Tara (East) & Tara (West) Opencast Coal Mine Project

RISK ASSESSMENT & DISASTER MANAGEMENT PLAN

1. PREAMBLE

The Disaster Management Act, 2005 defines the term "disaster" as under:

"disaster" means a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or manmade causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, or destruction of, property, or damage to, or degradation of environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area".

Further, the Disaster Management Act, 2005 defines the term "disaster management" as under:

"disaster management" means a continuous and integrated process of planning, organizing, coordinating and implementing measures which are necessary or expedient for-

i. prevention of danger or threat of any disaster;

ii. mitigation or reduction of risk of any disaster or its severity or consequences;

iii. capacity-building;

iv. preparedness to deal with any disaster;

v. prompt response to any threatening disaster situation or disaster;

vi. assessing the severity or magnitude of effects of any disaster;

vii. evacuation, rescue and relief;

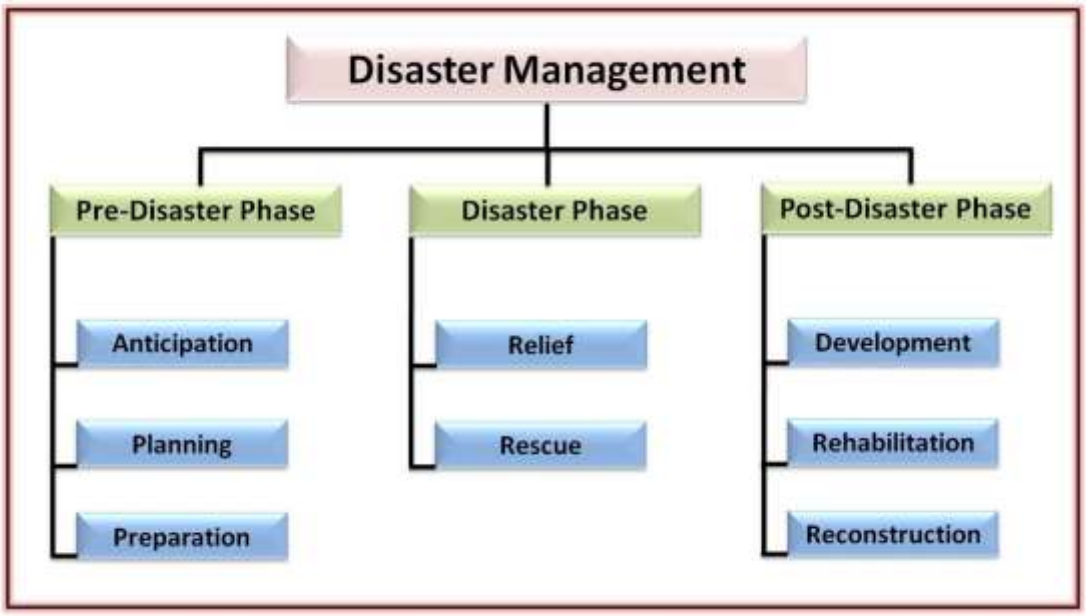
viii. rehabilitation and reconstruction;".

Coal Mining is a risky operation if not done systematically and scientifically. This is applicable to all the categories and sizes of the mines irrespective of the mineral being mined. Further, whether the mine is being worked by Opencast Methodology or Underground Methodology, with or without mechanization, all the activities associated with mining pose several potential risks if safety aspects are not followed properly. Natural disasters can also affect the mining operations.

Though a disaster may not always be averted, a Company can, through well designed emergency preparedness planning, mitigate or minimize their effects. If an emergency preparedness plan is well designed, properly implemented and periodically reviewed, it can greatly enhance the Mining Company's ability to respond effectively and efficiently to most emergencies and significantly reduce the potential loss or injury of miners and property. Thus, it is always beneficial to have a Disaster Management Plan in place to tackle any unfortunate event.

The Disaster Management Plan may be designed to consider the following three phases of the disaster (**Figure 1).**

Figure 1
Disaster Management



2. OBJECTIVES OF RISK ASSESSMENT & DISASTER MANAGEMENT PLAN

The objective of the Risk Assessment and Disaster Management Plan (RADMP) is to describe the Project Proponent's emergency preparedness capability, resources mobilization capability and capability to respond to various types of exigencies that could take place in an event of happening of any disaster at the Mine Site.

The control & containment of the hazardous situation to minimize the risk and impact of the disastrous event is the main objective of the RADMP.

3. RISK ASSESSMENT – MANMADE CAUSES

The first step towards preparation of any Disaster Management Plan is identification of the potential hazards due to the proposed mining operations. The hazards associated with the mining activities shall constitute the manmade causes of the disaster.

The mining of coal from the Project Area of 937.44 Ha shall be undertaken by Mechanized Opencast Methodology using HEMM along with Drilling & Blasting. The annual production shall be 4 MTPA of coal at peak production level.

The major hazardous activities associated with the mining of coal in this area are listed in **Table 1**.

Table 1
Major Hazardous Activities associated with Coal Mining

Sr. No.	Hazardous Activity	Associated Hazards
1	Removal of OB & Mining of Coal using HEMM	Accidents due to operation of HEMM
		Failure of Bench/Pit Slope
		Inundation of Working during monsoon
2	Drilling & Blasting	Accidents due to improper connections/handling of explosives
		Accidents due to improper storage of explosives
		Fly Rocks due to blasting
3	Loading/Unloading & Transportation of Coal & Overburden	Accidents due to operation of HEMM
4	Overburden Dumping	Accidents due to Slope Failure
5	Pit Head Coal Stock Yard	Fire due to spontaneous heating
6	Storage of HSD	Accidents due to explosion
7	Use of Electricity for allied activities like Workshop, Office & Industrial Lighting Etc.	Accidents due to electrical shocks

3.1 Risk Assessment for operation of removal of OB & mining of coal:

The operations for removal of OB and mining of coal shall involve use of HEMM like Hydraulic Excavators, Rear Dumpers, Trucks, Surface Miners, Dozers etc along with a number of ancillary equipment.

The HEMM shall be in operation round-the-clock as the mine shall be working on 24x7 basis. During such continuous operations of the HEMM the mechanical failures and/or human errors
may result in disastrous accidents.

The removal of overburden and mining of coal shall be undertaken by system of multiple benches. The Mining Plan provides the details of the Bench Slope and the Ultimate Pit Slope to be maintained during mining operations. Considering the envisaged ultimate depth of 255m of the opencast workings, strict implementation of the approved Bench / Pit Slope Geometry shall be needed.

Further, the Mine shall be intersecting the water table and local aquifer and there will be inflow of groundwater into the working during the operations. Also, during monsoon season there are chances of heavy surface runoffs entering into the workings. Such situation may result in inundation of the mine workings unless proper precautions are taken.

3.2 Risk Assessment for Drilling & Blasting Operation:

The Project envisages drilling & blasting of 160mm/250mm holes for removal of overburden with consumption of about 26.47 Tonnes of explosives on daily basis.

Operation of diesel/electrically operated Heavy Duty Drills is a skilled work and if not done properly may result in accident. Further, most of the accidents from blasting occur due to fly rocks mainly due to overcharging of the shot holes. Overcharging also creates ground vibrations which may lead to displacement of adjoining areas. Dust and noise are also problems commonly encountered during drilling and blasting operations. Further, wrong connections, improper handling and storage of explosives may also results in an accident.

Drilling & blasting shall not be involved in mining of coal as the same shall be done by Surface Miner.

The details of the envisaged Explosive Storage are provided in **Table 2**.

Table 2
Envisaged Explosive Storage Capacity

Sr. No.	Particulars	Details
1	No. of Explosive Magazines	2 Nos.
2	Capacity of each Magazine	3 Tonnes
3	Total Explosive Storage Capacity	6 Tonnes
4	Products to be stored:	
	a. Detonators	10 Nos/Day
	b. Detonating Fuses	4.0 Kms/Day
	c. Cord Boosters	0.12 Tonnes/Day

The location of the Explosive Magazine has been selected considering all the safety aspects. The Magazines shall be located in the north-west corner of the Project Area away from the Main Mine Workings and habitations. The Magazine Area shall be properly fenced and shall be guarded. The Area shall be isolated by development of Green Belt around it.

The location of the Explosive Magazine is indicated in **Plate 1**.

3.3 Risk Assessment for the operations of Loading/Unloading & Transportation of coal & overburden:

The Project involves peak production of 4 MTPA with associated OB Removal of 29.41 MillionCum. Considering the working days per annum as 330 days, the peak handling of the coal and overburden shall be 12,122 Tonnes and 89,122 Cum respectively on daily basis.

The operation of loading, transportation and unloading of such huge quantities at the designated place shall involve use of hundreds of HEMM. Operation of HEMM is a skilled work and if not done properly may result in accident. Synchronization of the HEMM Fleet to handle such volume of material needs special attention. Most of the accidents during operation of the HEMM occur due to oversight or negligence of the operator while operating or reversing the machine during operations.

3.4 Risk Assessment for Overburden Dumping Operation

The Tara (East) & Tara (West) was an operating mine before 31st March 2015. About 183.25 MillionCum Overburden was generated between the period from 1996-97 to year 2014-15. Out of this 183.25 MillionCum Overburden, about 34 MillionCum Overburden has already been dumped externally at four locations. The height of Dump 1 & 2 is 60m and that of Dump 3 & 4 is 30m. These four External OB Dumps have already been stabilized and do not pose any risk of slope failures.

However, in due course of time, the high overburden dumps may cause sliding of the overburden material due to excessive loading or heavy moisture content, thereby causing loss to life and property.

3.5 Risk Assessment for Pit Head Coal Stock Yard

The coal mined from the face is usually loaded into the Heavy Duty Rear Dump Trucks which are not permitted to ply outside the lease area. Therefore, the coal is dumped at the Pit Head Coal Stock Yard where from it is loaded into the Trucks for onward transport up to the Railway Siding/final destination.

In Tara (East) & Tara (West) Coal Mining Project, a Pit Head Coal Stock Yard of 3 Lakh Tonnes capacity is envisaged. The ROM Coal from the Stock Yard shall be transported by road to the Bahnwora Railway Siding by Trucks for onward despatch to the Thermal Power Plant by rail.

The coal stocked in the yard, pose risk of fire due to spontaneous heating. Particularly in summer season when the ambient temperature is more the susceptibility of coal to spontaneous heating increases.

If not checked, the Stock Yard Fires can cause substantial loss to operating HEMM, Coal Stock.

3.6 Risk Assessment for Storage of High Speed Diesel (HSD)

A number of diesel operated HEMM shall be deployed for the Tara (East) & Tara (West) Coal Mining Project. The deployed equipment may be directly owned by WBPDCL or may be deployed by the selected Mine Developer & Operator. The Project, therefore, envisages installation of HSD Storage Tank and Dispensing Unit to meet the diesel requirement of the HEMM.

Three HSD Storage & Dispensing Units have been envisaged. Two Units shall have 20 KL Capacity whereas one Unit shall have 70 KL Capacity. Thus, the total storage capacity of HSD shall be 110 KL. Necessary permissions / approvals for the same shall be obtained in accordance with applicable statutes.

The details of the HSD Storage and its hazardous characteristics are provided in **Table 3**

Table 3
Envisaged HSD Storage Capacity & Its Hazardous Characteristics

Sr. No.	Particulars	Details
1	No. of Storage Tanks	3
2	Total Capacity	110 KL
3	Chemical Classification*	Flammable Liquid
4	Hazchem Code*	Class 3
5	NFPA Hazard Signals:*	
	a. Health	1
	b. Flammability	2
	c. Stability	0
6	Explosive Sensitivity to Impact*	Not sensitive to mechanical impact
7	Explosive Sensitivity to Static Electricity*	Sensitivity exists for vapors
8	Hazardous Combustion Products*	CO, NOx and other aromatic hydrocarbons

**Source: - Material Safety Data Sheet (HPCL)*

Improper storage & handling of HSD may result in severe health issues apart from fires & explosions causing substantial loss to life and property.

3.7 Risk Assessment for use of Electricity

Electrically operated equipment consumes significant power in any Opencast Project. Mine dewatering, workshop, offices, colony etc add to the total power demand of the Project. Based on Peak Rated capacity of 4 MTPA ROM Coal form Tara (East) & Tara (West) Coal Block, the tentative requirement of power shall be in the range of 2-3 MVA at 33 kV.

This power requirement shall be sourced through West Bengal Electricity Distribution Company Ltd through overhead transmission lines and electrical sub-station.

Use of electricity is associated with hazards of electrical fires and electrical shocks causing loss of life and property.

4. Risk Assessment – Natural Causes

There may be occurrence of earthquake which may disturb the mining operations due to landslides etc and pose threat to the men and machinery. Further, there are chances that heavy rains may inundate the mine workings.

The applied mining area is under Seismic Zone III and is in stable zone. Thus, the chances of occurrence of any earthquake in the mine area are negligible.

The following three sources have been identified as potential risks resulting in inundation of the mine workings:

⇒ Surface Run-Offs from the surrounding area and river/nallas flowing over the lease area
⇒ Seepage from strata
⇒ Direct Precipitation

In case of Tara (East) and Tara (West) Coal Mine, the general topography of the area is slightly undulating. The ground elevation varies from 133m around the Borehole No. TR-6, 68 and 52 in the northern part of the block to about 92m around Borehole No. TR-35 in the eastern part.

A perennial nala traverses across the block and passes through the central part and drains the area to Ajoy River flowing in the eastern proximity of the block. River Ajoy is the main drainage channel flowing from north-west to south-east. There are some shallow ponds within the block.

The average elevation of the High Flood Level (HFL) for Ajoy River has been assessed as 94m. However, the area near the River has already been worked out and has been backfilled. The proposed Opencast Workings to be carried during next few years shall be well away from the HFL and therefore the chances of inundation of the Mine Workings due to surface run-off from Ajoy River is almost nil.

The area has wide range of geological formations ranging in age from Archean to Recent. While Archean and Gondwana Formations constitute the major parts, Quaternary Alluvium is restricted to the topographic depressions along the river channels in the form of thin veneer. The Archean metasedimentaries occupy greater part of the area and offers circulation of the groundwater to a limited extent through the secondary openings represented by joints, cracks, fissures and such other planes of discontinuity. The Gondawana sediments for the semi-consolidated formations and are better water potential zone.

Hydrogeological conditions together with climate and topography influences the occurrence and movement of groundwater in this region.

Climatologically, the area is not known for heavy rains. Thus, considering the relevant factors it is assessed that chances of inundation of the mine workings due to groundwater seepage / heavy rain water are also negligible.

5. Disaster Management Plan

A Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in the order of priorities.

For effective implementation of the Disaster Management Plan it shall be widely circulated and training of personnel along with rehearsals/mock drills shall be organized.

The Disaster Management Plan aims to:

1. Organize the rescue operation and provide medical treatment to injured
2. Minimize damage to property and the environment
3. Contain and ultimately bring the accident under control
4. Provide authoritative information to the relatives and news media

5. Secure the safe rehabilitation of affected area
6. Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of the emergency
7. Optimize operational efficiency for rehabilitation and render medical help and restore normalcy at the earliest.

The Disaster Management Plan needs to outline various actions to be undertaken in pre-disaster and post-disaster situations. The same has been detailed below:

Pre-Disaster Actions : This stage occurs when the prior information is available about a situation that may lead to a disaster in near future: Organizing Employee / Public Awareness Programmes is very important. The workers / employees as well as general public needs to be informed about potential hazards likely to occur in mining area. Emphasis may be given to the following aspects:

⇒ Pamphlets and booklets constraining details Dos & Don'ts in the event of crisis / emergency situations and hazards associated with coal mining be prepared and be made available.

⇒ Permanent notice boards may be fixed at all the suitable places in the area displaying information maps, escape routes, precautions to be taken and emergency communication details of supervisor.

⇒ Help from local youth organizations, voluntary organizations educational institutions may be sought to conduct educational session to make people aware about the safely measures and rescue operations in the event of a disaster.

Pre-Alert Notification: This type of notification is mainly used for disseminating an important piece of information concerning slowly developing emergencies which can either be rectified or would take some time before they turn into a crisis/disaster.

Alert Notification: An alert notification implies that although a crisis / disaster is not imminent, aggravation of the situation could lead to crisis unless condition improve / Officials should be alerted that an unsafe situation is developing.

Warning Notification: A warning notification implies that a crisis / disaster is imminent and advance action maybe initiated for minimizing the damage / rescue operations. The warning notification indicating the magnitude of crisis / disaster should be communicated to other mines in the region and to the authorities concerned.

Measures to avoid accidents due to Removal of OB & Mining of Coal

All the safety aspects in accordance with the applicable statutes shall be followed. The Code of Practice to be followed by the Company shall be based on the following:

a. Coal Mines Regulation 2017
b. ILO Code of Safety and Health and in Opencast Mines (1991)
c. Mines Act 1952
d. Mines Rules 1966
e. Vocational Training Rules 1966
f. Indian Electricity Rules 1956

g. DGMS Circulars from 1948 upto date as applicable
h. Factories Act 1948 (as applicable to Mines)
i. Conditions attached to Statutory Permissions and Exemptions granted by DGMS
j. Recommendations of National Safety Conferences, Tripartite Safety Review Committees.
k. Special Guidelines issued by DGMS following accident enquiries etc.

Safety for HEMM Equipment and Workers: : Special precaution shall be taken while deploying the HEMM and workers in the mine. Some of the major safety aspects before deploying of workers & HEMM to the mine are enumerated as follows:

A. For Mine Workers:

i. No worker shall be deployed unless he is skilled enough to take up the designated assignment and trained at VTC.
ii. Records in Form- B and Form- D shall be maintained.
iii. Records of Vocational training Certificate and driving license of operators shall be kept by owner. No persons shall be employed unless person holds VTC certificate. A record of it shall be maintained.
iv. Adequate supervision shall be maintained by qualified competent persons.
v. Safety guidelines and safety instruction will be followed.
vi. All drivers shall obey traffic rules prepared by the management.
vii. Before deploying workers, they must be trained and briefed about safety aspects in opencast mine. However during course of execution of the work, if any accident occurs, whether major or minor, the matter shall have to be immediately informed to the Mine Management i.e. Colliery Manager/Agent/GM of Area so that Notices of Accidents in a accordance with (Reg.9 of CMR) and Section 23 of Mines Act 1952 may be given and other necessary steps may be taken in accordance with the Mines Act 1952.

B. For machineries as recommended by DGMS Cir. (Tech.) 1 of 1999:

i. All machineries to be deployed in mines shall be checked before deployment by the relevant Chief Engineer (Mine).
ii. Regular checking of machines deployed by outside agency shall be done. No unfit machine shall be deployed before the defect is rectified.
iii. A proper record of repair and maintenance along with inspection done by Manager and defect pointed out shall be maintained and signed by authorized person.
iv. The HEMM shall be provided with Audio Visual Alarms, proper light for use at night and during period when natural light is not sufficient. Also audio-visual alarms for reversing of HEMM shall be provided.
v. RTO certificate photo copies of all vehicles shall be submitted to the Manager.
vi. Regular inspection of HEMM shall be done by the Mechanic as directed by the Manager.
vii. Machine manufacturers shall be asked to give risk analysis details in respect of machines deployed.
viii. Suitable fire extinguishers shall be provided in every machine.
ix. Risk Management Plan of HEMM shall be made and implemented.
x. Transport System shall be deployed in such a way so as to minimize pollution in the mine and keep the environmental status as recommended under the approved EMP.

Stability of Benches and Quarry High Walls:

During mining it is necessary to adopt approved Mining Parameters for the stability of benches and high-walls. It is also mandatory to examine systematically the fencing of mine working, landslides and cracks between benches. It is required to maintain well graded and wide roads on benches keeping the width of working areas sufficient for spreading of blasted rock and movement of the mining and transport equipment.

During actual mining operation, systematic observations and regular monitoring of the condition of benches, high-wall slopes shall be carried out and the dimensions shall be modified if necessary, to suit the local conditions. Recommended Bench Geometry for different HEMM has been found suitable in existing opencast mines in the country.

Following slopes have been recommended considering the practices in the other mines:

Overall (Ultimate) Pit Slope	-	42^0
Coal Bench	-	70^0

It is proposed to get studies of Physico-Mechanical Properties of rocks done at IITs/ISM/CMRI/CMPDI or other Institutes so that further stability study can be performed by Experts.

The following measures shall be adopted to address the Slope Stability Issue:

i. Areas prone to slope failure shall be identified and marked on appropriate Plans.
ii. Reviews & inspection at regular intervals shall be done by Rock Mechanics Engineers during operational life of the mine.
iii. Observation of actual alignment of fault, its throw, joints, etc shall be recorded on appropriate Plans during the process of mining to facilitate identification of potential shear zones beforehand.
iv. Water Drainage System shall be properly implemented to prevent accumulation of water in cracks.
v. Benches shall be properly leveled to prevent accumulation of water over it.
vi. Regular monitoring of tension cracks, horizontal and vertical movement of strata in critical area shall be done.
vii. If required, reinforcement of Rise Side Slopes shall be done. Minimum 15m wide strip from the mine edge shall be always kept free from any dump or structure.
viii. Undercutting of Slopes shall not be permitted.
ix. Hydrogeological Studies shall be done to facilitate identification of slope areas prone to built-up of hydrostatic pressure. If required, dewatering shall be done for reduction of hydrostatic pressure.

Precautions against danger of inundation from Surface Water:

A careful assessment shall be made against the danger from surface water before the onset of rainy season. The necessary precautions shall be clearly laid down and implemented. A garland drain shall be provided to drain away the surface rain water from coming into the mine.

Garland drain shall be provided around OB Dumps and working mines to course the rain water to main streams.

Inspections for any accumulation of rain water, obstruction in normal drainage shall be undertaken at regular intervals.

Standing order for withdrawal of working persons in case of apprehended danger shall be issued.

During heavy rain inspection of vulnerable points is essential. In case of any danger persons shall be withdrawn to safer places.

Measures to avoid accidents due to Drilling & Blasting

The following measures shall be adopted:

i. Drilling shall be done only by experienced Drill Machine Operator and Blasting shall be done only by a licensed Blaster.
ii. Shots shall not be fired except during the hours of day light.
iii. Holes charged on a particular day shall be fired on the same day.
iv. Care shall be taken to prevent flying of projectiles beyond a distance of 10 m from the place of blasting;
v. Adequate shelters or other protective structures shall be provided to the workers at all times;
vi. Sufficient warning by effective signal over the entire area falling within a radius of 500m shall be provided.
vii. During the approach and progress of any natural lightening storm either the blasting shall not be done or adequate precaution shall be taken.
viii. The Explosive Magazines shall be designed as per the statutory requirements of the Indian Explosives Act 1884.
ix. All the statutory provisions for storage, transportation and use of explosives shall be implemented. Vans of approved design would be provided for transportation of explosive.
x. For controlling the Fly Rock and Ground Vibration issues due to blasting the approved Blast Design Parameter shall be adopted in context of following:
    - ⇒ Explosive Charge / Delay
    - ⇒ Spacing and Burden
    - ⇒ Total Explosive Charge / Blast
    - ⇒ Proper Delay Initiation & Delay Sequence

Measures to avoid accidents due to Loading/Unloading & Transportation

The following measures shall be adopted:

i. The Trucks / Tippers shall be maintained in good conditions and checked thoroughly at least once a week by a competent person to prevent accidents due to mechanical failure.
ii. Relevant signs shall be provided at each and every turning point for the guidance of the drivers.

iii. To avoid dangers while reversing the machine, provision of sound device to indicate reversing of trucks shall be done.

iv. Education and Training of operators shall be taken on regular basis to prevent incidence of such accidents.

Measures to avoid accidents due to Overburden Dumping

Following slopes have been recommended considering the practices in the other mines:

Max. Height of the Dump	-	60m
Dump Bench Slope	-	37^0
Max. Overall Slope	-	28^0

The use of a continuous monitoring "Dump & Pit Slope Stability Radar" with integrated Visual Imaging System or any other such technology giving real-time displacement of strata and dumps and warn well in advance of any impending failure of pit slope or dump slope shall be explored. This will ensure safe and timely withdrawal of men and machinery from such prone areas. A protocol for such monitoring shall be developed in consultation with DGMS and Supplier Agency.

The following measures shall be adopted to address the Slope Stability Issue associated with OB Dumps:

i. Proper selection of site for dumping shall be done before dumping. The area shall be made free from loose material. Dumping shall not be done at an angle more than angle of repose of material being dumped.
ii. After completion of dumping operations dumps to be stabilized by growing vegetation.
iii. Regular monitoring of tension cracks, horizontal and vertical movement of Dumps shall be done.
iv. Garland Drain System shall be properly implemented to prevent accumulation of water over Dumps.
v. Dump Benches shall be properly leveled to prevent accumulation of water over it.

Measures to avoid fires in Pit Head Coal Stock Yard

In order to prevent fire hazards in Pit Head Coal Stock Yard following measures shall be taken:

i. The stacking height for the coal shall be limited to 2m to avoid built-up of internal heat within the stock.
ii. Storage of flammable material near coal stock yard shall not be permitted.
iii. The internal temperature of the stock pile shall be monitored at regular intervals by inserting pipes in the stock pile.
iv. The dispatch of the coal shall be done strictly on the basis of FIFO Basis to avoid storage of coal for longer period.
v. Sufficient fire extinguishers shall be installed at selected locations on surface like Electrical Sub-stations, work-shop, Garage, Stores, etc. Besides, sufficient number of water hydrants with sufficient hose pipes shall be made available on the surface for fire protection.

Measures to avoid accidents due to Storage of HSD

Petroleum Products are inflammable and therefore dangerous if not handled or stored properly. In order to prevent fire hazards in Pit Head Coal Stock Yard following measures shall be taken:

i. The installation and operation of the HSD Storage Tanks and Dispensing Units shall be done strictly in accordance with the applicable Petroleum & Explosive Safety Organization (PESO) Rules.
ii. Smoking shall not be permitted in the premises of HSD Storage and handling area.
iii. Storage of other flammable materials shall not be permitted in the premises of HSD Storage and handling area.
iv. Sufficient fire extinguishers suitable for Petroleum Fires shall be installed at appropriate locations in the HSD Storage Area.

Measures to avoid accidents due to fires / electrical shocks:

The following measures shall be adopted:

i. During mining operations, all the statutory provisions of the Indian Electricity Rules 1956 and Indian Standards for installation and Maintenance of Electrical Equipment etc shall be observed.
ii. For protection from electric shocks to persons, from electrical equipment with voltage up to 1000V Earth Leakage Relay shall be provided which will automatically disconnect electrical circuits.
iii. Closed mobile substations and switchgears shall be mechanically interlocked which excludes the possibility of opening the door when oil switch and air circuit breakers are in operation.
iv. All metal parts of electrical equipment shall be properly earthed to avoid failure of insulation.
v. All High Tension Lines (HT) and cables located within the blasting zones shall be disconnected during blasting operations.
vi. Storage of inflammable materials like diesel, lubricants, cotton waste etc shall be done properly to avoid occurrence of fire.
vii. Fire Extinguishers shall be provided to deal the exigency.

Emergency Organization : It is proposed to setup an Emergency Organization to handle the situation in case of happening of any accident / disaster. A Senior Executive, who has control over the activities of the mine, would be heading the Emergency Organization. He would be designated as Site Controller. As per the organizational chart, a Mine Manager would be designated as the Incident Controller (IC). The Incident Controller shall be reporting to the Site Controller.

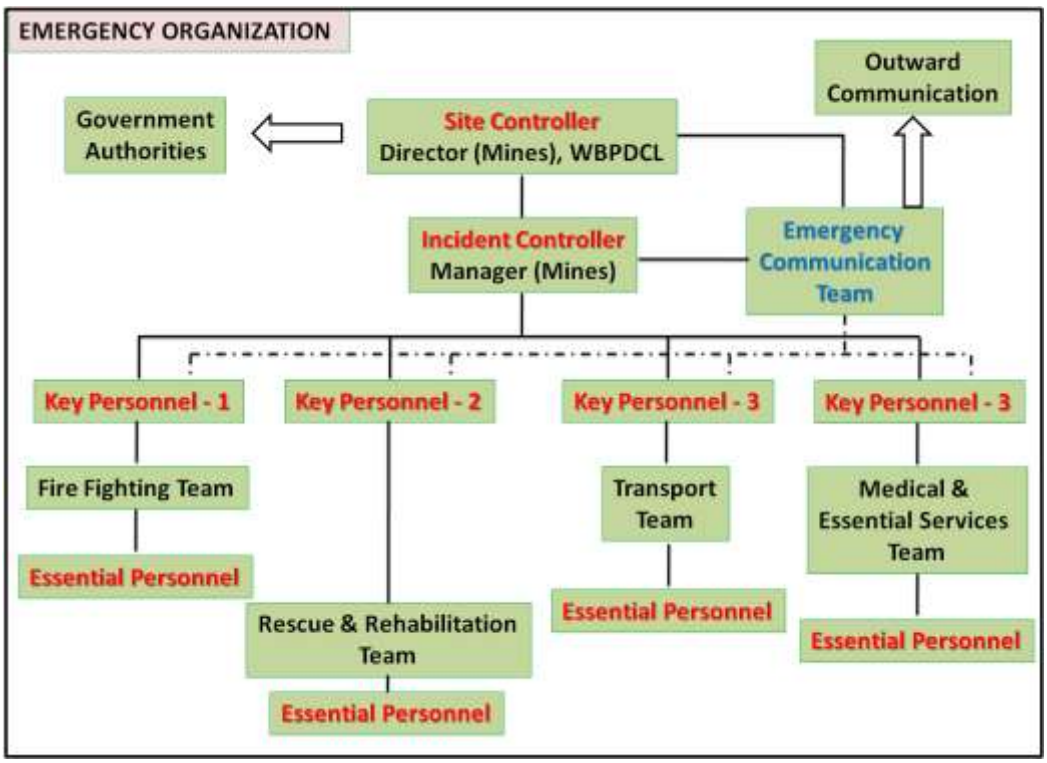
The Incident Controller would constitute a Team responsible for controlling the incident. Shift In-charge would be the Reporting Officer, who would bring the incident to the notice of the Incident Controller and Site Controller.

In addition, Emergency Coordinators would be appointed who would be responsible for activities like firefighting, rescue, rehabilitation, transport and providing essential support services. For this purposes, security in-charge, personnel department, essential services personnel would be engaged. All these personnel would be designated in Key Personnel Category.

In each shift, electrical supervisor, electrical fitters, pump house in-charge and other maintenance staff would be mobilized for emergency operations. In the event of power or communication system failure, some of staff members in the mine offices would be mobilized and their services would be utilized as messengers for quick communications. All these personnel would come under Essential Personnel Category.

The suggested structure of the Emergency Organization for Tara (East) & Tara (West) Coal Mining Project is provided in **Figure 2**.

Figure 2
Structure of Emergency Organization



Emergency Communication

Whoever notices an emergency situation such as fire / accident etc would inform his immediate superior and Emergency Control Center (ECC). The person on duty in the ECC would appraise the situation to the Site Controller. Site Controller would verify the situation from the Incident Controller of that area or the shift In-charge and take a decision about an impending on - site emergency. This would be communicated to the all Incident Controllers, Emergency Coordinators. Simultaneously, the emergency warning system would be activated on the instructions of the Site Controller.

Responsibilities of Key Personnel during Emergency

<u>Site Controller</u>:

On receiving information about emergency he would rush to emergency control center and take charge of ECC and assesses the magnitude of the situation on the advice of incident controller and decide:

i. Whether the effected area needs to be evacuated;
ii. Whether personnel who are at assembly points need to be evacuated;
iii. Declares Emergency and orders for operation of emergency siren;
iv. Organizes announcement by public address system about location of emergency;
v. Maintains a continuous review of likely development and assesses the situation in consultation with Incident Controller and other Key Personnel as to whether shutting the mine operation required and if evacuation of personnel is required;
vi. Directs personnel for rescue, rehabilitation, transport, fire brigade, medical and other designated mutual support systems locally available, for meeting emergencies;
vii. Controls evacuation of affected areas, if the situation is likely to go out of control or effects are likely to go beyond the mine boundary, informs the District Emergency Authority, Police, Hospital and seeks their intervention and help;
viii. Informs the statutory authorities;
ix. Gives a public statement if necessary;
x. Keeps record of chronological events and prepares an investigation report and preserves evidence; and
xi. On completion of on-site emergency and restoration of normalcy, declares all clear and orders for the same.

Incident Controller:

i. Assembles the incident control team;
ii. Directs operations within the affected areas with the priorities for safety to personnel, minimum damage to property, environment and minimum loss of materials;
iii. Directs shutting down operations and areas likely to be adversely affected by the emergency;
iv. Seeks help of all key personnel ;
v. Provides advice and information to the Fire and Security Officer and the Local Fire Services as and when they arrive;
vi. Ensures that all non-essential workers/staff of the affected areas evacuated to the appropriate assembly points, and the areas are searched for causalities;
vii. Preserve the evidences for any likely inquiry later into the cause and circumstances which caused or escalated the emergency;
viii. Co-ordinates with emergency services at the site;
ix. Provides tools and safety equipment to the team members;
x. Keeps in touch with the team and advises them regarding the method of control to be used; and
xi. Keeps the Site Controller of Emergency informed of the progress of operation.

Emergency Coordinator - Rescue, Fire Fighting:

i. On learning about emergency, rushes to ECC;
ii. Helps the incident Controller in containment of the emergency;

iii. Ensure fire pumps in operating conditions and instructs pump house operator to be ready for any emergency with standby arrangement;
iv. Guides the firefighting crew i.e. firemen, trained mine personnel and security staff;
v. Organizes shifting of firefighting facilities to the emergency site, if required;
vi. Takes guidance from the Incident Controller for firefighting as well as assesses the requirements of outside help;
vii. Controls the traffic at the incident area;
viii. Directs the security staff to the incident site to handle emergency operations under his guidance and supervision;
ix. Evacuates the people in the mine or in the nearby areas as advised by Site Controller;
x. Searches for casualties and make necessary arrangements;
xi. Assembles search and evacuation team;
xii. Make arrangements for safety equipment for the members of the team;
xiii. Decides which paths the evacuated workers should follow; and
xiv. Maintains law and order in the area, and if necessary seeks the help of police.

Emergency Coordinator - Medical, Mutual Aid, Rehabilitation, Transport and Communication:

i. In the event of failure of electric supply and internal telephones, sets up communication point and establishes contact with the Emergency Control Center (ECC).
ii. Organizes medical treatment to the injured and if necessary shifts them to nearby hospitals;
iii. Mobilizes extra medical help from outside, if necessary;
iv. Keeps a list of qualified first aid providers of the factory and seek their assistance;
v. Maintains first aid and medical emergency requirements;
vi. Makes sure that all safety equipment are made available to the emergency team;
vii. Assists Site Controller with necessary data in coordinating emergency activities;
viii. Assists Site Controller in updating emergency plan, organizing mock drills, verification of inventory of emergency facilities and furnishing report to Site Controller;
ix. Maintains liaison with Civil Administration;
x. Ensures availability of canteen facilities and maintenance of rehabilitation center;
xi. Ensures transportation facility;
xii. Ensures availability of necessary cash for rescue/rehabilitation and emergency expenditure;
xiii. Controls rehabilitation of affected areas on discontinuation of emergency; and
xiv. Makes available diesel/petrol for transport vehicles engaged in emergency operation.

Emergency Coordinator - Essential Services

i. He would assist Site Controller and Incident Controller;
ii. Maintains essential services like diesel generator, water, fire water, power supply for lighting;
iii. Gives necessary instructions regarding emergency electrical supply, isolation of certain sections etc. to shift in-charge and electricians; and
iv. Ensures availability of adequate quantities of protective equipment and other emergency materials, spares etc.

General Responsibilities of Employees during an Emergency:

During an emergency, the workers in-charge should adopt safe and emergency shut down and attend to any prescribed duty as essential employee. If no such responsibility is assigned, he should adopt a safe course to assembly point and await instructions. He should not resort to spread panic. On the other hand, he must assist emergency personnel towards objectives of DMP.

Emergency Facilities

Emergency Control Center (ECC):

Mine Office Block shall be the Emergency Control Center. It would have external telephone, fax. All the site controller/ incident controllers, senior personnel would be located here. It would be an elevated place.

The following information and equipment are to be provided at the Emergency Control Center (ECC):

a. Intercom, telephone;
b. Self-contained breathing apparatus;
c. Fire suit/gas tight goggles/gloves/helmets;
d. Hand tools, wind direction/velocities indicators;

e. Public address megaphone, hand bell, telephone directories;
f. Site plan;
g. Emergency lamp/torch light/batteries;
h. Plan indicating locations of hazard inventories, sources of safety equipment, work road plan, assembly points, rescue location vulnerable zones, escape routes;
i. Hazard chart;
j. Emergency shut-down procedures;
k. Nominal roll of employees;
l. List of key personnel, essential employees, and emergency co-ordinators;
m. Duties of key personnel;
n. Address with telephone numbers of key personnel, emergency coordinator, essential employees; and
o. Important address and telephone numbers of government agencies, neighboring industries and other sources of help, outside experts including population details around the Mine.

Assembly Points:

Number of assembly points depending upon the mine location would be identified wherein employees who are not directly connected with the disaster management would be assembled for safety and rescue. Emergency breathing apparatus, minimum facilities like water etc. would be organized.

Depending on the size of mine, different locations should be earmarked as assembly points. Depending upon the location of hazard, the assembly points are to be used.

Emergency Power Supply:

Mine facilities are connected to power supply from the MSEB. In the event of any grid supply failure, diesel generator will be provided at the mine, which is operated as soon as any power failure occurs. Water pumps, mine lighting and emergency control center, administrative building and other auxiliary services are connected to emergency power supply. In all the blocks flame proof type emergency lamps would be provided.

Fire Fighting Facilities:

Firefighting equipment suitable for emergency should be maintained in each operation areas of the mine as per statutory requirements.

Location of Wind Sock:

On the top of the administrative block, windsocks would be installed to indicate direction of wind for emergency escape.

Emergency Medical Facilities:

Stretchers, gas masks and general first aid materials for dealing with chemical burns, fire burns etc. would be maintained in the medical center as well as in the emergency control room. Private medical practitioners help would be sought. Government hospital would be approached for emergency help.

First aid facilities would be augmented. Names of medical personnel and medical facilities available in the area would be prepared and updated. Necessary medicines for emergency treatment of burns patient, and for those affected by toxic emission would be maintained.

Breathing apparatus and other emergency medical equipment would be provided and maintained. The help of nearby industrial management would be taken.

Ambulance:

An ambulance with availability of driver in all the shifts would be ensured to transport injured or affected persons. Number of persons trained in providing first aid would be deployed in each shift.

Emergency Actions

Emergency Warning:

Communication of emergency would be made to the personnel inside the mine and people outside. An emergency warning system would be established.

Evacuation of Personnel:

In the event of an emergency, unconnected people have to escape to assembly point. Operators have to take emergency shutdown procedure and escape. Time office maintains a record of deployment of employees in each shift. If necessary, persons can be evacuated by rescue teams.

All Clear Signal:

At the end of an emergency, after discussing with Incident Controllers and Emergency coordinators, the Site Controller orders an all clear signal.

General Preparedness for Emergency Situation

Employee Information:

During an emergency, employees would be warned by blowing siren in specific pattern. Employees would be provided with information related to fire hazards, antidotes and first aid measures. Those who are designated as key personnel and essential employees would be given training in emergency response.

Co-ordination with Local Authorities:

Keeping in view the nature of emergency, two levels of coordination are proposed. In case of an On- Site Emergency, resources within the organization would be mobilized and in the event of an Extreme Emergency local authorities help would also be sought.

In the event of an emergency developing into an offsite emergency, Local Authority and District Emergency Authority (normally the Collector) would be apprised of the situation and under his supervision, the offsite Disaster Management Plan would be implemented. For this purpose, the facilities that are available locally, i.e. medical, transport, personnel, rescue accommodation, voluntary organizations etc. would be mustered.

Mutual Aid:

Mutual aid in the form of technical personnel, runners, helpers, special protective equipment, transports vehicles, communication facility etc. would be sought from the neighboring industrial management.

Mock Drills:

Emergency preparedness is an important aspect of planning in Industrial Disaster Management. Personnel would be trained suitably and prepared mentally and physically in emergency response through carefully planned, simulated procedures. Similarly, the key personnel and essential personnel would be trained in the operations.

Important Information:

Important information such names and addresses of key personnel, essential employees, medical personnel, transporters address, address of those connected with Off Site Emergency

such as Police, Local Authorities, Fire Services, District Emergency Authority would be prepared and maintained.

Off-Site Emergency Preparedness Plan

The task of preparing the off-site emergency plan lies with the District Collector. The main aspects which should be included in the off-site emergency plan are:

a. Organization: Details of command structure, warning systems, implementation procedures, emergency control centers, names and appointments of incident controller, site main controller, their deputies and other key personnel.
b. Communications: Identification of personnel involved, communication center, call signs, network, lists of telephone numbers.
c. Specialized Knowledge: Details of specialist bodies, firms and people upon whom it may be necessary to call e.g. those with specialized knowledge of fire control.
d. Voluntary Organizations: Details of organizers, telephone numbers, resources etc.
e. Chemical Information: Details of the hazardous substances stored or procedure on each site and a summary of the risk associated with them.
f. Meteorological Information: Arrangements for obtaining details of weather conditions prevailing at the time and weather forecasts.
g. Public Arrangements and Information: Transport, evacuation centers, emergency treatment of injured, first aid, ambulances, temporary mortuaries. Arrangements for communicating with the media and information to relatives, etc.
h. Assessment of Emergency: Arrangements for: (a) collecting information on the causes of the emergency; (b) reviewing the efficiency and effectiveness of all aspects of the emergency plan.

Role of the Emergency Coordinating Officer

The various emergency services should be coordinated by an Emergency Coordinating Officer (ECO), who will be designated by the district collector. The ECO should liaise closely with the site main controller. The ECO should inform the DGMS authorities in case of accidents as per the statutory requirement.
Again depending on local arrangements, for very severe incidents/accidents with major or prolonged off-site consequences, the external control should be passed on to a senior local authority administrator or even an administrator appointed by the central or state government.

Role of the Local Authority

The duty to prepare the off-site plan lies with the local authorities. The emergency planning officer (EPO) should prepare for a whole range of different emergencies within the local authority area. It will be the responsibility of the EPO to ensure that all those organizations which will be involved in off- site handling of the emergency, know of their role and are able to execute it by having for example, sufficient staff and appropriate equipment to discharge their responsibilities. Rehearsals for off-site plans should be organized by the EPO.

Role of Police:

Formal duties of the police during an emergency include protecting life and property and controlling traffic movements. Their functions would include controlling by- standers,

evacuating the public, identifying the dead and dealing with casualties, and informing relatives of death or injury.

Role of Fire Authorities:

The control of a fire should be normally the responsibility of the senior fire brigade officer who would take over the handling of the fire from the site incident controller on arrival at the site.

The senior fire brigade officer should also have a similar responsibility for other events, such as explosions. Fire authorities in the region should be apprised about the location of all stores of flammable materials, water supply points and fire-fighting equipment. They should be involved in on-site emergency rehearsals both as participants and occasionally as observers of exercises involving only site personnel.

Role of Health Authorities:

Health authorities, including doctors, surgeons, hospitals, ambulances, and so on, have a vital part to play following a major accident, and they should form an integral part of the emergency plan.

Major off-site incidents are likely to require medical equipment and facilities additional to those available locally, and a medical "mutual aid" scheme should exist to enable the assistance of neighboring authorities.

Role of Government Safety Authority:

This will be the Factory Inspectorate in the region. Inspectors would ensure that the organization responsible for producing the off-site plan has adequate arrangements for handling emergencies of all types including major emergencies. They may ascertain well documented procedures and evidence of exercise undertaken to test the plan. In the event of an accident, the role of the factory inspector will come into play which may vary from keeping a watching brief to a close involvement in advising on operations.

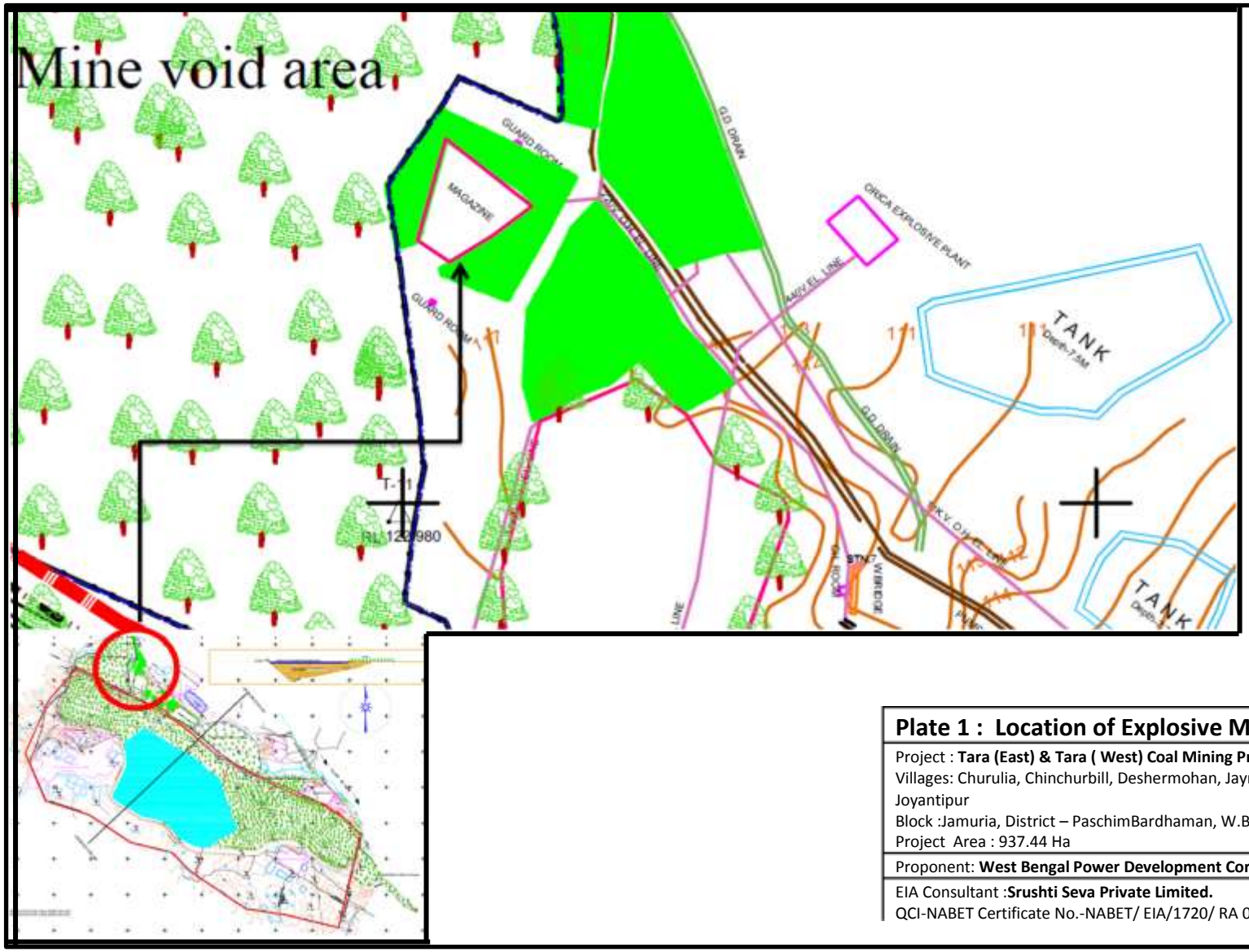


Plate 1 : Location of Explosive Magazine

Project : **Tara (East) & Tara (West) Coal Mining Project**
Villages: Churulia, Chinchurbill, Deshermohan, Jaynagar, Birkulti, Manpur and Joyantipur
Block :Jamuria, District – PaschimBardhaman, W.B.
Project Area : 937.44 Ha

Proponent: **West Bengal Power Development Corp. Ltd.**

EIA Consultant :**Srushti Seva Private Limited.**
QCI-NABET Certificate No.-NABET/ EIA/1720/ RA 0105