

7 ADDITIONAL STUDIES

The proposed project aims laying of natural gas pipeline using HDD method from Sewari- Chembur link road to Bhakti park area. The pipeline will be responsible to supply natural gas to the housing colonies in Bhakti park area and Wadala.

Risk assessment and Disaster Management Plan (DMP) for the proposed project is explained briefly in the below sections:

7.1 PUBLIC CONSULTATION

Public hearing for the proposed project is not applicable as per CRZ notification – 2011.

7.2 RISK ASSESSMENT

The process of estimating the magnitude of risk and nature of the risk is called **Risk Assessment**. For assessment of risk, identification of potential hazard areas and representative failure cases are very important. It is used to assess the overall damage potential of the identified hazardous events and the impact zones from the accidental scenarios and visualization of resulting scenarios in terms of fire (thermal radiation) and explosion.

Risk assessment is carried out to identify hazards and quantify the risk of hazardous work activities & introduce control measures to either eliminate or reduce the risk to the people, property or environment to lowest possible extent. Hazard and risk analysis involves very extensive studies and requires a very detailed design and engineering information. This requires a thorough knowledge of failure probability, credible accident scenario, sources of ignition, leakage through pipeline, emergency handling etc.

7.2.1 Procedure of Emergency Risk Assessment (ERA)

The emergency risk assessment process includes:

Hazard Identification: builds on the identification of impacts in an EIA and identifies potential significant risks associated with the proposed project.

Hazard Accounting: sets the practical boundaries and scope of the ERA for the proposed project.

Environmental Pathway Evaluation: considers routes by which people or the environment could be exposed to a hazard and the expected effects of that exposure.

Risk Characterization: estimates the frequency and severity of adverse impacts and presents the information in a format that can be used to make management decision.

Risk Management: describes the selection and implementation of risk reduction measures.

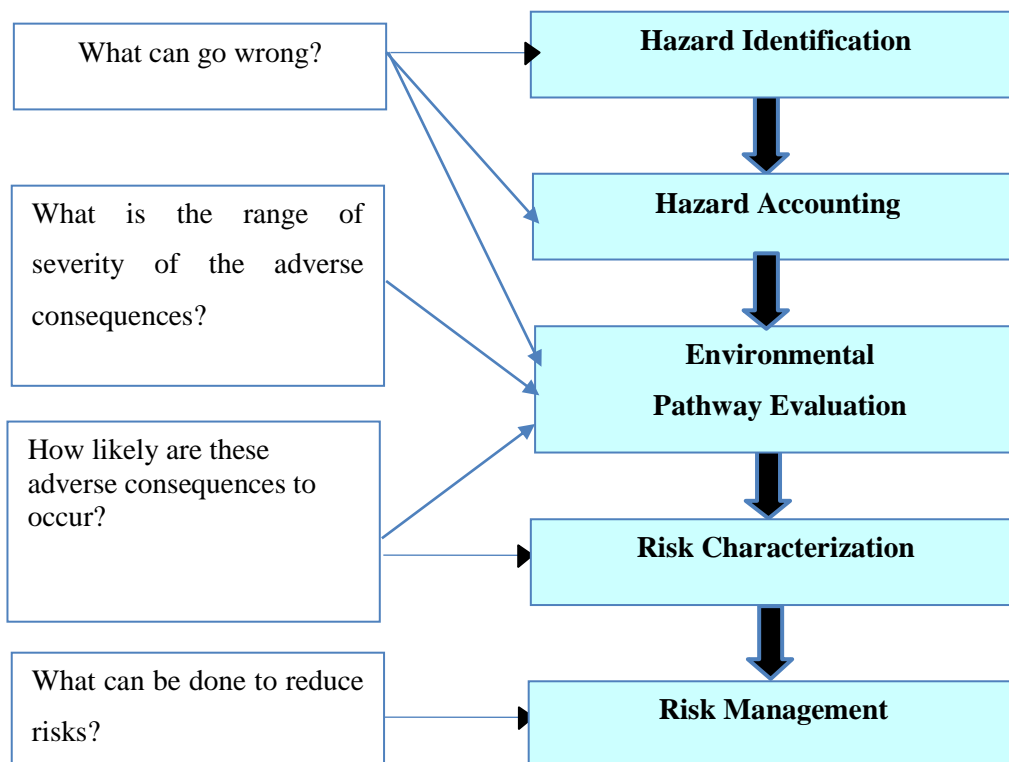


Figure 7-1: Overview of ERA Process

7.2.2 Identification of Potential Hazards

MGL is pioneer in the field of natural gas distribution network in Mumbai. MGL receives gas from City Gate Station (CGS) in front of Anik Bus Depot, Wadala and will supply natural gas to meet the domestic and industrial need to the customers in the Wadala and Bhakti Park which is separated by the Mahul Creek.

7.2.3 Identification of Hazard

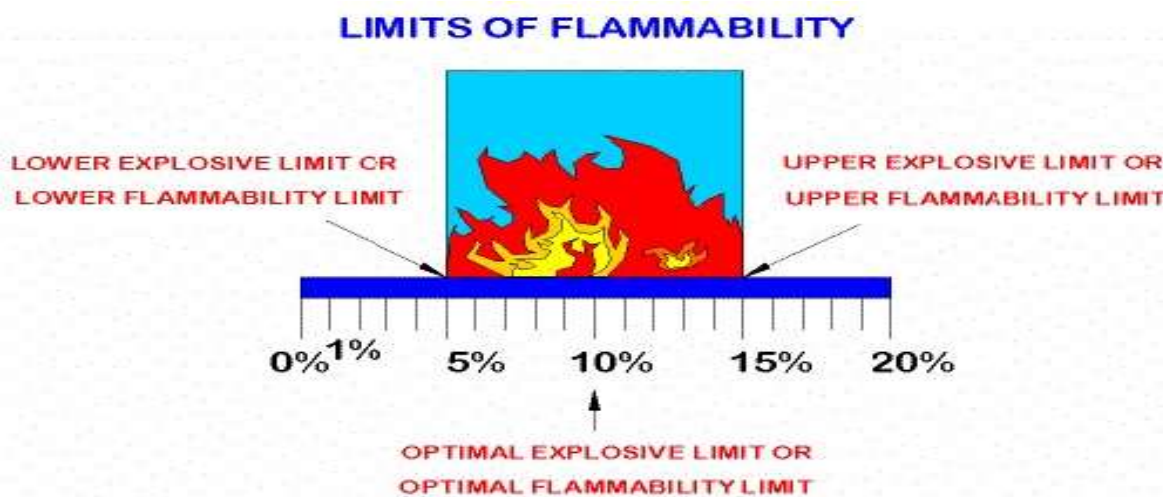
(A) Properties of Natural Gas

- It is a mixture of C1 to C7 hydrocarbons, mainly (Methane).
- It is an environment friendly fuel (contains no lead and very less sulphur)
- It is highly combustible and hence suitable for various applications.
- It is colorless, tasteless, odorless and non-toxic (but asphyxiate).
- It is highly flammable.

In general, the chemical hazard related to Natural Gas can be classified as Flammable, Reactive and Toxic. Natural gas is a flammable material and the risks associated in handling of this gas are fire and explosion.

Table 7-1: Flammability & Explosive Limits of Natural Gas

Initials	Term	Comments
LEL	Lower explosive limit	It is the minimum concentration of the flammable gas in air above which it can be ignited.
UEL	Upper explosive limit	It is the maximum concentration of the flammable gas in air below which it can be ignited.
Natural Gas	LEL & UEL	Ignition Temperature
	5% - 15%	537 ⁰ C or 1000 ⁰ F



- The mixture having concentration below LEL can cause explosion but is less dangerous.
- The mixture having concentration between LEL and UEL is the most dangerous.
- The mixture having concentration greater than UEL is still dangerous since dilution in air produces an explosive mixture.

Hazards of Natural Gas

- Asphyxiation
- Global warming
- Fire
- Explosion

Death	Unconsciousness death in 7 – 8 min.	Reduction of muscular strength	Fast breathing Headache	Safety Zone	Brain Damage
0% – 6 %	8 %	12 %	16 % - 19.5 %	23.5%	100%

From this we can conclude that Natural gas is a flammable material and the risks associated in handling of this gas are fire and explosion. The most important point to be kept in mind during transportation of Natural gas is that there should be no leakage of Natural gas through pipeline.

B) Properties of Ethyl Mercaptan

- It is a C_2H_5SH (Ethanethiol)
- It is colorless liquid with a penetrating odor like garlic or decayed cabbage.
- It is extremely flammable liquid & vapor.
- It is incompatible with strong oxidizing agent i.e. hydrogen peroxide, nitric acid, hypochlorites

Table 7-2: Flammability & Explosive Limits of Ethyl Mercaptan

Initials	Term	Comments
Ethyl Mercaptan	LEL & UEL	Ignition Temperature
	2.8% - 18%	300 ⁰ C or 572 ⁰ F

Hazards of Ethyl Mercaptan

- Nausea, Headache or Dizziness
- Fire
- Explosion

From this we can conclude that Ethyl Mercaptan is more explosive than Natural gas and the risks associated in handling of this liquid / gas are fire and explosion.

Because of its composition, natural gas is readily combustible and thus explosions are not unheard of. As a precaution, Ethyl mercaptan is an odorous substance added to natural gas (1 – 3 ppm by volume) to make natural gas leaks easily detectable. However, when gas leaks and does build up in buildings or other structures, the structure can suffer light to moderate damage if ignited.

7.2.4 Identification of Pipeline Hazards

Design pressure is 19 bars for gas transmission pipeline of proposed Bhakti park project.

The causes of pipeline failure can be generally divided into five major categories:

- Outside forces
- Corrosion
- Construction defects
- Material defects
- Soil movement

Failures due to outside forces are directly related to the strength and ductility of the pipeline. The last four of these are directly related to the physical properties of the pipeline material.

7.2.5 Hazard Assessments and Evaluation

Risks have been assessed using established analytical techniques for assessing failure rate and consequences of several accident scenarios. Risk measures presented in the report include effect distances, individual risks, and societal risks.

Risk analysis considers individual failure cases and the damage caused by the failure. From the identification of hazards the potentially serious hazardous outcome of accidents to man and material in and around the installation limits is predicted. Consequence analysis has been carried out for selected failure cases consequence analysis quantifies vulnerable zones for a conceived incident and once the vulnerable zone is identified for an incident, measures are proposed to eliminate damage to plant and potential personnel injury.

The purpose and benefits that are likely to be derived by carrying out consequent analysis, assessment and evaluation are given below:

- To improve installation layout,
- To meet statutory requirements,
- Protection of public in the nearby areas,
- Disaster management planning,
- Training tool,

Various major accident scenarios will yield a range of hazard distances specifying different damage level. With the help of damage criteria explained it is possible to judge the type of damage to man and material due to realization of the accident scenarios.

From the study of the risk assessment it can be concluded that risk associated with the project can be minimised by adopting the following mitigation measures:

- To carry out daily vantage point patrolling of the entire pipeline route to identify the activity that interferes and cause damage to the pipeline.
- To use pipes of thicker steel to reduce the risk of punctures and rupture during excavation by third party.
- To input additional mitigation measures along the route in the areas exposed to high population clusters.

7.2.6 Fire Risk of Gas Pipeline Leakage

Gas pipeline is an important "lifeline" of national economy and social development. Owing to the characteristics of flammability, high energy and pressure, noxiousness, harm, continuous operation, excessive points and large length, complex environment, once the gas leaks, it is very likely to cause fire, explosion, poisoning and other serious accidents. The safety problem of gas pipeline not only affects safe and normal pipeline transport and normal gas supply for enterprises and residents, but also threatens safety and living environment of people.

Fire Hazard

The fire is a process of burning that produces heat, light and often smokes and flames. The effect of fire on the people takes the form of skin burn on exposure to thermal radiation.

S. No.	Radiation Level (kW/m ²)	Observed Effect
1.	37.5	Sufficient to cause damage to process equipment
2.	25	Minimum energy required to ignite wood at indefinitely long exposures (non-piloted)
3.	12.5	Minimum energy required for piloted ignition of wood, melting of plastic tubing
4.	9.5	Pain threshold reached after 8s; second degree burns after 20s
5.	4	Sufficient to cause pain to personnel if unable to reach cover within 20s; however blistering of the skin (second degree burns) is likely; 0: lethality
6.	1.6	Will cause no discomfort for long exposure

Fire risk assessment method of gas pipeline leakage

- Estimation of gas leakage quantity
- Estimation of heat radiation flux
- Estimation of incident heat radiation intensity
- Estimation of damage range and damage area

7.3 DISASTER MANAGEMENT PLAN

The disaster risk management cycle consists of two stages:

a. Pre-disaster stage

- Prevention/Mitigation
- Preparedness

b. Post -disaster stage

- Response
- Rehabilitation/Reconstruction

- In the Prevention/Mitigation phase, efforts are made to prevent or mitigate damage.
- Activities and measures for ensuring an effective response to the impact of hazards are classified as Preparedness and are not aimed at averting the occurrence of a disaster.
- Response includes such activities as rescue efforts, first aid, firefighting and evacuation.



Figure 7-2: Disaster Risk Management Cycle

7.3.1 Types of Disasters

Disasters can be classified in two categories:

A. Man Made Disaster

- Industrial accidents, factory fires,
- Explosions
- Escape of toxic gases or Chemical substances,
- River pollution,
- Structural collapses,
- Air, sea, rail and road transport accidents,
- Aircraft crashes,
- Collisions of vehicles carrying inflammable liquids,
- Oil spills at sea etc.
- Causes malafide intensions such as sabotage, riots, industrial unrest, air attack etc.

B. Natural Disaster

- Earthquakes,
- Storm, surges, cyclones, tropical storms,
- Floods,
- Landslides,
- Forest fires

7.3.2 Types of Emergency

Emergency is a situation where the resources all of a sudden acquire high potential and causes havoc. Such situation leads to hazards and disaster. If there is slightest ignorance during such condition it will give rise to loss of lives/ properties and production. Therefore it is of prime importance to see that such situations are thought in advance so that they can be tackled within the shortest time.

Onsite emergency arise due to uncontrolled reaction, small fire, small gas leak, spill, failure of power, water, air, steam, etc. and which can be locally handled by plant personnel alone (without outside help) is not considered as major emergency. Line of actions to tackle such emergencies should be as per the onsite plan.

A major emergency occurring at work is one that may affect several departments within and / or may cause serious injuries, loss of life, extensive damage to property or serious disruption outside the works. It will require the use of outside resources to handle it effectively.

7.3.3 Emergency action plan for natural calamities

Flood

There is no probability of flood in project area in normal situation. However a flood emergency plan is prepared to manage such emergency as it may cause due to extremely heavy rain.

(a) Few Tips on Flood Emergency

- Collect information about flood from local news channel, transistor radio and authorities and obey instructions, if any.
- People living in low level / flood affected area should be prepared for shifting at desired safer place. Flood gives enough time for preparedness
- Luggage, important precious items at ground floor should be shifted to upper floor. Vehicle should be shifted to safer place.
- Keep torch, mobile phones, money, medicines and food with you.
- Do not allow children to go away and if possible send them at safer place.
- If you have to leave the house, turn off gas supply & electricity.
- Take light food, so that you can help others.
- After normalcy, carry out cleaning & spraying of disinfectants to prevent outbreaks of disease.

Earthquake

Earthquake is unpredictable and strike without warning. It can damage lot and create disaster. Therefore it is important to know the appropriate steps to take when earthquake occurs and to be familiar with these steps to be able to react quickly and safety.

(a) During Earthquake

- Do not run in panic situation.
- Seek immediate shelter in open ground. If not possible seek shelter under heavy structural portion of the building.
- Use staircase or emergency exit in safe manner. Avoid the use lift.

- If you are in a vehicle, stop the vehicle. Avoid stopping vehicle either on or under a bridge or overpass.
- Keep away from river, lake, under electrical cable or old unsafe building.
- Don't be surprised if electricity goes out.
- Remain calm and act safely until the shaking stops.

(b) After Earthquake

- Earthquake may strike again so, avoid shelter in unsafe building. It is very important and necessary to remain calm.
- Be prepared to respond to psychological after effects generated by earthquake.
- It is advisable to be gathered for appropriate and safe decision.
- Turn on the radio, TV to receive emergency instructions.
- Check your house condition. Check for injuries and administer First-Aid.
- Do not drink water from open container / Vessel.
- Turn off gas cylinder, gas pipeline supply and electric supply. There may be risk and hazards.
- Do not use candles, matches, or other open flames, or turn lights on/off, either during or after the tremor because of possible gas leaks.
- Keep away from electrical lines.
- Always keep torch with you.
- Do not take harmful drugs / drinks.
- Do not spread gossip.

7.3.4 Cyclone / Storm

Cyclone / Storm can make intensive damage to property and injury to persons at large, depends upon the severity of cyclone and duration.

- For advance information and advice, listen to the radio / TV. Allow considerable margin for safety.
- Confirm the same form local authority and communicate to all employees, contractors accordingly.
- A cyclone may change direction, speed or intensity within a few hours, so stay turned to the radio / TV, for updated information.

(a) Preparation

- If the storm-force winds or severe gales are forecast for your area.
- Store or secure loose boards, corrugated iron, rubbish tins or anything else that could become dangerous.

- Tape up large windows to prevent from shattering.
- Assigning responsibility to take care of power lines dangling wires are serious hazards.
- Do not plan critical works like hot work / shut-down job / commissioning job, during the predication of possible cyclone / storm.
- Move to the nearest shelter or vacate the area if this is ordered by the appropriate government agency / authority.

(b) When the Cyclone / Storm hits

- Stay indoors and take shelter in the strongest part of the building / plant / office.
- Listen to the radio / TV, follow instruction and plan accordingly
- Establish contact with relevant local authority.
- Keep / review records about persons working at the field, out side the premises and give appropriate advice according to the situation.
- Stop critical / Hazardous job as per the situation.
- Open windows on the sheltered side of building if roof begins to lift.
- Find shelter if you are caught out in the open
- Do not go outside or into a beach during the storm.

Cyclone is often accompanied by large storm surges from the ocean or lakes and the precautions listed for flood should be taken.

7.3.5 Dont's during Natural Calamities

- Do not get panic.
- Do not spread non- authentic information.
- Do not approach a scene as a separator.
- Do not engage communication channels like Telephones, Wireless.
- Do not move about unnecessarily.
- Do not approach a control room, unnecessarily.
- Be attentive to the instructions.
- If you have no role to play, move out of the area of incidence.
- Be aware of Emergency Exists, Assembly Point.
- All Contract workers should report to their supervisions.

- Give full cooperation to emergency staff / external agencies as per instructions.
- Check wind direction for emergency escape.
- Give priority to human lives.

7.4 REHABILITATION & RESETTLEMENT (R & R) PLAN:

There is no rehabilitation or settlement of people as proposed project is laying of natural gas pipeline passing through Mahul creek. There is no need for any plan for rehabilitation & resettlement under central or state policy.

7.5 SOCIAL IMPACT ASSESSMENT

Since no rehabilitation or settlement of people will take place for the proposed project, social impact assessment for the proposed project is not applicable.

7.6 SUMMARY

Public hearing is not applicable as per CRZ notification – 2011. The main hazard associated with the proposed gas pipeline is the handling of natural gas (predominantly composed of methane gas), which is a flammable gas held under pressure. The predominant mode in which a hazardous incident may be generated is associated with a rupture or leak. Since the proposed pipeline is of smaller length, thus no major risk hazard is anticipated.

Disaster management plan will be prepared to prevent or mitigate damage. Activities and measures for ensuring an effective response to the impact of hazards are classified as preparedness and are not aimed at averting the occurrence of a disaster. Response includes such activities as rescue efforts, first aid, firefighting and evacuation.

As there is no rehabilitation or settlement of people, there is no need for any plan for rehabilitation & resettlement under central or state policy. Since no rehabilitation or settlement of people will take place for the proposed project, social impact assessment for the proposed project is not applicable.