

Simulation Technology Laboratory Building 970 Hazards Assessment Document

Project Leader: Zeferino Banda
Authors: Carrie L. Wood, Michael D. Starr

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Abstract

The Department of Energy Order 5500.3A requires facility-specific hazards assessments be prepared, maintained, and used for emergency planning purposes. This hazards assessment document describes the chemical and radiological hazards associated with the Simulation Technology Laboratory, Building 970. The entire inventory was screened according to the potential airborne impact to onsite and offsite individuals. The air dispersion model, ALOHA, estimated pollutant concentrations downwind from the source of a release, taking into consideration the toxicological and physical characteristics of the release site, the atmospheric conditions, and the circumstances of the release. The greatest distances at which a postulated facility event will produce consequences exceeding the ERPG-2 and Early Severe Health Effects thresholds are 78 and 46 meters, respectively. The highest emergency classification is a Site Area Emergency. The Emergency Planning Zone is 100 meters.

EXECUTIVE SUMMARY

This hazards assessment provides an evaluation of the chemical and radiological hazards at the Simulation Technology Laboratory (STL, Building 970) as mandated by the Department of Energy (DOE) Order 5500.3A, Planning and Preparedness for Operational Emergencies.

The hazards assessment process developed scenarios and estimated consequences for those chemical and radiological materials determined to be hazardous. The results were used to develop the following information for use in Sandia National Laboratories/New Mexico (SNL/NM) Emergency Management Program for the STL.

- The greatest distance at which a postulated facility event will produce consequences exceeding the Early Severe Health Effects threshold is 46 m. This event involves the release of 1.9 m^3 (68 ft^3) of the fluorine gas mixture.
- The highest emergency classification is a Site Area Emergency.
- The recommended protective response action for a fluorine gas leak outside the building is sheltering in place.
- The recommended protective response action for a fluorine gas leak inside the building is evacuation.
- The Emergency Planning Zone is 100 meters.

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KEY to ABBREVIATIONS

| | |
|----------|---|
| ACGIH | American Conference of Governmental Industrial Hygienists |
| ADF | Accelerator Development Facility |
| AIHA | American Industrial Hygiene Association |
| ALARA | As Low As Reasonably Achievable |
| ALOHA | Aerial Locations of Hazardous Atmospheres |
| CAMEO | Computer-Aided Management of Emergency Operations |
| CHEM | Chemical |
| DESHE | Distance at which Early Severe Health Effects are reached |
| DOE | Department of Energy |
| DOE-KAO | Department of Energy-Kirtland Area Office |
| DOT | Department of Transportation |
| EAL | Emergency Action Level |
| EMG | Emergency Management Guide |
| EOC | Emergency Operations Center |
| EPA | Environmental Protection Agency |
| EPZ | Emergency Planning Zone |
| ERPG | Emergency Response Planning Guidelines |
| ESHE | Early Severe Health Effects |
| FEMA | Federal Emergency Management Agency |
| G | Gas |
| g | Gram |
| gal | Gallon |
| gcf | Gaseous cubic feet |
| J | Joule |
| kA | Kiloamperes |
| KAFB | Kirtland Air Force Base |
| kg | Kilogram |
| Kj | Kilojoule |
| KrF | Krypton fluoride |
| L | Liquid |
| l | Liter |
| lb | Pound |
| LEPC | Local Emergency Planning Committee |
| LOC CODE | Location Code |
| MeV | Million electron volts |
| MITL | Magnetically Insulated Transmission Line |
| ml | Milliliter |
| MQTY | Maximum Quantity |
| ms | Millisecond |
| MSDS | Material Safety Data Sheets |
| mv | Megavolt |
| NOAA | National Oceanic and Atmospheric Administration |
| ns | Nanosecond |
| oz | Ounce (avoirdupois) |
| ozd | Dry ounce (avoirdupois) |

| | |
|------------|---|
| ozf | Fluid ounce (U.S. liquid measure) |
| PAG | Protective Action Guide |
| PHA | Preliminary Hazard Assessments |
| PHYS STATE | Physical State |
| ppm | Parts Per Million |
| pt | Pint |
| QTY UNIT | Quantity Unit |
| RLA | Recirculating Linear Accelerator |
| S | Solid |
| SCR CRIT | Screening Criteria |
| SIH | Standard Industrial Hazard |
| SOP | Standard Operating Procedures |
| SNL/NM | Sandia National Laboratories/New Mexico |
| SPEGL | Short-Term Public Emergency Guidance Levels |
| STF | Subsystem Test Facility |
| STL | Simulation Technology Laboratory |
| TA-I | Technical Area-I |
| TA-II | Technical Area-II |
| TA-III | Technical Area- III |
| TA-IV | Technical Area-IV |
| TA-V | Technical Area-V |
| TLV | Threshold Limit Value |
| TWA | Time Weighted Average |

1.0 INTRODUCTION

The purpose of the hazards assessment process is to document the impact of the release of hazardous materials at the Simulation Technology Laboratory (STL) that are significant enough to warrant consideration in Sandia National Laboratories' operational emergency management program. This hazards assessment is prepared in accordance with the Department of Energy Order 5500.3A¹ requirement that facility-specific hazards assessments be prepared, maintained, and used for emergency planning purposes.

This hazards assessment provides an analysis of the potential airborne release of chemicals associated with the operations and processes at the STL. The STL provides the DOE with upgraded radiation facilities for testing the effects of weapons. It enables Sandia National Laboratories in Albuquerque, New Mexico (SNL/NM) to effectively conduct the vulnerability and hardness testing necessary for the development of future radiation hardened defense systems. The focus of the hazards assessment is the airborne release of materials because this requires the most rapid, coordinated emergency response on the part of the STL, SNL/NM, collocated facilities, and surrounding jurisdiction to protect workers, the public, and the environment.

A key objective of DOE's emergency management program is to ensure that all DOE facilities and operations develop and maintain emergency planning, preparedness and response capabilities, as well as effective public and interagency communications; to minimize consequences to workers and the general public from events involving the release of hazardous materials. If planning and preparedness for emergencies is to be adequate and appropriate, then the hazards that are specific to each facility and operation must first be identified and understood. The hazards assessment herein provides the technical basis for such planning.

STL currently houses the following accelerators: HERMES III, PROTO II, SABRE, Subsystem Test Facility (STF), and the Accelerator Development Facility (ADF). The EPOCH laboratory (TROLL accelerator) has been disassembled and is currently inoperational. However, once the access control system is modified, the TROLL accelerator will become active. Therefore, the TROLL accelerator is included in this hazards assessment. Support space in STL includes a machine shop, welding shop, facility office, training room, lunch room, lower level screen room, desk areas, and laboratory work areas.

All chemical and radioactive materials within the STL have been identified. The entire inventory was screened according to the potential to affect onsite and offsite individuals. Those materials that were determined hazardous were fully characterized, accident scenarios were developed, and consequences were estimated. The resultant consequences were utilized to determine the appropriate emergency planning zone, emergency classes, and emergency action levels.

2.0 SITE AND FACILITY DESCRIPTION

2.1 SNL/NM Site

SNL/NM is located approximately 10 kilometers (6 miles) east of downtown Albuquerque, New Mexico, in the foothills of the Manzano Mountains (see Illustrations 2.1-1 and 2.1-2). SNL/NM is surrounded by Kirtland Air Force Base (KAFB) and has co-use agreements on some portions of Air Force property. KAFB is located on two broad mesas that are bisected by the Tijeras Arroyo, an east-west trending canyon. These mesas are bounded by the Sandia and Manzano Mountains (Cibola National Forest) to the east and the Rio Grande to the west. Regional elevations range from a low of 1,500 meters (4,922 feet) at the Rio Grande to a high of 3,255 meters (10,680 feet) at Sandia Crest. KAFB is at a mean elevation of 1,630 meters (5,348 feet).

SNL/NM is operated for the Department of Energy (DOE). It consists of five technical areas (TAs) and remote test areas situated in the eastern half of the 74-square-mile KAFB military reservation (see Illustration 2.1-3). Adjacent to and physically combined with the KAFB installations is the Albuquerque International Airport, in what constitutes a large joint military and commercial transportation complex. Landing and takeoff patterns for the various runways at the airport facilities are not expected to affect SNL/NM operations. The runway of most concern is the east-west runway.

2.2 Weather and Climate

SNL/NM temperatures are characteristic of high-altitude, dry, continental climates. Sunshine is a predominant feature of SNL/NM and occurs approximately 75 percent of daylight hours. Maximum daytime temperatures during the winter of 1988 averaged near 10°C (50°F); summer daytime maximum temperatures averaged less than 32°C (90°F) except in July when the maximum average reached 34°C (93°F).² Temperature extremes below -27°C (-17°F) or above 41°C (105°F) occur infrequently.³

The average annual precipitation for SNL/NM is 21 centimeters (8.3 inches); half of this precipitation occurs from July through September in the form of convective thundershowers. Winters are typically dry with less than five cm of precipitation normally recorded in a given month. This includes occasional snowstorms with accumulations of 20-to-30 centimeters (8-to-12 inches) of snow. The maximum observed precipitation in 24 hours occurred in September, 1983, when 5.7 centimeters (2.3 inches) of rain was recorded. The total annual precipitation of 33 centimeters (13 inches) for 1988 was 12 centimeters (4.8 inches) above the 30-year average of 21 centimeters (8.3 inches). The average annual relative humidity recorded from 1951 to 1980 was about 43 percent, with the average humidity dropping to less than 20 percent in April, May, and June.

Strong winds, often accompanied by blowing dust, occur mostly in late winter and early spring. Wind speeds reach a maximum velocity of 28 knots (32 miles per hour) on an average of 46 days per year. Every two years, a one-minute duration gust of 52 knots (60 miles per hour) is expected.⁴ The average hourly wind velocity at the Albuquerque International Airport recorded from 1951 to 1980 ranged from 6.7 knots (7.7 miles per hour) in December to 9.6 knots (11 miles per hour) during April.⁵ The annual surface wind speed and direction for SNL/NM Technical Area I are depicted in Illustration 2.2-1. Rapid nighttime ground cooling produces strong temperature inversions as well as drainage winds that flow out of the mountains during evening hours.⁶

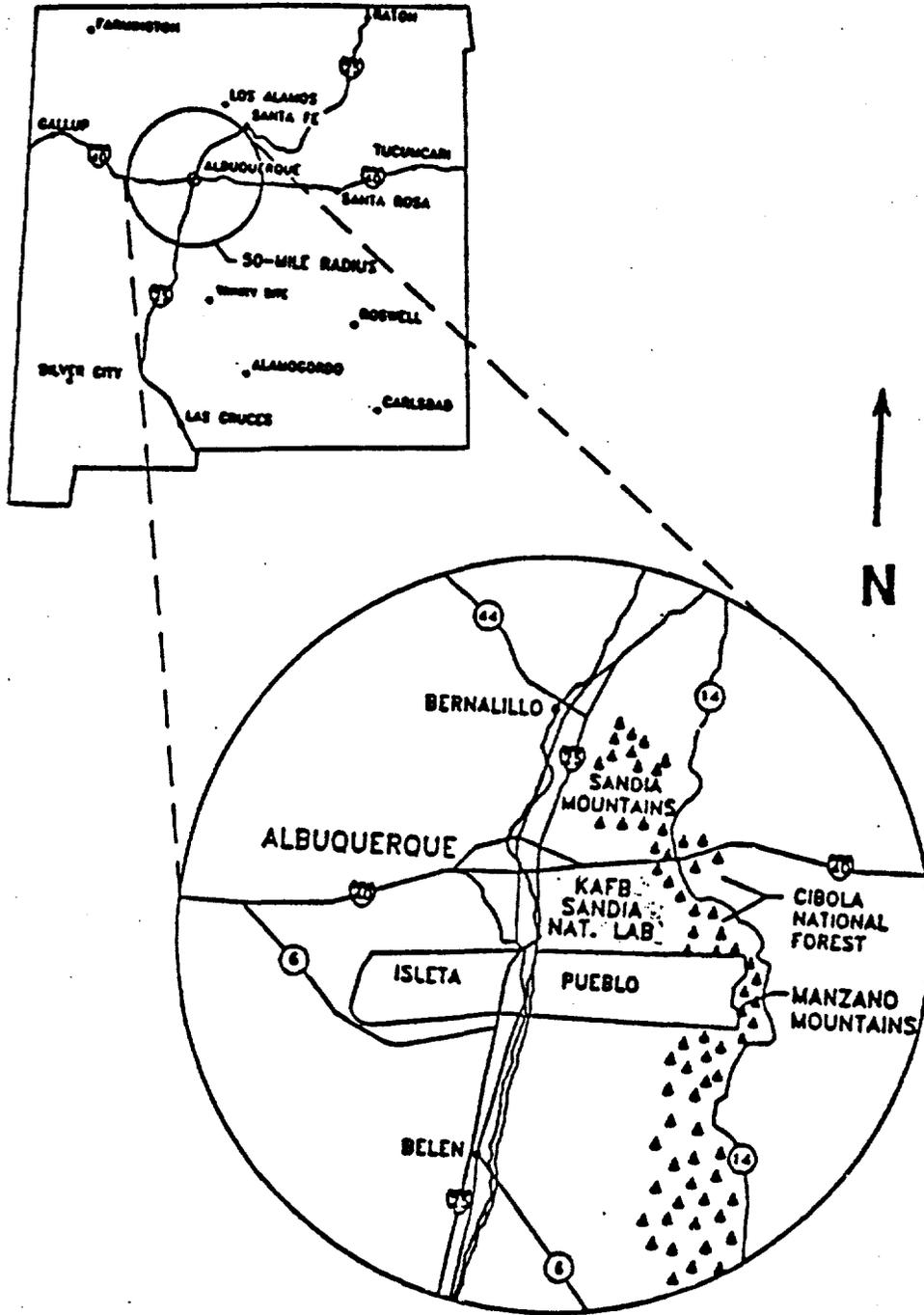


Illustration 2.1-1 General Location Map, Sandia National Laboratories, Albuquerque, NM

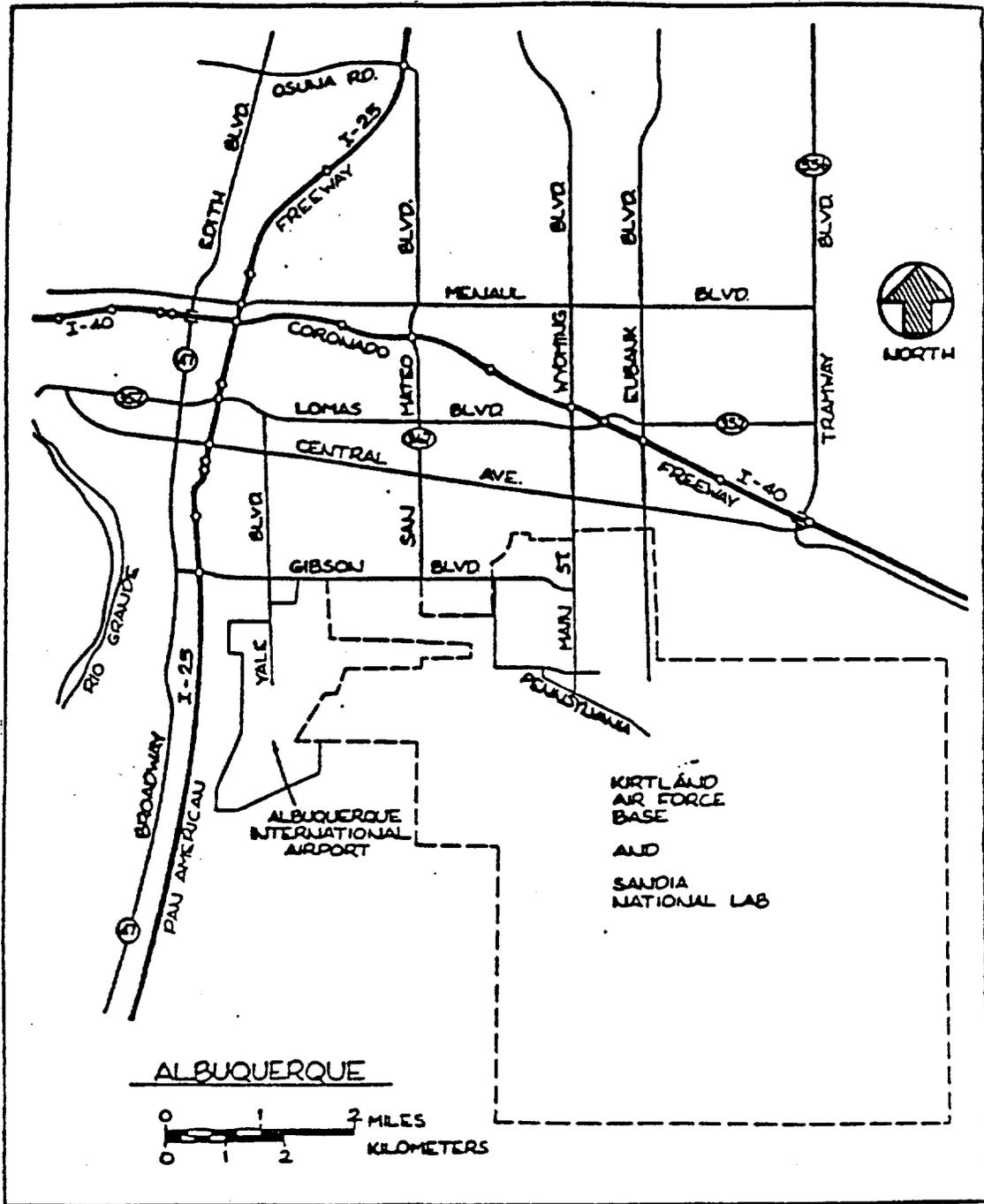


Illustration 2.1-2 Location Map for Sandia National Laboratories/New Mexico

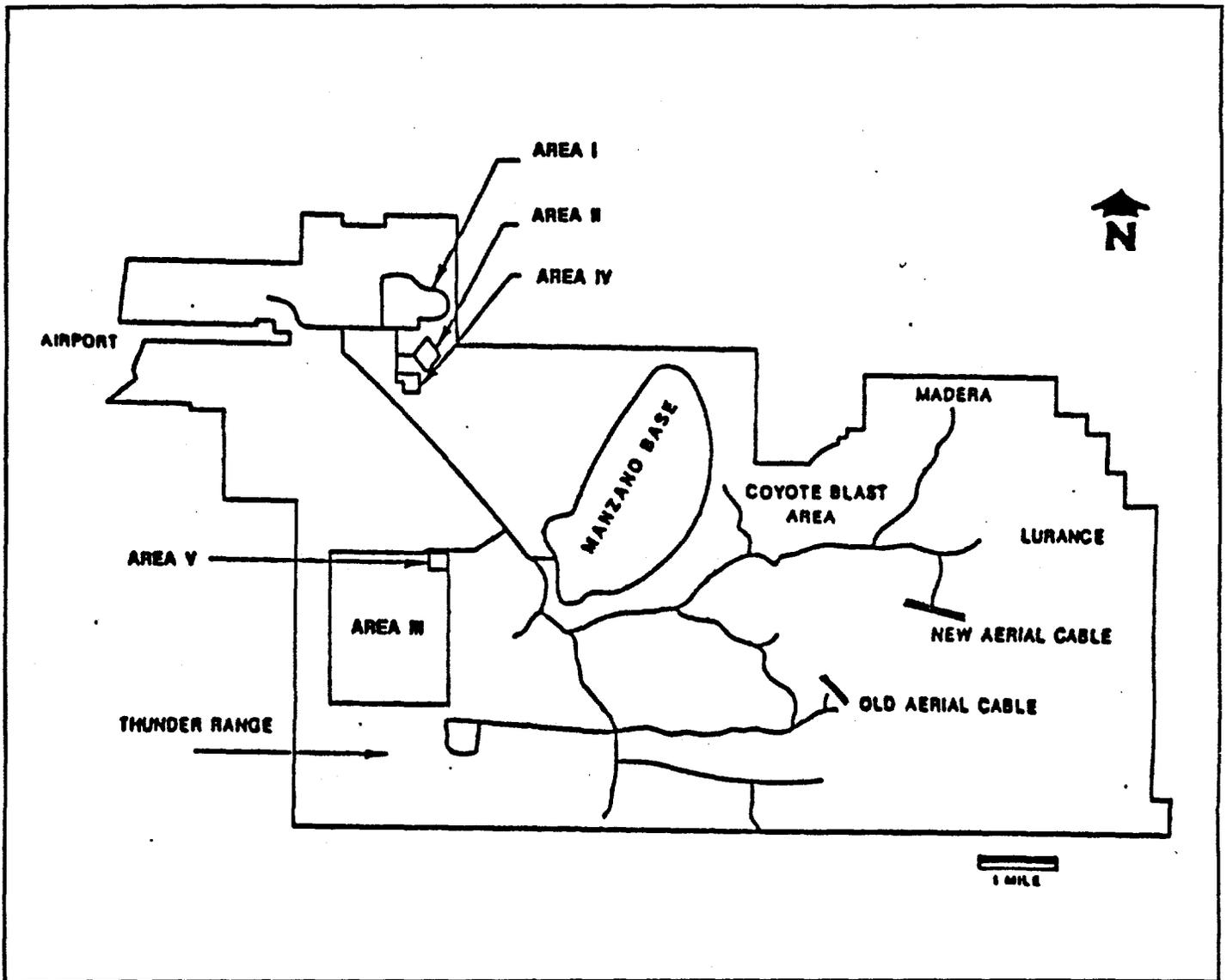
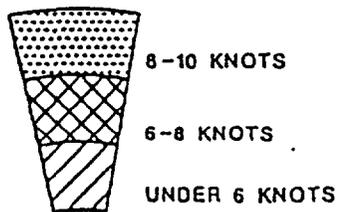
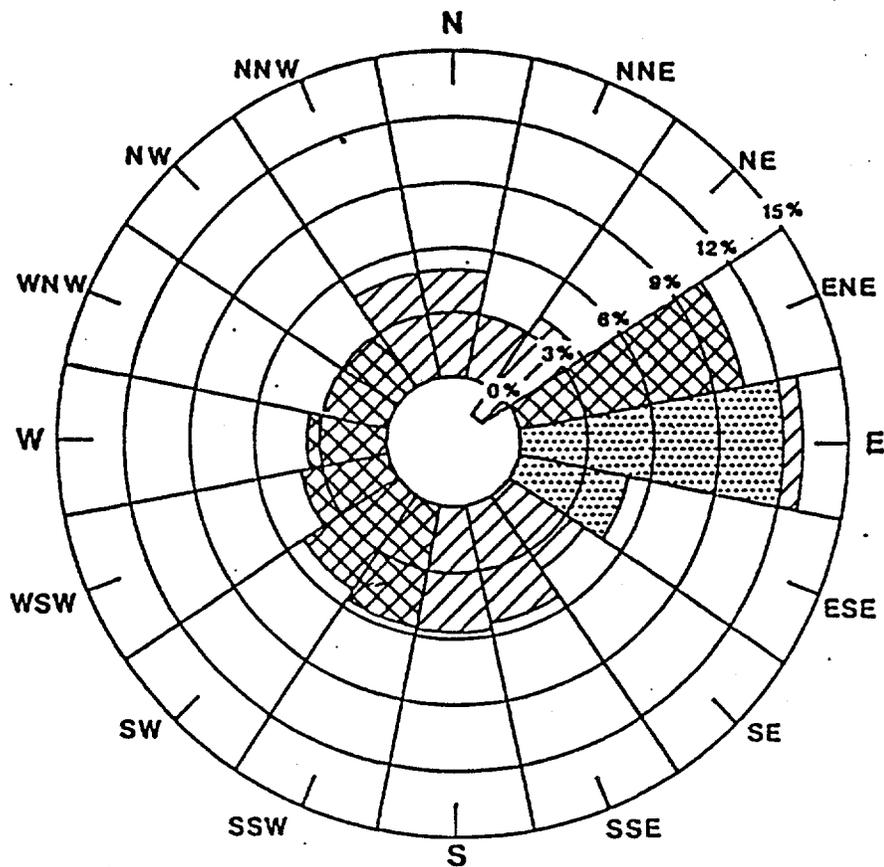


Illustration 2.1-3 SNL/NM Technical Areas



AVERAGE ANNUAL WIND SPEED

Illustration 2.2-1 Annual Surface Wind Speed and Direction, Technical Area I

Tornado occurrences within the state of New Mexico vary from a minimum annual frequency of 0.2 to a maximum of 1.1.⁷ Statistically, the highest frequency has been observed in the eastern half of the state. For the western half of the state, generally demarcated by the Rio Grande and the mountain ranges that parallel it on the east side, tornado frequencies are 0.3 or less. In the Albuquerque area, which lies west of the Sandia and Manzano Mountains, only two tornadoes have been reported in more than a 20-year span. These occurred within the center of the city of Albuquerque in the years 1985 and 1987 and are officially listed in the climatological records of the National Weather Service as "small tornadoes." Damage was light and no official wind readings are available.

In addition, one funnel cloud has been observed in the same 20-year period. This was reported in the Four Hills area of Albuquerque about 2 kilometers to the east of Technical Area I on KAFB, but it was not observed to touch down and accordingly, it did not cause any reported damage. Based on the climatological records available, Albuquerque can be classified as a region of low occurrence with an annual frequency of 0.1 or less.

2.3 Air Quality

The air quality at SNL/NM is strongly influenced by the presence of the Albuquerque metropolitan area to the north and west.

SNL/NM is situated in the Rio Grande Valley, which is flanked by the Sandia and Manzano Mountains on the east and the Puerco Plateau on the west. This protects the Rio Grande Valley from many passing storms and reduces much of the air flow that would carry air pollution away from the metropolitan area.⁸ During many winter nights, the air in the metropolitan area becomes very stable and still, creating a temperature inversion which traps the pollutants emitted into the colder air at ground level. During the winter months, Albuquerque occasionally exceeds the ambient standards for carbon monoxide. Air quality has been improving, with fewer violations of the standards being reported over the past few years basically because of implementation of the Albuquerque/Bernalillo Air Pollution Control Program.⁹

2.4 Geology: Surface and Subsurface Features

SNL/NM is located in the Rio Grande Rift Valley of the Basin and Range physiographic province. The Rio Grande Rift is a structural feature that trends north-south from southern Colorado to El Paso, Texas.¹⁰ The SNL/NM area is situated on the East Mesa in the east-central portion of the Albuquerque-Belen basin segment of the rift (Illustration 2.4-1). The basin is bounded on the east by the fault-block Sandia and Manzano Mountains, which consist of Precambrian granites, schist, gneisses, quartzite, and metavolcanics; on the west by the Lucero uplift and Puerco plateau; on the north by the Nacimiento uplift; and on the south by the Socorro Channel.

Large-scale faulting, deepening of the basin and tilting of the mountains in the late Miocene period have resulted in a differential vertical movement of 6,000 to 7,000 meters (3.7 to 4.4 miles) on the eastern basin border.¹¹ Both concurrent with and subsequent to the structural changes, the basin began to fill due to a complex mixture of eolian, channel, debris flow, levee, and flood plain-type mechanisms¹² resulting in a complex sequence of gravel, sand, silt, clay, and caliche deposits known as the Santa Fe Formation. The basin, which consists primarily of Tertiary and Quaternary deposits, is estimated to be 1,200 to 1,500 meters (0.75 to 0.9 miles) thick (Illustration 2.4-2).

The East Mesa is characterized by alluvial and colluvial deposits formed due to runoff from the mountains onto alluvial fans or stream channels. The soils are the Embudo gravel, fine, sandy loam and the Wink fine, sandy loam, both of which are part of the Maurez-Wink Association.¹³ The Embudo soils are deep, moderately alkaline, well-drained soils that formed in alluvium derived from decomposed, course-grained, granitic rocks on old alluvial fans.¹⁴ The Wink soils are deep, calcareous, and moderately alkaline, well-drained soils that formed in old, unconsolidated alluvium modified by wind.¹⁵ Runoff from both these soils is medium with moderate water erosion hazard and the shrink-swell potential for both is low.¹⁶

The Rio Grande Rift between Albuquerque and Socorro is the most seismically active area in New Mexico. Seismic records date back to 1849, when the first reported earthquake occurred in Socorro; however, complete instrumental records are available only after 1962.¹⁷ Instrumental data since 1960 indicate a maximum probable local magnitude shock (M_L) within a 100-year period of 4.2 to 4.9 on the Richter scale.¹⁸ SNL/NM seismic activity research is being conducted as mandated by DOE Order 5480.28, Natural Phenomena Hazards Mitigation.¹⁹

The SNL/NM area is located in Seismic Risk Zone 2B (Illustration 2.4-3) in which moderate damage from earthquakes (corresponding to Intensity VII of the Modified Mercalli Intensity Scale of 1931) may be expected to occur.

The largest recorded earthquakes in the Albuquerque-Socorro area have been measured at 4.7 on the Richter scale. An earthquake of this magnitude occurred on January 4, 1971, with the epicenter in the Albuquerque area. Minor damage to buildings was reported by the University of Albuquerque (now St. Pius High School); however, no damage to SNL/NM buildings was reported.

Two other earthquakes with magnitudes of approximately 4.7 on the Richter scale occurred on November 28, 1970, and January 4, 1990, near the town of Bernardo, New Mexico, 105 kilometers (65 miles) south of Albuquerque. Damage to the Bernardo area was the only damage reported.

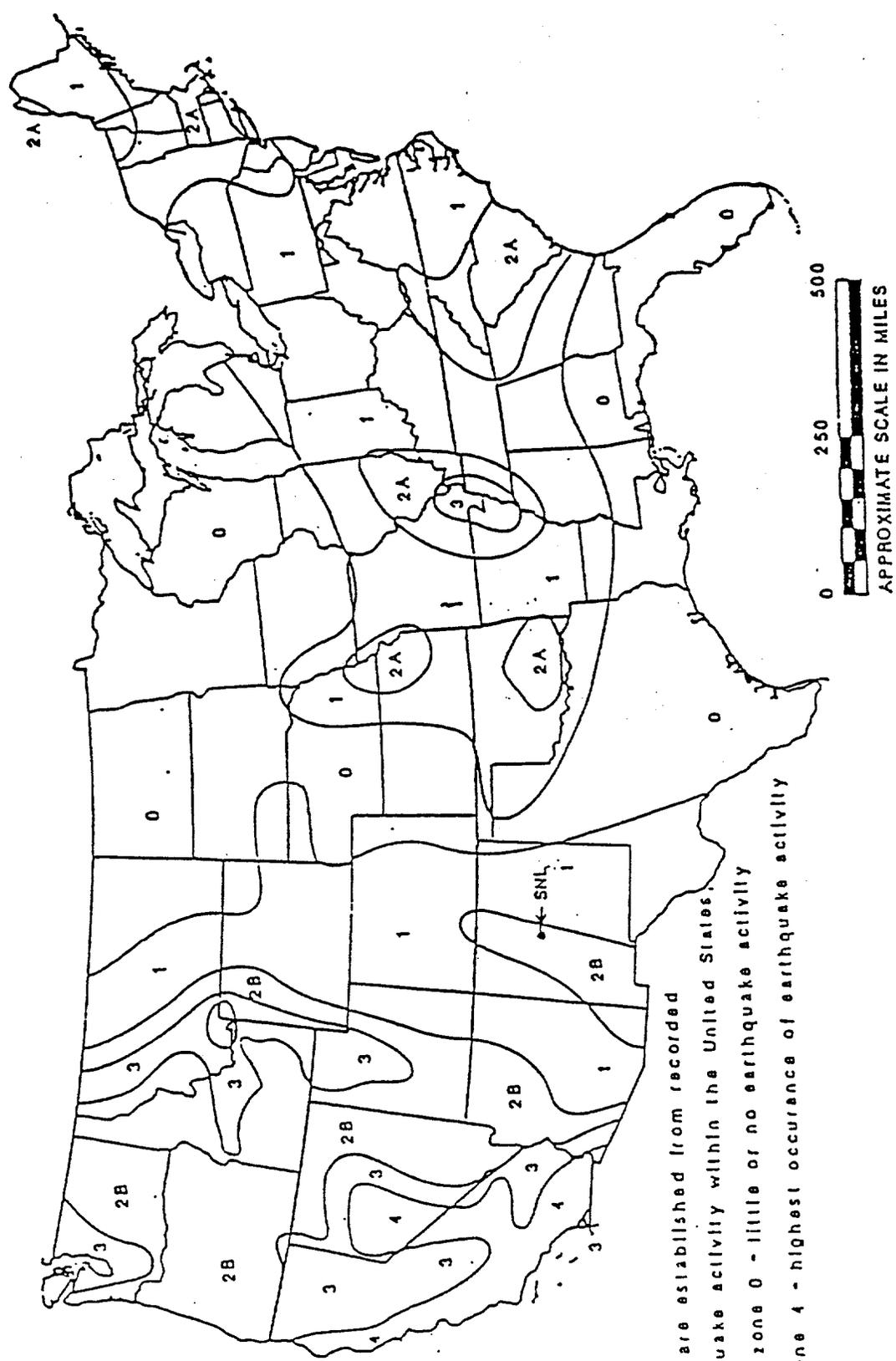
The fault zones along the eastern and western sides of the Albuquerque-Belen Basin were active in Miocene times and appear to have become stable since the mid-Pleistocene. Present seismic activity shows little correlation with the Albuquerque area fault zones, but is concentrated more with the mountains west of Socorro, 120 kilometers (75 miles) south of KAFB.

Numerous small volcanic centers occur along a line paralleling the axis of the Albuquerque basin to the west of the metropolitan area. The volcanoes include five small cones and 13 nubbins, the largest of which protrude about 180 feet above the ground surface. At least eight flows (andesite and basalt) occurred in the volcanic field, which was active only for a short period approximately 190,000 years ago.

2.5 Water Resources

2.5.1 Surface Water

The East Mesa has a generally west-southwestward ground surface slope ranging from about 47 meters per kilometer (250 feet per mile) near the mountains to 3.8 meters per kilometer (20 feet per mile) near the river. The distance from the foot of the mountains to the river varies from 4.8 kilometers (three miles) in the northern part of the mesa to 14.5 kilometers (nine miles) in the southern part of the mesa.²⁰



Zones are established from recorded earthquake activity within the United States, where zone 0 - little or no earthquake activity and zone 4 - highest occurrence of earthquake activity

From UBC, 1988.

Illustration 2.4-3 Seismic Risk Zone, SNL/NM

Tijeras Arroyo, the major drainage of the East Mesa area, originates in the mountains and joins the Rio Grande at approximately 16 kilometers (10 miles) south of Albuquerque, cutting across the eastern part of KAFB. In addition, numerous small drainages emerge from the mountains onto the mesa. In general, very little of this surface water reaches the Rio Grande²¹ because most surface water runoff enters the permeable deposits of the Quaternary-Tertiary alluvium or is evaporated or transpired.

During heavy precipitation, the elevated interfluvial regions drain by sheet flow into small gullies and rivulets. This water is carried by natural or artificial flow paths into Tijeras Arroyo and eventually reaches the Rio Grande. Occasional flooding is likely within these gullies and arroyos. The Army Corps of Engineers has estimated that a 100-year flood will reach a crest of 1,597 meters (5,240.5 feet). The 24 meter (80 ft) walls of the Tijeras Arroyo are adequate to protect SNL/NM against flooding.

2.5.2 Subsurface Water

The major subsurface reservoir beneath the Albuquerque area (including SNL/NM) is composed of basin fill material of the Rio Grande (for deposits and alluvial material of Quaternary and Tertiary age) with a depth to bedrock of nearly 1.6 kilometers (5,000 feet) throughout most of the basin (Illustration 2.4-2). The alluvial aquifer is bounded on the west by the Lucero uplift and on the east by the Sandia-Manzano Mountains.²²

Groundwater in the alluvial aquifer generally occurs under unconfined conditions and flows in a southward direction under an overall gradient of approximately two meters per kilometer (10 feet per mile). The transmissivity of the alluvial aquifer is estimated to be 2,480 square meters per day (200,000 gallons per day per foot), and storativity (quantity of water that the aquifer will release from or the quantity that will be taken into storage per unit surface area of the aquifer per unit of head) is approximately 0.2. The groundwater flow velocity is approximately six meters per year (20 feet per year).²³ The water table beneath SNL/NM on the East Mesa is approximately 150 meters (500 feet) beneath the surface, and groundwater generally flows in a southwestern direction towards the axis of the Rio Grande alluvial basin.

The alluvial aquifer is recharged principally by the Rio Grande. The aquifer also receives recharge at the base of the mountains where small canyons open onto alluvial fans and the alluvium is relatively coarse. Relatively little water percolates into the aquifer through the unsaturated zone, as most runoff from precipitation ultimately flows into drainages and into the Rio Grande, or is lost through evapotranspiration.

The greatest water level changes from 1960 to 1978 in the Albuquerque area were recorded on the east side of the Rio Grande. In the future, water levels will continue to decline on both the east and west sides of Albuquerque due to increased population. Total decline of the water table by the year 2000 will probably not exceed 37 meters of fresh-water saturation in the aquifer beneath the Albuquerque area.²⁴

2.6 Flora and Fauna

The vegetation in this area is typical of an arid grassland. While more than 50 grasses may be found within this grassland association and the surrounding area, only a small number of species are abundant. The homogeneous nature of the vegetation does not support a high diversity of wildlife. Small mammals, reptiles, and birds are the most abundant species found. No species of federally listed endangered or threatened plants or animals have been observed at SNL/NM. The New Mexico Energy, Minerals and Resources Department²⁵ lists two state endangered species of cacti as potentially occurring in the area—the grama grass cactus and Wright's fish-hook cactus. The New Mexico Game and Fish Department's

Handbook of Species Endangered in New Mexico lists four animal species that may occur in Bernalillo County. However, these species are not expected to reside at SNL/NM because of specific habitat requirements.

2.7 Demography

SNL/NM is on KAFB, which is located in Bernalillo County, New Mexico. The population of Bernalillo County in 1990 was 480,577.²⁶ KAFB is bordered on the north and west by densely populated residential areas of the City of Albuquerque. To the east of KAFB is the Four Hills residential area of Albuquerque. Albuquerque had a population of 384,736 in 1990.²⁷ To the south of KAFB is the Isleta Indian Reservation, which had a population of 2,915 in 1990,²⁸ and Valencia County. Valencia County is a rural and sparsely populated area. The most recent population figure for Valencia County is 45,235.²⁹ KAFB itself houses up to 7,830 residents in barracks and detached or semi-detached family houses. As of 1990, the residential population of KAFB was 5,761. The total estimated population within a 80 kilometer (50 mile) radius of SNL/NM is 632,500.

2.8 Description of STL and Boundaries

The Simulation Technology Laboratory, Building 970, is located in the southeast quadrant of Tech Area IV (Illustration 2.8-1). STL is built of concrete and metal construction and has built-up bituminous roofing. The facility is not within a DOE security area. Fences are used to restrict casual pedestrian traffic from entering potentially hazardous places such as chemical storage areas. Once visitors enter the building, they find themselves in an office that has combination locks on doors leading to the machine area, thus, preventing unauthorized personnel from entering a hazardous area.

STL comprises of the high-bay, medium-bay, and the low-bay. The high-bay houses the HERMES III, PROTO II, SABRE, and STF accelerators and incorporates approximately 2,322.5 m² (25,000 ft²). The medium-bay houses the TROLL and ADF accelerators and incorporates approximately 1,950.9 m² (21,000 ft²). The low-bay is separated into a facility office, training room, lunch room, machine shop, general maintenance area, lower level screen room, desk areas, laboratory work areas, HERMES III office, restrooms, and hallways and stairs to the upper floor. The low-bay incorporates approximately 836.1 m² (9,000 ft²).

Also comprised of STL is Building 970A and outside storage areas within the fence line. Building 970A is separated into a ground level with an AC power center, uninterruptible power system, de-ionized water processing system/water storage, and a basement that houses an oil/water transfer system (pumps, controllers, and a valve panel) with its computer control system. Also part of 970A is an outdoor oil storage tank farm with secondary containment, a waste water lagoon, and a covered containment area. Other storage areas include sheds B through K, raw stock, scrap bins, and covered gas bottle racks.

The STL facility boundary is defined as the outside walls of the STL. However, this hazards assessment conservatively utilizes a nominal 30 meter boundary from the perimeter of STL (Illustration 2.8-2) in order to identify STL's emergency classifications. This was established in consonance with emergency planning practices³⁰ and is utilized in Section 6.0 for determining the emergency classification.

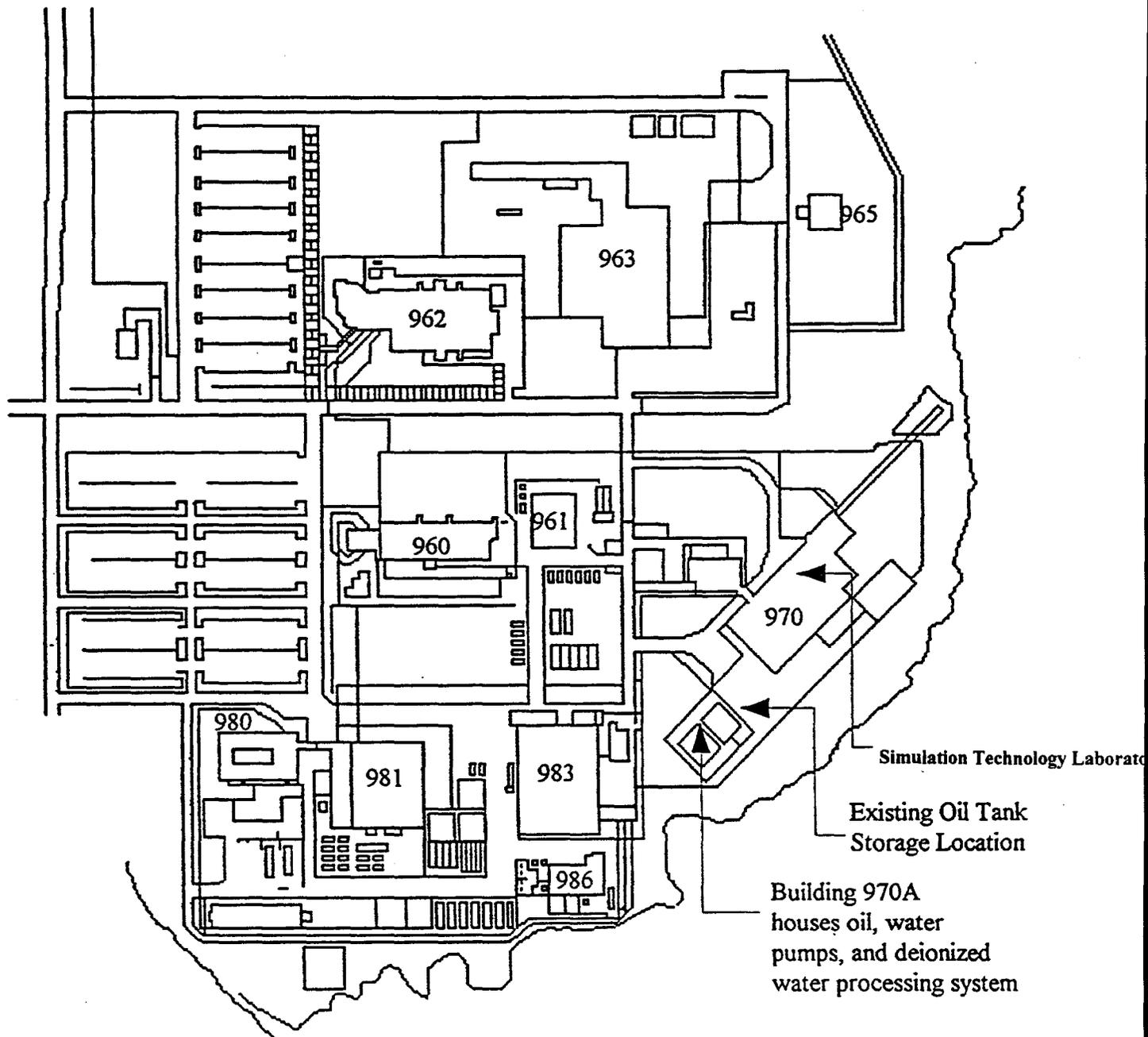


Illustration 2.8-1 TA-IV

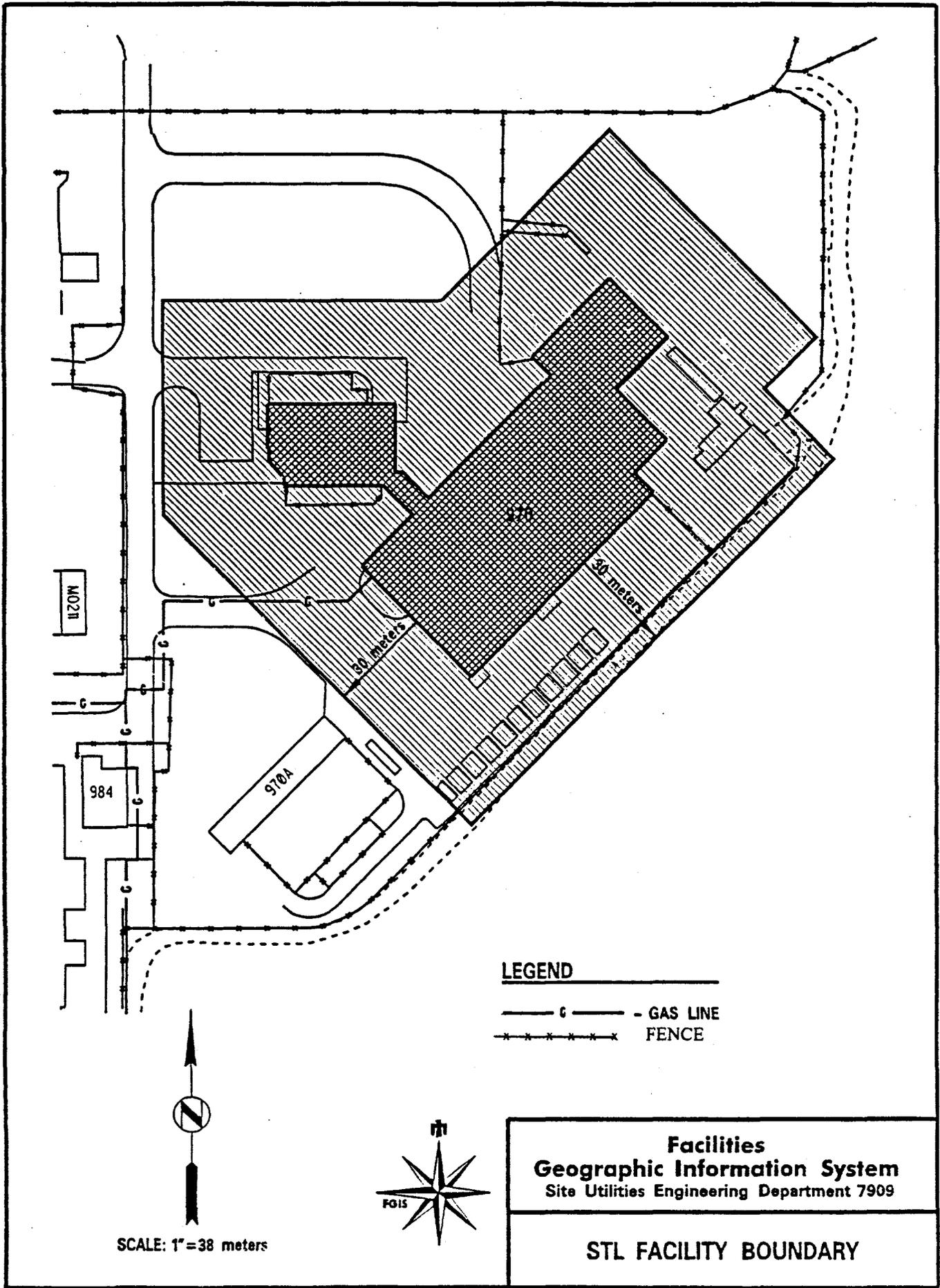


Illustration 2.8-2 STL Facility Boundary

The STL site boundary is defined as a radial 100 meters (Illustration 2.8-3) and is also used in Section 6.0 for determining the emergency classification. As stated in the Emergency Management Guide, areas subject to access by the general public must be considered offsite unless it is assured that those areas can be evacuated and access control can be established within (1) hour of any emergency declaration.³¹ The conservative 100 meter STL site boundary allows for such an evacuation and controlled access in the time required.³²

2.9 STL Facility Mission

The mission of the STL is to provide the U.S. Department of Energy (DOE) with facilities for testing the effects of weapons.

2.10 STL

As mentioned in Section 2.8, STL houses the following accelerators: HERMES III, PROTO II, SABRE, STF, ADF, and the EPOCH laboratory (TROLL accelerator). The EPOCH laboratory (TROLL accelerator) has been disassembled and is currently inoperational. However, once the access control system is modified, the TROLL accelerator will become active. The following description of the EPOCH laboratory and its associated processes assumes that the TROLL accelerator is active.

HERMES III, PROTO II, SABRE, and STF operate alternately in the high-bay. Status boards list which machines are operational and indicate when a machine is charging to fire by flashing its name. Simultaneous operation (firing of machines) of high-bay machines is not permitted. The TROLL and ADF accelerators are located in the medium-bay of Building 970 and operate independently from the machines in the high-bay.

The potential airborne release of chemical or radiological hazards was analyzed for all accelerators and labs within STL. The chemical and radiological hazards within PROTO II, SABRE, STF, and ADF were determined to be insignificant, and no further analysis of these accelerators is required. However, HERMES III and the EPOCH laboratory contain chemicals which require further analysis. These chemicals are identified and characterized in Sections 3 and 4, respectively. A brief description of HERMES III, the EPOCH laboratory, and their associated processes is provided below.

2.10.1 HERMES III

HERMES III is the nation's most powerful, pulsed radiation simulator.³³ HERMES III produces gamma-rays under controlled conditions using extremely high voltages and current pulses of electrical energy. The purpose of the facility is to provide an above-ground source for gamma-ray radiation effects experiments.

The HERMES III laboratory includes the accelerator, the exposure cell, an outdoor exposure cell, local screen room, user trailer park and the portion of the building trench system in these areas. The accelerator occupies the eastern third of the high-bay, and the dimensions are 21 meters wide, 11 meters long, and 5 meters high (Illustration 2.10-1). The exposure cell is where routine radiation exposures are performed. The outdoor area allows very large assemblies to be tested. The area is shielded so that tests can be conducted during normal working hours. Approximately 10 people work daily in the HERMES laboratory.

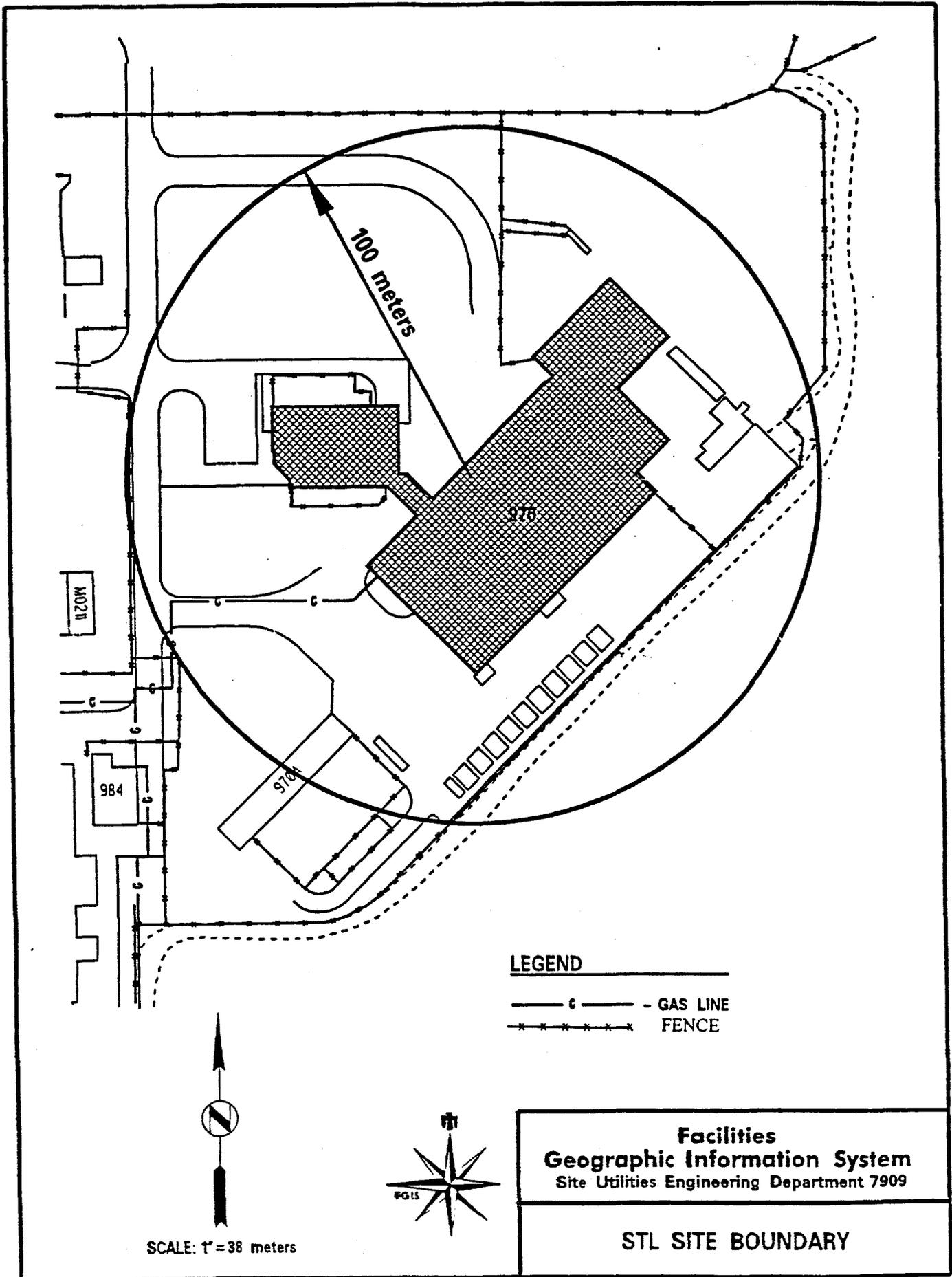


Illustration 2.8-3 STL Site Boundary

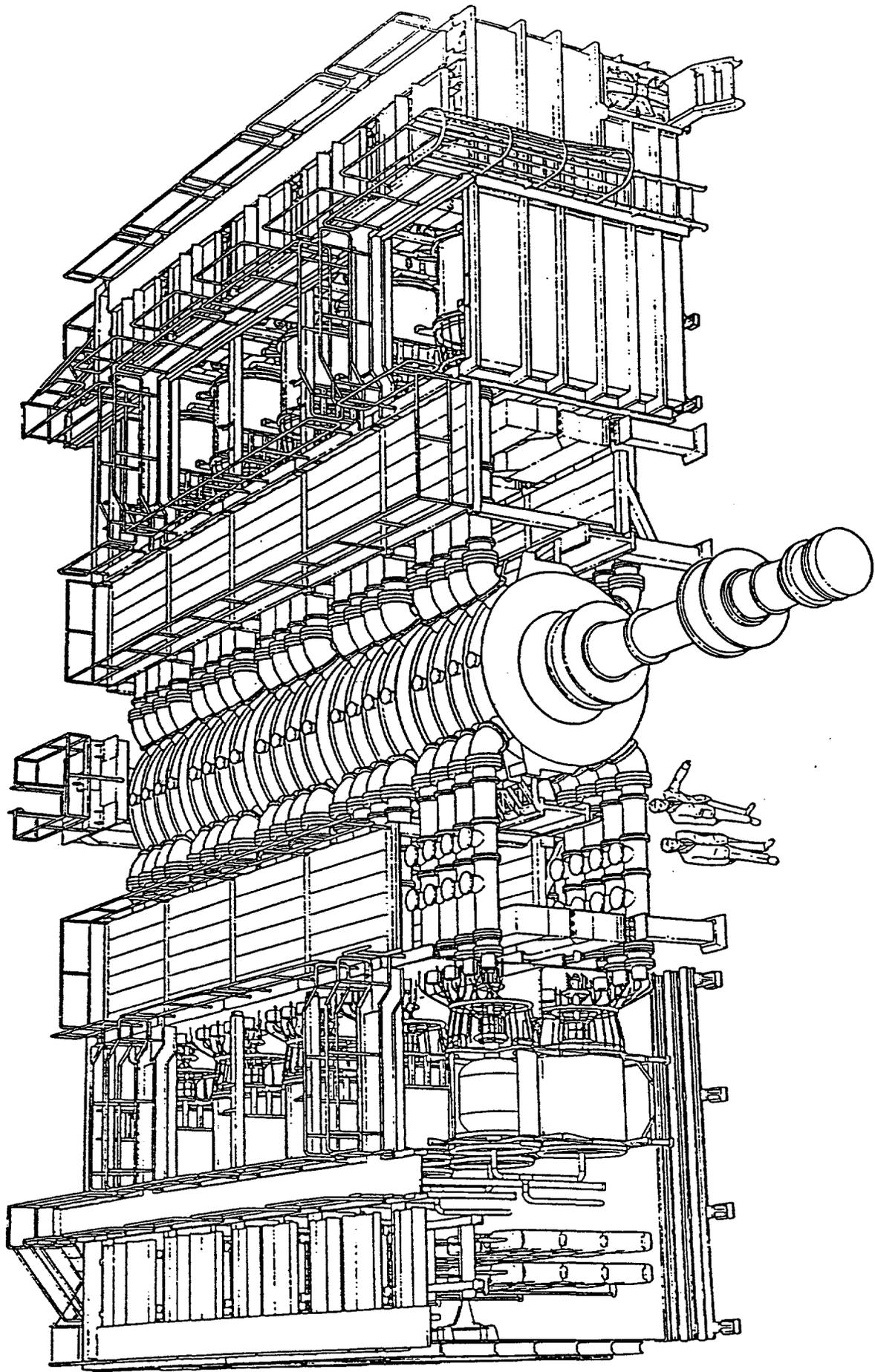


Illustration 2.10-1 HERMES III

2.10.2 EPOCH

The EPOCH laboratory is a beam-propagation laboratory which has a 105 meter evacuated propagation tank and the TROLL accelerator. The TROLL accelerator is a pulsed electron-beam accelerator. The EPOCH laboratory is used to conduct research on electron beam propagation at high altitude.

The EPOCH laboratory occupies the western half of the medium-bay which is located at the northwest corner of 970. The bay is shared with the ADF laboratory, operated by Department 1221 (Illustration 2.10-2). Two people are permanently assigned to the EPOCH laboratory. During experimental operations, there may be up to 8 people in the test area.

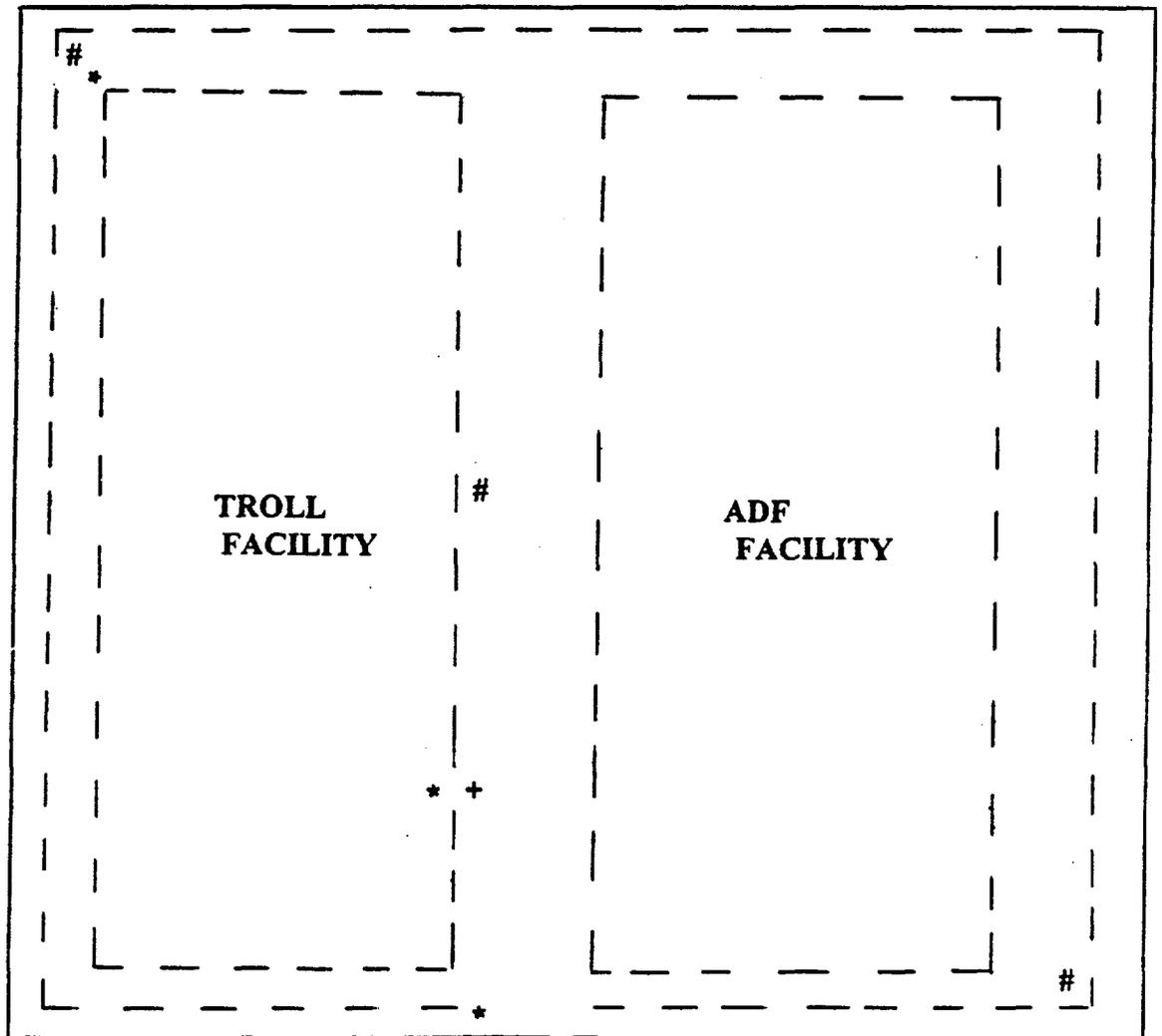
2.11 Processes and Operations

2.11.1 HERMES III

HERMES III is primarily used for conducting nuclear weapon-effects tests on various types of military hardware. HERMES III produces ionizing radiation in the form of bremsstrahlung (i.e., gamma-ray simulation). Test exposures are normally made with objects located in the exposure (test) cell which is surrounded by multiple layers of radiation shielding. In another mode of operation, test objects, such as large tracked vehicles, are exposed in a courtyard just outside the test cell where thick earthworks and massive concrete shields provide protection.

The HERMES III energy storage-section consists of ten 2.4 mega volt (MV), 156 kilojoule (kJ) Marx generators. Each of the Marx generators charges two water dielectric intermediate storage capacitors. Twenty intermediate storage capacitors are discharged through laser-triggered gas switches to charge four water dielectric pulse-forming transmission lines to 2.2 MV. Each cavity is driven by four 5 pulse-forming transmission lines. Azimuthal transmission lines in each cavity further symmetrize the four-point feed to provide azimuthal symmetry of the power feed to the Magnetically Insulated Transmission Line (MITL) adder. Each cavity supplies a 1 MV, 750 kiloamperes (kA) pulse to the MITL adder. Metglas cores are used for ferromagnetic isolation. The MITL adder is tapered to satisfy the minimum current condition for magnetic insulation and efficient pulse addition as the voltage is increased through the adder. A constant impedance MITL transports the power from the adder to the diode/converter in the exposure cell. An electron beam is generated in the single anode-cathode gap diode at the end of the MITL. A tantalum bremsstrahlung converter on the anode side of the diode generates the gamma-ray output.

The interaction of up to 20 million electron volts (MeV) bremsstrahlung gamma-rays with machine components, test apparatus, and the air in the exposure cell can generate temporary radioactive materials. Machine components and other objects in close proximity to the radiation source could become activated depending on their composition. The air activation products, nitrogen-13 (N_{13}) and oxygen-15 (O_{15}), have short half-lives (2 minutes for O_{15} and 10 minutes for N_{13}). Thus, decay during plume transport greatly reduces the possible doses at receptor locations. Personnel will be protected by delaying entry into the exposure cell area until radiation levels have been reduced. Shielding structures have been provided around the target areas. These structures consist of concrete walls and heavy steel and lead doors that reduce the gamma-ray dose to well below the acceptable level for workers.



- * Interlock Access Gate
- # Trench Warning Lights
- + Locked Trench Access Gate

Illustration 2.10-2 STL Medium-bay

Stringent access control measures (including locked gates and machine interlocks) supplement the shielding to ensure personnel exposure is maintained at ALARA levels. Before an accelerator shot, visual searches are combined with the interlock system to ensure that personnel are out of the hazardous areas. The safety interlock system is designed and installed to prevent inadvertent firing of HERMES III while personnel remain in hazardous locations. In addition, a log is initialed by personnel conducting the search to verify the designated areas are cleared.

Small quantities of possibly toxic materials used at the facility are adequately removed from the atmosphere in the work area by the high-bay heating, ventilating, and air-conditioning (HVAC) systems.

Areas affected by the facility, when operated in the outdoor exposure mode only, are the northeast corner of Tech Area IV (enclosed by a fence) and the perimeter patrol road. Barricades are placed on the road with signs warning of radiation tests in progress. The northeast corner is physically cleared and access controlled at the only personnel entrance (an evacuation route) to the area by a person posted and in radio contact with the accelerator operator.

2.11.2 EPOCH

The EPOCH laboratory houses the TROLL accelerator, a pulsed electron-beam accelerator. A two-stage high energy laser is used to establish an ionized channel in a propagation chamber. A 0.9 joule (J) 20 ns (nanosecond) KrF laser (Lambda-Physik) is the injection laser. The KrF laser is not presently active, and the fluorine gas mixture has been removed from the laboratory, pending modification to the access control system. However, once the access control system is modified, the KrF laser will become operational. The following description assumes that the TROLL accelerator is active.

The TROLL accelerator produces a maximum voltage of 4.6 MV and a maximum current of 10 kA for a millisecond (ms) pulse. The electron beam is propagated in a .91 meter diameter stainless steel vacuum chamber. The chamber is composed of 7 meter segments with a maximum extent of approximately 90 meters down a tunnel, north of the TROLL accelerator area. Pulse intervals are 8 minutes between firings.

The KrF beam is amplified to a maximum of 10 J with a lambda-cell driven by a 112A pulser. The output of the laser is directed to the propagation chamber by turning mirrors. The laser and optical train are located at the far end of the propagation tunnel.

The following features are included in the laboratory for the safe operation of the TROLL accelerator. Three feet of compacted dirt have been placed over the tunnel, in accordance with the recommendations of the Sandia Health Physics department. Additional dirt has been placed between the fences where the security access road crosses the tunnel so that it is safe to be on the road during firing. Interlocks that prevent the charging of the TROLL are placed on the outside exit doors at the two ends of the tunnel, the cell door (inside entrance to the tunnel), the three gates guarding local access to the trenches on the cell, the 970 status board, and the fenced-off area above the tunnel.

Personnel access to the laser is controlled by a locked gate with flashing lights to indicate when the laser and/or accelerator are being activated. Television cameras are mounted inside the tunnel at both ends and outside the tunnel on the roof of the medium-bay to give immediate visual access to the radiation-hazard areas of the facility, including the inside of the laser room.

3.0 IDENTIFICATION AND SCREENING OF HAZARDS

This section outlines the processes used to identify both onsite and offsite hazards significant enough to warrant consideration in the SNL/NM emergency management program for the STL and to screen out those hazards that pose minimal risk to the health and safety of onsite workers and the general public. Those hazards identified by the screening process that pose a significant risk are further evaluated in Section 4.0.

3.1 Identification and Screening of Onsite Hazards

For the purpose of emergency planning, onsite hazards of primary concern are those hazardous materials that if released to the environment may:

- immediately threaten those who are in close proximity to the release,
- have the potential for dispersal beyond the immediate vicinity in quantities which threaten the health and safety of onsite personnel or the public in collocated facilities and/or offsite,
- and have a rate of transport and dispersion sufficient to require time-urgent emergency response to implement protective actions.

The process of identifying the onsite hazards at STL consisted of the following steps: (a) reviewing the most current PHAs, (b) reviewing the ChemMaster chemical inventory to determine the maximum quantities, and (c) conducting walkthroughs of the facility to verify that the inventory was complete and accurate.

The following primary sources of information were used to complete the hazard identification and screening process. Based on this information, a comprehensive list of hazardous materials was compiled for STL. The complete list was then screened to determine which hazards required further evaluation.

- Preliminary Hazard Assessments (PHA)
- Standard Operating Procedures
- ChemMaster Chemical Inventory
- Safety Assessments
- Material Safety Data Sheets (MSDSs)

3.1.1 Screening Criteria

The Emergency Management Guide (EMG) for Hazards Assessments states, in part, "... screening quantities or thresholds should be used to eliminate the need to analyze insignificant hazards."³⁴ Using this guidance from the EMG and other applicable documents, the following screening criteria were developed and utilized to screen chemical and radiological hazards.

3.1.1.1 Chemical Hazards

Standard Industrial Hazard (SIH)

In accordance with 40 CFR, Part 355.20, "Any substance used for personal, family, or household purposes, or is present in the same form and concentration as a product packaged for distribution and use by the general public" is not considered a hazardous chemical.³⁵ Therefore, for the purpose of hazards assessments, such chemicals are eliminated from further evaluation.

Quantity of Material

The quantity at which a chemical does not require evaluation is one pound. This was established based upon 40 CFR Part 302, the Hazardous Substances and Reportable Quantities³⁶ and 40 CFR Part 355, Appendix A, the Extremely Hazardous Substances and Threshold Planning Quantities³⁷ in which no chemical had a quantity greater than one pound.

Toxicity of Material

For those chemicals exceeding one pound, the MSDS and/or the Hazardous Chemical Desk Reference³⁸ are reviewed to determine if a chemical is hazardous due to its toxicity. Occupational exposure limits are reviewed to determine the toxicity. Those chemicals determined to be non-toxic are screened from further evaluation.

Dispersibility

A chemical is removed from further evaluation if it is determined to be non-dispersible. In order for the chemical to be non-dispersible, it must meet at least one of the following criteria:

- have a boiling point of greater than 100° C,
- be a powder of greater than 10 microns, or
- cannot conceivably be involved in a high energy event such as a fire or explosion.

Dispersion Modeling

Dispersion modeling allows chemicals to be analyzed to determine toxicity levels at various distances. This hazards assessment is primarily concerned with Emergency Response Planning Guidelines (ERPGs) published by the American Industrial Hygiene Association. The ERPG levels in ascending order of severity are ERPG-1, ERPG-2, and ERPG-3. The level of concern used in the screening criteria is an ERPG-1. The ERPGs are discussed in detail in Section 6.2.1 of this document.

A chemical is removed from further evaluation if it does not exceed an ERPG-1 at 30 meters. The distance of 30 meters was selected because it represents the minimum facility boundary at SNL/NM. The minimum facility boundary of 30 meters was determined in accordance with the Emergency Management Guide which states that a 200 meter radius may be utilized as the facility boundary if this area does not encompass a significant number of other site workers and does not include areas routinely accessible to the general public. In such a case, a smaller facility boundary is appropriate.³⁹ Because SNL/NM has densely populated areas accessible to the general public, a conservative 30 meter facility boundary was determined and is utilized in dispersion modeling to determine toxicity levels at a definitive distance. An ERPG-1 at 30 meters or greater would constitute a minimum of an alert emergency classification. Emergency classifications are described in Section 6.2.2 of this document.

The dispersion modeling is performed through the Areal Locations of Hazardous Atmospheres (ALOHA) model. ALOHA allows two types of dispersions: heavy gas and gaussian. If unsure which dispersion type should be used, ALOHA gives the option to let the model decide. The infiltration building parameter that should be used in the screening process is 60 air changes per hour. In addition, "worst case" meteorological conditions should be employed for the purpose of modeling (i.e., wind speed of 1 m/s, 10% cloud cover, F stability, 50% humidity, and 68° F).

3.1.1.2 Radiological Hazards

Quantity of Material

For radioactive materials, the screening criteria is based on 10 CFR, Part 30.72, Schedule C⁴⁰ which lists quantities (in curies) of radioactive materials that require consideration for emergency planning. Radioactive materials that have quantities less than those on 10 CFR, Part 30.72, Schedule C can be eliminated from further evaluation.

Dispersibility

A radioactive material is removed from further evaluation if it is determined to be non-dispersible. In order for the material to be non-dispersible it must meet both of the following criteria:

- it is a *sealed source* (a radioactive material encapsulated in a container designed to prevent leakage or escape of the material), and
- it cannot conceivably be involved in a high energy event such as a fire or explosion.

3.2 Identification and Evaluation of Offsite Hazards

The objective of the hazards assessment is to determine the type and extent of planning and preparedness that is appropriate for each facility and site. Hazards originating outside the DOE facility and site that could impact the health and safety of onsite personnel or other DOE interests are identified and examined. Offsite facilities, airways, highways, railroads, and utility transportation arteries (i.e. pipelines) are considered as possible locations of hazardous material accidents.

The Local Emergency Planning Committee (LEPC) for the City of Albuquerque, on which Sandia is represented, is headquartered in the Albuquerque Fire Department, with an assistant Fire Chief being the chairman of the committee. The assistant Fire Chief was consulted to provide assistance in identifying nearby facilities in the city of Albuquerque that have hazardous material inventories that could potentially impact the Sandia Albuquerque site. Railroads, highways, and other transportation arteries near the facility or site were considered as possible locations of hazardous material transportation accidents. The effects of hazardous material events originating offsite were estimated and used as the basis for determining whether specific arrangements should be made with offsite authorities for notification of releases and joint response.

3.2.1 Offsite Facilities

The following offsite facility with a hazardous materials inventory large enough and within a reasonable distance of SNL/NM that could have a negative impact on the operation of SNL/NM has been identified.

- The City of Albuquerque water treatment plant is located approximately 10 km from the SNL/NM Site Boundary. This facility has the capacity to store up to 45360 kg (100,000 pounds) of liquid chlorine in two 22680 kg (50,000 pound) capacity tanks.⁴¹ Chlorine is used to treat the municipal water system for biological contaminants prior to distribution. In the event of a significant airborne chlorine release to the environment, the LEPC would contact the SNL/NM EOC. The EOC would then implement protective actions, as needed.

- Additional facilities are currently being researched as part of the City of Albuquerque's Emergency Preparedness program. Several individuals from SNL/NM Emergency Planning and Risk Management and NEPA Department are members of the LEPC. The identification of offsite facilities that could potentially impact SNL/NM is a continuous process.

3.2.2 Airways

Due to the close proximity of the Albuquerque International Airport to SNL/NM, an airplane crash scenario is postulated and considered an offsite hazard. Extensive research concerning an airplane crash at SNL/NM was performed and the results of this analysis are summarized below.⁴²

A significant fraction of the more than 225,000 annual operations at the airport could pass over SNL/NM facilities. SNL/NM is also located about 25 kilometers from Coronado Airport. However, since the general aviation aircraft using this facility would, in general, avoid the Albuquerque International Airport traffic area and based on the relatively long distance to Coronado Airport and the altitude that such aircraft will have if they happen to pass over Sandia, such aircraft are not a significant factor in determining the crash probability. Therefore, they are not considered to pose a significant risk to SNL/NM facilities.

3.2.2.1 Event Frequency Estimation

Several low-and high-altitude airways pass over or in the vicinity of SNL/NM. Because of nearby high terrain, the minimum en route altitudes of these airways are relatively high, about 1,400 meters (approximately 4,600 feet) or more above ground level. Although the frequency of flights using these airways is unknown, the crash frequency resulting from on-airways (or in-flight) through traffic would not be significant relative to the crash probability resulting from landings and takeoffs at the Albuquerque International Airport. The contribution of in-flight or airways traffic to the crash probability is therefore ignored.

The Albuquerque International Airport is utilized by commercial air carriers, the military, and general aviation aircraft. The carrier aircraft are jet transports, of which the largest currently in use at the airport is the Lockheed 1011. The military aircraft are primarily jet fighters but also include other aircraft ranging from small helicopters to the Lockheed C-5. General aviation aircraft include light single and twin engine airplanes. In this analysis, three types of aircraft are considered: air carrier jets typified by jet transports of the Boeing 737 through the DC-8 and 9; military aircraft typified by the A7; and air taxi (commuter) airlines and general aviation aircraft typified by light twin-engine aircraft.

Since only data on the total aircraft movement at the Albuquerque International Airport is available and because of the lack of specific data on the number of take-offs and landings, it will be assumed that the number of landings and takeoffs are the same.

Due to safety and noise abatement considerations, the preferred directions for takeoffs and landings is to the south, east, and west of the airport. If it is assumed that these directions are equally likely to be used for both landings and takeoffs, the east end of the East-West runway will have approximately 34% of the total aircraft movement. The movement of aircraft west of the East-West runway or south of the South-North runway are assumed not to contribute to the probability or number of crashes. In other words, the fraction of movements (landings and takeoffs) at the east end of the runway will be 0.34 for all types of aircraft. Table 3.2.2.1-1 presents aircraft movement data at Albuquerque International Airport for the

calendar year 1990. These data were provided by the Albuquerque Airport Manager's Office.

| Aircraft Type | Operations |
|---------------------------|------------|
| Air Carriers | 70,108 |
| Military | 35,792 |
| General Aviation/Air Taxi | 119,991 |
| Total | 225,891 |

This movement has been steadily increasing each year. Therefore, to ensure conservatism in aircraft movement in the future, an average increase of 100% is assumed over the life of the facility (assuming on the average, a growth rate of 2.5% per year for an assumed facility life of 40 years). Thus, the total number of movements (landings or takeoffs) at the east end of the runway per year for each of the categories of aircraft is assumed to be

$$N_{\text{carrier}} = N_1 = 140,216$$

$$N_{\text{military}} = N_2 = 71,584$$

$$N_{\text{general}} = N_3 = 239,982,$$

for a total of 451,782 movements. The probability of a crash per aircraft movement (landing or takeoff), P_i , for all types of aircraft is given in Table 3.2.2.1-2.

| Movement | Air Carrier | Military | General Aviation |
|----------|-------------|-------------|------------------|
| Landing | $2.3E^{-6}$ | $3.1E^{-6}$ | $2.3E^{-6}$ |
| Takeoff | $6.0E^{-6}$ | $1.6E^{-6}$ | $6.0E^{-7}$ |

3.2.2.2 Airway Summary

In the unlikely event of an airplane crash at SNL/NM, KAFB, SNL/NM, and the City of Albuquerque emergency response teams would jointly respond. For the purpose of hazards assessments, the airplane crash scenario could serve as a possible initiating event which fails all mitigative barriers.

3.2.3 Highways

Two major transportation routes are proximal to the Sandia Albuquerque site. These are U.S. Interstate 40, approximately 4.0 km to the North, and U.S. Interstate 25, approximately 4.0 km to the West of the KAFB site boundary.

Truck accident statistics (1989-1990) from the Motor Carrier Division of the National Highway Safety Council indicate the average accident rate for medium to heavy vehicles (>4536 kg/10,000 pounds Gross Vehicle Weight) to be one accident per 2.2 million miles.⁴³

The accident rate may appear to be statistically quite low. However, because of the size of the transportation routes surrounding SNL/NM and the high volume of truck traffic on the roads, the potential for a vehicle accident involving hazardous materials is considered to be a credible scenario.

The New Mexico State Police maintains responsibility for response to a hazardous materials accident on local transportation routes. The Albuquerque/Bernalillo LEPC conducts exercises relating to emergency response and has conducted exercises relating to a hazardous materials accident to test the Emergency Response Plan. The Emergency Response Plan includes a provision for notifying SNL/NM in the event of an offsite transport transportation accident. SNL/NM can then take the necessary protective actions to ensure the safety and integrity of onsite personnel and their respective operations.

3.2.4 Railways

The Atchison Topeka and Santa Fe, which is a class 1 railroad, has a line that runs parallel to Interstate 25 through the city of Albuquerque, approximately 4.0 km from the western boundary of the site. The inventory of materials transported along this stretch of track for calendar year 1993 was provided by the Director of Environmental Quality and Hazardous Materials.⁴⁴ This data indicates that the majority of hazardous material is either flammable liquid or gas, or corrosive material.

Hazardous materials shipments comprise only 14% of the total car loads on the Sante Fe Railway.⁴⁵ The shipments are most likely mixed loads containing sizeable amounts of nonhazardous material within the same trailer or container. Even though the percentage of hazardous materials is low, the potential for a railway accident remains a credible scenario.

In the event of a hazardous materials accident involving a rail car, a joint response between local responders, the State Police, and the railroad would be initiated. The railroad employs a team of security personnel to secure the hazmat spill site until arrangements can be made for cleanup and disposal. Federal law requires the notification of the LEPC in the event of a hazardous materials accident. Under the Emergency Response Plan, SNL/NM would then be notified. SNL/NM can then take the necessary protective actions to ensure the safety and integrity of onsite personnel and their respective operations.

3.2.5 Pipelines

Natural gas pipelines exist throughout TA-IV. A natural gas line is distributed to the west side of building 970. The line is approximately 53 meters from the fluorine gas storage area which is located on the north side of the building. The major hazard associated with the natural gas line is an explosion hazard. For the purpose of hazards assessments, an explosion from the gas line would not present an airborne hazard in which protective actions would need to be initiated other than response. However, due to the close proximity of the gas line to the fluorine gas storage area, the gas line could serve as a possible initiating event which could create an airborne release of hazardous chemicals stored at STL. The event scenarios and resultant consequences of STL's hazardous chemicals are depicted in Tables 5.1.1-1 and 6.3.2-2, respectively.

3.3 STL Chemical Hazards Summary

As a result of screening the hazards at STL, 1 chemical (fluorine gas mixture) was kept for further evaluation. This evaluation is performed in Section 4.0, Hazard Characterization. The fluorine gas mixture and the maximum quantity that will be stored in any one location are depicted below.

Table 3.3-1
STL Hazardous Material Summary

| Chemical | Maximum Quantity | Location |
|-------------------------|-------------------------|-------------------|
| 1. Fluorine gas mixture | 68 ft ³ | North side of 970 |

3.4 STL Radiological Hazards Summary

The anticipated maximum quantity of Nitrogen-13 and Oxygen-15 is 0.58 and 0.5 Curies, respectively. The radioactive hazard for each air activation product is < 1.0 Curie and is considered to be minimal. Therefore, no further evaluation is needed for the radiological hazards.

3.5 Offsite Hazards Summary

SNL/NM provides representatives to the LEPC, and a strong working relationship with the offsite Emergency Response community has been established. Development of local plans is in progress, and the contemplation of both SNL/NM hazards to the city, and city hazards to SNL/NM are being incorporated in this planning development process. Therefore, no offsite hazards were considered for characterization or further evaluation.

4.0 HAZARD CHARACTERIZATION

The screening process described in the preceding section identified 1 chemical hazard that exceeded the screening criteria. This hazard is fully characterized (i.e. physical properties, storage, and use) in this section to support the development of accident scenarios and analysis of possible airborne releases. Engineered controls and/or safety systems designed to prevent or mitigate a hazardous material release will be discussed. The administrative controls for HERMES III and the EPOCH laboratory include approved SOPs for all handling and use of hazardous chemicals in the STL. These procedures include the use of protective equipment and protective clothing as well as the training requirements for all workers.

ERPGs are listed in the characterization below⁴⁶ and are utilized in Section 6.0 to determine the consequences of the following hazards. For those chemicals in which no ERPG values were published, a conservative methodology was developed that expeditiously allows ERPG equivalents to be established for every chemical that has a Time Weighted Average (TWA) value. This methodology is described in detail in the Concentration Limit Hierarchy for Toxicological Accident Analysis,⁴⁷ and the ERPG equivalent calculations are depicted in Table 4.0-1. The ERPGs are discussed in detail in Section 6.0.

Table 4.0-1

| ERPG Equivalent Calculations | |
|------------------------------|------------|
| ERPG-1 | TWA x 1.25 |
| ERPG-2 | TWA x 3.75 |
| ERPG-3 | TWA x 8.63 |

4.1 Fluorine Gas Mixture (Excimer Laser Mixture: 5% F₂ and 95% He.)

The major physical hazard associated with this mixture is that it contains fluorine. Fluorine is the most powerful oxidizing agent known and is considered an extreme fire hazard. Though the concentration of fluorine in this mixture substantially reduces the heats of reaction and the risk for fire and explosion, this mixture is still considered extremely hazardous. Because specific physical data on this mixture is not available, it should be handled carefully with the assumption that its physical characteristics are similar to that of pure fluorine (i.e., a hazardous, toxic, corrosive gas that has high heats of reaction and considered a fire and explosion hazard). The physical properties of both fluorine and helium are provided in Table 4.1-1.

This mixture should never be intentionally mixed with flammable gases or substances. The fluorine in this mixture will react with metals, though the reaction is relatively slow at room temperature. Systems should still be thoroughly cleaned, dried and then passivated with a small sample of the mixture. The helium contained in this mixture is nonflammable, inert, non-toxic and stable and does not pose any unusual physical hazards other than it is stored as a compressed gas and should be handled appropriately.

The fluorine gas mixture should not be stored for longer than one year.⁴⁸ Cylinders should be stored separately from oxidizers, flammables, sources of ignition and any combustible or explosive materials. Do not expose cylinders to direct sunlight or heat. Cylinders should be stored upright in a cool, dry well ventilated place away from excessive heat, (not above 125° F). Cylinders should not be stored near heavily trafficked areas and should not block emergency exits. Cylinder plugs and caps should be in place when cylinders are not in use. Empty cylinders should be stored separately from full cylinders. Full cylinders should be used according to a first-in first-out basis. The cylinders should not be knocked

against objects, dragged, or rolled. A cylinder hand truck should always be used when transporting the cylinders.

Inventory

- 3 (20 ft³) and 1 (8 ft³) Fluorine Gas Mixture Cylinders (5% Fluorine, 95% Helium)

**Table 4.1-1
Fluorine Gas Mixture Properties**

| Properties | Fluorine | Helium |
|---------------------------------|--------------------------|---------------------------|
| Molecular Weight | 38.00 g/mole | 4.00 g/mole |
| Specific Volume at 21° C, 1 atm | 10.2 ft ³ /lb | 97.09 ft ³ /lb |
| Boiling Point at 1 atm | -188.1° C | -268.9° C |
| Density at 25° C, 1 atm | 1.554 kg/m ³ | 0.165 kg/m ³ |
| Relative Density (air = 1) | 1.312 | 0.138 |
| Critical Pressure | 756.4 psia | 33 psia |
| SPEGL* (Approximate ERPG-2) | 7.5 ppm | n/a |
| Estimated ERPG-3 | 17.25 ppm | n/a |

* When ERPG values do not exist, SPEGLs (Short-Term Public Emergency Guidance Levels) are used in place of the ERPG-2 value. SPEGLs, developed by the National Research Council, are based upon the same sort of logic as the ERPGs and are intended for use in emergency planning and response.⁴⁹

Conditions of Storage and Use

The gas cylinders are delivered by Tri-Gas to the outside storage area which is located along the service driveway on the north side of building 970. The cylinders are secured against the wall with a chain. Full gas cylinders have an internal pressure of 500 psig. When the cylinder needs replenished in HERMES or the EPOCH laboratory, a cart is used to transfer the full cylinder from the outside storage area to the exhaust storage cabinet associated with that particular laboratory.

The 5% fluorine gas mixture is located in the gas handling cabinet, which in turn is pumped and vented to the propagation tunnel. There are two negative pressure monitors inside the gas handling cabinet and a flow meter outside the cabinet. During the transfer, all gases are shut off. The line is evacuated and backfilled with helium to dilute the fluorine. The cylinder inside the gas exhaust cabinet is not stored under pressure.

The cylinders stored outside are a bigger hazard as they are not stored in a controlled area, and they are stored under pressure. The scenarios associated with the outside storage area and the gas handling cabinet in the HERMES and EPOCH laboratories are described in the following section. The resultant consequences are described in Section 6.0, Event Consequences.

5.0 EVENT SCENARIOS

The barriers that maintain control over the fluorine gas mixture described in Section 4.0 have been analyzed, and the possible failure modes have been considered. The initiating events, barrier analyses, and release scenarios are described in the following section. Each scenario is identified by a release designation.

5.1 Chemical Event Scenarios

The Technical Guidance for Hazards Analysis⁵⁰ recommends that the dispersion of a gaseous chemical should be released over a ten-minute period. However, STL's worst case scenario utilizes a five-minute release rate to compensate for its initiating event, an explosion. This is further explained in Appendix B.

5.1.1 Fluorine Gas Mixture

Failure of the Primary Barrier

The fluorine gas mixture is stored in DOT steel cylinders. Therefore, the steel cylinders are the primary barriers to be considered. The chemical event scenarios described below involve the breach of the primary barrier(s) resulting in a release of fluorine gas to the atmosphere. Two meteorological conditions are utilized in the following four events:

- the ten-minute release of one fluorine cylinder caused by inadvertently dropping the cylinder while transferring it to the laser process;
- the ten-minute release of two fluorine cylinders caused by a vehicle impacting the fluorine gas storage area;
- the ten-minute release of three fluorine cylinders caused by random bullets, as mandated in DOE Order 5480.16, Fire Arms Safety⁵¹;
- and the five-minute release of four fluorine cylinders caused by sabotage or a gas line explosion.

Transfer Scenario (F₇₋₁, F₇₋₂)

The fluorine gas mixture is transferred from the north side of building 970 to the appropriate lab, HERMES or EPOCH, via the gas bottle cart. Once the fluorine is placed within the gas exhaust cabinet, the cylinder is depressurized. The fluorine flows to the laser only when the cylinder valves are opened. The potential for a significant release of fluorine while stored within the gas cabinet is unlikely, and the hazard is considered minimal. A release of fluorine through the exhaust system would result in insignificant concentration levels (i.e., < ERPG-1 at 30 meters) to the atmosphere. However, prior to reaching the gas cabinet the cylinder is still pressurized and poses a greater hazard to the worker. After the valve cover is removed, the cylinder could inadvertently be dropped, and the valve could be sheered off. This scenario involves the ten-minute release of 1 cylinder, .57 m³ (20 ft³) of the fluorine gas mixture to the high-bay. No credit is given for the mitigative features.

Vehicle Scenario (F₇₋₃, F₇₋₄)

The fluorine gas storage area is located towards the end of the service driveway. Vehicles travel the service driveway for deliveries. There aren't any safety stops to prevent a vehicular impact to the fluorine cylinders. It is assumed that two cylinders are impacted by a vehicle, the valve covers are separated from the cylinders, and the valves are fractured. This scenario involves the ten-minute release of two fluorine cylinders, 1.1 m³ (40 ft³) of the fluorine gas mixture to the atmosphere. The release is considered unmitigated.

Random Bullet Scenario (F₇₋₅, F₇₋₆)

This scenario involves the possibility of random bullets, as mandated in DOE Order 5480.16, Fire Arms Safety.⁵² In the event that security personnel are attempting to apprehend an armed individual(s), the fluorine gas mixture could be released from the cylinders due to penetration from random bullets. In the event of random bullets, it is assumed that three cylinders, 1.7 m³ (60 ft³) of the fluorine gas mixture are impacted and release their entire contents in ten minutes. This would also result in an unmitigated release.

Explosion Scenario (F₇₋₇, F₇₋₈)

This scenario involves an explosion which releases the entire fluorine gas mixture inventory in five minutes. This scenario considers two different initiating events: a gas line explosion and sabotage. As mentioned in Section 3.2.5, natural gas is delivered to the west side of STL. In the event of a gas line explosion, the fluorine gas storage area could be impacted.

In addition, the fluorine gas storage area is not located in an access controlled area. A saboteur could gain access to the gas storage area and simply remove the cap and untighten the cylinder valve or damage the primary barriers via weapons or explosives. Both initiating events could result in the five-minute release of the entire inventory, 1.9 m³ (68 ft³) of the fluorine gas mixture to the environment.

Effects of Other Barriers

Each fluorine gas mixture cylinder is stored with a DOT approved valve cover. This protects the valve, however, the valve covers in the above mentioned scenarios do not mitigate the release. Therefore, no credit is given for secondary barriers.

**Table 5.1.1-1
Fluorine Scenarios**

| Scenario | Source Term Parameter | Meteorological Conditions | Release Designation |
|---|--------------------------------------|----------------------------------|----------------------------|
| Transfer 20 ft ³ F1 mixture | Direct 20 ft ³ /ten min. | Worst Case | F ₂ -1 |
| | Direct 20 ft ³ /ten min. | Average | F ₂ -2 |
| Vehicular impact 40 ft ³ F1 mixture | Direct 40 ft ³ /ten min. | Worst Case | F ₂ -3 |
| | Direct 40 ft ³ /ten min. | Average | F ₂ -4 |
| Random Bullets 60 ft ³ F1 mixture | Direct 60 ft ³ /ten min. | Worst Case | F ₂ -5 |
| | Direct 60 ft ³ /ten min. | Average | F ₂ -6 |
| Explosion 68 ft ³ F1 mixture | Direct 68 ft ³ /five min. | Worst Case | F ₂ -7 |
| | Direct 68 ft ³ /five min. | Average | F ₂ -8 |

5.2 Radiological Event Scenarios

No radiological scenarios are postulated because the radiological hazard located in STL was considered minimal and was screened in Section 3.0. The maximum quantity of Nitrogen-13 and Oxygen-15 is < 1.0 Curie.

6.0 EVENT CONSEQUENCES

The consequences from the airborne release scenarios described in Section 5.0 are estimated to determine the area potentially affected, the need for personnel protective actions, and the time available to take those actions. This section describes computer codes, calculational techniques, input data used for dispersion modeling, and consequence criteria. The results of the dispersion modeling are summarized at the end of this section for each previously identified release designation. The dispersion model data sheets for each release designation are included in Appendix B.

6.1 Calculational Models and Methods

Event consequences are estimated using calculational models and methods that are most appropriate to the physical and atmospheric conditions of SNL/NM and the material released.

6.1.1 Calculational Models

The chemical model CAMEO and its air model, ALOHA, were utilized for estimating the movement and dispersion of gases.⁵³ CAMEO was designed by the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Environmental Protection Agency (EPA) to help emergency planners, facility operators, and first responders plan for and safely handle chemical accidents. The air model estimates pollutant concentrations downwind from the source of a release, taking into consideration the toxicological and physical characteristics of the release site, the atmospheric conditions, and the circumstances of the release.

ALOHA is designed to model the release rate and dispersion of pure chemicals only. It's difficult for a model like ALOHA to correctly predict the behavior of a mixture of chemicals.⁵⁴ However, for the purpose of emergency planning, ALOHA serves a vital role in estimating the distance at which protective actions should be initiated. The resultant consequences from the release scenarios described in Section 5.1.1 have been rounded to whole numbers. The actual numbers are provided in Appendix B.

6.1.2 Calculational Methods

The transport of hazardous materials in the atmosphere from the STL to offsite locations during an accident is a significant concern. Several factors affect the downwind calculations. These factors include the source term (quantity of the material available for release), release and evaporation rates, duration, mixture, transport, diffusion, deposition, and stability.

Six classes of atmospheric stability are used to indicate mixing in the atmosphere. These classes are referred to as the Pasquill-Gifford Stability Classes.

Pasquill-Gifford Stability Classes

- A - Extremely unstable (bright, sunny days)
- B - Moderately unstable
- C - Slightly unstable (cloudy, low wind speed)
- D - Neutral (heavy overcast, day or night)
- E - Slightly stable (night, low winds)
- F - Moderately stable (very low wind, night or just before dawn)

As shown in Tables 5.1.1-1, two meteorological conditions were utilized: worst case and average. The meteorological conditions provided a range of accident scenarios for input into ALOHA. The worst case meteorological conditions are Pasquill-Gifford Stability Class F, a 1 m/s wind speed, and a 500 meter inversion.

The average Albuquerque meteorological conditions were obtained from the *Technical Guidance for Siting Criteria*,⁵⁵ by selecting data from four months (one from each season). This data provided a range of daily meteorological conditions. The calculations used to determine the average Albuquerque meteorological conditions can be found in the *1994 TA-V Hazards Assessment Document*.⁵⁶ The average meteorological conditions analysis resulted in the following conclusions: the average Albuquerque wind speed is 4 m/s, and the average stability class is slightly unstable.

6.2 Consequence Thresholds

The consequence thresholds are based upon the Emergency Response Planning Guidelines (ERPGs) published by the American Industrial Hygiene Association (AIHA).⁵⁷

6.2.1 ERPGs

The ERPG values are intended to provide estimates of concentration ranges above which one could reasonably anticipate adverse effects as a consequence of exposure to a specific substance. ERPG-1, ERPG-2, and ERPG-3 are defined below.

- The ERPG-1 is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor.
- The ERPG-2 is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action.
- The ERPG-3 is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.

Note: For those chemicals in which no ERPG values were published, a methodology was developed that allows ERPG equivalents to be established for every chemical that has a TWA value (Illustration 4.0-1).

6.2.2 Application of ERPGs

The ERPGs are used to classify the operational emergency events. The three classes of operational emergencies in ascending order are: alert, site area emergency, and general emergency. The ERPGs that result in the various levels of operational emergencies are described below.

- The ERPG-1 value is used as a screening criterion, as explained in Section 3.1.1.1, Dispersion Modeling. The ERPG-1 is also used to determine the low end of the emergency classification spectrum (i.e., alert). For example, if an ERPG-1 is exceeded at 30 meters, the event would constitute a minimum of an alert emergency classification.
- The ERPG-2 value is compared with the maximum toxicity concentration at the facility and site boundaries to determine the appropriate emergency class. If the ERPG-2 is exceeded within the site boundary, the event is considered a site area emergency. If the ERPG-2 is exceeded beyond the site boundary, the event is considered a general emergency.
- The ERPG-3 value is a consideration in defining the Emergency Planning Zone. The ERPG-3 value represents the Early Severe Health Effects (ESHE) value. The distance at which ESHE is reached is determined for each scenario.

6.3 Receptor Locations

Consequences of the hazardous material releases were quantitatively evaluated for various onsite and offsite receptor locations. The demarcation between the onsite and offsite receptors is the radial 100 m site boundary. The following distances are measured from the fluorine gas storage area, and the concentrations in ppm are based upon the worst case scenario, RD-F₂-7.

Note: The concentrations associated with the receptor locations listed below should be compared to the fluorine ERPG exposure levels:

ERPG-1 equivalent = 2.5 ppm
 ERPG-2 equivalent = 7.5 ppm
 ERPG-3 equivalent = 17.25 ppm

6.3.1 Onsite Receptors

The 100 meter STL site boundary encompasses 970 and its associated storage areas. The only onsite personnel other than the STL technicians are those occupants in the office area directly across the service driveway.

**Table 6.3.1-1
 Onsite Receptors**

| Onsite Receptor | Distance (m) | Population | Concentration * (ppm) |
|-----------------|--------------|------------|-----------------------|
| Office Area | 25 | 15 | 51.5 |

* Based upon worst case scenario, release designation RD-F₂-7

6.3.2 Offsite Receptors

The following offsite receptors include those facilities and areas outside the 100 meter STL site boundary.

**Table 6.3.2-1
Offsite Receptors**

| Offsite Receptor | Distance (m) | Population | Concentration * (ppm) |
|------------------|--------------|------------|--------------------------|
| Building 961 | 130 m | 6 | 3.5 |
| MO 211 | 122 m | 25 | 3.8 |
| Building 984 | 137 m | 3 | 3.2 |
| Isleta Pueblo | ~ 9 km | ~3,000 | insignificant |
| KAFB Housing | 1.6 km | ~550 | 0.06 |

* Based upon worst case scenario, release designation RD-F₂-7.

6.4 Summary of Consequences

As shown in Table 6.4-1, the greatest distances at which ERPG-2 and ERPG-3 are reached are 78 and 46 meters, respectively. The greatest STL emergency classification is found to be a site area emergency.

**Table 6.4-1
Summary of Consequences**

| Event Consequences for the STL | | | | | | |
|--------------------------------|---------------------------------|------------------------------|---------------------|---------------|--|--------------------------------|
| Release Designation | Maximum Concentration at | | Maximum Distance to | | Possible/Probable EAL(s) ** | Emergency Event Classification |
| | Facility Boundary at 30 m (ppm) | Site Boundary at 100 m (ppm) | ERPG-2 (meters) | ESHE (meters) | | |
| F ₂ -1 | 7.6 | 1.325 | 30 | 20 | Breach of 1 (20 ft ³) cylinder (w.c. met.) | Site Area |
| F ₂ -2 | 0.3965 | 0.04 | 7 | 5 | Breach of 1 (20 ft ³) cylinder (avg. met.) | Alert |
| F ₂ -3 | 12.8 | 2.145 | 43 | 27 | Breach of 2 (20 ft ³) cylinders (w.c. met.) | Site Area |
| F ₂ -4 | 7.95 | 0.07 | 10 | 6 | Breach of 2 (20 ft ³) cylinders (avg. met.) | Alert |
| F ₂ -5 | 17.45 | 2.86 | 53 | 30 | Breach of 3 (20 ft ³) cylinders (w.c. met.) | Site Area |
| F ₂ -6 | 3.395 | 0.32 | 22 | 20 | Breach of 3 (20 ft ³) cylinders (avg. met.) | Alert |
| F ₂ -7 | 33 | 5.15 | 78 | 46 | Breach of 3 (20 ft ³) & 1 (8 ft ³) cylinders (w.c. met.) | Site Area |
| F ₂ -8 | 8.1 | 0.73 | 32 | 23 | Breach of 3 (20 ft ³) & 1 (8 ft ³) cylinders (avg. met.) | Site Area |

** There aren't any quantifiable detection methods to confirm that actual releases occurred in the scenarios described in Section 5.0, therefore, symptom-based EALs are not utilized in this hazards assessment. The above mentioned event-based EALs are stated in terms of the overall event descriptors as indicated by direct observation. The resulting event classifications are based on the consequences resulting from the releases of the total quantity of the material.⁵⁸

Note: w.c. met. = worst case meteorological conditions
avg. met. = average meteorological conditions

7.0 THE EMERGENCY PLANNING ZONE

The results of the consequence analysis performed in section 6.0 were used to propose an Emergency Planning Zone (EPZ). An EPZ is a geographic area surrounding a specific DOE facility for which special planning and preparedness efforts are carried out to ensure that prompt and effective actions can be taken to reduce or minimize the impact to onsite personnel, public health and safety, and the environment in the event of an Operational Emergency.

7.1 The Minimum EPZ Radius

As can be seen from the data in Table 6.4-1, the highest facility emergency class is a site area emergency, and the greatest distance at which a postulated facility event will produce consequences exceeding the Early Severe Health Effects (D_{ESHE}) threshold is 46 meters (Release Designation F₂₋₇). In accordance with Figure 4.1 of the EMG, if the D_{ESHE} and the site boundary are not greater than 2 km, then the "minimum EPZ radius" (EPZ_{min}) is equal to the minimum distance to the site boundary. Therefore, the EPZ_{min} for STL is 100 meters. The nominal 100 meter EPZ follows physical boundaries and is depicted in Illustration 7.1-1.

7.1.1 Tests of Reasonableness

The EPZ meets the following five tests of reasonableness:

1. Are the maximum distances to PAG/ERPG-level impacts for most of the analyzed accident scenarios equal to or less than the EPZ radius selected?

Yes. All of the ERPG impacts are less than the 100 meter EPZ. As shown in table 6.4-1, the maximum distance for the ERPG-2 is 78 meters.

2. Is the selected EPZ radius large enough to provide a credible basis for extending response activities outside the EPZ if conditions warrant?

Yes. Lines of communication and decision processes involving KAFB, as well as city and county response agencies, have been established and practiced. In exercises, as well as actual events, the offsite agencies have demonstrated the flexibility to adapt and extend pre-planned response actions to different areas, depending upon the conditions of the particular event. This process is facilitated through the use of the Incident Command Structure.

3. Is the EPZ radius large enough to support an effective response at and near the scene of the emergency?

Yes. The nominal 100 meter EPZ encompasses STL and all routes leading to it. Communication between emergency planning and safeguards and security organizations has been established. The safeguards and security representatives can effectively control access within approximately 120 meters from 970.⁵⁸ This will allow the emergency personnel to respond to the event without interference from uninvolved people and activity, facilitate onsite protective actions, and optimize on-scene command, control, and mitigation efforts.

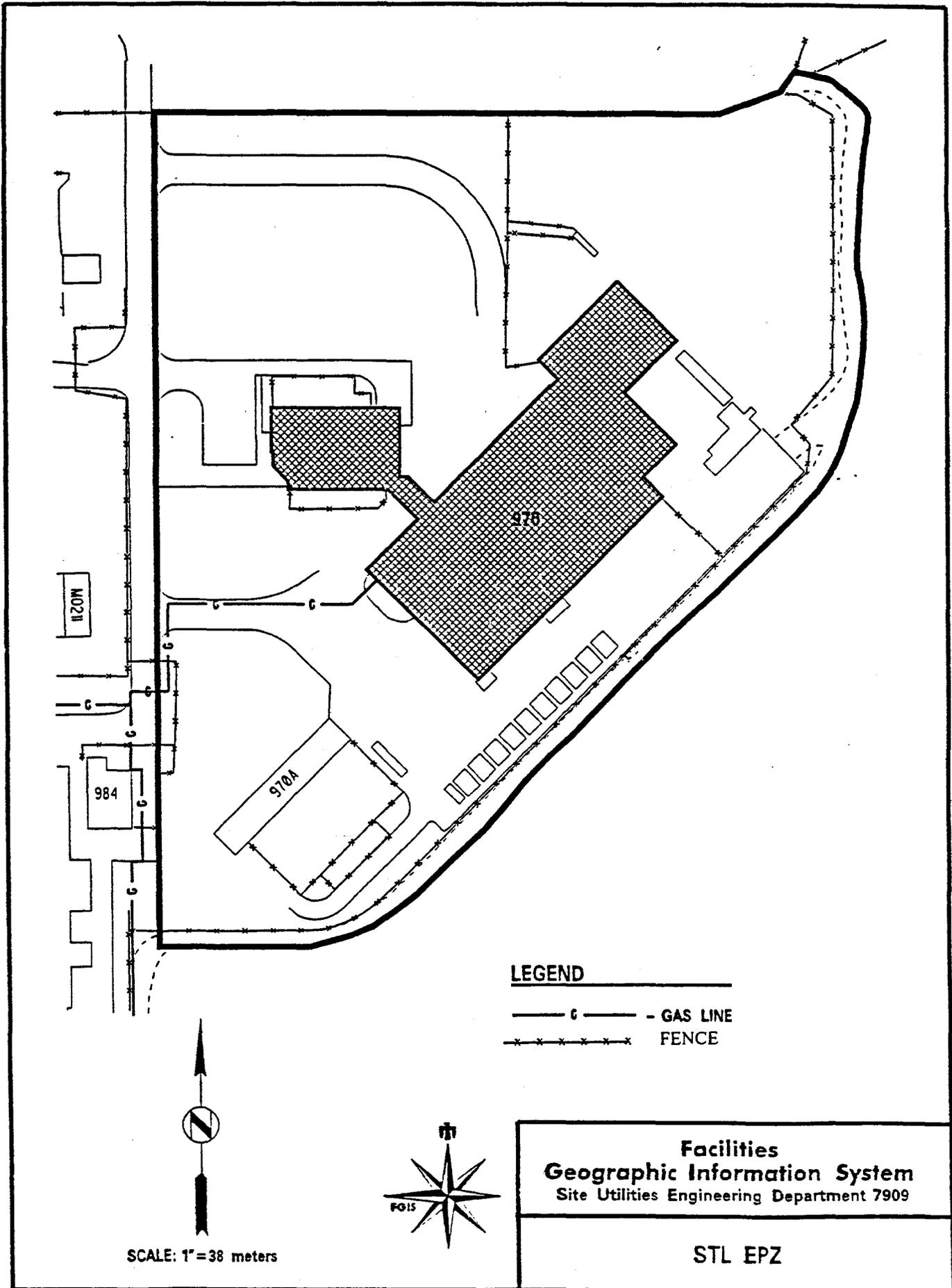


Illustration 7.1-1

4. Does the proposed EPZ conform to natural and jurisdictional boundaries where reasonable, and are other expectations and needs of the offsite agencies likely to be met by the selected EPZ?

Yes. The EPZ conforms to jurisdictional boundaries and physical street boundaries. By utilizing streets and fences as physical boundaries for portions of the EPZ, access within the EPZ can be adequately controlled as needed by offsite agencies. The established EPZ would appropriately meet the needs of offsite agencies.

5. What enhancements of the facility and site preparedness stature would be achieved by increasing the selected radius?

The proposed EPZ radius ensures the involvement and integration of any required response organizations in the planning process. It is not obvious that any increase in the proposed EPZ boundary will provide significant improvement in the level of facility or site preparedness.

8.0 EMERGENCY CLASSES, PROTECTIVE ACTIONS, AND EALS

The correlation of event scenarios and estimated consequences developed in Sections 5.0 and 6.0 are used to determine the emergency classes and protective actions that are appropriate to the scenarios, as well as the observable indications (i.e. EALs) to trigger emergency declarations and protective actions.

8.1 Emergency Classes

As mentioned in section 6.0, the three classes of operational emergencies in ascending order of severity are alert, site area emergency, and general emergency. These classes are differentiated by severity for the purpose of specifying appropriate emergency actions, including required response activities and notifications, commensurate with the degree of hazard presented by the event. The three classes of emergencies are defined below.

8.1.1 Alert

An alert represents events in progress or have occurred which involve an actual or potential substantial reduction for the level of facility safety and protection. An environmental release of hazardous materials is expected to be limited to small fractions of the appropriate Protective Action Guide (PAG) or ERPG-2 onsite. An alert represents an event that is noteworthy; the potential impacts are not expected to be serious; and a negligible long-term supply is anticipated. Declaration of an alert requires the availability of personnel and resources to:

- Provide continuous assessment of pertinent information for DOE decision makers, offsite authorities, the public, and other appropriate entities;
- Conduct appropriate assessments, investigations, or preliminary or confirmatory sampling and monitoring;
- Mitigate the severity of the occurrence or its consequences; and
- Prepare for other response actions should the situation become more serious.

8.1.2 Site Area Emergency

A site area emergency represents events which are in progress or have occurred involving actual or likely major failure(s) of facility safety or safeguards systems needed for the protection of onsite personnel, the public health and safety, the environment, or national security. An environmental release of hazardous materials is not expected to exceed the appropriate PAG or ERPG-2 levels offsite. A site area emergency represents an event in which a substantial supply impact is anticipated. Declaration of a site area emergency requires initiation of predetermined protective actions for onsite personnel and the notification and assembly of emergency response personnel and equipment to activate response centers to provide:

- Continuous assessment of pertinent information for DOE decision makers, offsite authorities, the public, and other appropriate entities;
- Establish communications, consultation, and liaison with offsite authorities;
- Provide information to the public through offsite authorities and the media;

- Conduct or assist in any evacuations and sheltering;
- Conduct appropriate assessments, investigations, or sampling and monitoring;
- Mitigate the severity of the actual or potential consequences; and
- Mobilize appropriate emergency response groups or security forces for immediate dispatch should the situation become more serious.

8.1.3 General Emergency

A general emergency represents events which are in progress or have occurred that involve actual or imminent catastrophic failure of facility safety systems with potential for loss of confinement integrity, catastrophic degradation of facility protection systems, or catastrophic failure in safety or protection systems threatening the integrity of a weapon or test device which could lead to substantial offsite impacts. Any environmental release of hazardous materials can reasonably be expected to exceed the appropriate PAG or ERPG-2 levels offsite. Declaration of a general emergency requires the notification, mobilization, and dispatch of all appropriate emergency response personnel and equipment including appropriate DOE national response assets to:

- Activate the response centers and other emergency assets to provide continuous assessment of information;
- Establish communications, consultation, and liaison with offsite authorities and recommend predetermined protective actions for the public;
- Provide information to the public through offsite authorities and the media;
- Conduct or assist evacuations and sheltering;
- Conduct appropriate assessments, investigations, or sampling and monitoring;
- Mitigate the severity of the actual or potential consequences; and
- Mobilize and dispatch appropriate emergency response groups or security forces.

8.2 Fluorine Gas Storage Area Events and EALs

The consequence analysis performed in Section 6.0 identified the following conditions which could precipitate an alert or a site area emergency involving chemicals stored outside the STL in the fluorine gas storage area. The EAL involves:

- Any condition which could breach the primary barriers of the fluorine cylinders stored outside the STL.

Basis: The fluorine gas storage area is located on the north side of STL. As mentioned in Section 6.0, there aren't any quantifiable detection methods to confirm that actual releases occurred in the previously described scenarios. Therefore, symptom-based EALs

are not utilized in this hazards assessment. The EAL is indicated by the observable conditions that threaten the integrity of the cylinder (i.e., vehicular impact). This release could create a site area emergency.

8.3 High-bay Events and EALs

The consequence analysis performed in Section 6.0 identified the following conditions which could precipitate an alert or a site area emergency involving fluorine in the high-bay, prior to its storage in the gas cabinet. The EAL involves:

- Any condition which could breach the primary barrier of the fluorine gas mixture cylinder as it is being transported to the fluorine gas cabinet.

Basis: In the event of a cylinder falling off the gas cart as it is being taken to the gas cabinet, the EAL is indicated by the observable conditions that threaten the integrity of the cylinder (i.e., falling cylinder).

8.4 Fluorine Gas Cabinet Events and EALs

The consequence analysis performed in Section 6.0 identified the following conditions which could precipitate an alert or a site area emergency involving fluorine in the fluorine gas cabinet. The EAL involves:

- Any condition which could breach the primary barriers of fluorine gas mixture stored in the gas cabinet.

Basis: Pressure gauges are viewed by personnel to ensure positive pressure of the laser unit. If a cylinder is leaking inside the cabinet, the EAL is indicated by a direct observation of the pressure gauges.

8.5 Protective Actions

The recommended protective action involving all scenarios inside the STL (i.e., chemical spill, fire, etc.) is evacuation. The recommended protective actions for a fluorine leak outside of STL is sheltering in place. If the situation warrants and the STL must be evacuated during a fluorine release, mitigative measures should include warning employees over the intercom system to prevent them from exiting from the STL toward the fluorine gas storage area.

The following recommendations complement the existing warning system:

- Consider moving the fluorine gas storage area out of the service driveway to an area where there's less traffic.
- Place a manual warning system in the service driveway that includes an alarm and one or more warning lights. The alarm should be triggered in the event of a fluorine release to provide a warning to passerbys who intend on entering the STL via the service driveway.
- In the event of a fluorine release from the outside fluorine gas storage area, the current alarm

system should not be triggered in order to prevent personnel from evacuating to the gathering point which is located by the fluorine gas storage area in the service driveway. Instructions to shelter in place should then be delivered over the intercom.

Response

The emergency response personnel in the SNL Emergency Operations Center (EOC) will ensure prompt notification of the DOE Kirtland Area Office (DOE-KAO) Duty Officer and ensure that the coordinated actions of the Sandia and DOE Emergency plans are initiated. Sandia EOC cadre will initiate consequence assessment and recommend to DOE-KAO protective action guidance.

The DOE-KAO Duty Officer will establish and maintain contact with offsite agencies such as KAFB, City of Albuquerque, State of New Mexico and the Isleta Pueblo. DOE-KAO is responsible for the notification to offsite authorities of the recommended Sandia protective actions, revising or supplementing the Sandia protective actions, or issuing any changes to the protective actions. After Sandia personnel have successfully mitigated the event, the Emergency Response Director will establish a recovery team and when conditions warrant, recommend termination of the emergency, and declare the event to be in the recovery mode.

9.0 MAINTENANCE AND REVIEW

The Risk Management and NEPA Department is responsible for ensuring that Hazards Assessment Documents are regularly reviewed and maintained.

It is the responsibility of the chemical owners and a facility authority to periodically review Hazards Assessment Documents applicable to their facilities and insure that they accurately reflect any changes in facility design, operations, safety features, inventories of hazardous materials, and features of the surrounding area.

The line organizations should provide information relative to changes in facility design, operation, safety features, inventories of hazardous materials, and features of the surrounding area to the facility authority.

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Appendix A

970 ChemMaster Inventory

SNL/NM Hazards Project

HA Required : YES Number of Chemicals: 491

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|---------------------------------------|----------|------------|----------|------|-------------------|
| ETHANOL | 970 | | (gal) | 0 | SIH |
| LIQUID NITROGEN | 970 | L | (gal) | 500 | SIH |
| NITROGEN GAS - UHP | 970 | G | (gcf) | 2570 | SIH |
| A-1 FIX AND PATCH HARDENER, PART 2 | 970/113 | L | (ozf) | 1 | SIH |
| ACETONE | 970/113 | L | (l) | 1 | < ERPG-1 AT 30 M. |
| ALPHA 60/40 TIN/LEAD SOLDER | 970/113 | S | (lb) | 1 | SIH |
| BARIUM FLOURIDE | 970/113 | S | (kg) | 1 | NON-DISPERSIBLE |
| BARIUM POWDER | 970/113 | S | (ozd) | 2 | <1 LB. |
| BLOW HARD | 970/113 | L | (ozf) | 960 | < ERPG-1 AT 30 M. |
| BORON | 970/113 | S | (g) | 50 | <1 LB. |
| CALCIUM FLOURIDE | 970/113 | S | (g) | 500 | <1 LB. |
| CARGILLE OPTICAL GEL, CODE 0607 | 970/113 | L | (ozf) | 8 | <1 LB. |
| DOW CORNING 3140 RTV COATING | 970/113 | L | (ozf) | 9 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|------------------------------|----------|------------|----------|------|-------------------|
| DYSPROSIUM FOIL | 970/113 | S | (g) | 30 | <1 LB. |
| DYSPROSIUM POWDER | 970/113 | S | (g) | 10 | <1 LB. |
| EPO-TEK 320 (OFTI) | 970/113 | L | (g) | 80 | SIH |
| EPO-TEK 353ND, PART A (OFTI) | 970/113 | L | (g) | 200 | SIH |
| EPO-TEK 353ND, PART B (OFTI) | 970/113 | L | (g) | 200 | SIH |
| ERBIUM POWDER | 970/113 | S | (g) | 5 | <1 LB. |
| ERSIN 60/40 TIN/LEAD SOLDER | 970/113 | S | (lb) | 2 | NON-DISPERSIBLE |
| ETHYLENE GLYCOL | 970/113 | L | (l) | 1 | BP > 100 C |
| GADOLINIUM FOIL | 970/113 | S | (g) | 30 | <1 LB. |
| GADOLINIUM POWDER | 970/113 | S | (g) | 10 | <1 LB. |
| GOLD | 970/113 | S | (g) | 5 | NON-DISPERSIBLE |
| HAFNIUM FOIL | 970/113 | S | (g) | 30 | <1 LB. |
| HAFNIUM POWDER | 970/113 | S | (g) | 5 | <1 LB. |
| HARDMAN 5-MINUTE EPOXY | 970/113 | L | (g) | 500 | SIH |
| HEXANES | 970/113 | L | (l) | 1 | < ERPG-1 AT 30 M. |
| HOLMIUM POWDER | 970/113 | S | (g) | 5 | <1 LB. |

Chemical Inventory

| CHEM | LOC_CODE | PHYS_STATE | QTY_UNIT | MQTY | SCR_CRIT |
|--|----------|------------|----------|------|-------------------|
| IMMERSION LIQUID CODE 06350 | 970/113 | L | (ozf) | 4 | <1 LB. |
| INDICATING DRIERITE DESICCANT, CASO4 | 970/113 | S | (lb) | 24 | NON-DISPERSIBLE |
| INDIUM FOIL | 970/113 | S | (g) | 30 | <1 LB. |
| INDIUM POWDER | 970/113 | S | (g) | 5 | <1 LB. |
| IRON FOIL | 970/113 | S | (g) | 30 | <1 LB. |
| KALEX TUFF STUFF URETHANE #04022 | 970/113 | L | (g) | 125 | SIH |
| KALEX TUFF STUFF URETHANE #04024 | 970/113 | L | (g) | 125 | SIH |
| KESTER 60/40 TIN/LEAD SOLDER | 970/113 | S | (lb) | 1 | SIH |
| KRYLON INT/EXT ENAMEL SPRAY PAINT "AERSOL" 1602 FLAT BLACK | 970/113 | L | (ozf) | 13 | SIH |
| LANTHANUM FOIL | 970/113 | S | (g) | 30 | <1 LB. |
| LEAD | 970/113 | S | (lb) | 800 | NON-DISPERSIBLE |
| MAGNESIUM FLUORIDE | 970/113 | S | (kg) | 1 | NON-DISPERSIBLE |
| METADI FLUID, DIAMOND POLISH EXTENDER | 970/113 | L | (pt) | 1 | SIH |
| METHANOL | 970/113 | L | (l) | 3 | < ERPG-1 AT 30 M. |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|---|----------|------------|----------|------|-------------------|
| METHANOL ABSOLUTE | 970/113 | L | (l) | 1 | < ERPG-1 AT 30 M. |
| NEODYMIUM FOIL | 970/113 | S | (g) | 30 | <1 LB. |
| NEODYMIUM POWDER | 970/113 | S | (g) | 10 | <1 LB. |
| NIObIUM FOIL | 970/113 | S | (g) | 30 | <1 LB. |
| NIObIUM POWDER | 970/113 | S | (g) | 25 | <1 LB. |
| NYE DELICATE MACHINERY OIL #154 | 970/113 | L | (ozf) | 1 | SIH |
| OM ECP-2200 SOLAR ABSORBER COATING, NEXTEL VELVET COATING | 970/113 | L | (ozf) | 5 | SIH |
| RUST GUARD ANTIQUE WHITE | 970/113 | L | (ozf) | 26 | SIH |
| SAMARIUM FOIL | 970/113 | S | (g) | 30 | SIH |
| SAMARIUM POWDER | 970/113 | S | (g) | 10 | <1 LB. |
| SEALING COMPOUND, APIEZON TYPE Q | 970/113 | S | (kg) | 5 | SIH |
| SILICONE MONOXIDE | 970/113 | S | (lb) | 1 | SIH |
| SILVER FOIL | 970/113 | S | (g) | 30 | SIH |
| SOLDER, ERSIN MULTICORE 63/37 | 970/113 | L | (l) | 1 | SIH |
| SPRAY-FIX NO ODOR MATTE FIXATIVE | 970/113 | L | (ozf) | 13 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MOQTY | SCR CRIT |
|---------------------------------|----------|------------|----------|-------|-------------------|
| STYRENE-D8 | 970/113 | L | (g) | 500 | <1 LB. |
| TIN FOIL | 970/113 | S | (g) | 30 | <1 LB. |
| TIN POWDER | 970/113 | S | (g) | 5 | <1 LB. |
| TIN/LEAD SOLDER | 970/113 | S | (lb) | 1 | SIH |
| TRA-DUCT 2902 HARDENER | 970/113 | L | (g) | 120 | SIH |
| TRA-DUCT 2902 RESIN | 970/113 | L | (g) | 120 | SIH |
| VANADIUM FOIL | 970/113 | S | (g) | 30 | <1 LB. |
| VANADIUM POWDER | 970/113 | S | (g) | 10 | <1 LB. |
| YTTERBIUM FOIL | 970/113 | S | (g) | 30 | <1 LB. |
| YTTERBIUM POWDER | 970/113 | S | (g) | 10 | <1 LB. |
| YTTRIUM FOIL | 970/113 | S | (g) | 30 | <1 LB. |
| ZINC CHROMATE PRIMER, YELLOW | 970/113 | L | (ozf) | 26 | BP > 100 C |
| ZINC FOIL | 970/113 | S | (g) | 30 | <1 LB. |
| ZIRCONIUM FOIL | 970/113 | S | (g) | 30 | <1 LB. |
| BLOW HARD | 970/121 | L | (ozf) | 24 | < ERPG-1 AT 30 M. |
| ERSIN MULTICORE SOLDER 63/37 | 970/121 | S | (lb) | 1 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|--|----------|------------|----------|------|-------------------|
| BLOW HARD | 970/211 | L | (ozf) | 180 | < ERPG-1 AT 30 M. |
| CALCIUM HYDROXIDE | 970/211 | S | (g) | 500 | <1 LB. |
| DEVCON 5-MINUTE EPOXY HARDENER | 970/211 | L | (ozf) | 4 | SIH |
| DEVCON 5-MINUTE EPOXY RESIN | 970/211 | L | (ozf) | 4 | SIH |
| MAGNESIUM CARBONATE | 970/211 | S | (g) | 100 | NON-DISPERSIBLE |
| METHYL ALCOHOL | 970/211 | L | (l) | 1 | < ERPG-1 AT 30 M. |
| ACETONE | 970/219 | L | (l) | 1 | < ERPG-1 AT 30 M. |
| ADHESIVE, RTV 734 SEALANT, DOW CORNING | 970/219 | L | (ml) | 90 | SIH |
| ARGON | 970/219 | G | (gcf) | 1 | SIH |
| BLOW HARD | 970/219 | | (ozf) | 72 | < ERPG-1 AT 30 M. |
| COPPER | 970/219 | S | (lb) | 2 | NON-DISPERSIBLE |
| DIAMOND POLISH EXTENDER FLUID | 970/219 | L | (ozf) | 16 | <1 LB. |
| DIAMOND POLISHING COMPOUND, AEROSOL | 970/219 | L | (ozf) | 15 | SIH |
| DIAMOND POLISHING COMPOUND, PASTE | 970/219 | L | (g) | 140 | SIH |
| DOW CORNING 1 CATALYST | 970/219 | L | (lb) | 0.1 | <1 LB. |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|--|----------|------------|----------|------|-----------------|
| DOW CORNING 3110 RTV | 970/219 | L | (lb) | 1 | SIH |
| DOW CORNING 3110 RTV | 970/219 | L | (lb) | 1 | SIH |
| DOW CORNING 3112 RTV | 970/219 | L | (lb) | 1 | SIH |
| DOW CORNING 4 CATALYST | 970/219 | | | 0 | SIH |
| DOW CORNING 4 CATALYST | 970/219 | | | 0 | SIH |
| DOW CORNING 4 CATALYST | 970/219 | | (lb) | 0.1 | SIH |
| EPOXY, HARDMAN 5-MINUTE, RED DOUBLE BUBBLE | 970/219 | L | (g) | 500 | SIH |
| FC-104 OPTICAL INDEX MATCHING FLUID | 970/219 | L | (ozf) | 24 | SIH |
| GOOP THREAD LUBRICANT | 970/219 | L | (ozf) | 1 | SIH |
| GREASE, APIEZON TYPE N | 970/219 | L | (g) | 50 | SIH |
| GREASE, HIGH VACUUM, DOW CORNING | 970/219 | L | (ozf) | 5 | SIH |
| GREASE, LUBRICANT, FISKE BROS. | 970/219 | L | (g) | 30 | SIH |
| HYSOL EPOXI PATCH 1-C WHITE | 970/219 | L | (ozf) | 4 | SIH |
| LEAD | 970/219 | S | (lb) | 5 | NON-DISPERSIBLE |
| LIQUID PAPER CORRECTION | 970/219 | L | (ozf) | 4 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MGTY | SCR CRIT |
|---------------------------------|----------|------------|----------|------|-------------------|
| FLUID | | | | | |
| METHYL ALCOHOL | 970/219 | L | (l) | 4 | < ERPG-1 AT 30 M. |
| MOLYBDENUM | 970/219 | S | (g) | 200 | <1 LB. |
| NICKEL | 970/219 | S | (g) | 200 | <1 LB. |
| OIL, BALZERS VACUUM PUMP | 970/219 | L | (l) | 2 | SIH |
| PROPANE | 970/219 | G | (gcf) | 4 | SIH |
| SOLDER, ALFA 60/40 TIN/LEAD | 970/219 | S | (lb) | 1 | SIH |
| SOLDER, KESTER 50/50 TIN/LEAD | 970/219 | S | (lb) | 1 | SIH |
| SOLDER, KESTER 60/40 TIN/LEAD | 970/219 | S | (lb) | 1 | SIH |
| SOLDER, KESTER RESIN CORE 63/37 | 970/219 | S | (lb) | 1 | SIH |
| STAY-CLEAN PASTE FLUX | 970/219 | L | (ozf) | 4 | SIH |
| TANTALUM | 970/219 | S | (lb) | 3 | NON-DISPERSIBLE |
| TUNGSTEN | 970/219 | S | (lb) | 1 | NON-DISPERSIBLE |
| VACUUM GOOP | 970/219 | L | (ozf) | 3 | SIH |
| VACUUM GOOP | 970/219 | | | 3 | SIH |

Chemical Inventory

| CHEM | LOC_CODE | PHYS_STATE | QTY_UNIT | MQTY | SCR_CRIT |
|--|----------|------------|----------|--------|----------|
| VACUUM GOOP | 970/219 | | (ozf) | 3 | SIH |
| VACUUM GOOP | 970/219 | L | (ozf) | 3 | SIH |
| GASOLINE | 970/A | L | (gal) | 4 | SIH |
| PETROLEUM ELECTRICAL INSULATING OIL | 970/A | L | (gal) | 400000 | SIH |
| 5E FILLED INSULATING COMPOUND | 970/DAS | L | (gal) | 1 | SIH |
| CHANNEL MASTER CONTACT SHIELD | 970/DASM | L | (ozf) | 16 | <1 LB. |
| GOLD WIPES LIQUID AEROSOL | 970/DASM | L | (ozf) | 12 | <1 LB. |
| HEAVY DUTY SOLVENT FLUX REMOVER, MS-190HD | 970/DASM | L | (ozf) | 32 | SIH |
| HP MAGNETIC HEAD CLEANER | 970/DASM | L | (ozf) | 4 | SIH |
| KLEEN-ALL RELAY & CONTACT CLEANER | 970/DASM | L | (ozf) | 32 | SIH |
| TECH SPRAY FLUX STRIPPER W | 970/DASM | L | (ozf) | 16 | SIH |
| 3M SPRAYMENT ART&DISPLAY ADHESIVE, AEROSOL | 970/GM1 | L | (ozf) | 36 | SIH |
| 3M SUPER 77 SPRAY ADHESIVE | 970/GM1 | L | (ozf) | 120 | SIH |
| BESTINE 201 RUBBER SOLVENT AND THINNER | 970/GM1 | L | (ozf) | 16 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|--|----------|------------|----------|------|-------------------|
| DAYTON DEM-COTE, SILOCONE LUBRICANT, AEROSOL | 970/GM1 | L | (ozf) | 40 | SIH |
| DAYTON, DEMKOTE, CUTTING & DRILLING FLUID,2W755, AEROSOL | 970/GM1 | L | (ozf) | 64 | SIH |
| DEGRACO GP/ENAMEL 37304 DEEP BASE | 970/GM1 | L | (gal) | 1 | SIH |
| DELSTAR ACRYLIC ENAMEL, DAR 24679 | 970/GM1 | L | (gal) | 1 | SIH |
| DEXTER HYSOL RESIN 907 | 970/GM1 | L | (qt) | 1 | SIH |
| DEXTER HYSOL, HARDENER 907 | 970/GM1 | L | (qt) | 1 | SIH |
| DYKEM STEEL BLUE SP1100 | 970/GM1 | L | (ozf) | 12 | SIH |
| ETHYL ALCOHOL, U.S.P ANHYDROUS 200 PROOF | 970/GM1 | L | (gal) | 10 | SIH |
| ETHYLENE GLYCOL E-178 | 970/GM1 | L | (gal) | 1 | BP > 100 C |
| GLYPTAL 1201 RED ENAMEL (INSULATING PAINT) | 970/GM1 | L | (qt) | 1 | SIH |
| METHANOL OPTIMA A454-4 | 970/GM1 | L | (gal) | 1 | < ERPG-1 AT 30 M. |
| MULTI-PURPOSE OIL, DAYTON DEM-KOTE, AEROSOL,5X628-A | 970/GM1 | L | (ozf) | 24 | SIH |
| NAPA CHAIN & CABLE LUBE, AEROSOL | 970/GM1 | L | (ozf) | 24 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|--|----------|------------|----------|------|----------|
| PENETROL QUALITY PAINT CONDITIONER | 970/GM1 | L | (qt) | 2 | SIH |
| PPG EMCOR BAKING ENAMEL EN-BR | 970/GM1 | L | (qt) | 2 | SIH |
| PPG EMCOR ENAMEL LAS- BR | 970/GM1 | L | (ozf) | 60 | SIH |
| PROPANE FUEL, TRUE VALUE MASTER MECHANIC | 970/GM1 | L | (ozf) | 84 | SIH |
| RUSTOLEUM INDUSTRIAL ENAMEL,721 | 970/GM1 | L | (gal) | 4 | SIH |
| RUSTOLEUM INDUSTRIAL ENAMELS, 866 | 970/GM1 | L | (gal) | 2 | SIH |
| RUSTOLEUM RUST INHIBITIVE ZINC CHROMATE PRIMER,960 | 970/GM1 | L | (gal) | 2 | SIH |
| RUSTOLEUM,, HARDHAT COATINGS, 2125, AEROSOL | 970/GM1 | L | (ozf) | 140 | SIH |
| T & R LACQUER THINNER | 970/GM1 | L | (gal) | 5 | SIH |
| WD-40 | 970/GM1 | L | (ozf) | 36 | SIH |
| WELLBORN PLASTIBOND,1044034 | 970/GM1 | L | (qt) | 1 | SIH |
| PERMATEx FORM A GASKET NO. 1 SEALANT P/N 1C ITEM NO. 80003 | 970/GM2 | L | (ozd) | 33 | SIH |
| PERMATEx FORM A GASKET RTV BLUE GASKET MAKER P/N 6M | 970/GM2 | L | (ozf) | 48 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|---|----------|------------|----------|------|------------|
| 3M FLUORINERT ELECTRONIC LIQUID FC-77 | 970/GM2C | L | (gal) | 1 | BP > 100 C |
| CITGARD 500 15W-40 MOTOR OIL | 970/GM2C | L | (qt) | 1 | SIH |
| CMP 19 | 970/GM2C | L | (gal) | 2 | SIH |
| CMP CONVALEX-10 FLUID | 970/GM2C | L | (gal) | 1 | SIH |
| CMP-704 SILICONE HIGH VAC. DIFFUSION PUMP FLUID | 970/GM2C | L | (gal) | 7 | SIH |
| DUOSEAL VAC PUMP OIL, 1407K-15 | 970/GM2C | L | (gal) | 4 | SIH |
| FISKE BROS LUBRIPLATE,APG-90 | 970/GM2C | L | (qt) | 1 | SIH |
| FLUX STRIPPER W,AEROSOL | 970/GM2C | L | (ozf) | 16 | SIH |
| HEAVY DUTY SOLVENT FLUX REMOVER, MS-190HD | 970/GM2C | L | (ozf) | 16 | SIH |
| HYDRAULIC FLUID H-544 TYPE 1 FRH | 970/GM2C | L | (gal) | 1 | SIH |
| HYDRAULIC OIL, HO- 1,LUBRIPLATE | 970/GM2C | L | (gal) | 1 | SIH |
| RELEASE AGENT DRY LUBRICANT, MS-122 | 970/GM2C | S | (ozd) | 16 | SIH |
| SONISOL REFRIGATOR OIL, 3GS | 970/GM2C | L | (gal) | 6 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|---|-----------|------------|----------|------|-------------------|
| SPRAYKLEEN CLEANER& LUBRICANT 10-8666-16, AEROSAL | 970/GM2C | L | (ozf) | 16 | SIH |
| TEFLON DRY LUBE, DAYTON DEM-COTE, 2W757, AEROSOL | 970/GM2C | L | (ozd) | 64 | SIH |
| TEXTRON E-Z-GO 2-CYCLE ENGINE OIL | 970/GM2C | L | (gal) | 1 | SIH |
| FLUORINE (5%)/HELIUM (95%) | 970/H3EET | G | (ft3) | 68 | KEEP |
| FREON TF | 970/H3EET | L | (gal) | 5 | < ERPG-1 AT 30 M. |
| HELIUM | 970/H3EET | G | (lb) | 50 | SIH |
| KRYPTON | 970/H3EET | G | (lb) | 50 | NON-TOXIC |
| NEON | 970/H3EET | G | (lb) | 50 | NON-TOXIC |
| NITROGEN | 970/H3EET | L | (lb) | 1400 | SIH |
| SULFURHEXAFLUORIDE | 970/H3EET | L | (lb) | 4200 | NON-TOXIC |
| SULFURHEXAFLUORIDE | 970/H3EET | L | (lb) | 1400 | NON-TOXIC |
| BONDO EPOXI-PATCH, HARDENER | 970/H3NET | L | (ozf) | 4.5 | SIH |
| BONDO EPOXI-PATCH, RESIN | 970/H3NET | L | (ozf) | 4.5 | SIH |
| DEXTER HYSOL EPOXY, PATCH KIT, 608, CLEAR | 970/H3NET | L | (ozf) | 3 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|--|-----------|------------|----------|------|-------------------|
| DEXTER HYSOL EPOXY, PATCH KIT, 6C, ALUMINUM | 970/H3NET | L | (ozf) | 3 | SIH |
| HARDMAN EPOXY, 3-5 MINUTE | 970/H3NET | L | (ozf) | 100 | SIH |
| HIGH PURITY GOOP SEALANT | 970/H3NET | L | (ozf) | 300 | SIH |
| LOCTITE 609 | 970/H3NET | S | (ozf) | 17 | SIH |
| PLASTI DIP | 970/H3NET | L | (ozf) | 32 | SIH |
| ARO PNEUMATIC LUBE OIL | 970/H3SET | L | (qt) | 3 | SIH |
| LEAK TEST LIQUID | 970/H3SET | L | (ozf) | 8 | SIH |
| MANOSTAT BLOW-HARD DUSTER | 970/H3SET | L | (ozf) | 72 | < ERPG-1 AT 30 M. |
| APIEZON SEALING COMPOUND | 970/H3VAC | S | (kg) | 10 | SIH |
| GELVASEAL LEAK SEALANT | 970/H3VAC | L | (ozf) | 6 | SIH |
| CVC VACUUM GREASE, HEAVY | 970/H3VAC | S | (lb) | 6 | SIH |
| CVC VACUUM GREASE, MEDIUM | 970/H3VAC | S | (lb) | 6 | SIH |
| DOW CORNING DIFFUSION PUMP FLUID, 704 | 970/H3VAC | L | (gal) | 1 | SIH |
| DOW CORNING DIFFUSION PUMP FLUID, 705 | 970/H3VAC | L | (gal) | 1 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|--|-----------|------------|----------|------|-------------------|
| DOW CORNING HIGH VACCUUM GREASE | 970/H3VAC | S | (ozd) | 100 | SIH |
| TORRSEAL EPOXY, HARDENER | 970/H3VAC | L | (ozf) | 12 | SIH |
| TORRSEAL EPOXY, RESIN | 970/H3VAC | L | (ozf) | 9 | SIH |
| CADMIUM | 970/K | S | (lb) | 5 | NON-DISPERSIBLE |
| DUO-SEAL SWSII PUMP OIL | 970/K | L | (qt) | 3 | SIH |
| FISHERBRAND 19 MECHANICAL PUMP OIL | 970/K | L | (l) | 3 | SIH |
| HYVAC PUMP OIL | 970/K | L | (qt) | 2 | SIH |
| LEAD | 970/K | S | (kg) | 5500 | NON-DISPERSIBLE |
| ULTRA-HIGH SPEED TURBO-MOLECULAR PUMP OIL | 970/K | L | (qt) | 1 | SIH |
| A-9 ALUMINUM CUTTING FLUID | 970/MBAY | L | (qt) | 1 | SIH |
| ACETONE | 970/MBAY | L | (l) | 6 | < ERPG-1 AT 30 M. |
| ACRYL-GLO CATALYST | 970/MBAY | L | (l) | 1 | SIH |
| ALCONOX | 970/MBAY | S | (lb) | 5 | NON-DISPERSIBLE |
| BACK UP ALGAE INHIBITOR, WINTERIZER ALGICIDE | 970/MBAY | L | (qt) | 2 | SIH |
| BIOGUARD BALANCE PAK 200 | 970/MBAY | S | (lb) | 5 | NON-DISPERSIBLE |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|---|----------|------------|----------|------|-----------------|
| BIOGUARD CLC | 970/MBAY | S | (lb) | 10 | NON-DISPERSIBLE |
| BIOGUARD POOL MAGNET | 970/MBAY | L | (qt) | 2 | NON-DISPERSIBLE |
| CEMENT SOLVENT | 970/MBAY | L | (pt) | 1 | SIH |
| CERROLOW 117 | 970/MBAY | S | (lb) | 10 | NON-DISPERSIBLE |
| CERROLOW 136 | 970/MBAY | S | (lb) | 10 | NON-DISPERSIBLE |
| CHEMGRIP CEMENT FOR BONDING TEFLON PART A RESIN | 970/MBAY | S | (g) | 54 | <1 LB. |
| CHEMGRIP CEMENT PART B | 970/MBAY | S | (lb) | 1 | <1 LB. |
| CHEMGRIP TREATING AGENT | 970/MBAY | L | (lb) | 1 | <1 LB. |
| COPPER | 970/MBAY | S | (lb) | 5 | NON-DISPERSIBLE |
| CUPRIC SULFATE | 970/MBAY | S | (lb) | 5 | NON-DISPERSIBLE |
| DIAMOND COMPOUND EXTENDER | 970/MBAY | L | (ozf) | 16 | SIH |
| DIAMOND PASTE (POLISHING COMPOUND) | 970/MBAY | L | (g) | 160 | SIH |
| DOW CORNING 4 COMPOUND | 970/MBAY | S | (g) | 300 | SIH |
| DOW CORNING 7 RELEASE PASTE COMPOUND | 970/MBAY | S | (g) | 300 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|---|----------|------------|----------|------|----------|
| DOW CORNING G-N METAL ASSEMBLY PASTE | 970/MBAY | S | (g) | 200 | SIH |
| DOW CORNING HIGH VACUUM GREASE | 970/MBAY | S | (lb) | 2 | SIH |
| EPOXY PATCH KIT, 1C WHITE | 970/MBAY | L | (ozf) | 24 | SIH |
| EPOXY PATCH KIT, 6C ALUMINUM | 970/MBAY | L | (ozf) | 24 | SIH |
| EPOXY, 04001, HARDMAN, EXTRA FAST SETTING, RED | 970/MBAY | L | (g) | 400 | SIH |
| EPOXY, 04002, HARDMAN, MACHINEABLE, YELLOW | 970/MBAY | L | (g) | 400 | SIH |
| EPOXY, 04003, HARDMAN, PURPLE | 970/MBAY | L | (g) | 400 | SIH |
| EPOXY, 04004, HARDMAN, GREEN | 970/MBAY | L | (g) | 400 | SIH |
| EPOXY, 04005, HARDMAN, GENERAL PURPOSE, BLUE | 970/MBAY | L | (g) | 400 | SIH |
| EPOXY, 04007, HARDMAN, ORANGE | 970/MBAY | L | (g) | 400 | SIH |
| EPOXY, 04022, KALEX URETHANE, HARDMAN, GREEN/BIEGE PKG. | 970/MBAY | L | (g) | 400 | SIH |
| EPOXY, 04023, KALEX URETHANE, HARDMAN, BLUE/BIEGE PKG. | 970/MBAY | L | (g) | 400 | SIH |
| EPOXY, 04050, ACRYLIC, HARDMAN, BLUE/WHITE PKG. | 970/MBAY | L | (g) | 400 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|--|----------|------------|----------|------|-------------------|
| ETCH RESIST LACQUER | 970/MBAY | L | (pt) | 1 | SIH |
| ETHYL ALCOHOL | 970/MBAY | L | (l) | 1 | SIH |
| ETHYLCELLULOSE | 970/MBAY | S | (lb) | 50 | NON-DISPERSIBLE |
| FLUORINERT FC-77 | 970/MBAY | L | (gal) | 5 | NON-TOXIC |
| FLUOROLUBE GREASE FR-362 | 970/MBAY | S | (ozd) | 12 | SIH |
| FLUX REMOVER MS-190HD, HEAVY DUTY | 970/MBAY | L | (lb) | 5 | SIH |
| FLUX, SOLDER FLUX, STAY-CLEAN LIQUID AND PASTE | 970/MBAY | S | (lb) | 5 | NON-DISPERSIBLE |
| FREEZE MIST II, "22" CHLORODIFLUOROMETHANE | 970/MBAY | L | (ozf) | 144 | < ERPG-1 AT 30 M. |
| FREON TF, TRICHLOROTRIFLUOROETHANE | 970/MBAY | L | (gal) | 1 | SIH |
| GREASE, APIEZON L | 970/MBAY | S | (ozd) | 25 | SIH |
| GREASE, APIEZON N | 970/MBAY | S | (lb) | 1 | SIH |
| ISOPROPYL ALCOHOL | 970/MBAY | L | (l) | 6 | < ERPG-1 AT 30 M. |
| METHANOL | 970/MBAY | L | (l) | 2 | < ERPG-1 AT 30 M. |
| METHYL ETHYL KETONE | 970/MBAY | L | (l) | 1 | < ERPG-1 AT 30 M. |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|--|----------|------------|----------|------|-------------------|
| METHYLENE CHLORIDE | 970/MBAY | L | (l) | 1 | < ERPG-1 AT 30 M. |
| MICRODUSTER OS,CHLORODIFLUOROMETH ANE | 970/MBAY | L | (ozf) | 144 | < ERPG-1 AT 30 M. |
| MYSTIK JT-7 GEAR LUBRICANT | 970/MBAY | L | (gal) | 5 | SIH |
| NITROGEN | 970/MBAY | G | (cf) | 230 | SIH |
| NOALOX | 970/MBAY | L | (ozf) | 48 | SIH |
| OIL, HYDRAULIC OIL 32 | 970/MBAY | L | (gal) | 1 | SIH |
| PAINT, SPRAY PAINT, HI- TEMP BBQ BLACK | 970/MBAY | L | (qt) | 2 | SIH |
| PHOSPHORIC ACID | 970/MBAY | L | (gal) | 3 | SIH |
| PHOTO RESIST, EAGLE 2100 ED | 970/MBAY | L | (gal) | 40 | SIH |
| POTASSIUM CHLORIDE | 970/MBAY | S | (lb) | 1 | <1 LB. |
| PROPANE | 970/MBAY | L | (ozf) | 30 | SIH |
| PVC CEMENT, GRAY, HERCULES | 970/MBAY | L | (qt) | 1 | SIH |
| SILICON SEAL, 732 MULTI- PURPOSE SEALANT, RTV | 970/MBAY | L | (ozd) | 60 | SIH |
| SILICON SEAL,736 HEAT RESISTANT SEALANT,RTV | 970/MBAY | S | (ozd) | 64 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|--|----------|------------|----------|------|-----------------|
| SILVABRITE 100 | 970/MBAY | S | (lb) | 3 | SIH |
| SILVER PRINT | 970/MBAY | L | (pt) | 1 | SIH |
| SNOOP LIQUID LEAK DETECTOR | 970/MBAY | L | (l) | 1 | SIH |
| SODIUM HYDROXIDE | 970/MBAY | L | (l) | 6 | NON-DISPERSIBLE |
| SOLDER, ERSIN MULTICORE SOLDER, SN60, TIN/LEAD | 970/MBAY | S | (lb) | 3 | NON-DISPERSIBLE |
| SOLDER, ERSIN MULTICORE SOLDER, SN63, TIN/LEAD | 970/MBAY | S | (lb) | 3 | NON-DISPERSIBLE |
| SPRA KLEEN CLEANER LUBRICANT | 970/MBAY | L | (lb) | 1 | SIH |
| SPRAY 'N GLUE | 970/MBAY | L | (lb) | 1 | SIH |
| SULFURIC ACID | 970/MBAY | L | (gal) | 3 | SIH |
| SWAK | 970/MBAY | S | (lb) | 1 | SIH |
| SWIF 95,HERCULES TIN- ANTIMONY SOLDER AND FLUX PASTE | 970/MBAY | S | (lb) | 5 | SIH |
| TAPMATIC CUTTING FLUID #1 | 970/MBAY | L | (pt) | 1 | SIH |
| TORRSEAL, 2 PART EPOXY | 970/MBAY | S | (ozd) | 10 | SIH |
| TRA-DUCT EPOXY, 2902 | 970/MBAY | L | (g) | 100 | SIH |
| UNIVOLT 60 TRANSFORMER OIL | 970/MBAY | L | (gal) | 600 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|--|----------|------------|----------|------|-------------------|
| VACUUM PUMP OIL, FISHERBRAND 19 | 970/MBAY | L | (l) | 6 | SIH |
| WD-40 | 970/MBAY | L | (qt) | 1 | SIH |
| AERODAG G, AEROSOL | 970/PII | L | (ozf) | 13 | SIH |
| ALL PRO SPRAY ENAMEL | 970/PII | L | (ozf) | 72 | SIH |
| JIF-ACTION CONTACT CLEANER | 970/PII | L | (ozf) | 10 | SIH |
| PROPANE FUEL | 970/PII | G | (ozf) | 60 | SIH |
| REDI-SPRAY INDUSTRIAL MAINTENANCE ENAMEL RS 90-1 GLOSS WHITE | 970/PII | L | (ozf) | 60 | SIH |
| RUSTOLEUM HARD HAT SPRAY PAINT, AEROSOL | 970/PII | L | (ozf) | 60 | SIH |
| RUSTOLEUM STOPS RUST PROTECTIVE COATING, AEROSOL | 970/PII | L | (ozf) | 24 | SIH |
| SULFURHEXAFLUORIDE | 970/PII | L | (lb) | 1400 | NON-TOXIC |
| SUPERCUB BUTANE | 970/PII | L | (ozf) | 20 | SIH |
| TRICHLOROETHYLENE, NEUTRAL GRADE, NON FLAMABLE | 970/PII | L | (gal) | 5 | < ERPG-1 AT 30 M. |
| WD-40 | 970/PII | L | (ozf) | 12 | SIH |
| WEEKEND SPRAY PAINT INTERIOR/EXTERIOR | 970/PII | L | (ozf) | 13 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|---|-----------|------------|----------|------|-------------------|
| COPPER SULFATE CRYSTALS | 970/RF | S | (lb) | 5 | NON-DISPERSIBLE |
| COPPER SULFATE SOLUTION | 970/RF | L | (gal) | 10 | BP > 100 C |
| 2-PROPANOL | 970/SABRE | L | (l) | 3 | SIH |
| 2-PROPANOL | 970/SABRE | L | (l) | 12 | SIH |
| ACHESON AERODAG G | 970/SABRE | L | (ozf) | 32 | SIH |
| ALCATEL 100 MECHANICAL VACUUM PUMP OIL | 970/SABRE | L | (qt) | 5 | SIH |
| APIEZON N GREASE | 970/SABRE | S | (g) | 125 | SIH |
| APIEZON Q SEALING COMPOUND | 970/SABRE | S | (kg) | 1 | SIH |
| ARGON COMPRESSED GAS | 970/SABRE | G | (lb) | 150 | SIH |
| BERNZOMATIC GOLD SEAL PROPANE FUEL | 970/SABRE | G | (ozf) | 85 | SIH |
| BLOW HARD | 970/SABRE | G | (ozf) | 100 | < ERPG-1 AT 30 M. |
| CARNAUBA WAX | 970/SABRE | S | (lb) | 2 | SIH |
| CELVASEAL BAKEABLE LEAK SEALANT | 970/SABRE | L | (ozf) | 72 | SIH |
| CIT ALCATEL DIRECT DRIVE MECHANICAL VACUUM PUMP FLUID | 970/SABRE | L | (l) | 8 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|--|-----------|------------|----------|------|------------|
| COPPER SULFATE SOLUTION | 970/SABRE | L | (gal) | 55 | BP > 100 C |
| DEVCON 5-MINUTE EPOXY | 970/SABRE | L | (ozf) | 16 | SIH |
| DIVCO ROSIN SOLDER GRADE #233 | 970/SABRE | S | (lb) | 1 | SIH |
| DOW CORNING HIGH VACUUM GREASE | 970/SABRE | S | (ozd) | 25 | SIH |
| ENCON HYDROSEP PORTABLE EYEWASH ADDITIVE | 970/SABRE | L | (ozf) | 96 | SIH |
| EPOXI-PATCH KIT 1C WHITE | 970/SABRE | L | (ozf) | 27 | SIH |
| ETHYLENE GLYCOL | 970/SABRE | L | (l) | 5 | BP > 100 C |
| FISHERBRAND 19 MECHANICAL PUMP FLUID | 970/SABRE | L | (l) | 10 | SIH |
| FISHERBRAND ULTRASONIC CLEANING SOLUTION CONCENTRATE | 970/SABRE | L | (gal) | 4 | SIH |
| HARDMAN EXTRA FAST SETTING EPOXY RED DOUBLE BUBBLE PACKAGE | 970/SABRE | S | (lb) | 1 | SIH |
| HARDMAN URETHANE BLUE DOUBLE BUBBLE PACKAGE | 970/SABRE | S | (lb) | 1 | SIH |
| HARDMAN URETHANE PURPLE DOUBLE BUBBLE PACKAGE | 970/SABRE | S | (lb) | 1 | SIH |
| HIGH PURITY GOOP | 970/SABRE | L | (ozf) | 10 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|--|-----------|------------|----------|------|-----------------|
| IMS SILICONE SPRAY PARTING AGENT | 970/SABRE | L | (ozf) | 12 | SIH |
| JOHNSON'S PURE SOLDERS 60/40 | 970/SABRE | S | (lb) | 1 | <1 LB. |
| LEAD BRICK | 970/SABRE | S | (lb) | 500 | NON-DISPERSIBLE |
| LEAD SHEET | 970/SABRE | S | (lb) | 200 | NON-DISPERSIBLE |
| LEAD SHOT | 970/SABRE | S | (lb) | 200 | NON-DISPERSIBLE |
| LOCTITE SUPER BONDER 495 | 970/SABRE | L | (ozf) | 4 | SIH |
| LOCTITE WATER PROOFING SOLUTION | 970/SABRE | L | (ozf) | 1 | SIH |
| MASTER MECHANIC PROPANE FUEL | 970/SABRE | G | (ozf) | 85 | SIH |
| NEON COMPRESSED GAS | 970/SABRE | G | (lb) | 150 | NON-TOXIC |
| NITROGEN COMPRESSED GAS | 970/SABRE | G | (lb) | 750 | SIH |
| OXAZINE 720 PERCHLORATE SOLUTION | 970/SABRE | L | (l) | 2 | NON-TOXIC |
| PFEIFFER BALZERS OL P3 OIL P275140203 | 970/SABRE | L | (pt) | 2 | SIH |
| PLASTI DIP SPRAY-ON COATING | 970/SABRE | L | (ozf) | 12 | SIH |
| RECTORSEEK LOW-TEMP LEAK LOCATOR | 970/SABRE | L | (pt) | 1 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|------------------------------------|-----------|------------|----------|-------|-----------------|
| ROSIN CORE SOLDER SN60 | 970/SABRE | S | (lb) | 1 | SIH |
| SIMPLE GREEN SOLUTION | 970/SABRE | L | (gal) | 1 | SIH |
| SN 50 ACID CORE SOLDER | 970/SABRE | S | (lb) | 1 | SIH |
| SODIUM HYDROXIDE 6.25N SOLUTION | 970/SABRE | L | (l) | 10 | NON-DISPERSIBLE |
| SULFORHODAMINE 640 SOLUTION | 970/SABRE | L | (l) | 2 | NON-TOXIC |
| SULFUR HEXAFLUORIDE COMPRESSED GAS | 970/SABRE | G | (lb) | 300 | NON-TOXIC |
| SYLGARD 184 SILICONE CURING AGENT | 970/SABRE | L | (lb) | 0.1 | SIH |
| SYLGARD 184 SILICONE ELASTOMER | 970/SABRE | S | (lb) | 1 | SIH |
| TORRSEAL LOW VAPOR PRESSURE RESIN | 970/SABRE | L | (ozf) | 10 | SIH |
| TRANSFORMER OIL NO PCBS | 970/SABRE | L | (gal) | 30000 | SIH |
| ULTRA ZERO AIR COMPRESSED GAS | 970/SABRE | G | (lb) | 150 | NON-TOXIC |
| WD-40 AEROSOL | 970/SABRE | L | (ozf) | 18 | SIH |
| ZEOLITE MOLECULAR SIEVE | 970/SABRE | S | (lb) | 5 | NON-DISPERSIBLE |
| 3M SILICONE LUBRICANT, SPRAY | 970/SR1 | L | (ozf) | 40 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|--|----------|------------|----------|------|-------------------|
| 3M SPRAY ADHESIVE SUPER 77 | 970/SR1 | L | (ozf) | 17 | SIH |
| 3M SPRAY MOUNT ARTIST'S ADHESIVE, AEROSOL, 6065 | 970/SR1 | L | (ozf) | 13 | SIH |
| AERODAG G, AEROSOL SPRAY, SUPER 77 | 970/SR1 | L | (ozf) | 12 | SIH |
| ALL SPRAY PAINT, 10,150,170,210,220 | 970/SR1 | L | (ozf) | 84 | SIH |
| BLAIR SPRAYFIX AEROSOL NO. 105AEROSOL | 970/SR1 | L | (ozf) | 13 | SIH |
| BUTANE FUEL | 970/SR1 | L | (ozf) | 18 | SIH |
| BUTANE GAS, RC650 | 970/SR1 | L | (ozf) | 54 | SIH |
| BUTANE SUPER CUB | 970/SR1 | L | (ozf) | 5 | SIH |
| CORONADO RUST- INHIBITIVE SEMI-GLOSS URETHANE ALKYD M13-38 | 970/SR1 | L | (gal) | 1 | SIH |
| ETHYL ALCOHOL, U.S.P ANHYDROUS, 200PROOF | 970/SR1 | L | (gal) | 20 | SIH |
| GLYPTAL SPRAY PAINT, 1201-A | 970/SR1 | L | (ozf) | 26 | SIH |
| LOCTITE WATER PROOFING SOLUTION P/N 74126 | 970/SR1 | L | (ozf) | 1 | SIH |
| METHANOL A412-1 | 970/SR1 | L | (l) | 1 | < ERPG-1 AT 30 M. |
| MICROFLAME TORCH KIT | 970/SR1 | L | (ozf) | 10 | <1 LB. |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MGTY | SCR CRIT |
|--|----------|------------|----------|------|----------|
| MINERAL SPIRITS (PAINT THINNER) | 970/SR1 | L | (gal) | 1 | SIH |
| PLASTIC DIP SPRAY-ON COATING | 970/SR1 | L | (ozf) | 13 | SIH |
| PPG EMCOR TOUCH-UP/AIR DRY AEROSOL, LAS-BE, LAS-BR | 970/SR1 | L | (ozf) | 32 | SIH |
| PROPANE FUEL | 970/SR1 | L | (ozf) | 60 | SIH |
| RUSTOLEUM HARD HAT INDUSTRIAL COATING, AEROSOL | 970/SR1 | L | (ozf) | 60 | SIH |
| RUSTOLEUM WHITE | 970/SR1 | L | (gal) | 1 | SIH |
| RUSTOLEUM WHITE PAINT 2766, 5292 | 970/SR1 | L | (gal) | 2 | SIH |
| SHERWIN WILLIAMS SAFETY YELLOW B54Y27 617-4072 | 970/SR1 | L | (gal) | 2 | SIH |
| SPRAYON 200 HI-PRESSURE MOLYLUBE | 970/SR1 | L | (ozf) | 10 | SIH |
| SPRAYON LUBRICATING COMPOUND DIMETHYSILICONE TYPE II | 970/SR1 | L | (ozf) | 16 | SIH |
| WD-40 | 970/SR1 | L | (ozf) | 60 | SIH |
| WESTERN FINISHES SATIN BASE ENAMEL BASE 4 363 4A | 970/SR1 | L | (gal) | 1 | SIH |
| DEVCON EPOXY ADHESIVES | 970/SR2C | L | (ozd) | 12 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MGTY | SCR CRIT |
|--|----------|------------|----------|------|-----------------|
| 5 MIN. | | | | | |
| HYSOL BOND SEAL REPAIR EPOXY-PATCH KIT 1C WHITE | 970/SR2C | L | (ozd) | 36 | SIH |
| ALCONOX | 970/SR3C | S | (lb) | 4 | NON-DISPERSIBLE |
| SIMPLE GREEN | 970/SR3C | L | (gal) | 5 | SIH |
| SODIUM HYDROXIDE CRYSTALS S318-500 | 970/SR3C | S | (lb) | 2 | NON-DISPERSIBLE |
| SODIUM HYDROXIDE, 6.25N SOLUTION | 970/SR3C | L | (pt) | 32 | BP > 100 C |
| 2 PROPANAL ISOPROPYL ALCHOL | 970/TUN | L | (qt) | 1 | SIH |
| 3000 CS MINERAL OIL | 970/TUN | L | (qt) | 1 | SIH |
| AMMONIUM CHLORIDE (A- 661,70600) | 970/TUN | L | (lb) | 1 | <1 LB. |
| CAPRIC SULFATE | 970/TUN | S | (lb) | 4 | NON-DISPERSIBLE |
| CMP 19 VACUUM PUMP OIL | 970/TUN | L | (gal) | 1 | SIH |
| CUPIC SULFATE (C-493) | 970/TUN | S | (lb) | 3.1 | NON-DISPERSIBLE |
| CUTTING FLUID | 970/TUN | L | (gal) | 1 | SIH |
| DIFFUSION PUMP FLUID (DC- 704-1) | 970/TUN | L | (gal) | 1 | SIH |
| DOW CORNING SILICONE 705 FLUID | 970/TUN | G | (gal) | 1 | SIH |

Chemical Inventory

| CHEM | LOC_CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|---|----------|------------|----------|------|-------------------|
| DUAL ACTION PLUS CUTTING FLUID #1 | 970/TUN | L | (ozf) | 16 | SIH |
| DUAL ACTION PLUS CUTTING FLUID #2 | 970/TUN | L | (ozf) | 16 | SIH |
| DUO SEAL PUMP OIL | 970/TUN | L | (gal) | 0.2 | SIH |
| ELMERS GLUE ALL (RECORD NO.E395) | 970/TUN | L | (oz) | 32 | SIH |
| HANDY FLUX LOW TEMP.BRAZING | 970/TUN | S | (oz) | 8 | SIH |
| HIGH VACUUM PUMP OIL (093050-20) | 970/TUN | L | (qt) | 5 | SIH |
| HIGH VACUUM PUMP OIL (093060-002) | 970/TUN | L | (qt) | 5 | SIH |
| KESTER SOLDERING PASTE | 970/TUN | S | (oz) | 2 | SIH |
| MARVEL AIR TOOL OIL (NO.085) | 970/TUN | L | (ozf) | 64 | SIH |
| MASTER MECHANIC PROPANE FUEL (DOT-39 NRC 240/300 M1012) | 970/TUN | G | (l) | 33 | SIH |
| MECHANICAL VACUUM PUMP FLUID | 970/TUN | L | (l) | 7.2 | SIH |
| MECHANICAL VACUUM PUMP OIL (ALCATEL 100) | 970/TUN | L | (gal) | 1.2 | SIH |
| MICRO FLAME (CUB) BUTANE TORCH | 970/TUN | G | (ozd) | 7 | < ERPG-1 AT 30 M. |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|---|----------|------------|----------|------|-----------------|
| N-PROPYL ALOCHOL (NO. 40017A04) | 970/TUN | L | (pt) | 6 | SIH |
| NORK SHOK | 970/TUN | G | (oz) | 16 | <1 LB. |
| OATEY REGULAR CLEAR CEMENT FOR PVC (NO.31012) | 970/TUN | L | (ozf) | 4 | SIH |
| PHOSPHORIC ACID (P1095) | 970/TUN | S | (pt) | 2 | NON-DISPERSIBLE |
| RUST GUARD (LIGHT GRAY PRIMER 260) | 970/TUN | G | (oz) | 11 | SIH |
| SEALANT COMPOUND | 970/TUN | S | (oz) | 5 | SIH |
| SILASTIC SILICONE RUBBER KIT | 970/TUN | S | (lb) | 1 | SIH |
| SILICONE HIGH VACUUM DIFF PUMP OIL | 970/TUN | L | (gal) | 1 | SIH |
| SILICONE RUTHER COMPOUND | 970/TUN | L | (lb) | 1.8 | SIH |
| SOLDER PASTE | 970/TUN | S | (oz) | 1.7 | SIH |
| SPRA KLEEN CLEANER AND LUBRICANT | 970/TUN | G | (oz) | 16 | SIH |
| SPRAY PAINT (BLACK) | 970/TUN | G | (ozf) | 13 | SIH |
| STAY CLEAN | 970/TUN | S | (oz) | 12 | SIH |
| STAY CLEAN PASTE FLUX | 970/TUN | S | (oz) | 1.7 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|---|----------|------------|----------|------|----------|
| STAY SLIVER FLUX | 970/TUN | S | (oz) | 16 | SIH |
| SUPER 77 SPRAY ADHESIVE | 970/TUN | G | (oz) | 17 | SIH |
| UNI-WELD PLASTIC PIPE PRODUCTS | 970/TUN | L | (qt) | 1 | SIH |
| VACSEAL HIGH VACUUM LEAK SEALANT | 970/TUN | G | (oz) | 32 | SIH |
| VARIAN GENERAL PURPOSE MECHANICAL PUMP FLUID | 970/TUN | L | (oz) | 10 | SIH |
| WD-40 | 970/TUN | G | (oz) | 9 | SIH |
| WELDWOOD SPRAY N'GLUE | 970/TUN | G | (oz) | 11.5 | SIH |
| 3M SILICONE LUBRICANT SPRAY | 970/WELD | L | (ozf) | 13 | SIH |
| ALL PRO SPRAY ENAMEL, 10,60,120,170,260,220,210 | 970/WELD | L | (ozf) | 468 | SIH |
| ALL SPRAY SPRAY PAINT, 10, 130,150,220 | 970/WELD | L | (ozf) | 160 | SIH |
| COLOR GUILD SPRAY FINISH, CGE20 | 970/WELD | L | (ozf) | 39 | SIH |
| CROWN DRY GRAPHITE LUBRICANT, 8078 | 970/WELD | L | (ozf) | 14 | SIH |
| CROWN MOLY GREASE / LIFT TRUCK GREASE, 7041 AEROSOL | 970/WELD | L | (ozf) | 16 | SIH |
| DOW CORNING 732 RTV ADH | 970/WELD | L | (ozd) | 10 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|--|----------|------------|----------|------|----------|
| ESIVE SEALANT | | | | | |
| DYKEM SPRAY LAYOYT GREEN, SP1165 | 970/WELD | L | (ozf) | 24 | SIH |
| DYKEM STEEL BLUE LAY OUT FLUID, SP1100, AEROSOL | 970/WELD | L | (ozf) | 24 | SIH |
| DYKEM STEEL BLUE, DX100 | 970/WELD | L | (ozf) | 36 | SIH |
| DYNA-FLUX CRACK CHECK DEVELOPER | 970/WELD | L | (ozf) | 70 | SIH |
| DYNA-FLUX P-HF CRACK CHECK PENETRANT | 970/WELD | L | (ozf) | 45 | SIH |
| ETHANOL | 970/WELD | L | (qt) | 1 | SIH |
| GALV-ALUM ANTI- CORROSION PRIMER | 970/WELD | L | (gal) | 1 | SIH |
| GENERAL ELECTRIC SILICONE SEALANT, GE112 | 970/WELD | L | (ozd) | 30 | SIH |
| GROWCO ENAMEL, 15526 | 970/WELD | L | (ozf) | 26 | SIH |
| HERCULES CLEAR PVC PRIMER, 60-460 | 970/WELD | L | (pt) | 1 | SIH |
| IRONCAD RETARD RUST INHIBITIVE PRIMER, RED 49320 | 970/WELD | L | (ozf) | 26 | SIH |
| KRYLON ENAMEL, SILVER 1401, 1303 | 970/WELD | L | (ozf) | 44 | SIH |
| LACQUER BLEND, PROFESSIONAL CHOICE NO | 970/WELD | L | (ozf) | 24 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|---|----------|------------|----------|------|----------|
| 861 | | | | | |
| LUBRIPLATE SPRAY GEAR SHIELD SXTRA HEAVY #15263 | 970/WELD | L | (ozf) | 28 | SIH |
| MACCO LIQUID NAILS, 601 | 970/WELD | L | (ozf) | 50 | SIH |
| MACKLEBURG-DUNCAN CAULKING COMPOUND | 970/WELD | L | (ozd) | 40 | SIH |
| MARVEL MYSTERY OIL | 970/WELD | L | (gal) | 1 | SIH |
| METAL PRIMER, MP1 | 970/WELD | L | (qt) | 1 | SIH |
| MOORE'S FLAT PENTAFLEX, BASE 4 114 4A | 970/WELD | L | (gal) | 1 | SIH |
| NEW COLOR HORIZONS ALKYD COATINGS | 970/WELD | L | (gal) | 7 | SIH |
| ORR-LOC ENGIN SPRAY PAINT, SILVER 954, AEROSOL | 970/WELD | L | (ozf) | 12 | SIH |
| PLASTIC COATING | 970/WELD | L | (gal) | 1 | SIH |
| PPG AQUAPON EXTER/INTER GLOSS POLYIMIDE EPOXY CATYLIST,A & B | 970/WELD | L | (gal) | 2 | SIH |
| PROPANE | 970/WELD | L | (ozf) | 70 | SIH |
| RUSTOLEUM SPRAY PAINT HARD HAT 2125, 2175 | 970/WELD | L | (ozf) | 48 | SIH |
| RUSTOLEUM SYSTEM 9300 H | 970/WELD | L | (gal) | 2 | SIH |

Chemical Inventory

| CHEM | LOC_CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|---|----------|------------|----------|------|----------|
| EAVY DUTY POLYAMIDE EPOXY, 9352, 9301 | | | | | |
| S & R GUM TURPENTINE | 970/WELD | L | (qt) | 1 | SIH |
| STARTEX LAQUER THINNER | 970/WELD | L | (gal) | 2 | SIH |
| SURE FOOT NON-SLIP ABRASIVE PAINT | 970/WELD | L | (gal) | 4 | SIH |
| T & R BRAND LACQUER THINNER | 970/WELD | L | (gal) | 4 | SIH |
| TRUE TEST HI Q ENAMEL, U- 16 | 970/WELD | L | (ozf) | 32 | SIH |
| TRUE TEST X-D RUST GRAY PRIMER, 1280 | 970/WELD | L | (ozf) | 144 | SIH |
| WD-40 | 970/WELD | L | (ozf) | 108 | SIH |
| WEEKEND SPRAY PAINT INTERIOR EXTERIOR, 351 | 970/WELD | L | (ozf) | 13 | SIH |
| WELBORN INSTANT SPRAY FINISHES, RUST PREVENTATIVE | 970/WELD | L | (ozf) | 26 | SIH |
| WELBORN RED-SPRAY INDUSTRIAL MAINT ENAMEL | 970/WELD | L | (ozf) | 24 | SIH |
| WELDON PVC CEMENT, 711 | 970/WELD | L | (pt) | 1 | SIH |
| WELDON PVC PRIMER, P-70 | 970/WELD | L | (pt) | 1 | SIH |
| WELLBORN 90 POLYURETHANE FLOOR FINISH | 970/WELD | L | (gal) | 1 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|---------------------------------|-----------|------------|----------|------|----------|
| L A CO. FLUX PASTE KIT | 970/WELD- | S | (ozd) | 8 | SIH |
| MARVEL AIR TOOL OIL | 970/WELD- | L | (qt) | 1 | SIH |
| SPRA KLEEN NO 8666-6 | 970/WELD- | L | (ozf) | 16 | SIH |
| TAPMATIC CUTTING FLUID #1,#2 | 970/WELD- | L | (ozf) | 32 | SIH |

Chemical Inventory

| CHEM | LOC CODE | PHYS STATE | QTY UNIT | MQTY | SCR CRIT |
|--|-----------|------------|----------|------|-----------------|
| ZYNOLYTE EPOXY SPRAY PAINT,SILVER 0607 | 970/WELD | L | (ozf) | 26 | SIH |
| ALL PRO MARINE PAINT REMOVER | 970/WELD- | L | (gal) | 1 | SIH |
| ALL STATE BRAZALOY NO. S- 200 | 970/WELD- | S | (ozf) | 8 | SIH |
| B LINE ANTI-SPATTER, NOZZLE SHIELD B16200, AEROSOL | 970/WELD- | L | (ozf) | 16 | <1 LB. |
| BLACK & DECKER OIL MPTOR OIL # 60539 | 970/WELD- | L | (qt) | 1 | SIH |
| CHEM-SHARP, ULTRA BRAND | 970/WELD- | S | (ozd) | 30 | NON-DISPERSIBLE |
| DAYTON AIR TOOL OIL, 42989 | 970/WELD- | L | (pt) | 1 | SIH |
| DAYTON DEM-KOTE, TEFLON DRY LUBE, 2W757 | 970/WELD- | L | (ozf) | 16 | SIH |
| GEMINI, ANTI-SPLATTER, AEROSOL | 970/WELD- | L | (ozf) | 160 | SIH |
| HYDROLIC OIL HO1 | 970/WELD- | L | (gal) | 1 | SIH |
| IMS SILICONE SPRAY PARTING AGENT NO. S512 | 970/WELD- | L | (ozf) | 24 | SIH |
| KANO AEROKROIL | 970/WELD- | L | (ozf) | 12 | SIH |
| KLEEM-ALL RELAY & CONTACT CLEANER #1604- 165 | 970/WELD- | L | (ozf) | 16 | SIH |

Appendix B

ALOHA Dispersion Model Printouts

Fluorine Release Designations

| | |
|------------------------|------|
| F ₂ -1..... | B-1 |
| F ₂ -2..... | B-10 |
| F ₂ -3..... | B-19 |
| F ₂ -4..... | B-28 |
| F ₂ -5..... | B-37 |
| F ₂ -6..... | B-46 |
| F ₂ -7..... | B-55 |
| F ₂ -8..... | B-64 |

Release Rate Modification for Gaseous Mixtures

The following appendix provides a description of the process used to disperse the fluorine gas mixture through the chemical dispersion model, ALOHA. As with any model, there are limitations. In order to compensate for limitations in the model and to accurately reflect the postulated scenarios described in Section 5.0, compensation adjustments were used in ALOHA. The release rate that reflects the scenarios and the process used to disperse the fluorine gas mixture are described below.

For the purpose of emergency planning, ALOHA serves a vital role in estimating the distance at which protective actions should be initiated. ALOHA provides the tool needed to estimate the area within which special planning and preparedness efforts are warranted, as a means of apportioning preparedness resources to the areas where they are most needed.

Release Rate

ALOHA has a programmed one-hour release rate for gases. The scenarios described in Section 5.0 depict six ten-minute releases (release designations F₂-1 - F₂-6) and two five-minute releases (release designations F₂-7 - F₂-8). In order to utilize ALOHA's one-hour gaseous release rate which releases a gas at a constant rate, the following multiplication applications were used.

For the ten-minute releases, the total fluorine gas mixture inventory for each 10-minute release scenario was multiplied by 6 and was released over the hour. For the five-minute releases, the total fluorine gas mixture inventory for each 5-minute release scenario was multiplied by 12 and was released over the hour.

Dispersing Fluorine Gas Mixture

ALOHA is used to determine the distances at which ERPG-2 and ESHE thresholds are reached for the dispersion of the fluorine gas mixture. However, it's difficult for a model like ALOHA to correctly predict the behavior of a mixture of chemicals. The following methodology describes the process used to disperse the fluorine gas mixture.

The fluorine gas mixture analyzed in this hazards assessment is 5% fluorine and 95% helium. Since 95% of this mixture is an inert gas and no protective actions are warranted if helium is released, compensation measures have been utilized to provide more realistic ERPG-2 and ESHE threshold distances.

Rather than calculating 5% of the total quantity and releasing that to the environment as pure fluorine, the total quantity of the fluorine gas mixture was released as fluorine and 5% of the resultant concentration levels in ppm was then calculated to determine at which distance the ERPG-2 and ESHE thresholds would be reached.

The distances depicted in Section 5.1.1 were rounded to whole numbers. The following chart depicts the actual distances in meters that were input into ALOHA to determine the ERPG-2 and ESHE thresholds.

Actual Distances

| Release Designation | Maximum Distance to | |
|---------------------|---------------------|----------|
| | ERPG-2 (m) | ESHE (m) |
| F ₂ -1 | 30.4 | 19.9903 |
| F ₂ -2 | 6.89 | 4.54 |
| F ₂ -3 | 42.5 | 26.65 |
| F ₂ -4 | 9.75 | 6.42 |
| F ₂ -5 | 52.7 | 30.3 |
| F ₂ -6 | 21.9 | 19.961 |
| F ₂ -7 | 78.3 | 45.5 |
| F ₂ -8 | 31.6 | 23.04 |

Release Designation
F₂-1

Fluorine
Breach of one cylinder

.57 m³ (20 ft³), 10 Minute Release
Worst Case Meteorological Conditions

**SITE DATA INFORMATION:**

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 1 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: F Air Temperature: 68° F
Relative Humidity: 5% Ground Roughness: Open country
Cloud Cover: 1 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 120 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 74.5 grams/min
Total Amount Released: 4.47 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION:

Model Run: Heavy Gas
User specified LOC: equals IDLH (25 ppm)
Max Threat Zone for LOC: 101 meters
Note: The Heavy Gas footprint is an initial screening.
For short releases it may be an overestimation.
Be sure to check concentration information at specific locations.

TIME DEPENDENT INFORMATION:

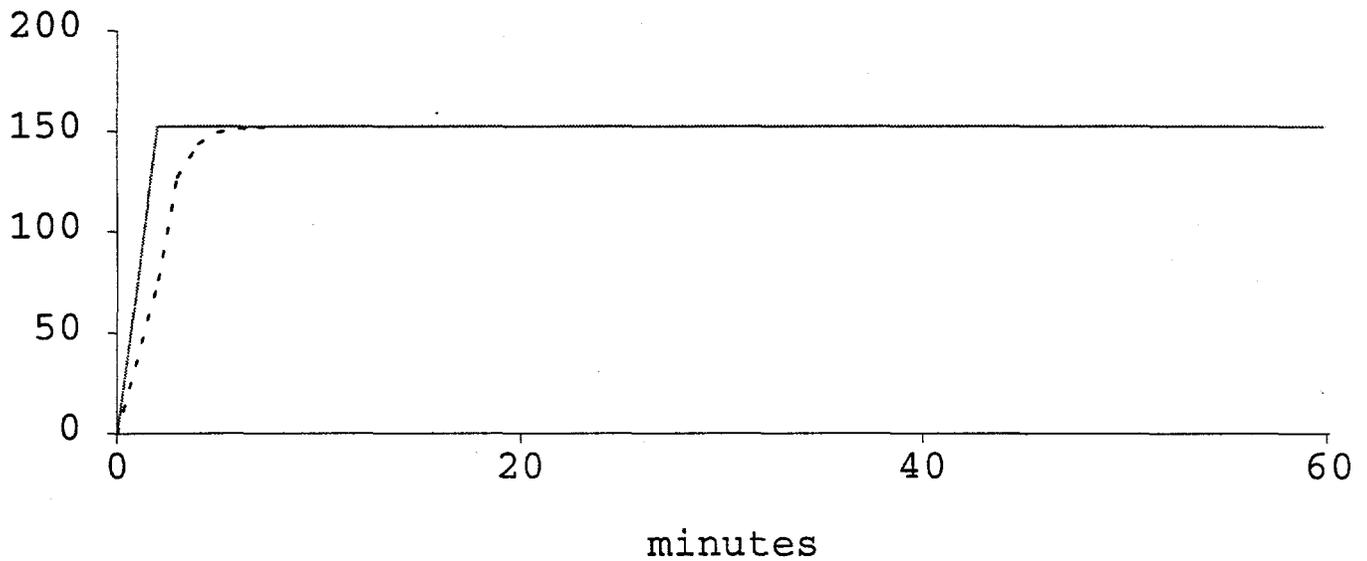
Concentration Estimates at the point:
Downwind: 30 meters
Off Centerline: 0 meters
Max Concentration:
Outdoor: 152 ppm
Indoor: 152 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Heavy Gas
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:
Concentration Estimates at the point:
Downwind: 30 meters
Off Centerline: 0 meters
Max Concentration:
Outdoor: 152 ppm
Indoor: 152 ppm
Note: Indoor graph is shown with a dotted line.

ppm



**SITE DATA INFORMATION:**

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 1 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: F Air Temperature: 68° F
Relative Humidity: 5% Ground Roughness: Open country
Cloud Cover: 1 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 120 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 74.5 grams/min
Total Amount Released: 4.47 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION:

Model Run: Heavy Gas
User specified LOC: equals IDLH (25 ppm)
Max Threat Zone for LOC: 101 meters
Note: The Heavy Gas footprint is an initial screening.
For short releases it may be an overestimation.
Be sure to check concentration information at specific locations.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 100 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 26.5 ppm
 Indoor: 26.5 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Heavy Gas
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 100 meters

Off Centerline: 0 meters

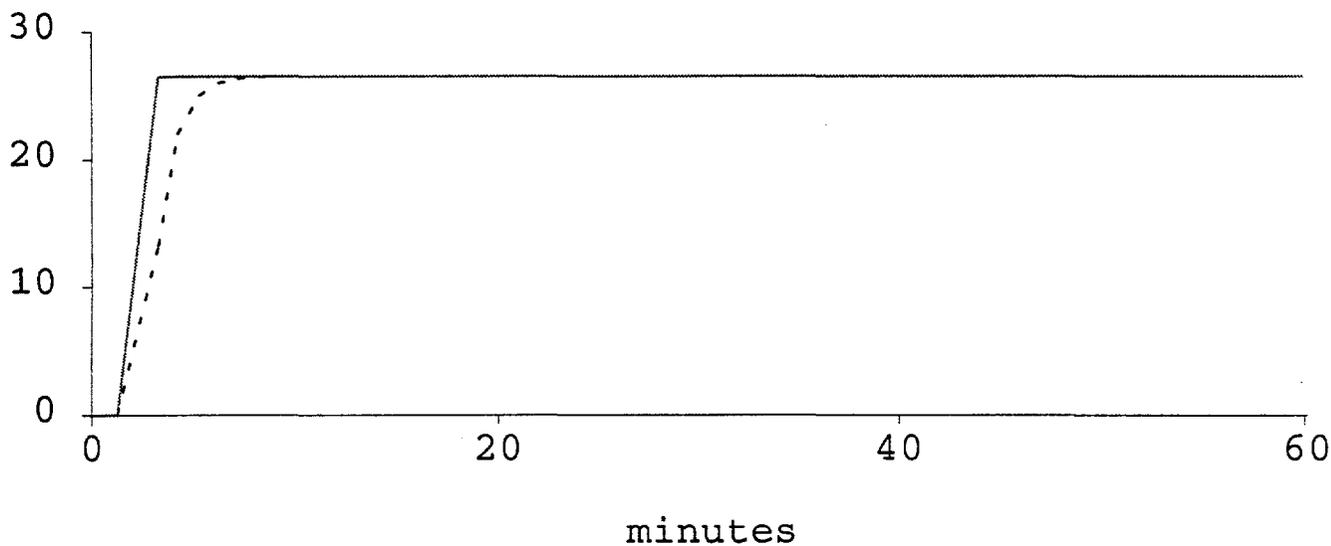
Max Concentration:

Outdoor: 26.5 ppm

Indoor: 26.5 ppm

Note: Indoor graph is shown with a dotted line.

ppm





SITE DATA INFORMATION:

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 1 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: F Air Temperature: 68° F
Relative Humidity: 5% Ground Roughness: Open country
Cloud Cover: 1 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 120 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 74.5 grams/min
Total Amount Released: 4.47 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION:

Model Run: Heavy Gas
User specified LOC: equals IDLH (25 ppm)
Max Threat Zone for LOC: 101 meters
Note: The Heavy Gas footprint is an initial screening.
For short releases it may be an overestimation.
Be sure to check concentration information at specific locations.

TIME DEPENDENT INFORMATION:

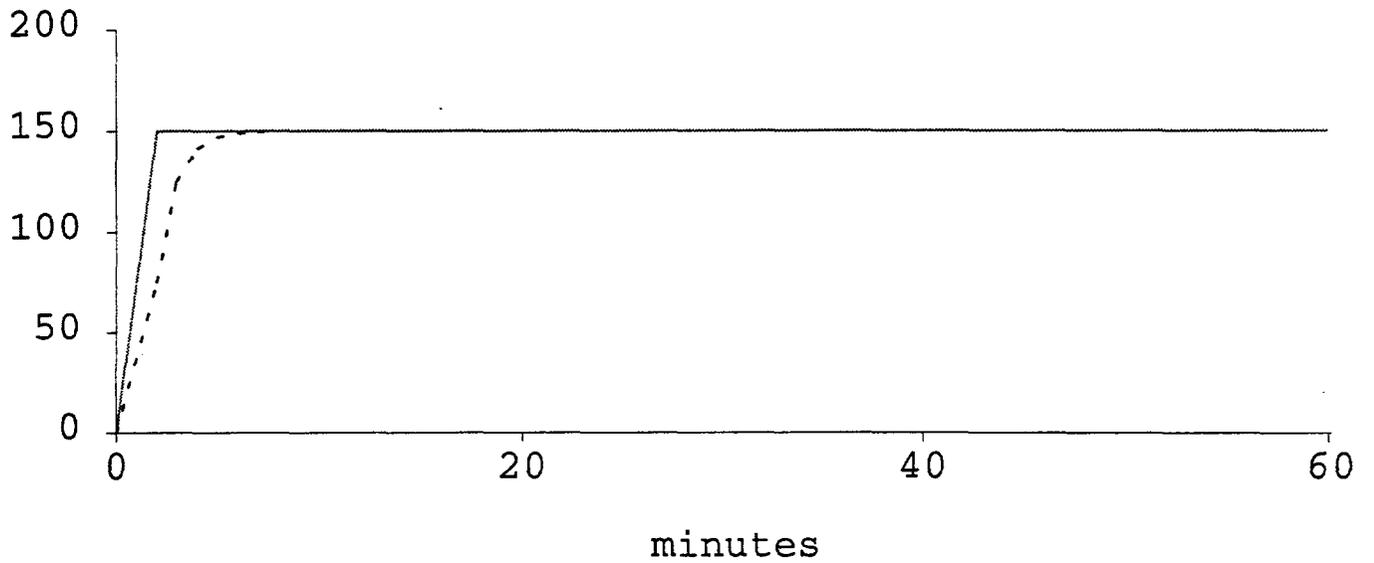
Concentration Estimates at the point:
Downwind: 30 meters
Off Centerline: 0 meters
Max Concentration:
Outdoor: 150 ppm
Indoor: 150 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Heavy Gas
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:
Concentration Estimates at the point:
Downwind: 30 meters
Off Centerline: 0 meters
Max Concentration:
Outdoor: 150 ppm
Indoor: 150 ppm
Note: Indoor graph is shown with a dotted line.

ppm



**SITE DATA INFORMATION:**

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 1 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: F Air Temperature: 68° F
Relative Humidity: 5% Ground Roughness: Open country
Cloud Cover: 1 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 120 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 74.5 grams/min
Total Amount Released: 4.47 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION:

Model Run: Heavy Gas
User specified LOC: equals IDLH (25 ppm)
Max Threat Zone for LOC: 101 meters
Note: The Heavy Gas footprint is an initial screening.
For short releases it may be an overestimation.
Be sure to check concentration information at specific locations.

TIME DEPENDENT INFORMATION:

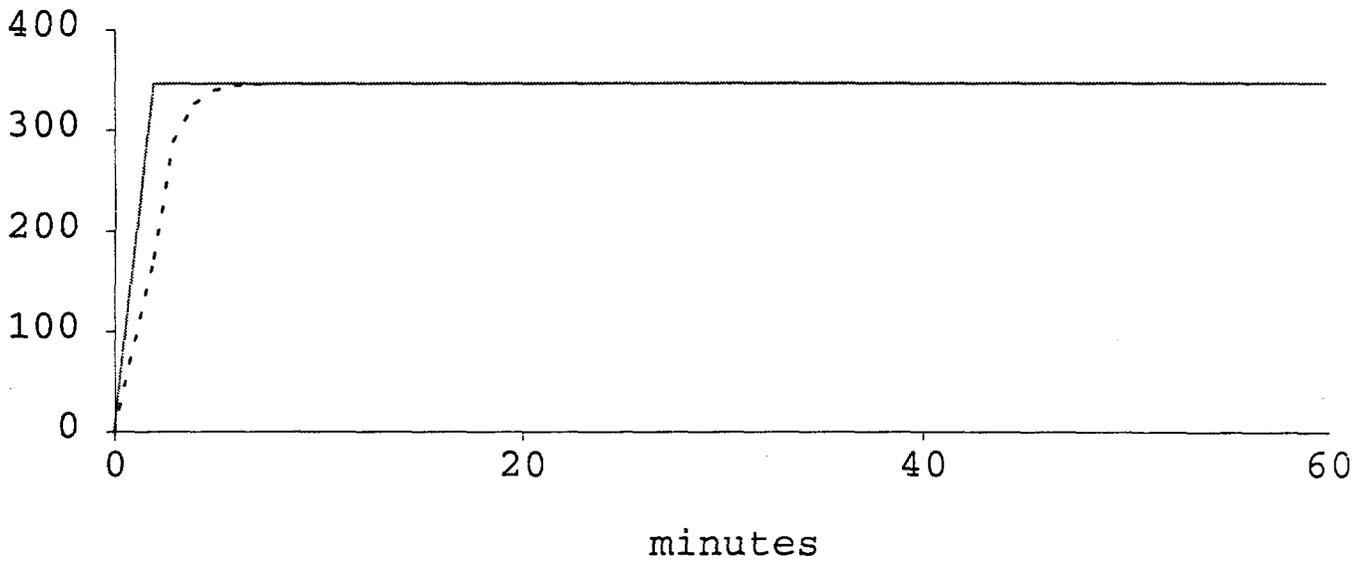
Concentration Estimates at the point:
Downwind: 20 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 345 ppm
 Indoor: 345 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Heavy Gas
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:
Concentration Estimates at the point:
Downwind: 20 meters
Off Centerline: 0 meters
Max Concentration:
Outdoor: 345 ppm
Indoor: 345 ppm
Note: Indoor graph is shown with a dotted line.

ppm



Release Designation

F₂-2

Fluorine

Breach of one cylinder

*.57 m³ (20 ft³), 10 Minute Release
Average Meteorological Conditions*

**SITE DATA INFORMATION:**

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: C Air Temperature: 68° F
Relative Humidity: 25% Ground Roughness: Open country
Cloud Cover: 3 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 120 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 74.5 grams/min
Total Amount Released: 4.47 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 30 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 7.93 ppm
 Indoor: 7.93 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Gaussian
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 30 meters

Off Centerline: 0 meters

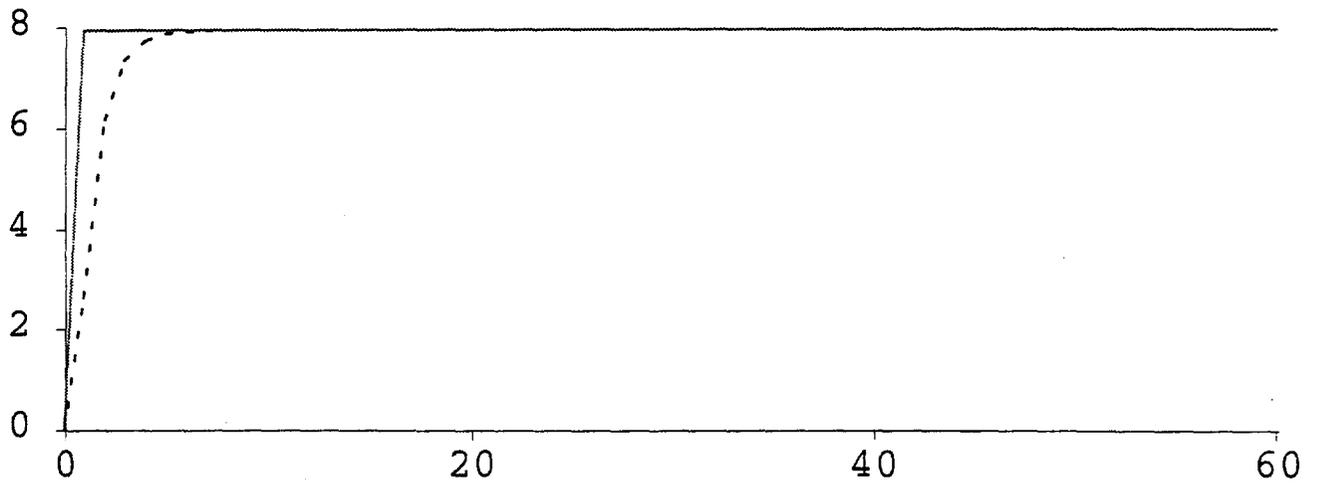
Max Concentration:

Outdoor: 7.93 ppm

Indoor: 7.93 ppm

Note: Indoor graph is shown with a dotted line.

ppm



minutes



SITE DATA INFORMATION:

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: C Air Temperature: 68° F
Relative Humidity: 25% Ground Roughness: Open country
Cloud Cover: 3 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 120 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 74.5 grams/min
Total Amount Released: 4.47 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 100 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 0.721 ppm
 Indoor: 0.721 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Gaussian
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 100 meters

Off Centerline: 0 meters

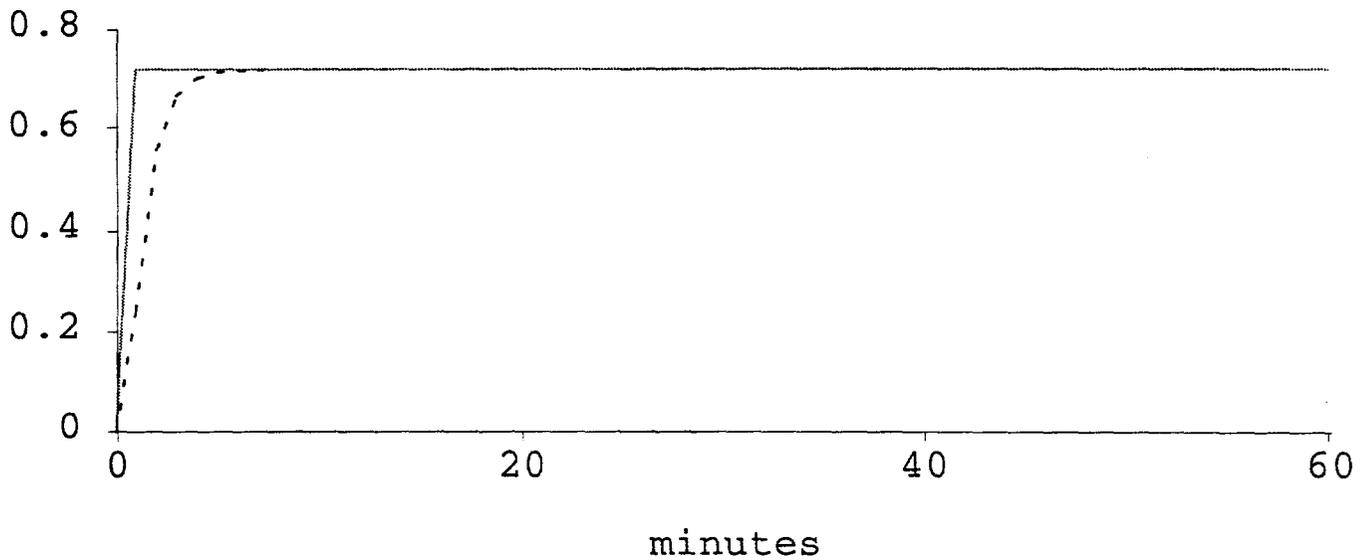
Max Concentration:

Outdoor: 0.721 ppm

Indoor: 0.721 ppm

Note: Indoor graph is shown with a dotted line.

ppm



**SITE DATA INFORMATION:**

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: C Air Temperature: 68° F
Relative Humidity: 25% Ground Roughness: Open country
Cloud Cover: 3 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 120 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 74.5 grams/min
Total Amount Released: 4.47 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 7 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 150 ppm
 Indoor: 150 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Gaussian
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 7 meters

Off Centerline: 0 meters

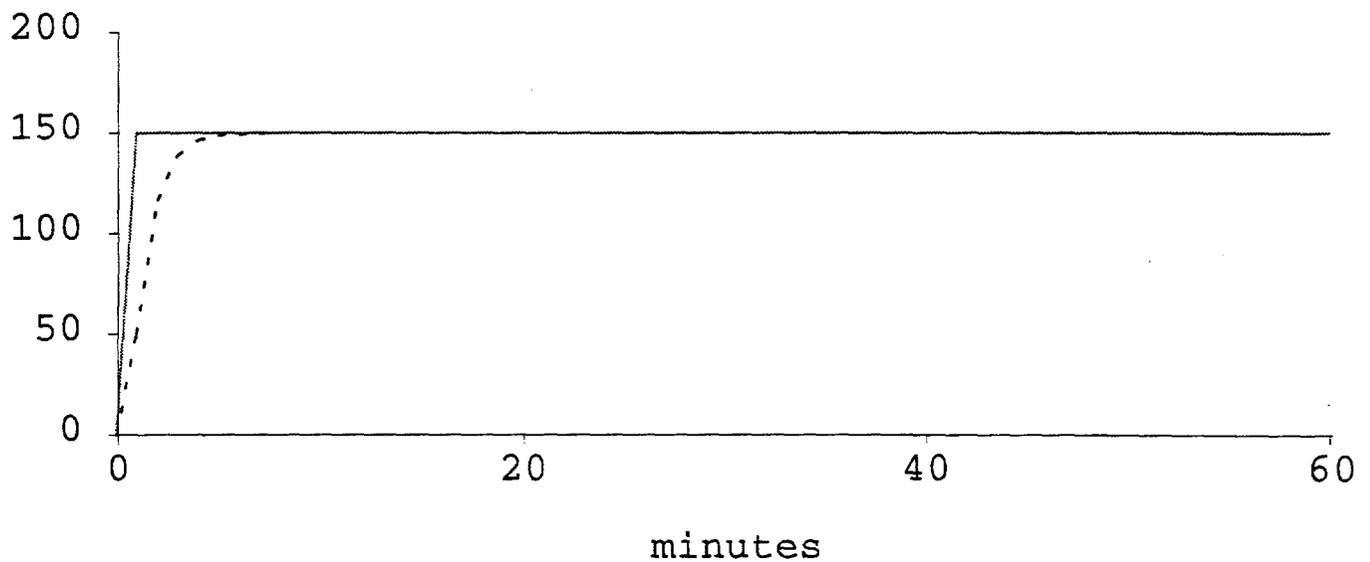
Max Concentration:

Outdoor: 150 ppm

Indoor: 150 ppm

Note: Indoor graph is shown with a dotted line.

ppm





SITE DATA INFORMATION:

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: C Air Temperature: 68° F
Relative Humidity: 25% Ground Roughness: Open country
Cloud Cover: 3 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 120 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 74.5 grams/min
Total Amount Released: 4.47 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 5 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 345 ppm
 Indoor: 345 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Gaussian
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 5 meters

Off Centerline: 0 meters

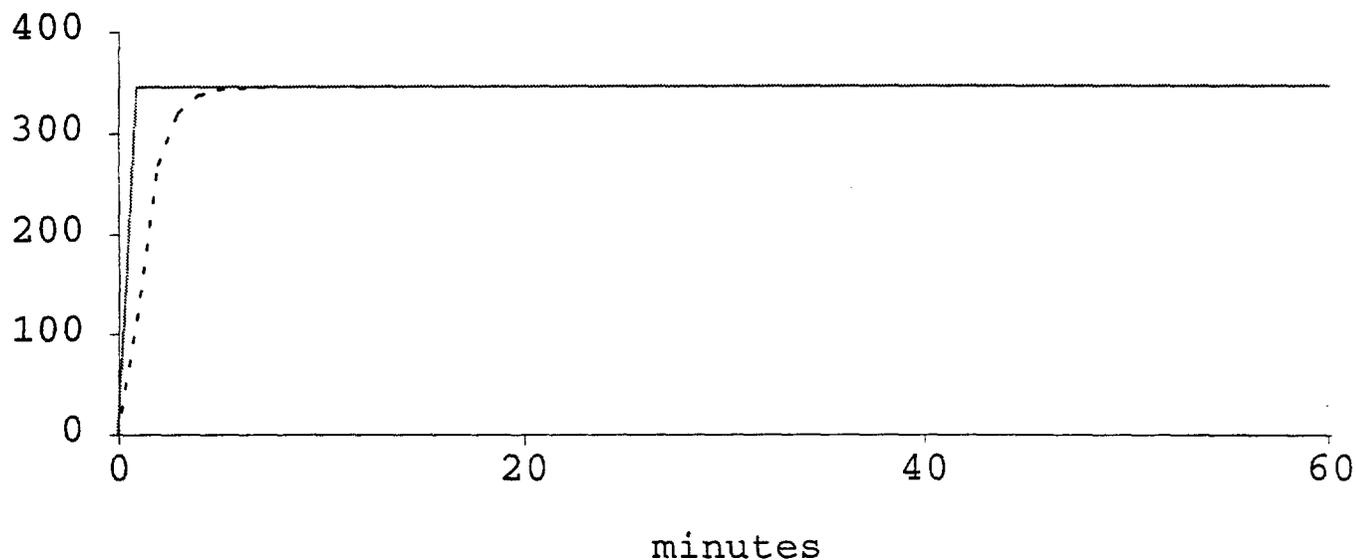
Max Concentration:

Outdoor: 345 ppm

Indoor: 345 ppm

Note: Indoor graph is shown with a dotted line.

ppm



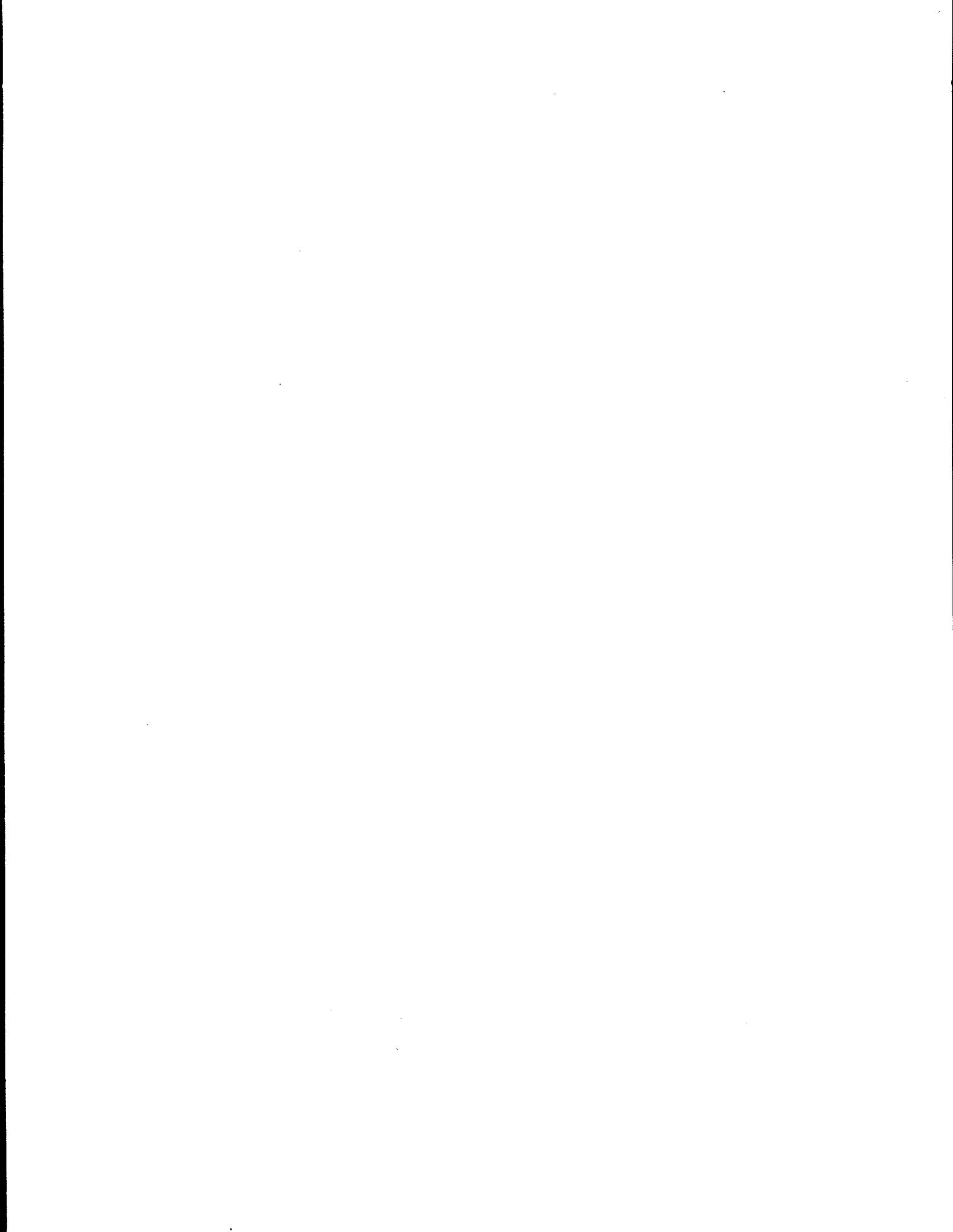
Release Designation

F₂-3

Fluorine

Breach of two cylinders

*1.1 m³ (40 ft³), 10 Minute Release
Worst Case Meteorological Conditions*



**SITE DATA INFORMATION:**

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 1 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: F Air Temperature: 68° F
Relative Humidity: 5% Ground Roughness: Open country
Cloud Cover: 1 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 240 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 149 grams/min
Total Amount Released: 8.94 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION:

Model Run: Heavy Gas
User specified LOC: equals IDLH (25 ppm)
Max Threat Zone for LOC: 140 meters
Note: The Heavy Gas footprint is an initial screening.
For short releases it may be an overestimation.
Be sure to check concentration information at specific locations.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 30 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 256 ppm
 Indoor: 256 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Heavy Gas
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 30 meters

Off Centerline: 0 meters

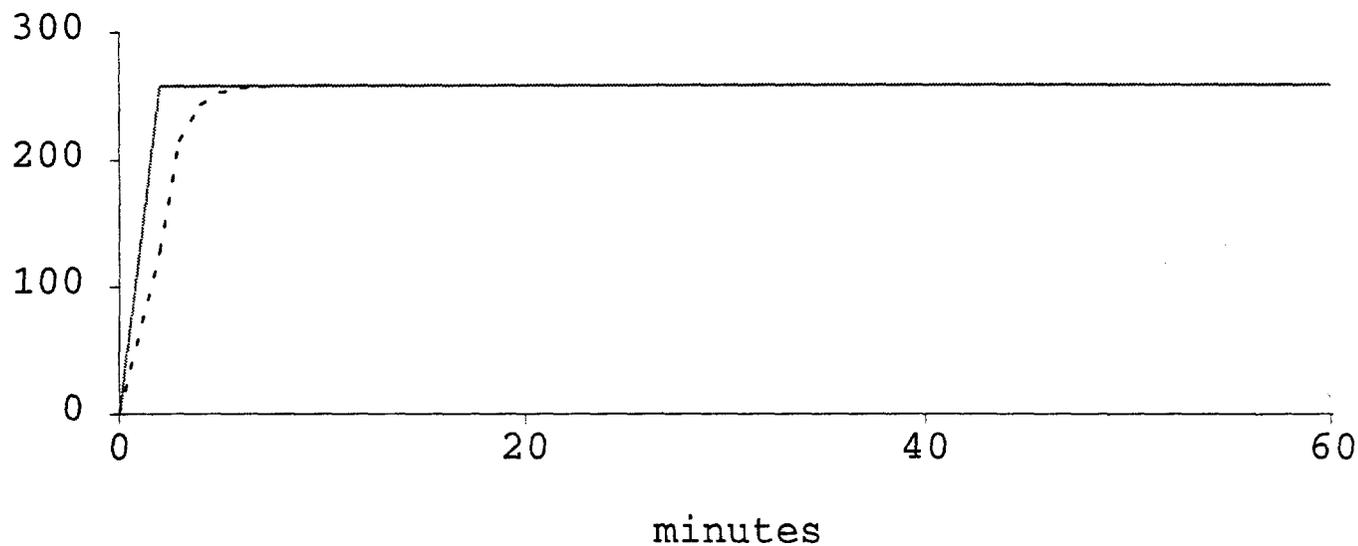
Max Concentration:

Outdoor: 256 ppm

Indoor: 256 ppm

Note: Indoor graph is shown with a dotted line.

ppm



**SITE DATA INFORMATION:**

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 1 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: F Air Temperature: 68° F
Relative Humidity: 5% Ground Roughness: Open country
Cloud Cover: 1 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 240 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 149 grams/min
Total Amount Released: 8.94 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION:

Model Run: Heavy Gas
User specified LOC: equals IDLH (25 ppm)
Max Threat Zone for LOC: 140 meters
Note: The Heavy Gas footprint is an initial screening.
For short releases it may be an overestimation.
Be sure to check concentration information at specific locations.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 100 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 42.9 ppm
 Indoor: 42.9 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Heavy Gas
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 100 meters

Off Centerline: 0 meters

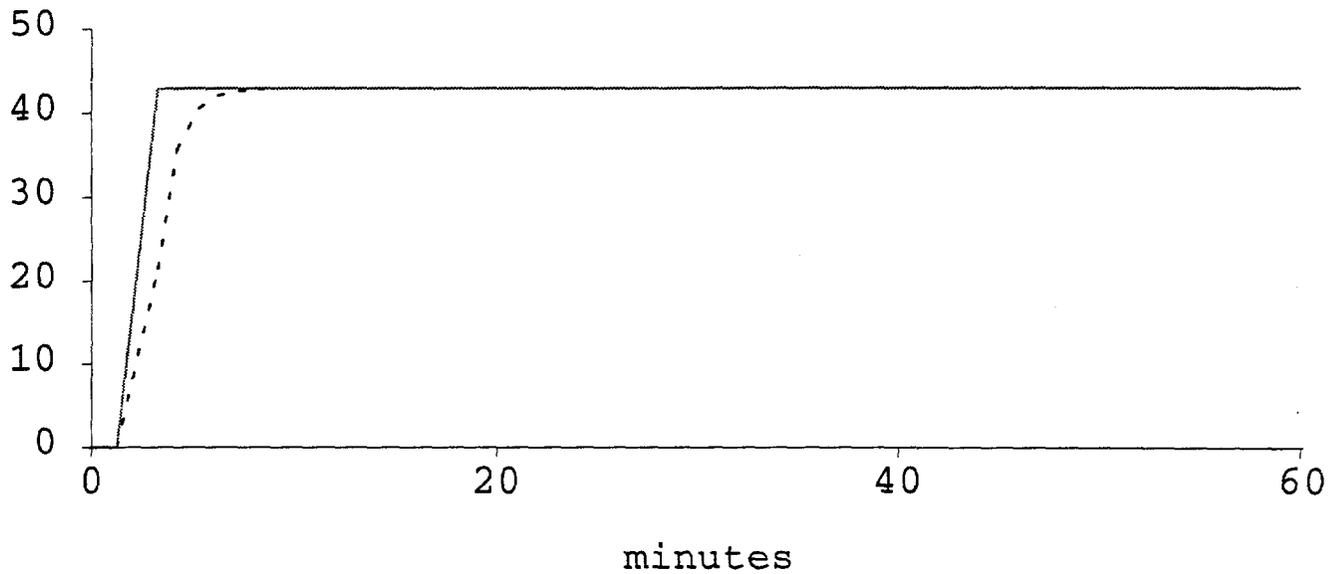
Max Concentration:

Outdoor: 42.9 ppm

Indoor: 42.9 ppm

Note: Indoor graph is shown with a dotted line.

ppm



**SITE DATA INFORMATION:**

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 1 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: F Air Temperature: 68° F
Relative Humidity: 5% Ground Roughness: Open country
Cloud Cover: 1 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 240 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 149 grams/min
Total Amount Released: 8.94 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION:

Model Run: Heavy Gas
User specified LOC: equals IDLH (25 ppm)
Max Threat Zone for LOC: 140 meters
Note: The Heavy Gas footprint is an initial screening.
For short releases it may be an overestimation.
Be sure to check concentration information at specific locations.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 43 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 150 ppm
 Indoor: 150 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Heavy Gas
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 43 meters

Off Centerline: 0 meters

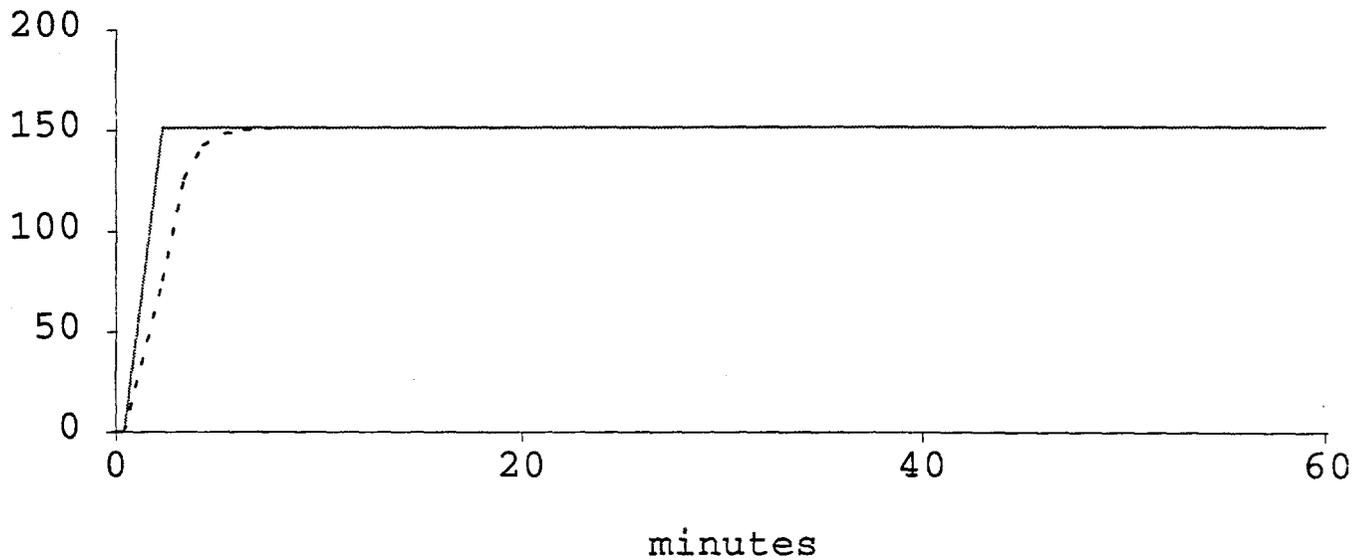
Max Concentration:

Outdoor: 150 ppm

Indoor: 150 ppm

Note: Indoor graph is shown with a dotted line.

ppm





SITE DATA INFORMATION:

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 1 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: F Air Temperature: 68° F
Relative Humidity: 5% Ground Roughness: Open country
Cloud Cover: 1 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 240 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 149 grams/min
Total Amount Released: 8.94 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION:

Model Run: Heavy Gas
User specified LOC: equals IDLH (25 ppm)
Max Threat Zone for LOC: 140 meters
Note: The Heavy Gas footprint is an initial screening.
For short releases it may be an overestimation.
Be sure to check concentration information at specific locations.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 27 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 345 ppm
 Indoor: 345 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Heavy Gas
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 27 meters

Off Centerline: 0 meters

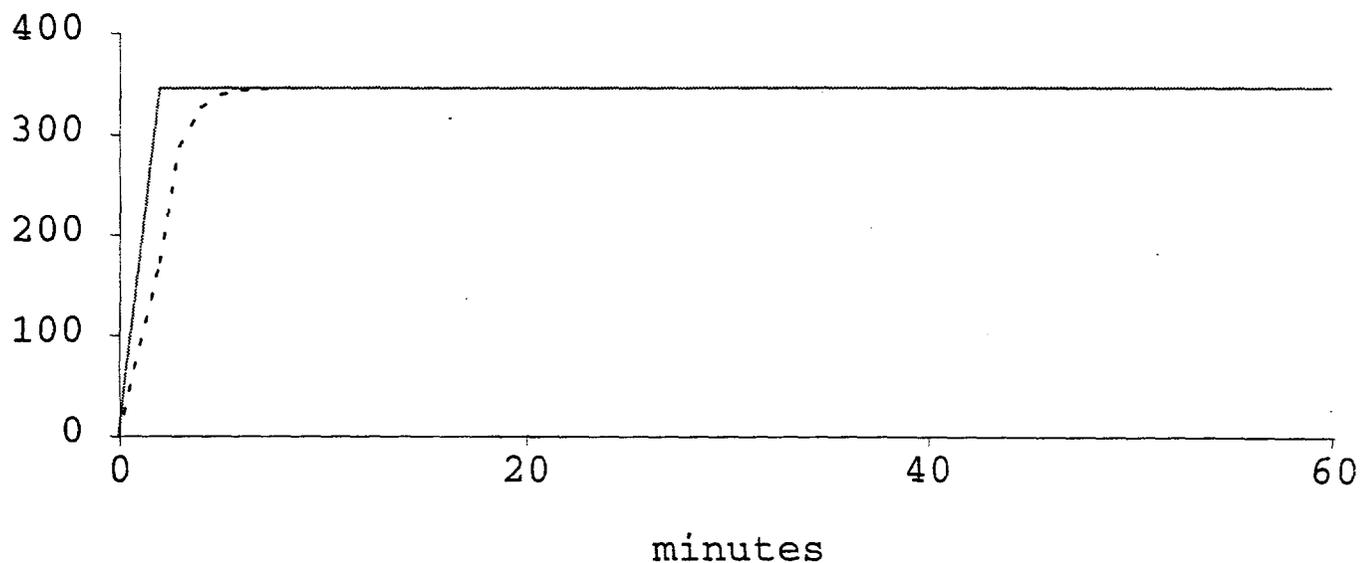
Max Concentration:

Outdoor: 345 ppm

Indoor: 345 ppm

Note: Indoor graph is shown with a dotted line.

ppm



Release Designation

F₂-4

Fluorine

Breach of two cylinders

*1.1 m³ (40 ft³), 10 Minute Release
Average Meteorological Conditions*

**SITE DATA INFORMATION:**

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: C Air Temperature: 68° F
Relative Humidity: 25% Ground Roughness: Open country
Cloud Cover: 3 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 240 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 149 grams/min
Total Amount Released: 8.94 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 30 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 15.9 ppm
 Indoor: 15.9 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Gaussian
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 30 meters

Off Centerline: 0 meters

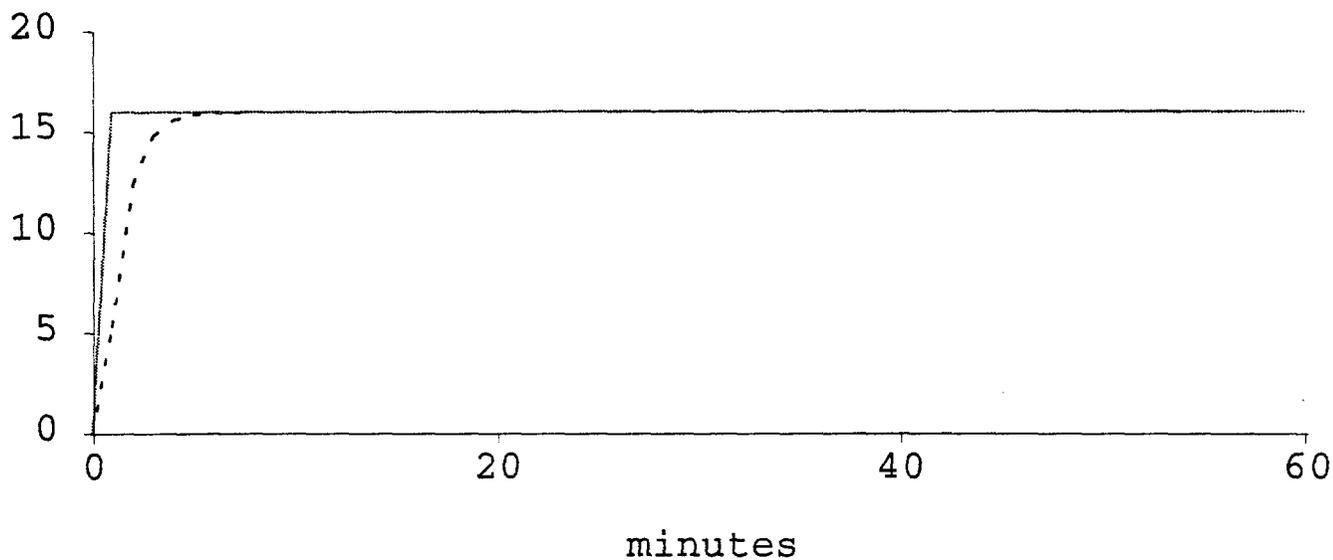
Max Concentration:

Outdoor: 15.9 ppm

Indoor: 15.9 ppm

Note: Indoor graph is shown with a dotted line.

ppm





SITE DATA INFORMATION:

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: C Air Temperature: 68° F
Relative Humidity: 25% Ground Roughness: Open country
Cloud Cover: 3 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 240 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 149 grams/min
Total Amount Released: 8.94 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 100 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 1.44 ppm
 Indoor: 1.44 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Gaussian
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 100 meters

Off Centerline: 0 meters

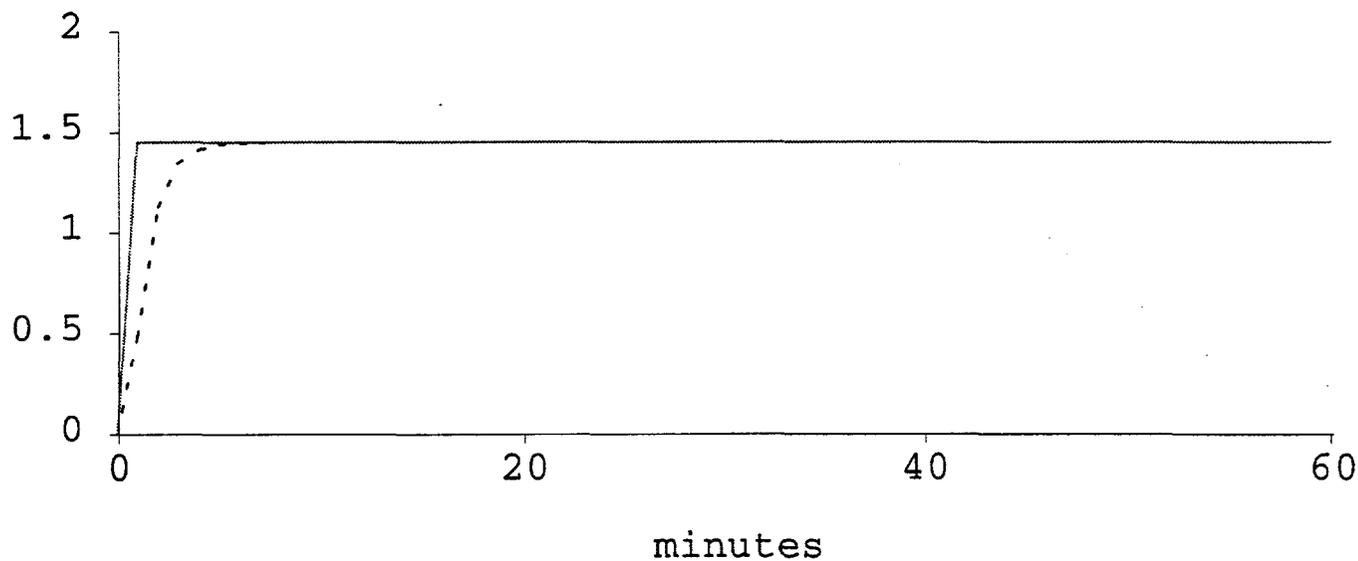
Max Concentration:

Outdoor: 1.44 ppm

Indoor: 1.44 ppm

Note: Indoor graph is shown with a dotted line.

ppm



**SITE DATA INFORMATION:**

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: C Air Temperature: 68° F
Relative Humidity: 25% Ground Roughness: Open country
Cloud Cover: 3 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 240 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 149 grams/min
Total Amount Released: 8.94 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 10 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 150 ppm
 Indoor: 150 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Gaussian
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 10 meters

Off Centerline: 0 meters

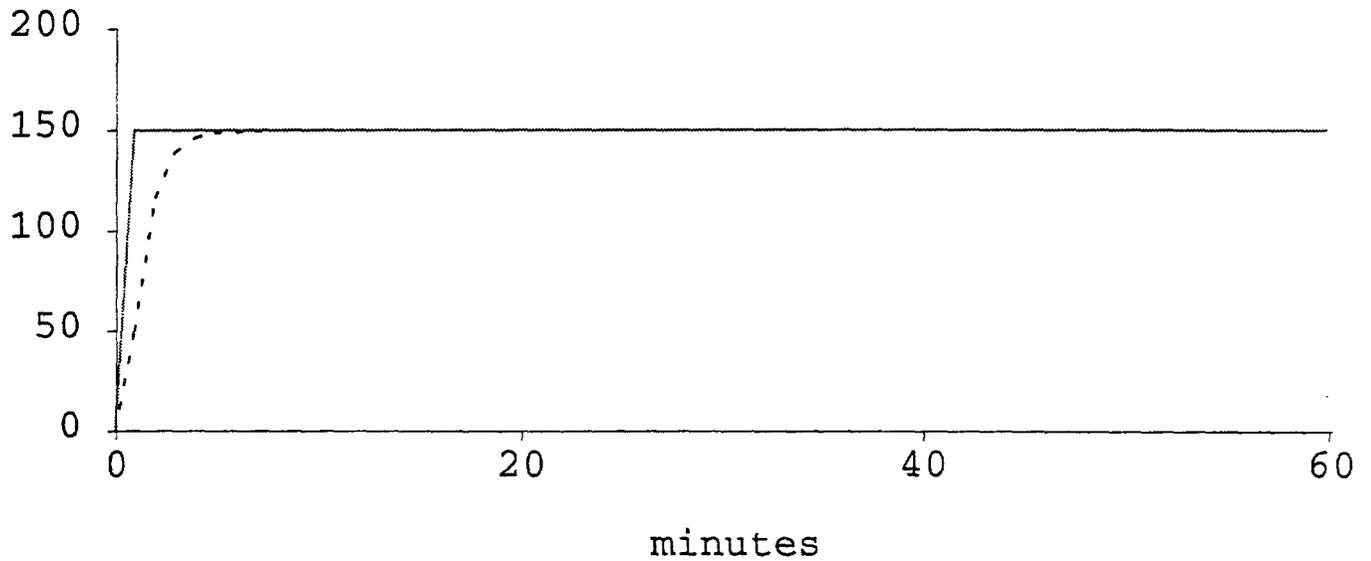
Max Concentration:

Outdoor: 150 ppm

Indoor: 150 ppm

Note: Indoor graph is shown with a dotted line.

ppm



**SITE DATA INFORMATION:**

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: C Air Temperature: 68° F
Relative Humidity: 25% Ground Roughness: Open country
Cloud Cover: 3 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 240 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 149 grams/min
Total Amount Released: 8.94 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 6 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 345 ppm
 Indoor: 345 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Gaussian
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 6 meters

Off Centerline: 0 meters

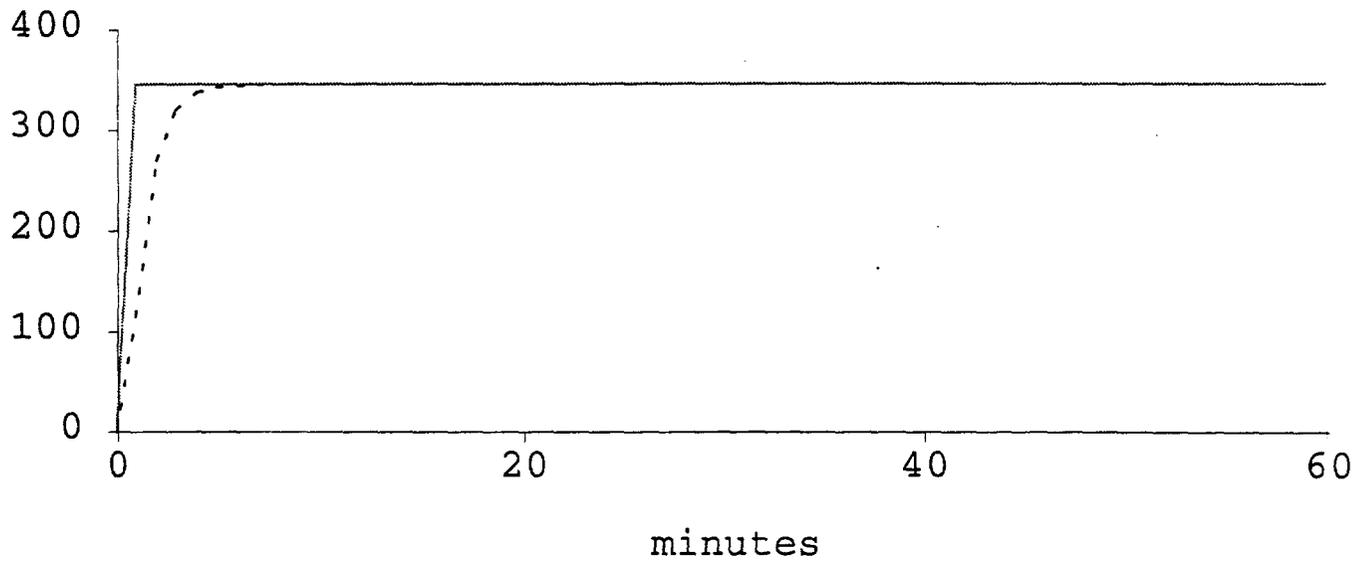
Max Concentration:

Outdoor: 345 ppm

Indoor: 345 ppm

Note: Indoor graph is shown with a dotted line.

ppm



Release Designation

F₂-5

Fluorine

Breach of three cylinders

*1.7 m³ (60 ft³), 10 Minute Release
Worst Case Meteorological Conditions*



SITE DATA INFORMATION:

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 1 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: F Air Temperature: 68° F
Relative Humidity: 5% Ground Roughness: Open country
Cloud Cover: 1 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 360 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 223 grams/min
Total Amount Released: 13.4 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION:

Model Run: Heavy Gas
User specified LOC: equals IDLH (25 ppm)
Max Threat Zone for LOC: 169 meters
Note: The Heavy Gas footprint is an initial screening.
For short releases it may be an overestimation.
Be sure to check concentration information at specific locations.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 30 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 349 ppm
 Indoor: 349 ppm
Note: Indoor graph is shown with a dotted line.

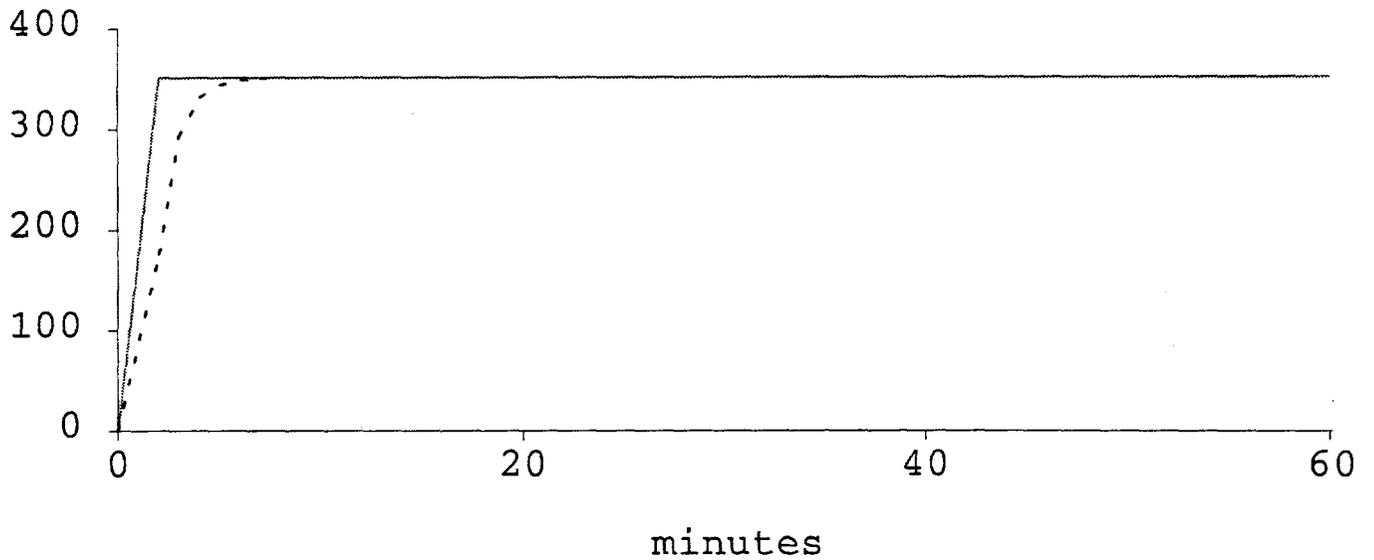


Chemical Name: FLUORINE
Model Run: Heavy Gas
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 30 meters
Off Centerline: 0 meters
Max Concentration:
Outdoor: 349 ppm
Indoor: 349 ppm
Note: Indoor graph is shown with a dotted line.

ppm



**SITE DATA INFORMATION:**

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 1 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: F Air Temperature: 68° F
Relative Humidity: 5% Ground Roughness: Open country
Cloud Cover: 1 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 360 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 223 grams/min
Total Amount Released: 13.4 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION:

Model Run: Heavy Gas
User specified LOC: equals IDLH (25 ppm)
Max Threat Zone for LOC: 169 meters
Note: The Heavy Gas footprint is an initial screening.
For short releases it may be an overestimation.
Be sure to check concentration information at specific locations.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 100 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 57.2 ppm
 Indoor: 57.2 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Heavy Gas
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 100 meters

Off Centerline: 0 meters

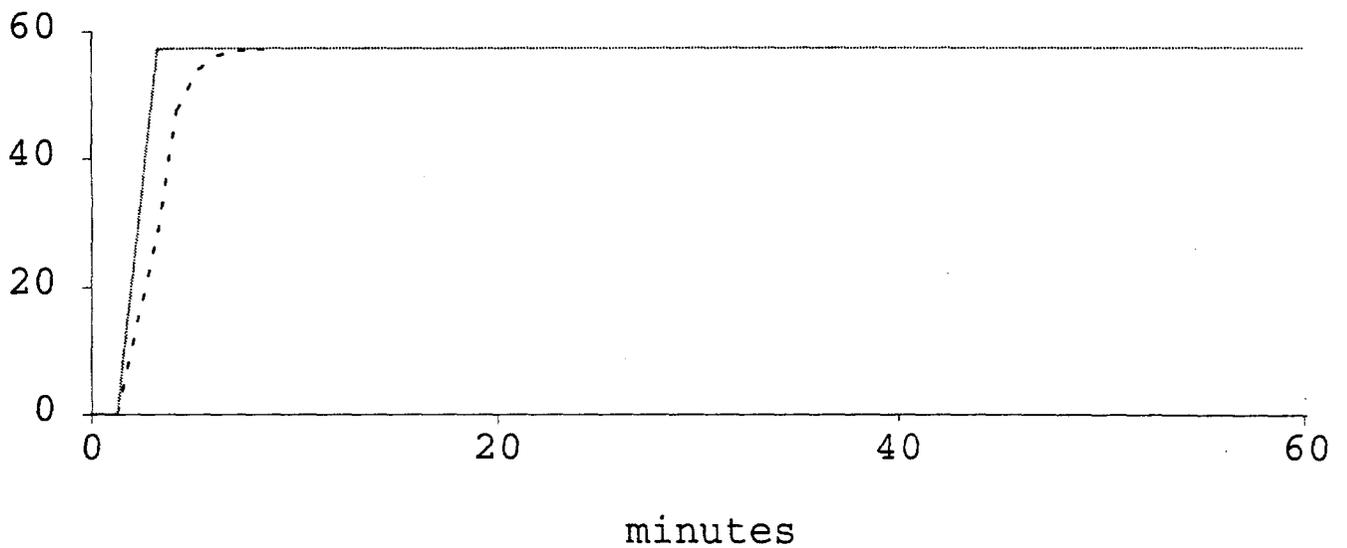
Max Concentration:

Outdoor: 57.2 ppm

Indoor: 57.2 ppm

Note: Indoor graph is shown with a dotted line.

ppm



**SITE DATA INFORMATION:**

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 1 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: F Air Temperature: 68° F
Relative Humidity: 5% Ground Roughness: Open country
Cloud Cover: 1 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 360 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 223 grams/min
Total Amount Released: 13.4 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION:

Model Run: Heavy Gas
User specified LOC: equals IDLH (25 ppm)
Max Threat Zone for LOC: 169 meters
Note: The Heavy Gas footprint is an initial screening.
For short releases it may be an overestimation.
Be sure to check concentration information at specific locations.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 53 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 150 ppm
 Indoor: 150 ppm
Note: Indoor graph is shown with a dotted line.

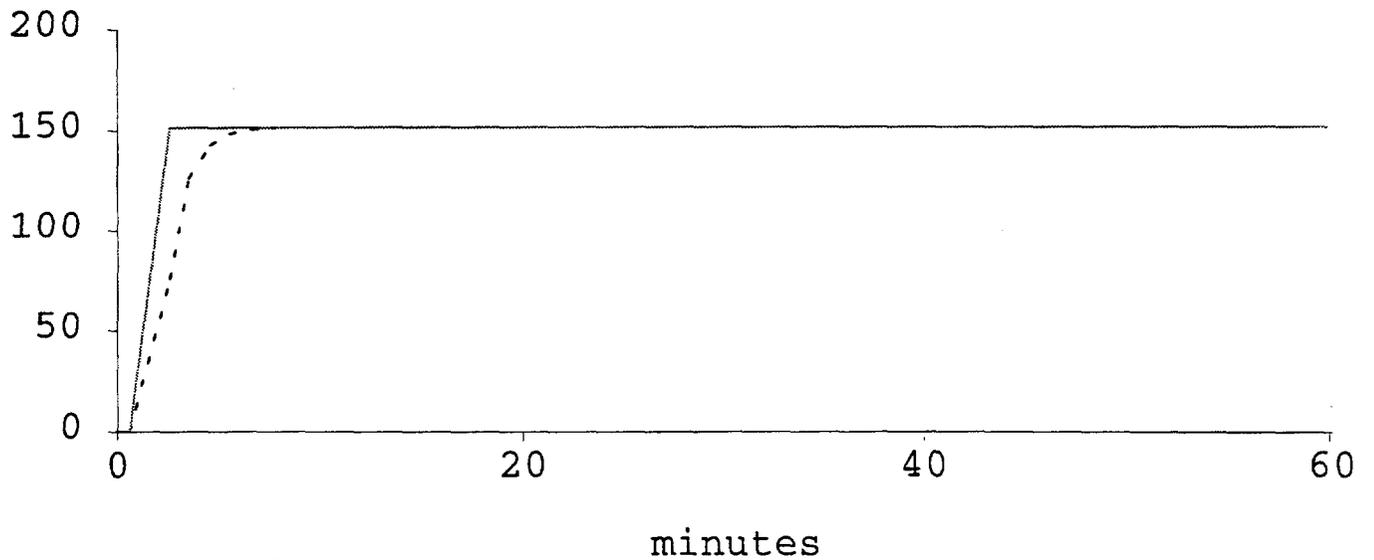


Chemical Name: FLUORINE
Model Run: Heavy Gas
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 53 meters
Off Centerline: 0 meters
Max Concentration:
Outdoor: 150 ppm
Indoor: 150 ppm
Note: Indoor graph is shown with a dotted line.

ppm





SITE DATA INFORMATION:

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 1 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: F Air Temperature: 68° F
Relative Humidity: 5% Ground Roughness: Open country
Cloud Cover: 1 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 360 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 223 grams/min
Total Amount Released: 13.4 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION:

Model Run: Heavy Gas
User specified LOC: equals IDLH (25 ppm)
Max Threat Zone for LOC: 169 meters
Note: The Heavy Gas footprint is an initial screening.
For short releases it may be an overestimation.
Be sure to check concentration information at specific locations.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 30 meters
Off Centerline: 0 meters
Max Concentration:
Outdoor: 345 ppm
Indoor: 345 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Heavy Gas
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 30 meters

Off Centerline: 0 meters

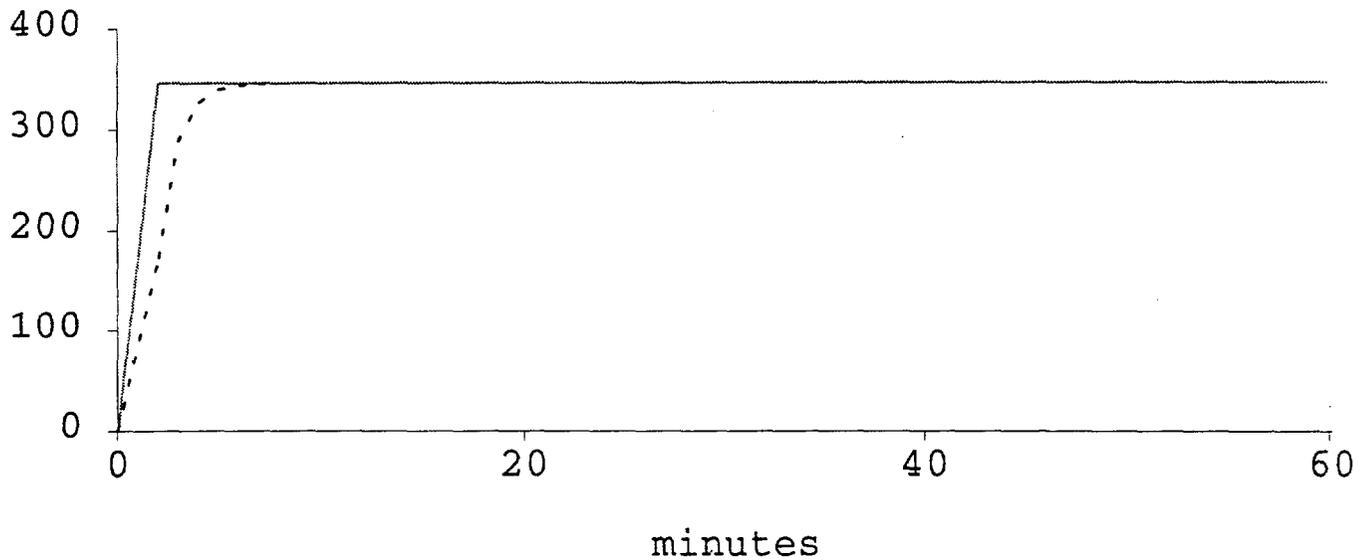
Max Concentration:

Outdoor: 345 ppm

Indoor: 345 ppm

Note: Indoor graph is shown with a dotted line.

ppm



Release Designation

F₂-6

Fluorine

Breach of three cylinders

*1.7 m³ (60 ft³), 10 Minute Release
Average Meteorological Conditions*

**SITE DATA INFORMATION:**

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: C Air Temperature: 68° F
Relative Humidity: 25% Ground Roughness: Open country
Cloud Cover: 3 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 360 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 223 grams/min
Total Amount Released: 13.4 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION:

Model Run: Heavy Gas
User specified LOC: equals IDLH (25 ppm)
Max Threat Zone for LOC: 48 meters
Note: Footprint wasn't drawn because effects of near-field patchiness make plume presentation unreliable for short distances.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 30 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 67.9 ppm
 Indoor: 67.9 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Heavy Gas
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 30 meters

Off Centerline: 0 meters

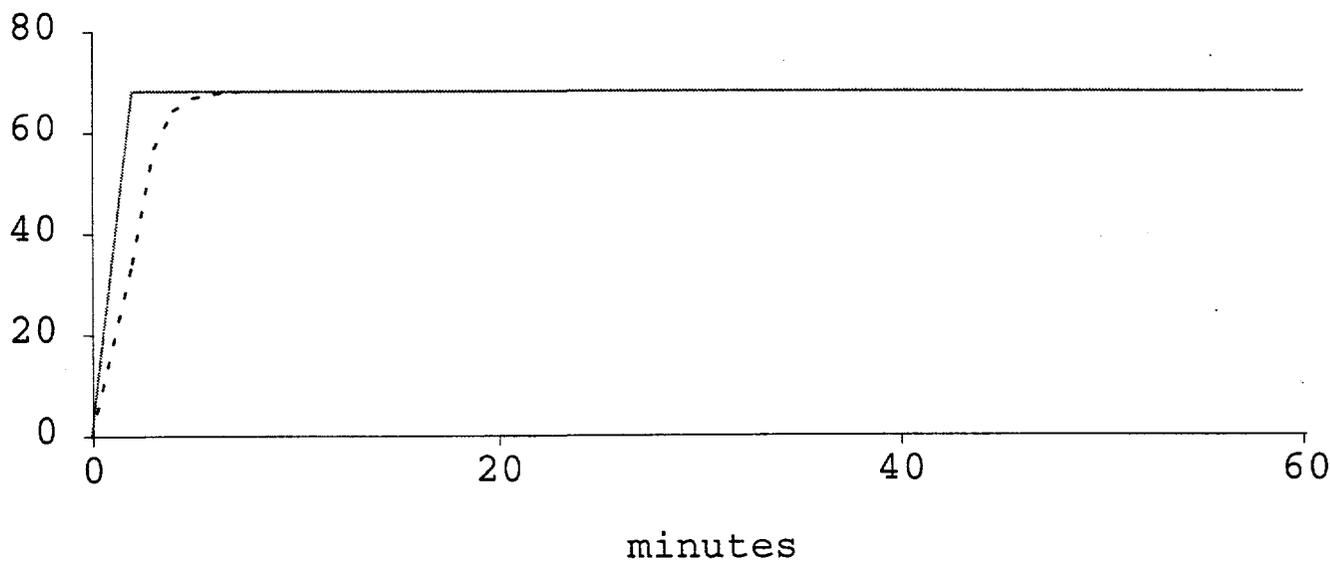
Max Concentration:

Outdoor: 67.9 ppm

Indoor: 67.9 ppm

Note: Indoor graph is shown with a dotted line.

ppm





SITE DATA INFORMATION:

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: C Air Temperature: 68° F
Relative Humidity: 25% Ground Roughness: Open country
Cloud Cover: 3 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 360 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 223 grams/min
Total Amount Released: 13.4 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION:

Model Run: Heavy Gas
User specified LOC: equals IDLH (25 ppm)
Max Threat Zone for LOC: 48 meters
Note: Footprint wasn't drawn because effects of near-field patchiness make plume presentation unreliable for short distances.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 100 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 6.34 ppm
 Indoor: 6.34 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Heavy Gas
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 100 meters

Off Centerline: 0 meters

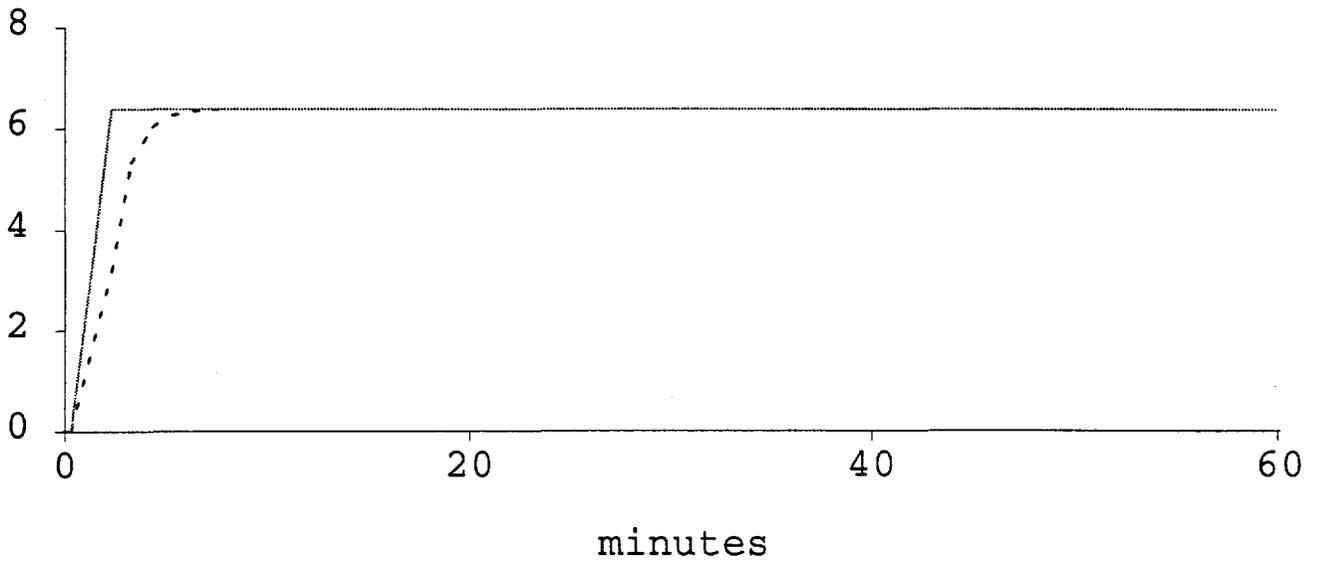
Max Concentration:

Outdoor: 6.34 ppm

Indoor: 6.34 ppm

Note: Indoor graph is shown with a dotted line.

ppm





SITE DATA INFORMATION:

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: C Air Temperature: 68° F
Relative Humidity: 25% Ground Roughness: Open country
Cloud Cover: 3 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 360 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 223 grams/min
Total Amount Released: 13.4 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION:

Model Run: Heavy Gas
User specified LOC: equals IDLH (25 ppm)
Max Threat Zone for LOC: 48 meters
Note: Footprint wasn't drawn because effects of
near-field patchiness make plume presentation
unreliable for short distances.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 22 meters
Off Centerline: 0 meters
Max Concentration:
Outdoor: 150 ppm
Indoor: 150 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Heavy Gas
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 22 meters

Off Centerline: 0 meters

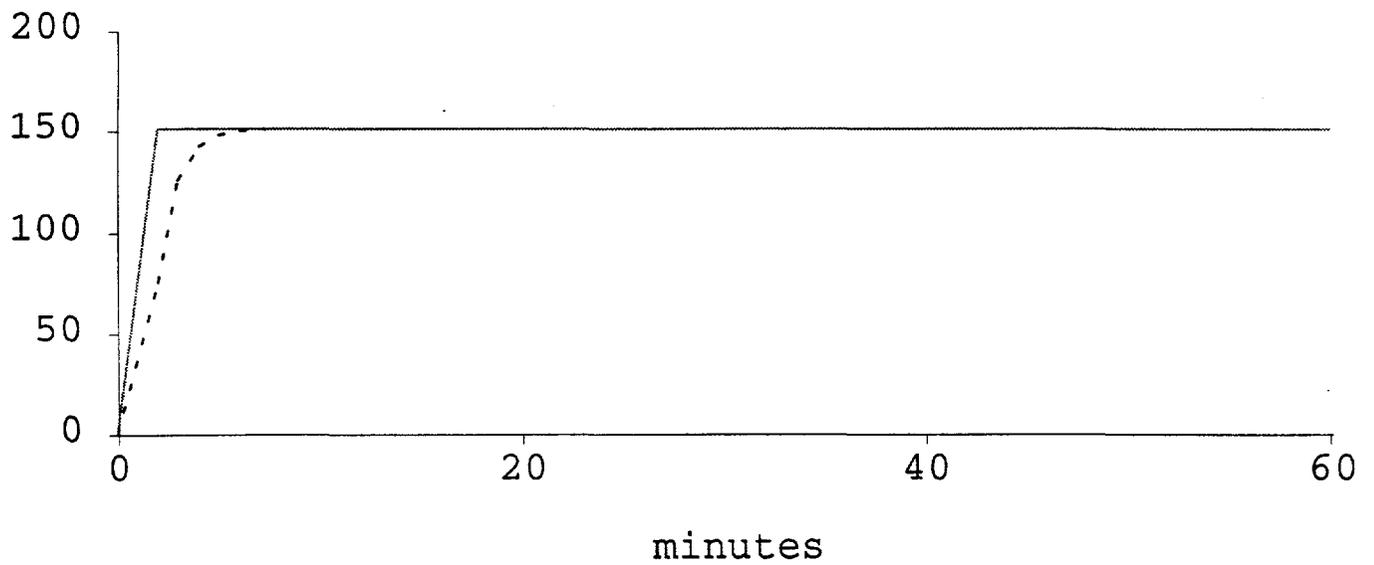
Max Concentration:

Outdoor: 150 ppm

Indoor: 150 ppm

Note: Indoor graph is shown with a dotted line.

ppm



**SITE DATA INFORMATION:**

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: C Air Temperature: 68° F
Relative Humidity: 25% Ground Roughness: Open country
Cloud Cover: 3 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 360 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 223 grams/min
Total Amount Released: 13.4 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION:

Model Run: Heavy Gas
User specified LOC: equals IDLH (25 ppm)
Max Threat Zone for LOC: 48 meters
Note: Footprint wasn't drawn because effects of near-field patchiness make plume presentation unreliable for short distances.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 20 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 345 ppm
 Indoor: 345 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Heavy Gas
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 20 meters

Off Centerline: 0 meters

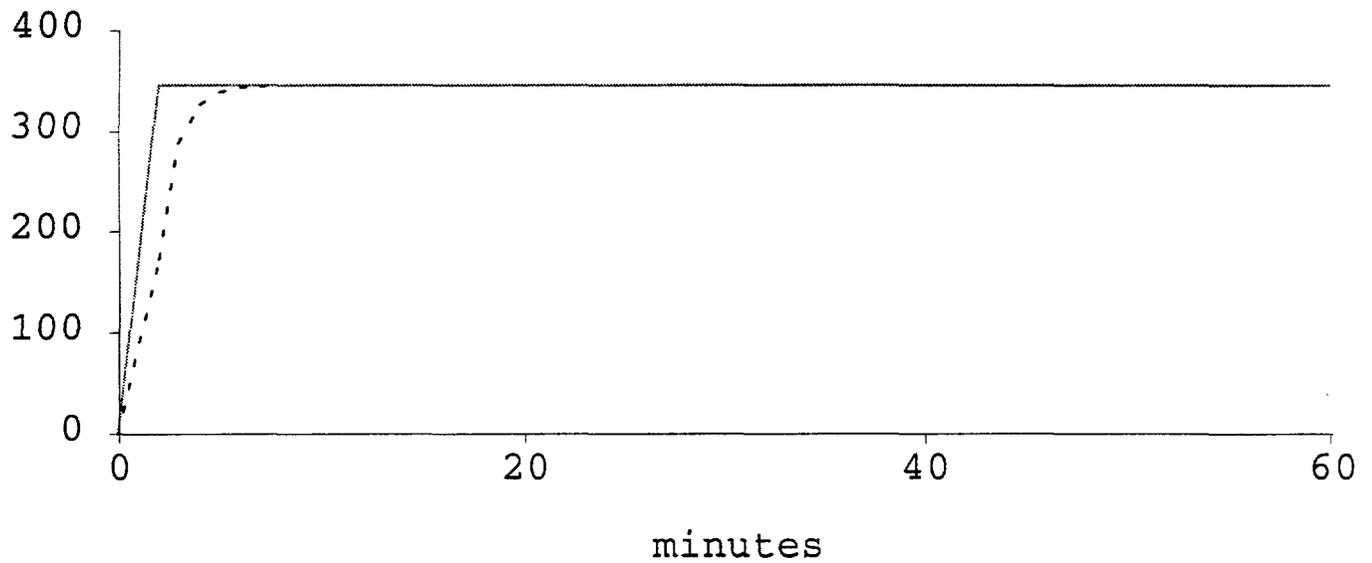
Max Concentration:

Outdoor: 345 ppm

Indoor: 345 ppm

Note: Indoor graph is shown with a dotted line.

ppm



Release Designation

F₂-7

Fluorine

Breach of four cylinders

*1.9 m³ (68 ft³), 5 Minute Release
Worst Case Meteorological Conditions*



SITE DATA INFORMATION:

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 1 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: F Air Temperature: 68° F
Relative Humidity: 5% Ground Roughness: Open country
Cloud Cover: 1 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 816 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 506 grams/min
Total Amount Released: 30.4 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION:

Model Run: Heavy Gas
User specified LOC: equals IDLH (25 ppm)
Max Threat Zone for LOC: 248 meters
Note: The Heavy Gas footprint is an initial screening.
For short releases it may be an overestimation.
Be sure to check concentration information at specific locations.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 30 meters
Off Centerline: 0 meters
Max Concentration:
Outdoor: 660 ppm
Indoor: 660 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Heavy Gas
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 30 meters

Off Centerline: 0 meters

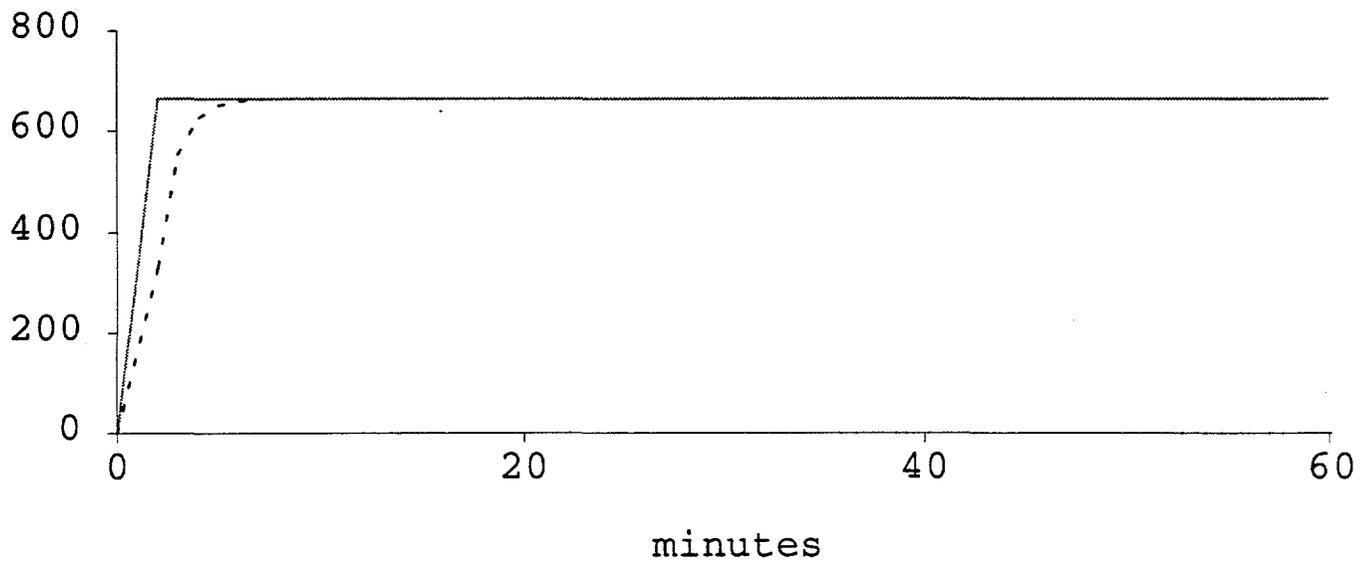
Max Concentration:

Outdoor: 660 ppm

Indoor: 660 ppm

Note: Indoor graph is shown with a dotted line.

ppm



**SITE DATA INFORMATION:**

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 1 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: F Air Temperature: 68° F
Relative Humidity: 5% Ground Roughness: Open country
Cloud Cover: 1 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 816 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 506 grams/min
Total Amount Released: 30.4 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION:

Model Run: Heavy Gas
User specified LOC: equals IDLH (25 ppm)
Max Threat Zone for LOC: 248 meters
Note: The Heavy Gas footprint is an initial screening.
For short releases it may be an overestimation.
Be sure to check concentration information at specific locations.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 100 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 103 ppm
 Indoor: 103 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Heavy Gas
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 100 meters

Off Centerline: 0 meters

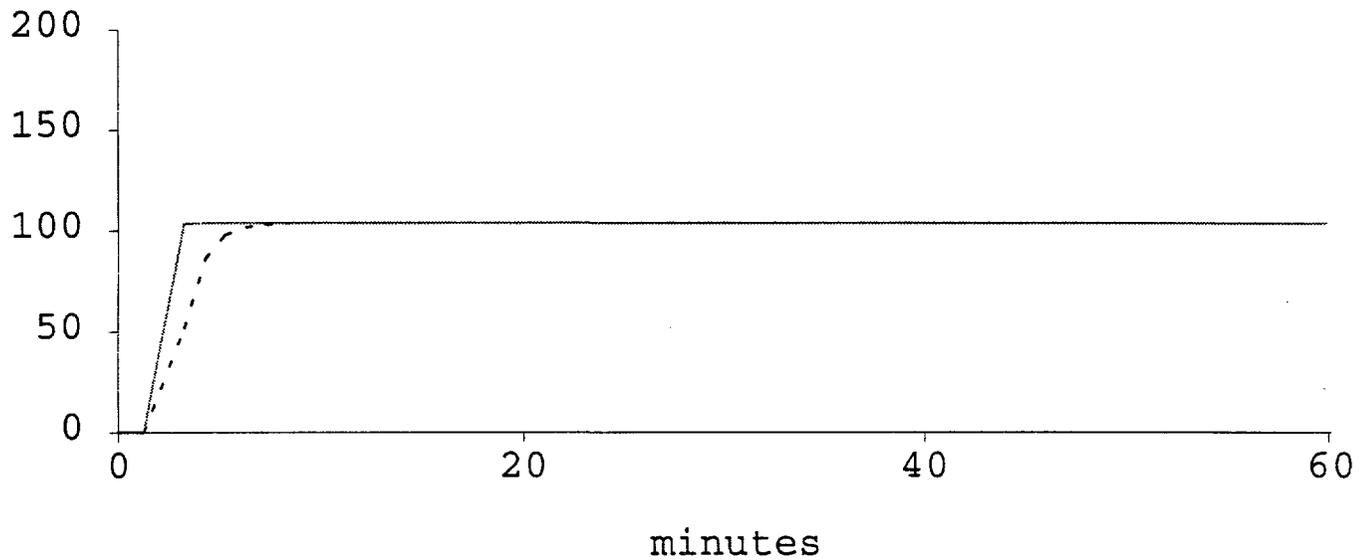
Max Concentration:

Outdoor: 103 ppm

Indoor: 103 ppm

Note: Indoor graph is shown with a dotted line.

ppm





SITE DATA INFORMATION:

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 1 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: F Air Temperature: 68° F
Relative Humidity: 5% Ground Roughness: Open country
Cloud Cover: 1 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 816 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 506 grams/min
Total Amount Released: 30.4 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION:

Model Run: Heavy Gas
User specified LOC: equals IDLH (25 ppm)
Max Threat Zone for LOC: 248 meters
Note: The Heavy Gas footprint is an initial screening.
For short releases it may be an overestimation.
Be sure to check concentration information at specific locations.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 78 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 150 ppm
 Indoor: 150 ppm
Note: Indoor graph is shown with a dotted line.

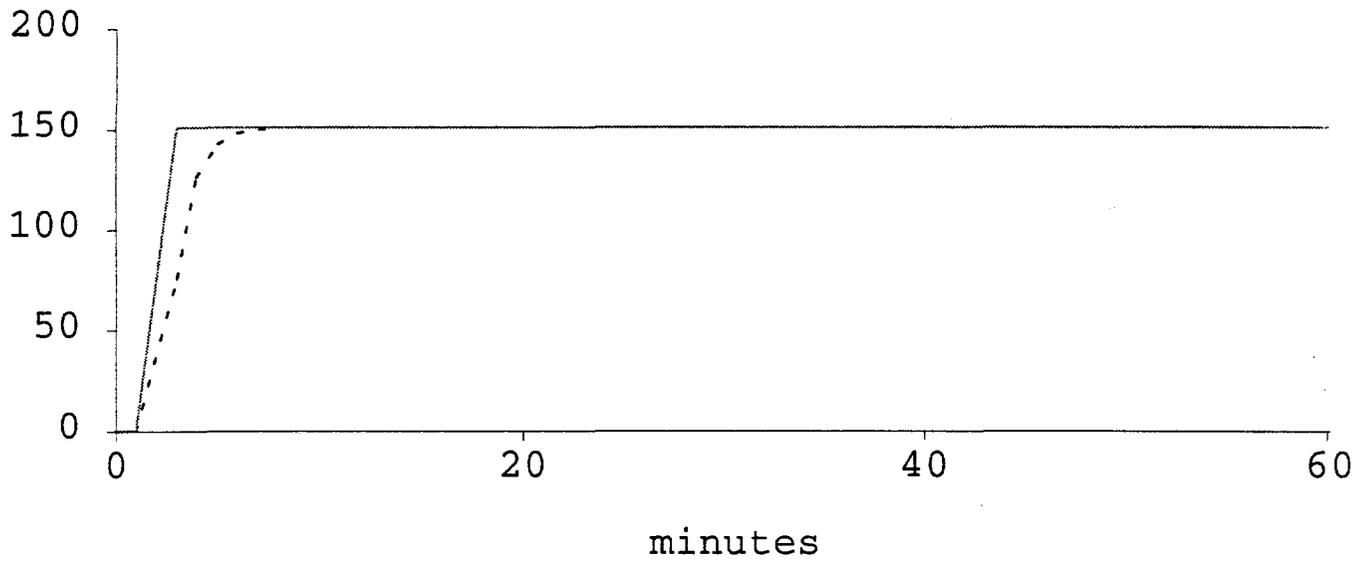


Chemical Name: FLUORINE
Model Run: Heavy Gas
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 78 meters
Off Centerline: 0 meters
Max Concentration:
Outdoor: 150 ppm
Indoor: 150 ppm
Note: Indoor graph is shown with a dotted line.

ppm



**SITE DATA INFORMATION:**

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 1 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: F Air Temperature: 68° F
Relative Humidity: 5% Ground Roughness: Open country
Cloud Cover: 1 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 816 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 506 grams/min
Total Amount Released: 30.4 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION:

Model Run: Heavy Gas
User specified LOC: equals IDLH (25 ppm)
Max Threat Zone for LOC: 248 meters
Note: The Heavy Gas footprint is an initial screening.
For short releases it may be an overestimation.
Be sure to check concentration information at specific locations.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 46 meters
Off Centerline: 0 meters
Max Concentration:
Outdoor: 345 ppm
Indoor: 345 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Heavy Gas
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 46 meters

Off Centerline: 0 meters

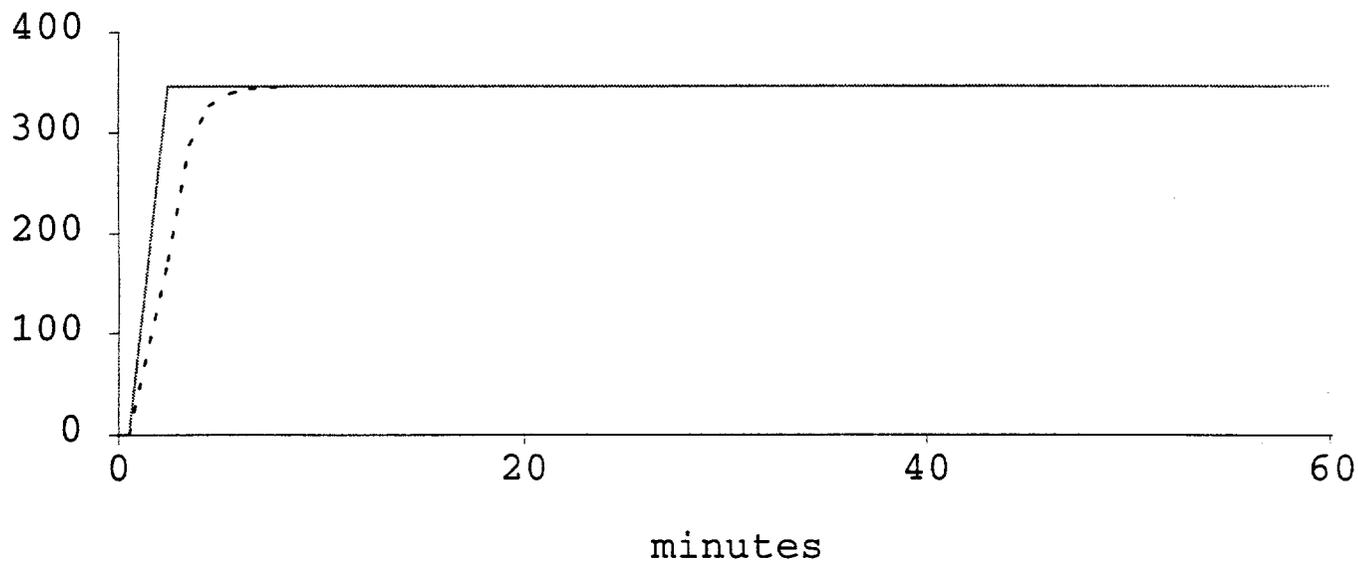
Max Concentration:

Outdoor: 345 ppm

Indoor: 345 ppm

Note: Indoor graph is shown with a dotted line.

ppm



Release Designation

F₂-8

Fluorine

Breach of four cylinders

*1.9 m³ (68 ft³), 5 Minute Release
Average Meteorological Conditions*

**SITE DATA INFORMATION:**

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: C Air Temperature: 68° F
Relative Humidity: 25% Ground Roughness: Open country
Cloud Cover: 3 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 816 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 506 grams/min
Total Amount Released: 30.4 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION:

Model Run: Heavy Gas
User specified LOC: equals IDLH (25 ppm)
Max Threat Zone for LOC: 75 meters
Note: Footprint wasn't drawn because effects of
near-field patchiness make plume presentation
unreliable for short distances.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 30 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 162 ppm
 Indoor: 162 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Heavy Gas
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 30 meters

Off Centerline: 0 meters

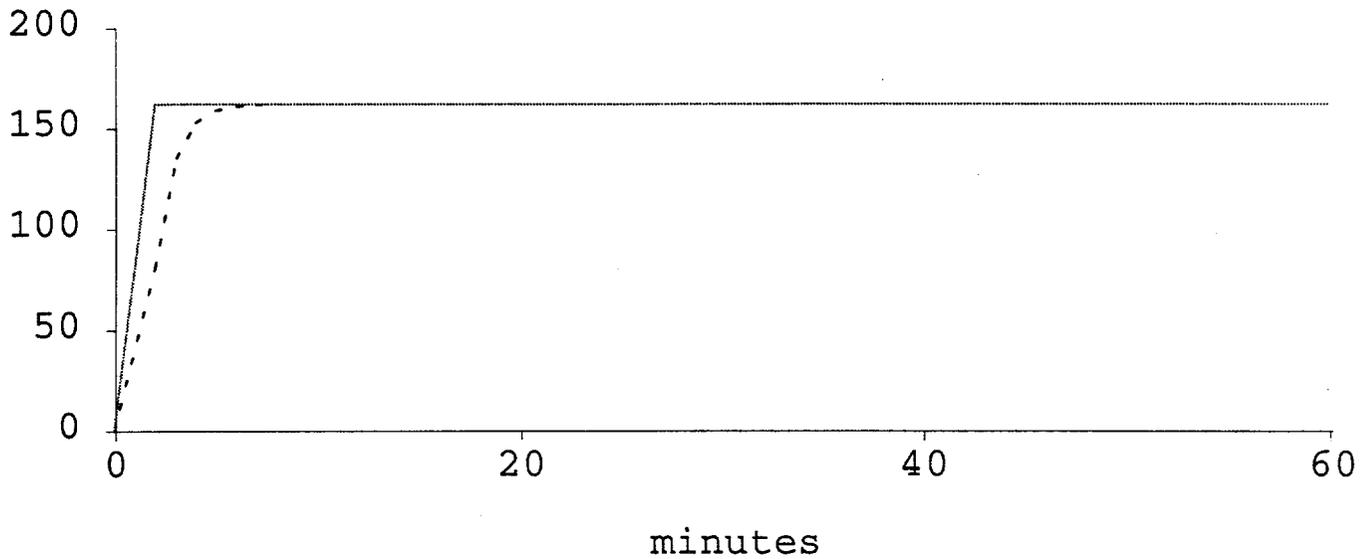
Max Concentration:

Outdoor: 162 ppm

Indoor: 162 ppm

Note: Indoor graph is shown with a dotted line.

ppm



**SITE DATA INFORMATION:**

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: C Air Temperature: 68° F
Relative Humidity: 25% Ground Roughness: Open country
Cloud Cover: 3 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 816 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 506 grams/min
Total Amount Released: 30.4 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION:

Model Run: Heavy Gas
User specified LOC: equals IDLH (25 ppm)
Max Threat Zone for LOC: 75 meters
Note: Footprint wasn't drawn because effects of
near-field patchiness make plume presentation
unreliable for short distances.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 100 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 14.6 ppm
 Indoor: 14.6 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Heavy Gas
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 100 meters

Off Centerline: 0 meters

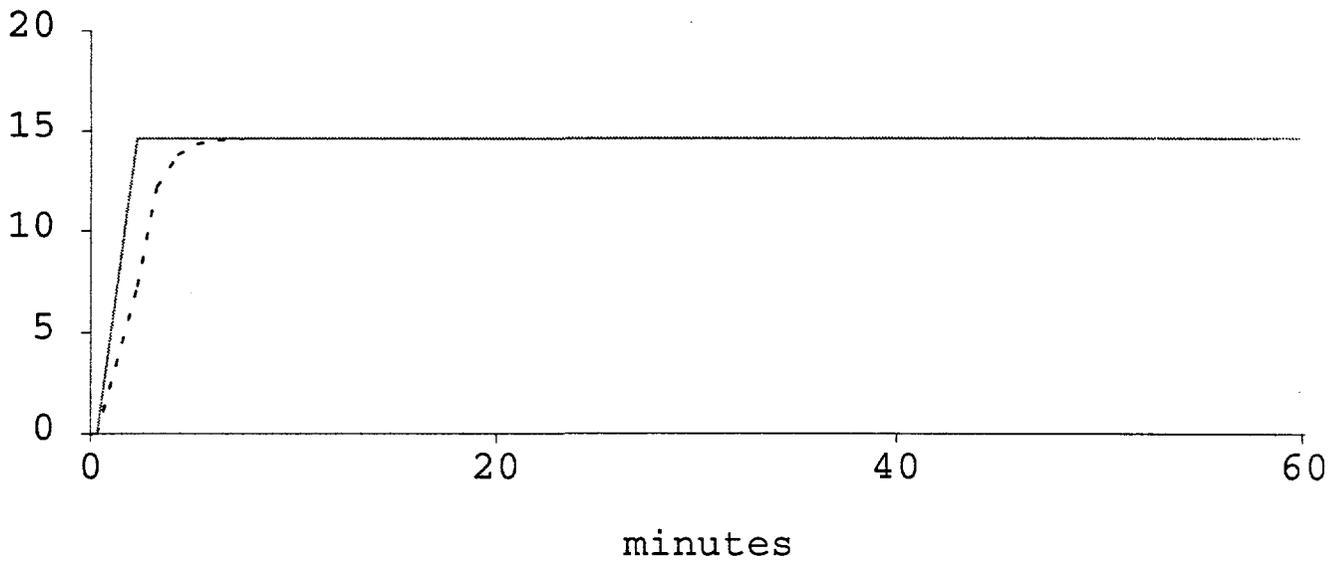
Max Concentration:

Outdoor: 14.6 ppm

Indoor: 14.6 ppm

Note: Indoor graph is shown with a dotted line.

ppm





SITE DATA INFORMATION:

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: C Air Temperature: 68° F
Relative Humidity: 25% Ground Roughness: Open country
Cloud Cover: 3 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 816 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 506 grams/min
Total Amount Released: 30.4 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION:

Model Run: Heavy Gas
User specified LOC: equals IDLH (25 ppm)
Max Threat Zone for LOC: 75 meters
Note: Footprint wasn't drawn because effects of
near-field patchiness make plume presentation
unreliable for short distances.

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:
Downwind: 32 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 150 ppm
 Indoor: 150 ppm
Note: Indoor graph is shown with a dotted line.

Concentration Window

2873088494



Chemical Name: FLUORINE
Model Run: Heavy Gas
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:

Concentration Estimates at the point:

Downwind: 32 meters

Off Centerline: 0 meters

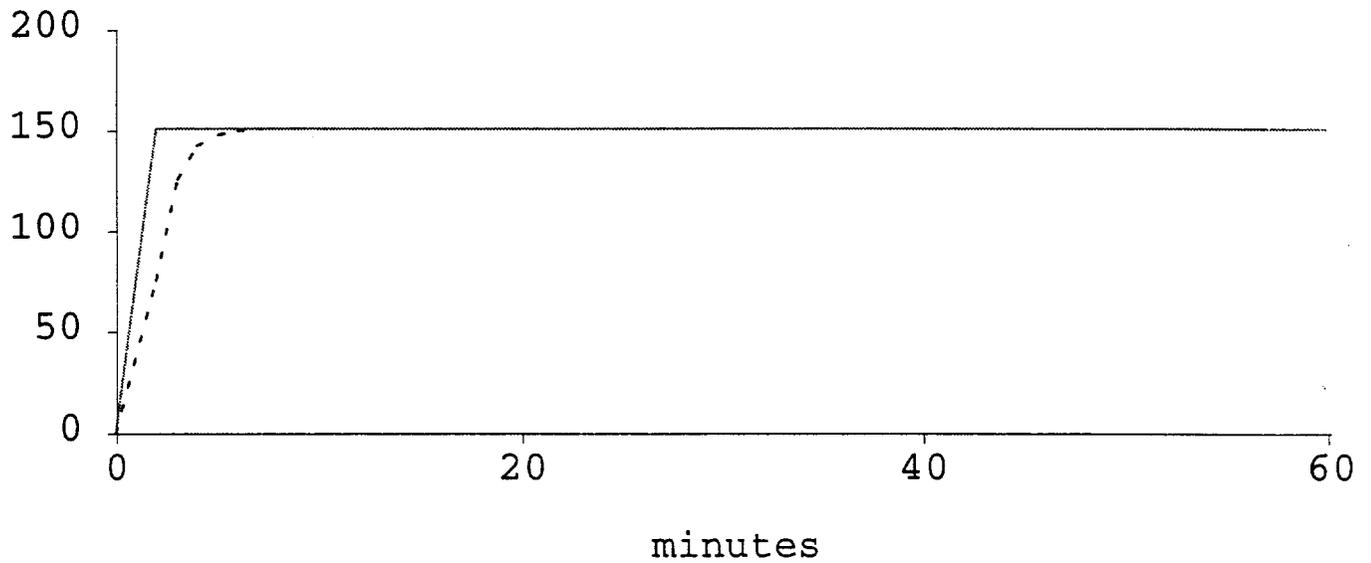
Max Concentration:

Outdoor: 150 ppm

Indoor: 150 ppm

Note: Indoor graph is shown with a dotted line.

ppm



**SITE DATA INFORMATION:**

Location: ALBUQUERQUE, NEW MEXICO
Building Air Exchanges Per Hour: 60 (User specified)
Date and Time: Using computer's internal clock

CHEMICAL INFORMATION:

Chemical Name: FLUORINE Molecular Weight: 38.00 kg/kmol
TLV-TWA: 1.00 ppm IDLH: 25.00 ppm
Footprint Level of Concern: 25 ppm
Boiling Point: -188.20° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC INFORMATION: (MANUAL INPUT OF DATA)

Wind: 4 meters/sec from 0° true
Inversion Height: 500 meters
Stability Class: C Air Temperature: 68° F
Relative Humidity: 25% Ground Roughness: Open country
Cloud Cover: 3 tenths

SOURCE STRENGTH INFORMATION:

Direct Source: 816 cubic feet/hr
Source Height: 0
Source State: Gas
Source Temperature: equal to ambient
Source Pressure: equal to ambient
Release Duration: ALOHA limited the duration to 1 hour
Release Rate: 506 grams/min
Total Amount Released: 30.4 kilograms
Note: This chemical may flash boil and/or result in two phase flow.

FOOTPRINT INFORMATION:

Model Run: Heavy Gas
User specified LOC: equals IDLH (25 ppm)
Max Threat Zone for LOC: 75 meters
Note: Footprint wasn't drawn because effects of near-field patchiness make plume presentation unreliable for short distances.

TIME DEPENDENT INFORMATION:

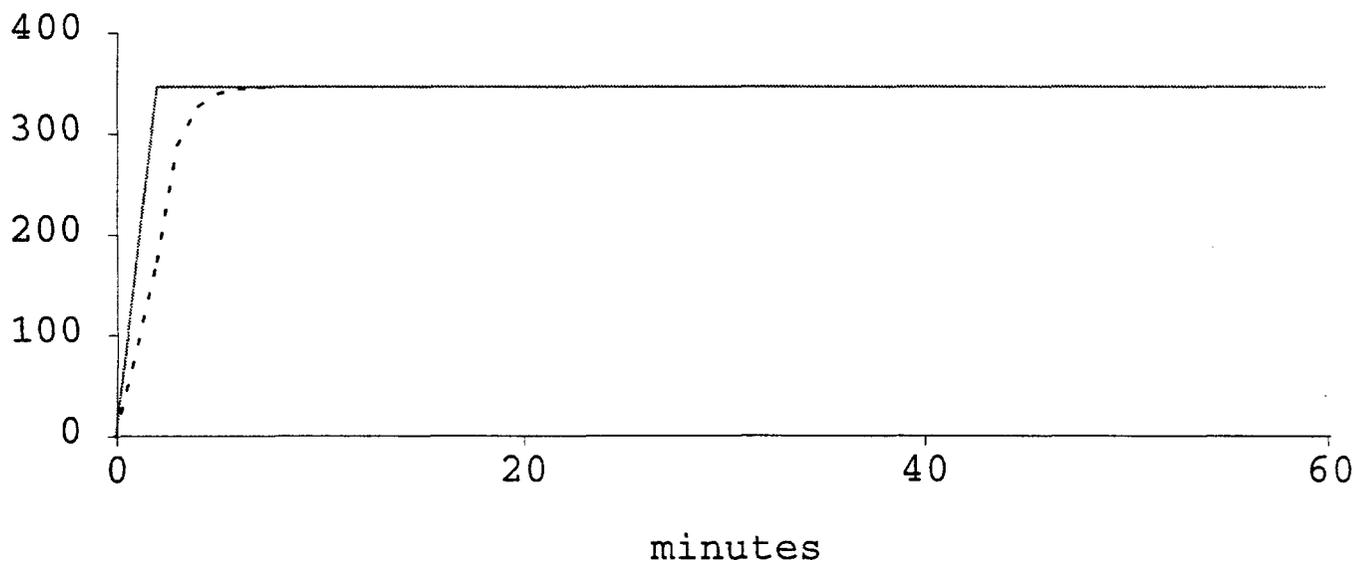
Concentration Estimates at the point:
Downwind: 23 meters
Off Centerline: 0 meters
Max Concentration:
 Outdoor: 345 ppm
 Indoor: 345 ppm
Note: Indoor graph is shown with a dotted line.



Chemical Name: FLUORINE
Model Run: Heavy Gas
Building Air Exchanges Per Hour: 60 (User specified)

TIME DEPENDENT INFORMATION:
Concentration Estimates at the point:
Downwind: 23 meters
Off Centerline: 0 meters
Max Concentration:
Outdoor: 345 ppm
Indoor: 345 ppm
Note: Indoor graph is shown with a dotted line.

ppm



Distribution List

| | | | |
|---|----|------|---|
| 1 | MS | 9018 | Central Technical Files, 8523-2 |
| 5 | MS | 0899 | Technical Library, 13414 |
| 1 | MS | 0619 | Print Media, 12615 |
| 2 | MS | 0100 | Document Processing, 7613-2 for DOE/OSTI |
| 2 | MS | 1037 | Risk Management, Al Bendure, 7258 |
| 6 | MS | 1037 | Risk Management, Zeferino Banda, 7258 |
| 3 | MS | 0407 | Emergency Planning, Steve Ross, 7259 |
| 3 | MS | 1107 | Ken Mikkelson, 9342-1 |
| 2 | MS | 1182 | Bob Turman, 1221 |
| 4 | MS | 1037 | Risk Management, Carrie Wood, 7258 |
| 2 | MS | 1113 | Protective Force Department, Sam Ortega, 7435 |
| 2 | MS | 1113 | Protective Force Department, Matt Umstead, 7435 |
| 1 | MS | 1054 | Safety and Health, William Burnett, 7701 |