

CHAPTER – 4

ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

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4.1 IDENTIFICATION OF IMPACTS

Various sources of pollution with respect to wastewater, the flue gas / process emission, hazardous waste and noise generation along with their qualitative and quantitative analysis as well as measures taken to control them are discussed herein with details. The network method was adopted to identify potential impact, which involves understanding of cause-condition-effect relationship between an activity and environmental parameters. This method involves the "road map" type of approach to the identification of second and third order effect. The basic idea is to account for the project activity and identify the type of impact that could initially occur followed by the identification of secondary and tertiary impacts.

Identified potential impacts for the various components of the environment, i.e. air, noise, water, land and socio-economic, are presented in figure-4.1. It should be noted that in these illustrations the lines are to be read as "might have an effect on".

FIGURE - 4.1 IMPACT NETWORK ON AIR ENVIRONMENT

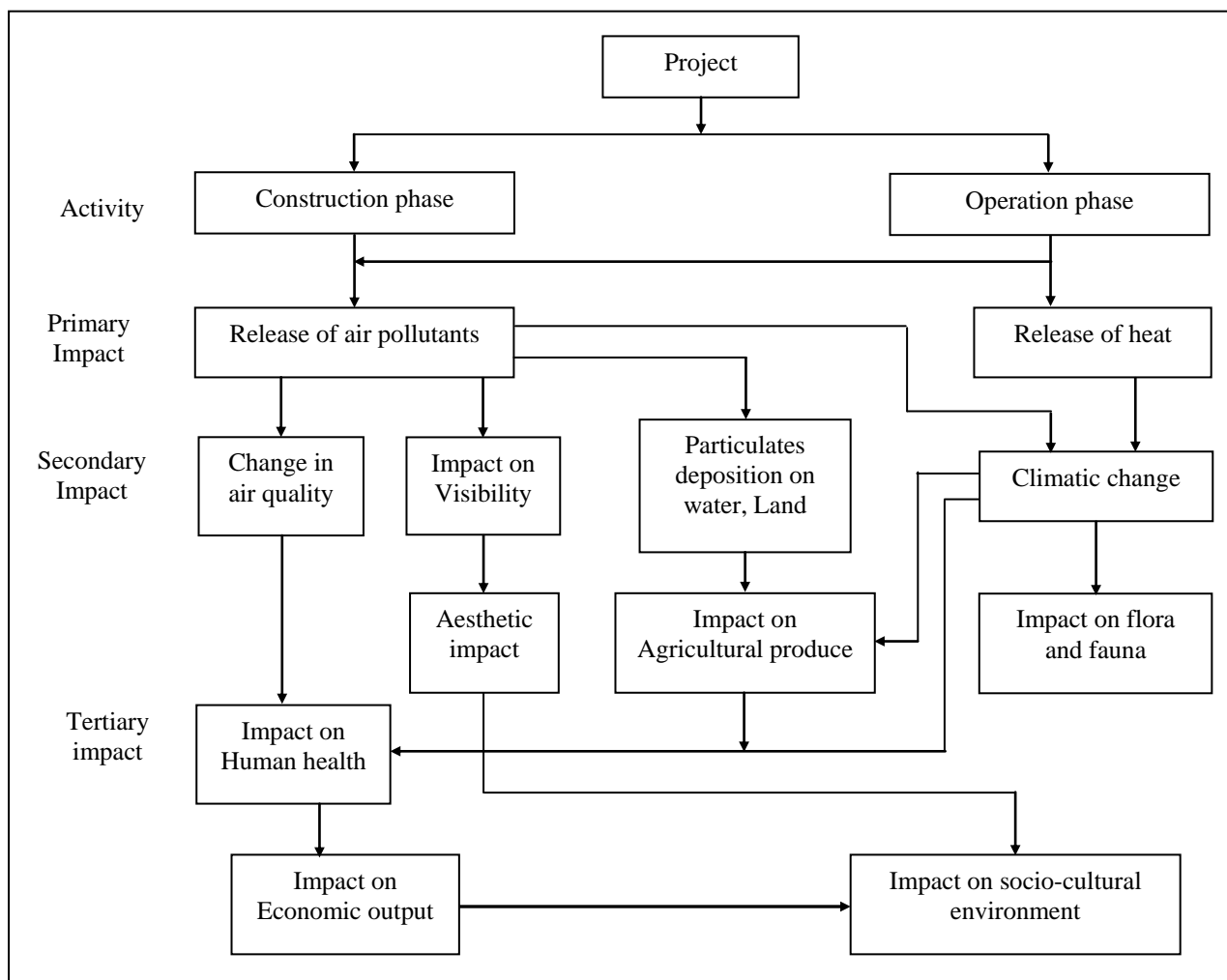


FIGURE - 4.1(CONT.) IMPACT ON WATER ENVIRONMENT

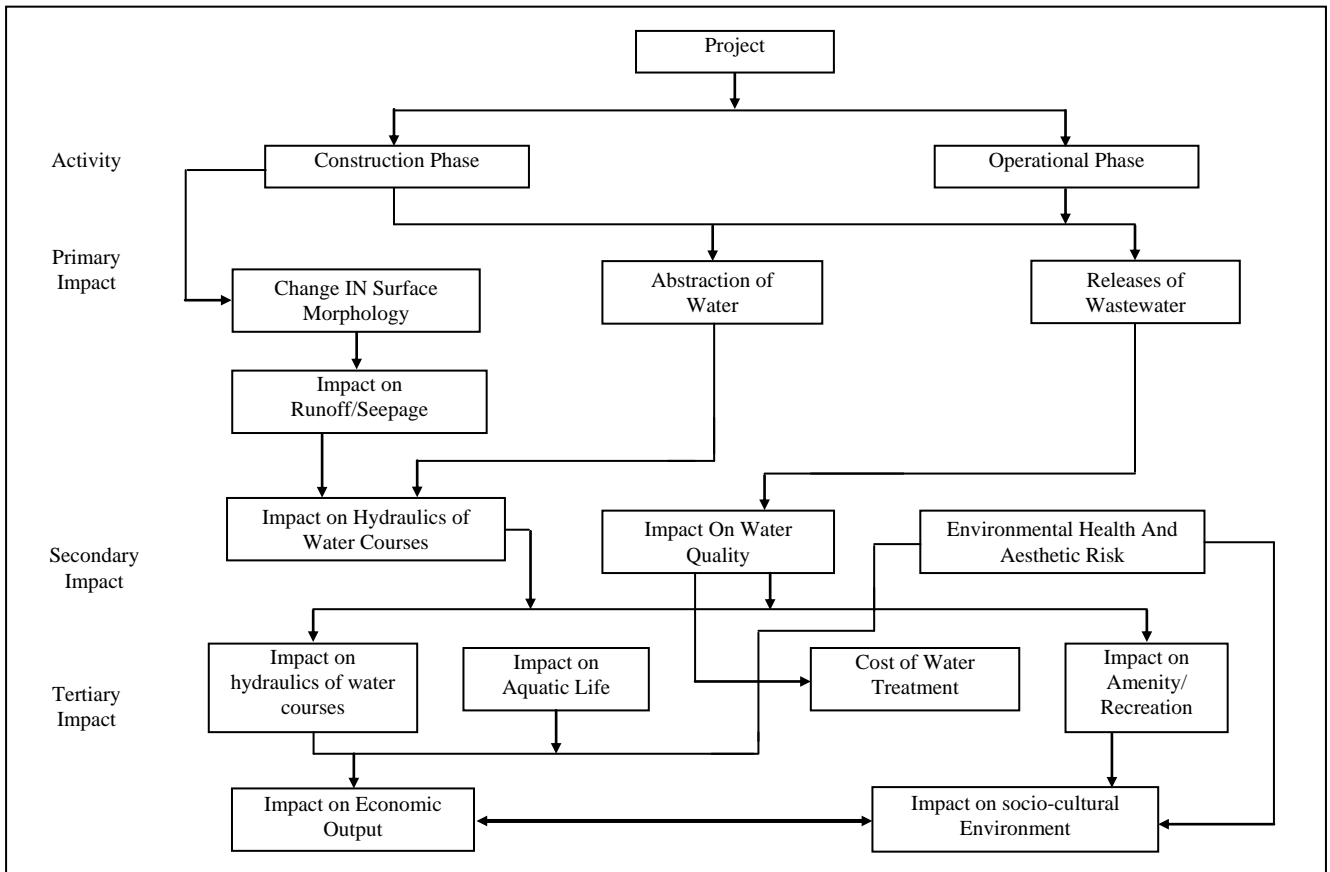
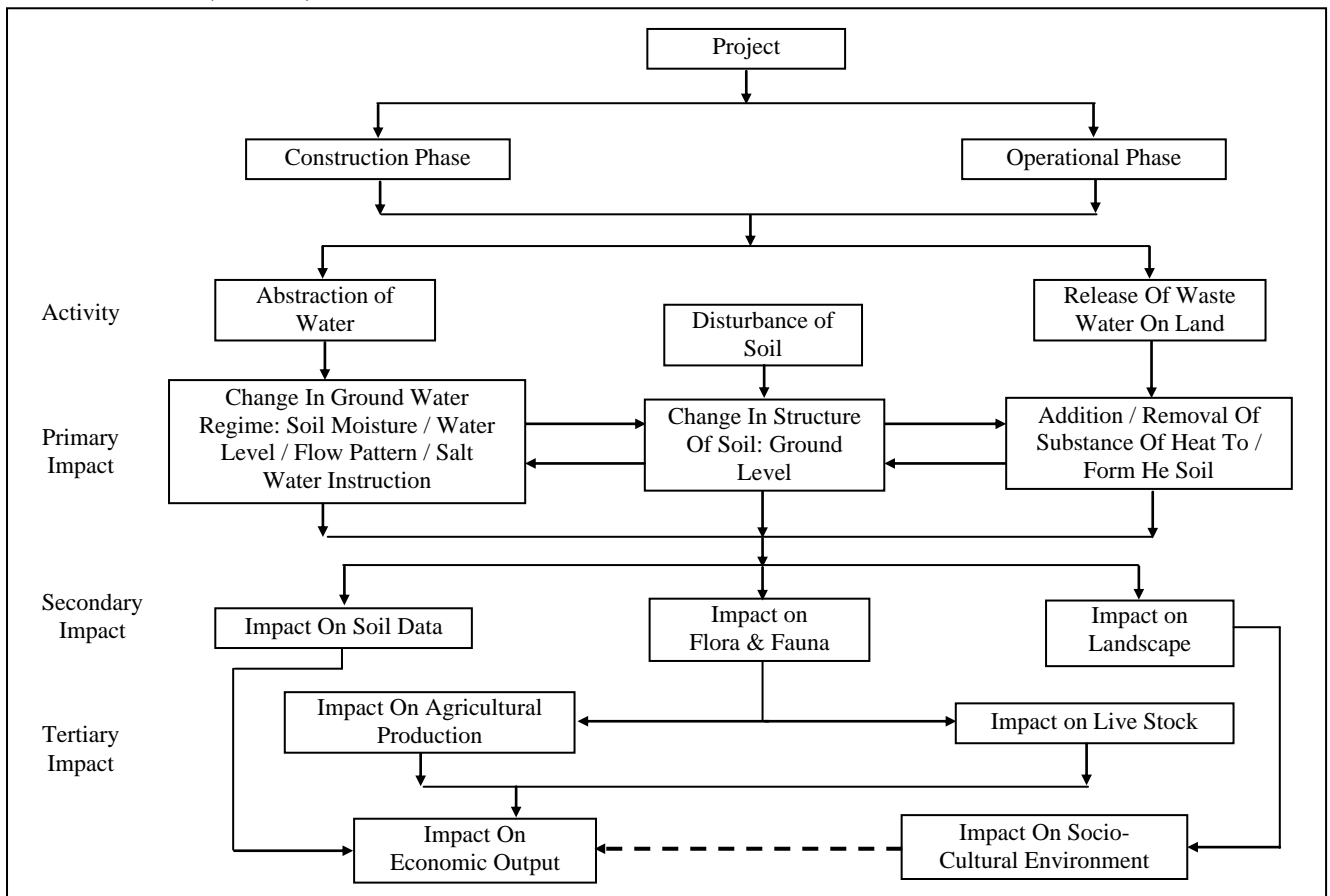


FIGURE - 4.1(CONT.) IMPACT ON GROUND WATER ENVIRONMENT



FIGUER - 4.1 (CONT.) IMPACT ON NOISE ENVIRONMENT

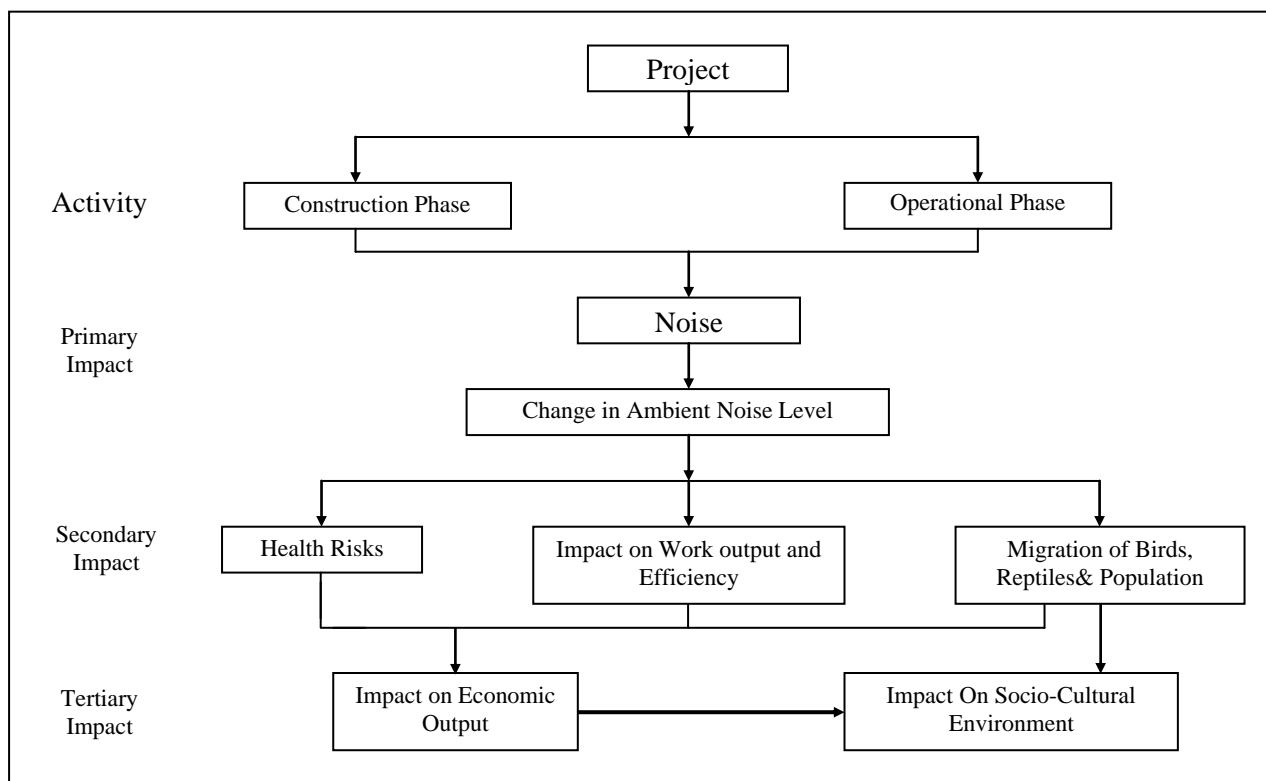


FIGURE - 4.1(CONT.) IMPACT ON LAND ENVIRONMENT

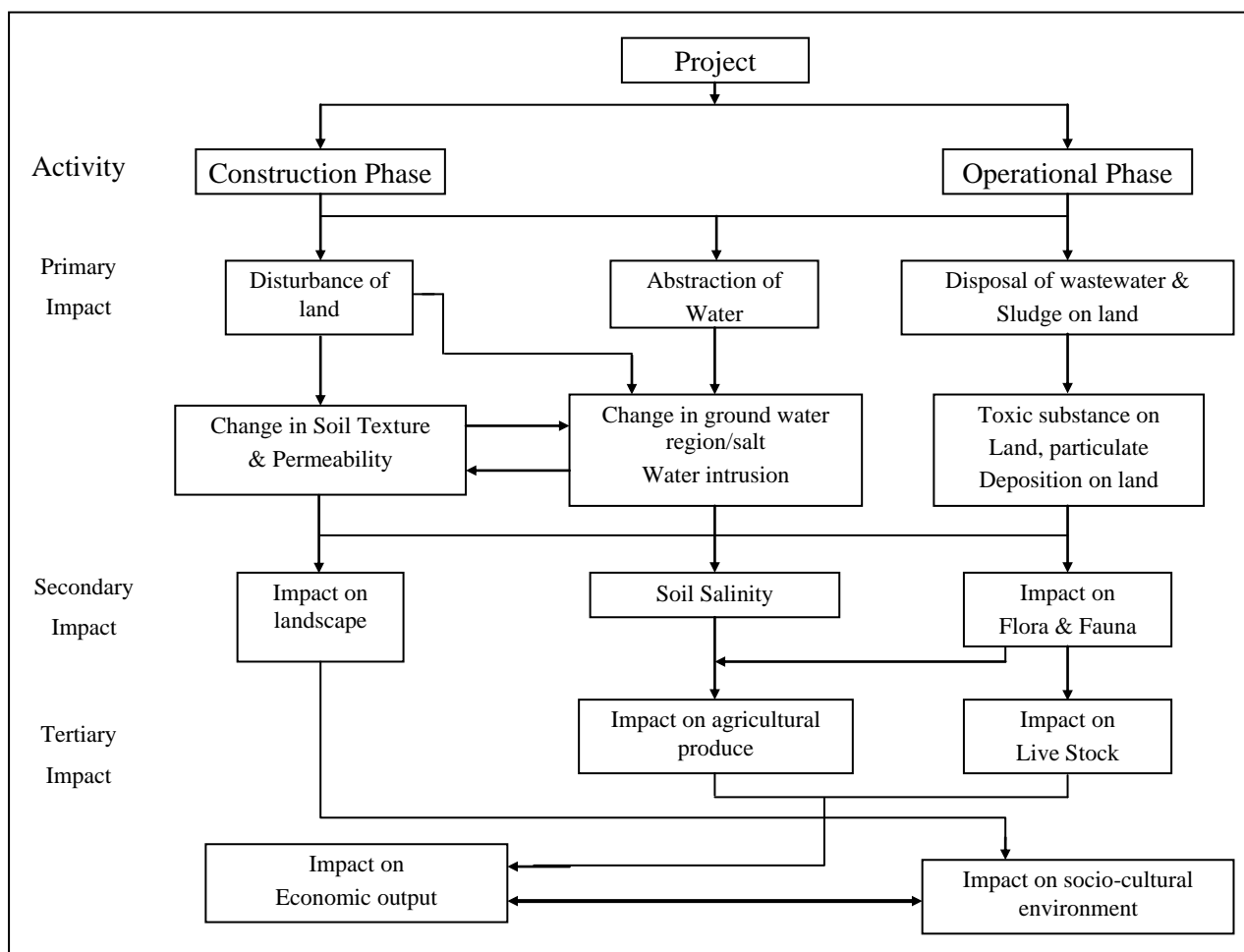
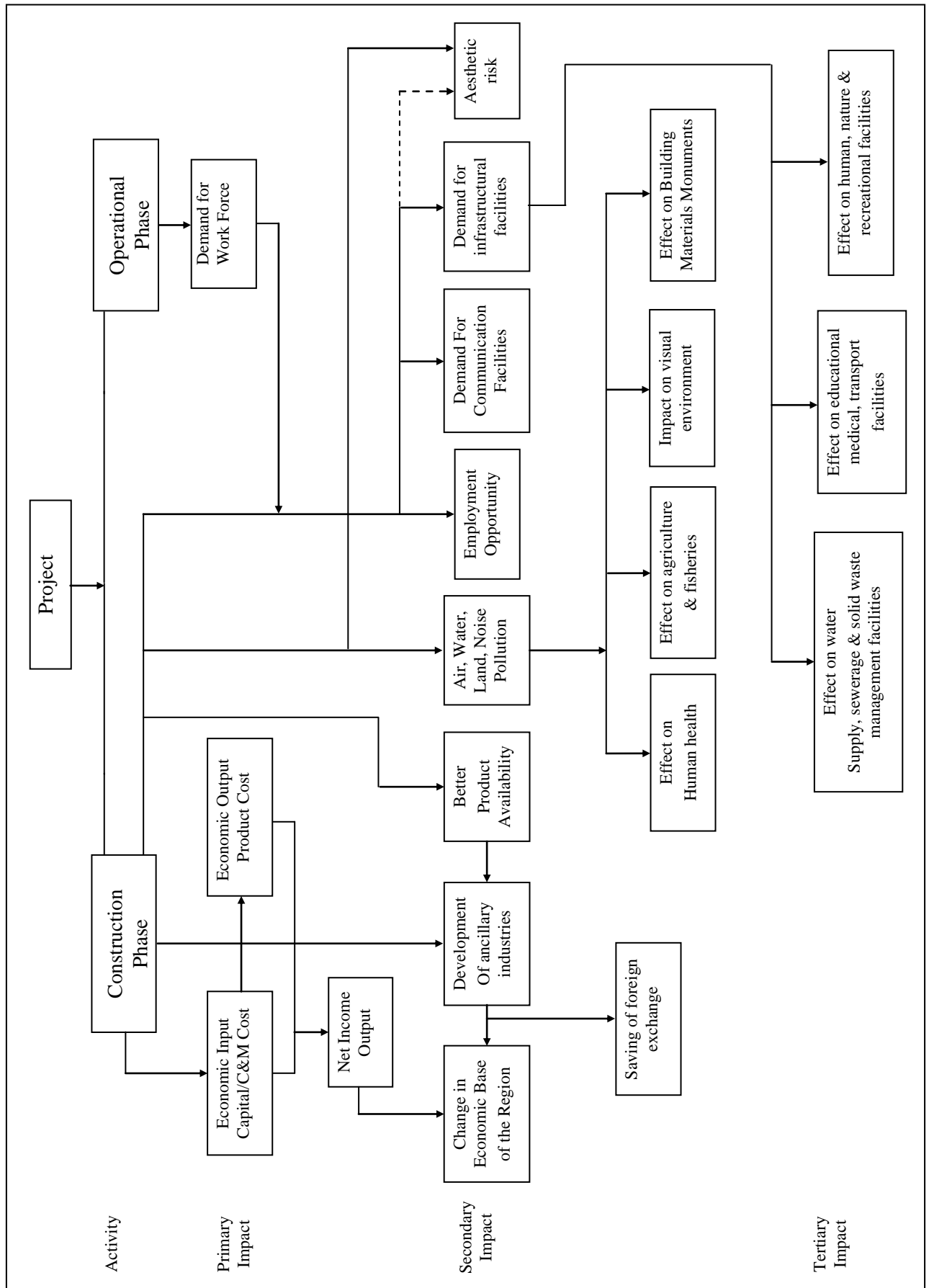


FIGURE - 4.1(CONT.) IMPACT NETWORK ON SOCIO-ECONOMIC AND CULTURAL ENVIRONMENT



4.2 PREDICTIONS AND EVALUATION OF IMPACTS

An impact can be defined as any change in physical, chemical, biological, cultural and/or socioeconomic environment that can be attributed to activities related to alternatives under study for meeting the project needs. Impact methodology provides an organized approach for prediction and assessing these impacts.

Scientific techniques and methodologies based on mathematical modeling are available for studying impacts of various project activities on environmental parameters.

The nature of the impacts due to said project activities are discussed here in detail. Each parameter identified in the proceeding chapter, is singularly considered for the anticipated impact due to various activities listed. The impact is quantified using numerical scores 0, 1, 2, 3, 4 and 5 in increasing order of activity. In order to assess the impact accurately, each parameter is discussed in detail covering the following:

- 1) Project activities likely to generate impact
- 2) Quantification and prediction of impact

4.2.1 WATER ENVIRONMENT

With respect to water environment three aspects are generally considered in Rapid EIA, the raw water availability, consumption and wastewater generation that will be disposed. The first priority in water quality assessment is to maintain and restore the desirable level of water quality in general.

4.2.1.1 CONSTRUCTION PHASE IMPACTS AND MITIGATION MEASURES

As company will be constructing various facilities so construction phase impacts will be anticipated. During Construction, drainage pattern and water supply system of overland water flow will be somewhat changed for the site preparation activities. Potential impacts may be on surface water quality during this phase could arise from dust emissions (from vehicles and disturbance of soil) such Suspended solids can be controlled by sprinkling water and by employing enclosures to construction area to allow the particles to settle down, prior to discharge. There would be no significant effect on water quality and quantity during construction phase.

4.2.1.2 OPERATION PHASE IMPACTS AND MITIGATION MEASURES

Water requirement shall be met from ground water using bore well located within premises. The details of water consumption are given in Chapter-2.

The total domestic waste water generation from the proposed activities shall be 4.5 KL/Day which will be treated through septic tank and disposed off through local drain. As no water is required in the manufacturing process and therefore no industrial wastewater will be generated.

Thus, it can be concluded that there will not be any significant adverse impact on the water environment.

4.2.2 AIR ENVIRONMENT

4.2.2.1 CONSTRUCTION PHASE IMPACTS AND MITIGATION MEASURES

Generally Construction phase involves Site cleaning, Excavation, Construction, Erection or Installation of equipment & machinery, Transportation, Material Handling. Dust will be the main pollutant affecting the ambient air quality of the surrounding area during the construction phase.

During excavation, care shall be taken that the excavator will not release the sand from higher elevation. The Pilling of sand will be done uniformly and proper storage will be maintained to avoid dusting because of wind.

Fume generation will be there due to welding and allied activities; this impact will be negligible and restricted to project site. The workers would be trained to use welding shields and use safer practice.

Motor vehicle transportation (to, from and around the site) particularly the traffic of trucks at the site, material movement into the site will introduce particulates and other exhaust gases into the local ambient air and there is some likelihood that during the construction period local air quality may be temporarily affected by these emissions.

However, these activities will be intermittent and hence, significant adverse impact is low.

Providing suitable surface treatment to ease the traffic, flow and regular sprinkling of water will reduce the fugitive dust generation significantly.

4.2.2.2 OPERATION PHASE IMPACTS AND MITIGATION MEASURES

The cement plant handles large quantities of solids viz., limestone, clay, cock breeze, iron dust, clinker and cement, which are subjected to various dust generating operations like crushing, grinding, transfer, packing, etc. These operations generate large quantities of fugitive dust, which would otherwise disperse into the work zone atmosphere and plant surroundings. To control the dispersion of fugitive dust, all crushers and transfer points will be provided with dust extraction system consist of hoods, ducting, bag house ID fans and exhaust ducts. The dust extraction system brings down the particulate matter concentration in the exhaust air to approximately 50 mg/Nm.

The dispersion of pollutants in the atmosphere is a function of several meteorological parameters viz. temperature, wind speed and direction, mixing depths, inversion level, etc. A number of models have been developed for the prediction of pollutant concentration at any point from an emitting source. The Industrial Source Complex – Short Term (ISCST3) dispersion model is a steady-state Gaussian plume model. It is most widely accepted for its interpretability. It gives reasonably correct values because this obeys the equation of continuity and it also takes care of diffusion, which is a random process. For the present study, this model is used for the prediction of maximum ground level concentration (GLC).

The air emission at M/s. Rudradev Cement Pvt. Ltd. can be considered to be mainly suspended particulate matter (SPM) with a considerable proportion being respirable particulate matter. The site specific and monitored details considered for input data for the software “ISC-AERMOD View” by Lakes Environmental, Canada for prediction of impact on air environment.

In order to conduct a refined air dispersion modeling using ISCST3 and ISC-PRIME short-term air quality dispersion models, the site specific hourly meteorological data measured at site is pre-processed using the U.S. EPA PCRAMMET and U.S. EPA AERMET programs. Before starting air dispersion modeling with ISC-AERMOD View, a building downwash analysis using BPIP View was done. BPIP View is a graphical user interface designed to speed up the work involved in setting up input data for the U.S. EPA Building Profile Input Program (BPIP) and Building Profile Input Program – Plume Rise Model Enhancements (BPIP-PRIME).

The air pollution caused by the gaseous emissions from a single or small group of stacks is a local phenomenon. Its impact will occur at a distance ranging from within the immediate vicinity of the stack to several kilometers away from the stack. Maximum ground level concentration will occur within this range. All plumes at more downwind distances from the source by stack emission become diluted by diffusion in the ambient atmosphere, that concentrations of pollutants become negligible. The maximum ground level concentration for different parameters is given in table-4.2. Equal concentration contour plots for PM, SO₂, and NO₂ are given in figure-4.2.

TABLE - 4.1 DETAILS OF EMISSION FROM STACKS

SR. NO.	OPERATING PARAMETER	UNIT	SOURCE OF EMISSION			
			Clinker Kiln Cooler	Raw Mill	Coal Mill	Cement Mill
1.	Stack height	meter	30	30	15	15
2.	Stack diameter at top	meter	2.0	1.5	0.5	0.5
3.	Flue gas exit velocity	m/s	18	5	11	6
4.	Emission concentration					
	PM	mg/Nm ³	50*	50*	50*	50*
	SO ₂	ppm	100 [#]	-	-	-
	NO _x	ppm	50 [#]	-	-	-
5.	Flue gas temp.	⁰ K	408	433	323	433

* Limit as per CREP guidelines, # Permissible limit of APCB.

FIGURE - 4.2 EQUAL CONCENTRATION CONTOUR PLOT FOR SPM

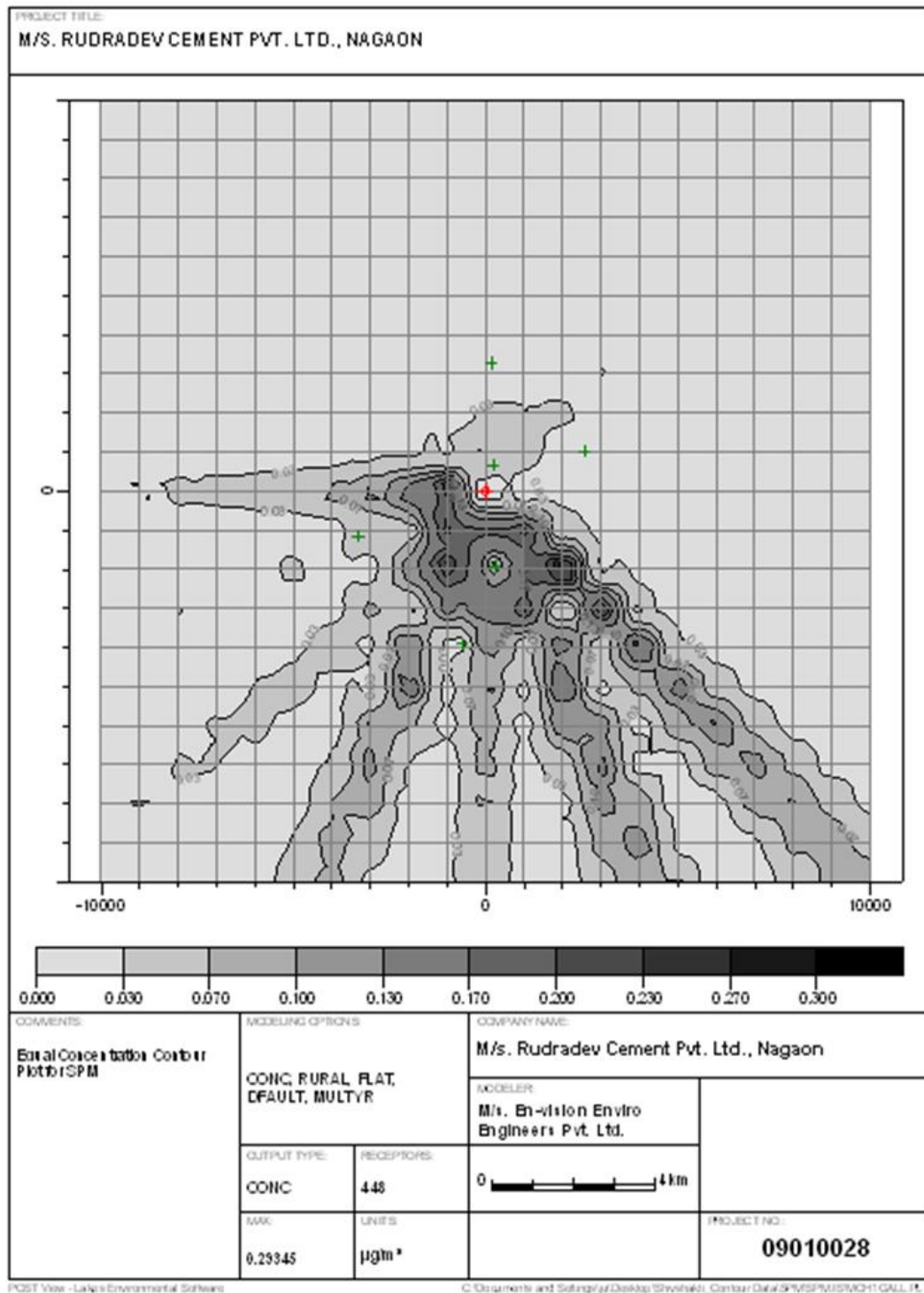


FIGURE - 4.2 EQUAL CONCENTRATION CONTOUR PLOT FOR SO₂

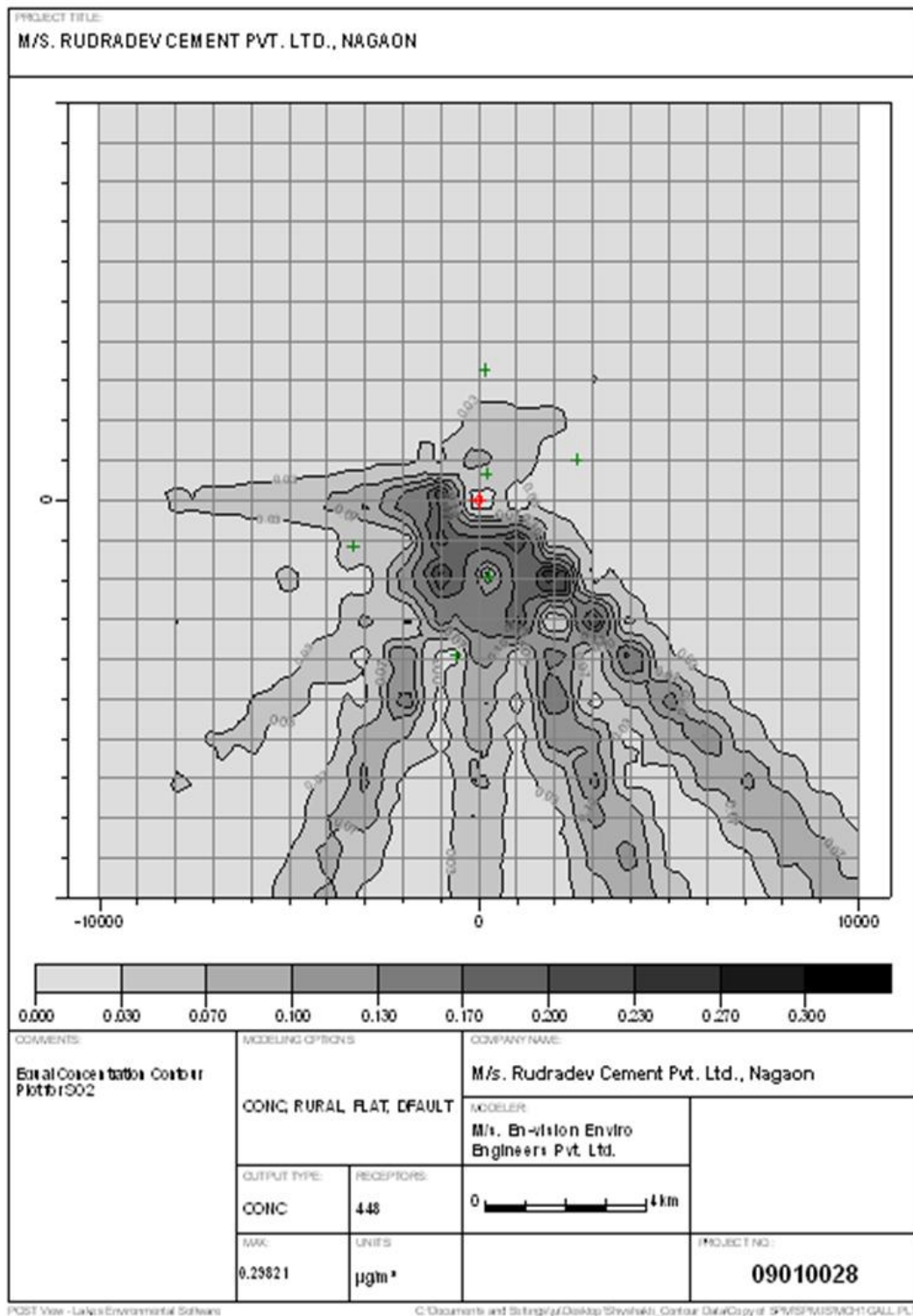


TABLE - 4.2 SUMMARY OF ISCST3 MODEL OUTPUT FOR PM, SO₂ AND NO_x

SR. NO.	LOCATIONS	CO-ORDINATES (X, Y)	MAXIMUM CONCENTRATION		
			SPM ($\mu\text{g}/\text{m}^3$)	SO ₂ ($\mu\text{g}/\text{m}^3$)	NO ₂ ($\mu\text{g}/\text{m}^3$)
1.	Project Site (A1)	(0 , 0)	0.00000	0.00000	0.00000
2.	Dekeruva (A2)	(215.8 , 647.5)	0.03744	0.05478	0.01977
3.	Nagayanpam (A3)	(-3309.4 , -1151.1)	0.00854	0.01364	0.00947
4.	Bher Bheri (A4)	(2589.9 , 1007.2)	0.04632	0.04124	0.01862
5.	Reng Beng (A5)	(251.8 , -1942.4)	0.01987	0.03469	0.01078
6.	Mikir Gaon (A6)	(143.9 , 3273.4)	0.01754	0.02247	0.00721

TABLE - 4.2 (CONT.) SUMMARY OF ISCST3 MODEL OUTPUT FOR PM, SO₂ AND NO_x

SR. NO.	X, Y CO-ORDINATES	MAXIMUM CONCENTRATION		
		PM ($\mu\text{g}/\text{m}^3$)	SO ₂ ($\mu\text{g}/\text{m}^3$)	NO ₂ ($\mu\text{g}/\text{m}^3$)
1.	(-2000 , -2000)	0.29345	-	-
2.	(-2000 , -2000)	-	0.29821	-
3.	(-2000 , -2000)	-	-	0.11764

TABLE - 4.3 PREDICTED AMBIENT AIR QUALITY FOR SPM, SO₂ AND NO_xUnit: $\mu\text{g}/\text{m}^3$

Avg. Period: 24 hours

SR. NO.	SAMPLING LOCATION	SPM	SO ₂	NO _x
		AVERAGE		
1.	Project Site (A1)	139.00	10.00	19.00
2.	Dekeruva (A2)	122.04	8.05	14.02
3.	Nagayanpam (A3)	128.01	9.01	15.01
4.	Bher Bheri (A4)	119.05	8.04	15.02
5.	Reng Beng (A5)	172.02	10.03	18.01
6.	Mikir Gaon (A6)	125.02	8.02	13.01

Ground level concentrations calculated for proposed project activities are superimposed on existing ambient air quality monitoring results and combined values (table-4.3) are found within permissible National Ambient Air Quality Standards.

4.2.3 FUGITIVE EMISSION AND CONTROL MEASURES

The cement plant handles large quantities of materials like limestone, sand, clinker and cement which are subjected to various dust generating operations like crushing, grinding, transfer etc. The unit will install air pollution control equipments to control particulate matter emissions. Fugitive emissions from the proposed plant would be significant as there will be air pollution due to activities like raw materials handling, crushing, transfer points of materials, packing of product and movement of vehicles. These operations generate large quantity of dust. Specific instances of fugitive dust generation may include dust blown by wind from the raw-materials stockpile, dust caused by vehicular traffic within the factory, dust leakage from conveyors, conveyor transport points, storage hoppers and packers etc, Good housekeeping, proper maintenance, wetting of dusty areas, use of enclosed storage wherever feasible etc., would considerably reduce fugitive dust.

For the purpose of effective prevention and control of fugitive emissions, the M/s. Rudradev Cement Pvt. Ltd. shall implement following:

- The storage shall be done under covered shed.
- Storage area shall be clearly earmarked.
- The silo vent shall be provided with a bag filter system to vent out the air borne fine.
- Enclosure shall be provided for all the unloading operations.
- Water shall be sprayed on the material prior and during unloading.
- All transfer points shall be fully enclosed.
- Airborne dust shall be controlled.
- All roads shall be paved on which movement of raw materials or products will take place.
- Regular sweeping of roads shall be carried out to minimize emissions.
- Preventive measures shall be employed to minimize dust build up on road.
- Conveyors shall be provided with conveyor cover.
- Maintenance of air pollution control equipment shall be done regularly.
- All the workers shall be provided with disposable dust mask.
- Green belt will be developed around the plant to arrest the fugitive emissions.
- Regular training shall be given to the personnel operating and maintaining fugitive emissions control systems.
- The industry shall take records to document the specific control actions taken.

Environmental Guidelines for Prevention and control of fugitive emissions from cement plants are given in Annexure-6.

The M/s. Rudradev Cement Pvt. Ltd. will follow CREP Guidelines as specified by CPCB and control fugitive emissions from all the raw material and products storage and transfer points.

4.2.4 SOIL ENVIRONMENT

4.2.4.1 SOURCE OF SOIL POLLUTION

Construction activities like excavation, construction material handling & storage, construction waste disposal etc. are main sources of soil pollution.

4.2.4.2 IMPACT AND MITIGATION MEASURES

The impact of air, water and solid waste pollution on soil causes direct/indirect effect on soil. As all necessary air pollution control steps will be provided and based on the results of the dispersion model for the ground level concentrations of various pollutants after the commissioning of the proposed project, there will not be any adverse impact of air pollution on soil. It may be noted that there will not be any industrial effluent generation as no water is required in the manufacturing process. Thus, there will not be any impact on soil due to water.

All necessary control steps will be provided for handling, storage and disposal of solid waste generated from the plant. Thus, there will not be any significant impact of solid waste on the soil environment.

4.2.5 NOISE ENVIRONMENT

4.2.5.1 CONSTRUCTION PHASE IMPACT

During construction, construction equipment, including dozer, scrapers, concrete mixers, generators, vibrators and power tools, and vehicles will be the major noise sources. Construction noise is difficult to predict because the level of activity will constantly change. Most of construction activities are expected to produce noise level within the prescribed limit. The noise generated from various sources will be of short duration. Therefore, no significant impact is envisaged on the construction force.

4.2.5.2 OPERATION PHASE IMPACT

The impact of noise depends mainly on the characteristic of the noise generating sources, topography and atmospheric conditions. Vehicular movements during operation phase for loading/unloading of raw and finished materials and other transportation activity may increase noise level. The noise generating sources will be enclosed with acoustic proof material to cut down the noise levels. Further, green belt will be developed in & around the proposed plant. So, the significant adverse impact of noise will be minimized.

Noise level in and around the plant site were measured. These values represent status of Noise levels, which is given in table-3.6 of Chapter-3.

4.2.5.3 MITIGATION MEASURES

Adequate noise control measures such as mufflers, silencers at the air inlet/outlet, anti vibration pad for equipment with high vibration, earmuff and earplugs to the operators etc. are provided. However, the existing and proposed green belt and plantation area will help to reduce noise. The adverse impact on occupationally exposed workers will not be envisaged, as noise protection devices will be provided as suggested in EMP.

4.2.6 SOLID WASTE GENERATION AND DISPOSAL METHOD

Solid waste generation and its disposal method are given in following table-4.4.

TABLE - 4.4 HAZARDOUS WASTE GENERATION AND DISPOSAL METHOD

SR.NO.	SOLID WASTE	SOURCE	WASTE MANAGEMENT DETAILS
1.	used/spent oil	Prime Movers	Reused in plant for lubrication or sell to authorized recyclers
2.	discarded drums or bags	Storage	Return to raw material supplier or sell to authorized recyclers

4.2.7 ENVIRONMENTAL HAZARD

Raw materials shall be transported by road and shall be stored in the plant premises. This report is prepared with the consideration of hazards and care shall be taken for all aspects of environmental hazards. The project proponent shall consider all the safety aspects in planning, designing and operation of the plant as per standard practices. Hence, no adverse impact on this account is anticipated.

4.2.8 HOUSING

Any permanent demand on existing housing facilities is considered as permanent impact. No township is constructed or proposed. Enough number of dwellings is available in nearby towns and villages for accommodating extra workforce. On neighboring towns or villages, the impact on this account is minimal.

4.2.9 ECOLOGY

The impact due to operation of the project and its activities on the ecological parameters like natural vegetation, cropping pattern, fisheries and aquatic life, forests and species diversity could be summarized as below.

4.2.9.1 NATURAL VEGETATION

There will not be any cutting of the plantation at the site. The industry will develop a green belt on the surrounding periphery.

Since the effluents and emissions generated from the project activities shall be treated and disposed as per the EMP provisions, adverse impact over any of the ecological components of the environment is reduced to minimum.

4.2.9.2 CROPS

Since, the proposed activities shall be on a non-agricultural land, it shall not alter the crop production of the area. Further, the necessary environmental protection measures have been planned under EMP e.g. air pollution control systems shall be designed to take care of even emergency releases of the gaseous pollutants and regular environmental surveillance shall be done, so as not to have any short-term or cumulative effect on the crops and the natural vegetation of the area.

4.2.9.3 FISHERIES AND AQUATIC LIFE

Only waste water i.e. sewage waste water 4.5 KL/day will be generated which will be treated through a septic tank followed by soak. Thus, it can be concluded that there will not be any significant adverse impact on the water environment. Hence no adverse impact of proposed project is envisaged.

4.2.9.4 AESTHETIC ENVIRONMENT

The proposed activities and plantation will enhance the aesthetic environment.

4.2.9.5 DEMOGRAPHY, ECONOMICS, SOCIOLOGY AND HUMAN SETTLEMENT

M/s. Rudradev Cement Pvt. Ltd. will give direct employment. In addition to direct employment; indirect employment shall generate ancillary business to some extent for the local population. There is a positive effect due to improved communication and health services, which have lead to economic prosperity, better educational opportunities and access to better health and family welfare facilities. There has been a beneficial effect on human settlement due to employment opportunities. There shall be no displacement of any population in plant area. Hence, there is no permanent impact on this account.

The increasing industrial activity will boost the commercial and economical status of the locality up to some extent.

4.2.9.6 PLACES OF ARCHAEOLOGICAL/HISTORICAL/RELIGIOUS/TOURIST INTEREST

There is no place of archaeological, historical, religious or tourist interest within the study area i.e.10 km radius of plant site. Hence, there shall be no impact on places of interest.

TABLE - 4.5 POTENTIAL IMPACTS & MITIGATIVE MEASURES

ACTIVITY	ENVIRONMENTAL ASPECT	POTENTIAL ENVIRONMENTAL IMPACT	MITIGATING MEASURES
<i>Air Resources</i>			
Site excavation, grading; and offloading of construction materials at the site	Dust	<ul style="list-style-type: none"> • Adverse Human health • Impaired visibility • Legal non –compliance • Nuisance 	Water the ground before excavation
	Emissions from construction equipment such as bulldozers, graders, concrete mixers and compactors including: Particulates, CO ₂ ,SO _x & NO _x	<ul style="list-style-type: none"> • Legal non –compliance • Adverse Human health • Greenhouse effect • Acid rain • Smog 	<ul style="list-style-type: none"> • Use of respirators by workers • Engine tune-up • Establish inspection program for equipment
<i>Water Resources</i>			
Site excavation, grading; & offloading of construction materials at the site	Dust	Nuisance	Water the ground
Factory operation	Sewage disposal	<ul style="list-style-type: none"> • Ground water contamination • Surface water contamination 	Sewage water to be discharged to septic tank
	Solid waste disposal	<ul style="list-style-type: none"> • Ground water contamination through leaching • Surface water contamination through run off 	Contract a licensed solid waste recycler or re-processor

ACTIVITY	ENVIRONMENTAL ASPECT	POTENTIAL ENVIRONMENTAL IMPACT	MITIGATING MEASURES
Geological Resources:			
Site excavation, grading; & offloading of construction materials at the site	Oil and material spills	Soil contamination	<ul style="list-style-type: none"> Spill control procedures Training
Biological Resources (Biodiversity):			
Excavation	Removal of soil and vegetation	Loss of vegetation and habitat to some animals (fauna)	Landscaping incorporating Grass cover, Plants, Flowers
Socio-economic Activities			
<i>Land use:</i>			
Construction of the factory	Non – compliance with regulatory and legal requirements	Change of land use pattern	Comply with regulatory and legal requirements
Economic Activity: All the significant impacts are positive. No mitigation measures are necessary.			
Community Services:			
Construction process	Water usage	Increased demand for water from local sources	Implement appropriate water conservation measures
Construction process	Electricity usage	Increased demand for electricity from the utility company	Implement appropriate energy conservation measures
Factory Operation			Conduct annual energy audits
Transportation:			
Construction activities	Transportation of construction materials to the site	Damage to roads	All vehicles delivering bulk materials to the site not to exceed recommended weight limit and comply with traffic rules
General Category:			
Construction at the site	Visual change	Perception of historical perspective of the area by stakeholders	Landscaping incorporating Grass cover, Plants, Flowers
Health & Safety:			
<i>Construction Phase:</i>			
Excavation, grading and concrete mixing	Dust	<ul style="list-style-type: none"> Adverse human health Legal compliance Nuisance 	<ul style="list-style-type: none"> Safety procedures Personal protective equipment Use of water sprays
	Noise		Personal protective equipment- ear protectors.
Operation Phase			
Factory operation	Fire	Loss of life and property	<ul style="list-style-type: none"> Fire prevention equipment to be provided Equipment inspection & service program Training of staff on fire management Provide & Label fire escape routes

ACTIVITY	ENVIRONMENTAL ASPECT	POTENTIAL ENVIRONMENTAL IMPACT	MITIGATING MEASURES
	Dust	Respiratory ailments	<ul style="list-style-type: none"> • Use of personal protective gear Use of water sprays at temporary storage piles • Use of covers on trucks to prevent air entrainment & spillage during hauling • Cleaning of trucks and covers after unloading each load • Use of covered or enclosed conveyors, crushers and material transfer points. • Site landscaping and planting of tree belts to prevent soil erosion and to reduce wind velocity
	Noise	Adverse human health	<ul style="list-style-type: none"> • Use of personal protective equipment – ear protectors • Inspection and maintenance programme on equipment • Annual noise level measurement • Use of suitable enclosures • Identification of noise hazardous areas and labeling as appropriate
	Use of equipment subject to statutory inspection	<ul style="list-style-type: none"> • Injury to users • Damage to the equipment 	Inspection & Maintenance programme
	<ul style="list-style-type: none"> • Sewage disposal / overflow • Solid waste disposal 	<ul style="list-style-type: none"> • Ground water contamination • Surface water contamination 	<ul style="list-style-type: none"> • Sewage & waste water to be discharged to septic tank • Contract a licensed solid waste transporter

4.3 MATRIX REPRESENTATION

The potential impacts during construction and operation phases are presented in the form of a matrix in Table 4.4 and 4.5. Construction activities will include only production facilities. The quantification of impact is done using numerical scores 0 to 5 as per the following criteria.

Score	Severity criteria
0	No impact
1	No damage
2	Slight/ Short-term effect
3	Occasional reversible effect
4	Irreversible/ Long-term effect
5	Permanent damage

The scores for various parameters and activities are presented in table-4.6 to 4.9.

4.3.1 CUMULATIVE IMPACT CHART

The total negative impact of various activities on any one parameter is represented as a cumulative score and the cumulative scores of various parameters are given in the form of a cumulative impact chart. Any particular parameter having an individual score greater than 4 or cumulative score of 20 implies serious effects due to the project and calls for suitable mitigation measures.

It is evident from the matrices that the resultant impact is beneficial to the local population and due to export (and import substitution) the resultant impact is beneficial to our country.

TABLE - 4.6 IMPACT IDENTIFICATION MATRIX (CONSTRUCTION PHASE)

Activities During Operation Phase	Air Quality	Noise & Odor	Water Quality	Soil	Flora	Fauna	Aesthetics	Socio-Economic Status	Cultural	Health & Safety
Site Cleaning	✓	✓	✓	✓	✓	✓	✓	-	-	✓
Excavation	✓	✓	-	✓	✓	✓	✓	-	-	✓
Construction	✓	✓	✓	✓	-	-	✓	-	-	✓
Equipment Installation	✓	✓	-		✓	✓	-	-	-	✓
Transportation	✓	✓	-	✓	✓	✓	-	-	-	✓
Material handling	-	-	-	-	✓	-	-	-	-	✓
Employment	✓	-	-	-	-	-	-	✓	✓	✓
Green belt development	✓	✓	✓	✓	✓	✓	✓	-	-	✓

TABLE - 4.6 (CONT.) ENVIRONMENTAL IMPACT MATRIX (CONSTRUCTION PHASE)

Activities During Operation Phase	Air Quality	Noise & Odor	Water Quality	Soil	Flora	Fauna	Aesthetics	Socio-Economic Status	Cultural	Health & Safety
Site Cleaning	2	1	1	2	1	1	1	0	0	2
Excavation	2	1	0	0	1	1	2	0	0	2
Construction	2	2	1	2	0	0	2	0	0	2
Equipment Installation	2	2	0	0	0	1	0	0	0	2
Transportation	2	2	0	1	2	2	0	0	0	2
Material handling	0	0	0	0	2	0	0	0	0	2
Employment	2	0	0	0	0	0	0	2	2	2
Green belt development	2	1	1	1	1	1	1	0	0	2

TABLE - 4.7 CUMULATIVE IMPACT CHART (CONSTRUCTION PHASE)

ENVIRONMENTAL PARAMETER	TOTAL CUMULATIVE SCORE
Air Quality	14
Noise and Odour	9
Water Quality	3
Soil	6
Flora	7
Fauna	6
Aesthetics	6
Socio Economic Status	2
Cultural	2
Health & Safety	16

TABLE - 4.8 IMPACT IDENTIFICATION MATRIX (OPERATION PHASE)

Activities During Operation Phase	Air Quality	Noise & Odor	Water Quality	Land Requirement	Infra-structure	Env. Hazards	Terrestrial Ecology Land-use	Socio-Economic Status	Aquatic Ecology	Resource Depletion
Water Requirement	-	-	✓	-	✓	-	-	✓	✓	✓
Raw material storage/Handling	✓	✓	✓	✓	✓	✓	✓	-	✓	✓
Gaseous/ fugitive Emissions	✓	-	-	-	✓	✓	-	✓	-	-
Product Storage/ Handling	✓	-	-	✓	✓	-	-	-	✓	-
Shutdown/ Startup	✓	✓	✓	-	✓	✓	-	-	-	✓
Equipment Failures	✓	✓	✓	-	✓	✓	-	-	-	-
Plant Operations	✓	✓	✓	✓	✓	✓	-	✓	✓	✓
Transportation	✓	✓	-	-	✓	✓	-	✓	-	-
Medical & Other Needs	-	-	-	✓	-	-	-	✓	-	-
Resource Consumption	✓	✓	✓	✓	✓	-	✓	-	-	✓

TABLE - 4.8 (CONT.) ENVIRONMENTAL IMPACT MATRIX

Activities During Operation Phase	Air Quality	Noise & Odor	Water Quality	Land Requirement	Infra-structure	Env. Hazards	Terrestrial Ecology Land-use	Socio Economic Status	Aquatic Ecology	Resource Depletion
Water Requirement	0	0	2	0	1	0	0	2	1	1
Raw material Storage/ Handling	1	2	1	1	1	2	1	0	1	2
Gaseous/ Fugitive Emissions	2	0	0	0	1	2	0	1	0	0
Product Storage/ Handling	1	0	0	2	1	0	0	0	1	0
Shutdown/ Startup	1	2	1	0	1	2	0	0	0	2
Equipment Failures	2	2	1	0	2	2	0	0	0	0
Plant Operations	1	2	1	1	1	2	0	2	1	2
Transportation	2	2	0	0	1	2	0	2	0	0
Medical & Other Needs	0	0	0	1	0	0	0	2	0	0
Resource Consumption	1	1	2	2	1	0	1	0	0	3

TABLE - 4.9 CUMULATIVE IMPACT CHART

ENVIRONMENTAL PARAMETER	TOTAL CUMULATIVE SCORE
Air Quality	19
Noise and Odour	16
Water Quality	10
Land Requirement	11
Infrastructure	12
Environmental Hazards	15
Terrestrial Ecology / Land use	3
Socio Economic Status	11
Aquatic Ecology	5
Re-source Depletion	6