosols along downwind of the facility.

IV. Operation at Landfill:

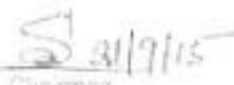
1. The landfill facility operator must ensure that only the residual inert material and rejects of compost plant, sewer silt is disposed.
2. Disposal of construction debris at landfill is not preferably being allowed.
3. The waste transported at landfill facility shall be reported with date, time, waste quality etc.
4. The landfill shall be compacted during active operations on daily basis and covered as per requirement.
5. Suitable design slope shall be maintained in the sanitary landfill.
6. The actual stability shall be tested at regular interval.
7. An intermediate liner should be provided before onset of monsoon.
8. The final cover shall be laid as per construction requirements and MSW regulations to enhance surface drainage, minimize infiltration, vegetation and control the release of the landfill gases. To ensure the rapid removal of rainfall from the completed landfill and to avoid the formation of puddles, the final cover should have a requisite slope.
9. Sufficient distance is to maintain to avoid circular collapses. The Geotechnical Investigation on reports should be consulted for ensuring adequate safety factor.
10. In constructing the road accessing from the Dibrugarh & adjoining area to the landfill site the current flow of rain water in the rainy season could be prevented. So that the drain pipe needs to be big enough for the flow of rain water from the upper reaches of the access road to lower reaches of the access road.
11. Ambient noise level should not exceed the permissible limit. The overall noise levels in and around the plant area shall be kept well within the standards by providing noise control measures including acoustic hoods, silencers, enclosures etc. on all sources of noise generation. The ambient noise levels should conform to the standards prescribed under EPA Rules, 1989 viz. 75 dB(A) Leq (daytime) and 70 dB(A) Leq (nighttime) and its subsequent amendments.
12. Green belt shall be developed at least 33% of the land area for proposed project to be covered by plantation.
13. All internal roads should be concreted/ pitched. Proper lighting and proper pathway inside the premises should be constructed to ensure safe vehicular movement. Provision of separate pathway for entry and exit of vehicles should be considered. Vehicles should conform to pollution under control (PUC) norms. Proper house keeping shall be maintained within the premises. Solar lighting should be used as far as practicable.
14. Health and safety of workers should be ensured. Workers should be provided with adequate personnel protective equipment (PPE) as per proposal and sanitation facilities. Occupational Health Surveillance of the workers shall be done on a regular basis and records maintained as per the Factories Act.
15. The implementation and monitoring of Environmental Management Plan should be carried out as proposed.
16. Corporate Social Responsibility programs should be carried out and shall be adopted as mentioned in EIA report.

V. Monitoring and landfill facilities:

1. Monitoring of the ambient air quality, surface water quality shall be conducted as specified in MSW Rules.
2. Monitoring wells should be set up to monitor leakage leachate into ground water. At least four monitoring wells should be set up at each side to monitor groundwater flow in all possible directions. The monitoring wells can be located in consultation with District Administration/ PHED.
3. The surface water, ground water, air quality, landfill gas, leachate, incoming waste etc. should be monitored as per the proposed Environmental Monitoring Plan.
4. The monitoring network is to be expanded/ modified as and when situation required.

VI. Plantation at Landfill Site:

A vegetative cover shall be provided over the completed site in accordance with the following specifications:


 Chairman
 BEIAA, Assam

1. Selection of locally adopted non-edible perennial plants that are resistant to drought and extreme temperatures shall be allowed to grow.
2. The plants grown be such that their roots do not penetrate more than 30 cms. This condition shall apply till the landfill is stabilized.
3. Selected plants shall have ability to thrive on low- nutrient soil with minimum nutrient addition.
4. Plantation to be made in sufficient density to minimize soil erosion.

C. Closure of the Site & Post Closure Care:

The post- closure care of landfill site should be conducted for at least fifteen years and long term monitoring or care plan shall consist of the following

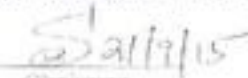
1. Maintaining the integrity and effectiveness of final cover making repairs and preventing run-on and run-off from eroding or otherwise damaging the final cover.
2. Monitoring leachate collection system to ensure no overflow of leachate.
3. Monitoring the influent and effluent quality at the sludge and leachate treatment plant.
4. Maintaining and operating the landfill gas collection system to meet the standards.
5. Adequate venting system should be provided for venting gas. The gas collected in the gas vent layer shall be collected and vented through vent pipes.

VII. Additional Conditions:

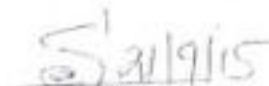
1. The L.P. school located near the proposed landfill site shall be shifted to a safe distance by the authority concern before construction of the proposed site.
2. The existing landscape shall be maintained to the extent of maximum possible way.
3. Dumping of MSW shall not be allowed in the proposed landfill area before completion and commissioning of the project.
4. The commitment made in the Meeting held on 22/07/2015 in the Conference Hall of Deputy Commissioner's office, Dibrugarh before the public of Lekai area in connection with establishment of Solid Waste Management Project at Lekai, Ghoramara, Dibrugarh shall be complied alongwith the compliance of the EIA report.

D. General Conditions:

1. The project proponent shall comply with all the environmental protection measures and safeguards recommended. MSW Rules 2000 should be followed strictly. Further, the unit must undertake socio- economic development activities in the surrounding villages like community development programmes, educational programmes, drinking water supply and health care etc.
2. All the conditions, liabilities and legal provisions contained in the Environmental Clearances shall be equally applicable to the successor management of the project in the event of the project proponent transferring the ownership, maintenance of management of the project to any other entity.
3. Provision should be made for the supply of kerosene or cooking gas to the labourers during construction phase. All the labourers to be engaged for construction works should be screened for health and adequately treated before issue of work permits.
4. The vehicles and MSW handling/ processing equipments shall be arranged as per EIA report and as per requirement from time to time.
5. The project proponent should make financial provision in the total budget of the project for implementation of the environmental safeguards. The project authorities will provide requisite funds recurring and non- recurring to implement the conditions stipulated by the SEIAA alongwith the implementation schedule for all the conditions stipulated herein. The funds so provided should not be diverted for any other purpose.
6. No further expansion or modifications in the plant should be carried out without prior approval of the State Environmental Impact Assessment Authority, Assam.
7. In case of any violation of the conditions laid down in this Environmental Clearance, Section 16 of the Environment (Protection) Act, 1986 will be applicable.
8. In the case of any change(s) in the scope of the project, the project would require a fresh appraisal by the SEIAA.
9. The State Environmental Impact Assessment Authority reserves the right to add additional condition (s).
10. Safeguard measures subsequently if found necessary and to take action including revoking of the environment clearance under the provisions of the Environmental Protection Act 1986 to ensure effective implementation of the suggested measures in a time- bound and satisfactory manner.
11. The Project Proponent should inform the public that the project has been accorded environmental clearance by the SEIAA. This should be advertised within seven days from the date of issue of the


 Chairman
 SEIAA, Assam

- clearance letter, at least in two local newspapers that are widely circulated in the region of which one shall be in the vernacular language of the locality concerned.
12. The Project Authorities should inform the State Pollution Control Board as well as the SEIAA, the date of financial closure and final approval of the project by the concerned authorities and the date of commencing the land development work/ project implementation.
 13. Prior Consent to Establish (NOC) for the proposed project must be obtained from PCB, Assam before commencement of construction. All other statutory clearance should be obtained by the project proponent from the competent authorities.
 14. The environmental clearance accorded shall be valid for a period of 5 years for the proposed project.
 15. The above stipulations would be enforced alongwith those under the Water (Prevention and Control of Pollution) Act 1974, the Air (Prevention and Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986, the Hazardous Wastes (Management, Handling and Trans boundary Movement) Rules, 2008, the Public Liability Insurance Act, 1991, the Environment Impact Assessment Notification 2006 and their amendments.


(Prof. S. K. Borthakur)
Chairman, SEIAA, Assam
Bamunimaidam, Guwahati-21.

Memo No. SEIAA.27/2015/EC/56-A

Dated: Guwahati the 21st September 2015.

Copy to:-

1. The Secretary to the Govt. of Assam, Environment & Forest Department, Dispur, Guwahati-6 Cum Member Secretary, SEIAA, Assam for favour of kind information.
2. The Deputy Commissioner, Dibrugarh, Assam for favour of kind information & necessary action.
3. The Chairman, Dibrugarh Municipal Board, Dibrugarh, Assam, for favour of kind information & necessary action.
4. The P.C.C.F, HoFF, Govt. of Assam, Rehabari, Guwahati-8 for favour of kind information.
5. The Member Secretary, PCB, Assam for favour of kind information.
6. The Regional Office, MoEF, Govt. of India, Low-U-sib, Lumbatngen, Near MTC Workshop, Shillong-21 for favour of kind information.
7. Office Copy.


(Prof. S. K. Borthakur)
Chairman, SEIAA, Assam
Bamunimaidam, Guwahati-21.

EC Condition Authenticated by DMB for compliance



**OFFICE OF THE CHAIRPERSON
DIBRUGARH MUNICIPAL BOARD
DIBRUGARH**

Letter No: _____ Dated: _____

To
The Chairman
State Environment Impact Assessment Authority, Assam
Bamunimaidam, Guwahati-21

Sub:- Proposal for establishment of 100TPD Municipal Solid Waste Processing facility (MSWPF) for Dibrugarh city at village Ghoramara, Dibrugarh West Revenue Circle, Dibrugarh, Assam; Regarding Environmental Clearance.

Ref: Letter no. SEIAA. 27/2015/EC/55/265 dt. 21-09-2015

Sir,
I am to acknowledge the receipt of the above referred letter conveying "Environmental Clearance" to the MSWPF project.

I do agree to carry out all the relevant terms and conditions detailed in your letter during construction of the project as well as during operation of the MSWPF plant. Dibrugarh Municipality Board will abide by the prevailing MSW (Management & Handling) Rules, 2000.

This is for your kind information and necessary action.

Yours faithfully

(Mrs. Anuradha Dey)
Chairperson,
Dibrugarh Municipal Board

Letter No: DM/SWM/LLF/193/2011/2239-40 Dated: 20.11.2015

Copy to: ✓ 1. The Deputy Commissioner, Dibrugarh, for kind information.
2. The Project Director, AUIP, Guwahati for kind information and necessary action.


(Mrs. Anuradha Dey)
Chairperson,
Dibrugarh Municipal Board

Compliance Statement- Environmental Clearance

Compliance Requirement – EC Condition	Specific actions and design considerations	Remarks – Action plan
A. Specific Condition		
I. Construction & Design Stage		
1. House to house collection/ community bin collection/ collection of waste from slums and squatters/commercial/official complexes shall be organized by DMB.	In design house to house collection has been considered and already in few pockets DMB started the process	House to house collection to be cover for entire Dibrugarh within 3 months of operation of landfill
2. Bio-medical waste, horticulture waste, construction debris, hazardous waste, dairy waste shall be managed separately as per provision of existing rules and regulations.	Different type of wastes would be collected separately as per National Rules. Considered in the design	Already maintained.
3. As proposed, adequate link routes are to be developed for proper collection of Municipal Solid Waste(MSW) from various source locations and for smooth transportation of the same to the identified treatment/disposal facilities.	Collection and Transportation route for management of solid waste already planned and which will be rectified again after purchase of new vehicles and equipments under the said sub project	New vehicles will be purchase under the project and after increase in number of transport vehicle route to be developed/ revised for minimization of transportation time. All action will be completed within 6 months of commissioning of improved SWM system
4. Color coded bins shall be provided at every house hold and source segregation shall be ensured.	Under the sub project 50000 numbers 25-litre household dustbins is to be provided for the residents for segregation of waste at source (biodegradable and non-biodegradable)	After implementation of project within 3 months colour coded bins will be distributed
5. The waste receptacles and the garbage lifting machineries should conform to each other.	Considered under procurement and utilization process	
6. Manpower should be planned in such a manner that collection and transport of waste is achieved upto desired level.	Additional manpower will be engaged in DMB for running improved SWM system	
7. Waste from slaughter houses, meat & fish markets, fruits and vegetable markets which are biodegradable in nature shall be managed to make use of such waste scientifically.	Waste from slaughter houses, meat & fish markets, fruits and vegetable markets which are biodegradable will be collected separately under improved system and utilize in	

Compliance Requirement – EC Condition	Specific actions and design considerations	Remarks – Action plan
	compost plant. This is considered in the design	
8. Waste (garbage, dry leaves) shall not be burnt.	Dry leaves will be collected after road sweeping. Burning of dry leaves would be avoided	
9. Stray animals shall not be allowed to move around waste storage facilities and shall be managed in accordance with the State laws.	Waste storage will be planned under improved SWM system with use of cover so that Stray animals unable to move around waste bin	
10. The municipal authority shall notify waste collection schedule and likely method to be adopted for public benefit in the town.	The municipal authority will notify improved waste collection schedule for public	After commissioning of improved system
11. The MSW shall be sent to the treatment facility after collection. Secondary collection point (SCPs) shall be constructed. Adequate storage facilities and hygienic conditions are to be provided in the SCPs.	As per design the MSW would be sent to the treatment facility after collection from secondary point or from direct household level. Hygienic condition will be maintained at all secondary collection point	
12. The Municipal authority shall undertake phased program to ensure community participation in waste segregation	Involvement of community in waste segregation is already planned	
II. Storage of MSW		
1. Municipal authority shall establish and maintain storage facilities in a such a manner as they do not create unhygienic and in-sanitary condition around it.	Municipal authority would establish and maintain storage facilities in hygienic manner	
2. Storage facilities to be set up by municipal authority or any other agency shall be so designed that wastes stored are not exposed to open atmosphere and shall be aesthetically acceptable and user-friendly.	Covered storage facility/ bins have been procured and used presently. Waste will be not stored in open atmosphere and bins will be placed at common place so aesthetically accept by local people	
3. Storage facilities or bins shall have easy to operate for handling, transfer & transfer & transportation of waste. Bins for storage of biodegradable waste shall be green, storage of recyclable shall be white and for storage of other waste shall be black.	Storage of different category of waste to be done as per colour coded bins which to be provided under improved solid waste management system	Will be provided during and just after commissioning of improved system

Compliance Requirement – EC Condition	Specific actions and design considerations	Remarks – Action plan
4. Manual handling of waste shall be prohibited.	Manual handling / double handling of waste will be no longer be continued. As per design source segregation in colour coded bin has been planned	
III. Waste Treatment Facility		
1. Segregated organic waste shall be sent to the compost plant in covered manner as proposed.	As per compost plant design segregated waste will be sent to compost plant	
2. Windrow composting shall be conducted for stabilizing the organic portion of the waste.	Windrow composting would be set up under waste processing unit	
3. The composting plants at treatment facilities shall have waste receiving platform. Window platform, monsoon shed, Preparatory section, curing area, refinement section, quality check Area, godown. Each section should be constructed with the general requirement proposed in the report.	As per compost plant design all sections (waste receiving platform. Window platform, monsoon shed, Preparatory section, curing area, refinement section, quality check Area, godown) would be provided in compost plant	
4. Receiving platform of concrete slab covered with shed will be provided for further segregation and maintaining waste before sending to windrow area. Gutters to collect leachate will be provided on the platform and leachate will be drained into and stored in the leachate pit(s). Leachate will be finally brought for treatment and discharge.	Waste will be further segregated before sending to windrow. Leachate will be collected in pit and after treatment it will be discharge. Lechate collection pit considered in the design.	
5. Fence and Buffer zone will be provided surrounding the transfer section/compost plant. Water taps will be provided for daily cleaning and treatment shall be done for the cleaning waste water properly to comply the standard as prescribed by CPCB/MoEF.	As per design provision adequate buffer zone would be provided around compost plant and landfill facility. Washing platform will also be provided at treatment and disposal facility sites and waste water will be treated before discharge and conforming standard of CPCB	
6. Adequate roof shed and concrete platform/roof should be provided to all sections.	Adequate roof shed and concrete platform/roof would be provided at compost plant's different section	
7. Access to loaders should be ensured.	Being ensured	
8. Ambient air quality monitoring will be carried out during operation period and report shall be made available to public.	Ambient air quality monitoring will be conducted during operation phase as per EMP and condition of clearance and report will be disclosed in website and to public	Monitoring will be carried out as per accepted EMP and monitoring plan after starting of defect liability and then operation phase

Compliance Requirement – EC Condition	Specific actions and design considerations	Remarks – Action plan
IV. Pre - processing Area		
1. The size and design of the pre-processing area should be adequate for proper storage of incoming MSW.	Pre- processing area is designed to store entire MSW	
2. Pre-processing area should consist of permanent roof shed over platform, partition wall for protection against wind and noise, concrete platform, Weighbridge facility, Waste loading, Waste segregation(if required) and Waste shredding facilities etc. Access to loaders should be ensured.	Pre-processing area would be consist of permanent roof shed over platform, partition wall for protection against wind and noise, concrete platform, weighbridge facility, Waste loading, Waste segregation and Waste shredding facilities etc.	
3. Recyclables will be segregated into 5 categories (papers, plastics, rubbers, metals and glasses) and placed in the respective containers and routed through appropriate vendors. Non-recyclables will be sent to landfill site.	Recyclable materials will be segregated at household levels and at pre processing level as per the categories mentioned. Recycled materials will be sold to respective registered vendors. Non recyclable materials will be dispose to landfill site	
4. Battery wastes, E-wastes & Hazardous wastes shall be handled and disposed as per respective rules framed under E.P. Act 1986.	Battery wastes, E-wastes & Hazardous wastes will be not mixed with MSW. Those will be collected separately and dispose to hazardous waste disposal site as per Environment Protection (E. P) 1986 and Hazardous waste handling rules	
V. Processing Area		
1. The processing area comprises of mass composting and curing activity.	In processing area there will be mass composting and curing activity. Those are part of design of processing unit before composting	
2. Adequate residence time should be provided for compostable waste in mass windrow.	Under processing unit sufficient time will be provided for maturing in mass windrow	
3. Proper space is required for easy movement for loader or operation of vehicle.	Sufficient space will be provided at processing unit for easy movement for loader or operation of vehicle.	
4. The mass composting pad surface and curing area is paved to avoid erosion from runoff. Grading the surface of the pad to meet the optimal slope will also help to prevent erosion by allowing smooth drainage.	The mass composting pad surface and curing area will be paved to avoid erosion from runoff. Grading the surface will be done to prevent erosion and smooth draining	
5. This facility will be equipped with	Processing facility will be equipped	

Compliance Requirement – EC Condition	Specific actions and design considerations	Remarks – Action plan
hopper, feeding conveyor, dual trammel, reject conveyor and transfer conveyor. The under sizes digested material including manure will be conveyed by transfer conveyor to curing area and rejects shall be conveyed by trolley to transfer station.	with hopper, feeding conveyor, dual trammel, reject conveyor and transfer conveyor. Manure will be conveyed to transfer station	
6. Digested material will be stacked in the curing area to remove moisture from digested material for effective screening and to protect the digested material from rain. Moisture shall be measured.	Composting materials after segregation will be placed for curing to remove moisture	
7. Adequate drainage at composting facilities should be provided in order to prevent water logging.	Adequate drainage at composting facilities would be provided (as per design) around the active areas in order to prevent water logging.	
VI. Post Processing Area		
1. The post processing area at composting facilities shall be used for screening, size reduction and bleeding operations for compost, conducting tests to ensure quality of compost, preparing compost for market and also for storing compost.	The post processing area at composting facilities would be used for screening, size reduction and bleeding operations for compost. Quality test for compost will be conducted to ensure quality of compost, preparing compost for market.	
2. Proper vibro-screen, density separator shall be installed to segregate metals, pebbles, sand and all undigested materials.	Proper vibro-screen, density separator will be installed for all kind of segregation	
3. Adequate storage capacities should be incorporated into site design for composting facilities. Backup storage and disposal capacity should also be ready to accommodate demand of seasonal markets.	Adequate storage capacities should be incorporated into site design for composting facilities. Backup storage and disposal capacity should also be ready to accommodate demand of seasonal markets.	
4. Buffer zone should be provided to minimize the odour and transport of bio aerosols along download of the facility.	Buffer zone will be provided around treatment and disposal facility to minimize the odour	Buffer zone will be developed at later phase of construction
5. Sprinklers/water spraying facility should be installed in order to reduce the dust generation at site during the construction work.	Water sprinkling facility would be installed at all working areas in order to reduce the dust generation at site during the construction work and operation	
6. On site road leading to the tipping and storage areas should be paved or graveled roads to accommodate	Internal road will be developed after consideration of movement of large	

Compliance Requirement – EC Condition	Specific actions and design considerations	Remarks – Action plan
movement of large vehicles even during adverse weather conditions. Roads shall be designed to provide adequate space for turning. The roads at dumping areas should be designed to accommodate delivery by all sorts of vehicles.	vehicles, delivery of all materials	
7. Inert materials and rejects of compost shall be transported to landfill site.	As per landfill site design Inert materials and rejects of compost will be transported to landfill site. Capacity of landfill site considered accordingly	
8. Ventilation arrangement should be ensured in case of close siding.	Would be done as per design provision	
VII. Landfill Sanitary Facility		
1. Semi-Aerobic landfill system shall be constructed as proposed.	For disposal of MSW Semi-Aerobic landfill system will be developed	
2. The sanitary landfill shall include following features: Section Embankment, Disposal ground, Leachate Collection and Removal System, Municipal Solid Waste Inspection area, Storm Water drainage system, Green belt/buffer area/lawns, Boundary wall, Weigh Bridge, Leachate Treatment plant, Gas collection system if required, water supply system, Quality control laboratory, Boundary wall and Fencing, Roads and street lighting, Office block, Shed for machinery storage and parking, vehicle washing platform and other basic amenities.	As per design and MSW rules the sanitary landfill facility will include following features: Section Embankment, Disposal ground, Leachate Collection and Removal System, Municipal Solid Waste Inspection area, Storm Water drainage system, Green belt/buffer area/lawns, Boundary wall, Weigh Bridge, Leachate Treatment plant, Gas collection system if required, water supply system, Quality control laboratory, Boundary wall and Fencing, Roads and street lighting, Office block, Shed for machinery storage and parking, vehicle washing platform and other basic amenities.	
3. Landfill layout should be designed to cater landfill as per MSW (M&H) Rules 2000 and guidelines prescribed by CPCB/MoEF for 30 years as mentioned in the EIA report.	Landfill layout designed to cater landfill as per MSW (M&H) Rules 2000 and guidelines prescribed by CPCB/MoEF for 30 years	
4. The landfill should be designed in line with MSW Rules, 2000 having minimum environmental impact.	The landfill is designed in line with MSW Rules, 2000 having minimum environmental impact (Ref EIA report including EMP)	
5. The landfill should be developed in two phases.	Landfill will be developed in phases as mentioned in DPR and EIA report	
6. The landfill should be of the capacity to handle 60 MT waste in 1 st phased as	Landfill is planned accordingly	

Compliance Requirement – EC Condition	Specific actions and design considerations	Remarks – Action plan
proposed.		
7. Adequate bottom liner system and top liner system shall be provided. Appropriate thickness of the HDPE liner for the bottom liner as well as top liner system shall be provided to prevent and damaging impact in surrounding area and to prevent water infiltration.	1.5 mm thick HDPE geo-membranes liner will be provided on the top of the 900 mm thick clay liner to prevent and damaging impact in surrounding area and to prevent water infiltration.	
8. The coefficient of permeability as proposed should be used as guiding factor.	Proposed coefficient of permeability will be used for infiltration and leachate generation	
9. Leachate produced from infiltration of water percolated through the dumped waste layers will be collected in a pond(aeration pond) through properly sized perforated pipes (main leachate pipes and branch leachate pipes) embedded in graded gravels/boulders as filter material.	Leachate collection lateral pipes would be provided above the membranes in 300 mm thick silt sand. The 150 mm collection pipes shall be provided at a spacing of 20 m c/c. The pipes shall be perforated at the bottom and shall be laid at a slope of 1 in 100 and will be connected to the Header pipes These Header pipes will be ultimately connected to the inlet of the leachate treatment tank.	
10. The drainage should be designed with special care to avoid any overflow.	The drainage has been designed with special care to avoid any overflow.	
11. Leachate collection, treatment and removal system should be developed for effective collection of leachate and reducing the risk of contamination of ground water.	Leachate collection, treatment and removal system would be developed for effective collection of leachate without contamination of ground water	
12. Daily cell cover is to be provided as per norms.	Will be provided as per MSW Rules	
13. As per the Municipal Solid Waste (Management and Handling) Rules 2000, DMB should declare a no-development buffer zone around the landfill site and the same should be incorporated in the town planning department land use plans.	DMB will declare a no-development buffer zone around the landfill site and the same would be incorporated in the town planning department land use plans.	Within 3 months. Before starting of the construction work DMB will take necessary action
VIII. Facilities at site		
1. A buffer zone of no-development shall be maintained around landfill site and shall be incorporated in the Town Planning Department's land-use plans.	A buffer zone of no-development will be maintained around landfill site and will be incorporated in the Town Planning Department's land-use plans.	The action will be taken accordingly.
2. Landfill site shall be fenced or hedged and provided with proper gate to	As per design landfill site will be fenced and monitoring of incoming	

Compliance Requirement – EC Condition	Specific actions and design considerations	Remarks – Action plan
monitor incoming vehicles or other modes of transportation.	vehicles or other modes of transportation will be done from gate	
3. Landfill site shall be well protected to prevent entry of unauthorized persons and stray animals.	Landfill site will be well protected to prevent entry of unauthorized persons and stray animals.	
4. Approach and other internal roads for free movement of vehicles and other machinery shall exist at the landfill site.	At landfill approach and other internal roads will be constructed	
5. The landfill site shall have wastes inspection facility to monitor wastes brought in for landfill, office facility for record keeping and shelter for keeping equipment and machinery including pollution monitoring equipments.	The landfill site will have wastes inspection facility to monitor wastes brought in for landfill, office facility for record keeping and shelter for keeping equipment and machinery including pollution monitoring equipments.	
6. Provisions like Weigh bridge to measure quantity of waste brought at landfill site, fire protection equipments and other facilities as may be required shall be provided.	Weigh bridge will be provided to measure quantity of waste brought at landfill site, fire protection equipments and other facilities as may be required will be provided.	
7. Utilities such as drinking water (preferably bathing facilities for workers) and lighting arrangements for easy landfill operations when carried out in night hours shall be provided.	Utilities such as drinking water (preferably bathing facilities for workers) and lighting arrangements for easy landfill operations when carried out in night hours will be provided as per design	
8. Safety provisions including health inspections of workers at landfill site shall be periodically made.	Safety provisions including health inspections of workers at landfill site will be periodically made as per H & S plan.	
IX. Leachate Collection, Treatment & Removal System		
1. Suitable bottom liner system shall be provided with adequate slope towards the leachate collection pipes.	Suitable bottom liner system will be provided with adequate slope towards the leachate collection pipes. Considered in design	
2. As proposed, HDPE pipes with adequate strength, diameter should be laid at suitable slope and spacing and leachate collection.	As proposed, HDPE pipes with adequate strength, diameter should be laid at suitable slope and spacing and leachate collection.	
3. Perforated drainage pipes shall be provided for rapid transport of fluids. Adequate slope and spacing should be	Perforated drainage pipes will be provided for rapid transport of fluids. Adequate slope and spacing shall be provided.	

Compliance Requirement – EC Condition	Specific actions and design considerations	Remarks – Action plan
provided.		
4. These pipes should be of good quality HDPE with appropriate pressure-specification and perforations.	The pipes would be of good quality HDPE with appropriate pressure-specification and perforations.	
5. RCC collection sump shall be constructed.	RCC collection sump will be constructed.	
6. Leachate shall be treated in the leachate treatment plant and disposed or re-used in landscaping after compliance of the standards prescribed by CPCB/MoEF.	Leachate will be treated in the leachate treatment plant and disposed or re-used in landscaping after compliance of the standards prescribed by CPCB/MoEF.	
7. The component that is most vulnerable to compressive strength failure is the drainage layer piping. Leachate collection system piping can fail by excessive deflection which may lead to bucking or collapse. All components of the leachate collection system must have sufficient strength to support the weight of the overlying waste, cover system and post closure loadings as well as stresses from operating equipment.	All components of the leachate collection system would have sufficient strength to support the weight of the overlying waste, cover system and post closure loadings as well as stresses from operating equipment.	
8. The depth of the drainage layer around the pipe should be deeper than the diameter of then pipe. The pipe should be placed in trenches to provide the extra depth. In addition, the trench serves as a sump for leachate collection.	The depth of the drainage layer around the pipe would be deeper than the diameter of the pipe. The pipe will be placed in trenches to provide the extra depth. In addition, the trench serves as a sump for leachate collection.	
9. As pipe can be susceptible to particulate and biological clogging similar to drainage layer material regular maintenance should be ensured.	As pipe can be susceptible to particulate and biological clogging similar to drainage layer material regular maintenance would be ensured. Further the perforated pipes will be covered by geo-textile material in order to stop the clogging.	
X. Storm water collection and drainage system		
1. Storm water drainage system should be designed to minimize the leachate generation and to prevent contamination of surface water through runoff from dumpsite. The storm water should not be allowed to enter the active cell of the landfill. Stagnation must be avoided. Storm water from the site will be collected in a detention pond prior	Storm water drainage system is designed to minimize the leachate generation and to prevent contamination of surface water through runoff from dumpsite. Further due care will be taken so that storm water will not enter into the	

Compliance Requirement – EC Condition	Specific actions and design considerations	Remarks – Action plan
disposal.	active cell.	
2. The project site should be suitable leveled and embankments should be constructed in such a manner that under no circumstances the storm water from outside area can enter the project site or the project site runoff inundates surrounding roads or adjoining area located nearby.	The project site would be suitable leveled and embankments would be constructed in such a manner that under no circumstances the storm water from outside area can enter the project site or the project site runoff inundates surrounding roads or adjoining area located nearby.	
XI. Transport and other conditions		
1. Adequate Buffer zone should be provided to minimize the transport of odour and bio aerosols downwind of the facility.	Adequate Buffer zone would be provided as per design to minimize the transport of odour and bio aerosols downwind of the facility. Buffer zone development is already considered in design	
2. Adequate transport management plan should be in place for uninterrupted traffic flow. Roads shall be designed to provide adequate turning and dumping areas to accommodate delivery by all types of vehicles.	Adequate transport management plan would be in place for uninterrupted traffic flow. Roads will be designed to provide adequate turning and dumping areas to accommodate delivery by all types of vehicles.	
3. On site roads should be paved or graveled roads leading to the tipping area and storage areas to accommodate movement of large vehicles during adverse weather conditions.	On site roads would be paved or graveled roads leading to the tipping area and storage areas to accommodate movement of large vehicles during adverse weather conditions.	
4. Adequate lighting should be provided in streets and working areas for ensuring operation and security	As per design adequate lighting would be provided in streets and working areas for ensuring operation and security	
A. Specific Conditions-For Operation Stage:		
I. Collection and Transport system		
1. All the vehicles shall be used for transportation of MSW from Processing facility to Landfill site must have suitable tracking system.	All the vehicles will be used for transportation of MSW from Processing facility to Landfill site would have suitable tracking system.	
2. All vehicles shall be fitted with fire extinguishers and first aid kit.	All vehicles will be fitted with fire extinguishers and first aid kit.	
3. Medical chec ups of drivers and other field staff should be carried out from time to time.	Medical checkups of drivers and other field staff would be carried out from time to time.	
4. During transportation the container shall remain closed from all side and shall be opened at the time of disposal of the	During transportation the container will be remain closed from all side and will be opened at the time of disposal	

Compliance Requirement – EC Condition	Specific actions and design considerations	Remarks – Action plan
waste only. Each container should be inspected atleast once in a week for any leakage spillage problem.	of the waste only. Each container should be inspected atleast once in a week for any leakage spillage problem.	
5. The transporter shall be made about the time of wastes and quantities	The transporter will be made about the time of wastes and quantities	The action will be taken accordingly during implementation stage.
II. Segregation and reuse of Recycling Materials		
1. Recyclables will be segregated at compost plant as well as at transfer station..	Recyclables will be segregated at compost plant as well as at transfer station.	
2. Wastes other than biodegradable and recyclables after segregation will go to landfill as per specifications of Schedule III of MSW (M&H) Rules 2000.	Wastes other than biodegradable and recyclables after segregation would go to landfill as per specifications of Schedule III of MSW (M&H) Rules 2000.	
3. As proposed manual segregation of recyclable material (paper, glass, plastics, rubber and metal) will take place at the transfer station platform. Recyclable material will be segregated by adequate number of workers equipped with all safety tools and equipment.	As proposed in design manual segregation of recyclable material (paper, glass, plastics, rubber and metal) will take place at the transfer station platform. Recyclable material will be segregated by adequate number of workers equipped with all safety tools and equipment.	
III. Operation at composting plants		
1. Daily log of MSW handled in the facilities should be recorded and kept in place.	Daily log of MSW handled in the facilities would be recorded at compost plant and kept in place.	
2. Weighbridge should be used for quantification of waste. Weighbridges should be calibrated by independent agency on regular basis.	Weighbridge would be used for quantification of waste. Weighbridges will be calibrated at definite interval by independent agency	
3. The number of vehicles, number of trips by each vehicle, quantity of waste transported by should be recorded at all facilities.	The number of vehicles, number of trips by each vehicle, quantity of waste transported by would be recorded at all facilities.	
4. The organic solid waste shall be stabilized through microbial action.	The organic solid waste will be stabilized through microbial action.	
5. As proposed windrow shall be turned twice a week for oxygenation. Active composting shall be followed by curing at bunker for adequate time period as and when required.	Windrow will be turned twice a week for oxygenation. Active composting will be followed by curing at bunker for adequate time period as and when required.	
6. In the mass windrow, adequate moisture content is to be maintained	In the mass windrow, adequate moisture content is to be maintained throughout the fermented cycle.	

Compliance Requirement – EC Condition	Specific actions and design considerations	Remarks – Action plan
throughout the fermented cycle.		
7. Waste should be stacked in adequately spaced rows.	Waste would be stacked in adequately spaced rows.	
8. Ground compaction and leaving shall be provided in the area occupied by the composting bunkers, curing pads and roads.	Ground compaction and leaving will be provided in the area occupied by the composting bunkers, curing pads and roads.	
9. Water shall be supplied to the piles to maintain the desired moisture content. Any leachate or runoff from the piles will be collected and treated or added back to a batch of incoming MSW to increase its moisture content.	Water will be supplied to the piles to maintain the desired moisture content. Any leachate or runoff from the piles will be collected and treated or added back to a batch of incoming MSW to increase its moisture content.	
10. Quality control shall be ensured for physical, chemical and biological parameters. On site laboratory facility should be provided with skilled manpower.	Quality control will be ensured for physical, chemical and biological parameters. On site laboratory facility should be provided with skilled manpower.	
11. Finished product shall be packed in HDPE bags or polybags.	Finished product will be packed in HDPE bags or polybags for sale.	
12. In order to ensure safe application of compost the specification for compost quality shall be met as prescribed MSW(M & H) Rules 2000.	In order to ensure safe application of compost the specification for compost quality will be met as prescribed MSW(M & H) Rules 2000.	
13. Necessary precautions shall be taken to minimize nuisance of order, flies, rodents, bird menace and fire hazards.	Necessary precautions will be taken to minimize nuisance of order, flies, rodents, and bird menace and fire hazards.	
14. Ambient air quality monitoring shall be regularly carried out particularly for checking odour, nuisance at down-wind direction on the boundary of processing plant.	Ambient air quality monitoring will be regularly carried out particularly for checking odour, nuisance at down-wind direction on the boundary of processing plant.	Monitoring will be carried out at definite interval and as per EMP
15. Routine operation and maintenance scheme should be complemented by Emergency Response Protocol (ERP) to carry out emergency repairs and damage controls.	Routine operation and maintenance scheme would be complemented by Emergency Response Protocol (ERP) to carry out emergency repairs and damage controls.	
16. The compost and leachate should comply with quality standards proposed in MSW rules	The compost and leachate would comply with quality standards proposed in MSW rules	
17. Buffer zone should be provided to minimize the odour and transport of bio aerosols along downwind of the facility.	Buffer zone would be provided as per design to minimize the odour and transport of bio aerosols along downwind of the facility.	
IV. Operation at Landfill		
1. The landfill facility operator must ensure	At proposed landfill facility it is	

Compliance Requirement – EC Condition	Specific actions and design considerations	Remarks – Action plan
that only the residual inert material and rejects of compost plant, sewer silt is disposed.	ensured that only the residual inert material and rejects of compost plant, sewer silt will be disposed	
2. Disposal of construction debris at landfill is not preferably being allowed.	Disposal of construction debris at landfill will be not done	
3. The waste transported at landfill facility shall be reported with date, time, waste quality etc.	The waste transported at landfill facility will be reported with date, time, waste quality etc. and these will be recorded	
4. The landfill shall be compacted during active operations on daily basis and covered as per requirement.	The landfill will be compacted during active operations on daily basis and covered as per requirement.	
5. Suitable design slope shall be maintained in the sanitary landfill.	Suitable design slope will be maintained in the sanitary landfill.	
6. The actual stability shall be tested at regular interval.	The actual stability will be tested at regular interval.	
7. An intermediate liner should be provided before onset of monsoon.	An intermediate liner would be provided before onset of monsoon.	
8. The final cover shall be laid as per construction requirements and MSW regulations to enhance surface drainage, minimize infiltration, vegetation and control the release of the landfill gases. To ensure the rapid removal; of rainfall from the completed landfill and to avoid the formation of puddles, the final cover should have a requisite slope	The final cover will be laid as per construction requirements and MSW regulations to enhance surface drainage, minimize infiltration, vegetation and control the release of the landfill gases.	
9. Sufficient distance is to maintain to avoid circular collapses. The geotechnical investigations on reports should be consulted for ensuring adequate safety factor.	Sufficient distance is to be maintained to avoid circular collapses. The geotechnical investigations on reports would be consulted for ensuring adequate safety factor.	
10. In constructing the road accessing from the Dibrugarh and adjoining area to the landfill site the current flow of rainwater in the rainy season could be prevented. So that the drain pipe needs to be big enough for the flow of rainwater from the upper reaches of the access road to the lower reaches of the access road.	In constructing the road accessing from the Dibrugarh and adjoining area to the landfill site the current flow of rainwater in the rainy season would be prevented. So that the drain pipe needs to be big enough for the flow of rainwater from the upper reaches of the access road to the lower reaches of the access road.	
11. Ambient noise level should not exceed the permissible limit. The overall noise levels in and around the plant area shall be kept well within the standards by providing noise control measures including acoustic hoods, silencers,	Ambient noise level would not exceed the permissible limit. The overall noise levels in and around the plant area will be kept well within the standards by providing noise control	

Compliance Requirement – EC Condition	Specific actions and design considerations	Remarks – Action plan
enclosures etc. on all sources of noise generations. The ambient noise levels should conform to the standards prescribed under EPA rules, 1989 viz. 75 db(A) Leq (daytime) and 70 db(A) Leq (night time) and its subsequent amendments.	measures as per EMP	
12. Green belt shall be developed atleast 33% of the land area for proposed project to be covered by plantation.	Green belt will be developed atleast 33% of the land area for proposed project to be covered by plantation.	Plantation will be done as per design and to be completed before operation
13. All internal roads should be concreted/pitched. Proper lighting and proper pathway inside the premises should be constructed to ensure safe vehicular movement. Provision of separate pathways for entry and exit of vehicles should be considered. Vehicles should conform to pollution under control (PUC) norms. Proper housekeeping shall be maintained within the premises. Solar lighting should be used as far as practicable.	All internal roads would be concreted/pitched. Proper lighting and proper pathway inside the premises would be constructed to ensure safe vehicular movement. Vehicles would conform to pollution under control (PUC) norms. Proper housekeeping will be maintained within the premises.	
14. Health and safety of workers shall be ensured. Workers shall be provided with adequate personal protective equipment (PPE) as per proposal and sanitation facilities. Occupational health surveillance of the workers shall be done on a regular basis and records maintained as per the factories act.	Health and safety of workers will be ensured. Workers shall be provided with adequate personal protective equipment (PPE) as per proposal and sanitation facilities. Occupational health surveillance of the workers will be done on a regular basis and records maintained as per the factories act.	
15. The implementation and monitoring of Environmental Management Plan should be carried out as proposed.	The implementation and monitoring of Environmental Management Plan would be carried out as proposed.	
16. Corporate social responsibility programs should be carried out and shall be adopted as mentioned in EIA report.	Corporate social responsibility programs would be carried out and shall be adopted as mentioned in EIA report.	
V. Monitoring and Landfill facilities		
1. Monitoring of the ambient air quality, surface water quality shall be conducted as specified in MSW rules.	Monitoring of the ambient air quality, surface water quality will be conducted as specified in MSW rules	Monitoring will be done at definite interval
2. Monitoring wells should be set up to monitor leakage leachate into ground water. Atleast 4 monitoring wells should be set up at each site to monitor ground water flow in all possible directions. The monitoring wells can be located in consultation with district	Monitoring wells will be set up to monitor leakage leachate into ground water. Atleast 4 monitoring wells would be set up at each site to monitor ground water flow in all possible directions. The monitoring	

Compliance Requirement – EC Condition	Specific actions and design considerations	Remarks – Action plan
administration/PHED.	wells will be located in consultation with district administration/PHED.	
3. The surface water, ground water, air quality, landfill gas, leachate, incoming waste etc. should be monitored as per the proposed environmental monitoring plant.	The surface water, ground water, air quality, landfill gas, leachate, incoming waste etc. would be monitored as per the proposed environmental monitoring plan	
4. The monitoring network is to be expanded/modified as and when situation required.	The monitoring network is to be expanded/modified as and when situation required.	
VI. Plantation at landfill site: A vegetative cover shall be provided over the completed site in accordance with the following specifications		
1. Selection of locality adopted non-edible perennial plants that are resistant to drought and extreme temperatures shall be allowed to grow.	Locality adopted non-edible perennial plants that are resistant to drought and extreme temperatures will be selected for plantation	
2. The plants grown be such that their roots do not penetrate more than 30 cms. This condition shall apply till the landfill is stabilized.	The plants grown will be such that their roots do not penetrate more than 30 cms. This condition shall apply till the landfill is stabilize	
3. Selected plants shall have ability to thrive on low-nutrient soil with minimum nutrient addition.	Selected plants will have ability to thrive on low-nutrient soil with minimum nutrient addition.	
4. Plantation to be made in sufficient density to minimize soil erosion.	Plantation will be done in sufficient density to minimize soil erosion.	
C. Closure of the Site & Post Closure cares: The post – closure care of landfill site should be conducted for at least fifteen years and long term monitoring or care plan shall consist of the following.	The post – closure care of landfill site will be conducted for at least fifteen years Long term monitoring to be continued	
1. Maintaining the integrity and effectiveness of final cover making repairs and preventing run-on and run off from eroding or otherwise damaging the final cover.	Will be maintained the integrity and effectiveness of final cover making repairs and preventing run-on and run off from eroding or otherwise damaging the final cover.	
2. Monitoring leachate collection system to ensure no overflow of leachate.	Leachate collection system will be monitored to ensure no overflow of leachate.	

Compliance Requirement – EC Condition	Specific actions and design considerations	Remarks – Action plan
3. Monitoring the influent and effluent quality at the sludge and leachate treatment plant.	The influent and effluent quality of the sludge and leachate treatment plant will be monitored	
4. Maintaining and operating the landfill gas collection system to meet the standards.	To meet the standards the landfill gas collection system will be monitored during operation	
5. Adequate venting system should be provided for venting gas. The gas collected in the vent layer shall be collected and vented through vent pipes.	At landfill adequate venting system would be provided for venting gas	
VII. Additional Conditions		
1. The L. P. School located near the proposed landfill site be shifted to a safe distance by the authority concern before construction of the proposed site.	Before construction of the proposed site L. P. School will be shifted	The action will be taken before construction.
2. The existing landscape shall be maintained to the extent of maximum possible way.	The existing landscape will be maintained to the extent of maximum possible way	
3. Dumping of MSW shall not be allowed in to the proposed landfill area before completion and commissioning of the project.	Dumping of MSW at new landfill will be started after commissioning of the project.	
4. The commitment made in the Meeting held on 22/07/2015 in the Conference Hall of Deputy Commissioner's office, Dibrugarh before the public of Lekai area in connection with establishment of Solid Waste Management Project at Lekai, Ghoramara, Dibrugarh shall be complied along with the compliance of the EIA report.	The commitment made in the Meeting held on 22/07/2015 in the Conference Hall of Deputy Commissioner's office, Dibrugarh before the public of Lekai area in connection with establishment of Solid Waste Management Project at Lekai, Ghoramara, Dibrugarh will be complied along with the compliance of the EIA report.	
D. General Condition:		
1. The project proponent shall comply with all the environmental protection measures and safeguards recommended. MSW Rules 2000 should be followed strictly. Further, the unit must undertake socio-economic development activities in the surrounding villages like community development programmes, educational programmes, drinking water supply and	DMB and project Implementation agency will comply with all the environmental protection measures and safeguards recommended. MSW Rules 2000 would be followed strictly. Community development work will be conducted through community development cell of DMB	

Compliance Requirement – EC Condition	Specific actions and design considerations	Remarks – Action plan
health care etc.		
2. All the conditions, liabilities and legal provisions contained in the Environmental Clearance shall be equally applicable to the successor management of the project in the event of the project proponent transferring the ownership, maintenance of management of the project to any other entity.	It is understood that all the conditions, liabilities and legal provisions contained in the Environmental Clearance will be equally applicable to the successor management of the project in the event of the project proponent transferring the ownership, maintenance of management of the project to any other entity through PPP model or direct transfer	
3. Provision should be made for the supply of kerosene or cooking gas to the labourers during construction phase. All the labourers to be engaged for construction works should be screened for health and adequately treated before issue of work permit.	Kerosene or cooking gas to be provided to the labourers during construction phase. All the labourers to be engaged for construction works will be screened for health and adequately treated before issue of work permit.	
4. The vehicles and MSW handling/processing equipments shall be arranged as per EIA report and as per requirement from time to time.	The vehicles and MSW handling/processing equipments will be arranged as per EIA report and changes may be done as per requirement	
5. The project proponent should make financial provision in the total budget of the project for implementation of the environmental safeguards. The project authorities will provide requisite funds recurring and non-recurring to implement the conditions stipulated by the SEIAA along with the implementation schedule for all the conditions stipulated herein. The funds so provided should not be diverted for any other purpose.	As per EMP provision there is separate budget and provision of fund to be maintained for implementation of safeguard	
6. Not further expansion or modifications in plant should carried out without prior approval of the State Environmental Impact Assessment Authority, Assam.	Expansion or modifications in plant will be not carried out without prior approval of the State Environmental Impact Assessment Authority, Assam.	
7. In case of any violation of the conditions laid down in this Environmental Clearance, Section 16 of the Environment (Protection) Act, 1986 will be applicable.	This is agreed that in case of any violation of the conditions laid down in this Environmental Clearance, Section 16 of the Environment (Protection) Act, 1986 will be applicable.	

Compliance Requirement – EC Condition	Specific actions and design considerations	Remarks – Action plan
8. In the case of any change(s) in the scope of the project, the project would require a fresh appraisal by the SEIAA.	This is agreed in the case of any change(s) in the scope of the project, the project would require a fresh appraisal by the SEIAA.	
9. The State Environmental Impact Assessment Authority reserves the right to add additional condition(s).	This is understood that The State Environmental Impact Assessment Authority reserves the right to add additional condition(s).	
10. Safeguard measures subsequently if found necessary and to take action including revoking of the environmental clearance under the provisions of the Environment (Protection) Act, 1986 to ensure effective implementation of the suggested measures in a time-bound and satisfactory manner.	Safeguard measures subsequently if found necessary and to take action including revoking of the environmental clearance under the provisions of the Environment (Protection) Act, 1986 to ensure effective implementation of the suggested measures in a time-bound and satisfactory manner.	
11. The project proponent should inform the public that the project has been accorded environmental clearance by the SEIAA. This should be advertised within seven days from the date of issue of the clearance letter, at least in two local newspapers that are widely circulated in the region of which one shall be in the vernacular language of the locality concerned.	The project proponent already informs the public that the project has been accorded environmental clearance by the SEIAA. Disclosure to two newspapers has been done	
12. The project authorities should inform the State Pollution Control Board as well as the SEIAA, the date of financial closure and final approval of the project implementation.	The project authorities will inform the State Pollution Control Board as well as the SEIAA, the date of financial closure and final approval of the project implementation.	
13. Prior Consent to Establish (NOC) for the proposed project must be obtained from PCB, Assam before commencement of construction. All other statutory clearance should be obtained by the project proponent from the competent authorities.	Prior Consent to Establish (NOC) for the proposed project would be obtained from PCB, Assam before commencement of construction	
14. The environmental clearance accorded shall be valid for a period of 5 years for the proposed project.	Landfill will be establish within 2017	
15. The above stipulation would be enforced along with those under the Water (Prevention and Control of	The above stipulation would be enforced along with all relevant Acts & Rules Water (Prevention and	

Compliance Requirement – EC Condition	Specific actions and design considerations	Remarks – Action plan
<p>Pollution) Act 1974, the Air (Prevention and Control of Pollution) Act 1981, the Environment (Prevention) Act 1986, the Hazardous Waste (Management, Handling and Trans boundary Movement) Rules, 2008, the Public Liability Insurance Act, 1991, the Environment Impact Assessment Notification 2006 and their amendments.</p>	<p>Control of Pollution) Act 1974, the Air (Prevention and Control of Pollution) Act 1981, the Environment (Prevention) Act 1986, the Hazardous Waste (Management, Handling and Trans boundary Movement) Rules, 2008, the Public Liability Insurance Act, 1991, the Environment Impact Assessment Notification 2006 and their amendments.</p>	

Letter from Project Director related to shifting of L. P School at Dibrugarh



O/c

Government of Assam

Assam Urban Infrastructure Investment Program (AUHP)

3rd Floor, Tripti Tower, Ganeshtguri, Guwahati-05

Tel No.: +91 361- 2349839, Fax No.: +91 361- 2349849, web site : www.auihp.in

No. ADB/AUHP/SLF Site/66/2012/122

Date: 5 .11.2015

From,

The Project Director,
Assam Urban Infrastructure Investment Program
Guwahati, Assam

To,

The Deputy Commissioner
Dibrugarh, Assam

Sub: Dibrugarh Solid Waste Management (SWM) subproject- Identification and allotment of Land for L.P School near the landfill site at Ghoramara, Dibrugarh

Sir,

With reference to the above, I would like to inform you that Environmental Clearance for the Solid Waste Management (SWM) project, Dibrugarh of Assam Urban Infrastructure Investment Program (AUHP) was obtained on 21st September 2015. As per the condition in the EC report at point no. 1of VII (Additional Conditions) under "C" (Closure of the Site & Post Closure Care) it states that the L.P. School located near the proposed landfill site should be shifted to a safe distance before the commencement of the construction activities. And the RP prepared for the SWM subprojects will be revised accordingly.

Therefore, you are requested to take up the matter and instruct the concerned authority at Dibrugarh to select a suitable plot of land for shifting of the school.

Encl: Copy of EC

Yours faithfully

Project Director
Assam Urban Infrastructure Investment Program
Assam Urban Infrastructure Investment Programme
Ganeshtguri, Guwahati-5

No. ADB/AUHP/SLF Site/66/2012/ (A)

Date: .11.2015

Copy for information to:

1. Liaison Officer, PIU, Dibrugarh, AUHP
2. The TL, PMC, AUHP.
3. The TL, DSC, AUHP.

6/11/2015
DSC
COPY RECEIVE

**CENTRAL POLLUTION CONTROL BOARD (CPCB)
APPLICABLE ENVIRONMENTAL STANDARDS**

General Standards for Discharge of Environmental Pollutants: Effluents

SL.no	Parameter	Standards			
		Inland surface water	Public sewers	Land of irrigation	Marine/coastal areas
		(a)	(b)	(c)	(d)
1.	Colour and odour	remove as far as practicable			
2.	Suspended solids mg/l. max.	100	600	200	(a) For process waste water 100 (b) For cooling water effluent 10% above total suspended matter of influent.
3.	Particle size of suspended solids	shall pass 850 micron IS Sieve			(a) Floatable solids, max. 3mm. (b) Settable solids (max 850 micron)
4.	pH value	5.5. to 9.0	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
5.	Temperature	shall not exceed 5 ^o C above the receiving water temperature			shall not exceed 5 ^o C above the receiving water temperature
6.	Oil and grease, mg./l, max.	10	20	10	20
7.	Total residual chlorine, mg/l. max.	1.0			1.0
8.	Ammonical nitrogen (as N.) mg/l max	50	50		50
9.	Total Kjeldahl Nitrogen (as NH ₃) mg/l. max	100			100
10.	Free ammonia (as NH ₃), mg/l.max	5.0			5.0
11.	Biochemical oxygen demand (3 days at 27 ^o C), mg/l. max.	30	350	100	100
12.	Chemical oxygen demand, mg/l, max.	250			250

SL.no	Parameter	Standards			
		Inland surface water	Public sewers	Land of irrigation	Marine/coastal areas
13.	Arsenic (as As) mg/l, max.	0.2	0.2	0.2	0.2
14.	Mercury (As Hg), mg/l, max.	0.01	0.01		0.01
15.	Lead (as Pb) mg/l, max	0.1	1.0		2.0
16.	Cadmium (as Cd) mg/l. max	2.0	1.0		2.0
17.	Hexavalent chromium (as Cr. +6). mg/l, max	0.1	2.0		1.0
18.	Total Chromium (as Cr) mg/l, max	2.0	2.0		2.0
19.	Copper (as Cu) mg/l, max	3.0	3.0		3.0
20.	Zinc (as Zn) mg/l, max	5.0	15		15
21.	Selenium (as Se) mg/l, max	0.05	0.05		0.05
22.	Nickel (as Ni) mg/l, max	3.0	3.0		5.0
23.	Cyanide (as CN) mg/l, max	0.2	2.0	0.2	0.2
24.	Fluoride (as F) mg/l, max	2.0	15		15
25.	Dissolved phosphates (as P) mg/l, max	5.0			
26.	Sulfide (as S) mg/l, max	2.0			5.0
27.	Phenolic compounds (as C ₆ H ₅ OH) mg/l, max	1.0	5.0		5.0
28.	Radioactive materials: (a)Alfa emitters microcurie/ml, max. (b)Beta emitters micro curie/ml,max.	10 ⁻⁷ 10 ⁻⁶	10 ⁻⁷ 10 ⁻⁶	10 ⁻⁸ 10 ⁻⁷	10 ⁻⁷ 10 ⁻⁶

SL.no	Parameter	Standards			
		Inland surface water	Public sewers	Land of irrigation	Marine/coastal areas
29.	Bio-assay test	90% Survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent
30.	Manganese (as Mn)	2 mg/l	2 mg/l		2 mg/l
31.	Iron (as Fe)	3 mg/l	3 mg/l		3 mg/l
32.	Vanadium (as V)	0.2 mg/l	0.2 mg/l		0.2 mg/l
33.	Nitrate Nitrogen	10 mg/l			20 mg/l

These standards shall be applicable for industries, operations or process other than those industries operations or process for which standards have been specified in schedule of the Environment Protection Rules, 1989

CPCB Primary Water Quality Criteria

Designated-Best-Use	Class of Water	Criteria
Drinking Water Source without conventional treatment but after disinfection	A	<ul style="list-style-type: none"> ❖ Total Coliform Organisms: MPN # 50 per 100MI ❖ 6.5 # pH # 8.5 ❖ Dissolved Oxygen: \geq6 mg/L ❖ Biochemical Oxygen Demand (5 days @ 20°C): # 2 mg/L
Outdoor bathing (organized)	B	<ul style="list-style-type: none"> ❖ Total Coliform Organisms: MPN # 500 per 100mL ❖ 6.5 # pH # 8.5 ❖ Dissolved Oxygen: \geq5 mg/L ❖ Biochemical Oxygen Demand (5 days @ 20°C): # 3 mg/L
Drinking water sources after conventional treatment and disinfection	C	<ul style="list-style-type: none"> ❖ Total Coliform Organisms: MPN # 5000 per 100mL ❖ 6 # pH # 9 ❖ Dissolved Oxygen: \geq4 mg/L ❖ Biochemical Oxygen Demand (5 days @ 20°C): # 3 mg/L
Propagation of wildlife and fisheries	D	<ul style="list-style-type: none"> ❖ 6.5 # pH # 8.5 ❖ Dissolved Oxygen: \geq4 mg/L ❖ Free ammonia (as N): # 1.2 mg/L
Irrigation, industrial cooling, controlled waste disposal	E	<ul style="list-style-type: none"> ❖ # pH # 8.5 ❖ Electrical conductivity at 25°C: #2250 micro mhos/cm ❖ Sodium absorption ratio: Max 26 ❖ Boron: Max 2 mg/L

Indian Standards for Drinking Water - Specification (BIS 10500: 2012)

SI.No	Substance or Characteristic	Requirement (Desirable Limit)	Permissible Limit in the absence of Alternate source
Essential characteristics			

SI.No	Substance or Characteristic	Requirement (Desirable Limit)	Permissible Limit in the absence of Alternate source
1.	Colour, (Hazen units, Max)	5	25
2.	Odour	Unobjectionable	Unobjectionable
3.	Taste	Agreeable	Agreeable
4.	Turbidity (NTU, Max)	5	10
5.	pH Value	6.5 to 8.5	No Relaxation
6.	Total Hardness (as CaCO ₃) mg/lit.,Max	300	600
7.	Iron (as Fe) mg/lit,Max	0.3	1.0
8.	Chlorides (as Cl) mg/lit,Max.	250	1000
9.	Residual, free chlorine, mg/lit, Min	0.2	--
Desirable Characteristics			
10.	Dissolved solids mg/lit, Max	500	2000
11.	Calcium (as Ca) mg/lit, Max	75	200
12.	Magnesium (as Mg)mg/lit, Max.	30	100
13.	Copper (as Cu) mg/lit, Max	0.05	1.5
14.	Manganese (as Mn)mg/lit ,Max	0.10	0.3
15.	Sulfate (as SO ₄) mg/lit, Max	200	400
16.	Nitrate (as NO ₃) mg/lit, Max	45	100
17.	Fluoride (as F) mg/lit, Max	1.0	1.5
18.	Phenolic Compounds (as C ₆ H ₅ OH) mg/lit, Max.	0.001	0.002
19.	Mercury (as Hg)mg/lit, Max	0.001	No relaxation
20.	Cadmium (as Cd)mg/lit, Max	0.01	No relaxation
21.	Selenium (as Se)mg/lit,Max	0.01	No relaxation
22.	Arsenic (as As) mg/lit, Max	0.05	No relaxation
23.	Cyanide (as CN) mg/lit, Max	0.05	No relaxation
24.	Lead (as Pb) mg/lit, Max	0.05	No relaxation
25.	Zinc (as Zn) mg/lit, Max	5	15
26.	Anionic detergents (as MBAS) mg/lit, Max	0.2	1.0
27.	Chromium (as Cr ⁶⁺) mg/lit, Max	0.05	No relaxation
28.	Polynuclear aromatic hydrocarbons (as PAH) g/lit, Max	--	--
29.	Mineral Oil mg/lit, Max	0.01	0.03
30.	Pesticides mg/l, Max	Absent	0.001
31.	Radioactive Materials		
	i. Alpha emitters Bq/l, Max	--	0.1
	ii. Beta emitters pci/l,Max	--	1.0
32.	Alkalinity mg/lit. Max	200	600
33.	Aluminium (as Al) mg/l,Max	0.03	0.2
34.	Boron mg/lit, Max	1	5

Ambient Air Quality Standards

Pollutant	Time Weighted Average	Industrial, Residential, Rural and Other Areas	Sensitive Area (Notified by Central Govt.)	Method of Measurement
Sulphur Dioxide (SO ₂)	Annual Average *	50 µg / m ³	20 µg / m ³	• Improved West & Gaeke method

Pollutant	Time Weighted Average	Industrial, Residential, Rural and Other Areas	Sensitive Area (Notified by Central Govt.)	Method of Measurement
	24 hours Average**	80 µg/m ³	80 µg/m ³	<ul style="list-style-type: none"> • Ultraviolet Fluorescence
Oxides of Nitrogen (NO _x)	Annual Average *	40 µg / m ³	30 µg / m ³	<ul style="list-style-type: none"> • Jacobs & Hochheiser modified (NaOH – NaAsO₂) method • Gas Chemiluminescence
	24 hours Average**	80 µg/m ³	80 µg/m ³	
Particulate Matter (PM ₁₀) (Size <10 µm)	Annual Average *	60 µg / m ³	60 µg / m ³	<ul style="list-style-type: none"> • Gravimetric • TOEM • Beta Attenuation
	24 hours Average**	100 µg/m ³	100 µg/m ³	
Particulate Matter (PM _{2.5}) (Size <2.5 µm)	Annual Average *	40 µg / m ³	40 µg / m ³	<ul style="list-style-type: none"> • Gravimetric • TOEM • Beta Attenuation
	24 hours Average**	60 µg/m ³	60 µg/m ³	
Ozone (O ₃)	8 hours average **	100 µg/m ³	100 µg/m ³	<ul style="list-style-type: none"> • UV photometric • Chemiluminescence • Chemical method
	1 hour **	180 µg/m ³	180 µg/m ³	
Lead (Pb)	Annual Average *	0.5 µg / m ³	0.5 µg/m ³	<ul style="list-style-type: none"> • AAS method after sampling using EPM 2000 or equivalent filter paper
	24 hours Average**	1.0 µg / m ³	1.0 µg/m ³	
Carbon Monoxide (CO)	8 hours Average**	2.0 mg/ m ³	2.0 mg/ m ³	<ul style="list-style-type: none"> • Non Dispersive Infrared Spectroscopy
	1 hour **	4.0 mg/ m ³	4.0 mg/ m ³	
Ammonia (NH ₃)	Annual Average *	100 µg / m ³	100 µg / m ³	<ul style="list-style-type: none"> • Chemiluminescence • Indophenol blue method
	24 hours Average**	400 µg / m ³	400 µg / m ³	
Benzene (C ₆ H ₆)	Annual Average *	5 ng/ m ³	5 ng/ m ³	<ul style="list-style-type: none"> • Gas Chromatography continuous analyzer • Adsorption & desorption followed by GC analysis
Benzo(o)pyrene particulate phase only	Annual Average *	1 ng/ m ³	1 ng/ m ³	<ul style="list-style-type: none"> • Solvent extraction followed by GC/HPLC analysis
Arsenic (As)	Annual Average *	6 ng/ m ³	6 ng/ m ³	<ul style="list-style-type: none"> • AAS/ICP method after sampling using EPM 2000 or equivalent filter paper
Nickel (Ni)	Annual Average *	20 ng/ m ³	20 ng/ m ³	<ul style="list-style-type: none"> • AAS/ICP method after sampling using EPM 2000 or equivalent filter paper

(Source: Central Pollution Control Board, New Delhi, Notification dated 18th November 2009)

Notes:

1. * Indicate Annual Arithmetic Mean of Minimum 104 measurement in a year measured twice a week, 24 hourly at uniform intervals
2. ** 24 hourly / 8 hourly/1 hourly values should be met 98% of the time in a year. However, 2% of the time, it may exceed by not on two consecutive days

Standards for Diesel Generator Sets: Stack Height

The minimum height of stack to be provided with each generator set can be worked out using the following formula:

$$H = h + 0.2 \times \text{KVA}$$

H = Total height of stack in metre

h = Height of the building in metres where the generator set is installed

KVA = Total generator capacity of the set in KVA

Based on the above formula the minimum stack height to be provided with different range of generator sets may be categorised as follows:

For Generator Sets	Total Height of stack in metre
50 KVA	Ht. of the building + 1.5 metre
50-100 KVA	Ht. of the building + 2.0 metre
100-150 KVA	Ht. of the building + 2.5 metre
150-200 KVA	Ht. of the building + 3.0 metre
200-250 KVA	Ht. of the building + 3.5 metre
250-300 KVA	Ht. of the building + 3.5 metre

Similarly for higher KVA ratings a stack height can be worked out using the above formula.

Noise Standards

Noise limits for domestic appliances and construction equipments at the manufacturing stage in dB(A).

Window air conditioners of 1 -1.5 tonne	68
Air coolers	60
Refrigerators	46
Diesel generator for domestic purposes	85
Compactors (rollers), front loaders, concentrate mixers, cranes (movable), vibrators and saws	75

National Ambient Noise Standards The Noise Pollution (Regulation and Control) Rules, 2000

Area Code	Category of Area	Limit in dB(A) Leq*	
		Day Time	Night Time
A.	Industrial area	75	70
B.	Commercial area	65	55
C.	Residential area	55	45
D.	Silence zone	50	40

Note-1 Day time is reckoned in between 6 a.m. and 10 p.m.

Note-2 Night time is reckoned in between 10 p.m. and 6 a.m.

Note-3 Silence zone is an area comprising not less than 100 m around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority

Note-4 Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.

* dB(A) Leq denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.

A “decibel” is a unit in which noise is measured.

“A”, in dB(A) Leq, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.

Leq: It is an energy mean of the noise level over a specified period.

Appendix 6

QUANTITY OF PROPOSED SOLID WASTE GENERATION WITHIN DMB AND DMPA

SL No.	Area	2011 (TPD)	2013 (TPD)	2016 (TPD)	2026 (TPD)	2036 (TPD)	2046 (TPD)
1	DMB	48.53	50.65	56.14	79.10	111.45	157.02
2	Outside DMB	19.39	22.12	24.56	34.75	48.69	68.64
3	DMPA	67.92	72.77	80.70	113.85	160.14	225.66

PROJECTED GENERATION OF BIODEGRADABLE, RECYCLABLE AND INERT WASTES IN DMPA

Year	Total Generation of Solid Waste (TPD)	Biodegradable Matter (TPD) – 40% of total generation for Compost Plant	Recyclable (TPD)- 30% of Total	Inert (TPD) – 30% of Total
2013	72.77	29.11	21.83	21.83
2016	80.70	32.28	24.21	24.21
2026	113.85	45.54	34.15	34.16
2036	160.14	64.06	48.04	48.04
2046	225.66	90.28	67.69	67.69

PROJECTED GENERATION OF COMPOSTABLE AND LANDFILLING MATERIALS IN DMPA

Year	Biodegradable Matter (TPD) FOR Composting	Compost Plant Reject (TPD) – 30% of Biodegradable Material	Total Transfer to Landfill (Inert + Compost plant Reject), TPD
2013	29.11	8.73	21.83+8.73=30.56
2016	32.28	9.68	24.21+9.68=33.89
2026	45.54	13.66	34.16+13.66=47.82
2036	64.06	19.22	48.04+19.22=67.26
2046	90.28	27.08	67.69+27.08=94.77

Design of Compost Plant

Considering the life of the compost plant is 20 years, from the base year 2016, the projected waste generation and waste collection figures are as under-

Compost plant capacity

Sr.No.	Year	Waste generation	Waste Transportation (With 80%)

			collection efficiency)
		MT/DAY	MT/DAY
1	2016	80.70	64.56
2	2026	113.85	91.08
3	2036	160.14	128.11

Therefore, a compost plant of 100 MT/DAY has been proposed. After 20 years (i.e. after year-2036) the plant has to be renovated and capacity has to be augmented suitably.

AVERAGE CHARACTERISTICS OF MSW

SI. No.	Parameters	Contents
1.	Moisture	43 %
2.	Compostable matter	40 %
3.	Inert matter	30 %
4.	Recyclable material	30 %
5.	C / N Ratio	26
6.	Calorific Value	952 K cal/kg

(Source: Dibrugarh Municipal Board, 2009-10)

The photo Illustration of the Existing and Proposed Landfill site

Existing dumpsite at Maijan and present status of storage and disposal of MSW





Paltan Bazaar, Loharpatty



Community Dustbin at PNP Path



Existing Vertical Bin



Existing Community Bin



Proposed landfill site at Ghoramara



Proposed landfill site at Ghoramara



Proposed landfill site at Ghoramara



Proposed landfill site at Ghoramara



Road near proposed landfill site at Ghoramara



Road near proposed landfill site at Ghoramara

Appendix 8

Test results – Soil and Water (Source: EIA Report of SWM)

Table: Soil Quality in the Study Area of SLF

100 TDP Common MSW Dibrugarh Assam							
Soil Quality Data(March-2014)							
S. No	Parameter	Unit	SQ-1	SQ-2	SQ-3	SQ-4	SQ-5
			Project Site	Tapo Gaon	SutaBaspar	Khonikar Vill	Dulia gaon
1	Texture	-	Sandy Clay Loam	Loam	Clay Loam	Clay	Clay Loam
	Sand	%	58.9	52.4	45.2	43.5	49.7
	Silt	%	12.5	23.5	18.6	16.3	19.0
	Clay	%	28.6	24.1	36.2	40.2	31.3
2	pH (1:2)	-	7.23	6.89	7.52	7.42	6.69
3	Electrical Conductivity (1:2)	µmhos/cm	364	435	523	612	657
4	Cation exchange capacity	meq/100 gm	11.4	13.9	15.3	13.3	14.2
5	Exchangeable Potassium	mg/kg	88	91	79	102	125
6	Exchangeable Sodium	mg/kg	76	87	96	73	94
7	Exchangeable Calcium	mg/kg	1765	2136	2214	1963	2015
8	Exchangeable Magnesium	mg/kg	241	314	436	343	403
9	Sodium Adsorption Ratio	-	0.45	0.46	0.49	0.40	0.50
10	Water Holding Capacity	%	31.2	32.7	33.1	34.6	33.2
11	Porosity	%	35.4	34.5	35.1	33.7	35.1

Table: Surface water quality

100 TPD Common MSW Project Ghoramara Dibrugarh Landfill Site Assam							
Surface Water Quality March2014							
S.No.	Parameter	Unit	S.W. 1	S.W. 2	SW3	SW4	SW5
			Sersa River Upstream	Sersa River Downstream	Nala Near DainijanGaon	Brahmaputra River(UP)	Brahmaputra River(Dowen)
1	pH	-	7.12	7.21	7.67	7.36	7.21
2	Dissolved Oxygen	mg/l	6.5	6.3	4.8	6.2	6.3
3	BOD (3 Days at 27°C)	mg/l	2.8	2.9	7.1	2.2	2.5
4	Free Ammonia (as N)	mg/l	<0.1	<0.1	1.4	<0.1	<0.1
5	Sodium Adsorption Ratio	mg/l	0.09	0.18	3.67	1.06	0.86
6	Boron	mg/l	0.1	0.2	0.3	0.1	0.2
7	Conductivity	µmhos/cm	240	279	1035	266	303
8	Temperature	(°C)	26	27	28	25	26
9	Turbidity	NTU	7	8	21	6	5

10	Magnesium Hardness (as CaCO3)	mg/l	30	32	72	27	34
11	Total Alkalinity (as CaCO3)	mg/l	78	84	240	74	82
12	Chloride (as Cl)	mg/l	15	18	130	21	23
13	Sulphate (as SO4)	mg/l	12	18	45	17	22
14	Nitrate (as NO3)	mg/l	0.5	0.7	2.1	0.4	0.5
15	Fluoride (as F)	mg/l	0.4	0.5	0.6	0.4	0.3
16	Sodium (as Na)	mg/l	13	18	118	21	19
17	Potassium (as K)	mg/l	2	3	15	2	2.5
18	TKN (as N)	mg/l	0.2	0.3	2.1	0.3	0.3
19	Total Phosphorous (as P)	mg/l	0.02	0.03	0.08	0.03	0.03
20	COD	mg/l	12	14	30	8	10
21	Phenolic compounds (as C6H5OH)	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
22	Lead (as Pb)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
23	Iron (as Fe)	mg/l	0.05	0.06	0.24	0.04	0.06
24	Cadmium (as Cd)	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
25	Zinc (as Zn)	mg/l	0.04	0.06	0.11	0.03	0.02
26	Arsenic (as As)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
27	Mercury (as Hg)	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
28	Chromium (as Cr)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
29	Nickel (as Ni)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
30	TDS	mg/l	144	167	620	159	182
31	Total Coliform	MPN/100ml	700	900	5000	400	600
32	Faecal Coliform	MPN/100ml	260	320	2100	170	200

Table: Surface water quality

100 TPD Common MSW Project Ghoramara Dibrugarh Landfill Site Assam							
Surface Water Quality April, 2014							
S.No.	Parameter	Unit	S.W. 1	S.W. 2	SW3	SW4	SW5
			Sersa River Upstream	Sersa River Down stream	Nala Near Dainijan Gaon	Brahmaputra River(UP)	Brahmaputra River(Down)
1	pH	-	7.09	7.13	7.74	7.25	7.23
2	Dissolved Oxygen	mg/l	6.3	5.7	4.2	6.4	6.7
3	BOD (3 Days at 27°C)	mg/l	3.1	3.2	9.2	2.6	2.7
4	Free Ammonia (as N)	mg/l	<0.1	<0.1	1.8	<0.1	<0.1
5	Sodium Adsorption Ratio	mg/l	0.44	0.69	3.12	0.84	0.67
6	Boron	mg/l	0.1	0.1	0.2	0.1	0.1
7	Conductivity	µmhos/cm	253	302	1092	289	317
8	Temperature	(°C)	27	28	28	26	27

9	Turbidity	NTU	10	12	23	7	8
10	Magnesium Hardness (as CaCO3)	mg/l	35	37	90	32	39
11	Total Alkalinity (as CaCO3)	mg/l	80	92	251	78	84
12	Chloride (as Cl)	mg/l	18	22	138	22	25
13	Sulphate (as SO4)	mg/l	12	16	51	21	23
14	Nitrate (as NO3)	mg/l	0.6	0.4	2.6	0.3	0.4
15	Fluoride (as F)	mg/l	0.5	0.6	0.6	0.4	0.4
16	Sodium (as Na)	mg/l	10	16	112	18	16
17	Potassium (as K)	mg/l	3	4	10	3	3
18	TKN (as N)	mg/l	0.3	0.4	2.4	0.3	0.4
19	Total Phosphorous (as P)	mg/l	0.03	0.04	0.7	0.05	0.05
20	COD	mg/l	14	15	34	10	12
21	Phenolic compounds (as C6H5OH)	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
22	Lead (as Pb)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
23	Iron (as Fe)	mg/l	0.09	0.11	0.17	0.05	0.06
24	Cadmium (as Cd)	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
25	Zinc (as Zn)	mg/l	0.03	0.04	0.13	0.04	0.02
26	Arsenic (as As)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
27	Mercury (as Hg)	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
28	Chromium (as Cr)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
29	Nickel (as Ni)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
30	TDS	mg/l	152	181	655	173	190
31	Total Coliform	MPN/100ml	1100	1300	7000	800	900
32	Faecal Coliform	MPN/100ml	330	400	2600	270	320

Table: Surface water quality

100 TPD Common MSW Project Ghoramara Dibrugarh Landfill Site Assam							
Surface Water Quality May, 2014							
S.No.	Parameter	Unit	S.W. 1	S.W. 2	SW3	SW4	SW5
			Sersa River Upstream	Sersa River Downstream	Nala Near DainijanGaon	Brahmaputra River(UP)	Brahmaputra River(Dowen)
1	pH	-	7.13	7.38	7.82	7.32	7.26
2	Dissolved Oxygen	mg/l	6.1	5.7	4.2	6.6	6.5
3	BOD (3 Days at 27°C)	mg/l	3.2	3.5	12	2	2.6
4	Free Ammonia (as N)	mg/l	<0.1	<0.1	1.5	<0.1	<0.1
5	Sodium Adsorption Ratio	mg/l	0.35	0.36	3.84	0.79	0.80
6	Boron	mg/l	0.1	0.1	0.3	0.2	0.1
7	Conductivity	µhos/cm	260	295	1125	315	340
8	Temperature	(°C)	28	29	30	27	27
9	Turbidity	NTU	6	7	24	5	5

10	Magnesium Hardness (as CaCO ₃)	mg/l	38	43	80	36	40
11	Total Alkalinity (as CaCO ₃)	mg/l	83	96	256	80	83
12	Chloride (as Cl)	mg/l	22	23	142	27	32
13	Sulphate (as SO ₄)	mg/l	8	9	54	23	24
14	Nitrate (as NO ₃)	mg/l	0.8	0.9	3.1	0.4	0.5
15	Fluoride (as F)	mg/l	0.4	0.5	0.8	0.3	0.4
16	Sodium (as Na)	mg/l	8	9	130	18	19
17	Potassium (as K)	mg/l	2	3	12	4	4
18	TKN (as N)	mg/l	0.6	0.8	2.8	0.4	0.5
19	Total Phosphorous (as P)	mg/l	0.03	0.05	0.11	0.05	0.06
20	COD	mg/l	14	17	48	9	11
21	Phenolic compounds (as C ₆ H ₅ OH)	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
22	Lead (as Pb)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
23	Iron (as Fe)	mg/l	0.11	0.11	0.21	0.08	0.06
24	Cadmium (as Cd)	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
25	Zinc (as Zn)	mg/l	0.03	0.06	0.14	0.04	0.05
26	Arsenic (as As)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
27	Mercury (as Hg)	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
28	Chromium (as Cr)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
29	Nickel (as Ni)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
30	TDS	mg/l	156	165	678	190	205
31	Total Coliform	MPN/100ml	1600	1700	8000	1100	1400
32	Faecal Coliform	MPN/100ml	500	700	2700	400	500

Table: Ground Water Quality

100 TPD Common MSW Project Ghoramara Dibrugarh Landfill Site Assam									
GROUND WATER QUALITY March 2014									
S.No.	Parameter	Unit	Limit (IS-10500:2012)		GW1	GW2	GW3	GW4	GW5
			Desirable	Permissible	Project Site	Taor Gaon	SutaBogpar	NejKhani korGaer	Dulia Gaon
1	Colour	Hazen	5	15	<5	<5	<5	<5	<5
2	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	NTU	1	5	<1	<1	<1	<1	<1
5	pH	-	6.5-8.5	No Relaxation	6.94	7.02	6.88	7.19	7.25
6	Total Hardness (as CaCO ₃)	mg/l	200	600	141	152	160	147	158
7	Iron (as Fe)	mg/l	0.3	No Relaxation	0.08	0.07	0.06	0.09	0.08
8	Chlorides (as Cl)	mg/l	250	1000	22	27	23	34	41

9	Fluoride (as F)	mg/l	1	1.5	0.6	0.5	0.4	0.5	0.4
10	TDS	mg/l	500	2000	208	215	220	234	241
11	Calcium(as Ca ²⁺)	mg/l	75	200	34	36	38	35	38
12	Magnesium (as Mg ²⁺)	mg/l	30	100	13	15	15	14	15
13	Copper (as Cu)	mg/l	0.05	1.5	<0.01	<0.01	<0.01	<0.01	<0.01
14	Manganese (as Mn)	mg/l	0.1	0.3	<0.01	<0.01	<0.01	<0.01	<0.01
15	Sulphate (as SO ₄)	mg/l	200	400	15	16	14	17	12
16	Nitrate(as NO ₃)	mg/l	45	No Relaxation	2	3	2	3	4
17	Phenolic Compounds (as C ₆ H ₅ OH)	mg/l	0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001
18	Mercury (as Hg)	mg/l	0.001	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001
19	Cadmium (as Cd)	mg/l	0.003	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001
20	Selenium (as Se)	mg/l	0.01	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
21	Arsenic (as As)	mg/l	0.01	0.05	<0.01	<0.01	<0.01	<0.01	<0.01
22	Cyanide (as CN)	mg/l	0.05	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
23	Lead (as Pb)	mg/l	0.01	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
24	Zinc (as Zn)	mg/l	5	15	0.03	0.02	0.03	0.03	0.04
25	Anionic Detergent (as MBAS)	mg/l	0.2	1	<0.01	<0.01	<0.01	<0.01	<0.01
26	Chromium (as Cr ⁶⁺)	mg/l	0.05	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
27	Mineral oil	mg/l	0.5	No Relaxation	<0.1	<0.1	<0.1	<0.1	<0.1
28	Alkalinity (as CaCO ₃)	mg/l	200	600	127	118	131	124	130
29	Aluminum (as Al)	mg/l	0.03	0.2	<0.01	<0.01	<0.01	<0.01	<0.01
30	Boron (as B)	mg/l	0.5	1	<0.01	0.1	<0.01	0.1	0.2
Bacteriological Parameter									
1	Total Coliform	MPN/100ml	Couldn't be detected		Not Detected (<2)	Not Detected (<2)	Not Detected (<2)	Not Detected (<2)	Not Detected (<2)
2	<u>E.coli</u>	<u>E.coli</u> /100ml	Couldn't be detected		Absent	Absent	Absent	Absent	Absent

Table: Ground Water Quality

100 TPD Common MSW Project Ghoramare Dibrugarh Landfill Site Assam									
GROUND WATER QUALITY April 2014									
S.No.	Parameter	Unit	Limit (IS-10500:2012)		GW1	GW2	GW3	GW4	GW5
			Desirable	Permissible	Project Site	TaorGaon	SutaBogpar	NejKhanikorGaer	Dulia Gaon
1	Colour	Hazen	5	15	<5	<5	<5	<5	<5

2	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	NTU	1	5	<1	<1	<1	<1	<1
5	pH	-	6.5-8.5	No Relaxation	7.11	6.95	7.05	7.32	7.21
6	Total Hardness (as CaCO ₃)	mg/l	200	600	150	160	170	155	167
7	Iron (as Fe)	mg/l	0.3	No Relaxation	0.09	0.05	0.11	0.07	0.09
8	Chlorides (as Cl)	mg/l	250	1000	25	31	26	39	34
9	Fluoride (as F)	mg/l	1	1.5	0.4	0.5	0.5	0.6	0.5
10	TDS	mg/l	500	2000	234	228	241	245	260
11	Calcium(as Ca ²⁺)	mg/l	75	200	36	38	41	37	40
12	Magnesium (as Mg ²⁺)	mg/l	30	100	14	16	16	15	16
13	Copper (as Cu)	mg/l	0.05	1.5	<0.01	<0.01	<0.01	<0.01	<0.01
14	Manganese (as Mn)	mg/l	0.1	0.3	<0.01	<0.01	<0.01	<0.01	<0.01
15	Sulphate (as SO ₄)	mg/l	200	400	17	14	18	13	21
16	Nitrate(as NO ₃)	mg/l	45	No Relaxation	2	4	3	4	2
17	Phenolic Compounds (as C ₆ H ₅ OH)	mg/l	0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001
18	Mercury (as Hg)	mg/l	0.001	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001
19	Cadmium (as Cd)	mg/l	0.003	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001
20	Selenium (as Se)	mg/l	0.01	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
21	Arsenic (as As)	mg/l	0.01	0.05	<0.01	<0.01	<0.01	<0.01	<0.01
22	Cyanide (as CN)	mg/l	0.05	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
23	Lead (as Pb)	mg/l	0.01	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
24	Zinc (as Zn)	mg/l	5	15	0.02	0.03	0.02	0.04	0.3
25	Anionic Detergent (as MBAS)	mg/l	0.2	1	<0.01	<0.01	<0.01	<0.01	<0.01
26	Chromium (as Cr ⁶⁺)	mg/l	0.05	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
27	Mineral oil	mg/l	0.5	No Relaxation	<0.1	<0.1	<0.1	<0.1	<0.1
28	Alkalinity (as CaCO ₃)	mg/l	200	600	134	123	136	130	141
29	Aluminum (as Al)	mg/l	0.03	0.2	<0.01	<0.01	<0.01	<0.01	<0.01
30	Boron (as B)	mg/l	0.5	1	<0.01	<0.01	<0.01	<0.01	<0.01
Bacteriological Parameter									

1	Total Coliform	MPN /100 ml	Couldn't be detected	Not Detected (<2)	Not Detected (<2)	Not Detected (<2)	Not Detected (<2)	Not Detected (<2)
2	<u>E.coli</u>	<u>E.coli</u> /100 ml	Couldn't be detected	Absent	Absent	Absent	Absent	Absent

Table: Ground Water Quality

100 TPD Common MSW Project Ghoramare Dibrugarh Landfill Site Assam									
GROUND WATER QUALITY May 2014									
S.No.	Parameter	Unit	Limit (IS-10500:2012)		GW1	GW2	GW3	GW4	GW5
			Desirable	Permissible	Project Site	TaorGaon	SutaBogpar	NejKhanikorGaer	Dulia Gaon
1	Colour	Hazen	5	15	<5	<5	<5	<5	<5
2	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	NTU	1	5	<1	<1	<1	<1	<1
5	pH	-	6.5-8.5	No Relaxation	7.11	7.08	7.05	7.13	7.27
6	Total Hardness (as CaCO ₃)	mg/l	200	600	158	167	172	174	181
7	Iron (as Fe)	mg/l	0.3	No Relaxation	0.11	0.12	0.13	0.13	0.11
8	Chlorides (as Cl)	mg/l	250	1000	26	36	31	43	50
9	Fluoride (as F)	mg/l	1	1.5	0.6	0.5	0.4	0.7	0.7
10	TDS	mg/l	500	2000	220	240	255	240	255
11	Calcium(as Ca ²⁺)	mg/l	75	200	38	40	41	40	41
12	Magnesium (as Mg ²⁺)	mg/l	30	100	15	16	17	16	17
13	Copper (as Cu)	mg/l	0.05	1.5	<0.01	<0.01	<0.01	<0.01	<0.01
14	Manganese (as Mn)	mg/l	0.1	0.3	<0.01	<0.01	<0.01	<0.01	<0.01
15	Sulphate (as SO ₄)	mg/l	200	400	20	15	21	15	22
16	Nitrate(as NO ₃)	mg/l	45	No Relaxation	3	2	3	5	3
17	Phenolic Compounds (as C ₆ H ₅ OH)	mg/l	0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001
18	Mercury (as Hg)	mg/l	0.001	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001
19	Cadmium (as Cd)	mg/l	0.003	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001
20	Selenium (as Se)	mg/l	0.01	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
21	Arsenic (as As)	mg/l	0.01	0.05	<0.01	<0.01	<0.01	<0.01	<0.01
22	Cyanide (as CN)	mg/l	0.05	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
23	Lead (as Pb)	mg/l	0.01	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01

24	Zinc (as Zn)	mg/l	5	15	0.02	0.01	0.02	0.05	0.04
25	Anionic Detergent (as MBAS)	mg/l	0.2	1	<0.01	<0.01	<0.01	<0.01	<0.01
26	Chromium (as Cr6+)	mg/l	0.05	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
27	Mineral oil	mg/l	0.5	No Relaxation	<0.1	<0.1	<0.1	<0.1	<0.1
28	Alkalinity (as CaCO3)	mg/l	200	600	150	130	142	140	150
29	Aluminum (as Al)	mg/l	0.03	0.2	<0.02	<0.02	<0.02	<0.02	<0.02
30	Boron (as B)	mg/l	0.5	1	<0.01	<0.01	<0.01	<0.01	<0.01
Bacteriological Parameter									
1	Total Coliform	MPN/100ml	Couldn't be detected		Not Detected (<2)	Not Detected (<2)	Not Detected (<2)	Not Detected (<2)	Not Detected (<2)
2	<u>E. coli</u>	<u>E. coli</u> /100ml	Couldn't be detected		Absent	Absent	Absent	Absent	Absent

Rapid Environmental Assessment Checklist

Screening Questions	Yes	No	Remarks
A. PROJECT SITING			
• Densely populated?	✓		The nearest inhabited area from the subproject landfill site is 500 meters. As an emerging town, the population distribution shows that the town core, i.e. the Dibrugarh Municipal Board (DMB) area, is densely populated.
• Heavy with development activities?		✓	
• Adjacent to or within any environmentally sensitive areas?			
• Cultural heritage site		✓	
• Protected area		✓	There is no protected area/ ecologically sensitive area within radius of 10 km of the landfill site.
• Wetland		✓	
• Mangrove		✓	
• Estuarine		✓	
• Buffer zone of protected area		✓	
• Special area for protecting biodiversity		✓	
• Bay		✓	
B. Potential environmental impacts			
Will the project cause - - -			
• Impacts associated with transport of wastes to the disposal site or treatment facility.		✓	Only covered vehicle will be engaged for transportation of municipal solid waste.
• impairment of historical/cultural monuments/areas and loss/damage to these sites?			There are no historical/cultural monuments/ areas adjacent or within the vicinity of the proposed landfill site.
• Degradation of aesthetic and property value loss?		✓	There will be positive impact on the aesthetic and property value of Dibrugarh as the city will be cleaner and more hygienic. There are no human settlements within the 500 meter radius from the landfill site and the land is vacant and unproductive so any loss of aesthetic and property value
• Nuisance to neighbouring areas due to foul odour and influx of insects, rodents etc.?		✓	Not expected. There are no human settlements within the 500 meter radius of the proposed landfill site.

Screening Questions	Yes	No	Remarks
<ul style="list-style-type: none"> Dislocation or involuntary resettlement of people? 		✓	No physical displacement is anticipated as no human settlement is within the radius of 500 m ' of proposed land fill site. However approx. 30 hectares, of private land from private owners was acquired by the government.
<ul style="list-style-type: none"> Disproportionate impacts on the poor, women and children, indigenous peoples or other vulnerable group? 		✓	The subproject will be equally beneficial to all.
<ul style="list-style-type: none"> Risks and vulnerabilities related occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation? 		✓	Risks and vulnerability during construction are temporary, reversible and short-term in duration. The EMP includes mitigation measures related to occupational health and safety. During operations, O&M contractors will be required to operate the same level of Health and Safety procedures as used in the construction phase to protect workers and the public.
<ul style="list-style-type: none"> Public health hazards from odour, smoke from fire, and diseases transmitted by flies, insects, birds and rats? 		✓	An O&M Manual will be developed as part of the subproject. Included are odour control, gas management, and vector controls.
<ul style="list-style-type: none"> Deterioration of water quality as a result of contamination of receiving waters by leachate from land disposal system? 		✓	A leachate collection and treatment system has been included in the design. Treated leachate will be re-circulated in the active cells of the landfill. Any discharge, if necessary, will be regularly monitored and ensured to conform to the standards prescribed by the State Pollution Control Board (SPCB)
<ul style="list-style-type: none"> Contamination of ground and/or surface water by leach ate from land disposal system? 		✓	The landfill has been designed with liners as per recommendations of the Central Public Health and Environmental Engineering Organization (CPHEEO) Manual.
<ul style="list-style-type: none"> Land use conflicts? 		✓	Not expected. The proposed landfill site is vacant unproductive land adjacent to the existing dumpsite. A radius of 500 meter from landfill site, area will be declared as "No Development Zone" and was discussed with local officials and the SPCB. Meaningful consultations were held with land owners and community. A Resettlement Plan was prepared.
<ul style="list-style-type: none"> Pollution of surface and ground water from leachate coming from sanitary sites or methane gas 		✓	The design of the landfill will be in compliance with the requirements of the government's MSWMHR, 2000 and

Screening Questions	Yes	No	Remarks
produced from decomposition of solid wastes in the absence of air, which could enter the aquifer or escape through soil fissures at places far from the landfill site?			CPHEEO Manual. The technical details and O&M Manual ensure that leachate and gas produced during the operation of the landfill are contained and regularly monitored.
<ul style="list-style-type: none"> Inadequate buffer zone around landfill site to alleviate nuisances? 		✓	The MSWMHR, 2000 encourages declaration of a "no-development zone" of 500 meters around the landfill site. A radius of 500 meter from landfill site, area will be declared as "No Development Zone" and was discussed with local officials and the SPCB. The design of the landfill includes development of a 100-meter wide green buffer zone.
<ul style="list-style-type: none"> Road blocking and/or increased traffic during construction of facilities? 	✓		Road blocking or traffic diversion will not be required during the construction of the landfill site. However, vehicular movement and materials deliveries will temporarily increase the traffic volume during construction. This will be site-specific and short-term in nature. The EMP will ensure measures are included to mitigate the impacts.
<ul style="list-style-type: none"> Noise and dust from construction activities? 	✓		Expected during construction activities. However, impacts are temporary and short-term in duration. The EMP ensures measures are included to mitigate the impacts.
<ul style="list-style-type: none"> Temporary silt runoff due to construction? 		✓	The EMP ensures measures are included to mitigate the impacts. Construction contractors will be required to include channelization where required.
<ul style="list-style-type: none"> Hazards to public health due to inadequate management of landfill site caused by inadequate institutional and financial capabilities for the management of the landfill operation? 		✓	Training will be conducted under the project to build local capacity for O&M.
<ul style="list-style-type: none"> Emission of potentially toxic volatile organics from land disposal site? 		✓	Not anticipated. A compost plan is included in the facility design and a source segregation awareness program will encourage separate waste collection. Interested private operators may operate and manage. Local tea plantations available for sale of compost
<ul style="list-style-type: none"> Surface and ground water pollution from leachate and methane gas migration? 		✓	The design of the landfill is in compliance with the requirements of the MSWMHR, 2000 and CPHEEO Manual. The technical details and O&M Manual ensure

Screening Questions	Yes	No	Remarks
			that leachate and gas produced during the operation of the landfill are contained and regularly monitored.
<ul style="list-style-type: none"> Loss of deep-rooted vegetation (e.g. trees) from landfill gas? 		✓	Only inorganic residual wastes will be disposed in landfill so generation of large amount gas is not expected. There are no deep-rooted trees within the landfill site.
<ul style="list-style-type: none"> Explosion of toxic response from accumulated landfill gas in buildings? 		✓	Only inorganic residual wastes will be disposed in landfill so generation of large amount gas is not expected. Thus explosion hazard is not expected.
<ul style="list-style-type: none"> Contamination of air quality from incineration? 		✓	Incineration is not proposed in subproject.
<ul style="list-style-type: none"> Public health hazards from odour, smoke from fire, and diseases transmitted by flies, rodents, insects and birds, etc.? 		✓	Not expected as no human settlement within radius of 500 m of landfill site.
<ul style="list-style-type: none"> Health and safety hazards to workers from toxic gases, and hazardous materials in the site? 	✓		An O&M Manual will be developed as part of the subproject. Included are odour control, gas management, and vector controls
<ul style="list-style-type: none"> Large population influx during project construction and - operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)? 		✓	Priority in employment will be given to local residents. Construction contractors will be required to provide workers camp with water supply and sanitation. The implementing agency has manpower to operate the improved system.
<ul style="list-style-type: none"> Social conflicts if workers from other regions or countries are hired? 		✓	Priority in employment will be given to local residents.
<ul style="list-style-type: none"> Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction? 		✓	Not applicable. Construction will not involve use of explosives and chemicals. Trenching will be done manually.
<ul style="list-style-type: none"> Community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning? 		✓	Operational area will be clearly demarcated and access will be controlled. Only worker and project concerned members will be allowed to visit the operational sites.
Climate Change and Disaster Risk	Yes	No	Remarks

Screening Questions	Yes	No	Remarks
<p>Questions</p> <p>The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks.</p>			
Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes (see Appendix I)?		✓	Most part of Assam is located in Seismic Zone V (very high damage risk zone). All facilities will be designed to meet government guidelines for high seismic risk zones and hilly areas.
Could changes in temperature, precipitation, or extreme events patterns over the Project lifespan affect technical or financial sustainability (e.g., changes in rainfall patterns disrupt reliability of water supply; sea level rise creates salinity intrusion into proposed water supply source)?		✓	
Are there any demographic or socio-economic aspects of the Project area that are already vulnerable (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)?		✓	Poor households are located in the project area . A RP was prepared and provides additional entitlements to any vulnerable groups physically impacted by the project.
Could the Project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., by using water from a vulnerable source that is relied upon by many user groups, or encouraging settlement in earthquake zones)?		✓	Improved SWM will improve clogging problems in local drains. This will improve drainage and adaptability to climate impacts from increased precipitation.

SUGGESTED OUTLINE FOR THE LANDFILL OPERATIONS AND MAINTENANCE MANUAL

- I. Introduction
- II. Purpose of the Manual
 - A. Purpose and Scope of the Manual
 - B. Limitations
 - i. Owner's Responsibility
 - ii. Operator's Responsibility
 - C. Organizational Structure
- III. Landfill Design and Operation
 - A. General
 - B. Basis of Design
 - i. Master Design
 - a. Description of Facilities
 - b. Landfill Containment System
 - c. Final Cover Design
 - d. Cell and Liner Construction
 - e. Monitoring Systems
 - f. Groundwater Monitoring
 - g. Landfill Gas Monitoring
 - h. Surface Water Monitoring (Effluent and Receiving Body)
 - C. Operations Plan
 - i. Landfill Phasing and Life
 - ii. Landfill Operations
 - a. Basic Landfill Operation
 - 1. Initial Load Inspection
 - 2. Refuse Unloading
 - 3. Spreading of Refuse
 - 4. Refuse Compaction
 - 5. Refuse Lift and Daily Cover
 - 6. Interim (Intermediate) Cover
 - 7. Final Cover
 - b. Basic Landfill Equipment
 - 1. Spreading of Refuse
 - 2. Refuse Compaction
 - 3. Landfill Cover
 - c. Equipment Maintenance
 - d. Wet Weather Operations
 - 1. Access to Working Area
 - 2. Wet Weather Tipping Pads
 - e. Grade Control
 - 1. General
 - 2. Landfill Survey Staking

- 3. Periodic Topographic Surveying
 - 4. Volume Calculations
 - D. Landfill Closure and Post-Closure
 - I. Closure Plan
 - ii. Closure Procedures
 - iii. Post-Closure Maintenance and Monitoring
- IV. Environmental Control and Mitigation
 - A. Leachate Control
 - i. Leachate Removal
 - ii. Leachate Storage
 - iii. Leachate Recirculation/Treatment
 - B. Dust Control
 - I. Dust Control Within the Landfill Footprint (Active Areas)
 - ii. Dust Control Outside the Landfill Footprint
 - iii. Using Leachate for Dust Control
 - C. Litter Control
 - i. Litter Fence
 - ii. Other
 - D. Vector Control
 - i. Rodent Control
 - ii. Fly Control
 - E. Odor Control
 - i. Odor from Incoming Refuse
 - ii. Odor from In-place Refuse
 - iii. Odor from Leachate Tank
 - F. Noise Abatement
 - G. Bird Control
 - i. Cover Soil Placement
 - ii. Monofilament Line Shield
 - iii. Anti-Perch Strips
 - iv. Predator Decoys
 - V. Acoustic Controls
 - H. Other Controls
 - i. Erosion Control
 - 1. Slope Damage
 - 2. Exposed Garbage
 - 3. Downstream Sedimentation
 - I. Periodic Routine Inspections
- V. Emergency Management
 - A. Types of Emergencies
 - B. Emergency Management and Contingency Plan

- C. Emergency Response
 - i. Unauthorized Loads
 - ii. Hazardous, Toxic, and Infectious Wastes
 - iii. Spills
 - iv. Fire
 - v. Earthquake
 - vi. Inclement Weather
 - vii. Other Emergencies

- VI. Environmental Monitoring and Inspection
 - A. Groundwater Monitoring
 - i. Sampling and Analysis — Procedures, Parameters, and Frequency
 - ii. Monitoring Well Inspection
 - B. Leachate Monitoring
 - i. Leachate Sump Level Monitoring
 - ii. Leachate Storage Tank Monitoring
 - ii. Leachate Discharge Sampling and Analysis — Procedures, Parameters, and Frequency
 - C. Surface Water Monitoring (Effluent and Receiving Body)
 - I. Sampling and Analysis — Procedures, Parameters, and Frequency
 - D. Gas Monitoring
 - i. Landfill Perimeter Probe Monitoring
 - ii. Confined Spaces
 - E. Other Monitoring

- VII. Landfill Safety Procedures
 - A. Site Specific Procedures
 - i. Fire and Explosion Prevention
 - ii. Unauthorized Loads
 - iii. Toxic and Hazardous Waste Exposures
 - iv. Hazardous Material Handling
 - v. Employee Health and Safety
 - vi. Baseline Health Monitoring
 - vii. Routine Health Monitoring

- VIII. Annexes and Other Relevant Information
 - A. Master Plan Drawings
 - B. Environmental Quality Standards
 - C. Monitoring Checklists

Monitoring Report Format**Semi-Annual Environmental Reporting Format (Dibrugarh Solid Waste Management)****I. INTRODUCTION**

- Overall project description and objectives
- Description of subprojects
- Environmental category of the sub-projects
- Details of site personnel and/or consultants responsible for environmental monitoring
- Overall project and sub-project progress and status

No.	Sub-Project Name	Status of Sub-Project				List of Works	Progress of Works
		Design	Pre-Construction	Construction	Operational Phase		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

Compliance status with National/ State/ Local statutory environmental requirements

No.	Sub-Project Name	Statutory Environmental Requirements	Status of Compliance	Action Required

Compliance status with environmental loan covenants

No. (List schedule and paragraph number of Loan Agreement)	Covenant	Status of Compliance	Action Required

II. COMPLIANCE STATUS WITH THE ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

- Provide the monitoring results as per the parameters outlined in the EMP. Append supporting documents where applicable, including Environmental Site Inspection Reports.

- There should be reporting on the following items which can be incorporated in the checklist of routine Environmental Site Inspection Report followed with a summary in the semi-annual report send to ADB. Visual assessment and review of relevant site documentation during routine site inspection needs to note and record the following:

- (i) What are the dust suppression techniques followed for site and if any dust was noted to escape the site boundaries?
- (ii) If muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads;
- (iii) Adequacy of type of erosion and sediment control measures installed on site, condition of erosion and sediment control measures including if these were intact following heavy rain;
- (iv) Are there designated areas for concrete works, and re-fuelling?
- (v) Are there spill kits on site and if there are site procedure for handling emergencies;
- (vi) Is there any chemical stored on site and what is the storage condition?
- (vii) Is there any dewatering activities if yes, where is the water being discharged;
- (viii) How are the stockpiles being managed?
- (ix) How is solid and liquid waste being handled on site?
- (x) Review of the complaint management system;
- (xi) Checking if there are any activities being under taken out of working hours and how that is being managed.

Summary Monitoring Table –Dibrugarh Solid Waste Management Subproject

A. Pre-construction Stage

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
Environmental clearances	(i) Environmental Clearance under EIA Notification (ii) Consent to Establish under Water (Prevention and Control of Pollution) Act (iii) Consent to Establish under Air (Prevention and Control of Pollution) Act (iv) Authorization for setting up waste processing and disposal facility from Assam Pollution Control Board (v) Tree-cutting (if any) permit from the Forest Department					
Security	The boundary walls will be marked and a billboard will be placed at the gate and at conspicuous locations in the landfill site. Security will be provided to ensure that illegal dumping, theft, and unauthorized access do not happen.					
Traffic Investigation	Conduct of traffic					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	<p>investigation to determine peak traffic volume</p> <p>Adequate transport management plan would be in place for uninterrupted traffic flow.</p> <p>Roads will be designed to provide adequate turning and dumping areas to accommodate delivery by all types of vehicles.</p>					
Landfill design consideration	<p>The landfill design and management emphasize prevention of any nuisance, leachate formation minimization, flood mitigation measures for 100 year flood, reducing emission and also minimizing air, water and land pollution.</p> <p>The project site would be suitable leveled and embankments would be constructed in such a manner that under no circumstances the storm water from outside area can enter the project site.</p> <p>All components of the leachate collection system would have</p>					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	sufficient strength to support the weight of the overlying waste, cover system and post closure loadings as well as stresses from operating equipment.					
Compost Facility Design Considerations	(i) Consideration of aerobic process for Organic decomposition; and (ii) ensure sufficient availability of absorbent materials such as saw dust (iii) segregated waste will be sent to compost plant., (iv) buffer zone would be provided as per design to minimize the odour and transport of bio aerosols along downwind of the facility.					
Locational Consideration	Declaration of "No-Development Buffer Zone" after the landfill location is finalised					
Social and Cultural Resources	(i) Consult DMB to obtain an expert assessment of the archaeological potential of the site; (ii) Consider alternatives if the site is found to be of high risk; (iii) Include state and local archaeological,					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	<p>cultural and historical authorities, and interest groups in consultation forums as project stakeholders so that their expertise can be made available; and</p> <p>(iv) Develop a protocol for use by the construction contractors in conducting any excavation work, to ensure that any chance finds are recognised and measures are taken to ensure they are protected and conserved.</p>					
<p>Construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas</p>	<p>(i) Prioritize areas within or nearest possible vacant space in the subproject location;</p> <p>(ii) If it is deemed necessary to locate elsewhere, consider sites that will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems;</p> <p>(iii) Do not consider residential areas;</p> <p>(iv) Take extreme care in selecting sites to avoid direct disposal to</p>					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	water body which will inconvenience the community.					
Sources of Materials	(i) Prioritize sites already permitted by The Mining Department; (ii) If other sites are necessary, inform construction contractor that it is their responsibility to verify the suitability of all material sources and to obtain the approval of PMU and (iii) If additional quarries will be required after construction is started, inform construction contractor to obtain a written approval from PMU/PIU					
Landfill Operations Manual	(i) Prepare Operations and Maintenance (O&M) Manual					
Environmental Monitoring Program	(i) conduct one (1) year baseline surveys of groundwater quality, surface water quality, landfill gas, dust, odor, noise, and vegetative cover					

DSC = Design Supervision Consultant, PMU = Project Management Unit; PIU = Project Implementation Unit

B. Construction Stage

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
Sources of Materials	<p>(i) Use quarry sites and sources permitted by government;</p> <p>(ii) Verify suitability of all material sources and obtain approval of Investment PMU/PIU;</p> <p>(iii) If additional quarries will be required after construction has started, obtain written approval from PMU/PIU; and;</p> <p>(iv) Submit to DSC on a monthly basis documentation of sources of materials.</p>					
Air Quality	<p>(i) Consult with PMU/PIU/DSC on the designated areas for stockpiling of construction materials;</p> <p>(ii) Carry out air quality monitoring;</p> <p>(iii) Damp down exposed soil and any stock piled onsite by spraying with water when necessary during dry weather;</p>					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	<p>(iv) Use tarpaulins to cover sand and other loose material when transported by trucks; and</p> <p>(v) Fit all heavy equipment and machinery with air pollution control devices which are operating correctly.</p>					
Surface water quality	<p>(i) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;</p> <p>(ii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with PMU/PIU/DSC on designated disposal areas;</p> <p>(iii) Place storage areas for fuels and lubricants away from any drainage leading to water bodies;</p> <p>(v) Dispose any wastes generated by construction activities in designated sites;</p> <p>and</p> <p>(vi) Conduct surface quality inspection</p>					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	according to the Environmental Management Plan (EMP).					
Noise Levels	<p>(i) Plan activities in consultation with PMU/PIU/DSC so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance;</p> <p>(ii) Require horns not be used unless it is necessary to warn other road users of the vehicle's approach;</p> <p>(iii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor</p>					
Existing Infrastructure and Facilities	<p>(i) Obtain from PMU/PIU/DSC the list of affected utilities and operators if any;</p> <p>(ii) Prepare a contingency plan to include actions to be done in case of</p>					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	unintentional interruption of service					
Landscape and Aesthetics	<p>(i) Prepare and implement Waste Management Plan;</p> <p>(ii) Avoid stockpiling of excess excavated soils; (ii) Coordinate with DMB for beneficial uses of excess excavated soils or immediately dispose to designated areas; (iv) Recover used oil and lubricants and reuse or remove from the sites;</p> <p>(v) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;</p> <p>(vi) Remove all wreckage, rubbish; and</p> <p>(vii) Request PMU/PIU/DSC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.</p>					
Accessibility	(i) Plan transportation routes so that heavy vehicles do not use					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	<p>narrow local roads, except in the immediate vicinity of delivery sites;</p> <p>(ii) Schedule transport and hauling activities during non- peak hours;</p> <p>(iii) Locate entry and exit points in areas where there is low potential for traffic congestion;</p> <p>(iv) Keep the site free from all unnecessary obstructions;</p> <p>(v) Drive vehicles in a considerate manner;</p> <p>(vi) Coordinate with Dibrugarh Municipal Traffic Office for temporary road diversions and with for provision of traffic aids if transportation activities cannot be avoided during peak hours;</p> <p>(vii) Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/ complaints</p>					
Socio-Economic - Employment	(i) Employ at least 50% of the labor force, or to the					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	<p>maximum extent, local persons within the 2-km immediate area if manpower is available; and</p> <p>(ii) Secure construction materials from local market.</p>					
Occupational Health and Safety	<p>(i) Develop and implement site-specific Health and Safety (H&S) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment like helmet, gumboot, safety belt, gloves, nose mask and ear plugs; (c) H&S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;</p> <p>(ii) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;</p> <p>(iii) Provide medical insurance coverage for workers;</p> <p>(iv) Secure all installations from unauthorized intrusion and accident risks;</p> <p>(v) Provide supplies of</p>					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	<p>potable drinking water;</p> <p>(vi) Provide clean eating areas where workers are not exposed to hazardous or noxious substances;</p> <p>(vii) Provide H&S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;</p> <p>(viii) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted;</p> <p>(ix) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;</p> <p>(x) Ensure moving equipment is outfitted with audible back- up alarms;</p> <p>(xi) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for</p>					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	<p>storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; and</p> <p>(xii) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.</p>					
Community Health and Safety.	<p>(i) Plan routes to avoid times of peak-pedestrian activities.</p> <p>(ii) Liaise with PMU/PIU/DSC in identifying high-risk areas on route cards/maps.</p> <p>(iii) Maintain regularly the vehicles and use of manufacturer- approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.</p> <p>(iv) Provide road signs and flag persons to warn.</p>					
Camp sites (if needed)	(i) Consult PMU/PIU/DSC before locating project					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	<p>offices, sheds, and construction plants;</p> <p>(ii) Minimize removal of vegetation and disallow cutting of trees;</p> <p>(iii) Provide water and sanitation facilities for employees;</p> <p>(iv) Prohibit employees from cutting of trees for firewood;</p> <p>(v) Train employees in the storage and handling of materials which can potentially cause soil contamination;</p> <p>(vi) Recover used oil and lubricants and reuse or remove from the site;</p> <p>(vii) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;</p> <p>(viii) Remove all wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and</p> <p>(ix) Request PMU/PIU/DSC to report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.</p>					
Social and Cultural Resources	(i) Strictly follow the protocol for chance finds in any					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	excavation work; (ii) Request PMU/PIU/DSC or any authorized person with archaeological field training to observe excavation; (iii) Stop work immediately to allow further investigation if any finds are suspected; and (iv) Inform PMU/PIU/DSC if a find is suspected, and take any action they require ensuring its removal or protection in situ.					

DSC = Design Supervision Management Consultant, H&S = health and safety, RPM = respirable particulate matter,, SPM = suspended particulate matter, DMB = Dibrugarh Municipal Board; PMU = Project Management Unit; PIU = Project Implementation Unit

C. Defects Liability Stage

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
Leachate Control	Re-circulate leachate to the active parts of the landfill 1.5 mm thick HDPE geomembranes liner will be provided on the top of the 900 mm thick clay liner to prevent and damaging impact in surrounding area and to prevent water					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	infiltration.					
Dust Control	<p>(i) Placement of daily, intermediate, and final cover over the waste routinely;</p> <p>(ii) The main access road to the active landfill modules is paved over native ground;</p> <p>(iii) Continuous attention is given to proper maintenance of haul roads;</p> <p>(iv) Water spray or dust palliative will be applied on soil-covered work areas when conditions may result in fugitive dust; and</p> <p>(v) Planting and maintenance of vegetation on closed fill slopes.</p>					
Dust Control – Specific	<p>(i) Dust control within the Landfill Footprint (Active Areas) – temporary access roads within the landfill footprint will be watered, as required, to prevent dust problems;</p> <p>(ii) Dust control outside landfill footprint – permanent concrete or asphalt and gravel or rock-surfaced roads outside</p>					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	the landfill footprint will be watered periodically to mitigate dust. Soil surfaced roads will require more frequent watering; and (iii) Using Leachate for Dust Control – leachate may be used for dust control depending on its concentration. However, leachate will only be used on daily cover or waste within the landfill footprint.					
Litter Control	(i) Minimize windblown or dropped materials on-site; (ii) Daily check for waste that has been blown or fallen from the collection vehicles; (iii) Clear drains of litter material; (iv) Instruct waste collectors to cover loads and vehicles; (v) Reprimand waste collectors with uncovered loads					
Vector control	(i) Develop Rodent and Fly Control Plan					
Odour Control	(i) Cover daily and immediately waste materials with soil;					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	(ii) Maintain integrity of soil cover material of covered wastes; (iii) Plant trees, shrubs, flowers, and other vegetation (iv) Hose each bin once it is emptied; (v) Ensure that residual waste is not left in bins and allowed to decompose for a long period of time					
Noise Abatement	(i) Fit all equipment with sound dampening devices (such as mufflers); (ii) Keep vehicles in good working conditions; (iii) Maintain vehicles and equipment periodically					
Occupational Health and Safety	DMB will at least tell them: (i) The likely exposure and the risks; (ii) What DMB is doing to control risks and exposures; (iii) Where and how people can obtain protection; (iv) How to report defects in protection and control equipment; and (v) What they shall					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	<p>do to minimize the risk, such as the proper way to use protection and other control equipment, how to look after it and store it, and where to use it.</p> <p>This information will be given in a way the employee can be expected to understand (for example special arrangements might need to be made if the employee does not understand English or cannot read).</p>					
Community Health and Safety	<p>(i) Fit vehicles with highly audible reversing alarms and mirrors and check at least daily and maintained in good working order.</p> <p>(ii) Allow only authorized and competent workers to operate the vehicles;</p> <p>(iii) Plan collection routes to avoid times of high-pedestrian activities. (iv) Liaise with communities to position collection points in safe positions and/or collect at quiet times; (v) Identify</p>					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	<p>high-risk areas on route cards/maps and access pedestrianized areas such as business areas during quiet hours.</p> <p>(vi) All internal roads would be concreted/ pitched. Proper lighting and proper pathway inside the premises would be constructed to ensure safe vehicular movement. Vehicles would conform to pollution under control (PUC) norms. Proper housekeeping will be maintained within the premises.</p>					

H&S = health and safety, O&M = operation and maintenance;, DMB = Dibrugarh Municipal Board

Overall Compliance with CEMP/ EMP

No.	Sub-Project Name	EMP/ CEMP Part of Contract Documents (Y/N)	CEMP/ EMP Being Implemented (Y/N)	Status of Implementation (Excellent/ Satisfactory/ Partially Satisfactory/ Below Satisfactory)	Action Proposed and Additional Measures Required

III. Training Orientation program details – Date, Venue, Participants, Subjects

IV. APPROACH AND METHODOLOGY FOR ENVIRONMENTAL MONITORING OF THE PROJECT

Brief description on the approach and methodology used for environmental monitoring of each subproject

- Monitoring of environmental IMPACTS on PROJECT SURROUNDINGS (ambient air, water quality and noise levels)
- Brief discussion on the basis for monitoring
- Indicate type and location of environmental parameters to be monitored
- Indicate the method of monitoring and equipment to be used
- Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements

As a minimum the results should be presented as per the tables below.

Air Quality Results

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)		
			PM10 µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³

Water Quality Results

Site No.	Date of Sampling	Site Location	Parameters (Government Standards)					
			pH	Conductivity µS/cm	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L

Noise Quality Results

Site No.	Date of Testing	Site Location	LAeq (dBA) (Government Standard)	
			Day Time	Night Time

V. SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS

Summary of follow up time-bound actions to be taken within a set timeframe.

VI. APPENDIXES

Photos

Summary of consultations

Copies of environmental clearances and permits

Sample of environmental site inspection report

Others

SAMPLE GRIEVANCE REGISTRATION FORM

(To be available in Hindi, Assamese or any other local languages, if any)

The AUIP welcomes complaints, suggestions, queries and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback.

Should you choose to include your personal details but want that information to remain confidential, please inform us by writing/typing ***(CONFIDENTIAL)*** above your name. Thank you.

Date	Place of registration			
Contact Information/Personal Details				
Name		Gender	<input type="checkbox"/> Male <input type="checkbox"/> Female	Age
Home Address				
Village / Town				
District				
Phone no.				
E-mail				
Complaint/Suggestion/Comment/Question Please provide the details (who, what, where and how) of your grievance below:				
If included as attachment/note/letter, please tick here:				
How do you want us to reach you for feedback or update on your comment/grievance?				

FOR OFFICIAL USE ONLY

Registered by: (Name of Official registering grievance)	
If ver:	
<input type="checkbox"/> Note/Letter <input type="checkbox"/> E-mail <input type="checkbox"/> Verbal/Telephonic	
Reviewed by: (Names/Positions of Official(s) reviewing grievance)	
Action Taken:	
Whether Action Taken Disclosed:	<input type="checkbox"/> Yes <input type="checkbox"/> No
Means of Disclosure:	

Public consultation details

Location: Lekai, Thakurthan (Near SLF)

Date: 09.11.2013

No. of people: 10 persons

The issues discussed as ,

- Majority of the local (almost 90%) are engaged in business, while 10% are service holders.
- The community was aware of the project through the DMB. They have been in touch with the Deputy Commissioner (DC) regularly for understanding the development.
- The community was skeptical about the maintenance of the landfill site after completion. They have raised the concern to the DC that if the sanitary landfill not maintained it will cause a serious health hazard to all the villages surrounding it.
- Though the town will benefit from landfill site , the people had no comments on economic uplift of society
- Presently all waste is dumped in the nearby open area, which create health problem.
- No tree felling will be required. Villages suggested plantation in and around landfill site
- Villager informed that there is no drainage problem in and around their village
- The community shared that wage labor is available in the area, if required during construction they will be participate.
- No forest area available nearby – forest located about 2.5 km from landfill site

ASSAM URBAN INFRASTRUCTURE INVESTMENT PROGRAM

Attendance Sheet of Public Consultation Meeting
Name of the project: Solid Waste Management Subproject, Dibrugarh
(.....)

District Dibrugarh

Block Bonbasaah

Venue Lekai, Thakurbari

Duration of Discussion 1 hr

Date 09.11.2023

Time 10:30 AM

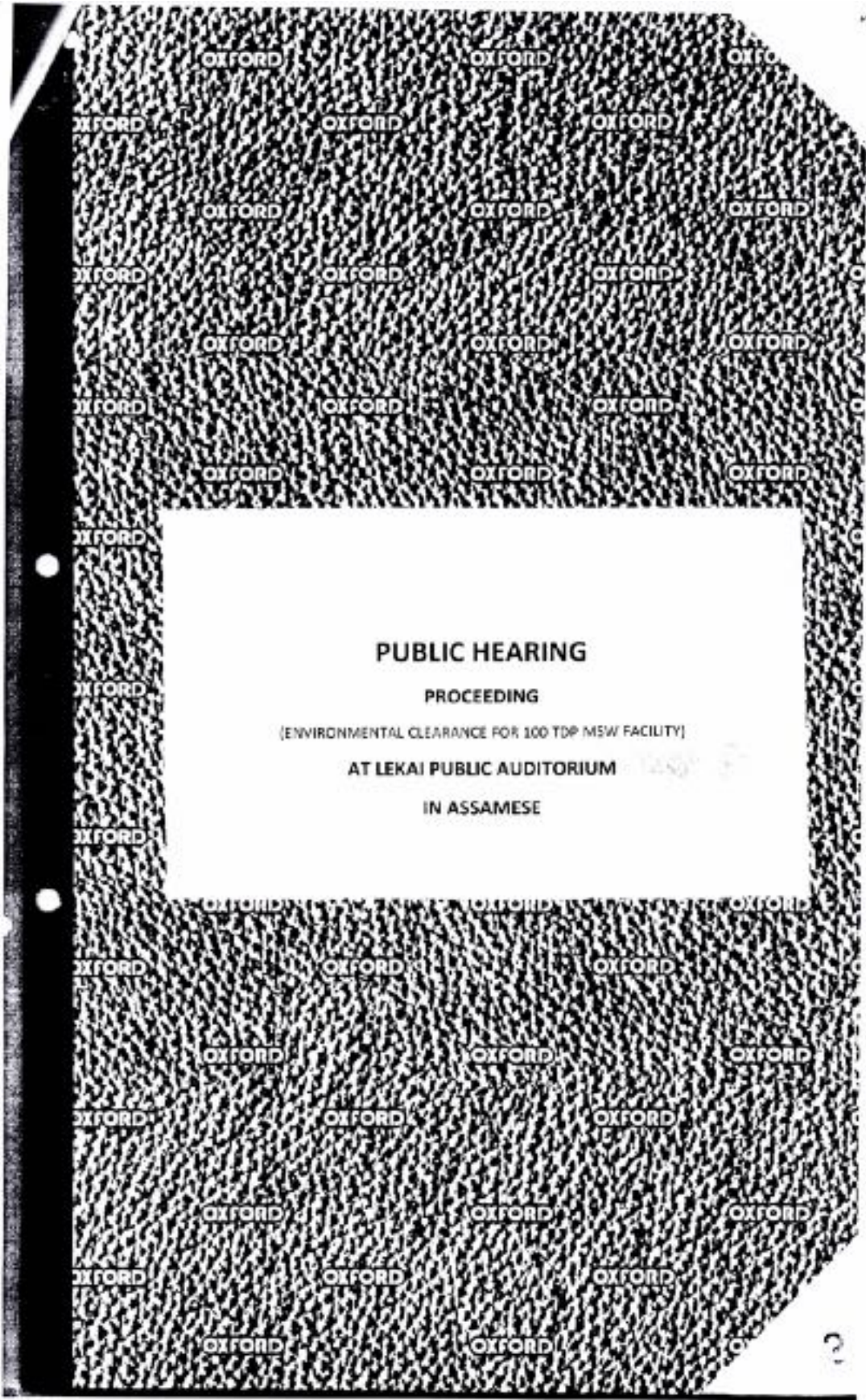
Total No. of Participants

Male 9

Female 0

Total 9

S. No.	Name	Sex	Age	Profession 1. Service 2. Business 3. Agriculture 4. Labour 5. Not working 6. Any other	Social Category 1. SC 2. ST 3. OBC 4. Gen 5. Any Other	Signature
1	Shupan Hazarika	M	33	2	2	
2	Lakhiprasad Barua	M	67	5	4	
3	Hermanta Hazarika	M	47	1	2	
4	Bijon Saha	M	40	2	3	
5	Namrul Hazarika	M	60	2	2	
6	Banahan Lohar	M	27	4	4	
7	সি সঞ্জয় সান	M	34	3.4	4	
8	Hermanta Saikia	M	44	2	2	
9	Robajit Barua	M	36	1	2	
10						
11						
12						
13						
14						
15						



Today at 11:30 AM, dated 17/12/2014, Wednesday a public hearing meeting for Environmental Clearance for proposed ROZOF MSW Facility for Bibrigharh City (Gachanara) at Sakai Public Auditorium, Tolai was held. Organized by Bibrigharh South Administration and PCBA. Inauguration speech was given by Mr. Anjan Dasika and welcomed the guest and public present in the meeting.

Additional District Commissioner Mr. Jyotsna Garnaah presided over the meeting. He explained the purpose of the meeting. In his speech he stressed the requirement of Pollution Control Board Clearance for implementation of such Government Project as well as the positive opinion and consent of the local people surrounding the project. He requested the people to co-operate with the experts present in the public hearing and give their opinions.

Pollution Control Board - Bibrigharh Regional executive Engineer Mr. Holi Ram Phukan described the importance of this Project in this region. He said that every necessary steps has been taken in this Project to control possible emission of any kind of Pollution. He also stressed that the public opinion is very important and if they think or have found any defect in this Project they need to come forward with their Complaint and suggestions which will be noted and action for re-examination to concern authorities.

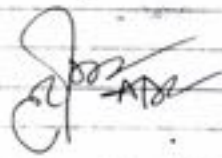
Dr. Rathan Sharma, In-Geo Consultancy & Research Centre's CEO, said that this project has been established under base line data collection. He also said that if the people resist this project there is no way Government can implement it.

Dr. Kishor Sharma said that this meeting is the stage 2 procedure for the project. After that there will be stage 3 advisory committee decision then finally stage 4 which will be regulatory board decision. This stage is very important and wanted the people to pay attention to the power point presentation to be deliberated on Environmental Impact assessment.

Dr. Kishor Singh representative of BRC gave an power point presentation on EIA based on baseline data analysis. He projected upon the recycling processes of this project to the people and also told about the benefits the people would get if this project is implemented successfully.

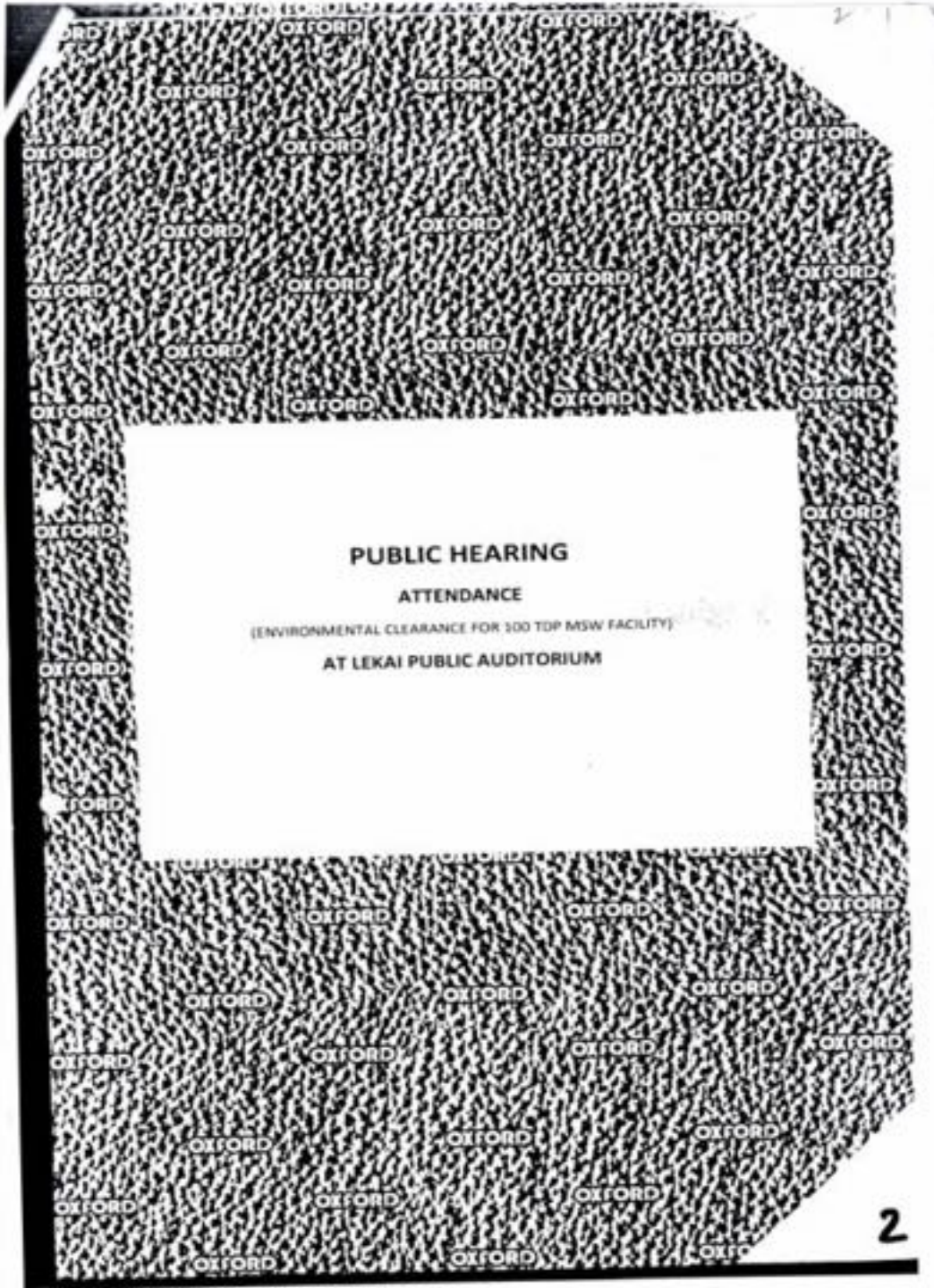
~~Dr. Kishor~~
Dr. Kishor Chaudhary, Milan, Nagpur, Maharashtra, Advisor pointed out about the botanical Garden project in Indur which is now in its dying situation. The people plantation project in which government has spend 50000 of Rupees in this area is now ignored and there is no one to look after this project. He is concerned about this project to be an area of government project in this area last long. And if this project be ignored like the others then it will cause severe natural imbalance and cause pollution in large scale. Instead he would ask for Sport Complex or Darga house/centre from government which will help next generation. The cultural and religious harmony may be at stake if this project be successful. He also pointed out the major schools and other facilities which are existing near the proposed project site and likely to be affected.

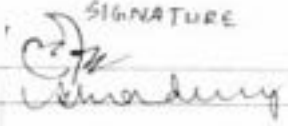
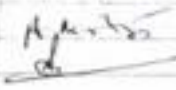

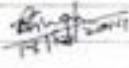

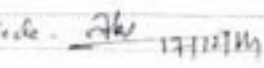
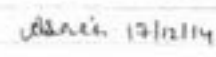

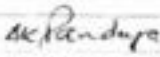




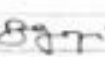

Report Committee and decision regarding the
project will be taken only after that final steps
will be taken. With this be concluded and
announced the cost of the public hearing.

A handwritten signature in black ink, appearing to be 'S. J. ...' with a flourish.

Adtl. Deputy Commissioner
Ditrognan





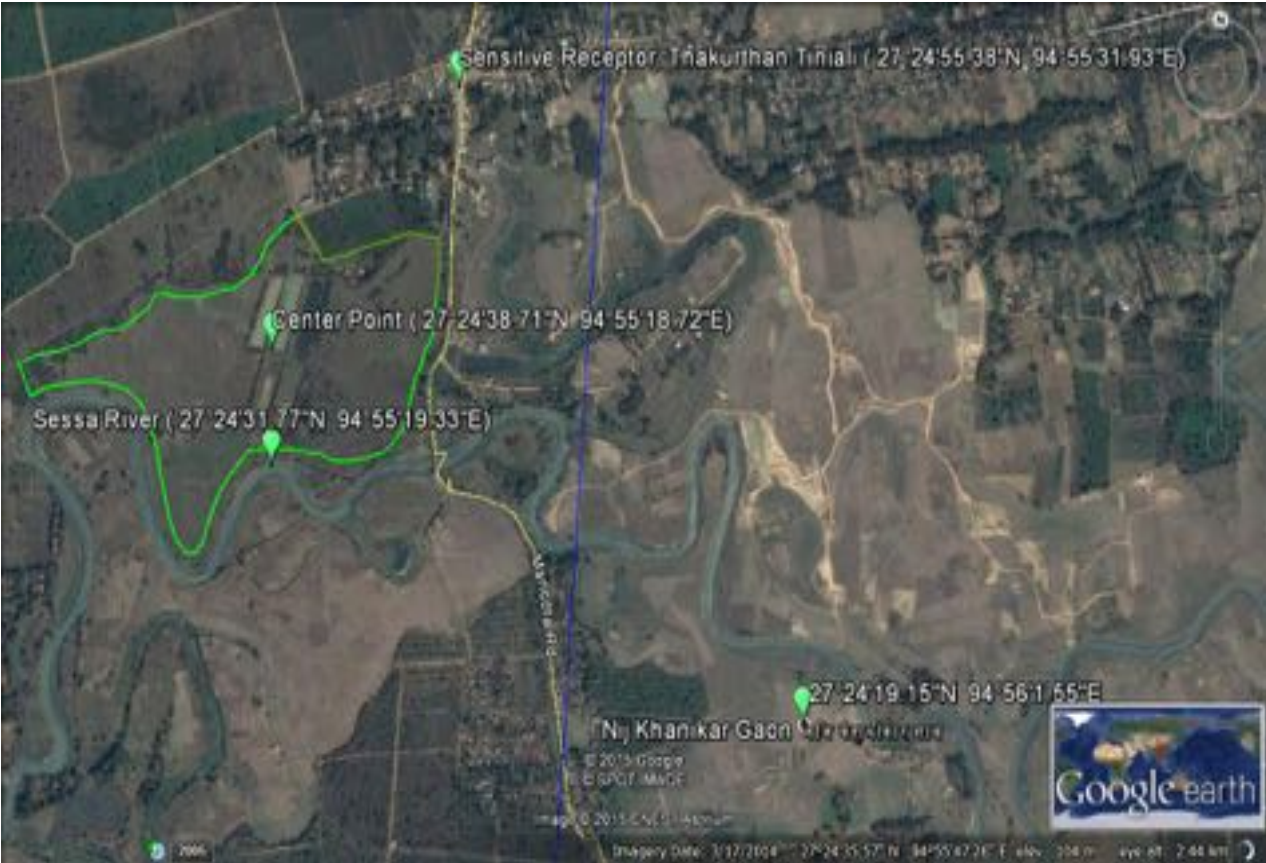
S. NO	NAME	SIGNATURE
1	J. BARUAH, ADC C. Dhadury	
2	A. Mitra S. Ramiah	
3	R. N. ...	
4	Rohita Singh	
5	Signature	
6	S. Gopal o/o Sitangah West Rev. Circle.	
7	Shyam Sircar.	
8	Shyam Sircar	
9	A. K. Pandya	
10	Ratul Boruah	
11	Chama Barua	
12	Anjan Chetani	
13	S. K. Patraik	
14	Bikash Yogi	
15	Manabprabha Saha	
16		
17		
18		

NO	NAME	SIGNATURE
19	Prakash Kumar Verman	B.C. DEY
20	M. H. Hamid Khan	M. J. Khan
21	Prakash Kumar Verman	[Signature]
22	Raghavendra S Jorhi (ASNL)	[Signature]
23	Datul Boruah (RDS)	[Signature]
24	Safique-Rahman	[Signature]
25	Mukul D.R.	[Signature]
26	Bulax Sharma	[Signature]
27	Ranjit Gogoi	[Signature]
28	Kamanta Sharma	[Signature]
29	Mamig Chakraborty	[Signature]
30	MD. Saleem Akbar	[Signature]
31	Ronal Rohman	[Signature]
32	Sai Biswajit Gogoi	[Signature]
33	Ranjit Gogoi	[Signature]
34	Uttam Gogoi	[Signature]
35	H.R. Phukan	[Signature]



Consultation photographs

Tentative sampling locations – shown in Google map



Recommended Contract Clauses for the Construction Contractors**1. Sources of Materials**

- (i) Use material sources permitted by government;
- (ii) Verify suitability of all material sources and obtain approval of Design and Supervision Consultant (DSC); and
- (iii) Submit to DSC on a monthly basis documentation of sources of materials.

2. Air Quality.

- (i) Prevent/minimize dust generation by removing the waste soil immediately from the site;
- (ii) Construction material, particularly sand/gravel for trench bedding, shall be brought as and when required; minimize on-site storage;
- (iii) Consult with DSC on the designated areas for stockpiling of clay, soils, gravel, and other construction materials;
- (iv) Excavate the foundations at the same time as the access roads (if needed) are built so that dug material is used immediately, avoiding the need to stockpile on site;
- (v) Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather;
- (vi) Use tarpaulins to cover sand and other loose material when transported by trucks; and
- (vii) Fit all heavy equipment and machinery with air pollution control devices which are operating correctly.

3. Surface Water Quality

- (i) Avoid excavation activities during monsoon. Ensure that works complete before onset of monsoon
- (ii) Minimize on-site storage of waste soil
- (iii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;
- (iv) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with DSC on designated disposal areas;
- (v) Place storage areas for fuels and lubricants away from any drainage leading to water bodies;
- (vi) Dispose any wastes generated by construction activities in designated sites; and
- (vii) Conduct surface water quality inspection according to the Environmental Management Plan (EMP).

4. Noise Levels.

- (i) Plan activities in consultation with DSC so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance;
- (ii) Require horns not be used unless it is necessary to warn other road users or animals of the vehicle's approach;
- (iii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor; and
- (iv) Maintain maximum sound levels not exceeding 80 decibels (dbA) when measured at a distance of 10 m or more from the vehicle/s.

5. Existing Infrastructure and Facilities.

- (i) Obtain from DSC the list of affected utilities and operators;
- (ii) Prepare a contingency plan to include actions to be done in case of unintentional interruption of services.

6. Landscape and Aesthetics.

- (i) Prepare and implement Waste Management List;

- (ii) Avoid stockpiling of excess excavated soils;
- (iii) Coordinate with DMB for beneficial uses of excess excavated soils or immediately dispose to designated areas;
- (iv) Recover used oil and lubricants and reuse or remove from the sites;
- (v) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;
- (vi) Remove all wreckage, rubbish, or temporary structures which are no longer required; and
- (vii) Request DSC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.

6. Accessibility.

- (i) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites;
- (ii) Schedule transport and hauling activities during non-peak hours;
- (iii) Locate entry and exit points in areas where there is low potential for traffic congestion;
- (iv) Keep the site free from all unnecessary obstructions;
- (v) Drive vehicles in a considerate manner;
- (vi) Coordinate with Dibrugarh Traffic Department for temporary road diversions and with for provision of traffic aids if transportation activities cannot be avoided during peak hours; and
- (vii) Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.

7. Socio-Economic – Employment.

- (i) Employ majority of the labour force, or to the maximum extent, local persons within the 2-km immediate area if manpower is available; and
- (ii) If available, secure construction materials from local market.

8. Occupational Health and Safety.

- (i) Develop and implement site-specific Health and Safety (H&S) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment; (c) H&S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;
- (ii) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;
- (iii) Provide medical insurance coverage for workers;
- (iv) Secure all installations from unauthorized intrusion and accident risks;
- (v) Provide supplies of potable drinking water;
- (vi) Provide clean eating areas where workers are not exposed to hazardous or noxious substances;
- (vii) Provide H&S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;
- (viii) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted;
- (ix) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;
- (x) Ensure moving equipment is outfitted with audible back-up alarms;
- (xi) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; and
- (xii) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than

8 hours per day without hearing protection. The use of hearing protection shall be enforced activity.

9. Community Health and Safety.

- (i) Plan routes to avoid times of peak-pedestrian activities.
- (ii) Liaise with DSC in identifying risk areas on route cards/maps.
- (iii) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.
- (iv) Provide road signs and flag persons to warn of dangerous conditions, in case of location near the road.

10. Work Camps (if needed).

- o Consult with DSC before locating project offices, sheds, and construction plants;
- o Minimize removal of vegetation and disallow cutting of trees;
- o Provide water and sanitation facilities for employees;
- o Prohibit employees from cutting of trees for firewood;
- o Train employees in the storage and handling of materials which can potentially cause soil contamination;
- o Recover used oil and lubricants and reuse or remove from the site;
- o Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;
- o Remove all wreckage, rubbish, or temporary structures which are no longer required; and
- o Request DSC to report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.

11. Social and Cultural Resources.

- o Stop work immediately to allow further investigation if any finds are suspected
- o Inform DSC if a find is suspected, and take any action they require ensuring its removal or protection in situ
- o Request DSC or any authorized person with archaeological/historical field training to observe excavation