CHAPTER – 4.0
ENVIRONMENTAL IMPACTS OF THE PROJECT

4.1 PROJECT ACTIVITIES

4.1.1 PHASES OF IMPACTS

The proposed project will have impacts on the environment in two distinct phases. During the construction phase, which may be regarded as temporary or short-term; the other during the operation stage which will have long term effects.

The environmental impacts in this study have, as such, been discussed separately for the construction phase and the operation stage.

Spatially, the impacts have been assessed over the study area of 10 km radius of the project site. Overall impacts in the regional context are negligible unless stated otherwise.

4.1.2 ACTIVITIES DURING CONSTRUCTION PHASE

During the construction phase, the following activities among many are considered to be important towards development of impacts:

a) Site preparation
b) Excavation and backfilling
c) Hauling of earth materials and wastes
d) Piling, cutting and drilling
e) Erection of concrete and steel structures
f) Road construction
g) Painting and finishing
h) Clean up operations

The activities can be divided into two categories, viz. sub-structural and super-structural work. Certain foundation would require pile driving. The pile driving machinery would pose noise and gaseous pollution.

Moreover, construction work will involve cutting of trenches, excavation, concreting etc. All these activities will give rise to dust pollution. The super-structural work will involve steel work, concrete work, masonry work etc. and will involve massive construction equipment like cranes, concrete mixers, hoists, welding sets etc. There may be dust, gaseous and noise pollution from these activities. Concrete and masonry works involve considerable amount of water which generally induce certain impact on the local water source.

Mechanical erection work involves extensive use of mechanical equipment for storage, transportation, erection and on-site fabrication work. These activities generally produce some air contaminants and noise pollution. On the other hand, electrical work is less polluting in general.

4.1.3 ACTIVITIES DURING OPERATIONAL PHASE

The operation of the proposed plant will generate a number of liquid, solid and gaseous effluents. The generation of these effluents from various sources has been discussed in Chapter-2. These effluents will have impact on several environmental parameters. Though, environmental parameters are same as in construction phase, here the impacts are continuous and therefore will have a permanent effect. Probable impacts on different environmental parameters are discussed in the following sections.

4.2 IMPACTS ON SOIL AND LAND USE

The proposed project shall be set up within already procured land (200 acres) within the Industrial Growth Centre of Assam Industrial Development Corporation (AIDC).

As such, the construction activities would be confined within & around the boundary of the allocated land only, earmarked for the industrial purpose. Therefore, the impacts will be minimum.

Preparatory activities like construction of access roads, temporary offices, quarters and godowns, piling, storage of construction materials etc. will be confined within the project area. These will not generally exercise any significant impact except altering the land use pattern of the proposed site. There will be no impact on the adjoining land.

As a result, the impact on land use would be very insignificant and any impact due to construction will be confined within the project area and will not hamper the land use aspects outside.

The plant and its vicinity being industrial area, it shall be of no importance to ensure that no degradation of agricultural soils shall result from the industrial or other types of pollution.

Overall, it could be easily inferred that there will be no adverse impact on soil quality & land use in the study area.

4.3 IMPACTS ON HYDROLOGY

4.3.1 IMPACTS ON HYDROLOGY DURING CONSTRUCTION

The drainage pattern of overland water flow will not be changed due to the site preparation involving alteration of the existing profile and slope of the land.

4.3.2 IMPACTS ON HYDROLOGY DURING OPERATION

Appropriate drainage facilities will be developed within the plant including proper disposal to drains. Thus, the operation of the plant is not likely to cause any impact on surface water hydrology.

About 18,480 m^3/day water will be required as make-up water, which will be met from river Brahmaputra/ Ground Water. The water availability of the source is well ascertained by the relevant Authority before making the allotment of water, and thus, is expected that it will have no significant impact on the water distribution system.

As no other water body will be utilized for proposed project, the hydrological scenario of the natural water bodies in the study area surrounding the project site will not be affected.

Estimated volume of the total effluent generation would be about 521 m^3/day, which will undergo the treatment in the proposed Effluent Treatment Plant. The treated wastewater will be discharged into Brahmaputra River. The quality of the waste water, to be discharged into the river shall be much within the acceptable limits. Moreover, such discharge being negligible compared to the extent and flow of the river Brahmaputra, the impacts on the hydrology of the river is negligible.

Brahmaputra River is an important source for irrigation and transportation. The average depth of the river is 124 feet (38 m) and maximum depth is 380 feet (120 m). The average discharge of the river is about 19,300 m^3/sec (680,000 cu ft/s). The requirement of water for the project will be around 18,480 m^3/day (0.214 m^3/sec), which is negligible, considering the average discharge of the river.

4.4 IMPACTS ON WATER QUALITY

4.4.1 IMPACTS ON WATER QUALITY DURING CONSTRUCTION

Adequate arrangements will be made to ensure proper drainage of wastewater from the construction sites so that such waters do not form stagnant pools nor aggravate soil erosion. Stagnant pools of water will promote breeding of mosquitoes and create generally unsanitary conditions.

With regard to the water quality, wastewater from construction activities would mostly contain suspended impurities. Other pollutants that may find their way to it will be in insignificant concentrations and may be safely disregarded.

As the wastewater would ultimately have to be discharged to existing surface water drains, care would be taken so that excess suspended solids in the wastewater are arrested before discharge.

Thus, it is recommended to lead drains from different construction sites to pits where excess suspended solids are settled out and relatively clear supernatant is discharged.

4.4.2 IMPACTS ON WATER QUALITY DURING OPERATION

4.4.2.1 Impacts on Surface Water Quality

Background water quality has been found by actual sampling and analysis. The major water body close to the project site is the river Brahmaputra. The treated effluent will be disposed into river Brahmaputra. Water quality of this river has, therefore, been monitored with due importance.

No thermal pollution is expected as closed cycle cooling system with cooling towers has been adopted.

Estimated volume of the total effluent generation would be about 521 m^3/day, which will undergo the treatment in the proposed Effluent Treatment Plant. The treated wastewater will be discharged into Brahmaputra River. As the quality of the waste water, to be discharged into Brahmaputra River shall be within relevant effluent discharge standards, no impact on the water quality of the receiving water body is envisaged.

4.5 IMPACTS ON AIR QUALITY

4.5.1 IMPACTS ON AIR QUALITY DURING CONSTRUCTION

Particulate matter would be the predominant pollutant affecting the air quality during the construction phase. The soil of the project area, being generally silty in texture, is likely to generate considerable quantities of dust, especially during dry condition. Dust will be generated mainly during excavation, back filling and hauling operations along with transportational activities. However, wind in the area generally being low to medium, wind blown dust is not expected to have tangible effects.

Undesirable gaseous pollutants will be generated mostly by the automobile traffic. However, this would not lead to any tangible effect, as the expected traffic volume is low. Whatsoever, it would be ensured that all the vehicles plying during construction are properly tuned and maintained to keep emissions within the permissible limits.

4.5.2 EMISSIONS DURING OPERATION

4.5.2.1 Sources of Emissions

There will be total 2 (two) stacks, out of which 1 (one) will be attached to the process boiler and the other, attached to 2 boilers of 10 MW co-generation Captive Power Plant. Major pollutants, emitted are particulate matter, sulphur dioxide (SO_2) & nitrogen oxides (NOx). Other emissions are negligible.

The Stack & Emission Characteristics are presented in Tables - 4.1.

4.5.2.2 Air Quality Modelling

4.5.2.2.1 Selection of Model

The gaseous pollutants, emitted through the stacks have the potential to deteriorate the air quality of the area. In order to evaluate the impact on ambient air quality due to such releases, the ground level concentrations (GLCs) as a result of the plant emissions have been evaluated through mathematical modelling using computer aided techniques.

Upon discharge to atmosphere, the emissions from sources are subjected to transport and diffusion processes which together are termed as dispersion. The processes which govern the atmospheric dispersion of pollutants are plume rise, transport by wind, diffusion by turbulence and a number of physico-chemical processes such as gravitational settling, deposition, chemical reactions, transformation, decomposition and wash out.

The computation has been made applying ISCST3 of USEPA, which is most widely used and also recommended by CPCB (PROBES/70/1997-98). The model is based on some assumption such as steady state conditions, continuous homogeneous flow, inert passive pollutants, no ground absorption and a Gaussian distribution of the plume in both horizontal and vertical planes.

4.5.2.2.2 Data Used for Modelling

The hourly meteorological data like ambient temperature, wind speed and wind direction used for air quality modelling have been taken from such data, generated through continuous on-site monitoring during three months' period (October 2010 – December 2010).

The hourly occurrence of various atmospheric stability classes has been determined from the on-site hourly wind speed and cloud cover data using the insolation based stability classification.

The Mixing Height data were taken from one of the published documents i.e., "Spatial Distribution of Hourly Mixing Depth over Indian Region" of R. N. Gupta, applicable for Guwahati region.

Stack and emission data as presented in Table-4.1 have been used as input to the model. The prediction of GLCs and corresponding impacts has been made for the emission figures mentioned therein.

TABLE-4.1

STACK & EMISSION CHARACTERISTICS

(Proposed Stacks)

(Based on design data)

Description	10 MW Co-generation Power Plant (Coal based)	Recovery Boiler
No. of Stack	1	1
Stack height (m)	60	60
Internal dia. at Stack Top (m)	1.5	1.5
Exit velocity of flue gas (m/s)	16	16
Temp. of flue gas degree (^oC)	140	140
Flue gas flow rate (Nm^3/Hr)	67283	67283
PM emission rate (mg/Nm^3)	50	50
PM emission rate (gm/sec)	0.93	0.93
SO_2 emission rate (gm/sec)	13.14	1.00
NOx emission rate (gm/sec)	5.00	5.00

4.5.2.2.3 Modelling Procedure

Modelling exercise has been performed for both the proposed stacks.

The actual locations of the emission sources have been defined in a Cartesian co-ordinate (x,y) system, with Absolute Reference Point (ARP), being the Chipper House.

As recommended by CPCB, radial pattern of receptor locations has been implemented using the polar (r,θ) co-ordinate system with origin at the ARP of the Cartesian co-ordinate system. The locations of the receptors have then been defined with respect to 16 radial directions (N to NNW angle θ of such directions measured clockwise from North) and radial distance 'r' from the ARP.

The receptors are selected in such a way that more receptors are located close to the maximum concentration point. The maximum distance covered is 10 km., which has been seen adequate to cover the maximum concentrations for this particular situation.

For multiple stacks computation, inter-stack distances have been considered. Since the contributions from different pollution sources are additive, the contributions of all sources at a given receptor have been computed separately and then added to give the total concentration.

In order to compute the 24 hourly concentrations due to the operation of the project, the hourly meteorological data recorded near the project site was used. The model was used to compute the 24-hour concentrations for each day for the study period.

4.5.2.2.4 Modelling Results

The predicted maximum GLCs of SO_2, NOx & PM are presented in Table – 4.2. The isopleths of SO_2, NOx & PM have been depicted in Figures – 4.1, 4.2 & 4.3 respectively.

Table – 4.2
Predicted Maximum GLCs of various pollutants

Pollutants	Max. GLC ($\mu g/m^3$)	Direction	Distance (km)
SO_2	5.63	SSE	0.5
NOx	3.61	SW	0.2
PM	0.67	SW	0.2

Hence, the maximum incremental values of SO_2, NOx & PM are about 5.63, 3.61 & 0.67 $\mu g/m^3$ respectively, which will occur at a distance of about 0.2-0.8 km. in ‘SSE’, ‘SW’ & ‘SW’ directions respectively w.r.t. the ARP.

The maximum incremental values of SO_2, NOx & PM are well within the prescribed limits, set for the industrial as well as the residential areas.

It may be observed that these values have been attained only on one day in the post-monsoon season. It may also be noted that the modelling results depict the worst case scenario as washout due to rain has not been considered and deposition on other forms of structures as buildings, trees etc. have not been taken into account. Thus, in actuality, these pollutant concentrations are expected to be relatively lower than the predicted values.

4.5.2.3 Impact due to transportation of raw materials and finished products

Bulk of the raw materials and products shall be transported by rail. As such due to this activity some negligible adverse impact will be on the surrounding environment.

Presently, the background emissions in the project area are primarily confined to emissions from traffic plying on the road in the vicinity of the site. During the operation phase of the proposed project, movement of goods' vehicles and loading and unloading operations may contribute air emission. But with advanced and stringent traffic management system within the project site, scope for such emission will be minimized. The layout of the proposed project has generous area earmarked for greenery development. This will act as effective media for arresting the emissions within the project site.

The vehicular traffic plying in and out of the project site will be one of the significant sources of air pollution. If the site is not properly regulated, it can create disruption in free traffic movement leading to air pollution problems. This difficulty can be tackled to a great extent by properly regulating the traffic and by following strict and disciplined vehicular movement and operation in the project site. By imposing vehicular emission standards, this problem can be further curbed to a large extent. Adequate and planned road network will be set up in the proposed project for smooth movement of the goods vehicles.

Though operation of trucks, materials loading and unloading and other activities will offer air pollutants to the ambient air of the area, it was felt that idling of trucks particularly during winter season may have some impact of concern on the air environment. In fact, in many cases, the truckers warm up the engines of their vehicles sufficiently after a long waiting/rest period (like after overnight parking). While idling of one or a couple of trucks may not create a problem but a number of trucks idling all at a time may have a negative effect on the ambient air quality of the neighborhood, though the number of trucks at a time will be negligible.

In the proposed project it is estimated that at a time around 30 trucks will be situated within the project site. Since the number of trucks that might be idling at a time is very difficult to predict at this stage, it was decided to consider that around 15 trucks will be idling at a time. At this stage, it is also not possible to predict the location of such trucks within the project site. However, the total truck parking area has been considered as a single volume source input to the model having multiple sources scattered within it. The impact under consideration is expected to be maximum during the winter. The emission of SPM, SOx & NOx from the 15 idle trucks has been calculated based on the emission factor (Ref Table – 4.3 & 4.4).

Undesirable gaseous pollutants will be generated mostly by the traffic and use of machineries. However, this would not lead to any tangible effect, as the expected emission volume is low. It would be ensured that all the vehicles plying in the working zone are properly tuned and maintained to keep emissions within the permissible limits. At loading and unloading points, arrangement for Water sprinkling is being made so that dust generation during transportation of materials will be minimized further.

TABLE 4.3
EMISSION FACTOR FOR THE IDLE TRUCKS

Source Type	Units	NOx	SOx	SPM
Heavy Duty Diesel Vehicles – idle	gm/hr	68.08	0.04	1.30
Heavy Duty Diesel Vehicles – idle	gm/sec	0.0189	0.00001	0.0004

Source: Idling Emission Factors developed from EMFA AC2002 (ARB2003)

TABLE 4.4
TOTAL EMISSION LOAD FOR 15 IDLE TRUCKS

No. of Trucks	Units	NOx	SOx	SPM
15 Trucks	gm/sec	0.2835	0.00015	0.006

There will be some impact on the surrounding environment due to NOx emission. However it will be within the acceptable ranges. The impact due to the emission of other pollutants will be negligible.

With strict traffic management system and various environmental management practices, contribution of pollutants in the ambient air will be kept under control so as to create minimum disturbances in the neighbourhood.

4.6 IMPACTS ON NOISE

4.6.1 IMPACTS ON NOISE DURING CONSTRUCTION

Sources of Plant Noise

The operation of the new units is expected to generate relatively high and continuous noise levels especially near the Cooling Towers, Boilers, Generators, Compressors and Various Pumps etc. However, all the machineries will be within the permissible noise limit as per Environment Protection Act.

Impacts of Plant Noise

Operational activities are not expected to cause any undue disturbances to the people living in the proximate areas outside the plant boundary. Impacts of noise on workers could be minimised through the adoption of adequate protective measures in the form of (a) use of personal protective equipment (ear plugs, ear muffs etc.), (b) education and public awareness, and (c) exposure control through the rotation of work assignments in the intense noise areas.

As such, due to protection, there will not be any appreciable impact from noise due to the operation of the proposed project.

4.7 IMPACTS ON ECOLOGY

4.7.1 IMPACTS ON TERRESTRIAL ECOLOGY DURING CONSTRUCTION

The impact of construction activities will be confined to the project site. Thus, the site development works will not lead to any significant loss of vegetation.

No wild life is involved in the site and vicinity. Therefore, there is no likely tangible impact from higher noise and emissions during construction on the common animals and birds in the area.

4.7.2 IMPACTS ON TERRESTRIAL ECOLOGY DURING OPERATION

The base line status of terrestrial flora and fauna within the study area have been drawn up earlier. As such, there is no wild life sanctuary in the study area. The study area is dominated by urban and semi-urban land use.

The harmful effects of such air pollutants as PM, SO_2, and NO_x in affecting growth and other similar functions of trees, either singularly or synergistically is well known. However, such effects are experienced only at high levels. The levels of pollutants contributed by the project are insignificant and are not envisaged to cause any such stress.

4.7.3 IMPACTS ON AQUATIC ECOLOGY DURING CONSTRUCTION

As the water quality of the surface water bodies is not likely to change significantly due to the construction activities, no tangible impact on the aquatic life is expected.

4.7.4 IMPACTS ON AQUATIC ECOLOGY DURING OPERATION

As the effluent of the proposed plant will be completely treated, no impact on the aquatic ecology is envisaged. No thermal pollution is expected as closed cycle cooling system will be adopted.

4.8 IMPACTS ON DEMOGRAPHY AND SOCIOECONOMICS

Some workforce comprising of skilled, semi-skilled and unskilled labourers will be needed at the peak period of construction phase. Since most of labour force will be drawn from established neighbourhood, no new environmental problem is anticipated.

The project management shall take adequate steps to ensure suitable sanitary facilities for the workers. These facilities include water supply, sanitary toilets and waste treatment etc. Otherwise, the local land and water courses may get polluted.

As the construction phase will be limited to a very short time span, it would not have any long term effect.

The setting up of the project will lead to the development of additional infrastructure in the area including transport, power, water supply and other public utilities which will contribute significantly to the development of the area, at least in the peripheral zone if not over a large area.

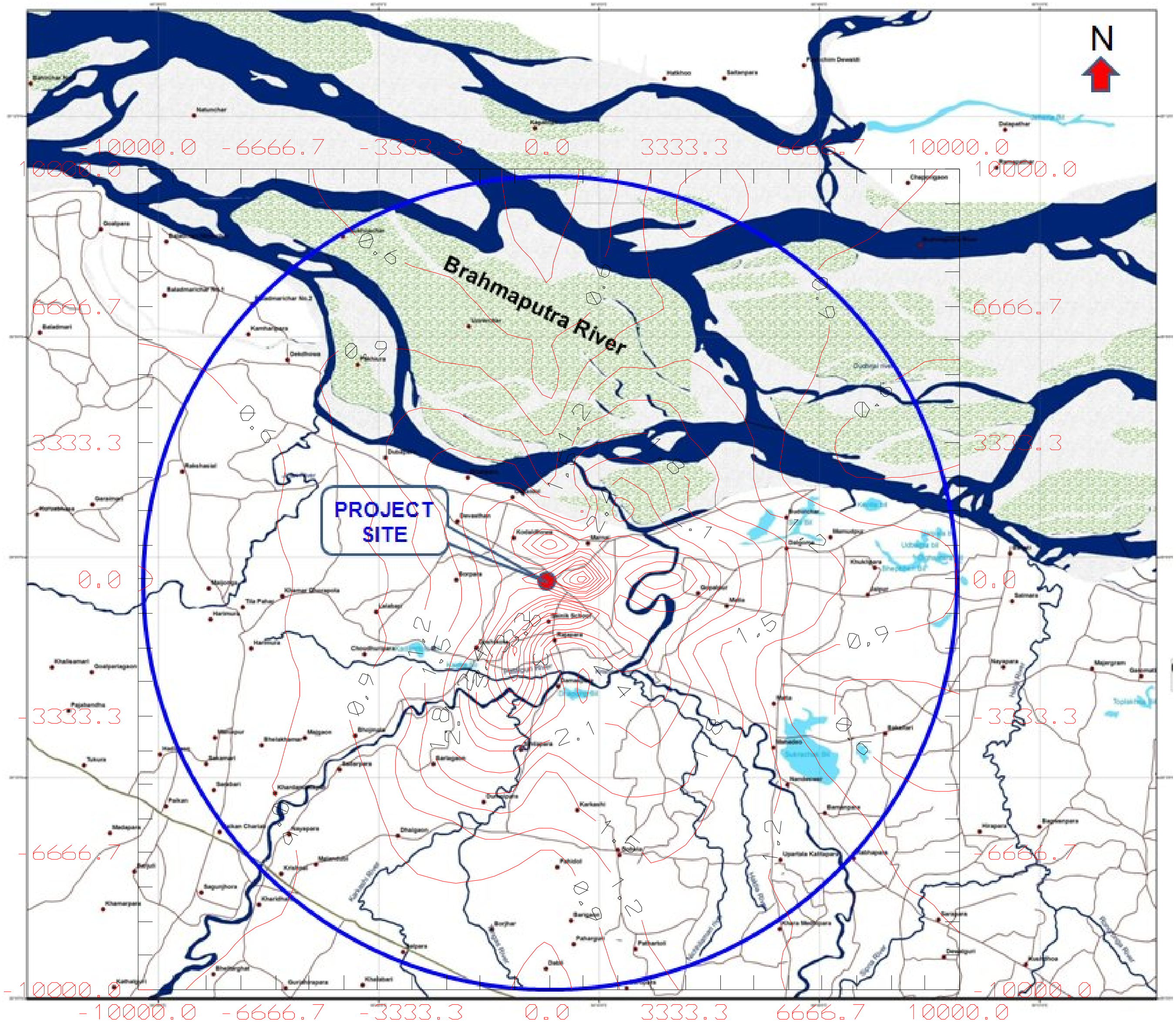

FIGURE 4.1: ISOPLETHS OF SO_2

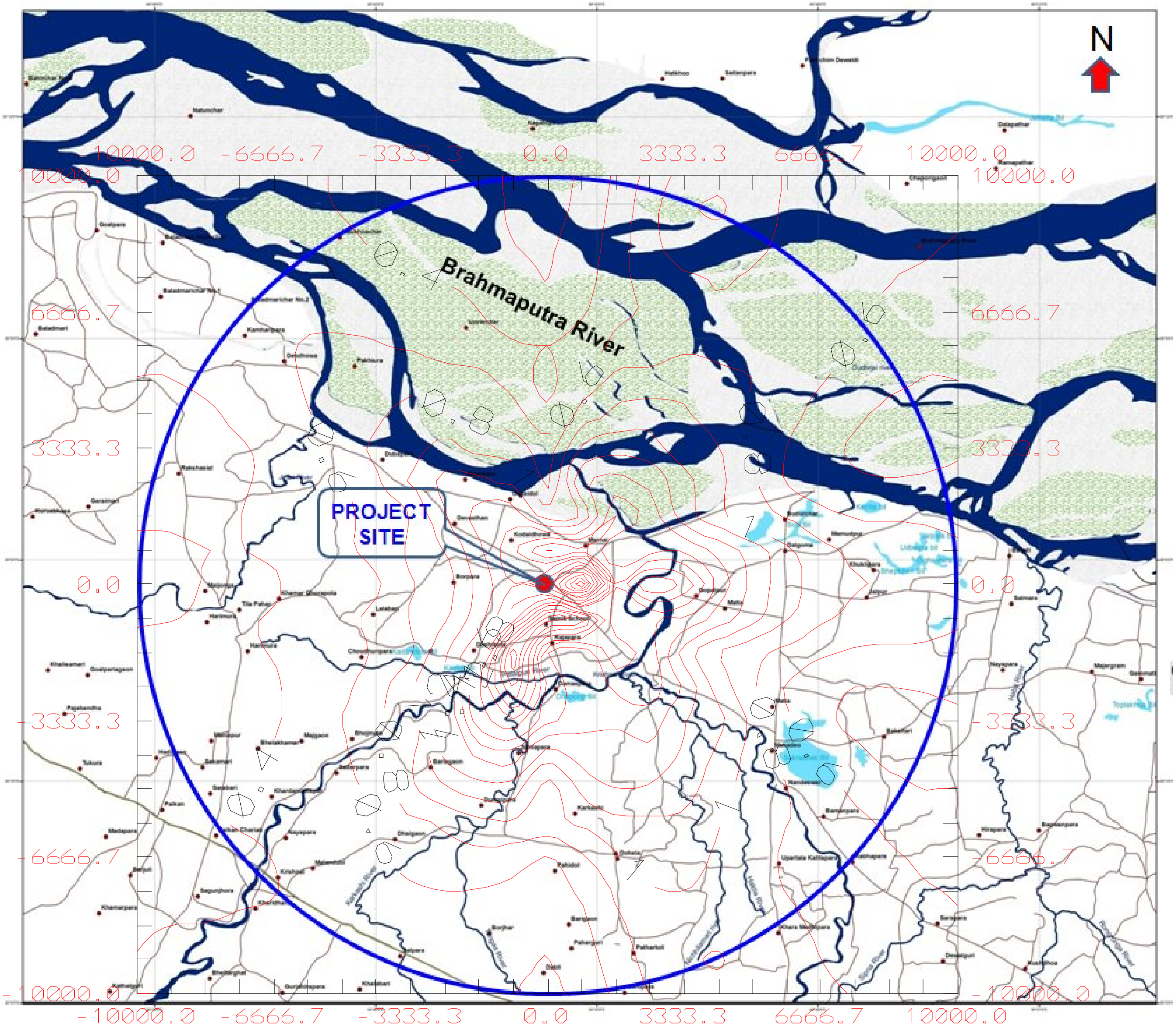

FIGURE 4.2: ISOPLETHS OF NOx

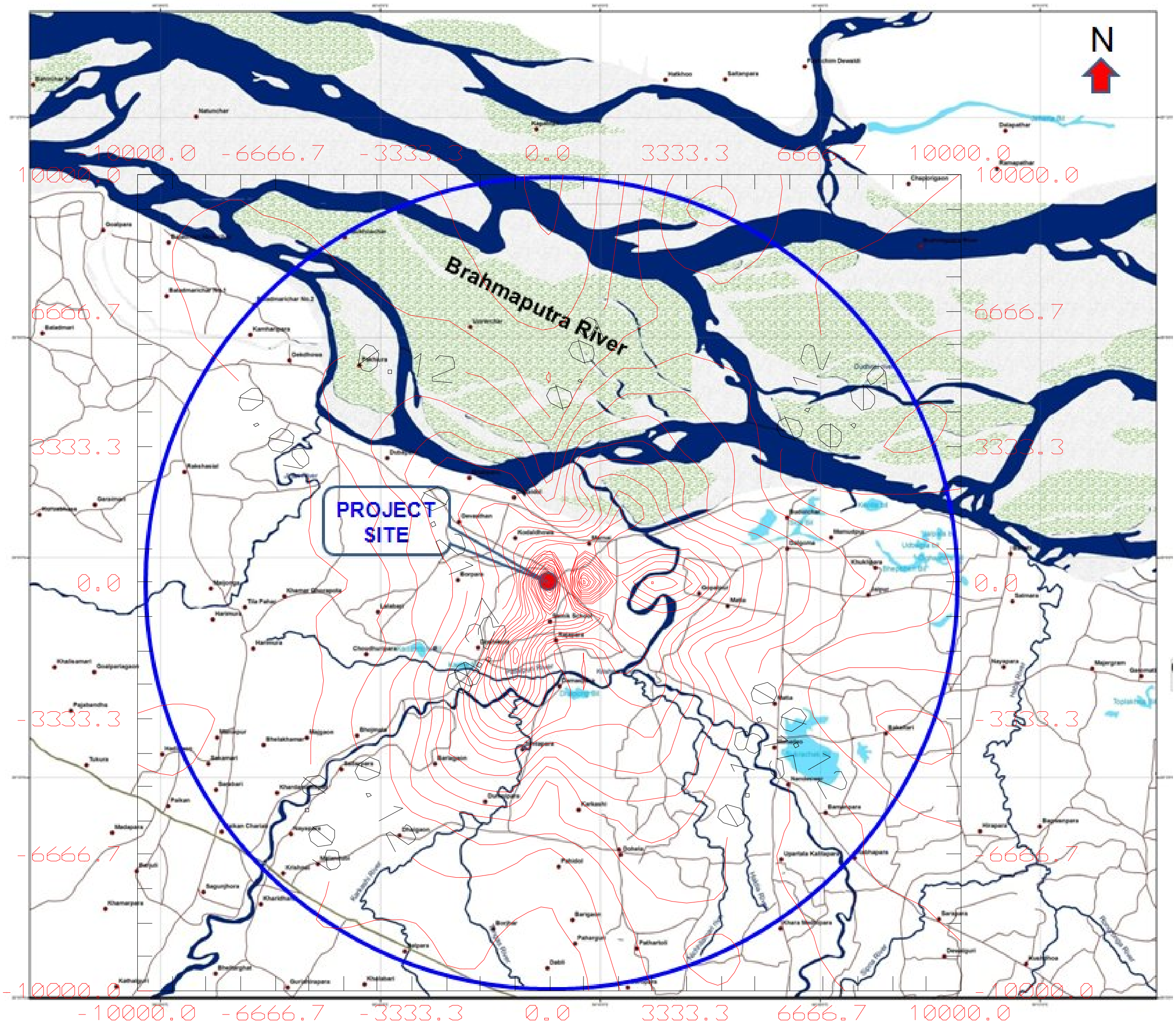

FIGURE 4.3: ISOPLETHS OF PM