RAPID ENVIRONMENTAL IMPACT ASSESSMENT

OF

DURGA CEMENT WORKS LIMESTONE MINE

ANDHRA CEMENTS LTD.

Gamalapadu Village, Dachepalli mandal, Guntur District,
Andhra Pradesh

For

INCREASE OF LIMESTONE PRODUCTION FROM 1.5 TO 3.0 MTPA

WINTER SEASON '06-07

Prepared By

B.S. ENVI-TECH (P) LTD
Hyderabad – 500 057

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CHAPTER - 1

INTRODUCTION

1.0 INTRODUCTION

1.1 ANDHRA CEMENTS LTD

ANDHRA CEMENTS LTD (ACL), is operating the following units for cement production in the state of Andhra Pradesh with total installed capacity of 1.4 MTPA.

	Production MTPA
Durga Cement Works	0.9
VCW	0.5

ACL has commissioned Durga Cement Works in the year 1983 near Durgapuram, Dachepalli Mandal of Andhra Pradesh. The clinker production capacity of the cement plant is 1.0 MTPA. Of the total clinker production of 1.0 MTPA, **ACL** is dispatching about 0.30 MTPA of clinker to VCW for cement production. With the balance clinker of 0.70 MTPA, **ACL** is producing cement of 0.8 MTPA.

Various grades of cement produced by **ACL** are:

a. Ordinary Portland Cement
b. Portland Pozzolona Cement
c. Portland Slag Cement

Limestone requirement is met from Captive Limestone Mine.

The current status of various units of **ACL** along with installed production capacities are given below :

OVERVIEW OF PRODUCTION CAPACITIES OF ACL

		INSTALLED CAPACITY MTPA
1	Clinker Production Capacity	1.00
2	Cement Production Capacity	0.90
3	Captive Limestone Mining	1.50

1.2 PRESENT PROPOSAL

ACL proposes to increase clinker production capacity of the cement plant from 1.00 to 2.00 MTPA. With increase of clinker production capacity of the cement plant, the limestone requirement increases from 1.5 to 3.0 MTPA

Limestone requirement of the plant is met from Durga Cement Works (**DCW**) Limestone Mine located in an area of 170.22 ha adjacent to the cement plant.

The present proposal pertains to increase of limestone production capacity of DCW Limestone Mine from 1.5 to 3.0 MTPA by incurring a project cost of Rs 5.0 crores.

1.3 LOCATION OF DCW LIMESTONE MINE

The mine is located near Gamalapadu village, Dachepalli Mandal, Guntur District of Andhra Pradesh. The site falls between 79°40' to 79°45' East longitude and 16°35' to 16°40' North latitude with an average msl of 80 m above msl. The area falls within Survey of India Toposheet no. 65 D/1 [1:50000 scale].

Fig-1.1 shows the location map of the mine.

The mine is located at a distance of 1.7 km away from the State Highway connecting Hyderabad-Vijayawada. Krishna River is flowing at a distance of 2.9 km in the northern direction of the mine.

Naguleru flows along the northern boundary of the mine site. Dandi vagu, a tributary of Krishna river is located at a distance 5.5 km of the plant in the western direction of the mine.

Bugga vagu source of Musi River is flowing at a distance of 7.0 km in NNW direction of mine. The confluence point of River Krishna & Musi is about 8.0 km from the mine in NW direction

The nearest village to the plant is Shrinagar located at a distance of 1.7 km form the mine.

FIG - 1.1
LOCATION MAP

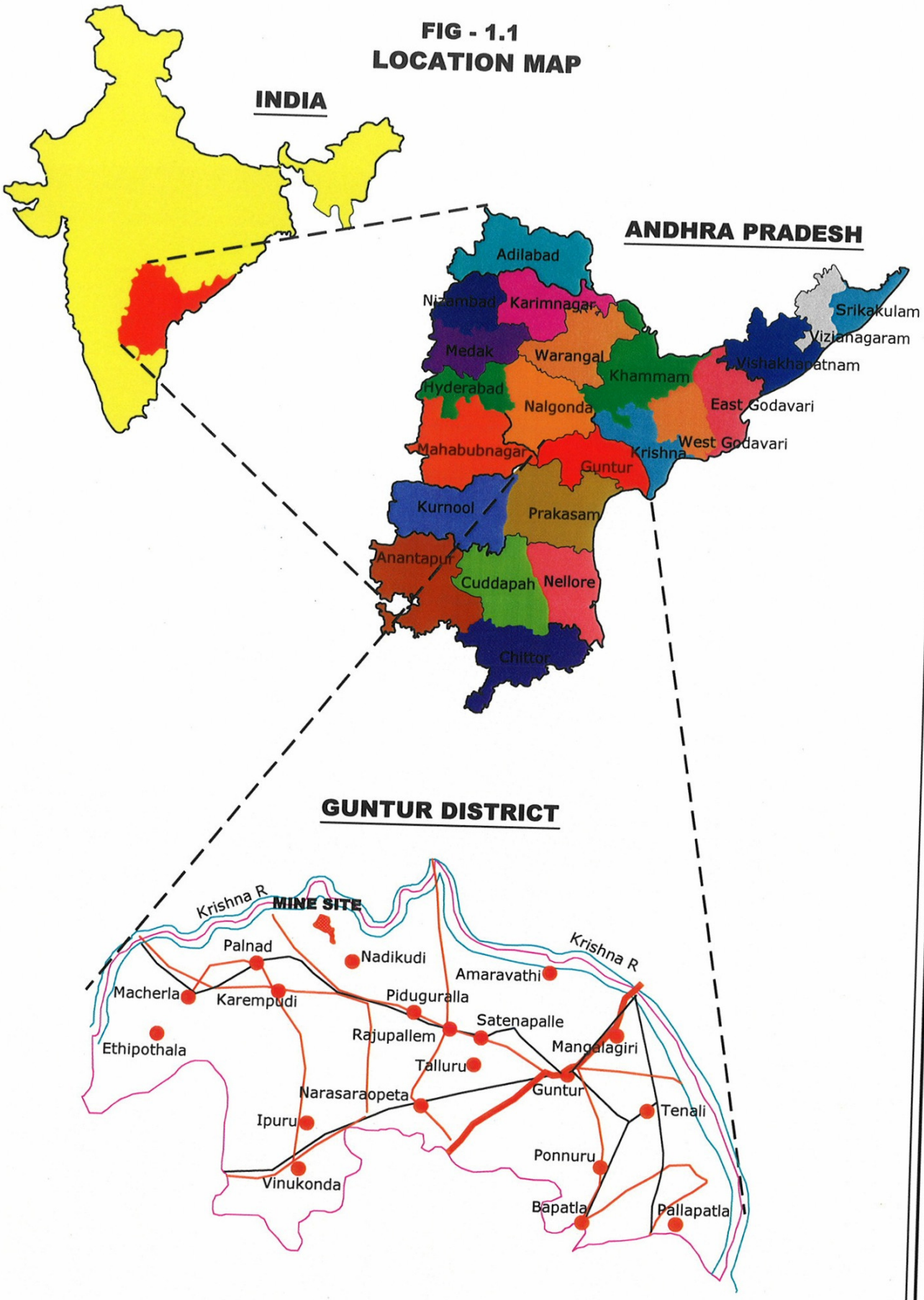


Fig-1.2 shows the Key Map of the mine.

The area is well connected by roads from Miryalaguda, Gurajala & Guntur. Miryalaguda is the main city which is located at a distance of 35.0 km from the mine.

The site is connected by Broad gauge railway line of South Central Railway on Guntur-Hyderabad section. The railway head is passing at a distance of 6.9 km in the SSW direction and the nearest railway station is Vishnupuram and junction is Nadikudi at 9.0 km from the Mine.

The India Cement Ltd.,
Penna Cement Industries Ltd.
Deccan Cements

The following are the Reserved Forests present in 10 km radius of mine:

Gamalapadu RF-0.1 km
Madinapadu RF-1.2 km
Daida RF-4.9 km
Saidaulnam RF-3.8 km
Ravipahad RF-5.3 km
Wazirabad RF-6.2 km

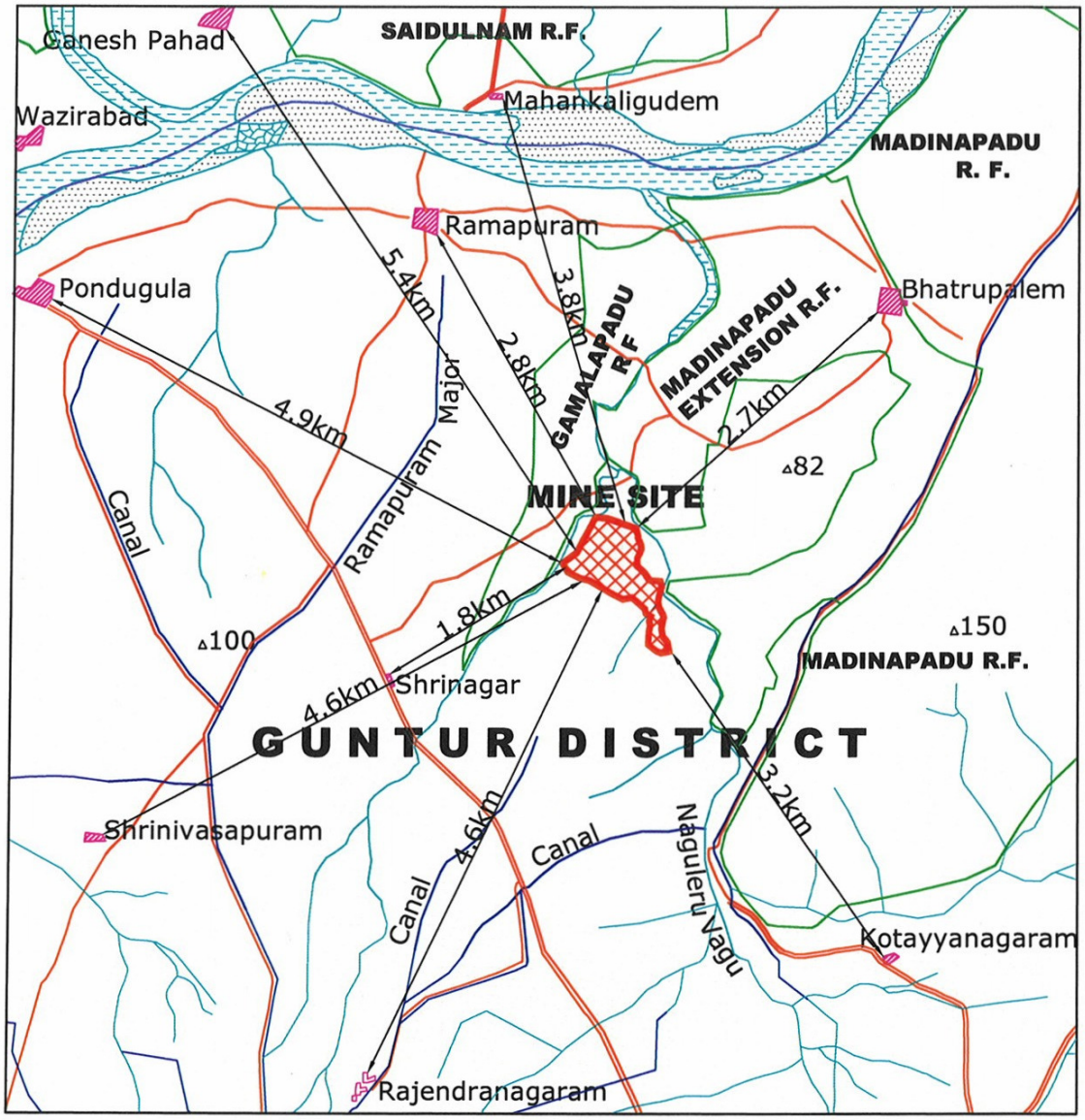
The nearest airport is at Vijayawada at a distance of 150 km from the mine.

Fig-1.3 shows the 10 km radius of the study area around the mine. **Table-1.1** gives the salient features of the mine.

1.4 DETAILS OF DCW MINE

The mine area falls under the revenue jurisdiction of Gamalapadu village in Guntur District of Andhra Pradesh. The entire mine area is a non forest land bearing survey number 611/18(P).

FIG - 1.2
KEY MAP



LEGEND

- ROAD
- STREAM/ TANK
- FOREST
- CANAL
- RIVER
- SETTLEMENT
- ▲100 SPOT HEIGHT
- DISTRICT BOUNDARY
- MINE SITE

SCALE
0 1 2km

FIG - 1.2

PROJECT :
ANDHRA CEMENTS LIMITED.,
GAMALAPADU VILLAGE, DACHEPALLI MANDAL,
GUNTUR DT, A.P.

TITLE :
KEY MAP

PREPARED BY:
B.S.ENVI-TECH (P) LTD.,
HYDERABAD

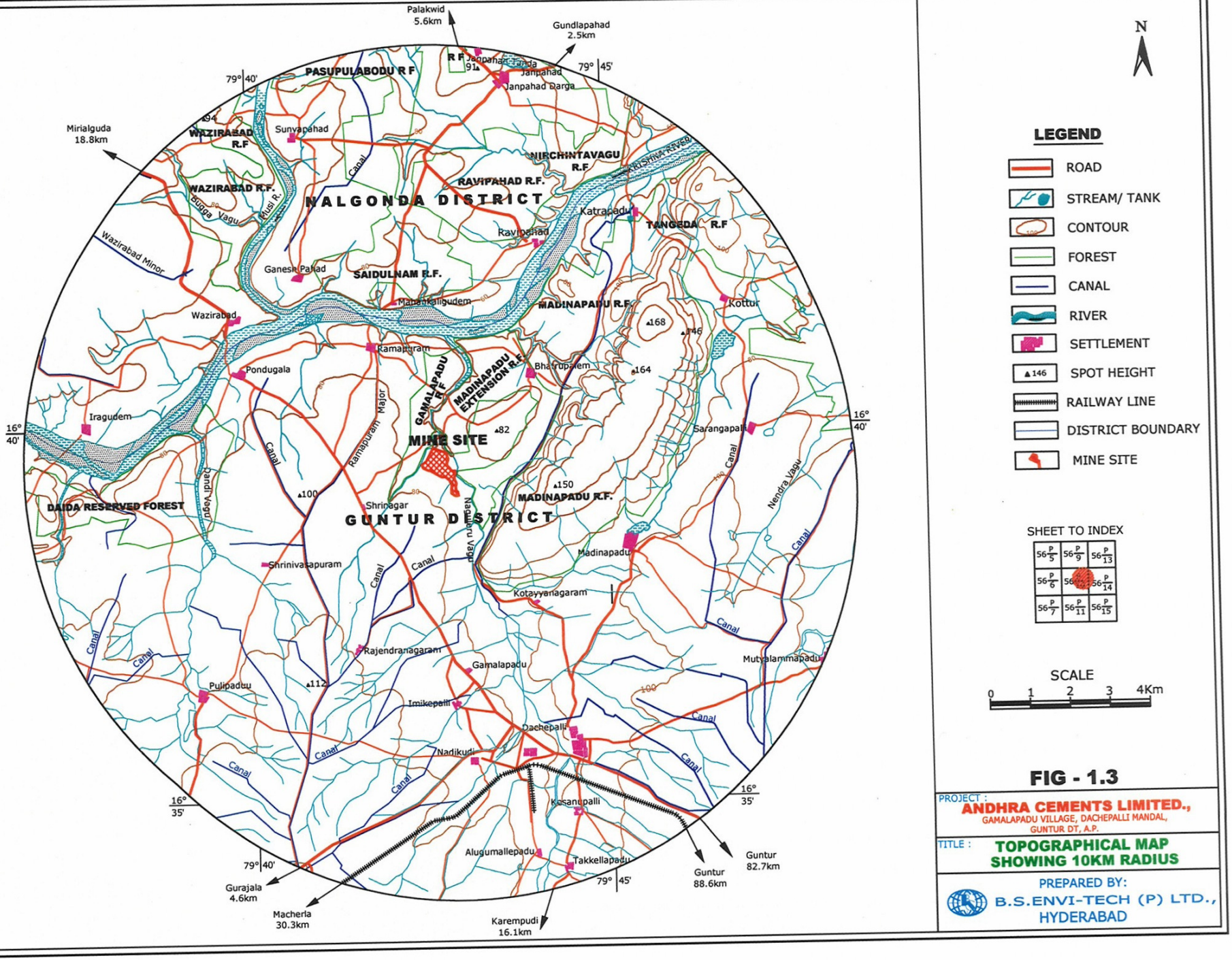


FIG - 1.3

PROJECT :
ANDHRA CEMENTS LIMITED.,
GAMALAPADU VILLAGE, DACHEPALLI MANDAL,
GUNTUR DT, A.P.

TITLE :
TOPOGRAPHICAL MAP SHOWING 10KM RADIUS

PREPARED BY:
B.S.ENVI-TECH (P) LTD.,
HYDERABAD

TABLE - 1.1

SALIENT FEATURES OF THE MINE

FEATURE	DETAILS
Altitude	68-78 m above msl
Longitude	79°40' to 79°45' E
Latitude	16°35' to 16°40' N
Village, Tehsil, District, State	Gamalapadu village, Dachepalli Mandal, Guntur District of Andhra Pradesh
Max. Temp.	46 °C
Min. Temp.	12 °C
Relative Humidity	40-80 %
Annual rainfall	800 mm
Land availability	170.22 Ha
Topography	Plain
Soil Type	SandyLoam
Nearest River	Krishna River – 5.0 km and Musi River - 8.0 km
Nearest Highway	State Highway connecting Miryalaguda-Guntur is passing at a distance of 1.7 km from the mine.
Nearest Railway station	Pondugala
Nearest Railway Junction	Nadikudi-8.0
Nearest Industries	The India Cement Ltd., Penna Cement Industries Ltd, Deccan Cements (All the Cement industries/mines are located within 10 km from the mine)
Nearest Village	Shrinagar Village- 1.7 km
Nearest City	Miryalaguda– 35.0 km
Nearest Air port	Vijayawada – 150 km
Nearest Forest	Gamalapadu RF-0.1 km, Madinapadu RF-1.2, Daida RF-4.9, Saidaulnam RF-3.8, Ravipahad RF- 5.3 & Wazirabad RF-6.2
Historical places	None within 10 km

** all distances mentioned in the above table are aerial distances.*

TABLE – 1.2

SALIENT FEATURES OF DCW LIMESTONE MINE

	DESCRIPTION	FEATURES
1.	Location of Mine	Gamalapadu village, Guntur District, Andhra Pradesh
2.	Total Area of Mining Lease (ha)	170.22
3.	Available limestone reserves (in million tonnes) in the mining area	63.52
4.	Production capacity (MTPA)	2.7
5.	Recovery ratio (Limestone:Overburden)	1:0
6.	Method of mining	Mechanised open-cast mining
7.	Disturbed area till date (ha)	55.0
8.	Expected mine life (years)	23
9.	Maximum depth of mining	24 m below ground level (42 m above msl)
10.	Source of Water	Mine Pit
11.	Total water requirement (m^3/day)	70
12.	Source of Power	Grid
13.	Manpower Requirement	50

The mine area is in the form of miniature promontory sloping from south to north. The contour level in the southern region is 78 m whereas it is 68 m in the northern region.

The promontory has slope both towards Naguleru on the east and Rallavagu on the West. The mine is surrounded by Gammalapadu reserved forest and Madinapadu Reserved forest.

The mine is located adjacent to the cement plant. Gamalpadu Village is about 4 km in the southern direction.

LIMESTONE RESERVES

The total mineable reserves of DCW mine as on 31-03-2007 are 63.56 million tonnes.

LIFE OF THE MINE

With the increased limestone production of 3.0 MTPA, the life of the mine is expected to be about 21 years.

LANDUSE PATTERN

The detailed land breakup of the mine lease area is given below :

LAND BREAKUP OF THE MINE AREA, HA.

S.No.	Item		AREA (HA.)
1	Area to be mined	Broken	55.00
		To be broken	65.00
2	Mines Office & infrastructure		3.50
3	Non Mining area	7.5 m barrier all along the mine lease	6.00
4		Area of Naguleru Stream along with area under HFL	29.22
5		50 m Barrier zone of Naguleru stream	9.50
6		Area of Rallavagu Seasonal stream	2.00
Total			**170.22**

Table – 1.2 shows the salient features of the DCW Limestone Mine

1.5 INFRASTRUCTURAL FACILITIES

All the buildings such as Mines office, well-equipped workshop, store, first-aid station, a sub station and Mines vocational Training Center under various Mines Rules have been provided by ACL. These buildings are well equipped with the required provisions and other facilities, such as power supply, water supply and fuel storage essential for smooth running of the mine.

ACL will procure required machinery for achieving the increased production of 3.0 MTPA.

1.5.1 PROVISION OF WORKSHOP

A well-equipped workshop is maintained at the Mine for maintenance and overhauling of Heavy Earth Moving Machineries, Compressors and Drills.

Well-experienced and skilled engineers and technicians look after the workshop. All the sub assemblies of HEMM, such as engine, transmission, brake and steering system are overhauled at the workshop.

1.5.2 WATER

ACL is presently using about 30 m^3/day of water for dust suppression, greenbelt, workshop and domestic consumption. The requirement of mining operations is met from the mine pit. The water for Domestic purpose is being supplied in tankers from the cement plant.

The additional water required when the mine is operated at enhanced production of 3.0TPA will be 30^3/day. Therefore the total water consumption in the mine will increase to 60 m^3/day.

1.5.3 POWER

The total power requirement of DCW mine area is 1.0 MW for quarry illumination and other utilities in the mine. This includes flood lights at the actual excavation face, dumping sites and street lights along the roads.

No additional power is required.

1.5.4 MANPOWER REQUIREMENT

ACL has employed about 31 persons for the present mining operations. Another 19 personal will be employed for handling the increased production

1.5.5 REST SHELTER

As per the requirement of Mines Act/Rules, rest shelter has been provided for workers to rest during lunch and tea breaks. A water cooler of adequate capacity has been provided to meet the requirement of supply of cool, whole-some drinking water to the workers.

1.5.6 FIRST AID STATION

As per the requirement of Mines Act/Rules a full-fledged first aid center and a dispensary under the charge of a qualified doctor is maintained with appropriate number of medical staff. To cope with the emergency situation one ambulance van with necessary medical equipment is provided at the first aid center.

1.5.7 STORES

To store the fast moving items and lubricants to be used in the mining machineries a storeroom at the mine site has also been provided.

1.5.8 MAGAZINE

A 10 metric tonne explosives magazine has been provided for storage of class 2 types of explosives along with an armed guard watch tower

1.6 ENVIRONMENTAL IMPACT ASSESSMENT STUDY

Keeping in view of the increase in limestone production and also to comply with the statutory requirement of the MoEF for obtaining the Environmental Clearance for increased production, ACL has carried out Environmental Impact Assessment over a radial distance of 10 km around the mine during Winter Season '06-07 covering the months of December '06 to February '07.

This report presents the existing baseline scenario, prediction of impacts along with detailed Environmental Management Plan, which will be implemented in the operational Phase at the increased limestone production.

CHAPTER - 2

SCOPE OF METHODOLOGY OF REIA

2.0 SCOPE AND METHODOLOGY OF THE REIA STUDY

2.1 SCOPE

The scope of the study includes preparation of Environmental Impact Assessment study with detailed characterisation of various environmental components such as air, noise, water, land and socio economic within an area of 10 km radius around the DCW limestone mine of Andhra Cements Ltd., [ACL] located near Gamalapadu village, Dachepalli Mandal, Guntur District of Andhra Pradesh as per the latest guidelines of MOEF/IBM.

The main objectives of characterisation are

- To assess the existing baseline status of air, water, noise, land and socio-economic environments within the Mine site (core zone) and around 10 km radius of the study area (buffer zone).

- To identify and quantify significant impacts due to various operations of the proposed increase in limestone production on various environmental components through prediction of impacts.

- To evaluate the beneficial and adverse impacts of the proposed increase in limestone production.

- To prepare an Environmental Management Plan (EMP) detailing control technologies and measures to be adopted for mitigation of adverse impacts if any, as a consequence of the proposed increase of limestone production.

- To prepare a Post Project Monitoring Programme for checking and regulating the environmental quality in the post expansion phase of the mine and help in sustainable development of the area.

2.2 METHODOLOGY OF REIA

Any developmental activity is expected to cause impacts on surrounding environment during the construction and operation phases. The impacts may be adverse or beneficial. In order to assess

the impacts due to increase in limestone production from 1.5 MTPA to 3.0 MTPA, an Environmental Impact Assessment study has been conducted within an area of 10 km radius around the mine site.

The various steps involved in Environmental Impact Assessment study of the project site are divided into the following phases:

- Identification of significant environmental parameters and assessing the existing status within the impact zone with respect of air, water, noise, soil and socioeconomic components of environment.

- Prediction of impact on air quality taking into consideration the proposed emissions to project the overall scenario

- Prediction of impact on Water, Land and Socio Economic Environment

- Evaluation of total impacts after superimposing the predicted scenario over the baseline scenario to prepare an Environmental Management Plan

The methodology adopted for studying the various individual components of environment are described below.

2.2.1 MICRO METEOROLOGY

An auto weather monitoring station to record meteorological parameters was installed to record the various parameters like Wind speed, Wind direction, maximum and minimum temperatures, relative humidity, cloud cover was recorded on hourly basis continuously for the winter season 2006 -07covering the months of December '06, January '07 and February '07.

Wind speed & wind direction data recorded during the study period were used for computation of relative percentage frequencies of different wind directions. The meteorological data thus collected has been used for interpretation of the existing Ambient Air Quality status,

and the same data has been used for prediction of impacts of future scenario due to the activities of the expansion scheme.

2.2.2 AMBIENT AIR QUALITY

Core Zone

Ambient air quality of the mine is assessed by three AAQ monitoring stations located at different locations of mine area.

Buffer Zone

The scenario of the existing ambient air quality in the study region has been assessed through a network of six ambient air quality stations during the study period within an area of 10 km radius around the mine. The monitoring network was so designed such that representative samples are obtained from the upwind direction, down wind and cross wind directions of the mine site. These monitoring sites have been established keeping in view the available climatological norms of predominant wind direction and wind speed of this particular region. The following points were also taken into consideration in designing the network of sampling stations:

a) Topography / Terrain of the study area
b) Populated areas within the study area
c) Residential and sensitive areas within the study area.
d) Magnitude of the surrounding industries
e) Representation of regional background levels
f) Representation of cross sectional distribution in downward direction.

The existing Ambient Air Quality status (AAQ) has been monitored for SPM, RPM, SO_2, NO_x, and CO. SPM & RPM at each station has been monitored on 24 hourly basis and all the gaseous sampling has been done on 8 hourly basis except CO which was monitored on 4 hourly basis.

Precalibrated Respirable dust samplers have been used for monitoring of the existing AAQ status. Methodologies adopted for sampling and

analysis were, as per the approved methods of Central Pollution Control Board (CPCB). Maximum, minimum, average and percentile values have been computed from the raw data collected at all individual sampling stations to represent the ambient air quality status of the study area.

2.2.3 NOISE ENVIRONMENT

Core zone

Spot Noise levels were measured at four locations within mine area at various noise generating sources.

Buffer zone

Noise monitoring has been carried out at six locations to identify the impact due to the existing sources on the surroundings in the study area. Noise levels were recorded at an interval of 30 minutes during the day and night times to compute the day equivalent, night equivalent and day-night equivalent level.

2.2.4 WATER ENVIRONMENT

Eight water samples from various locations around the mine site within 10 km radius were collected for assessment of the existing physico-chemical and bacteriological quality. Out of 8 samples, 7 samples from ground water & one sample from surface water body [Krishna River] were collected. Methodologies adopted for sampling and analysis were according to the IS methods. Field parameters such as pH, Temperature were monitored on site. The parameters thus analysed were compared with IS 10500. The activities surrounding the source during sampling were taken into consideration in interpretation of the water quality of that particular source.

2.2.5 LAND ENVIRONMENT

Field surveys were conducted to identify the land use in and around 10 km radius of the mine area. Representative soil samples were collected from -seven sampling locations within an area of 10 km

radius in and around the mine for analysis of the physico chemical characteristics to assess the cropping pattern, microbial growth etc. Standard procedures were followed for sampling and analysis. The samples collected were also analysed to check the suitability for growth of native plant species in and around the mine site. Information on flora and fauna has been collected in the study area during the study period within 10 km radius.

2.2.6 SOCIO – ECONOMIC ENVIRONMENT

Details on economic status of various villages within an area of 10 km around the mine site have collected.

Information on existing amenities has been collected to determine the developmental activities to be undertaken by the ACL authorities. Such developmental activities would result in upliftment of the economic status in the area.

All the above environmental parameters have been used for identification, evaluation and prediction of significant impacts.

2.3 PREDICTION OF IMPACTS, ENVIRONMENTAL MANAGEMENT PLAN & DISASTER MANAGEMENT PLAN

Various technical aspects of the expansion of the mine have been studied to identify the significant impacts which would arise for the limestone production from 1.5 to 3.0 MTPA. The identified impacts have been quantified through prediction of impacts to estimate the post project scenario.

Identified impacts due to expansion of the limestone production have been studied in detail to predict the impacts on various environmental components. Standard techniques and methodologies have been adopted to predict impacts on various environmental components. Predicted scenario has been superimposed over the baseline (pre-project) status of environmental quality to derive the ultimate (post-project) scenario of environmental conditions.

Environmental Management Plan (EMP) of the limestone mine details the control measures which are being undertaken and which are proposed to be undertaken by ACL for the increased production to maintain environmental quality within the stipulated limits specified by State Pollution Control Board /MOEF/IBM.

CHAPTER - 3

GEOLOGY AND RESERVES

3.0 GEOLOGY AND RESERVES

The geological reserves in the mine area have been estimated after carrying out detailed exploration. This chapter presents details of the same.

3.1 PHYSIOGRAPHY OF THE SITE

The mine area is an undulating terrain with low relief and no prominent physiographic features. The drainage pattern is of dendritic type, primarily controlled by the Naguleru and Rallavagu. The Naguleru, which as the larger stream is a tributary of the Krishna River. It runs parallel to the eastern arid northern boundary of the leases. The Pallavagu is a tributary of the Naguleru and it forms the western boundary of the lease area. The lease area in general is triangular with the apex pointing to the north base forming the southern boundary.

Topographically the lease area is in the form of miniature promontory sloping from south to north. The contour level in the southern area is about 79m and whereas in the northern area it is 58m. The promontory has a slope both towards Naguleru on the east and Rallavagu on the west. Both these streams appear to be controlled by the structure mainly the eastern and western thrusts.

Both streams appear to have changed the course in recent times. Naguleru has shifted eastward from its original course. The old course is marked by a prominent pebble bed, and the area upstream forms an alluvial patch. The Pallavagu has cut-off a meander near its confluence with the Naguleru and presently there is only a trickle in its abandonded course, which forms a minature ox—bow.

Gamalapadu Village is about 4 km south of the area as crow flies. It is 3 kms to the west of Dachepalli on the Guntur— Hyderabad highway. Another Village nearby is Ramapuram located about 3 km north of the area. Agriculture is the main occupation of this part of the District. Cultivation is seasonal and confined to the vicinity of the Villages. There are no forest lands within the lease area but such lands are

found on the north eastern, side beyond the Naguleru comprising a scrub jungle. Further to the east is a high ground the slope of which is occupied by rocky waste. Beyond the Rallavagu there is a narrow strip of forest extending northwards, consisting of cacti. Between the forest land and the Ramapuram village seasonal cultivation is practised but only in patches.

Fig – 3.1 shows the surface features of the DCW limestone mine.

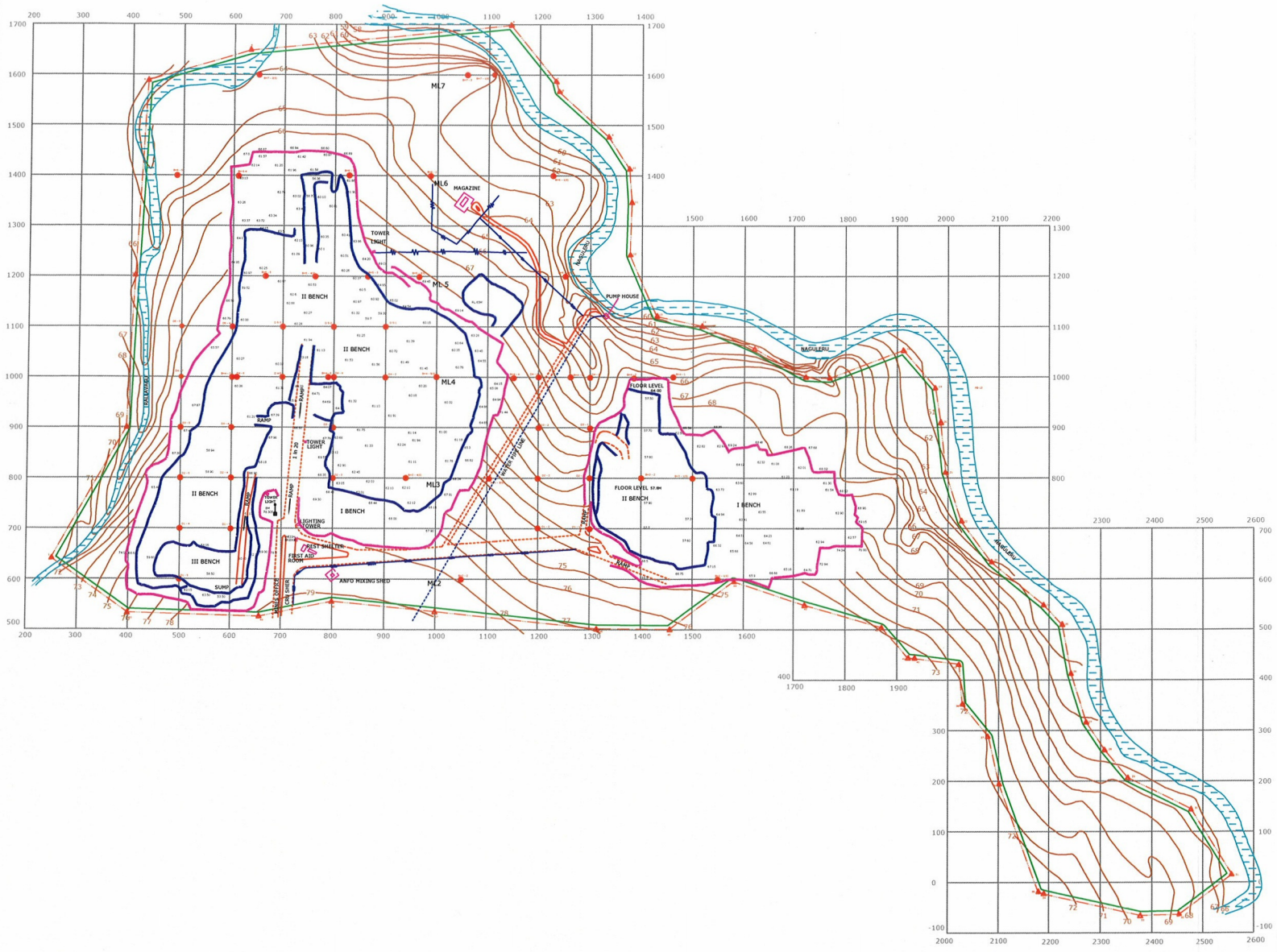
3.2 GEOLOGY

REGIONAL GEOLOGY

According to the Geological Survey of India, this area forms part of the Palnad basin, which is considered to be the eastern extension of the Kurnool basin. The Geological sequence as identified by the G.S.I. is given next:

Series	**Stages**
Kundair	Nandyal Shales Koilkuntla Limestone
Panyam	Pinnacled Quartzites Plateau Quartzites
Jammalamadugu	Nargi Limestones Auk Shales
Banganapalli	Sandstones

The Limestone in this area are considered as being equivalent to the Narji Limestones. Detailed work, carried out in various parts of the Palnad basin in connection with the limestone investigations has thrown considerable light of the scale of the tectonic disturbances as well as the grade of metamorphism and metasomatism exhibited by these rocks, which indicate that the rocks are possibly older.



N

LEGEND

- BOUDARY
- CONTOUR
- ROADS
- POWER LINE
- BORE HOLES
- NALA
- BENCH MARK

FIG - 3.1

PROJECT :
ANDHRA CEMENTS LIMITED.,
GAMALAPADU VILLAGE, DACHEPALLI MANDAL, GUNTUR DT, A.P.

TITLE : **SURFACE FEATURES OF DCW MINE**

PREPARED BY:
B.S.ENVI-TECH (P) LTD.,
HYDERABAD

Since the main tectonic stresses associated with the eastern Ghat Orogeny, have acted from the East or E.S.E direction, the entire sequence, in the Palnad, yielded to thrusting by over-folding and subsequently to contemporaneous shearing. The sheares are of low angle type, the angles scarcely exceeding 10 deg and appear in certain places to be of the bedding plane type. The presence of cleavage and shear planes has completely obliterated the bedding dip, and the limestones shows recrystallisation and also flowage. The dips displayed by these rocks are the dip of the cleavage and the shear planes. However, the bedding is visible and it is represented by very faint striations on the cleavage surfaces.

Both the shear planes dip at low angles between 5 to 10 deg. To the E.S.E. it is also seen that the limestones have been traversed by secondary quartz veins indicating a period of silicification or silica matasomatism. Veins of calcite are also seen as remifications within the limestones indicating the mobilization of the limestones increasing the magnesium content but not appreciably. This has been confirmed by petrographic examination.

MINE GEOLOGY

The Gamalapadu area being located at the eastern extremity of the Palnad basin has been disturbed by the post Cuddapah tectonic movements. The structural disturbances are seen in the form of shearing and thrusting. One of the major thrusts is exposed near the eastern margin of the existing leasehold close to the Naguleru. Another thrust of lesser magnitude is seen near the western margin of the lease close to the Rallavagu. Since the two thrusts mentioned above converge in the north, the lease area lying in between, has been subjected to compression.

The formations have responded sympathetically by yielding. Which is expresses itself as miniature bedding plane thrusts as a consequence there is an apparent increase in the thickness of the formation locally due to repetition. Since the arogrenic forces had induced flowage, the margin between the green and grey limestones are diffused.

As seen elsewhere in the Palnad area, the subject area also has quartzites expected to form basel beds. However the quartzites outcrop at a distance of about 1 KM to the east of the eastern boundary beyond the Naguleru and the vicinity of the villages they form a low ridge, the dips as seen in the quartzities is of the order of 20 deg to the west. Assuming that there is no structural disturbances in the intervening area, the basel beds are likely to be present at a depth of 60 m and beyond or BO.

Detailed petrographic examination of the grey and green limestones has shown that the grain sizes of the primary calcite found in the limestone vary between 10-20 microns. The grain size of the quartz originally present in the limestone is about 50 or 30 microns where as the quartz in the secondary silicon veins which traverse the limestone is 150-200 microns in length. Both the secondary silica veins and calcite veins shows anaistotropism and fine remifications, which influence the tenor.

The limestone exposed within the leasehold shows variations in colour generally green to grey which have gradational contacts. As the same time these limestones are fine grained hard, compact and recrystallised due to low grade metamorphism which has obliterated the bedding planes completely.

STRUCTURE OF THE DEPOSIT

What is observed as dips are those of the cleavage plan resulting from structural disturbances and induced partial recrystallisation. The strike of the cleavage planes is nearly NS and dip is towards E or S E at varying angles between 15 to 20 degrees. It is due to this reason that the western wall of pit. 1 shows number of slips whereas eastern wall is firm and vertical since the cleavage planes dip inwards into the face. The dips wherever observed are low being 5 to 6 deg, towards E. these features are clearly displayed on the western wall of the present working pit addition to cleavage planes there are vertical joint planes running NE-SW. some of the cleavage planes have been traversed by secondary silica and calcite veins with vugs and these vugs certain quartz crystals. One of the minor shear planes exposed at the western side of the northern end of the ramp contains reddish siliceous

material can be traced on western wall of the pit. The rocks on either side of this band appear to be disturbed and it is marked by the presence of quartz calcite veins.

A major thrust is observed along the western boundary of the lease area trending in a general NW-SE direction and dipping eastwards. It is well exposed near the SE corner of the pit-2 (Lat.600 Dep.147h) when it is traced northwards, it is seen that the older course of the Naguleru follows this thrust and the abandoned course is represented by pebble bed. As a result of this thrust, the grey limestone occurring on the east has been brought into contact with greenish limestone on the west. Further as a result of this low angle thrust, which dips towards the east, wedge of a grey limestone overlies the green limestone. Consequently, the drilling carried out in pit-2 shows that the holes on the western side do not encounter the grey limestone whereas the holes on the eastern side of the pit have shown large thickness of grey limestone comparatively. There is a comparatively minor thrust which runs parallel to Rallavagu on the western boundary of the lease. This structure also dips at a low angle eastwards.

Fig – 3.2 shows the geological plan and geological section of the area is shown **Fig – 3.3**.

3.3 RESERVES

A) GEOLOGICAL RESERVES – DCW Mine

The total geological reserves were estimated to be about 92.73 million tonnes.

B) MINEABLE RESERVES

In the mine area, it is planned to exploit the entire thickness of Grey & Variegated Limestone up to the Ultimate pit limit. The ultimate pit limit is designed, considering safety zone from Naguleru Nalla. Mineable reserves are recalculated and estimated considering the following.

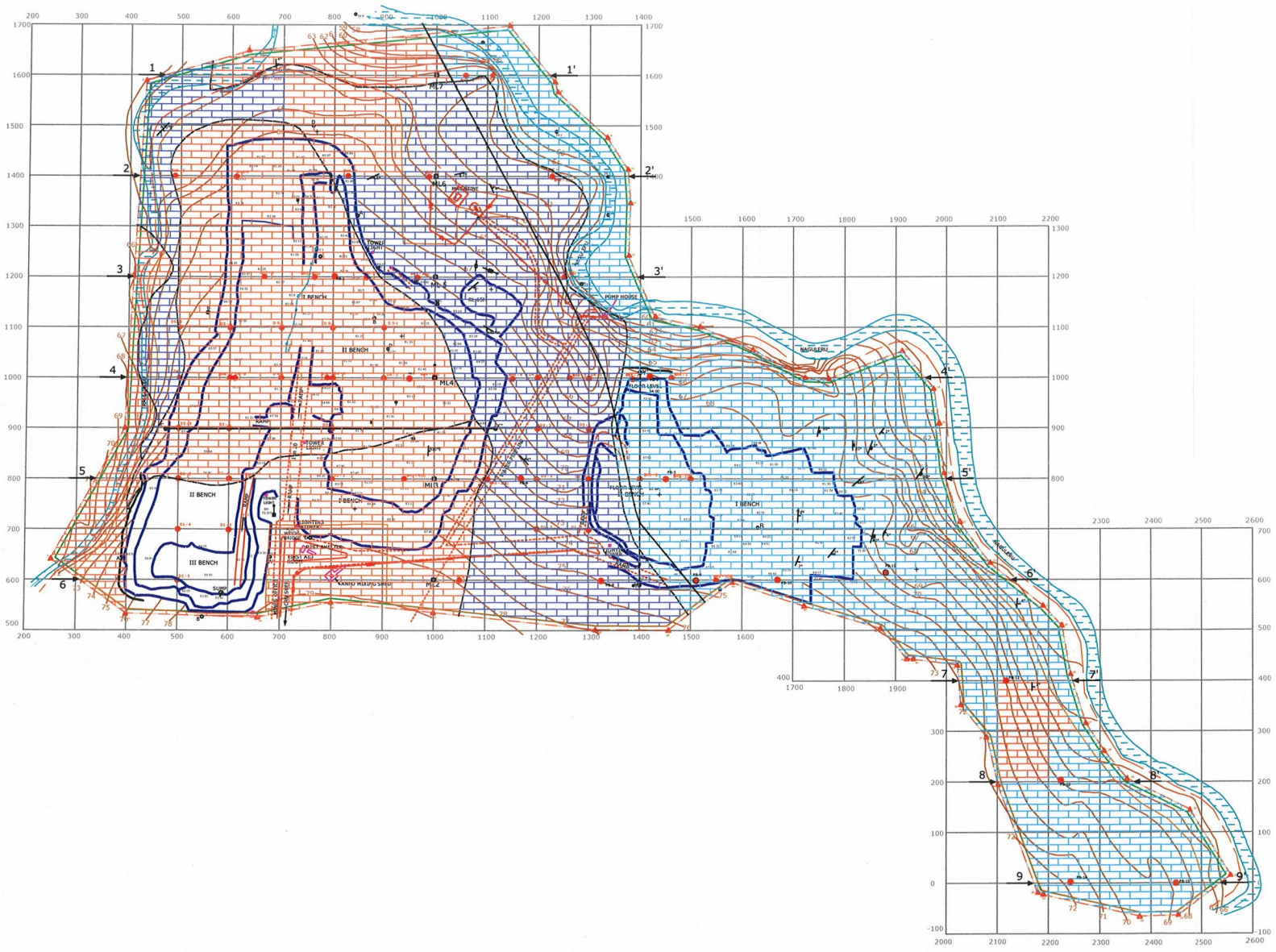


FIG - 3.2

PROJECT :
ANDHRA CEMENTS LIMITED.,
GAMALAPADU VILLAGE, DACHEPALLI MANDAL, GUNTUR DT, A.P.

TITLE :
GEOLOGICAL PLAN

PREPARED BY:
B.S.ENVI-TECH (P) LTD.,
HYDERABAD

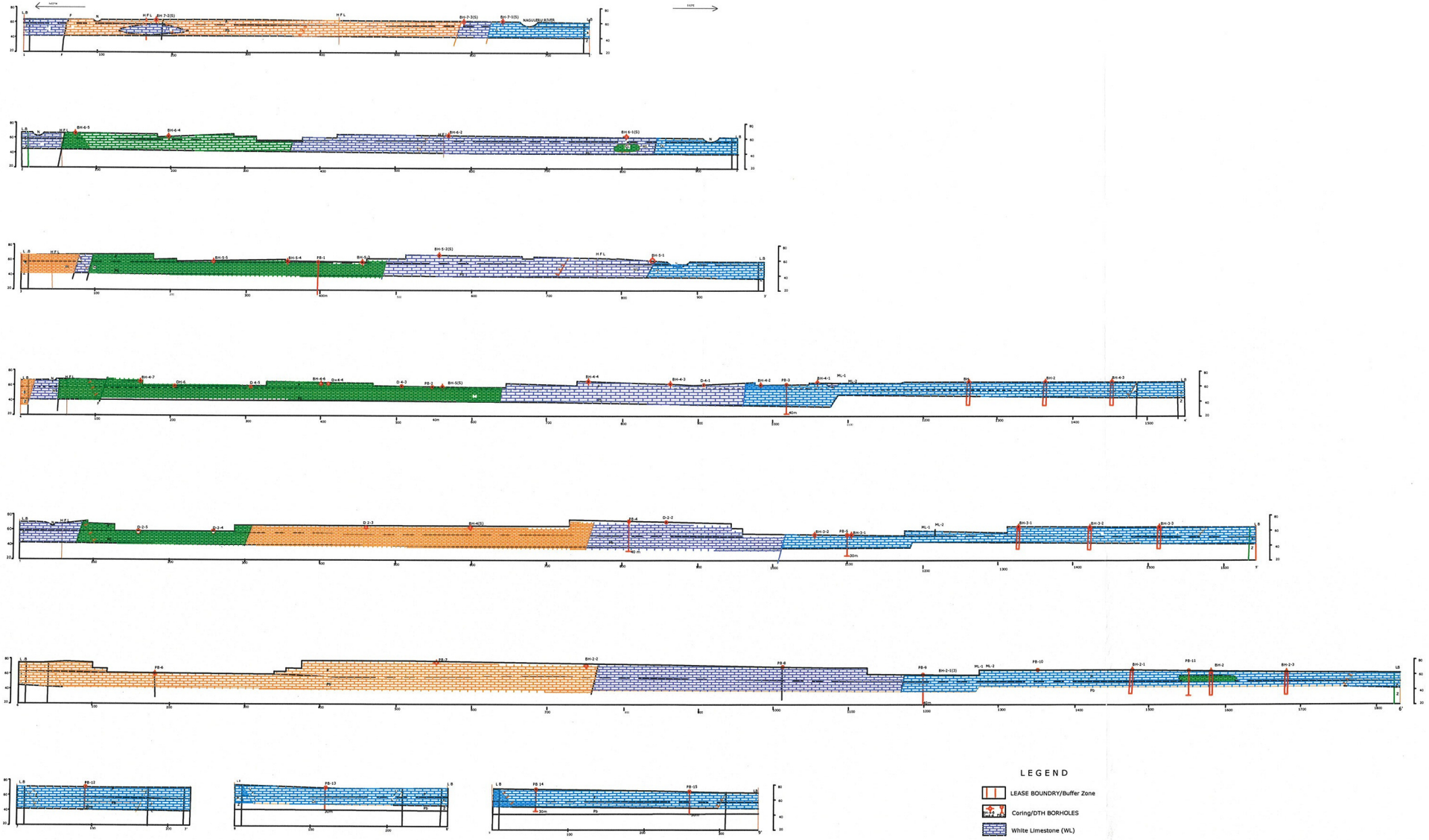


FIG - 3.3

PROJECT :
ANDHRA CEMENTS LIMITED.,
GAMALAPADU VILLAGE, DACHEPALLI MANDAL, GUNTUR DT, A.P.

TITLE :
GEOLOGICAL CROSS SECTIONS

PREPARED BY:
B.S.ENVI-TECH (P) LTD.,
HYDERABAD

- 7.5 m barrier all along the mine lease
- Area of Naguleru Stream along with area under HFL
- 50 m Barrier zone of Naguleru stream
- Area of Rallavagu Seasonal stream

The total reserves in the mine area after deducting the reserves locked up under the above limits are about 63.56 million tonnes

The mineable reserves which are about 63.56 million tonnes would support the cement plant by supplying the limestone requirement for 23 years at production rate of 2.7 MTPA.

3.4 USE OF LIMESTONE

The mined out limestone will be used exclusively for captive consumption in the cement plant.

CHAPTER - 4

LIMESTONE MINING

4.0 LIMESTONE MINING

4.1 PRODUCTION CAPACITY

ACL is producing the limestone mineral from 55 ha of the broken area. This mine is supplies the limestone requirement of DCW cement plant. The present limestone production from the mine is about 1.5 MTPA. ACL proposes to increase the limestone production to 2.7 MTPA. The measured mineable reserves are of the order of 63.56 million tonnes which will last for another 23 years.

4.2 ACTIVE MINING AREA

The total area of the mining lease is about 170.22 ha. Of the total 170.22 ha., about 55 ha. is already broken for production of limestone

Entire lease area is mineral bearing where the area proposed to be mined during the entire life of the mine shall be 120 ha. leaving the following safety zones

- 7.5 m barrier all along the mine lease
- Area of Naguleru Stream along with area under HFL
- 50 m Barrier zone of Naguleru stream
- Area of Rallavagu Seasonal stream

Therefore the active mine area of mine for operation during the next 23 years will be as follows :

ACTIVE MINE AREA (ha.)

S.No.	Item		AREA (HA.)
1	Area to be mined	Broken	55.00
		To be broken	65.00
2	Mines Office & infrastructure		3.50
3	Non Mining area	7.5 m barrier all along the mine lease	6.00
4		Area of Naguleru Stream along with area under HFL	29.22
5		50 m Barrier zone of Naguleru stream	9.50
6		Area of Rallavagu Seasonal stream	2.00
Total			**170.22**

4.3 MINE GEOMETRY

The mining operations are carried out by fully mechanised open cast mining method with versatile drilling units powered by compressors. Hydraulic excavators are being used to load the blasted limestone into dumpers.

A safe working and permitted bench height of 8 metres maximum is maintained in the present workings. Presently two pits are under operation.

The drilling pattern adopted at the top bench is 3.5 mts. burden, 4.5 mts. spacing and 8.1 mts. depth. The holes are drilled with 115 mm dia. bit in staggered pattern. Inclined hole drilling is adopted with 15° inclination to the vertical. The explosive distribution is 15 to 20% base charge (slurry explosives)and 85 to 80% column charge (ANFO mixture) adopting controlled blasting techniques. Adequate stemming with drill cuttings is used, and Exel Down- the-hole detonators as well as surface connectors in combination with Sequential Blasting machine is utilised for control of blast induced ground vibration, fly rock and noise.

The present method of drilling and blasting with Non-Electrical initiation system has the following advantages.

Better fragmentation, muck pile formation lower than the bench height, minimised vibration, noise and fly rock. The explosive charge will be utilized better when compared to the other type of initiation. Toe breakage is good facilitating easy digging of the material. An explosive van of 3 tonnes capacity serves to transport the required quantity of the explosives from the licensed magazine to the mine site for conducting blasting. To facilitate on-site maintenance of the field mining equipment, an Elgi mobile service van is provided.

A Demag excavator of 3.2 Cu.mts capacity bucket is deployed for loading the blasted material onto the 35 tonnes dumpers. The loaded material is transported and unloaded at 450 tph capacity

crusher hopper located at a distance of 0.5 km from the mine. For transportation of the mineral three Dumpers are deployed .

The Mine hosts outcrop of limestone. Hence no developmental works are envisaged.

4.4 PRODUCTION PLAN

The limestone produced from the mine will be at the rate of 6.0 MTPA

It is proposed to excavate about 63.56 million tonnes of limestone in 11 years. A maximum of three benches would be operated.

4.5 HANDLING OF WASTE /SUB GRADE MATERIAL

The mine is devoid of top soil or waste rock.

4.6 CONCEPTUAL MINING PLAN

Out of the total lease area of 170.22 ha, the area proposed to be utilized for mining is about 120 ha. ACL will retain the course of seasonal nala and Naguleru river. Conceptually there will be two – three mineral benches.

Considering the geological, mining, Environmental and site specific constraints such as seasonal nala, the total deposit in its horizontal and vertical extent will be worked in two pits i.e "Pit – 1 in East", "Pit – 2 in West which ultimately merge into a single pit

Conceptually the ultimate pit layout will be irregular in shape.

The volume of the void resulting from exhaust of the deposit is estimated to be about 25.0 cum. The minedout area will be converted into the water reservoir.

Ultimate pit slope would be 60° to provide the stability. Minimum bench width would be kept as 6 m from the faces at the end of ultimate pit limit. Ultimate Pit geometry of three pits is given below

The bench parameters upto the end of conceptual period of the deposit is given below :

ULTIMATE PITS GEOMETRY – LIFE OF MINE

• Area, ha	120
• Total nos of working benches	2-3
• Ultimate pit slope	below 60°
• Ultimate depth of Pit	24 (max)
• Minimum width to be left out, m	6

The conceptual plan and section at the end of the deposit is enclosed in **Fig – 4.1**.

4.7 ANTICIPATED LIFE OF THE MINE

In the Mining area, a total quantity of 63.56 Million Tonnes of mineable reserves are available as on 31-03-2007. Based on the proposed rate of consumption of 6.0 million tones per annum, the existing reserves shall last for about 11 years.

Anticipated life of the mine = 63.56/6.0 = 10.9 years say 11 years

4.8 MINING MACHINERY

The list of mining machinery is given below in **Table – 4.1**.

TABLE – 4.1
LIST OF MINING MACHINERY

SL. No	TYPE OF MACHINERY	Number
1.	Wagon Drilling machine, 150 mm dia	3 nos
2.	Compressors 180 HP	3 nos
3.	Hydraulic Excavator	3 nos
4.	Dumpers – 35 tonnes	7nos
5.	Wheel loader – 1.5 cum	1 no
6.	Water tanker – 10 kl	1 no
7.	Dozer, D-155, 450HP Kirloskar	1 no
8.	Mobile servicing unit for equipment maintenance	1 no
9.	Welding Transformer	1 no
10.	Explosive van, 3 T capacity	1 no
11.	Centrifugal pumps, 37KW, Kirloskar	2 no

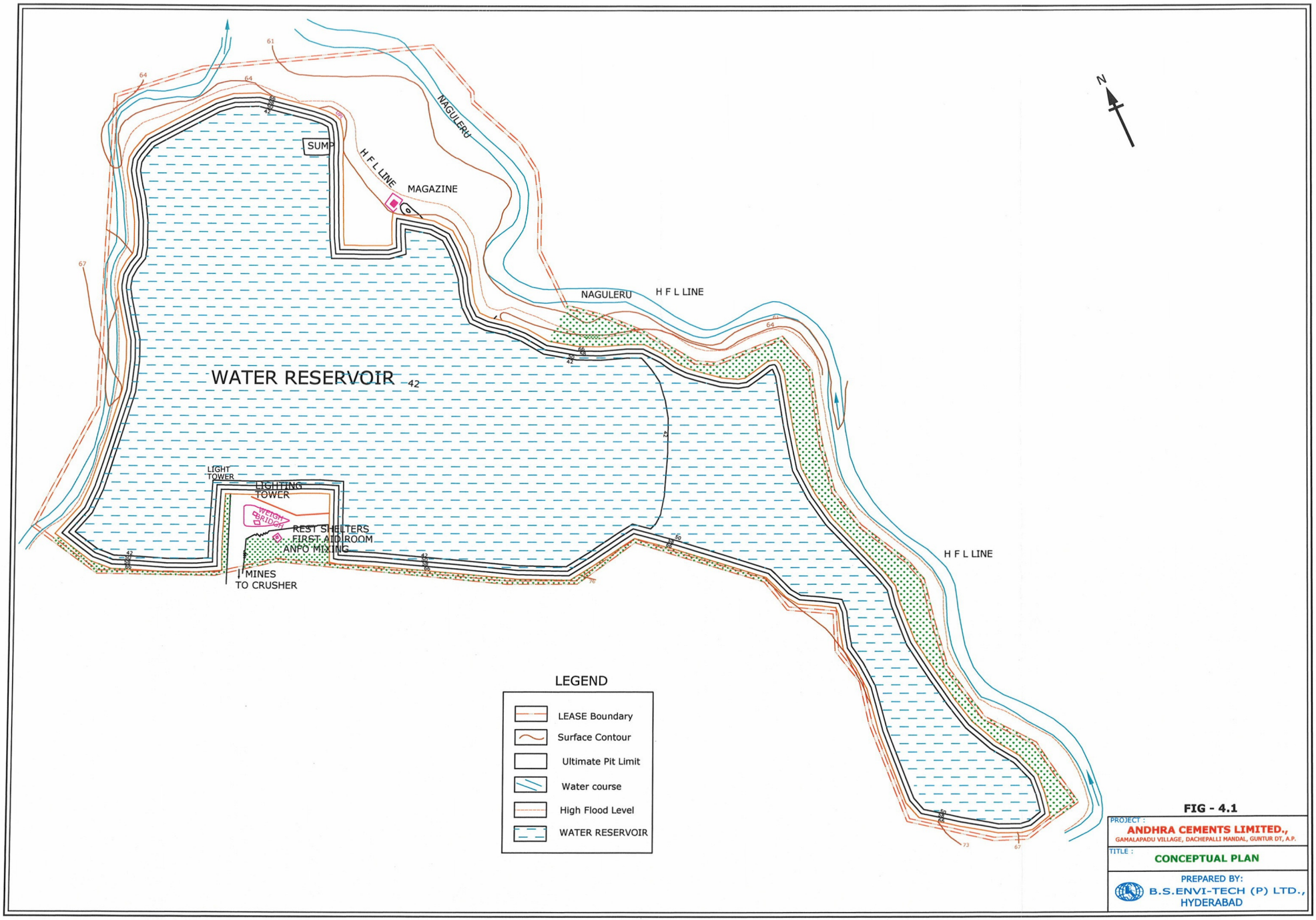


FIG - 4.1

PROJECT :
ANDHRA CEMENTS LIMITED.,
GAMALAPADU VILLAGE, DACHEPALLI MANDAL, GUNTUR DT, A.P.

TITLE :
CONCEPTUAL PLAN

PREPARED BY:
B.S.ENVI-TECH (P) LTD.,
HYDERABAD

CHAPTER - 5

BASELINE ENVIRONMENT

5.0 BASELINE ENVIRONMENT

The baseline environment quality represents the background environmental scenario of various environmental components such as air, water, noise, land, and socio economic status of the study area. The sources of emission in the study area are the Cement industries, Mining activities, unpaved roads and fuel burning in the villages.

Agriculture is the main activity in the area. Due to the rich limestone belt in the area, the following are the major industries located within 10 km radius of the study area.

Industries, Cement plants & Limestone Plants	• India Cements Ltd– Wazirabad – 4 km • Penna Cement Industries Ltd., • Deccan Cements – 10 km

The study area is dominated by the mining activities and cement plants of the above industries.

5.1 MICRO METEOROLOGY OF THE STUDY AREA

5.1.1 Micro Meteorology

Regional Climate

In general, the study area experiences subtropical climate with cold winter nights with a minimum temperature of 16 °C and hot summer days with a peak temperature of 46 °C. Monsoon starts in the month of July with peak precipitation in the months of August and September. The average relative humidity is around 60 %.

Mean wind speeds observed in the area were between 8 -16 kmph with predominant winds from N-NE-E-SE-S sector for 7 months of the year in winter season and summer seasons and SW-W-NW sector for 5 months of the year during monsoon and Summer season. Wind speeds during winter season (3 months) were found to be low (< 9 kmph) when compared with other seasons (> 9 kmph and <17 kmph)

5.1.2 Site Meteorology

An auto weather monitoring station has been installed on top of mine office building to record micro meteorological data on Wind Speed (kmph), Wind Direction, Ambient Temperature (^{0}C), Relative Humidity (%), and Rain fall (mm) on hourly basis.

Percentage frequencies of wind in 16 directions have been computed from the recorded data of study period covering December '06 to February'07. During the study period the wind roses were plotted at an interval for 8 hourly (00-08hrs, 08-16 hrs and 16-24 hrs) and 24 hrs (00-24hrs).

Wind pattern during 00-08 hours

The predominant wind direction during this period was from N to ESE sector direction accounting to about 53.2% of the total time with calm winds of less than 1.7 kmph for about 30.92% Wind speeds during this period were varying between 1.0-10 kmph.

Wind pattern during 08-16 hours

The predominant wind direction during this period was from N to ESE sector accounting to about 63.16 % of the total time with calm winds of less than 1.7 kmph for about 14.58 % Wind speeds during this period were varying between 1.0-10 kmph.

Wind pattern during 16-24 hours

The predominant wind direction during this period was from NNE to ESE sector accounting to about 63.66% of the total time with calm winds of less than 1.0 kmph for about 9.99% Wind speeds during this period were varying between 1.0-10 kmph.

Wind pattern during 00-24 hours (WINTER 2006-07)

The predominant wind direction during this period was from N to ESE sector accounting to about 62.11% of the total time with calm winds of less than 1.7 kmph for about 18.50 % Wind speeds during this period were varying between 1.0-10 kmph. **Fig – 5.1 & 5.2** represents the wind pattern of the study period. The summary of the wind pattern is given below:

Summary of Wind Pattern

DURATION (HRS)	PREDOMINANT WIND DIRECTION
00:00 – 08:00 hrs	N to ESE Sector
08:00 – 16:00 hrs	
16:00 – 24:00 hrs	
00:00 – 24:00 hrs	

5.2 AMBIENT AIR QUALITY

In order to identify the background air quality data and also to represent the interference from various industrial and local activities, screening techniques have been used for identification of air quality stations in the study area.

The area experiences dry climate and most of the roads in the area are metalled. Though the route of limestone transportation was metalled, heavy traffic density has led to vehicular emissions and flying of carried dust.

The air pollution-monitoring network was designed to know the complex environmental scenario that exists as of now which would serve as baseline information prevailing in the area.

A Identification of Ambient air Quality Monitoring Stations:

Ambient air quality of the study area has been assessed through a network of 9 ambient air quality locations. Of the 9 locations, 6

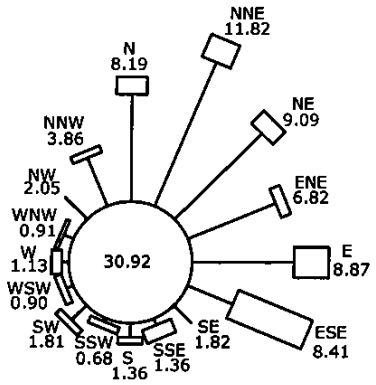
FIG - 5.1
WINDROSE DIAGRAM

PROJECT : ANDHRA CEMENTS LIMITED

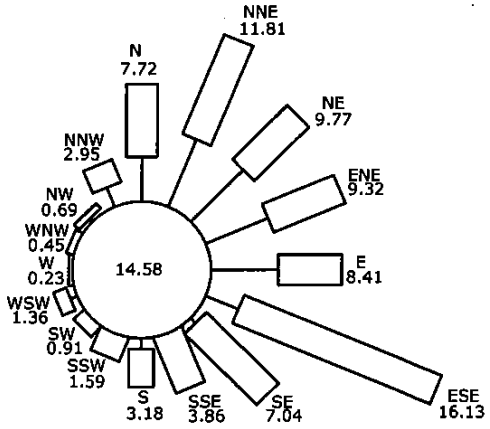
LOCATION : MINE SITE

PERIOD : WINTER '06-'07

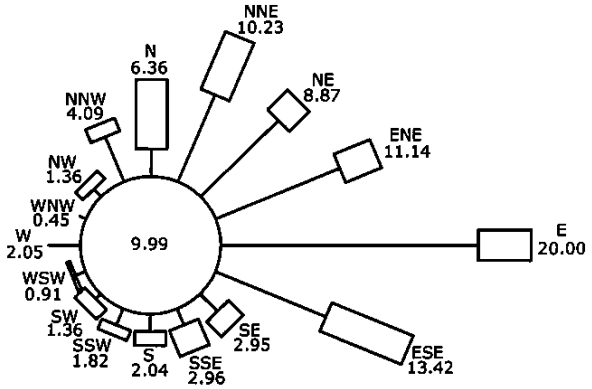
N



DURATION : 00 - 08 HRS.



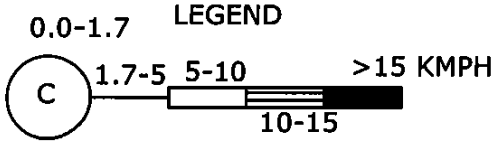
DURATION : 09 - 16 HRS.



DURATION : 17 - 24 HRS.

NOTE : All readings are in percentage occurance of wind

LEGEND



C = Calm Conditions in Percentage

SCALE

5 % 10 %

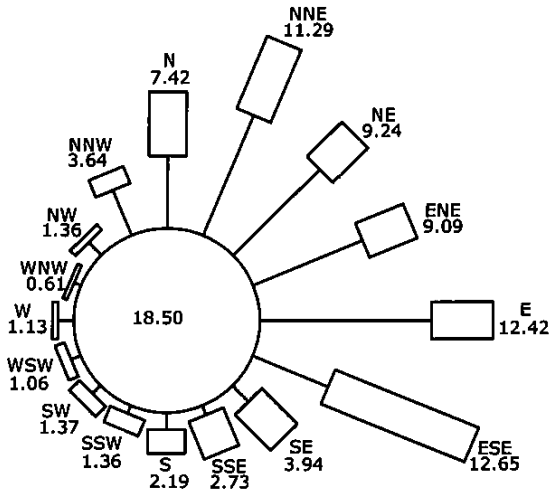
FIG - 5.2

WINDROSE DIAGRAM

PROJECT : ANDHRA CEMENTS LIMITED

LOCATION : MINE SITE PERIOD : WINTER '06-'07

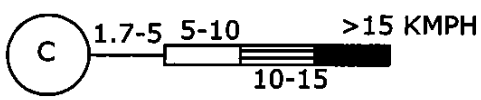
N



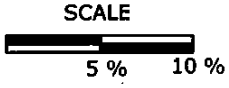
DURATION : 00 - 24 HRS.

NOTE : All readings are in percentage occurance of wind

LEGEND



C = Calm Conditions in Percentage



ambient are located in the buffer zone and 3 stations within the Mine area [Core zone].

Fig –5.3 shows the locations of the air quality stations in the study area and Mine area. **Table – 5.2** gives the details of ambient air quality locations:

TABLE-5.1

DETAILS OF AMBIENT AIR QUALITY MONITORING STATIONS

Station Codes	Location	With respective to Mine		Activities Around Sampling Station
		Distance [km]	Direction	
A-1	Mine Office	---	---	Mine activities
A-2	Drilling Area	---	---	
A-3	Haulage Road	---	---	
A-4	Ramapuram village	2.8	WNW	Industrial activity, Human activities, Vehicular movement, bad road conditions.
A-5	Bhatrupalem village	2.8	NE	
A-6	Kotayyanagaram village	3.2	SSE	
A-7	Gamalapadu village	4.3	S	
A-8	Shrinagar village	1.7	SW	
A-9	Pondugula village	5.0	NW	

B ANALYSIS OF BASELINE CONCENTRATIONS

BUFFER ZONE (STATIONS A4 TO A9)

Suspended Particulate Matter - SPM

Study area: Suspended particulate matter monitored in the study area showed 98th percentile values in the range of 139.8 - 160.3 $\mu g/m^3$. The SPM concentration in the study area was found to be well within the norms prescribed for Rural and residential areas.

Respirable Particulate Matter - RPM

RPM values monitored at 6 locations showed 98th percentile values in the range of 49.7 – 60.2 $\mu g/m^3$. Highest value of 60.2 $\mu g/m^3$ was recorded at Pondugula village. However, this value is well within the limits of NAAQ.

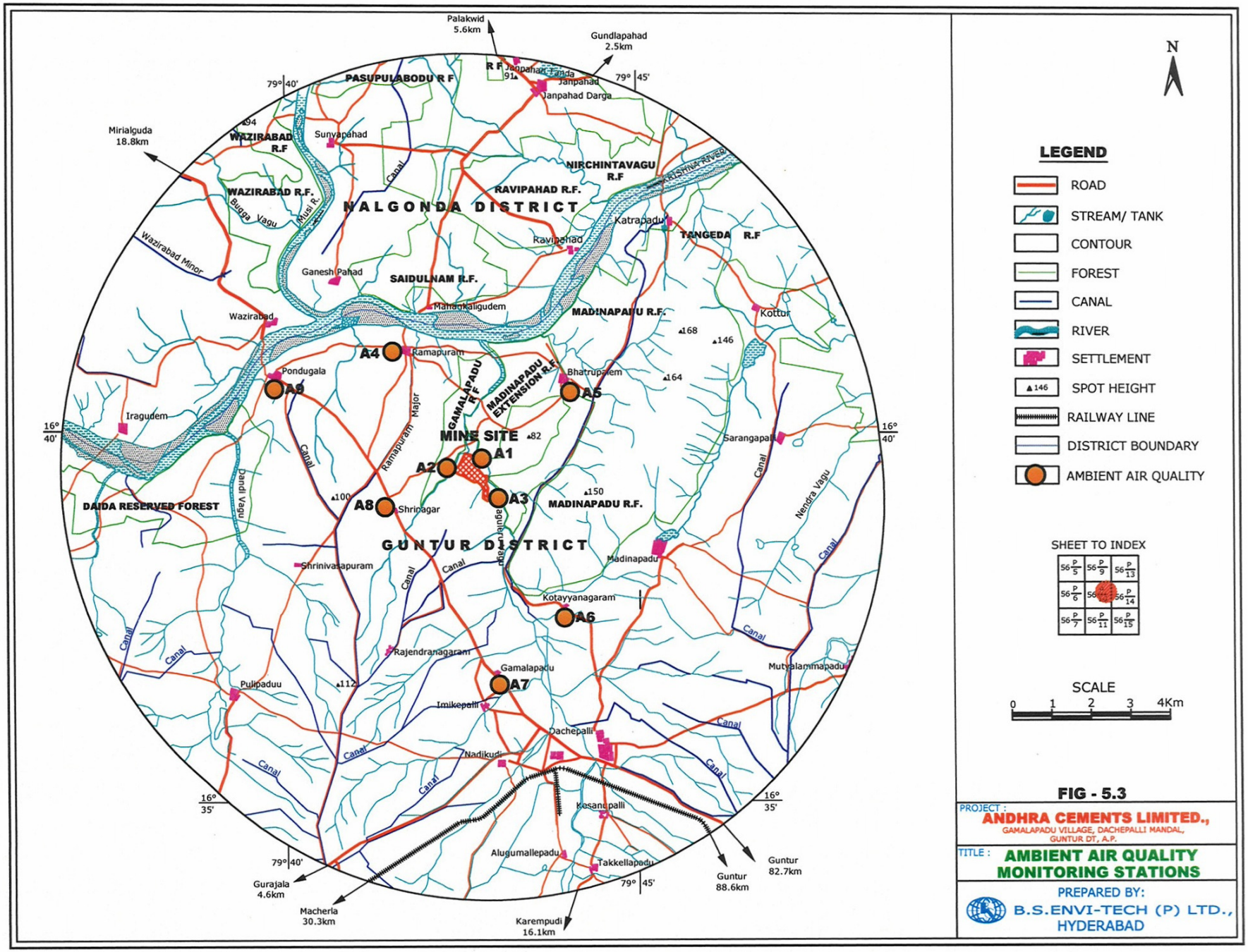


FIG - 5.3

PROJECT :
ANDHRA CEMENTS LIMITED.,
GAMALAPADU VILLAGE, DACHEPALLI MANDAL, GUNTUR DT., A.P.

TITLE :
AMBIENT AIR QUALITY MONITORING STATIONS

PREPARED BY:
B.S.ENVI-TECH (P) LTD., HYDERABAD

Sulphurdioxide - SO_2

98th percentile value of Sulphur dioxide in the study area from the monitored data was in the range of 13.7 – 15.5 µg/m³. Maximum value of sulphurdioxide of 15.5 µg/m³ obtained near the sampling station located at Pondugula village. The values of SO_2 monitored in the study area are well within the limits of NAAQ standards.

Oxides of Nitrogen - NOx

Ambient air quality status monitored for nitrogen oxides in the study area were in the range with 98th percentile values between 14.8 – 16.5 µg/m³. A maximum value of 16.5 µg/m³ was prevailing at the time of sampling at A9 (Pondugula village) sampling station.

Carbon Monoxide - CO

CO concentration at all the locations was found to be less than 1 ppm.

Percentile values of ambient air quality in buffer zone are presented in **Annexure–5 A.** The values of SPM, RPM, SO_2, NOx and CO monitored at all locations are well within the limit of AAQ standards.

CORE ZONE – MINE AREA (STATIONS A1 TO A3)

Suspended Particulate Matter - SPM

Study area: Suspended particulate matter monitored in the study area showed 98th percentile values in the range of 165.2 – 318.5 µg/m³. The SPM concentration in the study area was found to be well within the norms prescribed for Rural and residential areas.

Respirable Particulate Matter - RPM

RPM values monitored at 3 locations showed 98th percentile values in the range of 67.2 – 152.5 µg/m³. Highest value of 152.5 µg/m³ was

recorded at Drilling. However, this value is well within the limits of NAAQ.

Sulphurdioxide - SO_2

98th percentile value of Sulphur dioxide in the study area from the monitored data was in the range of 14.6 – 16.8 $\mu g/m^3$. Maximum value of sulphurdioxide of 16.8 $\mu g/m^3$ obtained near the Haulage road. The values of SO_2 monitored in the study area are well within the limits of NAAQ standards.

Oxides of Nitrogen - NOx

Ambient air quality status monitored for nitrogen oxides in the study area were in the range with 98th percentile values between 16.1 – 18.1 $\mu g/m^3$. A maximum value of 18.1 $\mu g/m^3$ was prevailing at the time of sampling at haulage road sampling station.

Carbon Monoxide - CO

CO concentration at all the locations was found to be less than 1 ppm.

Percentile values of ambient air quality in core zone are presented in **Annexure – 5 A.** The values of SPM, RPM, SO_2, NOx and CO monitored at all locations are well within the limit of AAQ standards.

C OVERALL BASELINE AMBIENT AIR QUALITY

Results of the ambient air quality at all the above locations were found to be well within the limits of National Ambient Air Quality (NAAQ) standards specified for Residential and industrial areas. Concentrations of SPM, RPM, SO_2 and NOx are mainly contributed due to vehicular traffic and local activities.

The 98th percentile values of SPM, RPM, SO_2 and NOx at all the locations in the study area during winter season 2006-07 are given below.

Summary of Ambient Air Quality (μg/m³)

CODE	Location Name	98TH PERCENTILE VALUES			
		SPM	RPM	SO_2	NOx
A-1	Mine Office	165.2	67.2	14.6	16.1
A-2	Drilling Area	318.5	152.5	15.8	17.0
A-3	Haulage Road	292.4	148.3	16.8	18.1
A-4	Ramapuram village	156.3	57.1	14.7	15.6
A-5	Bhatrupalem village	145.3	52.1	13.7	15.0
A-6	Kotayyanagaram village	139.8	54.0	14.0	14.8
A-7	Gamalapadu village	149.3	49.7	15.0	16.0
A-8	Shrinagar village	155.8	56.7	14.6	15.6
A-9	Pondugula village	160.3	60.2	15.5	16.5

Note: CO values are observed less than 1 ppm during study period.

5.3 NOISE ENVIRONMENT

The acoustical environment varies dynamically in magnitude and character through out most communities. The noise level variation can be temporal, spectral and spatial. The residential noise level is that level below which the ambient noise does not seem to dropdown during the given interval of time and is generally characterized by unidentified sources. Ambient noise level is characterized by significant variations above a base or a residential noise level. The maximum impact of noise is felt on urban areas, which is mostly due to the commercial activities and vehicular movement during peak hours of the day.

Measured noise level displayed as a function of time provides a useful scheme for describing the acoustical climate of a community. Noise levels recorded at each station with a time interval of about 30 minutes are computed for equivalent noise levels. Equivalent noise level is a single number descriptor for describing time varying noise levels. The equivalent noise level is defined as mathematically

$$10\text{Log}1/T\ \Sigma\ (10^{Ln/10})$$

where L = sound pressure level a function of time dB (A)
T = Time interval of observations

Noise levels during the night time generally drop, therefore to compute Equivalent noise levels for the night time, noise levels are increased by 10 dB (A) as the night time high noise levels are judged more annoying compared to the day time.

Noise levels at a particular station are represented as Day-Night equivalent (Ldn). Day-Night equivalent is the single number index designed to rate environmental noise on daily/24 hourly basis. Mathematically Ldn is given by

$$Ldn = 10 \log \{1/24 (15 X 10^{(Ld/10)} + 9 X 10^{(Ln+10)/10)}\}$$

Where

Ld = A weighed equivalent for day time period (7 am to 10 pm)

Ln = A weighed equivalent for night time period (10 pm to 7 am)

A NOISE LEVELS MONITORING

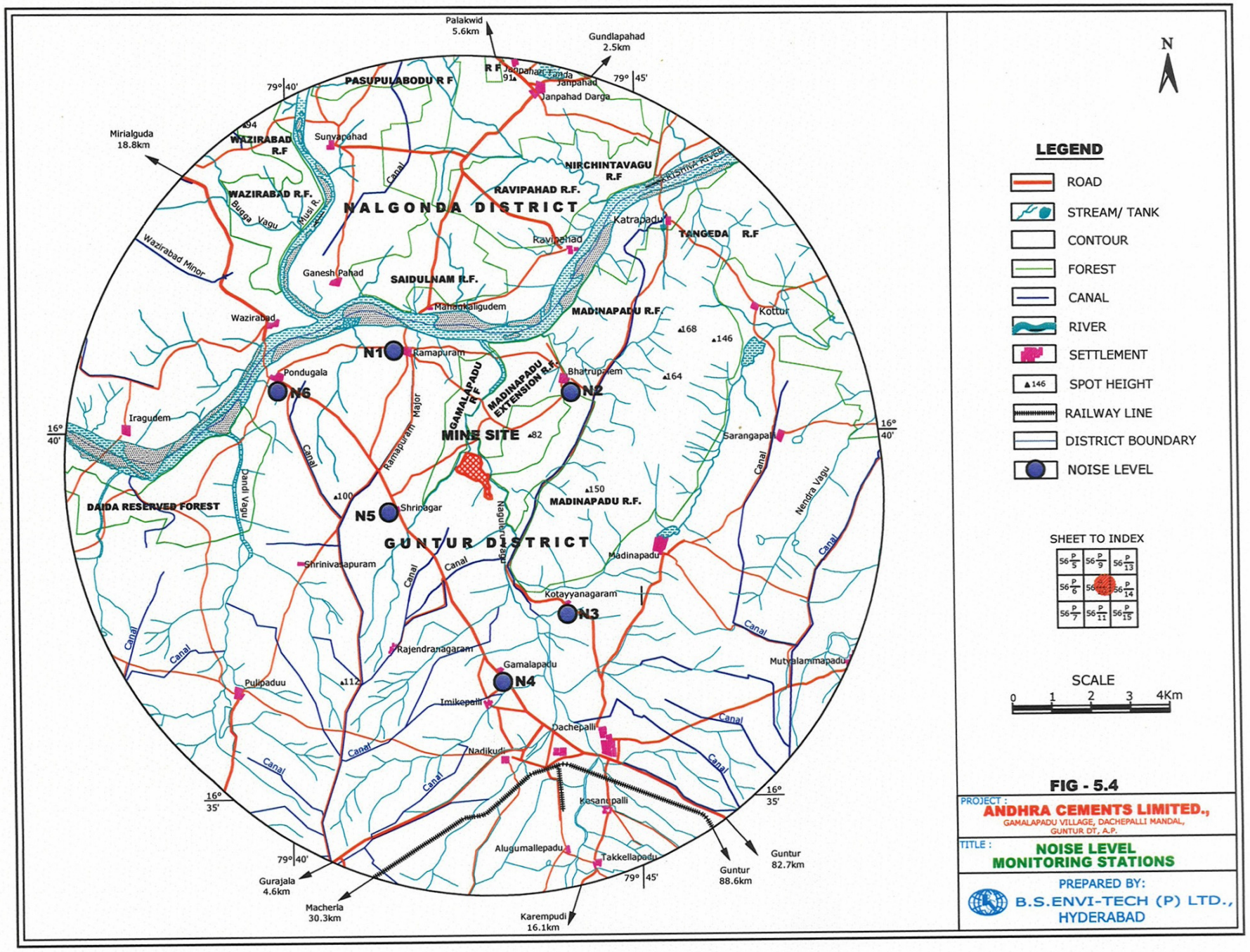
Noise levels in buffer zone were measured near residential areas and other settlements located within 10 km radius around the Mine area.

The noise recording stations at Mine area and buffer zone are shown in **Fig- 5.4** and are given in the following **Table - 5.3.**

TABLE – 5.2

NOISE MONITORING STATIONS

Station	Code	Distance From The Mine (Km)	Direction wrt Mine Site
Ramapuram village	N-1	2.8	WNW
Bhatrupalem village	N-2	2.8	NE
Kotayyanagaram village	N-3	3.2	SSE
Gamalapadu village	N-4	4.3	S
Shrinagar village	N-5	1.7	SW
Pondugula village	N-6	5.0	NW


Palakwid
5.6km
Gundlapahad
2.5km
Janpahad
Janpahad Tanda
Janpahad Darga
79° 40'
79° 45'
PASUPULABODU R F
Mirialguda
18.8km
WAZIRABAD R.F
Sunvapahad
NIRCHINTAVAGU R.F
RAVIPAHAD R.F.
WAZIRABAD R.F.
Bugga Vagu
Musi R.
NALGONDA DISTRICT
Krishna River
Katrapadu
TANGEDA R.F
Ravipahad
Wazirabad Minor
Ganesh Pahad
SAIDULNAM R.F.
Mamidikaligudem
MADINAPADU R.F.
Kottur
Wazirabad
N1
Ramapuram
Pondugala
N6
Bhatrupalem
N2
GAMALAPADU R.F
MADINAPADU EXTENSION R.F.
Iragudem
MINE SITE
Sarangapalli
16° 40'
Ramapuram Major
Canal
Chandi Vagu
DAIDA RESERVED FOREST
N5
Shrinagar
MADINAPADU R.F.
Nendra Vagu
GUNTUR DISTRICT
Shrinivasapuram
Madinapadu
Kotayyanagaram
N3
Rajendranagaram
Gamalapadu
N4
Mutyalammapadu
Pulipaduu
Imikepalli
Dachepalli
Nadikudi
16° 35'
Kasarapalli
Alugumallepadu
Takkellapadu
Guntur
82.7km
Guntur
88.6km
Gurajala
4.6km
Macherla
30.3km
Karempudi
16.1km
N
LEGEND
ROAD
STREAM/ TANK
CONTOUR
FOREST
CANAL
RIVER
SETTLEMENT
SPOT HEIGHT
RAILWAY LINE
DISTRICT BOUNDARY
NOISE LEVEL
SHEET TO INDEX
SCALE
0 1 2 3 4Km
FIG - 5.4
PROJECT :
ANDHRA CEMENTS LIMITED.,
GAMALAPADU VILLAGE, DACHEPALLI MANDAL,
GUNTUR DT, A.P.
TITLE :
NOISE LEVEL
MONITORING STATIONS
PREPARED BY:
B.S.ENVI-TECH (P) LTD.,
HYDERABAD

B AMBIENT NOISE LEVELS IN BUFFER ZONE - WITHIN 10 KM RADIUS

Noise levels recorded were found to be in the range of 53 – 59 dB (A) during day time and in the range of 41 – 50 dB (A) during night time.

NOISE LEVELS IN THE STUDY AREA (10 KM RADIUS)

Location	Code	Noise Level dB (A)		
		Day Equivalent	Night Equivalent	Day-Night Equivalent
Ramapuram village	N-1	56.4	46.7	56.5
Bhatrupalem village	N-2	54.1	44.3	53.3
Kotayyanagaram village	N-3	53.8	42.6	53.4
Gamalapadu village	N-4	55.6	41.8	54.5
Shrinagar village	N-5	56.8	47.7	57.1
Pondugula village	N-6	59.0	49.3	59.1

C NOISE LEVELS IN CORE ZONE – MINE AREA

Noise levels at the following locations were monitored to assess the noise level due to various operations of the mine.

SPOT NOISE LEVELS IN THE MINE AREA

LOCATION	NOISE LEVEL IN dB(A)
Near Mines Office	63
Near drilling area	84
Near Loading area	89
On haulage Road	76

The maximum level of noise in the mine area was produced due to drilling and loading activity. The minimum levels were recorded to be about 63 dB(A) during the vehicular movement in the mine office area.

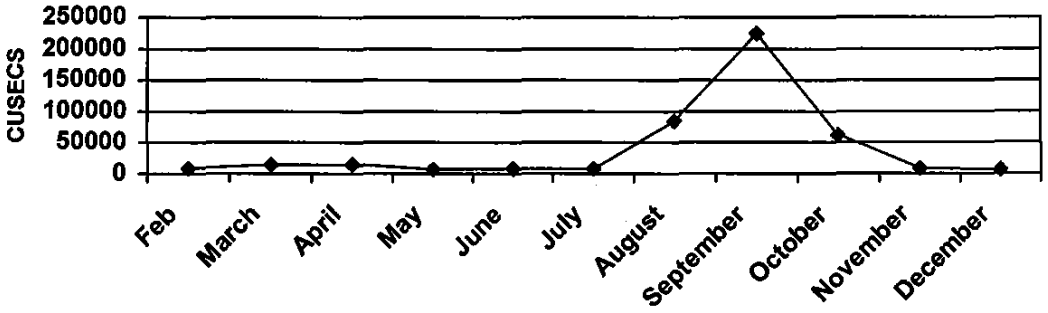
5.4 WATER ENVIRONMENT

5.4.1 Surface water regime

The major water sources in the study area are river Krishna and their tributaries. River Krishna enters in the Guntur district after traveling a distance of 85 km in the Nalgonda district in the easterly direction

The river Krishna is flowing at a distance of about 2.9 km on the northern side of mine site. The tributary, Naguleru Vagu is flowing at a distance of -0.2 km in eastern direction from the mine and joins Krishna River. The other stream joining the Krishna in the study area is Musi River and Dandi vagu at distances of 5.1 km & 5.5 km from the mine. All these streams experience perennial flow for almost 6-8 months in a year. The following figure shows the flow variation in Krishna River.

Average flows of Krishna River



As the major river Krishna is flowing with its tributaries, the ground water potential is good in the study area. The ground water table occurs at a depth of 40 m near the mine site area.

In the area, top black clay soil varying in thickness from 0.5 to 1.5m is followed by semi-hard or compact pink and grey limestone. The semi-compact limestone is followed by semi-weathered limestone: weathered and fractured limestone and semi massive limestone. The semi massive limestone is followed by hard compact limestone, which are non-water bearing. Recharge is totally controlled by local streams and Krishna River.

5.4.2 WATER QUALITY

Assessment of baseline data on Water environment includes

a) Identification of surface water sources
b) Identification of ground water sources
c) Collection of water samples
d) Analyzing water samples collected for physico-chemical and biological parameters

The details of the above are presented below Assessment of water quality in the study area includes the quality assessment of parameters as per the Indian standard IS 10500 (drinking water standard). About eight water samples have been collected from various locations of the study area, out of the eight samples, one sample from plant, 5 samples were collected from bore wells of the surrounding villages, two sample from surface water sources. The location of water sampling stations is shown in **Fig-5.5** and **Table-5.4.**

TABLE - 5.3
WATER SAMPLING LOCATIONS

Station Code	Location	Source	Distance From Mine Site (Km)	Direction Wrt Mine Site	Usage
W1	Plant	Bore well	---	---	Domestic & Drinking
W2	Ramapuram village	Borewell	2.8	WNW	
W3	Bhatrupalem village	Borewell	2.8	NE	
W4	Kotayyanagaram village	Borewell	3.2	SSE	
W5	Gamalapadu village	Borewell	4.3	S	
W6	Shrinagar village	Borewell	1.7	SW	
W7	Pondugula village	Borewell	5.0	NW	
W8	Krishna River	Surface water	2.9	Northern	Industry, Domestic & Drinking

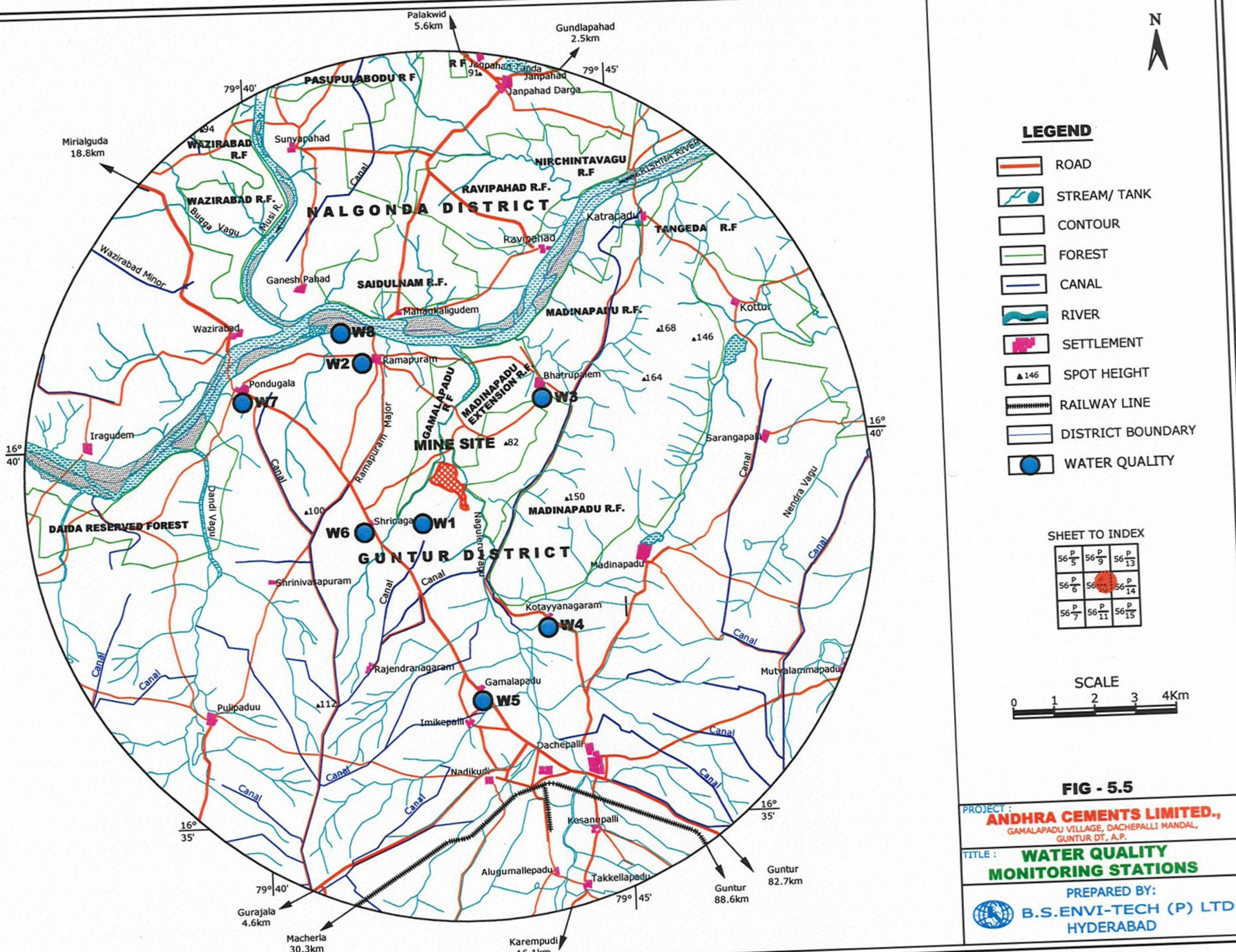


FIG - 5.5

PROJECT : **ANDHRA CEMENTS LIMITED.,**
GAMALAPADU VILLAGE, DACHEPALLI MANDAL, GUNTUR DT, A.P.

TITLE : **WATER QUALITY MONITORING STATIONS**

PREPARED BY:
B.S.ENVI-TECH (P) LTD., HYDERABAD

Summary of water quality of surface and ground water samples analysed for various parameters are give below

WATER QUALITY IN THE STUDY AREA

PARAMETERS	River Krishna	Plant Water	Ground Water
pH	8.10	7.56	7.32-8.14
Total Hardness as $CaCO_3$ [mg/l]	166	280	110-310
Total Dissolved Solids [mg/l]	440	570	260-650
Chlorides as Cl [mg/l]	86	56	42-110
Sulphates as SO_4 [mg/l]	58	114	34-76
Nitrates as NO_3 [mg/l]	8	12	12-26
Fluoride as F [mg/l]	0.7	0.98	0.8-0.95
Iron as Fe [mg/l]	0.15	0.16	0.15-0.20

Surface water samples collected from river krishna showed compliance of all parameters with the drinking water standard of IS 10500 except the e-coli which is on higher side.

Ground water samples collected from seven locations within the study area showed compliance of all parameters with the drinking water standard of IS 10500.

The water quality data of the study area are given in **Annexure – 5B**.

5.5 LAND ENVIRONMENT

5.5.1 LAND USE PATTERN

Landuse pattern of the study area has been assessed through Remote Sensing methodology using IRS-1D, LISS-III geocoded images. Level – I landuse / landcover categories identified in the area are built-up, agricultural land, wasteland, forest, water bodies and others. Their spatial distribution and areal extent is given in **Table – 5.5** and **Fig 5.6 & Fig – 5.7**.

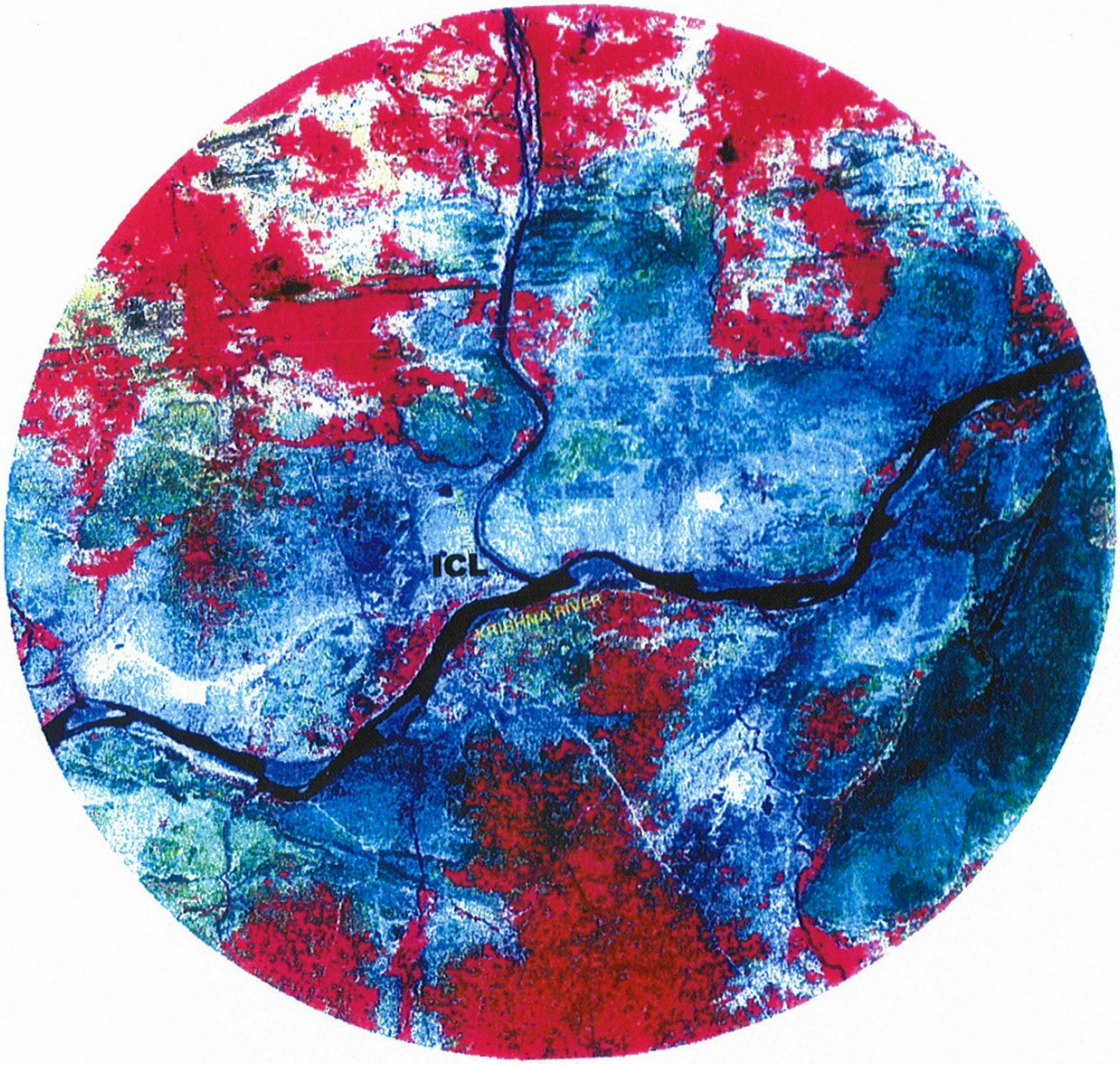


FIG – 5.6

IRS-1C, SATELLITE DATA (LISS – III)

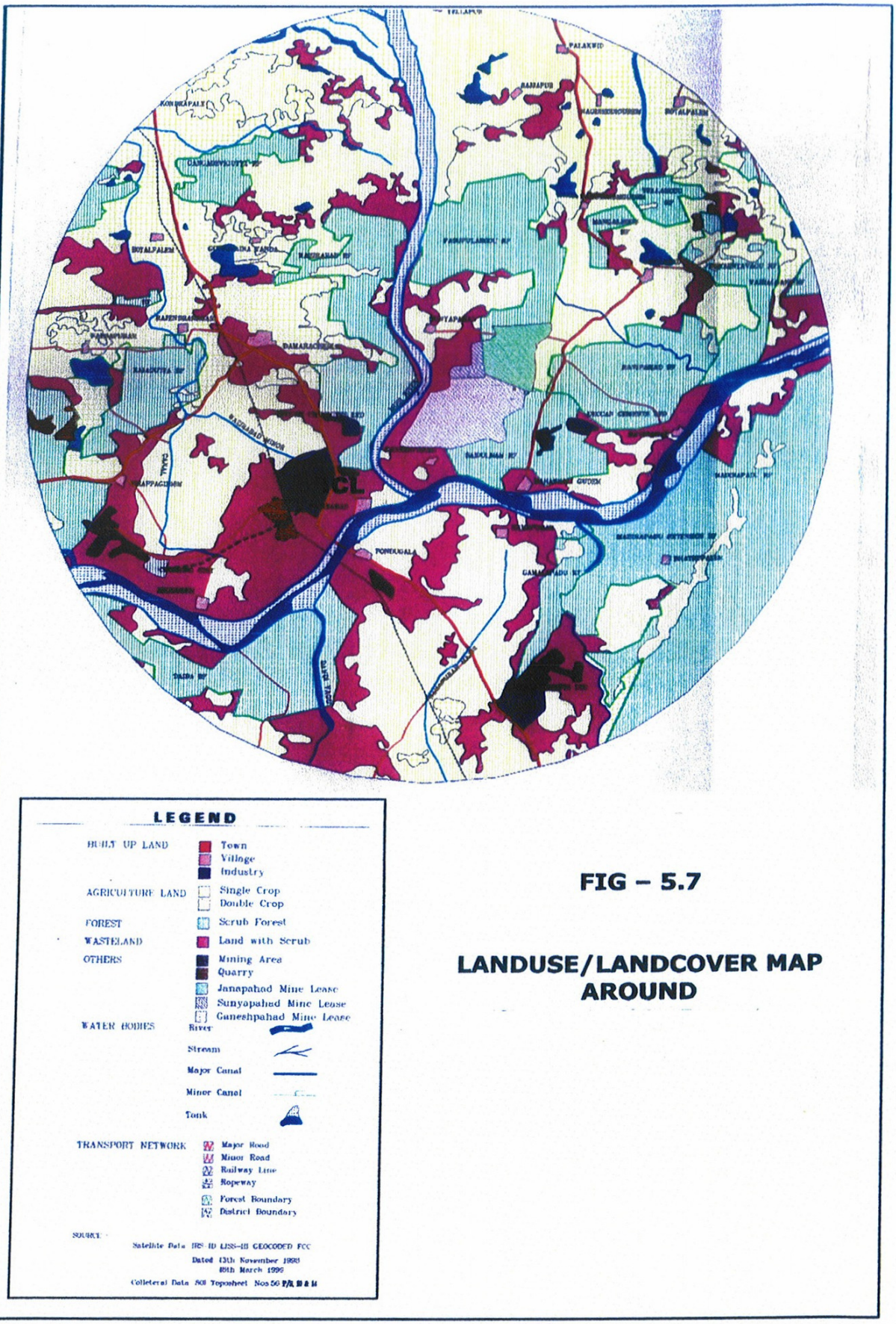


FIG – 5.7

LANDUSE/LANDCOVER MAP AROUND

TABLE – 5.4
SPATIAL DISTRIBUTION OF LEVEL-II LAND USE / LAND COVER CLASSES WITH IN 10KM RADIUS AREA

SL.NO.	LAND USE/LAND COVER	AREA	
		Km²	Percentage
1.	Built-up land		
	1.1 Residential	1.54	0.49
	1.2 Industrial	3.78	1.20
2.	Agricultural land		
	2.1 Single crop	97.78	31.14
	2.2 Double crop	39.29	12.52
3.	Forest		
	3.1 Scrub forest	85.64	27.27
4.	Wastelands		
	4.1 Land with scrub	58.01	18.40
5.	Water bodies		
	5.1 River/Stream/Reservoir/Tank	19.76	6.28
6.	Others		
	6.1 Mining area	4.71	1.6
	6.2 Quarry	1.14	0.36
	6.3 Plant site	2.35	0.74
TOTAL		314.00	100.00

5.5.2 DESCRIPTION OF LAND USE/LAND COVER CLASSES

1. Built-up Land

It is defined as an area of human habitation developed due to non-agricultural activities. It comprises dwellings, roads, railway line and vacant land, etc. In the study area the built-up land consists of settlements like Botalpalem, Pondugala, Ramapuram, Ganeshpahad Wazirabad & Shrinagar etc. The total area estimated in this category is 5.32 sq.km or 1.69% of the total study area. The major industries mapped are ICL, Deccan Cements, Andhra Cements, Deccan Chromites Ltd. and Penna Cement Industries Ltd.

2. Agricultural Land

It is defined as the land primarily used for cultivation of agricultural crops. The major crops are Paddy, Cotton, Chillies and Redgram. The main source of water for this activity is through canals/tanks/rivers. The Agricultural land in the study area accounts for 137.07 square km or 43.66% of the total study area.

Single crop

This category observed in the uplands towards the northern and southern portions of the Krishna river. The main crops in this category are cotton, chillies and redgram. This category occupies an area of 97.78 square km or 31.14% of the total area. Generally in this area the cropping season starts from July-August to February – March.

Double Cropped area

Double-cropped area refers to standing crops during both Kharif and Rabi seasons. Western portion of the study area is under double crop. Paddy is the major crop in both the seasons. It covers an area of 39.29 sq. km. or 12.52% of the study area.

3. Forest-Scrub Forest

This is an area of degraded forest due to excessive biotech interference and natural causes consists of mainly stunted tree or bushes/shrubs which belongs to xerophytes. In the study area most of the reserved forest belongs to scrub forest category. It occupies an area of 85.64 sq. kms or 27.27% of the total area.

4. Waste land-Land with Scrub

These are the lands, which are lying un-utilised and can be brought under good vegetative cover. This category is mainly observed on the fringes of the forest areas which predominantly consists of shrubs.

This category is observed in patches in the entire study area. It occupies an area of 58.01 sq. kms or 18.40% of the total area.

5. Water bodies: River/Stream

These classes comprise areas of surface water either impounded in the form of ponds, lakes and reservoirs or flowing streams etc. The major rivers drained in the study area are Krishna river, Musi river. The water bodies account for 19.76 sq. km or 6.28% of the total study area.

6. Others-Mining area

It is an area under excavation of ores/plantrals. It consists of active excavated sites and overburden of the waste material. Lime stone mining is observed near Irkigudem, Shrinagar, and Wazirabad villages adjacent to cement plants. It is occupied by an area of 4.71 sq. kms. Or 1.6% of the total study area.

Quarry

Quarries occupies an area of 1.14 sq. kms. Or 0.36% of the total study area.

5.5.3 Landuse & Land cover Observations

The following are the observations in 10 km radius of the study area

a. Land with scrub is the proplantnt class in and around the mine.
b. Major industries like Deccan cements, Deccan Chromates Ltd., Penna Cement Industries Ltd. and India Cements Ltd. are located in the study area
c. Nearest settlement Shrinagar is around 1.7 km from the mine site.
d. Nadikudi-Bibinagar broadguage railway line runs 6.9 km of the mine site.
e. Ramapuram major irrigation canal is observed near the mine site.
f. The reserved forest areas are devoid of any species of economic value. The forest is mostly of scrub type consisting of thorny bushes and shrubs of xerophytic group.

g. In the study area 43% of the area falls under agricultural land 27% under scrub forest and 18% under wasteland categories.
h. Cotton, chillies and redgram are major rainfed crops categorised as single crop.
i. Paddy is the only double crop in the study area.
j. In the study area industries and mining areas occupy 5.32 and 1.69 sq. km respectively.

5.5.4 REGIONAL GEOLOGY

This region forms part of the Indian Peninsula, which remained a stable landmass. The oldest known geological formations are the Dharwars which were deposited in shallow basins and subsequently intruded by the basic rocks. Later, these rocks were subjected to intense earth movements and have undergone metamorphism compiled with large scale invasion of granitic magma which by metamorphism assumed gneissic structure at places. These granites and gneisses were subsequently intruded by dykes of dolerite and veins of pegmatite and quartz.

After a gap of 500 million years, inland basins, where sand, stones, shales, limestone and dolomites were deposited, were formed. These basins were further affected by uplifts caused by igneous activity and earth movements, which folded and faulted the sedimentary basin.

Along the Krishna River i.e. in the southern part of the Nalgonda district, sedimentary rocks of Purana group consisting of quartzites, shales and limestones are exposed. This area lies north of the sedimentary formations of Huzurnagar and Miryalguda taluks which is made up of granites of Peninsular Complex. In other words, the area comprising Devarakonda, Bhongiri, Suryapet and part of Achampet taluks mostly represents this group.

5.5.5 SOIL QUALITY

Seven soil samples were collected from the study area for assessing the quality. The location of the sampling stations is shown in **Fig - 5.8** and are given in **Table - 5.5.**

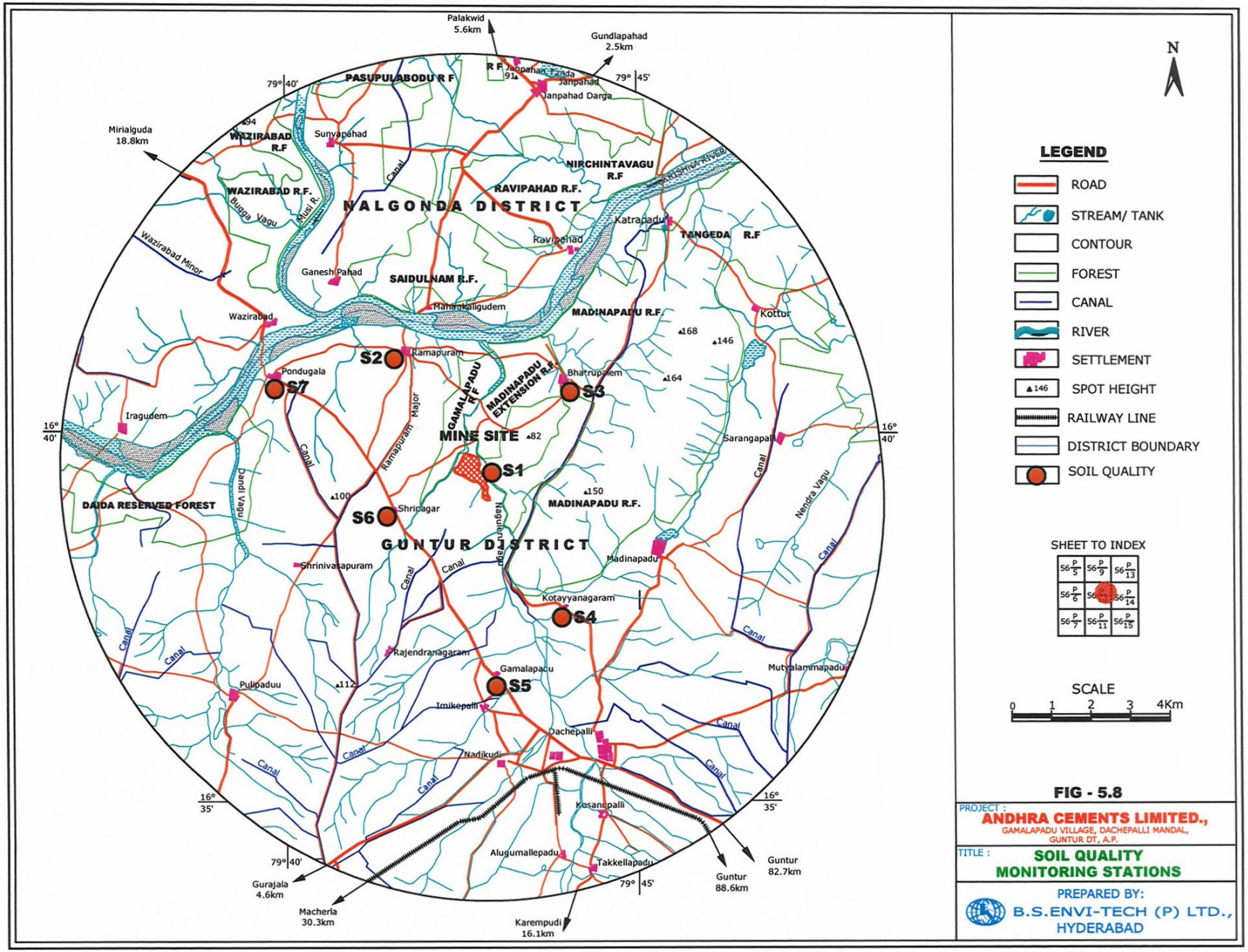


FIG - 5.8

PROJECT :
ANDHRA CEMENTS LIMITED.,
GAMALAPADU VILLAGE, DACHEPALLI MANDAL,
GUNTUR DT, A.P.

TITLE :
SOIL QUALITY MONITORING STATIONS

PREPARED BY:
B.S.ENVI-TECH (P) LTD.,
HYDERABAD

TABLE-5.5

SOIL SAMPLING STATIONS

STATION CODE	STATION	DISTANCE FROM THE MINE (KM)	DIRECTION WRT MINE SITE
S1	Mine pit	--	--
S2	Ramapuram village	2.8	WNW
S3	Bhatrupalem village	2.8	NE
S4	Kotayyanagaram village	3.2	SSE
S5	Gamalapadu village	4.3	S
S6	Shrinagar village	1.7	SW
S7	Pondugula village	5.0	NW

SOIL SAMPLE AT MINE PIT

- Samples collected at mine showed pH value of 8.16.
- Soil sample in this area showed sandy Loam in texture with sand percentage of 38%, silt 20% and Clay 42%.
- Soluble salts were found to be of 460 mg/kg.
- Organic content of the soil samples was found to be good exhibiting of 0.40% and good fertility.
- Chloride content of the soil sample was of 165 mg/kg.

SOIL SAMPLES WITHIN 10 KM RADIUS

- pH of the all soil samples were found to be in the range of 6.98-8.34.
- Soluble salts were found to be in the range of 286-530 mg/kg
- Organic content of the soil samples was found to be medium exhibiting and average fertility
- Soils in the area were found to be sandy clayey Loam in texture with sand percentage in the range between 38-46%, silt between 23-38% and Clay 20-36%.
- Chloride content of the soil samples were in the range of 119-190 mg/kg

Results of soil sampling analysis are given in **Annexure – 5 C.**

5.5.6 AGRICULTURE AND IRRIGATION

The undulating character of terrain of the area and availability of water in the rivers, canals, favour the irrigation in this area. During the monsoon season substantial water flow can be seen in all the surface water bodies and also in the lean season, favorable ground water potential encourages the local farmers to go for mixed cropping pattern. All the villages are provided with bore wells/dug wells and tube wells to cater to the agricultural needs.

There are two cropping seasons namely Kharif from June to September and Rabi from November to March. There is however, a little variation in these periods with regards to paddy, which is cultivated in both seasons. The major Kharif crops are Paddy, Chillies, Vegetables, Jowar, Ragi and Groundnut. The major commercial crop in this area is castor. The crop yield in the area is low to moderate. The average crop yield for Kharif and Rabi Season in the study area are given below:

AVERAGE YEILD OF THE CROPS

S.NO.	CROP	YIELD (TONNES/HA)
Kharif		
1	Black Gram	0.89
2	Red Gram	0.75
3	Chilly	2.54
4	Sugar Cane	74.28
5	Cotton	0.40
6	Paddy	2.70
Rabi		
1	Black Gram	0.57
2	Paddy	2.87

5.5.7 FLORA AND FAUNA

A FORESTS

The study area is a dry part of Dachepalli & Gurazala of Guntur district and Damaracherla mandal, Miryalguda Taluk of Nalgonda

district. The general terrain is apparently rolling. The district slants from West and North-West to South-East. There are a number of isolated hills which are located in different ranges existing in the district.

The study area is drained by the river Krishna, Musi, Gadidela,& Dandi, Among these, the Krishna is the most important river forming the North western most boundary of the district.

The study area falls under following types of forest types as classified by Champion & Seth (1965).

1. Southern Dry Mixed Deciduous Forest
2. Southern Tropical Thorn Forest

Reserve forests (14.51%) in the study area are highly degraded due to extensive biotech interference and natural causes consists of mainly stunted tree or bushes / shrubs which belong to xerophytes and hardy species dominating. The following are the Reserve forests belonging to scrub forest category exists in the study area.

Pasupulabodu	Saidulnam
Ravipahad	Madinapadu
Gamalapadu	Wazirabad
Rajagutta	Gangadevigutta
Daida	Mangalbodu
Yellabodu	

The major plant species observed in the reserve forest areas are:

Trees:
Acacia Catechu
Acacia ferruginea
Acacia leucophloea
Adina cardifolia
Aegle marmelos
Albizzia lebbek
Bassia latifolia
Bauhinia serrata

Shrubs:
Celastrus senagalensis
Dodonea viscose
Randia dumetorum
Streblus asper
Woodfordia floribanda

Climbers:
Bauhinia vahlii

Bridelia retusa	Derris scandens
Cleistanthus collinus	Lantana camara
Chloroxylon sweitenia	Calycopteris floribunda
	Abrus precatorius
	Decandrum arikota
	Acacia instia
	Zizyphus Oenoplia
	Cissus quadrangularis

B FLORA

During field survey, it was observed that the flora of the study area is very poor when compared to other parts of the district. The inhospitable terrain with little or no-top soil could afford only hardy species, which can withstand the onslaught of Man, Cattle and extremely dry climate.

The vegetation in the study area can be broadly stratified into 4 classes depending on their area of existence.

1. Vegetation along the banks of Rivers / Canals
2. Vegetation around mine area.
3. Vegetation along side avenue and habitations

C VEGETATION ALONG THE BANKS OF RIVERS / CANALS

During field survey, it was observed that bamboo (Bambusa arundanecea) occurs along the river Krishna in small patches. To check soil erosion and promote soil binding, canal plantations were undertaken by the Social Forestry Division along major rivers in the study area such as River Krishna, Musi, and Dandi. Notable among the species afforested along the canals include Cassia Siamea, Dalbergia sisoo, Helianthus excelsa and Terminalia arjuna.

It is noteworthy to mention that the banks of river Krishna are very much disturbed. The disturbed locals had no tree cover. Bushes and rickets dominated the entire area with scanty grass cover and few herbs. Fuel wood species such as Prosphis juliflora was seen growing abundantly along the banks of river Krishna. A few water weeds such

as Eichornia and Pistia along with Phytoplankton were observed floating near the banks of river Krishna.

D SPECIES IN THE STUDY AREA

There are no threatened/ rare/endangered species of flora existing in the area and as such the flora existing in the proposed area has neither ecological nor economic importance for conservation.

The following table gives the species in the study area:

Common Name	**Botanical Name**	**Common Name**	**Botonical Name**
Asoka	*Saraca Indica*	Manga	*Randia Species*
Balusu	*Canthium parviflora*	Marri	*Ficusa Bengalensis*
Billudu	*Chloroxylon Sujeteveir*	Miryalu	*Cerissa Carindus*
Buddareni	*Capparis divaricater*	Narepi	*Hardwickia Binata*
Chigara	*Albizzia Amova*	Nimma	*Citras Medica*
Chintha	*Tamarindus Indica*	Paoadi	*Pavetta Indica*
Danti	*Celastrus Senegagalensis*	Pulivailu	*Dodonca Viscoa*
Darisanam	*Albizza Lebbek*	Ravi	*Ficcus Religiosa*
Gotti	*Zizyphus Xylopyrus*	Regu	*Zizyphus jujube*
Jama	*Psidium Guajava*	Sandra	*Acacia Sundra*
Jilledu	*Calotropis Gigantea*	Sithapal	*Squamosa Anomaceae*
Kanerugu	*Flacortia Indica*	Sonri	*Soymida Febrifua*
Korinta	*Plerolobium Indicum*	Tella bittu	*Mundelea Suberosa*
Velturu	*Dichrostachaya Cinerca*	Thgra magoli	*Morinda Tinctoria*
Vepa	*Azaadirachta Indica*	Usiri	*Officinals Euphorbiaceae*

E FAUNA

A rapid survey of wildlife of the study area brings out the salient features:

TERRESTRIAL FAUNA

Due to the scanty vegetation and openness of the area, there was no evidence of wild animals existence. However, it was reported that small mammals such as hare (lepus negricolis) wild bear (Sus scrofa cristatus), Porcupine (Hystrix indica) and Mungoose (Herpestes edwardsi) occur in very small numbers in the adjoining reserve forest areas.

AVI FAUNA

The broken terrain with absence of fruit yielding trees and roosting sites, supports mostly ground nesting birds such as grey patridge & quails. The other commonly occurring birds include Red Vented Bulbul, Babblers, kingfishers, Common Crow and Brahminy kite.

AQUATIC FAUNA

Survey along the major rivers in the study, area, for aquatic fauna revealed the occurrence of many fresh water fishes, crustaceans and mollusks.

HERPATO FAUNA

There was no sight of land reptiles such as snakes and lizards in the study area. However, it was reported that reptiles such as mabuya carinata (nelkis), Monitor lizard (Varanus sp.) along with snakes occur in the area. The most commonly occurring non-poisonous snake in the area is Rat snake (Dhaman) poisonous snake such as Cobra krait occur very few in number.

In a nutshell, the mine area does not harbour any rare/endangered/threatened species of flora and fauna as scheduled in the Wildlife Protection Act. (1972).

5.6 SOCIO-ECONOMIC ENVIRONMENT

As part of the Environmental Impact Assessment studies of proposed mines, information has been collected to define the socio-economic profiles of the study area.

Information on socio-economic environment includes description of the demography, available basic amenities like housing, health, medical services, transportation, education and cultural activities.

Baseline information was collected from villages in the study area and detailed information from the Government agencies. The study area falls under Guntur. River Krishna is the common boundary line for the two mandals, Wazirabad in Nalgonda and Daida in Guntur district.

The study area comprises 25 revenue villages with total population of 57,762. The salient observations obtained as a result of the study are discussed hereunder.

- Agriculture is the major activity in this area. A left canal laid from Srisailam project and Nagarjuna sagar passes through the study area.

- The total population density of the study area is about 184 persons / sq. km. However the major villages are thickly populated.

- The average literacy rate in the study area is observed to be low when compared to the other parts of the area which is about 46.02 percent.

- About 54.31% of the total population is engaged in working category with main working population 26255 and marginal working population 5121

- Percentage of non working category in study area is 45.69%.

- SC and ST population in the study area is about 14.6 % and 11.3 % of the total population respectively.

- The male female ratio was found to be 1000:977

- Literacy rate of male Population is relatively high than the female population. Only 11490 [27.90%] males are literate where as the female literacy population is 6330 [15.37%].

- Due to the abundance of lime stone mines in the study area, large cement industries such as Andhra, Raasi, Deccan Cement, Penna Cement Industries etc., located within 10 Km radial distance from the mine.

- Due to presence of cement plants in the vicinity of study area considerable share of total population either directly or indirectly is working in mines and cement industries.

- The major crops are Paddy, Cotton, Chillies and Redgram. The main source of water for this activity is through canals/tanks/rivers.

- Most of the villages are electrified.

- The social activities such as literacy camps, family planning and eye camps have been organized both by the local government bodies and industries in association with voluntary agencies.

- Nadikudi and Dachepalli are the local market place in this area. All the villages are connected to both villages either with metal or cart roads.

- Nadikudi and Miryalaguda are the major market centre for paddy, groundnut and chillies. There are also many small scale rice and oil mills.

- Telephone and Telegraph facilities are available within 5 km radial distance.

- Medical facilities are available at all mandal head quarters and regional medical centre at Miryalaguda.

Annexure – 5 D shows the demographic profile and occupational status of the study area in 10 km radius.

CHAPTER - 6

PREDICTION AND IMPACTS

6.0 PREDICTION OF IMPACTS

Opencast mining activity causes some adverse impacts on the surrounding environment unless proper environmental management plan is adopted. Selecting suitable sites for mining and also adopting all the guidelines prescribed by the Ministry of Environment and Forests and Indian Bureau of Mines (IBM) can minimize the major possible impacts. M/s ACL, has taken enough care in the mine to avoid adverse impacts on the surrounding environment.

In this chapter, an attempt has been made to quantify the possible environmental impacts on various features such as air, water, land and socioeconomic factors. The following aspects have been studied to identify the impacts of the operating mine.

The magnitude and significance of the environmental pollution caused by mining depends on method of mining, scale and concentration of mining activity.

ACL proposes to increase the limestone production from 1.5 to 3.0 MTPA.

This chapter deals with the impacts arising out of the proposed increase of limestone production.

6.1 AIR ENVIRONMENT

The air borne particulate matter is the main air pollutant contributed by opencast mining. Various emission sources are identified from the mining operations for the increased limestone production of 1.5 MTPA. The mine is devoid of top soil/overburden hence no developmental works are required which will result emissions.

Present and proposed production details of ACL considered for estimation of impacts are given below :

ACL 'S PRODUCTION DETAILS

	MTPA		
	Present Production	**Proposed Production**	**Net Increase**
Limestone	1.50	3.0	(+) 1.50

It may be noted from the above table that there will be increase in dust levels due to increase in quantity of limestone.

The baseline concentrations monitored in the study area reflect the emissions due to total material handling of 1.5 MTPA. Therefore for prediction of impacts, the additional production limestone of 1.5 MTPA has been considered.

The limestone produced from the mine is transported to the crusher located in the cement plant which is 0.5 - 1.0 km away from the working pits.

The mining operations are carried out by adopting highly mechanised methods where mining machinery is employed for drilling, excavation and dumping.

ACL is carrying out the mining operations for two shifts in a day to achieve the limestone of 1.50 MTPA. Inorder to produce the additional limestone of 1.50 MTPA, ACL will increase the scale of operation by putting the additional machinery into service.

An attempt has been made to know the emission rate from each of the above operation of the mining activity taking into account increase in limestone production from 1.5 to 3.0 MTPA. Resultant groundlevel concentration for the prevailing meteorological conditions using the mathematical model were estimated.

6.1.1 QUANTITATIVE ESTIMATION OF IMPACTS ON AIR ENVIRONMENT:

An attempt has been made to predict the incremental rise of various ground level concentrations above the baseline status in respect of air pollution due to increase in limestone production by an additional quantity of 1.50 MTPA. The mathematical model employed for predictions in the present study is FDM 93070 model which was approved by United States Environmental Protection Agency for mining applications.

The Fugitive dust model is a computerised air quality model specifically designed for computing concentrations and deposition impacts of fugitive dust sources. The model is based on the well-known Gaussain Plume formulation for computing concentrations and also the model has been specifically adapted to incorporate an improved gradient transfer deposition algorithm. Emissions for each source are apportioned into a series of particle size classes. Gravitational settling velocity and deposition velocity are calculated by FDM for each class.

Salient features of the FDM model are given hereunder.

- Drilling is considered as point source.
- Excavation and dumping operations are considered as area sources.
- Transportation of material on haulage roads has been considered as line source

The predicted ground level concentrations for Winter '06-07computed using EPA approved FDM model are plotted as isopleths using the **SURFER – 7** package of Golden Software.

6.1.2 SOURCES OF DUST EMISSION

Mining is carried out by highly mechanised opencast method which involves development of benches, drilling, blasting, loading of blasted

material by excavation into dumpers and transportation of limestone to crusher at cement plant .

ACL will adopt the same mining methodology which is presently being practiced for achieving the increased production in the operating mine.

Based on the various operations involved in the production of limestone, the various emission sources at each stage has been identified as given below.

a. Point sources
b. Area sources
c. Line sources.

Drilling operations of the mine are considered as point sources. Extraction of mineral by various activities in mining area, are considered as area sources. Transportation of material from mining benches to various end points are considered as line sources. The impact of above sources on air environment is discussed below:

A) Drilling

In the operating mine, 2 nos of 150 mm diameter down the hole drill machine and hydraulic drill and top hammer are employed. Drilling operations are carried out for two shifts. Due to increase in production rate of limestone, the number of drill machines will be increased to 2.

B) Blasting

Blasting is done using slurry and NONEL bottom hole shock tube detonators. Air pollutants generated during blasting are in the form of chemical gases and particulate matter. The gases and particulate matter generated during blasting do not contribute any air pollution as such effects of the escaped gases are not observed on vegetation in and around mining lease area. Blasting is carried out during day time only and will be avoided during high windy periods. The same practice will be followed for the increased production. All ground vibrations are measured by seismograph and are monitored closely.

The concentration due to instantaneous blasting is high and is confined to a maximum distance of 100 m from the area of the blast around each pit. These concentrations are not emitted continuously. However, presence of personnel near the blasting site during blasting is totally avoided. Hence the impact of blasting on the air environment is minimal.

C) Loading

Loading is being done by excavator with bucket capacity of 3.2 m^3 capacity. ACL will press into service additional excavator for handling the total limestone of 3.0 MTPA. Loading activity of mine operation is contributing to the area source emission and the extent of influence of this operation is about 2500 m^2.

D) Transportation

In the operating mine, the excavated material from mine face to the crusher is transported by dumpers. The dumpers are well maintained so that exhaust smoke does not contribute abnormal values of noxious gases and unburnt hydrocarbons. The other sources of air pollution is due to the dust generated during the movement of dumpers on the haul road.

The crushing plant is about 0.5 – 1.0 km away from the working pit. The present production of 1.5 MTPA is handled through full-time deployment of 3 dumpers in two shifts. ACL will put into service ..... dumpers of 35 t capacity to meet the haulage and transport requirement of increased limestone. One water tanker of 5 kl capacity is being used for regular water sprinkling on the haul roads and blasted material to ensure effective dust suppression.

ACL has paved the main transport route to the crusher of cement plant. The only connecting haulage road within working pits upto main road is not paved. However for estimation of the worst case scenario, the impact of transport has been considered for the entire stretch of transport paths from mine to the crusher.

The above sources which include drilling, blasting, excavation, haulage for transport of limestone upto cement plant contribute to dust pollution in the air.

The dust generated in the operating mine is that of limestone (Calcium carbonate), fine clay (alumina and silica) and rarely laterite dust (rich in iron oxide).

6.1.3 EMISSION DETAILS

All the emissions discussed above are quantified for increased limestone production of 1.50 MTPA as the existing production emissions are already covered in the baseline scenario.

The emissions are computed based on AP-42 emission factors. Operational hours, activity rate, wind speed and moisture content have been considered for estimation of emissions from point and area sources. For line source, apart from operational hours, activity rate, moisture, silt content and vehicle weight have been considered. The emissions computed for the increased production are given in the **Annexure – 6 A.**

Particle size distribution assumed in the modeling consisted of five separate particle size classes 1.0, 2.5, 5.0, 10, 20, 25 and 32 micrometers with a particle fraction of 0.05, 0.05, 0.07, 0.08, 0.12, 0.20 and 0.43 respectively.

6.1.4 METEOROLOGICAL DATA

The meteorological data recorded continuously during the month of December '06- February '07 on hourly basis on wind speed, wind direction and temperature has been processed to extract the 24 – hourly mean meteorological data as per the guidelines of IMD and MoEF for application of FDM 93070 model. Stability classes computed for the mean hours is based on guidelines issued by CPCB on modeling. Mixing heights representative of the region have been taken from the available published literature. **Annexure – 6 B** provides the mean meteorological data used for modeling.

6.1.5 ASSUMPTION MADE IN PREDICTION OF AIR POLLUTION MPACTS

For the purpose of computation of rise in the ground level concentrations due to mining operations, the following assumptions have been considered.

Drilling operations are carried out for a period of 14 –16 hours a day and hence it is not a continuous source of emission and other operations may not be simultaneous and continuous. However, for the prediction of worst case concentration, the sources mentioned above are assumed to be under simultaneous and continuous operation for 24-hours.

6.1.6 SUMMARY OF PREDICTED GROUND LEVEL CONCENTRATIONS (GLC'S) OF SUSPENDED PARTICULATE MATTER (SPM)

Ground level concentrations due to the mining activities have been estimated to know the incremental raise and extent of impact in the study area.

The major activity being limestone transport from the working pit to the cement plant and waste & top soil to respective designated areas, the dust levels are distributed all along the transport route in the mine area and to the crusher at the cement plant.

The maximum ground level concentration is estimated to be about 90 $\mu g/m^3$ within the mine area near to the crusher and the same was found to be less than 5 $\mu g/m^3$ beyond 100 m. No villages located within 2 km from the mining activities and hence the air pollution impacts on the surrounding villages is nil.

Fig – 6.1 represents the spatial distribution of the predicted ground level concentrations of SPM due to emissions from mine. The possible ground level concentrations of SPM at the boundary of the mine have been found to be less than 5 $\mu g/m^3$.

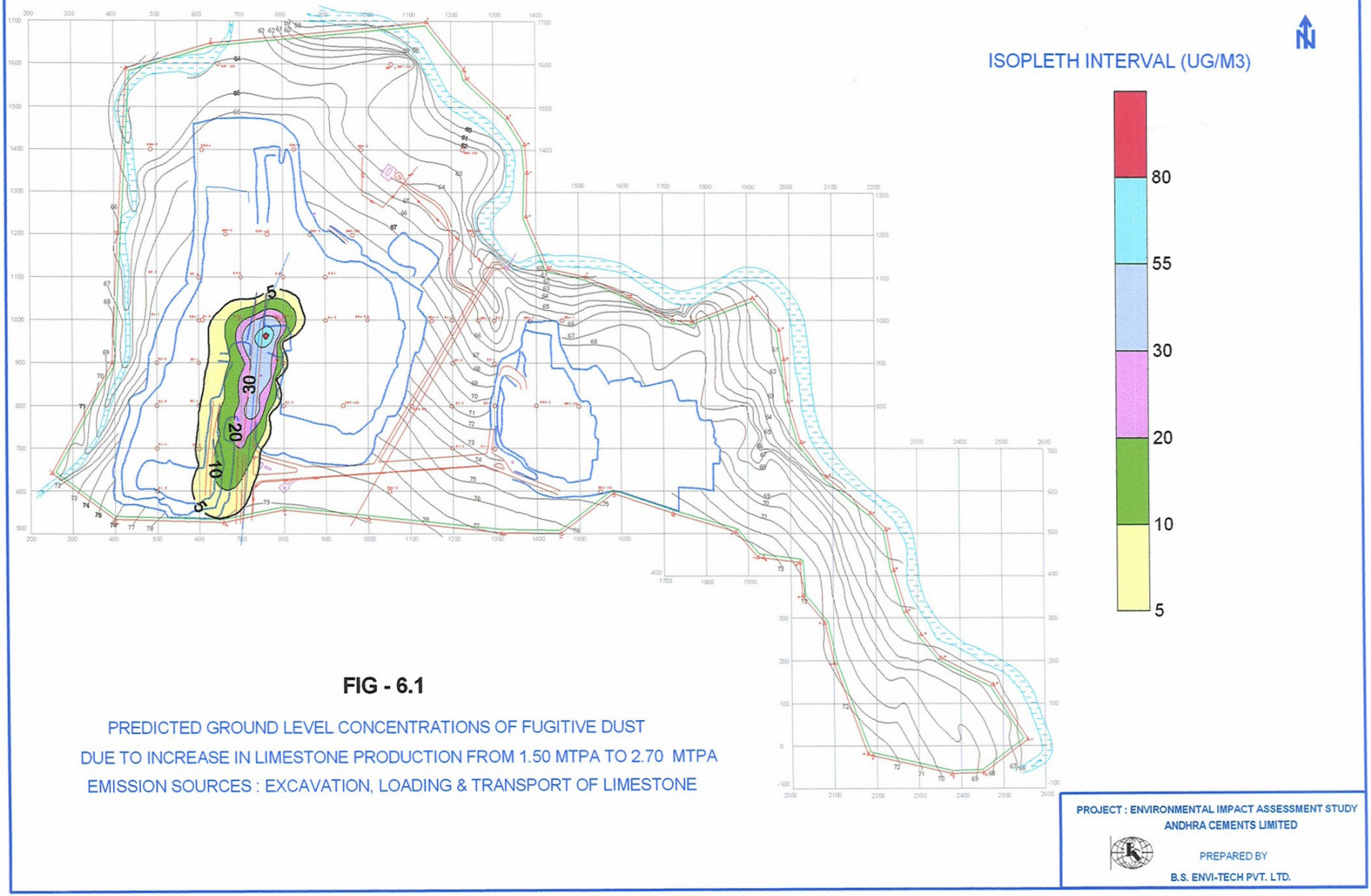


FIG - 6.1

PREDICTED GROUND LEVEL CONCENTRATIONS OF FUGITIVE DUST
DUE TO INCREASE IN LIMESTONE PRODUCTION FROM 1.50 MTPA TO 2.70 MTPA
EMISSION SOURCES : EXCAVATION, LOADING & TRANSPORT OF LIMESTONE

PROJECT : ENVIRONMENTAL IMPACT ASSESSMENT STUDY
ANDHRA CEMENTS LIMITED

PREPARED BY
B.S. ENVI-TECH PVT. LTD.

Predicted value superimposed on the existing baseline value gives the overall scenario which would prevail during winter season once mine is operated for the increased production. The following table shows the overall scenario :

OVERALL SCENARIO (WINTER SEASON '06-07)

	$\mu g/m^3$	
	CORE ZONE	**BUFFER ZONE**
Baseline concentration (max)	318.5	160.3
Predicted Concentration (max)	90	<5
Overall scenario	408.5	165.3
Specified Limits	500 ug/m^3 {NAAQ limit for Industrial area}	200 $\mu g/m^3$ {NAAQ limit for Residential area}

6.2 NOISE ENVIRONMENT

Noise produced at the operating mine is due to drilling, blasting, compressors, pumps, movement of vehicles and other machinery. The noise generated by the mining activity is dissipated within a small zone around the mines. There is no major impact of the mining activity on the vicinity However, pronounced effect of above noise levels is felt only near the active working area and on the personnel working in the vicinity.

The impact of noise on the villages is negligible as the villages are located far from the mine site. ACL has developed greenbelt in an area of 2.0 ha which includes 0.5 ha. covered under both sides of the main transport route. The mine is almost isolated from the surrounding villages by a green barrier which is reducing the impact of noise levels on the surrounding villages.

6.3 WATER ENVIRONMENT

Mining activities cause adverse impacts due to mine drainage, siltation due to storm water and contaminated water from workshops and domestic sewage water. The following various components have been identified for study of impact of the mine operations on the water environment.

- Impact on surface water bodies
- Impact on ground water table
- Impact due to water consumption and wastewater generation at mine

The above impacts are detailed below :

6.3.1 IMPACT ON SURFACE WATER BODIES

As part of the open cast mining operations, the mine lay out and year wise extension of the mines has been designed keeping in view of the availability of limestone and also to facilitate the mining activities.

Naguleru stream flows along the NW boundary of the mine area. This streams is a perennial water source and is a tributary of River Krishna located at 2.9 km from the mine site in the northern direction. Ralla vagu seasonal stream flows along the western boundary of the mine Season.

ACL will not carryout any mining towards the Naguleru Nala. A barrier of 50 m width will be left along the stream. Apart from this ACL does not proposes to takeup mining in the HFL area of the stream. The ultimate pit limit has been designed keeping in view HFL of Naguleru Stream.

Rainwater from the mine area due to natural slope drains into the Naguleru stream and Ralla vagu seasonal stream. Siltation of the Naguleru stream and Rralla vagu is envisaged due to the mining activities. The measure proposed for control of siltation are details under chapter – 7

6.3.2 IMPACT ON GROUND WATER TABLE

Detailed hydrogeological studies have been conducted at site to identify the ground water resources in the lease area. The water table in the mine area is located at a depth of about 40 m. ACL proposes to restrict the depth of mining to a maximum of 24 m (three benches each of 8 m height). Hence no interference of ground water is envisaged. However, due to existence of Naguleru stream, seepage of water is envisaged. It is estimated that about 110 m^3/day of water is required to be pumped out which will have impact on Naguleru stream.

6.3.3 IMPACT ON WATER QUALITY

Water samples collected from bore wells located in the core and buffer zone have indicated that the groundwater is free from heavy metal concentration indicating no interference of mine activity on the water quality.

As the mining progresses horizontally and vertically, the rain water precipitating and seepage water due to ground water table within the work area shall be stored in the worked out pit.

In order to avoid soil erosion and also the possibility of carry over of the material from the dumps with rainwater, garland drains are proposed with sedimentation pits. Hence adverse impact on water quality is not envisaged.

6.3.4 WATER CONSUMPTION AND WASTEWATER GENERATION

ACL is presently using about 30 m^3/day of water in the following areas:

1. For water sprinkling and main mine haul roads and feeder roads.
2. For domestic consumption at mines office.
3. For greenbelt development

Out of the total quantity of 30 m^3/day, about 2 m^3 is used for domestic purpose, 5 m^3 for greenbelt, 22 m^3 for dust suppression and 1 m^3 for workshop vehicle servicing.

The additional water required for the expansion of the mine will be about 30 m^3/day. Therefore the total water consumption in the mine after increase of limestone production will be as follows. This requirement will be met from the borewells till mine pit is developed by ACL.

WATER CONSUMPTION (M^3/DAY)

	Present Consumption	Additional Consumption	Total Consumption
Dust Suppression	22	22	44
Greenbelt	5	5	10
Domestic	2	2	4
Workshop	1	1	2
Total	30	30	60

WASTEWATER GENERATION

The wastewater generation from the above consumption is mainly from the following two areas:

a. Domestic wastewater –3.2m^3/day
b. Workshop wastewater - 2 m^3/day

The wastewater generated from the domestic front is mainly from toilets and canteen. This water is treated in septic tank followed by Soak pit.

The workshop wastewater contains about 20 ppm of oil and grease is being subjected to oil removal and the treated wastewater will be used for green belt development.

6.4 LAND ENVIRONMENT

Various components of land environment have been identified for study of impact of the mine operations. Details of the same are given below :

6.4.1 TOP SOIL GENERATION

The extent of availability of the topsoil in the lease area is very marginal. The thickness of the topsoil has been found to be 10 cm to 50 cm and in most of the places the soil was found to be present in the joints of the exposed limestone rock. The topsoil generated from the mining areas will be used for soil stabilization for green belt development.

As the catchment area of the lease is very less and most of the area is rocky and barren land, the possibility of soil erosion due to mining activities will be minimal. However, proper management plan will be designed to control the soil erosion.

6.4.2 SOLID WASTE GENERATION

No solid waste which need disposal is generated from the mine area

6.4.3 IMPACT ON LAND USE

The mine is located in an area of 170.22 ha. No forest land is involved.

The Mining Lease area is not a part of any type of forest. The forest area located within 5km from the lease boundary is mainly degraded forest with or without shrubs. No thick green cover was found in these forestlands. The vegetation cover is very poor and no tall growing trees or medicinal plants have been observed in the forest area.

The active mine area/area degraded under mining will be about 120 ha. ACL will develop 7.5 m wide greenbelt all along the boundary plantation. Apart from the 50 m wide greenbelt along the naguleru stream covering an area of about 9.5 ha will be developed under greenbelt. At the end of the life of mine, the land use pattern in the core zone is likely to be as follows:

TABLE – 6.3
LANDUSE PATTERN OF THE MINE AREA (Ha)

S.No.	Item		AREA (HA.)
1	Area to be mined		120
2	Mines Office & infrastructure		3.50
3	Non Mining area	7.5 m barrier all along the mine lease with greenbelt	6.00
4		Area of Naguleru Stream along with area under HFL	29.22
5		50 m Barrier zone of Naguleru stream with greenbelt	9.50
6		Area of Rallavagu Seasonal stream	2.00
Total			**170.22**

The details of post mining landuse pattern and reclamation of mined out are discussed in Chapter – 7

6.4.4 IMPACT ON LANDSCAPE

The subject area and its immediate surroundings offer a barren landscape. The aesthetic environment does not get affected as such there is no specific impact on this environmental parameter. There is ample scope, in fact, for a better aesthetic environment during the operational phase of mining.

In the conceptual scheme of mining it is envisaged that over 120 ha of the mine area will be degraded by mining resulting in single large pit of 24 m (max) depth

The total mined out area about 120 ha will be converted into a water reservoir surrounded by thick greenery.

The measures (vide subsequent chapter- 7) taken by ACL are likely to bring forth positive impact on the core zone landscape, although the degraded land cannot be fully reclaimed. The aesthetic environment of

the core zone will have a positive impact by the time mining ceases in the area with proposed dense afforestation .

6.5 IMPACT OF GROUND VIBRATIONS

Fragmentation of rock by blasting is an important operation in mining project, where hard ore occurs. Blasting is always essential unless the mineral is of soft grade and surface mining techniques could be adopted.

Blasting of the mineral at the operating mine of ACL is done using slurry explosive booster in conjunction with ANFO.

6.5.1 VIBRATION LEVELS AT OPERATING MINE

DETAILS OF VIBRATION STUDY

ACL has undertaken ground vibration studies to estimate the charge weights for blasting at various distances from the mine boundary keeping threshold PPV values of 12.5 mm/sec.

Subsequent studies carried out revealed that ground vibration/air blasts caused by blasting is not having any effect for the blasting pattern followed in the mine. Same method will be followed for the entire life of the mine.

6.6 SOCIO-ECONOMIC ENVIRONMENT

6.6.1 NO REHABILITATION

The mine area does not cover any habitation. Hence the mining activities does not involve any displacement of human settlement. No public buildings, places, monuments etc exist within the lease area or in the vicinity. The mining operations will not disturb/relocate any village or need resettlement. Thus no adverse impact is anticipated.

6.6.2 IMPROVEMENT IN SOCIO ECONOMIC STATUS

It is obvious to assume that the activities of the existing mining operations have produced some improvements in the socio-economic levels in the study area.

ACL has provided employment to local population and it will give preference to the local people when ever there is requirement of man power. The company also encourages and provides the required space for setting up small shops to local population.

ACL maintains roads to the project site from nearest state roads.

ACL has established a public relation office to maintain a good line of communication between the management and the public on matters of environmental concern. All public grievances are redressed.

The impact of mining on the economic aspects are clearly observed. The existing mining activities provided employment to persons of different skills and trades. The local population is the largest plausibility among these employees. The employment potential ameliorated economic conditions of these families directly and provided employment to many other families indirectly who are involved in business and service oriented activities. This in-turn will improve the socio-economic conditions of the area.

6.6.3 OCCUPATIONAL HEALTH AND SAFETY

Excessive dust, noise and vibration are the chief health hazards for the miners. As already mentioned these causative factors are well within the safety limits and ACL is strictly implementing all the prescribed safety measures. The health of the workers is being regularly checked and suitable medical facilities have been created on or close to the site. Highest safety is being ensured in the working conditions of the miners. Details of Occupational Health Center provided by ACL are given in the subsequent chapter.

CHAPTER - 7

ENVIRONMENTAL MANAGEMENT PLAN

7.0 ENVIRONMENTAL MANAGEMENT PLAN

Environmental measures are planned and updated on the basis of the impact assessment carried out for the proposed increase of limestone from 1.50 to 3.0 MTPA and existing environmental control measures which are being implemented at the mine at 1.50 MTPA of limestone production.

In the previous chapters, the possible environmental impacts due to mining operations have been identified. In order to mitigate adverse effects, Environmental management plan giving the environmental protection measures for implementation at mine have been proposed. ACL has taken all necessary measures in the design of mining plan as per guidelines of IBM. There is no habitation in the mine area.

Environmental management plan giving the environmental protection measures at mine to meet the stipulated norms of APPCB/IBM/MOEF is detailed below :

7.1 AIR POLLUTION CONTROL MEASURES

The present ambient air quality measurements in the mine area are well within the limits. The mining operations being fugitive dust prone, the impact at far distances will be minimal. Due to increase in production from 1.50 to 3.0 MTPA , there will be marginal increase in fugitive dust concentrations. Therefore the environmental control measures which are being implemented will be increased and extended to control the fugitive dust released due to additional production:

The following dust prone areas are identified for adopting proper control measures in the mine area.

a. Drilling
b. Excavation
c. Transportation

The environmental control measure which are being implemented and proposed to be continued to control the fugitive dust released for the increased production are given below :.

- DTH drill is provided with wet drilling arrangement
- Use of sharp drill bits for drilling holes. Charging the holes by using optimum charge and using millisecond delay detonator.
- Water sprinkling arrangements such as specially fabricated tankers mounted on tipper are deployed at mine site to control the fugitive dust generation from the haulage roads.
- Regular grading of haul roads and service roads to clear accumulation of loose material.
- About 44 m^3/day of water will be used for dust suppression operations at mines, Treated wastewater generated from the captive power plant will be used and no fresh water will be drawn.
- The blasted limestone piles (temporary) are wetted by spraying water.
- Avoiding blasting during high windy periods, night times and temperature inversion periods.
- Excavation operations are suspended during periods of very strong winds
- Avoiding over filling of dumpers and consequent spillage on the roads.
- Afforestation for control of dust.
- Spraying of water on sub grade stacks.
- The vehicles and machinery are kept in well-maintained condition so that emission of fugitive constituents is minimized.

- Plantation of wide leaf trees, creepers, tall grass around working pit, waste dump, along roads, and in barren zones will help suppress dust.

- ACL has proposed to develop about 15.5 HA. of vegetation cover in the lease area. Tall trees with an average height of 5 m will be developed all along the boundary of the lease area to minimize the dispersion of the dust from the mining.

It has been observed that, the predicted ground level concentration due to the proposed mining activities are not more than 10 $\mu g/m^3$ at a distance of 300m from the mining area. There will be minimum impact on the surrounding villages as there are no villages located within 1km from the mining area.

7.2 NOISE POLLUTION CONTROL MEASURES

The following measures are being implemented by ACL to control the noise pollution in the vicinity of the mine :

- The noise generated by the machinery are reduced by proper lubrication of the machinery and equipment.

- The workers employed are provided with personal hearing protection equipment, with ear-muffs and ear-plugs combined, as a protection from the high noise level generated at the plant site.

- The provision of green barrier of about 50 m width will further reduce the propagation of noise level generated.

- Limiting time exposure of workers to excessive noise.

- Carrying out blasting only during daytime and avoiding the same on cloudy days and when strong wind blows across.

- Speed of trucks entering or leaving the mine is limited to moderate speed of 25 kmph to prevent undue noise from empty tippers.

ACL is conducting the studies with periodical noise measurement surveys at specific vulnerable points to ensure that noise levels are below the permissible limit.

Periodic inspection and checks of the risk prone areas and equipment are being conducted. The generation of noise by the quarry equipment and machinery is much below the tolerance limits. The levels at different points are measured and compared with the standard set by circular no.18 (Mech.) 1975 when the mine is in operation.

7.3. CONTROL OF GROUND VIBRATIONS

During blasting, proper blast pattern is adopted. The latest technology delay blasting is adopted to reduce the impact on the ground vibrations and noise generation during blasting operations, are already in use.

The following measures are adopted to contain the Peak Particle Velocity due to blasting within the permissible limits based on operational experience and ground vibration studies carried out at the mine:

- The charge distribution is 15 to 20% base charge (Slurry explosives) and 80% column charge (ANFO mixture), stemming is about 1-2 m.
- Shock tube initiation system with sequential blasting is adopted.
- Staggered pattern of blasting is being adopted.
- Charge weights per delay is properly adopted so as to protect different categories of structures surrounding the mine site.
- Blasting is done in only one bench at a time.
- Delay between the circuits is varied as per the requirement.

ACL is adopting the charge weights in such a way that the peak particle velocity is maintained less than 10 mm/sec.

All the above mentioned points are taken care, while planning and conducting blasts.

7.3.1 SAFETY IN BLASTING

Care is taken to evacuate the mining area completely at the time of blasting operations. The blasting team is equipped with all personal safety and precautionary measure. The following safety measures are given attention while conducting the blasting operations

- A blasting SIREN is used at the time of blasting for audio signal.
- Before blasting and after blasting, red and green flags are displayed as visual signals.
- Warning notice boards indicating the time of blasting and NOT TO TRESSPASS are displayed prominently.
- Guards will be posted at all approaches at the time of blasting.

All these measures will be continued for enhanced production.

7.4 WATER POLLUTION CONTROL MEASURES

Mining activities may cause adverse impacts due to mine drainage, siltation due to storm water and contaminated water from work shops and domestic sewage water. In order to mitigate the likely impacts the following management has been proposed.

7.4.1 SURFACE WATER SOURCES – CONTROL MEASURES

Naguleru stream flows along the NW boundary of the mine area. Ralla vagu seasonal stream flows along the western boundary of the mine Season.

ACL will not carryout any mining towards the Naguleru Nala. A barrier of 50 m width will be left along the stream. Apart from this, ACL does not proposes to takeup mining in the HFL area of the stream. The ultimate pit limit has been designed keeping in view HFL of Naguleru Stream.

Ralla Vagu seasonal stream carried the rain water from the upstream catchment of the mine area. Ralla vagu drains into River Krishna. Part of the storm water mine area drains into the vagu. Hence to control siltation from the water ACL proposes to construct one check dam across Ralla Vagu in the NW corner of the mine area for control of stiltation. The desilted water will be discharged in into river Krishna.

The HFL of river Nagulery stands at 64 m above msl. The RL of the mine area varies from 68 m to 78 m Above MSL. To control siltation of Naguleru Stream, no mining is proposed beyond HFL of the stream. The mining pit towards Naguleru stream starts below 64 m and the pit formed in the due course will restrict the flow of storm water into the Naguleru stream.

The rain water collected in the mine pit will be routed to the sump proposed at the lower most bench for desiltation. The silt free water is used for mining activities.

7.4.2 GROUND WATER – CONTROL MEASURES

Due to existence Naguleru steam, seepage of river water into the mine is envisaged at the rate of about 110 m3/day. This water will be pumped back into Naguleru stream through Ralla vagu so that the hydrology of the Naguleru is not disturbed much.

7.4.3 WASTE WATER MANAGEMENT AT MINES SITE

Opencast mining of the limestone will not generate any wastewater. As there is no mineral processing, no wastewater will be generated. However, wastewater to the tune of 2.0 m^3/day will be generated from the workshop. This wastewater contains about 20 ppm of oil and grease will be subjected to oil removal and the treated wastewater will be used for green belt development.

About 3.2 m^3/day of sewage generated from the mines office is treated in septic tank and soak pit.

7.5 LAND ENVIRONMENT

The environmental management plan of land environment is divided into the following three components

- Solid Waste Management
- Reclamation of degraded areas
- Afforestation/Plantation/Greenbelt Development

Each of the above components are discussed below :

7.5.1 SOLID WASTE MANAGEMENT

TOP SOIL MANAGEMENT

No topsoil generated from the mines.

WASTE ROCK

No solid waste which need disposal is generated from the mine area

7.5.2 RECLAMATION OF MINED OUT AREAS

Land degradation is one of the major adverse impacts of open cast mining activities and effort to control adverse impacts would be incomplete without appropriate land reclamation strategy.

Of the total area of 170.22 hectares, ACL will mine limestone from 120 ha. An area of about 6.0 ha all along the boundary will be developed under greenbelt. Apart from this ACL will develop an area of 9.5 ha under greenbelt in the barrier zone of the Naguleru stream. The mineout pit shall be converted into a reservoir for storing the annual precipitation and improving the water regime of the area to facilitate better land use of the surrounding lands eventually. Reclamation of the mined out pit in the form of a water reservoir is an eternal benefit to the area in the long run.

POST MINING LANDUSE PATTERN

The post mining land use of the mine area is shown in table below :

POST MINING LAND USE (Ha)
LANDUSE PATTERN OF THE MINE AREA (Ha)

S.No.	Item		AREA (HA.)
1	Water reservoir		120
2	Mines Office & infrastructure		3.50
3	Non Mining area	7.5 m barrier all along the mine lease with greenbelt	6.00
4		Area of Naguleru Stream along with area under HFL	29.22
5		50 m Barrier zone of Naguleru stream with greenbelt	9.50
6		Area of Rallavagu Seasonal stream	2.00
Total			**170.22**

Fig – 7.1 shows the Conceptual Plan of the mine area.

7.5.3 AFFORESTATION

ACL has proposed to develop an area of 15.5 ha under greenbelt. Of the 15.5 ha, about 2.0 ha was already developed. Balance area of 13.5 ha will be developed in future in a phased manner.

7.5.3.1 AFFORESTION CARRIED OUT TILL DATE

A AFFORESTATION CARRIED OUT WITHIN AND OUTSIDE LEASE AREA

ACL ready developed greenbelt and avenue plantation in an area of 2.0 within the mine area.

ACL has takenup massive planting in the leased area and outside the leased area also.

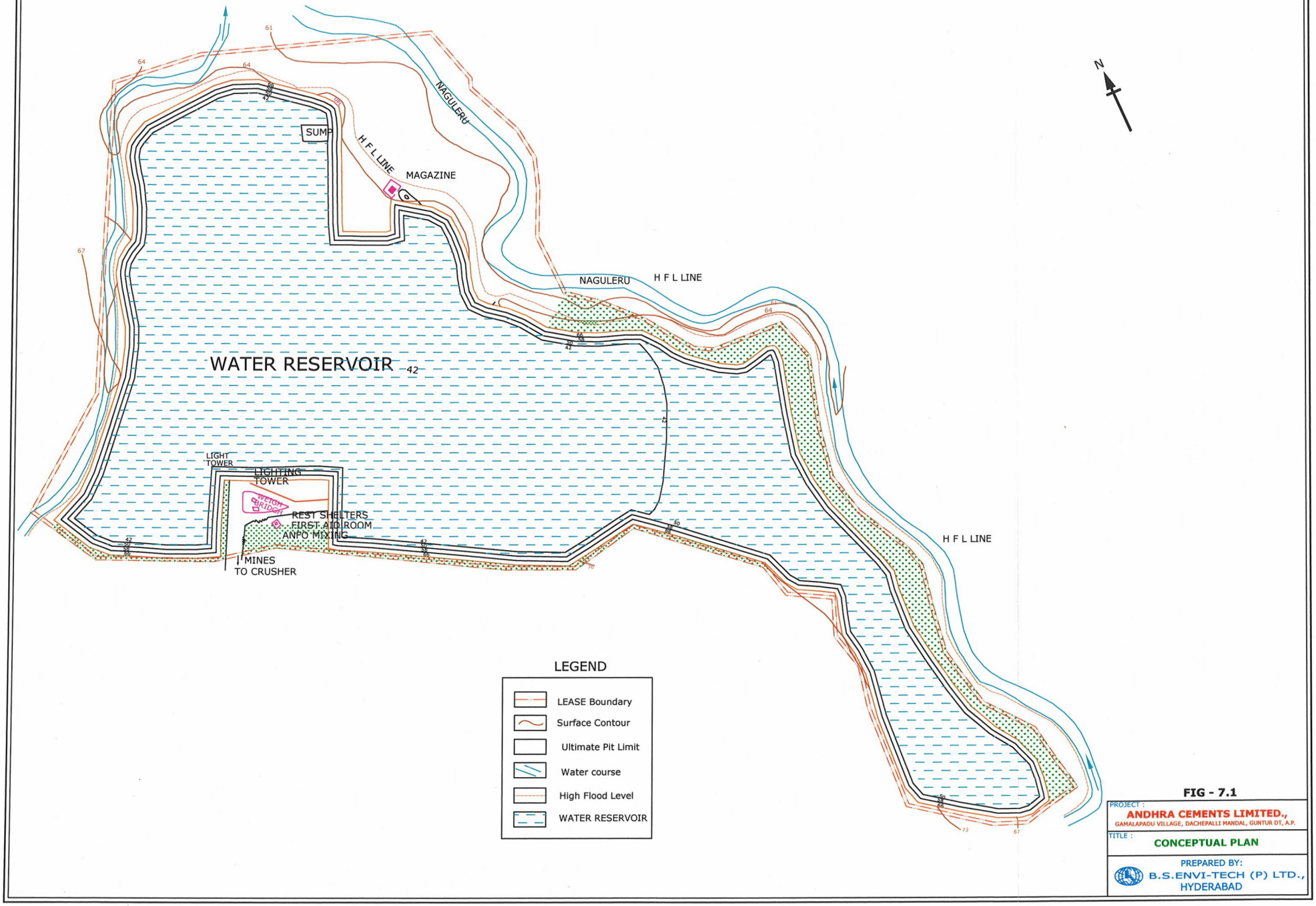


FIG - 7.1

PROJECT :
ANDHRA CEMENTS LIMITED.,
GAMALAPADU VILLAGE, DACHEPALLI MANDAL, GUNTUR DT, A.P.

TITLE :
CONCEPTUAL PLAN

PREPARED BY:
B.S.ENVI-TECH (P) LTD.,
HYDERABAD

Till date ACL has planted about 2642 saplings in an area of 2.0 ha. Survival rate in the area is found to be about 60 %. Apart from the plantation in the mine area. ACL has taken up massive afforestation outside the mine area (at cement plant and colony). Summary of afforestation carried out by ACL is given below :

SUMMARY OF AFFORESTATION PLAN

	Within Mine Lease Area	**Outside Mine Lease Area**
Area covered , ha	0.5	1.5
Trees Planted, numbers	562	2080
Survival rate, %	75-80%	85%
Density attained, trees/ha		

ACL has incurred about Rs 2.642 lakhs in the past for afforestation. Apart from the budget already incurred, ACL has allocated Rs 2 lakhs/annum for development of greenbelt in future.

7.5.3.2 PROPOSED AFFORESTATION

ACL will develop another 13.5 ha of the mine area under greenbelt.

7.6 SOCIAL WELFARE MEASURES

Any industrial activity can show a significantly beneficial impacts such as, employment, communication, educational and other social benefits in the regional environment. The management of ACL has provided employment to about 31 persons in the mine. Another 19 persons will be recruitment in semi skilled and unskilled categories.

ACL has undertaken the following social welfare programme for upliftment of the area.

The salient features of rural development programme are to provide :

- Health and hygiene through mobile medical clinic
- Agricultural extension
- Drinking water Project

- Educational Programme
- Woman and youth development activities
- Income generating schemes
- Sports and cultural activities

As a responsible corporate group, ACL is supporting development of local infrastructural facilities like bus shelter, roads, school building with the active help of local NGO's and other voluntary organization.

Some of the brief highlights of the activities undertaken by ACL are given in **Annexure – 7A.**

7.7 OCCUPATIONAL HEALTH AND SAFETY

The health of the workers is being checked once in 5 years regularly as per the DGMS rules. ACL has provided medical facilities close to the site and protective equipment for all employees. Highest safety is being ensured in the working conditions of the miners.

7.8 POST PROJECT MONITORING

7.8.1 ENVIRONMENTAL MONITORING

ACL is implementing various productivity management programs in the plant to improve the work environment, effective house keeping and environmental quality. ACL is currently monitoring the environmental parameters as per APPCB/IBM/MOEF guidelines

7.8.2 ENVIRONMENTAL MANAGEMENT CELL

In order to implement the measures suggested for mitigating the adverse impacts on the environment as also to monitor or some of the environmental parameters regularly a separate cell Headed by Dy. General Manager Mines. Additionally the Manager (Mines assisted by mining Engineer are working to monitor the various pollution

7.9 BUDGET FOR EMP

ACL has so far incurred an amount of Rs 15 lakhs for implementation of the environmental management plan during the last one year. ACL will incur an additional of Rs 50.0 lakhs on environmental management plan. Details of budget on environmental protection measures are given below :

BUDGET FOR ENVIRONMENTAL PROTECTION MEASURES

S.NO.		ADDITIONAL CAPITAL COST (RS IN LAKHS)	RECURRING COST (RS IN LAKHS) PER ANNUM
1	Air Pollution Control	15.0	9.0
2	Environment Monitoring and Management	5.0	0.2
3	Reclamation borrow/mined area	5.0	-
4	Occupational Health	5.0	12.0
5	Green Belt	5.0	2.0
Total		**35.0**	**23.2**

ANNEXURES

ANNEXURE-5 A

SUMMARY OF AMBIENT AIR QUALITY IN THE STUDY AREA (Buffer Zone)

CODE	µg/M³			PERCENTILE VALUES (µg/M³)									
	MAX	MIN	AVG	10	20	30	40	50	60	70	80	90	98
Suspended particulate matter (SPM)													
A-1	166.3	104.2	133.2	107.6	114.7	120.2	127.5	133.2	141.2	148.2	155.6	163.3	165.2
A-2	328.7	168.5	247.5	178.2	196.2	221.4	236.3	247.5	262.2	274.3	290.5	310.5	318.5
A-3	301.8	182.1	242.4	189.4	205.3	217.2	232.5	242.4	251.2	262.2	372.7	286.5	292.4
A-4	158.3	94.2	125.3	97.2	106.5	113.3	119.7	125.3	133.3	140.4	147.3	154.1	156.3
A-5	148.7	90.1	116.7	93.2	99.6	105.9	110.2	116.7	123.6	129.8	135.0	143.6	145.3
A-6	142.1	86.8	112.2	88.8	94.5	99.3	106.7	112.2	118.7	124.6	130.2	137.3	139.8
A-7	150.1	95.0	124.5	97.3	105.7	112.9	118.6	124.5	130.6	136.0	142.2	148.5	149.3
A-8	157.3	95.3	121.6	98.4	105.5	110.3	116.1	121.6	128.2	136.5	144.6	152.2	155.8
A-9	163.1	109.5	130.6	111.3	116.5	121.0	125.4	130.6	137.5	144.2	150.5	158.5	160.3
Respirable Particulate Matter (RPM)													
A-1	68.7	40.6	53.2	42.5	44.4	47.2	49.3	53.2	53.6	55.8	58.3	61.4	67.2
A-2	154.2	78.6	116.4	81.2	91.7	98.4	107.4	116.4	124.4	132.7	140.4	149.6	152.5
A-3	150.3	82.7	120.3	85.1	94.3	102.6	111.5	120.3	126.3	132.1	138.7	146.8	148.3
A-4	58.6	35.3	47.5	37.2	39.2	42.4	45.4	47.5	49.3	52.1	54.2	56.2	57.1
A-5	53.5	31.3	41.6	32.7	35.2	37.1	39.2	41.6	44.2	46.5	48.1	51.6	52.1
A-6	55.0	33.0	43.3	34.3	36.5	38.3	41.4	43.3	46.1	48.4	50.2	53.1	54.0
A-7	50.2	31.0	40.2	32.7	34.1	36.6	38.6	40.2	42.8	44.6	46.2	48.9	49.7
A-8	57.6	32.8	44.5	34.1	37.2	39.5	42.4	44.5	47.2	49.2	52.3	55.3	56.7
A-9	61.2	35.8	47.2	37.5	40.2	43.4	45.3	47.2	50.2	52.7	55.5	59.1	60.2
Sulfur Dioxide (SO_2)													
A-1	14.7	9.6	12.1	9.8	10.4	11.0	11.6	12.1	12.7	13.3	13.8	14.4	14.6
A-2	16.1	9.8	12.6	10.1	10.8	11.4	11.9	12.6	13.3	13.9	14.6	15.5	15.8
A-3	17.0	10.8	13.2	11.0	11.6	12.2	12.7	13.2	14.0	14.7	15.4	16.5	16.8
A-4	14.9	8.5	11.3	8.8	9.4	10.0	10.7	11.3	12.0	12.7	13.5	14.4	14.7
A-5	13.8	7.9	10.7	8.2	8.8	9.5	10.1	10.7	11.4	12.0	12.6	13.4	13.7
A-6	14.2	8.2	11.4	8.5	9.1	9.9	10.7	11.4	12.0	12.6	13.2	13.8	14.0
A-7	15.2	9.2	12.5	9.5	10.1	10.9	10.7	12.5	13.2	13.8	14.3	14.8	15.0
A-8	14.8	8.3	11.4	8.5	9.2	9.9	10.6	11.4	12.1	12.8	13.5	14.3	14.6
A-9	15.6	9.0	12.2	9.4	10.1	10.8	11.5	12.2	13.0	13.7	14.5	15.2	15.5
Oxides of Nitrogen (NO_X)													
A-1	16.3	11.2	13.7	11.4	12.0	12.6	13.2	13.7	14.4	14.9	15.4	15.9	16.1
A-2	17.3	11.3	14.0	11.5	12.1	12.7	13.4	14.0	14.7	15.4	16.0	16.7	17.0
A-3	18.4	12.4	15.1	12.6	13.3	13.9	14.5	15.1	15.8	16.4	17.0	17.8	18.1
A-4	15.7	9.6	12.5	9.8	10.5	11.2	11.9	12.5	13.2	13.9	14.6	15.3	15.6
A-5	15.1	8.8	12.1	9.1	9.8	10.6	11.4	12.1	12.9	13.5	14.2	14.8	15.0
A-6	15.0	9.3	12.5	9.6	10.3	11.0	11.7	12.5	13.0	13.5	14.0	14.6	14.8
A-7	16.2	10.5	13.5	10.7	11.4	12.1	12.8	13.5	14.1	14.6	15.2	15.8	16.0
A-8	15.8	9.4	12.7	9.6	10.3	11.0	11.8	12.7	13.5	14.1	14.7	15.4	15.6
A-9	16.7	11.1	14.2	11.3	12.0	12.7	13.5	14.2	14.8	15.3	15.5	16.3	16.5

Mine Office	A-1	Drilling	A-2
Haulage Road	A-3	Ramapuram village	A-4
Bhatrupalem village	A-5	Kotayyanagaram village	A-6
Gamalapadu village	A-7	Shrinagar village	A-8
Pondugula village	A-9		

ANNEXURE-5 B

WATER QUALITY DATA

SL. NO.	TESTS	RESULTS			IS 10500 [DRINKING WATER STANDARD]	
		RAMAPURAM VILLAGE	BHATRUPALEM VILLAGE	KOTAYYANA GARAM VILLAGE	DESIRABLE LIMITS	PERMISSIBLE LIMITS
		BOREWELL	BOREWELL	BOREWELL		
1	Odour	Un Objectionable	Un Objectionable	Un Objectionable	-------	-----
2	Taste	Agreeable	Agreeable	Agreeable	-------	-----
3	Colour (Hazen units)	<5	<5	<5	5	25
4	pH	7.95	7.42	7.32	6.5 to 8.5	6.5 to 8.5
5	Turbidity, NTU	2	2	2	5	10
6	Total Hardness as $CaCo_3$, mg/l	270	295	196	300	600
7	Mineral oil, mg/l	Nil	Nil	Nil	0.01	0.03
8	Iron as Fe, mg/l	0.18	0.16	0.14	0.3	1.0
9	Chlorides as Cl, mg/l	42	66	53	250	1000
10	Dissolved solids, mg/l	582	520	368	500	2000
11	Calcium as Ca, mg/l	56	48	40	75	200
12	Magnesium as Mg, mg/l			23.3	30	100
13	Copper as Cu, mg/l	BDL	BDL	BDL	0.05	1.5
14	Manganese as Mn, mg/l	BDL	BDL	BDL	0.1	0.3
15	Sulphate as SO_4, mg/l	46	57	76	200	400
16	Nitrate as NO_3, mg/l	22	12	18	45	100
17	Fluoride as F, mg/l	0.85	0.80	0.90	0.6-1.2	1.5
18	Mercury as Hg, mg/l	BDL	BDL	BDL	0.001	0.001
19	Cadmium as Cd, mg/l	BDL	BDL	BDL	0.01	0.01
20	Selenium as Se, mg/l	BDL	BDL	BDL	0.01	0.01
21	Cyanide as CN, mg/l	BDL	BDL	BDL	0.05	0.05
22	Lead as Pb, mg/l	BDL	BDL	BDL	0.05	0.05
23	Zinc as Zn, mg/l	BDL	BDL	BDL	5	15
24	Chromium as Cr^{+6}, mg/l	BDL	BDL	BDL	0.05	0.05
25	Pesticides	Absent	Absent	Absent	Absent	0.001
26	Alkalinity as $CaCo_3$, mg/l	336	269	165	200	600
27	Boron as B, mg/l	0.12	0.09	0.11	1	5
28	Arsenic as As, mg/l	BDL	BDL	BDL	0.05	No relaxation
29	Coliform count, MPN/100 ml	Nil	Nil	Nil	10 (e-coli absent)	10 (e-coli absent)

Note: BDL: Below Detectable Limit (for Hg, 0.001 mg/l and for all other parameters, 0.01 mg/l)

ANNEXURE-5 B (CONTD)

WATER QUALITY DATA

SL. NO.	TESTS	RESULTS			IS 10500 [DRINKING WATER STANDARD]	
		GAMALAPADU VILLAGE	**SHRINAGAR VILLAGE**	**PONDUGULA VILLAGE**	DESIRABLE LIMITS	PERMISSIBLE LIMITS
		BOREWELL	**BOREWELL**	**BOREWELL**		
1	Odour	Un Objectionable	Un Objectionable	Un Objectionable	-------	-----
2	Taste	Agreeable	Agreeable	Agreeable	-------	-----
3	Colour (Hazen units)	<5	<5	<5	5	25
4	pH	7.65	8.14	7.84	6.5 to 8.5	6.5 to 8.5
5	Turbidity, NTU	1	3	2	5	10
6	Total Hardness as $CaCo_3$, mg/l	310	276	110	300	600
7	Mineral oil, mg/l	Nil	Nil	Nil		
8	Iron as Fe, mg/l	0.15	0.20	0.16	0.3	1.0
9	Chlorides as Cl, mg/l	110	74	47	250	1000
10	Dissolved solids, mg/l	650	560	260	500	2000
11	Calcium as Ca, mg/l	62	60	26	75	200
12	Magnesium as Mg, mg/l				30	100
13	Copper as Cu, mg/l	BDL	BDL	BDL	0.05	1.5
14	Manganese as Mn, mg/l	BDL	BDL	BDL	0.1	0.3
15	Sulphate as SO_4, mg/l	70	48	34	200	400
16	Nitrate as NO_3, mg/l	26	20	12	45	100
17	Fluoride as F, mg/l	0.95	0.94	0.90	0.6-1.2	1.5
18	Mercury as Hg, mg/l	BDL	BDL	BDL	0.001	0.001
19	Cadmium as Cd, mg/l	BDL	BDL	BDL	0.01	0.01
20	Selenium as Se, mg/l	BDL	BDL	BDL	0.01	0.01
21	Cyanide as CN, mg/l	BDL	BDL	BDL	0.05	0.05
22	Lead as Pb, mg/l	BDL	BDL	BDL	0.05	0.05
23	Zinc as Zn, mg/l	BDL	BDL	BDL	5	15
24	Chromium as Cr^{+6}, mg/l	BDL	BDL	BDL	0.05	0.05
25	Pesticides	Absent	Absent	Absent	Absent	0.001
26	Alkalinity as $CaCo_3$, mg/l	366	348	160	200	600
27	Boron as B, mg/l	0.09	0.12	0.10	1	5
28	Arsenic as As, mg/l	BDL	BDL	BDL	0.05	No relaxation
29	Coliform count, MPN/100 ml	Nil	Nil	Nil	10 (e-coli absent)	10 (e-coli absent)

Note: BDL: Below Detectable Limit (for Hg, 0.001 mg/l and for all other parameters, 0.01 mg/l)

ANNEXURE-5 B [Contd.]

WATER QUALITY DATA

SL. NO.	TESTS	RESULTS		IS 10500 [DRINKING WATER STANDARD]	
		KRISHNA RIVER	POTABLE WATER	DESIRABLE LIMITS	PERMISSIBLE LIMITS
	CODE	Surface water	Surface water		
1	Odour	Un Objectionable	Un Objectionable	-------	-----
2	Taste	Agreeable	Agreeable	-------	-----
3	Colour (Hazen units)	<5	<5	5	25
4	pH	8.10	7.56	6.5 to 8.5	6.5 to 8.5
5	Turbidity, NTU	6	2	5	10
6	Total Hardness as $CaCo_3$, mg/l	166	280	300	600
7	Mineral oil, mg/l	Nil	Nil	0.01	0.03
8	Iron as Fe, mg/l	0.15	0.16	0.3	1.0
9	Chlorides as Cl, mg/l	86	56	250	1000
10	Dissolved solids, mg/l	440	570	500	2000
11	Calcium as Ca, mg/l	32	38	75	200
12	Magnesium as Mg, mg/l			30	100
13	Copper as Cu, mg/l	BDL	BDL	0.05	1.5
14	Manganese as Mn, mg/l	BDL	BDL	0.1	0.3
15	Sulphate as SO_4, mg/l	58	114	200	400
16	Nitrate as NO_3, mg/l	8	12	45	100
17	Fluoride as F, mg/l	0.70	0.98	0.6-1.2	1.5
18	Mercury as Hg, mg/l	BDL	BDL	0.001	0.001
19	Cadmium as Cd, mg/l	BDL	BDL	0.01	0.01
20	Selenium as Se, mg/l	BDL	BDL	0.01	0.01
21	Cyanide as CN, mg/l	BDL	BDL	0.05	0.05
22	Lead as Pb, mg/l	BDL	BDL	0.05	0.05
23	Zinc as Zn, mg/l	BDL	BDL	5	15
24	Chromium as Cr^{+6}, mg/l	BDL	BDL	0.05	0.05
25	Pesticides	Absent	Absent	Absent	0.001
26	Alkalinity as $CaCo_3$, mg/l	145	236	200	600
27	Boron as B, mg/l	0.12	0.09	1	5
28	Arsenic as As, mg/l	BDL	BDL	0.05	No relaxation
29	Coliform count, MPN/100 ml	276	Nil	10 (e-coli absent)	10 (e-coli absent)

Note: BDL: Below Detectable Limit (for Hg, 0.001 mg/l and for all other parameters, 0.01 mg/l)

ANNEXURE-5 C

SOIL QUALITY DATA

S.NO.	PARAMETERS	RESULTS						
		S1	S2	S3	S4	S5	S6	S7
1	pH (1:2 Soil water Extract)	8.16	7.90	7.10	8.34	7.42	6.98	7.87
2	Electrical conductivity (micro mhos) (1:2 Soil water Extract)	316	320	366	280	204	426	415
3	Total Soluble salts, mg/kg	460	342	364	340	310	530	286
4	Nitrates as N, mg/kg	182	186	190	150	154	198	186
5	Phosphorous as P_2O_5, mg/kg	31	22	24	15	18	25	29
6	Potassium as K_2O, mg/kg	256	543	450	362	324	542	510
7	Sodium as Na_2O, mg/kg	3130	985	1098	820	786	1182	2176
8	Calcium as Ca, mg/kg	7250	6560	5860	6880	5840	8270	7240
	Magnesium as Mg, mg/kg	1160	320	360	556	290	780	980
9	Chloride as Cl, mg/kg	165	184	170	155	119	190	180
10	Organic Carbon, %	0.40	0.46	0.48	0.36	0.50	0.42	0.38
11	Texture							
	Sand %	38	42	40	42	38	46	40
	Silt %	20	24	24	38	28	23	34
	Clay %	42	34	36	20	34	31	26

S1	Mine site
S2	Ramapuram village
S3	Bhatrupalem village
S4	Kotayyanagaram village
S5	Gamalapadu village
S6	Shrinagar village
S7	Pondugula village

ANNEXURE-5 D

DEMOGRAPHIC PROFILE OF THE STUDY AREA (10 km radius)

Name	Total/ Rural/ Urban	Number of households	Total population				0-6 years aged populatic			SC population				ST population			
			Total	Male	Female	Sex ratio	Total	Male	Female	SC%	Total	Male	Female	ST%	Total	Male	Female
0-3 km																	
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3-5 km																	
Bhatrupalem	Rural	395	2016	1030	986	957	362	183	179	12.5	251	131	120	66.0	1330	677	653
Madinapadu	Rural	1158	4977	2467	2510	1017	692	334	358	24.1	1201	612	589	9.8	490	232	258
Mahankaligudem	Rural	340	1444	712	732	1028	180	81	99	22.2	320	157	163	1.2	17	10	7
Ramapuram	Rural	515	2118	1102	1016	922	251	137	114	34.1	722	383	339	3.6	76	42	34
Shrinivasapuram	Rural	236	1060	528	532	1008	169	86	83	3.5	37	21	16	0.0	0	0	0
Total (3-5 km)		**2644**	**11615**	**5839**	**5776**	**989**	**1654**	**821**	**833**	**21.8**	**2531**	**1304**	**1227**	**16.5**	**1913**	**961**	**952**
5-7 km																	
Gamalapadu	Rural	990	4127	2105	2022	961	540	292	248	6.7	277	151	126	4.2	174	92	82
Pondugala	Rural	2140	8808	4496	4312	959	1123	578	545	19.9	1751	880	871	0.8	71	42	29
Ravipahad	Rural	202	873	459	414	902	111	64	47	8.8	77	36	41	52.0	454	241	213
Total (5-7 km)		**3332**	**13808**	**7060**	**6748**	**956**	**1774**	**934**	**840**	**15.2**	**2105**	**1067**	**1038**	**5.1**	**699**	**375**	**324**
7-10 km																	
Alugumallepadu	Rural	87	333	174	159	914	37	18	19	4.2	14	7	7	0.0	0	0	0
Dachepalli	Rural	3164	14256	7237	7019	970	2108	1073	1035	7.2	1023	529	494	2.8	403	197	206
Janpahad	Rural	821	3479	1764	1715	972	523	267	256	8.8	305	148	157	53.5	1862	950	912
Katrapadu	Rural	269	1056	529	527	996	119	61	58	14.0	148	77	71	1.1	12	7	5
Mutyalammapadu	Rural	1013	4368	2239	2129	951	476	259	217	16.6	727	391	336	5.9	258	129	129
Nadikudi	Rural	353	1632	791	841	1063	222	107	115	23.3	381	173	208	0.5	8	3	5
Pulipaduu	Rural	528	2531	1284	1247	971	381	189	192	25.3	641	334	307	0.0	0	0	0
Sunyapahad	Rural	312	1420	703	717	1020	247	118	129	4.4	62	31	31	88.3	1254	613	641
Takkellapadu	Rural	894	3264	1604	1660	1035	401	196	205	15.7	512	257	255	2.8	91	44	47
Total (7-10 km)		**7441**	**32339**	**16325**	**16014**	**981**	**4514**	**2288**	**2226**	**11.8**	**3813**	**1947**	**1866**	**12.0**	**3888**	**1943**	**1945**
Total		**13417**	**57762**	**29224**	**28538**	**977**	**7942**	**4043**	**3899**	**14.6**	**8449**	**4318**	**4131**	**11.3**	**6500**	**3279**	**3221**

Source:2001 Census Published Data

ANNEXURE-5 D

LITERACY STATUS (10 km radius)

Name	Total/ Rural/ Urban	No of Literates			No of Illiterates		
		Total	Male	Female	Total	Male	Female
0-3 km							
	-	-	-	-	-	-	-
3-5 km							
Bhatrupalem	Rural	689	463	226	1327	567	760
Madinapadu	Rural	1787	1152	635	3190	1315	1875
Mahankaligudem	Rural	1034	570	464	410	142	268
Ramapuram	Rural	1120	712	408	998	390	608
Shrinivasapuram	Rural	392	248	144	668	280	388
Total (3-5 km)		**5022**	**3145**	**1877**	**6593**	**2694**	**3899**
5-7 km							
Gamalapadu	Rural	1920	1179	741	2207	926	1281
Pondugala	Rural	4237	2615	1622	4571	1881	2690
Ravipahad	Rural	314	225	89	559	234	325
Total (5-7 km)		**6471**	**4019**	**2452**	**7337**	**3041**	**4296**
7-10 km							
Alugumallepadu	Rural	172	106	66	161	68	93
Dachepalli	Rural	6576	4091	2485	7680	3146	4534
Janpahad	Rural	1390	911	479	2089	853	1236
Katrapadu	Rural	693	380	313	363	149	214
Mutyalammapadu	Rural	2203	1377	826	2165	862	1303
Nadikudi	Rural	627	372	255	1005	419	586
Pulipaduu	Rural	1102	735	367	1429	549	880
Sunyapahad	Rural	487	353	134	933	350	583
Takkellapadu	Rural	1841	1068	773	1423	536	887
Total (7-10 km)		**15091**	**9393**	**5698**	**17248**	**6932**	**10316**
Total		**26584**	**16557**	**10027**	**31178**	**12667**	**18511**

Source:2001 Census Published Data

ANNEXURE-5 D

OCCUPATIONAL STRUCTURE OF THE STUDY AREA (10 km Radius)

Name	Total/ Rural/ Urban	Total Working Population			Total Non Working Population			Total Main Worker			Total Marginal Worker		
		Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
0-3 km													
	-												
3-5 km													
Bhatrupalem	Rural	1101	555	546	915	475	440	991	541	450	110	14	96
Madinapadu	Rural	3114	1557	1557	1863	910	953	3079	1546	1533	35	11	24
Mahankaligudem	Rural	456	403	53	988	309	679	432	397	35	24	6	18
Ramapuram	Rural	1231	636	595	887	466	421	728	406	322	503	230	273
Shrinivasapuram	Rural	625	318	307	435	210	225	495	304	191	130	14	116
Total (3-5 km)		**6527**	**3469**	**3058**	**5088**	**2370**	**2718**	**5725**	**3194**	**2531**	**802**	**275**	**527**
5-7 km													
Gamalapadu	Rural	2216	1280	936	1911	825	1086	2195	1277	918	21	3	18
Pondugala	Rural	4610	2472	2138	4198	2024	2174	3762	2247	1515	848	225	623
Ravipahad	Rural	428	234	194	445	225	220	315	190	125	113	44	69
Total (5-7 km)		**7254**	**3986**	**3268**	**6554**	**3074**	**3480**	**6272**	**3714**	**2558**	**982**	**272**	**710**
7-10 km													
Alugumallepadu	Rural	188	105	83	145	69	76	186	105	81	2	0	2
Dachepalli	Rural	7506	4267	3239	6750	2970	3780	6309	3864	2445	1197	403	794
Janpahad	Rural	2077	1025	1052	1402	739	663	1756	949	807	321	76	245
Katrapadu	Rural	547	335	212	509	194	315	533	334	199	14	1	13
Mutyalammapadu	Rural	2294	1265	1029	2074	974	1100	1739	985	754	555	280	275
Nadikudi	Rural	1001	513	488	631	278	353	807	462	345	194	51	143
Pulipaduu	Rural	1251	675	576	1280	609	671	1250	674	576	1	1	0
Sunyapahad	Rural	854	425	429	566	278	288	352	320	32	502	105	397
Takkellapadu	Rural	1877	994	883	1387	610	777	1326	746	580	551	248	303
Total (7-10 km)		**17595**	**9604**	**7991**	**14744**	**6721**	**8023**	**14258**	**8439**	**5819**	**3337**	**1165**	**2172**
Total		**31376**	**17059**	**14317**	**26386**	**12165**	**14221**	**26255**	**15347**	**10908**	**5121**	**1712**	**3409**

Source:2001 Census Published Data

ANNEXURE-5 D

CATEGORY OF WORKERS IN THE STUDY AREA (10 Km Radius)

Name	Total/ Rural/ Urban	Cultivators			Agricultural Labourers			House hold Industry Workers			Other workers		
		Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
0-3 km													
	-	-	-	-	-	-	-	-	-	-	-	-	-
3-5 km													
Bhatrupalem	Rural	503	328	175	457	185	272	1	0	1	30	28	2
Madinapadu	Rural	1251	691	560	1713	771	942	34	14	20	81	70	11
Mahankaligudem	Rural	2	2	0	16	8	8	2	2	0	412	385	27
Ramapuram	Rural	347	208	139	232	102	130	48	27	21	101	69	32
Shrinivasapuram	Rural	202	170	32	121	19	102	6	5	1	166	110	56
Total (3-5 km)		**2305**	**1399**	**906**	**2539**	**1085**	**1454**	**91**	**48**	**43**	**790**	**662**	**128**
5-7 km													
Gamalapadu	Rural	666	404	262	1121	544	577	15	6	9	393	323	70
Pondugala	Rural	1018	688	330	1783	818	965	101	71	30	860	670	190
Ravipahad	Rural	115	70	45	112	42	70	2	1	1	86	77	9
Total (5-7 km)		**1799**	**1162**	**637**	**3016**	**1404**	**1612**	**118**	**78**	**40**	**1339**	**1070**	**269**
7-10 km													
Alugumallepadu	Rural	57	33	24	100	48	52	4	3	1	25	21	4
Dachepalli	Rural	1019	590	429	3015	1310	1705	124	62	62	2151	1902	249
Janpahad	Rural	512	452	60	859	281	578	118	21	97	267	195	72
Katrapadu	Rural	211	146	65	268	143	125	8	4	4	46	41	5
Mutyalammapadu	Rural	1373	812	561	249	92	157	19	3	16	98	78	20
Nadikudi	Rural	333	177	156	384	215	169	3	0	3	87	70	17
Pulipaduu	Rural	347	256	91	641	206	435	49	41	8	213	171	42
Sunyapahad	Rural	175	170	5	25	16	9	14	11	3	138	123	15
Takkellapadu	Rural	603	362	241	553	265	288	8	3	5	162	116	46
Total (7-10 km)		**4630**	**2998**	**1632**	**6094**	**2576**	**3518**	**347**	**148**	**199**	**3187**	**2717**	**470**
Total		**8734**	**5559**	**3175**	**11649**	**5065**	**6584**	**556**	**274**	**282**	**5316**	**4449**	**867**

Source:2001 Census Published Data

ANNEXURE – 6 A

EMISSION DETAILS

(BASIS – AP-42 : EMISSION ESTIMATION TECHNIQUE MANUAL FOR MINING)

A Excavation of Limestone – Area source

	Present	Proposed	Incremental
Quantity, mtpa	1.5	2.7	1.2
Operational Hours per year	3600	3600	3600
Activity rate, t/hr	416	750	334
Emission of dust, gm/t	*0.1		
Emission of dust, gm/hr			33.4
Area of influence, m^2			2500
Uncontrolled Emission Rate, $g/s/m^2$			0.0000037
Controlled emission rate, $g/s/m^2$			0.00000037

B Transport of Limestone - Haulage Emissions

	Present	Proposed	Incremental
Quantity, mtpa	1.5	2.7	1.2
Operational hours	3600	3600	3600
Capacity of each dumper	35	35	35
Total number of dumpers per year	42857	77142	34285
Lead length per trip, km	1.4 (two way)		
Total VKT per year, km			48000
Emission, kg/VKT	+1.0		
Total emission, kg per year			48000
Uncontrolled Emission rate, gm/sec/m			0.00529
Controlled emission rate, g/sec/m			0.000529

Note * Emission factor computed based on wind speed of 2 m/sec and moisture of 10%
+ Emission factor computed based on silt content of 10 % and moisture content of 10 %