

BHOPAL GAS TRAGEDY

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— What is Bhopal Gas Tragedy?

The Bhopal gas tragedy (commonly referred to as Bhopal disaster) was a gas leak incident in India, considered one of the world's worst industrial catastrophes.

It occurred on the night of 2nd-3rd December 1984 at the Union Carbide India Limited (UCI) pesticide plant in Bhopal, Madhya Pradesh

A leakage of Methyl Isocyanate (MIC) gas and other chemicals from the plant resulted in the exposure of hundreds of thousands of people.

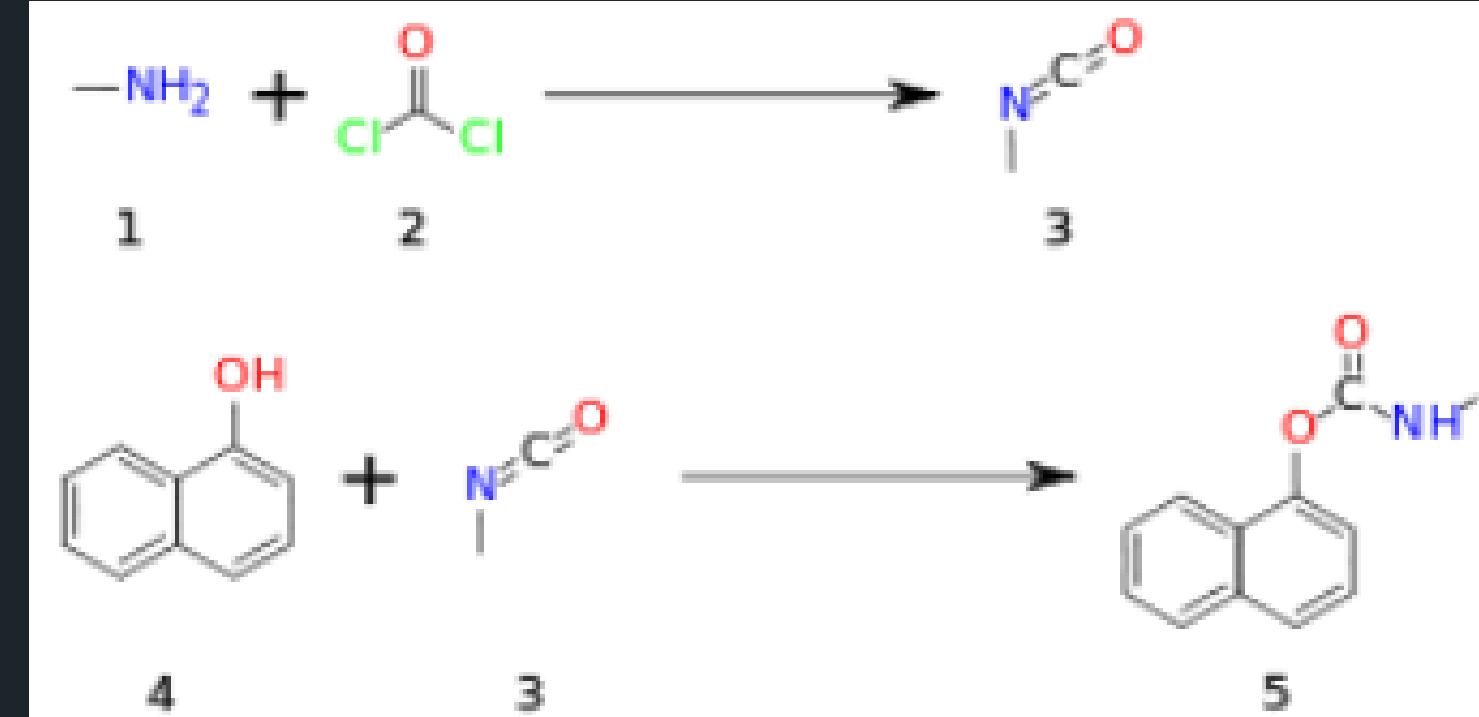


UCIL

- UCIL was the Indian subsidiary of Union Carbide Corporation (UCC),with Indian Government controlled banks and the Indian public holding a 49.1 percent stake.
- It started in 1969 at the northern state of India.
- Phosgene, Monomethylamine, Methyl Isocyanate (MIC) and the pesticide Carbaryl, also known as Sevin were manufactured here.

Plant Production Process

The UCIL factory was built to produce the pesticide Sevin (UCC's brand name for Carbaryl) using Methyl isocyanate (MIC) as an intermediate.



Reaction

Methylamine (1) reacts with phosgene (2) to produce Methyl isocyanate (3) which reacts with 1-naphthol (4) to yield carbaryl (5).



IGNORANCE IN LATER 70'S AND 80'S

- **In 1976, two local trade unions complained of pollution within the plant. In 1981, a worker was accidentally splashed with phosgene as he was carrying out a maintenance job of the plant's pipes.**
- **In January 1982, a phosgene leak exposed 24 workers, all of whom were admitted to a hospital. None of the workers had been ordered to wear protective masks.**

LEAKAGE

- The Bhopal UCIL facility housed three underground 68,000 liters liquid MIC storage tanks.
- In late October 1984, tank E610 lost the ability to effectively contain most of its nitrogen gas pressure. It meant that the liquid MIC contained within could not be pumped out.



WHAT HAPPENED ON THAT DANGEROUS NIGHT?

- During the night of 2-3 December 1984, water entered Tank E610 containing 42 tons of MIC.
- The resulting exothermic reaction increased the temperature inside the tank to over 200°C (392 °F) and raised the pressure.
- About 30 metric tons of methyl isocyanate (MIC) escaped from the tank into the atmosphere of Bhopal in 45 to 60 minutes.
- A leak of Methyl Isocyanate (MIC) gas and other chemicals from the plant resulted in the exposure of thousands of people. The toxic substance spread its way in and around the neighborhood located near the plant.

ON DECEMBER 2, 1984

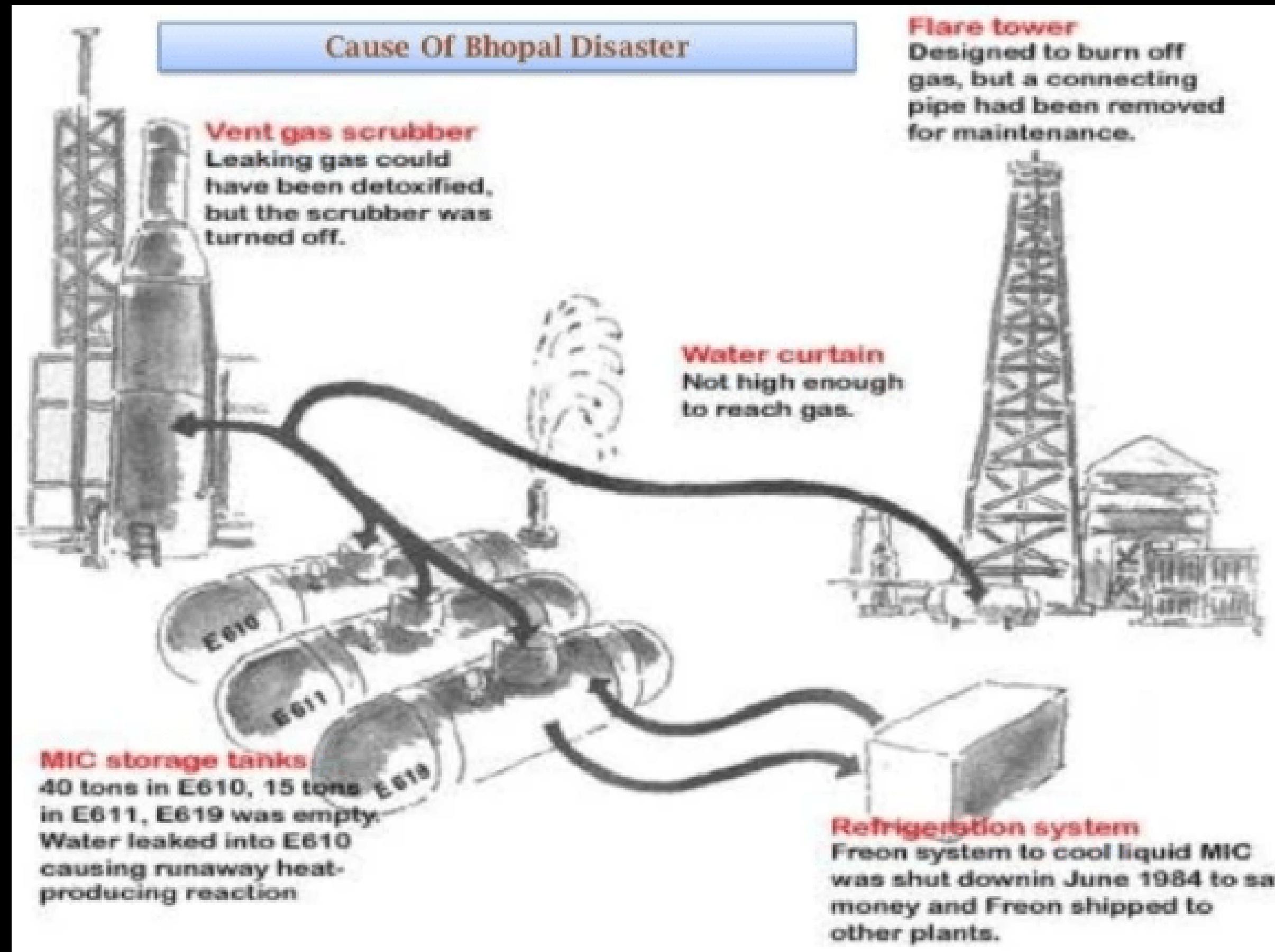
THE DEVASTATION

- The official immediate death toll was 2,259 and the government of Madhya Pradesh has confirmed a total of 3,787 deaths related to the gas release.
- Others estimate 8,000 died within two weeks and another 8,000 or more have since died from gas related diseases.
- A government affidavit in 2006 stated the leak caused 5,58,125 injuries including 38,478 temporary partial and approximately 3,900 severely and permanently disabling injuries.
- 2,000 bloated animal carcasses had to be disposed.



WHAT ARE THE DISASTER CONTRIBUTING FACTORS?

CAUSE OF THE DISASTER



Human Error

Critical isolation valve not closed before pipes were flushed with water, causing the fatal pressurization of tank containing MIC.

Inadequate Safety

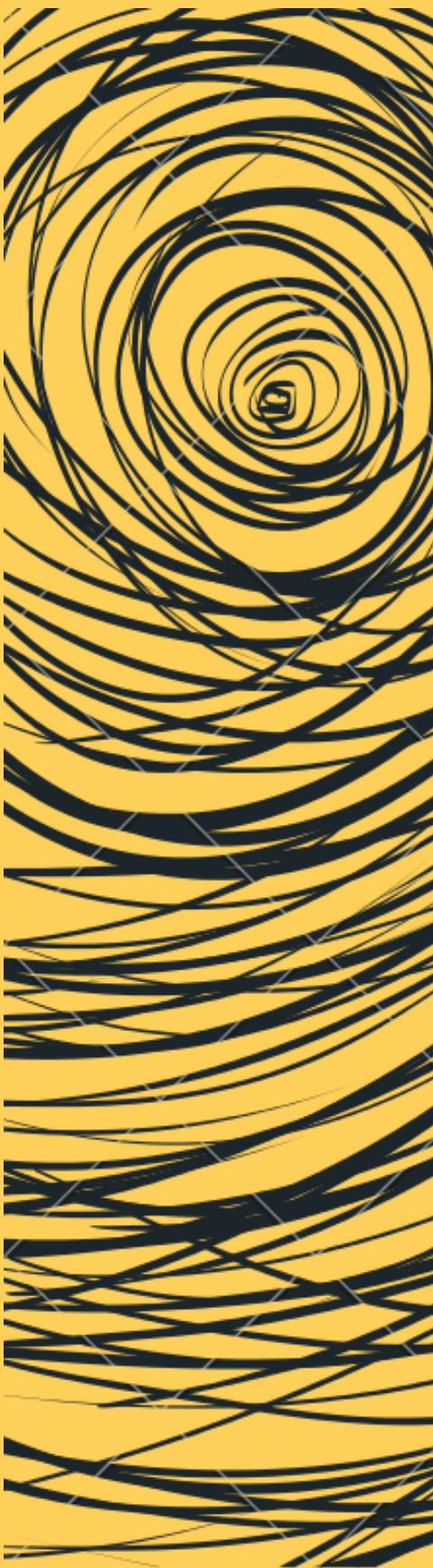
Reach of sprayer for water neutralization of escaping gas was inadequate. Plant managers were aware of deficiency.

Failure of Safety Equipment

Stack scrubber, activated by operator during leak, failed.

Poor Maintenance

Tank refrigerators inoperable; had been drained of freon.



EFFECTS ON HUMAN HEALTH

- **Respiratory Disorders - Irritation to the lungs, causing coughing and/or shortness of breathing. Higher exposure caused build up of fluids (pulmonary edema). Caused Asthma.**
- **Cancer Hazard - Caused mutation (genetic changes). It caused cancer.**
- **Reproductive Hazard Association between exposure to Methyl Isocyanate and miscarriages. It may damage the growing fetus. May also affect fertility in men and women.**
- **Traces of many toxins were found in the Breast Milk of mothers and were in turn transmitted to the recipient babies.**



AFTERMATH THE LEAKAGE

- Medical staff were unprepared for the thousands of casualties.
- Doctors and hospitals were not informed of proper treatment methods for MIC gas inhalation. They were told to simply give cough medicine and eye drops to their patients.
- The gases immediately caused visible damage to the trees. Within a few days, all the leaves fell off.
- "Operation Faith": On 16 December, the tanks 611 and 619 were emptied of the remaining MIC. This led to a second mass evacuation from Bhopal.
- Formal statements were issued that air, water, vegetation and foodstuffs were safe within the city. At the same time, people were informed that poultry was unaffected, but were warned not to consume fish.

UCIL PLANT AFTER DISASTER



CHEMICALS DUMPED BY UNION CARBIDE IN BHOPAL

S.No	Chemical	Amount	Use in factory	Nature of original pollution
1	Methylene Chloride	100 MT	Solvent	Air
2	Methanol	50 MT	Solvent	Air
3	Ortho-idichlorobenzene	500 MT	Solvent	Air, Water, Soil
4	Carbon tetrachloride	500 MT	Solvent	Air
5	Chloroform	300 MT	Solvent	Air
6	Tri methylamine	50 MT	Catalyst	Air
7	Chloro benzyl chloride	10 MT	Ingredient	Air, Water, Soil
8	Mono chloro toluene	10 MT	Ingredient	Air, Water, Soil
9	Toluene	20 MT	Ingredient	Air, Water, Soil
10	Aldicarb	2 MT	Product	Air, Water, Soil
11	Carbaryl	50 MT	Product	Air, Water, Soil
12	Benzene Hexachloride	5 MT	Ingredient	Air, Water, Soil
13	Mercury	1 MT		Water, Soil
14	Mono methyl amine	25 MT	Ingredient	Air
15	Chlorine	20 MT	Ingredient	Air
16	Phosgene	5 MT	Ingredient	Air
17	Hydro chlorig acid	50 MT	Ingredient	Air, Soil
18	Chloro sulphonic acid	50 MT	Ingredient	Air, Soil
19	Alpha Naphthol *	50 MT	Ingredient	Air, Soil
20	Naphthalin	50 MT	Ingredient	Air
21	Chemical waste Tar	50 MT	Waste	Water, Soil
22	Methyl Isocyanate	5 MT	Ingredient	Air, Water, Soil



COMPENSATION FROM UNION CARBIDE

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- The Government of India passed the Bhopal Gas Leak Disaster Act that gave the government rights to represent all victims in or outside India.
 - UCC offered US \$350 million, the insurance sum. The Government of India claimed US\$ 3.3 billion from UCC.
 - In 1989, a settlement was reached under which UCC agreed to pay US\$470 million (the insurance sum, plus interest) in a full and final settlement of its civil criminal liability.

WARREN ANDERSON (THE DEVIL)

- The UCC chairman and CEO Warren Anderson, together with a technical team immediately travelled to India.
- Upon arrival, Anderson was placed under house arrest and urged by the Indian Government to leave the country within 24 hours.

LEGAL ACTION

- Legal proceedings involving UCC, the United States and Indian governments, local Bhopal authorities, and the disaster victims started immediately after the catastrophe.
- He was declared a fugitive from justice by the Chief Judicial Magistrate of Bhopal on 1 February 1992 for failing to appear at the court hearings.

CURRENT SITUATION

- UCIL Bhopal site not remediated.
- Plant still leaks toxic chemicals.
- 1999 analysis of groundwater shows
 - * 20,000 times permissible amount of mercury.
 - * 50 times permissible amount of trichloroethane.
- 2002 tests show chlorinated organics, lead and mercury in breast milk of nursing mothers.

THANK YOU!

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