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العدد العاشر

A Geographical Information System for Plotting The Dispersion Model Results of Toxic Cloud

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Abstract

Geographic Information System (GIS) is defined as an information system that is used to input, store, retrieve, manipulate, analyze and generate geographically referenced data or geospatial data in order to support decision making for planning and management of land use, natural resources, environment, transportation, urban facilities, and other administrative records.

ALOHA (Areal Locations of Hazardous Atmospheres) is a computer program designed especially for use by people responding to chemical accidents, as well as for emergency planning and training. ALOHA can predict the rates at which chemical vapors may escape into the atmosphere from broken gas pipes, leaking tanks, and evaporating puddles. It can then predict how a hazardous gas cloud might disperse in the atmosphere after an accidental chemical release.

El-Ameria Industrial zone was chosen to be a model for applying this study .It contains 8 factories of different industrial type with various potential hazardous such as: the Egyptian Petrochemical Factory, El-Ameria Textile Factory, and Alexandria Tire Factory. It is an industrial zone situated on the borders of Alexandria with residential areas and highway. In addition, the residential areas found around this industrial zone are subjected to air pollution as a result of these factories emissions

1.Introduction

A hazard assessment is complete only if the consequences of a possible accident are known. For this reason, the last step of a hazard assessment is to analyze the consequences that a potential major accident could have on the plant itself, on the employees, on the neighborhood and on the environment. The results of the analysis are used to determine which protective measures, such as fire-fighting systems, alarm systems or pressure-relief systems have to be installed. (Ref. 29)

An accident consequence analysis should contain the following:

a. A description of the accident (tank rupture, rupture of a pipe, failure of a safety valve, fire);

b. An estimate of the quantity of material released (toxic,

flammable, explosive);

c. A calculation of the dispersion of the material released (gas or evaporating liquid);

d. An estimate of the effects (toxic, heat radiation, blast wave).

This is considering the main points of the risk management of hazardous

substances.

1.1. Dispersion Model

ALOHA is designed to be easy to use so that you can operate it successfully during high-pressure situations. Its chemical library contains information about the physical properties of about 1,000 common hazardous chemicals. Its computations represent a compromise between accuracy and speed. it has been designed to produce good results quickly enough to be of use to responders. ALOHA is designed to minimize operator error. It checks information that you enter and warns you when you make a mistake. ALOHA's online help offers you quick access to explanations of ALOHA's features and computations, as well as background information to help you interpret its output.

Basic program organization

To use ALOHA, you'll typically perform several basic steps:

- Indicate the time and date of the accident;
- Choose the chemical of concern from ALOHA's library of chemical

  information;
- Enter information about current weather conditions;
- Describe how the chemical is escaping from containment;
- Request ALOHA to display a footprint, showing the area where chemical;

  concentrations in the air may become high enough to pose a hazard to people.

1.2. GIS Background

The key components of GIS are a computer system, geospatial data and users, as shown in Figure (1).

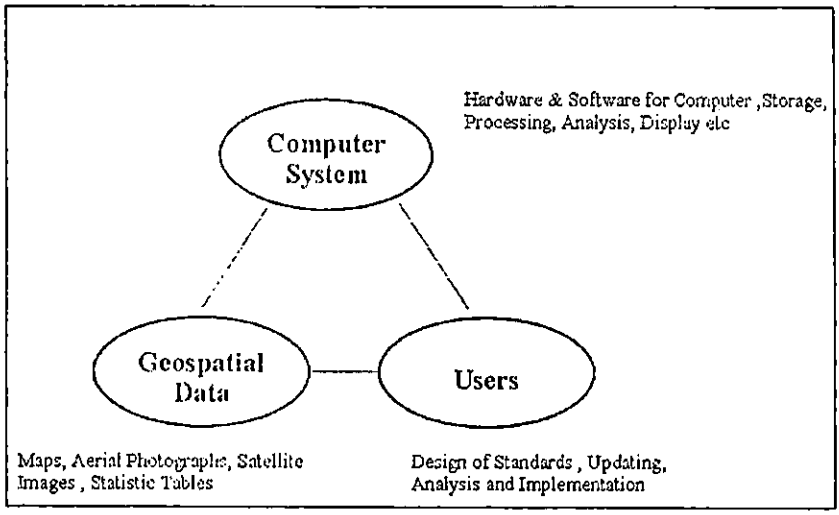


Figure (1) Key Components of GIS

A computer system for GIS consists of hardware, software, and procedures designed to support the data capture, processing, analysis, modeling and display of geospatial data. The sources of geospatial data are digitized maps, aerial photographs, satellite images, statistical tables and other related documents.

Geospatial data are classified into graphic data (or called geometric data) and attributes (or called thematic data). Graphic data has three elements: point (or called node), line (or called arc) and area (or called polygon) in either vector or raster form which represent a geometry of topology, size, shape, position and orientation.

The roles of the user are to select pertinent information, to set necessary standards, to design cost-efficient updating schemes, to analyze GIS outputs for relevant purpose and plan the implementation.

- **The GIS is needed due to the following reasons?**

  - Geospatial data are poorly maintained
  - Maps and statistics are out of data
  - Data and information are inaccurate
  - There is no data retrieval service
  - There is no data sharing

Once a GIS is implemented, the following benefits are expected.

- Geospatial data are better maintained in a standard format.
- Revision and updating are easier.
- Geospatial data and information are easier to search, analyze and represent.
- More value added product.
- Geospatial data can be shared and exchanged freely.
- Productivity of the staff is improved and more efficient time and money are saved.
- Better decisions can be made.

- **Required Functions for GIS**

The questions that a GIS is required to answer are mainly as follows:

- What is at.....? (Location question; what exists at a particular location).
- Where is it.....? (Conditional question; which locations satisfy certain conditions).
- How has it changed.....? (Trendy question; which identifies geographic occurrence or trends that have changed or in the process of changing).
- Which data are related .....? (Relational question; which analyzes the spatial relationship between objects of geographic features).
- What if.....? (Model based question; computers and displays an optimum path, a suitable land, risky area against disasters ..... etc. based on model).

2. Materials and Methods

2.1 Hazard Identifications

- The Chemicals Used In This Study are:
- Chlorine ,Vinyl Chloride, Ethylene, Ammonia, Hydrogen and Liquefied Petroleum Gas (LPG)

2.2 Chlorine

2.2.1 Substances Identification

- Chemical name: Chlorine
- CAS registry number: 7782-50-5
- Molecular weight: Cl2
- UN 1017; Chlorine
- IMO 2.0; Chlorine

2.2.2 Description and Warning Properties

- Color / Form: Greenish-Yellow, Diatomic Gas. (Ref. 5)
- Color / Form: Greenish-Yellow Gas (Ref. 20)
- Odor: Suffocating (Ref. 5), Pungent, irritating (Ref. 16)
- Odor Threshold: Water odor threshold: 0.0020 mg/l. Air odor threshold: 0.31 ppm. (Ref. 1)
- Odor Safety. Class: C. C= Odor safety factor from 1-26. Less than 50% of distracted persons perceive warning of threshold limit value.
- Low odor threshold= 0.0300 mg/cu m. High odor threshold= 15.0000 mg/cu m.

  Irritating conc.= 9.00 mg/cu m. (Ref. 25)
- Skin, eye, and respiratory irritation: Irritating to nose & throat at 5 ppm or above ... (Ref. 11)
- Highly irritating especially to the mucous membranes of the eyes and respiratory tract. (Ref. 30)
- Caution: Potential symptoms of overexposure are burning of eyes, nose and mouth; lacrimation, rhinorrhea; coughing, choking and substernal pain; nausea, vomiting; headache, dizziness; syncope; pulmonary edema; pneumonia; hypoxemia; dermatitis; eye and skin burns. (Ref .5)

2.2.3 Safety Hazards and Protection

DOT emergency guidelines: (Ref. 31)

- Health: Toxic; may be fatal if inhaled or absorbed through skin. Fire will produce irritating, corrosive and/or toxic gases. Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite. Runoff from fire control may cause pollution.
- Fire or explosion: Substance does not burn but will support combustion. Vapours from liquefied gas are initially heavier than air and spread along ground. These are strong oxidizers and will react vigorously or explosively with many materials including fuels. May ignite combustibles (wood, paper, oil, clothing, etc...). Some will react violently with air, moist air and/or water. Containers may explode when heated. Ruptured cylinders may rocket.
- First aid: Move victim to fresh air. Call emergency medical care. Apply artificial respiration if victim is not breathing. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Administer oxygen if breathing is difficult. Clothing frozen to the skin should be thawed before being removed. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes. Keep victim warm and quiet. Keep victim under observation. Effects of contact or inhalation may be delayed. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

2.3 Vinyl Chloride

2.3.1 Substances Identification

- Chemical Name: Vinyl Chloride
- CAS Registry Number: 75-01-4

- Molecular Formula: C2-H3-Cl (Ref.6)
- UN 1086; Vinyl chloride, inhibited or stabilized
- IMO 2.0; Vinyl chloride, inhibited or stabilized

2.3.2 Description and Warning Properties

- Color/Form: Colorless gas or liquid (below 77 degrees F) ... [Note: Shipped as liquefied compressed gas.] (21)
- Odor: Ethereal odor (Ref. 17) Sweet odor (Ref. 2)
- Pleasant odor at high concentrations ... (Ref. 12)
- Odor Threshold: Although vinyl chloride has an odor at high concentration, it is of no value in preventing excessive exposure. The actual vapor conc. that can be detected has never been adequately determined and varies from one individual to another, from impurities in the sample and probably from duration of exposure. (Ref. 12)
- Skin, eye, and respiratory irritations: primary irritant for skin.... (Ref.18)

2.3.3 Safety Hazards and Protection

Dot emergency guidelines:

- Fire or Explosion: EXTREMELY FLAMMABLE. Will be easily ignited by heat, sparks or flames. Will form explosive mixtures with air. Silane will ignite spontaneously in air. Some may polymerize (P) explosively when heated or involved in a fire. Vapors from liquefied gas are initially heavier than air and spread along ground. Vapors may travel to source of ignition and flash back. Containers may explode when heated. Ruptured cylinders may rocket. /Vinyl chloride; vinyl chloride, inhibited; or vinyl chloride, stabilized/ (Ref.32)

2.4 Ethylene

2.4.1 Substances Identification

- Chemical name: ETHYLENE
- CAS Registry number: 74-85-1
- Molecular formula: C2-H4
- UN 1962; Ethylene, compressed
- IMO 2.1; Ethylene, compressed; ethylene, refrigerated liquid
- UN 1038; Ethylene, refrigerated liquid

2.4.2 Description and Warning Properties

- Color/Form: Colorless Gas (Ref. 7)
- Monoclinic Prisms When It Solidifies At -181 Deg C (Ref. 8)
- Odor: SWEET (Ref.27) Olefinic, hedonic tone: unpleasant to neutral (Ref. 36)
- Taste: Slightly Sweet (Ref.23)
- Odor Threshold: Odor Index at 20 deg C = 57,100 (Ref.20) Detection in air by odor (purity not specified) 2.60x10+2 ppm. (Ref.3)

2.4.3 Safety Hazards and Protection

Dot emergency guidelines:

- **Fire or explosion:** Extremely flammable. Will be easily ignited by heat, sparks or flames. Will form explosive mixtures with air. Silane will ignite spontaneously in air. Some may polymerize (P) explosively when heated or involved in a fire. Vapours from liquefied gas are initially heavier than air and spread along ground. Vapours may travel to source of ignition and flash back. Containers may explode when heated. Ruptured cylinders may rocket. /Ethylene; Ethylene, compressed/ [QR] (Ref.33)
- Health: Vapours may cause dizziness or asphyxiation without warning. Some may be toxic if inhaled at high concentrations. Contact with gas or liquefied gas may

cause burns, severe injury and/or frostbite. Fire may produce irritating and/or toxic gases. /Ethylene; Ethylene, compressed/ [QR] (Ref.33)

2.5 Ammonia

2.5.1 Substance Identification

- Chemical Name: Ammonia
- CAS Registry Number: 7664-41-7
- Molecular formula: H3-N
- UN 1005; Ammonia, anhydrous, liquefied; ammonia solutions with more than 50% ammonia. (Ref. 34)
- IMO 2.3; Ammonia, anhydrous, liquefied.

2.5.2 Description and Warning Properties

- Color/form: Colorless gas [note shipped as a liquefied compressed gas. Easily liquefied under pressure). [qr] (Ref. 22)
- Odor: Sharp, cloying, repellent (Ref.9). Pungent, suffocating odor ... [qr] (Ref.22) sharp, intensely irritating odor (Ref.19) very pungent odor, characteristic of drying urine. (Ref. 10)
- Odor threshold: Water: 1.5 mg/l; air: 5.2 ul/l; odor safety class c;c=less than 50% of distracted persons perceive warning of tlv. (Ref.4) odor recognition of pure ammonia in air is 4.68x10+1 ppm. (Ref.13) sharp, cloying, repellent; low threshold = 0.0266 mg/cu m; high threshold = 39.60 mg/cu m; irritating concn = 72.00 mg/cu m. (Ref.24) low threshold= 0.0266 mg/cu m; high threshold= 39.6 mg/cu m; irritating concentration= 72 mg/cu m. (Ref.26)
- Skin, eye, and respiratory irritations: The vapour even in low concn is extremely irritating to skin, eyes and respiratory passages. (Ref.14)

- Caution: potential symptoms of overexposure are eye, nose and throat
- Irritation: dyspnea, bronchospasm and chest pain; pulmonary edema; pink frothy sputum; skin burns, vesiculation. (Ref.10) strong irritant to eyes, skin, respiratory tract. Pungent odor. Liquid produces severe burns. Inhalation of high concn causes violent coughing, severe lung irritation, and pulmonary edema. Death can result if rapid escape is not possible. Swallowing liquid is corrosive to mouth, throat, stomach. Not a systemic poison. (Ref.24)

2.5.3 Safety Hazards and Protection Hazards Summary

The major hazards encountered in the use and handling of ammonia stem from its toxicological properties and reactivity. Exposure to this colorless gas (liquid, if compressed or in aqueous solution) may occur from its use as a fertilizer, chemical intermediate, alkalizer, metal treating/extraction agent, and common household cleaner. Ammonia is hazardous by all routes (ie, dermal, ingestion, inhalation), with the liquid capable of burning the skin, causing permanent eye damage, or corroding the digestive tract upon contact; and the gas capable of causing severe eye damage, pulmonary edema, and even death from spasm, inflammation, and edema of the larynx. Osha has established an ammonia permissible exposure level (pel) of 50 ppm as an 8-hr time-weighted average (twa). The acgih recommends an 8-hr tlv-twa of 25 ppm. Ammonia levels should be controlled through process enclosure and the use of local exhaust and dilution ventilation, as necessary. While its offensive odor may serve as a warning, to assure against ammonia exposure, workers should wear chemical protective clothing composed of butyl rubber, natural rubber, neoprene, nitrile rubber, or polyvinyl chloride (not viton), gloves, face protection, and, in emergency situations, a self-contained breathing apparatus. Facilities for quick-drenching the body, as well as eyewash fountains, should be immediately at hand for the worker. Clothing that becomes wet with liquid ammonia should be placed in closed containers until it can be discarded. While this substance does not burn or ignite readily (autoignition temp:

1204 deg f), containers of ammonia may explode in the heat of a fire. For small fires involving ammonia, extinguish with dry chemical or co2, and for large fires, use water spray, fog, or foam, taking care to prevent fire control or dilution water from causing pollution. More hazardous than its fire potential is ammonia's reactivity with halogens, interhalogens, and oxidizers. These reactions may be violent and/or may form explosive products. Ammonia should be stored in a cool, well-ventilated location, away from sources of ignition, and separate from other chemicals, particularly oxidizing gases (chlorine, bromine, and iodine) and acids. Aqueous ammonia is commonly containerized in steel drums. Anhydrous ammonia is stored and shipped (prohibited in passenger planes) in pressurized containers, fitted with pressure-relief safety devices, and bearing the label, "nonflammable compressed gas". For small spills of ammonia, isolate 80 feet in all directions from the spill, ventilate the area, and allow vapour or gas to disperse. For large spills, evacuate the area for 160 feet in all directions, and dike to contain the spill for later recovery or disposal and to prevent runoff from causing pollution. Stay upwind and wear positive-pressure breathing apparatus and full protective clothing, as necessary.

2.6 Hydrogen

2.6.1 Hazard Identification

- Chemical Name: Hydrogen (Ref.28)
- CAS Registry Number: 1333-74-0.
- Molecular Formula: H2 (Ref.15)
- UN1049; Hydrogen; Hydrogen, Compressed.
- IMO 2.1; Hydrogen; Hydrogen, Compressed; Hydrogen, Refrigerated Liquid.
- UN1966; Hydrogen, Refrigerated liquid.

2.6.2 Safety Hazards and Protection

Dot Emergency Guidelines:

- Fire or explosion: Extremely Flammable. Will be easily ignited by heat, sparks or flames. Will form explosive

mixtures with air. Vapors from liquefied gas are initially heavier than air and spread along ground. Vapors may travel to source of ignition and flash back. Containers may explode when heated. Ruptured cylinders may rocket. /Hydrogen; Hydrogen, compressed; Hydrogen, refrigerated liquid (cryogenic liquid)/ (Ref.35)

- Health: Vapors may cause dizziness or asphyxiation without warning. Some may be irritating if inhaled at high concentrations. Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite. Fire may produce irritating and/or toxic gases. /Hydrogen; Hydrogen, compressed; Hydrogen, refrigerated liquid (cryogenic liquid)/ (Ref.35).
- Public safety: CALL Emergency Response Telephone Number. Isolate spill or leak area immediately for at least 50 to 100 meters (160 to 330 feet) in all directions. Keep unauthorized personnel away. Stay upwind. Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks). Keep out of low areas. /Hydrogen; Hydrogen, compressed; Hydrogen, refrigerated liquid (cryogenic liquid)/ (Ref.35)
- Protective clothing: Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection. Always wear thermal protective clothing when handling refrigerated/cryogenic liquids. /Hydrogen; Hydrogen, compressed; Hydrogen, refrigerated liquid (cryogenic liquid)/ (Ref.35)
- Evacuation: Large spill: Consider initial downwind evacuation for at least 800 meters (1/2 mile). Fire: If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions. /Hydrogen; Hydrogen, compressed; Hydrogen, refrigerated liquid (cryogenic liquid)/ (Ref.35)

- Fire: do not extinguish a leaking gas.fire unless leak can be stopped. Small fires: Dry Chemical Or CO2. Large Fires: Water Spray Or Fog. Move Containers From Fire area if you can do it without risk. Fire involving Tanks: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Do not direct water at source of leak or safety devices; icing may occur. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from the ends of tanks. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn. /Hydrogen: Hydrogen, compressed; Hydrogen, refrigerated liquid (cryogenic liquid)/ (Ref.35)
- Spill or leak: ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Stop leak if you can do it without risk. If possible, turn leaking containers so that gas escapes rather than liquid. Use water spray to reduce vapours or divert vapour cloud drift. Do not direct water at spill or source of leak. Prevent spreading of vapours through sewers, ventilation systems and confined areas. Isolate area until gas has dispersed. CAUTION: When in contact with refrigerated/cryogenic liquids, many materials become brittle and are likely to break without warning. /Hydrogen: Hydrogen, compressed; Hydrogen, refrigerated liquid (cryogenic liquid)/ (Ref.35)
- First aid: Move victim to fresh air. Call emergency medical care. Apply artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Remove and isolate contaminated clothing and shoes. Clothing frozen to the skin should be thawed before being removed. In case of contact with liquefied gas,

thaw frosted parts with lukewarm water. Keep victim warm and quiet. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. /Hydrogen; Hydrogen, compressed Hydrogen, refrigerated liquid (cryogenic liquid)/ (Ref.35)

2.7 Liquefied Petroleum Gas (LPG)

Baker Strehlow Explosion Model

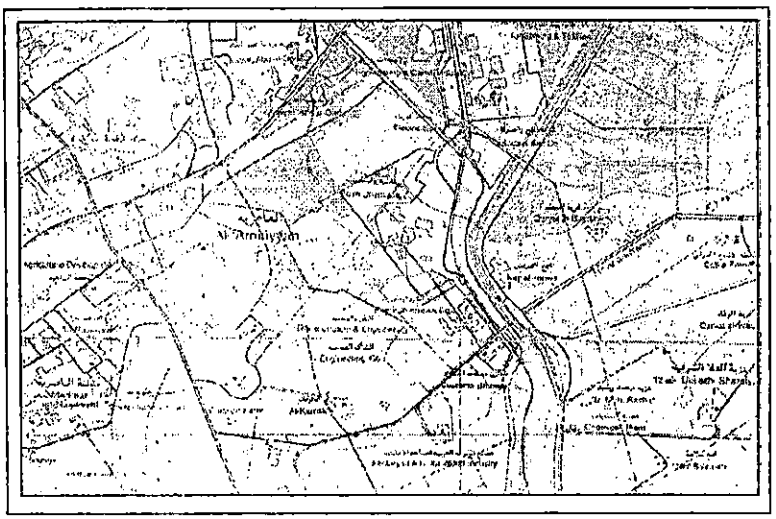
Input Data

- Selected substance :LPG (Liquefied Petroleum Gas)
- Heat of combustion :46026.0 kJ/kg
- Heat of combustion (Stoichiometric air mix) :3560.0 kJ/m**3
- Material Reactivity :High
- Ground Reflection :2
- Absolute Coordinates :0 m 0 m
- Confined Volume :1000.0 cu m
- Flame Expansion :1D
- Obstacle Density :Medium
- Flame Speed :5.2
- Energy :7120000000.0 J

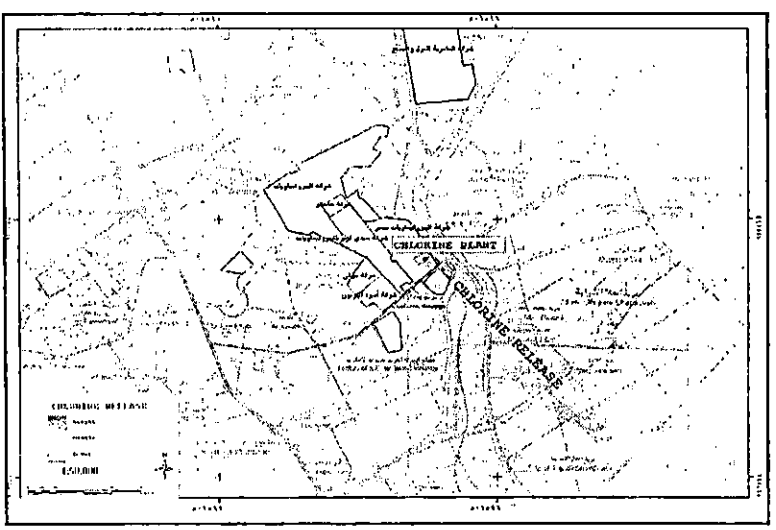
3. Results and Discussions

The Results from Dispersions Model Is Mapped to the El-Amirya as Shown in the following frequencies.

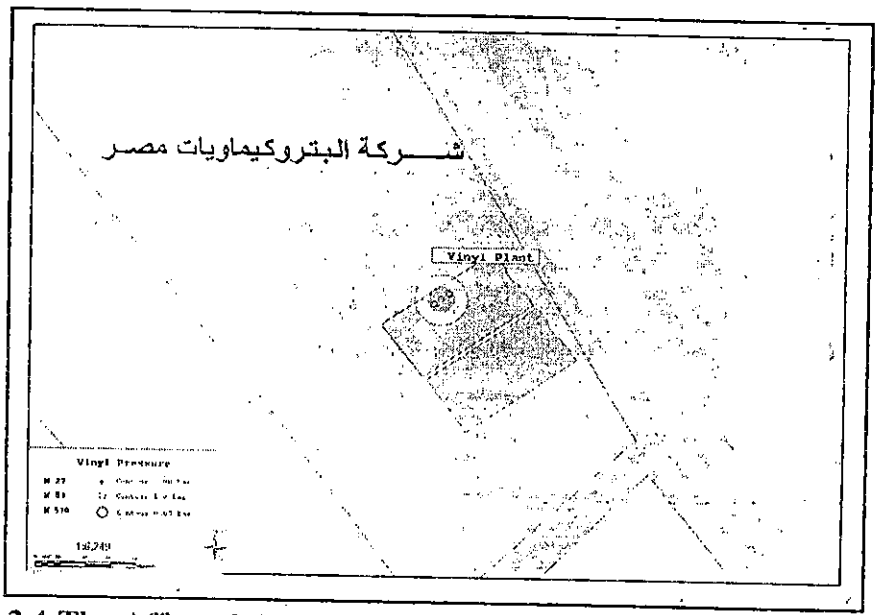
3.1 El-Amirya Industrial Zone



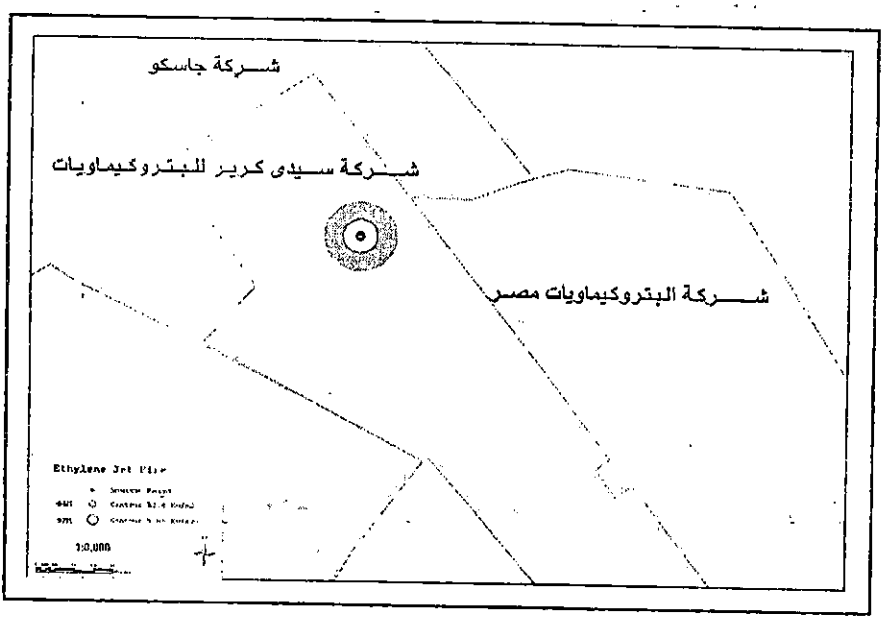
3.2 The Affected Area of Chlorine Release from Petrochemical Company that can be Affected



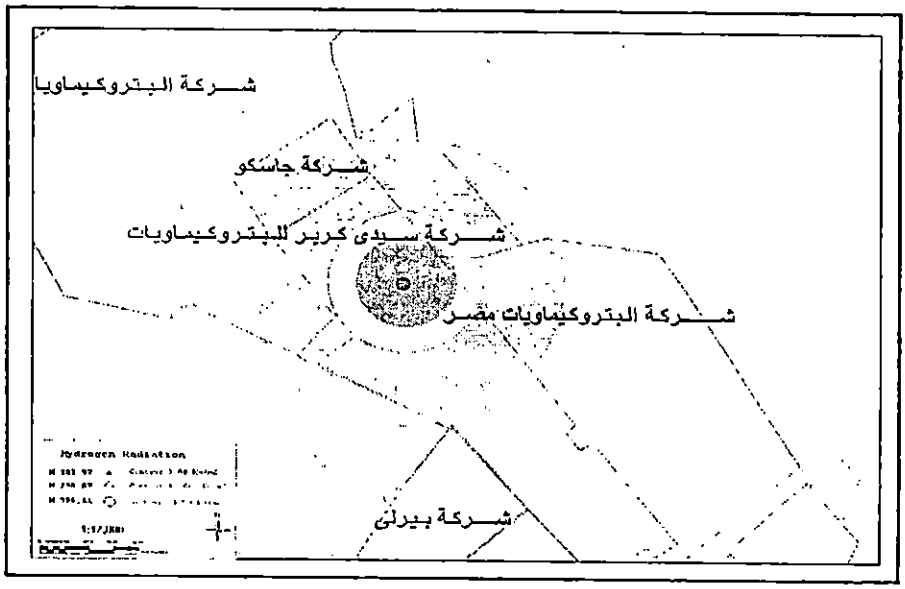
Petrochemical Company



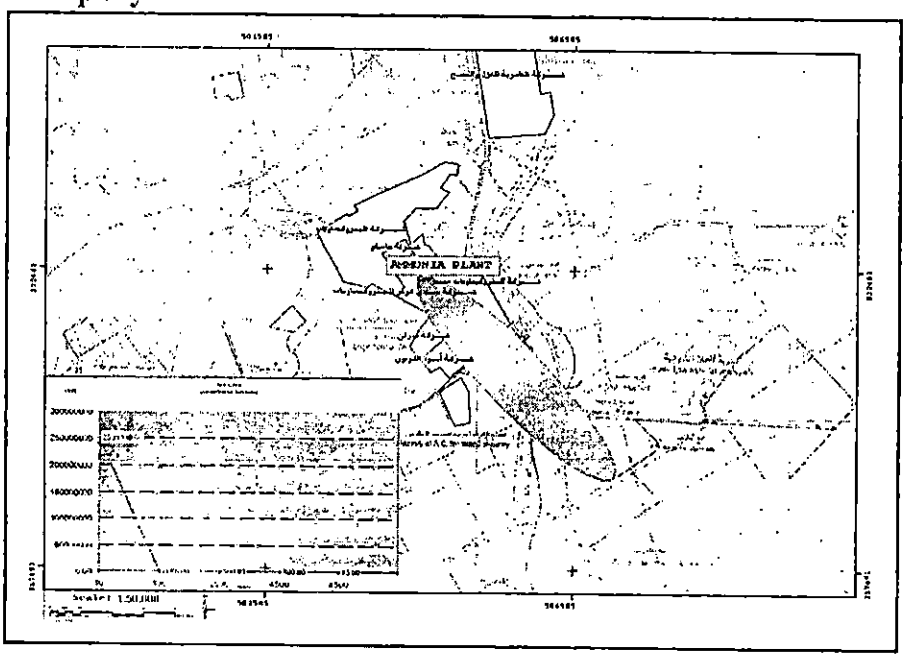
3.4 The Affected Area of Ethylene Jet Fire from Sidi Kerrir Company

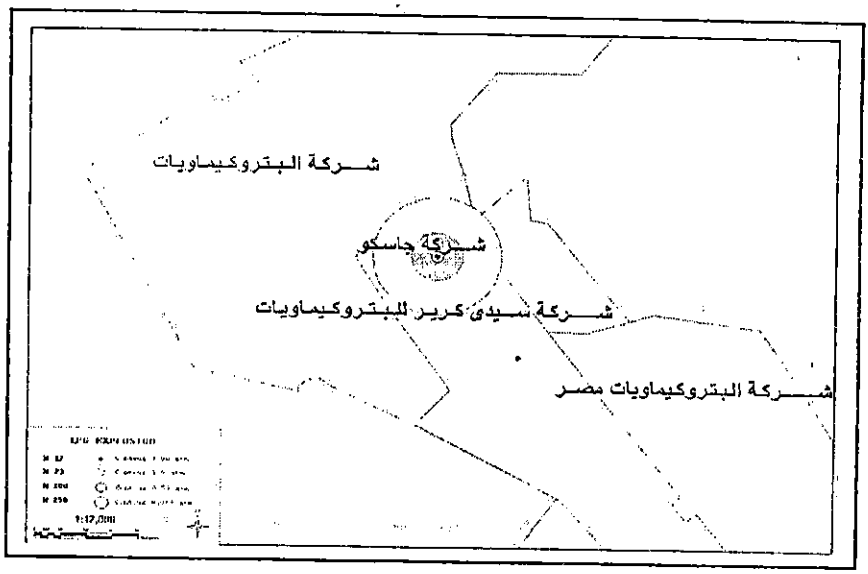


3.5 The Affected Area of Hydrogen Radiation from Sidi



3.6 The Effected Area of Ammonia Release from Sidi Kerrir Company





4. Results

Explosion Damage and Injury Thresholds Explosion damage thresholds for buildings, structures and other equipment are presented as Table 3.1. Criteria of interest are those relating to damage to the steel frames of buildings and the collapse of walls constructed of concrete blocks, as these are typical of the types of construction applied to the buildings in the industrial area at the plant.

Table 3-1 Explosion Damage Thresholds

Receiver/Target	Tolerable Temperature (°C)	Tolerable Heat Intensity (KW/m2)
Equipment (e.g. vessels)	550	30
Special Buildings (e.g. Control Room)	500	25
Normal Buildings (i.e. other than concrete)	390	14
Vegetation	330	10
Plastics	120	2
Escape Routes (30 seconds) *	65	4-6
Emergency Work (70 seconds) *	40	3
Safe Limit for Personnel *	25	1.5

Injuries to people are less easily summarized, since injury can occur by any, or a combination, of:

- Damage Lung (likelihood of injury depends on positive phase duration and overpressure);
- Eardrum ruptures;
- Whole-body displacement (dependent on displacement velocity and whether impact is with body or skull - a fatality is much more likely with a head impact). An impact velocity of 3m/s is regarded as safe for both body and head impacts. However, whilst 7m/s would be considered a safe threshold for bodily impact, it would be considered almost universally fatal for head impacts;
- Flying debris - a 4.5kg piece of debris impacting against the skull would cause minimal injury at 3m/s ('safe' threshold) but would be fatal at 7m/s; and
- Glass fragments - injuries can occur at great distances from an explosion due to fragmentation of unstrengthened windows (see Table 3.1).

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نظام معلومات جغرافي لتوقيع مسار السحابة السامة الناتج عن نموذج الانتشار

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تهدف البحث إلى استخدام نموذج تشتت المواد الكيميائية السامة في طبقات الجو (ALOHA Desertion models) مع ربط هذه النتائج بنظم المعلومات الجغرافية .وبرنامج ALOHA صمم خصيصا لتحليل وانتشار المواد الكيميائية نتيجة حدوث حوادث ناتج عنها تسرب هذه المواد في طبقات الجو أو عمل نماذج لمواجهة المخاطر يتم تدريب الأفراد والجهات عليها حيث يمكن من خلاله بما يمتلكه من مكتبة كبيرة محملة بخصائص المواد الكيميائية معرفة نسب أي أبخرة كيميائية قد تتسرب في الجو حيث يمكن تحديد إتجاه التشتت والزمن والمسافة المقطوعة في الجو ومستويات الخطر.

فقد تم إختيار منطقة العامرية الصناعية بالإسكندرية لكي تكون نموذج لتطبيق هذه الدراسة حيث تحتوي على ٨ مصانع أنواع من الصناعات المختلفة تحتوى على مواد خطرة مثل: المصنع البتروكيماوي المصري، مصنع منسوجات العامرية. وتعتبرمنطقة العامرية هي منطقة صناعية وقعت على حدود الإسكندرية بالمناطق السكنية والطريق السريع. بالإضافة، المناطق السكنية وجدت حول هذه المنطقة الصناعية تخضعُ إلى تلوث الهواء كنتيجة لهذه إشعاعات المصانع.

A Geographical Information System for Plotting The Dispersion Model Results of Toxic Cloud

Geographic Information System (GIS) is defined as an information system that is used to input, store, retrieve, manipulate, analyze and generate geographically referenced data or geospatial data in order to support decision making for planning and management of land use, natural resources, environment, transportation, urban facilities, and other administrative records.

ALOHA (Areal Locations of Hazardous Atmospheres) is a computer program designed especially for use by people responding to chemical accidents, as well as for emergency planning and training. ALOHA can predict the rates at which chemical vapors may escape into the atmosphere from broken gas pipes, leaking tanks, and evaporating puddles. It can then predict how a hazardous gas cloud might disperse in the atmosphere after an accidental chemical release.

El-Ameria Industrial zone was chosen to be a model for applying this study .It contains 8 factories of different industrial type with various potential hazardous such as: the Egyptian Petrochemical Factory, El-Ameria Textile Factory, and Alexandria Tire Factory. It is an industrial zone situated on the borders of Alexandria with residential areas and highway. In addition, the residential areas found around this industrial zone are subjected to air pollution as a result of these factories emissions