Appendix E

Hazards Report

HELLMAN PROPERTIES, LLC
HELLMAN RANCH GAS PLANT PROJECT

HAZARDS REPORT

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PREPARED FOR:

HELLMAN PROPERTIES, LLC

SEAL BEACH, CALIFORNIA

PREPARED BY:

MRS ENVIRONMENTAL, INC.

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1.0 Introduction

Hellman Properties, LLC is proposing to construct and operate a one million standard cubic foot per day (MMscfd) gas plant at their Hellman Ranch Oil and Gas Production Facility (OGPF). This document provides a discussion of the potential risk of upset hazards associated with the proposed gas plant.

2.0 Existing Gas Operation Hazards

The existing Hellman Ranch OGPF site is located east of the San Gabriel River, and north of the Pacific Coast Highway in the City of Seal Beach. Seal Beach is located in the northwest portion of the County of Orange. A "Regional Map" is provided as Figure 1. Hellman Properties, LLC owns and operates the OGPF on the Hellman Ranch in Seal Beach, California. A project area map is provided in Figure 2. This facility has been in operation since the 1930's and consists of over 60 wells, oil and gas pipelines, offices, storage facilities, crude oil truck loading facilities, and a crude oil tank farm.

Currently the produced oil is treated at the OGPF, placed in crude oil tanks and then loaded on to trucks for shipment to local refineries. The gas produced from the production wells is shipped via existing 4-inch and 6-inch pipelines to a gas processing facility located at the Breitburn Energy Partners, LP site in Seal Beach. The produced gas travels in a 4-inch pipeline from the Hellman OGPF to the SoCal injection point at the corner of Seal Beach and Anchor Way. The gas then uses a 6-inch pipeline from the SoCal injection point to the Seal Beach Gas Processing Joint Venture Gas Plant. This gas processing facility is a joint venture and is used to process gas from several local oil and gas production sites. The produced gas is processed and then transported through a 4-inch pipeline to be injected into and sold to Southern California Gas (SoCal Gas) system. Some of the natural gas liquids (NGLs) produced as part of the gas processing operations are trucked back to the Hellman Ranch OGPF facility where they are unloaded into an existing 12,000-gallon NGL storage tank. The NGLs are then moved via an existing 4-inch pipeline from the NGL storage tank to the crude oil tank farm where they are blended with the crude oil prior to the crude being trucked from the OGPF site. Figure 3 shows the location of the current gas processing site, the pipeline routes used to get the produced gas to the Seal Beach Gas Processing Joint Venture Gas Plant located at the Breitburn Energy Partners site, the location of the existing NGL storage tank, the existing crude oil tank farm, and the location of the existing sales gas injection point for SoCal Gas.

The two main hazards associated with the existing gas operations are (1) a release from the NGL onsite pipeline and associated NGL storage tank, and (2) a release of produced gas from the 4-inch and 6-inch pipelines to the Seal Beach Gas Processing Joint Venture Gas Plant. The location of these two facilities are shown in Figure 3. The release parameters for these two hazard scenarios are provided in Table 1.

Figure 1 Regional Map

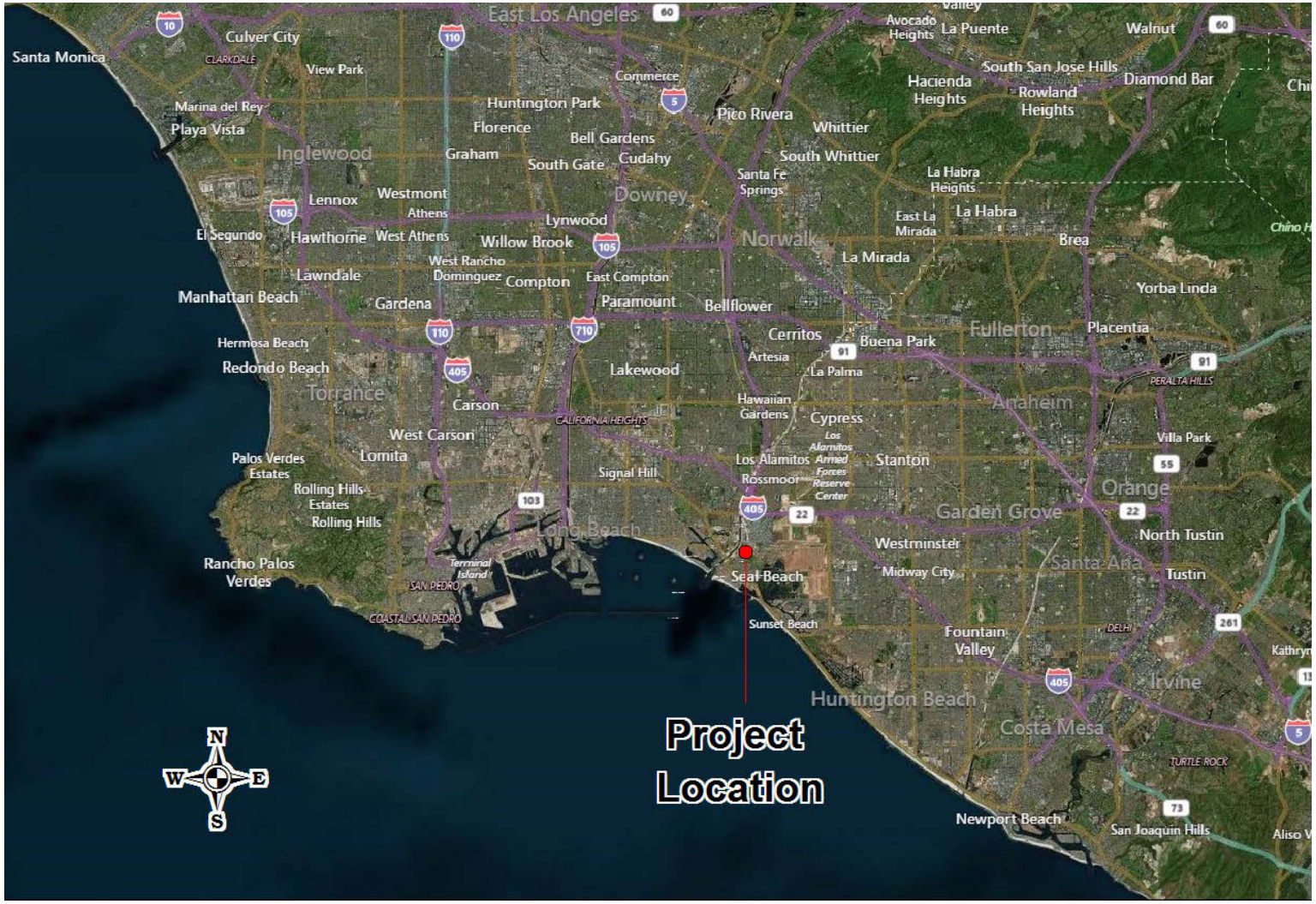


Figure 2 Project Area Map

Figure 3 Existing Facility Map

Table 1 Current Operation Release Scenarios

Description	Pressure (psia)	Temp ºF	Pipe Size (ID in)	Comments
A rupture of the produced gas pipeline from SoCal injection to Seal Beach Gas Processing Joint Venture Gas Plant.	50	86	6	10,000 feet of buried pipe, of which 4,300 is 4-inch and 6,700 feet is 6-inch Assumes release of entire pipeline.
A rupture of the produced gas pipeline going from Hellman OGPF to SoCal Gas injection location.	50	86	4	10,000 feet of buried pipe, of which 4,300 is 4-inch and 6,700 feet is 6-inch Assumes release of entire pipeline.
A rupture of the NGL pipeline to the crude oil tank farm.	215	73	3.5	Assumes release of entire 1,000 feet of pipe plus the 12,000-gallon NGL vessel.

ID-Internal Diameter

These potential release scenarios are unlikely events that would only occur due to a major catastrophic event. These release scenarios were modeled to determine that extent of the hazard zones for both fatality and serious injury. Appendix A provides a detailed write-up on the types of consequence models that were used in the analysis, and the bases for selecting the fatality and serious injury criteria.

Under the current gas operations, NGLs are trucked from the Breitburn Energy Partners Seal Beach Gas Processing Joint Venture Gas Plant back to the Hellman facility where they are unloaded into the NGL storage tank. This trucking operation presents the potential hazard of a truck accident resulting in a spill of NGLs. With the proposed gas plant project this potential trucking hazard would be eliminated.

Table 2 provides the estimated hazard zones for current gas operations release scenarios. Table 2 also provides the distance to the nearest residential and industrial/commercial properties. Hazard distances are provided for thermal radiation, explosions, and flammable vapor clouds. None of the hazard zones associated with the NGL pipeline and storage tank would impact any residential or industrial/commercial areas.

The hazard zones associated with the existing produced gas pipeline have the potential to impact both residential and industrial/commercial areas in the unlikely event of a pipeline rupture. These areas also have other high-pressure natural gas pipelines that would be expected to have greater hazard zones due to the higher operating pressures.

Table 2 Current Operation Hazard Distances (feet)

Scenario	Rupture of Produced Gas Pipeline (6-inch/4-inch)	Rupture of NGL Pipeline	Comments
Thermal Hazard Distances			
10 kw/m^2	74/58	169	Thermal radiation level that could result in fatality.
5 kw/m^2	93/72	220	Thermal radiation level that could result in serious injury.
Explosion Hazard Distances			
1.0 pound per square inch (psi)	-	223	Overpressure level that could result in fatality from debris strike.
0.3 pound per square inch (psi)	-	561	Overpressure level that could result in serious injury from debris strike.
Vapor Cloud Hazard Distances			
Lower Flammability Limit (LFL)	60/33	127	Ignition of a vapor cloud within the LFL could result in fatality.
½ Lower Flammability Limit (LFL)	175/91	240	Ignition of a vapor cloud between the LFL and the ½ LFL could result in serious injury.
Distance to Nearest Receptors			
Residential	30/70	1,150	The existing NGL pipeline is closest to residential areas southeast of the crude oil tank farm. The existing produced gas pipeline is closest to residences along Anchor Way.
Industrial/Commercial	25/25	1,020	The existing NGL pipeline is closest to industrial/commercial areas east of the crude oil tank farm. The existing produced gas pipeline is closest to industrial/commercial just south of Adolfo Lopez Dr.

1. See Appendix A for discussion of hazards modeling and basis for hazard criteria selection.
2. See Appendix B for hazard modeling input and output files.

3.0 Proposed Gas Plant Hazards

The proposed gas plant would be located within the southeastern part of the active oil production area, east of the office and west of the existing crude oil tank farm. The location is central to the oil field and provides access to all required existing pipelines and electrical power connections. Figure 3 shows the location of the proposed gas plant. The layout of the major pieces of equipment for the proposed gas plant is provided in Figure 4. Figure 5 provides a simplified flow diagram of the proposed gas plant.

Figure 4 Equipment Layout for the Proposed Gas Plant

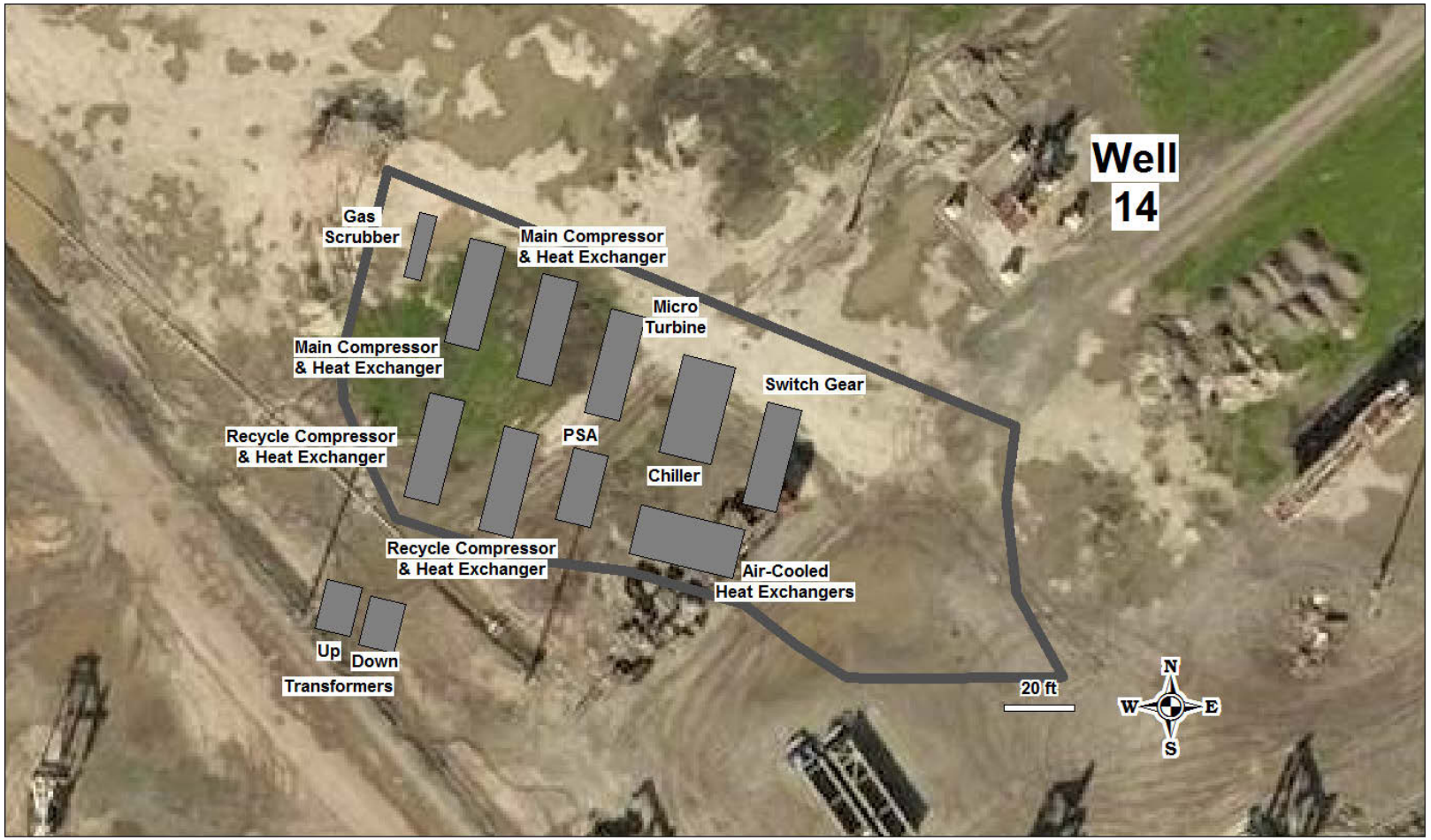
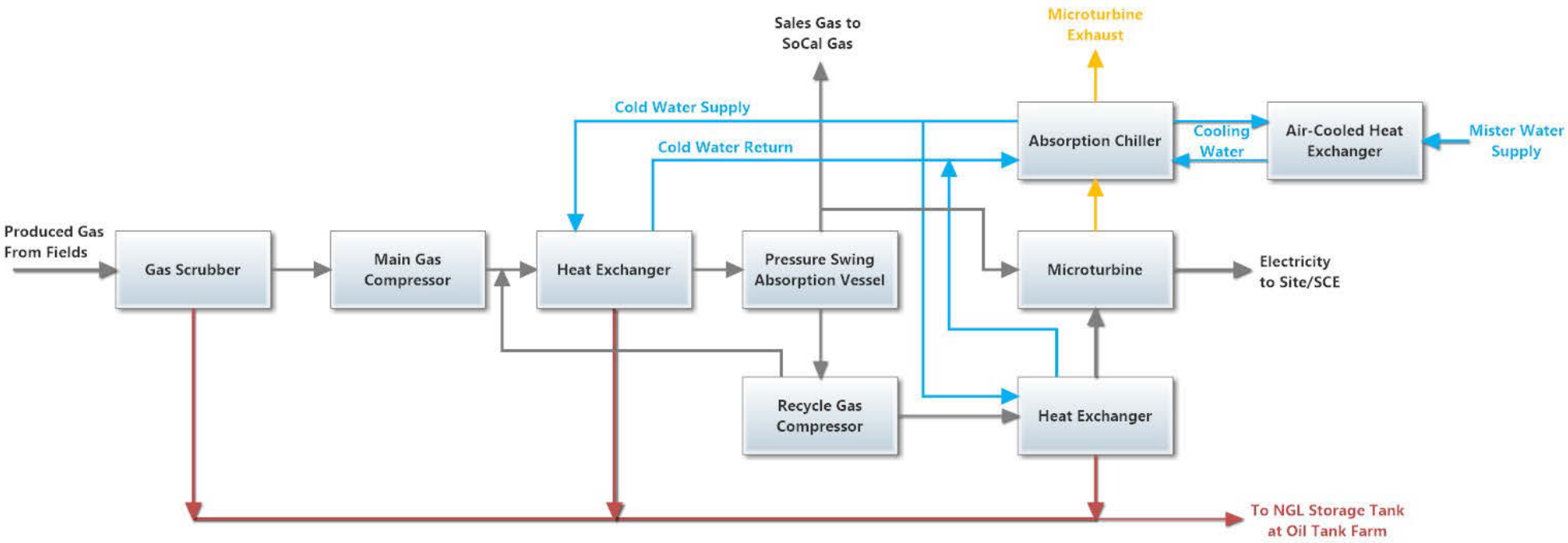


Figure 5 Simple Block Flow Diagram of the Proposed Gas Plant



A review of the proposed gas plant process flow diagram was conducted to determine the potential worst-case hazard scenarios in the unlikely event of an upset conditions. The worst-case hazards associated with the proposed gas plant are (1) high pressure gas releases downstream of the compressors, and (2) a release of sales gas from the existing 4-inch pipeline to the SoCal Gas pipeline injection point at the corner of Seal Beach Boulevard and Anchor Way. The release parameters for the proposed gas plant hazard scenarios are provided in Table 3.

Table 3 Proposed Gas Plant Release Scenarios

Description	Pressure (psia)	Temp ºF	Pipe Size (ID in)	Comments
Rupture of Piping after Main Gas Compressor	215	413	3	100 feet of pipe plus 60 seconds of full flow of compressor until low pressure shutdown activates.
Rupture of Piping after Main Gas Compressor Exchanger	215	85	3	100 feet of pipe plus 60 seconds of full flow of compressor until low pressure shutdown activates, and 50 cubic feet of downstream vessel capacity.
Rupture of Piping after Recycle Compressor	215	345	3	100 feet of pipe plus 60 seconds of full flow of compressor until low pressure shutdown activates plus 50 cubic feet of downstream vessel capacity.
Rupture of Sales Gas Pipeline	50	76	4	4,300 feet of buried pipe. Assumes release of entire pipeline.

ID-Internal Diameter

These potential release scenarios are unlikely events that would only occur due to a major catastrophic event. These release scenarios were modeled to determine that extent of the hazard zones for both fatality and serious injury. Appendix A provides a detailed write-up on the types of consequence models that were used in the analysis, and the bases for selecting the fatality and serious injury criteria.

Table 4 provides the estimated hazard zones for proposed gas plant release scenarios. Table 4 also provides the distance to the nearest residential and industrial/commercial properties. Hazard distances are provided for thermal radiation, explosions, and flammable vapor clouds. Other than the sales gas pipeline, none of the hazard zones for the proposed gas plant would extend beyond the boundaries of the Hellman property.

The hazard zones associated with the sales gas pipeline have the potential to impact both residential and industrial/commercial areas in the unlikely event of a pipeline rupture. However, the sales gas pipeline hazard zones would be reduced from the current operations. This reduction in hazard

zones is because the pipeline would switch from produced gas service to sales gas service, thereby eliminating the transportation of heavier gas liquids which are part of the produced gas.

Also, the portion of the existing 6-inch gas pipeline from the SoCal Gas injection point at the intersection of Seal Beach Boulevard and Anchor Way to the Seal Beach Gas Processing Joint Venture Gas Plant would no longer be in service. This would eliminate the potential hazards from a pipeline rupture to most of the homes along Anchor Way.

Table 4 Proposed Gas Plant Hazard Distances (feet)

Scenario	Rupture of Piping after Main Gas Compressor	Rupture of Piping after Main Gas Compressor Exchanger	Rupture of Piping after Recycle Compressor	Rupture of Sales Gas Pipeline	Comments
Thermal Hazard Distances					
10 kw/m^2	17	55	25	62	Thermal radiation level that could result in fatality.
5 kw/m^2	23	72	33	73	Thermal radiation level that could result in serious injury.
Explosion Hazard Distances					
1.0 pound per square inch (psi)	-	-	-	-	Overpressure level that could result in fatality from debris strike.
0.3 pound per square inch (psi)	-	-	-	-	Overpressure level that could result in serious injury from debris strike.
Vapor Cloud Hazard Distances					
Lower Flammability Limit (LFL)	23	23	15	35	Ignition of a vapor cloud with the LFL could result in fatality.
½ Lower Flammability Limit (LFL)	56	61	45	100	Ignition of a vapor cloud between the LFL and the ½ LFL could result in serious injury.
Distance to Nearest Receptors					
Residential	1,300	1,300	1,300	70	The proposed gas plant is closest to residential areas south of the site. The existing gas pipeline is closest to residential areas just south of Adolfo Lopez Dr.
Industrial/Commercial	1,470	1,470	1,470	25	The proposed gas plant is closest to industrial/commercial areas east of the site. The existing gas pipeline is closest to industrial/commercial just south of Adolfo Lopez Dr.

1. See Appendix A for discussion of hazards modeling and basis for hazard criteria selection.
2. See Appendix B for hazard modeling input and output files.

Appendix A – Consequence Modeling Approach

The consequence analysis and hazard modeling consider the physical effects of a release and its damage to people. The analysis judges the severity of potential hazards associated with accidents and their possible consequences.

The consequence analysis typically evaluates fire, flammability, explosion, and toxicity. Fire and flammability hazards are relevant for flammable vapors with relatively low flash points, such as propane and methane; their hazard is usually thermal radiation from vapor jet or pool fires. In addition, larger vapor jet fires can also lead to a loss of structural integrity of other storage or process vessels. The temperature in flame jets is usually high, and flame impingement onto nearby equipment is a concern.

The release and ignition of flammable vapors may also cause an explosion. The blast overpressure hazard depends on the nature of the chemical, the strength of the ignition source, and the degree of confinement. Finally, toxic chemicals can produce adverse effects to humans, if there are toxic chemicals released. The degree of these effects depends on the toxicity of the material and the duration of the exposure.

Performing state-of-the-art hazard assessment requires a combination of sophisticated analytical techniques and extensive professional experience. The consequence models used in this analysis are the result of more than two decades of development, and they have been validated using large-scale field tests. While a large number of consequence models are available, only a few specific models were needed to assess the hazards identified as part of this study. The hazard assessment models used as part of this analysis can be categorized into two groups:

- Release rate models; and
- Vapor dispersion models.

The following sections discuss the general characteristics of each of the models used for the consequence analysis. Specific models used in the consequence analysis were selected based on the scenarios identified in the hazard identification task.

A. Release Rate Models

Several models were utilized to simulate potential releases of gas, natural gas liquids, and crude vapor, and two-phase releases from pipes and vessels.

One of the first steps in consequence modeling is to establish the source terms (i.e., release rate, temperature, pressure, and velocity) associated with each scenario. The release rate is the rate at which the material is released from the pipe or vessel to the atmosphere. Before the source terms can be estimated for each scenario identified in the hazard analysis, the thermodynamic and physical properties of each hydrocarbon stream must be characterized. The thermodynamic and physical properties of the hydrocarbon streams were estimated using the IoMosaic SuperChems™ model, which utilizes numerous thermodynamic and physical property estimation techniques.

The SuperChems™ model simulates the release of multi-component liquid and vapor streams characteristic of the potential releases associated with the facility. For this study, these models are useful in assessing the effect of multi-component streams on vapor cloud flammability characteristics.

• A.1 Steady and Non-Steady Release from a Pressurized Vessel or Pipeline

These numerical steady and non-steady state flow models are used to compute multi-component liquid and vapor release rates from a ruptured valve or pipeline. The steady-choked and un-choked flow models compute a single release rate assuming uniform pressure and temperature in the vessel; in most blow-down processes from pressure vessels, the pressure inside is sufficiently high that choked flow (i.e., releases at sonic velocity) conditions exist during most of the blow-down period. However, in smaller pressure vessels, or for relatively larger release rates, the conditions inside the vessel are not steady. The pressure drop influences the flow velocity and, thus, the mass flow rate. In addition, the density and temperature inside the vessel are also changing. The unsteady state models compute a time-dependent release rate profile based on the chemical component properties.

The modeling method for release rate is to simulate the initial and the average release rate from a pipe or vessel rupture based on the operating conditions: the temperature, pressure, and composition. The release rate for the first 30-60 seconds is assumed to define the extent of the flammable release. The average release rate over a longer period is used for a toxic release.

Releases of natural gas liquids or liquified gasses addresses both the flash fraction of the materials as it is released from the piping as well as the release of materials from any pool that may form on the ground after the release.

A.2 Unconfined and Partially Confined Vapor Cloud Explosion Model

Flammable gas releases can produce clouds of the released gas and, if an ignition source is encountered, can explode, producing impacts through overpressure. A partially confined deflagration model was used to estimate overpressure levels for each flammable vapor release considered. The pressure-time histories within the explosion chamber (i.e., confined space or vapor cloud) are calculated by the model and are in generally good agreement with small- and large-scale experimental data on methane-air, propane-air, and hydrocarbon mixture vented and unvented explosions. Explosion potential is expressed in terms of trinitrotoluene (TNT) equivalence, and well-known shock wave propagation relationships are used to estimate overpressure levels at specified distances from the explosion.

The potential for unconfined vapor cloud fires and explosions was assessed using the IoMosaic SuperChems model. The potential for a vapor cloud explosion versus a vapor cloud fire (deflagration) was assessed based on the physical characteristics of the hydrocarbon stream. Generally, releases of methane into open air would produce a deflagration instead of an explosion as methane requires some "confinement" (within a building) in order to explode. This is due to the low flame speeds of methane-air mixtures as, in a deflagration, the pressure waves propagate significantly faster than the flame does. Parameters that influence the potential for, and consequences of, a vapor cloud explosion include:

- Characteristics of ignition sources;
- Flame acceleration mechanisms;
- Deflagration to detonation transitions;

- Direct initiation of detonations;
- Overpressure levels within the combustion zone;
- Effects of pressure rise time dependency on structures versus TNT curves;
- Minimum amount of mass sufficient to sustain an unconfined vapor cloud explosion;
- Partial vapor cloud confinement and flame reflection characteristics; and
- Explosion efficiencies.

The SuperChems model was used to assess whether or not enough flammable mass could accumulate to sustain an unconfined vapor cloud explosion (a relatively large amount of flammable mass is required for the flame front in the vapor cloud to gain sufficient speed to result in a pressure wave within the vapor cloud). In most cases, the amount of flammable mass or the levels of confinement were not sufficient to sustain an unconfined vapor cloud explosion for methane.

A.3 Flame Jet Model

A flame jet can occur if pressurized gas is released and encounters an ignition source, thereby producing a flaming jet emanating from the release location and causing impacts through thermal exposure. This model is designed to simulate turbulent diffusion flames (flame jets) and can characterize the turbulent flame length, diameter, temperature, and thermal radiation effects. This flame jet model in the SuperChems model was used and is capable of simulating inclined turbulent jets, radiation fields, and the aerodynamic effects on radiant energy and flame stability. This model was used for all scenarios where potential flammable vapor releases were identified.

B. Dispersion Models

Dispersion is the spreading out of a released material into the atmosphere after it has been released and is a function of the material type, temperature, and meteorological characteristics at the time of the release. Among the models required for hazard assessment, vapor dispersion models are perhaps the most complex. This is due to the varied nature of release scenarios, as well as the varied nature of the chemicals that may be released into the environment. The user must select the exposure limit carefully, to reflect both the impact of interest (e.g., fatality, serious injury) and the scenario release conditions (particularly the duration of the release).

In dispersion analysis, gases and two-phase vapor-liquid mixtures (where some aerosols of liquid are comingled with the vapor/gasses, thereby affecting the dispersion) are divided into three general classes:

- Positively buoyant;
- Neutrally buoyant; and
- Negatively buoyant.

These classifications are based on density differences between the released material and its surrounding medium (air) and are influenced by release temperature, molecular weight, ambient temperature, relative humidity, and the presence of aerosols.

Initially, the density of the release affects the dispersion process. A buoyant release may increase the effective height of the source. By the same token, a heavier-than-air release will slump towards the ground. For heavier-than-air releases at or near ground level, the initial density determines the initial spreading rate. This is the case particularly true for large releases of liquefied or pressurized chemicals, where flashing of vapor and formation of liquid aerosols contributes to the initial effective vapor density, due to the cooling effect, and, therefore, to the density difference with the air. This is particularly true for gas releases where significant cooling of the released material occurs due to expansion of the gas from the pipe pressure to atmospheric pressure.

Results of recent research dramatically indicate the importance of heavy gas dispersion in chemical hazard assessment; for these reasons:

- The initial rate of spreading is large and is dependent on the differences between the effective mean vapor density and the air density.
- The rapid mixing with ambient air due to slumping leads to lower concentrations at shorter distances than those predicted using neutral density dispersion models.
- There is very little mixing in the vertical direction and, thus, a vapor cloud hugging the ground is generated.
- When the mean density difference becomes small, the subsequent dispersion is governed by prevailing atmospheric conditions.

Since heavy gas dispersion occurs near the release, this effect is important when considering large releases of pressurized flammable chemicals.

In addition, dispersion analysis is also a function of release modes, which are divided into several categories:

- Instantaneous release (puff);
- Continuous release (plume);
- Momentum-dominated continuous release (jet); and
- Time-dependent continuous releases (jet/plume).

For instance, a momentum-dominated jet will dilute much faster than a plume due to increased entrainment of air caused by the jet. This is especially important when simulating the release of compressed gases.

In addition to the effects of initial release density, the presence of aerosols, release rate and quantity, release duration, and mode of release, dispersion analysis also depends on:

- Prevailing atmospheric conditions;
- Limiting concentration;

- Elevation of the source;
- Surrounding roughness and terrain; and
- Source geometry.

Prevailing atmospheric conditions include a representative wind speed and an atmospheric stability class. Less stable atmospheric conditions result in shorter dispersion distances than more stable weather conditions. Wind speed affects the dispersion distance inversely. Because weather conditions at the time of an accident cannot be determined a priori, it is usually prudent to exercise the model, at a minimum, for both typical and worst-case weather conditions.

Surrounding roughness and terrain affect the dispersion process greatly. Roughness is a function of the presence of trees, shrubs, buildings, structures and other surface features, while terrain is defined as hills and general topology. Roughness usually enhances dispersion, leading to a shorter dispersion distance than predicted using a smoother, or lower, roughness factor.

Source geometry refers to the actual size and geometry of the source emission. For example, a release from a safety valve may be modeled as a point source. However, an evaporating pool may be very large in area and require an area source model. Source geometry effects are significant when considering near field dispersion (less than ten times the characteristic dimensions of the source). At farther distances, the source geometry effects are less significant and eventually negligible.

Plume Dispersion Models (Atmospheric)

For the estimation of the distance that a release could impact, or the hazard zones, for low to zero velocity releases (such as releases from an evaporating pool) involving flammable or toxic materials, a set of neutrally buoyant Gaussian plume models are available. The effects of initial density are usually small in the computation of far field dispersion zones.

Several mathematical variations are included in the models. They have also been computerized as part of the IoMosaic SuperChems modeling package for ease of use. Additional models, rigorously evaluated, are available in the public domain. These models have been validated using large-scale field tests and wind tunnel experiments.

As a function of downwind distance, each of these models evaluates concentration and width of the dispersing vapor cloud at both source and ground level.

Dense Gas Dispersion Model

The SLAB model for dense gas dispersion was used to model the high-pressure gas releases and the gas liquids releases. This model has been validated against experimental data and is available in the public domain. It is appropriate for gas releases, which become cold when they expand from high pressure to atmospheric pressure upon escape from a pipe or vessel. The SLAB model includes the effects of air entrainment into high speed jets of gas, the gravity effects on cold dense gases which cause the cloud to slump and spread, the warming of the cloud and the transition to a passive Gaussian dispersion. NTIS publication DE91-008443, available from the EPA, contains more details on the SLAB model.

A number of sources discuss the effects of jet entrainment and momentum dominated jets, including Lees's "Loss Prevention in the Process Industries," and the CCPS's "The Use of Vapor Cloud Dispersion Models" and "Vapor Cloud Source Dispersion Models Workbook." The Center for Chemical Process Safety discusses jet entrainment and momentum dominated jets. For releases from pressurized pipes and vessels, if the pressure exceeds two times the ambient pressure, then the flows are generally sonic, with speeds up to 400 m/s, and produce significant jet entrainment issues.

Several studies have validated the jet models in large-scale controlled releases at the Burro trials, Coyote trials, Desert Tortoise, and the Goldfish trials (Chan and Ermak 1983, Koopman 1983, and Morgan 1983).

It should be noted that using a jet model for the near-field dispersion produces smaller hazard zones than a simplified Gaussian model because the jet effects of a gas released from a pressurized source entrain large amounts of air. This entrained air causes more rapid dilution of the streams and, in combination with temperature and density effects, subsequently smaller hazard zones. Jet effects can reduce hazard zone estimates by up to 50 times over the simplified Gaussian estimates (CCPS, Lee). Given the extensive field validation of the effects of jets and near-field air entrainment, it is believed that the jet models are a more realistic estimate of hazard distances than the simplified Gaussian models.

C. Damage Criteria

Since the release streams are flammable, releases could potentially result in thermal radiation exposure from a fire, or an overpressure hazard due to explosions/deflagrations from flammable vapor clouds. Damage criteria were developed in order to quantify the potential consequences of an accidental release. Damage criteria are defined as the levels of exposure that could produce fatalities and produce serious injuries.

Serious injury is defined as an impact from the exposure that could require medical intervention and could produce effects that last significantly longer than the duration of the exposure. An injury such as lung damage that would require hospitalization and/or other types of therapy would be considered a serious injury.

C.1 Thermal Radiation Damage Criteria

The potential concern associated with fires is thermal radiation intensity, and its effects on persons, the surrounding structures, processes, and fire suppression equipment. Table A.1 presents an overview of thermal radiation intensity and observed effects.

Table A.1 Thermal Radiation Serious Injury and Impacts

Intensity (kW/m^2)	Impact
1	Time for severe pain - 115 seconds Time for second-degree burns - 663 seconds [a]
1.6	No discomfort for long exposure [b]
2	Time for severe pain - 45 seconds

Table A.1 Thermal Radiation Serious Injury and Impacts

Intensity (kW/m^2)	Impact
	Time for second-degree burns – 187 seconds [a]
3	Time for severe pain - 27 seconds Time for second-degree burns - 92 seconds [a]
4	Time for severe pain - 18 seconds Time for second-degree burns - 57 seconds [a]
5	Time for severe pain - 13 seconds Time for second-degree burns - 40 seconds [a]
10	Time for severe pain - 5 seconds Time for second-degree burns - 14 seconds Time for 100% fatality - 270 seconds [a c]
12.5	Melting of plastic tubing [b]
25	Minimum energy to ignite wood [b]
37.5	Damage to process equipment [b]
100	Time for severe pain - <1 seconds Time for second-degree burns - 1 sec Time for 100% fatality - 11 seconds [c]

a. Based on Handbook of Chemical Hazard Analysis Procedures, FEMA.
b. CCPS Chemical Process Quantitative Risk Analysis.
c. CCPS Chemical Process Quantitative Risk Analysis using probit equation by Eisenberg.

Data presented in this table shows that no considerable physical effect would result from exposure to a radiation intensity between 1 and 1.6 kW/m^2 over extended periods. Exposure to a radiation intensity of 5 kW/m^2 would result in pain if the exposure period were to exceed 13 seconds, and it would result in second-degree burns after 40 seconds. Exposure to a radiation intensity of 10 kW/m^2 would result in pain (5 seconds) and second-degree burns after short exposure periods (i.e., 14 seconds), and death after longer periods. The time required to reach pain, second-degree burn, and fatality thresholds were used to estimate radiation levels that would result in serious injury or fatality. Persons exposed to thermal radiation have the opportunity to move away from the hazard, unlike overpressure effects or vapor cloud fires and explosions, which are instantaneous. It was assumed in this analysis that some people not within the flame area would move away from the flame to get away from the heat. Analysis of the distances to various radiation levels indicates that this is feasible. Therefore, a less than 1-minute exposure was used as the basis for determining the damage criteria. Exposure to a thermal radiation level of 10 kW/m^2 could result in a serious injury (at least second-degree burns) if exposed for less than 1 minute, and it was, therefore, assumed that all persons exposed to 10 kW/m^2 would suffer serious injuries. Serious injuries would start to be realized at and above 5 kW/m^2. Exposure to thermal radiation levels in excess of 10 kW/m^2 would likely begin to generate fatalities in less than 1 minute. All persons exposed to thermal radiation within the flame area were assumed to suffer fatalities regardless of exposure duration.

C.2 Flammable Vapor Criteria

A release of flammable material can produce impacts by producing a cloud of the flammable material that, if it encounters an ignition source, either explodes or burns (deflagration) back to the material source. Persons located within the cloud when it explodes, or burns could be seriously impacted. Whether the cloud explodes, or burns is a function of the material and the level of

confinement in the environment in which the cloud is located (e.g., within pipe racks, between buildings). All release scenarios from the project could contain flammable vapors.

Several biological and structural explosion damage criteria were reviewed, specifically the Center for Chemical Process Safety "Evaluating Process Plant Buildings for External Explosions and Fires" and Center for Chemical Process Safety "Chemical Process Quantitative Risk Analysis." This reference indicates that persons within a structure suffer considerably more damage than persons in the open due to overpressures. This is primarily due to secondary object impacts. Table A.2 details the levels of impacts at various overpressure levels to buildings, equipment and persons.

Table A.2 Overpressure Damage

Overpressure Level	Impact
0.04	Loud noise, sonic boom (143 dBA)
0.15	Glass breakage
0.30	Center for Chemical Process Safety projectile limit, 10% broken window glass, 95% no serious damage
1.0	Wood trailer roof and walls collapse Unreinforced masonry building partial collapse Estimated 10% injury rate
5.0	Wood trailer completely destroyed Unreinforced masonry building completely destroyed Utility poles snapped Estimated 100% injury rate
6.0	Reinforced building major damage/collapse Estimated 40% fatality rate
7.0	Loaded train wagons overturned
12.0	Reinforced building completely destroyed Estimated 100% fatality rate
15.0	Lung hemorrhage, lower range of direct human fatalities

Source: CCPS 1989

An overpressure level of 0.3 psi would likely result in broken windows and some potential for serious injury. Complete structural damage and serious injury/fatality could occur for wooden buildings and unreinforced masonry as a result of exposure to an overpressure level of 1.0 psi. An overpressure level of 5.0 psi would result in structures being completely destroyed and an estimated 100 percent serious injury/fatality to building occupants.

Deflagration of the vapor cloud would produce impacts to persons located within the flammability limits of the vapor cloud. Persons located within the lower flammability limit would most likely suffer at least serious injuries. As there is some natural variability within the cloud, it is assumed that persons located within the area that would be encompassed by a level of concern equal to one-half the lower flammability limit (a larger area than the lower flammability limit area) would suffer serious injuries.

Appendix B – Consequence Modeling Input and Output Files

```
SSSSSSSSSS
SS      S
SS
SSSSSSSSSS U   U PPPPPP EEEEEE RRRRRR
      SS U   U P    P E      R    R
S      SS U   U PPPPPP EEEEEE RRRRRR
S      SS U   U P      E      R  R
SSSSSSSSSS UUUUU P      EEEEEE R  RRR

                    CCCCCCCCCC
                    CC      C
                    CC                      TM
                    CC        H    H EEEEEE MM  MM SSSSSS
                    CC        H    H E      M MM M S
                    CC      C HHHHHH EEEEEE M MM M SSSSSS
                    CC      C H    H E      M    M      S
                    CCCCCCCCCC H    H EEEEEE M    M SSSSSS
```

Supercharged Chemical hazard evaluation methods

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Welcome to Release 3.10 of SuperChems

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Acorn Park,
Cambridge, Massachusetts 02140,
USA.

Tel: (617) 498-5472
Fax: (617) 498-7161
Email: ML-EHS-RISKWORKS/SUPPORT@adlittle.com
Internet: www.riskworks.com

Level = Expert

Default parameter settings:

VLE: 15 divisions, 2.000 K step, start from dew point
Databanks: \SC31\BANKS\IBANK.ID and \SC31\BANKS\TBANK.TPP
Working path: \SC31\SUPER\

User defined scenario:

Name: GasPlant1
Description:Release from gas Plant production current
>:
>:

HAZOP reference: MISSING
Fault tree reference: MISSING
Site: DEFAULT
Vessel: PIPE6IN
Piping layout: 6INSHORT
Reaction:
Thermal damage criteria: 5KW
Toxic damage criteria: DEFAULT
Overpressure damage criteria: 1PSI
Mixture: PRODGAS
User specified project stream

Spill time (hours) 1
Day of the year (1-365) 200
Scenario duration (hours) 1

Ignition time (s) ..... -1
Spill surface thermal diffysivity, (m2/s) 4.52E-07
Spill surface thermal conductivity, (W/m/K) 0.92
Dike area (m2) ..... 1E+38
Spill surface intrinsic permeability (m2) 1E-20
Spill surface = CONCRETE

User Specified Site Conditions:

Name: DEFAULT
Location: MA_CAMBRIDGE 71.1061 42.3669 6.0960
Description: ANYWHERE USA

Longitude, (degrees) 71.11
Latitude, (degrees) 42.37
Altitude, (m) 6.096
Time zone factor, (hrs) 4.74
Ambient temperature, (K) 298
Ambient pressure, (Pa) ..... 1.013E+05
Soil temperature, (K) 298
Water temperature, (K) 283
Mean water flow velocity, (m/s) 2
Mean water depth, (m) 10
Relative humidity, (percent) 70
Visual range, (m) 5000
Roughness length (m) 0.024

Wind speed, (m/s) 5
Wind friction velocity, (m/s) 0.3398
Wind power law constant 0.1468
Wind speed reference height, (m) 10
Stability class (A=0/B=1/C=2/D=3/E=4/F=5) 3
Monin-Obuhkov length (m) ..... 1E+38
Water dew point (K) 292.2

User defined thermal radiation damage criteria:

Thermal radiation criteria name: 5kw
Description: 5 kw/m2 radiation

Heat Flux, (kW/m2)

5

Time integrated heat flux value, (kJ/m2)

25

User defined toxic damage criteria:

Toxic criteria name [s]: DEFAULT
Description: DEFAULT TOXICITY CRITERION

Limiting concentration (ppm)

1E+04

Averaging time (s) 600
Receptor elevation (m) 0.0001

User defined overpressure damage criteria:

Overpressure criteria name: 1psi
Description: 1psi

Overpressure (Pa)

6893

User defined mixture:

Name: ProdGas
Description: produced gas
Index bank:
Properties bank:

Chemical Mixture Definition

0. ID = 0. METHANE, CH4
1. ID = 1. ETHANE, C2H6
2. ID = 2. PROPANE, C3H8
3. ID = 3. n-BUTANE, C4H10
4. ID = 4. n-PENTANE, C5H12
5. ID = 980. NITROGEN, N2
6. ID = 224. CARBON DIOXIDE, CO2
7. ID = 1013. WATER, H2O

Binary interaction matrix:

[0, 1] Kij= -0.013279 Lij= 0
[0, 2] Kij= -0.017717 Lij= 0
[0, 3] Kij= -0.018908 Lij= 0
[0, 4] Kij= -0.019555 Lij= 0
[0, 5] Kij= -0.021293 Lij= 0
[0, 6] Kij= -0.091871 Lij= 0
[0, 7] Kij= -0.69258 Lij= 0
[1, 2] Kij= 0.0058948 Lij= 0
[1, 3] Kij= 0.0066349 Lij= 0
[1, 4] Kij= 0.0063165 Lij= 0
[1, 5] Kij= -0.087935 Lij= 0
[1, 6] Kij= -0.14153 Lij= 0
[1, 7] Kij= -0.53087 Lij= 0
[2, 3] Kij= 0.0048013 Lij= 0
[2, 4] Kij= 0.0068797 Lij= 0
[2, 5] Kij= -0.090081 Lij= 0
[2, 6] Kij= -0.13095 Lij= 0
[2, 7] Kij= -0.52693 Lij= 0
[3, 4] Kij= 0.0045108 Lij= 0
[3, 5] Kij= -0.086925 Lij= 0
[3, 6] Kij= -0.096929 Lij= 0
[3, 7] Kij= -0.50942 Lij= 0
[4, 5] Kij= -0.086716 Lij= 0
[4, 6] Kij= -0.086988 Lij= 0
[4, 7] Kij= -0.50229 Lij= 0
[5, 6] Kij= -0.23422 Lij= 0
[5, 7] Kij= -1.0431 Lij= 0

[6, 7] Kij= -0.3672 Lij= 0

#	cid	massfrac	molefrac
0	0	0.41	0.674
1	1	0.0376	0.033

```
|2    |        2 |     0.104 |     0.062 |
|3    |        3 |     0.141 |     0.064 |
|4    |        4 |     0.175 |     0.064 |
|5    |      980 |   0.00318 |     0.003 |
|6    |      224 |     0.105 |     0.063 |
|7    |     1013 |    0.0252 |     0.037 |
+-------------------------------------------+
```

cid:Chemical Identification Number - massfrac:Mass fraction - molefrac:Mole fraction of individual components.

ProdGas is not soluble in water

The following atom matrices will be used:

Mixture atom matrix: H,C,N,O

```
    4     6     8    10    12     0     0
    2
    1     2     3     4     5     0     1
    0
    0     0     0     0     0     2     0
    0
    0     0     0     0     0     0     2
    1
```


Vessel Name: pipe6in
Description: pipeline 6 inch 10,000ft long

Horizontal Cylindrical (Flat heads)
Material of construction: IRON

Length [straight side for cylinders] (m) 3000
Inside diameter (m) 0.152
Vessel metal mass (kg) ..... 2.25E+04
Wall metal thickness (m) 0.002
Base elevation with respect to scenario ground level (z=0)
(m) 0
Total vessel surface area (m2) 1436
Total volume (m3) 54.7
Maximum pressure limit for vessel in simulation (Pa) ..... 1E+38
Maximum temperature limit for vessel in simulation (K) 0

No fire loading specified

No eductor specified

No water sprays specified

Vessel is not insulated

Vessel does not have a cooling jacket

Vessel does not have a heating jacket

Vessel is not visible to solar flux

#	Zl	Az	Vz
0	0	0	0
1	0.00391	145	0.378
2	0.00782	202	1.06
3	0.0117	244	1.94
4	0.0156	277	2.96
5	0.0195	306	4.1
6	0.0234	330	5.34
7	0.0274	351	6.67
8	0.0313	369	8.08
9	0.0352	385	9.55
10	0.0391	399	11.1
11	0.043	411	12.7
12	0.0469	422	14.3
13	0.0508	431	16
14	0.0547	439	17.7
15	0.0586	445	19.4
16	0.0625	450	21.1
17	0.0664	453	22.9
18	0.0703	456	24.7
19	0.0742	457	26.5
20	0.0782	457	28.3
21	0.0821	456	30
22	0.086	453	31.8
23	0.0899	450	33.6
24	0.0938	445	35.3
25	0.0977	439	37.1
26	0.102	431	38.8
27	0.106	422	40.4
28	0.109	411	42.1
29	0.113	399	43.6
30	0.117	385	45.2
31	0.121	369	46.6
32	0.125	351	48.1
33	0.129	330	49.4

```
|34   |     0.133 |       306 |      50.6 |
|35   |     0.137 |       277 |      51.8 |
|36   |     0.141 |       244 |      52.8 |
|37   |     0.145 |       202 |      53.7 |
|38   |     0.148 |       145 |      54.3 |
|39   |     0.152 |   0.00234 |      54.7 |
+-------------------------------------------+
```

Zl:Liquid height (m) - Az:A(z); Area as a function of liquid height m2=f(m) - Vz:V(z); Volume as a function of liquid height m3=f(m)

Piping layout:

Tag: 6inshort
Description: 6 inch hole .1m pipe length

```
+-------------------------------------------------------------------+
|#    | Sid       | Stype     | Length    | K1        | Kinf      |
+-------------------------------------------------------------------+
|0    |         0 |         0 |       0.1 |       160 |       0.5 |
+-------------------------------------------------------------------+
```

Sid:Segment identification number [] - Stype:0: Straight pipe / valves / fittings, 1: Relief device, 2: Rupture disk, 3: Thin sharp edged orifice, 4: Expander, 5: Reducer, 6: Pump - Length:Piping segment length (m) [] - K1:Number of Velocity Heads in K = K1/NRe + Kinf + Kid/ID - Kinf:Number of Velocity Heads in K = K1/NRe + Kinf + Kid/ID

```
+-------------------------------------------------------------------+
|#    | Kid       | Eps       | AreaC1    | Angle     | Z         |
+-------------------------------------------------------------------+
|0    |         0 |   4.57E-05 |    0.0182 |         0 |      0.01 |
+-------------------------------------------------------------------+
```

Kid:Number of Velocity Heads in K = K1/NRe + Kinf + Kid/ID - Eps:Typical pipe roughness: (m), Cast Iron (2.60E-04), Wrought Iron (4.57E-05), Commercial Steel (4.57E-05), Galvanized Iron (1.52E-04), Asphalted Cast Iron (1.22E-04), Drawn Tubing (1.52E-04) - AreaC1:flow area (m2) [] - Angle:Angle with respect to horizontal (degrees) [] - Z:Elevation of segment entrance (m) []

```
+-------------------------------+
|#    | H         | Ts        |
+-------------------------------+
|0    |     1E+38 |       293 |
+-------------------------------+
```

H:1/Overall heat transfer coefficient (W/m2/K); Sum_i (1/hi) [] -

Ts:Surroundings temperature (K) []

Total length = 0.1 meters
Discharge coefficient (when applicable) = 1.000
1st relief device set / reset pressures (Pa) = 0 / 0

Reaction name =
Description =

Chemical Identification Number

0

Number of chemicals [] 0
Number of chemical reactions [] 0

Stoichiometric coefficient of reactants (positive)

0

Reaction order for reactants

0

Stoichiometric coefficient of products (positive)

0

Reaction order for products

0

Pre-exponential factor (m^3, s, kmol)

0

Activation energy (K)

0

Rate expression B parameter (K^(1/3))

0

Rate expression C parameter (K^(2/3))

0

Temperature Exponent

0

Reaction phase: Liquid = 0, Vapor = 1

0

Upper bound on reaction rate (kmol/s)

0

Is reaction reversible (0-No, 1-Yes)

0

Checking properties for mixture ProdGas
produced gas

COMP 0, ID 0, NAME = METHANE

COMP 1, ID 1, NAME = ETHANE

COMP 2, ID 2, NAME = PROPANE

COMP 3, ID 3, NAME = n-BUTANE

COMP 4, ID 4, NAME = n-PENTANE

COMP 5, ID 980, NAME = NITROGEN

COMP 6, ID 224, NAME = CARBON DIOXIDE

COMP 7, ID 1013, NAME = WATER

Multicomponent Gas Flow:

User Inputs:

Initial temperature (K) 303
Initial pressure (Pa) ..... 3.446E+05
Maximum allowable time step (s) 3.6
Minimum allowable time step (s) 0.01
Final time for analysis (s) 360
Maximum number of data points to collect 1000

Outputs:

Velocity of sound in gas at initial conditions, (m/s) 334.8

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PROJECT: Releases Chittick
PROBLEM: Releases Thu Jul 19 14:49:06 2018

#	TIME	TEMP	PRES	FLOW
0	0.0001	303	0.3446	11.38
1	1.034	302.5	0.3249	11.06
2	2.132	302	0.3051	10.41
3	3.304	301.4	0.2853	9.762
4	4.559	300.9	0.2656	9.114
5	5.911	300.4	0.246	8.466
6	7.373	299.9	0.2263	7.819
7	8.967	299.3	0.2067	7.174
8	10.72	298.8	0.1872	6.529
9	12.62	298.3	0.1683	5.827
10	14.43	297.9	0.1525	5.144
11	16.11	297.6	0.1397	4.471
12	17.66	297.3	0.1295	3.781
13	19.81	297	0.1179	3.076
14	22.96	296.7	0.1065	1.828
15	191	297.2	0.1022	1.921E-07
16	360.5	297.6	0.1019	1.893E-07

TIME:TIME (s) - TEMP:TEMPERATURE (K) - PRES:PRESSURE (MPa) - FLOW:CUMULITIVE VENTING RATE (kg/s)

#	TCRIT	PCRIT	MTOT	NTOT
0	0.9021	0.4803	201.9	7.647
1	0.9021	0.4803	190.4	7.212
2	0.9022	0.4802	178.9	6.777

3	0.9022	0.4801	167.4	6.342
4	0.9022	0.48	156	5.908
5	0.9023	0.4798	144.5	5.473
6	0.9024	0.4798	133	5.039
7	0.9024	0.4797	121.6	4.606
8	0.9025	0.4796	110.2	4.174
9	0.9007	0.474	99.08	3.753
10	0.9441	0.6334	89.81	3.402
11	0.9563	0.6959	82.33	3.118
12	0.9658	0.7542	76.34	2.892
13	0.979	0.835	69.51	2.633
14	0.9927	0.9374	62.78	2.378
15	0.9984	0.991	60.17	2.279
16	0.999	0.994	59.92	2.27

TCRIT:TCRIT - PCRIT:PCRIT - MTOT:MTOT - NTOT:Total number of moles

(kmol)

#	TDOT	PDOT	UEXIT	TPHI
0	-0.5028	-19619	320.8	28.48
1	-0.4944	-18648	320.8	30.14
2	-0.4645	-17497	320.7	32.02
3	-0.4343	-16346	320.6	34.16
4	-0.404	-15196	320.5	36.61
5	-0.3735	-14045	320.5	39.46
6	-0.3427	-12893	320.4	42.78
7	-0.3117	-11737	320.3	46.73
8	-0.2802	-10570	320.2	51.48
9	-0.2458	-9320	319.9	57.15
10	-0.2158	-8190	245.4	62.97
11	-0.1854	-7080	215.5	68.62
12	-0.1544	-5948	184.2	73.93
13	-0.1227	-4764	151.8	81.11
14	-0.06733	-2708	91.36	89.72
15	0.002733	0.9517	9.671E-06	93.54
16	0.001546	0.5357	9.547E-06	93.91

TDOT:TDOT - PDOT:PDOT - UEXIT:Exit velocity (m/s) - TPHI:Thermal inertia phi factor

#	IMPULSE1	IMPULSE2
0	7795	6665

1	7571	6474
2	7124	6091
3	6678	5709
4	6232	5328
5	5787	4947
6	5343	4567
7	4899	4188
8	4457	3810
9	4017	3396
10	3597	3106
11	3228	2810
12	2910	2540
13	2519	2311
14	2084	2011
15	1877	1844
16	1866	1844

IMPULSE1:Peak Impulse at pipe inlet (N) - IMPULSE2:Steady state

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PROJECT: Releases Chittick
PROBLEM: Releases Thu Jul 19 14:49:06 2018

Impulse at pipe exit (N)
No expansion calculations performed

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PROJECT: Releases Chittick
PROBLEM: Releases Thu Jul 19 14:51:37 2018

Gas/Vapor pipe flow

User Inputs:

Inlet temperature (K) 303
Inlet pressure (Pa) ..... 3.44E+05
Surroundings pressure (Pa) ..... 1.01E+05

#	cid	Ndoti
0	0	0.154
1	1	0.00756
2	2	0.0142
3	3	0.0147
4	4	0.0147
5	980	0.000688
6	224	0.0144
7	1013	0.00848

cid:Chemical Identification Number - Ndoti:Inlet molar flow rate (kmol/s)

Model Outputs:

Exit temperature (K) 280
Exit pressure (Pa) ..... 1.01E+05
Mass flow rate (kg/s) 6.05
Fraction of pipe travelled 16.3

#	cid	Ndot
0	0	0.154
1	1	0.00756
2	2	0.0142
3	3	0.0147
4	4	0.0147
5	980	0.000688
6	224	0.0144
7	1013	0.00848

cid:Chemical Identification Number - Ndot:Exit molar flow rate (kmol/s)

Number of relief devices for this piping arrangement 0

Piping Segment 1, Diameter(in/m)= 5.99318/0.152227
IN: T= 303.00 K, P= 344643.00 Pa
OUT: T= 280.33 K, P= 101322.78 Pa, dP= 243320.22 Pa, 240.14 % of IN
No expansion calculations performed

Jet Dispersion:

Input Summary:

Chemical mole fraction 1
Release angle with horizontal, (degrees) 5
Source elevation (m) 0.01
Lower Limiting concentration = 27171.42 ppm or 2.9337E-02 kg/m3
Upper Limiting concentration = 141115.00 ppm or 1.5236E-01 kg/m3
To convert from kg/m3 to ppm multiply by 926175

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PROJECT: Testing Chittick
PROBLEM: Releases Thu Jul 19 14:53:20 2018

Jet Characteristics

#	S	X	Y	B
0	0	0	0.01	0.0762
1	0.02046	0.02038	0.01178	0.08002
2	0.04194	0.04178	0.01365	0.08402
3	0.0645	0.06425	0.01562	0.08823
4	0.08819	0.08785	0.01768	0.09264
5	0.1131	0.1126	0.01984	0.09726
6	0.1392	0.1387	0.02211	0.1021
7	0.1666	0.166	0.02448	0.1072
8	0.1954	0.1947	0.02698	0.1125
9	0.2256	0.2248	0.0296	0.1181
10	0.2573	0.2564	0.03234	0.124
11	0.2906	0.2895	0.03522	0.1302
12	0.3256	0.3244	0.03824	0.1366
13	0.3623	0.3609	0.0414	0.1434
14	0.4008	0.3992	0.04471	0.1505
15	0.4411	0.4395	0.04819	0.1579
16	0.4835	0.4817	0.05183	0.1657
17	0.528	0.526	0.05564	0.1739
18	0.5746	0.5725	0.05963	0.1825
19	0.6236	0.6212	0.06381	0.1915
20	0.6749	0.6724	0.06819	0.2009
21	0.7287	0.726	0.07277	0.2107
22	0.7852	0.7822	0.07757	0.221
23	0.8443	0.8412	0.08259	0.2319
24	0.9064	0.903	0.08784	0.2432
25	0.9714	0.9678	0.09333	0.2551
26	1.04	1.036	0.09907	0.2675
27	1.111	1.107	0.1051	0.2805
28	1.186	1.182	0.1113	0.2941

29	1.264	1.26	0.1179	0.3084
30	1.347	1.342	0.1247	0.3233
31	1.433	1.427	0.1319	0.3389
32	1.523	1.517	0.1393	0.3552
33	1.617	1.611	0.1471	0.3722
34	1.716	1.71	0.1552	0.3901
35	1.819	1.813	0.1636	0.4087
36	1.927	1.92	0.1724	0.4282
37	2.04	2.033	0.1816	0.4486
38	2.159	2.151	0.1911	0.4699
39	2.282	2.274	0.201	0.4921
40	2.412	2.403	0.2113	0.5153
41	2.547	2.538	0.222	0.5395
42	2.688	2.679	0.2331	0.5648
43	2.836	2.826	0.2447	0.5911

44	2.99	2.98	0.2566	0.6186
45	3.151	3.14	0.2691	0.6473
46	3.319	3.307	0.2819	0.6772
47	3.494	3.482	0.2952	0.7083
48	3.676	3.664	0.309	0.7407
49	3.867	3.854	0.3232	0.7745
50	4.065	4.052	0.3379	0.8096
51	4.272	4.258	0.3531	0.8462
52	4.488	4.473	0.3688	0.8842
53	4.712	4.697	0.3849	0.9238
54	4.946	4.93	0.4015	0.9649
55	5.189	5.173	0.4186	1.008
56	5.442	5.425	0.4362	1.052
57	5.704	5.687	0.4542	1.098
58	5.978	5.96	0.4727	1.146
59	6.262	6.243	0.4917	1.195
60	6.557	6.537	0.5111	1.246
61	6.861	6.841	0.5308	1.299
62	7.166	7.146	0.5503	1.352
63	7.471	7.45	0.5695	1.405
64	7.776	7.754	0.5884	1.458
65	8.081	8.058	0.607	1.51
66	8.385	8.363	0.6253	1.563
67	8.69	8.667	0.6433	1.615
68	8.995	8.971	0.6611	1.667
69	9.3	9.275	0.6786	1.719
70	9.605	9.58	0.6958	1.771
71	9.909	9.884	0.7127	1.823
72	10.21	10.19	0.7294	1.875
73	10.52	10.49	0.7459	1.927
74	10.82	10.8	0.7621	1.978
75	11.13	11.1	0.778	2.03
76	11.43	11.41	0.7937	2.082

77	11.74	11.71	0.8092	2.133
78	12.04	12.01	0.8244	2.184
79	12.35	12.32	0.8394	2.235
80	12.65	12.62	0.8542	2.286

S:Curvilinear Jet Axis Distance, m - X:Downwind Distance, m - Y:Elevation, m - B:Jet Radius, m

Jet Characteristics

#	AREA
0	0
1	0.003183
2	0.006694
3	0.01057

4	0.01483
5	0.01954
6	0.02473
7	0.03045
8	0.03675
9	0.04369
10	0.05135
11	0.05978
12	0.06907
13	0.0793
14	0.09057
15	0.103
16	0.1166
17	0.1317
18	0.1483
19	0.1665
20	0.1865
21	0.2086
22	0.2329
23	0.2596
24	0.289
25	0.3213
26	0.3568
27	0.3958
28	0.4387
29	0.4857
30	0.5375
31	0.5942
32	0.6566
33	0.725
34	0.8

```
|35   |       0.8823 |
|36   |       0.9725 |
|37   |        1.071 |
|38   |         1.18 |
|39   |        1.298 |
|40   |        1.428 |
|41   |         1.57 |
|42   |        1.726 |
|43   |        1.896 |
|44   |        2.082 |
|45   |        2.285 |
|46   |        2.506 |
|47   |        2.748 |
|48   |        3.012 |
|49   |          3.3 |
|50   |        3.614 |
|51   |        3.955 |
|52   |        4.327 |
|53   |        4.732 |
```



```
|54   |        5.172 |
|55   |         5.65 |
|56   |         6.17 |
|57   |        6.733 |
|58   |        7.345 |
|59   |        8.008 |
|60   |        8.727 |
|61   |        9.501 |
|62   |        10.31 |
|63   |        11.15 |
|64   |        12.02 |
|65   |        12.92 |
|66   |        13.86 |
|67   |        14.82 |
|68   |        15.82 |
|69   |        16.85 |
|70   |        17.91 |
|71   |        19.01 |
|72   |        20.13 |
|73   |        21.29 |
|74   |        22.48 |
|75   |         23.7 |
|76   |        24.95 |
|77   |        26.23 |
|78   |        27.55 |
|79   |        28.89 |
|80   |        30.27 |
+--------------------+
```

AREA:Cumulative projected jet area, (m2)

Jet Characteristics

#	THETA	RHO	U	Cs
0	0.08726	-0.02807	286.4	1.158
1	0.08721	-0.02673	272.7	1.103
2	0.08716	-0.02546	259.6	1.05
3	0.0871	-0.02425	247.2	1
4	0.08704	-0.02309	235.4	0.9527
5	0.08697	-0.02199	224.2	0.9073
6	0.0869	-0.02095	213.5	0.8641
7	0.08683	-0.01995	203.3	0.8229
8	0.08675	-0.019	193.7	0.7837
9	0.08667	-0.01809	184.5	0.7464
10	0.08658	-0.01723	175.7	0.7109
11	0.08648	-0.01641	167.4	0.677
12	0.08638	-0.01563	159.5	0.6447
13	0.08628	-0.01489	152	0.614
14	0.08616	-0.01418	144.8	0.5848

15	0.08604	-0.0135	138	0.5569
16	0.08592	-0.01286	131.5	0.5304
17	0.08578	-0.01225	125.4	0.5051
18	0.08564	-0.01166	119.5	0.4811
19	0.08549	-0.01111	113.9	0.4581
20	0.08533	-0.01058	108.6	0.4363
21	0.08516	-0.01007	103.5	0.4155
22	0.08499	-0.009593	98.71	0.3957
23	0.0848	-0.009136	94.12	0.3768
24	0.0846	-0.0087	89.77	0.3589
25	0.08439	-0.008286	85.62	0.3418
26	0.08417	-0.007891	81.67	0.3255
27	0.08394	-0.007515	77.91	0.31
28	0.0837	-0.007156	74.33	0.2952
29	0.08344	-0.006815	70.93	0.2811
30	0.08317	-0.00649	67.69	0.2677
31	0.08288	-0.006181	64.61	0.2549
32	0.08258	-0.005886	61.67	0.2428
33	0.08226	-0.005605	58.88	0.2312
34	0.08193	-0.005338	56.22	0.2202
35	0.08158	-0.005084	53.69	0.2096
36	0.08121	-0.004841	51.28	0.1996
37	0.08082	-0.00461	48.99	0.1901
38	0.08041	-0.00439	46.81	0.181
39	0.07999	-0.004181	44.74	0.1724
40	0.07954	-0.003981	42.76	0.1642
41	0.07907	-0.003792	40.88	0.1563

42	0.07858	-0.003611	39.09	0.1489
43	0.07807	-0.003438	37.39	0.1417
44	0.07754	-0.003274	35.77	0.135
45	0.07698	-0.003118	34.22	0.1285
46	0.07639	-0.002969	32.76	0.1224
47	0.07578	-0.002828	31.36	0.1165
48	0.07515	-0.002693	30.03	0.1109
49	0.07448	-0.002564	28.76	0.1056
50	0.0738	-0.002442	27.56	0.1006
51	0.07308	-0.002326	26.41	0.09578
52	0.07234	-0.002215	25.32	0.09119
53	0.07157	-0.002109	24.29	0.08683
54	0.07077	-0.002008	23.3	0.08267
55	0.06994	-0.001913	22.36	0.07871
56	0.06909	-0.001822	21.46	0.07494
57	0.06821	-0.001735	20.61	0.07135
58	0.0673	-0.001652	19.8	0.06793
59	0.06636	-0.001574	19.03	0.06468
60	0.0654	-0.001499	18.3	0.06158
61	0.06441	-0.001428	17.61	0.05864
62	0.06344	-0.001362	16.97	0.05594
63	0.06248	-0.001302	16.38	0.05344
64	0.06153	-0.001247	15.84	0.05114

65	0.06059	-0.001195	15.34	0.049
66	0.05966	-0.001147	14.87	0.04701
67	0.05875	-0.001103	14.43	0.04516
68	0.05785	-0.001061	14.03	0.04342
69	0.05697	-0.001022	13.64	0.0418
70	0.05609	-0.0009852	13.29	0.04028
71	0.05523	-0.0009508	12.95	0.03885
72	0.05439	-0.0009184	12.64	0.0375
73	0.05356	-0.0008879	12.34	0.03623
74	0.05274	-0.0008591	12.06	0.03503
75	0.05193	-0.0008318	11.79	0.0339
76	0.05114	-0.000806	11.54	0.03282
77	0.05036	-0.0007816	11.3	0.0318
78	0.04959	-0.0007584	11.08	0.03083
79	0.04884	-0.0007363	10.86	0.02991
80	0.0481	-0.0007153	10.66	0.02904

THETA:Angle between jet axis and horizontal (radians) - RHO:Density Difference, kg/m3 - U:Jet Velocity, m/s - Cs:Concentration Difference, kg/m3

Jet Characteristics

#	Cedge

```
+-------------------+
|0    |       0.2636 |
|1    |        0.251 |
|2    |       0.2391 |
|3    |       0.2277 |
|4    |       0.2169 |
|5    |       0.2065 |
|6    |       0.1967 |
|7    |       0.1873 |
|8    |       0.1784 |
|9    |       0.1699 |
|10   |        0.1618 |
|11   |        0.1541 |
|12   |        0.1468 |
|13   |        0.1398 |
|14   |        0.1331 |
|15   |        0.1268 |
|16   |        0.1207 |
|17   |         0.115 |
|18   |        0.1095 |
|19   |        0.1043 |
|20   |       0.09932 |
|21   |       0.09458 |
|22   |       0.09008 |
|23   |       0.08578 |
```



```
|24   |       0.08169 |
|25   |        0.0778 |
|26   |       0.07409 |
|27   |       0.07056 |
|28   |       0.06719 |
|29   |       0.06399 |
|30   |       0.06094 |
|31   |       0.05803 |
|32   |       0.05526 |
|33   |       0.05263 |
|34   |       0.05011 |
|35   |       0.04772 |
|36   |       0.04545 |
|37   |       0.04328 |
|38   |       0.04121 |
|39   |       0.03924 |
|40   |       0.03737 |
|41   |       0.03558 |
|42   |       0.03388 |
|43   |       0.03227 |
|44   |       0.03072 |
|45   |       0.02925 |
|46   |       0.02786 |
```

47	0.02652
48	0.02526
49	0.02405
50	0.0229
51	0.0218
52	0.02076
53	0.01977
54	0.01882
55	0.01792
56	0.01706
57	0.01624
58	0.01546
59	0.01472
60	0.01402
61	0.01335
62	0.01273
63	0.01217
64	0.01164
65	0.01115
66	0.0107
67	0.01028
68	0.009885
69	0.009515
70	0.009169
71	0.008843
72	0.008537
73	0.008247

74	0.007974
75	0.007716
76	0.007471
77	0.007239
78	0.007019
79	0.006809
80	0.00661
+----------+

Cedge:Jet edge concentration, kg/m3

Jet Edge Profile

#	XL	LE	XU	UE
0	0.006641	-0.06591	-0.006641	0.08591
1	0.02735	-0.06793	0.01341	0.0915
2	0.04909	-0.07005	0.03447	0.09736
3	0.07193	-0.07228	0.05658	0.1035
4	0.09591	-0.07461	0.0798	0.11
5	0.1211	-0.07706	0.1042	0.1167

6	0.1475	-0.07962	0.1298	0.1238
7	0.1753	-0.08231	0.1567	0.1313
8	0.2044	-0.08514	0.1849	0.1391
9	0.235	-0.0881	0.2145	0.1473
10	0.2671	-0.0912	0.2456	0.1559
11	0.3008	-0.09446	0.2783	0.1649
12	0.3361	-0.09788	0.3126	0.1744
13	0.3733	-0.1015	0.3485	0.1843
14	0.4122	-0.1052	0.3863	0.1946
15	0.4531	-0.1092	0.4259	0.2055
16	0.4959	-0.1133	0.4675	0.2169
17	0.5409	-0.1176	0.5111	0.2289
18	0.5881	-0.1222	0.5569	0.2414
19	0.6376	-0.1269	0.6049	0.2546
20	0.6895	-0.1319	0.6553	0.2683
21	0.7439	-0.1372	0.7081	0.2827
22	0.801	-0.1427	0.7635	0.2978
23	0.8608	-0.1484	0.8216	0.3136
24	0.9236	-0.1545	0.8825	0.3302
25	0.9893	-0.1608	0.9463	0.3475
26	1.058	-0.1675	1.013	0.3656
27	1.13	-0.1744	1.083	0.3846
28	1.206	-0.1817	1.157	0.4044
29	1.285	-0.1894	1.234	0.4252
30	1.368	-0.1974	1.315	0.4469
31	1.455	-0.2058	1.399	0.4695
32	1.546	-0.2147	1.488	0.4933
33	1.642	-0.2239	1.581	0.518
34	1.742	-0.2336	1.678	0.5439

35	1.846	-0.2438	1.779	0.571
36	1.955	-0.2544	1.886	0.5992
37	2.069	-0.2656	1.997	0.6287
38	2.189	-0.2773	2.113	0.6594
39	2.314	-0.2895	2.235	0.6915
40	2.444	-0.3023	2.362	0.7249
41	2.581	-0.3158	2.496	0.7598
42	2.723	-0.3299	2.635	0.7961
43	2.872	-0.3446	2.78	0.834
44	3.028	-0.3601	2.932	0.8734
45	3.19	-0.3763	3.09	0.9144
46	3.359	-0.3933	3.256	0.9571
47	3.536	-0.411	3.428	1.001
48	3.72	-0.4296	3.609	1.048
49	3.912	-0.4491	3.796	1.096
50	4.112	-0.4695	3.992	1.145
51	4.32	-0.4908	4.197	1.197
52	4.537	-0.5131	4.409	1.251
53	4.763	-0.5365	4.631	1.306

54	4.998	-0.5609	4.862	1.364
55	5.243	-0.5865	5.102	1.424
56	5.497	-0.6132	5.352	1.486
57	5.762	-0.6411	5.612	1.55
58	6.037	-0.6704	5.883	1.616
59	6.322	-0.7009	6.164	1.684
60	6.619	-0.7328	6.456	1.755
61	6.925	-0.7659	6.758	1.828
62	7.231	-0.7992	7.06	1.9
63	7.538	-0.8328	7.362	1.972
64	7.844	-0.8665	7.664	2.043
65	8.15	-0.9004	7.967	2.114
66	8.456	-0.9345	8.269	2.185
67	8.762	-0.9688	8.572	2.255
68	9.067	-1.003	8.875	2.325
69	9.373	-1.038	9.177	2.395
70	9.679	-1.073	9.48	2.464
71	9.985	-1.108	9.783	2.533
72	10.29	-1.143	10.09	2.602
73	10.6	-1.178	10.39	2.67
74	10.9	-1.214	10.69	2.738
75	11.21	-1.249	11	2.805
76	11.51	-1.285	11.3	2.873
77	11.82	-1.321	11.6	2.939
78	12.12	-1.357	11.91	3.006
79	12.43	-1.393	12.21	3.072
80	12.73	-1.43	12.51	3.138

XL:Lower edge downwind distance, m - LE:Lower edge elevation, m -
XU:Upper edge downwind distance, m - UE:Upper edge elevation, m

Jet Edge Profile

#	S
0	0
1	0.02046
2	0.04194
3	0.0645
4	0.08819
5	0.1131
6	0.1392
7	0.1666
8	0.1954
9	0.2256
10	0.2573
11	0.2906

12	0.3256
13	0.3623
14	0.4008
15	0.4411
16	0.4835
17	0.528
18	0.5746
19	0.6236
20	0.6749
21	0.7287
22	0.7852
23	0.8443
24	0.9064
25	0.9714
26	1.04
27	1.111
28	1.186
29	1.264
30	1.347
31	1.433
32	1.523
33	1.617
34	1.716
35	1.819
36	1.927
37	2.04
38	2.159
39	2.282
40	2.412
41	2.547
42	2.688
43	2.836
44	2.99

45	3.151
46	3.319
47	3.494
48	3.676
49	3.867
50	4.065
51	4.272
52	4.488
53	4.712
54	4.946
55	5.189
56	5.442
57	5.704
58	5.978
59	6.262

```
|60   |       6.557 |
|61   |       6.861 |
|62   |       7.166 |
|63   |       7.471 |
|64   |       7.776 |
|65   |       8.081 |
|66   |       8.385 |
|67   |        8.69 |
|68   |       8.995 |
|69   |         9.3 |
|70   |       9.605 |
|71   |       9.909 |
|72   |       10.21 |
|73   |       10.52 |
|74   |       10.82 |
|75   |       11.13 |
|76   |       11.43 |
|77   |       11.74 |
|78   |       12.04 |
|79   |       12.35 |
|80   |       12.65 |
+--------------------+
```

S:Curvilinear Jet Axis Distance, m

LIMITING CONCENTRATION CALCULATIONS:
==========

Downwind distance 12.50 m
Height (centerline) 0.85 m
Calculated limiting concentration 2.93931461E-02 kg/m3
Calculate jet width 4.493 m

Downwind distance 3.17 m
Height (lower edge) -0.37 m
Calculated limiting concentration 2.93931463E-02 kg/m3
Calculate plume width 1.287 m

PLUME LIFTOFF/LOWER EDGE TOUCHDOWN CALCULATIONS:
==========

Downwind distance 0.03 m
Height (lower edge) -0.07 m
Edge concentration 2.50668228E-01 kg/m3

PLUME TOUCHDOWN CALCULATIONS:
==========

Downwind distance 0.02 m

Centerline Height 0.01 m
Centerline concentration 1.10280448E+00 kg/m3

PLUME MAXIMUM CENTERLINE HEIGHT:
==========

Centerline concentration 2.90358413E-02 kg/m3
Downwind distance 12.62 m
Centerline Height 0.85 m

PLUME COMPONENT MASS CALCULATIONS
==========

Lower limiting concentration (calculated) 0.02939 kg/m3
Jet axis distance 12.53 m
Total compound mass within cloud 3.874 kg
Total time to reach limiting concentration 0.6403 seconds
Total compound mass within specified limits 3.646 kg
Upper limiting concentration (calculated) 0.1524 kg/m3
Jet axis distance 2.62 m
Total compound mass above upper limit 0.2283 kg

NOTE: Time is calculated based on centerline velocity

Turbulent gaseous flame jets hazards:

User inputs:

Mass flow rate, (kg/s) 6.05
Exit velocity (m/s) 286.4
Speed of sound (m/s) 327.4
Mach number 0.8749

Model outputs:

Fraction of heat radiated by flame 0.15
Energy radiation rate (kW) 37549
Flame jet length (m) 12.65

Ground level distances to 5 kW/m2

```
+-----------------------------------------------+
|#   | Xdw        | Ycw        | Fc         |
+-----------------------------------------------+
```

```
|0    |      -15.64 |      0.05052 |           5 |
|1    |      -13.33 |        7.453 |           5 |
|2    |      -11.02 |         9.97 |           5 |
|3    |      -8.711 |        11.46 |           5 |
|4    |      -6.401 |        12.29 |       4.999 |
|5    |      -4.091 |        12.58 |           5 |
|6    |      -1.781 |        12.32 |       5.001 |
|7    |      0.5288 |        11.48 |           5 |
|8    |       2.839 |        10.82 |       4.999 |
|9    |       5.149 |        10.62 |           5 |
|10   |       7.459 |        10.64 |       5.001 |
|11   |       9.768 |        10.88 |       4.999 |
|12   |       12.08 |        11.55 |           5 |
|13   |       14.39 |        12.32 |           5 |
|14   |        16.7 |        12.57 |           5 |
|15   |       19.01 |        12.29 |           5 |
|16   |       21.32 |        11.46 |           5 |
|17   |       23.63 |        9.966 |           5 |
|18   |       25.94 |         7.45 |           5 |
|19   |       28.25 |      0.05968 |           5 |
+-------------------------------------------------+
```

Xdw:Downwind distance (m) to 5.00 kW/m2. 0.00 m elevation -
Ycw:Crosswind distance (m) to 5.00 kW/m2. 0.00 m elevation -
Fc:Calculated flux (kW/m2)

Maximum radial distances to user specified flux

```
+-----------------------------------+
|#    | MaxRad       | FLUX        |
+-----------------------------------+
|0    |       28.25 |           5 |
+-----------------------------------+
```

MaxRad:Maximum radial distance to user specified flux (m) - FLUX:Heat
Flux, (kW/m2)

Maximum radial distances to user specified flux

```
+-----------------------------------+
|#    | MaxRad       | FLUX        |
+-----------------------------------+
|0    |       22.73 |          10 |
+-----------------------------------+
```

MaxRad:Maximum radial distance to user specified flux (m) - FLUX:Heat
Flux, (kW/m2)

UVCE/TNT Model:

User Inputs:

Molecular weight, (kg/kmol) 26.4

Yield factor 0.03
Heat of combustion, (J/kmol) ..... -1.092E+09
Cloud Mass, (kg) 139
Explosion is at ground level

Note: Cloud mass may not be sufficient to sustain an unconfined vapor cloud explosion

Model Outputs:

Equivalent TNT mass, (kg) 35.7

Calculated Distance and Area

#	Xc	Ac	OPs	OPe
0	54.68	9393	6893	0.9997

Xc:Radial distance to user specified overpressure, (m) - Ac:Hazard area to user specified overpressure, (m^2) - OPs:Overpressure (Pa) - OPe:User specified overpressure, (Psi)

Calculated Distance and Area

#	Xc	Ac	OPs	OPe
0	138.5	60275	2068	0.2999

Xc:Radial distance to user specified overpressure, (m) - Ac:Hazard area to user specified overpressure, (m^2) - OPs:Overpressure (Pa) - OPe:User specified overpressure, (Psi)

```
SSSSSSSSSS
SS      S
SS
SSSSSSSSSS U   U PPPPPP EEEEEE RRRRRR
      SS U   U P    P E      R    R
S      SS U   U PPPPPP EEEEEE RRRRRR
S      SS U   U P      E      R  R
SSSSSSSSSS UUUUU P      EEEEEE R  RRR

                    CCCCCCCCCC
                    CC      C
                    CC                      TM
                    CC        H    H EEEEEE MM  MM SSSSSS
                    CC        H    H E      M MM M S
                    CC      C HHHHHH EEEEEE M MM M SSSSSS
                    CC      C H    H E      M    M      S
                    CCCCCCCCCC H    H EEEEEE M    M SSSSSS
```

Supercharged Chemical hazard evaluation methods

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Welcome to Release 3.10 of SuperChems

Copyright (C) 1989-1997, Arthur D. Little, Inc.,
Acorn Park,
Cambridge, Massachusetts 02140,
USA.

Tel: (617) 498-5472
Fax: (617) 498-7161
Email: ML-EHS-RISKWORKS/SUPPORT@adlittle.com
Internet: www.riskworks.com

Level = Expert

User defined scenario:

Name: GasPlant2
Description:Release after C201
>:
>:

HAZOP reference: MISSING
Fault tree reference: MISSING
Site: HELLMAN
Vessel: PIPE3IN3
Piping layout: 3IN SHOR
Reaction:
Thermal damage criteria: 10KW
Toxic damage criteria: DEFAULT
Overpressure damage criteria: 1PSI
Mixture: MIXEDFEE
User specified project stream

Spill time (hours) 1
Day of the year (1-365) 200
Scenario duration (hours) 1
Ignition time (s) ..... -1
Spill surface thermal diffysivity, (m2/s) 4.52E-07
Spill surface thermal conductivity, (W/m/K) 0.92
Dike area (m2) ..... 1E+38
Spill surface intrinsic permeability (m2) 1E-20

Spill surface = CONCRETE

User Specified Site Conditions:

Name: Hellman
Location: CA_LONG_BEACH 118.1883 33.7706 10.6680
Description: Hellman Gas Plant

Longitude, (degrees) 118.2
Latitude, (degrees) 33.77
Altitude, (m) 10.67
Time zone factor, (hrs) 7.879
Ambient temperature, (K) 298
Ambient pressure, (Pa) ..... 1.013E+05
Soil temperature, (K) 298
Water temperature, (K) 283
Mean water flow velocity, (m/s) 2
Mean water depth, (m) 10
Relative humidity, (percent) 70
Visual range, (m) 5000
Roughness length (m) 0.024

Wind speed, (m/s) 5
Wind friction velocity, (m/s) 0.3398
Wind power law constant 0.1468
Wind speed reference height, (m) 10
Stability class (A=0/B=1/C=2/D=3/E=4/F=5) 3
Monin-Obuhkov length (m) ..... 1E+38
Water dew point (K) 292.2

User defined thermal radiation damage criteria:

Thermal radiation criteria name: 10kw
Description: 10 kw/m2 radiation

Heat Flux, (kW/m2)

10

Time integrated heat flux value, (kJ/m2)

80

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PROBLEM: Releases Thu Jul 19 15:20:07 2018

User defined toxic damage criteria:

Toxic criteria name [s]: DEFAULT
Description: DEFAULT TOXICITY CRITERION

Limiting concentration (ppm)

1E+04

Averaging time (s) 600
Receptor elevation (m) 0.0001

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User defined overpressure damage criteria:

Overpressure criteria name: 1psi
Description: 1psi

Overpressure (Pa)

6893

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User defined mixture:

Name: MixedFee
Description: mixed feed
Index bank:
Properties bank:

Chemical Mixture Definition

0. ID = 0. METHANE, CH4
1. ID = 1. ETHANE, C2H6
2. ID = 2. PROPANE, C3H8

3. ID = 3. n-BUTANE, C4H10
4. ID = 4. n-PENTANE, C5H12
5. ID = 980. NITROGEN, N2
6. ID = 224. CARBON DIOXIDE, CO2
7. ID = 1013. WATER, H2O

Binary interaction matrix:

```
[  0,  1] Kij= -0.013279  Lij=         0
[  0,  2] Kij= -0.017717  Lij=         0
[  0,  3] Kij= -0.018908  Lij=         0
[  0,  4] Kij= -0.019555  Lij=         0
[  0,  5] Kij= -0.021293  Lij=         0
[  0,  6] Kij= -0.091871  Lij=         0
[  0,  7] Kij=  -0.69258  Lij=         0
[  1,  2] Kij= 0.0058948  Lij=         0
[  1,  3] Kij= 0.0066349  Lij=         0
[  1,  4] Kij= 0.0063165  Lij=         0
[  1,  5] Kij= -0.087935  Lij=         0
[  1,  6] Kij=  -0.14153  Lij=         0
[  1,  7] Kij=  -0.53087  Lij=         0
[  2,  3] Kij= 0.0048013  Lij=         0
[  2,  4] Kij= 0.0068797  Lij=         0
[  2,  5] Kij= -0.090081  Lij=         0
[  2,  6] Kij=  -0.13095  Lij=         0
[  2,  7] Kij=  -0.52693  Lij=         0
[  3,  4] Kij= 0.0045108  Lij=         0
[  3,  5] Kij= -0.086925  Lij=         0
[  3,  6] Kij= -0.096929  Lij=         0
[  3,  7] Kij=  -0.50942  Lij=         0
[  4,  5] Kij= -0.086716  Lij=         0
[  4,  6] Kij= -0.086988  Lij=         0
[  4,  7] Kij=  -0.50229  Lij=         0
[  5,  6] Kij=  -0.23422  Lij=         0
[  5,  7] Kij=   -1.0431  Lij=         0
```



```
[  6,  7] Kij=   -0.3672  Lij=         0
```

#	cid	massfrac	molefrac
0	0	0.319	0.586
1	1	0.0367	0.036
2	2	0.135	0.09
3	3	0.166	0.084
4	4	0.176	0.072
5	980	0.00285	0.003
6	224	0.146	0.098

```
|7    |      1013 |     0.0189 |      0.031 |
+-------------------------------------------+
```

cid:Chemical Identification Number - massfrac:Mass fraction - molefrac:Mole fraction of individual components.

MixedFee is not soluble in water

The following atom matrices will be used:

Mixture atom matrix: H,C,N,O

```
4       6       8       10      12      0       0
2
1       2       3       4       5       0       1
0
0       0       0       0       0       2       0
0
0       0       0       0       0       0       2
1
```


Vessel Name: pipe3in3
Description: pipeline 3 inch 100ft long

Horizontal Cylindrical (Flat heads)
Material of construction: IRON

Length [straight side for cylinders] (m) 30
Inside diameter (m) 0.0762
Vessel metal mass (kg) 113
Wall metal thickness (m) 0.002
Base elevation with respect to scenario ground level (z=0)
(m) 0
Total vessel surface area (m2) 7.19
Total volume (m3) 0.137
Maximum pressure limit for vessel in simulation (Pa) ..... 1E+38
Maximum temperature limit for vessel in simulation (K) 0

No fire loading specified

No eductor specified

No water sprays specified

Vessel is not insulated

Vessel does not have a cooling jacket

Vessel does not have a heating jacket

Vessel is not visible to solar flux

#	Zl	Az	Vz
0	0	0	0
1	0.00195	0.723	0.000946
2	0.00391	1.01	0.00266
3	0.00586	1.22	0.00484
4	0.00782	1.39	0.00739
5	0.00977	1.53	0.0102
6	0.0117	1.65	0.0133
7	0.0137	1.75	0.0167
8	0.0156	1.85	0.0202
9	0.0176	1.93	0.0239
10	0.0195	2	0.0277
11	0.0215	2.06	0.0317
12	0.0234	2.11	0.0358
13	0.0254	2.16	0.0399
14	0.0274	2.19	0.0442
15	0.0293	2.22	0.0485
16	0.0313	2.25	0.0529
17	0.0332	2.27	0.0573
18	0.0352	2.28	0.0617
19	0.0371	2.29	0.0662
20	0.0391	2.29	0.0706
21	0.041	2.28	0.0751
22	0.043	2.27	0.0795
23	0.0449	2.25	0.084
24	0.0469	2.22	0.0883
25	0.0488	2.19	0.0926
26	0.0508	2.16	0.0969
27	0.0528	2.11	0.101
28	0.0547	2.06	0.105
29	0.0567	2	0.109
30	0.0586	1.93	0.113
31	0.0606	1.85	0.117
32	0.0625	1.75	0.12
33	0.0645	1.65	0.123
34	0.0664	1.53	0.127
35	0.0684	1.39	0.129
36	0.0703	1.22	0.132
37	0.0723	1.01	0.134
38	0.0742	0.723	0.136

```
|39   |     0.0762 |   1.66E-05 |      0.137 |
+-------------------------------------------+
```

Zl:Liquid height (m) - Az:A(z); Area as a function of liquid height m2=f(m) - Vz:V(z); Volume as a function of liquid height m3=f(m)

Piping layout:

Tag: 3in shor
Description: 3 inch hole .1m pipe length

```
+-------------------------------------------------------------------+
|#    | Sid       | Stype     | Length    | K1        | Kinf      |
+-------------------------------------------------------------------+
|0    |         0 |         0 |       0.1 |       160 |       0.5 |
+-------------------------------------------------------------------+
```

Sid:Segment identification number [] - Stype:0: Straight pipe / valves / fittings, 1: Relief device, 2: Rupture disk, 3: Thin sharp edged orifice, 4: Expander, 5: Reducer, 6: Pump - Length:Piping segment length (m) [] - K1:Number of Velocity Heads in K = K1/NRe + Kinf + Kid/ID - Kinf:Number of Velocity Heads in K = K1/NRe + Kinf + Kid/ID

```
+-------------------------------------------------------------------+
|#    | Kid       | Eps       | AreaC1    | Angle     | Z         |
+-------------------------------------------------------------------+
|0    |         0 |   4.57E-05 |   0.00456 |         0 |      0.01 |
+-------------------------------------------------------------------+
```

Kid:Number of Velocity Heads in K = K1/NRe + Kinf + Kid/ID - Eps:Typical pipe roughness: (m), Cast Iron (2.60E-04), Wrought Iron (4.57E-05), Commercial Steel (4.57E-05), Galvanized Iron (1.52E-04), Asphalted Cast Iron (1.22E-04), Drawn Tubing (1.52E-04) - AreaC1:flow area (m2) [] - Angle:Angle with respect to horizontal (degrees) [] - Z:Elevation of segment entrance (m) []

```
+-----------------------------+
|#    | H         | Ts        |
+-----------------------------+
|0    |     1E+38 |       293 |
+-----------------------------+
```

H:1/Overall heat transfer coefficient (W/m2/K); Sum_i (1/hi) [] - Ts:Surroundings temperature (K) []

Total length = 0.1 meters
Discharge coefficient (when applicable) = 1.000
1st relief device set / reset pressures (Pa) = 0 / 0

Reaction name =
Description =

Chemical Identification Number

0

Number of chemicals [] 0
Number of chemical reactions [] 0

Stoichiometric coefficient of reactants (positive)

0

Reaction order for reactants

0

Stoichiometric coefficient of products (positive)

0

Reaction order for products

0

Pre-exponential factor (m^3, s, kmol)

0

Activation energy (K)

0

Rate expression B parameter (K^(1/3))

0

Rate expression C parameter (K^(2/3))

0

Temperature Exponent

0

Reaction phase: Liquid = 0, Vapor = 1

0

Upper bound on reaction rate (kmol/s)

0

Is reaction reversible (0-No, 1-Yes)

0

Checking properties for mixture MixedFee
mixed feed

COMP 0, ID 0, NAME = METHANE

COMP 1, ID 1, NAME = ETHANE

COMP 2, ID 2, NAME = PROPANE

COMP 3, ID 3, NAME = n-BUTANE

COMP 4, ID 4, NAME = n-PENTANE

COMP 5, ID 980, NAME = NITROGEN

COMP 6, ID 224, NAME = CARBON DIOXIDE

COMP 7, ID 1013, NAME = WATER

Multicomponent Gas Flow:

User Inputs:

Initial temperature (K) 485
Initial pressure (Pa) ..... 1.481E+06
Maximum allowable time step (s) 3.6
Minimum allowable time step (s) 0.01
Final time for analysis (s) 360
Maximum number of data points to collect 1000

Outputs:

Velocity of sound in gas at initial conditions, (m/s) 389.1

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#	TIME	TEMP	PRES	FLOW
0	0.0001	485	1.481	10.07
1	0.006907	484.5	1.415	10.06
2	0.0138	484	1.35	9.609
3	0.02077	483.5	1.288	9.174
4	0.02783	483	1.228	8.755
5	0.03498	482.6	1.171	8.349
6	0.04222	482.1	1.115	7.958
7	0.04955	481.7	1.061	7.58
8	0.05697	481.3	1.009	7.216
9	0.06448	480.9	0.9596	6.866
10	0.07209	480.5	0.9117	6.528
11	0.07979	480.1	0.8656	6.202
12	0.08759	479.8	0.8213	5.89
13	0.09548	479.4	0.7788	5.589
14	0.1035	479.1	0.7381	5.3
15	0.1115	478.8	0.699	5.024
16	0.1197	478.5	0.6615	4.758
17	0.128	478.2	0.6257	4.504
18	0.1364	477.9	0.5915	4.26
19	0.1448	477.6	0.5588	4.027
20	0.1534	477.4	0.5276	3.805
21	0.162	477.1	0.4978	3.593
22	0.1707	476.9	0.4695	3.391
23	0.1795	476.7	0.4425	3.198
24	0.1884	476.5	0.417	3.015
25	0.1973	476.3	0.3927	2.841
26	0.2063	476.1	0.3697	2.675
27	0.2153	475.9	0.348	2.519
28	0.2244	475.7	0.3274	2.371
29	0.2334	475.6	0.3081	2.231
30	0.2425	475.4	0.2898	2.099
31	0.2516	475.3	0.2727	1.975
32	0.2607	475.1	0.2567	1.859

33	0.2697	475	0.2417	1.749
34	0.2787	474.9	0.2276	1.647
35	0.2875	474.8	0.2146	1.552
36	0.2963	474.7	0.2024	1.463
37	0.3049	474.6	0.1912	1.38
38	0.3133	474.5	0.1808	1.303
39	0.3295	474.3	0.1625	1.155
40	0.3452	474.2	0.1472	0.9961
41	0.3599	474.1	0.1347	0.8785
42	0.3738	474	0.1247	0.7292
43	0.3923	473.9	0.1137	0.5872
44	0.4251	473.8	0.1032	0.2033

45	4.032	471.4	0.1014	3.35E-08
46	7.632	469	0.1009	3.325E-08
47	11.23	466.7	0.1004	0
48	14.83	464.4	0.09992	0
49	18.43	462.1	0.09943	0
50	22.03	459.8	0.09894	0
51	25.63	457.6	0.09846	0
52	29.23	455.4	0.09798	0
53	32.83	453.2	0.09751	0
54	36.43	451.1	0.09704	0
55	40.03	449	0.09658	0
56	43.63	446.9	0.09613	0
57	47.23	444.8	0.09568	0
58	50.83	442.7	0.09523	0
59	54.43	440.7	0.0948	0
60	58.03	438.7	0.09436	0
61	61.63	436.7	0.09393	0
62	65.23	434.7	0.09351	0
63	68.83	432.8	0.09309	0
64	72.43	430.9	0.09268	0
65	76.03	429	0.09227	0
66	79.63	427.1	0.09187	0
67	83.23	425.3	0.09147	0
68	86.83	423.5	0.09107	0
69	90.43	421.7	0.09068	0
70	94.03	419.9	0.0903	0
71	97.63	418.1	0.08992	0
72	101.2	416.4	0.08955	0
73	104.8	414.7	0.08918	0
74	108.4	413	0.08881	0
75	112	411.3	0.08845	0
76	115.6	409.7	0.08809	0
77	119.2	408.1	0.08774	0
78	122.8	406.5	0.0874	0
79	126.4	404.9	0.08705	0
80	130	403.3	0.08671	0

81	133.6	401.8	0.08638	0
82	137.2	400.2	0.08605	0
83	140.8	398.7	0.08572	0
84	144.4	397.3	0.0854	0
85	148	395.8	0.08509	0
86	151.6	394.3	0.08477	0
87	155.2	392.9	0.08446	0
88	158.8	391.5	0.08416	0
89	162.4	390.1	0.08386	0
90	166	388.7	0.08356	0
91	169.6	387.4	0.08327	0
92	173.2	386.1	0.08298	0
93	176.8	384.7	0.0827	0
94	180.4	383.4	0.08241	0

95	184	382.2	0.08214	0
96	187.6	380.9	0.08186	0
97	191.2	379.6	0.08159	0
98	194.8	378.4	0.08133	0
99	198.4	377.2	0.08106	0
100	202	376	0.08081	0
101	205.6	374.8	0.08055	0
102	209.2	373.7	0.0803	0
103	212.8	372.5	0.08005	0
104	216.4	371.4	0.0798	0
105	220	370.3	0.07956	0
106	223.6	369.1	0.07932	0
107	227.2	368.1	0.07909	0
108	230.8	367	0.07886	0
109	234.4	365.9	0.07863	0
110	238	364.9	0.0784	0
111	241.6	363.9	0.07818	0
112	245.2	362.9	0.07796	0
113	248.8	361.9	0.07775	0
114	252.4	360.9	0.07753	0
115	256	359.9	0.07732	0
116	259.6	358.9	0.07712	0
117	263.2	358	0.07691	0
118	266.8	357.1	0.07671	0
119	270.4	356.2	0.07651	0
120	274	355.2	0.07632	0
121	277.6	354.4	0.07612	0
122	281.2	353.5	0.07593	0
123	284.8	352.6	0.07575	0
124	288.4	351.8	0.07556	0
125	292	350.9	0.07538	0
126	295.6	350.1	0.0752	0
127	299.2	349.3	0.07503	0
128	302.8	348.5	0.07485	0

129	306.4	347.7	0.07468	0
130	310	346.9	0.07451	0
131	313.6	346.1	0.07435	0
132	317.2	345.4	0.07418	0
133	320.8	344.6	0.07402	0
134	324.4	343.9	0.07386	0
135	328	343.2	0.0737	0
136	331.6	342.5	0.07355	0
137	335.2	341.8	0.0734	0
138	338.8	341.1	0.07325	0
139	342.4	340.4	0.0731	0
140	346	339.7	0.07296	0
141	349.6	339.1	0.07281	0
142	353.2	338.4	0.07267	0
143	356.8	337.8	0.07253	0
144	360.4	337.1	0.0724	0

+----------+

TIME:TIME (s) - TEMP:TEMPERATURE (K) - PRES:PRESSURE (MPa) - FLOW:CUMULITIVE VENTING RATE (kg/s)

#	TCRIT	PCRIT	MTOT	NTOT
0	0.9329	0.4957	1.514	0.05134
1	0.9329	0.4957	1.446	0.04905
2	0.933	0.4956	1.381	0.04683
3	0.9331	0.4956	1.318	0.04469
4	0.9331	0.4955	1.257	0.04262
5	0.9332	0.4954	1.198	0.04062
6	0.9333	0.4954	1.141	0.0387
7	0.9334	0.4953	1.086	0.03684
8	0.9334	0.4952	1.033	0.03505
9	0.9335	0.4952	0.9824	0.03332
10	0.9336	0.4952	0.9335	0.03166
11	0.9336	0.4951	0.8864	0.03006
12	0.9337	0.495	0.8412	0.02853
13	0.9338	0.495	0.7977	0.02705
14	0.9338	0.4949	0.756	0.02564
15	0.9339	0.4948	0.7161	0.02429
16	0.9339	0.4948	0.6778	0.02299
17	0.934	0.4948	0.6411	0.02174
18	0.934	0.4948	0.6061	0.02055
19	0.9341	0.4947	0.5726	0.01942
20	0.9341	0.4946	0.5406	0.01834
21	0.9342	0.4946	0.5102	0.0173
22	0.9342	0.4946	0.4812	0.01632
23	0.9343	0.4946	0.4536	0.01538

24	0.9343	0.4945	0.4274	0.0145
25	0.9343	0.4945	0.4025	0.01365
26	0.9344	0.4945	0.379	0.01285
27	0.9344	0.4945	0.3567	0.0121
28	0.9344	0.4944	0.3357	0.01138
29	0.9345	0.4944	0.3158	0.01071
30	0.9345	0.4944	0.2972	0.01008
31	0.9345	0.4943	0.2796	0.009484
32	0.9346	0.4943	0.2632	0.008926
33	0.9346	0.4943	0.2478	0.008404
34	0.9346	0.4942	0.2334	0.007916
35	0.9346	0.4942	0.22	0.007462
36	0.9346	0.4942	0.2076	0.007041
37	0.9346	0.4941	0.1961	0.00665
38	0.9347	0.4942	0.1854	0.006289
39	0.9348	0.489	0.1667	0.005652
40	0.964	0.6557	0.151	0.005121
41	0.9729	0.7203	0.1382	0.004686

42	0.9797	0.7829	0.1279	0.004338
43	0.989	0.8668	0.1167	0.003957
44	0.9975	0.9732	0.1058	0.003589
45	0.9993	0.9939	0.1046	0.003547
46	0.9999	0.999	0.1046	0.003547
47	0	0	0.1046	0.003547
48	0	0	0.1046	0.003547
49	0	0	0.1046	0.003547
50	0	0	0.1046	0.003547
51	0	0	0.1046	0.003547
52	0	0	0.1046	0.003547
53	0	0	0.1046	0.003547
54	0	0	0.1046	0.003547
55	0	0	0.1046	0.003547
56	0	0	0.1046	0.003547
57	0	0	0.1046	0.003547
58	0	0	0.1046	0.003547
59	0	0	0.1046	0.003547
60	0	0	0.1046	0.003547
61	0	0	0.1046	0.003547
62	0	0	0.1046	0.003547
63	0	0	0.1046	0.003547
64	0	0	0.1046	0.003547
65	0	0	0.1046	0.003547
66	0	0	0.1046	0.003547
67	0	0	0.1046	0.003547
68	0	0	0.1046	0.003547
69	0	0	0.1046	0.003547
70	0	0	0.1046	0.003547
71	0	0	0.1046	0.003547

72	0	0	0.1046	0.003547
73	0	0	0.1046	0.003547
74	0	0	0.1046	0.003547
75	0	0	0.1046	0.003547
76	0	0	0.1046	0.003547
77	0	0	0.1046	0.003547
78	0	0	0.1046	0.003547
79	0	0	0.1046	0.003547
80	0	0	0.1046	0.003547
81	0	0	0.1046	0.003547
82	0	0	0.1046	0.003547
83	0	0	0.1046	0.003547
84	0	0	0.1046	0.003547
85	0	0	0.1046	0.003547
86	0	0	0.1046	0.003547
87	0	0	0.1046	0.003547
88	0	0	0.1046	0.003547
89	0	0	0.1046	0.003547
90	0	0	0.1046	0.003547
91	0	0	0.1046	0.003547

92	0	0	0.1046	0.003547
93	0	0	0.1046	0.003547
94	0	0	0.1046	0.003547
95	0	0	0.1046	0.003547
96	0	0	0.1046	0.003547
97	0	0	0.1046	0.003547
98	0	0	0.1046	0.003547
99	0	0	0.1046	0.003547
100	0	0	0.1046	0.003547
101	0	0	0.1046	0.003547
102	0	0	0.1046	0.003547
103	0	0	0.1046	0.003547
104	0	0	0.1046	0.003547
105	0	0	0.1046	0.003547
106	0	0	0.1046	0.003547
107	0	0	0.1046	0.003547
108	0	0	0.1046	0.003547
109	0	0	0.1046	0.003547
110	0	0	0.1046	0.003547
111	0	0	0.1046	0.003547
112	0	0	0.1046	0.003547
113	0	0	0.1046	0.003547
114	0	0	0.1046	0.003547
115	0	0	0.1046	0.003547
116	0	0	0.1046	0.003547
117	0	0	0.1046	0.003547
118	0	0	0.1046	0.003547
119	0	0	0.1046	0.003547

120	0	0	0.1046	0.003547
121	0	0	0.1046	0.003547
122	0	0	0.1046	0.003547
123	0	0	0.1046	0.003547
124	0	0	0.1046	0.003547
125	0	0	0.1046	0.003547
126	0	0	0.1046	0.003547
127	0	0	0.1046	0.003547
128	0	0	0.1046	0.003547
129	0	0	0.1046	0.003547
130	0	0	0.1046	0.003547
131	0	0	0.1046	0.003547
132	0	0	0.1046	0.003547
133	0	0	0.1046	0.003547
134	0	0	0.1046	0.003547
135	0	0	0.1046	0.003547
136	0	0	0.1046	0.003547
137	0	0	0.1046	0.003547
138	0	0	0.1046	0.003547
139	0	0	0.1046	0.003547
140	0	0	0.1046	0.003547
141	0	0	0.1046	0.003547

142	0	0	0.1046	0.003547
143	0	0	0.1046	0.003547
144	0	0	0.1046	0.003547

TCRIT:TCRIT - PCRIT:PCRIT - MTOT:MTOT - NTOT:Total number of moles (kmol)

#	TDOT	PDOT	UEXIT	TPHI
0	-76.56	-9.889E+06	378	17.96
1	-75.59	-9.641E+06	377.9	18.76
2	-72.34	-9.202E+06	377.9	19.6
3	-69.18	-8.778E+06	377.9	20.5
4	-66.13	-8.369E+06	377.9	21.45
5	-63.16	-7.974E+06	377.9	22.46
6	-60.3	-7.594E+06	377.8	23.54
7	-57.52	-7.227E+06	377.8	24.68
8	-54.84	-6.874E+06	377.8	25.89
9	-52.25	-6.535E+06	377.8	27.19
10	-49.75	-6.208E+06	377.8	28.57
11	-47.34	-5.894E+06	377.8	30.04
12	-45.02	-5.592E+06	377.8	31.6
13	-42.78	-5.302E+06	377.7	33.28
14	-40.62	-5.024E+06	377.8	35.06

15	-38.55	-4.758E+06	377.8	36.97
16	-36.56	-4.502E+06	377.8	39.01
17	-34.65	-4.258E+06	377.7	41.19
18	-32.82	-4.024E+06	377.7	43.52
19	-31.07	-3.801E+06	377.7	46.01
20	-29.39	-3.587E+06	377.7	48.67
21	-27.79	-3.384E+06	377.7	51.53
22	-26.26	-3.19E+06	377.7	54.58
23	-24.8	-3.006E+06	377.6	57.84
24	-23.41	-2.83E+06	377.7	61.33
25	-22.09	-2.664E+06	377.7	65.07
26	-20.83	-2.506E+06	377.7	69.05
27	-19.64	-2.357E+06	377.6	73.31
28	-18.52	-2.215E+06	377.6	77.85
29	-17.45	-2.082E+06	377.7	82.68
30	-16.45	-1.956E+06	377.6	87.82
31	-15.5	-1.838E+06	377.6	93.28
32	-14.61	-1.726E+06	377.6	99.05
33	-13.77	-1.622E+06	377.6	105.1
34	-12.99	-1.524E+06	377.7	111.6
35	-12.25	-1.433E+06	377.6	118.3
36	-11.57	-1.348E+06	377.6	125.3
37	-10.93	-1.269E+06	377.7	132.6
38	-10.34	-1.195E+06	377.6	140.2

39	-9.202	-1.054E+06	377.7	155.9
40	-7.955	-9.026E+05	277.4	172
41	-7.066	-7.896E+05	246.9	187.9
42	-5.906	-6.487E+05	206.3	202.9
43	-4.823	-5.113E+05	167.7	222.3
44	-1.966	-1.609E+05	58.54	245.1
45	-0.6589	-142.5	9.662E-06	248.3
46	-0.6515	-140.9	9.547E-06	248.6
47	-0.6443	-139.3	9.547E-06	248.9
48	-0.637	-137.7	9.547E-06	249.2
49	-0.6299	-136.2	9.547E-06	249.5
50	-0.6227	-134.6	9.547E-06	249.8
51	-0.6156	-133.1	9.547E-06	250.2
52	-0.6086	-131.6	9.547E-06	250.5
53	-0.6016	-130.1	9.547E-06	250.8
54	-0.5946	-128.6	9.547E-06	251.1
55	-0.5877	-127.1	9.547E-06	251.4
56	-0.5809	-125.6	9.547E-06	251.7
57	-0.5741	-124.1	9.547E-06	252
58	-0.5673	-122.7	9.547E-06	252.3
59	-0.5606	-121.2	9.547E-06	252.7
60	-0.554	-119.8	9.547E-06	253
61	-0.5474	-118.4	9.547E-06	253.3
62	-0.5408	-116.9	9.547E-06	253.6

63	-0.5344	-115.5	9.547E-06	253.9
64	-0.5279	-114.2	9.547E-06	254.2
65	-0.5215	-112.8	9.547E-06	254.5
66	-0.5152	-111.4	9.547E-06	254.8
67	-0.5089	-110	9.547E-06	255.1
68	-0.5026	-108.7	9.547E-06	255.4
69	-0.4964	-107.4	9.547E-06	255.7
70	-0.4903	-106	9.547E-06	256
71	-0.4842	-104.7	9.547E-06	256.3
72	-0.4782	-103.4	9.547E-06	256.6
73	-0.4722	-102.1	9.547E-06	256.9
74	-0.4663	-100.8	9.547E-06	257.2
75	-0.4604	-99.57	9.547E-06	257.5
76	-0.4546	-98.31	9.547E-06	257.7
77	-0.4488	-97.06	9.547E-06	258
78	-0.4431	-95.83	9.547E-06	258.3
79	-0.4374	-94.6	9.547E-06	258.6
80	-0.4318	-93.39	9.547E-06	258.9
81	-0.4263	-92.19	9.547E-06	259.1
82	-0.4208	-91	9.547E-06	259.4
83	-0.4153	-89.82	9.547E-06	259.7
84	-0.4099	-88.65	9.547E-06	260
85	-0.4046	-87.5	9.547E-06	260.2
86	-0.3993	-86.35	9.547E-06	260.5
87	-0.394	-85.22	9.547E-06	260.8
88	-0.3888	-84.09	9.547E-06	261

89	-0.3837	-82.98	9.547E-06	261.3
90	-0.3786	-81.88	9.547E-06	261.6
91	-0.3735	-80.79	9.547E-06	261.8
92	-0.3686	-79.72	9.547E-06	262.1
93	-0.3636	-78.65	9.547E-06	262.3
94	-0.3587	-77.59	9.547E-06	262.6
95	-0.3539	-76.55	9.547E-06	262.8
96	-0.3491	-75.51	9.547E-06	263.1
97	-0.3444	-74.49	9.547E-06	263.3
98	-0.3397	-73.48	9.547E-06	263.6
99	-0.3351	-72.48	9.547E-06	263.8
100	-0.3305	-71.49	9.547E-06	264
101	-0.326	-70.51	9.547E-06	264.3
102	-0.3215	-69.54	9.547E-06	264.5
103	-0.3171	-68.58	9.547E-06	264.7
104	-0.3127	-67.63	9.547E-06	265
105	-0.3083	-66.7	9.547E-06	265.2
106	-0.3041	-65.77	9.547E-06	265.4
107	-0.2998	-64.86	9.547E-06	265.6
108	-0.2956	-63.95	9.547E-06	265.8
109	-0.2915	-63.05	9.547E-06	266.1
110	-0.2874	-62.17	9.547E-06	266.3

111	-0.2834	-61.3	9.547E-06	266.5
112	-0.2794	-60.43	9.547E-06	266.7
113	-0.2754	-59.58	9.547E-06	266.9
114	-0.2715	-58.73	9.547E-06	267.1
115	-0.2676	-57.9	9.547E-06	267.3
116	-0.2638	-57.07	9.547E-06	267.5
117	-0.2601	-56.26	9.547E-06	267.7
118	-0.2563	-55.45	9.547E-06	267.9
119	-0.2527	-54.66	9.547E-06	268.1
120	-0.249	-53.87	9.547E-06	268.3
121	-0.2454	-53.1	9.547E-06	268.5
122	-0.2419	-52.33	9.547E-06	268.7
123	-0.2384	-51.57	9.547E-06	268.8
124	-0.2349	-50.83	9.547E-06	269
125	-0.2315	-50.09	9.547E-06	269.2
126	-0.2281	-49.36	9.547E-06	269.4
127	-0.2248	-48.64	9.547E-06	269.6
128	-0.2215	-47.93	9.547E-06	269.7
129	-0.2183	-47.22	9.547E-06	269.9
130	-0.2151	-46.53	9.547E-06	270.1
131	-0.2119	-45.85	9.547E-06	270.2
132	-0.2088	-45.17	9.547E-06	270.4
133	-0.2057	-44.5	9.547E-06	270.6
134	-0.2027	-43.85	9.547E-06	270.7
135	-0.1997	-43.2	9.547E-06	270.9
136	-0.1967	-42.55	9.547E-06	271
137	-0.1938	-41.92	9.547E-06	271.2
138	-0.1909	-41.3	9.547E-06	271.3

139	-0.188	-40.68	9.547E-06	271.5
140	-0.1852	-40.07	9.547E-06	271.6
141	-0.1824	-39.47	9.547E-06	271.8
142	-0.1797	-38.88	9.547E-06	271.9
143	-0.177	-38.29	9.547E-06	272.1
144	-0.1743	-37.72	9.547E-06	272.2

TDOT:TDOT - PDOT:PDOT - UEXIT:Exit velocity (m/s) - TPHI:Thermal inertia phi factor

#	IMPULSE1	IMPULSE2
0	8329	7154
1	8323	7149
2	7950	6828
3	7589	6518
4	7241	6219
5	6905	5930

6	6580	5651
7	6267	5382
8	5965	5123
9	5675	4873
10	5395	4633
11	5126	4401
12	4867	4179
13	4618	3965
14	4379	3760
15	4150	3563
16	3930	3374
17	3720	3194
18	3519	3021
19	3326	2855
20	3142	2698
21	2967	2547
22	2800	2403
23	2640	2266
24	2489	2136
25	2345	2013
26	2209	1896
27	2079	1785
28	1957	1680
29	1842	1581
30	1733	1487
31	1630	1399
32	1534	1317
33	1444	1239
34	1359	1167
35	1280	1099

36	1207	1036
37	1139	977.3
38	1076	923.1
39	963.1	818.2
40	862.2	738.3
41	771.2	678.9
42	691.5	612.5
43	595.3	560.5
44	487.1	473.9
45	467.7	462
46	463	462
47	0	0
48	0	0
49	0	0
50	0	0
51	0	0
52	0	0
53	0	0

54	0	0
55	0	0
56	0	0
57	0	0
58	0	0
59	0	0
60	0	0
61	0	0
62	0	0
63	0	0
64	0	0
65	0	0
66	0	0
67	0	0
68	0	0
69	0	0
70	0	0
71	0	0
72	0	0
73	0	0
74	0	0
75	0	0
76	0	0
77	0	0
78	0	0
79	0	0
80	0	0
81	0	0
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86	0	0
87	0	0
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89	0	0
90	0	0
91	0	0
92	0	0
93	0	0
94	0	0
95	0	0
96	0	0
97	0	0
98	0	0
99	0	0
100	0	0
101	0	0

102	0	0
103	0	0
104	0	0
105	0	0
106	0	0
107	0	0
108	0	0
109	0	0
110	0	0
111	0	0
112	0	0
113	0	0
114	0	0
115	0	0
116	0	0
117	0	0
118	0	0
119	0	0
120	0	0
121	0	0
122	0	0
123	0	0
124	0	0
125	0	0
126	0	0
127	0	0
128	0	0
129	0	0
130	0	0
131	0	0
132	0	0
133	0	0
134	0	0
135	0	0

136	0	0
137	0	0
138	0	0
139	0	0
140	0	0
141	0	0
142	0	0
143	0	0
144	0	0
+----------+

IMPULSE1:Peak Impulse at pipe inlet (N) - IMPULSE2:Steady state Impulse at pipe exit (N)
No expansion calculations performed

Gas/Vapor pipe flow

User Inputs:

Inlet temperature (K) 485
Inlet pressure (Pa) ..... 1.48E+06
Surroundings pressure (Pa) ..... 1.01E+05

#	cid	Ndoti
0	0	0.0477
1	1	0.00293
2	2	0.00733
3	3	0.00684
4	4	0.00586
5	980	0.000244
6	224	0.00798
7	1013	0.00252

cid:Chemical Identification Number - Ndoti:Inlet molar flow rate (kmol/s)

Model Outputs:

Exit temperature (K) 450
Exit pressure (Pa) ..... 1.75E+05
Mass flow rate (kg/s) 2.4
Fraction of pipe travelled 104

#	cid	Ndot
0	0	0.0477
1	1	0.00293
2	2	0.00733
3	3	0.00684
4	4	0.00586
5	980	0.000244
6	224	0.00798
7	1013	0.00252

cid:Chemical Identification Number - Ndot:Exit molar flow rate (kmol/s)

Number of relief devices for this piping arrangement 0

Piping Segment 1, Diameter(in/m)= 2.99988/0.0761969
IN: T= 485.00 K, P= 1481964.00 Pa
OUT: T= 450.06 K, P= 175287.47 Pa, dP= 1306676.53 Pa, 745.45 % of IN

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PROJECT: Testing Chittick
PROBLEM: Releases Fri Jul 20 11:24:36 2018

No expansion calculations performed

Jet Dispersion:

Input Summary:

Chemical mole fraction 1
Release angle with horizontal, (degrees) 5
Source elevation (m) 0.01
Lower Limiting concentration = 25785.31 ppm or 3.1094E-02 kg/m3
Upper Limiting concentration = 139172.12 ppm or 1.6783E-01 kg/m3
To convert from kg/m3 to ppm multiply by 829268

EAIL|386, V 1.42 PAGE 2
PROJECT: Testing Chittick
PROBLEM: Releases Fri Jul 20 11:25:06 2018

Jet Characteristics

#	S	X	Y	B
0	0	0	0.01	0.0381
1	0.01052	0.01048	0.01089	0.03913
2	0.0214	0.02133	0.01177	0.04019
3	0.03268	0.03257	0.01263	0.04128
4	0.04436	0.04422	0.01347	0.0424
5	0.05646	0.0563	0.01429	0.04356
6	0.06901	0.06883	0.01507	0.04475
7	0.08203	0.08182	0.01582	0.04598
8	0.09554	0.09531	0.01653	0.04724
9	0.1096	0.1093	0.01719	0.04855
10	0.1241	0.1238	0.0178	0.04989
11	0.1392	0.139	0.01835	0.05127
12	0.1549	0.1547	0.01883	0.0527
13	0.1713	0.171	0.01924	0.05417
14	0.1883	0.188	0.01955	0.05568
15	0.206	0.2057	0.01977	0.05724
16	0.2244	0.2241	0.01988	0.05885
17	0.2436	0.2434	0.01987	0.06053
18	0.2633	0.263	0.01972	0.06227
19	0.2831	0.2829	0.01943	0.06406
20	0.3032	0.3029	0.019	0.06592

21	0.3234	0.3231	0.01842	0.06784
22	0.3438	0.3435	0.0177	0.06982
23	0.3644	0.3641	0.01683	0.07186
24	0.3852	0.3848	0.0158	0.07397
25	0.4061	0.4057	0.01462	0.07616
26	0.4272	0.4268	0.01327	0.07841
27	0.4485	0.448	0.01177	0.08075
28	0.4699	0.4694	0.0101	0.08317
29	0.4915	0.4909	0.008264	0.08567
30	0.5132	0.5125	0.006257	0.08826
31	0.535	0.5341	0.004077	0.09095
32	0.5568	0.5559	0.001719	0.09376
33	0.5786	0.5775	-0.0008206	0.09672

S:Curvilinear Jet Axis Distance, m - X:Downwind Distance, m - Y:Elevation, m - B:Jet Radius, m

Jet Characteristics

#	AREA
0	0

1	0.0008092
2	0.00167
3	0.002586
4	0.003561
5	0.004599
6	0.005705
7	0.006884
8	0.008141
9	0.009483
10	0.01091
11	0.01244
12	0.01408
13	0.01582
14	0.01769
15	0.01969
16	0.02183
17	0.02412
18	0.02654
19	0.02904
20	0.03165
21	0.03435
22	0.03716
23	0.04007
24	0.0431
25	0.04624

26	0.04949
27	0.05287
28	0.05637
29	0.06
30	0.06376
31	0.06764
32	0.07165
33	0.07577

AREA:Cumulative projected jet area, (m2)

Jet Characteristics

#	THETA	RHO	U	Cs
0	0.08726	10.84	6.903	12.02
1	0.08301	10.32	6.868	11.45
2	0.07866	9.822	6.853	10.9
3	0.07419	9.352	6.836	10.38
4	0.0696	8.903	6.816	9.878
5	0.06489	8.477	6.793	9.404
6	0.06004	8.07	6.768	8.954
7	0.05505	7.684	6.74	8.524
8	0.04991	7.315	6.71	8.116

9	0.04462	6.965	6.678	7.727
10	0.03918	6.631	6.643	7.357
11	0.03356	6.314	6.605	7.005
12	0.02777	6.011	6.566	6.669
13	0.0218	5.723	6.524	6.35
14	0.01563	5.449	6.48	6.046
15	0.009256	5.188	6.433	5.756
16	0.002667	4.94	6.384	5.481
17	-0.004151	4.702	6.331	5.217
18	-0.01108	4.474	6.276	4.963
19	-0.01802	4.256	6.218	4.722
20	-0.02498	4.049	6.156	4.492
21	-0.03196	3.852	6.092	4.273
22	-0.03895	3.664	6.024	4.065
23	-0.04597	3.486	5.952	3.867
24	-0.05301	3.316	5.878	3.679
25	-0.06008	3.154	5.798	3.5
26	-0.06718	3.001	5.715	3.329
27	-0.07434	2.854	5.625	3.167
28	-0.08156	2.715	5.529	3.012
29	-0.08888	2.582	5.425	2.865
30	-0.09636	2.456	5.308	2.725
31	-0.1041	2.335	5.173	2.591

```
|32   |     -0.1122 |        2.22 |        5.006 |        2.463 |
|33   |     -0.1213 |        2.11 |        4.752 |        2.341 |
+-----------------------------------------------------------------+
```

THETA:Angle between jet axis and horizontal (radians) - RHO:Density Difference, kg/m3 - U:Jet Velocity, m/s - Cs:Concentration Difference, kg/m3

Jet Characteristics

```
+--------------------+
|#    | Cedge        |
+--------------------+
|0    |        2.737 |
|1    |        2.606 |
|2    |        2.481 |
|3    |        2.362 |
|4    |        2.249 |
|5    |        2.141 |
|6    |        2.038 |
|7    |         1.94 |
|8    |        1.848 |
|9    |        1.759 |
|10   |        1.675 |
|11   |        1.595 |
|12   |        1.518 |
|13   |        1.445 |
|14   |        1.376 |
```



```
|15   |         1.31 |
|16   |        1.248 |
|17   |        1.188 |
|18   |         1.13 |
|19   |        1.075 |
|20   |        1.023 |
|21   |       0.9728 |
|22   |       0.9254 |
|23   |       0.8803 |
|24   |       0.8375 |
|25   |       0.7966 |
|26   |       0.7578 |
|27   |       0.7208 |
|28   |       0.6856 |
|29   |       0.6521 |
|30   |       0.6202 |
|31   |       0.5898 |
|32   |       0.5608 |
|33   |       0.5329 |
+--------------------+
```

Cedge:Jet edge concentration, kg/m3

Jet Edge Profile

#	XL	LE	XU	UE
0	0.00332	-0.02796	-0.00332	0.04796
1	0.01372	-0.0281	0.007233	0.04989
2	0.02449	-0.02829	0.01817	0.05184
3	0.03563	-0.02853	0.02951	0.0538
4	0.04717	-0.02883	0.04127	0.05577
5	0.05912	-0.02918	0.05348	0.05775
6	0.07151	-0.0296	0.06614	0.05974
7	0.08435	-0.03009	0.07929	0.06173
8	0.09766	-0.03066	0.09295	0.06371
9	0.1115	-0.03131	0.1071	0.06569
10	0.1258	-0.03205	0.1219	0.06765
11	0.1407	-0.03289	0.1372	0.06959
12	0.1561	-0.03385	0.1532	0.07151
13	0.1722	-0.03492	0.1698	0.07339
14	0.1889	-0.03612	0.1871	0.07523
15	0.2062	-0.03747	0.2052	0.07702
16	0.2243	-0.03897	0.224	0.07874
17	0.2431	-0.04066	0.2436	0.08039
18	0.2623	-0.04254	0.2637	0.08198
19	0.2817	-0.04462	0.284	0.08348
20	0.3012	-0.0469	0.3045	0.0849
21	0.3209	-0.04938	0.3253	0.08623
22	0.3408	-0.05206	0.3462	0.08746

23	0.3608	-0.05496	0.3674	0.08861
24	0.3809	-0.05807	0.3887	0.08967
25	0.4011	-0.0614	0.4103	0.09064
26	0.4215	-0.06497	0.4321	0.09151
27	0.442	-0.06876	0.454	0.09229
28	0.4626	-0.07279	0.4761	0.09299
29	0.4833	-0.07707	0.4985	0.09359
30	0.504	-0.08159	0.521	0.09411
31	0.5247	-0.08638	0.5436	0.09454
32	0.5454	-0.09145	0.5664	0.09489
33	0.5658	-0.09683	0.5892	0.09519

XL:Lower edge downwind distance, m - LE:Lower edge elevation, m -
XU:Upper edge downwind distance, m - UE:Upper edge elevation, m

Jet Edge Profile

#	S

```
+--------------------+
|0    |          0 |
|1    |    0.01052 |
|2    |     0.0214 |
|3    |    0.03268 |
|4    |    0.04436 |
|5    |    0.05646 |
|6    |    0.06901 |
|7    |    0.08203 |
|8    |    0.09554 |
|9    |     0.1096 |
|10   |     0.1241 |
|11   |     0.1392 |
|12   |     0.1549 |
|13   |     0.1713 |
|14   |     0.1883 |
|15   |      0.206 |
|16   |     0.2244 |
|17   |     0.2436 |
|18   |     0.2633 |
|19   |     0.2831 |
|20   |     0.3032 |
|21   |     0.3234 |
|22   |     0.3438 |
|23   |     0.3644 |
|24   |     0.3852 |
|25   |     0.4061 |
|26   |     0.4272 |
|27   |     0.4485 |
|28   |     0.4699 |
|29   |     0.4915 |
```



```
|30   |     0.5132 |
|31   |      0.535 |
|32   |     0.5568 |
|33   |     0.5786 |
+--------------------+
```

S:Curvilinear Jet Axis Distance, m

LIMITING CONCENTRATION CALCULATIONS:
==========

Downwind distance 0.58 m

Height (centerline) -0.00 m
Calculated limiting concentration 2.34085058E+00 kg/m3
Calculate jet width 0.1968 m

Downwind distance 0.57 m
Height (lower edge) -0.10 m
Calculated limiting concentration 5.32076968E-01 kg/m3
Calculate plume width 0.1934 m

PLUME LIFTOFF/LOWER EDGE TOUCHDOWN CALCULATIONS:
==========

Downwind distance 0.01 m
Height (lower edge) -0.03 m
Edge concentration 2.60171076E+00 kg/m3

PLUME TOUCHDOWN CALCULATIONS:
==========

Downwind distance 0.57 m
Centerline Height 0.00 m
Centerline concentration 2.37933773E+00 kg/m3

PLUME MAXIMUM CENTERLINE HEIGHT:
==========

Centerline concentration 5.37544476E+00 kg/m3
Downwind distance 0.23 m
Centerline Height 0.02 m

PLUME COMPONENT MASS CALCULATIONS
==========

Lower limiting concentration (calculated) 2.341 kg/m3
Jet axis distance 0.5786 m
Total compound mass within cloud 0.03628 kg
Total time to reach limiting concentration 0.09585 seconds
Total compound mass within specified limits 0 kg
Upper limiting concentration (calculated) 2.341 kg/m3
Jet axis distance 0.5786 m
Total compound mass above upper limit 0.03628 kg

NOTE: Time is calculated based on centerline velocity

Turbulent gaseous flame jets hazards:

User inputs:

Mass flow rate, (kg/s) 0.3785

Exit velocity (m/s) 6.903
Speed of sound (m/s) 380.7
Mach number 0.01813

Model outputs:

Fraction of heat radiated by flame 0.2311
Energy radiation rate (kW) 3448
Flame jet length (m) 0.5786

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Ground level distances to 10 kW/m2

#	Xdw	Ycw	Fc
0	-4.579	0.01029	10
1	-4.067	1.751	10
2	-3.554	2.353	10
3	-3.042	2.721	10
4	-2.529	2.939	9.999
5	-2.017	3.036	10
6	-1.505	3.017	9.998
7	-0.9922	2.867	9.999
8	-0.4797	2.536	10
9	0.03273	1.818	10
10	0.5452	1.818	10
11	1.058	2.536	9.998
12	1.57	2.867	10
13	2.083	3.017	9.999
14	2.595	3.036	10
15	3.107	2.939	9.998
16	3.62	2.72	10
17	4.132	2.353	10
18	4.645	1.751	10
19	5.157	0.000161	10

Xdw:Downwind distance (m) to 10.00 kW/m2. 0.00 m elevation -
Ycw:Crosswind distance (m) to 10.00 kW/m2. 0.00 m elevation -
Fc:Calculated flux (kW/m2)

Maximum radial distances to user specified flux

#	MaxRad	FLUX
0	7.055	5

MaxRad:Maximum radial distance to user specified flux (m) - FLUX:Heat Flux, (kW/m2)

Maximum radial distances to user specified flux

#	MaxRad	FLUX
0	5.157	10

MaxRad:Maximum radial distance to user specified flux (m) - FLUX:Heat Flux, (kW/m2)

UVCE/TNT Model:

User Inputs:

Molecular weight, (kg/kmol) 29.48
Yield factor 0.03
Heat of combustion, (J/kmol) ..... -1.162E+09
Cloud Mass, (kg) 14.95
Explosion is at ground level

Note: Cloud mass may not be sufficient to sustain an unconfined vapor cloud explosion

Model Outputs:

Equivalent TNT mass, (kg) 3.659

Calculated Distance and Area

#	Xc	Ac	OPs	OPe
0	64.82	13199	2068	0.2999

Xc:Radial distance to user specified overpressure, (m) - Ac:Hazard area to user specified overpressure, (m^2) - OPs:Overpressure (Pa) - OPe:User specified overpressure, (Psi)

Calculated Distance and Area

| # | Xc | Ac | OPs | OPe |

```
+-----------------------------------------------------------------+
|0    |       25.59 |        2057 |        6893 |      0.9997 |
+-----------------------------------------------------------------+
```

Xc:Radial distance to user specified overpressure, (m) - Ac:Hazard area to user specified overpressure, (m^2) - OPs:Overpressure (Pa) - OPe:User specified overpressure, (Psi)

User defined scenario:

Name: GasPlant3
Description:Release cooled mixed feed
>:
>:

HAZOP reference: MISSING
Fault tree reference: MISSING
Site: HELLMAN
Vessel: 50FT3
Piping layout: 3IN SHOR
Reaction:
Thermal damage criteria: 5KW
Toxic damage criteria: DEFAULT
Overpressure damage criteria: 0.3PSI
Mixture: MIXEDFEE
User specified project stream

Spill time (hours) 1
Day of the year (1-365) 200
Scenario duration (hours) 1
Ignition time (s) ..... -1
Spill surface thermal diffysivity, (m2/s) 4.52E-07
Spill surface thermal conductivity, (W/m/K) 0.92
Dike area (m2) ..... 1E+38
Spill surface intrinsic permeability (m2) 1E-20
Spill surface = CONCRETE

User Specified Site Conditions:

Name: Hellman
Location: CA_LONG_BEACH 118.1883 33.7706 10.6680
Description: Hellman Gas Plant

Longitude, (degrees) 118.2
Latitude, (degrees) 33.77
Altitude, (m) 10.67
Time zone factor, (hrs) 7.879
Ambient temperature, (K) 298
Ambient pressure, (Pa) ..... 1.013E+05
Soil temperature, (K) 298

Water temperature, (K) 283
Mean water flow velocity, (m/s) 2
Mean water depth, (m) 10
Relative humidity, (percent) 70
Visual range, (m) 5000
Roughness length (m) 0.024

Wind speed, (m/s) 5
Wind friction velocity, (m/s) 0.3398
Wind power law constant 0.1468
Wind speed reference height, (m) 10
Stability class (A=0/B=1/C=2/D=3/E=4/F=5) 3
Monin-Obuhkov length (m) ..... 1E+38
Water dew point (K) 292.2

User defined thermal radiation damage criteria:

Thermal radiation criteria name: 5kw
Description: 5 kw/m2 radiation

Heat Flux, (kW/m2)

5

Time integrated heat flux value, (kJ/m2)

25

User defined toxic damage criteria:

Toxic criteria name [s]: DEFAULT
Description: DEFAULT TOXICITY CRITERION

Limiting concentration (ppm)

1E+04

Averaging time (s) 600
Receptor elevation (m) 0.0001

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User defined overpressure damage criteria:

Overpressure criteria name: 0.3psi
Description: 0.3psi

Overpressure (Pa)

2068

User defined mixture:

Name: MixedFee
Description: mixed feed
Index bank:
Properties bank:

Chemical Mixture Definition

0. ID = 0. METHANE, CH4
1. ID = 1. ETHANE, C2H6
2. ID = 2. PROPANE, C3H8
3. ID = 3. n-BUTANE, C4H10
4. ID = 4. n-PENTANE, C5H12
5. ID = 980. NITROGEN, N2
6. ID = 224. CARBON DIOXIDE, CO2
7. ID = 1013. WATER, H2O

Binary interaction matrix:

[0, 1] Kij= -0.013279 Lij= 0
[0, 2] Kij= -0.017717 Lij= 0
[0, 3] Kij= -0.018908 Lij= 0
[0, 4] Kij= -0.019555 Lij= 0
[0, 5] Kij= -0.021293 Lij= 0
[0, 6] Kij= -0.091871 Lij= 0
[0, 7] Kij= -0.69258 Lij= 0
[1, 2] Kij= 0.0058948 Lij= 0
[1, 3] Kij= 0.0066349 Lij= 0
[1, 4] Kij= 0.0063165 Lij= 0
[1, 5] Kij= -0.087935 Lij= 0
[1, 6] Kij= -0.14153 Lij= 0
[1, 7] Kij= -0.53087 Lij= 0
[2, 3] Kij= 0.0048013 Lij= 0

```
[  2,  4] Kij= 0.0068797  Lij=         0
[  2,  5] Kij= -0.090081  Lij=         0
[  2,  6] Kij=  -0.13095  Lij=         0
[  2,  7] Kij=  -0.52693  Lij=         0
[  3,  4] Kij= 0.0045108  Lij=         0
[  3,  5] Kij= -0.086925  Lij=         0
[  3,  6] Kij= -0.096929  Lij=         0
[  3,  7] Kij=  -0.50942  Lij=         0
[  4,  5] Kij= -0.086716  Lij=         0
[  4,  6] Kij= -0.086988  Lij=         0
[  4,  7] Kij=  -0.50229  Lij=         0
[  5,  6] Kij=  -0.23422  Lij=         0
[  5,  7] Kij=   -1.0431  Lij=         0
```



```
[  6,  7] Kij=   -0.3672  Lij=         0
```

#	cid	massfrac	molefrac
0	0	0.319	0.586
1	1	0.0367	0.036
2	2	0.135	0.09
3	3	0.166	0.084
4	4	0.176	0.072
5	980	0.00285	0.003
6	224	0.146	0.098
7	1013	0.0189	0.031

cid:Chemical Identification Number - massfrac:Mass fraction - molefrac:Mole fraction of individual components.

MixedFee is not soluble in water

The following atom matrices will be used:

Mixture atom matrix: H,C,N,O

```
      4       6       8       10      12       0       0
      2
      1       2       3       4       5       0       1
      0
      0       0       0       0       0       2       0
      0
      0       0       0       0       0       0       2
      1
```


file:///I|/Hellman%20Properties/Gas%20Plant/Modeling/SuperChems/SC%20Scen3%20flow.txt[7/24/2018 9:08:15 AM]

Vessel Name: 50ft3
Description: 50ft3 vessel

Vertical Cylindrical (With User Defined Head Types)
Vessel top head is hemispherical
Vessel bottom head is hemispherical
Material of construction: IRON

Length [straight side for cylinders] (m) 4.6
Inside diameter (m) 0.6
Vessel metal mass (kg) 979
Wall metal thickness (m) 0.0127
Base elevation with respect to scenario ground level (z=0)
(m) 0
Total vessel surface area (m2) 9.24
Total volume (m3) 1.41
Maximum pressure limit for vessel in simulation (Pa) ..... 1E+38
Maximum temperature limit for vessel in simulation (K) 0

No fire loading specified

No eductor specified

No water sprays specified

Vessel is not insulated

Vessel does not have a cooling jacket

Vessel does not have a heating jacket

Vessel is not visible to solar flux

#	Zl	Az	Vz
0	0	0	0
1	0.0378	0.0667	0.00129
2	0.0756	0.124	0.00493
3	0.113	0.173	0.0106
4	0.151	0.213	0.0179
5	0.189	0.244	0.0266

6	0.227	0.266	0.0362
7	0.264	0.279	0.0465
8	0.302	0.283	0.0572
9	0.34	0.283	0.0679
10	0.566	0.283	0.132
11	0.792	0.283	0.196
12	1.02	0.283	0.26
13	1.24	0.283	0.323
14	1.47	0.283	0.387
15	1.7	0.283	0.451
16	1.92	0.283	0.515
17	2.15	0.283	0.579
18	2.37	0.283	0.643
19	2.6	0.283	0.707
20	2.83	0.283	0.771
21	3.05	0.283	0.835
22	3.28	0.283	0.899
23	3.5	0.283	0.962
24	3.73	0.283	1.03
25	3.96	0.283	1.09
26	4.18	0.283	1.15
27	4.41	0.283	1.22
28	4.63	0.283	1.28
29	4.86	0.283	1.35
30	4.89	0.283	1.36
31	4.93	0.28	1.37
32	4.96	0.271	1.37
33	5	0.254	1.38
34	5.03	0.23	1.39
35	5.06	0.198	1.4
36	5.1	0.16	1.41
37	5.13	0.114	1.41
38	5.17	0.0605	1.41
39	5.2	-1.05E-15	1.41

Zl:Liquid height (m) - Az:A(z); Area as a function of liquid height m2=f(m) - Vz:V(z); Volume as a function of liquid height m3=f(m)

Piping layout:

Tag: 3in shor
Description: 3 inch hole .1m pipe length

#	Sid	Stype	Length	K1	Kinf
0	0	0	0.1	160	0.5

Sid:Segment identification number [] - Stype:0: Straight pipe / valves / fittings, 1: Relief device, 2: Rupture disk, 3: Thin sharp edged orifice, 4: Expander, 5: Reducer, 6: Pump - Length:Piping segment length (m) [] - K1:Number of Velocity Heads in K = K1/NRe + Kinf + Kid/ID - Kinf:Number of Velocity Heads in K = K1/NRe + Kinf + Kid/ID

#	Kid	Eps	AreaC1	Angle	Z
0	0	4.57E-05	0.00456	0	0.01

Kid:Number of Velocity Heads in K = K1/NRe + Kinf + Kid/ID - Eps:Typical pipe roughness: (m), Cast Iron (2.60E-04), Wrought Iron (4.57E-05), Commercial Steel (4.57E-05), Galvanized Iron (1.52E-04), Asphalted Cast Iron (1.22E-04), Drawn Tubing (1.52E-04) - AreaC1:flow area (m2) [] - Angle:Angle with respect to horizontal (degrees) [] - Z:Elevation of segment entrance (m) []

#	H	Ts
0	1E+38	293

H:1/Overall heat transfer coefficient (W/m2/K); Sum_i (1/hi) [] - Ts:Surroundings temperature (K) []

Total length = 0.1 meters
Discharge coefficient (when applicable) = 1.000
1st relief device set / reset pressures (Pa) = 0 / 0

Reaction name =
Description =

Chemical Identification Number

0

Number of chemicals [] 0
Number of chemical reactions [] 0

Stoichiometric coefficient of reactants (positive)

0

Reaction order for reactants

0

Stoichiometric coefficient of products (positive)

0

Reaction order for products

0

Pre-exponential factor (m^3, s, kmol)

0

Activation energy (K)

0

Rate expression B parameter (K^(1/3))

0

Rate expression C parameter (K^(2/3))

0

Temperature Exponent

0

Reaction phase: Liquid = 0, Vapor = 1

0

Upper bound on reaction rate (kmol/s)

0

Is reaction reversible (0-No, 1-Yes)

0

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Checking properties for mixture MixedFee
mixed feed

COMP 0, ID 0, NAME = METHANE

COMP 1, ID 1, NAME = ETHANE

COMP 2, ID 2, NAME = PROPANE

COMP 3, ID 3, NAME = n-BUTANE

COMP 4, ID 4, NAME = n-PENTANE

COMP 5, ID 980, NAME = NITROGEN

COMP 6, ID 224, NAME = CARBON DIOXIDE

COMP 7, ID 1013, NAME = WATER

Multicomponent Gas Flow:

User Inputs:

Initial temperature (K) 302
Initial pressure (Pa) ..... 1.481E+06
Maximum allowable time step (s) 3.6
Minimum allowable time step (s) 0.01
Final time for analysis (s) 360
Maximum number of data points to collect 1000

Outputs:

Velocity of sound in gas at initial conditions, (m/s) 298.1


```
+-----------------------------------------------------------------+
|#    | TIME        | TEMP        | PRES        | FLOW        |
+-----------------------------------------------------------------+
```

0	0.0001	302	1.482	13.34
1	0.02856	301.7	1.462	13.25
2	0.05741	301.3	1.442	13.07
3	0.08666	301	1.422	12.89
4	0.1163	300.6	1.402	12.71
5	0.1464	300.3	1.382	12.54
6	0.1769	299.9	1.362	12.36
7	0.2078	299.6	1.342	12.18
8	0.2392	299.3	1.322	12
9	0.2711	298.9	1.302	11.82
10	0.3035	298.6	1.282	11.64
11	0.3363	298.2	1.262	11.46
12	0.3697	297.9	1.242	11.28
13	0.4036	297.5	1.222	11.1
14	0.438	297.2	1.202	10.92
15	0.473	296.8	1.182	10.74
16	0.5086	296.5	1.163	10.57
17	0.5448	296.2	1.143	10.39
18	0.5816	295.8	1.123	10.21
19	0.6191	295.5	1.103	10.03
20	0.6572	295.1	1.083	9.848
21	0.696	294.8	1.063	9.668
22	0.7356	294.4	1.043	9.489
23	0.7759	294.1	1.023	9.31
24	0.8169	293.7	1.003	9.13
25	0.8588	293.4	0.983	8.951
26	0.9015	293	0.963	8.771
27	0.945	292.7	0.9431	8.592
28	0.9895	292.3	0.9231	8.412
29	1.035	292	0.9032	8.233
30	1.081	291.6	0.8833	8.054
31	1.129	291.3	0.8633	7.874
32	1.177	290.9	0.8434	7.694
33	1.227	290.6	0.8235	7.515
34	1.278	290.2	0.8035	7.335
35	1.33	289.9	0.7836	7.156
36	1.383	289.5	0.7637	6.976
37	1.438	289.2	0.7437	6.797
38	1.494	288.8	0.7238	6.617
39	1.552	288.5	0.7039	6.438
40	1.611	288.1	0.684	6.258
41	1.672	287.8	0.6641	6.079
42	1.735	287.4	0.6441	5.909
43	1.8	287.1	0.6242	5.73
44	1.866	286.7	0.6043	5.55

45	1.935	286.4	0.5844	5.371
46	2.006	286	0.5645	5.191
47	2.08	285.6	0.5446	5.011

48	2.156	285.3	0.5247	4.832
49	2.235	284.9	0.5049	4.652
50	2.318	284.6	0.485	4.473
51	2.403	284.2	0.4651	4.293
52	2.492	283.9	0.4452	4.114
53	2.586	283.5	0.4254	3.934
54	2.683	283.2	0.4055	3.755
55	2.785	282.8	0.3857	3.575
56	2.893	282.5	0.3659	3.397
57	3.006	282.1	0.3461	3.218
58	3.126	281.8	0.3263	3.039
59	3.253	281.4	0.3065	2.86
60	3.388	281.1	0.2867	2.681
61	3.533	280.7	0.267	2.503
62	3.688	280.4	0.2473	2.324
63	3.856	280	0.2277	2.147
64	4.039	279.7	0.2081	1.969
65	4.239	279.3	0.1886	1.792
66	4.45	279	0.17	1.62
67	4.654	278.7	0.1542	1.415
68	4.85	278.5	0.1411	1.233
69	5.031	278.3	0.1303	1.097
70	5.289	278.1	0.118	0.838
71	5.588	277.9	0.1078	0.5498
72	106.7	278.4	0.1021	5.686E-08
73	193.1	278.9	0.1023	5.716E-08
74	283.2	279.4	0.102	5.649E-08
75	362.4	279.9	0.1022	5.677E-08

TIME:TIME (s) - TEMP:TEMPERATURE (K) - PRES:PRESSURE (MPa) - FLOW:CUMULITIVE VENTING RATE (kg/s)

#	TCRIT	PCRIT	MTOT	NTOT
0	0.8964	0.4859	27.65	0.9378
1	0.8964	0.4858	27.27	0.925
2	0.8965	0.4857	26.9	0.9122
3	0.8966	0.4856	26.52	0.8994
4	0.8967	0.4855	26.14	0.8866
5	0.8968	0.4854	25.76	0.8738
6	0.8969	0.4853	25.39	0.861
7	0.897	0.4852	25.01	0.8482
8	0.8971	0.485	24.63	0.8354
9	0.8972	0.4849	24.25	0.8226
10	0.8973	0.4848	23.88	0.8098

11	0.8973	0.4846	23.5	0.797

12	0.8974	0.4845	23.12	0.7842
13	0.8976	0.4844	22.75	0.7714
14	0.8977	0.4844	22.37	0.7586
15	0.8978	0.4842	21.99	0.7459
16	0.8979	0.4841	21.62	0.7331
17	0.898	0.484	21.24	0.7203
18	0.8981	0.4839	20.86	0.7075
19	0.8982	0.4838	20.49	0.6948
20	0.8983	0.4836	20.11	0.682
21	0.8984	0.4835	19.73	0.6693
22	0.8985	0.4834	19.36	0.6565
23	0.8986	0.4833	18.98	0.6438
24	0.8987	0.4832	18.61	0.631
25	0.8988	0.483	18.23	0.6183
26	0.8989	0.4829	17.85	0.6056
27	0.899	0.4827	17.48	0.5928
28	0.8991	0.4826	17.1	0.5801
29	0.8993	0.4825	16.73	0.5674
30	0.8994	0.4824	16.36	0.5547
31	0.8995	0.4823	15.98	0.542
32	0.8996	0.4822	15.61	0.5293
33	0.8997	0.482	15.23	0.5166
34	0.8999	0.4819	14.86	0.5039
35	0.9	0.4817	14.49	0.4913
36	0.9001	0.4815	14.11	0.4786
37	0.9002	0.4815	13.74	0.466
38	0.9003	0.4814	13.37	0.4533
39	0.9005	0.4812	12.99	0.4407
40	0.9006	0.4811	12.62	0.428
41	0.9007	0.481	12.25	0.4154
42	0.901	0.4817	11.88	0.4028
43	0.9011	0.4816	11.51	0.3902
44	0.9012	0.4815	11.13	0.3776
45	0.9013	0.4813	10.76	0.365
46	0.9015	0.4812	10.39	0.3525
47	0.9016	0.481	10.02	0.3399
48	0.9017	0.481	9.652	0.3274
49	0.9019	0.4808	9.283	0.3148
50	0.902	0.4807	8.913	0.3023
51	0.9021	0.4806	8.545	0.2898
52	0.9023	0.4804	8.176	0.2773
53	0.9024	0.4803	7.808	0.2648
54	0.9026	0.4803	7.441	0.2524
55	0.9027	0.4801	7.074	0.2399
56	0.9028	0.48	6.707	0.2275
57	0.903	0.4799	6.341	0.2151
58	0.9031	0.4797	5.976	0.2027
59	0.9033	0.4796	5.611	0.1903
60	0.9034	0.4795	5.247	0.1779

61	0.9035	0.4793	4.884	0.1656
62	0.9037	0.4792	4.521	0.1533
63	0.9038	0.4789	4.16	0.1411
64	0.9039	0.4789	3.8	0.1289
65	0.9041	0.4787	3.442	0.1167
66	0.9046	0.4795	3.101	0.1052
67	0.9437	0.6268	2.813	0.0954
68	0.9556	0.6878	2.572	0.08723
69	0.9668	0.7485	2.374	0.08053
70	0.9792	0.8334	2.151	0.07294
71	0.991	0.9228	1.964	0.06662
72	0.9987	0.9925	1.855	0.06293
73	0.9984	0.9907	1.855	0.06293
74	0.9989	0.9932	1.847	0.06265
75	0.9986	0.9916	1.847	0.06265

TCRIT:TCRIT - PCRIT:PCRIT - MTOT:MTOT - NTOT:Total number of moles (kmol)

#	TDOT	PDOT	UEXIT	TPHI
0	-12.05	-7.05E+05	287.7	10.13
1	-11.94	-6.978E+05	287.7	10.26
2	-11.79	-6.883E+05	287.8	10.39
3	-11.64	-6.789E+05	287.8	10.53
4	-11.49	-6.696E+05	287.9	10.67
5	-11.34	-6.602E+05	287.9	10.81
6	-11.19	-6.508E+05	288	10.96
7	-11.04	-6.414E+05	288	11.12
8	-10.89	-6.32E+05	288.1	11.27
9	-10.74	-6.226E+05	288.1	11.44
10	-10.59	-6.132E+05	288.1	11.6
11	-10.44	-6.039E+05	288.2	11.78
12	-10.28	-5.945E+05	288.3	11.95
13	-10.13	-5.851E+05	288.3	12.14
14	-9.978	-5.758E+05	288.3	12.33
15	-9.825	-5.664E+05	288.4	12.53
16	-9.671	-5.57E+05	288.4	12.73
17	-9.517	-5.477E+05	288.5	12.94
18	-9.362	-5.383E+05	288.5	13.16
19	-9.207	-5.29E+05	288.6	13.39
20	-9.052	-5.196E+05	288.7	13.62
21	-8.896	-5.102E+05	288.7	13.87
22	-8.74	-5.009E+05	288.7	14.12
23	-8.583	-4.915E+05	288.8	14.38
24	-8.426	-4.822E+05	288.9	14.66
25	-8.269	-4.728E+05	288.9	14.94
26	-8.111	-4.634E+05	289	15.24

27	-7.953	-4.541E+05	289.1	15.55
28	-7.794	-4.447E+05	289.1	15.87
29	-7.636	-4.354E+05	289.2	16.21
30	-7.477	-4.26E+05	289.2	16.56
31	-7.317	-4.166E+05	289.3	16.93
32	-7.157	-4.072E+05	289.3	17.32
33	-6.997	-3.978E+05	289.4	17.72
34	-6.836	-3.884E+05	289.5	18.15
35	-6.674	-3.79E+05	289.5	18.59
36	-6.513	-3.696E+05	289.6	19.06
37	-6.351	-3.602E+05	289.7	19.56
38	-6.189	-3.508E+05	289.7	20.08
39	-6.026	-3.414E+05	289.8	20.63
40	-5.863	-3.32E+05	289.9	21.22
41	-5.699	-3.226E+05	289.9	21.84
42	-5.546	-3.137E+05	290	22.5
43	-5.381	-3.042E+05	290.1	23.2
44	-5.216	-2.948E+05	290.1	23.94
45	-5.051	-2.853E+05	290.2	24.74
46	-4.885	-2.758E+05	290.3	25.59
47	-4.719	-2.663E+05	290.4	26.51
48	-4.553	-2.568E+05	290.4	27.49
49	-4.386	-2.473E+05	290.5	28.55
50	-4.219	-2.378E+05	290.6	29.7
51	-4.051	-2.282E+05	290.6	30.95
52	-3.883	-2.187E+05	290.7	32.3
53	-3.714	-2.091E+05	290.8	33.79
54	-3.546	-1.996E+05	290.9	35.42
55	-3.376	-1.9E+05	290.9	37.21
56	-3.207	-1.804E+05	291	39.2
57	-3.036	-1.708E+05	291.1	41.41
58	-2.865	-1.611E+05	291.2	43.9
59	-2.694	-1.515E+05	291.2	46.69
60	-2.522	-1.418E+05	291.3	49.88
61	-2.349	-1.32E+05	291.4	53.53
62	-2.176	-1.223E+05	291.5	57.75
63	-2.001	-1.125E+05	291.6	62.69
64	-1.826	-1.026E+05	291.7	68.55
65	-1.648	-92695	291.7	75.59
66	-1.479	-83154	291.9	83.81
67	-1.285	-72315	224.7	92.32
68	-1.11	-62613	198.2	100.9
69	-0.9823	-55269	178.3	109.2
70	-0.736	-41584	137.9	120.5
71	-0.4642	-26355	91.56	131.8
72	0.005955	2.217	9.559E-06	139.5
73	0.005795	2.157	9.625E-06	139.4
74	0.005637	2.089	9.534E-06	140
75	0.005499	2.038	9.594E-06	139.9

TDOT:TDOT - PDOT:PDOT - UEXIT:Exit velocity (m/s) - TPHI:Thermal inertia phi factor

#	IMPULSE1	IMPULSE2
0	8350	7122
1	8294	7074
2	8182	6977
3	8070	6882
4	7958	6786
5	7846	6690
6	7734	6594
7	7622	6499
8	7510	6403
9	7398	6307
10	7286	6211
11	7174	6115
12	7062	6019
13	6950	5923
14	6838	5827
15	6726	5731
16	6614	5636
17	6502	5540
18	6390	5444
19	6278	5348
20	6165	5252
21	6053	5156
22	5941	5061
23	5829	4965
24	5717	4869
25	5605	4773
26	5493	4677
27	5380	4581
28	5268	4485
29	5156	4390
30	5044	4294
31	4932	4198
32	4820	4102
33	4707	4007
34	4595	3911
35	4483	3815
36	4371	3719
37	4258	3624
38	4146	3528
39	4034	3432
40	3922	3336
41	3810	3241

|42 | 3697 | 3150 |

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PROJECT: Testing Chittick
PROBLEM: Releases Fri Jul 20 10:11:17 2018

43	3585	3055
44	3473	2959
45	3361	2863
46	3248	2767
47	3136	2672
48	3024	2576
49	2912	2480
50	2799	2385
51	2687	2289
52	2575	2193
53	2463	2097
54	2351	2002
55	2239	1906
56	2127	1811
57	2015	1716
58	1903	1620
59	1791	1525
60	1679	1430
61	1568	1334
62	1456	1239
63	1345	1145
64	1234	1050
65	1123	955.8
66	1013	863.9
67	911.7	780.4
68	819	706.4
69	736.4	657.6
70	633.3	577.7
71	536.8	512.4
72	469	462
73	470.7	462
74	468.3	462
75	469.8	462

IMPULSE1:Peak Impulse at pipe inlet (N) - IMPULSE2:Steady state Impulse at pipe exit (N)

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PROJECT: Testing Chittick
PROBLEM: Releases Fri Jul 20 10:42:43 2018

Gas/Vapor pipe flow

User Inputs:

Inlet temperature (K) 302
Inlet pressure (Pa) ..... 1.48E+06
Surroundings pressure (Pa) ..... 1.01E+05

#	cid	Ndoti
0	0	0.0912
1	1	0.0056
2	2	0.014
3	3	0.0131
4	4	0.0112
5	980	0.000467
6	224	0.0153
7	1013	0.00483

cid:Chemical Identification Number - Ndoti:Inlet molar flow rate (kmol/s)

Model Outputs:

Exit temperature (K) 264
Exit pressure (Pa) ..... 2.48E+05
Mass flow rate (kg/s) 4.59
Fraction of pipe travelled 45.9

#	cid	Ndot
0	0	0.0912
1	1	0.0056
2	2	0.014
3	3	0.0131
4	4	0.0112
5	980	0.000467
6	224	0.0153
7	1013	0.00483

cid:Chemical Identification Number - Ndot:Exit molar flow rate (kmol/s)

Number of relief devices for this piping arrangement 0

Piping Segment 1, Diameter(in/m)= 2.99988/0.0761969
IN: T= 302.00 K, P= 1481964.00 Pa
OUT: T= 264.06 K, P= 248009.95 Pa, dP= 1233954.05 Pa, 497.54 % of IN

No expansion calculations performed

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PROJECT: Testing Chittick
PROBLEM: Releases Fri Jul 20 11:30:52 2018

No expansion calculations performed

Jet Dispersion:

Input Summary:

Chemical mole fraction 1
Release angle with horizontal, (degrees) 5
Source elevation (m) 0.01
Lower Limiting concentration = 25785.31 ppm or 3.1094E-02 kg/m3
Upper Limiting concentration = 139172.12 ppm or 1.6783E-01 kg/m3
To convert from kg/m3 to ppm multiply by 829268

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PROJECT: Testing Chittick
PROBLEM: Releases Fri Jul 20 11:30:54 2018

Jet Characteristics

#	S	X	Y	B
0	0	0	0.01	0.0381
1	0.01027	0.01023	0.01089	0.03911
2	0.02082	0.02074	0.01181	0.04015
3	0.03165	0.03153	0.01275	0.04122
4	0.04277	0.04261	0.01371	0.04233
5	0.05419	0.05399	0.0147	0.04346
6	0.06592	0.06567	0.01571	0.04463
7	0.07796	0.07767	0.01674	0.04584
8	0.09034	0.09	0.0178	0.04708
9	0.103	0.1027	0.01889	0.04836
10	0.1161	0.1157	0.02001	0.04968
11	0.1295	0.129	0.02115	0.05104
12	0.1433	0.1428	0.02232	0.05245
13	0.1575	0.1569	0.02351	0.0539
14	0.172	0.1714	0.02474	0.05539
15	0.187	0.1863	0.026	0.05693
16	0.2023	0.2016	0.02729	0.05853
17	0.2181	0.2173	0.02861	0.06017
18	0.2344	0.2335	0.02996	0.06187
19	0.2511	0.2502	0.03134	0.06362
20	0.2683	0.2673	0.03276	0.06544

21	0.2859	0.2849	0.03422	0.06731
22	0.3041	0.303	0.03571	0.06925
23	0.3228	0.3217	0.03723	0.07125
24	0.3421	0.3409	0.03879	0.07332
25	0.3619	0.3606	0.0404	0.07547
26	0.3822	0.3809	0.04203	0.07769
27	0.4032	0.4018	0.04371	0.07998
28	0.4248	0.4233	0.04543	0.08236
29	0.4471	0.4455	0.04719	0.08483
30	0.47	0.4684	0.049	0.08738
31	0.4936	0.4919	0.05084	0.09003
32	0.5179	0.5161	0.05273	0.09278
33	0.543	0.5411	0.05467	0.09562
34	0.5688	0.5669	0.05665	0.09858
35	0.5954	0.5934	0.05867	0.1016
36	0.6229	0.6208	0.06075	0.1048
37	0.6512	0.649	0.06287	0.1081
38	0.6804	0.6782	0.06504	0.1115
39	0.7105	0.7082	0.06725	0.1151
40	0.7416	0.7392	0.06952	0.1188
41	0.7737	0.7712	0.07184	0.1226
42	0.8069	0.8043	0.0742	0.1266
43	0.8411	0.8384	0.07662	0.1308

44	0.8764	0.8737	0.07909	0.1351
45	0.913	0.9101	0.0816	0.1396
46	0.9507	0.9478	0.08417	0.1443
47	0.9897	0.9867	0.08679	0.1491
48	1.03	1.027	0.08945	0.1542
49	1.072	1.069	0.09217	0.1594
50	1.115	1.112	0.09493	0.1649
51	1.159	1.156	0.09773	0.1706
52	1.206	1.202	0.1006	0.1765
53	1.253	1.25	0.1035	0.1827
54	1.303	1.299	0.1064	0.1891
55	1.354	1.35	0.1094	0.1957
56	1.407	1.403	0.1124	0.2027
57	1.462	1.458	0.1154	0.2099
58	1.519	1.515	0.1184	0.2175
59	1.578	1.574	0.1215	0.2253
60	1.639	1.635	0.1245	0.2335
61	1.702	1.698	0.1276	0.2419
62	1.768	1.764	0.1307	0.2508
63	1.836	1.832	0.1337	0.26
64	1.907	1.902	0.1367	0.2695
65	1.98	1.976	0.1397	0.2795
66	2.056	2.052	0.1427	0.2898
67	2.135	2.13	0.1455	0.3006
68	2.217	2.212	0.1483	0.3118

69	2.302	2.297	0.151	0.3234
70	2.39	2.386	0.1535	0.3355
71	2.482	2.477	0.1559	0.3481
72	2.577	2.572	0.1582	0.3612
73	2.676	2.671	0.1602	0.3748
74	2.779	2.774	0.162	0.3889
75	2.885	2.881	0.1635	0.4035
76	2.996	2.991	0.1648	0.4187
77	3.111	3.107	0.1657	0.4344
78	3.231	3.226	0.1662	0.4508
79	3.355	3.35	0.1663	0.4678
80	3.484	3.479	0.1659	0.4854
81	3.616	3.611	0.165	0.5038
82	3.752	3.747	0.1636	0.5228
83	3.891	3.886	0.1615	0.5425
84	4.034	4.029	0.1589	0.563
85	4.18	4.175	0.1555	0.5841
86	4.329	4.324	0.1515	0.6061
87	4.481	4.476	0.1467	0.6287
88	4.634	4.629	0.1413	0.6517
89	4.786	4.781	0.1353	0.6751
90	4.939	4.933	0.1286	0.6987
91	5.091	5.085	0.1214	0.7228
92	5.243	5.238	0.1135	0.7472
93	5.396	5.39	0.105	0.772

94	5.548	5.542	0.09586	0.7973
95	5.701	5.694	0.08616	0.8231
96	5.853	5.846	0.07586	0.8493
97	6.005	5.998	0.06498	0.8761
98	6.158	6.15	0.0535	0.9035
99	6.31	6.302	0.04142	0.9315
100	6.463	6.454	0.02872	0.9604
101	6.615	6.606	0.01539	0.9904
102	6.767	6.757	0.001368	1.022
103	6.92	6.909	-0.01358	1.058

S:Curvilinear Jet Axis Distance, m - X:Downwind Distance, m -
Y:Elevation, m - B:Jet Radius, m

Jet Characteristics

#	AREA
0	0
1	0.0007902
2	0.001623
3	0.002501

4	0.003427
5	0.004403
6	0.005432
7	0.006518
8	0.007663
9	0.008872
10	0.01015
11	0.01149
12	0.01291
13	0.01441
14	0.016
15	0.01767
16	0.01944
17	0.02131
18	0.02329
19	0.02538
20	0.02759
21	0.02992
22	0.0324
23	0.03502
24	0.03779
25	0.04073
26	0.04384
27	0.04713
28	0.05063
29	0.05434
30	0.05827

31	0.06245
32	0.06688
33	0.07158
34	0.07659
35	0.0819
36	0.08755
37	0.09357
38	0.09996
39	0.1068
40	0.114
41	0.1218
42	0.13
43	0.1388
44	0.1482
45	0.1582
46	0.1689
47	0.1803
48	0.1925
49	0.2055
50	0.2195
51	0.2344

52	0.2504
53	0.2675
54	0.2859
55	0.3055
56	0.3266
57	0.3493
58	0.3735
59	0.3996
60	0.4276
61	0.4577
62	0.49
63	0.5248
64	0.5621
65	0.6024
66	0.6456
67	0.6922
68	0.7423
69	0.7963
70	0.8545
71	0.9171
72	0.9846
73	1.057
74	1.136
75	1.22
76	1.311
77	1.41
78	1.516
79	1.63
80	1.752

81	1.883
82	2.022
83	2.171
84	2.328
85	2.496
86	2.673
87	2.861
88	3.056
89	3.259
90	3.468
91	3.684
92	3.908
93	4.139
94	4.378
95	4.624
96	4.878
97	5.141
98	5.411
99	5.69

100	5.977
101	6.273
102	6.579
103	6.894

AREA:Cumulative projected jet area, (m2)

Jet Characteristics

#	THETA	RHO	U	Cs
0	0.08726	22.83	41.9	24.02
1	0.08709	21.73	41.77	22.86
2	0.08691	20.69	41.66	21.76
3	0.08673	19.69	41.53	20.71
4	0.08655	18.74	41.4	19.72
5	0.08636	17.84	41.27	18.77
6	0.08616	16.98	41.12	17.86
7	0.08595	16.17	40.97	17
8	0.08574	15.39	40.81	16.19
9	0.08552	14.65	40.65	15.41
10	0.0853	13.94	40.47	14.67
11	0.08506	13.27	40.29	13.96
12	0.08482	12.63	40.1	13.29
13	0.08457	12.02	39.9	12.65
14	0.08431	11.44	39.69	12.04
15	0.08404	10.89	39.47	11.46
16	0.08376	10.37	39.25	10.91
17	0.08347	9.871	39.01	10.38
18	0.08317	9.396	38.77	9.884

19	0.08286	8.944	38.52	9.408
20	0.08254	8.513	38.25	8.956
21	0.0822	8.104	37.98	8.525
22	0.08185	7.714	37.7	8.115
23	0.08149	7.343	37.41	7.724
24	0.08112	6.99	37.1	7.353
25	0.08073	6.654	36.79	6.999
26	0.08033	6.334	36.47	6.663
27	0.07991	6.029	36.14	6.342
28	0.07947	5.739	35.79	6.037
29	0.07902	5.463	35.44	5.747
30	0.07854	5.2	35.08	5.471
31	0.07805	4.95	34.71	5.208
32	0.07754	4.712	34.33	4.957
33	0.07701	4.486	33.93	4.719
34	0.07645	4.27	33.53	4.492
35	0.07588	4.065	33.12	4.276

36	0.07527	3.87	32.7	4.071
37	0.07465	3.684	32.27	3.875
38	0.07399	3.507	31.83	3.689
39	0.07331	3.338	31.39	3.512
40	0.0726	3.178	30.93	3.343
41	0.07185	3.025	30.47	3.182
42	0.07108	2.88	30	3.03
43	0.07027	2.742	29.53	2.884
44	0.06942	2.61	29.05	2.746
45	0.06854	2.485	28.56	2.614
46	0.06762	2.365	28.06	2.488
47	0.06666	2.252	27.57	2.369
48	0.06565	2.144	27.06	2.255
49	0.0646	2.041	26.56	2.147
50	0.0635	1.943	26.05	2.044
51	0.06236	1.85	25.54	1.946
52	0.06116	1.761	25.02	1.852
53	0.0599	1.676	24.51	1.763
54	0.05859	1.596	23.99	1.679
55	0.05722	1.519	23.48	1.598
56	0.05579	1.447	22.96	1.522
57	0.05429	1.377	22.45	1.449
58	0.05272	1.311	21.94	1.379
59	0.05109	1.248	21.43	1.313
60	0.04938	1.188	20.92	1.25
61	0.04759	1.131	20.42	1.19
62	0.04573	1.077	19.92	1.133
63	0.04378	1.025	19.43	1.079
64	0.04175	0.9763	18.94	1.027
65	0.03963	0.9294	18.45	0.9777
66	0.03741	0.8849	17.98	0.9308
67	0.0351	0.8425	17.51	0.8862
68	0.0327	0.8021	17.04	0.8437

69	0.03019	0.7636	16.59	0.8033
70	0.02758	0.727	16.14	0.7648
71	0.02486	0.6921	15.7	0.7281
72	0.02203	0.6589	15.27	0.6932
73	0.01909	0.6274	14.84	0.6599
74	0.01603	0.5973	14.43	0.6283
75	0.01286	0.5686	14.02	0.5982
76	0.009564	0.5414	13.62	0.5695
77	0.006149	0.5154	13.23	0.5422
78	0.002609	0.4907	12.85	0.5162
79	-0.001057	0.4671	12.48	0.4914
80	-0.004839	0.4446	12.12	0.4677
81	-0.008704	0.4231	11.76	0.4451
82	-0.01265	0.4027	11.42	0.4236
83	-0.01667	0.3832	11.08	0.4031

84	-0.02075	0.3647	10.75	0.3836
85	-0.02489	0.347	10.43	0.3651
86	-0.02909	0.3302	10.12	0.3474
87	-0.03333	0.3143	9.814	0.3306
88	-0.03753	0.2994	9.522	0.3149
89	-0.04167	0.2854	9.243	0.3002
90	-0.04577	0.2723	8.974	0.2865
91	-0.04983	0.2601	8.715	0.2736
92	-0.05384	0.2485	8.465	0.2614
93	-0.05781	0.2376	8.222	0.25
94	-0.06174	0.2273	7.985	0.2391
95	-0.06565	0.2176	7.753	0.2289
96	-0.06954	0.2084	7.524	0.2192
97	-0.07344	0.1996	7.296	0.21
98	-0.07735	0.1913	7.067	0.2012
99	-0.08133	0.1834	6.832	0.1929
100	-0.08542	0.1758	6.585	0.1849
101	-0.08973	0.1685	6.312	0.1772
102	-0.09455	0.1614	5.976	0.1698
103	-0.102	0.1543	5.246	0.1623

THETA:Angle between jet axis and horizontal (radians) - RHO:Density Difference, kg/m3 - U:Jet Velocity, m/s - Cs:Concentration Difference, kg/m3

Jet Characteristics

#	Cedge
0	5.468
1	5.204
2	4.954
3	4.715
4	4.488

5	4.272
6	4.067
7	3.871
8	3.685
9	3.507
10	3.338
11	3.178
12	3.025
13	2.879
14	2.741
15	2.609
16	2.483
17	2.364

18	2.25
19	2.142
20	2.039
21	1.941
22	1.847
23	1.758
24	1.674
25	1.593
26	1.517
27	1.444
28	1.374
29	1.308
30	1.245
31	1.185
32	1.128
33	1.074
34	1.023
35	0.9734
36	0.9267
37	0.8821
38	0.8397
39	0.7994
40	0.761
41	0.7244
42	0.6896
43	0.6565
44	0.625
45	0.595
46	0.5664
47	0.5392
48	0.5133
49	0.4887
50	0.4652
51	0.4429
52	0.4217
53	0.4014
54	0.3822

55	0.3638
56	0.3464
57	0.3298
58	0.3139
59	0.2989
60	0.2846
61	0.2709
62	0.2579
63	0.2456
64	0.2338
65	0.2226

66	0.2119
67	0.2017
68	0.1921
69	0.1829
70	0.1741
71	0.1657
72	0.1578
73	0.1502
74	0.143
75	0.1362
76	0.1296
77	0.1234
78	0.1175
79	0.1119
80	0.1065
81	0.1013
82	0.09643
83	0.09177
84	0.08733
85	0.0831
86	0.07908
87	0.07526
88	0.07169
89	0.06835
90	0.06522
91	0.06228
92	0.05951
93	0.0569
94	0.05444
95	0.05211
96	0.0499
97	0.0478
98	0.04581
99	0.04391
100	0.04209
101	0.04035
102	0.03866
103	0.03695
+----------+

Cedge:Jet edge concentration, kg/m3

Jet Edge Profile

#	XL	LE	XU	UE
0	0.00332	-0.02796	-0.00332	0.04796
1	0.01364	-0.02807	0.006832	0.04986

2	0.02423	-0.02819	0.01726	0.05181
3	0.0351	-0.02832	0.02796	0.05382
4	0.04627	-0.02846	0.03895	0.05588
5	0.05774	-0.0286	0.05024	0.058
6	0.06951	-0.02876	0.06183	0.06018
7	0.08161	-0.02893	0.07374	0.06241
8	0.09403	-0.0291	0.08597	0.06471
9	0.1068	-0.02929	0.09853	0.06708
10	0.1199	-0.0295	0.1114	0.06951
11	0.1334	-0.02971	0.1247	0.07201
12	0.1472	-0.02994	0.1383	0.07458
13	0.1614	-0.03019	0.1523	0.07722
14	0.176	-0.03045	0.1667	0.07994
15	0.1911	-0.03073	0.1815	0.08273
16	0.2065	-0.03103	0.1967	0.08561
17	0.2224	-0.03135	0.2123	0.08857
18	0.2387	-0.0317	0.2284	0.09161
19	0.2555	-0.03206	0.2449	0.09475
20	0.2727	-0.03245	0.2619	0.09798
21	0.2904	-0.03286	0.2794	0.1013
22	0.3087	-0.03331	0.2974	0.1047
23	0.3275	-0.03378	0.3159	0.1082
24	0.3468	-0.03429	0.3349	0.1119
25	0.3667	-0.03483	0.3545	0.1156
26	0.3871	-0.0354	0.3747	0.1195
27	0.4082	-0.03602	0.3954	0.1234
28	0.4299	-0.03667	0.4168	0.1275
29	0.4522	-0.03737	0.4388	0.1318
30	0.4752	-0.03812	0.4615	0.1361
31	0.4989	-0.03892	0.4849	0.1406
32	0.5233	-0.03977	0.5089	0.1452
33	0.5485	-0.04067	0.5338	0.15
34	0.5744	-0.04164	0.5593	0.1549
35	0.6011	-0.04267	0.5857	0.16
36	0.6287	-0.04378	0.6129	0.1653
37	0.6571	-0.04495	0.641	0.1707
38	0.6864	-0.04621	0.6699	0.1763
39	0.7166	-0.04755	0.6998	0.1821
40	0.7478	-0.04897	0.7306	0.188
41	0.7801	-0.05049	0.7624	0.1942
42	0.8133	-0.05212	0.7953	0.2005

43	0.8476	-0.05385	0.8293	0.2071
44	0.8831	-0.05569	0.8643	0.2139
45	0.9197	-0.05766	0.9006	0.2209
46	0.9575	-0.05976	0.938	0.2281
47	0.9966	-0.06199	0.9768	0.2356
48	1.037	-0.06438	1.017	0.2433
49	1.079	-0.06692	1.058	0.2512

50	1.122	-0.06962	1.101	0.2595
51	1.167	-0.07251	1.145	0.268
52	1.213	-0.07558	1.191	0.2767
53	1.261	-0.07886	1.239	0.2858
54	1.31	-0.08234	1.288	0.2951
55	1.361	-0.08606	1.339	0.3048
56	1.415	-0.09002	1.392	0.3147
57	1.469	-0.09424	1.447	0.325
58	1.526	-0.09874	1.503	0.3356
59	1.585	-0.1035	1.562	0.3465
60	1.646	-0.1086	1.623	0.3577
61	1.71	-0.1141	1.687	0.3693
62	1.775	-0.1198	1.752	0.3812
63	1.843	-0.126	1.82	0.3935
64	1.914	-0.1326	1.891	0.4061
65	1.987	-0.1395	1.964	0.419
66	2.062	-0.147	2.041	0.4323
67	2.141	-0.1549	2.12	0.4459
68	2.223	-0.1633	2.202	0.4599
69	2.307	-0.1723	2.288	0.4743
70	2.395	-0.1819	2.376	0.4889
71	2.486	-0.1921	2.469	0.5039
72	2.58	-0.2029	2.564	0.5193
73	2.678	-0.2145	2.664	0.5349
74	2.78	-0.2268	2.768	0.5508
75	2.886	-0.2399	2.875	0.567
76	2.995	-0.2539	2.987	0.5834
77	3.109	-0.2687	3.104	0.6001
78	3.227	-0.2846	3.225	0.617
79	3.35	-0.3015	3.351	0.6341
80	3.477	-0.3195	3.481	0.6514
81	3.607	-0.3387	3.616	0.6688
82	3.74	-0.3592	3.754	0.6863
83	3.877	-0.3809	3.895	0.704
84	4.017	-0.404	4.04	0.7217
85	4.16	-0.4284	4.189	0.7395
86	4.306	-0.4543	4.342	0.7573
87	4.455	-0.4816	4.497	0.7751
88	4.604	-0.5099	4.653	0.7926
89	4.753	-0.5392	4.809	0.8098
90	4.901	-0.5694	4.965	0.8267
91	5.049	-0.6005	5.121	0.8433
92	5.197	-0.6327	5.278	0.8596

93	5.345	-0.6658	5.434	0.8757
94	5.493	-0.6999	5.591	0.8917
95	5.64	-0.7351	5.748	0.9074
96	5.787	-0.7714	5.905	0.9231
97	5.934	-0.8087	6.062	0.9387

98	6.08	-0.8473	6.22	0.9543
99	6.226	-0.887	6.378	0.9699
100	6.372	-0.9282	6.536	0.9857
101	6.517	-0.971	6.694	1.002
102	6.661	-1.016	6.854	1.019
103	6.801	-1.066	7.017	1.039

XL:Lower edge downwind distance, m - LE:Lower edge elevation, m -
XU:Upper edge downwind distance, m - UE:Upper edge elevation, m

Jet Edge Profile

#	S
0	0
1	0.01027
2	0.02082
3	0.03165
4	0.04277
5	0.05419
6	0.06592
7	0.07796
8	0.09034
9	0.103
10	0.1161
11	0.1295
12	0.1433
13	0.1575
14	0.172
15	0.187
16	0.2023
17	0.2181
18	0.2344
19	0.2511
20	0.2683
21	0.2859
22	0.3041
23	0.3228
24	0.3421
25	0.3619
26	0.3822
27	0.4032
28	0.4248
29	0.4471

30	0.47
31	0.4936
32	0.5179

33	0.543
34	0.5688
35	0.5954
36	0.6229
37	0.6512
38	0.6804
39	0.7105
40	0.7416
41	0.7737
42	0.8069
43	0.8411
44	0.8764
45	0.913
46	0.9507
47	0.9897
48	1.03
49	1.072
50	1.115
51	1.159
52	1.206
53	1.253
54	1.303
55	1.354
56	1.407
57	1.462
58	1.519
59	1.578
60	1.639
61	1.702
62	1.768
63	1.836
64	1.907
65	1.98
66	2.056
67	2.135
68	2.217
69	2.302
70	2.39
71	2.482
72	2.577
73	2.676
74	2.779
75	2.885
76	2.996
77	3.111
78	3.231
79	3.355

|80 | 3.484 |

81	3.616
82	3.752
83	3.891
84	4.034
85	4.18
86	4.329
87	4.481
88	4.634
89	4.786
90	4.939
91	5.091
92	5.243
93	5.396
94	5.548
95	5.701
96	5.853
97	6.005
98	6.158
99	6.31
100	6.463
101	6.615
102	6.767
103	6.92
+----------+

S:Curvilinear Jet Axis Distance, m

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PROJECT: Testing Chittick
PROBLEM: Releases Fri Jul 20 11:30:54 2018

LIMITING CONCENTRATION CALCULATIONS:
==========

Downwind distance 6.91 m
Height (centerline) -0.01 m
Calculated limiting concentration 1.62331906E-01 kg/m3
Calculate jet width 2.171 m

Downwind distance 6.80 m
Height (lower edge) -1.07 m
Calculated limiting concentration 3.68981554E-02 kg/m3
Calculate plume width 2.115 m

PLUME LIFTOFF/LOWER EDGE TOUCHDOWN CALCULATIONS:
==========

Downwind distance 0.01 m
Height (lower edge) -0.03 m
Edge concentration 5.19679004E+00 kg/m3

PLUME TOUCHDOWN CALCULATIONS:
==========

Downwind distance 6.77 m
Centerline Height -0.00 m
Centerline concentration 1.69135662E-01 kg/m3

PLUME MAXIMUM CENTERLINE HEIGHT:
==========

Centerline concentration 4.98329918E-01 kg/m3
Downwind distance 3.31 m
Centerline Height 0.17 m

PLUME COMPONENT MASS CALCULATIONS
==========

Lower limiting concentration (calculated) 0.1623 kg/m3
Jet axis distance 6.92 m
Total compound mass within cloud 2.723 kg
Total time to reach limiting concentration 0.5931 seconds
Total compound mass within specified limits 0.09748 kg
Upper limiting concentration (calculated) 0.1678 kg/m3
Jet axis distance 6.808 m
Total compound mass above upper limit 2.625 kg

NOTE: Time is calculated based on centerline velocity

Turbulent gaseous flame jets hazards:

User inputs:

Mass flow rate, (kg/s) 4.59
Exit velocity (m/s) 41.9
Speed of sound (m/s) 299.9
Mach number 0.1397

Model outputs:

Fraction of heat radiated by flame 0.15
Energy radiation rate (kW) 27141
Flame jet length (m) 6.92

Ground level distances to 5 kW/m2

+----------+

#	Xdw	Ycw	Fc
0	-14.9	0.0001607	5
1	-12.97	6.465	5
2	-11.04	8.676	5
3	-9.106	10.01	5
4	-7.173	10.79	5
5	-5.241	11.11	5
6	-3.309	10.99	5
7	-1.376	10.37	4.999
8	0.5559	9.113	4.999
9	2.488	8.239	4.999
10	4.421	8.238	4.999
11	6.353	9.111	5
12	8.285	10.37	5.001
13	10.22	10.99	5
14	12.15	11.11	5
15	14.08	10.79	4.999
16	16.01	10.01	5
17	17.95	8.676	5
18	19.88	6.466	5
19	21.81	0.1029	5

Xdw:Downwind distance (m) to 5.00 kW/m2. 0.00 m elevation -
Ycw:Crosswind distance (m) to 5.00 kW/m2. 0.00 m elevation -
Fc:Calculated flux (kW/m2)

Maximum radial distances to user specified flux

#	MaxRad	FLUX
0	21.81	5

MaxRad:Maximum radial distance to user specified flux (m) - FLUX:Heat Flux, (kW/m2)

Maximum radial distances to user specified flux

#	MaxRad	FLUX
0	16.91	10

MaxRad:Maximum radial distance to user specified flux (m) - FLUX:Heat Flux, (kW/m2)

UVCE/TNT Model:

User Inputs:

Molecular weight, (kg/kmol) 29.48
Yield factor 0.03
Heat of combustion, (J/kmol) ..... -1.162E+09
Cloud Mass, (kg) 38.74
Explosion is at ground level

Note: Cloud mass may not be sufficient to sustain an unconfined vapor cloud explosion

Model Outputs:

Equivalent TNT mass, (kg) 9.481

Calculated Distance and Area

#	Xc	Ac	OPs	OPe
0	89.03	24901	2068	0.2999

Xc:Radial distance to user specified overpressure, (m) - Ac:Hazard area to user specified overpressure, (m^2) - OPs:Overpressure (Pa) - OPe:User specified overpressure, (Psi)

Calculated Distance and Area

#	Xc	Ac	OPs	OPe
0	35.15	3881	6893	0.9997

Xc:Radial distance to user specified overpressure, (m) - Ac:Hazard area to user specified overpressure, (m^2) - OPs:Overpressure (Pa) - OPe:User specified overpressure, (Psi)

User defined scenario:

Name: GasPlant4
Description:Release PSA recycle/fuel gas
>:
>:

HAZOP reference: MISSING
Fault tree reference: MISSING
Site: HELLMAN
Vessel: 50FT3
Piping layout: 3IN SHOR
Reaction:
Thermal damage criteria: 5KW
Toxic damage criteria: DEFAULT
Overpressure damage criteria: 0.3PSI
Mixture: PSARECYC
User specified project stream

Spill time (hours) 1
Day of the year (1-365) 200
Scenario duration (hours) 1
Ignition time (s) ..... -1
Spill surface thermal diffysivity, (m2/s) 4.52E-07
Spill surface thermal conductivity, (W/m/K) 0.92
Dike area (m2) ..... 1E+38
Spill surface intrinsic permeability (m2) 1E-20
Spill surface = CONCRETE

User Specified Site Conditions:

Name: Hellman
Location: CA_LONG_BEACH 118.1883 33.7706 10.6680
Description: Hellman Gas Plant

Longitude, (degrees) 118.2
Latitude, (degrees) 33.77
Altitude, (m) 10.67
Time zone factor, (hrs) 7.879
Ambient temperature, (K) 298
Ambient pressure, (Pa) ..... 1.013E+05
Soil temperature, (K) 298

Water temperature, (K) 283
Mean water flow velocity, (m/s) 2
Mean water depth, (m) 10
Relative humidity, (percent) 70
Visual range, (m) 5000
Roughness length (m) 0.024

Wind speed, (m/s) 5
Wind friction velocity, (m/s) 0.3398
Wind power law constant 0.1468
Wind speed reference height, (m) 10
Stability class (A=0/B=1/C=2/D=3/E=4/F=5) 3
Monin-Obuhkov length (m) ..... 1E+38
Water dew point (K) 292.2

User defined thermal radiation damage criteria:

Thermal radiation criteria name: 5kw
Description: 5 kw/m2 radiation

Heat Flux, (kW/m2)

5

Time integrated heat flux value, (kJ/m2)

25

User defined toxic damage criteria:

Toxic criteria name [s]: DEFAULT
Description: DEFAULT TOXICITY CRITERION

Limiting concentration (ppm)

1E+04

Averaging time (s) 600
Receptor elevation (m) 0.0001

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User defined overpressure damage criteria:

Overpressure criteria name: 0.3psi
Description: 0.3psi

Overpressure (Pa)

2068

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User defined mixture:

Name: PSARecyc
Description: PSA recycle
Index bank:
Properties bank:

Chemical Mixture Definition

0. ID = 0. METHANE, CH4
1. ID = 1. ETHANE, C2H6
2. ID = 2. PROPANE, C3H8
3. ID = 3. n-BUTANE, C4H10
4. ID = 4. n-PENTANE, C5H12
5. ID = 980. NITROGEN, N2
6. ID = 224. CARBON DIOXIDE, CO2
7. ID = 1013. WATER, H2O

Binary interaction matrix Kij is zero

#	cid	massfrac	molefrac
0	0	0.0612	0.168
1	1	0.0342	0.05
2	2	0.222	0.222
3	3	0.239	0.181
4	4	0.175	0.107
5	980	0	0
6	224	0.265	0.265
7	1013	0.00286	0.007

cid:Chemical Identification Number - massfrac:Mass fraction - molefrac:Mole fraction of individual components.

PSARecyc is not soluble in water

The following atom matrices will be used:

Mixture atom matrix: H,C,N,O

```
4       6       8       10      12      0       0
2
1       2       3       4       5       0       1
0
0       0       0       0       0       2       0
0
```



```
0       0       0       0       0       0       2
1
```


Vessel Name: 50ft3
Description: 50ft3 vessel

Vertical Cylindrical (With User Defined Head Types)
Vessel top head is hemispherical
Vessel bottom head is hemispherical
Material of construction: IRON

Length [straight side for cylinders] (m) 4.6
Inside diameter (m) 0.6
Vessel metal mass (kg) 979
Wall metal thickness (m) 0.0127
Base elevation with respect to scenario ground level (z=0)
(m) 0
Total vessel surface area (m2) 9.24
Total volume (m3) 1.41
Maximum pressure limit for vessel in simulation (Pa) ..... 1E+38
Maximum temperature limit for vessel in simulation (K) 0

No fire loading specified

No eductor specified

No water sprays specified

Vessel is not insulated

Vessel does not have a cooling jacket

Vessel does not have a heating jacket

Vessel is not visible to solar flux

#	Zl	Az	Vz
0	0	0	0
1	0.0378	0.0667	0.00129
2	0.0756	0.124	0.00493
3	0.113	0.173	0.0106
4	0.151	0.213	0.0179
5	0.189	0.244	0.0266
6	0.227	0.266	0.0362
7	0.264	0.279	0.0465
8	0.302	0.283	0.0572
9	0.34	0.283	0.0679
10	0.566	0.283	0.132
11	0.792	0.283	0.196
12	1.02	0.283	0.26
13	1.24	0.283	0.323
14	1.47	0.283	0.387
15	1.7	0.283	0.451
16	1.92	0.283	0.515
17	2.15	0.283	0.579
18	2.37	0.283	0.643
19	2.6	0.283	0.707
20	2.83	0.283	0.771
21	3.05	0.283	0.835
22	3.28	0.283	0.899
23	3.5	0.283	0.962
24	3.73	0.283	1.03
25	3.96	0.283	1.09
26	4.18	0.283	1.15
27	4.41	0.283	1.22
28	4.63	0.283	1.28
29	4.86	0.283	1.35
30	4.89	0.283	1.36
31	4.93	0.28	1.37
32	4.96	0.271	1.37
33	5	0.254	1.38
34	5.03	0.23	1.39
35	5.06	0.198	1.4

```
|36   |       5.1 |       0.16 |       1.41 |
|37   |      5.13 |      0.114 |       1.41 |
|38   |      5.17 |     0.0605 |       1.41 |
|39   |       5.2 |  -1.05E-15 |       1.41 |
+-------------------------------------------+
```

Zl:Liquid height (m) - Az:A(z); Area as a function of liquid height m2=f(m) - Vz:V(z); Volume as a function of liquid height m3=f(m)

Piping layout:

Tag: 3in shor
Description: 3 inch hole .1m pipe length

```
+-----------------------------------------------------------------+
|#    | Sid       | Stype     | Length    | K1        | Kinf      |
+-----------------------------------------------------------------+
|0    |         0 |         0 |       0.1 |       160 |       0.5 |
+-----------------------------------------------------------------+
```

Sid:Segment identification number [] - Stype:0: Straight pipe / valves / fittings, 1: Relief device, 2: Rupture disk, 3: Thin sharp edged orifice, 4: Expander, 5: Reducer, 6: Pump - Length:Piping segment length (m) [] - K1:Number of Velocity Heads in K = K1/NRe + Kinf + Kid/ID - Kinf:Number of Velocity Heads in K = K1/NRe + Kinf + Kid/ID

```
+-----------------------------------------------------------------+
|#    | Kid       | Eps       | AreaC1    | Angle     | Z         |
+-----------------------------------------------------------------+
|0    |         0 |   4.57E-05 |   0.00456 |         0 |      0.01 |
+-----------------------------------------------------------------+
```

Kid:Number of Velocity Heads in K = K1/NRe + Kinf + Kid/ID - Eps:Typical pipe roughness: (m), Cast Iron (2.60E-04), Wrought Iron (4.57E-05), Commercial Steel (4.57E-05), Galvanized Iron (1.52E-04), Asphalted Cast Iron (1.22E-04), Drawn Tubing (1.52E-04) - AreaC1:flow area (m2) [] - Angle:Angle with respect to horizontal (degrees) [] - Z:Elevation of segment entrance (m) []

```
+-------------------------------+
|#    | H         | Ts        |
+-------------------------------+
|0    |     1E+38 |       293 |
+-------------------------------+
```

H:1/Overall heat transfer coefficient (W/m2/K); Sum_i (1/hi) [] - Ts:Surroundings temperature (K) []

Total length = 0.1 meters
Discharge coefficient (when applicable) = 1.000
1st relief device set / reset pressures (Pa) = 0 / 0

Reaction name =
Description =

Chemical Identification Number

0

Number of chemicals [] 0
Number of chemical reactions [] 0

Stoichiometric coefficient of reactants (positive)

0

Reaction order for reactants

0

Stoichiometric coefficient of products (positive)

0

Reaction order for products

0

Pre-exponential factor (m^3, s, kmol)

0

Activation energy (K)

0

Rate expression B parameter (K^(1/3))

0

Rate expression C parameter (K^(2/3))

0

Temperature Exponent

0

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Reaction phase: Liquid = 0, Vapor = 1

0

Upper bound on reaction rate (kmol/s)

0

Is reaction reversible (0-No, 1-Yes)

0

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Checking properties for mixture PSARecyc
PSA recycle

COMP 0, ID 0, NAME = METHANE

COMP 1, ID 1, NAME = ETHANE

COMP 2, ID 2, NAME = PROPANE

COMP 3, ID 3, NAME = n-BUTANE

COMP 4, ID 4, NAME = n-PENTANE

COMP 5, ID 980, NAME = NITROGEN

COMP 6, ID 224, NAME = CARBON DIOXIDE

COMP 7, ID 1013, NAME = WATER

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Multicomponent Gas Flow:

User Inputs:

Initial temperature (K) 447
Initial pressure (Pa) ..... 1.481E+06
Maximum allowable time step (s) 3.6
Minimum allowable time step (s) 0.01
Final time for analysis (s) 360
Maximum number of data points to collect 1000

Outputs:

Velocity of sound in gas at initial conditions, (m/s) 293.2

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#	TIME	TEMP	PRES	FLOW
0	0.0001	447	1.482	12.85
1	0.02808	446.8	1.462	12.76
2	0.05644	446.5	1.442	12.59
3	0.08518	446.3	1.422	12.41
4	0.1143	446.1	1.402	12.24
5	0.1439	445.8	1.382	12.07
6	0.1739	445.6	1.362	11.9
7	0.2043	445.3	1.342	11.72
8	0.2351	445.1	1.322	11.55
9	0.2664	444.9	1.302	11.38
10	0.2982	444.6	1.282	11.21
11	0.3305	444.4	1.262	11.03
12	0.3633	444.2	1.242	10.86
13	0.3966	443.9	1.222	10.69
14	0.4305	443.7	1.202	10.51
15	0.4649	443.5	1.182	10.34
16	0.4998	443.2	1.163	10.17
17	0.5354	443	1.143	9.995
18	0.5716	442.7	1.123	9.823
19	0.6084	442.5	1.103	9.65
20	0.6458	442.3	1.083	9.493
21	0.684	442	1.063	9.304
22	0.7228	441.8	1.043	9.147
23	0.7623	441.5	1.023	8.974
24	0.8026	441.3	1.003	8.801
25	0.8437	441.1	0.983	8.628
26	0.8856	440.8	0.963	8.455
27	0.9284	440.6	0.9431	8.282
28	0.9721	440.3	0.9231	8.109
29	1.017	440.1	0.9032	7.936

30	1.062	439.9	0.8833	7.763
31	1.109	439.6	0.8633	7.59
32	1.156	439.4	0.8434	7.417
33	1.205	439.1	0.8235	7.244
34	1.255	438.9	0.8035	7.07
35	1.306	438.7	0.7836	6.898
36	1.359	438.4	0.7637	6.724
37	1.413	438.2	0.7437	6.551
38	1.468	437.9	0.7238	6.378
39	1.525	437.7	0.7039	6.205
40	1.583	437.4	0.684	6.032
41	1.643	437.2	0.6641	5.859
42	1.705	437	0.6442	5.687
43	1.769	436.7	0.6242	5.514
44	1.834	436.5	0.6043	5.341

45	1.902	436.2	0.5844	5.168
46	1.972	436	0.5645	4.995
47	2.045	435.7	0.5447	4.822
48	2.12	435.5	0.5248	4.649
49	2.199	435.2	0.5049	4.477
50	2.28	435	0.485	4.304
51	2.364	434.8	0.4651	4.131
52	2.453	434.5	0.4453	3.958
53	2.545	434.3	0.4254	3.786
54	2.641	434	0.4056	3.613
55	2.742	433.8	0.3857	3.441
56	2.849	433.5	0.3659	3.268
57	2.961	433.3	0.3461	3.096
58	3.08	433	0.3263	2.924
59	3.206	432.8	0.3065	2.753
60	3.34	432.5	0.2868	2.58
61	3.483	432.3	0.2671	2.409
62	3.637	432.1	0.2474	2.238
63	3.804	431.8	0.2277	2.067
64	3.985	431.6	0.2081	1.896
65	4.183	431.3	0.1886	1.726
66	4.393	431.1	0.17	1.557
67	4.594	430.9	0.1542	1.362
68	4.788	430.7	0.141	1.191
69	4.968	430.6	0.1302	1.063
70	5.222	430.4	0.118	0.8156
71	5.515	430.3	0.1078	0.5366
72	20.22	429.7	0.1022	5.503E-08
73	38.22	429.2	0.1021	5.48E-08
74	56.22	428.6	0.1019	5.455E-08
75	74.22	428	0.1018	5.686E-08
76	92.22	427.4	0.1016	5.611E-08
77	110.2	426.8	0.1015	5.517E-08

78	128.2	426.3	0.1014	5.566E-08
79	146.2	425.7	0.1012	0
80	164.2	425.1	0.1011	0
81	182.2	424.6	0.101	0
82	200.2	424	0.1008	0
83	218.2	423.4	0.1007	0
84	236.2	422.9	0.1005	0
85	254.2	422.3	0.1004	0
86	272.2	421.7	0.1003	0
87	290.2	421.2	0.1001	0
88	308.2	420.6	0.1	0
89	326.2	420.1	0.09988	0
90	344.2	419.5	0.09975	0
91	362.2	419	0.09962	0

TIME:TIME (s) - TEMP:TEMPERATURE (K) - PRES:PRESSURE (MPa) -

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FLOW:CUMULITIVE VENTING RATE (kg/s)

#	TCRIT	PCRIT	MTOT	NTOT
0	0.9447	0.506	26.26	0.5966
1	0.9447	0.506	25.9	0.5884
2	0.9447	0.5059	25.54	0.5803
3	0.9448	0.5058	25.19	0.5722
4	0.9448	0.5057	24.83	0.5641
5	0.9449	0.5057	24.47	0.556
6	0.9449	0.5056	24.11	0.5478
7	0.9449	0.5055	23.76	0.5397
8	0.945	0.5055	23.4	0.5316
9	0.9451	0.5054	23.04	0.5235
10	0.9451	0.5053	22.69	0.5154
11	0.9451	0.5053	22.33	0.5073
12	0.9452	0.5052	21.97	0.4992
13	0.9452	0.5052	21.62	0.4911
14	0.9453	0.5051	21.26	0.483
15	0.9453	0.505	20.9	0.4749
16	0.9454	0.5049	20.55	0.4668
17	0.9454	0.5049	20.19	0.4587
18	0.9455	0.5048	19.83	0.4506
19	0.9455	0.5047	19.48	0.4425
20	0.9457	0.5056	19.12	0.4344
21	0.9456	0.5046	18.77	0.4264
22	0.9458	0.5054	18.41	0.4183
23	0.9458	0.5053	18.06	0.4102
24	0.9458	0.5053	17.7	0.4021
25	0.9459	0.5052	17.35	0.3941

26	0.9459	0.5052	16.99	0.386
27	0.946	0.5051	16.64	0.3779
28	0.946	0.505	16.28	0.3699
29	0.9461	0.5049	15.93	0.3618
30	0.9461	0.5049	15.57	0.3537
31	0.9462	0.5048	15.22	0.3457
32	0.9462	0.5048	14.86	0.3376
33	0.9463	0.5047	14.51	0.3296
34	0.9463	0.5046	14.15	0.3216
35	0.9464	0.5045	13.8	0.3135
36	0.9464	0.5045	13.45	0.3055
37	0.9465	0.5044	13.09	0.2974
38	0.9465	0.5043	12.74	0.2894
39	0.9466	0.5042	12.39	0.2814
40	0.9466	0.5042	12.03	0.2734
41	0.9467	0.5041	11.68	0.2654
42	0.9468	0.5041	11.33	0.2573
43	0.9468	0.5041	10.98	0.2493
44	0.9469	0.504	10.62	0.2413

45	0.9469	0.5039	10.27	0.2333
46	0.947	0.5039	9.919	0.2253
47	0.947	0.5037	9.567	0.2174
48	0.9471	0.5037	9.216	0.2094
49	0.9471	0.5036	8.865	0.2014
50	0.9472	0.5036	8.514	0.1934
51	0.9472	0.5035	8.163	0.1854
52	0.9473	0.5033	7.813	0.1775
53	0.9474	0.5033	7.462	0.1695
54	0.9474	0.5032	7.113	0.1616
55	0.9475	0.5031	6.763	0.1537
56	0.9475	0.5031	6.414	0.1457
57	0.9476	0.503	6.065	0.1378
58	0.9476	0.5029	5.717	0.1299
59	0.9477	0.503	5.369	0.122
60	0.9477	0.5027	5.022	0.1141
61	0.9478	0.5028	4.676	0.1062
62	0.9479	0.5028	4.33	0.09837
63	0.9479	0.5027	3.985	0.09053
64	0.948	0.5026	3.641	0.08272
65	0.948	0.5025	3.299	0.07495
66	0.9481	0.5025	2.973	0.06754
67	0.9672	0.6264	2.696	0.06125
68	0.9743	0.6877	2.466	0.05601
69	0.9808	0.7486	2.276	0.05172
70	0.988	0.8335	2.062	0.04685
71	0.9948	0.923	1.884	0.0428
72	0.9991	0.9912	1.788	0.04061
73	0.9993	0.9926	1.788	0.04061

74	0.9994	0.9939	1.788	0.04061
75	0.9995	0.9953	1.788	0.04061
76	0.9997	0.9967	1.788	0.04061
77	0.9998	0.998	1.788	0.04061
78	0.9999	0.9994	1.788	0.04061
79	0	0	1.788	0.04061
80	0	0	1.788	0.04061
81	0	0	1.788	0.04061
82	0	0	1.788	0.04061
83	0	0	1.788	0.04061
84	0	0	1.788	0.04061
85	0	0	1.788	0.04061
86	0	0	1.788	0.04061
87	0	0	1.788	0.04061
88	0	0	1.788	0.04061
89	0	0	1.788	0.04061
90	0	0	1.788	0.04061
91	0	0	1.788	0.04061

TCRIT:TCRIT - PCRIT:PCRIT - MTOT:MTOT - NTOT:Total number of moles

(kmol)

#	TDOT	PDOT	UEXIT	TPHI
0	-8.406	-7.17E+05	289.5	10.74
1	-8.364	-7.098E+05	289.5	10.88
2	-8.259	-7.003E+05	289.6	11.02
3	-8.155	-6.908E+05	289.6	11.16
4	-8.049	-6.813E+05	289.6	11.31
5	-7.944	-6.717E+05	289.6	11.46
6	-7.838	-6.622E+05	289.7	11.62
7	-7.733	-6.527E+05	289.7	11.78
8	-7.626	-6.432E+05	289.7	11.94
9	-7.52	-6.336E+05	289.8	12.12
10	-7.413	-6.241E+05	289.8	12.29
11	-7.306	-6.146E+05	289.8	12.47
12	-7.199	-6.05E+05	289.9	12.66
13	-7.092	-5.954E+05	289.9	12.86
14	-6.985	-5.86E+05	289.9	13.06
15	-6.877	-5.764E+05	290	13.27
16	-6.768	-5.668E+05	290	13.48
17	-6.66	-5.573E+05	290	13.7
18	-6.552	-5.478E+05	290.1	13.93
19	-6.444	-5.382E+05	290.1	14.17
20	-6.346	-5.296E+05	290.1	14.42
21	-6.225	-5.191E+05	290.2	14.68

22	-6.127	-5.104E+05	290.2	14.94
23	-6.018	-5.008E+05	290.2	15.22
24	-5.908	-4.913E+05	290.2	15.51
25	-5.797	-4.817E+05	290.3	15.81
26	-5.687	-4.721E+05	290.3	16.12
27	-5.576	-4.625E+05	290.4	16.44
28	-5.465	-4.529E+05	290.4	16.78
29	-5.354	-4.433E+05	290.5	17.14
30	-5.243	-4.337E+05	290.5	17.51
31	-5.131	-4.241E+05	290.5	17.9
32	-5.019	-4.145E+05	290.6	18.3
33	-4.907	-4.049E+05	290.6	18.73
34	-4.794	-3.953E+05	290.6	19.17
35	-4.682	-3.857E+05	290.7	19.64
36	-4.569	-3.76E+05	290.7	20.14
37	-4.456	-3.664E+05	290.7	20.66
38	-4.342	-3.567E+05	290.8	21.21
39	-4.229	-3.471E+05	290.8	21.79
40	-4.115	-3.375E+05	290.8	22.4
41	-4.001	-3.278E+05	290.9	23.05
42	-3.887	-3.182E+05	290.9	23.74
43	-3.773	-3.085E+05	290.9	24.47
44	-3.658	-2.989E+05	291	25.26

45	-3.542	-2.892E+05	291	26.09
46	-3.427	-2.795E+05	291.1	26.99
47	-3.312	-2.698E+05	291.1	27.95
48	-3.196	-2.601E+05	291.1	28.98
49	-3.08	-2.504E+05	291.2	30.09
50	-2.963	-2.407E+05	291.2	31.3
51	-2.847	-2.309E+05	291.3	32.61
52	-2.73	-2.212E+05	291.3	34.03
53	-2.613	-2.115E+05	291.3	35.59
54	-2.495	-2.017E+05	291.4	37.29
55	-2.377	-1.92E+05	291.4	39.18
56	-2.259	-1.822E+05	291.5	41.26
57	-2.141	-1.724E+05	291.5	43.58
58	-2.023	-1.626E+05	291.6	46.18
59	-1.905	-1.529E+05	291.6	49.12
60	-1.785	-1.43E+05	291.7	52.46
61	-1.666	-1.332E+05	291.7	56.28
62	-1.545	-1.233E+05	291.7	60.71
63	-1.424	-1.134E+05	291.8	65.89
64	-1.303	-1.034E+05	291.8	72.02
65	-1.179	-93367	291.9	79.4
66	-1.06	-83568	291.9	88.03
67	-0.9252	-72735	231	96.97
68	-0.8079	-63206	203.4	106
69	-0.7216	-55948	182.6	114.7

70	-0.552	-42268	141.1	126.5
71	-0.3626	-26852	93.5	138.4
72	-0.03254	-7.818	9.619E-06	145.9
73	-0.03242	-7.789	9.569E-06	145.9
74	-0.0323	-7.76	9.513E-06	146
75	-0.03217	-7.731	9.903E-06	146.1
76	-0.03205	-7.701	9.761E-06	146.1
77	-0.03193	-7.672	9.586E-06	146.2
78	-0.03181	-7.643	9.658E-06	146.3
79	-0.03169	-7.611	9.968E-06	146.3
80	-0.03157	-7.582	9.968E-06	146.4
81	-0.03145	-7.554	9.968E-06	146.4
82	-0.03133	-7.525	9.968E-06	146.5
83	-0.03121	-7.496	9.968E-06	146.6
84	-0.03109	-7.468	9.968E-06	146.6
85	-0.03097	-7.439	9.968E-06	146.7
86	-0.03085	-7.411	9.968E-06	146.8
87	-0.03074	-7.383	9.968E-06	146.8
88	-0.03062	-7.354	9.968E-06	146.9
89	-0.0305	-7.326	9.968E-06	147
90	-0.03038	-7.298	9.968E-06	147
91	-0.03027	-7.27	9.968E-06	147.1

TDOT:TDOT - PDOT:PDOT - UEXIT:Exit velocity (m/s) - TPHI:Thermal

inertia phi factor

#	IMPULSE1	IMPULSE2
0	8279	7138
1	8223	7090
2	8111	6994
3	8000	6898
4	7889	6802
5	7778	6706
6	7667	6609
7	7555	6514
8	7444	6417
9	7333	6321
10	7222	6225
11	7110	6129
12	6999	6033
13	6888	5936
14	6777	5841
15	6665	5745
16	6554	5648
17	6443	5552

18	6332	5456
19	6220	5360
20	6109	5273
21	5998	5168
22	5886	5081
23	5775	4984
24	5664	4888
25	5553	4792
26	5441	4696
27	5330	4600
28	5219	4504
29	5107	4408
30	4996	4311
31	4885	4215
32	4773	4119
33	4662	4023
34	4551	3927
35	4440	3831
36	4328	3734
37	4217	3638
38	4106	3542
39	3994	3446
40	3883	3350
41	3772	3254
42	3661	3158
43	3549	3062
44	3438	2966

45	3327	2870
46	3216	2774
47	3104	2678
48	2993	2582
49	2882	2486
50	2771	2390
51	2660	2294
52	2549	2198
53	2438	2102
54	2327	2006
55	2216	1910
56	2105	1815
57	1994	1719
58	1883	1624
59	1772	1529
60	1662	1432
61	1551	1338
62	1441	1243
63	1331	1148
64	1221	1053
65	1111	958.3

66	1003	864.4
67	904.2	776.7
68	814.2	704.3
69	733.4	656.1
70	632	577.3
71	536.4	512.2
72	470.2	462
73	468.9	462
74	467.7	462
75	466.4	462
76	465.1	462
77	463.9	462
78	462.6	462
79	0	0
80	0	0
81	0	0
82	0	0
83	0	0
84	0	0
85	0	0
86	0	0
87	0	0
88	0	0
89	0	0
90	0	0
91	0	0

IMPULSE1:Peak Impulse at pipe inlet (N) - IMPULSE2:Steady state

EAIL|386, V 1.42 PAGE 56
PROJECT: Testing Chittick
PROBLEM: Releases Fri Jul 20 11:54:10 2018

Impulse at pipe exit (N)
Gas/Vapor pipe flow

User Inputs:

Inlet temperature (K) 447
Inlet pressure (Pa) ..... 1.48E+06
Surroundings pressure (Pa) ..... 1.01E+05

#	cid	Ndoti
0	0	0.00466
1	1	0.00139
2	2	0.00615
3	3	0.00502
4	4	0.00297
5	980	0
6	224	0.00734

```
|7    |      1013 |   0.000194 |
+-------------------------------+
```

cid:Chemical Identification Number - Ndoti:Inlet molar flow rate (kmol/s)

Model Outputs:

Exit temperature (K) 428
Exit pressure (Pa) ..... 1.01E+05
Mass flow rate (kg/s) 1.22
Fraction of pipe travelled 713

```
+-------------------------------+
|#    | cid       | Ndot      |
+-------------------------------+
|0    |         0 |    0.00466 |
|1    |         1 |    0.00139 |
|2    |         2 |    0.00615 |
|3    |         3 |    0.00502 |
|4    |         4 |    0.00297 |
|5    |       980 |         0 |
|6    |       224 |    0.00734 |
|7    |      1013 |   0.000194 |
+-------------------------------+
```

cid:Chemical Identification Number - Ndot:Exit molar flow rate (kmol/s)

Number of relief devices for this piping arrangement 0

Piping Segment 1, Diameter(in/m)= 2.99988/0.0761969
IN: T= 447.00 K, P= 1481964.00 Pa
OUT: T= 428.06 K, P= 101321.12 Pa, dP= 1380642.88 Pa, 1362.64 % of IN

EAIL|386, V 1.42 PAGE 1
PROJECT: Testing Chittick
PROBLEM: Releases Fri Jul 20 12:07:55 2018

No expansion calculations performed

Jet Dispersion:

Input Summary:

Chemical mole fraction 1
Release angle with horizontal, (degrees) 5
Source elevation (m) 0.01
Lower Limiting concentration = 20852.88 ppm or 3.7540E-02 kg/m3
Upper Limiting concentration = 131060.76 ppm or 2.3594E-01 kg/m3
To convert from kg/m3 to ppm multiply by 555485

EAIL|386, V 1.42 PAGE 2
PROJECT: Testing Chittick
PROBLEM: Releases Fri Jul 20 12:07:57 2018

Jet Characteristics

#	S	X	Y	B
0	0	0	0.01	0.0381
1	0.01038	0.01034	0.0109	0.03911
2	0.02104	0.02097	0.01181	0.04016
3	0.03202	0.0319	0.01273	0.04123
4	0.0433	0.04315	0.01365	0.04234
5	0.05491	0.05471	0.01459	0.04348
6	0.06685	0.06662	0.01554	0.04465
7	0.07913	0.07886	0.0165	0.04586
8	0.09177	0.09146	0.01746	0.0471
9	0.1048	0.1044	0.01844	0.04838
10	0.1181	0.1178	0.01941	0.04971
11	0.1319	0.1315	0.02039	0.05107
12	0.1461	0.1456	0.02138	0.05247
13	0.1607	0.1602	0.02237	0.05392
14	0.1757	0.1752	0.02336	0.05542
15	0.1912	0.1906	0.02435	0.05696
16	0.2071	0.2065	0.02534	0.05855
17	0.2235	0.2229	0.02632	0.06019
18	0.2405	0.2398	0.0273	0.06188
19	0.2579	0.2572	0.02827	0.06363
20	0.2759	0.2752	0.02922	0.06544

21	0.2944	0.2937	0.03017	0.0673
22	0.3135	0.3127	0.0311	0.06923
23	0.3332	0.3324	0.03201	0.07122
24	0.3535	0.3527	0.0329	0.07328
25	0.3745	0.3737	0.03376	0.0754
26	0.3961	0.3953	0.03459	0.0776
27	0.4185	0.4176	0.03538	0.07987
28	0.4415	0.4407	0.03614	0.08222
29	0.4654	0.4645	0.03685	0.08465
30	0.49	0.4892	0.0375	0.08717
31	0.5155	0.5146	0.0381	0.08977
32	0.5418	0.5409	0.03863	0.09246
33	0.569	0.5682	0.03909	0.09525
34	0.5972	0.5963	0.03946	0.09813
35	0.6263	0.6254	0.03975	0.1011
36	0.6565	0.6556	0.03993	0.1042
37	0.6877	0.6869	0.03999	0.1074
38	0.7201	0.7192	0.03993	0.1107
39	0.7532	0.7523	0.03973	0.1142
40	0.787	0.7862	0.03939	0.1178
41	0.8216	0.8208	0.03889	0.1215
42	0.857	0.8561	0.03822	0.1253
43	0.8931	0.8923	0.03738	0.1293

44	0.93	0.9291	0.03635	0.1335
45	0.9677	0.9668	0.03513	0.1378
46	1.006	1.005	0.0337	0.1422
47	1.045	1.044	0.03206	0.1468
48	1.085	1.084	0.03019	0.1516
49	1.126	1.125	0.02808	0.1566
50	1.168	1.166	0.02572	0.1617
51	1.21	1.209	0.0231	0.1671
52	1.253	1.251	0.02022	0.1726
53	1.296	1.295	0.01704	0.1784
54	1.341	1.339	0.01358	0.1844
55	1.386	1.384	0.009812	0.1906
56	1.431	1.429	0.005728	0.1972
57	1.477	1.475	0.001315	0.204
58	1.523	1.521	-0.003449	0.2114

S:Curvilinear Jet Axis Distance, m - X:Downwind Distance, m - Y:Elevation, m - B:Jet Radius, m

Jet Characteristics

#	AREA
0	0

1	0.0007981
2	0.001641
3	0.002531
4	0.00347
5	0.004463
6	0.005512
7	0.00662
8	0.007792
9	0.00903
10	0.01034
11	0.01172
12	0.01319
13	0.01474
14	0.01638
15	0.01811
16	0.01995
17	0.02189
18	0.02395
19	0.02614
20	0.02846
21	0.03091
22	0.03352
23	0.03628
24	0.03921
25	0.04233

26	0.04564
27	0.04916
28	0.05289
29	0.05687
30	0.0611
31	0.0656
32	0.0704
33	0.07551
34	0.08095
35	0.08676
36	0.09295
37	0.09956
38	0.1066
39	0.1141
40	0.1219
41	0.1302
42	0.1389
43	0.1481
44	0.1578
45	0.168
46	0.1788
47	0.1901
48	0.202

49	0.2146
50	0.2277
51	0.2416
52	0.2562
53	0.2714
54	0.2875
55	0.3043
56	0.3218
57	0.3402
58	0.3592

AREA:Cumulative projected jet area, (m2)

Jet Characteristics

#	THETA	RHO	U	Cs
0	0.08726	18.4	13.66	19.59
1	0.08594	17.52	13.61	18.64
2	0.08458	16.67	13.58	17.75
3	0.08318	15.87	13.55	16.89
4	0.08175	15.11	13.51	16.08
5	0.08028	14.38	13.48	15.31
6	0.07876	13.69	13.44	14.57
7	0.0772	13.03	13.39	13.87
8	0.0756	12.4	13.34	13.2

9	0.07395	11.81	13.29	12.57
10	0.07226	11.24	13.24	11.96
11	0.07051	10.7	13.18	11.39
12	0.06872	10.18	13.12	10.84
13	0.06687	9.694	13.06	10.32
14	0.06496	9.228	12.99	9.823
15	0.063	8.784	12.92	9.35
16	0.06098	8.362	12.85	8.901
17	0.05889	7.96	12.77	8.473
18	0.05675	7.577	12.69	8.065
19	0.05453	7.213	12.61	7.677
20	0.05225	6.866	12.53	7.308
21	0.0499	6.536	12.44	6.957
22	0.04748	6.222	12.34	6.623
23	0.04497	5.923	12.25	6.304
24	0.04239	5.638	12.15	6.001
25	0.03973	5.367	12.05	5.713
26	0.03699	5.109	11.94	5.438
27	0.03415	4.864	11.83	5.177
28	0.03122	4.63	11.72	4.928
29	0.0282	4.408	11.6	4.692

30	0.02508	4.196	11.48	4.466
31	0.02186	3.994	11.36	4.252
32	0.01853	3.802	11.23	4.048
33	0.01509	3.62	11.1	3.853
34	0.01154	3.446	10.97	3.668
35	0.007864	3.281	10.84	3.492
36	0.004067	3.123	10.7	3.324
37	0.0001404	2.973	10.56	3.165
38	-0.003921	2.83	10.42	3.012
39	-0.00807	2.693	10.27	2.866
40	-0.01231	2.563	10.12	2.728
41	-0.01663	2.439	9.966	2.596
42	-0.02103	2.321	9.811	2.47
43	-0.02553	2.209	9.653	2.351
44	-0.03011	2.102	9.492	2.237
45	-0.03477	2	9.329	2.129
46	-0.03952	1.903	9.163	2.026
47	-0.04436	1.811	8.994	1.928
48	-0.04929	1.723	8.823	1.834
49	-0.05431	1.64	8.648	1.745
50	-0.05942	1.56	8.47	1.661
51	-0.06463	1.484	8.287	1.58
52	-0.06996	1.412	8.1	1.503
53	-0.07542	1.344	7.906	1.43
54	-0.08103	1.278	7.703	1.361
55	-0.08683	1.216	7.486	1.294
56	-0.09292	1.157	7.246	1.231
57	-0.09947	1.1	6.959	1.171
58	-0.1074	1.045	6.484	1.112

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THETA:Angle between jet axis and horizontal (radians) - RHO:Density Difference, kg/m3 - U:Jet Velocity, m/s - Cs:Concentration Difference, kg/m3

Jet Characteristics

#	Cedge
0	4.459
1	4.244
2	4.04
3	3.846
4	3.661
5	3.485
6	3.317
7	3.157
8	3.005

9	2.861
10	2.723
11	2.592
12	2.468
13	2.349
14	2.236
15	2.128
16	2.026
17	1.929
18	1.836
19	1.748
20	1.664
21	1.584
22	1.508
23	1.435
24	1.366
25	1.3
26	1.238
27	1.179
28	1.122
29	1.068
30	1.017
31	0.9679
32	0.9214
33	0.8771
34	0.835
35	0.7949
36	0.7568
37	0.7204
38	0.6856
39	0.6525

40	0.621
41	0.591
42	0.5624
43	0.5352
44	0.5093
45	0.4846
46	0.4612
47	0.4388
48	0.4176
49	0.3973
50	0.378
51	0.3597
52	0.3422
53	0.3256
54	0.3097
55	0.2946
56	0.2803

```
|57   |      0.2665 |
|58   |      0.2532 |
+--------------------+
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Cedge:Jet edge concentration, kg/m3

Jet Edge Profile

#	XL	LE	XU	UE
0	0.00332	-0.02796	-0.00332	0.04796
1	0.01369	-0.02807	0.00698	0.04987
2	0.02436	-0.02821	0.01757	0.05182
3	0.03532	-0.02836	0.02847	0.05381
4	0.0466	-0.02854	0.03969	0.05585
5	0.0582	-0.02874	0.05123	0.05793
6	0.07013	-0.02897	0.0631	0.06005
7	0.0824	-0.02922	0.07532	0.06222
8	0.09502	-0.0295	0.0879	0.06443
9	0.108	-0.02982	0.1009	0.06669
10	0.1214	-0.03016	0.1142	0.06899
11	0.1351	-0.03055	0.1279	0.07134
12	0.1493	-0.03097	0.142	0.07373
13	0.1638	-0.03143	0.1566	0.07617
14	0.1788	-0.03194	0.1716	0.07866
15	0.1942	-0.0325	0.1871	0.08119
16	0.2101	-0.0331	0.203	0.08377
17	0.2265	-0.03377	0.2194	0.0864
18	0.2433	-0.03449	0.2363	0.08908
19	0.2607	-0.03527	0.2538	0.0918
20	0.2786	-0.03612	0.2717	0.09457
21	0.297	-0.03705	0.2903	0.09739
22	0.316	-0.03805	0.3095	0.1003

23	0.3356	-0.03914	0.3292	0.1032
24	0.3558	-0.04031	0.3496	0.1061
25	0.3767	-0.04159	0.3707	0.1091
26	0.3982	-0.04296	0.3924	0.1121
27	0.4204	-0.04444	0.4149	0.1152
28	0.4433	-0.04605	0.4381	0.1183
29	0.4669	-0.04777	0.4622	0.1215
30	0.4913	-0.04964	0.487	0.1246
31	0.5166	-0.05165	0.5127	0.1278
32	0.5426	-0.05381	0.5392	0.1311
33	0.5696	-0.05615	0.5667	0.1343
34	0.5974	-0.05866	0.5952	0.1376
35	0.6262	-0.06137	0.6247	0.1409
36	0.656	-0.06428	0.6552	0.1441
37	0.6869	-0.06741	0.6868	0.1474

38	0.7188	-0.07081	0.7196	0.1507
39	0.7514	-0.07446	0.7532	0.1539
40	0.7847	-0.07838	0.7876	0.1572
41	0.8188	-0.08259	0.8228	0.1604
42	0.8535	-0.08709	0.8588	0.1635
43	0.889	-0.09191	0.8956	0.1667
44	0.9251	-0.09705	0.9332	0.1698
45	0.962	-0.1025	0.9716	0.1728
46	0.9996	-0.1084	1.011	0.1758
47	1.038	-0.1146	1.051	0.1787
48	1.077	-0.1212	1.092	0.1816
49	1.116	-0.1283	1.133	0.1844
50	1.157	-0.1357	1.176	0.1872
51	1.198	-0.1436	1.219	0.1898
52	1.239	-0.152	1.263	0.1924
53	1.281	-0.1608	1.308	0.1949
54	1.324	-0.1702	1.354	0.1974
55	1.367	-0.1801	1.4	0.1997
56	1.411	-0.1906	1.448	0.202
57	1.455	-0.2017	1.495	0.2043
58	1.498	-0.2136	1.544	0.2067

XL:Lower edge downwind distance, m - LE:Lower edge elevation, m -
XU:Upper edge downwind distance, m - UE:Upper edge elevation, m

Jet Edge Profile

#	S
0	0
1	0.01038
2	0.02104
3	0.03202
4	0.0433

5	0.05491
6	0.06685
7	0.07913
8	0.09177
9	0.1048
10	0.1181
11	0.1319
12	0.1461
13	0.1607
14	0.1757
15	0.1912
16	0.2071
17	0.2235

18	0.2405
19	0.2579
20	0.2759
21	0.2944
22	0.3135
23	0.3332
24	0.3535
25	0.3745
26	0.3961
27	0.4185
28	0.4415
29	0.4654
30	0.49
31	0.5155
32	0.5418
33	0.569
34	0.5972
35	0.6263
36	0.6565
37	0.6877
38	0.7201
39	0.7532
40	0.787
41	0.8216
42	0.857
43	0.8931
44	0.93
45	0.9677
46	1.006
47	1.045
48	1.085
49	1.126
50	1.168
51	1.21
52	1.253
53	1.296
54	1.341

55	1.386
56	1.431
57	1.477
58	1.523
+----------+

S:Curvilinear Jet Axis Distance, m

LIMITING CONCENTRATION CALCULATIONS:
==========

Downwind distance 1.52 m
Height (centerline) -0.00 m
Calculated limiting concentration 1.11210115E+00 kg/m3
Calculate jet width 0.4305 m

Downwind distance 1.50 m
Height (lower edge) -0.21 m
Calculated limiting concentration 2.52781367E-01 kg/m3
Calculate plume width 0.4227 m

PLUME LIFTOFF/LOWER EDGE TOUCHDOWN CALCULATIONS:
==========

Downwind distance 0.01 m
Height (lower edge) -0.03 m
Edge concentration 4.23787057E+00 kg/m3

PLUME TOUCHDOWN CALCULATIONS:
==========

Downwind distance 1.49 m
Centerline Height -0.00 m
Centerline concentration 1.15396883E+00 kg/m3

PLUME MAXIMUM CENTERLINE HEIGHT:
==========

Centerline concentration 3.15932751E+00 kg/m3
Downwind distance 0.69 m
Centerline Height 0.04 m

PLUME COMPONENT MASS CALCULATIONS
==========

Lower limiting concentration (calculated) 1.112 kg/m3
Jet axis distance 1.523 m
Total compound mass within cloud 0.1887 kg
Total time to reach limiting concentration 0.1547 seconds
Total compound mass within specified limits 0 kg
Upper limiting concentration (calculated) 1.112 kg/m3
Jet axis distance 1.523 m
Total compound mass above upper limit 0.1887 kg

NOTE: Time is calculated based on centerline velocity

Ambient temperature 298.000 K

PROBLEM: Releases Fri Jul 20 12:07:58 2018

Relative humidity 70.000 Percent
Visual range 5000.000 m
Precipitable H2O 63.888 m/mm

Atmospheric Transmissivity

#	X	Tau
0	0.01516	0.995
1	0.5524	0.95
2	2.309	0.9
3	5.507	0.85
4	10.43	0.8
5	18.27	0.75
6	32.77	0.7
7	60.42	0.65
8	114	0.6
9	218.1	0.55
10	414.2	0.5
11	758.3	0.45
12	1314	0.4
13	2155	0.35
14	3388	0.3
15	5194	0.25
16	7890	0.2
17	12072	0.15
18	19054	0.1
19	32953	0.05

X:Target range, (m) - Tau:Atmospheric transmissivity

PROBLEM: Releases Fri Jul 20 12:07:58 2018

Turbulent gaseous flame jets hazards:

User inputs:

Mass flow rate, (kg/s) 1.22
Exit velocity (m/s) 13.66
Speed of sound (m/s) 299.2
Mach number 0.04564

Model outputs:

Fraction of heat radiated by flame 0.1677

Energy radiation rate (kW) 6917
Flame jet length (m) 1.523

Ground level distances to 5 kW/m2

#	Xdw	Ycw	Fc
0	-8.699	0.0001218	5
1	-7.703	3.394	5
2	-6.708	4.561	5
3	-5.712	5.273	5
4	-4.716	5.695	5
5	-3.72	5.885	5
6	-2.725	5.851	5.001
7	-1.729	5.565	4.999
8	-0.7331	4.93	5
9	0.2626	3.649	5.001
10	1.258	3.647	5.001
11	2.254	4.93	4.999
12	3.25	5.565	4.999
13	4.246	5.851	5
14	5.241	5.885	5
15	6.237	5.696	5
16	7.233	5.273	5
17	8.229	4.562	5
18	9.224	3.395	5
19	10.22	0.03641	5

Xdw:Downwind distance (m) to 5.00 kW/m2. 0.00 m elevation -
Ycw:Crosswind distance (m) to 5.00 kW/m2. 0.00 m elevation -
Fc:Calculated flux (kW/m2)

Maximum radial distances to user specified flux

#	MaxRad	FLUX
0	10.22	5

MaxRad:Maximum radial distance to user specified flux (m) - FLUX:Heat Flux, (kW/m2)

Maximum radial distances to user specified flux

#	MaxRad	FLUX
0	7.575	10

+----------+

MaxRad:Maximum radial distance to user specified flux (m) - FLUX:Heat Flux, (kW/m2)

UVCE/TNT Model:

User Inputs:

Molecular weight, (kg/kmol) 44.02
Yield factor 0.03
Heat of combustion, (J/kmol) ..... -1.488E+09
Cloud Mass, (kg) 28.47
Explosion is at ground level

Note: Cloud mass may not be sufficient to sustain an unconfined vapor cloud explosion

Model Outputs:

Equivalent TNT mass, (kg) 5.975

Calculated Distance and Area

#	Xc	Ac	OPs	OPe
0	76.33	18304	2068	0.2999

Xc:Radial distance to user specified overpressure, (m) - Ac:Hazard area to user specified overpressure, (m^2) - OPs:Overpressure (Pa) - OPe:User specified overpressure, (Psi)

Calculated Distance and Area

#	Xc	Ac	OPs	OPe
0	30.13	2852	6893	0.9997

Xc:Radial distance to user specified overpressure, (m) - Ac:Hazard area to user specified overpressure, (m^2) - OPs:Overpressure (Pa) - OPe:User specified overpressure, (Psi)

```
SSSSSSSSSS
SS      S
SS
SSSSSSSSSS U   U PPPPPP EEEEEE RRRRRR
      SS U   U P    P E      R    R
S      SS U   U PPPPPP EEEEEE RRRRRR
S      SS U   U P      E      R  R
SSSSSSSSSS UUUUU P      EEEEEE R  RRR

                    CCCCCCCCCC
                    CC      C
                    CC                      TM
                    CC        H    H EEEEEE MM  MM SSSSSS
                    CC        H    H E      M MM M S
                    CC      C HHHHHH EEEEEE M MM M SSSSSS
                    CC      C H    H E      M    M      S
                    CCCCCCCCCC H    H EEEEEE M    M SSSSSS
```

Supercharged Chemical hazard evaluation methods

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Welcome to Release 3.10 of SuperChems

Copyright (C) 1989-1997, Arthur D. Little, Inc.,
Acorn Park,
Cambridge, Massachusetts 02140,
USA.

Tel: (617) 498-5472
Fax: (617) 498-7161
Email: ML-EHS-RISKWORKS/SUPPORT@adlittle.com
Internet: www.riskworks.com

Level = Expert

User defined scenario:

Name: GasPlant5
Description:Release gas to sales
>:
>:

HAZOP reference: MISSING
Fault tree reference: MISSING
Site: HELLMAN
Vessel: PIPE4IN
Piping layout: 4IN_SHOR
Reaction:
Thermal damage criteria: 5KW
Toxic damage criteria: DEFAULT
Overpressure damage criteria: 0.3PSI
Mixture: NATGAS
User specified project stream

Spill time (hours) 1
Day of the year (1-365) 200
Scenario duration (hours) 1
Ignition time (s) ..... -1
Spill surface thermal diffysivity, (m2/s) 4.52E-07
Spill surface thermal conductivity, (W/m/K) 0.92
Dike area (m2) ..... 1E+38
Spill surface intrinsic permeability (m2) 1E-20

Spill surface = CONCRETE

User Specified Site Conditions:

Name: Hellman
Location: CA_LONG_BEACH 118.1883 33.7706 10.6680
Description: Hellman Gas Plant

Longitude, (degrees) 118.2
Latitude, (degrees) 33.77
Altitude, (m) 10.67
Time zone factor, (hrs) 7.879
Ambient temperature, (K) 298
Ambient pressure, (Pa) ..... 1.013E+05
Soil temperature, (K) 298
Water temperature, (K) 283
Mean water flow velocity, (m/s) 2
Mean water depth, (m) 10
Relative humidity, (percent) 70
Visual range, (m) 5000
Roughness length (m) 0.024

Wind speed, (m/s) 5
Wind friction velocity, (m/s) 0.3398
Wind power law constant 0.1468
Wind speed reference height, (m) 10
Stability class (A=0/B=1/C=2/D=3/E=4/F=5) 3
Monin-Obuhkov length (m) ..... 1E+38
Water dew point (K) 292.2

User defined thermal radiation damage criteria:

Thermal radiation criteria name: 5kw
Description: 5 kw/m2 radiation

Heat Flux, (kW/m2)

5

Time integrated heat flux value, (kJ/m2)

25

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PROJECT: Testing Chittick
PROBLEM: Releases Fri Jul 20 12:22:36 2018

User defined toxic damage criteria:

Toxic criteria name [s]: DEFAULT
Description: DEFAULT TOXICITY CRITERION

Limiting concentration (ppm)

1E+04

Averaging time (s) 600
Receptor elevation (m) 0.0001

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PROJECT: Testing Chittick
PROBLEM: Releases Fri Jul 20 12:22:36 2018

User defined overpressure damage criteria:

Overpressure criteria name: 0.3psi
Description: 0.3psi

Overpressure (Pa)

2068

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PROJECT: Testing Chittick
PROBLEM: Releases Fri Jul 20 12:22:36 2018

User defined mixture:

Name: NatGas
Description: natural gas
Index bank:
Properties bank:

Chemical Mixture Definition

0. ID = 0. METHANE, CH4
1. ID = 1. ETHANE, C2H6
2. ID = 2. PROPANE, C3H8

3. ID = 3. n-BUTANE, C4H10
4. ID = 4. n-PENTANE, C5H12
5. ID = 980. NITROGEN, N2
6. ID = 224. CARBON DIOXIDE, CO2
7. ID = 1013. WATER, H2O

Binary interaction matrix Kij is zero

#	cid	massfrac	molefrac
0	0	0.877	0.942
1	1	0.0541	0.031
2	2	0.0205	0.008
3	3	0.0135	0.004
4	4	0.00419	0.001
5	980	0.00813	0.005
6	224	0.023	0.009
7	1013	0	0

cid:Chemical Identification Number - massfrac:Mass fraction - molefrac:Mole fraction of individual components.

NatGas is not soluble in water

The following atom matrices will be used:

Mixture atom matrix: H,C,N,O

```
4       6       8       10      12      0       0
2
1       2       3       4       5       0       1
0
0       0       0       0       0       2       0
0
```



```
0       0       0       0       0       0       2
1
```


Vessel Name: pipe4in
Description: pipeline 4 inch 1.8 miles long

Horizontal Cylindrical (Flat heads)
Material of construction: IRON

Length [straight side for cylinders] (m) 2897
Inside diameter (m) 0.102
Vessel metal mass (kg) ..... 1.45E+04
Wall metal thickness (m) 0.002
Base elevation with respect to scenario ground level (z=0)
(m) 0
Total vessel surface area (m2) 925
Total volume (m3) 23.5
Maximum pressure limit for vessel in simulation (Pa) ..... 1E+38
Maximum temperature limit for vessel in simulation (K) 0

No fire loading specified

No eductor specified

No water sprays specified

Vessel is not insulated

Vessel does not have a cooling jacket

Vessel does not have a heating jacket

Vessel is not visible to solar flux

#	Zl	Az	Vz
0	0	0	0
1	0.00261	93	0.162
2	0.00521	130	0.456
3	0.00782	157	0.831
4	0.0104	179	1.27
5	0.013	197	1.76
6	0.0156	212	2.29
7	0.0182	226	2.86
8	0.0208	238	3.47
9	0.0234	248	4.1
10	0.0261	257	4.76
11	0.0287	265	5.44
12	0.0313	272	6.14
13	0.0339	278	6.85
14	0.0365	282	7.58

15	0.0391	286	8.32
16	0.0417	290	9.07
17	0.0443	292	9.83
18	0.0469	293	10.6
19	0.0495	294	11.4
20	0.0521	294	12.1
21	0.0547	293	12.9
22	0.0573	292	13.7
23	0.0599	290	14.4
24	0.0625	286	15.2
25	0.0651	282	15.9
26	0.0677	278	16.6
27	0.0703	272	17.3
28	0.0729	265	18
29	0.0755	257	18.7
30	0.0782	248	19.4
31	0.0808	238	20
32	0.0834	226	20.6
33	0.086	212	21.2
34	0.0886	197	21.7
35	0.0912	179	22.2
36	0.0938	157	22.7
37	0.0964	130	23
38	0.099	93	23.3
39	0.102	0.00185	23.5

Zl:Liquid height (m) - Az:A(z); Area as a function of liquid height m2=f(m) - Vz:V(z); Volume as a function of liquid height m3=f(m)

Piping layout:

Tag: 4IN_SHOR
Description: 4 inch hole with .1 meter length

#	Sid	Stype	Length	K1	Kinf
0	0	0	0.1	160	0.5

Sid:Segment identification number [] - Stype:0: Straight pipe / valves / fittings, 1: Relief device, 2: Rupture disk, 3: Thin sharp edged orifice, 4: Expander, 5: Reducer, 6: Pump - Length:Piping segment length (m) [] - K1:Number of Velocity Heads in K = K1/NRe + Kinf + Kid/ID - Kinf:Number of Velocity Heads in K = K1/NRe + Kinf + Kid/ID

```
|#    | Kid       | Eps       | AreaC1     | Angle      | Z          |
+-----------------------------------------------------------------------+
|0    |         0 |   4.57E-05 |    0.00811 |          0 |       0.01 |
+-----------------------------------------------------------------------+
```

Kid:Number of Velocity Heads in K = K1/NRe + Kinf + Kid/ID - Eps:Typical pipe roughness: (m), Cast Iron (2.60E-04), Wrought Iron (4.57E-05), Commercial Steel (4.57E-05), Galvanized Iron (1.52E-04), Asphalted Cast Iron (1.22E-04), Drawn Tubing (1.52E-04) - AreaC1:flow area (m2) [] - Angle:Angle with respect to horizontal (degrees) [] - Z:Elevation of segment entrance (m) []

```
+-------------------------------+
|#    | H         | Ts        |
+-------------------------------+
|0    |      1E+38 |       293 |
+-------------------------------+
```

H:1/Overall heat transfer coefficient (W/m2/K); Sum_i (1/hi) [] - Ts:Surroundings temperature (K) []

Total length = 0.1 meters
Discharge coefficient (when applicable) = 1.000
1st relief device set / reset pressures (Pa) = 0 / 0

Reaction name =
Description =

Chemical Identification Number

0

Number of chemicals [] 0
Number of chemical reactions [] 0

Stoichiometric coefficient of reactants (positive)

0

Reaction order for reactants

0

Stoichiometric coefficient of products (positive)

0

Reaction order for products

0

Pre-exponential factor (m^3, s, kmol)

0

Activation energy (K)

0

Rate expression B parameter (K^(1/3))

0

Rate expression C parameter (K^(2/3))

0

Temperature Exponent

0

Reaction phase: Liquid = 0, Vapor = 1

0

Upper bound on reaction rate (kmol/s)

0

Is reaction reversible (0-No, 1-Yes)

0

Checking properties for mixture NatGas
natural gas

COMP 0, ID 0, NAME = METHANE

COMP 1, ID 1, NAME = ETHANE

COMP 2, ID 2, NAME = PROPANE

COMP 3, ID 3, NAME = n-BUTANE

COMP 4, ID 4, NAME = n-PENTANE

COMP 5, ID 980, NAME = NITROGEN

COMP 6, ID 224, NAME = CARBON DIOXIDE

COMP 7, ID 1013, NAME = WATER

Multicomponent Gas Flow:

User Inputs:

Initial temperature (K) 297
Initial pressure (Pa) ..... 3.446E+05
Maximum allowable time step (s) 3.6
Minimum allowable time step (s) 0.01
Final time for analysis (s) 360
Maximum number of data points to collect 1000

Outputs:

Velocity of sound in gas at initial conditions, (m/s) 427.9

#	TIME	TEMP	PRES	FLOW
0	0.0001	297	0.3446	4.168
1	0.7978	296.7	0.3249	4.049
2	1.646	296.4	0.3051	3.811
3	2.55	296.1	0.2853	3.573
4	3.519	295.8	0.2656	3.335
5	4.562	295.5	0.246	3.098
6	5.691	295.2	0.2263	2.861
7	6.922	294.9	0.2067	2.624
8	8.272	294.6	0.1872	2.388

9	9.651	294.4	0.1694	2.134
10	11	294.2	0.1542	1.857
11	12.28	294	0.1415	1.653
12	13.5	293.8	0.131	1.397
13	15.21	293.7	0.1189	1.136
14	17.24	293.5	0.1086	0.7009
15	52.04	294.1	0.1023	5.74E-08
16	88.31	294.6	0.1021	5.662E-08
17	127.9	295.1	0.1023	5.704E-08
18	175	295.6	0.102	5.62E-08
19	232.6	296.1	0.1022	5.664E-08
20	312	296.7	0.1019	5.577E-08
21	362.4	296.9	0.102	5.601E-08

TIME:TIME (s) - TEMP:TEMPERATURE (K) - PRES:PRESSURE (MPa) - FLOW:CUMULITIVE VENTING RATE (kg/s)

#	TCRIT	PCRIT	MTOT	NTOT
0	0.869	0.4594	57	3.306
1	0.8691	0.4594	53.75	3.118
2	0.8691	0.4593	50.51	2.93
3	0.8691	0.4593	47.27	2.742
4	0.8692	0.4592	44.03	2.554
5	0.8692	0.4592	40.79	2.366
6	0.8693	0.4592	37.55	2.178
7	0.8693	0.4591	34.32	1.991
8	0.8693	0.4591	31.1	1.804
9	0.868	0.4536	28.15	1.633
10	0.9268	0.6276	25.63	1.487
11	0.9424	0.6873	23.52	1.364
12	0.9544	0.7453	21.78	1.263
13	0.9717	0.8275	19.77	1.147
14	0.9861	0.9162	18.06	1.048

15	0.9978	0.9904	16.99	0.9857
16	0.9984	0.9927	16.92	0.9815
17	0.998	0.9909	16.92	0.9815
18	0.9985	0.9934	16.85	0.9773
19	0.9981	0.9917	16.85	0.9773
20	0.9987	0.9941	16.77	0.9731
21	0.9985	0.9932	16.77	0.9731

TCRIT:TCRIT - PCRIT:PCRIT - MTOT:MTOT - NTOT:Total number of moles (kmol)

#	TDOT	PDOT	UEXIT	TPHI
0	-0.3931	-25454	401.7	54.11
1	-0.3687	-24164	401.6	57.32
2	-0.3451	-22670	401.5	60.94
3	-0.3213	-21179	401.4	65.05
4	-0.2975	-19688	401.3	69.77
5	-0.2736	-18195	401.2	75.24
6	-0.2495	-16701	401.1	81.65
7	-0.2253	-15201	401.1	89.24
8	-0.2008	-13690	400.9	98.39
9	-0.1756	-12153	400.5	108.6
10	-0.149	-10511	296.1	119.1
11	-0.1296	-9292	267.7	129.8
12	-0.105	-7790	229.3	140.1
13	-0.08049	-6241	189.8	154.2
14	-0.04013	-3728	118.8	168.7
15	0.01652	5.784	9.857E-06	179.2
16	0.01421	4.952	9.747E-06	180
17	0.01203	4.192	9.834E-06	180
18	0.009896	3.434	9.711E-06	180.7
19	0.007772	2.697	9.8E-06	180.7
20	0.0056	1.935	9.673E-06	181.5
21	0.004536	1.567	9.721E-06	181.5

TDOT:TDOT - PDOT:PDOT - UEXIT:Exit velocity (m/s) - TPHI:Thermal inertia phi factor

#	IMPULSE1	IMPULSE2
0	3508	2958
1	3407	2873
2	3206	2703
3	3005	2534
4	2804	2365

5	2603	2195
6	2403	2027
7	2204	1858
8	2005	1691
9	1810	1509
10	1630	1372
11	1467	1265
12	1321	1142
13	1140	1037
14	967	905

15	837.7	821.7
16	833.8	821.7
17	836.8	821.7
18	832.6	821.7
19	835.5	821.7
20	831.5	821.7
21	832.9	821.7
+----------+

IMPULSE1:Peak Impulse at pipe inlet (N) - IMPULSE2:Steady state Impulse at pipe exit (N)

Gas/Vapor pipe flow

User Inputs:

Inlet temperature (K) 297
Inlet pressure (Pa) ..... 3.44E+05
Surroundings pressure (Pa) ..... 1.01E+05

#	cid	Ndoti
0	0	0.125
1	1	0.00412
2	2	0.00106
3	3	0.000531
4	4	0.000133
5	980	0.000664
6	224	0.0012
7	1013	0

cid:Chemical Identification Number - Ndoti:Inlet molar flow rate (kmol/s)

Model Outputs:

Exit temperature (K) 260
Exit pressure (Pa) ..... 8.74E+04
Mass flow rate (kg/s) 2.29
Fraction of pipe travelled 14.5

#	cid	Ndot
0	0	0.125
1	1	0.00412
2	2	0.00106

```
|3    |         3 |   0.000531 |
|4    |         4 |   0.000133 |
|5    |       980 |   0.000664 |
|6    |       224 |     0.0012 |
|7    |      1013 |          0 |
+-------------------------------+
```

cid:Chemical Identification Number - Ndot:Exit molar flow rate (kmol/s)

Number of relief devices for this piping arrangement 0

Piping Segment 1, Diameter(in/m)= 4.00066/0.101617
IN: T= 297.00 K, P= 344643.00 Pa
OUT: T= 260.38 K, P= 87497.89 Pa, dP= 257145.11 Pa, 293.89 % of IN

EAIL|386, V 1.42 PAGE 1
PROJECT: Testing Chittick
PROBLEM: Releases Fri Jul 20 12:36:57 2018

No expansion calculations performed

Jet Dispersion:

Input Summary:

Chemical mole fraction 1
Release angle with horizontal, (degrees) 5
Source elevation (m) 0.01
Lower Limiting concentration = 34043.49 ppm or 2.4001E-02 kg/m3
Upper Limiting concentration = 149564.25 ppm or 1.0544E-01 kg/m3
To convert from kg/m3 to ppm multiply by 1.4184E+06

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PROJECT: Testing Chittick
PROBLEM: Releases Fri Jul 20 12:37:02 2018

Jet Characteristics

#	S	X	Y	B
0	0	0	0.01	0.0508
1	0.01366	0.01361	0.01119	0.05269
2	0.02784	0.02773	0.01242	0.05467
3	0.04255	0.04239	0.0137	0.05673
4	0.05782	0.0576	0.01503	0.05889
5	0.07367	0.07339	0.0164	0.06115
6	0.09013	0.08979	0.01783	0.06351
7	0.1072	0.1068	0.01931	0.06597
8	0.125	0.1245	0.02084	0.06855
9	0.1435	0.1429	0.02243	0.07125
10	0.1627	0.162	0.02408	0.07407
11	0.1826	0.1819	0.0258	0.07703
12	0.2034	0.2026	0.02758	0.08011
13	0.225	0.2241	0.02942	0.08335
14	0.2474	0.2465	0.03134	0.08673
15	0.2708	0.2698	0.03333	0.09026
16	0.2951	0.294	0.0354	0.09396
17	0.3204	0.3192	0.03754	0.09783
18	0.3468	0.3455	0.03977	0.1019
19	0.3743	0.3729	0.04209	0.1061
20	0.4028	0.4014	0.04449	0.1105

21	0.4326	0.4311	0.04698	0.1152
22	0.4637	0.462	0.04957	0.12
23	0.496	0.4942	0.05226	0.1251
24	0.5297	0.5278	0.05505	0.1304
25	0.5648	0.5628	0.05794	0.1359
26	0.6014	0.5993	0.06095	0.1417
27	0.6396	0.6373	0.06406	0.1478
28	0.6793	0.6769	0.0673	0.1541
29	0.7208	0.7183	0.07065	0.1608
30	0.764	0.7613	0.07412	0.1677
31	0.8091	0.8063	0.07773	0.1749
32	0.8561	0.8531	0.08146	0.1824
33	0.9051	0.9019	0.08532	0.1903
34	0.9561	0.9529	0.08932	0.1986
35	1.009	1.006	0.09346	0.2072
36	1.065	1.061	0.09774	0.2161
37	1.123	1.119	0.1022	0.2255
38	1.183	1.179	0.1067	0.2353
39	1.246	1.242	0.1114	0.2454
40	1.312	1.307	0.1163	0.2561
41	1.38	1.375	0.1213	0.2671
42	1.451	1.446	0.1265	0.2787
43	1.525	1.52	0.1318	0.2907

44	1.602	1.597	0.1373	0.3032
45	1.683	1.678	0.1429	0.3162
46	1.767	1.761	0.1486	0.3298
47	1.854	1.848	0.1546	0.3439
48	1.945	1.939	0.1606	0.3586
49	2.04	2.033	0.1668	0.3738
50	2.138	2.132	0.1731	0.3897
51	2.24	2.234	0.1796	0.4061
52	2.347	2.34	0.1861	0.4232
53	2.458	2.451	0.1928	0.441
54	2.573	2.566	0.1996	0.4594
55	2.693	2.685	0.2065	0.4785
56	2.817	2.81	0.2134	0.4983
57	2.947	2.939	0.2204	0.5188
58	3.081	3.073	0.2275	0.5401
59	3.22	3.212	0.2346	0.5621
60	3.365	3.357	0.2418	0.5849
61	3.516	3.507	0.249	0.6084
62	3.672	3.663	0.2561	0.6328
63	3.833	3.825	0.2632	0.658
64	4.001	3.992	0.2703	0.684
65	4.175	4.166	0.2773	0.7109
66	4.355	4.346	0.2842	0.7387
67	4.541	4.532	0.291	0.7673
68	4.735	4.725	0.2977	0.7969

69	4.934	4.925	0.3042	0.8274
70	5.138	5.128	0.3104	0.8583
71	5.341	5.331	0.3162	0.889
72	5.544	5.534	0.3216	0.9197
73	5.747	5.737	0.3266	0.9503
74	5.95	5.941	0.3313	0.9807
75	6.154	6.144	0.3356	1.011
76	6.357	6.347	0.3395	1.041
77	6.56	6.55	0.3432	1.072
78	6.763	6.753	0.3465	1.102
79	6.966	6.956	0.3495	1.132
80	7.17	7.16	0.3522	1.162
81	7.373	7.363	0.3546	1.192
82	7.576	7.566	0.3567	1.222
83	7.779	7.769	0.3585	1.252
84	7.982	7.972	0.3601	1.282
85	8.186	8.176	0.3614	1.312
86	8.389	8.379	0.3624	1.342
87	8.592	8.582	0.3632	1.371
88	8.795	8.785	0.3638	1.401
89	8.998	8.988	0.3641	1.431
90	9.202	9.192	0.3642	1.461
91	9.405	9.395	0.3641	1.491
92	9.608	9.598	0.3638	1.521
93	9.811	9.801	0.3633	1.551

94	10.01	10	0.3626	1.581
95	10.22	10.21	0.3617	1.612
96	10.42	10.41	0.3606	1.642
97	10.62	10.61	0.3594	1.673
98	10.83	10.82	0.3579	1.704
99	11.03	11.02	0.3564	1.735
100	11.23	11.22	0.3546	1.767
101	11.44	11.43	0.3527	1.798
102	11.64	11.63	0.3507	1.83
103	11.84	11.83	0.3485	1.861
104	12.05	12.04	0.3461	1.893
105	12.25	12.24	0.3437	1.925
106	12.45	12.44	0.3411	1.958
107	12.66	12.65	0.3384	1.99
108	12.86	12.85	0.3356	2.023
109	13.06	13.05	0.3327	2.055
110	13.27	13.26	0.3296	2.088

S:Curvilinear Jet Axis Distance, m - X:Downwind Distance, m -
Y:Elevation, m - B:Jet Radius, m

Jet Characteristics

#	AREA
0	0
1	0.001409
2	0.002925
3	0.004557
4	0.006316
5	0.008211
6	0.01026
7	0.01246
8	0.01484
9	0.01741
10	0.02019
11	0.0232
12	0.02645
13	0.02996
14	0.03377
15	0.03789
16	0.04235
17	0.04719
18	0.05244
19	0.05813
20	0.0643
21	0.071
22	0.07828
23	0.08618

24	0.09476
25	0.1041
26	0.1142
27	0.1252
28	0.1372
29	0.1502
30	0.1643
31	0.1797
32	0.1965
33	0.2147
34	0.2345
35	0.256
36	0.2794
37	0.3049
38	0.3326
39	0.3628
40	0.3956
41	0.4312
42	0.47
43	0.5121
44	0.5578

```
|45   |      0.6076 |
|46   |      0.6616 |
|47   |      0.7203 |
|48   |       0.784 |
|49   |      0.8531 |
|50   |      0.9281 |
|51   |       1.009 |
|52   |       1.098 |
|53   |       1.193 |
|54   |       1.297 |
|55   |       1.409 |
|56   |        1.53 |
|57   |       1.662 |
|58   |       1.804 |
|59   |       1.957 |
|60   |       2.123 |
|61   |       2.302 |
|62   |       2.496 |
|63   |       2.704 |
|64   |       2.929 |
|65   |       3.171 |
|66   |       3.432 |
|67   |       3.713 |
|68   |       4.015 |
|69   |        4.34 |
|70   |       4.682 |
|71   |       5.037 |
|72   |       5.404 |
|73   |       5.784 |
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|74   |       6.176 |
|75   |       6.581 |
|76   |       6.998 |
|77   |       7.427 |
|78   |       7.869 |
|79   |       8.323 |
|80   |       8.789 |
|81   |       9.267 |
|82   |       9.758 |
|83   |       10.26 |
|84   |       10.78 |
|85   |        11.3 |
|86   |       11.84 |
|87   |       12.39 |
|88   |       12.96 |
|89   |       13.53 |
|90   |       14.12 |
|91   |       14.72 |
|92   |       15.33 |
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93	15.96
94	16.59
95	17.24
96	17.9
97	18.58
98	19.26
99	19.96
100	20.67
101	21.4
102	22.13
103	22.88
104	23.65
105	24.42
106	25.21
107	26.01
108	26.83
109	27.66
110	28.5

AREA:Cumulative projected jet area, (m2)

Jet Characteristics

#	THETA	RHO	U	Cs
0	0.08726	1.599	101.4	2.785
1	0.08717	1.522	98.99	2.651
2	0.08708	1.449	96.58	2.524
3	0.08698	1.38	94.17	2.403
4	0.08687	1.314	91.78	2.288

5	0.08676	1.251	89.39	2.179
6	0.08664	1.191	87.02	2.074
7	0.08651	1.134	84.66	1.975
8	0.08638	1.08	82.33	1.881
9	0.08623	1.028	80.01	1.791
10	0.08608	0.9788	77.72	1.705
11	0.08592	0.932	75.46	1.623
12	0.08575	0.8874	73.23	1.546
13	0.08557	0.8449	71.03	1.472
14	0.08538	0.8045	68.86	1.401
15	0.08517	0.766	66.72	1.334
16	0.08496	0.7294	64.63	1.27
17	0.08473	0.6945	62.57	1.21
18	0.08449	0.6613	60.55	1.152
19	0.08423	0.6297	58.57	1.097
20	0.08396	0.5996	56.64	1.044
21	0.08368	0.5709	54.74	0.9944

22	0.08338	0.5436	52.89	0.9469
23	0.08306	0.5176	51.09	0.9016
24	0.08272	0.4929	49.33	0.8585
25	0.08236	0.4693	47.62	0.8175
26	0.08198	0.4469	45.95	0.7784
27	0.08158	0.4255	44.33	0.7412
28	0.08116	0.4052	42.75	0.7057
29	0.08072	0.3858	41.22	0.672
30	0.08025	0.3674	39.73	0.6399
31	0.07975	0.3498	38.29	0.6093
32	0.07923	0.3331	36.9	0.5802
33	0.07867	0.3171	35.55	0.5524
34	0.07809	0.302	34.24	0.526
35	0.07748	0.2875	32.98	0.5009
36	0.07683	0.2738	31.76	0.4769
37	0.07615	0.2607	30.58	0.4541
38	0.07543	0.2482	29.44	0.4324
39	0.07468	0.2364	28.34	0.4117
40	0.07389	0.2251	27.29	0.392
41	0.07306	0.2143	26.27	0.3733
42	0.07219	0.2041	25.29	0.3554
43	0.07128	0.1943	24.34	0.3384
44	0.07032	0.185	23.43	0.3222
45	0.06932	0.1761	22.56	0.3068
46	0.06828	0.1677	21.72	0.2921
47	0.06718	0.1597	20.91	0.2781
48	0.06604	0.152	20.14	0.2648
49	0.06485	0.1448	19.4	0.2521
50	0.06362	0.1378	18.68	0.2401
51	0.06233	0.1312	18	0.2286
52	0.06099	0.1249	17.34	0.2176
53	0.05961	0.119	16.71	0.2072
54	0.05817	0.1133	16.11	0.1973

55	0.05668	0.1078	15.53	0.1878
56	0.05515	0.1027	14.98	0.1788
57	0.05357	0.09775	14.45	0.1702
58	0.05194	0.09306	13.94	0.1621
59	0.05026	0.0886	13.46	0.1543
60	0.04854	0.08435	12.99	0.1469
61	0.04678	0.0803	12.55	0.1399
62	0.04498	0.07645	12.12	0.1331
63	0.04314	0.07278	11.72	0.1268
64	0.04127	0.06929	11.33	0.1207
65	0.03936	0.06596	10.96	0.1149
66	0.03742	0.06279	10.6	0.1094
67	0.03546	0.05978	10.26	0.1041
68	0.03348	0.05691	9.938	0.0991
69	0.03147	0.05417	9.628	0.09434

70	0.02949	0.05161	9.336	0.08988
71	0.02756	0.04925	9.067	0.08576
72	0.02568	0.04706	8.816	0.08194
73	0.02386	0.04503	8.582	0.0784
74	0.02209	0.04314	8.364	0.07511
75	0.02037	0.04137	8.16	0.07204
76	0.0187	0.03972	7.969	0.06916
77	0.01708	0.03818	7.789	0.06647
78	0.01551	0.03673	7.62	0.06394
79	0.01398	0.03536	7.46	0.06157
80	0.0125	0.03408	7.309	0.05933
81	0.01107	0.03287	7.166	0.05722
82	0.00968	0.03172	7.03	0.05522
83	0.008333	0.03064	6.901	0.05334
84	0.007029	0.02961	6.779	0.05155
85	0.005765	0.02864	6.662	0.04985
86	0.004541	0.02771	6.551	0.04824
87	0.003356	0.02683	6.445	0.04671
88	0.002208	0.026	6.344	0.04525
89	0.001096	0.0252	6.247	0.04386
90	1.959E-05	0.02444	6.154	0.04253
91	-0.001022	0.02371	6.065	0.04126
92	-0.002031	0.02301	5.978	0.04004
93	-0.003006	0.02233	5.895	0.03887
94	-0.003949	0.02169	5.815	0.03774
95	-0.004861	0.02107	5.738	0.03666
96	-0.005742	0.02047	5.663	0.03561
97	-0.006592	0.01989	5.59	0.03461
98	-0.007414	0.01934	5.52	0.03364
99	-0.008206	0.0188	5.452	0.03271
100	-0.008971	0.01829	5.386	0.03182
101	-0.009709	0.01779	5.322	0.03095
102	-0.01042	0.01731	5.26	0.03012
103	-0.0111	0.01685	5.2	0.02931
104	-0.01176	0.0164	5.142	0.02853

105	-0.0124	0.01597	5.085	0.02778
106	-0.01301	0.01556	5.03	0.02705
107	-0.0136	0.01515	4.976	0.02635
108	-0.01417	0.01476	4.924	0.02567
109	-0.01471	0.01439	4.873	0.02502
110	-0.01523	0.01402	4.824	0.02438

THETA:Angle between jet axis and horizontal (radians) - RHO:Density Difference, kg/m3 - U:Jet Velocity, m/s - Cs:Concentration Difference, kg/m3

Jet Characteristics

#	Cedge
0	0.6339
1	0.6035
2	0.5746
3	0.5471
4	0.5209
5	0.496
6	0.4722
7	0.4496
8	0.4281
9	0.4076
10	0.3881
11	0.3695
12	0.3519
13	0.335
14	0.319
15	0.3037
16	0.2892
17	0.2754
18	0.2622
19	0.2497
20	0.2377
21	0.2264
22	0.2155
23	0.2052
24	0.1954
25	0.1861
26	0.1772
27	0.1687
28	0.1607
29	0.153
30	0.1457
31	0.1387
32	0.1321
33	0.1258

34	0.1197
35	0.114
36	0.1086
37	0.1034
38	0.09843
39	0.09372
40	0.08924
41	0.08497
42	0.08091
43	0.07704
44	0.07335

45	0.06984
46	0.0665
47	0.06331
48	0.06028
49	0.0574
50	0.05465
51	0.05203
52	0.04954
53	0.04717
54	0.04491
55	0.04275
56	0.04071
57	0.03875
58	0.0369
59	0.03513
60	0.03344
61	0.03184
62	0.03031
63	0.02885
64	0.02747
65	0.02615
66	0.02489
67	0.0237
68	0.02256
69	0.02147
70	0.02046
71	0.01952
72	0.01865
73	0.01785
74	0.0171
75	0.0164
76	0.01574
77	0.01513
78	0.01456
79	0.01402
80	0.01351
81	0.01303
82	0.01257
83	0.01214

84	0.01173
85	0.01135
86	0.01098
87	0.01063
88	0.0103
89	0.009983
90	0.009681
91	0.009392
92	0.009114

93	0.008847
94	0.008591
95	0.008344
96	0.008107
97	0.007879
98	0.007659
99	0.007447
100	0.007243
101	0.007046
102	0.006855
103	0.006672
104	0.006495
105	0.006324
106	0.006158
107	0.005999
108	0.005844
109	0.005695
110	0.00555

Cedge:Jet edge concentration, kg/m3

Jet Edge Profile

#	XL	LE	XU	UE
0	0.004427	-0.04061	-0.004427	0.06061
1	0.0182	-0.0413	0.009025	0.06368
2	0.03249	-0.04204	0.02298	0.06688
3	0.04732	-0.04281	0.03746	0.07022
4	0.06271	-0.04364	0.05249	0.0737
5	0.07869	-0.04451	0.06809	0.07732
6	0.09529	-0.04544	0.0843	0.0811
7	0.1125	-0.04642	0.1011	0.08503
8	0.1304	-0.04746	0.1186	0.08914
9	0.1491	-0.04856	0.1368	0.09342
10	0.1684	-0.04972	0.1557	0.09788
11	0.1885	-0.05094	0.1753	0.1025
12	0.2095	-0.05224	0.1957	0.1074
13	0.2312	-0.05362	0.217	0.1125
14	0.2539	-0.05507	0.2391	0.1178

15	0.2775	-0.0566	0.2621	0.1233
16	0.302	-0.05822	0.286	0.129
17	0.3275	-0.05994	0.311	0.135
18	0.3541	-0.06174	0.3369	0.1413
19	0.3818	-0.06365	0.3639	0.1478
20	0.4106	-0.06567	0.3921	0.1546
21	0.4407	-0.0678	0.4214	0.1618

22	0.472	-0.07004	0.452	0.1692
23	0.5046	-0.07241	0.4838	0.1769
24	0.5386	-0.0749	0.517	0.185
25	0.574	-0.07754	0.5516	0.1934
26	0.6109	-0.08031	0.5877	0.2022
27	0.6493	-0.08324	0.6252	0.2114
28	0.6894	-0.08633	0.6644	0.2209
29	0.7312	-0.08958	0.7053	0.2309
30	0.7748	-0.093	0.7479	0.2413
31	0.8202	-0.09661	0.7923	0.2521
32	0.8675	-0.1004	0.8387	0.2633
33	0.9169	-0.1044	0.887	0.2751
34	0.9683	-0.1086	0.9374	0.2873
35	1.022	-0.1131	0.9899	0.3
36	1.078	-0.1178	1.045	0.3132
37	1.136	-0.1227	1.102	0.327
38	1.197	-0.1279	1.161	0.3413
39	1.26	-0.1333	1.224	0.3562
40	1.326	-0.1391	1.288	0.3717
41	1.395	-0.1451	1.356	0.3877
42	1.466	-0.1515	1.426	0.4044
43	1.541	-0.1581	1.5	0.4217
44	1.619	-0.1652	1.576	0.4397
45	1.7	-0.1726	1.656	0.4583
46	1.784	-0.1804	1.739	0.4777
47	1.871	-0.1886	1.825	0.4977
48	1.963	-0.1972	1.915	0.5184
49	2.058	-0.2062	2.009	0.5398
50	2.156	-0.2158	2.107	0.562
51	2.259	-0.2258	2.209	0.5849
52	2.366	-0.2363	2.314	0.6085
53	2.477	-0.2474	2.425	0.633
54	2.593	-0.259	2.539	0.6582
55	2.713	-0.2713	2.658	0.6842
56	2.837	-0.2841	2.782	0.7109
57	2.967	-0.2976	2.911	0.7385
58	3.101	-0.3118	3.045	0.7669
59	3.241	-0.3267	3.184	0.796
60	3.385	-0.3424	3.329	0.826
61	3.536	-0.3588	3.479	0.8567
62	3.691	-0.376	3.635	0.8883
63	3.853	-0.3941	3.796	0.9206
64	4.02	-0.4131	3.964	0.9538

65	4.194	-0.4331	4.138	0.9877
66	4.373	-0.4539	4.318	1.022
67	4.559	-0.4758	4.505	1.058
68	4.752	-0.4988	4.699	1.094
69	4.951	-0.5228	4.899	1.131

70	5.153	-0.5475	5.103	1.168
71	5.356	-0.5725	5.307	1.205
72	5.558	-0.5978	5.511	1.241
73	5.76	-0.6234	5.715	1.277
74	5.962	-0.6492	5.919	1.312
75	6.164	-0.6754	6.123	1.347
76	6.366	-0.7017	6.327	1.381
77	6.568	-0.7284	6.532	1.415
78	6.77	-0.7553	6.736	1.448
79	6.972	-0.7824	6.941	1.481
80	7.174	-0.8098	7.145	1.514
81	7.376	-0.8374	7.35	1.547
82	7.578	-0.8653	7.554	1.579
83	7.78	-0.8934	7.759	1.61
84	7.981	-0.9218	7.963	1.642
85	8.183	-0.9504	8.168	1.673
86	8.385	-0.9792	8.373	1.704
87	8.587	-1.008	8.577	1.735
88	8.788	-1.038	8.782	1.765
89	8.99	-1.067	8.987	1.795
90	9.192	-1.097	9.192	1.825
91	9.393	-1.127	9.396	1.855
92	9.595	-1.157	9.601	1.885
93	9.797	-1.188	9.806	1.914
94	9.998	-1.219	10.01	1.944
95	10.2	-1.25	10.22	1.974
96	10.4	-1.282	10.42	2.003
97	10.6	-1.314	10.63	2.033
98	10.8	-1.346	10.83	2.062
99	11.01	-1.379	11.03	2.092
100	11.21	-1.412	11.24	2.121
101	11.41	-1.445	11.44	2.151
102	11.61	-1.479	11.65	2.18
103	11.81	-1.513	11.85	2.21
104	12.01	-1.547	12.06	2.239
105	12.22	-1.581	12.26	2.269
106	12.42	-1.616	12.47	2.298
107	12.62	-1.651	12.67	2.328
108	12.82	-1.687	12.88	2.358
109	13.02	-1.722	13.08	2.388
110	13.22	-1.758	13.29	2.418

XL:Lower edge downwind distance, m - LE:Lower edge elevation, m -
XU:Upper edge downwind distance, m - UE:Upper edge elevation, m

Jet Edge Profile
+----------+

#	S
0	0
1	0.01366
2	0.02784
3	0.04255
4	0.05782
5	0.07367
6	0.09013
7	0.1072
8	0.125
9	0.1435
10	0.1627
11	0.1826
12	0.2034
13	0.225
14	0.2474
15	0.2708
16	0.2951
17	0.3204
18	0.3468
19	0.3743
20	0.4028
21	0.4326
22	0.4637
23	0.496
24	0.5297
25	0.5648
26	0.6014
27	0.6396
28	0.6793
29	0.7208
30	0.764
31	0.8091
32	0.8561
33	0.9051
34	0.9561
35	1.009
36	1.065
37	1.123
38	1.183
39	1.246
40	1.312
41	1.38
42	1.451
43	1.525
44	1.602

45	1.683

```
|46  |      1.767 |
|47  |      1.854 |
|48  |      1.945 |
|49  |       2.04 |
|50  |      2.138 |
|51  |       2.24 |
|52  |      2.347 |
|53  |      2.458 |
|54  |      2.573 |
|55  |      2.693 |
|56  |      2.817 |
|57  |      2.947 |
|58  |      3.081 |
|59  |       3.22 |
|60  |      3.365 |
|61  |      3.516 |
|62  |      3.672 |
|63  |      3.833 |
|64  |      4.001 |
|65  |      4.175 |
|66  |      4.355 |
|67  |      4.541 |
|68  |      4.735 |
|69  |      4.934 |
|70  |      5.138 |
|71  |      5.341 |
|72  |      5.544 |
|73  |      5.747 |
|74  |       5.95 |
|75  |      6.154 |
|76  |      6.357 |
|77  |       6.56 |
|78  |      6.763 |
|79  |      6.966 |
|80  |       7.17 |
|81  |      7.373 |
|82  |      7.576 |
|83  |      7.779 |
|84  |      7.982 |
|85  |      8.186 |
|86  |      8.389 |
|87  |      8.592 |
|88  |      8.795 |
|89  |      8.998 |
|90  |      9.202 |
|91  |      9.405 |
|92  |      9.608 |
|93  |      9.811 |
|94  |      10.01 |
```

```
|95   |       10.22 |
|96   |       10.42 |
|97   |       10.62 |
|98   |       10.83 |
|99   |       11.03 |
|100  |       11.23 |
|101  |       11.44 |
|102  |       11.64 |
|103  |       11.84 |
|104  |       12.05 |
|105  |       12.25 |
|106  |       12.45 |
|107  |       12.66 |
|108  |       12.86 |
|109  |       13.06 |
|110  |       13.27 |
+--------------------+
```

S:Curvilinear Jet Axis Distance, m

LIMITING CONCENTRATION CALCULATIONS:
==========

Downwind distance 13.25 m
Height (centerline) 0.33 m
Calculated limiting concentration 2.43833743E-02 kg/m3
Calculate jet width 4.186 m

Downwind distance 4.45 m
Height (lower edge) -0.46 m
Calculated limiting concentration 2.43833746E-02 kg/m3
Calculate plume width 1.499 m

PLUME LIFTOFF/LOWER EDGE TOUCHDOWN CALCULATIONS:
==========

Downwind distance 0.02 m
Height (lower edge) -0.04 m
Edge concentration 6.02649923E-01 kg/m3

PLUME TOUCHDOWN CALCULATIONS:
==========

Downwind distance 0.01 m
Centerline Height 0.01 m
Centerline concentration 2.65133337E+00 kg/m3

PLUME MAXIMUM CENTERLINE HEIGHT:

==========

Centerline concentration 4.25039606E-02 kg/m3
Downwind distance 9.20 m
Centerline Height 0.36 m

PLUME COMPONENT MASS CALCULATIONS
==========

Lower limiting concentration (calculated) 0.02438 kg/m3
Jet axis distance 13.26 m
Total compound mass within cloud 3.705 kg
Total time to reach limiting concentration 1.618 seconds
Total compound mass within specified limits 3.143 kg
Upper limiting concentration (calculated) 0.1054 kg/m3
Jet axis distance 4.492 m
Total compound mass above upper limit 0.5625 kg

NOTE: Time is calculated based on centerline velocity

Ambient temperature 298.000 K

Relative humidity 70.000 Percent
Visual range 5000.000 m
Precipitable H2O 63.888 m/mm

Atmospheric Transmissivity

#	X	Tau
0	0.01516	0.995
1	0.5524	0.95
2	2.309	0.9
3	5.507	0.85
4	10.43	0.8
5	18.27	0.75
6	32.77	0.7
7	60.42	0.65
8	114	0.6
9	218.1	0.55
10	414.2	0.5
11	758.3	0.45
12	1314	0.4
13	2155	0.35
14	3388	0.3
15	5194	0.25
16	7890	0.2

17	12072	0.15
18	19054	0.1
19	32953	0.05

X:Target range, (m) - Tau:Atmospheric transmissivity

Turbulent gaseous flame jets hazards:

User inputs:

Mass flow rate, (kg/s) 2.29
Exit velocity (m/s) 101.4
Speed of sound (m/s) 404.4
Mach number 0.2508

Model outputs:

Fraction of heat radiated by flame 0.15
Energy radiation rate (kW) 16545
Flame jet length (m) 13.27

Ground level distances to 5 kW/m2

#	Xdw	Ycw	Fc
0	-9.146	0.02977	5
1	-7.486	4.956	5
2	-5.827	6.578	5
3	-4.167	7.484	5
4	-2.507	7.919	5
5	-0.8468	7.947	4.999
6	0.8132	7.653	5
7	2.473	7.586	5
8	4.133	7.67	5
9	5.793	7.744	5.001
10	7.453	7.747	5
11	9.113	7.678	5.001
12	10.77	7.6	4.999
13	12.43	7.673	5
14	14.09	7.943	5.001
15	15.75	7.916	4.999
16	17.41	7.481	5

```
|17   |       19.07 |       6.575 |          5 |
|18   |       20.73 |       4.953 |          5 |
|19   |       22.39 |    0.000102 |          5 |
+-----------------------------------------------+
```

Xdw:Downwind distance (m) to 5.00 kW/m2. 0.00 m elevation -
Ycw:Crosswind distance (m) to 5.00 kW/m2. 0.00 m elevation -
Fc:Calculated flux (kW/m2)

Maximum radial distances to user specified flux

```
+-----------------------------------+
|#    | MaxRad       | FLUX         |
+-----------------------------------+
|0    |       22.39 |           5 |
+-----------------------------------+
```

MaxRad:Maximum radial distance to user specified flux (m) - FLUX:Heat Flux, (kW/m2)

Maximum radial distances to user specified flux

```
+-----------------------------------+
|#    | MaxRad       | FLUX         |
+-----------------------------------+
|0    |       18.88 |          10 |
+-----------------------------------+
```

MaxRad:Maximum radial distance to user specified flux (m) - FLUX:Heat Flux, (kW/m2)

UVCE/TNT Model:

User Inputs:

Molecular weight, (kg/kmol) 17.24
Yield factor 0.03
Heat of combustion, (J/kmol) ..... -8.302E+08
Cloud Mass, (kg) 38.94
Explosion is at ground level

Note: Cloud mass may not be sufficient to sustain an unconfined vapor cloud explosion

Model Outputs:

Equivalent TNT mass, (kg) 11.64

Calculated Distance and Area

#	Xc	Ac	OPs	OPe
0	95.34	28557	2068	0.2999

Xc:Radial distance to user specified overpressure, (m) - Ac:Hazard area to user specified overpressure, (m^2) - OPs:Overpressure (Pa) - OPe:User specified overpressure, (Psi)

Calculated Distance and Area

#	Xc	Ac	OPs	OPe
0	37.64	4450	6893	0.9997

Xc:Radial distance to user specified overpressure, (m) - Ac:Hazard area to user specified overpressure, (m^2) - OPs:Overpressure (Pa) - OPe:User specified overpressure, (Psi)

```
SSSSSSSSSS
SS      S
SS
SSSSSSSSSS U   U PPPPPP EEEEEE RRRRRR
      SS U   U P    P E      R    R
S      SS U   U PPPPPP EEEEEE RRRRRR
S      SS U   U P      E      R  R
SSSSSSSSSS UUUUU P      EEEEEE R  RRR

                    CCCCCCCCCC
                    CC      C
                    CC                      TM
                    CC        H    H EEEEEE MM  MM SSSSSS
                    CC        H    H E      M MM M S
                    CC      C HHHHHH EEEEEE M MM M SSSSSS
                    CC      C H    H E      M    M      S
                    CCCCCCCCCC H    H EEEEEE M    M SSSSSS
```

Supercharged Chemical hazard evaluation methods

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Welcome to Release 3.10 of SuperChems

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Acorn Park,
Cambridge, Massachusetts 02140,
USA.

Tel: (617) 498-5472
Fax: (617) 498-7161
Email: ML-EHS-RISKWORKS/SUPPORT@adlittle.com
Internet: www.riskworks.com

Level = Expert

User defined scenario:

Name: GasPlant6
Description:Release ngl liquids
>:
>:

HAZOP reference: MISSING
Fault tree reference: MISSING
Site: HELLMAN
Vessel: 12K GAL
Piping layout: 3INLONG3
Reaction:
Thermal damage criteria: 5KW
Toxic damage criteria: DEFAULT
Overpressure damage criteria: 0.3PSI
Mixture: NGL
User specified project stream

Spill time (hours) 1
Day of the year (1-365) 200
Scenario duration (hours) 1
Ignition time (s) ..... -1
Spill surface thermal diffysivity, (m2/s) 4.52E-07
Spill surface thermal conductivity, (W/m/K) 0.92
Dike area (m2) ..... 1E+38
Spill surface intrinsic permeability (m2) 1E-20

Spill surface = CONCRETE

User Specified Site Conditions:

Name: Hellman
Location: CA_LONG_BEACH 118.1883 33.7706 10.6680
Description: Hellman Gas Plant

Longitude, (degrees) 118.2
Latitude, (degrees) 33.77
Altitude, (m) 10.67
Time zone factor, (hrs) 7.879
Ambient temperature, (K) 298
Ambient pressure, (Pa) ..... 1.013E+05
Soil temperature, (K) 298
Water temperature, (K) 283
Mean water flow velocity, (m/s) 2
Mean water depth, (m) 10
Relative humidity, (percent) 70
Visual range, (m) 5000
Roughness length (m) 0.024

Wind speed, (m/s) 5
Wind friction velocity, (m/s) 0.3398
Wind power law constant 0.1468
Wind speed reference height, (m) 10
Stability class (A=0/B=1/C=2/D=3/E=4/F=5) 3
Monin-Obuhkov length (m) ..... 1E+38
Water dew point (K) 292.2

User defined thermal radiation damage criteria:

Thermal radiation criteria name: 5kw
Description: 5 kw/m2 radiation

Heat Flux, (kW/m2)

5

Time integrated heat flux value, (kJ/m2)

25

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PROJECT: Hellman Chittick
PROBLEM: Releases Fri Jul 20 15:04:57 2018

User defined toxic damage criteria:

Toxic criteria name [s]: DEFAULT
Description: DEFAULT TOXICITY CRITERION

Limiting concentration (ppm)

1E+04

Averaging time (s) 600
Receptor elevation (m) 0.0001

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PROJECT: Hellman Chittick
PROBLEM: Releases Fri Jul 20 15:04:57 2018

User defined overpressure damage criteria:

Overpressure criteria name: 0.3psi
Description: 0.3psi

Overpressure (Pa)

2068

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PROJECT: Hellman Chittick
PROBLEM: Releases Fri Jul 20 15:04:57 2018

User defined mixture:

Name: NGL
Description: Natural gas liquids
Index bank:
Properties bank:

Chemical Mixture Definition

0. ID = 0. METHANE, CH4
1. ID = 1. ETHANE, C2H6
2. ID = 2. PROPANE, C3H8

3. ID = 3. n-BUTANE, C4H10
4. ID = 4. n-PENTANE, C5H12
5. ID = 980. NITROGEN, N2
6. ID = 224. CARBON DIOXIDE, CO2
7. ID = 1013. WATER, H2O

Binary interaction matrix:

```
[  0,  1] Kij=     1E-08  Lij=         0
[  0,  2] Kij=     1E-08  Lij=         0
[  0,  3] Kij=     1E-08  Lij=         0
[  0,  4] Kij=     1E-08  Lij=         0
[  0,  5] Kij=     1E-08  Lij=         0
[  0,  6] Kij=     1E-08  Lij=         0
[  0,  7] Kij=     1E-08  Lij=         0
[  1,  2] Kij=     1E-08  Lij=         0
[  1,  3] Kij=     1E-08  Lij=         0
[  1,  4] Kij=     1E-08  Lij=         0
[  1,  5] Kij=     1E-08  Lij=         0
[  1,  6] Kij=     1E-08  Lij=         0
[  1,  7] Kij=     1E-08  Lij=         0
[  2,  3] Kij=     1E-08  Lij=         0
[  2,  4] Kij=     1E-08  Lij=         0
[  2,  5] Kij=     1E-08  Lij=         0
[  2,  6] Kij=     1E-08  Lij=         0
[  2,  7] Kij=     1E-08  Lij=         0
[  3,  4] Kij=     1E-08  Lij=         0
[  3,  5] Kij=     1E-08  Lij=         0
[  3,  6] Kij=     1E-08  Lij=         0
[  3,  7] Kij=     1E-08  Lij=         0
[  4,  5] Kij=     1E-08  Lij=         0
[  4,  6] Kij=     1E-08  Lij=         0
[  4,  7] Kij=     1E-08  Lij=         0
[  5,  6] Kij=     1E-08  Lij=         0
[  5,  7] Kij=     1E-08  Lij=         0
```



```
[  6,  7] Kij=     1E-08  Lij=         0
```

#	cid	massfrac	molefrac
0	0	0.0112	0.035
1	1	0.0132	0.022
2	2	0.16	0.181
3	3	0.294	0.253
4	4	0.415	0.288
5	980	0	0
6	224	0.0457	0.052

```
|7    |      1013 |     0.0609 |      0.169 |
+-------------------------------------------+
```

cid:Chemical Identification Number - massfrac:Mass fraction - molefrac:Mole fraction of individual components.

NGL is not soluble in water

The following atom matrices will be used:

Mixture atom matrix: H,C,N,O

```
4       6       8       10      12      0       0
2
1       2       3       4       5       0       1
0
0       0       0       0       0       2       0
0
0       0       0       0       0       0       2
1
```


Vessel Name: 12k gal
Description: 12000 gallon tank vessel horiz

Horizontal Cylindrical (Hemispherical heads)
Material of construction: IRON

Length [straight side for cylinders] (m) 9
Inside diameter (m) 2.4
Vessel metal mass (kg) 1352
Wall metal thickness (m) 0.002
Base elevation with respect to scenario ground level (z=0) (m) 0
Total vessel surface area (m2) 86
Total volume (m3) 48
Maximum pressure limit for vessel in simulation (Pa) ..... 1E+38
Maximum temperature limit for vessel in simulation (K) 0

No fire loading specified

No eductor specified

No water sprays specified

Vessel is not insulated

Vessel does not have a cooling jacket

Vessel does not have a heating jacket

Vessel is not visible to solar flux

#	Zl	Az	Vz
0	0	0	0
1	0.0615	7.28	0.296
2	0.123	10.4	0.845
3	0.185	12.8	1.56
4	0.246	14.8	2.41
5	0.308	16.5	3.37
6	0.369	17.9	4.43
7	0.431	19.2	5.58
8	0.492	20.4	6.8
9	0.554	21.4	8.09
10	0.615	22.3	9.43
11	0.677	23.1	10.8
12	0.738	23.8	12.3
13	0.8	24.4	13.8
14	0.862	24.9	15.3
15	0.923	25.3	16.8
16	0.985	25.6	18.4
17	1.05	25.9	20
18	1.11	26	21.6
19	1.17	26.1	23.2
20	1.23	26.1	24.8
21	1.29	26	26.4
22	1.35	25.9	28
23	1.42	25.6	29.6
24	1.48	25.3	31.1
25	1.54	24.9	32.7
26	1.6	24.4	34.2
27	1.66	23.8	35.7
28	1.72	23.1	37.1
29	1.78	22.3	38.5
30	1.85	21.4	39.9
31	1.91	20.4	41.2
32	1.97	19.2	42.4
33	2.03	17.9	43.5
34	2.09	16.5	44.6
35	2.15	14.8	45.5
36	2.22	12.8	46.4
37	2.28	10.4	47.1
38	2.34	7.28	47.7

```
|39   |       2.4 |         0 |        48 |
+-------------------------------------------+
```

Zl:Liquid height (m) - Az:A(z); Area as a function of liquid height m2=f(m) - Vz:V(z); Volume as a function of liquid height m3=f(m)

Piping layout:

Tag: 3inLong3
Description: 3 inch hole 1000ft pipe length

```
+-------------------------------------------------------------------+
|#    | Sid       | Stype     | Length    | K1        | Kinf      |
+-------------------------------------------------------------------+
|0    |         0 |         0 |       300 |       160 |       0.5 |
+-------------------------------------------------------------------+
```

Sid:Segment identification number [] - Stype:0: Straight pipe / valves / fittings, 1: Relief device, 2: Rupture disk, 3: Thin sharp edged orifice, 4: Expander, 5: Reducer, 6: Pump - Length:Piping segment length (m) [] - K1:Number of Velocity Heads in K = K1/NRe + Kinf + Kid/ID - Kinf:Number of Velocity Heads in K = K1/NRe + Kinf + Kid/ID

```
+-------------------------------------------------------------------+
|#    | Kid       | Eps       | AreaC1    | Angle     | Z         |
+-------------------------------------------------------------------+
|0    |         0 |   4.57E-05 |   0.00456 |         0 |      0.01 |
+-------------------------------------------------------------------+
```

Kid:Number of Velocity Heads in K = K1/NRe + Kinf + Kid/ID - Eps:Typical pipe roughness: (m), Cast Iron (2.60E-04), Wrought Iron (4.57E-05), Commercial Steel (4.57E-05), Galvanized Iron (1.52E-04), Asphalted Cast Iron (1.22E-04), Drawn Tubing (1.52E-04) - AreaC1:flow area (m2) [] - Angle:Angle with respect to horizontal (degrees) [] - Z:Elevation of segment entrance (m) []

```
+-------------------------------+
|#    | H         | Ts        |
+-------------------------------+
|0    |     1E+38 |       293 |
+-------------------------------+
```

H:1/Overall heat transfer coefficient (W/m2/K); Sum_i (1/hi) [] - Ts:Surroundings temperature (K) []

Total length = 300 meters
Discharge coefficient (when applicable) = 1.000
1st relief device set / reset pressures (Pa) = 0 / 0

Reaction name =
Description =

Chemical Identification Number

0

Number of chemicals [] 0
Number of chemical reactions [] 0

Stoichiometric coefficient of reactants (positive)

0

Reaction order for reactants

0

Stoichiometric coefficient of products (positive)

0

Reaction order for products

0

Pre-exponential factor (m^3, s, kmol)

0

Activation energy (K)

0

Rate expression B parameter (K^(1/3))

0

Rate expression C parameter (K^(2/3))

0

Temperature Exponent

0

Reaction phase: Liquid = 0, Vapor = 1

0

Upper bound on reaction rate (kmol/s)

0

Is reaction reversible (0-No, 1-Yes)

0

Checking properties for mixture NGL
Natural gas liquids

COMP 0, ID 0, NAME = METHANE

COMP 1, ID 1, NAME = ETHANE

COMP 2, ID 2, NAME = PROPANE

COMP 3, ID 3, NAME = n-BUTANE

COMP 4, ID 4, NAME = n-PENTANE

COMP 5, ID 980, NAME = NITROGEN

COMP 6, ID 224, NAME = CARBON DIOXIDE

COMP 7, ID 1013, NAME = WATER

Detailed pipe flow calculations:

Pressure (Pa)	1.494E+06	1.013E+05
Temperature (K)	296	296.3
Velocity (m/s)	9.115	
Liquid height (m)	2.4	
Claculated Cd	0.1254	

Detailed pipe flow calculations:

Pressure (Pa) 1.483E+06 1.013E+05
Temperature (K) 296 296.3
Velocity (m/s) 9.079
Liquid height (m) 0.249
Claculated Cd 0.1254

Liquid flow model:

User Inputs:

Mixture density (kg/m3) 529
Hole Diameter, (m) 0.0762
Distance Between Hole and Tank Bottom, (m) 0.01
Initial Liquid Height, (m) 2.4
Vapor space tank pressure, (Pa) ..... 1.481E+06
Surroundings pressure, (Pa) ..... 1.013E+05

Model Outputs:

Average mass flow rate (kg/s) 21.94
Average mass flux (kg/m2/s) 4811
Discharge duration (s) 1155

Discharge coefficient = 0.1254 + 0 Liquid Height

NAME: ETHANE
FORMULA: C2H6
STRUCTURE: CH3CH3
ALIAS_1: ETHANE
ALIAS_2: ETHANE
ALIAS_3: METHYLMETHANE
CAS #: 74840

Chemical ID is 1

Liquid Pools Model
==========

User Inputs:

Ambient temperature, (K) 298
Wind speed, (m/s) 1.5
Longitude, (degrees) 66.8
Latitude, (degrees) 18
Day number of the year 180
Local standard time of spill, (hrs) 4
Pool radius value bound, (m) 25
Maximum pool evaporation time, (s) 3600
Time Zone Factor, (hrs) 4
Cloud cover factor 3
Total volume spilled, (m3) 0.0428
Release time, (s) 60
Discharge temperature, (K) 185
Flash fraction added to mass lost 0.33
Default: Surface reflectivity 0.03
Default: Surface emissivity 0.97
Pool will spread on land, Ground type = Average Soil

Air collision diameter, (Angstroms) 3.62
Chemical collision diameter, (Angstroms) 4.49
Collision integral 1.18
Diffusivity in air, (cm2/s) 0.0935

Volumetric discharge rate, (m3/s) 0.000714

PROJECT: hellman chittick
PROBLEM: releases Mon Jul 23 17:38:22 2018

Simultaneous
Spreading / Evaporation / Boiling

#	Time	Rpool	Tpool	Mdot	Ydot
0	0	0	185	0	0.000456
1	2.2	0.647	185	0.455	0.000456
2	3.4	0.599	185	0.355	0.000368
3	4.6	0.579	185	0.31	0.000317
4	5.8	0.554	185	0.276	0.000282
5	7	0.527	185	0.25	0.000256
6	8.2	0.512	185	0.234	0.000236
7	9.4	0.532	185	0.235	0.00022
8	10.6	0.586	185	0.251	0.000208
9	11.8	0.648	185	0.27	0.000198
10	13	0.695	185	0.284	0.000189
11	15.4	0.747	185	0.294	0.000174
12	17.8	0.78	185	0.297	0.000162
13	20.2	0.816	185	0.302	0.000152
14	22.6	0.854	185	0.308	0.000144
15	25	0.889	185	0.314	0.000137
16	28.6	0.935	185	0.32	0.000128
17	32.2	0.974	185	0.325	0.000121
18	35.8	1.01	185	0.329	0.000115
19	39.4	1.04	185	0.332	0.00011
20	44.2	1.08	185	0.336	0.000104
21	49	1.12	185	0.339	9.87E-05
22	55	1.16	185	0.342	9.33E-05
23	62.1	1.19	185	0.213	8.8E-05
24	73.3	1.19	185	0.197	8.14E-05
25	82.1	1.19	185	0.187	7.72E-05

Time: Time, s
Rpool: Pool radius, m
Tpool: Pool surface temperature, K
Mdot: Mass evaporating/boiling rate, kg/s
Ydot: Liquid regression rate, m/s

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PROJECT: hellman chittick
PROBLEM: releases Mon Jul 23 17:38:22 2018

Simultaneous
Spreading / Evaporation / Boiling

| # | Time | Vlost | Mtotal |

0	0	0	0
1	2.2	0.000412	0.224
2	3.4	0.00135	0.737
3	4.6	0.00212	1.15
4	5.8	0.00279	1.52
5	7	0.00338	1.84
6	8.2	0.00392	2.14
7	9.4	0.00444	2.42
8	10.6	0.00498	2.71
9	11.8	0.00556	3.03
10	13	0.00618	3.37
11	15.4	0.00748	4.07
12	17.8	0.00879	4.79
13	20.2	0.0101	5.51
14	22.6	0.0115	6.25
15	25	0.0129	7
16	28.6	0.015	8.15
17	32.2	0.0171	9.32
18	35.8	0.0193	10.5
19	39.4	0.0215	11.7
20	44.2	0.0244	13.3
21	49	0.0274	14.9
22	55	0.0312	17
23	62.1	0.0352	19.2
24	73.3	0.0394	21.5
25	82.1	0.0425	23.2

Time: Time, s
Vlost: Volume evaporated / boiled off, m3
Mtotal: Mass lost, kg

NAME: PROPANE
FORMULA: C3H8
STRUCTURE: CH3CH2CH3
ALIAS_1: PROPANE
ALIAS_2: PROPANE
ALIAS_3: PROPYL HYDRIDE
CAS #: 74986

Chemical ID is 2

Liquid Pools Model
==========

User Inputs:

Ambient temperature, (K) 298
Wind speed, (m/s) 1.5
Longitude, (degrees) 66.8
Latitude, (degrees) 18
Day number of the year 180
Local standard time of spill, (hrs) 4
Pool radius value bound, (m) 25
Maximum pool evaporation time, (s) 3600
Time Zone Factor, (hrs) 4
Cloud cover factor 3
Total volume spilled, (m3) 0.393
Release time, (s) 60
Discharge temperature, (K) 231
Flash fraction added to mass lost 0.31
Default: Surface reflectivity 0.03
Default: Surface emissivity 0.97
Pool will spread on land, Ground type = Average Soil

Air collision diameter, (Angstroms) 3.62
Chemical collision diameter, (Angstroms) 4.99
Collision integral 1.19
Diffusivity in air, (cm2/s) 0.0868

Volumetric discharge rate, (m3/s) 0.00655

Simultaneous
Spreading / Evaporation / Boiling

#	Time	Rpool	Tpool	Mdot	Ydot
0	0	0	231	0	0.000283
1	2.2	1.58	231	2.48	0.000283
2	3.4	1.69	231	2.38	0.000229
3	4.6	1.7	231	2.23	0.000196
4	5.8	1.71	231	2.12	0.000175
5	7	1.72	231	2.05	0.000159
6	8.2	1.75	231	2	0.000147
7	9.4	1.79	231	1.99	0.000137
8	10.6	1.85	231	2	0.000129

9	11.8	1.94	231	2.02	0.000122
10	14.2	2.13	231	2.12	0.000112
11	16.6	2.34	231	2.23	0.000104
12	19	2.53	231	2.32	9.72E-05
13	21.4	2.69	231	2.4	9.17E-05
14	23.8	2.82	231	2.45	8.71E-05
15	26.2	2.94	231	2.5	8.31E-05
16	29.8	3.09	231	2.55	7.8E-05
17	33.4	3.24	231	2.6	7.37E-05
18	37	3.37	231	2.64	7.01E-05
19	40.6	3.5	231	2.68	6.7E-05
20	45.4	3.66	231	2.74	6.34E-05
21	50.2	3.8	231	2.78	6.03E-05
22	55	3.94	231	2.83	5.77E-05
23	64.8	4.18	231	1.71	5.33E-05
24	76.3	4.25	231	1.63	4.93E-05
25	90	4.23	231	1.49	4.55E-05
26	106	4.21	231	1.36	4.2E-05
27	112	4.21	231	1.33	4.1E-05

Time: Time, s
Rpool: Pool radius, m
Tpool: Pool surface temperature, K
Mdot: Mass evaporating/boiling rate, kg/s
Ydot: Liquid regression rate, m/s

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PROJECT: hellman chittick
PROBLEM: releases Mon Jul 23 17:39:26 2018

Simultaneous
Spreading / Evaporation / Boiling

#	Time	Vlost	Mtotal
0	0	0	0
1	2.2	0.00259	1.51
2	3.4	0.00794	4.63
3	4.6	0.0129	7.5
4	5.8	0.0175	10.2
5	7	0.0218	12.7
6	8.2	0.0261	15.2
7	9.4	0.0302	17.6
8	10.6	0.0344	20
9	11.8	0.0385	22.5
10	14.2	0.0471	27.5
11	16.6	0.0562	32.7
12	19	0.0656	38.3
13	21.4	0.0754	44
14	23.8	0.0855	49.8
15	26.2	0.0957	55.8

16	29.8	0.111	64.9
17	33.4	0.127	74.3
18	37	0.144	83.7
19	40.6	0.16	93.4
20	45.4	0.183	106
21	50.2	0.205	120
22	55	0.229	133
23	64.8	0.267	156
24	76.3	0.301	175
25	90	0.338	197
26	106	0.378	220
27	112	0.391	228

Time: Time, s
Vlost: Volume evaporated / boiled off, m3
Mtotal: Mass lost, kg

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PROJECT: hellman chittick
PROBLEM: releases Mon Jul 23 17:39:33 2018

NAME: n-BUTANE
FORMULA: C4H10
STRUCTURE: CH3(CH2)2CH3
ALIAS_1: BUTANE
ALIAS_2: BUTANE
ALIAS_3: METHYLETHYLMETHANE
CAS #: 106978

Chemical ID is 3

EAIL|386, V 1.4 PAGE 11
PROJECT: hellman chittick
PROBLEM: releases Mon Jul 23 17:39:39 2018

Liquid Pools Model
==========

User Inputs:

Ambient temperature, (K) 298
Wind speed, (m/s) 1.5
Longitude, (degrees) 66.8
Latitude, (degrees) 18
Day number of the year 180
Local standard time of spill, (hrs) 4
Pool radius value bound, (m) 25
Maximum pool evaporation time, (s) 3600

Time Zone Factor, (hrs) 4
Cloud cover factor 3
Total volume spilled, (m3) 0.639
Release time, (s) 60
Discharge temperature, (K) 270
Flash fraction added to mass lost 0.11
Default: Surface reflectivity 0.03
Default: Surface emissivity 0.97
Pool will spread on land, Ground type = Average Soil

Air collision diameter, (Angstroms) 3.62
Chemical collision diameter, (Angstroms) 5.41
Collision integral 1.19
Diffusivity in air, (cm2/s) 0.0831

Volumetric discharge rate, (m3/s) 0.0106

Simultaneous
Spreading / Evaporation / Boiling

#	Time	Rpool	Tpool	Mdot	Ydot
0	0	0	273	0	8.93E-05
1	2.2	2	273	1.38	8.93E-05
2	3.4	2.25	273	1.44	7.63E-05
3	4.6	2.36	273	1.39	6.5E-05
4	5.8	2.43	273	1.35	5.72E-05
5	7	2.5	273	1.32	5.16E-05
6	8.2	2.58	273	1.3	4.75E-05
7	9.4	2.67	273	1.3	4.43E-05
8	10.6	2.78	273	1.32	4.18E-05
9	11.8	2.91	273	1.35	3.98E-05
10	13	3.05	273	1.38	3.82E-05
11	15.4	3.35	273	1.47	3.57E-05
12	17.8	3.66	273	1.56	3.37E-05
13	20.2	3.95	273	1.65	3.19E-05
14	22.6	4.2	273	1.72	3.04E-05
15	25	4.42	273	1.78	2.91E-05
16	27.4	4.62	273	1.83	2.79E-05
17	29.8	4.8	273	1.88	2.68E-05
18	33.4	5.05	273	1.93	2.54E-05
19	37	5.29	273	1.99	2.42E-05
20	40.6	5.51	273	2.03	2.31E-05
21	44.2	5.72	273	2.08	2.22E-05
22	49	5.99	273	2.14	2.11E-05
23	53.8	6.25	273	2.2	2.02E-05

24	58.6	6.5	273	2.26	1.93E-05
25	77.8	7.15	273	1.65	1.71E-05
26	92.7	7.31	273	1.59	1.58E-05
27	107	7.37	273	1.52	1.48E-05
28	132	7.4	273	1.37	1.33E-05
29	155	7.39	273	1.26	1.22E-05
30	184	7.35	273	1.15	1.12E-05
31	213	7.32	272	1.08	1.07E-05
32	250	7.31	271	1.04	1.03E-05
33	272	7.31	271	1.02	1.01E-05

Time: Time, s
Rpool: Pool radius, m
Tpool: Pool surface temperature, K
Mdot: Mass evaporating/boiling rate, kg/s
Ydot: Liquid regression rate, m/s

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PROJECT: hellman chittick
PROBLEM: releases Mon Jul 23 17:40:44 2018

Simultaneous
Spreading / Evaporation / Boiling

#	Time	Vlost	Mtotal
0	0	0	0
1	2.2	0.00144	0.871
2	3.4	0.00439	2.65
3	4.6	0.00733	4.42
4	5.8	0.0101	6.12
5	7	0.0129	7.76
6	8.2	0.0155	9.36
7	9.4	0.0181	11
8	10.6	0.0208	12.5
9	11.8	0.0235	14.2
10	13	0.0262	15.8
11	15.4	0.0319	19.3
12	17.8	0.038	22.9
13	20.2	0.0444	26.8
14	22.6	0.0512	30.9
15	25	0.0582	35.1
16	27.4	0.0655	39.5
17	29.8	0.0729	44
18	33.4	0.0843	50.9
19	37	0.0961	58
20	40.6	0.108	65.2
21	44.2	0.121	72.7
22	49	0.137	82.9
23	53.8	0.155	93.3
24	58.6	0.173	104

25	77.8	0.229	138
26	92.7	0.271	163
27	107	0.308	186
28	132	0.371	224
29	155	0.422	254
30	184	0.481	290
31	213	0.536	323
32	250	0.599	361
33	272	0.638	384

Time: Time, s
Vlost: Volume evaporated / boiled off, m3
Mtotal: Mass lost, kg

CPU Time = 236 Seconds

Two-phase jet dispersion

User Inputs:

Release temperature, (K) 228.6
Release pressure, (Pa) ..... 1.013E+05
Discharge diameter, (m) 0.0762
Release duration, (s) 120
Release elevation, (m) 0.01
Release angle, (degrees) 0
Molar flow rate, (kmol/s) 0.6114
Overall vapor to liquid ration (0 to 1) 0.95
Limiting concentration (ppm) 18156
Averaging time (s) 600

Model Outputs:

Initial mixture density, (kg/m3) 2.006
Initial void fraction 0.9998
Initial liquid density, (kg/m3) 823.1
Initial vapor density, (kg/m3) 1.863
Initial mixture velocity, (m/s) 2414
Number of droplets ..... 6.149E+28
Droplet mass, (kg) 2.557E-29
Droplet diameter, (m) 3.9E-11

Initial vapor/liquid split

#	cid	Nc	nc
0	0	0.03971	2.505E-05
1	1	0.3455	0.003005
2	2	0.1472	0.008671
3	3	0.04838	0.01887
4	4	3.866E-29	7.124E-29
5	980	-2.588E-39	-4.686E-41
6	224	1.637E-27	1.096E-29
7	1013	3.801E-29	4.675E-29

cid:Chemical Identification Number - Nc:Nc - nc:Number of moles in liquid phase (kmol)

Limiting concentration of 18156.37 ppm reached at:

Time 0.1711 s
Downwind distance 19.93 m
Radius/semi-width 1.279 m

Two-phase jet time profile

#	JTIME	SJET	XJET	YJET
0	0	0	0	0.01
1	0	0.000381	0	0.01
2	7.093E-06	0.01715	0.01676	0.01095
3	1.723E-05	0.04001	0.03962	0.01227
4	2.898E-05	0.06515	0.06477	0.01375
5	4.02E-05	0.08801	0.08763	0.01511
6	5.371E-05	0.1143	0.1139	0.01671
7	6.974E-05	0.144	0.1436	0.01856
8	8.857E-05	0.1772	0.1768	0.02066
9	0.0001105	0.2137	0.2134	0.02301
10	0.0001357	0.2537	0.2534	0.02563
11	0.0001646	0.2972	0.2968	0.02852
12	0.0001976	0.344	0.3437	0.03168
13	0.000235	0.3943	0.394	0.03513
14	0.0002772	0.4481	0.4477	0.03888
15	0.0003245	0.5052	0.5048	0.04293
16	0.0003776	0.5658	0.5654	0.04729
17	0.0004367	0.6298	0.6294	0.05197
18	0.0005024	0.6972	0.6968	0.05698
19	0.0005752	0.7681	0.7677	0.06235
20	0.0006556	0.8424	0.842	0.06806
21	0.0007442	0.9201	0.9197	0.07414
22	0.0008417	1.001	1.001	0.08059
23	0.0009485	1.086	1.085	0.08742
24	0.001065	1.174	1.173	0.09465
25	0.001193	1.265	1.265	0.1023
26	0.001332	1.36	1.36	0.1103
27	0.001537	1.492	1.492	0.1217
28	0.001765	1.63	1.63	0.1339
29	0.002019	1.774	1.774	0.1469
30	0.0023	1.924	1.924	0.1607
31	0.002611	2.08	2.08	0.1754
32	0.002953	2.243	2.242	0.191
33	0.00333	2.411	2.411	0.2074
34	0.003744	2.585	2.585	0.2248
35	0.004197	2.766	2.766	0.2431
36	0.004692	2.953	2.952	0.2624
37	0.005231	3.146	3.145	0.2827
38	0.005819	3.344	3.344	0.304
39	0.006636	3.605	3.605	0.3325

40	0.007421	3.841	3.84	0.3587
41	0.008527	4.153	4.152	0.394
42	0.01001	4.54	4.54	0.4391
43	0.01195	5.004	5.004	0.4945

44	0.01442	5.545	5.544	0.5609
45	0.01589	5.843	5.843	0.5983
46	0.01754	6.161	6.161	0.6388
47	0.01938	6.498	6.498	0.6822
48	0.02142	6.854	6.853	0.7289
49	0.02368	7.229	7.228	0.7787
50	0.02619	7.623	7.622	0.8318
51	0.02896	8.036	8.035	0.8882
52	0.03201	8.468	8.467	0.948
53	0.03536	8.919	8.918	1.011
54	0.03904	9.389	9.389	1.078
55	0.04307	9.878	9.878	1.148
56	0.04747	10.39	10.39	1.222
57	0.05227	10.91	10.91	1.3
58	0.0575	11.46	11.46	1.381
59	0.06933	12.61	12.61	1.555
60	0.08321	13.84	13.84	1.743
61	0.09936	15.14	15.14	1.947
62	0.1181	16.52	16.52	2.166
63	0.1396	17.97	17.97	2.399
64	0.1642	19.5	19.5	2.648

JTIME:Jet arrival time, (s) - SJET:Jet axial distance, (m) -
XJET:Downwind distance, (m) - YJET:Jet centerline height, (m)

Two-phase jet time profile

#	RJET	AREA	JETV	JETDEN
0	0.0381	0	2414	2.006
1	0.114	0.0001534	2414	2.006
2	0.1153	0.007619	2316	1.968
3	0.1169	0.01045	2198	1.922
4	0.1187	0.0172	2085	1.878
5	0.1204	0.02249	1994	1.842
6	0.1223	0.02893	1901	1.805
7	0.1243	0.03624	1808	1.766
8	0.1266	0.04457	1717	1.728
9	0.1292	0.05392	1628	1.691
10	0.1319	0.06437	1543	1.657
11	0.1348	0.07595	1461	1.624
12	0.1379	0.08873	1383	1.594
13	0.1413	0.1028	1310	1.566

14	0.1448	0.1181	1240	1.54
15	0.1485	0.1349	1175	1.516
16	0.1524	0.1531	1113	1.494
17	0.1565	0.1729	1055	1.474
18	0.1608	0.1943	999.9	1.456
19	0.1653	0.2174	948.5	1.439

20	0.17	0.2423	900.2	1.423
21	0.1749	0.2691	854.8	1.409
22	0.1799	0.2979	812.1	1.395
23	0.1852	0.3288	772	1.383
24	0.1906	0.3619	734.4	1.372
25	0.1963	0.3973	698.9	1.361
26	0.2021	0.4351	665.6	1.352
27	0.2102	0.4894	624.2	1.34
28	0.2186	0.5485	586	1.329
29	0.2273	0.6128	550.7	1.32
30	0.2364	0.6824	518.1	1.311
31	0.2458	0.7577	488	1.303
32	0.2555	0.8391	460.1	1.295
33	0.2656	0.9268	434.2	1.289
34	0.2761	1.021	410.2	1.282
35	0.2869	1.123	387.9	1.277
36	0.298	1.232	367.2	1.271
37	0.3094	1.349	347.9	1.266
38	0.3212	1.475	329.9	1.262
39	0.3367	1.646	308.9	1.256
40	0.3506	1.808	292	1.252
41	0.369	2.033	272.2	1.247
42	0.3918	2.328	250.9	1.242
43	0.419	2.704	229.3	1.236
44	0.4507	3.174	208.2	1.231
45	0.4682	3.448	198.1	1.228
46	0.4867	3.752	188.3	1.226
47	0.5064	4.086	178.9	1.223
48	0.5271	4.454	169.9	1.221
49	0.549	4.857	161.3	1.219
50	0.5719	5.299	153.1	1.216
51	0.5959	5.781	145.4	1.214
52	0.6209	6.307	138.1	1.212
53	0.6471	6.879	131.1	1.211
54	0.6743	7.5	124.6	1.209
55	0.7026	8.174	118.5	1.207
56	0.732	8.903	112.7	1.206
57	0.7625	9.691	107.2	1.204
58	0.794	10.54	102.1	1.203
59	0.8602	12.44	92.7	1.2
60	0.9307	14.64	84.42	1.198
61	1.005	17.16	77.11	1.196

62	1.084	20.04	70.63	1.194
63	1.167	23.32	64.89	1.192
64	1.255	27.03	59.79	1.191

RJET:Jet radius or semi-width, (m) - AREA:Cumulative projected jet area, (m2) - JETV:Jet velocity, (m/s) - JETDEN:Jet density (kg/m3)

Two-phase jet time profile

#	ANGLE	TJET	Xc	Xw
0	0	228.6	0.95	0
1	0	228.6	0.95	0
2	0	229	0.9561	0.00638
3	0	229.8	0.9632	0.009268
4	0	231.1	0.9695	0.01301
5	0	232.6	0.974	0.01734
6	0	234.6	0.9777	0.02351
7	0	237.3	0.9798	0.03167
8	0	240.1	0.9815	0.04223
9	0	243	0.9828	0.05546
10	0	246	0.9839	0.07152
11	0	248.9	0.9848	0.09043
12	0	251.7	0.9855	0.1121
13	0	254.4	0.9861	0.1364
14	0	256.9	0.9865	0.1629
15	0	259.3	0.9869	0.1913
16	0	261.5	0.9873	0.2212
17	0	263.6	0.9875	0.2522
18	0	265.5	0.9878	0.2837
19	0	267.3	0.9878	0.315
20	0	269	0.9878	0.3462
21	0	270.6	0.9878	0.3771
22	0	272	0.9878	0.4075
23	0	273.3	0.9878	0.437
24	0	274.5	0.9878	0.4657
25	0	275.6	0.9878	0.4934
26	0	276.7	0.9878	0.5201
27	0	277.9	0.9878	0.5539
28	0	279.1	0.9878	0.5857
29	0	280.1	0.9878	0.6155
30	0	281.1	0.9878	0.6434
31	0	281.9	0.9878	0.6693
32	0	282.7	0.9878	0.6935
33	0	283.5	0.9878	0.7159
34	0	284.2	0.9878	0.7367
35	0	284.8	0.9878	0.7559

36	0	285.4	0.9878	0.7737
37	0	285.9	0.9878	0.7902
38	0	286.4	0.9878	0.8054
39	0	287	0.9878	0.823
40	0	287.5	0.9878	0.8369
41	0	288.1	0.9878	0.853
42	0	288.7	0.9878	0.8699
43	0	289.3	0.9878	0.8865
44	0	290	0.9878	0.9021
45	0	290.3	0.9878	0.9093

46	0	290.6	0.9878	0.9161
47	0	290.9	0.9878	0.9225
48	0	291.2	0.9878	0.9284
49	0	291.5	0.9878	0.9339
50	0	291.8	0.9878	0.9389
51	0	292	0.9878	0.9436
52	0	292.3	0.9878	0.9478
53	0	292.6	0.9878	0.9517
54	0	292.8	0.9878	0.9553
55	0	293	0.9878	0.9586
56	0	293.2	0.9878	0.9615
57	0	293.5	0.9878	0.9642
58	0	293.7	0.9878	0.9667
59	0	294	0.9878	0.971
60	0	294.4	0.9878	0.9746
61	0	294.7	0.9878	0.9777
62	0	294.9	0.9878	0.9802
63	0	295.2	0.9878	0.9824
64	0	295.4	0.9878	0.9842

ANGLE:Jet angle, (degrees) - TJET:Jet temperature, (K) - Xc:Chemical V/F ratio - Xw:Water V/F ratio

Two-phase jet time profile

#	XC
0	0.9901
1	0.9901
2	0.9405
3	0.8821
4	0.8273
5	0.7843
6	0.741
7	0.6985
8	0.6575
9	0.6182

10	0.5811
11	0.5461
12	0.5133
13	0.4827
14	0.4541
15	0.4275
16	0.4027
17	0.3796
18	0.3582
19	0.3382
20	0.3195
21	0.3022

22	0.286
23	0.2709
24	0.2568
25	0.2436
26	0.2313
27	0.216
28	0.2021
29	0.1893
30	0.1776
31	0.1667
32	0.1568
33	0.1476
34	0.1391
35	0.1312
36	0.1239
37	0.1172
38	0.1109
39	0.1036
40	0.09775
41	0.0909
42	0.08355
43	0.07612
44	0.0689
45	0.06544
46	0.0621
47	0.05889
48	0.05583
49	0.05291
50	0.05014
51	0.04751
52	0.04503
53	0.04269
54	0.04048
55	0.0384
56	0.03644
57	0.0346

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|58   |      0.03287 |
|59   |      0.02971 |
|60   |      0.02693 |
|61   |      0.02446 |
|62   |      0.02229 |
|63   |      0.02035 |
|64   |      0.01864 |
+--------------------+
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XC:Chemical mole fraction

Mole fraction of liquid phase (Excluding water)

```
  0.0008161     0.09789      0.2824      0.6145    2.32E-27
 -1.526E-39   3.571E-28   1.523E-27
  0.0008161     0.09789      0.2824      0.6145    2.32E-27
 -1.526E-39   3.571E-28   1.523E-27
  0.0009045      0.1085      0.2641      0.5964   2.003E-18
  -3.13E-19   2.376E-18  -1.178E-17
   0.001032      0.1238      0.2394      0.5633  -3.955E-17
 -3.287E-19   5.394E-18  -1.738E-17
   0.001172      0.1406      0.2129      0.5174    6.43E-17
 -3.419E-19   6.456E-18  -3.961E-18
   0.001286      0.1543        0.19      0.4704   3.721E-18
 -3.474E-19  -2.707E-19   8.393E-18
   0.001379      0.1654      0.1707      0.4133   1.549E-17
 -3.419E-19  -6.314E-18   3.803E-17
   0.001398      0.1677      0.1731      0.3482   6.432E-17
 -3.156E-19  -5.331E-18   5.412E-17
   0.001395      0.1674      0.1727      0.2897  -4.937E-17
 -2.858E-19  -6.288E-18    7.82E-17
   0.001373      0.1647        0.17      0.2397  -3.874E-18
 -2.551E-19  -4.918E-18   4.901E-17
   0.001338      0.1605      0.1656      0.1981  -4.477E-17
 -2.256E-19       1E-17   4.941E-17
   0.001295      0.1554      0.1604      0.1643      -3E-17
 -1.984E-19    8.09E-18   7.658E-17
    0.00125      0.1499      0.1547       0.137   6.142E-17
 -1.743E-19   6.495E-18   5.503E-17
   0.001204      0.1444      0.1491       0.115   1.573E-17
 -1.533E-19   1.509E-19   8.415E-17
   0.001161      0.1392      0.1437     0.09739    1.52E-16
 -1.352E-19  -5.354E-17   4.392E-17
    0.00112      0.1344      0.1387     0.08316   1.588E-16
 -1.198E-19  -1.432E-17  -1.677E-18
   0.001084        0.13      0.1342     0.07161   1.818E-16
 -1.066E-19  -1.057E-17   1.075E-16
   0.001051      0.1261      0.1302     0.06217   3.516E-16
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-9.541E-20 -9.441E-18 1.488E-16
0.001022 0.1226 0.1265 0.05479 4.418E-17
-8.581E-20 8.356E-19 1.58E-16
0.0009915 0.1189 0.1228 0.05315 1.213E-16
-7.715E-20 7.214E-19 1.527E-16
0.0009654 0.1158 0.1195 0.05174 3.569E-16
-6.979E-20 7.442E-19 1.435E-16
0.0009431 0.1131 0.1168 0.05055 4.39E-16
-6.349E-20 6.544E-19 1.228E-16
0.0009242 0.1109 0.1144 0.04954 7.032E-16
-5.806E-20 5.802E-19 9.318E-17

0.0009082 0.1089 0.1124 0.04868 8.846E-16
-5.335E-20 5.183E-19 1.072E-16
0.0008948 0.1073 0.1108 0.04796 5.901E-16
-4.924E-20 4.661E-19 8.753E-17
0.0008837 0.106 0.1094 0.04736 2.741E-16
-4.563E-20 4.219E-19 4.373E-17
0.0008745 0.1049 0.1083 0.04688 -7.009E-17
-4.245E-20 -6.086E-20 4.163E-17
0.0008652 0.1038 0.1071 0.04637 -3.541E-16
-3.875E-20 -6.187E-18 -4.236E-17
0.0008585 0.103 0.1063 0.04602 -2.649E-16
-3.558E-20 2.141E-18 -8.621E-17
0.0008543 0.1025 0.1058 0.04579 -1.32E-16
-3.284E-20 1.934E-18 -2.338E-16
0.0008522 0.1022 0.1055 0.04568 -9.662E-17
-3.045E-20 1.759E-18 -1.145E-16
0.000852 0.1022 0.1055 0.04566 -1.028E-16
-2.835E-20 1.609E-18 1.424E-17
0.0008534 0.1024 0.1057 0.04574 2.589E-16
-2.65E-20 1.48E-18 7.76E-17
0.0008563 0.1027 0.106 0.0459 1.721E-16
-2.486E-20 1.368E-18 8.766E-17
0.0008606 0.1032 0.1066 0.04613 2.041E-16
-2.34E-20 1.27E-18 8.166E-17
0.0008662 0.1039 0.1072 0.04643 1.587E-16
-2.209E-20 1.184E-18 5.985E-17
0.0008728 0.1047 0.1081 0.04678 2.245E-16
-2.091E-20 1.108E-18 6.571E-17
0.0008805 0.1056 0.109 0.04719 2.524E-16
-1.984E-20 1.041E-18 6.955E-17
0.0008891 0.1066 0.1101 0.04765 2.345E-16
-1.888E-20 9.8E-19 1.1E-16
0.0009011 0.1081 0.1116 0.0483 2.558E-16
-1.777E-20 9.12E-19 1.552E-16
0.0009125 0.1095 0.113 0.04891 1.947E-16
-1.691E-20 8.594E-19 1.141E-16
0.0009283 0.1114 0.1149 0.04976 1.142E-16

-1.591E-20 7.998E-19 1E-16
0.0009484 0.1138 0.1174 0.05083 4.313E-17
-1.486E-20 7.378E-19 -4.063E-17
0.0009726 0.1167 0.1204 0.05213 2.409E-16
-1.38E-20 6.768E-19 1.156E-16
0.001001 0.12 0.1239 0.05363 5.31E-17
-1.277E-20 6.187E-19 1.279E-16
0.001016 0.1218 0.1257 0.05444 3.101E-16
-1.228E-20 5.912E-19 1.54E-16
0.001031 0.1237 0.1277 0.05528 4.972E-16
-1.18E-20 5.647E-19 1.582E-16
0.001047 0.1256 0.1297 0.05614 3.503E-16
-1.134E-20 5.393E-19 4.313E-17

0.001064 0.1276 0.1317 0.05703 2.434E-16
-1.089E-20 5.15E-19 9.119E-17
0.001081 0.1296 0.1338 0.05792 2.623E-16
-1.045E-20 4.918E-19 8.656E-17
0.001097 0.1316 0.1359 0.05883 4.202E-16
-1.004E-20 7.003E-19 5.736E-17
0.001114 0.1337 0.138 0.05973 4.532E-17
-9.634E-21 6.688E-19 6.789E-17
0.001131 0.1357 0.14 0.06062 3.709E-16
-9.246E-21 6.387E-19 2.097E-16
0.001147 0.1376 0.1421 0.0615 5.58E-16
-8.873E-21 6.101E-19 2.198E-16
0.001164 0.1396 0.1441 0.06237 5.263E-16
-8.515E-21 -3.034E-18 5.774E-17
0.001179 0.1415 0.146 0.06321 6.263E-16
-8.17E-21 -6.2E-18 1.161E-16
0.001195 0.1433 0.1479 0.06403 1.297E-15
-7.84E-21 -5.924E-18 1.818E-16
0.00121 0.1451 0.1497 0.06483 1.026E-15
-7.523E-21 -5.663E-18 8.144E-17
0.001224 0.1468 0.1515 0.0656 3.443E-16
-7.219E-21 -5.414E-18 1.154E-16
0.001251 0.1501 0.1549 0.06706 3.121E-16
-6.65E-21 -4.952E-18 8.957E-16
0.001276 0.1531 0.158 0.06839 4.734E-16
-6.129E-21 -4.536E-18 9.19E-16
0.001299 0.1558 0.1608 0.06962 6.842E-16
-5.654E-21 -4.16E-18 1.293E-15
0.00132 0.1583 0.1634 0.07073 1.912E-15
-5.221E-21 -3.822E-18 7.383E-16
0.001338 0.1606 0.1657 0.07174 3.269E-15
-4.826E-21 -3.517E-18 8.375E-17
0.001355 0.1626 0.1678 0.07265 3.327E-15
-4.468E-21 -3.243E-18 -1.962E-15

Mole fraction of vapor phase (Excluding air and water)

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   0.06768     0.5888     0.2509    0.08246   6.589E-29
 -4.411E-39   2.789E-27   6.478E-29
   0.06768     0.5888     0.2509    0.08246   6.589E-29
 -4.411E-39   2.789E-27   6.478E-29
   0.06381     0.5551     0.2388    0.08152  -1.303E-18
  9.379E-21   3.256E-20   5.539E-19
   0.05938     0.5165     0.2244    0.08011  -8.976E-19
   7.69E-21  -1.047E-19   4.732E-19
   0.05534     0.4814     0.2109    0.07831  -3.401E-18
  6.234E-21  -3.274E-19   2.694E-19
   0.05225     0.4546     0.2003    0.07643  -2.207E-18
  5.176E-21  -5.457E-20   1.516E-19
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   0.04922     0.4282     0.1894    0.07404  -3.346E-18
  4.189E-21  -1.117E-20  -5.785E-19
   0.04632      0.403     0.1782    0.07117  -3.614E-18
  3.291E-21   8.021E-21  -8.337E-19
   0.04355     0.3788     0.1676    0.06804  -4.137E-18
  2.522E-21   1.316E-20  -1.257E-18
   0.04091     0.3559     0.1574    0.06478  -4.006E-18
  1.877E-21   9.624E-20  -7.778E-19
   0.03843     0.3343     0.1479    0.06149  -4.087E-18
  1.346E-21  -9.869E-20  -7.628E-19
    0.0361      0.314     0.1389    0.05824  -2.197E-18
  9.132E-22  -4.725E-20  -1.226E-18
   0.03392      0.295     0.1305    0.05509  -5.688E-18
  5.646E-22   1.655E-20  -9.852E-19
   0.03188     0.2773     0.1227    0.05206  -3.871E-18
  2.858E-22   1.307E-19  -1.284E-18
   0.02998     0.2608     0.1153    0.04918  -2.828E-18
  6.442E-23   1.114E-18  -3.626E-19
   0.02821     0.2454     0.1085    0.04645  -6.587E-18
 -1.101E-22    7.16E-19   4.506E-19
   0.02656     0.2311     0.1022    0.04388  -5.519E-18
 -2.467E-22   7.326E-19  -1.478E-18
   0.02503     0.2178    0.09631    0.04145  -9.605E-18
 -3.527E-22   5.686E-19  -2.175E-18
    0.0236     0.2053    0.09082    0.03917  -3.238E-18
  -4.34E-22   5.059E-19  -2.529E-18
   0.02228     0.1938    0.08571    0.03697  -3.071E-18
 -4.958E-22   4.788E-19  -2.283E-18
   0.02104      0.183    0.08096    0.03492  -7.175E-18
 -5.415E-22   2.903E-19  -2.133E-18
   0.01989      0.173    0.07652    0.03301  -6.624E-18
 -5.742E-22   2.753E-19  -1.816E-18
   0.01881     0.1637    0.07239    0.03122  -8.895E-18
```

-5.966E-22 2.612E-19 -1.436E-18
0.01781 0.155 0.06853 0.02956 -8.848E-18
-6.107E-22 2.48E-19 -1.476E-18
0.01688 0.1468 0.06493 0.02801 -4.497E-18
-6.182E-22 2.355E-19 -1.164E-18
0.016 0.1392 0.06157 0.02656 -9.08E-19
-6.204E-22 2.237E-19 -7.035E-19
0.01519 0.1321 0.05843 0.0252 4.85E-18
-6.185E-22 2.266E-19 -6.875E-19
0.01418 0.1233 0.05455 0.02353 1.008E-17
-6.109E-22 1.94E-19 -9.946E-20
0.01326 0.1153 0.051 0.022 9.404E-18
-5.991E-22 1.684E-19 5.649E-19
0.01241 0.108 0.04775 0.0206 6.305E-18
-5.844E-22 1.595E-19 1.779E-18
0.01163 0.1012 0.04476 0.01931 4.764E-18
-5.677E-22 1.51E-19 4.534E-19

0.01092 0.09498 0.04201 0.01812 2.705E-18
-5.498E-22 1.429E-19 -6.883E-19
0.01026 0.08926 0.03948 0.01703 -5.736E-19
-5.31E-22 1.353E-19 -1.174E-18
0.009654 0.08398 0.03714 0.01602 1.283E-18
-5.12E-22 1.281E-19 -1.198E-18
0.009094 0.07911 0.03499 0.01509 1.588E-18
-4.928E-22 1.214E-19 -1.139E-18
0.008577 0.07461 0.033 0.01423 8.823E-19
-4.739E-22 1.151E-19 -1.124E-18
0.008098 0.07044 0.03116 0.01344 1.955E-18
-4.553E-22 1.091E-19 -1.135E-18
0.007654 0.06658 0.02945 0.0127 1.439E-18
-4.372E-22 1.036E-19 -1.109E-18
0.007242 0.063 0.02786 0.01202 1.276E-18
-4.197E-22 9.837E-20 -1.188E-18
0.006762 0.05882 0.02602 0.01122 1.822E-18
-3.983E-22 9.223E-20 -1.324E-18
0.006378 0.05548 0.02454 0.01058 2.158E-18
-3.805E-22 8.727E-20 -1.071E-18
0.005929 0.05157 0.02281 0.009839 3.304E-18
-3.589E-22 8.143E-20 -9.682E-19
0.005447 0.04739 0.02096 0.00904 5.922E-18
-3.348E-22 7.51E-20 -4.491E-19
0.00496 0.04315 0.01908 0.008232 5.294E-18
-3.095E-22 6.865E-20 -9.384E-19
0.004488 0.03904 0.01727 0.007448 5.161E-18
-2.841E-22 6.233E-20 -7.866E-19
0.004262 0.03708 0.0164 0.007073 4.38E-18
-2.716E-22 5.929E-20 -7.295E-19
0.004044 0.03518 0.01556 0.006711 4.561E-18

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 -2.593E-22   5.634E-20  -6.922E-19
  0.003834     0.03336     0.01475    0.006364   4.299E-18
 -2.474E-22   5.351E-20  -4.365E-19
  0.003634     0.03162     0.01398    0.006032   4.092E-18
 -2.358E-22   5.079E-20  -4.476E-19
  0.003444     0.02996     0.01325    0.005716   3.591E-18
 -2.247E-22   4.819E-20  -4.241E-19
  0.003263     0.02839     0.01255    0.005415   3.778E-18
  -2.14E-22   5.026E-20  -4.575E-19
  0.003092      0.0269      0.0119    0.005131   3.723E-18
 -2.037E-22   4.769E-20    -4.9E-19
   0.00293     0.02549     0.01127    0.004863   2.067E-18
 -1.939E-22   4.526E-20  -6.257E-19
  0.002777     0.02416     0.01069    0.004609  -2.487E-19
 -1.846E-22   4.296E-20  -5.794E-19
  0.002633     0.02291     0.01013     0.00437  -1.566E-18
 -1.757E-22    3.67E-20  -2.493E-19
  0.002498     0.02173     0.00961    0.004145  -1.069E-18
 -1.673E-22  -8.732E-20  -4.091E-19
```



```
   0.00237     0.02062    0.009119    0.003933  -1.103E-18
 -1.593E-22  -8.331E-20  -4.797E-19
   0.00225     0.01957    0.008658    0.003734  -6.243E-19
 -1.517E-22  -7.949E-20  -3.884E-19
  0.002138     0.01859    0.008224    0.003547  -1.594E-18
 -1.445E-22  -7.585E-20  -4.414E-19
  0.001932     0.01681    0.007434    0.003206  -1.417E-18
 -1.314E-22  -6.913E-20  -1.158E-18
  0.001751     0.01523    0.006736    0.002905   5.125E-20
 -1.196E-22  -6.309E-20  -8.624E-19
   0.00159     0.01384    0.006119    0.002639   3.364E-19
 -1.091E-22  -5.766E-20   -1.08E-18
  0.001449      0.0126    0.005574    0.002404   1.655E-18
 -9.974E-23   -5.28E-20  -5.724E-19
  0.001323     0.01151     0.00509    0.002196   3.496E-19
 -9.138E-23  -4.845E-20   9.487E-20
  0.001211     0.01054    0.004661    0.002011  -1.002E-18
 -8.391E-23  -4.454E-20    1.34E-18


Fraction of total mass rained out .......................          0
Captured fraction of total mass rained out ..............          0
Minimum jet temperature calculated (K) ..................       228.6

Ambient temperature            298.000  K
Relative humidity               70.000  Percent
Visual range                  5000.000  m
Precipitable H2O                63.888  m/mm
```

Atmospheric Transmissivity

#	X	Tau
0	0.01516	0.995
1	0.5524	0.95
2	2.309	0.9
3	5.507	0.85
4	10.43	0.8
5	18.27	0.75
6	32.77	0.7
7	60.42	0.65
8	114	0.6
9	218.1	0.55
10	414.2	0.5
11	758.3	0.45
12	1314	0.4
13	2155	0.35
14	3388	0.3

15	5194	0.25
16	7890	0.2
17	12072	0.15
18	19054	0.1
19	32953	0.05

X:Target range, (m) - Tau:Atmospheric transmissivity

Turbulent two-phase flame jets hazards:

User inputs:

Mass flow rate (kg/s) 21.9

Model outputs:

Radiated fraction of combustion energy 0.3
Energy radiation rate (kW) ..... 3.08E+05
Flame jet length (m) 19.5

PROJECT: Hellman Chittick
PROBLEM: Releases Fri Jul 20 15:09:54 2018

Ground level distances to 5 kW/m2

#	Xdw	Ycw	Fc
0	0	29.36	5.004
1	7.439	25.17	4.987
2	14.88	26.5	5.004
3	22.32	31.47	4.991
4	29.76	34.51	5.004
5	37.2	35.05	4.997
6	44.63	33.5	5
7	52.07	29.72	5.005
8	59.51	22.72	5
9	66.95	4.827	5

Xdw:Downwind distance (m) - Ycw:1/2 crosswind distance (m) -
Fc:Calculated flux (kW/m2)

Ground level distances to 10 kW/m2

#	Xdw	Ycw	Fc
0	0	22.29	9.981
1	5.724	19.91	10.01
2	11.45	19.73	9.973
3	17.17	21.47	10
4	22.9	23.91	10.01
5	28.62	24.89	9.999
6	34.34	24.15	10.01
7	40.07	21.64	9.99
8	45.79	16.66	10
9	51.52	3.705	10

Xdw:Downwind distance (m) - Ycw:1/2 crosswind distance (m) -
Fc:Calculated flux (kW/m2)

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PROJECT: Hellman Chittick
PROBLEM: Releases Fri Jul 20 15:11:56 2018

UVCE/TNT Model:

User Inputs:

Molecular weight, (kg/kmol) 50.02

Yield factor 0.03
Heat of combustion, (J/kmol) ..... -2.036E+09
Cloud Mass, (kg) 268
Explosion is at ground level

Model Outputs:

Equivalent TNT mass, (kg) 67.72

Calculated Distance and Area

#	Xc	Ac	OPs	OPe
0	171.5	92361	2068	0.2999

Xc:Radial distance to user specified overpressure, (m) - Ac:Hazard area to user specified overpressure, (m^2) - OPs:Overpressure (Pa) - OPe:User specified overpressure, (Psi)

Calculated Distance and Area

#	Xc	Ac	OPs	OPe
0	67.69	14393	6893	0.9997

Xc:Radial distance to user specified overpressure, (m) - Ac:Hazard area to user specified overpressure, (m^2) - OPs:Overpressure (Pa) - OPe:User specified overpressure, (Psi)

•(10U•&l0O•&k2S•&l6D•

Scenario 1
Hazard Footprints

Met Scenario					c(ppm) ÄÄ 50000.0					c(ppm) ÄÄ 25000.0				
u (m/s)	temp (øK)	rh (%)	stb	avt (s)	length (m)	width (m)	w_dist (m)	area (m2)	fmass (kg)	length (m)	width (m)	w_dist (m)	area (m2)	fmass (kg)
4.0	293.0	60.	4	60.	1.64E+01	2.82E+00	7.45E+00	3.27E+01	1.16E+01	3.87E+01	4.75E+00	1.49E+01	1.39E+02	4.19E+01
2.0	293.0	60.	6	60.	1.84E+01	3.03E+00	8.83E+00	4.02E+01	1.86E+01	5.32E+01	5.50E+00	2.14E+01	2.19E+02	7.47E+01
Composite Maximum					1.84E+01	3.03E+00	8.83E+00	4.02E+01	1.86E+01	5.32E+01	5.50E+00	2.14E+01	2.19E+02	7.47E+01

Scenario 1

```
 problem input

 idspl =         2
 ncalc =         1
 wms   =   .016000
 cps   =   2240.00
 tbp   =    111.70
 cmed0 =       .00
 dhe   =   509880.
 cpsl  =   3349.00
 rhosl =    424.10
 spb   =     -1.00
 spc   =       .00
 ts    =    260.00
 qs    =      6.05
 as    =       .02
 tsd   =       60.
 qtis  =       .00
 hs    =      1.00
 tav   =     60.00
 xffm  =   9000.00
 zp(1) =       .00
 zp(2) =       .00
 zp(3) =       .00
 zp(4) =       .00
 z0    =   .300000
 za    =      2.00
 ua    =      4.00
 ta    =    293.00
 rh    =     60.00
 stab  =      4.00
```

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```
release gas properties

molecular weight of source gas (kg)              - wms  =  1.6000E-02
vapor heat capacity, const. p.  (j/kg-k)         - cps  =  2.2400E+03
temperature of source gas (k)                    - ts   =  2.6000E+02
density of source gas (kg/m3)                    - rhos =  7.4996E-01
boiling point temperature                        - tbp  =  1.1170E+02
liquid mass fraction                             - cmed0=  0.0000E+00
liquid heat capacity (j/kg-k)                    - cpsl =  3.3490E+03
heat of vaporization (j/kg)                      - dhe  =  5.0988E+05
liquid source density (kg/m3)                    - rhosl=  4.2410E+02
saturation pressure constant                     - spa  =  8.7843E+00
saturation pressure constant (k)                 - spb  =  9.8121E+02
saturation pressure constant (k)                 - spc  =  0.0000E+00


spill characteristics

spill type                                       - idspl=          2
mass source rate (kg/s)                          - qs   =  6.0500E+00
continuous source duration (s)                   - tsd  =  6.0000E+01
continuous source mass (kg)                      - qtcs =  3.6300E+02
instantaneous source mass (kg)                   - qtis =  0.0000E+00
source area (m2)                                 - as   =  1.8000E-02
vertical vapor velocity (m/s)                    - ws   =  0.0000E+00
source half width (m)                            - bs   =  6.7082E-02
source height (m)                                - hs   =  1.0000E+00
horizontal vapor velocity (m/s)                  - us   =  4.4817E+02


field parameters

concentration averaging time (s)                 - tav  =  6.0000E+01
mixing layer height (m)                          - hmx  =  1.0400E+03
maximum downwind distance (m)                    - xffm =  9.0000E+03
concentration measurement height (m)             - zp(1)=  0.0000E+00
                                                 - zp(2)=  0.0000E+00
                                                 - zp(3)=  0.0000E+00
                                                 - zp(4)=  0.0000E+00


ambient meteorological properties

molecular weight of ambient air (kg)            - wmae  =  2.8804E-02
heat capacity of ambient air at const p. (j/kg-k)- cpaa  =  1.0134E+03
density of ambient air (kg/m3)                  - rhoa  =  1.1980E+00
ambient measurement height (m)                  - za    =  2.0000E+00
ambient atmospheric pressure (pa=n/m2=j/m3)     - pa    =  1.0133E+05
ambient wind speed (m/s)                        - ua    =  4.0000E+00
```

```
ambient temperature (k)                          - ta    =  2.9300E+02
relative humidity (percent)                      - rh    =  6.0000E+01
ambient friction velocity (m/s)                  - uastr =  8.6521E-01
atmospheric stability class value                - stab  =  4.0000E+00
inverse monin-obukhov length (1/m)               - ala   =  0.0000E+00
surface roughness height (m)                     - z0    =  3.0000E-01


additional parameters

sub-step multiplier                              - ncalc =           1
number of calculational sub-steps                - nssm  =           3
acceleration of gravity (m/s2)                   - grav  =  9.8067E+00
gas constant (j/mol- k)                          - rr    =  8.3143E+00
von karman constant                              - xk    =  4.1000E-01
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instantaneous spatially averaged cloud parameters

```
          x        zc         h        bb         b        bbx       bx        cv        rho
   t        u        ua
        1.00E+00  1.00E+00  1.34E-01  6.71E-02  6.04E-02  0.00E+00  0.00E+00  1.00E+00  7.50E-01
2.60E+02  4.48E+02  1.37E+00
        1.02E+00  1.00E+00  1.80E-01  8.98E-02  6.80E-02  1.94E-02  1.94E-02  8.16E-01  8.44E-01
2.65E+02  3.12E+02  1.40E+00
        1.05E+00  1.00E+00  2.28E-01  1.14E-01  7.53E-02  4.28E-02  4.28E-02  6.84E-01  9.08E-01
2.69E+02  2.36E+02  1.43E+00
        1.08E+00  1.00E+00  2.80E-01  1.40E-01  8.25E-02  7.11E-02  7.11E-02  5.81E-01  9.55E-01
2.72E+02  1.86E+02  1.46E+00
        1.11E+00  1.00E+00  3.38E-01  1.69E-01  8.98E-02  1.05E-01  1.05E-01  4.99E-01  9.93E-01
2.75E+02  1.50E+02  1.49E+00
        1.16E+00  1.00E+00  4.03E-01  2.01E-01  9.73E-02  1.47E-01  1.47E-01  4.30E-01  1.02E+00
2.77E+02  1.23E+02  1.53E+00
        1.21E+00  1.00E+00  4.77E-01  2.38E-01  1.05E-01  1.97E-01  1.97E-01  3.72E-01  1.05E+00
2.79E+02  1.02E+02  1.58E+00
        1.28E+00  1.00E+00  5.62E-01  2.81E-01  1.14E-01  2.57E-01  2.57E-01  3.22E-01  1.07E+00
2.81E+02  8.57E+01  1.62E+00
        1.36E+00  1.00E+00  6.59E-01  3.29E-01  1.23E-01  3.31E-01  3.31E-01  2.79E-01  1.09E+00
2.82E+02  7.22E+01  1.68E+00
        1.45E+00  1.00E+00  7.72E-01  3.86E-01  1.32E-01  4.19E-01  4.19E-01  2.42E-01  1.10E+00
2.84E+02  6.10E+01  1.74E+00
        1.57E+00  1.00E+00  9.01E-01  4.50E-01  1.43E-01  5.26E-01  5.26E-01  2.10E-01  1.12E+00
2.85E+02  5.18E+01  1.81E+00
        1.71E+00  1.00E+00  1.05E+00  5.25E-01  1.53E-01  6.56E-01  6.56E-01  1.82E-01  1.13E+00
2.86E+02  4.41E+01  1.88E+00
        1.88E+00  1.00E+00  1.22E+00  6.11E-01  1.65E-01  8.13E-01  8.13E-01  1.58E-01  1.14E+00
2.87E+02  3.77E+01  1.97E+00
        2.08E+00  1.00E+00  1.42E+00  7.09E-01  1.77E-01  1.00E+00  1.00E+00  1.37E-01  1.15E+00
2.88E+02  3.24E+01  2.06E+00
        2.33E+00  1.00E+00  1.65E+00  8.22E-01  1.90E-01  1.23E+00  1.23E+00  1.19E-01  1.15E+00
2.88E+02  2.79E+01  2.17E+00
        2.63E+00  1.00E+00  1.90E+00  9.51E-01  2.04E-01  1.51E+00  1.51E+00  1.03E-01  1.16E+00
2.89E+02  2.41E+01  2.28E+00
        2.99E+00  1.00E+00  2.20E+00  1.10E+00  2.18E-01  1.84E+00  1.84E+00  8.94E-02  1.16E+00
2.89E+02  2.08E+01  2.48E+00
        3.43E+00  1.00E+00  2.52E+00  1.26E+00  2.33E-01  2.25E+00  2.25E+00  7.80E-02  1.17E+00
2.90E+02  1.81E+01  2.72E+00
        3.96E+00  1.00E+00  2.87E+00  1.43E+00  2.47E-01  2.74E+00  2.74E+00  6.84E-02  1.17E+00
2.90E+02  1.60E+01  2.95E+00
        4.61E+00  1.00E+00  3.24E+00  1.62E+00  2.60E-01  3.33E+00  3.33E+00  6.03E-02  1.17E+00
2.91E+02  1.43E+01  3.17E+00
        5.38E+00  1.00E+00  3.63E+00  1.81E+00  2.73E-01  4.05E+00  4.05E+00  5.32E-02  1.18E+00
2.91E+02  1.29E+01  3.39E+00
        6.32E+00  1.01E+00  4.05E+00  2.03E+00  2.85E-01  4.92E+00  4.92E+00  4.70E-02  1.18E+00
2.91E+02  1.17E+01  3.59E+00
        7.45E+00  1.01E+00  4.51E+00  2.25E+00  2.97E-01  5.97E+00  5.97E+00  4.15E-02  1.18E+00
2.92E+02  1.07E+01  3.79E+00
        8.83E+00  1.02E+00  4.99E+00  2.50E+00  3.08E-01  7.24E+00  7.23E+00  3.66E-02  1.18E+00
2.92E+02  9.92E+00  3.99E+00
        1.05E+01  1.03E+00  5.51E+00  2.75E+00  3.19E-01  8.77E+00  8.77E+00  3.23E-02  1.19E+00
2.92E+02  9.24E+00  4.18E+00
        1.25E+01  1.05E+00  6.06E+00  3.03E+00  3.29E-01  1.06E+01  1.06E+01  2.84E-02  1.19E+00
2.92E+02  8.67E+00  4.37E+00
        1.49E+01  1.07E+00  6.65E+00  3.32E+00  3.36E-01  1.29E+01  1.29E+01  2.50E-02  1.19E+00
2.92E+02  8.21E+00  4.55E+00
        1.79E+01  1.11E+00  7.28E+00  3.64E+00  3.43E-01  1.56E+01  1.56E+01  2.19E-02  1.19E+00
2.92E+02  7.83E+00  4.73E+00
        2.14E+01  1.17E+00  7.95E+00  3.97E+00  3.49E-01  1.89E+01  1.89E+01  1.91E-02  1.19E+00
2.92E+02  7.52E+00  4.91E+00
        2.57E+01  1.25E+00  8.68E+00  4.34E+00  3.54E-01  2.28E+01  2.28E+01  1.66E-02  1.19E+00
2.92E+02  7.27E+00  5.08E+00
        3.09E+01  1.35E+00  9.46E+00  4.73E+00  3.58E-01  2.76E+01  2.76E+01  1.43E-02  1.19E+00
2.93E+02  7.07E+00  5.26E+00
        3.72E+01  1.50E+00  1.03E+01  5.16E+00  3.61E-01  3.34E+01  3.34E+01  1.23E-02  1.19E+00
```

2.93E+02 6.93E+00 5.43E+00
4.48E+01 1.69E+00 1.13E+01 5.63E+00 3.62E-01 4.05E+01 4.05E+01 1.05E-02 1.19E+00
2.93E+02 6.84E+00 5.61E+00
5.40E+01 1.95E+00 1.23E+01 6.16E+00 3.62E-01 4.90E+01 4.90E+01 8.82E-03 1.19E+00
2.93E+02 6.78E+00 5.79E+00
6.51E+01 2.28E+00 1.35E+01 6.76E+00 3.62E-01 5.92E+01 5.92E+01 7.35E-03 1.20E+00
2.93E+02 6.77E+00 5.98E+00
7.85E+01 2.68E+00 1.48E+01 7.45E+00 3.62E-01 7.17E+01 7.17E+01 6.05E-03 1.20E+00
2.93E+02 6.79E+00 6.17E+00
9.48E+01 3.18E+00 1.63E+01 8.28E+00 3.61E-01 8.67E+01 8.67E+01 4.91E-03 1.20E+00
2.93E+02 6.84E+00 6.36E+00
1.14E+02 3.77E+00 1.79E+01 9.28E+00 3.60E-01 1.05E+02 1.05E+02 3.94E-03 1.20E+00
2.93E+02 6.92E+00 6.55E+00
1.38E+02 4.45E+00 1.98E+01 1.05E+01 3.59E-01 1.27E+02 1.27E+02 3.12E-03 1.20E+00
2.93E+02 7.03E+00 6.75E+00
1.67E+02 5.24E+00 2.18E+01 1.20E+01 3.58E-01 1.53E+02 1.53E+02 2.43E-03 1.20E+00
2.93E+02 7.15E+00 6.95E+00
2.02E+02 6.12E+00 2.42E+01 1.37E+01 3.55E-01 1.86E+02 1.86E+02 1.88E-03 1.20E+00
2.93E+02 7.31E+00 7.16E+00
2.44E+02 7.09E+00 2.68E+01 1.58E+01 3.53E-01 2.24E+02 2.24E+02 1.43E-03 1.20E+00
2.93E+02 7.48E+00 7.38E+00
2.95E+02 8.11E+00 3.03E+01 1.85E+01 3.53E-01 2.39E+02 2.24E+02 1.02E-03 1.20E+00
2.93E+02 7.70E+00 7.63E+00
3.60E+02 9.17E+00 3.45E+01 2.19E+01 3.53E-01 2.56E+02 2.24E+02 7.05E-04 1.20E+00
2.93E+02 7.94E+00 7.89E+00
4.40E+02 1.02E+01 3.93E+01 2.60E+01 3.53E-01 2.78E+02 2.24E+02 4.80E-04 1.20E+00
2.93E+02 8.19E+00 8.16E+00
5.40E+02 1.13E+01 4.49E+01 3.11E+01 3.53E-01 3.03E+02 2.24E+02 3.21E-04 1.20E+00
2.93E+02 8.45E+00 8.43E+00
6.65E+02 1.23E+01 5.15E+01 3.74E+01 3.53E-01 3.34E+02 2.24E+02 2.12E-04 1.20E+00
2.93E+02 8.73E+00 8.71E+00
8.21E+02 1.33E+01 5.92E+01 4.51E+01 3.53E-01 3.72E+02 2.24E+02 1.37E-04 1.20E+00
2.93E+02 9.01E+00 9.00E+00
1.02E+03 1.42E+01 6.82E+01 5.44E+01 3.53E-01 4.17E+02 2.24E+02 8.82E-05 1.20E+00
2.93E+02 9.29E+00 9.29E+00
1.26E+03 1.51E+01 7.87E+01 6.57E+01 3.53E-01 4.71E+02 2.24E+02 5.60E-05 1.20E+00
2.93E+02 9.58E+00 9.58E+00
1.56E+03 1.59E+01 9.10E+01 7.92E+01 3.53E-01 5.37E+02 2.24E+02 3.52E-05 1.20E+00
2.93E+02 9.87E+00 9.87E+00
1.94E+03 1.66E+01 1.05E+02 9.54E+01 3.53E-01 6.16E+02 2.24E+02 2.20E-05 1.20E+00
2.93E+02 1.02E+01 1.02E+01
2.41E+03 1.73E+01 1.22E+02 1.15E+02 3.53E-01 7.11E+02 2.24E+02 1.37E-05 1.20E+00
2.93E+02 1.05E+01 1.04E+01
2.99E+03 1.80E+01 1.41E+02 1.37E+02 3.53E-01 8.26E+02 2.24E+02 8.52E-06 1.20E+00
2.93E+02 1.07E+01 1.07E+01
3.72E+03 1.85E+01 1.63E+02 1.64E+02 3.53E-01 9.63E+02 2.24E+02 5.28E-06 1.20E+00
2.93E+02 1.10E+01 1.10E+01
4.61E+03 1.91E+01 1.89E+02 1.95E+02 3.53E-01 1.13E+03 2.24E+02 3.28E-06 1.20E+00
2.93E+02 1.13E+01 1.13E+01
5.73E+03 1.95E+01 2.19E+02 2.31E+02 3.53E-01 1.33E+03 2.24E+02 2.04E-06 1.20E+00
2.93E+02 1.16E+01 1.16E+01
7.11E+03 2.00E+01 2.52E+02 2.72E+02 3.53E-01 1.56E+03 2.24E+02 1.27E-06 1.20E+00
2.93E+02 1.18E+01 1.18E+01
8.82E+03 2.04E+01 2.91E+02 3.19E+02 3.53E-01 1.85E+03 2.24E+02 7.97E-07 1.20E+00
2.93E+02 1.21E+01 1.21E+01
1.09E+04 2.07E+01 3.34E+02 3.72E+02 3.53E-01 2.19E+03 2.24E+02 5.02E-07 1.20E+00
2.93E+02 1.24E+01 1.24E+01
1.35E+04 2.11E+01 3.82E+02 4.32E+02 3.53E-01 2.59E+03 2.24E+02 3.19E-07 1.20E+00
2.93E+02 1.26E+01 1.26E+01

x	cm	cmv	cmda	cmw	cmwv	wc	vg	ug	w	v	vx
1.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E+02	6.21E+01	0.00E+00
1.02E+00	7.11E-01	7.11E-01	2.86E-01	2.57E-03	2.57E-03	2.36E-04	0.00E+00	0.00E+00	2.18E+02	3.84E+01	9.80E-01
1.05E+00	5.45E-01	5.45E-01	4.51E-01	4.06E-03	4.02E-03	4.77E-04	0.00E+00	0.00E+00	1.50E+02	2.69E+01	9.81E-01
1.08E+00	4.36E-01	4.36E-01	5.59E-01	5.04E-03	4.86E-03	7.49E-04	0.00E+00	0.00E+00	1.10E+02	2.01E+01	9.83E-01
1.11E+00	3.56E-01	3.56E-01	6.38E-01	5.75E-03	5.61E-03	1.07E-03	0.00E+00	0.00E+00	8.39E+01	1.56E+01	9.85E-01
1.16E+00	2.95E-01	2.95E-01	6.98E-01	6.29E-03	6.27E-03	1.44E-03	0.00E+00	0.00E+00	6.54E+01	1.24E+01	9.87E-01
1.21E+00	2.48E-01	2.48E-01	7.46E-01	6.71E-03	6.71E-03	1.88E-03	0.00E+00	0.00E+00	5.17E+01	1.00E+01	9.89E-01
1.28E+00	2.09E-01	2.09E-01	7.84E-01	7.06E-03	7.06E-03	2.40E-03	0.00E+00	0.00E+00	4.13E+01	8.18E+00	9.92E-01
1.36E+00	1.77E-01	1.77E-01	8.15E-01	7.34E-03	7.34E-03	3.04E-03	0.00E+00	0.00E+00	3.32E+01	6.75E+00	9.94E-01
1.45E+00	1.51E-01	1.51E-01	8.42E-01	7.58E-03	7.58E-03	3.80E-03	0.00E+00	0.00E+00	2.68E+01	5.60E+00	9.98E-01
1.57E+00	1.29E-01	1.29E-01	8.63E-01	7.78E-03	7.78E-03	4.71E-03	0.00E+00	0.00E+00	2.17E+01	4.66E+00	1.00E+00

1.71E+00	1.10E-01	1.10E-01	8.82E-01	7.94E-03	7.94E-03	5.82E-03	0.00E+00	0.00E+00	1.76E+01	3.90E+00	1.01E+00
1.88E+00	9.44E-02	9.44E-02	8.98E-01	8.08E-03	8.08E-03	7.15E-03	0.00E+00	0.00E+00	1.43E+01	3.28E+00	1.01E+00
2.08E+00	8.10E-02	8.10E-02	9.11E-01	8.20E-03	8.20E-03	8.75E-03	0.00E+00	0.00E+00	1.17E+01	2.76E+00	1.01E+00
2.33E+00	6.95E-02	6.95E-02	9.22E-01	8.30E-03	8.30E-03	1.07E-02	0.00E+00	0.00E+00	9.53E+00	2.32E+00	1.02E+00
2.63E+00	5.98E-02	5.98E-02	9.32E-01	8.39E-03	8.39E-03	1.30E-02	0.00E+00	0.00E+00	7.80E+00	1.96E+00	1.03E+00
2.99E+00	5.17E-02	5.17E-02	9.40E-01	8.46E-03	8.46E-03	1.58E-02	0.00E+00	0.00E+00	6.19E+00	1.64E+00	1.04E+00
3.43E+00	4.49E-02	4.49E-02	9.47E-01	8.52E-03	8.52E-03	1.93E-02	0.00E+00	0.00E+00	4.62E+00	1.38E+00	1.05E+00
3.96E+00	3.92E-02	3.92E-02	9.52E-01	8.57E-03	8.57E-03	2.37E-02	0.00E+00	0.00E+00	3.57E+00	1.17E+00	1.06E+00
4.61E+00	3.44E-02	3.44E-02	9.57E-01	8.62E-03	8.62E-03	2.89E-02	0.00E+00	0.00E+00	2.82E+00	9.92E-01	1.07E+00
5.38E+00	3.03E-02	3.03E-02	9.61E-01	8.65E-03	8.65E-03	3.52E-02	0.00E+00	0.00E+00	2.28E+00	8.47E-01	1.09E+00
6.32E+00	2.66E-02	2.66E-02	9.65E-01	8.69E-03	8.69E-03	4.25E-02	0.00E+00	0.00E+00	1.87E+00	7.26E-01	1.10E+00
7.45E+00	2.35E-02	2.35E-02	9.68E-01	8.71E-03	8.71E-03	5.10E-02	0.00E+00	0.00E+00	1.55E+00	6.24E-01	1.11E+00
8.83E+00	2.07E-02	2.07E-02	9.71E-01	8.74E-03	8.74E-03	6.06E-02	0.00E+00	0.00E+00	1.31E+00	5.38E-01	1.12E+00
1.05E+01	1.82E-02	1.82E-02	9.73E-01	8.76E-03	8.76E-03	7.15E-02	0.00E+00	0.00E+00	1.12E+00	4.65E-01	1.13E+00
1.25E+01	1.60E-02	1.60E-02	9.75E-01	8.78E-03	8.78E-03	8.35E-02	0.00E+00	0.00E+00	9.68E-01	4.03E-01	1.14E+00
1.49E+01	1.40E-02	1.40E-02	9.77E-01	8.80E-03	8.80E-03	9.66E-02	0.00E+00	0.00E+00	8.47E-01	3.53E-01	1.15E+00
1.79E+01	1.23E-02	1.23E-02	9.79E-01	8.81E-03	8.81E-03	1.11E-01	0.00E+00	0.00E+00	7.49E-01	3.11E-01	1.15E+00
2.14E+01	1.07E-02	1.07E-02	9.80E-01	8.83E-03	8.83E-03	1.25E-01	0.00E+00	0.00E+00	6.70E-01	2.77E-01	1.16E+00
2.57E+01	9.28E-03	9.28E-03	9.82E-01	8.84E-03	8.84E-03	1.41E-01	0.00E+00	0.00E+00	6.05E-01	2.51E-01	1.17E+00
3.09E+01	8.01E-03	8.01E-03	9.83E-01	8.85E-03	8.85E-03	1.56E-01	0.00E+00	0.00E+00	5.51E-01	2.31E-01	1.18E+00
3.72E+01	6.87E-03	6.87E-03	9.84E-01	8.86E-03	8.86E-03	1.70E-01	0.00E+00	0.00E+00	5.06E-01	2.17E-01	1.19E+00
4.48E+01	5.84E-03	5.84E-03	9.85E-01	8.87E-03	8.87E-03	1.83E-01	0.00E+00	0.00E+00	4.69E-01	2.09E-01	1.20E+00
5.40E+01	4.92E-03	4.92E-03	9.86E-01	8.88E-03	8.88E-03	1.94E-01	0.00E+00	0.00E+00	4.38E-01	2.04E-01	1.20E+00
6.51E+01	4.09E-03	4.09E-03	9.87E-01	8.89E-03	8.89E-03	2.02E-01	0.00E+00	0.00E+00	4.12E-01	2.02E-01	1.21E+00
7.85E+01	3.37E-03	3.37E-03	9.88E-01	8.89E-03	8.89E-03	2.07E-01	0.00E+00	0.00E+00	3.89E-01	2.03E-01	1.22E+00
9.48E+01	2.74E-03	2.74E-03	9.88E-01	8.90E-03	8.90E-03	2.08E-01	0.00E+00	0.00E+00	3.70E-01	2.05E-01	1.22E+00
1.14E+02	2.19E-03	2.19E-03	9.89E-01	8.90E-03	8.90E-03	2.05E-01	0.00E+00	0.00E+00	3.54E-01	2.09E-01	1.23E+00
1.38E+02	1.73E-03	1.73E-03	9.89E-01	8.91E-03	8.91E-03	1.98E-01	0.00E+00	0.00E+00	3.39E-01	2.13E-01	1.23E+00
1.67E+02	1.35E-03	1.35E-03	9.90E-01	8.91E-03	8.91E-03	1.89E-01	0.00E+00	0.00E+00	3.27E-01	2.18E-01	1.24E+00
2.02E+02	1.04E-03	1.04E-03	9.90E-01	8.92E-03	8.92E-03	1.77E-01	0.00E+00	0.00E+00	3.16E-01	2.23E-01	1.24E+00
2.44E+02	7.96E-04	7.96E-04	9.90E-01	8.92E-03	8.92E-03	1.63E-01	0.00E+00	0.00E+00	3.06E-01	2.27E-01	1.25E+00
2.95E+02	5.64E-04	5.64E-04	9.91E-01	8.92E-03	8.92E-03	1.40E-01	0.00E+00	0.00E+00	2.95E-01	2.33E-01	1.23E+00
3.60E+02	3.92E-04	3.92E-04	9.91E-01	8.92E-03	8.92E-03	1.18E-01	0.00E+00	0.00E+00	2.85E-01	2.38E-01	1.23E+00
4.40E+02	2.67E-04	2.67E-04	9.91E-01	8.92E-03	8.92E-03	9.71E-02	0.00E+00	0.00E+00	2.75E-01	2.43E-01	1.23E+00
5.40E+02	1.79E-04	1.79E-04	9.91E-01	8.92E-03	8.92E-03	7.88E-02	0.00E+00	0.00E+00	2.66E-01	2.47E-01	1.23E+00
6.65E+02	1.18E-04	1.18E-04	9.91E-01	8.92E-03	8.92E-03	6.29E-02	0.00E+00	0.00E+00	2.57E-01	2.50E-01	1.23E+00
8.21E+02	7.64E-05	7.64E-05	9.91E-01	8.92E-03	8.92E-03	4.96E-02	0.00E+00	0.00E+00	2.49E-01	2.52E-01	1.23E+00
1.02E+03	4.90E-05	4.90E-05	9.91E-01	8.92E-03	8.92E-03	3.86E-02	0.00E+00	0.00E+00	2.40E-01	2.53E-01	1.22E+00
1.26E+03	3.11E-05	3.11E-05	9.91E-01	8.92E-03	8.92E-03	2.98E-02	0.00E+00	0.00E+00	2.32E-01	2.53E-01	1.22E+00
1.56E+03	1.96E-05	1.96E-05	9.91E-01	8.92E-03	8.92E-03	2.28E-02	0.00E+00	0.00E+00	2.23E-01	2.50E-01	1.22E+00
1.94E+03	1.22E-05	1.22E-05	9.91E-01	8.92E-03	8.92E-03	1.73E-02	0.00E+00	0.00E+00	2.15E-01	2.47E-01	1.21E+00
2.41E+03	7.62E-06	7.62E-06	9.91E-01	8.92E-03	8.92E-03	1.31E-02	0.00E+00	0.00E+00	2.06E-01	2.42E-01	1.20E+00
2.99E+03	4.73E-06	4.73E-06	9.91E-01	8.92E-03	8.92E-03	9.90E-03	0.00E+00	0.00E+00			

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 1.98E-01  2.35E-01  1.20E+00
        3.72E+03  2.94E-06  2.94E-06  9.91E-01  8.92E-03  8.92E-03  7.49E-03  0.00E+00  0.00E+00
 1.89E-01  2.27E-01  1.19E+00
        4.61E+03  1.82E-06  1.82E-06  9.91E-01  8.92E-03  8.92E-03  5.63E-03  0.00E+00  0.00E+00
 1.80E-01  2.17E-01  1.18E+00
        5.73E+03  1.13E-06  1.13E-06  9.91E-01  8.92E-03  8.92E-03  4.29E-03  0.00E+00  0.00E+00
 1.70E-01  2.07E-01  1.17E+00
        7.11E+03  7.06E-07  7.06E-07  9.91E-01  8.92E-03  8.92E-03  3.23E-03  0.00E+00  0.00E+00
 1.61E-01  1.96E-01  1.16E+00
        8.82E+03  4.43E-07  4.43E-07  9.91E-01  8.92E-03  8.92E-03  2.48E-03  0.00E+00  0.00E+00
 1.50E-01  1.85E-01  1.14E+00
        1.09E+04  2.79E-07  2.79E-07  9.91E-01  8.92E-03  8.92E-03  1.82E-03  0.00E+00  0.00E+00
 1.40E-01  1.73E-01  1.13E+00
        1.35E+04  1.77E-07  1.77E-07  9.91E-01  8.92E-03  8.92E-03  1.24E-03  0.00E+00  0.00E+00
 1.28E-01  1.62E-01  1.11E+00
•          time averaged (tav =   60. s) volume concentration:  concentration contour parameters

          c(x,y,z,t) = cc(x) * (erf(xa)-erf(xb)) * (erf(ya)-erf(yb)) * (exp(-za*za)+exp(-zb*zb))

                 c(x,y,z,t) = concentration (volume fraction) at (x,y,z,t)
                          x = downwind distance (m)
                          y = crosswind horizontal distance (m)
                          z = height (m)
                          t = time (s)

                        erf = error functon             exp = exponential function
                         xa = (x-xc+bx)/(sr2*betax)      za = (z-zc)/(sr2*sig)
                         xb = (x-xc-bx)/(sr2*betax)      zb = (z+zc)/(sr2*sig)
                         ya = (y+b)/(sr2*betac)         sr2 = sqrt(2.0)
                         yb = (y-b)/(sr2*betac)

             x        cc(x)     b(x)    betac(x)    zc(x)    sig(x)               t        xc(t)
    bx(t)   betax(t)
          1.00E+00  0.00E+00  6.04E-02  1.69E-02  1.00E+00  3.87E-02            0.00E+00
1.00E+00  0.00E+00  0.00E+00
          1.02E+00  3.72E-01  6.80E-02  3.38E-02  1.00E+00  5.19E-02            1.09E-04
1.02E+00  1.94E-02  1.58E-04
          1.05E+00  3.57E-01  7.53E-02  4.92E-02  1.00E+00  6.57E-02            2.98E-04
1.05E+00  4.28E-02  3.49E-04
          1.08E+00  3.41E-01  8.25E-02  6.52E-02  1.00E+00  8.08E-02            5.93E-04
1.08E+00  7.11E-02  5.80E-04
          1.11E+00  3.24E-01  8.98E-02  8.25E-02  1.00E+00  9.74E-02            1.04E-03
1.11E+00  1.05E-01  8.60E-04
          1.16E+00  3.07E-01  9.73E-02  1.02E-01  1.00E+00  1.16E-01            1.70E-03
1.16E+00  1.47E-01  1.20E-03
          1.21E+00  2.91E-01  1.05E-01  1.23E-01  1.00E+00  1.38E-01            2.67E-03
1.21E+00  1.97E-01  1.61E-03
          1.28E+00  2.75E-01  1.14E-01  1.48E-01  1.00E+00  1.62E-01            4.07E-03
1.28E+00  2.57E-01  2.10E-03
          1.36E+00  2.59E-01  1.23E-01  1.77E-01  1.00E+00  1.90E-01            6.10E-03
1.36E+00  3.31E-01  2.70E-03
          1.45E+00  2.44E-01  1.32E-01  2.09E-01  1.00E+00  2.23E-01            9.00E-03
1.45E+00  4.19E-01  3.42E-03
          1.57E+00  2.29E-01  1.43E-01  2.47E-01  1.00E+00  2.60E-01            1.31E-02
1.57E+00  5.26E-01  4.30E-03
          1.71E+00  2.15E-01  1.53E-01  2.90E-01  1.00E+00  3.03E-01            1.90E-02
1.71E+00  6.56E-01  5.36E-03
          1.88E+00  2.02E-01  1.65E-01  3.40E-01  1.00E+00  3.53E-01            2.74E-02
1.88E+00  8.13E-01  6.64E-03
          2.08E+00  1.89E-01  1.77E-01  3.97E-01  1.00E+00  4.10E-01            3.91E-02
2.08E+00  1.00E+00  8.18E-03
          2.33E+00  1.77E-01  1.90E-01  4.62E-01  1.00E+00  4.75E-01            5.57E-02
2.33E+00  1.23E+00  1.01E-02
          2.63E+00  1.66E-01  2.04E-01  5.37E-01  1.00E+00  5.50E-01            7.89E-02
2.63E+00  1.51E+00  1.23E-02
          2.99E+00  1.43E-01  2.18E-01  6.21E-01  1.00E+00  6.90E-01            1.11E-01
2.99E+00  1.84E+00  1.51E-02
          3.43E+00  1.21E-01  2.33E-01  7.15E-01  1.00E+00  8.79E-01            1.57E-01
3.43E+00  2.25E+00  1.84E-02
          3.96E+00  1.06E-01  2.47E-01  8.15E-01  1.00E+00  1.08E+00            2.19E-01
3.96E+00  2.74E+00  2.24E-02
          4.61E+00  9.39E-02  2.60E-01  9.22E-01  1.00E+00  1.29E+00            3.04E-01
4.61E+00  3.33E+00  2.72E-02
          5.38E+00  8.45E-02  2.73E-01  1.04E+00  1.00E+00  1.52E+00            4.19E-01
5.38E+00  4.05E+00  3.31E-02
          6.32E+00  7.67E-02  2.85E-01  1.16E+00  1.01E+00  1.76E+00            5.72E-01
6.32E+00  4.92E+00  4.01E-02
          7.45E+00  7.01E-02  2.97E-01  1.29E+00  1.01E+00  2.02E+00            7.75E-01
7.45E+00  5.97E+00  4.87E-02
          8.83E+00  6.44E-02  3.08E-01  1.43E+00  1.02E+00  2.29E+00            1.04E+00
8.83E+00  7.23E+00  5.91E-02
          1.05E+01  5.93E-02  3.19E-01  1.58E+00  1.03E+00  2.59E+00            1.39E+00
1.05E+01  8.77E+00  7.16E-02
          1.25E+01  5.49E-02  3.29E-01  1.74E+00  1.05E+00  2.89E+00            1.84E+00
1.25E+01  1.06E+01  8.67E-02
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           1.49E+01  5.10E-02  3.36E-01  1.91E+00  1.07E+00  3.22E+00            2.41E+00
1.49E+01  1.29E+01  1.05E-01
           1.79E+01  4.75E-02  3.43E-01  2.10E+00  1.11E+00  3.56E+00            3.15E+00
1.79E+01  1.56E+01  1.27E-01
           2.14E+01  4.43E-02  3.49E-01  2.30E+00  1.17E+00  3.92E+00            4.08E+00
2.14E+01  1.89E+01  1.54E-01
           2.57E+01  4.13E-02  3.54E-01  2.51E+00  1.25E+00  4.29E+00            5.24E+00
2.57E+01  2.28E+01  1.87E-01
           3.09E+01  3.86E-02  3.58E-01  2.75E+00  1.35E+00  4.68E+00            6.69E+00
3.09E+01  2.76E+01  2.26E-01
           3.72E+01  3.61E-02  3.61E-01  3.02E+00  1.50E+00  5.09E+00            8.48E+00
3.72E+01  3.34E+01  2.73E-01
           4.48E+01  3.39E-02  3.62E-01  3.32E+00  1.69E+00  5.53E+00            1.07E+01
4.48E+01  4.05E+01  3.30E-01
           5.40E+01  3.18E-02  3.62E-01  3.67E+00  1.95E+00  5.99E+00            1.34E+01
5.40E+01  4.90E+01  4.00E-01
           6.51E+01  2.98E-02  3.62E-01  4.07E+00  2.28E+00  6.49E+00            1.67E+01
6.51E+01  5.92E+01  4.84E-01
           7.85E+01  2.79E-02  3.62E-01  4.56E+00  2.68E+00  7.02E+00            2.06E+01
7.85E+01  7.17E+01  5.85E-01
           9.48E+01  2.62E-02  3.61E-01  5.17E+00  3.18E+00  7.59E+00            2.54E+01
9.48E+01  8.67E+01  7.08E-01
           1.14E+02  2.46E-02  3.60E-01  5.93E+00  3.77E+00  8.19E+00            3.11E+01
1.14E+02  1.05E+02  8.56E-01
           1.38E+02  2.31E-02  3.59E-01  6.88E+00  4.45E+00  8.84E+00            3.79E+01
1.38E+02  1.27E+02  1.04E+00
           1.67E+02  2.16E-02  3.58E-01  8.05E+00  5.24E+00  9.57E+00            4.60E+01
1.67E+02  1.53E+02  1.25E+00
           2.02E+02  2.01E-02  3.55E-01  9.47E+00  6.12E+00  1.04E+01            5.57E+01
2.02E+02  1.86E+02  1.51E+00
           2.44E+02  1.85E-02  3.53E-01  1.12E+01  7.09E+00  1.14E+01            6.70E+01
2.44E+02  2.24E+02  1.83E+00
           2.95E+02  1.69E-02  3.53E-01  1.35E+01  8.11E+00  1.28E+01            6.68E+01
2.95E+02  2.24E+02  4.74E+01
           3.60E+02  1.51E-02  3.53E-01  1.63E+01  9.17E+00  1.46E+01            7.50E+01
3.60E+02  2.24E+02  7.17E+01
           4.40E+02  1.34E-02  3.53E-01  1.97E+01  1.02E+01  1.68E+01            8.50E+01
4.40E+02  2.24E+02  9.44E+01
           5.40E+02  1.18E-02  3.53E-01  2.40E+01  1.13E+01  1.94E+01            9.70E+01
5.40E+02  2.24E+02  1.18E+02
           6.65E+02  1.03E-02  3.53E-01  2.93E+01  1.23E+01  2.26E+01            1.12E+02
6.65E+02  2.24E+02  1.43E+02
           8.21E+02  8.88E-03  3.53E-01  3.57E+01  1.33E+01  2.65E+01            1.29E+02
8.21E+02  2.24E+02  1.71E+02
           1.02E+03  7.63E-03  3.53E-01  4.35E+01  1.42E+01  3.12E+01            1.50E+02
1.02E+03  2.24E+02  2.03E+02
           1.26E+03  6.52E-03  3.53E-01  5.29E+01  1.51E+01  3.67E+01            1.76E+02
1.26E+03  2.24E+02  2.39E+02
           1.56E+03  5.56E-03  3.53E-01  6.42E+01  1.59E+01  4.34E+01            2.07E+02
1.56E+03  2.24E+02  2.82E+02
           1.94E+03  4.73E-03  3.53E-01  7.76E+01  1.66E+01  5.12E+01            2.45E+02
1.94E+03  2.24E+02  3.31E+02
           2.41E+03  4.03E-03  3.53E-01  9.36E+01  1.73E+01  6.03E+01            2.90E+02
2.41E+03  2.24E+02  3.90E+02
           2.99E+03  3.43E-03  3.53E-01  1.12E+02  1.80E+01  7.11E+01            3.45E+02
2.99E+03  2.24E+02  4.59E+02
           3.72E+03  2.92E-03  3.53E-01  1.35E+02  1.85E+01  8.36E+01            4.12E+02
3.72E+03  2.24E+02  5.41E+02
           4.61E+03  2.49E-03  3.53E-01  1.60E+02  1.91E+01  9.82E+01            4.92E+02
4.61E+03  2.24E+02  6.39E+02
           5.73E+03  2.13E-03  3.53E-01  1.90E+02  1.95E+01  1.15E+02            5.90E+02
5.73E+03  2.24E+02  7.55E+02
           7.11E+03  1.83E-03  3.53E-01  2.24E+02  2.00E+01  1.34E+02            7.08E+02
7.11E+03  2.24E+02  8.94E+02
           8.82E+03  1.57E-03  3.53E-01  2.63E+02  2.04E+01  1.56E+02            8.50E+02
8.82E+03  2.24E+02  1.06E+03
           1.09E+04  1.36E-03  3.53E-01  3.07E+02  2.07E+01  1.81E+02            1.02E+03
1.09E+04  2.24E+02  1.26E+03
           1.35E+04  1.18E-03  3.53E-01  3.57E+02  2.11E+01  2.08E+02            1.23E+03
1.35E+04  2.24E+02  1.49E+03
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time averaged (tav = 60. s) volume concentration: concentration in the z = .00 plane.

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           downwind    time of      cloud     effective                 average concentration
(volume fraction) at (x,y,z)
           distance    max conc    duration   half width        y/bbc=     y/bbc=     y/bbc=
 y/bbc=     y/bbc=     y/bbc=
             x (m)        (s)         (s)       bbc (m)             0.0        0.5        1.0
    1.5        2.0        2.5
           1.00E+00    3.00E+01    6.00E+01    6.71E-02         0.00E+00   0.00E+00   0.00E+00
 0.00E+00   0.00E+00   0.00E+00
           1.02E+00    3.00E+01    6.00E+01    8.98E-02         0.00E+00   0.00E+00   0.00E+00
```

0.00E+00	0.00E+00	0.00E+00						
	1.05E+00	3.00E+01	6.00E+01	1.14E-01	0.00E+00	0.00E+00	0.00E+00	
0.00E+00	0.00E+00	0.00E+00						
	1.08E+00	3.00E+01	6.00E+01	1.40E-01	1.10E-33	7.86E-34	2.62E-34	
3.53E-35	1.73E-36	2.90E-38						
	1.11E+00	3.00E+01	6.00E+01	1.69E-01	2.54E-23	1.78E-23	5.91E-24	
8.36E-25	4.69E-26	9.96E-28						
	1.16E+00	3.00E+01	6.00E+01	2.01E-01	1.37E-16	9.54E-17	3.14E-17	
4.57E-18	2.78E-19	6.82E-21						
	1.21E+00	3.00E+01	6.00E+01	2.38E-01	4.84E-12	3.36E-12	1.10E-12	
1.63E-13	1.05E-14	2.82E-16						
	1.28E+00	3.00E+01	6.00E+01	2.81E-01	6.73E-09	4.65E-09	1.52E-09	
2.28E-10	1.51E-11	4.35E-13						
	1.36E+00	3.00E+01	6.00E+01	3.29E-01	1.07E-06	7.42E-07	2.42E-07	
3.65E-08	2.49E-09	7.49E-11						
	1.45E+00	3.01E+01	6.00E+01	3.86E-01	3.88E-05	2.68E-05	8.72E-06	
1.32E-06	9.16E-08	2.85E-09						
	1.57E+00	3.01E+01	6.00E+01	4.50E-01	4.96E-04	3.41E-04	1.11E-04	
1.69E-05	1.19E-06	3.78E-08						
	1.71E+00	3.01E+01	6.00E+01	5.25E-01	3.02E-03	2.08E-03	6.77E-04	
1.03E-04	7.30E-06	2.37E-07						
	1.88E+00	3.01E+01	6.00E+01	6.11E-01	1.09E-02	7.47E-03	2.43E-03	
3.71E-04	2.64E-05	8.70E-07						
	2.08E+00	3.01E+01	6.00E+01	7.09E-01	2.66E-02	1.83E-02	5.94E-03	
9.09E-04	6.50E-05	2.16E-06						
	2.33E+00	3.02E+01	6.00E+01	8.22E-01	4.94E-02	3.39E-02	1.10E-02	
1.69E-03	1.21E-04	4.06E-06						
	2.63E+00	3.02E+01	6.00E+01	9.51E-01	7.48E-02	5.14E-02	1.67E-02	
2.56E-03	1.84E-04	6.20E-06						
	2.99E+00	3.02E+01	6.00E+01	1.10E+00	1.10E-01	7.54E-02	2.45E-02	
3.75E-03	2.70E-04	9.14E-06						
	3.43E+00	3.03E+01	6.00E+01	1.26E+00	1.29E-01	8.87E-02	2.88E-02	
4.41E-03	3.19E-04	1.08E-05						
	3.96E+00	3.04E+01	6.00E+01	1.43E+00	1.30E-01	8.96E-02	2.91E-02	
4.46E-03	3.22E-04	1.09E-05						
	4.61E+00	3.04E+01	6.00E+01	1.62E+00	1.23E-01	8.47E-02	2.75E-02	
4.22E-03	3.05E-04	1.04E-05						
	5.38E+00	3.05E+01	6.00E+01	1.82E+00	1.13E-01	7.75E-02	2.52E-02	
3.86E-03	2.79E-04	9.49E-06						
	6.32E+00	3.07E+01	6.00E+01	2.03E+00	1.01E-01	6.96E-02	2.26E-02	
3.47E-03	2.51E-04	8.56E-06						
	7.45E+00	3.08E+01	6.00E+01	2.25E+00	9.01E-02	6.19E-02	2.01E-02	
3.08E-03	2.23E-04	7.61E-06						
	8.83E+00	3.10E+01	6.00E+01	2.50E+00	7.96E-02	5.47E-02	1.78E-02	
2.72E-03	1.97E-04	6.74E-06						
	1.05E+01	3.12E+01	6.00E+01	2.76E+00	7.00E-02	4.81E-02	1.56E-02	
2.39E-03	1.73E-04	5.92E-06						
	1.25E+01	3.14E+01	6.00E+01	3.03E+00	6.14E-02	4.22E-02	1.37E-02	
2.10E-03	1.52E-04	5.21E-06						
	1.49E+01	3.17E+01	6.00E+01	3.33E+00	5.37E-02	3.69E-02	1.20E-02	
1.84E-03	1.33E-04	4.54E-06						
	1.79E+01	3.21E+01	6.00E+01	3.65E+00	4.68E-02	3.22E-02	1.04E-02	
1.60E-03	1.16E-04	3.97E-06						
	2.14E+01	3.25E+01	6.00E+01	3.99E+00	4.07E-02	2.80E-02	9.08E-03	
1.39E-03	1.01E-04	3.45E-06						
	2.57E+01	3.31E+01	6.00E+01	4.37E+00	3.52E-02	2.42E-02	7.85E-03	
1.20E-03	8.72E-05	2.99E-06						
	3.09E+01	3.37E+01	6.00E+01	4.78E+00	3.03E-02	2.08E-02	6.76E-03	
1.04E-03	7.51E-05	2.57E-06						
	3.72E+01	3.45E+01	6.00E+01	5.24E+00	2.59E-02	1.78E-02	5.78E-03	
8.86E-04	6.42E-05	2.19E-06						
	4.48E+01	3.54E+01	6.00E+01	5.76E+00	2.19E-02	1.51E-02	4.90E-03	
7.51E-04	5.44E-05	1.86E-06						
	5.40E+01	3.65E+01	6.00E+01	6.36E+00	1.84E-02	1.26E-02	4.10E-03	
6.29E-04	4.55E-05	1.56E-06						
	6.51E+01	3.79E+01	6.00E+01	7.06E+00	1.52E-02	1.04E-02	3.39E-03	
5.19E-04	3.76E-05	1.29E-06						
	7.85E+01	3.96E+01	6.00E+01	7.91E+00	1.23E-02	8.48E-03	2.75E-03	
4.22E-04	3.06E-05	1.05E-06						
	9.48E+01	4.16E+01	6.00E+01	8.97E+00	9.86E-03	6.77E-03	2.20E-03	
3.37E-04	2.44E-05	8.34E-07						
	1.14E+02	4.40E+01	6.00E+01	1.03E+01	7.73E-03	5.32E-03	1.73E-03	
2.65E-04	1.92E-05	6.57E-07						
	1.38E+02	4.70E+01	6.00E+01	1.19E+01	5.96E-03	4.10E-03	1.33E-03	
2.04E-04	1.48E-05	5.07E-07						
	1.67E+02	5.05E+01	6.00E+01	1.39E+01	4.52E-03	3.11E-03	1.01E-03	
1.55E-04	1.12E-05	3.83E-07						
	2.02E+02	5.48E+01	6.00E+01	1.64E+01	3.38E-03	2.32E-03	7.54E-04	
1.16E-04	8.37E-06	2.86E-07						
	2.44E+02	6.00E+01	6.00E+01	1.94E+01	2.49E-03	1.71E-03	5.55E-04	
8.51E-05	6.16E-06	2.10E-07						
	2.95E+02	6.68E+01	6.21E+01	2.33E+01	1.66E-03	1.14E-03	3.69E-04	
5.66E-05	4.10E-06	1.42E-07						
	3.60E+02	7.50E+01	6.46E+01	2.82E+01	1.13E-03	7.80E-04	2.53E-04	
3.88E-05	2.81E-06	9.58E-08						

	4.40E+02	8.50E+01	6.78E+01	3.42E+01	7.76E-04	5.33E-04	1.73E-04	2.65E-05	1.92E-06	6.64E-08
	5.40E+02	9.70E+01	7.18E+01	4.16E+01	5.26E-04	3.62E-04	1.17E-04	1.80E-05	1.31E-06	4.42E-08
	6.65E+02	1.12E+02	7.66E+01	5.07E+01	3.54E-04	2.44E-04	7.91E-05	1.21E-05	8.78E-07	2.96E-08
	8.21E+02	1.29E+02	8.25E+01	6.18E+01	2.36E-04	1.62E-04	5.26E-05	8.07E-06	5.85E-07	1.96E-08
	1.02E+03	1.50E+02	8.97E+01	7.53E+01	1.55E-04	1.07E-04	3.47E-05	5.31E-06	3.85E-07	1.29E-08
	1.26E+03	1.76E+02	9.84E+01	9.15E+01	1.01E-04	6.94E-05	2.25E-05	3.46E-06	2.50E-07	8.48E-09
	1.56E+03	2.07E+02	1.09E+02	1.11E+02	6.49E-05	4.46E-05	1.45E-05	2.22E-06	1.61E-07	5.29E-09
	1.94E+03	2.45E+02	1.21E+02	1.34E+02	4.13E-05	2.84E-05	9.22E-06	1.41E-06	1.02E-07	3.40E-09
	2.41E+03	2.90E+02	1.36E+02	1.62E+02	2.61E-05	1.79E-05	5.82E-06	8.92E-07	6.46E-08	2.07E-09
	2.99E+03	3.45E+02	1.54E+02	1.95E+02	1.63E-05	1.12E-05	3.64E-06	5.59E-07	4.05E-08	1.56E-09
	3.72E+03	4.12E+02	1.75E+02	2.33E+02	1.02E-05	7.00E-06	2.27E-06	3.49E-07	2.53E-08	8.71E-10
	4.61E+03	4.92E+02	2.00E+02	2.77E+02	6.35E-06	4.36E-06	1.42E-06	2.17E-07	1.57E-08	5.38E-10
	5.73E+03	5.90E+02	2.29E+02	3.29E+02	3.95E-06	2.71E-06	8.81E-07	1.35E-07	9.76E-09	3.18E-10
	7.11E+03	7.08E+02	2.64E+02	3.88E+02	2.46E-06	1.69E-06	5.49E-07	8.42E-08	6.13E-09	2.33E-10
	8.82E+03	8.50E+02	3.05E+02	4.55E+02	1.54E-06	1.06E-06	3.44E-07	5.27E-08	3.81E-09	1.71E-10
	1.09E+04	1.02E+03	3.54E+02	5.31E+02	9.69E-07	6.66E-07	2.16E-07	3.32E-08	2.42E-09	6.29E-11
	1.35E+04	1.23E+03	4.11E+02	6.18E+02	6.13E-07	4.21E-07	1.37E-07	2.10E-08	1.50E-09	4.63E-11

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time averaged (tav = 60. s) volume concentration: maximum concentration (volume fraction) along centerline.

downwind distance x (m)	height z (m)	maximum concentration c(x,0,z)	time of max conc (s)	cloud duration (s)
1.00E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.02E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.05E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.08E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.11E+00	1.00E+00	9.38E-01	3.00E+01	6.00E+01
1.16E+00	1.00E+00	8.13E-01	3.00E+01	6.00E+01
1.21E+00	1.00E+00	7.06E-01	3.00E+01	6.00E+01
1.28E+00	1.00E+00	6.13E-01	3.00E+01	6.00E+01
1.36E+00	1.00E+00	5.32E-01	3.00E+01	6.00E+01
1.45E+00	1.00E+00	4.62E-01	3.01E+01	6.00E+01
1.57E+00	1.00E+00	4.01E-01	3.01E+01	6.00E+01
1.71E+00	1.00E+00	3.48E-01	3.01E+01	6.00E+01
1.88E+00	1.00E+00	3.01E-01	3.01E+01	6.00E+01
2.08E+00	1.00E+00	2.61E-01	3.01E+01	6.00E+01
2.33E+00	1.00E+00	2.26E-01	3.02E+01	6.00E+01
2.63E+00	9.98E-01	1.96E-01	3.02E+01	6.00E+01
2.99E+00	9.67E-01	1.59E-01	3.02E+01	6.00E+01
3.43E+00	7.50E-01	1.35E-01	3.03E+01	6.00E+01
3.96E+00	0.00E+00	1.30E-01	3.04E+01	6.00E+01
4.61E+00	0.00E+00	1.23E-01	3.04E+01	6.00E+01
5.38E+00	0.00E+00	1.13E-01	3.05E+01	6.00E+01
6.32E+00	0.00E+00	1.01E-01	3.07E+01	6.00E+01
7.45E+00	0.00E+00	9.01E-02	3.08E+01	6.00E+01
8.83E+00	0.00E+00	7.96E-02	3.10E+01	6.00E+01
1.05E+01	0.00E+00	7.00E-02	3.12E+01	6.00E+01
1.25E+01	0.00E+00	6.14E-02	3.14E+01	6.00E+01
1.49E+01	0.00E+00	5.37E-02	3.17E+01	6.00E+01
1.79E+01	0.00E+00	4.68E-02	3.21E+01	6.00E+01
2.14E+01	0.00E+00	4.07E-02	3.25E+01	6.00E+01
2.57E+01	0.00E+00	3.52E-02	3.31E+01	6.00E+01
3.09E+01	0.00E+00	3.03E-02	3.37E+01	6.00E+01
3.72E+01	0.00E+00	2.59E-02	3.45E+01	6.00E+01
4.48E+01	0.00E+00	2.19E-02	3.54E+01	6.00E+01
5.40E+01	0.00E+00	1.84E-02	3.65E+01	6.00E+01
6.51E+01	0.00E+00	1.52E-02	3.79E+01	6.00E+01
7.85E+01	0.00E+00	1.23E-02	3.96E+01	6.00E+01
9.48E+01	0.00E+00	9.86E-03	4.16E+01	6.00E+01
1.14E+02	0.00E+00	7.73E-03	4.40E+01	6.00E+01
1.38E+02	0.00E+00	5.96E-03	4.70E+01	6.00E+01
1.67E+02	0.00E+00	4.52E-03	5.05E+01	6.00E+01
2.02E+02	0.00E+00	3.38E-03	5.48E+01	6.00E+01
2.44E+02	0.00E+00	2.49E-03	6.00E+01	6.00E+01

2.95E+02	0.00E+00	1.66E-03	6.68E+01	6.21E+01
3.60E+02	0.00E+00	1.13E-03	7.50E+01	6.46E+01
4.40E+02	0.00E+00	7.76E-04	8.50E+01	6.78E+01
5.40E+02	0.00E+00	5.26E-04	9.70E+01	7.18E+01
6.65E+02	0.00E+00	3.54E-04	1.12E+02	7.66E+01
8.21E+02	0.00E+00	2.36E-04	1.29E+02	8.25E+01
1.02E+03	0.00E+00	1.55E-04	1.50E+02	8.97E+01
1.26E+03	0.00E+00	1.01E-04	1.76E+02	9.84E+01
1.56E+03	0.00E+00	6.49E-05	2.07E+02	1.09E+02
1.94E+03	0.00E+00	4.13E-05	2.45E+02	1.21E+02
2.41E+03	0.00E+00	2.61E-05	2.90E+02	1.36E+02
2.99E+03	0.00E+00	1.63E-05	3.45E+02	1.54E+02
3.72E+03	0.00E+00	1.02E-05	4.12E+02	1.75E+02
4.61E+03	0.00E+00	6.35E-06	4.92E+02	2.00E+02
5.73E+03	0.00E+00	3.95E-06	5.90E+02	2.29E+02
7.11E+03	0.00E+00	2.46E-06	7.08E+02	2.64E+02
8.82E+03	0.00E+00	1.54E-06	8.50E+02	3.05E+02
1.09E+04	0.00E+00	9.69E-07	1.02E+03	3.54E+02
1.35E+04	0.00E+00	6.13E-07	1.23E+03	4.11E+02

•(10U •&l0O •&k2S •&l8D •

problem input

```
idspl =         2
ncalc =         1
wms   =   .016000
cps   =   2240.00
tbp   =    111.70
cmed0 =       .00
dhe   =   509880.
cpsl  =   3349.00
rhosl =    424.10
spb   =     -1.00
spc   =       .00
ts    =    260.00
qs    =      6.05
as    =       .02
tsd   =       60.
qtis  =       .00
hs    =      1.00
tav   =     60.00
xffm  =   9000.00
zp(1) =       .00
zp(2) =       .00
zp(3) =       .00
zp(4) =       .00
z0    =   .300000
za    =      2.00
ua    =      2.00
ta    =    293.00
rh    =     60.00
stab  =      6.00
```

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release gas properties

```
molecular weight of source gas (kg)              - wms  =  1.6000E-02
vapor heat capacity, const. p.  (j/kg-k)         - cps  =  2.2400E+03
temperature of source gas (k)                    - ts   =  2.6000E+02
density of source gas (kg/m3)                    - rhos =  7.4996E-01
boiling point temperature                        - tbp  =  1.1170E+02
liquid mass fraction                             - cmed0=  0.0000E+00
liquid heat capacity (j/kg-k)                    - cpsl =  3.3490E+03
heat of vaporization (j/kg)                      - dhe  =  5.0988E+05
liquid source density (kg/m3)                    - rhosl=  4.2410E+02
saturation pressure constant                     - spa  =  8.7843E+00
saturation pressure constant (k)                 - spb  =  9.8121E+02
saturation pressure constant (k)                 - spc  =  0.0000E+00
```

spill characteristics

```
spill type                                       - idspl=          2
mass source rate (kg/s)                          - qs   =  6.0500E+00
continuous source duration (s)                   - tsd  =  6.0000E+01
continuous source mass (kg)                      - qtcs =  3.6300E+02
instantaneous source mass (kg)                   - qtis =  0.0000E+00
source area (m2)                                 - as   =  1.8000E-02
vertical vapor velocity (m/s)                    - ws   =  0.0000E+00
source half width (m)                            - bs   =  6.7082E-02
source height (m)                                - hs   =  1.0000E+00
horizontal vapor velocity (m/s)                  - us   =  4.4817E+02
```

field parameters

```
concentration averaging time (s)                  - tav  =  6.0000E+01
mixing layer height (m)                           - hmx  =  2.6000E+02
maximum downwind distance (m)                     - xffm =  9.0000E+03
concentration measurement height (m)              - zp(1)=  0.0000E+00
                                                  - zp(2)=  0.0000E+00
                                                  - zp(3)=  0.0000E+00
                                                  - zp(4)=  0.0000E+00
```

ambient meteorological properties

```
molecular weight of ambient air (kg)             - wmae  =  2.8804E-02
heat capacity of ambient air at const p. (j/kg-k)- cpaa  =  1.0134E+03
density of ambient air (kg/m3)                   - rhoa  =  1.1980E+00
ambient measurement height (m)                   - za    =  2.0000E+00
ambient atmospheric pressure (pa=n/m2=j/m3)      - pa    =  1.0133E+05
ambient wind speed (m/s)                         - ua    =  2.0000E+00
ambient temperature (k)                          - ta    =  2.9300E+02
relative humidity (percent)                      - rh    =  6.0000E+01
ambient friction velocity (m/s)                  - uastr =  3.2808E-01
atmospheric stability class value                - stab  =  6.0000E+00
inverse monin-obukhov length (1/m)               - ala   =  4.7330E-02
surface roughness height (m)                     - z0    =  3.0000E-01
```

additional parameters

```
sub-step multiplier                              - ncalc =           1
number of calculational sub-steps                - nssm  =           3
acceleration of gravity (m/s2)                   - grav  =  9.8067E+00
gas constant (j/mol- k)                          - rr    =  8.3143E+00
von karman constant                              - xk    =  4.1000E-01
```

instantaneous spatially averaged cloud parameters

```
          x        zc         h        bb         b        bbx       bx        cv        rho
   t         u        ua
        1.00E+00  1.00E+00  1.34E-01  6.71E-02  6.04E-02  0.00E+00  0.00E+00  1.00E+00  7.50E-01
2.60E+02  4.48E+02  6.26E-01
        1.02E+00  1.00E+00  1.84E-01  9.18E-02  6.87E-02  1.77E-02  1.77E-02  8.03E-01  8.50E-01
2.66E+02  3.04E+02  6.40E-01
        1.05E+00  1.00E+00  2.36E-01  1.18E-01  7.64E-02  3.92E-02  3.92E-02  6.65E-01  9.17E-01
2.70E+02  2.27E+02  6.56E-01
        1.08E+00  1.00E+00  2.92E-01  1.46E-01  8.40E-02  6.52E-02  6.51E-02  5.62E-01  9.65E-01
2.73E+02  1.77E+02  6.72E-01
        1.11E+00  1.00E+00  3.54E-01  1.77E-01  9.17E-02  9.65E-02  9.65E-02  4.79E-01  1.00E+00
2.76E+02  1.43E+02  6.90E-01
        1.16E+00  1.00E+00  4.24E-01  2.12E-01  9.97E-02  1.34E-01  1.34E-01  4.11E-01  1.03E+00
2.78E+02  1.17E+02  7.10E-01
        1.21E+00  1.00E+00  5.04E-01  2.52E-01  1.08E-01  1.80E-01  1.80E-01  3.54E-01  1.06E+00
2.80E+02  9.65E+01  7.33E-01
        1.28E+00  1.00E+00  5.95E-01  2.98E-01  1.17E-01  2.36E-01  2.36E-01  3.06E-01  1.08E+00
2.81E+02  8.05E+01  7.59E-01
        1.36E+00  1.00E+00  7.01E-01  3.50E-01  1.26E-01  3.03E-01  3.03E-01  2.65E-01  1.09E+00
2.83E+02  6.76E+01  7.88E-01
        1.45E+00  1.00E+00  8.22E-01  4.11E-01  1.37E-01  3.84E-01  3.84E-01  2.29E-01  1.11E+00
2.84E+02  5.70E+01  8.21E-01
        1.57E+00  1.00E+00  9.62E-01  4.81E-01  1.47E-01  4.82E-01  4.82E-01  1.98E-01  1.12E+00
2.85E+02  4.83E+01  8.58E-01
        1.71E+00  1.00E+00  1.12E+00  5.61E-01  1.59E-01  6.01E-01  6.01E-01  1.72E-01  1.13E+00
2.86E+02  4.10E+01  9.00E-01
        1.88E+00  1.00E+00  1.31E+00  6.54E-01  1.71E-01  7.45E-01  7.45E-01  1.49E-01  1.14E+00
2.87E+02  3.49E+01  9.46E-01
        2.08E+00  1.00E+00  1.52E+00  7.61E-01  1.84E-01  9.19E-01  9.19E-01  1.29E-01  1.15E+00
2.88E+02  2.98E+01  9.99E-01
        2.33E+00  1.00E+00  1.77E+00  8.84E-01  1.98E-01  1.13E+00  1.13E+00  1.12E-01  1.16E+00
2.89E+02  2.56E+01  1.06E+00
        2.63E+00  1.00E+00  2.04E+00  1.02E+00  2.12E-01  1.38E+00  1.38E+00  9.79E-02  1.16E+00
2.89E+02  2.21E+01  1.13E+00
        2.99E+00  1.00E+00  2.32E+00  1.16E+00  2.26E-01  1.69E+00  1.69E+00  8.66E-02  1.17E+00
2.90E+02  1.93E+01  1.25E+00
        3.43E+00  1.00E+00  2.63E+00  1.31E+00  2.40E-01  2.06E+00  2.06E+00  7.69E-02  1.17E+00
2.90E+02  1.70E+01  1.36E+00
        3.96E+00  1.00E+00  2.96E+00  1.48E+00  2.54E-01  2.51E+00  2.51E+00  6.85E-02  1.17E+00
2.90E+02  1.50E+01  1.48E+00
        4.61E+00  1.00E+00  3.32E+00  1.66E+00  2.68E-01  3.05E+00  3.05E+00  6.10E-02  1.17E+00
2.91E+02  1.34E+01  1.61E+00
        5.38E+00  1.01E+00  3.72E+00  1.86E+00  2.82E-01  3.71E+00  3.71E+00  5.44E-02  1.18E+00
2.91E+02  1.20E+01  1.73E+00
        6.32E+00  1.01E+00  4.16E+00  2.08E+00  2.96E-01  4.51E+00  4.51E+00  4.84E-02  1.18E+00
2.91E+02  1.08E+01  1.85E+00
```

7.45E+00 1.01E+00 4.63E+00 2.32E+00 3.10E-01 5.47E+00 5.47E+00 4.31E-02 1.18E+00
2.91E+02 9.74E+00 1.98E+00
8.83E+00 1.02E+00 5.15E+00 2.59E+00 3.23E-01 6.63E+00 6.63E+00 3.83E-02 1.18E+00
2.92E+02 8.84E+00 2.10E+00
1.05E+01 1.04E+00 5.71E+00 2.88E+00 3.35E-01 8.04E+00 8.04E+00 3.41E-02 1.18E+00
2.92E+02 8.07E+00 2.22E+00
1.25E+01 1.06E+00 6.30E+00 3.20E+00 3.46E-01 9.74E+00 9.74E+00 3.02E-02 1.19E+00
2.92E+02 7.42E+00 2.35E+00
1.49E+01 1.10E+00 6.92E+00 3.56E+00 3.57E-01 1.18E+01 1.18E+01 2.68E-02 1.19E+00
2.92E+02 6.85E+00 2.46E+00
1.79E+01 1.15E+00 7.57E+00 3.95E+00 3.67E-01 1.43E+01 1.43E+01 2.38E-02 1.19E+00
2.92E+02 6.37E+00 2.58E+00
2.14E+01 1.24E+00 8.24E+00 4.37E+00 3.77E-01 1.73E+01 1.73E+01 2.11E-02 1.19E+00
2.92E+02 5.97E+00 2.69E+00
2.57E+01 1.37E+00 8.96E+00 4.81E+00 3.85E-01 2.09E+01 2.09E+01 1.87E-02 1.19E+00
2.92E+02 5.63E+00 2.80E+00
3.09E+01 1.56E+00 9.70E+00 5.29E+00 3.91E-01 2.53E+01 2.53E+01 1.65E-02 1.19E+00
2.92E+02 5.35E+00 2.91E+00
3.72E+01 1.83E+00 1.05E+01 5.80E+00 3.97E-01 3.07E+01 3.07E+01 1.47E-02 1.19E+00
2.92E+02 5.11E+00 3.01E+00
4.48E+01 2.23E+00 1.12E+01 6.35E+00 4.01E-01 3.71E+01 3.71E+01 1.30E-02 1.19E+00
2.93E+02 4.92E+00 3.11E+00
5.40E+01 2.80E+00 1.20E+01 6.94E+00 4.06E-01 4.49E+01 4.49E+01 1.15E-02 1.19E+00
2.93E+02 4.76E+00 3.20E+00
6.51E+01 3.60E+00 1.28E+01 7.58E+00 4.09E-01 5.43E+01 5.43E+01 1.01E-02 1.19E+00
2.93E+02 4.62E+00 3.29E+00
7.85E+01 4.72E+00 1.36E+01 8.27E+00 4.12E-01 6.57E+01 6.57E+01 8.94E-03 1.19E+00
2.93E+02 4.52E+00 3.38E+00
9.48E+01 6.25E+00 1.45E+01 9.00E+00 4.13E-01 7.95E+01 7.94E+01 7.86E-03 1.19E+00
2.93E+02 4.44E+00 3.47E+00
1.14E+02 8.33E+00 1.54E+01 9.78E+00 4.13E-01 9.61E+01 9.61E+01 6.80E-03 1.20E+00
2.93E+02 4.43E+00 3.61E+00
1.38E+02 1.09E+01 1.67E+01 1.06E+01 4.10E-01 1.16E+02 1.16E+02 5.65E-03 1.20E+00
2.93E+02 4.55E+00 3.88E+00
1.67E+02 1.40E+01 1.79E+01 1.15E+01 4.06E-01 1.41E+02 1.41E+02 4.72E-03 1.20E+00
2.93E+02 4.69E+00 4.15E+00
2.02E+02 1.77E+01 1.95E+01 1.26E+01 4.06E-01 1.53E+02 1.41E+02 3.62E-03 1.20E+00
2.93E+02 4.82E+00 4.41E+00
2.46E+02 2.17E+01 2.13E+01 1.40E+01 4.06E-01 1.68E+02 1.41E+02 2.74E-03 1.20E+00
2.93E+02 4.97E+00 4.66E+00
3.01E+02 2.62E+01 2.31E+01 1.57E+01 4.06E-01 1.85E+02 1.41E+02 2.03E-03 1.20E+00
2.93E+02 5.12E+00 4.90E+00
3.69E+02 3.10E+01 2.52E+01 1.77E+01 4.06E-01 2.06E+02 1.41E+02 1.48E-03 1.20E+00
2.93E+02 5.28E+00 5.12E+00
4.54E+02 3.61E+01 2.75E+01 2.03E+01 4.06E-01 2.32E+02 1.41E+02 1.05E-03 1.20E+00
2.93E+02 5.43E+00 5.32E+00
5.60E+02 4.14E+01 3.02E+01 2.34E+01 4.06E-01 2.61E+02 1.41E+02 7.38E-04 1.20E+00
2.93E+02 5.59E+00 5.51E+00
6.92E+02 4.68E+01 3.32E+01 2.73E+01 4.06E-01 2.97E+02 1.41E+02 5.08E-04 1.20E+00
2.93E+02 5.74E+00 5.68E+00
8.55E+02 5.21E+01 3.66E+01 3.20E+01 4.06E-01 3.38E+02 1.41E+02 3.44E-04 1.20E+00
2.93E+02 5.88E+00 5.84E+00
1.06E+03 5.75E+01 4.06E+01 3.77E+01 4.06E-01 3.87E+02 1.41E+02 2.30E-04 1.20E+00
2.93E+02 6.01E+00 5.99E+00
1.31E+03 6.27E+01 4.52E+01 4.45E+01 4.06E-01 4.45E+02 1.41E+02 1.52E-04 1.20E+00
2.93E+02 6.14E+00 6.12E+00
1.61E+03 6.77E+01 5.07E+01 5.27E+01 4.06E-01 5.13E+02 1.41E+02 9.97E-05 1.20E+00
2.93E+02 6.25E+00 6.24E+00
1.99E+03 7.25E+01 5.71E+01 6.23E+01 4.06E-01 5.92E+02 1.41E+02 6.48E-05 1.20E+00
2.93E+02 6.37E+00 6.36E+00
2.46E+03 7.70E+01 6.46E+01 7.37E+01 4.06E-01 6.86E+02 1.41E+02 4.18E-05 1.20E+00
2.93E+02 6.48E+00 6.47E+00
3.03E+03 8.14E+01 7.37E+01 8.69E+01 4.06E-01 7.95E+02 1.41E+02 2.68E-05 1.20E+00
2.93E+02 6.58E+00 6.58E+00
3.74E+03 8.54E+01 8.45E+01 1.02E+02 4.06E-01 9.23E+02 1.41E+02 1.71E-05 1.20E+00
2.93E+02 6.68E+00 6.68E+00
4.60E+03 8.91E+01 9.77E+01 1.20E+02 4.06E-01 1.07E+03 1.41E+02 1.08E-05 1.20E+00
2.93E+02 6.78E+00 6.78E+00
5.67E+03 9.26E+01 1.14E+02 1.41E+02 4.06E-01 1.25E+03 1.41E+02 6.82E-06 1.20E+00
2.93E+02 6.89E+00 6.89E+00
6.97E+03 9.59E+01 1.34E+02 1.64E+02 4.06E-01 1.45E+03 1.41E+02 4.26E-06 1.20E+00
2.93E+02 6.99E+00 6.99E+00
8.57E+03 9.88E+01 1.60E+02 1.91E+02 4.06E-01 1.69E+03 1.41E+02 2.65E-06 1.20E+00
2.93E+02 7.10E+00 7.10E+00
1.05E+04 1.02E+02 1.94E+02 2.21E+02 4.06E-01 1.96E+03 1.41E+02 1.62E-06 1.20E+00
2.93E+02 7.22E+00 7.22E+00
1.30E+04 1.04E+02 2.09E+02 2.55E+02 4.06E-01 2.27E+03 1.41E+02 1.13E-06 1.20E+00
2.93E+02 7.27E+00 7.27E+00

x	cm	cmv	cmda	cmw	cmwv	wc	vg	ug	w	v	vx
1.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.44E+02	6.22E+01	0.00E+00
1.02E+00	6.93E-01	6.93E-01	3.04E-01	2.74E-03	2.74E-03	2.33E-04	0.00E+00	0.00E+00			

2.39E+02 3.72E+01 5.09E-01
1.05E+00 5.25E-01 5.25E-01 4.71E-01 4.24E-03 4.16E-03 4.71E-04 0.00E+00 0.00E+00
1.61E+02 2.57E+01 5.10E-01
1.08E+00 4.16E-01 4.16E-01 5.79E-01 5.21E-03 5.04E-03 7.40E-04 0.00E+00 0.00E+00
1.17E+02 1.91E+01 5.12E-01
1.11E+00 3.38E-01 3.38E-01 6.56E-01 5.91E-03 5.80E-03 1.05E-03 0.00E+00 0.00E+00
8.88E+01 1.47E+01 5.14E-01
1.16E+00 2.79E-01 2.79E-01 7.14E-01 6.43E-03 6.43E-03 1.42E-03 0.00E+00 0.00E+00
6.87E+01 1.17E+01 5.16E-01
1.21E+00 2.34E-01 2.34E-01 7.60E-01 6.84E-03 6.84E-03 1.86E-03 0.00E+00 0.00E+00
5.40E+01 9.44E+00 5.18E-01
1.28E+00 1.97E-01 1.97E-01 7.96E-01 7.17E-03 7.17E-03 2.39E-03 0.00E+00 0.00E+00
4.29E+01 7.71E+00 5.21E-01
1.36E+00 1.67E-01 1.67E-01 8.26E-01 7.44E-03 7.44E-03 3.02E-03 0.00E+00 0.00E+00
3.43E+01 6.36E+00 5.24E-01
1.45E+00 1.42E-01 1.42E-01 8.51E-01 7.66E-03 7.66E-03 3.78E-03 0.00E+00 0.00E+00
2.76E+01 5.28E+00 5.27E-01
1.57E+00 1.21E-01 1.21E-01 8.71E-01 7.85E-03 7.85E-03 4.71E-03 0.00E+00 0.00E+00
2.22E+01 4.40E+00 5.31E-01
1.71E+00 1.03E-01 1.03E-01 8.89E-01 8.00E-03 8.00E-03 5.83E-03 0.00E+00 0.00E+00
1.79E+01 3.69E+00 5.35E-01
1.88E+00 8.87E-02 8.87E-02 9.03E-01 8.13E-03 8.13E-03 7.19E-03 0.00E+00 0.00E+00
1.45E+01 3.10E+00 5.40E-01
2.08E+00 7.61E-02 7.61E-02 9.16E-01 8.25E-03 8.25E-03 8.83E-03 0.00E+00 0.00E+00
1.17E+01 2.61E+00 5.46E-01
2.33E+00 6.55E-02 6.55E-02 9.26E-01 8.34E-03 8.34E-03 1.08E-02 0.00E+00 0.00E+00
9.46E+00 2.21E+00 5.52E-01
2.63E+00 5.69E-02 5.69E-02 9.35E-01 8.42E-03 8.42E-03 1.33E-02 0.00E+00 0.00E+00
6.30E+00 1.88E+00 5.60E-01
2.99E+00 5.00E-02 5.00E-02 9.42E-01 8.48E-03 8.48E-03 1.66E-02 0.00E+00 0.00E+00
4.66E+00 1.61E+00 5.73E-01
3.43E+00 4.42E-02 4.42E-02 9.47E-01 8.53E-03 8.53E-03 2.06E-02 0.00E+00 0.00E+00
3.54E+00 1.39E+00 5.86E-01
3.96E+00 3.92E-02 3.92E-02 9.52E-01 8.57E-03 8.57E-03 2.55E-02 0.00E+00 0.00E+00
2.73E+00 1.21E+00 6.00E-01
4.61E+00 3.48E-02 3.48E-02 9.57E-01 8.61E-03 8.61E-03 3.13E-02 0.00E+00 0.00E+00
2.14E+00 1.05E+00 6.14E-01
5.38E+00 3.10E-02 3.10E-02 9.60E-01 8.65E-03 8.65E-03 3.84E-02 0.00E+00 0.00E+00
1.69E+00 9.09E-01 6.29E-01
6.32E+00 2.75E-02 2.75E-02 9.64E-01 8.68E-03 8.68E-03 4.68E-02 0.00E+00 0.00E+00
1.35E+00 7.90E-01 6.44E-01
7.45E+00 2.44E-02 2.44E-02 9.67E-01 8.71E-03 8.71E-03 5.67E-02 0.00E+00 0.00E+00
1.09E+00 6.86E-01 6.59E-01
8.83E+00 2.17E-02 2.17E-02 9.70E-01 8.73E-03 8.73E-03 6.83E-02 0.00E+00 0.00E+00
8.81E-01 5.95E-01 6.75E-01
1.05E+01 1.92E-02 1.92E-02 9.72E-01 8.75E-03 8.75E-03 8.18E-02 0.00E+00 0.00E+00
7.17E-01 5.16E-01 6.91E-01
1.25E+01 1.70E-02 1.70E-02 9.74E-01 8.77E-03 8.77E-03 9.74E-02 0.00E+00 0.00E+00
5.87E-01 4.48E-01 7.06E-01
1.49E+01 1.51E-02 1.51E-02 9.76E-01 8.79E-03 8.79E-03 1.15E-01 0.00E+00 0.00E+00
4.84E-01 3.88E-01 7.22E-01
1.79E+01 1.34E-02 1.34E-02 9.78E-01 8.81E-03 8.81E-03 1.36E-01 0.00E+00 0.00E+00
4.01E-01 3.36E-01 7.38E-01
2.14E+01 1.18E-02 1.18E-02 9.79E-01 8.82E-03 8.82E-03 1.59E-01 0.00E+00 0.00E+00
3.33E-01 2.91E-01 7.54E-01
2.57E+01 1.05E-02 1.05E-02 9.81E-01 8.83E-03 8.83E-03 1.85E-01 0.00E+00 0.00E+00
2.79E-01 2.53E-01 7.71E-01
3.09E+01 9.26E-03 9.26E-03 9.82E-01 8.84E-03 8.84E-03 2.13E-01 0.00E+00 0.00E+00
2.35E-01 2.20E-01 7.89E-01
3.72E+01 8.19E-03 8.19E-03 9.83E-01 8.85E-03 8.85E-03 2.45E-01 0.00E+00 0.00E+00
1.99E-01 1.92E-01 8.07E-01
4.48E+01 7.24E-03 7.24E-03 9.84E-01 8.86E-03 8.86E-03 2.80E-01 0.00E+00 0.00E+00
1.70E-01 1.69E-01 8.26E-01
5.40E+01 6.40E-03 6.40E-03 9.85E-01 8.87E-03 8.87E-03 3.17E-01 0.00E+00 0.00E+00
1.46E-01 1.49E-01 8.45E-01
6.51E+01 5.65E-03 5.65E-03 9.85E-01 8.87E-03 8.87E-03 3.57E-01 0.00E+00 0.00E+00
1.27E-01 1.32E-01 8.66E-01
7.85E+01 4.98E-03 4.98E-03 9.86E-01 8.88E-03 8.88E-03 4.00E-01 0.00E+00 0.00E+00
1.11E-01 1.18E-01 8.86E-01
9.48E+01 4.38E-03 4.38E-03 9.87E-01 8.89E-03 8.89E-03 4.44E-01 0.00E+00 0.00E+00
9.81E-02 1.07E-01 9.05E-01
1.14E+02 3.79E-03 3.79E-03 9.87E-01 8.89E-03 8.89E-03 4.81E-01 0.00E+00 0.00E+00
1.89E-01 9.78E-02 9.24E-01
1.38E+02 3.15E-03 3.15E-03 9.88E-01 8.90E-03 8.90E-03 4.94E-01 0.00E+00 0.00E+00
1.59E-01 9.23E-02 9.39E-01
1.67E+02 2.63E-03 2.63E-03 9.88E-01 8.90E-03 8.90E-03 5.05E-01 0.00E+00 0.00E+00
1.36E-01 8.98E-02 9.47E-01
2.02E+02 2.02E-03 2.02E-03 9.89E-01 8.91E-03 8.91E-03 4.72E-01 0.00E+00 0.00E+00
1.18E-01 8.83E-02 9.50E-01
2.46E+02 1.52E-03 1.52E-03 9.90E-01 8.91E-03 8.91E-03 4.34E-01 0.00E+00 0.00E+00
1.05E-01 8.88E-02 9.45E-01
3.01E+02 1.13E-03 1.13E-03 9.90E-01 8.91E-03 8.91E-03 3.91E-01 0.00E+00 0.00E+00
9.54E-02 9.03E-02 9.36E-01
3.69E+02 8.22E-04 8.22E-04 9.90E-01 8.92E-03 8.92E-03 3.45E-01 0.00E+00 0.00E+00
8.78E-02 9.22E-02 9.22E-01

```
        4.54E+02  5.86E-04  5.86E-04  9.90E-01  8.92E-03  8.92E-03  2.99E-01  0.00E+00  0.00E+00
8.17E-02  9.40E-02  9.06E-01
        5.60E+02  4.10E-04  4.10E-04  9.91E-01  8.92E-03  8.92E-03  2.54E-01  0.00E+00  0.00E+00
7.68E-02  9.55E-02  8.87E-01
        6.92E+02  2.82E-04  2.82E-04  9.91E-01  8.92E-03  8.92E-03  2.12E-01  0.00E+00  0.00E+00
7.27E-02  9.64E-02  8.66E-01
        8.55E+02  1.91E-04  1.91E-04  9.91E-01  8.92E-03  8.92E-03  1.74E-01  0.00E+00  0.00E+00
6.93E-02  9.67E-02  8.45E-01
        1.06E+03  1.28E-04  1.28E-04  9.91E-01  8.92E-03  8.92E-03  1.41E-01  0.00E+00  0.00E+00
6.65E-02  9.64E-02  8.22E-01
        1.31E+03  8.46E-05  8.46E-05  9.91E-01  8.92E-03  8.92E-03  1.13E-01  0.00E+00  0.00E+00
6.41E-02  9.54E-02  8.00E-01
        1.61E+03  5.54E-05  5.54E-05  9.91E-01  8.92E-03  8.92E-03  9.02E-02  0.00E+00  0.00E+00
6.22E-02  9.38E-02  7.77E-01
        1.99E+03  3.60E-05  3.60E-05  9.91E-01  8.92E-03  8.92E-03  7.10E-02  0.00E+00  0.00E+00
6.07E-02  9.16E-02  7.54E-01
        2.46E+03  2.32E-05  2.32E-05  9.91E-01  8.92E-03  8.92E-03  5.56E-02  0.00E+00  0.00E+00
5.97E-02  8.89E-02  7.31E-01
        3.03E+03  1.49E-05  1.49E-05  9.91E-01  8.92E-03  8.92E-03  4.32E-02  0.00E+00  0.00E+00
5.91E-02  8.57E-02  7.08E-01
        3.74E+03  9.48E-06  9.48E-06  9.91E-01  8.92E-03  8.92E-03  3.34E-02  0.00E+00  0.00E+00
5.91E-02  8.21E-02  6.85E-01
        4.60E+03  6.01E-06  6.01E-06  9.91E-01  8.92E-03  8.92E-03  2.57E-02  0.00E+00  0.00E+00
5.97E-02  7.82E-02  6.62E-01
        5.67E+03  3.79E-06  3.79E-06  9.91E-01  8.92E-03  8.92E-03  1.97E-02  0.00E+00  0.00E+00
6.11E-02  7.42E-02  6.38E-01
        6.97E+03  2.37E-06  2.37E-06  9.91E-01  8.92E-03  8.92E-03  1.50E-02  0.00E+00  0.00E+00
6.37E-02  7.00E-02  6.12E-01
        8.57E+03  1.47E-06  1.47E-06  9.91E-01  8.92E-03  8.92E-03  1.15E-02  0.00E+00  0.00E+00
6.80E-02  6.59E-02  5.84E-01
        1.05E+04  9.01E-07  9.01E-07  9.91E-01  8.92E-03  8.92E-03  8.61E-03  0.00E+00  0.00E+00
7.50E-02  6.18E-02  5.52E-01
        1.30E+04  6.26E-07  6.26E-07  9.91E-01  8.92E-03  8.92E-03  7.21E-03  0.00E+00  0.00E+00
6.06E-03  5.72E-02  5.33E-01
```

- time averaged (tav = 60. s) volume concentration: concentration contour parameters

```
c(x,y,z,t) = cc(x) * (erf(xa)-erf(xb)) * (erf(ya)-erf(yb)) * (exp(-za*za)+exp(-zb*zb))

       c(x,y,z,t) = concentration (volume fraction) at (x,y,z,t)
                x = downwind distance (m)
                y = crosswind horizontal distance (m)
                z = height (m)
                t = time (s)

              erf = error functon            exp = exponential function
               xa = (x-xc+bx)/(sr2*betax)     za = (z-zc)/(sr2*sig)
               xb = (x-xc-bx)/(sr2*betax)     zb = (z+zc)/(sr2*sig)
               ya = (y+b)/(sr2*betac)        sr2 = sqrt(2.0)
               yb = (y-b)/(sr2*betac)
```

x	cc(x)	b(x)	betac(x)	zc(x)	sig(x)	t	xc(t)	bx(t)	betax(t)
1.00E+00	0.00E+00	6.04E-02	1.69E-02	1.00E+00	3.87E-02	0.00E+00	1.00E+00	0.00E+00	0.00E+00
1.02E+00	3.71E-01	6.87E-02	3.52E-02	1.00E+00	5.30E-02	1.11E-04	1.02E+00	1.77E-02	1.45E-04
1.05E+00	3.54E-01	7.64E-02	5.17E-02	1.00E+00	6.80E-02	3.06E-04	1.05E+00	3.92E-02	3.20E-04
1.08E+00	3.37E-01	8.40E-02	6.88E-02	1.00E+00	8.42E-02	6.14E-04	1.08E+00	6.51E-02	5.32E-04
1.11E+00	3.19E-01	9.17E-02	8.73E-02	1.00E+00	1.02E-01	1.08E-03	1.11E+00	9.65E-02	7.88E-04
1.16E+00	3.02E-01	9.97E-02	1.08E-01	1.00E+00	1.22E-01	1.78E-03	1.16E+00	1.34E-01	1.10E-03
1.21E+00	2.85E-01	1.08E-01	1.31E-01	1.00E+00	1.45E-01	2.81E-03	1.21E+00	1.80E-01	1.47E-03
1.28E+00	2.69E-01	1.17E-01	1.58E-01	1.00E+00	1.72E-01	4.30E-03	1.28E+00	2.36E-01	1.93E-03
1.36E+00	2.53E-01	1.26E-01	1.89E-01	1.00E+00	2.02E-01	6.46E-03	1.36E+00	3.03E-01	2.47E-03
1.45E+00	2.38E-01	1.37E-01	2.24E-01	1.00E+00	2.37E-01	9.56E-03	1.45E+00	3.84E-01	3.14E-03
1.57E+00	2.24E-01	1.47E-01	2.64E-01	1.00E+00	2.78E-01	1.40E-02	1.57E+00	4.82E-01	3.94E-03
1.71E+00	2.10E-01	1.59E-01	3.11E-01	1.00E+00	3.24E-01	2.03E-02	1.71E+00	6.01E-01	4.91E-03
1.88E+00	1.97E-01	1.71E-01	3.65E-01	1.00E+00	3.78E-01	2.93E-02	1.88E+00	7.45E-01	6.08E-03
2.08E+00	1.84E-01	1.84E-01	4.26E-01	1.00E+00	4.40E-01	4.21E-02	2.08E+00	9.19E-01	7.50E-03
2.33E+00	1.73E-01	1.98E-01	4.98E-01	1.00E+00	5.11E-01	6.01E-02	2.33E+00	1.13E+00	9.22E-03
2.63E+00	1.59E-01	2.12E-01	5.75E-01	1.00E+00	5.99E-01	8.55E-02	2.63E+00	1.38E+00	1.13E-02
2.99E+00	1.35E-01	2.26E-01	6.56E-01	1.00E+00	7.62E-01	1.21E-01			

2.99E+00 1.69E+00 1.38E-02
3.43E+00 1.17E-01 2.40E-01 7.45E-01 1.00E+00 9.38E-01 1.69E-01
3.43E+00 2.06E+00 1.68E-02
3.96E+00 1.04E-01 2.54E-01 8.41E-01 1.00E+00 1.13E+00 2.36E-01
3.96E+00 2.51E+00 2.05E-02
4.61E+00 9.36E-02 2.68E-01 9.46E-01 1.00E+00 1.34E+00 3.27E-01
4.61E+00 3.05E+00 2.49E-02
5.38E+00 8.49E-02 2.82E-01 1.06E+00 1.01E+00 1.57E+00 4.49E-01
5.38E+00 3.71E+00 3.03E-02
6.32E+00 7.77E-02 2.96E-01 1.19E+00 1.01E+00 1.82E+00 6.15E-01
6.32E+00 4.51E+00 3.68E-02
7.45E+00 7.16E-02 3.10E-01 1.33E+00 1.01E+00 2.09E+00 8.37E-01
7.45E+00 5.47E+00 4.47E-02
8.83E+00 6.64E-02 3.23E-01 1.48E+00 1.02E+00 2.38E+00 1.13E+00
8.83E+00 6.63E+00 5.42E-02
1.05E+01 6.20E-02 3.35E-01 1.65E+00 1.04E+00 2.70E+00 1.53E+00
1.05E+01 8.04E+00 6.56E-02
1.25E+01 5.82E-02 3.46E-01 1.84E+00 1.06E+00 3.02E+00 2.05E+00
1.25E+01 9.74E+00 7.95E-02
1.49E+01 5.49E-02 3.57E-01 2.05E+00 1.10E+00 3.36E+00 2.73E+00
1.49E+01 1.18E+01 9.63E-02
1.79E+01 5.21E-02 3.67E-01 2.27E+00 1.15E+00 3.70E+00 3.62E+00
1.79E+01 1.43E+01 1.17E-01
2.14E+01 4.97E-02 3.77E-01 2.52E+00 1.24E+00 4.04E+00 4.77E+00
2.14E+01 1.73E+01 1.41E-01
2.57E+01 4.77E-02 3.85E-01 2.77E+00 1.37E+00 4.38E+00 6.26E+00
2.57E+01 2.09E+01 1.71E-01
3.09E+01 4.61E-02 3.91E-01 3.05E+00 1.56E+00 4.70E+00 8.15E+00
3.09E+01 2.53E+01 2.07E-01
3.72E+01 4.50E-02 3.97E-01 3.35E+00 1.83E+00 4.98E+00 1.06E+01
3.72E+01 3.07E+01 2.50E-01
4.48E+01 4.43E-02 4.01E-01 3.67E+00 2.23E+00 5.19E+00 1.36E+01
4.48E+01 3.71E+01 3.03E-01
5.40E+01 4.44E-02 4.06E-01 4.02E+00 2.80E+00 5.31E+00 1.74E+01
5.40E+01 4.49E+01 3.67E-01
6.51E+01 4.54E-02 4.09E-01 4.40E+00 3.60E+00 5.31E+00 2.21E+01
6.51E+01 5.43E+01 4.43E-01
7.85E+01 4.78E-02 4.12E-01 4.81E+00 4.72E+00 5.13E+00 2.80E+01
7.85E+01 6.57E+01 5.36E-01
9.48E+01 5.28E-02 4.13E-01 5.26E+00 6.25E+00 4.74E+00 3.53E+01
9.48E+01 7.94E+01 6.49E-01
1.14E+02 5.66E-02 4.13E-01 5.75E+00 8.33E+00 4.45E+00 4.42E+01
1.14E+02 9.61E+01 7.85E-01
1.38E+02 5.18E-02 4.10E-01 6.27E+00 1.09E+01 4.82E+00 5.48E+01
1.38E+02 1.16E+02 9.49E-01
1.67E+02 4.78E-02 4.06E-01 6.88E+00 1.40E+01 5.17E+00 6.73E+01
1.67E+02 1.41E+02 1.15E+00
2.02E+02 4.47E-02 4.06E-01 7.69E+00 1.77E+01 5.64E+00 6.74E+01
2.02E+02 1.41E+02 3.46E+01
2.46E+02 4.19E-02 4.06E-01 8.72E+00 2.17E+01 6.14E+00 7.64E+01
2.46E+02 1.41E+02 5.26E+01
3.01E+02 3.95E-02 4.06E-01 1.00E+01 2.62E+01 6.68E+00 8.72E+01
3.01E+02 1.41E+02 6.96E+01
3.69E+02 3.73E-02 4.06E-01 1.17E+01 3.10E+01 7.28E+00 1.00E+02
3.69E+02 1.41E+02 8.72E+01
4.54E+02 3.52E-02 4.06E-01 1.37E+01 3.61E+01 7.95E+00 1.16E+02
4.54E+02 1.41E+02 1.06E+02
5.60E+02 3.30E-02 4.06E-01 1.63E+01 4.14E+01 8.71E+00 1.35E+02
5.60E+02 1.41E+02 1.27E+02
6.92E+02 3.09E-02 4.06E-01 1.96E+01 4.68E+01 9.57E+00 1.59E+02
6.92E+02 1.41E+02 1.51E+02
8.55E+02 2.87E-02 4.06E-01 2.35E+01 5.21E+01 1.06E+01 1.87E+02
8.55E+02 1.41E+02 1.78E+02
1.06E+03 2.64E-02 4.06E-01 2.83E+01 5.75E+01 1.17E+01 2.21E+02
1.06E+03 1.41E+02 2.08E+02
1.31E+03 2.42E-02 4.06E-01 3.40E+01 6.27E+01 1.31E+01 2.62E+02
1.31E+03 1.41E+02 2.44E+02
1.61E+03 2.19E-02 4.06E-01 4.09E+01 6.77E+01 1.46E+01 3.11E+02
1.61E+03 1.41E+02 2.85E+02
1.99E+03 1.97E-02 4.06E-01 4.90E+01 7.25E+01 1.65E+01 3.71E+02
1.99E+03 1.41E+02 3.32E+02
2.46E+03 1.76E-02 4.06E-01 5.85E+01 7.70E+01 1.87E+01 4.44E+02
2.46E+03 1.41E+02 3.87E+02
3.03E+03 1.55E-02 4.06E-01 6.96E+01 8.14E+01 2.13E+01 5.32E+02
3.03E+03 1.41E+02 4.52E+02
3.74E+03 1.36E-02 4.06E-01 8.25E+01 8.54E+01 2.44E+01 6.38E+02
3.74E+03 1.41E+02 5.27E+02
4.60E+03 1.19E-02 4.06E-01 9.74E+01 8.91E+01 2.82E+01 7.67E+02
4.60E+03 1.41E+02 6.14E+02
5.67E+03 1.02E-02 4.06E-01 1.15E+02 9.26E+01 3.29E+01 9.22E+02
5.67E+03 1.41E+02 7.16E+02
6.97E+03 8.69E-03 4.06E-01 1.34E+02 9.59E+01 3.88E+01 1.11E+03
6.97E+03 1.41E+02 8.34E+02
8.57E+03 7.31E-03 4.06E-01 1.56E+02 9.88E+01 4.62E+01 1.34E+03
8.57E+03 1.41E+02 9.70E+02

1.05E+04 6.04E-03 4.06E-01 1.81E+02 1.02E+02 5.60E+01 1.61E+03 1.05E+04 1.41E+02 1.13E+03
1.30E+04 5.62E-03 4.06E-01 2.10E+02 1.04E+02 6.03E+01 1.94E+03 1.30E+04 1.41E+02 1.31E+03
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time averaged (tav = 60. s) volume concentration: concentration in the z = .00 plane.

downwind distance x (m)	time of max conc (s)	cloud duration (s)	effective half width bbc (m)	average concentration (volume fraction) at (x,y,z) y/bbc= 0.0	y/bbc= 0.5	y/bbc= 1.0	y/bbc= 1.5	y/bbc= 2.0	y/bbc= 2.5
1.00E+00	3.00E+01	6.00E+01	6.71E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1.02E+00	3.00E+01	6.00E+01	9.18E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1.05E+00	3.00E+01	6.00E+01	1.18E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1.08E+00	3.00E+01	6.00E+01	1.46E-01	5.11E-31	3.63E-31	1.21E-31	1.65E-32	8.38E-34	1.50E-35
1.11E+00	3.00E+01	6.00E+01	1.77E-01	2.89E-21	2.03E-21	6.70E-22	9.58E-23	5.51E-24	1.22E-25
1.16E+00	3.00E+01	6.00E+01	2.12E-01	5.03E-15	3.50E-15	1.15E-15	1.69E-16	1.05E-17	2.65E-19
1.21E+00	3.00E+01	6.00E+01	2.52E-01	7.37E-11	5.11E-11	1.67E-11	2.49E-12	1.62E-13	4.47E-15
1.28E+00	3.01E+01	6.00E+01	2.98E-01	5.20E-08	3.59E-08	1.17E-08	1.76E-09	1.18E-10	3.47E-12
1.36E+00	3.01E+01	6.00E+01	3.50E-01	4.95E-06	3.42E-06	1.11E-06	1.68E-07	1.16E-08	3.53E-10
1.45E+00	3.01E+01	6.00E+01	4.11E-01	1.21E-04	8.34E-05	2.72E-05	4.12E-06	2.87E-07	9.04E-09
1.57E+00	3.01E+01	6.00E+01	4.81E-01	1.15E-03	7.92E-04	2.58E-04	3.93E-05	2.76E-06	8.89E-08
1.71E+00	3.01E+01	6.00E+01	5.61E-01	5.62E-03	3.87E-03	1.26E-03	1.92E-04	1.36E-05	4.46E-07
1.88E+00	3.02E+01	6.00E+01	6.54E-01	1.71E-02	1.18E-02	3.83E-03	5.85E-04	4.17E-05	1.38E-06
2.08E+00	3.02E+01	6.00E+01	7.61E-01	3.71E-02	2.55E-02	8.29E-03	1.27E-03	9.08E-05	3.03E-06
2.33E+00	3.02E+01	6.00E+01	8.84E-01	6.28E-02	4.32E-02	1.40E-02	2.15E-03	1.54E-04	5.18E-06
2.63E+00	3.03E+01	6.00E+01	1.02E+00	9.09E-02	6.25E-02	2.03E-02	3.11E-03	2.24E-04	7.55E-06
2.99E+00	3.04E+01	6.00E+01	1.16E+00	1.23E-01	8.44E-02	2.74E-02	4.20E-03	3.03E-04	1.02E-05
3.43E+00	3.04E+01	6.00E+01	1.31E+00	1.34E-01	9.23E-02	3.00E-02	4.59E-03	3.32E-04	1.12E-05
3.96E+00	3.05E+01	6.00E+01	1.48E+00	1.33E-01	9.17E-02	2.98E-02	4.56E-03	3.30E-04	1.12E-05
4.61E+00	3.07E+01	6.00E+01	1.66E+00	1.26E-01	8.67E-02	2.81E-02	4.31E-03	3.12E-04	1.06E-05
5.38E+00	3.08E+01	6.00E+01	1.86E+00	1.16E-01	7.96E-02	2.59E-02	3.96E-03	2.87E-04	9.76E-06
6.32E+00	3.10E+01	6.00E+01	2.08E+00	1.05E-01	7.20E-02	2.34E-02	3.58E-03	2.59E-04	8.84E-06
7.45E+00	3.12E+01	6.00E+01	2.32E+00	9.37E-02	6.44E-02	2.09E-02	3.21E-03	2.32E-04	7.92E-06
8.83E+00	3.14E+01	6.00E+01	2.59E+00	8.33E-02	5.73E-02	1.86E-02	2.85E-03	2.06E-04	7.06E-06
1.05E+01	3.17E+01	6.00E+01	2.88E+00	7.38E-02	5.08E-02	1.65E-02	2.53E-03	1.83E-04	6.26E-06
1.25E+01	3.21E+01	6.00E+01	3.21E+00	6.53E-02	4.49E-02	1.46E-02	2.23E-03	1.62E-04	5.53E-06
1.49E+01	3.25E+01	6.00E+01	3.56E+00	5.77E-02	3.97E-02	1.29E-02	1.98E-03	1.43E-04	4.89E-06
1.79E+01	3.30E+01	6.00E+01	3.95E+00	5.10E-02	3.51E-02	1.14E-02	1.75E-03	1.27E-04	4.33E-06
2.14E+01	3.37E+01	6.00E+01	4.37E+00	4.52E-02	3.11E-02	1.01E-02	1.55E-03	1.12E-04	3.83E-06
2.57E+01	3.45E+01	6.00E+01	4.82E+00	4.01E-02	2.75E-02	8.94E-03	1.37E-03	9.93E-05	3.39E-06
3.09E+01	3.54E+01	6.00E+01	5.29E+00	3.56E-02	2.45E-02	7.94E-03	1.22E-03	8.82E-05	3.01E-06
3.72E+01	3.65E+01	6.00E+01	5.81E+00	3.16E-02	2.17E-02	7.06E-03	1.08E-03	7.84E-05	2.69E-06
4.48E+01	3.79E+01	6.00E+01	6.37E+00	2.81E-02	1.93E-02	6.27E-03	9.61E-04	6.96E-05	2.38E-06
5.40E+01	3.96E+01	6.00E+01	6.97E+00	2.48E-02	1.70E-02	5.52E-03	8.47E-04	6.14E-05	2.10E-06
6.51E+01	4.16E+01	6.00E+01	7.62E+00	2.13E-02	1.46E-02	4.74E-03			

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7.28E-04   5.27E-05   1.80E-06
            7.85E+01    4.40E+01    6.00E+01    8.34E+00         1.70E-02   1.17E-02   3.79E-03
5.81E-04   4.21E-05   1.44E-06
            9.48E+01    4.70E+01    6.00E+01    9.12E+00         1.10E-02   7.53E-03   2.44E-03
3.75E-04   2.71E-05   9.27E-07
            1.14E+02    5.05E+01    6.00E+01    9.96E+00         4.43E-03   3.05E-03   9.89E-04
1.52E-04   1.10E-05   3.76E-07
            1.38E+02    5.48E+01    6.00E+01    1.09E+01         1.63E-03   1.12E-03   3.63E-04
5.57E-05   4.04E-06   1.38E-07
            1.67E+02    6.00E+01    6.00E+01    1.19E+01         4.37E-04   3.01E-04   9.76E-05
1.50E-05   1.08E-06   3.71E-08
            2.02E+02    6.74E+01    6.34E+01    1.33E+01         9.45E-05   6.50E-05   2.11E-05
3.23E-06   2.34E-07   8.03E-09
            2.46E+02    7.64E+01    6.75E+01    1.51E+01         1.83E-05   1.26E-05   4.09E-06
6.28E-07   4.55E-08   1.54E-09
            3.01E+02    8.72E+01    7.24E+01    1.74E+01         3.29E-06   2.26E-06   7.35E-07
1.13E-07   8.16E-09   2.79E-10
            3.69E+02    1.00E+02    7.82E+01    2.02E+01         6.02E-07   4.14E-07   1.34E-07
2.06E-08   1.49E-09   5.17E-11
            4.54E+02    1.16E+02    8.52E+01    2.38E+01         1.25E-07   8.62E-08   2.80E-08
4.29E-09   3.11E-10   1.06E-11
            5.60E+02    1.35E+02    9.35E+01    2.83E+01         3.33E-08   2.29E-08   7.42E-09
1.14E-09   8.24E-11   2.80E-12
            6.92E+02    1.59E+02    1.03E+02    3.39E+01         1.22E-08   8.38E-09   2.72E-09
4.17E-10   3.03E-11   1.03E-12
            8.55E+02    1.87E+02    1.15E+02    4.07E+01         6.50E-09   4.47E-09   1.45E-09
2.22E-10   1.61E-11   5.48E-13
            1.06E+03    2.21E+02    1.29E+02    4.90E+01         5.06E-09   3.48E-09   1.13E-09
1.73E-10   1.26E-11   4.35E-13
            1.31E+03    2.62E+02    1.45E+02    5.89E+01         5.59E-09   3.84E-09   1.25E-09
1.91E-10   1.39E-11   4.72E-13
            1.61E+03    3.11E+02    1.64E+02    7.08E+01         8.21E-09   5.64E-09   1.83E-09
2.81E-10   2.03E-11   6.79E-13
            1.99E+03    3.71E+02    1.86E+02    8.48E+01         1.48E-08   1.02E-08   3.31E-09
5.08E-10   3.68E-11   1.27E-12
            2.46E+03    4.44E+02    2.12E+02    1.01E+02         3.05E-08   2.09E-08   6.80E-09
1.04E-09   7.56E-11   2.62E-12
            3.03E+03    5.32E+02    2.42E+02    1.21E+02         6.55E-08   4.50E-08   1.46E-08
2.24E-09   1.62E-10   5.87E-12
            3.74E+03    6.38E+02    2.76E+02    1.43E+02         1.38E-07   9.50E-08   3.08E-08
4.73E-09   3.43E-10   1.26E-11
            4.60E+03    7.67E+02    3.16E+02    1.69E+02         2.71E-07   1.87E-07   6.06E-08
9.29E-09   6.74E-10   2.43E-11
            5.67E+03    9.22E+02    3.62E+02    1.98E+02         4.78E-07   3.29E-07   1.07E-07
1.64E-08   1.19E-09   4.03E-11
            6.97E+03    1.11E+03    4.15E+02    2.32E+02         7.40E-07   5.08E-07   1.65E-07
2.53E-08   1.83E-09   5.47E-11
            8.57E+03    1.34E+03    4.75E+02    2.71E+02         9.93E-07   6.83E-07   2.22E-07
3.40E-08   2.46E-09   8.57E-11
            1.05E+04    1.61E+03    5.42E+02    3.14E+02         1.16E-06   7.96E-07   2.58E-07
3.96E-08   2.86E-09   1.16E-10
            1.30E+04    1.94E+03    6.24E+02    3.64E+02         9.35E-07   6.43E-07   2.09E-07
3.20E-08   2.31E-09   7.22E-11
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time averaged (tav = 60. s) volume concentration: maximum concentration (volume fraction) along centerline.

downwind distance x (m)	height z (m)	maximum concentration c(x,0,z)	time of max conc (s)	cloud duration (s)
1.00E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.02E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.05E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.08E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.11E+00	1.00E+00	9.02E-01	3.00E+01	6.00E+01
1.16E+00	1.00E+00	7.78E-01	3.00E+01	6.00E+01
1.21E+00	1.00E+00	6.73E-01	3.00E+01	6.00E+01
1.28E+00	1.00E+00	5.82E-01	3.01E+01	6.00E+01
1.36E+00	1.00E+00	5.04E-01	3.01E+01	6.00E+01
1.45E+00	1.00E+00	4.37E-01	3.01E+01	6.00E+01
1.57E+00	1.00E+00	3.78E-01	3.01E+01	6.00E+01
1.71E+00	1.00E+00	3.28E-01	3.01E+01	6.00E+01
1.88E+00	1.00E+00	2.84E-01	3.02E+01	6.00E+01
2.08E+00	1.00E+00	2.47E-01	3.02E+01	6.00E+01
2.33E+00	9.99E-01	2.14E-01	3.02E+01	6.00E+01
2.63E+00	9.93E-01	1.84E-01	3.03E+01	6.00E+01
2.99E+00	9.20E-01	1.51E-01	3.04E+01	6.00E+01
3.43E+00	5.75E-01	1.36E-01	3.04E+01	6.00E+01
3.96E+00	0.00E+00	1.33E-01	3.05E+01	6.00E+01
4.61E+00	0.00E+00	1.26E-01	3.07E+01	6.00E+01
5.38E+00	0.00E+00	1.16E-01	3.08E+01	6.00E+01
6.32E+00	0.00E+00	1.05E-01	3.10E+01	6.00E+01
7.45E+00	0.00E+00	9.37E-02	3.12E+01	6.00E+01

8.83E+00	0.00E+00	8.33E-02	3.14E+01	6.00E+01
1.05E+01	0.00E+00	7.38E-02	3.17E+01	6.00E+01
1.25E+01	0.00E+00	6.53E-02	3.21E+01	6.00E+01
1.49E+01	0.00E+00	5.77E-02	3.25E+01	6.00E+01
1.79E+01	0.00E+00	5.10E-02	3.30E+01	6.00E+01
2.14E+01	0.00E+00	4.52E-02	3.37E+01	6.00E+01
2.57E+01	0.00E+00	4.01E-02	3.45E+01	6.00E+01
3.09E+01	0.00E+00	3.56E-02	3.54E+01	6.00E+01
3.72E+01	0.00E+00	3.16E-02	3.65E+01	6.00E+01
4.48E+01	0.00E+00	2.81E-02	3.79E+01	6.00E+01
5.40E+01	0.00E+00	2.48E-02	3.96E+01	6.00E+01
6.51E+01	0.00E+00	2.13E-02	4.16E+01	6.00E+01
7.85E+01	0.00E+00	1.70E-02	4.40E+01	6.00E+01
9.48E+01	5.76E+00	1.35E-02	4.70E+01	6.00E+01
1.14E+02	8.31E+00	1.28E-02	5.05E+01	6.00E+01
1.38E+02	1.09E+01	1.05E-02	5.48E+01	6.00E+01
1.67E+02	1.40E+01	8.64E-03	6.00E+01	6.00E+01
2.02E+02	1.77E+01	6.33E-03	6.74E+01	6.34E+01
2.46E+02	2.17E+01	4.78E-03	7.64E+01	6.75E+01
3.01E+02	2.62E+01	3.57E-03	8.72E+01	7.24E+01
3.69E+02	3.10E+01	2.62E-03	1.00E+02	7.82E+01
4.54E+02	3.61E+01	1.88E-03	1.16E+02	8.52E+01
5.60E+02	4.14E+01	1.33E-03	1.35E+02	9.35E+01
6.92E+02	4.68E+01	9.19E-04	1.59E+02	1.03E+02
8.55E+02	5.21E+01	6.26E-04	1.87E+02	1.15E+02
1.06E+03	5.75E+01	4.20E-04	2.21E+02	1.29E+02
1.31E+03	6.27E+01	2.79E-04	2.62E+02	1.45E+02
1.61E+03	6.77E+01	1.83E-04	3.11E+02	1.64E+02
1.99E+03	7.25E+01	1.19E-04	3.71E+02	1.86E+02
2.46E+03	7.70E+01	7.70E-05	4.44E+02	2.12E+02
3.03E+03	8.14E+01	4.94E-05	5.32E+02	2.42E+02
3.74E+03	8.54E+01	3.15E-05	6.38E+02	2.76E+02
4.60E+03	8.91E+01	2.00E-05	7.67E+02	3.16E+02
5.67E+03	9.26E+01	1.26E-05	9.22E+02	3.62E+02
6.97E+03	9.59E+01	7.87E-06	1.11E+03	4.15E+02
8.57E+03	9.88E+01	4.88E-06	1.34E+03	4.75E+02
1.05E+04	1.01E+02	3.00E-06	1.61E+03	5.42E+02
1.30E+04	1.04E+02	2.08E-06	1.94E+03	6.24E+02

•(10U•&l0O•&k2S•&l6D•

Scenario 2
Hazard Footprints

Met Scenario					c(ppm) ÄÄ 50000.0					c(ppm) ÄÄ 25000.0				
u (m/s)	temp (øK)	rh (%)	stb	avt (s)	length (m)	width (m)	w_dist (m)	area (m2)	fmass (kg)	length (m)	width (m)	w_dist (m)	area (m2)	fmass (kg)
4.0	293.0	60.	4	60.	3.60E+00	8.91E-01	2.33E+00	1.81E+00	1.76E-01	7.22E+00	1.49E+00	3.43E+00	6.57E+00	4.14E-01
2.0	293.0	60.	6	60.	3.67E+00	9.75E-01	2.33E+00	2.01E+00	2.89E-01	9.16E+00	1.64E+00	2.99E+00	1.02E+01	8.59E-01
Composite Maximum					3.67E+00	9.75E-01	2.33E+00	2.01E+00	2.89E-01	9.16E+00	1.64E+00	2.99E+00	1.02E+01	8.59E-01

Scenario 2

```
problem input

idspl =         2
ncalc =         1
wms   =   .016000
cps   =   2240.00
tbp   =    111.70
cmed0 =       .00
dhe   =   509880.
cpsl  =   3349.00
rhosl =    424.10
spb   =     -1.00
spc   =       .00
ts    =    450.00
qs    =       .38
as    =       .00
tsd   =       60.
qtis  =       .00
hs    =      1.00
tav   =     60.00
xffm  =   9000.00
zp(1) =       .00
zp(2) =       .00
zp(3) =       .00
zp(4) =       .00
z0    =   .300000
za    =      2.00
ua    =      4.00
ta    =    293.00
rh    =     60.00
stab  =      4.00
```

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```
release gas properties

molecular weight of source gas (kg)              - wms  =  1.6000E-02
vapor heat capacity, const. p.  (j/kg-k)         - cps  =  2.2400E+03
temperature of source gas (k)                    - ts   =  4.5000E+02
density of source gas (kg/m3)                    - rhos =  4.3331E-01
boiling point temperature                        - tbp  =  1.1170E+02
liquid mass fraction                             - cmed0=  0.0000E+00
liquid heat capacity (j/kg-k)                    - cpsl =  3.3490E+03
heat of vaporization (j/kg)                      - dhe  =  5.0988E+05
liquid source density (kg/m3)                    - rhosl=  4.2410E+02
saturation pressure constant                     - spa  =  8.7843E+00
saturation pressure constant (k)                 - spb  =  9.8121E+02
saturation pressure constant (k)                 - spc  =  0.0000E+00


spill characteristics

spill type                                       - idspl=          2
mass source rate (kg/s)                          - qs   =  3.8000E-01
continuous source duration (s)                   - tsd  =  6.0000E+01
continuous source mass (kg)                      - qtcs =  2.2800E+01
instantaneous source mass (kg)                   - qtis =  0.0000E+00
source area (m2)                                 - as   =  4.5000E-03
vertical vapor velocity (m/s)                    - ws   =  0.0000E+00
source half width (m)                            - bs   =  3.3541E-02
source height (m)                                - hs   =  1.0000E+00
horizontal vapor velocity (m/s)                  - us   =  1.9488E+02


field parameters

concentration averaging time (s)                 - tav  =  6.0000E+01
mixing layer height (m)                          - hmx  =  1.0400E+03
maximum downwind distance (m)                    - xffm =  9.0000E+03
concentration measurement height (m)             - zp(1)=  0.0000E+00
                                                 - zp(2)=  0.0000E+00
                                                 - zp(3)=  0.0000E+00
                                                 - zp(4)=  0.0000E+00


ambient meteorological properties

molecular weight of ambient air (kg)            - wmae  =  2.8804E-02
heat capacity of ambient air at const p. (j/kg-k)- cpaa  =  1.0134E+03
```

```
density of ambient air (kg/m3)                    - rhoa  =  1.1980E+00
ambient measurement height (m)                    - za    =  2.0000E+00
ambient atmospheric pressure (pa=n/m2=j/m3)       - pa    =  1.0133E+05
ambient wind speed (m/s)                          - ua    =  4.0000E+00
ambient temperature (k)                           - ta    =  2.9300E+02
relative humidity (percent)                       - rh    =  6.0000E+01
ambient friction velocity (m/s)                   - uastr =  8.6521E-01
atmospheric stability class value                 - stab  =  4.0000E+00
inverse monin-obukhov length (1/m)                - ala   =  0.0000E+00
surface roughness height (m)                      - z0    =  3.0000E-01


additional parameters

sub-step multiplier                               - ncalc =           1
number of calculational sub-steps                 - nssm  =           3
acceleration of gravity (m/s2)                    - grav  =  9.8067E+00
gas constant (j/mol- k)                           - rr    =  8.3143E+00
von karman constant                               - xk    =  4.1000E-01
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instantaneous spatially averaged cloud parameters

            x         zc         h         bb         b         bbx       bx        cv        rho        t
      u         ua
         1.00E+00  1.00E+00  6.71E-02  3.35E-02  3.02E-02  0.00E+00  0.00E+00  1.00E+00  4.33E-01
4.50E+02  1.95E+02  1.33E+00
         1.02E+00  1.00E+00  1.43E-01  7.17E-02  3.94E-02  2.51E-02  2.51E-02  5.19E-01  7.06E-01
3.83E+02  6.98E+01  1.38E+00
         1.05E+00  1.00E+00  2.03E-01  1.01E-01  4.53E-02  5.55E-02  5.55E-02  3.74E-01  8.14E-01
3.59E+02  4.56E+01  1.41E+00
         1.08E+00  1.00E+00  2.61E-01  1.30E-01  5.03E-02  9.23E-02  9.23E-02  2.92E-01  8.83E-01
3.46E+02  3.39E+01  1.45E+00
         1.11E+00  1.00E+00  3.22E-01  1.61E-01  5.50E-02  1.37E-01  1.37E-01  2.37E-01  9.34E-01
3.36E+02  2.67E+01  1.49E+00
         1.16E+00  1.00E+00  3.88E-01  1.94E-01  5.97E-02  1.90E-01  1.90E-01  1.96E-01  9.73E-01
3.29E+02  2.17E+01  1.52E+00
         1.21E+00  1.00E+00  4.61E-01  2.31E-01  6.43E-02  2.55E-01  2.55E-01  1.65E-01  1.01E+00
3.24E+02  1.80E+01  1.57E+00
         1.28E+00  1.00E+00  5.42E-01  2.71E-01  6.90E-02  3.34E-01  3.34E-01  1.39E-01  1.03E+00
3.19E+02  1.52E+01  1.61E+00
         1.36E+00  1.00E+00  6.32E-01  3.16E-01  7.38E-02  4.29E-01  4.29E-01  1.19E-01  1.05E+00
3.15E+02  1.30E+01  1.66E+00
         1.45E+00  1.00E+00  7.33E-01  3.67E-01  7.86E-02  5.44E-01  5.44E-01  1.01E-01  1.07E+00
3.12E+02  1.12E+01  1.72E+00
         1.57E+00  1.00E+00  8.46E-01  4.23E-01  8.35E-02  6.83E-01  6.83E-01  8.66E-02  1.09E+00
3.09E+02  9.72E+00  1.78E+00
         1.71E+00  1.00E+00  9.73E-01  4.86E-01  8.82E-02  8.52E-01  8.51E-01  7.41E-02  1.11E+00
3.07E+02  8.54E+00  1.85E+00
         1.88E+00  1.00E+00  1.11E+00  5.57E-01  9.29E-02  1.05E+00  1.05E+00  6.34E-02  1.12E+00
3.05E+02  7.56E+00  1.92E+00
         2.08E+00  1.00E+00  1.27E+00  6.36E-01  9.76E-02  1.30E+00  1.30E+00  5.42E-02  1.13E+00
3.03E+02  6.74E+00  2.00E+00
         2.33E+00  1.01E+00  1.45E+00  7.24E-01  1.02E-01  1.60E+00  1.60E+00  4.62E-02  1.14E+00
3.02E+02  6.07E+00  2.08E+00
         2.63E+00  1.01E+00  1.65E+00  8.23E-01  1.07E-01  1.96E+00  1.96E+00  3.92E-02  1.15E+00
3.00E+02  5.52E+00  2.18E+00
         2.99E+00  1.02E+00  1.87E+00  9.32E-01  1.11E-01  2.39E+00  2.39E+00  3.31E-02  1.16E+00
2.99E+02  5.06E+00  2.28E+00
         3.43E+00  1.03E+00  2.07E+00  1.04E+00  1.14E-01  2.92E+00  2.92E+00  2.85E-02  1.16E+00
2.98E+02  4.75E+00  2.38E+00
         3.96E+00  1.04E+00  2.31E+00  1.15E+00  1.16E-01  3.56E+00  3.56E+00  2.43E-02  1.17E+00
2.98E+02  4.48E+00  2.57E+00
         4.61E+00  1.06E+00  2.55E+00  1.27E+00  1.18E-01  4.33E+00  4.33E+00  2.08E-02  1.17E+00
2.97E+02  4.29E+00  2.74E+00
         5.38E+00  1.08E+00  2.79E+00  1.39E+00  1.20E-01  5.26E+00  5.26E+00  1.79E-02  1.18E+00
2.96E+02  4.16E+00  2.90E+00
         6.32E+00  1.12E+00  3.04E+00  1.52E+00  1.21E-01  6.38E+00  6.38E+00  1.53E-02  1.18E+00
2.96E+02  4.08E+00  3.05E+00
         7.45E+00  1.17E+00  3.30E+00  1.65E+00  1.21E-01  7.75E+00  7.74E+00  1.31E-02  1.18E+00
2.95E+02  4.04E+00  3.21E+00
         8.83E+00  1.23E+00  3.58E+00  1.79E+00  1.21E-01  9.39E+00  9.39E+00  1.11E-02  1.18E+00
2.95E+02  4.03E+00  3.36E+00
         1.05E+01  1.31E+00  3.89E+00  1.94E+00  1.20E-01  1.14E+01  1.14E+01  9.39E-03  1.19E+00
2.94E+02  4.04E+00  3.51E+00
         1.25E+01  1.41E+00  4.23E+00  2.11E+00  1.20E-01  1.38E+01  1.38E+01  7.85E-03  1.19E+00
2.94E+02  4.09E+00  3.67E+00
         1.49E+01  1.53E+00  4.60E+00  2.30E+00  1.19E-01  1.67E+01  1.67E+01  6.50E-03  1.19E+00
2.94E+02  4.16E+00  3.83E+00
         1.79E+01  1.67E+00  5.02E+00  2.51E+00  1.18E-01  2.02E+01  2.02E+01  5.33E-03  1.19E+00
```

```
2.94E+02  4.26E+00  4.00E+00
         2.14E+01  1.84E+00  5.50E+00  2.75E+00  1.17E-01  2.45E+01  2.45E+01  4.32E-03  1.19E+00
2.94E+02  4.37E+00  4.18E+00
         2.57E+01  2.02E+00  6.05E+00  3.03E+00  1.15E-01  2.96E+01  2.96E+01  3.47E-03  1.19E+00
2.93E+02  4.51E+00  4.37E+00
         3.09E+01  2.23E+00  6.67E+00  3.34E+00  1.13E-01  3.59E+01  3.59E+01  2.75E-03  1.20E+00
2.93E+02  4.67E+00  4.56E+00
         3.72E+01  2.45E+00  7.40E+00  3.70E+00  1.11E-01  4.34E+01  4.34E+01  2.16E-03  1.20E+00
2.93E+02  4.84E+00  4.76E+00
         4.48E+01  2.69E+00  8.23E+00  4.12E+00  1.09E-01  5.25E+01  5.25E+01  1.68E-03  1.20E+00
2.93E+02  5.03E+00  4.97E+00
         5.40E+01  2.94E+00  9.19E+00  4.60E+00  1.08E-01  6.36E+01  6.36E+01  1.29E-03  1.20E+00
2.93E+02  5.24E+00  5.20E+00
         6.51E+01  3.21E+00  1.03E+01  5.16E+00  1.06E-01  7.69E+01  7.69E+01  9.83E-04  1.20E+00
2.93E+02  5.46E+00  5.43E+00
         7.85E+01  3.48E+00  1.16E+01  5.82E+00  1.04E-01  9.30E+01  9.30E+01  7.43E-04  1.20E+00
2.93E+02  5.69E+00  5.67E+00
         9.48E+01  3.75E+00  1.31E+01  6.63E+00  1.03E-01  1.13E+02  1.13E+02  5.57E-04  1.20E+00
2.93E+02  5.92E+00  5.91E+00
         1.14E+02  4.03E+00  1.47E+01  7.61E+00  1.01E-01  1.36E+02  1.36E+02  4.14E-04  1.20E+00
2.93E+02  6.16E+00  6.15E+00
         1.38E+02  4.30E+00  1.66E+01  8.81E+00  1.00E-01  1.65E+02  1.65E+02  3.06E-04  1.20E+00
2.93E+02  6.40E+00  6.39E+00
         1.67E+02  4.57E+00  1.87E+01  1.03E+01  9.90E-02  1.99E+02  1.99E+02  2.24E-04  1.20E+00
2.93E+02  6.64E+00  6.64E+00
         2.03E+02  4.84E+00  2.16E+01  1.22E+01  9.90E-02  2.10E+02  1.99E+02  1.55E-04  1.20E+00
2.93E+02  6.94E+00  6.94E+00
         2.47E+02  5.10E+00  2.50E+01  1.46E+01  9.90E-02  2.24E+02  1.99E+02  1.05E-04  1.20E+00
2.93E+02  7.24E+00  7.24E+00
         3.04E+02  5.34E+00  2.90E+01  1.76E+01  9.90E-02  2.40E+02  1.99E+02  6.99E-05  1.20E+00
2.93E+02  7.54E+00  7.54E+00
         3.75E+02  5.57E+00  3.36E+01  2.14E+01  9.90E-02  2.60E+02  1.99E+02  4.59E-05  1.20E+00
2.93E+02  7.84E+00  7.84E+00
         4.65E+02  5.78E+00  3.91E+01  2.60E+01  9.90E-02  2.84E+02  1.99E+02  2.97E-05  1.20E+00
2.93E+02  8.15E+00  8.15E+00
         5.78E+02  5.97E+00  4.54E+01  3.18E+01  9.90E-02  3.12E+02  1.99E+02  1.90E-05  1.20E+00
2.93E+02  8.45E+00  8.45E+00
         7.19E+02  6.15E+00  5.28E+01  3.89E+01  9.90E-02  3.47E+02  1.99E+02  1.20E-05  1.20E+00
2.93E+02  8.76E+00  8.76E+00
         8.96E+02  6.31E+00  6.14E+01  4.75E+01  9.90E-02  3.90E+02  1.99E+02  7.54E-06  1.20E+00
2.93E+02  9.07E+00  9.07E+00
         1.12E+03  6.45E+00  7.14E+01  5.80E+01  9.90E-02  4.41E+02  1.99E+02  4.70E-06  1.20E+00
2.93E+02  9.38E+00  9.38E+00
         1.39E+03  6.57E+00  8.31E+01  7.07E+01  9.90E-02  5.02E+02  1.99E+02  2.91E-06  1.20E+00
2.93E+02  9.68E+00  9.68E+00
         1.74E+03  6.69E+00  9.67E+01  8.59E+01  9.90E-02  5.76E+02  1.99E+02  1.79E-06  1.20E+00
2.93E+02  9.99E+00  9.99E+00
         2.17E+03  6.79E+00  1.12E+02  1.04E+02  9.90E-02  6.66E+02  1.99E+02  1.10E-06  1.20E+00
2.93E+02  1.03E+01  1.03E+01
         2.70E+03  6.88E+00  1.31E+02  1.25E+02  9.90E-02  7.73E+02  1.99E+02  6.75E-07  1.20E+00
2.93E+02  1.06E+01  1.06E+01
         3.37E+03  6.96E+00  1.52E+02  1.51E+02  9.90E-02  9.03E+02  1.99E+02  4.14E-07  1.20E+00
2.93E+02  1.09E+01  1.09E+01
         4.20E+03  7.03E+00  1.77E+02  1.80E+02  9.90E-02  1.06E+03  1.99E+02  2.55E-07  1.20E+00
2.93E+02  1.12E+01  1.12E+01
         5.23E+03  7.10E+00  2.05E+02  2.14E+02  9.90E-02  1.25E+03  1.99E+02  1.57E-07  1.20E+00
2.93E+02  1.15E+01  1.15E+01
         6.50E+03  7.17E+00  2.37E+02  2.53E+02  9.90E-02  1.47E+03  1.99E+02  9.71E-08  1.20E+00
2.93E+02  1.17E+01  1.17E+01
         8.07E+03  7.22E+00  2.74E+02  2.98E+02  9.90E-02  1.74E+03  1.99E+02  6.04E-08  1.20E+00
2.93E+02  1.20E+01  1.20E+01
         1.00E+04  7.27E+00  3.15E+02  3.49E+02  9.90E-02  2.06E+03  1.99E+02  3.78E-08  1.20E+00
2.93E+02  1.23E+01  1.23E+01
         1.24E+04  7.33E+00  3.62E+02  4.07E+02  9.90E-02  2.44E+03  1.99E+02  2.38E-08  1.20E+00
2.93E+02  1.25E+01  1.25E+01
         1.54E+04  7.39E+00  4.13E+02  4.72E+02  9.90E-02  2.90E+03  1.99E+02  1.51E-08  1.20E+00
2.93E+02  1.27E+01  1.27E+01
•

            x        cm        cmv       cmda      cmw       cmwv      wc        vg        ug        w
      v        vx
         1.00E+00  1.00E+00  1.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
9.74E+01  4.65E+01  0.00E+00
         1.02E+00  3.75E-01  3.75E-01  6.19E-01  5.58E-03  5.58E-03  1.43E-03  0.00E+00  0.00E+00
5.81E+01  1.01E+01  9.79E-01
         1.05E+00  2.49E-01  2.49E-01  7.44E-01  6.70E-03  6.70E-03  3.07E-03  0.00E+00  0.00E+00
3.19E+01  5.65E+00  9.81E-01
         1.08E+00  1.86E-01  1.86E-01  8.06E-01  7.26E-03  7.26E-03  5.05E-03  0.00E+00  0.00E+00
2.12E+01  3.83E+00  9.82E-01
         1.11E+00  1.47E-01  1.47E-01  8.45E-01  7.61E-03  7.61E-03  7.42E-03  0.00E+00  0.00E+00
1.53E+01  2.81E+00  9.84E-01
```

	1.16E+00	1.19E-01	1.19E-01	8.73E-01	7.86E-03	7.86E-03	1.03E-02	0.00E+00	0.00E+00	1.16E+01	2.16E+00	9.86E-01
	1.21E+00	9.86E-02	9.86E-02	8.93E-01	8.04E-03	8.04E-03	1.36E-02	0.00E+00	0.00E+00	9.04E+00	1.71E+00	9.89E-01
	1.28E+00	8.25E-02	8.25E-02	9.09E-01	8.19E-03	8.19E-03	1.77E-02	0.00E+00	0.00E+00	7.20E+00	1.37E+00	9.91E-01
	1.36E+00	6.95E-02	6.95E-02	9.22E-01	8.30E-03	8.30E-03	2.24E-02	0.00E+00	0.00E+00	5.83E+00	1.12E+00	9.94E-01
	1.45E+00	5.89E-02	5.89E-02	9.33E-01	8.40E-03	8.40E-03	2.80E-02	0.00E+00	0.00E+00	4.78E+00	9.19E-01	9.97E-01
	1.57E+00	5.00E-02	5.00E-02	9.42E-01	8.48E-03	8.48E-03	3.45E-02	0.00E+00	0.00E+00	3.98E+00	7.61E-01	1.00E+00
	1.71E+00	4.26E-02	4.26E-02	9.49E-01	8.54E-03	8.54E-03	4.21E-02	0.00E+00	0.00E+00	3.35E+00	6.33E-01	1.00E+00
	1.88E+00	3.62E-02	3.62E-02	9.55E-01	8.60E-03	8.60E-03	5.06E-02	0.00E+00	0.00E+00	2.87E+00	5.29E-01	1.01E+00
	2.08E+00	3.08E-02	3.08E-02	9.61E-01	8.65E-03	8.65E-03	6.02E-02	0.00E+00	0.00E+00	2.49E+00	4.43E-01	1.01E+00
	2.33E+00	2.62E-02	2.62E-02	9.65E-01	8.69E-03	8.69E-03	7.08E-02	0.00E+00	0.00E+00	2.19E+00	3.71E-01	1.02E+00
	2.63E+00	2.22E-02	2.22E-02	9.69E-01	8.73E-03	8.73E-03	8.22E-02	0.00E+00	0.00E+00	1.95E+00	3.11E-01	1.02E+00
	2.99E+00	1.87E-02	1.87E-02	9.73E-01	8.76E-03	8.76E-03	9.41E-02	0.00E+00	0.00E+00	1.77E+00	2.62E-01	1.03E+00
	3.43E+00	1.60E-02	1.60E-02	9.75E-01	8.78E-03	8.78E-03	1.09E-01	0.00E+00	0.00E+00	1.44E+00	2.26E-01	1.03E+00
	3.96E+00	1.36E-02	1.36E-02	9.78E-01	8.80E-03	8.80E-03	1.23E-01	0.00E+00	0.00E+00	1.19E+00	1.90E-01	1.05E+00
	4.61E+00	1.17E-02	1.17E-02	9.80E-01	8.82E-03	8.82E-03	1.37E-01	0.00E+00	0.00E+00	1.02E+00	1.64E-01	1.06E+00
	5.38E+00	1.00E-02	1.00E-02	9.81E-01	8.84E-03	8.84E-03	1.52E-01	0.00E+00	0.00E+00	8.95E-01	1.46E-01	1.07E+00
	6.32E+00	8.57E-03	8.57E-03	9.83E-01	8.85E-03	8.85E-03	1.66E-01	0.00E+00	0.00E+00	7.99E-01	1.34E-01	1.08E+00
	7.45E+00	7.32E-03	7.32E-03	9.84E-01	8.86E-03	8.86E-03	1.79E-01	0.00E+00	0.00E+00	7.26E-01	1.27E-01	1.09E+00
	8.83E+00	6.21E-03	6.21E-03	9.85E-01	8.87E-03	8.87E-03	1.89E-01	0.00E+00	0.00E+00	6.67E-01	1.23E-01	1.10E+00
	1.05E+01	5.24E-03	5.24E-03	9.86E-01	8.88E-03	8.88E-03	1.97E-01	0.00E+00	0.00E+00	6.19E-01	1.23E-01	1.11E+00
	1.25E+01	4.37E-03	4.37E-03	9.87E-01	8.89E-03	8.89E-03	2.02E-01	0.00E+00	0.00E+00	5.79E-01	1.24E-01	1.12E+00
	1.49E+01	3.62E-03	3.62E-03	9.87E-01	8.89E-03	8.89E-03	2.03E-01	0.00E+00	0.00E+00	5.46E-01	1.27E-01	1.13E+00
	1.79E+01	2.97E-03	2.97E-03	9.88E-01	8.90E-03	8.90E-03	2.01E-01	0.00E+00	0.00E+00	5.18E-01	1.31E-01	1.14E+00
	2.14E+01	2.40E-03	2.40E-03	9.89E-01	8.90E-03	8.90E-03	1.96E-01	0.00E+00	0.00E+00	4.93E-01	1.36E-01	1.15E+00
	2.57E+01	1.93E-03	1.93E-03	9.89E-01	8.91E-03	8.91E-03	1.87E-01	0.00E+00	0.00E+00	4.72E-01	1.41E-01	1.16E+00
	3.09E+01	1.53E-03	1.53E-03	9.90E-01	8.91E-03	8.91E-03	1.76E-01	0.00E+00	0.00E+00	4.52E-01	1.47E-01	1.17E+00
	3.72E+01	1.20E-03	1.20E-03	9.90E-01	8.91E-03	8.91E-03	1.63E-01	0.00E+00	0.00E+00	4.34E-01	1.53E-01	1.18E+00
	4.48E+01	9.32E-04	9.32E-04	9.90E-01	8.92E-03	8.92E-03	1.49E-01	0.00E+00	0.00E+00	4.18E-01	1.60E-01	1.19E+00
	5.40E+01	7.17E-04	7.17E-04	9.90E-01	8.92E-03	8.92E-03	1.34E-01	0.00E+00	0.00E+00	4.03E-01	1.66E-01	1.20E+00
	6.51E+01	5.46E-04	5.46E-04	9.91E-01	8.92E-03	8.92E-03	1.19E-01	0.00E+00	0.00E+00	3.88E-01	1.73E-01	1.20E+00
	7.85E+01	4.13E-04	4.13E-04	9.91E-01	8.92E-03	8.92E-03	1.05E-01	0.00E+00	0.00E+00	3.75E-01	1.81E-01	1.21E+00
	9.48E+01	3.09E-04	3.09E-04	9.91E-01	8.92E-03	8.92E-03	9.13E-02	0.00E+00	0.00E+00	3.62E-01	1.88E-01	1.22E+00
	1.14E+02	2.30E-04	2.30E-04	9.91E-01	8.92E-03	8.92E-03	7.87E-02	0.00E+00	0.00E+00	3.50E-01	1.95E-01	1.22E+00
	1.38E+02	1.70E-04	1.70E-04	9.91E-01	8.92E-03	8.92E-03	6.73E-02	0.00E+00	0.00E+00	3.39E-01	2.02E-01	1.23E+00
	1.67E+02	1.25E-04	1.25E-04	9.91E-01	8.92E-03	8.92E-03	5.71E-02	0.00E+00	0.00E+00	3.28E-01	2.08E-01	1.23E+00
	2.03E+02	8.59E-05	8.59E-05	9.91E-01	8.92E-03	8.92E-03	4.56E-02	0.00E+00	0.00E+00	3.17E-01	2.16E-01	1.22E+00
	2.47E+02	5.82E-05	5.82E-05	9.91E-01	8.92E-03	8.92E-03	3.60E-02	0.00E+00	0.00E+00	3.05E-01	2.24E-01	1.23E+00
	3.04E+02	3.88E-05	3.88E-05	9.91E-01	8.92E-03	8.92E-03	2.80E-02	0.00E+00	0.00E+00	2.94E-01	2.31E-01	1.23E+00
	3.75E+02	2.55E-05	2.55E-05	9.91E-01	8.92E-03	8.92E-03	2.16E-02	0.00E+00	0.00E+00	2.84E-01	2.37E-01	1.23E+00
	4.65E+02	1.65E-05	1.65E-05	9.91E-01	8.92E-03	8.92E-03	1.64E-02	0.00E+00	0.00E+00	2.74E-01	2.43E-01	1.23E+00
	5.78E+02	1.06E-05	1.06E-05	9.91E-01	8.92E-03	8.92E-03	1.24E-02	0.00E+00	0.00E+00			

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2.65E-01  2.47E-01  1.23E+00
         7.19E+02  6.68E-06  6.68E-06  9.91E-01  8.92E-03  8.92E-03  9.25E-03  0.00E+00  0.00E+00
2.55E-01  2.50E-01  1.23E+00
         8.96E+02  4.19E-06  4.19E-06  9.91E-01  8.92E-03  8.92E-03  6.88E-03  0.00E+00  0.00E+00
2.46E-01  2.52E-01  1.23E+00
         1.12E+03  2.61E-06  2.61E-06  9.91E-01  8.92E-03  8.92E-03  5.07E-03  0.00E+00  0.00E+00
2.37E-01  2.53E-01  1.23E+00
         1.39E+03  1.61E-06  1.61E-06  9.91E-01  8.92E-03  8.92E-03  3.73E-03  0.00E+00  0.00E+00
2.28E-01  2.52E-01  1.22E+00
         1.74E+03  9.94E-07  9.94E-07  9.91E-01  8.92E-03  8.92E-03  2.74E-03  0.00E+00  0.00E+00
2.20E-01  2.49E-01  1.22E+00
         2.17E+03  6.11E-07  6.11E-07  9.91E-01  8.92E-03  8.92E-03  2.03E-03  0.00E+00  0.00E+00
2.11E-01  2.44E-01  1.22E+00
         2.70E+03  3.75E-07  3.75E-07  9.91E-01  8.92E-03  8.92E-03  1.53E-03  0.00E+00  0.00E+00
2.02E-01  2.38E-01  1.21E+00
         3.37E+03  2.30E-07  2.30E-07  9.91E-01  8.92E-03  8.92E-03  1.16E-03  0.00E+00  0.00E+00
1.93E-01  2.31E-01  1.20E+00
         4.20E+03  1.41E-07  1.41E-07  9.91E-01  8.92E-03  8.92E-03  8.65E-04  0.00E+00  0.00E+00
1.84E-01  2.22E-01  1.19E+00
         5.23E+03  8.72E-08  8.72E-08  9.91E-01  8.92E-03  8.92E-03  6.75E-04  0.00E+00  0.00E+00
1.75E-01  2.12E-01  1.18E+00
         6.50E+03  5.39E-08  5.39E-08  9.91E-01  8.92E-03  8.92E-03  5.07E-04  0.00E+00  0.00E+00
1.65E-01  2.01E-01  1.17E+00
         8.07E+03  3.36E-08  3.36E-08  9.91E-01  8.92E-03  8.92E-03  3.56E-04  0.00E+00  0.00E+00
1.55E-01  1.90E-01  1.16E+00
         1.00E+04  2.10E-08  2.10E-08  9.91E-01  8.92E-03  8.92E-03  2.66E-04  0.00E+00  0.00E+00
1.44E-01  1.78E-01  1.15E+00
         1.24E+04  1.32E-08  1.32E-08  9.91E-01  8.92E-03  8.92E-03  3.21E-04  0.00E+00  0.00E+00
1.33E-01  1.66E-01  1.13E+00
         1.54E+04  8.41E-09  8.41E-09  9.91E-01  8.92E-03  8.92E-03  2.11E-04  0.00E+00  0.00E+00
1.21E-01  1.55E-01  1.11E+00
•          time averaged (tav =   60. s) volume concentration:  concentration contour parameters

          c(x,y,z,t) = cc(x) * (erf(xa)-erf(xb)) * (erf(ya)-erf(yb)) * (exp(-za*za)+exp(-zb*zb))

                 c(x,y,z,t) = concentration (volume fraction) at (x,y,z,t)
                          x = downwind distance (m)
                          y = crosswind horizontal distance (m)
                          z = height (m)
                          t = time (s)

                        erf = error functon             exp = exponential function
                         xa = (x-xc+bx)/(sr2*betax)      za = (z-zc)/(sr2*sig)
                         xb = (x-xc-bx)/(sr2*betax)      zb = (z+zc)/(sr2*sig)
                         ya = (y+b)/(sr2*betac)         sr2 = sqrt(2.0)
                         yb = (y-b)/(sr2*betac)

             x        cc(x)     b(x)    betac(x)    zc(x)    sig(x)               t        xc(t)
bx(t)   betax(t)
          1.00E+00  0.00E+00  3.02E-02  8.44E-03  1.00E+00  1.94E-02            0.00E+00  1.00E+00
0.00E+00  0.00E+00
          1.02E+00  3.26E-01  3.94E-02  3.46E-02  1.00E+00  4.14E-02            4.12E-04  1.02E+00
2.51E-02  2.05E-04
          1.05E+00  2.89E-01  4.53E-02  5.23E-02  1.00E+00  5.85E-02            1.34E-03  1.05E+00
5.55E-02  4.53E-04
          1.08E+00  2.61E-01  5.03E-02  6.95E-02  1.00E+00  7.53E-02            2.92E-03  1.08E+00
9.23E-02  7.54E-04
          1.11E+00  2.39E-01  5.50E-02  8.73E-02  1.00E+00  9.30E-02            5.41E-03  1.11E+00
1.37E-01  1.12E-03
          1.16E+00  2.21E-01  5.97E-02  1.07E-01  1.00E+00  1.12E-01            9.16E-03  1.16E+00
1.90E-01  1.56E-03
          1.21E+00  2.04E-01  6.43E-02  1.28E-01  1.00E+00  1.33E-01            1.47E-02  1.21E+00
2.55E-01  2.09E-03
          1.28E+00  1.89E-01  6.90E-02  1.51E-01  1.00E+00  1.57E-01            2.26E-02  1.28E+00
3.34E-01  2.73E-03
          1.36E+00  1.76E-01  7.38E-02  1.77E-01  1.00E+00  1.83E-01            3.40E-02  1.36E+00
4.29E-01  3.50E-03
          1.45E+00  1.63E-01  7.86E-02  2.07E-01  1.00E+00  2.12E-01            5.00E-02  1.45E+00
5.44E-01  4.44E-03
          1.57E+00  1.52E-01  8.35E-02  2.39E-01  1.00E+00  2.44E-01            7.23E-02  1.57E+00
6.83E-01  5.58E-03
          1.71E+00  1.41E-01  8.82E-02  2.76E-01  1.00E+00  2.81E-01            1.03E-01  1.71E+00
8.51E-01  6.95E-03
          1.88E+00  1.31E-01  9.29E-02  3.17E-01  1.00E+00  3.22E-01            1.46E-01  1.88E+00
1.05E+00  8.61E-03
          2.08E+00  1.22E-01  9.76E-02  3.63E-01  1.00E+00  3.67E-01            2.03E-01  2.08E+00
1.30E+00  1.06E-02
          2.33E+00  1.13E-01  1.02E-01  4.14E-01  1.01E+00  4.18E-01            2.81E-01  2.33E+00
1.60E+00  1.31E-02
          2.63E+00  1.05E-01  1.07E-01  4.71E-01  1.01E+00  4.75E-01            3.85E-01  2.63E+00
1.96E+00  1.60E-02
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2.99E+00	9.66E-02	1.11E-01	5.35E-01	1.02E+00	5.38E-01	5.22E-01	2.99E+00	2.39E+00	1.95E-02
3.43E+00	8.88E-02	1.14E-01	5.96E-01	1.03E+00	6.06E-01	7.02E-01	3.43E+00	2.92E+00	2.38E-02
3.96E+00	7.58E-02	1.16E-01	6.64E-01	1.04E+00	7.34E-01	9.33E-01	3.96E+00	3.56E+00	2.90E-02
4.61E+00	6.64E-02	1.18E-01	7.33E-01	1.06E+00	8.59E-01	1.23E+00	4.61E+00	4.33E+00	3.53E-02
5.38E+00	5.91E-02	1.20E-01	8.04E-01	1.08E+00	9.82E-01	1.59E+00	5.38E+00	5.26E+00	4.29E-02
6.32E+00	5.32E-02	1.21E-01	8.78E-01	1.12E+00	1.11E+00	2.05E+00	6.32E+00	6.38E+00	5.21E-02
7.45E+00	4.83E-02	1.21E-01	9.58E-01	1.17E+00	1.23E+00	2.61E+00	7.45E+00	7.74E+00	6.33E-02
8.83E+00	4.41E-02	1.21E-01	1.04E+00	1.23E+00	1.36E+00	3.29E+00	8.83E+00	9.39E+00	7.67E-02
1.05E+01	4.02E-02	1.20E-01	1.14E+00	1.31E+00	1.49E+00	4.11E+00	1.05E+01	1.14E+01	9.30E-02
1.25E+01	3.67E-02	1.20E-01	1.25E+00	1.41E+00	1.62E+00	5.10E+00	1.25E+01	1.38E+01	1.13E-01
1.49E+01	3.35E-02	1.19E-01	1.37E+00	1.53E+00	1.77E+00	6.28E+00	1.49E+01	1.67E+01	1.36E-01
1.79E+01	3.06E-02	1.18E-01	1.51E+00	1.67E+00	1.94E+00	7.68E+00	1.79E+01	2.02E+01	1.65E-01
2.14E+01	2.79E-02	1.17E-01	1.68E+00	1.84E+00	2.12E+00	9.32E+00	2.14E+01	2.45E+01	2.00E-01
2.57E+01	2.53E-02	1.15E-01	1.87E+00	2.02E+00	2.33E+00	1.13E+01	2.57E+01	2.96E+01	2.42E-01
3.09E+01	2.29E-02	1.13E-01	2.10E+00	2.23E+00	2.57E+00	1.35E+01	3.09E+01	3.59E+01	2.93E-01
3.72E+01	2.06E-02	1.11E-01	2.38E+00	2.45E+00	2.85E+00	1.62E+01	3.72E+01	4.34E+01	3.54E-01
4.48E+01	1.84E-02	1.09E-01	2.70E+00	2.69E+00	3.20E+00	1.92E+01	4.48E+01	5.25E+01	4.29E-01
5.40E+01	1.64E-02	1.08E-01	3.10E+00	2.94E+00	3.61E+00	2.28E+01	5.40E+01	6.36E+01	5.19E-01
6.51E+01	1.44E-02	1.06E-01	3.57E+00	3.21E+00	4.10E+00	2.70E+01	6.51E+01	7.69E+01	6.28E-01
7.85E+01	1.26E-02	1.04E-01	4.13E+00	3.48E+00	4.70E+00	3.18E+01	7.85E+01	9.30E+01	7.59E-01
9.48E+01	1.10E-02	1.03E-01	4.82E+00	3.75E+00	5.38E+00	3.74E+01	9.48E+01	1.13E+02	9.19E-01
1.14E+02	9.52E-03	1.01E-01	5.67E+00	4.03E+00	6.17E+00	4.39E+01	1.14E+02	1.36E+02	1.11E+00
1.38E+02	8.25E-03	1.00E-01	6.70E+00	4.30E+00	7.09E+00	5.15E+01	1.38E+02	1.65E+02	1.34E+00
1.67E+02	7.13E-03	9.90E-02	7.94E+00	4.57E+00	8.15E+00	6.03E+01	1.67E+02	1.99E+02	1.63E+00
2.03E+02	6.07E-03	9.90E-02	9.54E+00	4.84E+00	9.69E+00	6.52E+01	2.03E+02	1.99E+02	3.89E+01
2.47E+02	5.16E-03	9.90E-02	1.15E+01	5.10E+00	1.15E+01	7.16E+01	2.47E+02	1.99E+02	5.88E+01
3.04E+02	4.38E-03	9.90E-02	1.40E+01	5.34E+00	1.37E+01	7.92E+01	3.04E+02	1.99E+02	7.73E+01
3.75E+02	3.72E-03	9.90E-02	1.72E+01	5.57E+00	1.62E+01	8.85E+01	3.75E+02	1.99E+02	9.62E+01
4.65E+02	3.16E-03	9.90E-02	2.10E+01	5.78E+00	1.92E+01	9.97E+01	4.65E+02	1.99E+02	1.17E+02
5.78E+02	2.68E-03	9.90E-02	2.58E+01	5.97E+00	2.28E+01	1.13E+02	5.78E+02	1.99E+02	1.39E+02
7.19E+02	2.27E-03	9.90E-02	3.16E+01	6.15E+00	2.69E+01	1.30E+02	7.19E+02	1.99E+02	1.64E+02
8.96E+02	1.93E-03	9.90E-02	3.88E+01	6.31E+00	3.18E+01	1.49E+02	8.96E+02	1.99E+02	1.93E+02
1.12E+03	1.64E-03	9.90E-02	4.75E+01	6.45E+00	3.75E+01	1.73E+02	1.12E+03	1.99E+02	2.27E+02
1.39E+03	1.39E-03	9.90E-02	5.80E+01	6.57E+00	4.42E+01	2.02E+02	1.39E+03	1.99E+02	2.66E+02
1.74E+03	1.19E-03	9.90E-02	7.06E+01	6.69E+00	5.20E+01	2.38E+02	1.74E+03	1.99E+02	3.12E+02
2.17E+03	1.01E-03	9.90E-02	8.56E+01	6.79E+00	6.10E+01	2.80E+02	2.17E+03	1.99E+02	3.67E+02
2.70E+03	8.64E-04	9.90E-02	1.03E+02	6.88E+00	7.16E+01	3.31E+02	2.70E+03	1.99E+02	4.32E+02
3.37E+03	7.39E-04	9.90E-02	1.24E+02	6.96E+00	8.38E+01	3.93E+02	3.37E+03	1.99E+02	5.09E+02
4.20E+03	6.33E-04	9.90E-02	1.48E+02	7.03E+00	9.79E+01	4.68E+02	4.20E+03	1.99E+02	6.00E+02
5.23E+03	5.43E-04	9.90E-02	1.77E+02	7.10E+00	1.14E+02	5.59E+02	5.23E+03	1.99E+02	7.10E+02
6.50E+03	4.67E-04	9.90E-02	2.09E+02	7.17E+00	1.33E+02	6.69E+02	6.50E+03		

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1.99E+02  8.41E+02
           8.07E+03  4.03E-04  9.90E-02  2.46E+02  7.22E+00  1.54E+02            8.01E+02  8.07E+03
1.99E+02  9.97E+02
           1.00E+04  3.49E-04  9.90E-02  2.88E+02  7.27E+00  1.78E+02            9.62E+02  1.00E+04
1.99E+02  1.18E+03
           1.24E+04  3.03E-04  9.90E-02  3.36E+02  7.33E+00  2.05E+02            1.16E+03  1.24E+04
1.99E+02  1.40E+03
           1.54E+04  2.64E-04  9.90E-02  3.90E+02  7.39E+00  2.34E+02            1.39E+03  1.54E+04
1.99E+02  1.67E+03
•

             time averaged (tav =   60. s) volume concentration:  concentration in the z =   .00 plane.

             downwind    time of      cloud     effective                average concentration (volume
fraction) at (x,y,z)
             distance    max conc    duration   half width        y/bbc=     y/bbc=     y/bbc=     y/bbc=
    y/bbc=     y/bbc=
             x (m)         (s)         (s)       bbc (m)             0.0        0.5        1.0
1.5        2.0        2.5
             1.00E+00    3.00E+01    6.00E+01    3.35E-02         0.00E+00   0.00E+00   0.00E+00
0.00E+00   0.00E+00   0.00E+00
             1.02E+00    3.00E+01    6.00E+01    7.17E-02         0.00E+00   0.00E+00   0.00E+00
0.00E+00   0.00E+00   0.00E+00
             1.05E+00    3.00E+01    6.00E+01    1.01E-01         0.00E+00   0.00E+00   0.00E+00
0.00E+00   0.00E+00   0.00E+00
             1.08E+00    3.00E+01    6.00E+01    1.30E-01         6.24E-39   4.31E-39   1.41E-39
2.12E-40   1.43E-41   4.23E-43
             1.11E+00    3.00E+01    6.00E+01    1.61E-01         7.10E-26   4.89E-26   1.59E-26
2.42E-27   1.68E-28   5.23E-30
             1.16E+00    3.00E+01    6.00E+01    1.94E-01         3.99E-18   2.75E-18   8.95E-19
1.36E-19   9.59E-21   3.08E-22
             1.21E+00    3.00E+01    6.00E+01    2.31E-01         3.56E-13   2.45E-13   7.96E-14
1.21E-14   8.63E-16   2.83E-17
             1.28E+00    3.01E+01    6.00E+01    2.71E-01         7.23E-10   4.97E-10   1.62E-10
2.47E-11   1.77E-12   5.85E-14
             1.36E+00    3.01E+01    6.00E+01    3.16E-01         1.37E-07   9.44E-08   3.07E-08
4.69E-09   3.37E-10   1.13E-11
             1.45E+00    3.01E+01    6.00E+01    3.67E-01         5.47E-06   3.76E-06   1.22E-06
1.87E-07   1.35E-08   4.53E-10
             1.57E+00    3.01E+01    6.00E+01    4.23E-01         7.53E-05   5.18E-05   1.68E-05
2.57E-06   1.86E-07   6.28E-09
             1.71E+00    3.01E+01    6.00E+01    4.86E-01         4.92E-04   3.38E-04   1.10E-04
1.68E-05   1.21E-06   4.12E-08
             1.88E+00    3.02E+01    6.00E+01    5.57E-01         1.89E-03   1.30E-03   4.21E-04
6.46E-05   4.66E-06   1.59E-07
             2.08E+00    3.02E+01    6.00E+01    6.36E-01         4.94E-03   3.40E-03   1.10E-03
1.69E-04   1.22E-05   4.17E-07
             2.33E+00    3.02E+01    6.00E+01    7.24E-01         9.75E-03   6.70E-03   2.18E-03
3.34E-04   2.41E-05   8.23E-07
             2.63E+00    3.03E+01    6.00E+01    8.23E-01         1.56E-02   1.07E-02   3.48E-03
5.34E-04   3.86E-05   1.32E-06
             2.99E+00    3.04E+01    6.00E+01    9.33E-01         2.13E-02   1.46E-02   4.75E-03
7.28E-04   5.27E-05   1.80E-06
             3.43E+00    3.04E+01    6.00E+01    1.04E+00         2.56E-02   1.76E-02   5.72E-03
8.77E-04   6.35E-05   2.17E-06
             3.96E+00    3.05E+01    6.00E+01    1.16E+00         3.09E-02   2.12E-02   6.89E-03
1.06E-03   7.65E-05   2.62E-06
             4.61E+00    3.07E+01    6.00E+01    1.28E+00         3.18E-02   2.18E-02   7.09E-03
1.09E-03   7.87E-05   2.69E-06
             5.38E+00    3.08E+01    6.00E+01    1.40E+00         3.02E-02   2.08E-02   6.75E-03
1.03E-03   7.50E-05   2.56E-06
             6.32E+00    3.10E+01    6.00E+01    1.53E+00         2.76E-02   1.90E-02   6.16E-03
9.44E-04   6.84E-05   2.34E-06
             7.45E+00    3.12E+01    6.00E+01    1.66E+00         2.44E-02   1.68E-02   5.45E-03
8.36E-04   6.06E-05   2.07E-06
             8.83E+00    3.14E+01    6.00E+01    1.81E+00         2.12E-02   1.46E-02   4.73E-03
7.25E-04   5.25E-05   1.79E-06
             1.05E+01    3.17E+01    6.00E+01    1.98E+00         1.80E-02   1.24E-02   4.02E-03
6.17E-04   4.47E-05   1.53E-06
             1.25E+01    3.21E+01    6.00E+01    2.16E+00         1.51E-02   1.04E-02   3.36E-03
5.16E-04   3.74E-05   1.28E-06
             1.49E+01    3.25E+01    6.00E+01    2.38E+00         1.24E-02   8.53E-03   2.77E-03
4.25E-04   3.08E-05   1.05E-06
             1.79E+01    3.30E+01    6.00E+01    2.62E+00         1.01E-02   6.92E-03   2.25E-03
3.45E-04   2.50E-05   8.57E-07
             2.14E+01    3.37E+01    6.00E+01    2.91E+00         8.05E-03   5.53E-03   1.80E-03
2.76E-04   2.00E-05   6.83E-07
             2.57E+01    3.45E+01    6.00E+01    3.24E+00         6.36E-03   4.37E-03   1.42E-03
2.17E-04   1.58E-05   5.41E-07
             3.09E+01    3.54E+01    6.00E+01    3.64E+00         4.96E-03   3.41E-03   1.11E-03
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1.70E-04   1.23E-05   4.20E-07
             3.72E+01    3.65E+01    6.00E+01    4.12E+00         3.83E-03   2.63E-03   8.55E-04
1.31E-04   9.50E-06   3.27E-07
             4.48E+01    3.79E+01    6.00E+01    4.69E+00         2.93E-03   2.02E-03   6.54E-04
1.00E-04   7.27E-06   2.49E-07
             5.40E+01    3.96E+01    6.00E+01    5.37E+00         2.23E-03   1.53E-03   4.97E-04
7.62E-05   5.52E-06   1.87E-07
             6.51E+01    4.16E+01    6.00E+01    6.18E+00         1.68E-03   1.15E-03   3.74E-04
5.74E-05   4.16E-06   1.42E-07
             7.85E+01    4.40E+01    6.00E+01    7.16E+00         1.25E-03   8.61E-04   2.80E-04
4.29E-05   3.10E-06   1.08E-07
             9.48E+01    4.70E+01    6.00E+01    8.36E+00         9.28E-04   6.38E-04   2.07E-04
3.17E-05   2.30E-06   7.80E-08
             1.14E+02    5.05E+01    6.00E+01    9.82E+00         6.82E-04   4.69E-04   1.52E-04
2.33E-05   1.69E-06   5.83E-08
             1.38E+02    5.48E+01    6.00E+01    1.16E+01         4.98E-04   3.42E-04   1.11E-04
1.70E-05   1.23E-06   4.23E-08
             1.67E+02    6.00E+01    6.00E+01    1.38E+01         3.60E-04   2.48E-04   8.04E-05
1.23E-05   8.92E-07   3.02E-08
             2.03E+02    6.52E+01    6.06E+01    1.65E+01         2.36E-04   1.62E-04   5.26E-05
8.07E-06   5.85E-07   2.04E-08
             2.47E+02    7.16E+01    6.18E+01    2.00E+01         1.58E-04   1.09E-04   3.53E-05
5.41E-06   3.92E-07   1.38E-08
             3.04E+02    7.92E+01    6.37E+01    2.43E+01         1.05E-04   7.23E-05   2.35E-05
3.60E-06   2.60E-07   8.92E-09
             3.75E+02    8.85E+01    6.62E+01    2.97E+01         6.95E-05   4.77E-05   1.55E-05
2.38E-06   1.72E-07   5.85E-09
             4.65E+02    9.97E+01    6.96E+01    3.64E+01         4.55E-05   3.13E-05   1.02E-05
1.56E-06   1.13E-07   3.61E-09
             5.78E+02    1.13E+02    7.39E+01    4.47E+01         2.96E-05   2.04E-05   6.61E-06
1.01E-06   7.33E-08   2.31E-09
             7.19E+02    1.30E+02    7.93E+01    5.48E+01         1.92E-05   1.32E-05   4.27E-06
6.55E-07   4.76E-08   1.83E-09
             8.96E+02    1.49E+02    8.59E+01    6.72E+01         1.23E-05   8.44E-06   2.74E-06
4.20E-07   3.04E-08   1.08E-09
             1.12E+03    1.73E+02    9.40E+01    8.23E+01         7.82E-06   5.38E-06   1.75E-06
2.68E-07   1.93E-08   5.61E-10
             1.39E+03    2.02E+02    1.04E+02    1.00E+02         4.95E-06   3.40E-06   1.10E-06
1.69E-07   1.22E-08   4.33E-10
             1.74E+03    2.38E+02    1.15E+02    1.22E+02         3.11E-06   2.14E-06   6.93E-07
1.06E-07   7.70E-09   3.31E-10
             2.17E+03    2.80E+02    1.29E+02    1.48E+02         1.94E-06   1.33E-06   4.33E-07
6.65E-08   4.83E-09   1.25E-10
             2.70E+03    3.31E+02    1.46E+02    1.79E+02         1.21E-06   8.31E-07   2.70E-07
4.14E-08   2.97E-09   9.42E-11
             3.37E+03    3.93E+02    1.66E+02    2.15E+02         7.50E-07   5.16E-07   1.67E-07
2.57E-08   1.86E-09   7.03E-11
             4.20E+03    4.68E+02    1.89E+02    2.57E+02         4.65E-07   3.20E-07   1.04E-07
1.59E-08   1.17E-09   5.21E-11
             5.23E+03    5.59E+02    2.17E+02    3.06E+02         2.89E-07   1.98E-07   6.44E-08
9.87E-09   7.12E-10   3.85E-11
             6.50E+03    6.69E+02    2.51E+02    3.62E+02         1.79E-07   1.23E-07   4.00E-08
6.13E-09   4.39E-10   2.83E-11
             8.07E+03    8.01E+02    2.90E+02    4.26E+02         1.12E-07   7.70E-08   2.50E-08
3.84E-09   2.81E-10   0.00E+00
             1.00E+04    9.62E+02    3.36E+02    4.99E+02         7.02E-08   4.83E-08   1.57E-08
2.41E-09   1.76E-10   0.00E+00
             1.24E+04    1.16E+03    3.91E+02    5.82E+02         4.43E-08   3.05E-08   9.90E-09
1.51E-09   1.07E-10   0.00E+00
             1.54E+04    1.39E+03    4.55E+02    6.75E+02         2.82E-08   1.94E-08   6.29E-09
9.67E-10   7.05E-11   0.00E+00
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             time averaged (tav =   60. s) volume concentration:  maximum concentration (volume fraction)
along centerline.
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downwind distance x (m)	height z (m)	maximum concentration c(x,0,z)	time of max conc (s)	cloud duration (s)
1.00E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.02E+00	1.00E+00	9.74E-01	3.00E+01	6.00E+01
1.05E+00	1.00E+00	7.09E-01	3.00E+01	6.00E+01
1.08E+00	1.00E+00	5.56E-01	3.00E+01	6.00E+01
1.11E+00	1.00E+00	4.51E-01	3.00E+01	6.00E+01
1.16E+00	1.00E+00	3.74E-01	3.00E+01	6.00E+01
1.21E+00	1.00E+00	3.14E-01	3.00E+01	6.00E+01
1.28E+00	1.00E+00	2.66E-01	3.01E+01	6.00E+01
1.36E+00	1.00E+00	2.26E-01	3.01E+01	6.00E+01
1.45E+00	1.00E+00	1.93E-01	3.01E+01	6.00E+01
1.57E+00	1.00E+00	1.65E-01	3.01E+01	6.00E+01

1.71E+00	1.00E+00	1.42E-01	3.01E+01	6.00E+01
1.88E+00	1.00E+00	1.21E-01	3.02E+01	6.00E+01
2.08E+00	1.00E+00	1.03E-01	3.02E+01	6.00E+01
2.33E+00	1.01E+00	8.81E-02	3.02E+01	6.00E+01
2.63E+00	1.01E+00	7.48E-02	3.03E+01	6.00E+01
2.99E+00	1.01E+00	6.32E-02	3.04E+01	6.00E+01
3.43E+00	1.02E+00	5.39E-02	3.04E+01	6.00E+01
3.96E+00	9.95E-01	4.29E-02	3.05E+01	6.00E+01
4.61E+00	9.16E-01	3.59E-02	3.07E+01	6.00E+01
5.38E+00	7.39E-01	3.11E-02	3.08E+01	6.00E+01
6.32E+00	3.21E-01	2.76E-02	3.10E+01	6.00E+01
7.45E+00	0.00E+00	2.44E-02	3.12E+01	6.00E+01
8.83E+00	0.00E+00	2.12E-02	3.14E+01	6.00E+01
1.05E+01	0.00E+00	1.80E-02	3.17E+01	6.00E+01
1.25E+01	0.00E+00	1.51E-02	3.21E+01	6.00E+01
1.49E+01	0.00E+00	1.24E-02	3.25E+01	6.00E+01
1.79E+01	0.00E+00	1.01E-02	3.30E+01	6.00E+01
2.14E+01	0.00E+00	8.05E-03	3.37E+01	6.00E+01
2.57E+01	0.00E+00	6.36E-03	3.45E+01	6.00E+01
3.09E+01	0.00E+00	4.96E-03	3.54E+01	6.00E+01
3.72E+01	0.00E+00	3.83E-03	3.65E+01	6.00E+01
4.48E+01	0.00E+00	2.93E-03	3.79E+01	6.00E+01
5.40E+01	0.00E+00	2.23E-03	3.96E+01	6.00E+01
6.51E+01	0.00E+00	1.68E-03	4.16E+01	6.00E+01
7.85E+01	0.00E+00	1.25E-03	4.40E+01	6.00E+01
9.48E+01	0.00E+00	9.28E-04	4.70E+01	6.00E+01
1.14E+02	0.00E+00	6.82E-04	5.05E+01	6.00E+01
1.38E+02	0.00E+00	4.98E-04	5.48E+01	6.00E+01
1.67E+02	0.00E+00	3.60E-04	6.00E+01	6.00E+01
2.03E+02	0.00E+00	2.36E-04	6.52E+01	6.06E+01
2.47E+02	0.00E+00	1.58E-04	7.16E+01	6.18E+01
3.04E+02	0.00E+00	1.05E-04	7.92E+01	6.37E+01
3.75E+02	0.00E+00	6.95E-05	8.85E+01	6.62E+01
4.65E+02	0.00E+00	4.55E-05	9.97E+01	6.96E+01
5.78E+02	0.00E+00	2.96E-05	1.13E+02	7.39E+01
7.19E+02	0.00E+00	1.92E-05	1.30E+02	7.93E+01
8.96E+02	0.00E+00	1.23E-05	1.49E+02	8.59E+01
1.12E+03	0.00E+00	7.82E-06	1.73E+02	9.40E+01
1.39E+03	0.00E+00	4.95E-06	2.02E+02	1.04E+02
1.74E+03	0.00E+00	3.11E-06	2.38E+02	1.15E+02
2.17E+03	0.00E+00	1.94E-06	2.80E+02	1.29E+02
2.70E+03	0.00E+00	1.21E-06	3.31E+02	1.46E+02
3.37E+03	0.00E+00	7.50E-07	3.93E+02	1.66E+02
4.20E+03	0.00E+00	4.65E-07	4.68E+02	1.89E+02
5.23E+03	0.00E+00	2.89E-07	5.59E+02	2.17E+02
6.50E+03	0.00E+00	1.79E-07	6.69E+02	2.51E+02
8.07E+03	0.00E+00	1.12E-07	8.01E+02	2.90E+02
1.00E+04	0.00E+00	7.02E-08	9.62E+02	3.36E+02
1.24E+04	0.00E+00	4.43E-08	1.16E+03	3.91E+02
1.54E+04	0.00E+00	2.82E-08	1.39E+03	4.55E+02

•(10U •&l0O •&k2S •&l8D •

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problem input

idspl =         2
ncalc =         1
wms   =   .016000
cps   =   2240.00
tbp   =    111.70
cmed0 =       .00
dhe   =   509880.
cpsl  =   3349.00
rhosl =    424.10
spb   =     -1.00
spc   =       .00
ts    =    450.00
qs    =       .38
as    =       .00
tsd   =       60.
qtis  =       .00
hs    =      1.00
tav   =     60.00
xffm  =   9000.00
zp(1) =       .00
zp(2) =       .00
zp(3) =       .00
zp(4) =       .00
z0    =   .300000
za    =      2.00
ua    =      2.00
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```
 ta    =    293.00
 rh    =     60.00
 stab  =      6.00
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release gas properties

molecular weight of source gas (kg)              - wms  =  1.6000E-02
vapor heat capacity, const. p.  (j/kg-k)         - cps  =  2.2400E+03
temperature of source gas (k)                    - ts   =  4.5000E+02
density of source gas (kg/m3)                    - rhos =  4.3331E-01
boiling point temperature                        - tbp  =  1.1170E+02
liquid mass fraction                             - cmed0=  0.0000E+00
liquid heat capacity (j/kg-k)                    - cpsl =  3.3490E+03
heat of vaporization (j/kg)                      - dhe  =  5.0988E+05
liquid source density (kg/m3)                    - rhosl=  4.2410E+02
saturation pressure constant                     - spa  =  8.7843E+00
saturation pressure constant (k)                 - spb  =  9.8121E+02
saturation pressure constant (k)                 - spc  =  0.0000E+00


spill characteristics

spill type                                       - idspl=          2
mass source rate (kg/s)                          - qs   =  3.8000E-01
continuous source duration (s)                   - tsd  =  6.0000E+01
continuous source mass (kg)                      - qtcs =  2.2800E+01
instantaneous source mass (kg)                   - qtis =  0.0000E+00
source area (m2)                                 - as   =  4.5000E-03
vertical vapor velocity (m/s)                    - ws   =  0.0000E+00
source half width (m)                            - bs   =  3.3541E-02
source height (m)                                - hs   =  1.0000E+00
horizontal vapor velocity (m/s)                  - us   =  1.9488E+02


field parameters

concentration averaging time (s)                 - tav  =  6.0000E+01
mixing layer height (m)                          - hmx  =  2.6000E+02
maximum downwind distance (m)                    - xffm =  9.0000E+03
concentration measurement height (m)             - zp(1)=  0.0000E+00
                                                 - zp(2)=  0.0000E+00
                                                 - zp(3)=  0.0000E+00
                                                 - zp(4)=  0.0000E+00


ambient meteorological properties

molecular weight of ambient air (kg)            - wmae  =  2.8804E-02
heat capacity of ambient air at const p. (j/kg-k)- cpaa  =  1.0134E+03
density of ambient air (kg/m3)                  - rhoa  =  1.1980E+00
ambient measurement height (m)                  - za    =  2.0000E+00
ambient atmospheric pressure (pa=n/m2=j/m3)     - pa    =  1.0133E+05
ambient wind speed (m/s)                        - ua    =  2.0000E+00
ambient temperature (k)                         - ta    =  2.9300E+02
relative humidity (percent)                     - rh    =  6.0000E+01
ambient friction velocity (m/s)                 - uastr =  3.2808E-01
atmospheric stability class value               - stab  =  6.0000E+00
inverse monin-obukhov length (1/m)              - ala   =  4.7330E-02
surface roughness height (m)                    - z0    =  3.0000E-01


additional parameters

sub-step multiplier                             - ncalc =          1
number of calculational sub-steps               - nssm  =          3
acceleration of gravity (m/s2)                  - grav  =  9.8067E+00
gas constant (j/mol- k)                         - rr    =  8.3143E+00
von karman constant                             - xk    =  4.1000E-01
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instantaneous spatially averaged cloud parameters

          x        zc         h        bb         b        bbx       bx        cv        rho        t
      u        ua
        1.00E+00  1.00E+00  6.71E-02  3.35E-02  3.02E-02  0.00E+00  0.00E+00  1.00E+00  4.33E-01
4.50E+02  1.95E+02  6.06E-01
        1.02E+00  1.00E+00  1.49E-01  7.47E-02  4.01E-02  2.27E-02  2.27E-02  5.00E-01  7.19E-01
3.80E+02  6.62E+01  6.30E-01
        1.05E+00  1.00E+00  2.14E-01  1.07E-01  4.64E-02  5.03E-02  5.02E-02  3.56E-01  8.29E-01
```

3.57E+02 4.27E+01 6.49E-01
1.08E+00 1.00E+00 2.77E-01 1.38E-01 5.18E-02 8.35E-02 8.35E-02 2.77E-01 8.97E-01
3.43E+02 3.15E+01 6.68E-01
1.11E+00 1.00E+00 3.44E-01 1.72E-01 5.70E-02 1.24E-01 1.24E-01 2.23E-01 9.47E-01
3.34E+02 2.46E+01 6.88E-01
1.16E+00 1.00E+00 4.18E-01 2.09E-01 6.21E-02 1.72E-01 1.72E-01 1.85E-01 9.85E-01
3.27E+02 1.98E+01 7.09E-01
1.21E+00 1.00E+00 4.99E-01 2.49E-01 6.73E-02 2.31E-01 2.31E-01 1.55E-01 1.02E+00
3.22E+02 1.63E+01 7.32E-01
1.28E+00 1.00E+00 5.90E-01 2.95E-01 7.25E-02 3.02E-01 3.02E-01 1.31E-01 1.04E+00
3.17E+02 1.36E+01 7.57E-01
1.36E+00 1.00E+00 6.91E-01 3.46E-01 7.80E-02 3.88E-01 3.88E-01 1.11E-01 1.06E+00
3.14E+02 1.15E+01 7.85E-01
1.45E+00 1.00E+00 8.06E-01 4.03E-01 8.36E-02 4.93E-01 4.93E-01 9.51E-02 1.08E+00
3.11E+02 9.82E+00 8.17E-01
1.57E+00 1.00E+00 9.34E-01 4.67E-01 8.94E-02 6.18E-01 6.18E-01 8.17E-02 1.10E+00
3.08E+02 8.44E+00 8.51E-01
1.71E+00 1.00E+00 1.08E+00 5.38E-01 9.53E-02 7.71E-01 7.71E-01 7.03E-02 1.11E+00
3.06E+02 7.32E+00 8.89E-01
1.88E+00 1.00E+00 1.24E+00 6.18E-01 1.01E-01 9.55E-01 9.55E-01 6.07E-02 1.12E+00
3.05E+02 6.39E+00 9.30E-01
2.08E+00 1.01E+00 1.41E+00 7.07E-01 1.07E-01 1.18E+00 1.18E+00 5.25E-02 1.13E+00
3.03E+02 5.63E+00 9.75E-01
2.33E+00 1.01E+00 1.61E+00 8.04E-01 1.13E-01 1.45E+00 1.45E+00 4.54E-02 1.14E+00
3.02E+02 5.00E+00 1.02E+00
2.63E+00 1.01E+00 1.82E+00 9.11E-01 1.18E-01 1.77E+00 1.77E+00 3.94E-02 1.15E+00
3.01E+02 4.47E+00 1.08E+00
2.99E+00 1.02E+00 2.05E+00 1.02E+00 1.24E-01 2.17E+00 2.17E+00 3.44E-02 1.15E+00
3.00E+02 4.05E+00 1.13E+00
3.43E+00 1.04E+00 2.28E+00 1.14E+00 1.29E-01 2.64E+00 2.64E+00 3.01E-02 1.16E+00
2.99E+02 3.71E+00 1.23E+00
3.96E+00 1.06E+00 2.52E+00 1.26E+00 1.33E-01 3.22E+00 3.22E+00 2.66E-02 1.16E+00
2.98E+02 3.45E+00 1.32E+00
4.61E+00 1.10E+00 2.75E+00 1.38E+00 1.37E-01 3.92E+00 3.92E+00 2.36E-02 1.17E+00
2.97E+02 3.24E+00 1.41E+00
5.38E+00 1.15E+00 3.00E+00 1.50E+00 1.40E-01 4.76E+00 4.76E+00 2.10E-02 1.17E+00
2.97E+02 3.08E+00 1.50E+00
6.32E+00 1.22E+00 3.24E+00 1.62E+00 1.42E-01 5.78E+00 5.78E+00 1.86E-02 1.17E+00
2.96E+02 2.94E+00 1.58E+00
7.45E+00 1.34E+00 3.50E+00 1.75E+00 1.44E-01 7.01E+00 7.01E+00 1.66E-02 1.18E+00
2.96E+02 2.84E+00 1.66E+00
8.83E+00 1.49E+00 3.76E+00 1.88E+00 1.46E-01 8.50E+00 8.50E+00 1.48E-02 1.18E+00
2.96E+02 2.75E+00 1.74E+00
1.05E+01 1.72E+00 4.03E+00 2.01E+00 1.47E-01 1.03E+01 1.03E+01 1.32E-02 1.18E+00
2.95E+02 2.69E+00 1.82E+00
1.25E+01 2.03E+00 4.31E+00 2.15E+00 1.48E-01 1.25E+01 1.25E+01 1.17E-02 1.18E+00
2.95E+02 2.64E+00 1.89E+00
1.49E+01 2.45E+00 4.59E+00 2.30E+00 1.48E-01 1.51E+01 1.51E+01 1.03E-02 1.19E+00
2.95E+02 2.65E+00 2.00E+00
1.79E+01 2.98E+00 4.94E+00 2.47E+00 1.47E-01 1.83E+01 1.83E+01 8.68E-03 1.19E+00
2.94E+02 2.70E+00 2.17E+00
2.14E+01 3.63E+00 5.29E+00 2.64E+00 1.45E-01 2.22E+01 2.22E+01 7.36E-03 1.19E+00
2.94E+02 2.79E+00 2.34E+00
2.57E+01 4.42E+00 5.63E+00 2.82E+00 1.42E-01 2.68E+01 2.68E+01 6.24E-03 1.19E+00
2.94E+02 2.89E+00 2.52E+00
3.09E+01 5.35E+00 5.99E+00 3.00E+00 1.40E-01 3.25E+01 3.25E+01 5.28E-03 1.19E+00
2.94E+02 3.02E+00 2.71E+00
3.72E+01 6.44E+00 6.38E+00 3.19E+00 1.37E-01 3.93E+01 3.93E+01 4.45E-03 1.19E+00
2.94E+02 3.15E+00 2.90E+00
4.48E+01 7.70E+00 6.81E+00 3.41E+00 1.34E-01 4.75E+01 4.75E+01 3.73E-03 1.19E+00
2.94E+02 3.30E+00 3.09E+00
5.40E+01 9.14E+00 7.28E+00 3.65E+00 1.32E-01 5.75E+01 5.75E+01 3.11E-03 1.19E+00
2.94E+02 3.46E+00 3.29E+00
6.51E+01 1.08E+01 7.79E+00 3.96E+00 1.30E-01 6.96E+01 6.96E+01 2.56E-03 1.19E+00
2.93E+02 3.62E+00 3.48E+00
7.85E+01 1.26E+01 8.35E+00 4.34E+00 1.29E-01 8.42E+01 8.42E+01 2.09E-03 1.20E+00
2.93E+02 3.78E+00 3.68E+00
9.48E+01 1.46E+01 8.95E+00 4.81E+00 1.27E-01 1.02E+02 1.02E+02 1.68E-03 1.20E+00
2.93E+02 3.94E+00 3.86E+00
1.14E+02 1.67E+01 9.62E+00 5.38E+00 1.25E-01 1.23E+02 1.23E+02 1.34E-03 1.20E+00
2.93E+02 4.11E+00 4.05E+00
1.39E+02 1.90E+01 1.07E+01 6.17E+00 1.25E-01 1.33E+02 1.23E+02 9.81E-04 1.20E+00
2.93E+02 4.27E+00 4.23E+00
1.69E+02 2.14E+01 1.19E+01 7.17E+00 1.25E-01 1.44E+02 1.23E+02 6.99E-04 1.20E+00
2.93E+02 4.43E+00 4.40E+00
2.07E+02 2.37E+01 1.32E+01 8.41E+00 1.25E-01 1.58E+02 1.23E+02 4.87E-04 1.20E+00
2.93E+02 4.59E+00 4.56E+00
2.55E+02 2.61E+01 1.48E+01 9.94E+00 1.25E-01 1.75E+02 1.23E+02 3.32E-04 1.20E+00
2.93E+02 4.73E+00 4.71E+00
3.15E+02 2.84E+01 1.67E+01 1.18E+01 1.25E-01 1.95E+02 1.23E+02 2.22E-04 1.20E+00
2.93E+02 4.86E+00 4.85E+00

3.88E+02	3.05E+01	1.89E+01	1.42E+01	1.25E-01	2.19E+02	1.23E+02	1.46E-04	1.20E+00	2.93E+02	4.99E+00	4.99E+00	
4.80E+02	3.26E+01	2.16E+01	1.70E+01	1.25E-01	2.48E+02	1.23E+02	9.41E-05	1.20E+00	2.93E+02	5.11E+00	5.11E+00	
5.93E+02	3.45E+01	2.47E+01	2.05E+01	1.25E-01	2.83E+02	1.23E+02	5.98E-05	1.20E+00	2.93E+02	5.23E+00	5.23E+00	
7.33E+02	3.63E+01	2.84E+01	2.47E+01	1.25E-01	3.24E+02	1.23E+02	3.76E-05	1.20E+00	2.93E+02	5.34E+00	5.34E+00	
9.06E+02	3.79E+01	3.30E+01	2.98E+01	1.25E-01	3.74E+02	1.23E+02	2.33E-05	1.20E+00	2.93E+02	5.45E+00	5.45E+00	
1.12E+03	3.94E+01	3.85E+01	3.59E+01	1.25E-01	4.34E+02	1.23E+02	1.43E-05	1.20E+00	2.93E+02	5.56E+00	5.56E+00	
1.38E+03	4.06E+01	4.52E+01	4.32E+01	1.25E-01	5.06E+02	1.23E+02	8.67E-06	1.20E+00	2.93E+02	5.68E+00	5.68E+00	
1.71E+03	4.18E+01	5.35E+01	5.18E+01	1.25E-01	5.92E+02	1.23E+02	5.21E-06	1.20E+00	2.93E+02	5.80E+00	5.80E+00	
2.11E+03	4.28E+01	6.39E+01	6.21E+01	1.25E-01	6.95E+02	1.23E+02	3.10E-06	1.20E+00	2.93E+02	5.93E+00	5.93E+00	
2.61E+03	4.37E+01	7.71E+01	7.42E+01	1.25E-01	8.19E+02	1.23E+02	1.83E-06	1.20E+00	2.93E+02	6.07E+00	6.07E+00	
3.22E+03	4.44E+01	8.86E+01	8.84E+01	1.25E-01	9.66E+02	1.23E+02	1.13E-06	1.20E+00	2.93E+02	6.18E+00	6.18E+00	
3.98E+03	4.52E+01	9.33E+01	1.05E+02	1.25E-01	1.14E+03	1.23E+02	7.67E-07	1.20E+00	2.93E+02	6.25E+00	6.25E+00	
4.90E+03	4.59E+01	9.86E+01	1.24E+02	1.25E-01	1.35E+03	1.23E+02	5.19E-07	1.20E+00	2.93E+02	6.33E+00	6.33E+00	
6.03E+03	4.67E+01	1.05E+02	1.45E+02	1.25E-01	1.61E+03	1.23E+02	3.50E-07	1.20E+00	2.93E+02	6.41E+00	6.41E+00	
7.41E+03	4.75E+01	1.12E+02	1.70E+02	1.25E-01	1.91E+03	1.23E+02	2.36E-07	1.20E+00	2.93E+02	6.50E+00	6.50E+00	
9.11E+03	4.82E+01	1.20E+02	1.98E+02	1.25E-01	2.27E+03	1.23E+02	1.59E-07	1.20E+00	2.93E+02	6.60E+00	6.60E+00	
1.12E+04	4.91E+01	1.29E+02	2.29E+02	1.25E-01	2.70E+03	1.23E+02	1.07E-07	1.20E+00	2.93E+02	6.70E+00	6.70E+00	
1.38E+04	5.00E+01	1.39E+02	2.65E+02	1.25E-01	3.22E+03	1.23E+02	7.22E-08	1.20E+00	2.93E+02	6.79E+00	6.79E+00	

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x	cm	cmv	cmda	cmw	cmwv	wc	vg	ug	w	v	vx
1.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.12E+02	4.67E+01	0.00E+00
1.02E+00	3.57E-01	3.57E-01	6.37E-01	5.74E-03	5.74E-03	1.42E-03	0.00E+00	0.00E+00	6.18E+01	9.50E+00	5.08E-01
1.05E+00	2.35E-01	2.35E-01	7.58E-01	6.83E-03	6.83E-03	3.07E-03	0.00E+00	0.00E+00	3.35E+01	5.29E+00	5.10E-01
1.08E+00	1.75E-01	1.75E-01	8.17E-01	7.36E-03	7.36E-03	5.06E-03	0.00E+00	0.00E+00	2.21E+01	3.58E+00	5.12E-01
1.11E+00	1.38E-01	1.38E-01	8.54E-01	7.69E-03	7.69E-03	7.48E-03	0.00E+00	0.00E+00	1.59E+01	2.63E+00	5.14E-01
1.16E+00	1.12E-01	1.12E-01	8.80E-01	7.93E-03	7.93E-03	1.04E-02	0.00E+00	0.00E+00	1.19E+01	2.02E+00	5.16E-01
1.21E+00	9.22E-02	9.22E-02	9.00E-01	8.10E-03	8.10E-03	1.39E-02	0.00E+00	0.00E+00	9.17E+00	1.60E+00	5.18E-01
1.28E+00	7.71E-02	7.71E-02	9.15E-01	8.24E-03	8.24E-03	1.81E-02	0.00E+00	0.00E+00	7.19E+00	1.29E+00	5.21E-01
1.36E+00	6.50E-02	6.50E-02	9.27E-01	8.34E-03	8.34E-03	2.32E-02	0.00E+00	0.00E+00	5.71E+00	1.05E+00	5.24E-01
1.45E+00	5.52E-02	5.52E-02	9.36E-01	8.43E-03	8.43E-03	2.93E-02	0.00E+00	0.00E+00	4.57E+00	8.68E-01	5.27E-01
1.57E+00	4.71E-02	4.71E-02	9.44E-01	8.50E-03	8.50E-03	3.66E-02	0.00E+00	0.00E+00	3.69E+00	7.22E-01	5.30E-01
1.71E+00	4.03E-02	4.03E-02	9.51E-01	8.56E-03	8.56E-03	4.52E-02	0.00E+00	0.00E+00	2.99E+00	6.04E-01	5.34E-01
1.88E+00	3.46E-02	3.46E-02	9.57E-01	8.62E-03	8.62E-03	5.55E-02	0.00E+00	0.00E+00	2.44E+00	5.08E-01	5.39E-01
2.08E+00	2.98E-02	2.98E-02	9.62E-01	8.66E-03	8.66E-03	6.75E-02	0.00E+00	0.00E+00	2.00E+00	4.29E-01	5.44E-01
2.33E+00	2.57E-02	2.57E-02	9.66E-01	8.69E-03	8.69E-03	8.16E-02	0.00E+00	0.00E+00	1.65E+00	3.64E-01	5.50E-01
2.63E+00	2.23E-02	2.23E-02	9.69E-01	8.73E-03	8.73E-03	9.79E-02	0.00E+00	0.00E+00	1.37E+00	3.09E-01	5.56E-01
2.99E+00	1.94E-02	1.94E-02	9.72E-01	8.75E-03	8.75E-03	1.17E-01	0.00E+00	0.00E+00	1.06E+00	2.65E-01	5.63E-01
3.43E+00	1.70E-02	1.70E-02	9.74E-01	8.77E-03	8.77E-03	1.40E-01	0.00E+00	0.00E+00	8.21E-01	2.25E-01	5.75E-01
3.96E+00	1.50E-02	1.50E-02	9.76E-01	8.79E-03	8.79E-03	1.66E-01	0.00E+00	0.00E+00	6.52E-01	1.92E-01	5.88E-01
4.61E+00	1.32E-02	1.32E-02	9.78E-01	8.81E-03	8.81E-03	1.95E-01	0.00E+00	0.00E+00	5.29E-01	1.66E-01	6.01E-01
5.38E+00	1.17E-02	1.17E-02	9.79E-01	8.82E-03	8.82E-03	2.27E-01	0.00E+00	0.00E+00			

4.35E-01 1.43E-01 6.15E-01
6.32E+00 1.04E-02 1.04E-02 9.81E-01 8.83E-03 8.83E-03 2.63E-01 0.00E+00 0.00E+00
3.63E-01 1.25E-01 6.31E-01
7.45E+00 9.30E-03 9.30E-03 9.82E-01 8.84E-03 8.84E-03 3.02E-01 0.00E+00 0.00E+00
3.06E-01 1.09E-01 6.49E-01
8.83E+00 8.28E-03 8.28E-03 9.83E-01 8.85E-03 8.85E-03 3.44E-01 0.00E+00 0.00E+00
2.61E-01 9.58E-02 6.68E-01
1.05E+01 7.37E-03 7.37E-03 9.84E-01 8.86E-03 8.86E-03 3.88E-01 0.00E+00 0.00E+00
2.25E-01 8.47E-02 6.90E-01
1.25E+01 6.56E-03 6.56E-03 9.85E-01 8.87E-03 8.87E-03 4.35E-01 0.00E+00 0.00E+00
1.96E-01 7.56E-02 7.15E-01
1.49E+01 5.73E-03 5.73E-03 9.85E-01 8.87E-03 8.87E-03 4.74E-01 0.00E+00 0.00E+00
3.08E-01 6.85E-02 7.45E-01
1.79E+01 4.84E-03 4.84E-03 9.86E-01 8.88E-03 8.88E-03 4.94E-01 0.00E+00 0.00E+00
2.70E-01 6.30E-02 7.78E-01
2.14E+01 4.10E-03 4.10E-03 9.87E-01 8.89E-03 8.89E-03 5.11E-01 0.00E+00 0.00E+00
2.38E-01 5.99E-02 8.10E-01
2.57E+01 3.48E-03 3.48E-03 9.88E-01 8.89E-03 8.89E-03 5.25E-01 0.00E+00 0.00E+00
2.12E-01 5.87E-02 8.39E-01
3.09E+01 2.94E-03 2.94E-03 9.88E-01 8.90E-03 8.90E-03 5.34E-01 0.00E+00 0.00E+00
1.89E-01 5.89E-02 8.65E-01
3.72E+01 2.48E-03 2.48E-03 9.89E-01 8.90E-03 8.90E-03 5.37E-01 0.00E+00 0.00E+00
1.70E-01 6.03E-02 8.87E-01
4.48E+01 2.08E-03 2.08E-03 9.89E-01 8.91E-03 8.91E-03 5.34E-01 0.00E+00 0.00E+00
1.55E-01 6.24E-02 9.06E-01
5.40E+01 1.73E-03 1.73E-03 9.89E-01 8.91E-03 8.91E-03 5.24E-01 0.00E+00 0.00E+00
1.42E-01 6.50E-02 9.21E-01
6.51E+01 1.42E-03 1.42E-03 9.90E-01 8.91E-03 8.91E-03 5.08E-01 0.00E+00 0.00E+00
1.31E-01 6.80E-02 9.33E-01
7.85E+01 1.16E-03 1.16E-03 9.90E-01 8.91E-03 8.91E-03 4.86E-01 0.00E+00 0.00E+00
1.21E-01 7.11E-02 9.41E-01
9.48E+01 9.36E-04 9.36E-04 9.90E-01 8.92E-03 8.92E-03 4.59E-01 0.00E+00 0.00E+00
1.13E-01 7.43E-02 9.46E-01
1.14E+02 7.47E-04 7.47E-04 9.90E-01 8.92E-03 8.92E-03 4.28E-01 0.00E+00 0.00E+00
1.07E-01 7.73E-02 9.49E-01
1.39E+02 5.45E-04 5.45E-04 9.91E-01 8.92E-03 8.92E-03 3.66E-01 0.00E+00 0.00E+00
1.01E-01 8.04E-02 9.50E-01
1.69E+02 3.89E-04 3.89E-04 9.91E-01 8.92E-03 8.92E-03 3.08E-01 0.00E+00 0.00E+00
9.62E-02 8.32E-02 9.47E-01
2.07E+02 2.71E-04 2.71E-04 9.91E-01 8.92E-03 8.92E-03 2.54E-01 0.00E+00 0.00E+00
9.24E-02 8.56E-02 9.44E-01
2.55E+02 1.85E-04 1.85E-04 9.91E-01 8.92E-03 8.92E-03 2.06E-01 0.00E+00 0.00E+00
8.92E-02 8.76E-02 9.39E-01
3.15E+02 1.23E-04 1.23E-04 9.91E-01 8.92E-03 8.92E-03 1.65E-01 0.00E+00 0.00E+00
8.66E-02 8.93E-02 9.33E-01
3.88E+02 8.09E-05 8.09E-05 9.91E-01 8.92E-03 8.92E-03 1.29E-01 0.00E+00 0.00E+00
8.46E-02 9.05E-02 9.26E-01
4.80E+02 5.23E-05 5.23E-05 9.91E-01 8.92E-03 8.92E-03 1.00E-01 0.00E+00 0.00E+00
8.30E-02 9.14E-02 9.19E-01
5.93E+02 3.32E-05 3.32E-05 9.91E-01 8.92E-03 8.92E-03 7.68E-02 0.00E+00 0.00E+00
8.20E-02 9.18E-02 9.12E-01
7.33E+02 2.09E-05 2.09E-05 9.91E-01 8.92E-03 8.92E-03 5.81E-02 0.00E+00 0.00E+00
8.15E-02 9.17E-02 9.04E-01
9.06E+02 1.29E-05 1.29E-05 9.91E-01 8.92E-03 8.92E-03 4.35E-02 0.00E+00 0.00E+00
8.16E-02 9.13E-02 8.97E-01
1.12E+03 7.94E-06 7.94E-06 9.91E-01 8.92E-03 8.92E-03 3.22E-02 0.00E+00 0.00E+00
8.22E-02 9.04E-02 8.89E-01
1.38E+03 4.82E-06 4.82E-06 9.91E-01 8.92E-03 8.92E-03 2.36E-02 0.00E+00 0.00E+00
8.36E-02 8.91E-02 8.81E-01
1.71E+03 2.90E-06 2.90E-06 9.91E-01 8.92E-03 8.92E-03 1.72E-02 0.00E+00 0.00E+00
8.59E-02 8.74E-02 8.73E-01
2.11E+03 1.72E-06 1.72E-06 9.91E-01 8.92E-03 8.92E-03 1.24E-02 0.00E+00 0.00E+00
8.94E-02 8.54E-02 8.64E-01
2.61E+03 1.02E-06 1.02E-06 9.91E-01 8.92E-03 8.92E-03 8.87E-03 0.00E+00 0.00E+00
9.48E-02 8.31E-02 8.54E-01
3.22E+03 6.28E-07 6.28E-07 9.91E-01 8.92E-03 8.92E-03 6.70E-03 0.00E+00 0.00E+00
2.23E-02 8.00E-02 8.45E-01
3.98E+03 4.26E-07 4.26E-07 9.91E-01 8.92E-03 8.92E-03 5.61E-03 0.00E+00 0.00E+00
2.16E-02 7.61E-02 8.38E-01
4.90E+03 2.88E-07 2.88E-07 9.91E-01 8.92E-03 8.92E-03 4.70E-03 0.00E+00 0.00E+00
2.07E-02 7.21E-02 8.30E-01
6.03E+03 1.95E-07 1.95E-07 9.91E-01 8.92E-03 8.92E-03 3.97E-03 0.00E+00 0.00E+00
1.97E-02 6.81E-02 8.21E-01
7.41E+03 1.31E-07 1.31E-07 9.91E-01 8.92E-03 8.92E-03 3.30E-03 0.00E+00 0.00E+00
1.86E-02 6.41E-02 8.11E-01
9.11E+03 8.83E-08 8.83E-08 9.91E-01 8.92E-03 8.92E-03 2.85E-03 0.00E+00 0.00E+00
1.74E-02 6.01E-02 8.00E-01
1.12E+04 5.95E-08 5.95E-08 9.91E-01 8.92E-03 8.92E-03 2.49E-03 0.00E+00 0.00E+00
1.61E-02 5.62E-02 7.87E-01
1.38E+04 4.01E-08 4.01E-08 9.91E-01 8.92E-03 8.92E-03 2.15E-03 0.00E+00 0.00E+00
1.47E-02 5.23E-02 7.73E-01

• time averaged (tav = 60. s) volume concentration: concentration contour parameters

c(x,y,z,t) = cc(x) * (erf(xa)-erf(xb)) * (erf(ya)-erf(yb)) * (exp(-za*za)+exp(-zb*zb))

```
c(x,y,z,t) = concentration (volume fraction) at (x,y,z,t)
         x = downwind distance (m)
         y = crosswind horizontal distance (m)
         z = height (m)
         t = time (s)

       erf = error functon              exp = exponential function
        xa = (x-xc+bx)/(sr2*betax)       za = (z-zc)/(sr2*sig)
        xb = (x-xc-bx)/(sr2*betax)       zb = (z+zc)/(sr2*sig)
        ya = (y+b)/(sr2*betac)          sr2 = sqrt(2.0)
        yb = (y-b)/(sr2*betac)
```

x	cc(x)	b(x)	betac(x)	zc(x)	sig(x)	t	xc(t)	bx(t)	betax(t)
1.00E+00	0.00E+00	3.02E-02	8.44E-03	1.00E+00	1.94E-02	0.00E+00	1.00E+00	0.00E+00	0.00E+00
1.02E+00	3.22E-01	4.01E-02	3.64E-02	1.00E+00	4.32E-02	4.30E-04	1.02E+00	2.27E-02	1.86E-04
1.05E+00	2.83E-01	4.64E-02	5.55E-02	1.00E+00	6.17E-02	1.41E-03	1.05E+00	5.02E-02	4.10E-04
1.08E+00	2.55E-01	5.18E-02	7.41E-02	1.00E+00	8.00E-02	3.11E-03	1.08E+00	8.35E-02	6.82E-04
1.11E+00	2.33E-01	5.70E-02	9.38E-02	1.00E+00	9.94E-02	5.80E-03	1.11E+00	1.24E-01	1.01E-03
1.16E+00	2.14E-01	6.21E-02	1.15E-01	1.00E+00	1.21E-01	9.89E-03	1.16E+00	1.72E-01	1.41E-03
1.21E+00	1.98E-01	6.73E-02	1.39E-01	1.00E+00	1.44E-01	1.60E-02	1.21E+00	2.31E-01	1.89E-03
1.28E+00	1.83E-01	7.25E-02	1.65E-01	1.00E+00	1.70E-01	2.48E-02	1.28E+00	3.02E-01	2.47E-03
1.36E+00	1.70E-01	7.80E-02	1.94E-01	1.00E+00	2.00E-01	3.75E-02	1.36E+00	3.88E-01	3.17E-03
1.45E+00	1.58E-01	8.36E-02	2.27E-01	1.00E+00	2.33E-01	5.56E-02	1.45E+00	4.93E-01	4.02E-03
1.57E+00	1.47E-01	8.94E-02	2.64E-01	1.00E+00	2.70E-01	8.12E-02	1.57E+00	6.18E-01	5.05E-03
1.71E+00	1.37E-01	9.53E-02	3.06E-01	1.00E+00	3.11E-01	1.17E-01	1.71E+00	7.71E-01	6.29E-03
1.88E+00	1.28E-01	1.01E-01	3.52E-01	1.00E+00	3.57E-01	1.67E-01	1.88E+00	9.55E-01	7.80E-03
2.08E+00	1.20E-01	1.07E-01	4.03E-01	1.01E+00	4.08E-01	2.35E-01	2.08E+00	1.18E+00	9.62E-03
2.33E+00	1.12E-01	1.13E-01	4.60E-01	1.01E+00	4.65E-01	3.29E-01	2.33E+00	1.45E+00	1.18E-02
2.63E+00	1.05E-01	1.18E-01	5.22E-01	1.01E+00	5.27E-01	4.56E-01	2.63E+00	1.77E+00	1.45E-02
2.99E+00	9.81E-02	1.24E-01	5.87E-01	1.02E+00	5.91E-01	6.27E-01	2.99E+00	2.17E+00	1.77E-02
3.43E+00	8.46E-02	1.29E-01	6.54E-01	1.04E+00	7.17E-01	8.54E-01	3.43E+00	2.64E+00	2.16E-02
3.96E+00	7.50E-02	1.33E-01	7.22E-01	1.06E+00	8.40E-01	1.15E+00	3.96E+00	3.22E+00	2.63E-02
4.61E+00	6.81E-02	1.37E-01	7.91E-01	1.10E+00	9.58E-01	1.54E+00	4.61E+00	3.92E+00	3.20E-02
5.38E+00	6.30E-02	1.40E-01	8.61E-01	1.15E+00	1.07E+00	2.03E+00	5.38E+00	4.76E+00	3.89E-02
6.32E+00	5.91E-02	1.42E-01	9.34E-01	1.22E+00	1.17E+00	2.65E+00	6.32E+00	5.78E+00	4.72E-02
7.45E+00	5.63E-02	1.44E-01	1.01E+00	1.34E+00	1.25E+00	3.44E+00	7.45E+00	7.01E+00	5.72E-02
8.83E+00	5.47E-02	1.46E-01	1.08E+00	1.49E+00	1.31E+00	4.42E+00	8.83E+00	8.50E+00	6.94E-02
1.05E+01	5.44E-02	1.47E-01	1.16E+00	1.72E+00	1.33E+00	5.64E+00	1.05E+01	1.03E+01	8.42E-02
1.25E+01	5.59E-02	1.48E-01	1.24E+00	2.03E+00	1.32E+00	7.15E+00	1.25E+01	1.25E+01	1.02E-01
1.49E+01	5.55E-02	1.48E-01	1.33E+00	2.45E+00	1.33E+00	8.99E+00	1.49E+01	1.51E+01	1.23E-01
1.79E+01	5.11E-02	1.47E-01	1.44E+00	2.98E+00	1.43E+00	1.12E+01	1.79E+01	1.83E+01	1.50E-01
2.14E+01	4.72E-02	1.45E-01	1.55E+00	3.63E+00	1.53E+00	1.38E+01	2.14E+01	2.22E+01	1.81E-01
2.57E+01	4.36E-02	1.42E-01	1.66E+00	4.42E+00	1.63E+00	1.68E+01	2.57E+01	2.68E+01	2.19E-01
3.09E+01	4.04E-02	1.40E-01	1.78E+00	5.35E+00	1.73E+00	2.03E+01	3.09E+01	3.25E+01	2.65E-01
3.72E+01	3.74E-02	1.37E-01	1.92E+00	6.44E+00	1.84E+00	2.44E+01	3.72E+01		

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3.93E+01  3.21E-01
           4.48E+01  3.46E-02  1.34E-01  2.08E+00  7.70E+00  1.97E+00            2.91E+01  4.48E+01
4.75E+01  3.88E-01
           5.40E+01  3.20E-02  1.32E-01  2.27E+00  9.14E+00  2.10E+00            3.45E+01  5.40E+01
5.75E+01  4.70E-01
           6.51E+01  2.96E-02  1.30E-01  2.52E+00  1.08E+01  2.25E+00            4.08E+01  6.51E+01
6.96E+01  5.68E-01
           7.85E+01  2.75E-02  1.29E-01  2.83E+00  1.26E+01  2.41E+00            4.81E+01  7.85E+01
8.42E+01  6.88E-01
           9.48E+01  2.56E-02  1.27E-01  3.22E+00  1.46E+01  2.58E+00            5.65E+01  9.48E+01
1.02E+02  8.32E-01
           1.14E+02  2.38E-02  1.25E-01  3.70E+00  1.67E+01  2.78E+00            6.62E+01  1.14E+02
1.23E+02  1.01E+00
           1.39E+02  2.20E-02  1.25E-01  4.35E+00  1.90E+01  3.08E+00            6.58E+01  1.39E+02
1.23E+02  2.85E+01
           1.69E+02  2.02E-02  1.25E-01  5.17E+00  2.14E+01  3.42E+00            7.28E+01  1.69E+02
1.23E+02  4.33E+01
           2.07E+02  1.85E-02  1.25E-01  6.20E+00  2.37E+01  3.82E+00            8.13E+01  2.07E+02
1.23E+02  5.72E+01
           2.55E+02  1.68E-02  1.25E-01  7.47E+00  2.61E+01  4.28E+00            9.15E+01  2.55E+02
1.23E+02  7.16E+01
           3.15E+02  1.52E-02  1.25E-01  9.05E+00  2.84E+01  4.83E+00            1.04E+02  3.15E+02
1.23E+02  8.72E+01
           3.88E+02  1.36E-02  1.25E-01  1.10E+01  3.05E+01  5.47E+00            1.19E+02  3.88E+02
1.23E+02  1.05E+02
           4.80E+02  1.21E-02  1.25E-01  1.34E+01  3.26E+01  6.23E+00            1.37E+02  4.80E+02
1.23E+02  1.24E+02
           5.93E+02  1.07E-02  1.25E-01  1.63E+01  3.45E+01  7.13E+00            1.59E+02  5.93E+02
1.23E+02  1.47E+02
           7.33E+02  9.34E-03  1.25E-01  1.98E+01  3.63E+01  8.21E+00            1.85E+02  7.33E+02
1.23E+02  1.73E+02
           9.06E+02  8.11E-03  1.25E-01  2.40E+01  3.79E+01  9.52E+00            2.17E+02  9.06E+02
1.23E+02  2.04E+02
           1.12E+03  6.99E-03  1.25E-01  2.90E+01  3.94E+01  1.11E+01            2.56E+02  1.12E+03
1.23E+02  2.40E+02
           1.38E+03  5.98E-03  1.25E-01  3.51E+01  4.06E+01  1.30E+01            3.03E+02  1.38E+03
1.23E+02  2.83E+02
           1.71E+03  5.07E-03  1.25E-01  4.23E+01  4.18E+01  1.54E+01            3.60E+02  1.71E+03
1.23E+02  3.34E+02
           2.11E+03  4.25E-03  1.25E-01  5.08E+01  4.28E+01  1.84E+01            4.28E+02  2.11E+03
1.23E+02  3.95E+02
           2.61E+03  3.53E-03  1.25E-01  6.08E+01  4.37E+01  2.23E+01            5.11E+02  2.61E+03
1.23E+02  4.67E+02
           3.22E+03  3.08E-03  1.25E-01  7.26E+01  4.44E+01  2.56E+01            6.11E+02  3.22E+03
1.23E+02  5.53E+02
           3.98E+03  2.84E-03  1.25E-01  8.61E+01  4.52E+01  2.78E+01            7.33E+02  3.98E+03
1.23E+02  6.56E+02
           4.90E+03  2.59E-03  1.25E-01  1.02E+02  4.59E+01  3.04E+01            8.79E+02  4.90E+03
1.23E+02  7.79E+02
           6.03E+03  2.35E-03  1.25E-01  1.20E+02  4.67E+01  3.36E+01            1.06E+03  6.03E+03
1.23E+02  9.26E+02
           7.41E+03  2.12E-03  1.25E-01  1.40E+02  4.75E+01  3.72E+01            1.27E+03  7.41E+03
1.23E+02  1.10E+03
           9.11E+03  1.91E-03  1.25E-01  1.63E+02  4.82E+01  4.14E+01            1.53E+03  9.11E+03
1.23E+02  1.31E+03
           1.12E+04  1.71E-03  1.25E-01  1.89E+02  4.91E+01  4.62E+01            1.84E+03  1.12E+04
1.23E+02  1.56E+03
           1.38E+04  1.54E-03  1.25E-01  2.18E+02  5.00E+01  5.15E+01            2.22E+03  1.38E+04
1.23E+02  1.86E+03
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time averaged (tav = 60. s) volume concentration: concentration in the z = .00 plane.

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           downwind    time of      cloud     effective              average concentration (volume
fraction) at (x,y,z)
           distance    max conc    duration   half width        y/bbc=     y/bbc=     y/bbc=     y/bbc=
   y/bbc=     y/bbc=
             x (m)        (s)         (s)       bbc (m)             0.0        0.5        1.0
1.5        2.0        2.5
           1.00E+00    3.00E+01    6.00E+01    3.35E-02         0.00E+00   0.00E+00   0.00E+00
0.00E+00   0.00E+00   0.00E+00
           1.02E+00    3.00E+01    6.00E+01    7.47E-02         0.00E+00   0.00E+00   0.00E+00
0.00E+00   0.00E+00   0.00E+00
           1.05E+00    3.00E+01    6.00E+01    1.07E-01         0.00E+00   0.00E+00   0.00E+00
0.00E+00   0.00E+00   0.00E+00
           1.08E+00    3.00E+01    6.00E+01    1.38E-01         1.28E-34   8.87E-35   2.89E-35
4.37E-36   2.97E-37   8.93E-39
           1.11E+00    3.00E+01    6.00E+01    1.72E-01         9.21E-23   6.35E-23   2.07E-23
3.14E-24   2.19E-25   6.89E-27
           1.16E+00    3.00E+01    6.00E+01    2.09E-01         8.24E-16   5.67E-16   1.85E-16
```

2.81E-17	1.99E-18	6.43E-20							
	1.21E+00	3.01E+01	6.00E+01	2.49E-01	2.01E-11	1.38E-11	4.50E-12		
6.87E-13	4.90E-14	1.61E-15							
	1.28E+00	3.01E+01	6.00E+01	2.95E-01	1.59E-08	1.10E-08	3.56E-09		
5.45E-10	3.90E-11	1.30E-12							
	1.36E+00	3.01E+01	6.00E+01	3.46E-01	1.49E-06	1.03E-06	3.34E-07		
5.11E-08	3.67E-09	1.23E-10							
	1.45E+00	3.01E+01	6.00E+01	4.03E-01	3.48E-05	2.39E-05	7.77E-06		
1.19E-06	8.57E-08	2.89E-09							
	1.57E+00	3.02E+01	6.00E+01	4.67E-01	3.16E-04	2.17E-04	7.06E-05		
1.08E-05	7.80E-07	2.64E-08							
	1.71E+00	3.02E+01	6.00E+01	5.38E-01	1.50E-03	1.03E-03	3.35E-04		
5.13E-05	3.71E-06	1.26E-07							
	1.88E+00	3.02E+01	6.00E+01	6.18E-01	4.50E-03	3.09E-03	1.00E-03		
1.54E-04	1.11E-05	3.79E-07							
	2.08E+00	3.03E+01	6.00E+01	7.07E-01	9.69E-03	6.66E-03	2.16E-03		
3.31E-04	2.40E-05	8.17E-07							
	2.33E+00	3.04E+01	6.00E+01	8.04E-01	1.65E-02	1.13E-02	3.67E-03		
5.63E-04	4.07E-05	1.39E-06							
	2.63E+00	3.04E+01	6.00E+01	9.11E-01	2.35E-02	1.62E-02	5.25E-03		
8.05E-04	5.82E-05	1.99E-06							
	2.99E+00	3.05E+01	6.00E+01	1.02E+00	2.93E-02	2.02E-02	6.55E-03		
1.00E-03	7.27E-05	2.48E-06							
	3.43E+00	3.06E+01	6.00E+01	1.14E+00	3.71E-02	2.55E-02	8.27E-03		
1.27E-03	9.18E-05	3.13E-06							
	3.96E+00	3.08E+01	6.00E+01	1.26E+00	3.96E-02	2.72E-02	8.83E-03		
1.35E-03	9.80E-05	3.35E-06							
	4.61E+00	3.10E+01	6.00E+01	1.38E+00	3.88E-02	2.67E-02	8.67E-03		
1.33E-03	9.63E-05	3.29E-06							
	5.38E+00	3.12E+01	6.00E+01	1.50E+00	3.64E-02	2.50E-02	8.11E-03		
1.24E-03	9.01E-05	3.08E-06							
	6.32E+00	3.14E+01	6.00E+01	1.62E+00	3.29E-02	2.26E-02	7.35E-03		
1.13E-03	8.16E-05	2.80E-06							
	7.45E+00	3.17E+01	6.00E+01	1.75E+00	2.89E-02	1.99E-02	6.45E-03		
9.90E-04	7.17E-05	2.45E-06							
	8.83E+00	3.21E+01	6.00E+01	1.88E+00	2.44E-02	1.68E-02	5.44E-03		
8.34E-04	6.04E-05	2.07E-06							
	1.05E+01	3.25E+01	6.00E+01	2.02E+00	1.91E-02	1.31E-02	4.26E-03		
6.53E-04	4.73E-05	1.62E-06							
	1.25E+01	3.30E+01	6.00E+01	2.16E+00	1.28E-02	8.82E-03	2.86E-03		
4.39E-04	3.18E-05	1.09E-06							
	1.49E+01	3.37E+01	6.00E+01	2.32E+00	7.07E-03	4.86E-03	1.58E-03		
2.42E-04	1.75E-05	5.98E-07							
	1.79E+01	3.45E+01	6.00E+01	2.50E+00	3.69E-03	2.54E-03	8.24E-04		
1.26E-04	9.15E-06	3.13E-07							
	2.14E+01	3.54E+01	6.00E+01	2.68E+00	1.62E-03	1.12E-03	3.62E-04		
5.56E-05	4.03E-06	1.38E-07							
	2.57E+01	3.65E+01	6.00E+01	2.88E+00	5.81E-04	4.00E-04	1.30E-04		
1.99E-05	1.44E-06	4.92E-08							
	3.09E+01	3.79E+01	6.00E+01	3.09E+00	1.64E-04	1.13E-04	3.67E-05		
5.62E-06	4.07E-07	1.40E-08							
	3.72E+01	3.96E+01	6.00E+01	3.33E+00	3.62E-05	2.49E-05	8.07E-06		
1.24E-06	8.97E-08	3.07E-09							
	4.48E+01	4.16E+01	6.00E+01	3.61E+00	6.26E-06	4.30E-06	1.40E-06		
2.14E-07	1.55E-08	5.29E-10							
	5.40E+01	4.40E+01	6.00E+01	3.94E+00	8.70E-07	5.98E-07	1.94E-07		
2.98E-08	2.16E-09	7.38E-11							
	6.51E+01	4.69E+01	6.00E+01	4.37E+00	9.57E-08	6.58E-08	2.14E-08		
3.28E-09	2.37E-10	8.09E-12							
	7.85E+01	5.05E+01	6.00E+01	4.90E+00	8.74E-09	6.00E-09	1.95E-09		
2.99E-10	2.17E-11	7.40E-13							
	9.48E+01	5.48E+01	6.00E+01	5.58E+00	7.18E-10	4.93E-10	1.60E-10		
2.46E-11	1.78E-12	6.06E-14							
	1.14E+02	6.00E+01	6.00E+01	6.42E+00	5.86E-11	4.03E-11	1.31E-11		
2.01E-12	1.45E-13	4.99E-15							
	1.39E+02	6.58E+01	6.21E+01	7.54E+00	1.52E-11	1.05E-11	3.40E-12		
5.21E-13	3.77E-14	1.28E-15							
	1.69E+02	7.28E+01	6.51E+01	8.96E+00	7.14E-12	4.91E-12	1.59E-12		
2.44E-13	1.77E-14	6.06E-16							
	2.07E+02	8.13E+01	6.90E+01	1.07E+01	6.06E-12	4.16E-12	1.35E-12		
2.07E-13	1.50E-14	5.15E-16							
	2.55E+02	9.15E+01	7.39E+01	1.29E+01	9.06E-12	6.23E-12	2.02E-12		
3.10E-13	2.25E-14	7.88E-16							
	3.15E+02	1.04E+02	8.01E+01	1.57E+01	2.20E-11	1.51E-11	4.92E-12		
7.54E-13	5.46E-14	1.84E-15							
	3.88E+02	1.19E+02	8.77E+01	1.90E+01	7.71E-11	5.30E-11	1.72E-11		
2.64E-12	1.91E-13	6.57E-15							
	4.80E+02	1.37E+02	9.70E+01	2.32E+01	3.37E-10	2.31E-10	7.52E-11		
1.15E-11	8.35E-13	2.82E-14							
	5.93E+02	1.59E+02	1.08E+02	2.82E+01	1.60E-09	1.10E-09	3.56E-10		
5.47E-11	3.96E-12	1.39E-13							

7.33E+02 1.85E+02 1.21E+02 3.42E+01 7.27E-09 5.00E-09 1.62E-09 2.49E-10 1.80E-11 6.00E-13
9.06E+02 2.17E+02 1.37E+02 4.15E+01 2.88E-08 1.98E-08 6.43E-09 9.86E-10 7.16E-11 2.47E-12
1.12E+03 2.56E+02 1.56E+02 5.03E+01 9.35E-08 6.42E-08 2.09E-08 3.20E-09 2.32E-10 8.10E-12
1.38E+03 3.03E+02 1.78E+02 6.08E+01 2.39E-07 1.65E-07 5.34E-08 8.19E-09 5.92E-10 2.01E-11
1.71E+03 3.60E+02 2.04E+02 7.32E+01 4.80E-07 3.30E-07 1.07E-07 1.64E-08 1.19E-09 3.63E-11
2.11E+03 4.28E+02 2.35E+02 8.80E+01 7.60E-07 5.22E-07 1.70E-07 2.60E-08 1.89E-09 6.91E-11
2.61E+03 5.11E+02 2.70E+02 1.05E+02 9.69E-07 6.66E-07 2.16E-07 3.32E-08 2.41E-09 7.04E-11
3.22E+03 6.11E+02 3.13E+02 1.26E+02 9.14E-07 6.28E-07 2.04E-07 3.13E-08 2.28E-09 7.92E-11
3.98E+03 7.33E+02 3.66E+02 1.49E+02 7.25E-07 4.98E-07 1.62E-07 2.48E-08 1.81E-09 7.45E-11
4.90E+03 8.79E+02 4.28E+02 1.76E+02 5.70E-07 3.92E-07 1.27E-07 1.95E-08 1.40E-09 3.46E-11
6.03E+03 1.06E+03 5.02E+02 2.07E+02 4.41E-07 3.03E-07 9.84E-08 1.51E-08 1.08E-09 3.14E-11
7.41E+03 1.27E+03 5.88E+02 2.42E+02 3.34E-07 2.30E-07 7.46E-08 1.14E-08 8.23E-10 2.79E-11
9.11E+03 1.53E+03 6.89E+02 2.82E+02 2.48E-07 1.71E-07 5.54E-08 8.50E-09 6.16E-10 2.41E-11
1.12E+04 1.84E+03 8.08E+02 3.27E+02 1.81E-07 1.24E-07 4.04E-08 6.19E-09 4.49E-10 2.04E-11
1.38E+04 2.22E+03 9.47E+02 3.78E+02 1.30E-07 8.92E-08 2.90E-08 4.44E-09 3.21E-10 1.69E-11

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time averaged (tav = 60. s) volume concentration: maximum concentration (volume fraction) along centerline.

downwind distance x (m)	height z (m)	maximum concentration c(x,0,z)	time of max conc (s)	cloud duration (s)
1.00E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.02E+00	1.00E+00	9.39E-01	3.00E+01	6.00E+01
1.05E+00	1.00E+00	6.76E-01	3.00E+01	6.00E+01
1.08E+00	1.00E+00	5.27E-01	3.00E+01	6.00E+01
1.11E+00	1.00E+00	4.26E-01	3.00E+01	6.00E+01
1.16E+00	1.00E+00	3.52E-01	3.00E+01	6.00E+01
1.21E+00	1.00E+00	2.95E-01	3.01E+01	6.00E+01
1.28E+00	1.00E+00	2.49E-01	3.01E+01	6.00E+01
1.36E+00	1.00E+00	2.12E-01	3.01E+01	6.00E+01
1.45E+00	1.00E+00	1.82E-01	3.01E+01	6.00E+01
1.57E+00	1.00E+00	1.56E-01	3.02E+01	6.00E+01
1.71E+00	1.00E+00	1.34E-01	3.02E+01	6.00E+01
1.88E+00	1.00E+00	1.16E-01	3.02E+01	6.00E+01
2.08E+00	1.01E+00	1.00E-01	3.03E+01	6.00E+01
2.33E+00	1.01E+00	8.67E-02	3.04E+01	6.00E+01
2.63E+00	1.01E+00	7.52E-02	3.04E+01	6.00E+01
2.99E+00	1.02E+00	6.58E-02	3.05E+01	6.00E+01
3.43E+00	1.00E+00	5.37E-02	3.06E+01	6.00E+01
3.96E+00	9.44E-01	4.60E-02	3.08E+01	6.00E+01
4.61E+00	8.31E-01	4.09E-02	3.10E+01	6.00E+01
5.38E+00	6.89E-01	3.69E-02	3.12E+01	6.00E+01
6.32E+00	6.20E-01	3.32E-02	3.14E+01	6.00E+01
7.45E+00	7.78E-01	2.93E-02	3.17E+01	6.00E+01
8.83E+00	1.13E+00	2.57E-02	3.21E+01	6.00E+01
1.05E+01	1.56E+00	2.28E-02	3.25E+01	6.00E+01
1.25E+01	1.99E+00	2.13E-02	3.30E+01	6.00E+01
1.49E+01	2.45E+00	1.95E-02	3.37E+01	6.00E+01
1.79E+01	2.98E+00	1.64E-02	3.45E+01	6.00E+01
2.14E+01	3.63E+00	1.39E-02	3.54E+01	6.00E+01
2.57E+01	4.42E+00	1.17E-02	3.65E+01	6.00E+01
3.09E+01	5.35E+00	9.79E-03	3.79E+01	6.00E+01
3.72E+01	6.44E+00	8.16E-03	3.96E+01	6.00E+01
4.48E+01	7.70E+00	6.74E-03	4.16E+01	6.00E+01
5.40E+01	9.14E+00	5.50E-03	4.40E+01	6.00E+01
6.51E+01	1.08E+01	4.43E-03	4.69E+01	6.00E+01
7.85E+01	1.26E+01	3.53E-03	5.05E+01	6.00E+01
9.48E+01	1.46E+01	2.77E-03	5.48E+01	6.00E+01
1.14E+02	1.67E+01	2.15E-03	6.00E+01	6.00E+01
1.39E+02	1.90E+01	1.47E-03	6.58E+01	6.21E+01
1.69E+02	2.14E+01	1.04E-03	7.28E+01	6.51E+01
2.07E+02	2.37E+01	7.26E-04	8.13E+01	6.90E+01
2.55E+02	2.61E+01	5.02E-04	9.15E+01	7.39E+01

3.15E+02	2.84E+01	3.42E-04	1.04E+02	8.01E+01
3.88E+02	3.05E+01	2.30E-04	1.19E+02	8.77E+01
4.80E+02	3.26E+01	1.52E-04	1.37E+02	9.70E+01
5.93E+02	3.45E+01	9.92E-05	1.59E+02	1.08E+02
7.33E+02	3.63E+01	6.36E-05	1.85E+02	1.21E+02
9.06E+02	3.79E+01	4.02E-05	2.17E+02	1.37E+02
1.12E+03	3.94E+01	2.50E-05	2.56E+02	1.56E+02
1.38E+03	4.06E+01	1.54E-05	3.03E+02	1.78E+02
1.71E+03	4.18E+01	9.34E-06	3.60E+02	2.04E+02
2.11E+03	4.28E+01	5.60E-06	4.28E+02	2.35E+02
2.61E+03	4.36E+01	3.32E-06	5.11E+02	2.70E+02
3.22E+03	4.42E+01	2.07E-06	6.11E+02	3.13E+02
3.98E+03	4.47E+01	1.37E-06	7.33E+02	3.66E+02
4.90E+03	4.48E+01	9.00E-07	8.79E+02	4.28E+02
6.03E+03	4.44E+01	5.93E-07	1.06E+03	5.02E+02
7.41E+03	4.26E+01	3.94E-07	1.27E+03	5.88E+02
9.11E+03	3.81E+01	2.65E-07	1.53E+03	6.89E+02
1.12E+04	2.74E+01	1.83E-07	1.84E+03	8.08E+02
1.38E+04	0.00E+00	1.30E-07	2.22E+03	9.47E+02

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Scenario 3
Hazard Footprints

Met Scenario					c(ppm) ÄÄ 50000.0					c(ppm) ÄÄ 25000.0				
u (m/s)	temp (øK)	rh (%)	stb	avt (s)	length (m)	width (m)	w_dist (m)	area (m2)	fmass (kg)	length (m)	width (m)	w_dist (m)	area (m2)	fmass (kg)
4.0	293.0	60.	4	60.	6.88E+00	1.37E+00	4.61E+00	6.27E+00	1.16E+00	1.71E+01	3.03E+00	7.45E+00	3.64E+01	6.80E+00
2.0	293.0	60.	6	60.	7.13E+00	1.41E+00	4.61E+00	6.70E+00	2.05E+00	1.85E+01	3.19E+00	8.83E+00	4.25E+01	9.49E+00
Composite Maximum					7.13E+00	1.41E+00	4.61E+00	6.70E+00	2.05E+00	1.85E+01	3.19E+00	8.83E+00	4.25E+01	9.49E+00

Scenario 3

```
 problem input

 idspl =         2
 ncalc =         1
 wms   =   .016000
 cps   =   2240.00
 tbp   =    111.70
 cmed0 =       .00
 dhe   =   509880.
 cpsl  =   3349.00
 rhosl =    424.10
 spb   =     -1.00
 spc   =       .00
 ts    =    264.00
 qs    =      4.59
 as    =       .00
 tsd   =       60.
 qtis  =       .00
 hs    =      1.00
 tav   =     60.00
 xffm  =   9000.00
 zp(1) =       .00
 zp(2) =       .00
 zp(3) =       .00
 zp(4) =       .00
 z0    =   .300000
 za    =      2.00
 ua    =      4.00
 ta    =    293.00
 rh    =     60.00
 stab  =      4.00
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release gas properties

molecular weight of source gas (kg)              - wms  =  1.6000E-02
vapor heat capacity, const. p.  (j/kg-k)         - cps  =  2.2400E+03
temperature of source gas (k)                    - ts   =  2.6400E+02
density of source gas (kg/m3)                    - rhos =  7.3860E-01
boiling point temperature                        - tbp  =  1.1170E+02
liquid mass fraction                             - cmed0=  0.0000E+00
liquid heat capacity (j/kg-k)                    - cpsl =  3.3490E+03
heat of vaporization (j/kg)                      - dhe  =  5.0988E+05
liquid source density (kg/m3)                    - rhosl=  4.2410E+02
saturation pressure constant                     - spa  =  8.7843E+00
saturation pressure constant (k)                 - spb  =  9.8121E+02
saturation pressure constant (k)                 - spc  =  0.0000E+00


spill characteristics

spill type                                       - idspl=          2
mass source rate (kg/s)                          - qs   =  4.5900E+00
continuous source duration (s)                   - tsd  =  6.0000E+01
continuous source mass (kg)                      - qtcs =  2.7540E+02
instantaneous source mass (kg)                   - qtis =  0.0000E+00
source area (m2)                                 - as   =  4.5000E-03
vertical vapor velocity (m/s)                    - ws   =  0.0000E+00
source half width (m)                            - bs   =  3.3541E-02
source height (m)                                - hs   =  1.0000E+00
horizontal vapor velocity (m/s)                  - us   =  1.3810E+03


field parameters

concentration averaging time (s)                 - tav  =  6.0000E+01
mixing layer height (m)                          - hmx  =  1.0400E+03
maximum downwind distance (m)                    - xffm =  9.0000E+03
concentration measurement height (m)             - zp(1)=  0.0000E+00
                                                 - zp(2)=  0.0000E+00
                                                 - zp(3)=  0.0000E+00
                                                 - zp(4)=  0.0000E+00


ambient meteorological properties

molecular weight of ambient air (kg)            - wmae  =  2.8804E-02
heat capacity of ambient air at const p. (j/kg-k)- cpaa  =  1.0134E+03
density of ambient air (kg/m3)                  - rhoa  =  1.1980E+00
ambient measurement height (m)                  - za    =  2.0000E+00
ambient atmospheric pressure (pa=n/m2=j/m3)     - pa    =  1.0133E+05
ambient wind speed (m/s)                        - ua    =  4.0000E+00
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ambient temperature (k)                          - ta    =  2.9300E+02
relative humidity (percent)                      - rh    =  6.0000E+01
ambient friction velocity (m/s)                  - uastr =  8.6521E-01
atmospheric stability class value                - stab  =  4.0000E+00
inverse monin-obukhov length (1/m)               - ala   =  0.0000E+00
surface roughness height (m)                     - z0    =  3.0000E-01


additional parameters

sub-step multiplier                              - ncalc =           1
number of calculational sub-steps                - nssm  =           3
acceleration of gravity (m/s2)                   - grav  =  9.8067E+00
gas constant (j/mol- k)                          - rr    =  8.3143E+00
von karman constant                              - xk    =  4.1000E-01
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instantaneous spatially averaged cloud parameters

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          x        zc         h        bb         b        bbx       bx        cv        rho
   t        u        ua
        1.00E+00  1.00E+00  6.71E-02  3.35E-02  3.02E-02  0.00E+00  0.00E+00  1.00E+00  7.39E-01
2.64E+02  1.38E+03  1.33E+00
        1.02E+00  1.00E+00  1.11E-01  5.56E-02  3.73E-02  2.00E-02  2.00E-02  6.95E-01  8.93E-01
2.72E+02  7.44E+02  1.36E+00
        1.05E+00  1.00E+00  1.56E-01  7.78E-02  4.34E-02  4.42E-02  4.42E-02  5.32E-01  9.71E-01
2.76E+02  5.04E+02  1.39E+00
        1.08E+00  1.00E+00  2.04E-01  1.02E-01  4.91E-02  7.35E-02  7.35E-02  4.25E-01  1.02E+00
2.79E+02  3.72E+02  1.42E+00
        1.11E+00  1.00E+00  2.58E-01  1.29E-01  5.48E-02  1.09E-01  1.09E-01  3.47E-01  1.05E+00
2.82E+02  2.88E+02  1.45E+00
        1.16E+00  1.00E+00  3.19E-01  1.59E-01  6.07E-02  1.52E-01  1.52E-01  2.88E-01  1.08E+00
2.83E+02  2.28E+02  1.48E+00
        1.21E+00  1.00E+00  3.90E-01  1.95E-01  6.68E-02  2.03E-01  2.03E-01  2.40E-01  1.10E+00
2.85E+02  1.84E+02  1.53E+00
        1.28E+00  1.00E+00  4.72E-01  2.36E-01  7.33E-02  2.66E-01  2.66E-01  2.02E-01  1.12E+00
2.86E+02  1.50E+02  1.57E+00
        1.36E+00  1.00E+00  5.66E-01  2.83E-01  8.01E-02  3.42E-01  3.42E-01  1.71E-01  1.13E+00
2.87E+02  1.24E+02  1.63E+00
        1.45E+00  1.00E+00  6.77E-01  3.38E-01  8.74E-02  4.33E-01  4.33E-01  1.45E-01  1.14E+00
2.88E+02  1.02E+02  1.69E+00
        1.57E+00  1.00E+00  8.05E-01  4.02E-01  9.52E-02  5.44E-01  5.44E-01  1.23E-01  1.15E+00
2.89E+02  8.54E+01  1.76E+00
        1.71E+00  1.00E+00  9.54E-01  4.77E-01  1.03E-01  6.78E-01  6.78E-01  1.05E-01  1.16E+00
2.89E+02  7.15E+01  1.84E+00
        1.88E+00  1.00E+00  1.13E+00  5.63E-01  1.12E-01  8.40E-01  8.40E-01  8.93E-02  1.16E+00
2.90E+02  6.02E+01  1.92E+00
        2.08E+00  1.00E+00  1.33E+00  6.64E-01  1.22E-01  1.04E+00  1.04E+00  7.63E-02  1.17E+00
2.90E+02  5.09E+01  2.02E+00
        2.33E+00  1.00E+00  1.56E+00  7.79E-01  1.32E-01  1.27E+00  1.27E+00  6.52E-02  1.17E+00
2.91E+02  4.32E+01  2.13E+00
        2.63E+00  1.00E+00  1.83E+00  9.13E-01  1.42E-01  1.56E+00  1.56E+00  5.59E-02  1.18E+00
2.91E+02  3.68E+01  2.25E+00
        2.99E+00  1.00E+00  2.13E+00  1.06E+00  1.53E-01  1.91E+00  1.91E+00  4.81E-02  1.18E+00
2.91E+02  3.14E+01  2.43E+00
        3.43E+00  1.00E+00  2.48E+00  1.24E+00  1.66E-01  2.33E+00  2.33E+00  4.16E-02  1.18E+00
2.92E+02  2.68E+01  2.69E+00
        3.96E+00  1.00E+00  2.85E+00  1.42E+00  1.77E-01  2.83E+00  2.83E+00  3.63E-02  1.18E+00
2.92E+02  2.33E+01  2.94E+00
        4.61E+00  1.00E+00  3.25E+00  1.62E+00  1.88E-01  3.45E+00  3.45E+00  3.18E-02  1.19E+00
2.92E+02  2.05E+01  3.18E+00
        5.38E+00  1.00E+00  3.68E+00  1.84E+00  1.99E-01  4.19E+00  4.19E+00  2.80E-02  1.19E+00
2.92E+02  1.82E+01  3.41E+00
        6.32E+00  1.00E+00  4.15E+00  2.07E+00  2.10E-01  5.08E+00  5.08E+00  2.46E-02  1.19E+00
2.92E+02  1.63E+01  3.64E+00
        7.45E+00  1.00E+00  4.65E+00  2.33E+00  2.20E-01  6.17E+00  6.17E+00  2.17E-02  1.19E+00
2.92E+02  1.47E+01  3.86E+00
        8.83E+00  1.01E+00  5.20E+00  2.60E+00  2.30E-01  7.48E+00  7.48E+00  1.91E-02  1.19E+00
2.92E+02  1.33E+01  4.07E+00
        1.05E+01  1.01E+00  5.80E+00  2.90E+00  2.40E-01  9.07E+00  9.07E+00  1.68E-02  1.19E+00
2.92E+02  1.22E+01  4.28E+00
        1.25E+01  1.01E+00  6.44E+00  3.22E+00  2.50E-01  1.10E+01  1.10E+01  1.48E-02  1.19E+00
2.93E+02  1.12E+01  4.49E+00
        1.49E+01  1.02E+00  7.13E+00  3.56E+00  2.59E-01  1.33E+01  1.33E+01  1.30E-02  1.19E+00
2.93E+02  1.04E+01  4.69E+00
        1.79E+01  1.03E+00  7.86E+00  3.93E+00  2.67E-01  1.61E+01  1.61E+01  1.14E-02  1.19E+00
2.93E+02  9.77E+00  4.88E+00
        2.14E+01  1.05E+00  8.65E+00  4.32E+00  2.74E-01  1.95E+01  1.95E+01  9.99E-03  1.19E+00
2.93E+02  9.22E+00  5.08E+00
        2.57E+01  1.08E+00  9.50E+00  4.74E+00  2.80E-01  2.36E+01  2.36E+01  8.72E-03  1.19E+00
2.93E+02  8.77E+00  5.26E+00
        3.09E+01  1.12E+00  1.04E+01  5.20E+00  2.85E-01  2.86E+01  2.86E+01  7.59E-03  1.19E+00
2.93E+02  8.40E+00  5.45E+00
        3.72E+01  1.17E+00  1.14E+01  5.69E+00  2.89E-01  3.46E+01  3.46E+01  6.58E-03  1.20E+00
```

2.93E+02 8.10E+00 5.63E+00
4.48E+01 1.25E+00 1.24E+01 6.22E+00 2.93E-01 4.18E+01 4.18E+01 5.67E-03 1.20E+00
2.93E+02 7.86E+00 5.81E+00
5.40E+01 1.35E+00 1.36E+01 6.80E+00 2.96E-01 5.06E+01 5.06E+01 4.85E-03 1.20E+00
2.93E+02 7.69E+00 5.99E+00
6.51E+01 1.49E+00 1.49E+01 7.43E+00 2.97E-01 6.12E+01 6.12E+01 4.12E-03 1.20E+00
2.93E+02 7.56E+00 6.17E+00
7.85E+01 1.67E+00 1.63E+01 8.16E+00 2.98E-01 7.41E+01 7.41E+01 3.46E-03 1.20E+00
2.93E+02 7.49E+00 6.36E+00
9.48E+01 1.90E+00 1.79E+01 9.00E+00 2.98E-01 8.96E+01 8.96E+01 2.88E-03 1.20E+00
2.93E+02 7.45E+00 6.54E+00
1.14E+02 2.19E+00 1.96E+01 1.00E+01 2.98E-01 1.08E+02 1.08E+02 2.36E-03 1.20E+00
2.93E+02 7.44E+00 6.73E+00
1.38E+02 2.55E+00 2.15E+01 1.12E+01 2.98E-01 1.31E+02 1.31E+02 1.92E-03 1.20E+00
2.93E+02 7.47E+00 6.92E+00
1.67E+02 2.97E+00 2.36E+01 1.27E+01 2.97E-01 1.59E+02 1.59E+02 1.53E-03 1.20E+00
2.93E+02 7.53E+00 7.11E+00
2.02E+02 3.47E+00 2.59E+01 1.44E+01 2.97E-01 1.92E+02 1.92E+02 1.21E-03 1.20E+00
2.93E+02 7.62E+00 7.31E+00
2.44E+02 4.03E+00 2.85E+01 1.66E+01 2.96E-01 2.32E+02 2.32E+02 9.43E-04 1.20E+00
2.93E+02 7.73E+00 7.50E+00
2.95E+02 4.66E+00 3.19E+01 1.92E+01 2.96E-01 2.46E+02 2.32E+02 6.84E-04 1.20E+00
2.93E+02 7.90E+00 7.74E+00
3.59E+02 5.32E+00 3.59E+01 2.25E+01 2.96E-01 2.63E+02 2.32E+02 4.86E-04 1.20E+00
2.93E+02 8.08E+00 7.98E+00
4.37E+02 6.01E+00 4.06E+01 2.66E+01 2.96E-01 2.83E+02 2.32E+02 3.39E-04 1.20E+00
2.93E+02 8.30E+00 8.23E+00
5.35E+02 6.71E+00 4.60E+01 3.15E+01 2.96E-01 3.08E+02 2.32E+02 2.31E-04 1.20E+00
2.93E+02 8.53E+00 8.48E+00
6.57E+02 7.40E+00 5.24E+01 3.76E+01 2.96E-01 3.38E+02 2.32E+02 1.55E-04 1.20E+00
2.93E+02 8.78E+00 8.75E+00
8.09E+02 8.08E+00 5.98E+01 4.50E+01 2.96E-01 3.74E+02 2.32E+02 1.03E-04 1.20E+00
2.93E+02 9.04E+00 9.02E+00
9.98E+02 8.74E+00 6.85E+01 5.41E+01 2.96E-01 4.18E+02 2.32E+02 6.68E-05 1.20E+00
2.93E+02 9.31E+00 9.29E+00
1.23E+03 9.36E+00 7.87E+01 6.50E+01 2.96E-01 4.71E+02 2.32E+02 4.30E-05 1.20E+00
2.93E+02 9.58E+00 9.57E+00
1.53E+03 9.95E+00 9.05E+01 7.81E+01 2.96E-01 5.35E+02 2.32E+02 2.73E-05 1.20E+00
2.93E+02 9.86E+00 9.86E+00
1.89E+03 1.05E+01 1.04E+02 9.39E+01 2.96E-01 6.11E+02 2.32E+02 1.73E-05 1.20E+00
2.93E+02 1.01E+01 1.01E+01
2.34E+03 1.10E+01 1.20E+02 1.13E+02 2.96E-01 7.04E+02 2.32E+02 1.08E-05 1.20E+00
2.93E+02 1.04E+01 1.04E+01
2.91E+03 1.15E+01 1.39E+02 1.35E+02 2.96E-01 8.15E+02 2.32E+02 6.78E-06 1.20E+00
2.93E+02 1.07E+01 1.07E+01
3.60E+03 1.19E+01 1.61E+02 1.60E+02 2.96E-01 9.49E+02 2.32E+02 4.23E-06 1.20E+00
2.93E+02 1.10E+01 1.10E+01
4.47E+03 1.23E+01 1.86E+02 1.91E+02 2.96E-01 1.11E+03 2.32E+02 2.63E-06 1.20E+00
2.93E+02 1.13E+01 1.13E+01
5.55E+03 1.27E+01 2.15E+02 2.25E+02 2.96E-01 1.30E+03 2.32E+02 1.64E-06 1.20E+00
2.93E+02 1.15E+01 1.15E+01
6.88E+03 1.30E+01 2.47E+02 2.65E+02 2.96E-01 1.53E+03 2.32E+02 1.03E-06 1.20E+00
2.93E+02 1.18E+01 1.18E+01
8.52E+03 1.33E+01 2.85E+02 3.11E+02 2.96E-01 1.81E+03 2.32E+02 6.45E-07 1.20E+00
2.93E+02 1.21E+01 1.21E+01
1.06E+04 1.36E+01 3.27E+02 3.63E+02 2.96E-01 2.14E+03 2.32E+02 4.07E-07 1.20E+00
2.93E+02 1.23E+01 1.23E+01
1.31E+04 1.38E+01 3.74E+02 4.22E+02 2.96E-01 2.53E+03 2.32E+02 2.58E-07 1.20E+00
2.93E+02 1.26E+01 1.26E+01

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x cm cmv cmda cmw cmwv wc vg ug
w v vx
1.00E+00 1.00E+00 1.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
4.07E+02 1.95E+02 0.00E+00
1.02E+00 5.58E-01 5.58E-01 4.38E-01 3.94E-03 3.94E-03 7.33E-05 0.00E+00 0.00E+00
5.04E+02 8.66E+01 9.78E-01
1.05E+00 3.87E-01 3.87E-01 6.08E-01 5.47E-03 5.47E-03 1.48E-04 0.00E+00 0.00E+00
3.08E+02 5.39E+01 9.79E-01
1.08E+00 2.91E-01 2.91E-01 7.03E-01 6.33E-03 6.33E-03 2.35E-04 0.00E+00 0.00E+00
2.13E+02 3.79E+01 9.81E-01
1.11E+00 2.28E-01 2.28E-01 7.65E-01 6.89E-03 6.89E-03 3.37E-04 0.00E+00 0.00E+00
1.56E+02 2.83E+01 9.82E-01
1.16E+00 1.83E-01 1.83E-01 8.10E-01 7.29E-03 7.29E-03 4.59E-04 0.00E+00 0.00E+00
1.18E+02 2.18E+01 9.84E-01
1.21E+00 1.49E-01 1.49E-01 8.43E-01 7.59E-03 7.59E-03 6.07E-04 0.00E+00 0.00E+00
9.13E+01 1.73E+01 9.86E-01
1.28E+00 1.23E-01 1.23E-01 8.69E-01 7.82E-03 7.82E-03 7.85E-04 0.00E+00 0.00E+00
7.16E+01 1.38E+01 9.89E-01
1.36E+00 1.03E-01 1.03E-01 8.89E-01 8.01E-03 8.01E-03 1.00E-03 0.00E+00 0.00E+00
5.66E+01 1.12E+01 9.92E-01
1.45E+00 8.59E-02 8.59E-02 9.06E-01 8.16E-03 8.16E-03 1.26E-03 0.00E+00 0.00E+00
4.50E+01 9.20E+00 9.95E-01
1.57E+00 7.22E-02 7.22E-02 9.20E-01 8.28E-03 8.28E-03 1.58E-03 0.00E+00 0.00E+00
3.60E+01 7.58E+00 9.99E-01

1.71E+00 6.10E-02 6.10E-02 9.31E-01 8.38E-03 8.38E-03 1.97E-03 0.00E+00 0.00E+00
2.89E+01 6.28E+00 1.00E+00
1.88E+00 5.16E-02 5.16E-02 9.40E-01 8.46E-03 8.46E-03 2.43E-03 0.00E+00 0.00E+00
2.32E+01 5.22E+00 1.01E+00
2.08E+00 4.38E-02 4.38E-02 9.48E-01 8.53E-03 8.53E-03 3.00E-03 0.00E+00 0.00E+00
1.87E+01 4.36E+00 1.01E+00
2.33E+00 3.73E-02 3.73E-02 9.54E-01 8.59E-03 8.59E-03 3.69E-03 0.00E+00 0.00E+00
1.51E+01 3.65E+00 1.02E+00
2.63E+00 3.18E-02 3.18E-02 9.60E-01 8.64E-03 8.64E-03 4.53E-03 0.00E+00 0.00E+00
1.22E+01 3.06E+00 1.02E+00
2.99E+00 2.73E-02 2.73E-02 9.64E-01 8.68E-03 8.68E-03 5.56E-03 0.00E+00 0.00E+00
9.69E+00 2.56E+00 1.03E+00
3.43E+00 2.36E-02 2.36E-02 9.68E-01 8.71E-03 8.71E-03 6.86E-03 0.00E+00 0.00E+00
7.00E+00 2.13E+00 1.05E+00
3.96E+00 2.05E-02 2.05E-02 9.71E-01 8.74E-03 8.74E-03 8.50E-03 0.00E+00 0.00E+00
5.27E+00 1.80E+00 1.06E+00
4.61E+00 1.79E-02 1.79E-02 9.73E-01 8.76E-03 8.76E-03 1.05E-02 0.00E+00 0.00E+00
4.07E+00 1.53E+00 1.07E+00
5.38E+00 1.57E-02 1.57E-02 9.75E-01 8.78E-03 8.78E-03 1.29E-02 0.00E+00 0.00E+00
3.22E+00 1.30E+00 1.09E+00
6.32E+00 1.38E-02 1.38E-02 9.77E-01 8.80E-03 8.80E-03 1.58E-02 0.00E+00 0.00E+00
2.58E+00 1.11E+00 1.10E+00
7.45E+00 1.22E-02 1.22E-02 9.79E-01 8.82E-03 8.82E-03 1.93E-02 0.00E+00 0.00E+00
2.10E+00 9.54E-01 1.11E+00
8.83E+00 1.07E-02 1.07E-02 9.80E-01 8.83E-03 8.83E-03 2.32E-02 0.00E+00 0.00E+00
1.74E+00 8.19E-01 1.12E+00
1.05E+01 9.41E-03 9.41E-03 9.82E-01 8.84E-03 8.84E-03 2.78E-02 0.00E+00 0.00E+00
1.45E+00 7.04E-01 1.13E+00
1.25E+01 8.27E-03 8.27E-03 9.83E-01 8.85E-03 8.85E-03 3.29E-02 0.00E+00 0.00E+00
1.23E+00 6.07E-01 1.14E+00
1.49E+01 7.26E-03 7.26E-03 9.84E-01 8.86E-03 8.86E-03 3.87E-02 0.00E+00 0.00E+00
1.05E+00 5.24E-01 1.15E+00
1.79E+01 6.37E-03 6.37E-03 9.85E-01 8.87E-03 8.87E-03 4.52E-02 0.00E+00 0.00E+00
9.06E-01 4.54E-01 1.16E+00
2.14E+01 5.57E-03 5.57E-03 9.86E-01 8.87E-03 8.87E-03 5.22E-02 0.00E+00 0.00E+00
7.92E-01 3.96E-01 1.17E+00
2.57E+01 4.86E-03 4.86E-03 9.86E-01 8.88E-03 8.88E-03 5.97E-02 0.00E+00 0.00E+00
7.00E-01 3.49E-01 1.18E+00
3.09E+01 4.23E-03 4.23E-03 9.87E-01 8.89E-03 8.89E-03 6.76E-02 0.00E+00 0.00E+00
6.25E-01 3.11E-01 1.18E+00
3.72E+01 3.66E-03 3.66E-03 9.87E-01 8.89E-03 8.89E-03 7.57E-02 0.00E+00 0.00E+00
5.64E-01 2.80E-01 1.19E+00
4.48E+01 3.16E-03 3.16E-03 9.88E-01 8.90E-03 8.90E-03 8.37E-02 0.00E+00 0.00E+00
5.14E-01 2.57E-01 1.20E+00
5.40E+01 2.70E-03 2.70E-03 9.88E-01 8.90E-03 8.90E-03 9.14E-02 0.00E+00 0.00E+00
4.72E-01 2.41E-01 1.20E+00
6.51E+01 2.29E-03 2.29E-03 9.89E-01 8.90E-03 8.90E-03 9.83E-02 0.00E+00 0.00E+00
4.37E-01 2.30E-01 1.21E+00
7.85E+01 1.93E-03 1.93E-03 9.89E-01 8.91E-03 8.91E-03 1.04E-01 0.00E+00 0.00E+00
4.08E-01 2.24E-01 1.22E+00
9.48E+01 1.60E-03 1.60E-03 9.89E-01 8.91E-03 8.91E-03 1.08E-01 0.00E+00 0.00E+00
3.83E-01 2.21E-01 1.22E+00
1.14E+02 1.31E-03 1.31E-03 9.90E-01 8.91E-03 8.91E-03 1.11E-01 0.00E+00 0.00E+00
3.63E-01 2.20E-01 1.23E+00
1.38E+02 1.07E-03 1.07E-03 9.90E-01 8.91E-03 8.91E-03 1.11E-01 0.00E+00 0.00E+00
3.45E-01 2.22E-01 1.23E+00
1.67E+02 8.52E-04 8.52E-04 9.90E-01 8.92E-03 8.92E-03 1.10E-01 0.00E+00 0.00E+00
3.30E-01 2.24E-01 1.24E+00
2.02E+02 6.72E-04 6.72E-04 9.90E-01 8.92E-03 8.92E-03 1.06E-01 0.00E+00 0.00E+00
3.17E-01 2.28E-01 1.24E+00
2.44E+02 5.24E-04 5.24E-04 9.91E-01 8.92E-03 8.92E-03 1.01E-01 0.00E+00 0.00E+00
3.06E-01 2.31E-01 1.24E+00
2.95E+02 3.80E-04 3.80E-04 9.91E-01 8.92E-03 8.92E-03 8.94E-02 0.00E+00 0.00E+00
2.94E-01 2.36E-01 1.23E+00
3.59E+02 2.70E-04 2.70E-04 9.91E-01 8.92E-03 8.92E-03 7.74E-02 0.00E+00 0.00E+00
2.84E-01 2.40E-01 1.23E+00
4.37E+02 1.88E-04 1.88E-04 9.91E-01 8.92E-03 8.92E-03 6.57E-02 0.00E+00 0.00E+00
2.75E-01 2.45E-01 1.23E+00
5.35E+02 1.29E-04 1.29E-04 9.91E-01 8.92E-03 8.92E-03 5.46E-02 0.00E+00 0.00E+00
2.66E-01 2.48E-01 1.23E+00
6.57E+02 8.63E-05 8.63E-05 9.91E-01 8.92E-03 8.92E-03 4.46E-02 0.00E+00 0.00E+00
2.57E-01 2.51E-01 1.23E+00
8.09E+02 5.70E-05 5.70E-05 9.91E-01 8.92E-03 8.92E-03 3.58E-02 0.00E+00 0.00E+00
2.48E-01 2.53E-01 1.23E+00
9.98E+02 3.71E-05 3.71E-05 9.91E-01 8.92E-03 8.92E-03 2.84E-02 0.00E+00 0.00E+00
2.40E-01 2.54E-01 1.23E+00
1.23E+03 2.39E-05 2.39E-05 9.91E-01 8.92E-03 8.92E-03 2.22E-02 0.00E+00 0.00E+00
2.32E-01 2.53E-01 1.22E+00
1.53E+03 1.52E-05 1.52E-05 9.91E-01 8.92E-03 8.92E-03 1.72E-02 0.00E+00 0.00E+00
2.24E-01 2.51E-01 1.22E+00
1.89E+03 9.59E-06 9.59E-06 9.91E-01 8.92E-03 8.92E-03 1.32E-02 0.00E+00 0.00E+00
2.15E-01 2.47E-01 1.22E+00
2.34E+03 6.02E-06 6.02E-06 9.91E-01 8.92E-03 8.92E-03 1.01E-02 0.00E+00 0.00E+00
2.07E-01 2.42E-01 1.21E+00
2.91E+03 3.76E-06 3.76E-06 9.91E-01 8.92E-03 8.92E-03 7.65E-03 0.00E+00 0.00E+00

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 1.99E-01  2.36E-01  1.20E+00
        3.60E+03  2.35E-06  2.35E-06  9.91E-01  8.92E-03  8.92E-03  5.80E-03  0.00E+00  0.00E+00
 1.90E-01  2.28E-01  1.20E+00
        4.47E+03  1.46E-06  1.46E-06  9.91E-01  8.92E-03  8.92E-03  4.39E-03  0.00E+00  0.00E+00
 1.81E-01  2.19E-01  1.19E+00
        5.55E+03  9.13E-07  9.13E-07  9.91E-01  8.92E-03  8.92E-03  3.36E-03  0.00E+00  0.00E+00
 1.72E-01  2.09E-01  1.18E+00
        6.88E+03  5.71E-07  5.71E-07  9.91E-01  8.92E-03  8.92E-03  2.57E-03  0.00E+00  0.00E+00
 1.62E-01  1.98E-01  1.17E+00
        8.52E+03  3.58E-07  3.58E-07  9.91E-01  8.92E-03  8.92E-03  2.00E-03  0.00E+00  0.00E+00
 1.52E-01  1.87E-01  1.15E+00
        1.06E+04  2.26E-07  2.26E-07  9.91E-01  8.92E-03  8.92E-03  1.43E-03  0.00E+00  0.00E+00
 1.41E-01  1.75E-01  1.14E+00
        1.31E+04  1.43E-07  1.43E-07  9.91E-01  8.92E-03  8.92E-03  1.07E-03  0.00E+00  0.00E+00
 1.30E-01  1.63E-01  1.12E+00
•          time averaged (tav =   60. s) volume concentration:  concentration contour parameters

          c(x,y,z,t) = cc(x) * (erf(xa)-erf(xb)) * (erf(ya)-erf(yb)) * (exp(-za*za)+exp(-zb*zb))

                 c(x,y,z,t) = concentration (volume fraction) at (x,y,z,t)
                          x = downwind distance (m)
                          y = crosswind horizontal distance (m)
                          z = height (m)
                          t = time (s)

                        erf = error functon             exp = exponential function
                         xa = (x-xc+bx)/(sr2*betax)      za = (z-zc)/(sr2*sig)
                         xb = (x-xc-bx)/(sr2*betax)      zb = (z+zc)/(sr2*sig)
                         ya = (y+b)/(sr2*betac)         sr2 = sqrt(2.0)
                         yb = (y-b)/(sr2*betac)

             x        cc(x)     b(x)    betac(x)    zc(x)    sig(x)               t        xc(t)
    bx(t)   betax(t)
           1.00E+00  0.00E+00  3.02E-02  8.44E-03  1.00E+00  1.94E-02            0.00E+00
1.00E+00  0.00E+00  0.00E+00
           1.02E+00  3.58E-01  3.73E-02  2.38E-02  1.00E+00  3.21E-02            4.19E-05
1.02E+00  2.00E-02  1.63E-04
           1.05E+00  3.29E-01  4.34E-02  3.73E-02  1.00E+00  4.50E-02            1.27E-04
1.05E+00  4.42E-02  3.61E-04
           1.08E+00  3.04E-01  4.91E-02  5.15E-02  1.00E+00  5.89E-02            2.70E-04
1.08E+00  7.35E-02  6.00E-04
           1.11E+00  2.82E-01  5.48E-02  6.73E-02  1.00E+00  7.44E-02            4.98E-04
1.11E+00  1.09E-01  8.89E-04
           1.16E+00  2.61E-01  6.07E-02  8.51E-02  1.00E+00  9.21E-02            8.51E-04
1.16E+00  1.52E-01  1.24E-03
           1.21E+00  2.42E-01  6.68E-02  1.06E-01  1.00E+00  1.13E-01            1.38E-03
1.21E+00  2.03E-01  1.66E-03
           1.28E+00  2.24E-01  7.33E-02  1.29E-01  1.00E+00  1.36E-01            2.18E-03
1.28E+00  2.66E-01  2.17E-03
           1.36E+00  2.08E-01  8.01E-02  1.57E-01  1.00E+00  1.64E-01            3.35E-03
1.36E+00  3.42E-01  2.79E-03
           1.45E+00  1.93E-01  8.74E-02  1.89E-01  1.00E+00  1.95E-01            5.06E-03
1.45E+00  4.33E-01  3.54E-03
           1.57E+00  1.79E-01  9.52E-02  2.26E-01  1.00E+00  2.32E-01            7.55E-03
1.57E+00  5.44E-01  4.44E-03
           1.71E+00  1.67E-01  1.03E-01  2.69E-01  1.00E+00  2.75E-01            1.12E-02
1.71E+00  6.78E-01  5.54E-03
           1.88E+00  1.55E-01  1.12E-01  3.19E-01  1.00E+00  3.25E-01            1.63E-02
1.88E+00  8.40E-01  6.86E-03
           2.08E+00  1.44E-01  1.22E-01  3.77E-01  1.00E+00  3.83E-01            2.38E-02
2.08E+00  1.04E+00  8.46E-03
           2.33E+00  1.33E-01  1.32E-01  4.43E-01  1.00E+00  4.50E-01            3.44E-02
2.33E+00  1.27E+00  1.04E-02
           2.63E+00  1.24E-01  1.42E-01  5.21E-01  1.00E+00  5.27E-01            4.95E-02
2.63E+00  1.56E+00  1.27E-02
           2.99E+00  1.09E-01  1.53E-01  6.08E-01  1.00E+00  6.52E-01            7.09E-02
2.99E+00  1.91E+00  1.56E-02
           3.43E+00  9.02E-02  1.66E-01  7.09E-01  1.00E+00  8.54E-01            1.01E-01
3.43E+00  2.33E+00  1.90E-02
           3.96E+00  7.77E-02  1.77E-01  8.16E-01  1.00E+00  1.07E+00            1.44E-01
3.96E+00  2.83E+00  2.31E-02
           4.61E+00  6.85E-02  1.88E-01  9.31E-01  1.00E+00  1.30E+00            2.03E-01
4.61E+00  3.45E+00  2.81E-02
           5.38E+00  6.13E-02  1.99E-01  1.06E+00  1.00E+00  1.55E+00            2.83E-01
5.38E+00  4.19E+00  3.42E-02
           6.32E+00  5.54E-02  2.10E-01  1.19E+00  1.00E+00  1.82E+00            3.93E-01
6.32E+00  5.08E+00  4.15E-02
           7.45E+00  5.04E-02  2.20E-01  1.34E+00  1.00E+00  2.11E+00            5.40E-01
7.45E+00  6.17E+00  5.04E-02
           8.83E+00  4.62E-02  2.30E-01  1.50E+00  1.01E+00  2.42E+00            7.37E-01
8.83E+00  7.48E+00  6.11E-02
           1.05E+01  4.24E-02  2.40E-01  1.67E+00  1.01E+00  2.77E+00            9.99E-01
1.05E+01  9.07E+00  7.40E-02
           1.25E+01  3.91E-02  2.50E-01  1.85E+00  1.01E+00  3.13E+00            1.34E+00
1.25E+01  1.10E+01  8.97E-02
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           1.49E+01  3.61E-02  2.59E-01  2.05E+00  1.02E+00  3.53E+00            1.79E+00
1.49E+01  1.33E+01  1.09E-01
           1.79E+01  3.35E-02  2.67E-01  2.27E+00  1.03E+00  3.94E+00            2.38E+00
1.79E+01  1.61E+01  1.32E-01
           2.14E+01  3.11E-02  2.74E-01  2.50E+00  1.05E+00  4.39E+00            3.12E+00
2.14E+01  1.95E+01  1.59E-01
           2.57E+01  2.89E-02  2.80E-01  2.75E+00  1.08E+00  4.86E+00            4.08E+00
2.57E+01  2.36E+01  1.93E-01
           3.09E+01  2.70E-02  2.85E-01  3.01E+00  1.12E+00  5.36E+00            5.29E+00
3.09E+01  2.86E+01  2.33E-01
           3.72E+01  2.51E-02  2.89E-01  3.31E+00  1.17E+00  5.89E+00            6.82E+00
3.72E+01  3.46E+01  2.82E-01
           4.48E+01  2.34E-02  2.93E-01  3.63E+00  1.25E+00  6.46E+00            8.73E+00
4.48E+01  4.18E+01  3.42E-01
           5.40E+01  2.18E-02  2.96E-01  3.99E+00  1.35E+00  7.07E+00            1.11E+01
5.40E+01  5.06E+01  4.13E-01
           6.51E+01  2.03E-02  2.97E-01  4.40E+00  1.49E+00  7.73E+00            1.40E+01
6.51E+01  6.12E+01  5.00E-01
           7.85E+01  1.89E-02  2.98E-01  4.88E+00  1.67E+00  8.45E+00            1.76E+01
7.85E+01  7.41E+01  6.05E-01
           9.48E+01  1.77E-02  2.98E-01  5.46E+00  1.90E+00  9.21E+00            2.19E+01
9.48E+01  8.96E+01  7.32E-01
           1.14E+02  1.65E-02  2.98E-01  6.18E+00  2.19E+00  1.00E+01            2.72E+01
1.14E+02  1.08E+02  8.85E-01
           1.38E+02  1.55E-02  2.98E-01  7.07E+00  2.55E+00  1.09E+01            3.36E+01
1.38E+02  1.31E+02  1.07E+00
           1.67E+02  1.44E-02  2.97E-01  8.18E+00  2.97E+00  1.19E+01            4.13E+01
1.67E+02  1.59E+02  1.30E+00
           2.02E+02  1.35E-02  2.97E-01  9.55E+00  3.47E+00  1.29E+01            5.04E+01
2.02E+02  1.92E+02  1.57E+00
           2.44E+02  1.25E-02  2.96E-01  1.13E+01  4.03E+00  1.41E+01            6.14E+01
2.44E+02  2.32E+02  1.89E+00
           2.95E+02  1.15E-02  2.96E-01  1.34E+01  4.66E+00  1.57E+01            6.66E+01
2.95E+02  2.32E+02  4.73E+01
           3.59E+02  1.06E-02  2.96E-01  1.61E+01  5.32E+00  1.77E+01            7.45E+01
3.59E+02  2.32E+02  7.15E+01
           4.37E+02  9.59E-03  2.96E-01  1.95E+01  6.01E+00  2.00E+01            8.41E+01
4.37E+02  2.32E+02  9.40E+01
           5.35E+02  8.62E-03  2.96E-01  2.37E+01  6.71E+00  2.27E+01            9.58E+01
5.35E+02  2.32E+02  1.17E+02
           6.57E+02  7.68E-03  2.96E-01  2.88E+01  7.40E+00  2.60E+01            1.10E+02
6.57E+02  2.32E+02  1.42E+02
           8.09E+02  6.78E-03  2.96E-01  3.50E+01  8.08E+00  2.99E+01            1.27E+02
8.09E+02  2.32E+02  1.70E+02
           9.98E+02  5.95E-03  2.96E-01  4.26E+01  8.74E+00  3.45E+01            1.47E+02
9.98E+02  2.32E+02  2.01E+02
           1.23E+03  5.18E-03  2.96E-01  5.17E+01  9.36E+00  4.00E+01            1.72E+02
1.23E+03  2.32E+02  2.37E+02
           1.53E+03  4.50E-03  2.96E-01  6.27E+01  9.95E+00  4.65E+01            2.02E+02
1.53E+03  2.32E+02  2.78E+02
           1.89E+03  3.88E-03  2.96E-01  7.58E+01  1.05E+01  5.42E+01            2.39E+02
1.89E+03  2.32E+02  3.27E+02
           2.34E+03  3.35E-03  2.96E-01  9.14E+01  1.10E+01  6.32E+01            2.83E+02
2.34E+03  2.32E+02  3.84E+02
           2.91E+03  2.88E-03  2.96E-01  1.10E+02  1.15E+01  7.37E+01            3.36E+02
2.91E+03  2.32E+02  4.51E+02
           3.60E+03  2.48E-03  2.96E-01  1.31E+02  1.19E+01  8.60E+01            4.00E+02
3.60E+03  2.32E+02  5.31E+02
           4.47E+03  2.13E-03  2.96E-01  1.56E+02  1.23E+01  1.00E+02            4.78E+02
4.47E+03  2.32E+02  6.26E+02
           5.55E+03  1.84E-03  2.96E-01  1.85E+02  1.27E+01  1.17E+02            5.72E+02
5.55E+03  2.32E+02  7.40E+02
           6.88E+03  1.58E-03  2.96E-01  2.18E+02  1.30E+01  1.35E+02            6.86E+02
6.88E+03  2.32E+02  8.75E+02
           8.52E+03  1.37E-03  2.96E-01  2.56E+02  1.33E+01  1.57E+02            8.24E+02
8.52E+03  2.32E+02  1.04E+03
           1.06E+04  1.19E-03  2.96E-01  2.99E+02  1.36E+01  1.81E+02            9.91E+02
1.06E+04  2.32E+02  1.23E+03
           1.31E+04  1.03E-03  2.96E-01  3.48E+02  1.38E+01  2.08E+02            1.19E+03
1.31E+04  2.32E+02  1.46E+03
•

             time averaged (tav =   60. s) volume concentration:  concentration in the z =   .00
plane.

             downwind    time of      cloud     effective                average concentration
(volume fraction) at (x,y,z)
             distance    max conc    duration   half width        y/bbc=     y/bbc=     y/bbc=
 y/bbc=     y/bbc=     y/bbc=
               x (m)        (s)         (s)       bbc (m)             0.0        0.5        1.0
     1.5        2.0        2.5
             1.00E+00    3.00E+01    6.00E+01    3.35E-02         0.00E+00   0.00E+00   0.00E+00
 0.00E+00   0.00E+00   0.00E+00
             1.02E+00    3.00E+01    6.00E+01    5.56E-02         0.00E+00   0.00E+00   0.00E+00
```

0.00E+00	0.00E+00	0.00E+00						
	1.05E+00	3.00E+01	6.00E+01	7.78E-02	0.00E+00	0.00E+00	0.00E+00	
0.00E+00	0.00E+00	0.00E+00						
	1.08E+00	3.00E+01	6.00E+01	1.02E-01	0.00E+00	0.00E+00	0.00E+00	
0.00E+00	0.00E+00	0.00E+00						
	1.11E+00	3.00E+01	6.00E+01	1.29E-01	7.92E-40	5.49E-40	1.80E-40	
2.67E-41	1.75E-42	4.90E-44						
	1.16E+00	3.00E+01	6.00E+01	1.59E-01	2.86E-26	1.98E-26	6.46E-27	
9.73E-28	6.59E-29	1.97E-30						
	1.21E+00	3.00E+01	6.00E+01	1.95E-01	6.50E-18	4.48E-18	1.46E-18	
2.22E-19	1.54E-20	4.78E-22						
	1.28E+00	3.00E+01	6.00E+01	2.36E-01	1.48E-12	1.02E-12	3.31E-13	
5.04E-14	3.54E-15	1.13E-16						
	1.36E+00	3.00E+01	6.00E+01	2.83E-01	4.93E-09	3.40E-09	1.10E-09	
1.68E-10	1.20E-11	3.91E-13						
	1.45E+00	3.01E+01	6.00E+01	3.38E-01	1.13E-06	7.77E-07	2.53E-07	
3.86E-08	2.76E-09	9.13E-11						
	1.57E+00	3.01E+01	6.00E+01	4.02E-01	4.47E-05	3.08E-05	1.00E-05	
1.53E-06	1.10E-07	3.67E-09						
	1.71E+00	3.01E+01	6.00E+01	4.77E-01	5.48E-04	3.77E-04	1.22E-04	
1.88E-05	1.35E-06	4.54E-08						
	1.88E+00	3.01E+01	6.00E+01	5.63E-01	3.03E-03	2.08E-03	6.77E-04	
1.04E-04	7.47E-06	2.52E-07						
	2.08E+00	3.01E+01	6.00E+01	6.64E-01	9.68E-03	6.65E-03	2.16E-03	
3.31E-04	2.39E-05	8.10E-07						
	2.33E+00	3.02E+01	6.00E+01	7.79E-01	2.11E-02	1.45E-02	4.71E-03	
7.22E-04	5.22E-05	1.77E-06						
	2.63E+00	3.02E+01	6.00E+01	9.13E-01	3.53E-02	2.43E-02	7.88E-03	
1.21E-03	8.73E-05	2.97E-06						
	2.99E+00	3.02E+01	6.00E+01	1.06E+00	5.35E-02	3.67E-02	1.19E-02	
1.83E-03	1.32E-04	4.51E-06						
	3.43E+00	3.03E+01	6.00E+01	1.24E+00	6.71E-02	4.61E-02	1.50E-02	
2.29E-03	1.66E-04	5.67E-06						
	3.96E+00	3.04E+01	6.00E+01	1.42E+00	6.89E-02	4.73E-02	1.54E-02	
2.36E-03	1.71E-04	5.82E-06						
	4.61E+00	3.04E+01	6.00E+01	1.62E+00	6.52E-02	4.48E-02	1.46E-02	
2.23E-03	1.62E-04	5.52E-06						
	5.38E+00	3.05E+01	6.00E+01	1.84E+00	5.95E-02	4.09E-02	1.33E-02	
2.04E-03	1.47E-04	5.04E-06						
	6.32E+00	3.07E+01	6.00E+01	2.07E+00	5.32E-02	3.66E-02	1.19E-02	
1.82E-03	1.32E-04	4.50E-06						
	7.45E+00	3.08E+01	6.00E+01	2.33E+00	4.71E-02	3.24E-02	1.05E-02	
1.61E-03	1.17E-04	3.99E-06						
	8.83E+00	3.10E+01	6.00E+01	2.60E+00	4.15E-02	2.85E-02	9.25E-03	
1.42E-03	1.03E-04	3.51E-06						
	1.05E+01	3.12E+01	6.00E+01	2.90E+00	3.64E-02	2.50E-02	8.11E-03	
1.24E-03	9.01E-05	3.08E-06						
	1.25E+01	3.14E+01	6.00E+01	3.22E+00	3.18E-02	2.19E-02	7.10E-03	
1.09E-03	7.88E-05	2.70E-06						
	1.49E+01	3.17E+01	6.00E+01	3.57E+00	2.78E-02	1.91E-02	6.20E-03	
9.50E-04	6.88E-05	2.35E-06						
	1.79E+01	3.21E+01	6.00E+01	3.94E+00	2.42E-02	1.66E-02	5.40E-03	
8.28E-04	6.00E-05	2.05E-06						
	2.14E+01	3.25E+01	6.00E+01	4.33E+00	2.10E-02	1.45E-02	4.70E-03	
7.20E-04	5.22E-05	1.79E-06						
	2.57E+01	3.31E+01	6.00E+01	4.76E+00	1.83E-02	1.26E-02	4.08E-03	
6.25E-04	4.53E-05	1.55E-06						
	3.09E+01	3.37E+01	6.00E+01	5.23E+00	1.58E-02	1.09E-02	3.53E-03	
5.41E-04	3.92E-05	1.34E-06						
	3.72E+01	3.45E+01	6.00E+01	5.73E+00	1.36E-02	9.36E-03	3.04E-03	
4.66E-04	3.37E-05	1.16E-06						
	4.48E+01	3.54E+01	6.00E+01	6.29E+00	1.17E-02	8.02E-03	2.60E-03	
3.99E-04	2.89E-05	9.89E-07						
	5.40E+01	3.65E+01	6.00E+01	6.92E+00	9.92E-03	6.82E-03	2.21E-03	
3.40E-04	2.46E-05	8.41E-07						
	6.51E+01	3.79E+01	6.00E+01	7.63E+00	8.36E-03	5.75E-03	1.87E-03	
2.86E-04	2.07E-05	7.09E-07						
	7.85E+01	3.96E+01	6.00E+01	8.46E+00	6.97E-03	4.79E-03	1.55E-03	
2.38E-04	1.73E-05	5.89E-07						
	9.48E+01	4.16E+01	6.00E+01	9.47E+00	5.73E-03	3.94E-03	1.28E-03	
1.96E-04	1.42E-05	4.87E-07						
	1.14E+02	4.40E+01	6.00E+01	1.07E+01	4.64E-03	3.19E-03	1.04E-03	
1.59E-04	1.15E-05	3.96E-07						
	1.38E+02	4.70E+01	6.00E+01	1.23E+01	3.70E-03	2.54E-03	8.26E-04	
1.27E-04	9.17E-06	3.15E-07						
	1.67E+02	5.05E+01	6.00E+01	1.42E+01	2.91E-03	2.00E-03	6.48E-04	
9.94E-05	7.20E-06	2.45E-07						
	2.02E+02	5.48E+01	6.00E+01	1.66E+01	2.25E-03	1.54E-03	5.01E-04	
7.69E-05	5.57E-06	1.92E-07						
	2.44E+02	6.00E+01	6.00E+01	1.95E+01	1.71E-03	1.17E-03	3.81E-04	
5.84E-05	4.23E-06	1.46E-07						
	2.95E+02	6.66E+01	6.23E+01	2.33E+01	1.17E-03	8.03E-04	2.61E-04	
4.00E-05	2.90E-06	9.91E-08						
	3.59E+02	7.45E+01	6.51E+01	2.80E+01	8.18E-04	5.62E-04	1.82E-04	
2.80E-05	2.03E-06	6.84E-08						

	4.37E+02	8.41E+01	6.83E+01	3.38E+01	5.67E-04	3.89E-04	1.26E-04	1.94E-05	1.40E-06	4.89E-08
	5.35E+02	9.58E+01	7.23E+01	4.10E+01	3.88E-04	2.67E-04	8.66E-05	1.33E-05	9.62E-07	3.25E-08
	6.57E+02	1.10E+02	7.71E+01	4.98E+01	2.63E-04	1.81E-04	5.86E-05	8.99E-06	6.51E-07	2.20E-08
	8.09E+02	1.27E+02	8.29E+01	6.06E+01	1.76E-04	1.21E-04	3.92E-05	6.02E-06	4.36E-07	1.48E-08
	9.98E+02	1.47E+02	8.99E+01	7.37E+01	1.16E-04	8.00E-05	2.60E-05	3.98E-06	2.89E-07	1.00E-08
	1.23E+03	1.72E+02	9.83E+01	8.96E+01	7.61E-05	5.23E-05	1.70E-05	2.60E-06	1.88E-07	6.46E-09
	1.53E+03	2.02E+02	1.08E+02	1.09E+02	4.92E-05	3.38E-05	1.10E-05	1.68E-06	1.22E-07	3.90E-09
	1.89E+03	2.39E+02	1.21E+02	1.31E+02	3.15E-05	2.17E-05	7.04E-06	1.08E-06	7.82E-08	2.42E-09
	2.34E+03	2.83E+02	1.35E+02	1.58E+02	2.00E-05	1.38E-05	4.47E-06	6.85E-07	4.95E-08	1.85E-09
	2.91E+03	3.36E+02	1.52E+02	1.90E+02	1.26E-05	8.69E-06	2.82E-06	4.32E-07	3.14E-08	1.05E-09
	3.60E+03	4.00E+02	1.73E+02	2.27E+02	7.94E-06	5.45E-06	1.77E-06	2.71E-07	1.97E-08	7.89E-10
	4.47E+03	4.78E+02	1.97E+02	2.71E+02	4.97E-06	3.42E-06	1.11E-06	1.70E-07	1.24E-08	3.92E-10
	5.55E+03	5.72E+02	2.26E+02	3.21E+02	3.11E-06	2.14E-06	6.94E-07	1.06E-07	7.71E-09	2.91E-10
	6.88E+03	6.86E+02	2.60E+02	3.78E+02	1.95E-06	1.34E-06	4.35E-07	6.66E-08	4.84E-09	2.15E-10
	8.52E+03	8.24E+02	3.00E+02	4.44E+02	1.22E-06	8.40E-07	2.73E-07	4.18E-08	3.05E-09	7.92E-11
	1.06E+04	9.91E+02	3.47E+02	5.19E+02	7.71E-07	5.30E-07	1.72E-07	2.64E-08	1.90E-09	5.84E-11
	1.31E+04	1.19E+03	4.04E+02	6.03E+02	4.89E-07	3.36E-07	1.09E-07	1.67E-08	1.23E-09	4.30E-11

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time averaged (tav = 60. s) volume concentration: maximum concentration (volume fraction) along centerline.

downwind distance x (m)	height z (m)	maximum concentration c(x,0,z)	time of max conc (s)	cloud duration (s)
1.00E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.02E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.05E+00	1.00E+00	9.96E-01	3.00E+01	6.00E+01
1.08E+00	1.00E+00	8.03E-01	3.00E+01	6.00E+01
1.11E+00	1.00E+00	6.59E-01	3.00E+01	6.00E+01
1.16E+00	1.00E+00	5.47E-01	3.00E+01	6.00E+01
1.21E+00	1.00E+00	4.58E-01	3.00E+01	6.00E+01
1.28E+00	1.00E+00	3.85E-01	3.00E+01	6.00E+01
1.36E+00	1.00E+00	3.26E-01	3.00E+01	6.00E+01
1.45E+00	1.00E+00	2.76E-01	3.01E+01	6.00E+01
1.57E+00	1.00E+00	2.35E-01	3.01E+01	6.00E+01
1.71E+00	1.00E+00	2.00E-01	3.01E+01	6.00E+01
1.88E+00	1.00E+00	1.70E-01	3.01E+01	6.00E+01
2.08E+00	1.00E+00	1.46E-01	3.01E+01	6.00E+01
2.33E+00	1.00E+00	1.25E-01	3.02E+01	6.00E+01
2.63E+00	9.99E-01	1.07E-01	3.02E+01	6.00E+01
2.99E+00	9.80E-01	8.75E-02	3.02E+01	6.00E+01
3.43E+00	8.00E-01	7.20E-02	3.03E+01	6.00E+01
3.96E+00	0.00E+00	6.89E-02	3.04E+01	6.00E+01
4.61E+00	0.00E+00	6.52E-02	3.04E+01	6.00E+01
5.38E+00	0.00E+00	5.95E-02	3.05E+01	6.00E+01
6.32E+00	0.00E+00	5.32E-02	3.07E+01	6.00E+01
7.45E+00	0.00E+00	4.71E-02	3.08E+01	6.00E+01
8.83E+00	0.00E+00	4.15E-02	3.10E+01	6.00E+01
1.05E+01	0.00E+00	3.64E-02	3.12E+01	6.00E+01
1.25E+01	0.00E+00	3.18E-02	3.14E+01	6.00E+01
1.49E+01	0.00E+00	2.78E-02	3.17E+01	6.00E+01
1.79E+01	0.00E+00	2.42E-02	3.21E+01	6.00E+01
2.14E+01	0.00E+00	2.10E-02	3.25E+01	6.00E+01
2.57E+01	0.00E+00	1.83E-02	3.31E+01	6.00E+01
3.09E+01	0.00E+00	1.58E-02	3.37E+01	6.00E+01
3.72E+01	0.00E+00	1.36E-02	3.45E+01	6.00E+01
4.48E+01	0.00E+00	1.17E-02	3.54E+01	6.00E+01
5.40E+01	0.00E+00	9.92E-03	3.65E+01	6.00E+01
6.51E+01	0.00E+00	8.36E-03	3.79E+01	6.00E+01
7.85E+01	0.00E+00	6.97E-03	3.96E+01	6.00E+01
9.48E+01	0.00E+00	5.73E-03	4.16E+01	6.00E+01
1.14E+02	0.00E+00	4.64E-03	4.40E+01	6.00E+01
1.38E+02	0.00E+00	3.70E-03	4.70E+01	6.00E+01
1.67E+02	0.00E+00	2.91E-03	5.05E+01	6.00E+01
2.02E+02	0.00E+00	2.25E-03	5.48E+01	6.00E+01
2.44E+02	0.00E+00	1.71E-03	6.00E+01	6.00E+01

2.95E+02	0.00E+00	1.17E-03	6.66E+01	6.23E+01
3.59E+02	0.00E+00	8.18E-04	7.45E+01	6.51E+01
4.37E+02	0.00E+00	5.67E-04	8.41E+01	6.83E+01
5.35E+02	0.00E+00	3.88E-04	9.58E+01	7.23E+01
6.57E+02	0.00E+00	2.63E-04	1.10E+02	7.71E+01
8.09E+02	0.00E+00	1.76E-04	1.27E+02	8.29E+01
9.98E+02	0.00E+00	1.16E-04	1.47E+02	8.99E+01
1.23E+03	0.00E+00	7.61E-05	1.72E+02	9.83E+01
1.53E+03	0.00E+00	4.92E-05	2.02E+02	1.08E+02
1.89E+03	0.00E+00	3.15E-05	2.39E+02	1.21E+02
2.34E+03	0.00E+00	2.00E-05	2.83E+02	1.35E+02
2.91E+03	0.00E+00	1.26E-05	3.36E+02	1.52E+02
3.60E+03	0.00E+00	7.94E-06	4.00E+02	1.73E+02
4.47E+03	0.00E+00	4.97E-06	4.78E+02	1.97E+02
5.55E+03	0.00E+00	3.11E-06	5.72E+02	2.26E+02
6.88E+03	0.00E+00	1.95E-06	6.86E+02	2.60E+02
8.52E+03	0.00E+00	1.22E-06	8.24E+02	3.00E+02
1.06E+04	0.00E+00	7.71E-07	9.91E+02	3.47E+02
1.31E+04	0.00E+00	4.89E-07	1.19E+03	4.04E+02

•(10U •&l0O •&k2S •&l8D •

```
problem input

idspl =         2
ncalc =         1
wms   =   .016000
cps   =   2240.00
tbp   =    111.70
cmed0 =       .00
dhe   =   509880.
cpsl  =   3349.00
rhosl =    424.10
spb   =     -1.00
spc   =       .00
ts    =    264.00
qs    =      4.59
as    =       .00
tsd   =       60.
qtis  =       .00
hs    =      1.00
tav   =     60.00
xffm  =   9000.00
zp(1) =       .00
zp(2) =       .00
zp(3) =       .00
zp(4) =       .00
z0    =   .300000
za    =      2.00
ua    =      2.00
ta    =    293.00
rh    =     60.00
stab  =      6.00
```

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```
release gas properties

molecular weight of source gas (kg)              - wms  =  1.6000E-02
vapor heat capacity, const. p.  (j/kg-k)         - cps  =  2.2400E+03
temperature of source gas (k)                    - ts   =  2.6400E+02
density of source gas (kg/m3)                    - rhos =  7.3860E-01
boiling point temperature                        - tbp  =  1.1170E+02
liquid mass fraction                             - cmed0=  0.0000E+00
liquid heat capacity (j/kg-k)                    - cpsl =  3.3490E+03
heat of vaporization (j/kg)                      - dhe  =  5.0988E+05
liquid source density (kg/m3)                    - rhosl=  4.2410E+02
saturation pressure constant                     - spa  =  8.7843E+00
saturation pressure constant (k)                 - spb  =  9.8121E+02
saturation pressure constant (k)                 - spc  =  0.0000E+00


spill characteristics

spill type                                       - idspl=          2
mass source rate (kg/s)                          - qs   =  4.5900E+00
continuous source duration (s)                   - tsd  =  6.0000E+01
continuous source mass (kg)                      - qtcs =  2.7540E+02
instantaneous source mass (kg)                   - qtis =  0.0000E+00
source area (m2)                                 - as   =  4.5000E-03
vertical vapor velocity (m/s)                    - ws   =  0.0000E+00
source half width (m)                            - bs   =  3.3541E-02
source height (m)                                - hs   =  1.0000E+00
horizontal vapor velocity (m/s)                  - us   =  1.3810E+03
```

field parameters

```
concentration averaging time (s)                  - tav  =  6.0000E+01
mixing layer height (m)                           - hmx  =  2.6000E+02
maximum downwind distance (m)                     - xffm =  9.0000E+03
concentration measurement height (m)              - zp(1)=  0.0000E+00
                                                  - zp(2)=  0.0000E+00
                                                  - zp(3)=  0.0000E+00
                                                  - zp(4)=  0.0000E+00
```

ambient meteorological properties

```
molecular weight of ambient air (kg)             - wmae  =  2.8804E-02
heat capacity of ambient air at const p. (j/kg-k)- cpaa  =  1.0134E+03
density of ambient air (kg/m3)                   - rhoa  =  1.1980E+00
ambient measurement height (m)                   - za    =  2.0000E+00
ambient atmospheric pressure (pa=n/m2=j/m3)      - pa    =  1.0133E+05
ambient wind speed (m/s)                         - ua    =  2.0000E+00
ambient temperature (k)                          - ta    =  2.9300E+02
relative humidity (percent)                      - rh    =  6.0000E+01
ambient friction velocity (m/s)                  - uastr =  3.2808E-01
atmospheric stability class value                - stab  =  6.0000E+00
inverse monin-obukhov length (1/m)               - ala   =  4.7330E-02
surface roughness height (m)                     - z0    =  3.0000E-01
```

additional parameters

```
sub-step multiplier                              - ncalc =           1
number of calculational sub-steps                - nssm  =           3
acceleration of gravity (m/s2)                   - grav  =  9.8067E+00
gas constant (j/mol- k)                          - rr    =  8.3143E+00
von karman constant                              - xk    =  4.1000E-01
```

instantaneous spatially averaged cloud parameters

```
          x        zc         h        bb         b        bbx       bx        cv        rho
   t         u        ua
        1.00E+00  1.00E+00  6.71E-02  3.35E-02  3.02E-02  0.00E+00  0.00E+00  1.00E+00  7.39E-01
2.64E+02  1.38E+03  6.06E-01
        1.02E+00  1.00E+00  1.15E-01  5.75E-02  3.78E-02  1.49E-02  1.49E-02  6.76E-01  9.02E-01
2.72E+02  7.16E+02  6.20E-01
        1.05E+00  1.00E+00  1.63E-01  8.15E-02  4.43E-02  3.29E-02  3.28E-02  5.11E-01  9.80E-01
2.77E+02  4.79E+02  6.34E-01
        1.08E+00  1.00E+00  2.15E-01  1.07E-01  5.03E-02  5.46E-02  5.46E-02  4.05E-01  1.03E+00
2.80E+02  3.52E+02  6.50E-01
        1.11E+00  1.00E+00  2.73E-01  1.36E-01  5.63E-02  8.09E-02  8.09E-02  3.29E-01  1.06E+00
2.82E+02  2.71E+02  6.67E-01
        1.16E+00  1.00E+00  3.39E-01  1.70E-01  6.24E-02  1.13E-01  1.13E-01  2.71E-01  1.09E+00
2.84E+02  2.14E+02  6.86E-01
        1.21E+00  1.00E+00  4.15E-01  2.08E-01  6.88E-02  1.51E-01  1.51E-01  2.26E-01  1.11E+00
2.85E+02  1.72E+02  7.08E-01
        1.28E+00  1.00E+00  5.04E-01  2.52E-01  7.56E-02  1.98E-01  1.98E-01  1.90E-01  1.12E+00
2.87E+02  1.40E+02  7.33E-01
        1.36E+00  1.00E+00  6.06E-01  3.03E-01  8.27E-02  2.54E-01  2.54E-01  1.60E-01  1.13E+00
2.88E+02  1.15E+02  7.62E-01
        1.45E+00  1.00E+00  7.24E-01  3.62E-01  9.03E-02  3.22E-01  3.22E-01  1.35E-01  1.14E+00
2.88E+02  9.56E+01  7.94E-01
        1.57E+00  1.00E+00  8.62E-01  4.31E-01  9.84E-02  4.04E-01  4.04E-01  1.15E-01  1.15E+00
2.89E+02  7.97E+01  8.31E-01
        1.71E+00  1.00E+00  1.02E+00  5.11E-01  1.07E-01  5.04E-01  5.04E-01  9.79E-02  1.16E+00
2.90E+02  6.67E+01  8.74E-01
        1.88E+00  1.00E+00  1.21E+00  6.04E-01  1.16E-01  6.24E-01  6.24E-01  8.36E-02  1.17E+00
2.90E+02  5.61E+01  9.21E-01
        2.08E+00  1.00E+00  1.42E+00  7.11E-01  1.26E-01  7.70E-01  7.70E-01  7.15E-02  1.17E+00
2.90E+02  4.73E+01  9.74E-01
        2.33E+00  1.00E+00  1.67E+00  8.35E-01  1.37E-01  9.46E-01  9.46E-01  6.12E-02  1.17E+00
2.91E+02  4.00E+01  1.03E+00
        2.63E+00  1.00E+00  1.96E+00  9.79E-01  1.48E-01  1.16E+00  1.16E+00  5.25E-02  1.18E+00
2.91E+02  3.40E+01  1.10E+00
        2.99E+00  1.00E+00  2.26E+00  1.13E+00  1.59E-01  1.42E+00  1.42E+00  4.60E-02  1.18E+00
2.91E+02  2.93E+01  1.22E+00
        3.43E+00  1.00E+00  2.57E+00  1.29E+00  1.70E-01  1.73E+00  1.73E+00  4.06E-02  1.18E+00
2.92E+02  2.55E+01  1.35E+00
        3.96E+00  1.00E+00  2.92E+00  1.46E+00  1.80E-01  2.10E+00  2.10E+00  3.60E-02  1.18E+00
2.92E+02  2.24E+01  1.47E+00
        4.61E+00  1.00E+00  3.30E+00  1.65E+00  1.91E-01  2.56E+00  2.56E+00  3.19E-02  1.19E+00
2.92E+02  1.97E+01  1.60E+00
        5.38E+00  1.00E+00  3.73E+00  1.86E+00  2.02E-01  3.11E+00  3.11E+00  2.83E-02  1.19E+00
2.92E+02  1.75E+01  1.73E+00
        6.32E+00  1.00E+00  4.19E+00  2.10E+00  2.14E-01  3.78E+00  3.78E+00  2.51E-02  1.19E+00
2.92E+02  1.55E+01  1.86E+00
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7.45E+00	1.00E+00	4.71E+00	2.36E+00	2.25E-01	4.58E+00	4.58E+00	2.23E-02	1.19E+00	2.92E+02	1.39E+01	1.99E+00	
8.83E+00	1.01E+00	5.28E+00	2.66E+00	2.35E-01	5.56E+00	5.56E+00	1.98E-02	1.19E+00	2.92E+02	1.24E+01	2.13E+00	
1.05E+01	1.01E+00	5.90E+00	2.98E+00	2.45E-01	6.74E+00	6.74E+00	1.75E-02	1.19E+00	2.92E+02	1.12E+01	2.27E+00	
1.25E+01	1.02E+00	6.57E+00	3.35E+00	2.56E-01	8.16E+00	8.16E+00	1.55E-02	1.19E+00	2.92E+02	1.01E+01	2.40E+00	
1.49E+01	1.03E+00	7.29E+00	3.76E+00	2.65E-01	9.89E+00	9.88E+00	1.37E-02	1.19E+00	2.93E+02	9.19E+00	2.53E+00	
1.79E+01	1.04E+00	8.05E+00	4.22E+00	2.75E-01	1.20E+01	1.20E+01	1.21E-02	1.19E+00	2.93E+02	8.40E+00	2.66E+00	
2.14E+01	1.07E+00	8.84E+00	4.73E+00	2.84E-01	1.45E+01	1.45E+01	1.07E-02	1.19E+00	2.93E+02	7.73E+00	2.78E+00	
2.57E+01	1.11E+00	9.68E+00	5.28E+00	2.93E-01	1.75E+01	1.75E+01	9.41E-03	1.19E+00	2.93E+02	7.17E+00	2.91E+00	
3.09E+01	1.16E+00	1.05E+01	5.89E+00	3.01E-01	2.12E+01	2.12E+01	8.30E-03	1.19E+00	2.93E+02	6.69E+00	3.02E+00	
3.72E+01	1.25E+00	1.14E+01	6.53E+00	3.07E-01	2.57E+01	2.57E+01	7.33E-03	1.20E+00	2.93E+02	6.29E+00	3.13E+00	
4.48E+01	1.38E+00	1.24E+01	7.21E+00	3.12E-01	3.11E+01	3.11E+01	6.47E-03	1.20E+00	2.93E+02	5.96E+00	3.25E+00	
5.40E+01	1.58E+00	1.33E+01	7.95E+00	3.17E-01	3.76E+01	3.76E+01	5.72E-03	1.20E+00	2.93E+02	5.68E+00	3.35E+00	
6.51E+01	1.86E+00	1.43E+01	8.74E+00	3.21E-01	4.55E+01	4.55E+01	5.05E-03	1.20E+00	2.93E+02	5.46E+00	3.45E+00	
7.85E+01	2.25E+00	1.53E+01	9.60E+00	3.24E-01	5.50E+01	5.50E+01	4.46E-03	1.20E+00	2.93E+02	5.27E+00	3.55E+00	
9.48E+01	2.82E+00	1.63E+01	1.05E+01	3.27E-01	6.66E+01	6.66E+01	3.93E-03	1.20E+00	2.93E+02	5.11E+00	3.64E+00	
1.14E+02	3.60E+00	1.73E+01	1.15E+01	3.30E-01	8.05E+01	8.05E+01	3.46E-03	1.20E+00	2.93E+02	4.98E+00	3.73E+00	
1.38E+02	4.68E+00	1.84E+01	1.26E+01	3.31E-01	9.74E+01	9.74E+01	3.04E-03	1.20E+00	2.93E+02	4.89E+00	3.81E+00	
1.67E+02	6.16E+00	1.95E+01	1.38E+01	3.32E-01	1.18E+02	1.18E+02	2.67E-03	1.20E+00	2.93E+02	4.81E+00	3.90E+00	
2.02E+02	8.15E+00	2.06E+01	1.51E+01	3.33E-01	1.43E+02	1.43E+02	2.33E-03	1.20E+00	2.93E+02	4.75E+00	3.98E+00	
2.43E+02	1.07E+01	2.16E+01	1.65E+01	3.33E-01	1.57E+02	1.43E+02	1.84E-03	1.20E+00	2.93E+02	4.64E+00	4.06E+00	
2.93E+02	1.36E+01	2.39E+01	1.81E+01	3.33E-01	1.74E+02	1.43E+02	1.37E-03	1.20E+00	2.93E+02	4.73E+00	4.30E+00	
3.55E+02	1.67E+01	2.69E+01	2.00E+01	3.33E-01	1.96E+02	1.43E+02	9.79E-04	1.20E+00	2.93E+02	4.86E+00	4.55E+00	
4.32E+02	2.00E+01	3.02E+01	2.23E+01	3.33E-01	2.21E+02	1.43E+02	6.92E-04	1.20E+00	2.93E+02	5.00E+00	4.79E+00	
5.29E+02	2.34E+01	3.39E+01	2.51E+01	3.33E-01	2.52E+02	1.43E+02	4.81E-04	1.20E+00	2.93E+02	5.14E+00	5.00E+00	
6.48E+02	2.69E+01	3.81E+01	2.86E+01	3.33E-01	2.89E+02	1.43E+02	3.28E-04	1.20E+00	2.93E+02	5.29E+00	5.20E+00	
7.97E+02	3.04E+01	4.29E+01	3.28E+01	3.33E-01	3.34E+02	1.43E+02	2.20E-04	1.20E+00	2.93E+02	5.44E+00	5.38E+00	
9.82E+02	3.38E+01	4.85E+01	3.80E+01	3.33E-01	3.86E+02	1.43E+02	1.45E-04	1.20E+00	2.93E+02	5.59E+00	5.55E+00	
1.21E+03	3.71E+01	5.51E+01	4.43E+01	3.33E-01	4.49E+02	1.43E+02	9.43E-05	1.20E+00	2.93E+02	5.74E+00	5.71E+00	
1.50E+03	4.02E+01	6.30E+01	5.18E+01	3.33E-01	5.24E+02	1.43E+02	6.05E-05	1.20E+00	2.93E+02	5.88E+00	5.87E+00	
1.85E+03	4.32E+01	7.25E+01	6.08E+01	3.33E-01	6.13E+02	1.43E+02	3.82E-05	1.20E+00	2.93E+02	6.03E+00	6.02E+00	
2.29E+03	4.59E+01	8.42E+01	7.16E+01	3.33E-01	7.18E+02	1.43E+02	2.39E-05	1.20E+00	2.93E+02	6.17E+00	6.16E+00	
2.83E+03	4.84E+01	9.60E+01	8.42E+01	3.33E-01	8.43E+02	1.43E+02	1.52E-05	1.20E+00	2.93E+02	6.30E+00	6.29E+00	
3.49E+03	5.08E+01	9.98E+01	9.89E+01	3.33E-01	9.92E+02	1.43E+02	1.06E-05	1.20E+00	2.93E+02	6.36E+00	6.36E+00	
4.30E+03	5.33E+01	1.06E+02	1.16E+02	3.33E-01	1.17E+03	1.43E+02	7.21E-06	1.20E+00	2.93E+02	6.43E+00	6.43E+00	
5.29E+03	5.58E+01	1.11E+02	1.35E+02	3.33E-01	1.38E+03	1.43E+02	4.99E-06	1.20E+00	2.93E+02	6.50E+00	6.50E+00	
6.51E+03	5.84E+01	1.17E+02	1.57E+02	3.33E-01	1.63E+03	1.43E+02	3.45E-06	1.20E+00	2.93E+02	6.56E+00	6.56E+00	
7.99E+03	6.10E+01	1.24E+02	1.83E+02	3.33E-01	1.93E+03	1.43E+02	2.38E-06	1.20E+00	2.93E+02	6.64E+00	6.64E+00	
9.80E+03	6.36E+01	1.31E+02	2.11E+02	3.33E-01	2.28E+03	1.43E+02	1.63E-06	1.20E+00	2.93E+02	6.72E+00	6.72E+00	
1.20E+04	6.63E+01	1.40E+02	2.44E+02	3.33E-01	2.70E+03	1.43E+02	1.12E-06	1.20E+00	2.93E+02	6.80E+00	6.80E+00	

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x	cm	cmv	cmda	cmw	cmwv	wc	vg	ug	w	v	vx
1.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.65E+02	1.95E+02	0.00E+00
1.02E+00	5.37E-01	5.37E-01	4.59E-01	4.13E-03	4.13E-03	7.23E-05	0.00E+00	0.00E+00			

5.45E+02 8.26E+01 5.07E-01
1.05E+00 3.67E-01 3.67E-01 6.27E-01 5.65E-03 5.65E-03 1.46E-04 0.00E+00 0.00E+00
3.29E+02 5.09E+01 5.08E-01
1.08E+00 2.74E-01 2.74E-01 7.19E-01 6.48E-03 6.48E-03 2.32E-04 0.00E+00 0.00E+00
2.25E+02 3.56E+01 5.10E-01
1.11E+00 2.14E-01 2.14E-01 7.79E-01 7.01E-03 7.01E-03 3.33E-04 0.00E+00 0.00E+00
1.64E+02 2.65E+01 5.12E-01
1.16E+00 1.71E-01 1.71E-01 8.21E-01 7.39E-03 7.39E-03 4.54E-04 0.00E+00 0.00E+00
1.24E+02 2.04E+01 5.13E-01
1.21E+00 1.40E-01 1.40E-01 8.53E-01 7.68E-03 7.68E-03 6.00E-04 0.00E+00 0.00E+00
9.52E+01 1.62E+01 5.16E-01
1.28E+00 1.15E-01 1.15E-01 8.77E-01 7.90E-03 7.90E-03 7.77E-04 0.00E+00 0.00E+00
7.43E+01 1.30E+01 5.18E-01
1.36E+00 9.56E-02 9.56E-02 8.96E-01 8.07E-03 8.07E-03 9.92E-04 0.00E+00 0.00E+00
5.85E+01 1.05E+01 5.21E-01
1.45E+00 8.00E-02 8.00E-02 9.12E-01 8.21E-03 8.21E-03 1.25E-03 0.00E+00 0.00E+00
4.63E+01 8.64E+00 5.25E-01
1.57E+00 6.73E-02 6.73E-02 9.24E-01 8.32E-03 8.32E-03 1.57E-03 0.00E+00 0.00E+00
3.69E+01 7.13E+00 5.28E-01
1.71E+00 5.69E-02 5.69E-02 9.35E-01 8.42E-03 8.42E-03 1.96E-03 0.00E+00 0.00E+00
2.94E+01 5.92E+00 5.33E-01
1.88E+00 4.82E-02 4.82E-02 9.43E-01 8.49E-03 8.49E-03 2.43E-03 0.00E+00 0.00E+00
2.35E+01 4.93E+00 5.38E-01
2.08E+00 4.10E-02 4.10E-02 9.50E-01 8.56E-03 8.56E-03 3.01E-03 0.00E+00 0.00E+00
1.88E+01 4.13E+00 5.43E-01
2.33E+00 3.50E-02 3.50E-02 9.56E-01 8.61E-03 8.61E-03 3.71E-03 0.00E+00 0.00E+00
1.51E+01 3.46E+00 5.50E-01
2.63E+00 2.99E-02 2.99E-02 9.61E-01 8.66E-03 8.66E-03 4.57E-03 0.00E+00 0.00E+00
1.21E+01 2.91E+00 5.57E-01
2.99E+00 2.61E-02 2.61E-02 9.65E-01 8.69E-03 8.69E-03 5.72E-03 0.00E+00 0.00E+00
7.34E+00 2.48E+00 5.70E-01
3.43E+00 2.30E-02 2.30E-02 9.68E-01 8.72E-03 8.72E-03 7.17E-03 0.00E+00 0.00E+00
5.46E+00 2.13E+00 5.84E-01
3.96E+00 2.03E-02 2.03E-02 9.71E-01 8.74E-03 8.74E-03 8.95E-03 0.00E+00 0.00E+00
4.15E+00 1.84E+00 5.99E-01
4.61E+00 1.80E-02 1.80E-02 9.73E-01 8.76E-03 8.76E-03 1.11E-02 0.00E+00 0.00E+00
3.21E+00 1.60E+00 6.13E-01
5.38E+00 1.59E-02 1.59E-02 9.75E-01 8.78E-03 8.78E-03 1.37E-02 0.00E+00 0.00E+00
2.51E+00 1.38E+00 6.29E-01
6.32E+00 1.41E-02 1.41E-02 9.77E-01 8.80E-03 8.80E-03 1.69E-02 0.00E+00 0.00E+00
1.98E+00 1.20E+00 6.45E-01
7.45E+00 1.25E-02 1.25E-02 9.79E-01 8.81E-03 8.81E-03 2.06E-02 0.00E+00 0.00E+00
1.57E+00 1.04E+00 6.61E-01
8.83E+00 1.11E-02 1.11E-02 9.80E-01 8.83E-03 8.83E-03 2.51E-02 0.00E+00 0.00E+00
1.26E+00 9.02E-01 6.77E-01
1.05E+01 9.79E-03 9.79E-03 9.81E-01 8.84E-03 8.84E-03 3.03E-02 0.00E+00 0.00E+00
1.01E+00 7.81E-01 6.94E-01
1.25E+01 8.65E-03 8.65E-03 9.82E-01 8.85E-03 8.85E-03 3.64E-02 0.00E+00 0.00E+00
8.22E-01 6.75E-01 7.10E-01
1.49E+01 7.64E-03 7.64E-03 9.84E-01 8.86E-03 8.86E-03 4.35E-02 0.00E+00 0.00E+00
6.70E-01 5.84E-01 7.26E-01
1.79E+01 6.74E-03 6.74E-03 9.84E-01 8.86E-03 8.86E-03 5.18E-02 0.00E+00 0.00E+00
5.48E-01 5.04E-01 7.42E-01
2.14E+01 5.95E-03 5.95E-03 9.85E-01 8.87E-03 8.87E-03 6.12E-02 0.00E+00 0.00E+00
4.51E-01 4.35E-01 7.57E-01
2.57E+01 5.25E-03 5.25E-03 9.86E-01 8.88E-03 8.88E-03 7.20E-02 0.00E+00 0.00E+00
3.73E-01 3.76E-01 7.72E-01
3.09E+01 4.63E-03 4.63E-03 9.86E-01 8.88E-03 8.88E-03 8.42E-02 0.00E+00 0.00E+00
3.10E-01 3.25E-01 7.87E-01
3.72E+01 4.09E-03 4.09E-03 9.87E-01 8.89E-03 8.89E-03 9.79E-02 0.00E+00 0.00E+00
2.58E-01 2.81E-01 8.01E-01
4.48E+01 3.61E-03 3.61E-03 9.88E-01 8.89E-03 8.89E-03 1.13E-01 0.00E+00 0.00E+00
2.16E-01 2.44E-01 8.16E-01
5.40E+01 3.18E-03 3.18E-03 9.88E-01 8.90E-03 8.90E-03 1.30E-01 0.00E+00 0.00E+00
1.83E-01 2.13E-01 8.31E-01
6.51E+01 2.81E-03 2.81E-03 9.88E-01 8.90E-03 8.90E-03 1.48E-01 0.00E+00 0.00E+00
1.55E-01 1.86E-01 8.45E-01
7.85E+01 2.48E-03 2.48E-03 9.89E-01 8.90E-03 8.90E-03 1.68E-01 0.00E+00 0.00E+00
1.33E-01 1.64E-01 8.60E-01
9.48E+01 2.19E-03 2.19E-03 9.89E-01 8.90E-03 8.90E-03 1.90E-01 0.00E+00 0.00E+00
1.15E-01 1.45E-01 8.75E-01
1.14E+02 1.93E-03 1.93E-03 9.89E-01 8.91E-03 8.91E-03 2.12E-01 0.00E+00 0.00E+00
1.01E-01 1.29E-01 8.91E-01
1.38E+02 1.69E-03 1.69E-03 9.89E-01 8.91E-03 8.91E-03 2.36E-01 0.00E+00 0.00E+00
8.86E-02 1.17E-01 9.06E-01
1.67E+02 1.48E-03 1.48E-03 9.90E-01 8.91E-03 8.91E-03 2.60E-01 0.00E+00 0.00E+00
7.89E-02 1.06E-01 9.20E-01
2.02E+02 1.30E-03 1.30E-03 9.90E-01 8.91E-03 8.91E-03 2.85E-01 0.00E+00 0.00E+00
7.10E-02 9.82E-02 9.32E-01
2.43E+02 1.02E-03 1.02E-03 9.90E-01 8.92E-03 8.92E-03 2.81E-01 0.00E+00 0.00E+00
6.26E-02 8.87E-02 9.42E-01
2.93E+02 7.59E-04 7.59E-04 9.90E-01 8.92E-03 8.92E-03 2.57E-01 0.00E+00 0.00E+00
1.42E-01 8.50E-02 9.49E-01
3.55E+02 5.44E-04 5.44E-04 9.91E-01 8.92E-03 8.92E-03 2.27E-01 0.00E+00 0.00E+00
1.27E-01 8.43E-02 9.49E-01

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        4.32E+02  3.85E-04  3.85E-04  9.91E-01  8.92E-03  8.92E-03  1.96E-01  0.00E+00  0.00E+00
 1.16E-01  8.52E-02  9.45E-01
        5.29E+02  2.67E-04  2.67E-04  9.91E-01  8.92E-03  8.92E-03  1.67E-01  0.00E+00  0.00E+00
 1.08E-01  8.66E-02  9.38E-01
        6.48E+02  1.82E-04  1.82E-04  9.91E-01  8.92E-03  8.92E-03  1.39E-01  0.00E+00  0.00E+00
 1.03E-01  8.79E-02  9.28E-01
        7.97E+02  1.22E-04  1.22E-04  9.91E-01  8.92E-03  8.92E-03  1.14E-01  0.00E+00  0.00E+00
 9.84E-02  8.89E-02  9.16E-01
        9.82E+02  8.07E-05  8.07E-05  9.91E-01  8.92E-03  8.92E-03  9.15E-02  0.00E+00  0.00E+00
 9.54E-02  8.93E-02  9.03E-01
        1.21E+03  5.24E-05  5.24E-05  9.91E-01  8.92E-03  8.92E-03  7.24E-02  0.00E+00  0.00E+00
 9.35E-02  8.92E-02  8.89E-01
        1.50E+03  3.36E-05  3.36E-05  9.91E-01  8.92E-03  8.92E-03  5.64E-02  0.00E+00  0.00E+00
 9.28E-02  8.85E-02  8.74E-01
        1.85E+03  2.12E-05  2.12E-05  9.91E-01  8.92E-03  8.92E-03  4.34E-02  0.00E+00  0.00E+00
 9.32E-02  8.72E-02  8.58E-01
        2.29E+03  1.33E-05  1.33E-05  9.91E-01  8.92E-03  8.92E-03  3.30E-02  0.00E+00  0.00E+00
 9.50E-02  8.54E-02  8.42E-01
        2.83E+03  8.43E-06  8.43E-06  9.91E-01  8.92E-03  8.92E-03  2.54E-02  0.00E+00  0.00E+00
 2.10E-02  8.29E-02  8.26E-01
        3.49E+03  5.87E-06  5.87E-06  9.91E-01  8.92E-03  8.92E-03  2.15E-02  0.00E+00  0.00E+00
 2.03E-02  7.91E-02  8.15E-01
        4.30E+03  4.01E-06  4.01E-06  9.91E-01  8.92E-03  8.92E-03  1.79E-02  0.00E+00  0.00E+00
 1.95E-02  7.53E-02  8.02E-01
        5.29E+03  2.77E-06  2.77E-06  9.91E-01  8.92E-03  8.92E-03  1.51E-02  0.00E+00  0.00E+00
 1.87E-02  7.12E-02  7.89E-01
        6.51E+03  1.92E-06  1.92E-06  9.91E-01  8.92E-03  8.92E-03  1.27E-02  0.00E+00  0.00E+00
 1.79E-02  6.71E-02  7.75E-01
        7.99E+03  1.32E-06  1.32E-06  9.91E-01  8.92E-03  8.92E-03  1.06E-02  0.00E+00  0.00E+00
 1.69E-02  6.30E-02  7.60E-01
        9.80E+03  9.08E-07  9.08E-07  9.91E-01  8.92E-03  8.92E-03  8.91E-03  0.00E+00  0.00E+00
 1.58E-02  5.90E-02  7.44E-01
        1.20E+04  6.24E-07  6.24E-07  9.91E-01  8.92E-03  8.92E-03  7.72E-03  0.00E+00  0.00E+00
 1.47E-02  5.50E-02  7.26E-01
```

- time averaged (tav = 60. s) volume concentration: concentration contour parameters

```
c(x,y,z,t) = cc(x) * (erf(xa)-erf(xb)) * (erf(ya)-erf(yb)) * (exp(-za*za)+exp(-zb*zb))

       c(x,y,z,t) = concentration (volume fraction) at (x,y,z,t)
                x = downwind distance (m)
                y = crosswind horizontal distance (m)
                z = height (m)
                t = time (s)

              erf = error functon            exp = exponential function
               xa = (x-xc+bx)/(sr2*betax)     za = (z-zc)/(sr2*sig)
               xb = (x-xc-bx)/(sr2*betax)     zb = (z+zc)/(sr2*sig)
               ya = (y+b)/(sr2*betac)        sr2 = sqrt(2.0)
               yb = (y-b)/(sr2*betac)
```

x	cc(x)	b(x)	betac(x)	zc(x)	sig(x)	t	xc(t)	bx(t)	betax(t)
1.00E+00	0.00E+00	3.02E-02	8.44E-03	1.00E+00	1.94E-02	0.00E+00	1.00E+00	0.00E+00	0.00E+00
1.02E+00	3.55E-01	3.78E-02	2.50E-02	1.00E+00	3.32E-02	4.31E-05	1.02E+00	1.49E-02	1.21E-04
1.05E+00	3.25E-01	4.43E-02	3.95E-02	1.00E+00	4.71E-02	1.32E-04	1.05E+00	3.28E-02	2.68E-04
1.08E+00	2.99E-01	5.03E-02	5.48E-02	1.00E+00	6.21E-02	2.83E-04	1.08E+00	5.46E-02	4.46E-04
1.11E+00	2.76E-01	5.63E-02	7.18E-02	1.00E+00	7.88E-02	5.25E-04	1.11E+00	8.09E-02	6.61E-04
1.16E+00	2.55E-01	6.24E-02	9.10E-02	1.00E+00	9.79E-02	9.00E-04	1.16E+00	1.13E-01	9.20E-04
1.21E+00	2.36E-01	6.88E-02	1.13E-01	1.00E+00	1.20E-01	1.47E-03	1.21E+00	1.51E-01	1.23E-03
1.28E+00	2.18E-01	7.56E-02	1.39E-01	1.00E+00	1.45E-01	2.32E-03	1.28E+00	1.98E-01	1.61E-03
1.36E+00	2.02E-01	8.27E-02	1.68E-01	1.00E+00	1.75E-01	3.57E-03	1.36E+00	2.54E-01	2.07E-03
1.45E+00	1.88E-01	9.03E-02	2.02E-01	1.00E+00	2.09E-01	5.40E-03	1.45E+00	3.22E-01	2.63E-03
1.57E+00	1.74E-01	9.84E-02	2.42E-01	1.00E+00	2.49E-01	8.07E-03	1.57E+00	4.04E-01	3.30E-03
1.71E+00	1.61E-01	1.07E-01	2.88E-01	1.00E+00	2.95E-01	1.19E-02	1.71E+00	5.04E-01	4.11E-03
1.88E+00	1.50E-01	1.16E-01	3.42E-01	1.00E+00	3.49E-01	1.75E-02	1.88E+00	6.24E-01	5.10E-03
2.08E+00	1.39E-01	1.26E-01	4.04E-01	1.00E+00	4.11E-01	2.55E-02	2.08E+00	7.70E-01	6.29E-03
2.33E+00	1.29E-01	1.37E-01	4.76E-01	1.00E+00	4.83E-01	3.69E-02	2.33E+00	9.46E-01	7.72E-03
2.63E+00	1.20E-01	1.48E-01	5.59E-01	1.00E+00	5.66E-01	5.33E-02	2.63E+00	1.16E+00	9.46E-03
2.99E+00	1.01E-01	1.59E-01	6.45E-01	1.00E+00	7.25E-01	7.63E-02			

2.99E+00 1.42E+00 1.16E-02
3.43E+00 8.69E-02 1.70E-01 7.37E-01 1.00E+00 9.09E-01 1.09E-01
3.43E+00 1.73E+00 1.41E-02
3.96E+00 7.64E-02 1.80E-01 8.36E-01 1.00E+00 1.11E+00 1.53E-01
3.96E+00 2.10E+00 1.72E-02
4.61E+00 6.82E-02 1.91E-01 9.47E-01 1.00E+00 1.33E+00 2.14E-01
4.61E+00 2.56E+00 2.09E-02
5.38E+00 6.15E-02 2.02E-01 1.07E+00 1.00E+00 1.57E+00 2.98E-01
5.38E+00 3.11E+00 2.54E-02
6.32E+00 5.60E-02 2.14E-01 1.21E+00 1.00E+00 1.84E+00 4.12E-01
6.32E+00 3.78E+00 3.08E-02
7.45E+00 5.15E-02 2.25E-01 1.36E+00 1.00E+00 2.14E+00 5.67E-01
7.45E+00 4.58E+00 3.74E-02
8.83E+00 4.76E-02 2.35E-01 1.53E+00 1.01E+00 2.47E+00 7.77E-01
8.83E+00 5.56E+00 4.54E-02
1.05E+01 4.43E-02 2.45E-01 1.72E+00 1.01E+00 2.82E+00 1.06E+00
1.05E+01 6.74E+00 5.50E-02
1.25E+01 4.14E-02 2.56E-01 1.93E+00 1.02E+00 3.21E+00 1.44E+00
1.25E+01 8.16E+00 6.66E-02
1.49E+01 3.90E-02 2.65E-01 2.17E+00 1.03E+00 3.61E+00 1.94E+00
1.49E+01 9.88E+00 8.07E-02
1.79E+01 3.68E-02 2.75E-01 2.43E+00 1.04E+00 4.04E+00 2.61E+00
1.79E+01 1.20E+01 9.77E-02
2.14E+01 3.48E-02 2.84E-01 2.72E+00 1.07E+00 4.49E+00 3.50E+00
2.14E+01 1.45E+01 1.18E-01
2.57E+01 3.31E-02 2.93E-01 3.05E+00 1.11E+00 4.95E+00 4.65E+00
2.57E+01 1.75E+01 1.43E-01
3.09E+01 3.16E-02 3.01E-01 3.40E+00 1.16E+00 5.41E+00 6.16E+00
3.09E+01 2.12E+01 1.73E-01
3.72E+01 3.03E-02 3.07E-01 3.77E+00 1.25E+00 5.88E+00 8.10E+00
3.72E+01 2.57E+01 2.10E-01
4.48E+01 2.91E-02 3.12E-01 4.17E+00 1.38E+00 6.35E+00 1.06E+01
4.48E+01 3.11E+01 2.54E-01
5.40E+01 2.81E-02 3.17E-01 4.60E+00 1.58E+00 6.79E+00 1.37E+01
5.40E+01 3.76E+01 3.07E-01
6.51E+01 2.74E-02 3.21E-01 5.06E+00 1.86E+00 7.20E+00 1.77E+01
6.51E+01 4.55E+01 3.72E-01
7.85E+01 2.68E-02 3.24E-01 5.56E+00 2.25E+00 7.53E+00 2.28E+01
7.85E+01 5.50E+01 4.49E-01
9.48E+01 2.66E-02 3.27E-01 6.11E+00 2.82E+00 7.79E+00 2.90E+01
9.48E+01 6.66E+01 5.44E-01
1.14E+02 2.67E-02 3.30E-01 6.72E+00 3.60E+00 7.92E+00 3.68E+01
1.14E+02 8.05E+01 6.58E-01
1.38E+02 2.72E-02 3.31E-01 7.37E+00 4.68E+00 7.91E+00 4.65E+01
1.38E+02 9.74E+01 7.95E-01
1.67E+02 2.85E-02 3.32E-01 8.10E+00 6.16E+00 7.70E+00 5.83E+01
1.67E+02 1.18E+02 9.62E-01
2.02E+02 3.09E-02 3.33E-01 8.93E+00 8.15E+00 7.21E+00 7.29E+01
2.02E+02 1.43E+02 1.16E+00
2.43E+02 3.55E-02 3.33E-01 9.88E+00 1.07E+01 6.35E+00 6.89E+01
2.43E+02 1.43E+02 3.79E+01
2.93E+02 3.32E-02 3.33E-01 1.10E+01 1.36E+01 6.91E+00 7.96E+01
2.93E+02 1.43E+02 5.81E+01
3.55E+02 3.01E-02 3.33E-01 1.25E+01 1.67E+01 7.78E+00 9.25E+01
3.55E+02 1.43E+02 7.75E+01
4.32E+02 2.76E-02 3.33E-01 1.43E+01 2.00E+01 8.73E+00 1.08E+02
4.32E+02 1.43E+02 9.79E+01
5.29E+02 2.53E-02 3.33E-01 1.65E+01 2.34E+01 9.79E+00 1.27E+02
5.29E+02 1.43E+02 1.20E+02
6.48E+02 2.32E-02 3.33E-01 1.94E+01 2.69E+01 1.10E+01 1.50E+02
6.48E+02 1.43E+02 1.45E+02
7.97E+02 2.13E-02 3.33E-01 2.29E+01 3.04E+01 1.24E+01 1.78E+02
7.97E+02 1.43E+02 1.74E+02
9.82E+02 1.93E-02 3.33E-01 2.73E+01 3.38E+01 1.40E+01 2.11E+02
9.82E+02 1.43E+02 2.07E+02
1.21E+03 1.74E-02 3.33E-01 3.26E+01 3.71E+01 1.59E+01 2.52E+02
1.21E+03 1.43E+02 2.46E+02
1.50E+03 1.56E-02 3.33E-01 3.90E+01 4.02E+01 1.82E+01 3.01E+02
1.50E+03 1.43E+02 2.91E+02
1.85E+03 1.38E-02 3.33E-01 4.66E+01 4.32E+01 2.09E+01 3.60E+02
1.85E+03 1.43E+02 3.44E+02
2.29E+03 1.21E-02 3.33E-01 5.57E+01 4.59E+01 2.43E+01 4.32E+02
2.29E+03 1.43E+02 4.07E+02
2.83E+03 1.07E-02 3.33E-01 6.64E+01 4.84E+01 2.77E+01 5.18E+02
2.83E+03 1.43E+02 4.80E+02
3.49E+03 1.04E-02 3.33E-01 7.87E+01 5.08E+01 2.88E+01 6.23E+02
3.49E+03 1.43E+02 5.67E+02
4.30E+03 9.89E-03 3.33E-01 9.29E+01 5.33E+01 3.06E+01 7.50E+02
4.30E+03 1.43E+02 6.70E+02
5.29E+03 9.50E-03 3.33E-01 1.09E+02 5.58E+01 3.20E+01 9.03E+02
5.29E+03 1.43E+02 7.93E+02
6.51E+03 9.06E-03 3.33E-01 1.28E+02 5.84E+01 3.37E+01 1.09E+03
6.51E+03 1.43E+02 9.39E+02
7.99E+03 8.49E-03 3.33E-01 1.49E+02 6.10E+01 3.61E+01 1.31E+03
7.99E+03 1.43E+02 1.11E+03

9.80E+03 7.88E-03 3.33E-01 1.72E+02 6.36E+01 3.91E+01 1.58E+03 9.80E+03 1.43E+02 1.32E+03
1.20E+04 7.26E-03 3.33E-01 1.99E+02 6.63E+01 4.25E+01 1.91E+03 1.20E+04 1.43E+02 1.56E+03
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time averaged (tav = 60. s) volume concentration: concentration in the z = .00 plane.

downwind distance x (m)	time of max conc (s)	cloud duration (s)	effective half width bbc (m)	average concentration (volume fraction) at (x,y,z) y/bbc= 0.0	y/bbc= 0.5	y/bbc= 1.0	y/bbc= 1.5	y/bbc= 2.0	y/bbc= 2.5
1.00E+00	3.00E+01	6.00E+01	3.35E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1.02E+00	3.00E+01	6.00E+01	5.75E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1.05E+00	3.00E+01	6.00E+01	8.15E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1.08E+00	3.00E+01	6.00E+01	1.07E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1.11E+00	3.00E+01	6.00E+01	1.36E-01	1.44E-35	9.94E-36	3.25E-36	4.86E-37	3.21E-38	9.13E-40
1.16E+00	3.00E+01	6.00E+01	1.70E-01	2.40E-23	1.66E-23	5.40E-24	8.15E-25	5.57E-26	1.69E-27
1.21E+00	3.00E+01	6.00E+01	2.08E-01	6.89E-16	4.75E-16	1.55E-16	2.35E-17	1.64E-18	5.16E-20
1.28E+00	3.00E+01	6.00E+01	2.52E-01	3.81E-11	2.62E-11	8.54E-12	1.30E-12	9.18E-14	2.97E-15
1.36E+00	3.01E+01	6.00E+01	3.03E-01	4.80E-08	3.30E-08	1.07E-08	1.64E-09	1.17E-10	3.83E-12
1.45E+00	3.01E+01	6.00E+01	3.62E-01	5.55E-06	3.82E-06	1.24E-06	1.90E-07	1.36E-08	4.52E-10
1.57E+00	3.01E+01	6.00E+01	4.31E-01	1.36E-04	9.39E-05	3.05E-05	4.67E-06	3.35E-07	1.12E-08
1.71E+00	3.01E+01	6.00E+01	5.11E-01	1.20E-03	8.22E-04	2.67E-04	4.09E-05	2.94E-06	9.92E-08
1.88E+00	3.01E+01	6.00E+01	6.04E-01	5.21E-03	3.58E-03	1.16E-03	1.78E-04	1.29E-05	4.35E-07
2.08E+00	3.02E+01	6.00E+01	7.11E-01	1.41E-02	9.68E-03	3.14E-03	4.82E-04	3.48E-05	1.18E-06
2.33E+00	3.02E+01	6.00E+01	8.35E-01	2.73E-02	1.88E-02	6.10E-03	9.34E-04	6.75E-05	2.30E-06
2.63E+00	3.02E+01	6.00E+01	9.79E-01	4.20E-02	2.89E-02	9.38E-03	1.44E-03	1.04E-04	3.54E-06
2.99E+00	3.03E+01	6.00E+01	1.13E+00	6.10E-02	4.19E-02	1.36E-02	2.09E-03	1.51E-04	5.16E-06
3.43E+00	3.04E+01	6.00E+01	1.29E+00	6.92E-02	4.76E-02	1.54E-02	2.37E-03	1.71E-04	5.85E-06
3.96E+00	3.04E+01	6.00E+01	1.46E+00	6.95E-02	4.78E-02	1.55E-02	2.38E-03	1.72E-04	5.89E-06
4.61E+00	3.05E+01	6.00E+01	1.65E+00	6.58E-02	4.53E-02	1.47E-02	2.25E-03	1.63E-04	5.57E-06
5.38E+00	3.07E+01	6.00E+01	1.86E+00	6.04E-02	4.15E-02	1.35E-02	2.07E-03	1.50E-04	5.11E-06
6.32E+00	3.08E+01	6.00E+01	2.10E+00	5.44E-02	3.74E-02	1.21E-02	1.86E-03	1.35E-04	4.61E-06
7.45E+00	3.10E+01	6.00E+01	2.36E+00	4.85E-02	3.33E-02	1.08E-02	1.66E-03	1.20E-04	4.11E-06
8.83E+00	3.12E+01	6.00E+01	2.66E+00	4.29E-02	2.95E-02	9.57E-03	1.47E-03	1.06E-04	3.64E-06
1.05E+01	3.14E+01	6.00E+01	2.98E+00	3.78E-02	2.60E-02	8.44E-03	1.29E-03	9.37E-05	3.20E-06
1.25E+01	3.17E+01	6.00E+01	3.35E+00	3.32E-02	2.28E-02	7.42E-03	1.14E-03	8.24E-05	2.82E-06
1.49E+01	3.21E+01	6.00E+01	3.76E+00	2.92E-02	2.01E-02	6.51E-03	9.99E-04	7.24E-05	2.48E-06
1.79E+01	3.25E+01	6.00E+01	4.22E+00	2.56E-02	1.76E-02	5.72E-03	8.77E-04	6.35E-05	2.18E-06
2.14E+01	3.31E+01	6.00E+01	4.73E+00	2.25E-02	1.55E-02	5.02E-03	7.70E-04	5.58E-05	1.91E-06
2.57E+01	3.37E+01	6.00E+01	5.28E+00	1.98E-02	1.36E-02	4.41E-03	6.77E-04	4.90E-05	1.68E-06
3.09E+01	3.45E+01	6.00E+01	5.89E+00	1.74E-02	1.20E-02	3.88E-03	5.96E-04	4.31E-05	1.48E-06
3.72E+01	3.54E+01	6.00E+01	6.54E+00	1.54E-02	1.06E-02	3.43E-03	5.25E-04	3.81E-05	1.30E-06
4.48E+01	3.65E+01	6.00E+01	7.22E+00	1.36E-02	9.33E-03	3.03E-03	4.64E-04	3.36E-05	1.15E-06
5.40E+01	3.79E+01	6.00E+01	7.97E+00	1.20E-02	8.26E-03	2.68E-03	4.11E-04	2.98E-05	1.02E-06
6.51E+01	3.96E+01	6.00E+01	8.77E+00	1.07E-02	7.34E-03	2.38E-03			

3.65E-04	2.65E-05	9.06E-07						
	7.85E+01	4.16E+01	6.00E+01	9.64E+00		9.50E-03	6.53E-03	2.12E-03
3.25E-04	2.35E-05	8.10E-07						
	9.48E+01	4.40E+01	6.00E+01	1.06E+01		8.44E-03	5.80E-03	1.88E-03
2.89E-04	2.09E-05	7.13E-07						
	1.14E+02	4.70E+01	6.00E+01	1.16E+01		7.46E-03	5.13E-03	1.66E-03
2.55E-04	1.85E-05	6.36E-07						
	1.38E+02	5.05E+01	6.00E+01	1.28E+01		6.46E-03	4.44E-03	1.44E-03
2.21E-04	1.60E-05	5.48E-07						
	1.67E+02	5.48E+01	6.00E+01	1.40E+01		5.31E-03	3.65E-03	1.19E-03
1.82E-04	1.32E-05	4.51E-07						
	2.02E+02	6.00E+01	6.00E+01	1.55E+01		3.78E-03	2.59E-03	8.42E-04
1.29E-04	9.36E-06	3.22E-07						
	2.43E+02	6.89E+01	6.76E+01	1.71E+01		1.63E-03	1.12E-03	3.63E-04
5.57E-05	4.04E-06	1.37E-07						
	2.93E+02	7.96E+01	7.38E+01	1.91E+01		7.45E-04	5.12E-04	1.66E-04
2.55E-05	1.85E-06	6.36E-08						
	3.55E+02	9.25E+01	8.06E+01	2.16E+01		3.72E-04	2.56E-04	8.31E-05
1.27E-05	9.23E-07	3.18E-08						
	4.32E+02	1.08E+02	8.87E+01	2.47E+01		1.93E-04	1.33E-04	4.31E-05
6.61E-06	4.79E-07	1.64E-08						
	5.29E+02	1.27E+02	9.81E+01	2.86E+01		1.06E-04	7.31E-05	2.37E-05
3.64E-06	2.64E-07	9.08E-09						
	6.48E+02	1.50E+02	1.09E+02	3.36E+01		6.37E-05	4.38E-05	1.42E-05
2.18E-06	1.58E-07	5.41E-09						
	7.97E+02	1.78E+02	1.23E+02	3.97E+01		4.20E-05	2.88E-05	9.36E-06
1.44E-06	1.04E-07	3.57E-09						
	9.82E+02	2.11E+02	1.38E+02	4.73E+01		3.04E-05	2.09E-05	6.78E-06
1.04E-06	7.54E-08	2.61E-09						
	1.21E+03	2.52E+02	1.57E+02	5.65E+01		2.39E-05	1.65E-05	5.34E-06
8.19E-07	5.93E-08	2.02E-09						
	1.50E+03	3.01E+02	1.78E+02	6.75E+01		2.00E-05	1.38E-05	4.47E-06
6.86E-07	4.97E-08	1.76E-09						
	1.85E+03	3.60E+02	2.03E+02	8.08E+01		1.74E-05	1.20E-05	3.88E-06
5.95E-07	4.31E-08	1.46E-09						
	2.29E+03	4.32E+02	2.33E+02	9.65E+01		1.52E-05	1.05E-05	3.40E-06
5.22E-07	3.78E-08	1.34E-09						
	2.83E+03	5.18E+02	2.68E+02	1.15E+02		1.25E-05	8.58E-06	2.78E-06
4.27E-07	3.10E-08	1.12E-09						
	3.49E+03	6.23E+02	3.12E+02	1.36E+02		8.38E-06	5.76E-06	1.87E-06
2.87E-07	2.08E-08	7.40E-10						
	4.30E+03	7.50E+02	3.64E+02	1.61E+02		5.91E-06	4.06E-06	1.32E-06
2.02E-07	1.47E-08	4.93E-10						
	5.29E+03	9.03E+02	4.25E+02	1.89E+02		4.09E-06	2.81E-06	9.13E-07
1.40E-07	1.01E-08	3.01E-10						
	6.51E+03	1.09E+03	4.97E+02	2.21E+02		2.88E-06	1.98E-06	6.42E-07
9.85E-08	7.14E-09	2.48E-10						
	7.99E+03	1.31E+03	5.81E+02	2.57E+02		2.10E-06	1.45E-06	4.70E-07
7.20E-08	5.20E-09	2.11E-10						
	9.80E+03	1.58E+03	6.80E+02	2.99E+02		1.57E-06	1.08E-06	3.50E-07
5.36E-08	3.88E-09	1.21E-10						
	1.20E+04	1.91E+03	7.94E+02	3.45E+02		1.18E-06	8.08E-07	2.62E-07
4.02E-08	2.92E-09	1.05E-10						

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time averaged (tav = 60. s) volume concentration: maximum concentration (volume fraction) along centerline.

downwind distance x (m)	height z (m)	maximum concentration c(x,0,z)	time of max conc (s)	cloud duration (s)
1.00E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.02E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.05E+00	1.00E+00	9.59E-01	3.00E+01	6.00E+01
1.08E+00	1.00E+00	7.67E-01	3.00E+01	6.00E+01
1.11E+00	1.00E+00	6.25E-01	3.00E+01	6.00E+01
1.16E+00	1.00E+00	5.17E-01	3.00E+01	6.00E+01
1.21E+00	1.00E+00	4.31E-01	3.00E+01	6.00E+01
1.28E+00	1.00E+00	3.62E-01	3.00E+01	6.00E+01
1.36E+00	1.00E+00	3.05E-01	3.01E+01	6.00E+01
1.45E+00	1.00E+00	2.58E-01	3.01E+01	6.00E+01
1.57E+00	1.00E+00	2.20E-01	3.01E+01	6.00E+01
1.71E+00	1.00E+00	1.87E-01	3.01E+01	6.00E+01
1.88E+00	1.00E+00	1.60E-01	3.01E+01	6.00E+01
2.08E+00	1.00E+00	1.36E-01	3.02E+01	6.00E+01
2.33E+00	1.00E+00	1.17E-01	3.02E+01	6.00E+01
2.63E+00	9.96E-01	1.01E-01	3.02E+01	6.00E+01
2.99E+00	9.47E-01	8.08E-02	3.03E+01	6.00E+01
3.43E+00	6.71E-01	7.11E-02	3.04E+01	6.00E+01
3.96E+00	0.00E+00	6.95E-02	3.04E+01	6.00E+01
4.61E+00	0.00E+00	6.58E-02	3.05E+01	6.00E+01
5.38E+00	0.00E+00	6.04E-02	3.07E+01	6.00E+01
6.32E+00	0.00E+00	5.44E-02	3.08E+01	6.00E+01
7.45E+00	0.00E+00	4.85E-02	3.10E+01	6.00E+01

8.83E+00	0.00E+00	4.29E-02	3.12E+01	6.00E+01
1.05E+01	0.00E+00	3.78E-02	3.14E+01	6.00E+01
1.25E+01	0.00E+00	3.32E-02	3.17E+01	6.00E+01
1.49E+01	0.00E+00	2.92E-02	3.21E+01	6.00E+01
1.79E+01	0.00E+00	2.56E-02	3.25E+01	6.00E+01
2.14E+01	0.00E+00	2.25E-02	3.31E+01	6.00E+01
2.57E+01	0.00E+00	1.98E-02	3.37E+01	6.00E+01
3.09E+01	0.00E+00	1.74E-02	3.45E+01	6.00E+01
3.72E+01	0.00E+00	1.54E-02	3.54E+01	6.00E+01
4.48E+01	0.00E+00	1.36E-02	3.65E+01	6.00E+01
5.40E+01	0.00E+00	1.20E-02	3.79E+01	6.00E+01
6.51E+01	0.00E+00	1.07E-02	3.96E+01	6.00E+01
7.85E+01	0.00E+00	9.50E-03	4.16E+01	6.00E+01
9.48E+01	0.00E+00	8.44E-03	4.40E+01	6.00E+01
1.14E+02	0.00E+00	7.46E-03	4.70E+01	6.00E+01
1.38E+02	0.00E+00	6.46E-03	5.05E+01	6.00E+01
1.67E+02	0.00E+00	5.31E-03	5.48E+01	6.00E+01
2.02E+02	5.98E+00	3.94E-03	6.00E+01	6.00E+01
2.43E+02	1.06E+01	3.34E-03	6.89E+01	6.76E+01
2.93E+02	1.35E+01	2.54E-03	7.96E+01	7.38E+01
3.55E+02	1.67E+01	1.85E-03	9.25E+01	8.06E+01
4.32E+02	2.00E+01	1.33E-03	1.08E+02	8.87E+01
5.29E+02	2.34E+01	9.30E-04	1.27E+02	9.81E+01
6.48E+02	2.69E+01	6.37E-04	1.50E+02	1.09E+02
7.97E+02	3.04E+01	4.27E-04	1.78E+02	1.23E+02
9.82E+02	3.38E+01	2.81E-04	2.11E+02	1.38E+02
1.21E+03	3.71E+01	1.82E-04	2.52E+02	1.57E+02
1.50E+03	4.02E+01	1.16E-04	3.01E+02	1.78E+02
1.85E+03	4.32E+01	7.28E-05	3.60E+02	2.03E+02
2.29E+03	4.58E+01	4.53E-05	4.32E+02	2.33E+02
2.83E+03	4.81E+01	2.87E-05	5.18E+02	2.68E+02
3.49E+03	5.06E+01	1.99E-05	6.23E+02	3.12E+02
4.30E+03	5.30E+01	1.36E-05	7.50E+02	3.64E+02
5.29E+03	5.55E+01	9.36E-06	9.03E+02	4.25E+02
6.51E+03	5.81E+01	6.45E-06	1.09E+03	4.97E+02
7.99E+03	6.05E+01	4.38E-06	1.31E+03	5.81E+02
9.80E+03	6.29E+01	2.96E-06	1.58E+03	6.80E+02
1.20E+04	6.52E+01	2.00E-06	1.91E+03	7.94E+02

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Scenario 4
Hazard Footprints

Met Scenario					c(ppm) ÄÄ 50000.0					c(ppm) ÄÄ 25000.0				
u (m/s)	temp (øK)	rh (%)	stb	avt (s)	length (m)	width (m)	w_dist (m)	area (m2)	fmass (kg)	length (m)	width (m)	w_dist (m)	area (m2)	fmass (kg)
4.0	293.0	60.	4	60.	3.88E+00	1.03E+00	2.63E+00	2.16E+00	2.14E-01	1.15E+01	2.03E+00	5.38E+00	1.63E+01	1.60E+00
2.0	293.0	60.	6	60.	4.53E+00	1.07E+00	2.33E+00	2.51E+00	5.99E-01	1.38E+01	2.28E+00	6.32E+00	2.20E+01	3.46E+00
Composite Maximum					4.53E+00	1.07E+00	2.33E+00	2.51E+00	5.99E-01	1.38E+01	2.28E+00	6.32E+00	2.20E+01	3.46E+00

Scenario 4

```
problem input

idspl =         2
ncalc =         1
wms   =   .016000
cps   =   2240.00
tbp   =    111.70
cmed0 =       .00
dhe   =   509880.
cpsl  =   3349.00
rhosl =    424.10
spb   =     -1.00
spc   =       .00
ts    =    428.00
qs    =      1.22
as    =       .00
tsd   =       60.
qtis  =       .00
hs    =      1.00
tav   =     60.00
xffm  =   9000.00
zp(1) =       .00
zp(2) =       .00
zp(3) =       .00
zp(4) =       .00
z0    =   .300000
za    =      2.00
ua    =      4.00
ta    =    293.00
rh    =     60.00
stab  =      4.00
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release gas properties

molecular weight of source gas (kg)              - wms  =  1.6000E-02
vapor heat capacity, const. p.  (j/kg-k)         - cps  =  2.2400E+03
temperature of source gas (k)                    - ts   =  4.2800E+02
density of source gas (kg/m3)                    - rhos =  4.5558E-01
boiling point temperature                        - tbp  =  1.1170E+02
liquid mass fraction                             - cmed0=  0.0000E+00
liquid heat capacity (j/kg-k)                    - cpsl =  3.3490E+03
heat of vaporization (j/kg)                      - dhe  =  5.0988E+05
liquid source density (kg/m3)                    - rhosl=  4.2410E+02
saturation pressure constant                     - spa  =  8.7843E+00
saturation pressure constant (k)                 - spb  =  9.8121E+02
saturation pressure constant (k)                 - spc  =  0.0000E+00


spill characteristics

spill type                                       - idspl=          2
mass source rate (kg/s)                          - qs   =  1.2200E+00
continuous source duration (s)                   - tsd  =  6.0000E+01
continuous source mass (kg)                      - qtcs =  7.3200E+01
instantaneous source mass (kg)                   - qtis =  0.0000E+00
source area (m2)                                 - as   =  4.5000E-03
vertical vapor velocity (m/s)                    - ws   =  0.0000E+00
source half width (m)                            - bs   =  3.3541E-02
source height (m)                                - hs   =  1.0000E+00
horizontal vapor velocity (m/s)                  - us   =  5.9509E+02


field parameters

concentration averaging time (s)                 - tav  =  6.0000E+01
mixing layer height (m)                          - hmx  =  1.0400E+03
maximum downwind distance (m)                    - xffm =  9.0000E+03
concentration measurement height (m)             - zp(1)=  0.0000E+00
                                                 - zp(2)=  0.0000E+00
                                                 - zp(3)=  0.0000E+00
                                                 - zp(4)=  0.0000E+00


ambient meteorological properties

molecular weight of ambient air (kg)            - wmae  =  2.8804E-02
heat capacity of ambient air at const p. (j/kg-k)- cpaa  =  1.0134E+03
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density of ambient air (kg/m3)                    - rhoa  =  1.1980E+00
ambient measurement height (m)                    - za    =  2.0000E+00
ambient atmospheric pressure (pa=n/m2=j/m3)       - pa    =  1.0133E+05
ambient wind speed (m/s)                          - ua    =  4.0000E+00
ambient temperature (k)                           - ta    =  2.9300E+02
relative humidity (percent)                       - rh    =  6.0000E+01
ambient friction velocity (m/s)                   - uastr =  8.6521E-01
atmospheric stability class value                 - stab  =  4.0000E+00
inverse monin-obukhov length (1/m)                - ala   =  0.0000E+00
surface roughness height (m)                      - z0    =  3.0000E-01


additional parameters

sub-step multiplier                               - ncalc =           1
number of calculational sub-steps                 - nssm  =           3
acceleration of gravity (m/s2)                    - grav  =  9.8067E+00
gas constant (j/mol- k)                           - rr    =  8.3143E+00
von karman constant                               - xk    =  4.1000E-01
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instantaneous spatially averaged cloud parameters

            x         zc         h         bb         b         bbx       bx        cv        rho        t
      u        ua
         1.00E+00  1.00E+00  6.71E-02  3.35E-02  3.02E-02  0.00E+00  0.00E+00  1.00E+00  4.56E-01
4.28E+02  5.95E+02  1.33E+00
         1.02E+00  1.00E+00  1.41E-01  7.04E-02  3.95E-02  2.20E-02  2.20E-02  5.34E-01  7.20E-01
3.72E+02  2.20E+02  1.38E+00
         1.05E+00  1.00E+00  2.00E-01  1.00E-01  4.56E-02  4.87E-02  4.87E-02  3.86E-01  8.27E-01
3.52E+02  1.42E+02  1.41E+00
         1.08E+00  1.00E+00  2.60E-01  1.30E-01  5.10E-02  8.09E-02  8.09E-02  3.01E-01  8.95E-01
3.40E+02  1.05E+02  1.45E+00
         1.11E+00  1.00E+00  3.23E-01  1.61E-01  5.61E-02  1.20E-01  1.20E-01  2.44E-01  9.44E-01
3.31E+02  8.16E+01  1.49E+00
         1.16E+00  1.00E+00  3.92E-01  1.96E-01  6.12E-02  1.67E-01  1.67E-01  2.02E-01  9.83E-01
3.25E+02  6.55E+01  1.53E+00
         1.21E+00  1.00E+00  4.70E-01  2.35E-01  6.65E-02  2.24E-01  2.24E-01  1.69E-01  1.01E+00
3.20E+02  5.37E+01  1.57E+00
         1.28E+00  1.00E+00  5.57E-01  2.78E-01  7.19E-02  2.93E-01  2.93E-01  1.43E-01  1.04E+00
3.16E+02  4.46E+01  1.62E+00
         1.36E+00  1.00E+00  6.56E-01  3.28E-01  7.75E-02  3.76E-01  3.76E-01  1.22E-01  1.06E+00
3.13E+02  3.74E+01  1.68E+00
         1.45E+00  1.00E+00  7.68E-01  3.84E-01  8.35E-02  4.77E-01  4.77E-01  1.04E-01  1.08E+00
3.10E+02  3.16E+01  1.74E+00
         1.57E+00  1.00E+00  8.96E-01  4.48E-01  8.97E-02  5.99E-01  5.99E-01  8.91E-02  1.10E+00
3.07E+02  2.69E+01  1.80E+00
         1.71E+00  1.00E+00  1.04E+00  5.20E-01  9.61E-02  7.46E-01  7.46E-01  7.65E-02  1.11E+00
3.05E+02  2.31E+01  1.88E+00
         1.88E+00  1.00E+00  1.21E+00  6.03E-01  1.03E-01  9.25E-01  9.25E-01  6.58E-02  1.12E+00
3.04E+02  1.99E+01  1.96E+00
         2.08E+00  1.00E+00  1.39E+00  6.96E-01  1.10E-01  1.14E+00  1.14E+00  5.66E-02  1.13E+00
3.02E+02  1.72E+01  2.05E+00
         2.33E+00  1.00E+00  1.60E+00  8.01E-01  1.17E-01  1.40E+00  1.40E+00  4.88E-02  1.14E+00
3.01E+02  1.50E+01  2.15E+00
         2.63E+00  1.00E+00  1.84E+00  9.20E-01  1.24E-01  1.72E+00  1.72E+00  4.21E-02  1.15E+00
3.00E+02  1.32E+01  2.26E+00
         2.99E+00  1.00E+00  2.10E+00  1.05E+00  1.31E-01  2.10E+00  2.10E+00  3.64E-02  1.16E+00
2.99E+02  1.16E+01  2.41E+00
         3.43E+00  1.00E+00  2.40E+00  1.20E+00  1.39E-01  2.56E+00  2.56E+00  3.14E-02  1.16E+00
2.98E+02  1.03E+01  2.63E+00
         3.96E+00  1.01E+00  2.71E+00  1.35E+00  1.45E-01  3.12E+00  3.12E+00  2.74E-02  1.17E+00
2.97E+02  9.28E+00  2.85E+00
         4.61E+00  1.01E+00  3.02E+00  1.51E+00  1.52E-01  3.79E+00  3.79E+00  2.40E-02  1.17E+00
2.97E+02  8.48E+00  3.05E+00
         5.38E+00  1.02E+00  3.35E+00  1.68E+00  1.57E-01  4.61E+00  4.61E+00  2.10E-02  1.17E+00
2.96E+02  7.83E+00  3.24E+00
         6.32E+00  1.03E+00  3.70E+00  1.85E+00  1.62E-01  5.60E+00  5.60E+00  1.85E-02  1.18E+00
2.96E+02  7.32E+00  3.42E+00
         7.45E+00  1.04E+00  4.06E+00  2.03E+00  1.66E-01  6.79E+00  6.79E+00  1.62E-02  1.18E+00
2.95E+02  6.90E+00  3.60E+00
         8.83E+00  1.07E+00  4.45E+00  2.22E+00  1.70E-01  8.23E+00  8.23E+00  1.42E-02  1.18E+00
2.95E+02  6.56E+00  3.77E+00
         1.05E+01  1.10E+00  4.85E+00  2.42E+00  1.73E-01  9.98E+00  9.98E+00  1.25E-02  1.18E+00
2.95E+02  6.29E+00  3.94E+00
         1.25E+01  1.14E+00  5.28E+00  2.64E+00  1.75E-01  1.21E+01  1.21E+01  1.09E-02  1.19E+00
2.95E+02  6.08E+00  4.10E+00
         1.49E+01  1.20E+00  5.75E+00  2.87E+00  1.77E-01  1.46E+01  1.46E+01  9.44E-03  1.19E+00
2.94E+02  5.91E+00  4.26E+00
         1.79E+01  1.29E+00  6.25E+00  3.12E+00  1.79E-01  1.77E+01  1.77E+01  8.14E-03  1.19E+00
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2.94E+02  5.79E+00  4.43E+00
          2.14E+01  1.40E+00  6.79E+00  3.39E+00  1.79E-01  2.15E+01  2.15E+01  6.98E-03  1.19E+00
2.94E+02  5.71E+00  4.59E+00
          2.57E+01  1.55E+00  7.39E+00  3.69E+00  1.79E-01  2.60E+01  2.60E+01  5.93E-03  1.19E+00
2.94E+02  5.67E+00  4.76E+00
          3.09E+01  1.73E+00  8.06E+00  4.03E+00  1.79E-01  3.15E+01  3.14E+01  4.99E-03  1.19E+00
2.94E+02  5.67E+00  4.93E+00
          3.72E+01  1.96E+00  8.81E+00  4.41E+00  1.79E-01  3.81E+01  3.81E+01  4.15E-03  1.19E+00
2.94E+02  5.69E+00  5.11E+00
          4.48E+01  2.24E+00  9.67E+00  4.84E+00  1.79E-01  4.61E+01  4.60E+01  3.41E-03  1.19E+00
2.93E+02  5.75E+00  5.30E+00
          5.40E+01  2.58E+00  1.06E+01  5.32E+00  1.78E-01  5.57E+01  5.57E+01  2.77E-03  1.20E+00
2.93E+02  5.84E+00  5.49E+00
          6.51E+01  2.96E+00  1.18E+01  5.89E+00  1.76E-01  6.74E+01  6.74E+01  2.22E-03  1.20E+00
2.93E+02  5.96E+00  5.70E+00
          7.85E+01  3.40E+00  1.30E+01  6.55E+00  1.75E-01  8.15E+01  8.15E+01  1.76E-03  1.20E+00
2.93E+02  6.10E+00  5.90E+00
          9.48E+01  3.89E+00  1.45E+01  7.36E+00  1.73E-01  9.86E+01  9.86E+01  1.37E-03  1.20E+00
2.93E+02  6.26E+00  6.12E+00
          1.14E+02  4.42E+00  1.61E+01  8.35E+00  1.72E-01  1.19E+02  1.19E+02  1.06E-03  1.20E+00
2.93E+02  6.44E+00  6.33E+00
          1.38E+02  4.98E+00  1.79E+01  9.54E+00  1.70E-01  1.44E+02  1.44E+02  8.09E-04  1.20E+00
2.93E+02  6.63E+00  6.55E+00
          1.67E+02  5.58E+00  2.00E+01  1.10E+01  1.68E-01  1.75E+02  1.75E+02  6.11E-04  1.20E+00
2.93E+02  6.83E+00  6.78E+00
          2.02E+02  6.21E+00  2.23E+01  1.27E+01  1.67E-01  2.11E+02  2.11E+02  4.58E-04  1.20E+00
2.93E+02  7.04E+00  7.00E+00
          2.45E+02  6.84E+00  2.56E+01  1.50E+01  1.67E-01  2.24E+02  2.11E+02  3.20E-04  1.20E+00
2.93E+02  7.30E+00  7.28E+00
          2.98E+02  7.46E+00  2.93E+01  1.79E+01  1.67E-01  2.39E+02  2.11E+02  2.19E-04  1.20E+00
2.93E+02  7.57E+00  7.56E+00
          3.66E+02  8.07E+00  3.37E+01  2.14E+01  1.67E-01  2.58E+02  2.11E+02  1.48E-04  1.20E+00
2.93E+02  7.85E+00  7.84E+00
          4.50E+02  8.65E+00  3.88E+01  2.58E+01  1.67E-01  2.80E+02  2.11E+02  9.79E-05  1.20E+00
2.93E+02  8.14E+00  8.13E+00
          5.56E+02  9.20E+00  4.48E+01  3.12E+01  1.67E-01  3.08E+02  2.11E+02  6.39E-05  1.20E+00
2.93E+02  8.43E+00  8.43E+00
          6.89E+02  9.71E+00  5.18E+01  3.79E+01  1.67E-01  3.41E+02  2.11E+02  4.12E-05  1.20E+00
2.93E+02  8.73E+00  8.72E+00
          8.55E+02  1.02E+01  5.99E+01  4.60E+01  1.67E-01  3.80E+02  2.11E+02  2.62E-05  1.20E+00
2.93E+02  9.02E+00  9.02E+00
          1.06E+03  1.06E+01  6.94E+01  5.59E+01  1.67E-01  4.28E+02  2.11E+02  1.65E-05  1.20E+00
2.93E+02  9.32E+00  9.32E+00
          1.32E+03  1.10E+01  8.05E+01  6.79E+01  1.67E-01  4.86E+02  2.11E+02  1.03E-05  1.20E+00
2.93E+02  9.62E+00  9.62E+00
          1.64E+03  1.14E+01  9.35E+01  8.23E+01  1.67E-01  5.56E+02  2.11E+02  6.43E-06  1.20E+00
2.93E+02  9.92E+00  9.92E+00
          2.05E+03  1.17E+01  1.09E+02  9.94E+01  1.67E-01  6.40E+02  2.11E+02  3.98E-06  1.20E+00
2.93E+02  1.02E+01  1.02E+01
          2.55E+03  1.19E+01  1.26E+02  1.20E+02  1.67E-01  7.42E+02  2.11E+02  2.46E-06  1.20E+00
2.93E+02  1.05E+01  1.05E+01
          3.17E+03  1.22E+01  1.46E+02  1.44E+02  1.67E-01  8.64E+02  2.11E+02  1.51E-06  1.20E+00
2.93E+02  1.08E+01  1.08E+01
          3.95E+03  1.24E+01  1.70E+02  1.72E+02  1.67E-01  1.01E+03  2.11E+02  9.34E-07  1.20E+00
2.93E+02  1.11E+01  1.11E+01
          4.91E+03  1.26E+01  1.97E+02  2.04E+02  1.67E-01  1.19E+03  2.11E+02  5.77E-07  1.20E+00
2.93E+02  1.14E+01  1.14E+01
          6.10E+03  1.28E+01  2.27E+02  2.42E+02  1.67E-01  1.40E+03  2.11E+02  3.58E-07  1.20E+00
2.93E+02  1.17E+01  1.17E+01
          7.58E+03  1.30E+01  2.63E+02  2.85E+02  1.67E-01  1.65E+03  2.11E+02  2.23E-07  1.20E+00
2.93E+02  1.19E+01  1.19E+01
          9.41E+03  1.32E+01  3.03E+02  3.34E+02  1.67E-01  1.95E+03  2.11E+02  1.39E-07  1.20E+00
2.93E+02  1.22E+01  1.22E+01
          1.17E+04  1.33E+01  3.48E+02  3.89E+02  1.67E-01  2.31E+03  2.11E+02  8.78E-08  1.20E+00
2.93E+02  1.24E+01  1.24E+01
          1.44E+04  1.35E+01  3.98E+02  4.52E+02  1.67E-01  2.74E+03  2.11E+02  5.58E-08  1.20E+00
2.93E+02  1.27E+01  1.27E+01
•

            x         cm         cmv        cmda       cmw        cmwv       wc         vg         ug          w
      v         vx
          1.00E+00  1.00E+00  1.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
2.84E+02  1.36E+02  0.00E+00
          1.02E+00  3.89E-01  3.89E-01  6.05E-01  5.45E-03  5.45E-03  4.34E-04  0.00E+00  0.00E+00
1.82E+02  3.16E+01  9.79E-01
          1.05E+00  2.59E-01  2.59E-01  7.35E-01  6.62E-03  6.62E-03  9.34E-04  0.00E+00  0.00E+00
1.00E+02  1.78E+01  9.80E-01
          1.08E+00  1.93E-01  1.93E-01  8.00E-01  7.20E-03  7.20E-03  1.54E-03  0.00E+00  0.00E+00
6.64E+01  1.20E+01  9.82E-01
          1.11E+00  1.52E-01  1.52E-01  8.40E-01  7.57E-03  7.57E-03  2.27E-03  0.00E+00  0.00E+00
4.78E+01  8.84E+00  9.84E-01
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1.16E+00	1.23E-01	1.23E-01	8.69E-01	7.82E-03	7.82E-03	3.16E-03	0.00E+00	0.00E+00	3.59E+01	6.78E+00	9.86E-01
1.21E+00	1.02E-01	1.02E-01	8.90E-01	8.02E-03	8.02E-03	4.24E-03	0.00E+00	0.00E+00	2.77E+01	5.35E+00	9.89E-01
1.28E+00	8.49E-02	8.49E-02	9.07E-01	8.17E-03	8.17E-03	5.54E-03	0.00E+00	0.00E+00	2.18E+01	4.30E+00	9.91E-01
1.36E+00	7.15E-02	7.15E-02	9.20E-01	8.29E-03	8.29E-03	7.11E-03	0.00E+00	0.00E+00	1.73E+01	3.50E+00	9.94E-01
1.45E+00	6.05E-02	6.05E-02	9.31E-01	8.38E-03	8.38E-03	9.00E-03	0.00E+00	0.00E+00	1.39E+01	2.88E+00	9.97E-01
1.57E+00	5.15E-02	5.15E-02	9.40E-01	8.46E-03	8.46E-03	1.13E-02	0.00E+00	0.00E+00	1.12E+01	2.39E+00	1.00E+00
1.71E+00	4.40E-02	4.40E-02	9.48E-01	8.53E-03	8.53E-03	1.40E-02	0.00E+00	0.00E+00	9.12E+00	1.99E+00	1.01E+00
1.88E+00	3.76E-02	3.76E-02	9.54E-01	8.59E-03	8.59E-03	1.73E-02	0.00E+00	0.00E+00	7.44E+00	1.66E+00	1.01E+00
2.08E+00	3.23E-02	3.23E-02	9.59E-01	8.64E-03	8.64E-03	2.12E-02	0.00E+00	0.00E+00	6.10E+00	1.40E+00	1.01E+00
2.33E+00	2.77E-02	2.77E-02	9.64E-01	8.68E-03	8.68E-03	2.58E-02	0.00E+00	0.00E+00	5.03E+00	1.18E+00	1.02E+00
2.63E+00	2.38E-02	2.38E-02	9.67E-01	8.71E-03	8.71E-03	3.12E-02	0.00E+00	0.00E+00	4.18E+00	9.94E-01	1.03E+00
2.99E+00	2.05E-02	2.05E-02	9.71E-01	8.74E-03	8.74E-03	3.76E-02	0.00E+00	0.00E+00	3.58E+00	8.35E-01	1.03E+00
3.43E+00	1.77E-02	1.77E-02	9.74E-01	8.77E-03	8.77E-03	4.49E-02	0.00E+00	0.00E+00	2.72E+00	6.93E-01	1.05E+00
3.96E+00	1.54E-02	1.54E-02	9.76E-01	8.79E-03	8.79E-03	5.36E-02	0.00E+00	0.00E+00	2.15E+00	5.82E-01	1.06E+00
4.61E+00	1.35E-02	1.35E-02	9.78E-01	8.80E-03	8.80E-03	6.36E-02	0.00E+00	0.00E+00	1.74E+00	4.93E-01	1.07E+00
5.38E+00	1.18E-02	1.18E-02	9.79E-01	8.82E-03	8.82E-03	7.49E-02	0.00E+00	0.00E+00	1.44E+00	4.21E-01	1.08E+00
6.32E+00	1.04E-02	1.04E-02	9.81E-01	8.83E-03	8.83E-03	8.74E-02	0.00E+00	0.00E+00	1.22E+00	3.62E-01	1.09E+00
7.45E+00	9.09E-03	9.09E-03	9.82E-01	8.84E-03	8.84E-03	1.01E-01	0.00E+00	0.00E+00	1.05E+00	3.14E-01	1.10E+00
8.83E+00	7.96E-03	7.96E-03	9.83E-01	8.85E-03	8.85E-03	1.15E-01	0.00E+00	0.00E+00	9.17E-01	2.75E-01	1.11E+00
1.05E+01	6.96E-03	6.96E-03	9.84E-01	8.86E-03	8.86E-03	1.30E-01	0.00E+00	0.00E+00	8.11E-01	2.43E-01	1.12E+00
1.25E+01	6.07E-03	6.07E-03	9.85E-01	8.87E-03	8.87E-03	1.46E-01	0.00E+00	0.00E+00	7.25E-01	2.18E-01	1.13E+00
1.49E+01	5.26E-03	5.26E-03	9.86E-01	8.88E-03	8.88E-03	1.61E-01	0.00E+00	0.00E+00	6.56E-01	1.99E-01	1.14E+00
1.79E+01	4.54E-03	4.54E-03	9.87E-01	8.88E-03	8.88E-03	1.75E-01	0.00E+00	0.00E+00	5.99E-01	1.86E-01	1.15E+00
2.14E+01	3.89E-03	3.89E-03	9.87E-01	8.89E-03	8.89E-03	1.88E-01	0.00E+00	0.00E+00	5.52E-01	1.77E-01	1.16E+00
2.57E+01	3.30E-03	3.30E-03	9.88E-01	8.89E-03	8.89E-03	1.99E-01	0.00E+00	0.00E+00	5.13E-01	1.72E-01	1.17E+00
3.09E+01	2.78E-03	2.78E-03	9.88E-01	8.90E-03	8.90E-03	2.06E-01	0.00E+00	0.00E+00	4.80E-01	1.71E-01	1.17E+00
3.72E+01	2.31E-03	2.31E-03	9.89E-01	8.90E-03	8.90E-03	2.11E-01	0.00E+00	0.00E+00	4.52E-01	1.71E-01	1.18E+00
4.48E+01	1.90E-03	1.90E-03	9.89E-01	8.91E-03	8.91E-03	2.11E-01	0.00E+00	0.00E+00	4.28E-01	1.74E-01	1.19E+00
5.40E+01	1.54E-03	1.54E-03	9.90E-01	8.91E-03	8.91E-03	2.08E-01	0.00E+00	0.00E+00	4.08E-01	1.78E-01	1.20E+00
6.51E+01	1.24E-03	1.24E-03	9.90E-01	8.91E-03	8.91E-03	2.01E-01	0.00E+00	0.00E+00	3.90E-01	1.83E-01	1.21E+00
7.85E+01	9.77E-04	9.77E-04	9.90E-01	8.92E-03	8.92E-03	1.91E-01	0.00E+00	0.00E+00	3.74E-01	1.88E-01	1.22E+00
9.48E+01	7.63E-04	7.63E-04	9.90E-01	8.92E-03	8.92E-03	1.78E-01	0.00E+00	0.00E+00	3.60E-01	1.94E-01	1.22E+00
1.14E+02	5.89E-04	5.89E-04	9.90E-01	8.92E-03	8.92E-03	1.64E-01	0.00E+00	0.00E+00	3.47E-01	2.00E-01	1.23E+00
1.38E+02	4.50E-04	4.50E-04	9.91E-01	8.92E-03	8.92E-03	1.48E-01	0.00E+00	0.00E+00	3.36E-01	2.06E-01	1.23E+00
1.67E+02	3.40E-04	3.40E-04	9.91E-01	8.92E-03	8.92E-03	1.32E-01	0.00E+00	0.00E+00	3.25E-01	2.12E-01	1.24E+00
2.02E+02	2.54E-04	2.54E-04	9.91E-01	8.92E-03	8.92E-03	1.17E-01	0.00E+00	0.00E+00	3.16E-01	2.18E-01	1.24E+00
2.45E+02	1.78E-04	1.78E-04	9.91E-01	8.92E-03	8.92E-03	9.62E-02	0.00E+00	0.00E+00	3.05E-01	2.25E-01	1.23E+00
2.98E+02	1.22E-04	1.22E-04	9.91E-01	8.92E-03	8.92E-03	7.79E-02	0.00E+00	0.00E+00	2.94E-01	2.31E-01	1.23E+00
3.66E+02	8.21E-05	8.21E-05	9.91E-01	8.92E-03	8.92E-03	6.21E-02	0.00E+00	0.00E+00	2.84E-01	2.37E-01	1.23E+00
4.50E+02	5.44E-05	5.44E-05	9.91E-01	8.92E-03	8.92E-03	4.88E-02	0.00E+00	0.00E+00	2.75E-01	2.42E-01	1.23E+00
5.56E+02	3.55E-05	3.55E-05	9.91E-01	8.92E-03	8.92E-03	3.78E-02	0.00E+00	0.00E+00			

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2.66E-01  2.47E-01  1.23E+00
         6.89E+02  2.29E-05  2.29E-05  9.91E-01  8.92E-03  8.92E-03  2.89E-02  0.00E+00  0.00E+00
2.56E-01  2.50E-01  1.23E+00
         8.55E+02  1.46E-05  1.46E-05  9.91E-01  8.92E-03  8.92E-03  2.19E-02  0.00E+00  0.00E+00
2.48E-01  2.52E-01  1.23E+00
         1.06E+03  9.18E-06  9.18E-06  9.91E-01  8.92E-03  8.92E-03  1.65E-02  0.00E+00  0.00E+00
2.39E-01  2.53E-01  1.23E+00
         1.32E+03  5.74E-06  5.74E-06  9.91E-01  8.92E-03  8.92E-03  1.23E-02  0.00E+00  0.00E+00
2.30E-01  2.52E-01  1.22E+00
         1.64E+03  3.57E-06  3.57E-06  9.91E-01  8.92E-03  8.92E-03  9.11E-03  0.00E+00  0.00E+00
2.22E-01  2.50E-01  1.22E+00
         2.05E+03  2.21E-06  2.21E-06  9.91E-01  8.92E-03  8.92E-03  6.74E-03  0.00E+00  0.00E+00
2.13E-01  2.46E-01  1.21E+00
         2.55E+03  1.36E-06  1.36E-06  9.91E-01  8.92E-03  8.92E-03  4.97E-03  0.00E+00  0.00E+00
2.04E-01  2.40E-01  1.21E+00
         3.17E+03  8.41E-07  8.41E-07  9.91E-01  8.92E-03  8.92E-03  3.68E-03  0.00E+00  0.00E+00
1.96E-01  2.33E-01  1.20E+00
         3.95E+03  5.19E-07  5.19E-07  9.91E-01  8.92E-03  8.92E-03  2.77E-03  0.00E+00  0.00E+00
1.87E-01  2.24E-01  1.19E+00
         4.91E+03  3.21E-07  3.21E-07  9.91E-01  8.92E-03  8.92E-03  2.12E-03  0.00E+00  0.00E+00
1.77E-01  2.15E-01  1.18E+00
         6.10E+03  1.99E-07  1.99E-07  9.91E-01  8.92E-03  8.92E-03  1.67E-03  0.00E+00  0.00E+00
1.68E-01  2.04E-01  1.17E+00
         7.58E+03  1.24E-07  1.24E-07  9.91E-01  8.92E-03  8.92E-03  1.27E-03  0.00E+00  0.00E+00
1.58E-01  1.93E-01  1.16E+00
         9.41E+03  7.74E-08  7.74E-08  9.91E-01  8.92E-03  8.92E-03  1.03E-03  0.00E+00  0.00E+00
1.47E-01  1.81E-01  1.15E+00
         1.17E+04  4.88E-08  4.88E-08  9.91E-01  8.92E-03  8.92E-03  7.90E-04  0.00E+00  0.00E+00
1.36E-01  1.70E-01  1.13E+00
         1.44E+04  3.10E-08  3.10E-08  9.91E-01  8.92E-03  8.92E-03  5.09E-04  0.00E+00  0.00E+00
1.25E-01  1.58E-01  1.11E+00
•          time averaged (tav =   60. s) volume concentration:  concentration contour parameters

          c(x,y,z,t) = cc(x) * (erf(xa)-erf(xb)) * (erf(ya)-erf(yb)) * (exp(-za*za)+exp(-zb*zb))

                 c(x,y,z,t) = concentration (volume fraction) at (x,y,z,t)
                          x = downwind distance (m)
                          y = crosswind horizontal distance (m)
                          z = height (m)
                          t = time (s)

                        erf = error functon             exp = exponential function
                         xa = (x-xc+bx)/(sr2*betax)      za = (z-zc)/(sr2*sig)
                         xb = (x-xc-bx)/(sr2*betax)      zb = (z+zc)/(sr2*sig)
                         ya = (y+b)/(sr2*betac)         sr2 = sqrt(2.0)
                         yb = (y-b)/(sr2*betac)

             x        cc(x)     b(x)    betac(x)    zc(x)    sig(x)               t        xc(t)
bx(t)   betax(t)
          1.00E+00  0.00E+00  3.02E-02  8.44E-03  1.00E+00  1.94E-02            0.00E+00  1.00E+00
0.00E+00  0.00E+00
          1.02E+00  3.29E-01  3.95E-02  3.37E-02  1.00E+00  4.07E-02            1.31E-04  1.02E+00
2.20E-02  1.80E-04
          1.05E+00  2.92E-01  4.56E-02  5.14E-02  1.00E+00  5.78E-02            4.27E-04  1.05E+00
4.87E-02  3.97E-04
          1.08E+00  2.65E-01  5.10E-02  6.88E-02  1.00E+00  7.49E-02            9.36E-04  1.08E+00
8.09E-02  6.61E-04
          1.11E+00  2.42E-01  5.61E-02  8.73E-02  1.00E+00  9.32E-02            1.74E-03  1.11E+00
1.20E-01  9.79E-04
          1.16E+00  2.23E-01  6.12E-02  1.07E-01  1.00E+00  1.13E-01            2.98E-03  1.16E+00
1.67E-01  1.36E-03
          1.21E+00  2.07E-01  6.65E-02  1.30E-01  1.00E+00  1.36E-01            4.82E-03  1.21E+00
2.24E-01  1.83E-03
          1.28E+00  1.91E-01  7.19E-02  1.55E-01  1.00E+00  1.61E-01            7.51E-03  1.28E+00
2.93E-01  2.39E-03
          1.36E+00  1.78E-01  7.75E-02  1.84E-01  1.00E+00  1.89E-01            1.14E-02  1.36E+00
3.76E-01  3.07E-03
          1.45E+00  1.65E-01  8.35E-02  2.16E-01  1.00E+00  2.22E-01            1.70E-02  1.45E+00
4.77E-01  3.90E-03
          1.57E+00  1.54E-01  8.97E-02  2.53E-01  1.00E+00  2.59E-01            2.50E-02  1.57E+00
5.99E-01  4.89E-03
          1.71E+00  1.43E-01  9.61E-02  2.95E-01  1.00E+00  3.01E-01            3.63E-02  1.71E+00
7.46E-01  6.10E-03
          1.88E+00  1.33E-01  1.03E-01  3.43E-01  1.00E+00  3.48E-01            5.22E-02  1.88E+00
9.25E-01  7.55E-03
          2.08E+00  1.24E-01  1.10E-01  3.97E-01  1.00E+00  4.02E-01            7.44E-02  2.08E+00
1.14E+00  9.31E-03
          2.33E+00  1.16E-01  1.17E-01  4.58E-01  1.00E+00  4.63E-01            1.05E-01  2.33E+00
1.40E+00  1.14E-02
          2.63E+00  1.08E-01  1.24E-01  5.26E-01  1.00E+00  5.31E-01            1.48E-01  2.63E+00
1.72E+00  1.40E-02
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2.99E+00	9.62E-02	1.31E-01	6.02E-01	1.00E+00	6.36E-01	2.07E-01	2.99E+00	2.10E+00	1.71E-02
3.43E+00	8.08E-02	1.39E-01	6.88E-01	1.00E+00	8.06E-01	2.87E-01	3.43E+00	2.56E+00	2.09E-02
3.96E+00	7.01E-02	1.45E-01	7.76E-01	1.01E+00	9.81E-01	3.96E-01	3.96E+00	3.12E+00	2.55E-02
4.61E+00	6.21E-02	1.52E-01	8.68E-01	1.01E+00	1.16E+00	5.41E-01	4.61E+00	3.79E+00	3.10E-02
5.38E+00	5.57E-02	1.57E-01	9.64E-01	1.02E+00	1.35E+00	7.32E-01	5.38E+00	4.61E+00	3.76E-02
6.32E+00	5.05E-02	1.62E-01	1.06E+00	1.03E+00	1.54E+00	9.81E-01	6.32E+00	5.60E+00	4.57E-02
7.45E+00	4.62E-02	1.66E-01	1.17E+00	1.04E+00	1.74E+00	1.30E+00	7.45E+00	6.79E+00	5.54E-02
8.83E+00	4.25E-02	1.70E-01	1.28E+00	1.07E+00	1.95E+00	1.71E+00	8.83E+00	8.23E+00	6.72E-02
1.05E+01	3.92E-02	1.73E-01	1.40E+00	1.10E+00	2.17E+00	2.23E+00	1.05E+01	9.98E+00	8.15E-02
1.25E+01	3.63E-02	1.75E-01	1.53E+00	1.14E+00	2.39E+00	2.88E+00	1.25E+01	1.21E+01	9.87E-02
1.49E+01	3.37E-02	1.77E-01	1.67E+00	1.20E+00	2.62E+00	3.69E+00	1.49E+01	1.46E+01	1.20E-01
1.79E+01	3.14E-02	1.79E-01	1.82E+00	1.29E+00	2.86E+00	4.69E+00	1.79E+01	1.77E+01	1.45E-01
2.14E+01	2.93E-02	1.79E-01	1.99E+00	1.40E+00	3.11E+00	5.93E+00	2.14E+01	2.15E+01	1.75E-01
2.57E+01	2.74E-02	1.79E-01	2.19E+00	1.55E+00	3.37E+00	7.44E+00	2.57E+01	2.60E+01	2.12E-01
3.09E+01	2.56E-02	1.79E-01	2.41E+00	1.73E+00	3.65E+00	9.27E+00	3.09E+01	3.14E+01	2.57E-01
3.72E+01	2.38E-02	1.79E-01	2.67E+00	1.96E+00	3.95E+00	1.15E+01	3.72E+01	3.81E+01	3.11E-01
4.48E+01	2.22E-02	1.79E-01	2.97E+00	2.24E+00	4.28E+00	1.41E+01	4.48E+01	4.60E+01	3.76E-01
5.40E+01	2.06E-02	1.78E-01	3.33E+00	2.58E+00	4.66E+00	1.73E+01	5.40E+01	5.57E+01	4.55E-01
6.51E+01	1.90E-02	1.76E-01	3.77E+00	2.96E+00	5.08E+00	2.11E+01	6.51E+01	6.74E+01	5.51E-01
7.85E+01	1.75E-02	1.75E-01	4.31E+00	3.40E+00	5.57E+00	2.55E+01	7.85E+01	8.15E+01	6.66E-01
9.48E+01	1.61E-02	1.73E-01	4.97E+00	3.89E+00	6.12E+00	3.08E+01	9.48E+01	9.86E+01	8.05E-01
1.14E+02	1.47E-02	1.72E-01	5.78E+00	4.42E+00	6.75E+00	3.70E+01	1.14E+02	1.19E+02	9.74E-01
1.38E+02	1.34E-02	1.70E-01	6.79E+00	4.98E+00	7.47E+00	4.43E+01	1.38E+02	1.44E+02	1.18E+00
1.67E+02	1.21E-02	1.68E-01	8.01E+00	5.58E+00	8.32E+00	5.28E+01	1.67E+02	1.75E+02	1.43E+00
2.02E+02	1.08E-02	1.67E-01	9.50E+00	6.21E+00	9.32E+00	6.28E+01	2.02E+02	2.11E+02	1.72E+00
2.45E+02	9.49E-03	1.67E-01	1.14E+01	6.84E+00	1.08E+01	6.60E+01	2.45E+02	2.11E+02	4.30E+01
2.98E+02	8.26E-03	1.67E-01	1.38E+01	7.46E+00	1.26E+01	7.32E+01	2.98E+02	2.11E+02	6.50E+01
3.66E+02	7.14E-03	1.67E-01	1.67E+01	8.07E+00	1.48E+01	8.19E+01	3.66E+02	2.11E+02	8.55E+01
4.50E+02	6.13E-03	1.67E-01	2.04E+01	8.65E+00	1.74E+01	9.25E+01	4.50E+02	2.11E+02	1.07E+02
5.56E+02	5.24E-03	1.67E-01	2.49E+01	9.20E+00	2.05E+01	1.05E+02	5.56E+02	2.11E+02	1.29E+02
6.89E+02	4.47E-03	1.67E-01	3.04E+01	9.71E+00	2.43E+01	1.21E+02	6.89E+02	2.11E+02	1.54E+02
8.55E+02	3.80E-03	1.67E-01	3.72E+01	1.02E+01	2.87E+01	1.39E+02	8.55E+02	2.11E+02	1.83E+02
1.06E+03	3.23E-03	1.67E-01	4.54E+01	1.06E+01	3.40E+01	1.62E+02	1.06E+03	2.11E+02	2.15E+02
1.32E+03	2.74E-03	1.67E-01	5.54E+01	1.10E+01	4.01E+01	1.89E+02	1.32E+03	2.11E+02	2.53E+02
1.64E+03	2.33E-03	1.67E-01	6.73E+01	1.14E+01	4.74E+01	2.22E+02	1.64E+03	2.11E+02	2.97E+02
2.05E+03	1.98E-03	1.67E-01	8.15E+01	1.17E+01	5.59E+01	2.62E+02	2.05E+03	2.11E+02	3.49E+02
2.55E+03	1.68E-03	1.67E-01	9.84E+01	1.19E+01	6.58E+01	3.11E+02	2.55E+03	2.11E+02	4.11E+02
3.17E+03	1.43E-03	1.67E-01	1.18E+02	1.22E+01	7.74E+01	3.69E+02	3.17E+03	2.11E+02	4.84E+02
3.95E+03	1.22E-03	1.67E-01	1.41E+02	1.24E+01	9.08E+01	4.40E+02	3.95E+03	2.11E+02	5.70E+02
4.91E+03	1.05E-03	1.67E-01	1.68E+02	1.26E+01	1.06E+02	5.26E+02	4.91E+03	2.11E+02	6.74E+02
6.10E+03	8.98E-04	1.67E-01	1.99E+02	1.28E+01	1.24E+02	6.29E+02	6.10E+03		

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2.11E+02  7.98E+02
           7.58E+03  7.73E-04  1.67E-01  2.35E+02  1.30E+01  1.44E+02            7.54E+02  7.58E+03
2.11E+02  9.45E+02
           9.41E+03  6.67E-04  1.67E-01  2.75E+02  1.32E+01  1.67E+02            9.06E+02  9.41E+03
2.11E+02  1.12E+03
           1.17E+04  5.78E-04  1.67E-01  3.21E+02  1.33E+01  1.93E+02            1.09E+03  1.17E+04
2.11E+02  1.33E+03
           1.44E+04  5.03E-04  1.67E-01  3.73E+02  1.35E+01  2.22E+02            1.31E+03  1.44E+04
2.11E+02  1.58E+03
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time averaged (tav = 60. s) volume concentration: concentration in the z = .00 plane.

downwind distance x (m)	time of max conc (s)	cloud duration (s)	effective half width bbc (m)	average concentration (volume fraction) at (x,y,z) y/bbc= 0.0	y/bbc= 0.5	y/bbc= 1.0	y/bbc= 1.5	y/bbc= 2.0	y/bbc= 2.5
1.00E+00	3.00E+01	6.00E+01	3.35E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1.02E+00	3.00E+01	6.00E+01	7.04E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1.05E+00	3.00E+01	6.00E+01	1.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1.08E+00	3.00E+01	6.00E+01	1.30E-01	2.34E-39	1.61E-39	5.27E-40	7.92E-41	5.32E-42	1.56E-43
1.11E+00	3.00E+01	6.00E+01	1.61E-01	8.79E-26	6.06E-26	1.98E-26	2.99E-27	2.07E-28	6.41E-30
1.16E+00	3.00E+01	6.00E+01	1.96E-01	8.64E-18	5.95E-18	1.94E-18	2.95E-19	2.07E-20	6.63E-22
1.21E+00	3.00E+01	6.00E+01	2.35E-01	9.82E-13	6.76E-13	2.20E-13	3.35E-14	2.38E-15	7.77E-17
1.28E+00	3.00E+01	6.00E+01	2.78E-01	2.16E-09	1.48E-09	4.82E-10	7.37E-11	5.26E-12	1.74E-13
1.36E+00	3.01E+01	6.00E+01	3.28E-01	4.05E-07	2.79E-07	9.05E-08	1.38E-08	9.93E-10	3.32E-11
1.45E+00	3.01E+01	6.00E+01	3.84E-01	1.52E-05	1.05E-05	3.40E-06	5.20E-07	3.74E-08	1.26E-09
1.57E+00	3.01E+01	6.00E+01	4.48E-01	1.93E-04	1.33E-04	4.31E-05	6.60E-06	4.75E-07	1.61E-08
1.71E+00	3.01E+01	6.00E+01	5.21E-01	1.15E-03	7.93E-04	2.57E-04	3.94E-05	2.85E-06	9.66E-08
1.88E+00	3.01E+01	6.00E+01	6.03E-01	4.06E-03	2.79E-03	9.06E-04	1.39E-04	1.00E-05	3.41E-07
2.08E+00	3.02E+01	6.00E+01	6.96E-01	9.80E-03	6.74E-03	2.19E-03	3.35E-04	2.42E-05	8.25E-07
2.33E+00	3.02E+01	6.00E+01	8.01E-01	1.80E-02	1.24E-02	4.03E-03	6.17E-04	4.46E-05	1.52E-06
2.63E+00	3.02E+01	6.00E+01	9.20E-01	2.72E-02	1.87E-02	6.07E-03	9.30E-04	6.73E-05	2.30E-06
2.99E+00	3.03E+01	6.00E+01	1.05E+00	3.83E-02	2.63E-02	8.54E-03	1.31E-03	9.48E-05	3.24E-06
3.43E+00	3.04E+01	6.00E+01	1.20E+00	4.75E-02	3.27E-02	1.06E-02	1.63E-03	1.18E-04	4.03E-06
3.96E+00	3.04E+01	6.00E+01	1.35E+00	4.92E-02	3.38E-02	1.10E-02	1.68E-03	1.22E-04	4.16E-06
4.61E+00	3.05E+01	6.00E+01	1.51E+00	4.71E-02	3.24E-02	1.05E-02	1.61E-03	1.17E-04	3.99E-06
5.38E+00	3.07E+01	6.00E+01	1.68E+00	4.34E-02	2.98E-02	9.68E-03	1.48E-03	1.07E-04	3.67E-06
6.32E+00	3.08E+01	6.00E+01	1.85E+00	3.91E-02	2.69E-02	8.73E-03	1.34E-03	9.69E-05	3.32E-06
7.45E+00	3.10E+01	6.00E+01	2.03E+00	3.48E-02	2.39E-02	7.77E-03	1.19E-03	8.63E-05	2.96E-06
8.83E+00	3.12E+01	6.00E+01	2.23E+00	3.07E-02	2.11E-02	6.86E-03	1.05E-03	7.62E-05	2.61E-06
1.05E+01	3.14E+01	6.00E+01	2.44E+00	2.69E-02	1.85E-02	6.01E-03	9.22E-04	6.68E-05	2.29E-06
1.25E+01	3.17E+01	6.00E+01	2.66E+00	2.35E-02	1.61E-02	5.24E-03	8.03E-04	5.82E-05	2.00E-06
1.49E+01	3.21E+01	6.00E+01	2.90E+00	2.03E-02	1.40E-02	4.54E-03	6.96E-04	5.04E-05	1.72E-06
1.79E+01	3.25E+01	6.00E+01	3.16E+00	1.75E-02	1.20E-02	3.90E-03	5.98E-04	4.33E-05	1.49E-06
2.14E+01	3.31E+01	6.00E+01	3.46E+00	1.49E-02	1.02E-02	3.32E-03	5.10E-04	3.69E-05	1.27E-06
2.57E+01	3.37E+01	6.00E+01	3.79E+00	1.26E-02	8.64E-03	2.80E-03	4.30E-04	3.12E-05	1.07E-06
3.09E+01	3.45E+01	6.00E+01	4.18E+00	1.05E-02	7.20E-03	2.34E-03			

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3.58E-04   2.60E-05   8.84E-07
             3.72E+01    3.54E+01    6.00E+01    4.62E+00         8.60E-03   5.91E-03   1.92E-03
2.94E-04   2.13E-05   7.28E-07
             4.48E+01    3.65E+01    6.00E+01    5.15E+00         6.95E-03   4.78E-03   1.55E-03
2.38E-04   1.72E-05   5.88E-07
             5.40E+01    3.79E+01    6.00E+01    5.78E+00         5.52E-03   3.79E-03   1.23E-03
1.89E-04   1.37E-05   4.69E-07
             6.51E+01    3.96E+01    6.00E+01    6.53E+00         4.31E-03   2.96E-03   9.62E-04
1.47E-04   1.07E-05   3.65E-07
             7.85E+01    4.16E+01    6.00E+01    7.46E+00         3.31E-03   2.28E-03   7.39E-04
1.13E-04   8.21E-06   2.80E-07
             9.48E+01    4.40E+01    6.00E+01    8.61E+00         2.51E-03   1.72E-03   5.59E-04
8.58E-05   6.21E-06   2.15E-07
             1.14E+02    4.70E+01    6.00E+01    1.00E+01         1.88E-03   1.29E-03   4.18E-04
6.42E-05   4.65E-06   1.58E-07
             1.38E+02    5.05E+01    6.00E+01    1.18E+01         1.39E-03   9.55E-04   3.10E-04
4.76E-05   3.45E-06   1.16E-07
             1.67E+02    5.48E+01    6.00E+01    1.39E+01         1.02E-03   7.04E-04   2.28E-04
3.50E-05   2.54E-06   8.74E-08
             2.02E+02    6.00E+01    6.00E+01    1.65E+01         7.48E-04   5.14E-04   1.67E-04
2.56E-05   1.85E-06   6.21E-08
             2.45E+02    6.60E+01    6.13E+01    1.98E+01         4.97E-04   3.41E-04   1.11E-04
1.70E-05   1.23E-06   4.19E-08
             2.98E+02    7.32E+01    6.32E+01    2.39E+01         3.39E-04   2.33E-04   7.57E-05
1.16E-05   8.41E-07   2.83E-08
             3.66E+02    8.19E+01    6.57E+01    2.90E+01         2.30E-04   1.58E-04   5.13E-05
7.87E-06   5.71E-07   1.90E-08
             4.50E+02    9.25E+01    6.89E+01    3.53E+01         1.55E-04   1.06E-04   3.45E-05
5.30E-06   3.84E-07   1.27E-08
             5.56E+02    1.05E+02    7.30E+01    4.32E+01         1.03E-04   7.08E-05   2.30E-05
3.53E-06   2.56E-07   9.21E-09
             6.89E+02    1.21E+02    7.81E+01    5.27E+01         6.79E-05   4.67E-05   1.52E-05
2.32E-06   1.68E-07   5.56E-09
             8.55E+02    1.39E+02    8.43E+01    6.45E+01         4.43E-05   3.04E-05   9.88E-06
1.52E-06   1.10E-07   3.69E-09
             1.06E+03    1.62E+02    9.19E+01    7.87E+01         2.86E-05   1.96E-05   6.37E-06
9.77E-07   7.10E-08   2.33E-09
             1.32E+03    1.89E+02    1.01E+02    9.59E+01         1.82E-05   1.25E-05   4.07E-06
6.25E-07   4.53E-08   1.36E-09
             1.64E+03    2.22E+02    1.12E+02    1.17E+02         1.16E-05   7.94E-06   2.58E-06
3.95E-07   2.86E-08   1.05E-09
             2.05E+03    2.62E+02    1.25E+02    1.41E+02         7.26E-06   4.99E-06   1.62E-06
2.48E-07   1.80E-08   5.31E-10
             2.55E+03    3.11E+02    1.41E+02    1.70E+02         4.54E-06   3.12E-06   1.01E-06
1.55E-07   1.13E-08   4.00E-10
             3.17E+03    3.69E+02    1.60E+02    2.05E+02         2.82E-06   1.94E-06   6.30E-07
9.66E-08   6.96E-09   2.99E-10
             3.95E+03    4.40E+02    1.82E+02    2.45E+02         1.75E-06   1.20E-06   3.91E-07
6.00E-08   4.33E-09   1.11E-10
             4.91E+03    5.26E+02    2.08E+02    2.91E+02         1.09E-06   7.47E-07   2.43E-07
3.72E-08   2.67E-09   8.21E-11
             6.10E+03    6.29E+02    2.40E+02    3.45E+02         6.76E-07   4.65E-07   1.51E-07
2.31E-08   1.66E-09   6.04E-11
             7.58E+03    7.54E+02    2.77E+02    4.07E+02         4.21E-07   2.90E-07   9.40E-08
1.44E-08   1.04E-09   4.44E-11
             9.41E+03    9.06E+02    3.21E+02    4.77E+02         2.64E-07   1.81E-07   5.88E-08
9.02E-09   6.51E-10   3.26E-11
             1.17E+04    1.09E+03    3.72E+02    5.57E+02         1.66E-07   1.14E-07   3.71E-08
5.68E-09   4.19E-10   2.39E-11
             1.44E+04    1.31E+03    4.33E+02    6.47E+02         1.05E-07   7.24E-08   2.35E-08
3.60E-09   2.56E-10   8.81E-12
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time averaged (tav = 60. s) volume concentration: maximum concentration (volume fraction) along centerline.

downwind distance x (m)	height z (m)	maximum concentration c(x,0,z)	time of max conc (s)	cloud duration (s)
1.00E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.02E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.05E+00	1.00E+00	7.31E-01	3.00E+01	6.00E+01
1.08E+00	1.00E+00	5.73E-01	3.00E+01	6.00E+01
1.11E+00	1.00E+00	4.65E-01	3.00E+01	6.00E+01
1.16E+00	1.00E+00	3.85E-01	3.00E+01	6.00E+01
1.21E+00	1.00E+00	3.23E-01	3.00E+01	6.00E+01
1.28E+00	1.00E+00	2.73E-01	3.00E+01	6.00E+01
1.36E+00	1.00E+00	2.32E-01	3.01E+01	6.00E+01
1.45E+00	1.00E+00	1.98E-01	3.01E+01	6.00E+01
1.57E+00	1.00E+00	1.70E-01	3.01E+01	6.00E+01

1.71E+00	1.00E+00	1.46E-01	3.01E+01	6.00E+01
1.88E+00	1.00E+00	1.26E-01	3.01E+01	6.00E+01
2.08E+00	1.00E+00	1.08E-01	3.02E+01	6.00E+01
2.33E+00	1.00E+00	9.32E-02	3.02E+01	6.00E+01
2.63E+00	1.00E+00	8.04E-02	3.02E+01	6.00E+01
2.99E+00	9.88E-01	6.68E-02	3.03E+01	6.00E+01
3.43E+00	8.80E-01	5.44E-02	3.04E+01	6.00E+01
3.96E+00	3.87E-01	4.93E-02	3.04E+01	6.00E+01
4.61E+00	0.00E+00	4.71E-02	3.05E+01	6.00E+01
5.38E+00	0.00E+00	4.34E-02	3.07E+01	6.00E+01
6.32E+00	0.00E+00	3.91E-02	3.08E+01	6.00E+01
7.45E+00	0.00E+00	3.48E-02	3.10E+01	6.00E+01
8.83E+00	0.00E+00	3.07E-02	3.12E+01	6.00E+01
1.05E+01	0.00E+00	2.69E-02	3.14E+01	6.00E+01
1.25E+01	0.00E+00	2.35E-02	3.17E+01	6.00E+01
1.49E+01	0.00E+00	2.03E-02	3.21E+01	6.00E+01
1.79E+01	0.00E+00	1.75E-02	3.25E+01	6.00E+01
2.14E+01	0.00E+00	1.49E-02	3.31E+01	6.00E+01
2.57E+01	0.00E+00	1.26E-02	3.37E+01	6.00E+01
3.09E+01	0.00E+00	1.05E-02	3.45E+01	6.00E+01
3.72E+01	0.00E+00	8.60E-03	3.54E+01	6.00E+01
4.48E+01	0.00E+00	6.95E-03	3.65E+01	6.00E+01
5.40E+01	0.00E+00	5.52E-03	3.79E+01	6.00E+01
6.51E+01	0.00E+00	4.31E-03	3.96E+01	6.00E+01
7.85E+01	0.00E+00	3.31E-03	4.16E+01	6.00E+01
9.48E+01	0.00E+00	2.51E-03	4.40E+01	6.00E+01
1.14E+02	0.00E+00	1.88E-03	4.70E+01	6.00E+01
1.38E+02	0.00E+00	1.39E-03	5.05E+01	6.00E+01
1.67E+02	0.00E+00	1.02E-03	5.48E+01	6.00E+01
2.02E+02	0.00E+00	7.48E-04	6.00E+01	6.00E+01
2.45E+02	0.00E+00	4.97E-04	6.60E+01	6.13E+01
2.98E+02	0.00E+00	3.39E-04	7.32E+01	6.32E+01
3.66E+02	0.00E+00	2.30E-04	8.19E+01	6.57E+01
4.50E+02	0.00E+00	1.55E-04	9.25E+01	6.89E+01
5.56E+02	0.00E+00	1.03E-04	1.05E+02	7.30E+01
6.89E+02	0.00E+00	6.79E-05	1.21E+02	7.81E+01
8.55E+02	0.00E+00	4.43E-05	1.39E+02	8.43E+01
1.06E+03	0.00E+00	2.86E-05	1.62E+02	9.19E+01
1.32E+03	0.00E+00	1.82E-05	1.89E+02	1.01E+02
1.64E+03	0.00E+00	1.16E-05	2.22E+02	1.12E+02
2.05E+03	0.00E+00	7.26E-06	2.62E+02	1.25E+02
2.55E+03	0.00E+00	4.54E-06	3.11E+02	1.41E+02
3.17E+03	0.00E+00	2.82E-06	3.69E+02	1.60E+02
3.95E+03	0.00E+00	1.75E-06	4.40E+02	1.82E+02
4.91E+03	0.00E+00	1.09E-06	5.26E+02	2.08E+02
6.10E+03	0.00E+00	6.76E-07	6.29E+02	2.40E+02
7.58E+03	0.00E+00	4.21E-07	7.54E+02	2.77E+02
9.41E+03	0.00E+00	2.64E-07	9.06E+02	3.21E+02
1.17E+04	0.00E+00	1.66E-07	1.09E+03	3.72E+02
1.44E+04	0.00E+00	1.05E-07	1.31E+03	4.33E+02

•(10U •&l0O •&k2S •&l8D •

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problem input

idspl =         2
ncalc =         1
wms   =   .016000
cps   =   2240.00
tbp   =    111.70
cmed0 =       .00
dhe   =   509880.
cpsl  =   3349.00
rhosl =    424.10
spb   =     -1.00
spc   =       .00
ts    =    428.00
qs    =      1.22
as    =       .00
tsd   =       60.
qtis  =       .00
hs    =      1.00
tav   =     60.00
xffm  =   9000.00
zp(1) =       .00
zp(2) =       .00
zp(3) =       .00
zp(4) =       .00
z0    =   .300000
za    =      2.00
ua    =      2.00
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 ta    =    293.00
 rh    =     60.00
 stab  =      6.00
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release gas properties

molecular weight of source gas (kg)              - wms  =  1.6000E-02
vapor heat capacity, const. p.  (j/kg-k)         - cps  =  2.2400E+03
temperature of source gas (k)                    - ts   =  4.2800E+02
density of source gas (kg/m3)                    - rhos =  4.5558E-01
boiling point temperature                        - tbp  =  1.1170E+02
liquid mass fraction                             - cmed0=  0.0000E+00
liquid heat capacity (j/kg-k)                    - cpsl =  3.3490E+03
heat of vaporization (j/kg)                      - dhe  =  5.0988E+05
liquid source density (kg/m3)                    - rhosl=  4.2410E+02
saturation pressure constant                     - spa  =  8.7843E+00
saturation pressure constant (k)                 - spb  =  9.8121E+02
saturation pressure constant (k)                 - spc  =  0.0000E+00


spill characteristics

spill type                                       - idspl=          2
mass source rate (kg/s)                          - qs   =  1.2200E+00
continuous source duration (s)                   - tsd  =  6.0000E+01
continuous source mass (kg)                      - qtcs =  7.3200E+01
instantaneous source mass (kg)                   - qtis =  0.0000E+00
source area (m2)                                 - as   =  4.5000E-03
vertical vapor velocity (m/s)                    - ws   =  0.0000E+00
source half width (m)                            - bs   =  3.3541E-02
source height (m)                                - hs   =  1.0000E+00
horizontal vapor velocity (m/s)                  - us   =  5.9509E+02


field parameters

concentration averaging time (s)                 - tav  =  6.0000E+01
mixing layer height (m)                          - hmx  =  2.6000E+02
maximum downwind distance (m)                    - xffm =  9.0000E+03
concentration measurement height (m)             - zp(1)=  0.0000E+00
                                                 - zp(2)=  0.0000E+00
                                                 - zp(3)=  0.0000E+00
                                                 - zp(4)=  0.0000E+00


ambient meteorological properties

molecular weight of ambient air (kg)            - wmae  =  2.8804E-02
heat capacity of ambient air at const p. (j/kg-k)- cpaa  =  1.0134E+03
density of ambient air (kg/m3)                  - rhoa  =  1.1980E+00
ambient measurement height (m)                  - za    =  2.0000E+00
ambient atmospheric pressure (pa=n/m2=j/m3)     - pa    =  1.0133E+05
ambient wind speed (m/s)                        - ua    =  2.0000E+00
ambient temperature (k)                         - ta    =  2.9300E+02
relative humidity (percent)                     - rh    =  6.0000E+01
ambient friction velocity (m/s)                 - uastr =  3.2808E-01
atmospheric stability class value               - stab  =  6.0000E+00
inverse monin-obukhov length (1/m)              - ala   =  4.7330E-02
surface roughness height (m)                    - z0    =  3.0000E-01


additional parameters

sub-step multiplier                             - ncalc =          1
number of calculational sub-steps               - nssm  =          3
acceleration of gravity (m/s2)                  - grav  =  9.8067E+00
gas constant (j/mol- k)                         - rr    =  8.3143E+00
von karman constant                             - xk    =  4.1000E-01
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instantaneous spatially averaged cloud parameters


          x        zc         h        bb         b        bbx       bx        cv        rho        t
     u        ua
        1.00E+00  1.00E+00  6.71E-02  3.35E-02  3.02E-02  0.00E+00  0.00E+00  1.00E+00  4.56E-01
4.28E+02  5.95E+02  6.06E-01
        1.02E+00  1.00E+00  1.46E-01  7.31E-02  4.00E-02  2.04E-02  2.04E-02  5.15E-01  7.32E-01
3.69E+02  2.10E+02  6.29E-01
        1.05E+00  1.00E+00  2.10E-01  1.05E-01  4.65E-02  4.51E-02  4.51E-02  3.68E-01  8.40E-01
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3.49E+02 1.35E+02 6.48E-01
1.08E+00 1.00E+00 2.73E-01 1.37E-01 5.21E-02 7.49E-02 7.49E-02 2.86E-01 9.08E-01
3.38E+02 9.89E+01 6.67E-01
1.11E+00 1.00E+00 3.41E-01 1.71E-01 5.75E-02 1.11E-01 1.11E-01 2.31E-01 9.56E-01
3.29E+02 7.66E+01 6.87E-01
1.16E+00 1.00E+00 4.16E-01 2.08E-01 6.29E-02 1.55E-01 1.55E-01 1.91E-01 9.94E-01
3.23E+02 6.13E+01 7.08E-01
1.21E+00 1.00E+00 5.00E-01 2.50E-01 6.85E-02 2.08E-01 2.07E-01 1.59E-01 1.02E+00
3.18E+02 5.01E+01 7.32E-01
1.28E+00 1.00E+00 5.95E-01 2.97E-01 7.42E-02 2.71E-01 2.71E-01 1.34E-01 1.05E+00
3.15E+02 4.14E+01 7.59E-01
1.36E+00 1.00E+00 7.02E-01 3.51E-01 8.03E-02 3.49E-01 3.49E-01 1.14E-01 1.07E+00
3.11E+02 3.46E+01 7.88E-01
1.45E+00 1.00E+00 8.25E-01 4.12E-01 8.66E-02 4.42E-01 4.42E-01 9.75E-02 1.09E+00
3.09E+02 2.91E+01 8.22E-01
1.57E+00 1.00E+00 9.65E-01 4.82E-01 9.33E-02 5.55E-01 5.55E-01 8.35E-02 1.10E+00
3.07E+02 2.47E+01 8.59E-01
1.71E+00 1.00E+00 1.13E+00 5.63E-01 1.00E-01 6.92E-01 6.92E-01 7.17E-02 1.12E+00
3.05E+02 2.10E+01 9.00E-01
1.88E+00 1.00E+00 1.31E+00 6.54E-01 1.08E-01 8.57E-01 8.57E-01 6.17E-02 1.13E+00
3.03E+02 1.80E+01 9.46E-01
2.08E+00 1.00E+00 1.52E+00 7.58E-01 1.16E-01 1.06E+00 1.06E+00 5.32E-02 1.14E+00
3.02E+02 1.54E+01 9.97E-01
2.33E+00 1.00E+00 1.75E+00 8.76E-01 1.24E-01 1.30E+00 1.30E+00 4.59E-02 1.14E+00
3.01E+02 1.33E+01 1.05E+00
2.63E+00 1.00E+00 2.01E+00 1.00E+00 1.32E-01 1.59E+00 1.59E+00 4.00E-02 1.15E+00
3.00E+02 1.16E+01 1.11E+00
2.99E+00 1.00E+00 2.28E+00 1.14E+00 1.40E-01 1.94E+00 1.94E+00 3.52E-02 1.16E+00
2.99E+02 1.03E+01 1.23E+00
3.43E+00 1.00E+00 2.56E+00 1.28E+00 1.47E-01 2.37E+00 2.37E+00 3.11E-02 1.16E+00
2.98E+02 9.14E+00 1.34E+00
3.96E+00 1.01E+00 2.86E+00 1.43E+00 1.55E-01 2.89E+00 2.89E+00 2.77E-02 1.17E+00
2.97E+02 8.22E+00 1.45E+00
4.61E+00 1.01E+00 3.19E+00 1.59E+00 1.62E-01 3.51E+00 3.51E+00 2.46E-02 1.17E+00
2.97E+02 7.44E+00 1.56E+00
5.38E+00 1.02E+00 3.53E+00 1.77E+00 1.69E-01 4.27E+00 4.27E+00 2.19E-02 1.17E+00
2.96E+02 6.79E+00 1.67E+00
6.32E+00 1.04E+00 3.90E+00 1.95E+00 1.76E-01 5.18E+00 5.18E+00 1.95E-02 1.18E+00
2.96E+02 6.23E+00 1.78E+00
7.45E+00 1.06E+00 4.30E+00 2.15E+00 1.82E-01 6.29E+00 6.29E+00 1.74E-02 1.18E+00
2.96E+02 5.76E+00 1.89E+00
8.83E+00 1.09E+00 4.71E+00 2.36E+00 1.88E-01 7.63E+00 7.63E+00 1.55E-02 1.18E+00
2.95E+02 5.36E+00 2.00E+00
1.05E+01 1.15E+00 5.15E+00 2.59E+00 1.94E-01 9.25E+00 9.25E+00 1.38E-02 1.18E+00
2.95E+02 5.02E+00 2.10E+00
1.25E+01 1.22E+00 5.62E+00 2.82E+00 1.97E-01 1.12E+01 1.12E+01 1.23E-02 1.18E+00
2.95E+02 4.74E+00 2.21E+00
1.49E+01 1.34E+00 6.11E+00 3.06E+00 2.01E-01 1.36E+01 1.36E+01 1.09E-02 1.19E+00
2.95E+02 4.51E+00 2.31E+00
1.79E+01 1.51E+00 6.61E+00 3.33E+00 2.04E-01 1.64E+01 1.64E+01 9.72E-03 1.19E+00
2.94E+02 4.31E+00 2.41E+00
2.14E+01 1.75E+00 7.11E+00 3.61E+00 2.06E-01 1.99E+01 1.99E+01 8.64E-03 1.19E+00
2.94E+02 4.15E+00 2.50E+00
2.57E+01 2.09E+00 7.63E+00 3.91E+00 2.08E-01 2.41E+01 2.41E+01 7.68E-03 1.19E+00
2.94E+02 4.02E+00 2.59E+00
3.09E+01 2.58E+00 8.16E+00 4.24E+00 2.10E-01 2.91E+01 2.91E+01 6.81E-03 1.19E+00
2.94E+02 3.90E+00 2.68E+00
3.72E+01 3.25E+00 8.70E+00 4.58E+00 2.12E-01 3.53E+01 3.53E+01 6.04E-03 1.19E+00
2.94E+02 3.82E+00 2.76E+00
4.48E+01 4.17E+00 9.27E+00 4.95E+00 2.12E-01 4.27E+01 4.27E+01 5.34E-03 1.19E+00
2.94E+02 3.75E+00 2.85E+00
5.40E+01 5.41E+00 9.95E+00 5.33E+00 2.12E-01 5.16E+01 5.16E+01 4.60E-03 1.19E+00
2.94E+02 3.76E+00 3.00E+00
6.51E+01 6.94E+00 1.08E+01 5.71E+00 2.10E-01 6.25E+01 6.24E+01 3.86E-03 1.19E+00
2.94E+02 3.86E+00 3.24E+00
7.85E+01 8.79E+00 1.16E+01 6.13E+00 2.08E-01 7.56E+01 7.55E+01 3.25E-03 1.19E+00
2.93E+02 3.99E+00 3.48E+00
9.48E+01 1.10E+01 1.23E+01 6.61E+00 2.05E-01 9.14E+01 9.14E+01 2.73E-03 1.20E+00
2.93E+02 4.13E+00 3.71E+00
1.14E+02 1.36E+01 1.31E+01 7.17E+00 2.03E-01 1.11E+02 1.11E+02 2.28E-03 1.20E+00
2.93E+02 4.29E+00 3.95E+00
1.38E+02 1.66E+01 1.39E+01 7.85E+00 2.01E-01 1.34E+02 1.34E+02 1.89E-03 1.20E+00
2.93E+02 4.46E+00 4.18E+00
1.68E+02 1.99E+01 1.51E+01 8.78E+00 2.01E-01 1.44E+02 1.34E+02 1.44E-03 1.20E+00
2.93E+02 4.62E+00 4.41E+00
2.04E+02 2.36E+01 1.64E+01 9.94E+00 2.01E-01 1.57E+02 1.34E+02 1.07E-03 1.20E+00
2.93E+02 4.79E+00 4.63E+00
2.50E+02 2.75E+01 1.79E+01 1.14E+01 2.01E-01 1.72E+02 1.34E+02 7.83E-04 1.20E+00
2.93E+02 4.96E+00 4.84E+00
3.08E+02 3.16E+01 1.96E+01 1.32E+01 2.01E-01 1.91E+02 1.34E+02 5.58E-04 1.20E+00
2.93E+02 5.12E+00 5.04E+00

3.79E+02	3.57E+01	2.15E+01	1.54E+01	2.01E-01	2.13E+02	1.34E+02	3.89E-04	1.20E+00	2.93E+02	5.27E+00	5.21E+00
4.69E+02	3.99E+01	2.38E+01	1.82E+01	2.01E-01	2.39E+02	1.34E+02	2.67E-04	1.20E+00	2.93E+02	5.42E+00	5.38E+00
5.79E+02	4.41E+01	2.64E+01	2.15E+01	2.01E-01	2.70E+02	1.34E+02	1.80E-04	1.20E+00	2.93E+02	5.56E+00	5.53E+00
7.17E+02	4.82E+01	2.94E+01	2.56E+01	2.01E-01	3.07E+02	1.34E+02	1.19E-04	1.20E+00	2.93E+02	5.69E+00	5.67E+00
8.86E+02	5.21E+01	3.29E+01	3.06E+01	2.01E-01	3.50E+02	1.34E+02	7.80E-05	1.20E+00	2.93E+02	5.81E+00	5.80E+00
1.10E+03	5.58E+01	3.71E+01	3.65E+01	2.01E-01	4.02E+02	1.34E+02	5.04E-05	1.20E+00	2.93E+02	5.93E+00	5.92E+00
1.35E+03	5.93E+01	4.20E+01	4.36E+01	2.01E-01	4.64E+02	1.34E+02	3.23E-05	1.20E+00	2.93E+02	6.04E+00	6.03E+00
1.67E+03	6.26E+01	4.79E+01	5.21E+01	2.01E-01	5.37E+02	1.34E+02	2.05E-05	1.20E+00	2.93E+02	6.14E+00	6.14E+00
2.06E+03	6.56E+01	5.50E+01	6.21E+01	2.01E-01	6.23E+02	1.34E+02	1.29E-05	1.20E+00	2.93E+02	6.25E+00	6.25E+00
2.55E+03	6.84E+01	6.36E+01	7.38E+01	2.01E-01	7.25E+02	1.34E+02	8.08E-06	1.20E+00	2.93E+02	6.35E+00	6.35E+00
3.14E+03	7.10E+01	7.40E+01	8.75E+01	2.01E-01	8.47E+02	1.34E+02	5.02E-06	1.20E+00	2.93E+02	6.45E+00	6.45E+00
3.86E+03	7.33E+01	8.69E+01	1.03E+02	2.01E-01	9.90E+02	1.34E+02	3.09E-06	1.20E+00	2.93E+02	6.56E+00	6.56E+00
4.76E+03	7.54E+01	1.03E+02	1.22E+02	2.01E-01	1.16E+03	1.34E+02	1.89E-06	1.20E+00	2.93E+02	6.67E+00	6.67E+00
5.86E+03	7.72E+01	1.23E+02	1.43E+02	2.01E-01	1.36E+03	1.34E+02	1.15E-06	1.20E+00	2.93E+02	6.79E+00	6.79E+00
7.21E+03	7.89E+01	1.50E+02	1.67E+02	2.01E-01	1.59E+03	1.34E+02	6.88E-07	1.20E+00	2.93E+02	6.92E+00	6.92E+00
8.88E+03	8.05E+01	1.61E+02	1.94E+02	2.01E-01	1.87E+03	1.34E+02	4.69E-07	1.20E+00	2.93E+02	6.98E+00	6.98E+00
1.09E+04	8.21E+01	1.67E+02	2.25E+02	2.01E-01	2.20E+03	1.34E+02	3.33E-07	1.20E+00	2.93E+02	7.02E+00	7.02E+00
1.34E+04	8.38E+01	1.74E+02	2.60E+02	2.01E-01	2.58E+03	1.34E+02	2.36E-07	1.20E+00	2.93E+02	7.07E+00	7.07E+00

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x	cm	cmv	cmda	cmw	cmwv	wc	vg	ug	w	v	vx
1.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.25E+02	1.36E+02	0.00E+00
1.02E+00	3.71E-01	3.71E-01	6.23E-01	5.61E-03	5.61E-03	4.30E-04	0.00E+00	0.00E+00	1.94E+02	2.97E+01	5.08E-01
1.05E+00	2.45E-01	2.45E-01	7.49E-01	6.74E-03	6.74E-03	9.28E-04	0.00E+00	0.00E+00	1.06E+02	1.67E+01	5.10E-01
1.08E+00	1.82E-01	1.82E-01	8.11E-01	7.30E-03	7.30E-03	1.53E-03	0.00E+00	0.00E+00	6.98E+01	1.13E+01	5.12E-01
1.11E+00	1.43E-01	1.43E-01	8.49E-01	7.65E-03	7.65E-03	2.27E-03	0.00E+00	0.00E+00	5.00E+01	8.28E+00	5.14E-01
1.16E+00	1.16E-01	1.16E-01	8.76E-01	7.89E-03	7.89E-03	3.15E-03	0.00E+00	0.00E+00	3.74E+01	6.36E+00	5.16E-01
1.21E+00	9.52E-02	9.52E-02	8.97E-01	8.07E-03	8.07E-03	4.23E-03	0.00E+00	0.00E+00	2.88E+01	5.02E+00	5.18E-01
1.28E+00	7.94E-02	7.94E-02	9.12E-01	8.22E-03	8.22E-03	5.54E-03	0.00E+00	0.00E+00	2.25E+01	4.04E+00	5.21E-01
1.36E+00	6.68E-02	6.68E-02	9.25E-01	8.33E-03	8.33E-03	7.13E-03	0.00E+00	0.00E+00	1.78E+01	3.29E+00	5.24E-01
1.45E+00	5.66E-02	5.66E-02	9.35E-01	8.42E-03	8.42E-03	9.06E-03	0.00E+00	0.00E+00	1.42E+01	2.71E+00	5.27E-01
1.57E+00	4.82E-02	4.82E-02	9.43E-01	8.49E-03	8.49E-03	1.14E-02	0.00E+00	0.00E+00	1.13E+01	2.25E+00	5.31E-01
1.71E+00	4.11E-02	4.11E-02	9.50E-01	8.56E-03	8.56E-03	1.42E-02	0.00E+00	0.00E+00	9.13E+00	1.88E+00	5.36E-01
1.88E+00	3.52E-02	3.52E-02	9.56E-01	8.61E-03	8.61E-03	1.76E-02	0.00E+00	0.00E+00	7.36E+00	1.57E+00	5.40E-01
2.08E+00	3.03E-02	3.03E-02	9.61E-01	8.65E-03	8.65E-03	2.18E-02	0.00E+00	0.00E+00	5.95E+00	1.33E+00	5.46E-01
2.33E+00	2.60E-02	2.60E-02	9.65E-01	8.69E-03	8.69E-03	2.67E-02	0.00E+00	0.00E+00	4.82E+00	1.12E+00	5.52E-01
2.63E+00	2.26E-02	2.26E-02	9.69E-01	8.72E-03	8.72E-03	3.29E-02	0.00E+00	0.00E+00	3.34E+00	9.53E-01	5.58E-01
2.99E+00	1.99E-02	1.99E-02	9.71E-01	8.75E-03	8.75E-03	4.06E-02	0.00E+00	0.00E+00	2.49E+00	8.14E-01	5.71E-01
3.43E+00	1.75E-02	1.75E-02	9.74E-01	8.77E-03	8.77E-03	4.99E-02	0.00E+00	0.00E+00	1.91E+00	7.01E-01	5.84E-01
3.96E+00	1.56E-02	1.56E-02	9.76E-01	8.79E-03	8.79E-03	6.09E-02	0.00E+00	0.00E+00	1.49E+00	6.06E-01	5.97E-01
4.61E+00	1.38E-02	1.38E-02	9.77E-01	8.80E-03	8.80E-03	7.38E-02	0.00E+00	0.00E+00	1.18E+00	5.25E-01	6.10E-01
5.38E+00	1.23E-02	1.23E-02	9.79E-01	8.81E-03	8.81E-03	8.89E-02	0.00E+00	0.00E+00			

9.49E-01 4.56E-01 6.24E-01
6.32E+00 1.09E-02 1.09E-02 9.80E-01 8.83E-03 8.83E-03 1.06E-01 0.00E+00 0.00E+00
7.68E-01 3.96E-01 6.38E-01
7.45E+00 9.73E-03 9.73E-03 9.81E-01 8.84E-03 8.84E-03 1.26E-01 0.00E+00 0.00E+00
6.26E-01 3.44E-01 6.52E-01
8.83E+00 8.66E-03 8.66E-03 9.82E-01 8.85E-03 8.85E-03 1.49E-01 0.00E+00 0.00E+00
5.14E-01 2.99E-01 6.67E-01
1.05E+01 7.70E-03 7.70E-03 9.83E-01 8.86E-03 8.86E-03 1.74E-01 0.00E+00 0.00E+00
4.25E-01 2.61E-01 6.83E-01
1.25E+01 6.85E-03 6.85E-03 9.84E-01 8.86E-03 8.86E-03 2.03E-01 0.00E+00 0.00E+00
3.53E-01 2.27E-01 7.00E-01
1.49E+01 6.10E-03 6.10E-03 9.85E-01 8.87E-03 8.87E-03 2.34E-01 0.00E+00 0.00E+00
2.96E-01 1.99E-01 7.17E-01
1.79E+01 5.42E-03 5.42E-03 9.86E-01 8.88E-03 8.88E-03 2.69E-01 0.00E+00 0.00E+00
2.49E-01 1.74E-01 7.36E-01
2.14E+01 4.82E-03 4.82E-03 9.86E-01 8.88E-03 8.88E-03 3.07E-01 0.00E+00 0.00E+00
2.12E-01 1.53E-01 7.56E-01
2.57E+01 4.28E-03 4.28E-03 9.87E-01 8.89E-03 8.89E-03 3.47E-01 0.00E+00 0.00E+00
1.82E-01 1.34E-01 7.78E-01
3.09E+01 3.80E-03 3.80E-03 9.87E-01 8.89E-03 8.89E-03 3.90E-01 0.00E+00 0.00E+00
1.57E-01 1.19E-01 8.01E-01
3.72E+01 3.36E-03 3.36E-03 9.88E-01 8.89E-03 8.89E-03 4.35E-01 0.00E+00 0.00E+00
1.37E-01 1.06E-01 8.26E-01
4.48E+01 2.97E-03 2.97E-03 9.88E-01 8.90E-03 8.90E-03 4.82E-01 0.00E+00 0.00E+00
1.21E-01 9.59E-02 8.51E-01
5.40E+01 2.56E-03 2.56E-03 9.89E-01 8.90E-03 8.90E-03 5.17E-01 0.00E+00 0.00E+00
2.20E-01 8.75E-02 8.78E-01
6.51E+01 2.15E-03 2.15E-03 9.89E-01 8.91E-03 8.91E-03 5.32E-01 0.00E+00 0.00E+00
1.87E-01 8.22E-02 9.04E-01
7.85E+01 1.81E-03 1.81E-03 9.89E-01 8.91E-03 8.91E-03 5.44E-01 0.00E+00 0.00E+00
1.62E-01 7.98E-02 9.23E-01
9.48E+01 1.52E-03 1.52E-03 9.90E-01 8.91E-03 8.91E-03 5.52E-01 0.00E+00 0.00E+00
1.42E-01 7.94E-02 9.37E-01
1.14E+02 1.27E-03 1.27E-03 9.90E-01 8.91E-03 8.91E-03 5.53E-01 0.00E+00 0.00E+00
1.26E-01 8.03E-02 9.45E-01
1.38E+02 1.05E-03 1.05E-03 9.90E-01 8.91E-03 8.91E-03 5.48E-01 0.00E+00 0.00E+00
1.13E-01 8.23E-02 9.49E-01
1.68E+02 8.02E-04 8.02E-04 9.90E-01 8.92E-03 8.92E-03 4.97E-01 0.00E+00 0.00E+00
1.03E-01 8.46E-02 9.49E-01
2.04E+02 5.97E-04 5.97E-04 9.90E-01 8.92E-03 8.92E-03 4.43E-01 0.00E+00 0.00E+00
9.53E-02 8.72E-02 9.43E-01
2.50E+02 4.35E-04 4.35E-04 9.91E-01 8.92E-03 8.92E-03 3.86E-01 0.00E+00 0.00E+00
8.89E-02 8.98E-02 9.34E-01
3.08E+02 3.10E-04 3.10E-04 9.91E-01 8.92E-03 8.92E-03 3.30E-01 0.00E+00 0.00E+00
8.37E-02 9.22E-02 9.23E-01
3.79E+02 2.16E-04 2.16E-04 9.91E-01 8.92E-03 8.92E-03 2.77E-01 0.00E+00 0.00E+00
7.94E-02 9.42E-02 9.10E-01
4.69E+02 1.48E-04 1.48E-04 9.91E-01 8.92E-03 8.92E-03 2.29E-01 0.00E+00 0.00E+00
7.58E-02 9.57E-02 8.95E-01
5.79E+02 9.97E-05 9.97E-05 9.91E-01 8.92E-03 8.92E-03 1.86E-01 0.00E+00 0.00E+00
7.28E-02 9.66E-02 8.79E-01
7.17E+02 6.62E-05 6.62E-05 9.91E-01 8.92E-03 8.92E-03 1.49E-01 0.00E+00 0.00E+00
7.03E-02 9.70E-02 8.63E-01
8.86E+02 4.33E-05 4.33E-05 9.91E-01 8.92E-03 8.92E-03 1.18E-01 0.00E+00 0.00E+00
6.83E-02 9.67E-02 8.47E-01
1.10E+03 2.80E-05 2.80E-05 9.91E-01 8.92E-03 8.92E-03 9.24E-02 0.00E+00 0.00E+00
6.67E-02 9.59E-02 8.31E-01
1.35E+03 1.80E-05 1.80E-05 9.91E-01 8.92E-03 8.92E-03 7.17E-02 0.00E+00 0.00E+00
6.55E-02 9.45E-02 8.14E-01
1.67E+03 1.14E-05 1.14E-05 9.91E-01 8.92E-03 8.92E-03 5.51E-02 0.00E+00 0.00E+00
6.48E-02 9.25E-02 7.98E-01
2.06E+03 7.18E-06 7.18E-06 9.91E-01 8.92E-03 8.92E-03 4.20E-02 0.00E+00 0.00E+00
6.46E-02 9.00E-02 7.82E-01
2.55E+03 4.49E-06 4.49E-06 9.91E-01 8.92E-03 8.92E-03 3.18E-02 0.00E+00 0.00E+00
6.48E-02 8.71E-02 7.66E-01
3.14E+03 2.79E-06 2.79E-06 9.91E-01 8.92E-03 8.92E-03 2.39E-02 0.00E+00 0.00E+00
6.57E-02 8.39E-02 7.50E-01
3.86E+03 1.72E-06 1.72E-06 9.91E-01 8.92E-03 8.92E-03 1.79E-02 0.00E+00 0.00E+00
6.75E-02 8.03E-02 7.33E-01
4.76E+03 1.05E-06 1.05E-06 9.91E-01 8.92E-03 8.92E-03 1.33E-02 0.00E+00 0.00E+00
7.03E-02 7.66E-02 7.15E-01
5.86E+03 6.37E-07 6.37E-07 9.91E-01 8.92E-03 8.92E-03 9.84E-03 0.00E+00 0.00E+00
7.48E-02 7.27E-02 6.95E-01
7.21E+03 3.82E-07 3.82E-07 9.91E-01 8.92E-03 8.92E-03 7.21E-03 0.00E+00 0.00E+00
8.18E-02 6.88E-02 6.73E-01
8.88E+03 2.61E-07 2.61E-07 9.91E-01 8.92E-03 8.92E-03 6.12E-03 0.00E+00 0.00E+00
1.19E-02 6.41E-02 6.60E-01
1.09E+04 1.85E-07 1.85E-07 9.91E-01 8.92E-03 8.92E-03 5.23E-03 0.00E+00 0.00E+00
1.11E-02 5.95E-02 6.48E-01
1.34E+04 1.31E-07 1.31E-07 9.91E-01 8.92E-03 8.92E-03 4.59E-03 0.00E+00 0.00E+00
1.03E-02 5.50E-02 6.35E-01

• time averaged (tav = 60. s) volume concentration: concentration contour parameters

c(x,y,z,t) = cc(x) * (erf(xa)-erf(xb)) * (erf(ya)-erf(yb)) * (exp(-za*za)+exp(-zb*zb))

```
c(x,y,z,t) = concentration (volume fraction) at (x,y,z,t)
         x = downwind distance (m)
         y = crosswind horizontal distance (m)
         z = height (m)
         t = time (s)

       erf = error functon              exp = exponential function
        xa = (x-xc+bx)/(sr2*betax)       za = (z-zc)/(sr2*sig)
        xb = (x-xc-bx)/(sr2*betax)       zb = (z+zc)/(sr2*sig)
        ya = (y+b)/(sr2*betac)          sr2 = sqrt(2.0)
        yb = (y-b)/(sr2*betac)
```

x	cc(x)	b(x)	betac(x)	zc(x)	sig(x)	t	xc(t)	bx(t)	betax(t)
1.00E+00	0.00E+00	3.02E-02	8.44E-03	1.00E+00	1.94E-02	0.00E+00	1.00E+00	0.00E+00	0.00E+00
1.02E+00	3.25E-01	4.00E-02	3.53E-02	1.00E+00	4.22E-02	1.36E-04	1.02E+00	2.04E-02	1.67E-04
1.05E+00	2.87E-01	4.65E-02	5.42E-02	1.00E+00	6.05E-02	4.47E-04	1.05E+00	4.51E-02	3.68E-04
1.08E+00	2.59E-01	5.21E-02	7.29E-02	1.00E+00	7.89E-02	9.86E-04	1.08E+00	7.49E-02	6.12E-04
1.11E+00	2.37E-01	5.75E-02	9.27E-02	1.00E+00	9.85E-02	1.85E-03	1.11E+00	1.11E-01	9.07E-04
1.16E+00	2.18E-01	6.29E-02	1.14E-01	1.00E+00	1.20E-01	3.16E-03	1.16E+00	1.55E-01	1.26E-03
1.21E+00	2.01E-01	6.85E-02	1.39E-01	1.00E+00	1.44E-01	5.13E-03	1.21E+00	2.07E-01	1.69E-03
1.28E+00	1.86E-01	7.42E-02	1.66E-01	1.00E+00	1.72E-01	8.02E-03	1.28E+00	2.71E-01	2.22E-03
1.36E+00	1.73E-01	8.03E-02	1.97E-01	1.00E+00	2.03E-01	1.22E-02	1.36E+00	3.49E-01	2.85E-03
1.45E+00	1.60E-01	8.66E-02	2.33E-01	1.00E+00	2.38E-01	1.83E-02	1.45E+00	4.42E-01	3.61E-03
1.57E+00	1.49E-01	9.33E-02	2.73E-01	1.00E+00	2.79E-01	2.70E-02	1.57E+00	5.55E-01	4.53E-03
1.71E+00	1.39E-01	1.00E-01	3.20E-01	1.00E+00	3.25E-01	3.93E-02	1.71E+00	6.92E-01	5.65E-03
1.88E+00	1.29E-01	1.08E-01	3.72E-01	1.00E+00	3.78E-01	5.69E-02	1.88E+00	8.57E-01	7.00E-03
2.08E+00	1.20E-01	1.16E-01	4.32E-01	1.00E+00	4.38E-01	8.16E-02	2.08E+00	1.06E+00	8.63E-03
2.33E+00	1.12E-01	1.24E-01	5.01E-01	1.00E+00	5.06E-01	1.16E-01	2.33E+00	1.30E+00	1.06E-02
2.63E+00	1.05E-01	1.32E-01	5.74E-01	1.00E+00	5.81E-01	1.65E-01	2.63E+00	1.59E+00	1.30E-02
2.99E+00	8.84E-02	1.40E-01	6.52E-01	1.00E+00	7.35E-01	2.31E-01	2.99E+00	1.94E+00	1.59E-02
3.43E+00	7.69E-02	1.47E-01	7.34E-01	1.00E+00	8.98E-01	3.22E-01	3.43E+00	2.37E+00	1.94E-02
3.96E+00	6.82E-02	1.55E-01	8.21E-01	1.01E+00	1.07E+00	4.45E-01	3.96E+00	2.89E+00	2.36E-02
4.61E+00	6.13E-02	1.62E-01	9.15E-01	1.01E+00	1.25E+00	6.09E-01	4.61E+00	3.51E+00	2.87E-02
5.38E+00	5.57E-02	1.69E-01	1.02E+00	1.02E+00	1.45E+00	8.28E-01	5.38E+00	4.27E+00	3.49E-02
6.32E+00	5.09E-02	1.76E-01	1.12E+00	1.04E+00	1.66E+00	1.12E+00	6.32E+00	5.18E+00	4.23E-02
7.45E+00	4.70E-02	1.82E-01	1.24E+00	1.06E+00	1.87E+00	1.50E+00	7.45E+00	6.29E+00	5.14E-02
8.83E+00	4.37E-02	1.88E-01	1.36E+00	1.09E+00	2.09E+00	1.99E+00	8.83E+00	7.63E+00	6.23E-02
1.05E+01	4.10E-02	1.94E-01	1.49E+00	1.15E+00	2.31E+00	2.63E+00	1.05E+01	9.25E+00	7.55E-02
1.25E+01	3.87E-02	1.97E-01	1.63E+00	1.22E+00	2.54E+00	3.46E+00	1.25E+01	1.12E+01	9.15E-02
1.49E+01	3.69E-02	2.01E-01	1.77E+00	1.34E+00	2.75E+00	4.51E+00	1.49E+01	1.36E+01	1.11E-01
1.79E+01	3.56E-02	2.04E-01	1.92E+00	1.51E+00	2.95E+00	5.84E+00	1.79E+01	1.64E+01	1.34E-01
2.14E+01	3.47E-02	2.06E-01	2.09E+00	1.75E+00	3.10E+00	7.52E+00	2.14E+01	1.99E+01	1.62E-01
2.57E+01	3.45E-02	2.08E-01	2.26E+00	2.09E+00	3.20E+00	9.63E+00	2.57E+01	2.41E+01	1.97E-01
3.09E+01	3.49E-02	2.10E-01	2.46E+00	2.58E+00	3.22E+00	1.23E+01	3.09E+01	2.91E+01	2.38E-01
3.72E+01	3.64E-02	2.12E-01	2.67E+00	3.25E+00	3.15E+00	1.55E+01	3.72E+01		

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3.53E+01  2.88E-01
           4.48E+01  3.96E-02  2.12E-01  2.89E+00  4.17E+00  2.95E+00            1.95E+01  4.48E+01
4.27E+01  3.48E-01
           5.40E+01  4.08E-02  2.12E-01  3.13E+00  5.41E+00  2.87E+00            2.44E+01  5.40E+01
5.16E+01  4.21E-01
           6.51E+01  3.73E-02  2.10E-01  3.39E+00  6.94E+00  3.11E+00            3.03E+01  6.51E+01
6.24E+01  5.10E-01
           7.85E+01  3.44E-02  2.08E-01  3.68E+00  8.79E+00  3.34E+00            3.71E+01  7.85E+01
7.55E+01  6.17E-01
           9.48E+01  3.20E-02  2.05E-01  4.02E+00  1.10E+01  3.56E+00            4.51E+01  9.48E+01
9.14E+01  7.46E-01
           1.14E+02  2.99E-02  2.03E-01  4.45E+00  1.36E+01  3.78E+00            5.45E+01  1.14E+02
1.11E+02  9.03E-01
           1.38E+02  2.81E-02  2.01E-01  4.97E+00  1.66E+01  4.00E+00            6.53E+01  1.38E+02
1.34E+02  1.09E+00
           1.68E+02  2.65E-02  2.01E-01  5.70E+00  1.99E+01  4.35E+00            6.65E+01  1.68E+02
1.34E+02  3.14E+01
           2.04E+02  2.50E-02  2.01E-01  6.63E+00  2.36E+01  4.73E+00            7.43E+01  2.04E+02
1.34E+02  4.77E+01
           2.50E+02  2.35E-02  2.01E-01  7.81E+00  2.75E+01  5.17E+00            8.37E+01  2.50E+02
1.34E+02  6.29E+01
           3.08E+02  2.21E-02  2.01E-01  9.29E+00  3.16E+01  5.66E+00            9.51E+01  3.08E+02
1.34E+02  7.86E+01
           3.79E+02  2.06E-02  2.01E-01  1.11E+01  3.57E+01  6.22E+00            1.09E+02  3.79E+02
1.34E+02  9.56E+01
           4.69E+02  1.91E-02  2.01E-01  1.34E+01  3.99E+01  6.86E+00            1.26E+02  4.69E+02
1.34E+02  1.14E+02
           5.79E+02  1.76E-02  2.01E-01  1.62E+01  4.41E+01  7.61E+00            1.46E+02  5.79E+02
1.34E+02  1.35E+02
           7.17E+02  1.60E-02  2.01E-01  1.97E+01  4.82E+01  8.48E+00            1.70E+02  7.17E+02
1.34E+02  1.59E+02
           8.86E+02  1.45E-02  2.01E-01  2.38E+01  5.21E+01  9.51E+00            2.00E+02  8.86E+02
1.34E+02  1.87E+02
           1.10E+03  1.30E-02  2.01E-01  2.88E+01  5.58E+01  1.07E+01            2.35E+02  1.10E+03
1.34E+02  2.19E+02
           1.35E+03  1.16E-02  2.01E-01  3.47E+01  5.93E+01  1.21E+01            2.79E+02  1.35E+03
1.34E+02  2.56E+02
           1.67E+03  1.03E-02  2.01E-01  4.18E+01  6.26E+01  1.38E+01            3.31E+02  1.67E+03
1.34E+02  3.00E+02
           2.06E+03  9.01E-03  2.01E-01  5.01E+01  6.56E+01  1.59E+01            3.94E+02  2.06E+03
1.34E+02  3.51E+02
           2.55E+03  7.83E-03  2.01E-01  5.99E+01  6.84E+01  1.83E+01            4.70E+02  2.55E+03
1.34E+02  4.12E+02
           3.14E+03  6.75E-03  2.01E-01  7.12E+01  7.10E+01  2.14E+01            5.63E+02  3.14E+03
1.34E+02  4.83E+02
           3.86E+03  5.77E-03  2.01E-01  8.44E+01  7.33E+01  2.51E+01            6.74E+02  3.86E+03
1.34E+02  5.66E+02
           4.76E+03  4.88E-03  2.01E-01  9.97E+01  7.54E+01  2.97E+01            8.10E+02  4.76E+03
1.34E+02  6.65E+02
           5.86E+03  4.08E-03  2.01E-01  1.17E+02  7.72E+01  3.56E+01            9.73E+02  5.86E+03
1.34E+02  7.81E+02
           7.21E+03  3.36E-03  2.01E-01  1.37E+02  7.89E+01  4.34E+01            1.17E+03  7.21E+03
1.34E+02  9.17E+02
           8.88E+03  3.12E-03  2.01E-01  1.60E+02  8.05E+01  4.67E+01            1.41E+03  8.88E+03
1.34E+02  1.08E+03
           1.09E+04  2.97E-03  2.01E-01  1.86E+02  8.21E+01  4.91E+01            1.70E+03  1.09E+04
1.34E+02  1.27E+03
           1.34E+04  2.82E-03  2.01E-01  2.14E+02  8.38E+01  5.18E+01            2.05E+03  1.34E+04
1.34E+02  1.49E+03
•

             time averaged (tav =   60. s) volume concentration:  concentration in the z =   .00 plane.

             downwind    time of      cloud     effective                average concentration (volume
fraction) at (x,y,z)
             distance    max conc    duration   half width        y/bbc=     y/bbc=     y/bbc=     y/bbc=
    y/bbc=     y/bbc=
             x (m)         (s)          (s)       bbc (m)             0.0        0.5        1.0
1.5        2.0        2.5
             1.00E+00    3.00E+01    6.00E+01    3.35E-02         0.00E+00   0.00E+00   0.00E+00
0.00E+00   0.00E+00   0.00E+00
             1.02E+00    3.00E+01    6.00E+01    7.31E-02         0.00E+00   0.00E+00   0.00E+00
0.00E+00   0.00E+00   0.00E+00
             1.05E+00    3.00E+01    6.00E+01    1.05E-01         0.00E+00   0.00E+00   0.00E+00
0.00E+00   0.00E+00   0.00E+00
             1.08E+00    3.00E+01    6.00E+01    1.37E-01         1.43E-35   9.89E-36   3.23E-36
4.86E-37   3.29E-38   9.81E-40
             1.11E+00    3.00E+01    6.00E+01    1.71E-01         3.75E-23   2.58E-23   8.42E-24
1.28E-24   8.88E-26   2.78E-27
             1.16E+00    3.00E+01    6.00E+01    2.08E-01         6.56E-16   4.52E-16   1.47E-16
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2.24E-17	1.58E-18	5.10E-20							
	1.21E+00	3.00E+01	6.00E+01	2.50E-01	2.30E-11	1.58E-11	5.14E-12		
7.85E-13	5.58E-14	1.83E-15							
	1.28E+00	3.01E+01	6.00E+01	2.97E-01	2.21E-08	1.52E-08	4.93E-09		
7.54E-10	5.40E-11	1.79E-12							
	1.36E+00	3.01E+01	6.00E+01	3.51E-01	2.28E-06	1.57E-06	5.10E-07		
7.80E-08	5.60E-09	1.88E-10							
	1.45E+00	3.01E+01	6.00E+01	4.12E-01	5.54E-05	3.81E-05	1.24E-05		
1.90E-06	1.36E-07	4.60E-09							
	1.57E+00	3.01E+01	6.00E+01	4.82E-01	5.09E-04	3.50E-04	1.14E-04		
1.74E-05	1.26E-06	4.25E-08							
	1.71E+00	3.02E+01	6.00E+01	5.63E-01	2.40E-03	1.65E-03	5.35E-04		
8.20E-05	5.92E-06	2.01E-07							
	1.88E+00	3.02E+01	6.00E+01	6.54E-01	7.05E-03	4.85E-03	1.57E-03		
2.41E-04	1.74E-05	5.93E-07							
	2.08E+00	3.02E+01	6.00E+01	7.58E-01	1.49E-02	1.02E-02	3.32E-03		
5.09E-04	3.68E-05	1.26E-06							
	2.33E+00	3.03E+01	6.00E+01	8.76E-01	2.48E-02	1.70E-02	5.52E-03		
8.47E-04	6.13E-05	2.09E-06							
	2.63E+00	3.04E+01	6.00E+01	1.00E+00	3.45E-02	2.37E-02	7.69E-03		
1.18E-03	8.54E-05	2.91E-06							
	2.99E+00	3.04E+01	6.00E+01	1.14E+00	4.74E-02	3.25E-02	1.06E-02		
1.62E-03	1.17E-04	4.01E-06							
	3.43E+00	3.05E+01	6.00E+01	1.28E+00	5.23E-02	3.60E-02	1.17E-02		
1.79E-03	1.30E-04	4.43E-06							
	3.96E+00	3.06E+01	6.00E+01	1.43E+00	5.23E-02	3.60E-02	1.17E-02		
1.79E-03	1.30E-04	4.42E-06							
	4.61E+00	3.08E+01	6.00E+01	1.59E+00	4.97E-02	3.42E-02	1.11E-02		
1.70E-03	1.23E-04	4.21E-06							
	5.38E+00	3.10E+01	6.00E+01	1.77E+00	4.59E-02	3.15E-02	1.02E-02		
1.57E-03	1.14E-04	3.89E-06							
	6.32E+00	3.12E+01	6.00E+01	1.95E+00	4.17E-02	2.87E-02	9.30E-03		
1.43E-03	1.03E-04	3.53E-06							
	7.45E+00	3.14E+01	6.00E+01	2.15E+00	3.75E-02	2.58E-02	8.37E-03		
1.28E-03	9.29E-05	3.18E-06							
	8.83E+00	3.17E+01	6.00E+01	2.36E+00	3.36E-02	2.31E-02	7.49E-03		
1.15E-03	8.32E-05	2.84E-06							
	1.05E+01	3.21E+01	6.00E+01	2.59E+00	2.99E-02	2.06E-02	6.68E-03		
1.02E-03	7.42E-05	2.54E-06							
	1.25E+01	3.25E+01	6.00E+01	2.82E+00	2.67E-02	1.83E-02	5.95E-03		
9.12E-04	6.61E-05	2.26E-06							
	1.49E+01	3.30E+01	6.00E+01	3.07E+00	2.37E-02	1.63E-02	5.29E-03		
8.11E-04	5.88E-05	2.01E-06							
	1.79E+01	3.37E+01	6.00E+01	3.33E+00	2.11E-02	1.45E-02	4.70E-03		
7.20E-04	5.22E-05	1.78E-06							
	2.14E+01	3.45E+01	6.00E+01	3.62E+00	1.86E-02	1.28E-02	4.15E-03		
6.37E-04	4.61E-05	1.58E-06							
	2.57E+01	3.54E+01	6.00E+01	3.93E+00	1.62E-02	1.12E-02	3.62E-03		
5.56E-04	4.02E-05	1.38E-06							
	3.09E+01	3.65E+01	6.00E+01	4.26E+00	1.37E-02	9.43E-03	3.06E-03		
4.70E-04	3.40E-05	1.16E-06							
	3.72E+01	3.79E+01	6.00E+01	4.63E+00	1.07E-02	7.36E-03	2.39E-03		
3.66E-04	2.65E-05	9.08E-07							
	4.48E+01	3.96E+01	6.00E+01	5.02E+00	6.70E-03	4.61E-03	1.50E-03		
2.29E-04	1.66E-05	5.67E-07							
	5.40E+01	4.16E+01	6.00E+01	5.43E+00	2.93E-03	2.01E-03	6.53E-04		
1.00E-04	7.26E-06	2.48E-07							
	6.51E+01	4.40E+01	6.00E+01	5.87E+00	1.19E-03	8.20E-04	2.66E-04		
4.08E-05	2.96E-06	1.01E-07							
	7.85E+01	4.69E+01	6.00E+01	6.37E+00	3.74E-04	2.57E-04	8.34E-05		
1.28E-05	9.27E-07	3.16E-08							
	9.48E+01	5.05E+01	6.00E+01	6.97E+00	8.43E-05	5.79E-05	1.88E-05		
2.88E-06	2.09E-07	7.15E-09							
	1.14E+02	5.48E+01	6.00E+01	7.70E+00	1.28E-05	8.81E-06	2.86E-06		
4.39E-07	3.18E-08	1.08E-09							
	1.38E+02	6.00E+01	6.00E+01	8.62E+00	1.24E-06	8.55E-07	2.78E-07		
4.26E-08	3.09E-09	1.05E-10							
	1.68E+02	6.65E+01	6.24E+01	9.88E+00	1.29E-07	8.86E-08	2.88E-08		
4.41E-09	3.19E-10	1.09E-11							
	2.04E+02	7.43E+01	6.56E+01	1.15E+01	1.40E-08	9.63E-09	3.13E-09		
4.80E-10	3.47E-11	1.19E-12							
	2.50E+02	8.37E+01	6.96E+01	1.35E+01	1.79E-09	1.23E-09	4.00E-10		
6.14E-11	4.45E-12	1.51E-13							
	3.08E+02	9.51E+01	7.46E+01	1.61E+01	3.14E-10	2.16E-10	7.02E-11		
1.08E-11	7.80E-13	2.67E-14							
	3.79E+02	1.09E+02	8.07E+01	1.93E+01	8.57E-11	5.89E-11	1.91E-11		
2.93E-12	2.12E-13	7.28E-15							
	4.69E+02	1.26E+02	8.82E+01	2.33E+01	3.93E-11	2.70E-11	8.77E-12		
1.34E-12	9.75E-14	3.34E-15							
	5.79E+02	1.46E+02	9.71E+01	2.81E+01	3.11E-11	2.13E-11	6.93E-12		
1.06E-12	7.69E-14	2.63E-15							

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            7.17E+02    1.70E+02    1.08E+02    3.41E+01         4.08E-11   2.80E-11   9.10E-12
1.40E-12   1.01E-13   3.43E-15
            8.86E+02    2.00E+02    1.21E+02    4.12E+01         8.19E-11   5.63E-11   1.83E-11
2.80E-12   2.03E-13   6.89E-15
            1.10E+03    2.35E+02    1.36E+02    4.99E+01         2.24E-10   1.54E-10   5.01E-11
7.68E-12   5.57E-13   1.93E-14
            1.35E+03    2.79E+02    1.54E+02    6.02E+01         7.43E-10   5.11E-10   1.66E-10
2.54E-11   1.84E-12   6.25E-14
            1.67E+03    3.31E+02    1.75E+02    7.24E+01         2.64E-09   1.81E-09   5.89E-10
9.03E-11   6.55E-12   2.26E-13
            2.06E+03    3.94E+02    1.99E+02    8.68E+01         9.07E-09   6.24E-09   2.02E-09
3.11E-10   2.25E-11   7.62E-13
            2.55E+03    4.70E+02    2.28E+02    1.04E+02         2.80E-08   1.92E-08   6.24E-09
9.57E-10   6.92E-11   2.49E-12
            3.14E+03    5.63E+02    2.62E+02    1.23E+02         7.32E-08   5.03E-08   1.63E-08
2.51E-09   1.82E-10   5.83E-12
            3.86E+03    6.74E+02    3.02E+02    1.46E+02         1.58E-07   1.09E-07   3.53E-08
5.41E-09   3.93E-10   1.49E-11
            4.76E+03    8.10E+02    3.48E+02    1.73E+02         2.79E-07   1.92E-07   6.22E-08
9.53E-09   6.93E-10   2.07E-11
            5.86E+03    9.73E+02    4.00E+02    2.03E+02         4.03E-07   2.77E-07   8.99E-08
1.38E-08   9.93E-10   3.52E-11
            7.21E+03    1.17E+03    4.60E+02    2.38E+02         4.83E-07   3.32E-07   1.08E-07
1.65E-08   1.20E-09   4.94E-11
            8.88E+03    1.41E+03    5.35E+02    2.77E+02         3.90E-07   2.68E-07   8.70E-08
1.33E-08   9.64E-10   2.32E-11
            1.09E+04    1.70E+03    6.25E+02    3.21E+02         2.97E-07   2.04E-07   6.62E-08
1.02E-08   7.29E-10   2.05E-11
            1.34E+04    2.05E+03    7.31E+02    3.71E+02         2.27E-07   1.56E-07   5.07E-08
7.78E-09   5.62E-10   1.81E-11
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time averaged (tav = 60. s) volume concentration: maximum concentration (volume fraction) along centerline.

downwind distance x (m)	height z (m)	maximum concentration c(x,0,z)	time of max conc (s)	cloud duration (s)
1.00E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.02E+00	1.00E+00	9.67E-01	3.00E+01	6.00E+01
1.05E+00	1.00E+00	6.99E-01	3.00E+01	6.00E+01
1.08E+00	1.00E+00	5.45E-01	3.00E+01	6.00E+01
1.11E+00	1.00E+00	4.40E-01	3.00E+01	6.00E+01
1.16E+00	1.00E+00	3.63E-01	3.00E+01	6.00E+01
1.21E+00	1.00E+00	3.04E-01	3.00E+01	6.00E+01
1.28E+00	1.00E+00	2.57E-01	3.01E+01	6.00E+01
1.36E+00	1.00E+00	2.18E-01	3.01E+01	6.00E+01
1.45E+00	1.00E+00	1.86E-01	3.01E+01	6.00E+01
1.57E+00	1.00E+00	1.59E-01	3.01E+01	6.00E+01
1.71E+00	1.00E+00	1.37E-01	3.02E+01	6.00E+01
1.88E+00	1.00E+00	1.18E-01	3.02E+01	6.00E+01
2.08E+00	1.00E+00	1.02E-01	3.02E+01	6.00E+01
2.33E+00	1.00E+00	8.77E-02	3.03E+01	6.00E+01
2.63E+00	9.96E-01	7.63E-02	3.04E+01	6.00E+01
2.99E+00	9.44E-01	6.17E-02	3.04E+01	6.00E+01
3.43E+00	7.17E-01	5.43E-02	3.05E+01	6.00E+01
3.96E+00	0.00E+00	5.23E-02	3.06E+01	6.00E+01
4.61E+00	0.00E+00	4.97E-02	3.08E+01	6.00E+01
5.38E+00	0.00E+00	4.59E-02	3.10E+01	6.00E+01
6.32E+00	0.00E+00	4.17E-02	3.12E+01	6.00E+01
7.45E+00	0.00E+00	3.75E-02	3.14E+01	6.00E+01
8.83E+00	0.00E+00	3.36E-02	3.17E+01	6.00E+01
1.05E+01	0.00E+00	2.99E-02	3.21E+01	6.00E+01
1.25E+01	0.00E+00	2.67E-02	3.25E+01	6.00E+01
1.49E+01	0.00E+00	2.37E-02	3.30E+01	6.00E+01
1.79E+01	0.00E+00	2.11E-02	3.37E+01	6.00E+01
2.14E+01	0.00E+00	1.86E-02	3.45E+01	6.00E+01
2.57E+01	0.00E+00	1.62E-02	3.54E+01	6.00E+01
3.09E+01	0.00E+00	1.37E-02	3.65E+01	6.00E+01
3.72E+01	1.36E+00	1.07E-02	3.79E+01	6.00E+01
4.48E+01	4.00E+00	9.32E-03	3.96E+01	6.00E+01
5.40E+01	5.40E+00	8.64E-03	4.16E+01	6.00E+01
6.51E+01	6.94E+00	7.18E-03	4.40E+01	6.00E+01
7.85E+01	8.79E+00	5.96E-03	4.69E+01	6.00E+01
9.48E+01	1.10E+01	4.94E-03	5.05E+01	6.00E+01
1.14E+02	1.36E+01	4.05E-03	5.48E+01	6.00E+01
1.38E+02	1.66E+01	3.28E-03	6.00E+01	6.00E+01
1.68E+02	1.99E+01	2.35E-03	6.65E+01	6.24E+01
2.04E+02	2.36E+01	1.73E-03	7.43E+01	6.56E+01
2.50E+02	2.75E+01	1.26E-03	8.37E+01	6.96E+01

3.08E+02	3.16E+01	9.03E-04	9.51E+01	7.46E+01
3.79E+02	3.57E+01	6.37E-04	1.09E+02	8.07E+01
4.69E+02	3.99E+01	4.43E-04	1.26E+02	8.82E+01
5.79E+02	4.41E+01	3.03E-04	1.46E+02	9.71E+01
7.17E+02	4.82E+01	2.04E-04	1.70E+02	1.08E+02
8.86E+02	5.21E+01	1.35E-04	2.00E+02	1.21E+02
1.10E+03	5.58E+01	8.87E-05	2.35E+02	1.36E+02
1.35E+03	5.93E+01	5.74E-05	2.79E+02	1.54E+02
1.67E+03	6.26E+01	3.68E-05	3.31E+02	1.75E+02
2.06E+03	6.56E+01	2.33E-05	3.94E+02	1.99E+02
2.55E+03	6.84E+01	1.47E-05	4.70E+02	2.28E+02
3.14E+03	7.10E+01	9.15E-06	5.63E+02	2.62E+02
3.86E+03	7.33E+01	5.66E-06	6.74E+02	3.02E+02
4.76E+03	7.54E+01	3.47E-06	8.10E+02	3.48E+02
5.86E+03	7.72E+01	2.11E-06	9.73E+02	4.00E+02
7.21E+03	7.87E+01	1.27E-06	1.17E+03	4.60E+02
8.88E+03	8.00E+01	8.64E-07	1.41E+03	5.35E+02
1.09E+04	8.15E+01	6.05E-07	1.70E+03	6.25E+02
1.34E+04	8.29E+01	4.23E-07	2.05E+03	7.31E+02

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Scenario 5
Hazard Footprints

Met Scenario					c(ppm) ÄÄ 50000.0					c(ppm) ÄÄ 25000.0				
u (m/s)	temp (øK)	rh (%)	stb	avt (s)	length (m)	width (m)	w_dist (m)	area (m2)	fmass (kg)	length (m)	width (m)	w_dist (m)	area (m2)	fmass (kg)
4.0	293.0	60.	4	60.	9.50E+00	1.73E+00	5.38E+00	1.12E+01	2.42E+00	2.22E+01	3.17E+00	8.83E+00	5.14E+01	1.01E+01
2.0	293.0	60.	6	60.	1.07E+01	1.92E+00	5.38E+00	1.42E+01	4.73E+00	3.06E+01	3.60E+00	1.25E+01	7.99E+01	1.90E+01
Composite Maximum					1.07E+01	1.92E+00	5.38E+00	1.42E+01	4.73E+00	3.06E+01	3.60E+00	1.25E+01	7.99E+01	1.90E+01

Scenario 5

```
 problem input

 idspl =         2
 ncalc =         1
 wms   =   .016000
 cps   =   2240.00
 tbp   =    111.70
 cmed0 =       .00
 dhe   =   509880.
 cpsl  =   3349.00
 rhosl =    424.10
 spb   =     -1.00
 spc   =       .00
 ts    =    260.00
 qs    =      2.29
 as    =       .01
 tsd   =       60.
 qtis  =       .00
 hs    =      1.00
 tav   =     60.00
 xffm  =   9000.00
 zp(1) =       .00
 zp(2) =       .00
 zp(3) =       .00
 zp(4) =       .00
 z0    =   .300000
 za    =      2.00
 ua    =      4.00
 ta    =    293.00
 rh    =     60.00
 stab  =      4.00
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release gas properties

molecular weight of source gas (kg)              - wms  =  1.6000E-02
vapor heat capacity, const. p.  (j/kg-k)         - cps  =  2.2400E+03
temperature of source gas (k)                    - ts   =  2.6000E+02
density of source gas (kg/m3)                    - rhos =  7.4996E-01
boiling point temperature                        - tbp  =  1.1170E+02
liquid mass fraction                             - cmed0=  0.0000E+00
liquid heat capacity (j/kg-k)                    - cpsl =  3.3490E+03
heat of vaporization (j/kg)                      - dhe  =  5.0988E+05
liquid source density (kg/m3)                    - rhosl=  4.2410E+02
saturation pressure constant                     - spa  =  8.7843E+00
saturation pressure constant (k)                 - spb  =  9.8121E+02
saturation pressure constant (k)                 - spc  =  0.0000E+00


spill characteristics

spill type                                       - idspl=          2
mass source rate (kg/s)                          - qs   =  2.2900E+00
continuous source duration (s)                   - tsd  =  6.0000E+01
continuous source mass (kg)                      - qtcs =  1.3740E+02
instantaneous source mass (kg)                   - qtis =  0.0000E+00
source area (m2)                                 - as   =  8.0000E-03
vertical vapor velocity (m/s)                    - ws   =  0.0000E+00
source half width (m)                            - bs   =  4.4721E-02
source height (m)                                - hs   =  1.0000E+00
horizontal vapor velocity (m/s)                  - us   =  3.8169E+02


field parameters

concentration averaging time (s)                 - tav  =  6.0000E+01
mixing layer height (m)                          - hmx  =  1.0400E+03
maximum downwind distance (m)                    - xffm =  9.0000E+03
concentration measurement height (m)             - zp(1)=  0.0000E+00
                                                 - zp(2)=  0.0000E+00
                                                 - zp(3)=  0.0000E+00
                                                 - zp(4)=  0.0000E+00


ambient meteorological properties

molecular weight of ambient air (kg)            - wmae  =  2.8804E-02
heat capacity of ambient air at const p. (j/kg-k)- cpaa  =  1.0134E+03
density of ambient air (kg/m3)                  - rhoa  =  1.1980E+00
ambient measurement height (m)                  - za    =  2.0000E+00
ambient atmospheric pressure (pa=n/m2=j/m3)     - pa    =  1.0133E+05
ambient wind speed (m/s)                        - ua    =  4.0000E+00
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```
ambient temperature (k)                          - ta    =  2.9300E+02
relative humidity (percent)                      - rh    =  6.0000E+01
ambient friction velocity (m/s)                  - uastr =  8.6521E-01
atmospheric stability class value                - stab  =  4.0000E+00
inverse monin-obukhov length (1/m)               - ala   =  0.0000E+00
surface roughness height (m)                     - z0    =  3.0000E-01


additional parameters

sub-step multiplier                              - ncalc =           1
number of calculational sub-steps                - nssm  =           3
acceleration of gravity (m/s2)                   - grav  =  9.8067E+00
gas constant (j/mol- k)                          - rr    =  8.3143E+00
von karman constant                              - xk    =  4.1000E-01
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instantaneous spatially averaged cloud parameters

```
          x        zc         h        bb         b        bbx       bx        cv        rho
   t        u        ua
        1.00E+00  1.00E+00  8.94E-02  4.47E-02  4.02E-02  0.00E+00  0.00E+00  1.00E+00  7.50E-01
2.60E+02  3.82E+02  1.35E+00
        1.02E+00  1.00E+00  1.34E-01  6.68E-02  4.76E-02  2.21E-02  2.21E-02  7.52E-01  8.75E-01
2.67E+02  2.33E+02  1.37E+00
        1.05E+00  1.00E+00  1.79E-01  8.96E-02  5.41E-02  4.89E-02  4.89E-02  6.00E-01  9.47E-01
2.72E+02  1.66E+02  1.40E+00
        1.08E+00  1.00E+00  2.28E-01  1.14E-01  6.04E-02  8.13E-02  8.12E-02  4.92E-01  9.96E-01
2.75E+02  1.26E+02  1.43E+00
        1.11E+00  1.00E+00  2.83E-01  1.41E-01  6.66E-02  1.20E-01  1.20E-01  4.11E-01  1.03E+00
2.78E+02  9.93E+01  1.46E+00
        1.16E+00  1.00E+00  3.45E-01  1.72E-01  7.31E-02  1.68E-01  1.68E-01  3.46E-01  1.06E+00
2.80E+02  8.00E+01  1.50E+00
        1.21E+00  1.00E+00  4.15E-01  2.08E-01  7.98E-02  2.25E-01  2.25E-01  2.93E-01  1.08E+00
2.82E+02  6.54E+01  1.54E+00
        1.28E+00  1.00E+00  4.96E-01  2.48E-01  8.69E-02  2.94E-01  2.94E-01  2.50E-01  1.10E+00
2.83E+02  5.41E+01  1.59E+00
        1.36E+00  1.00E+00  5.90E-01  2.95E-01  9.43E-02  3.78E-01  3.78E-01  2.13E-01  1.12E+00
2.85E+02  4.51E+01  1.64E+00
        1.45E+00  1.00E+00  6.97E-01  3.48E-01  1.02E-01  4.79E-01  4.79E-01  1.82E-01  1.13E+00
2.86E+02  3.79E+01  1.70E+00
        1.57E+00  1.00E+00  8.21E-01  4.10E-01  1.10E-01  6.02E-01  6.02E-01  1.56E-01  1.14E+00
2.87E+02  3.20E+01  1.77E+00
        1.71E+00  1.00E+00  9.63E-01  4.81E-01  1.19E-01  7.50E-01  7.50E-01  1.34E-01  1.15E+00
2.88E+02  2.72E+01  1.84E+00
        1.88E+00  1.00E+00  1.13E+00  5.63E-01  1.28E-01  9.29E-01  9.29E-01  1.15E-01  1.15E+00
2.88E+02  2.32E+01  1.92E+00
        2.08E+00  1.00E+00  1.31E+00  6.56E-01  1.38E-01  1.15E+00  1.15E+00  9.89E-02  1.16E+00
2.89E+02  1.99E+01  2.01E+00
        2.33E+00  1.00E+00  1.52E+00  7.62E-01  1.48E-01  1.41E+00  1.41E+00  8.50E-02  1.17E+00
2.90E+02  1.72E+01  2.11E+00
        2.63E+00  1.00E+00  1.76E+00  8.81E-01  1.58E-01  1.72E+00  1.72E+00  7.31E-02  1.17E+00
2.90E+02  1.50E+01  2.22E+00
        2.99E+00  1.00E+00  2.01E+00  1.01E+00  1.67E-01  2.11E+00  2.11E+00  6.36E-02  1.17E+00
2.90E+02  1.32E+01  2.33E+00
        3.43E+00  1.00E+00  2.33E+00  1.16E+00  1.78E-01  2.57E+00  2.57E+00  5.46E-02  1.18E+00
2.91E+02  1.15E+01  2.58E+00
        3.96E+00  1.00E+00  2.65E+00  1.33E+00  1.88E-01  3.13E+00  3.13E+00  4.73E-02  1.18E+00
2.91E+02  1.03E+01  2.81E+00
        4.61E+00  1.00E+00  2.99E+00  1.49E+00  1.97E-01  3.81E+00  3.81E+00  4.13E-02  1.18E+00
2.91E+02  9.29E+00  3.03E+00
        5.38E+00  1.01E+00  3.34E+00  1.67E+00  2.06E-01  4.63E+00  4.63E+00  3.62E-02  1.18E+00
2.92E+02  8.52E+00  3.23E+00
        6.32E+00  1.01E+00  3.70E+00  1.85E+00  2.13E-01  5.62E+00  5.62E+00  3.17E-02  1.19E+00
2.92E+02  7.89E+00  3.42E+00
        7.45E+00  1.02E+00  4.09E+00  2.04E+00  2.20E-01  6.82E+00  6.82E+00  2.78E-02  1.19E+00
2.92E+02  7.39E+00  3.61E+00
        8.83E+00  1.03E+00  4.49E+00  2.24E+00  2.25E-01  8.27E+00  8.27E+00  2.44E-02  1.19E+00
2.92E+02  6.98E+00  3.79E+00
        1.05E+01  1.05E+00  4.91E+00  2.46E+00  2.30E-01  1.00E+01  1.00E+01  2.14E-02  1.19E+00
2.92E+02  6.66E+00  3.96E+00
        1.25E+01  1.07E+00  5.37E+00  2.68E+00  2.34E-01  1.21E+01  1.21E+01  1.86E-02  1.19E+00
2.92E+02  6.39E+00  4.13E+00
        1.49E+01  1.10E+00  5.85E+00  2.92E+00  2.37E-01  1.47E+01  1.47E+01  1.62E-02  1.19E+00
2.92E+02  6.19E+00  4.30E+00
        1.79E+01  1.15E+00  6.37E+00  3.18E+00  2.39E-01  1.78E+01  1.78E+01  1.40E-02  1.19E+00
2.93E+02  6.04E+00  4.47E+00
        2.14E+01  1.21E+00  6.94E+00  3.46E+00  2.41E-01  2.16E+01  2.16E+01  1.21E-02  1.19E+00
2.93E+02  5.93E+00  4.63E+00
        2.57E+01  1.29E+00  7.55E+00  3.77E+00  2.41E-01  2.61E+01  2.61E+01  1.03E-02  1.19E+00
2.93E+02  5.86E+00  4.80E+00
        3.09E+01  1.40E+00  8.24E+00  4.11E+00  2.41E-01  3.16E+01  3.16E+01  8.69E-03  1.19E+00
2.93E+02  5.83E+00  4.98E+00
        3.72E+01  1.54E+00  9.00E+00  4.50E+00  2.41E-01  3.82E+01  3.82E+01  7.27E-03  1.20E+00
```

2.93E+02 5.84E+00 5.15E+00
4.48E+01 1.71E+00 9.87E+00 4.94E+00 2.41E-01 4.63E+01 4.63E+01 6.01E-03 1.20E+00
2.93E+02 5.88E+00 5.34E+00
5.40E+01 1.92E+00 1.09E+01 5.43E+00 2.40E-01 5.60E+01 5.60E+01 4.91E-03 1.20E+00
2.93E+02 5.95E+00 5.53E+00
6.51E+01 2.17E+00 1.20E+01 6.00E+00 2.39E-01 6.77E+01 6.77E+01 3.96E-03 1.20E+00
2.93E+02 6.05E+00 5.73E+00
7.85E+01 2.46E+00 1.33E+01 6.66E+00 2.37E-01 8.19E+01 8.19E+01 3.15E-03 1.20E+00
2.93E+02 6.18E+00 5.94E+00
9.48E+01 2.79E+00 1.47E+01 7.47E+00 2.35E-01 9.91E+01 9.91E+01 2.47E-03 1.20E+00
2.93E+02 6.33E+00 6.15E+00
1.14E+02 3.16E+00 1.63E+01 8.46E+00 2.33E-01 1.20E+02 1.20E+02 1.92E-03 1.20E+00
2.93E+02 6.49E+00 6.36E+00
1.38E+02 3.57E+00 1.82E+01 9.65E+00 2.31E-01 1.45E+02 1.45E+02 1.47E-03 1.20E+00
2.93E+02 6.67E+00 6.58E+00
1.67E+02 4.01E+00 2.02E+01 1.11E+01 2.29E-01 1.75E+02 1.75E+02 1.12E-03 1.20E+00
2.93E+02 6.87E+00 6.80E+00
2.02E+02 4.48E+00 2.26E+01 1.28E+01 2.27E-01 2.12E+02 2.12E+02 8.39E-04 1.20E+00
2.93E+02 7.07E+00 7.02E+00
2.45E+02 4.96E+00 2.58E+01 1.51E+01 2.27E-01 2.25E+02 2.12E+02 5.89E-04 1.20E+00
2.93E+02 7.33E+00 7.30E+00
2.98E+02 5.45E+00 2.95E+01 1.80E+01 2.27E-01 2.40E+02 2.12E+02 4.05E-04 1.20E+00
2.93E+02 7.59E+00 7.57E+00
3.66E+02 5.94E+00 3.39E+01 2.15E+01 2.27E-01 2.59E+02 2.12E+02 2.74E-04 1.20E+00
2.93E+02 7.87E+00 7.86E+00
4.50E+02 6.41E+00 3.90E+01 2.59E+01 2.27E-01 2.81E+02 2.12E+02 1.82E-04 1.20E+00
2.93E+02 8.15E+00 8.14E+00
5.55E+02 6.87E+00 4.49E+01 3.13E+01 2.27E-01 3.08E+02 2.12E+02 1.19E-04 1.20E+00
2.93E+02 8.44E+00 8.43E+00
6.88E+02 7.31E+00 5.19E+01 3.79E+01 2.27E-01 3.41E+02 2.12E+02 7.70E-05 1.20E+00
2.93E+02 8.73E+00 8.73E+00
8.53E+02 7.71E+00 6.00E+01 4.60E+01 2.27E-01 3.81E+02 2.12E+02 4.91E-05 1.20E+00
2.93E+02 9.03E+00 9.02E+00
1.06E+03 8.10E+00 6.95E+01 5.59E+01 2.27E-01 4.28E+02 2.12E+02 3.10E-05 1.20E+00
2.93E+02 9.32E+00 9.32E+00
1.32E+03 8.45E+00 8.05E+01 6.78E+01 2.27E-01 4.86E+02 2.12E+02 1.94E-05 1.20E+00
2.93E+02 9.62E+00 9.62E+00
1.64E+03 8.77E+00 9.34E+01 8.21E+01 2.27E-01 5.56E+02 2.12E+02 1.21E-05 1.20E+00
2.93E+02 9.92E+00 9.92E+00
2.04E+03 9.06E+00 1.08E+02 9.92E+01 2.27E-01 6.40E+02 2.12E+02 7.50E-06 1.20E+00
2.93E+02 1.02E+01 1.02E+01
2.54E+03 9.33E+00 1.26E+02 1.19E+02 2.27E-01 7.41E+02 2.12E+02 4.64E-06 1.20E+00
2.93E+02 1.05E+01 1.05E+01
3.16E+03 9.57E+00 1.46E+02 1.43E+02 2.27E-01 8.62E+02 2.12E+02 2.86E-06 1.20E+00
2.93E+02 1.08E+01 1.08E+01
3.93E+03 9.80E+00 1.69E+02 1.71E+02 2.27E-01 1.01E+03 2.12E+02 1.77E-06 1.20E+00
2.93E+02 1.11E+01 1.11E+01
4.89E+03 1.00E+01 1.96E+02 2.04E+02 2.27E-01 1.18E+03 2.12E+02 1.09E-06 1.20E+00
2.93E+02 1.14E+01 1.14E+01
6.08E+03 1.02E+01 2.27E+02 2.41E+02 2.27E-01 1.39E+03 2.12E+02 6.77E-07 1.20E+00
2.93E+02 1.17E+01 1.17E+01
7.55E+03 1.04E+01 2.62E+02 2.84E+02 2.27E-01 1.65E+03 2.12E+02 4.21E-07 1.20E+00
2.93E+02 1.19E+01 1.19E+01
9.36E+03 1.05E+01 3.02E+02 3.33E+02 2.27E-01 1.95E+03 2.12E+02 2.64E-07 1.20E+00
2.93E+02 1.22E+01 1.22E+01
1.16E+04 1.06E+01 3.47E+02 3.88E+02 2.27E-01 2.31E+03 2.12E+02 1.66E-07 1.20E+00
2.93E+02 1.24E+01 1.24E+01
1.44E+04 1.08E+01 3.97E+02 4.51E+02 2.27E-01 2.74E+03 2.12E+02 1.06E-07 1.20E+00
2.93E+02 1.27E+01 1.27E+01

x	cm	cmv	cmda	cmw	cmwv	wc	vg	ug	w	v	vx
1.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+02	5.28E+01	0.00E+00
1.02E+00	6.28E-01	6.28E-01	3.69E-01	3.32E-03	3.32E-03	2.64E-04	0.00E+00	0.00E+00	1.59E+02	2.76E+01	9.78E-01
1.05E+00	4.54E-01	4.54E-01	5.41E-01	4.87E-03	4.70E-03	5.33E-04	0.00E+00	0.00E+00	1.03E+02	1.81E+01	9.80E-01
1.08E+00	3.50E-01	3.50E-01	6.44E-01	5.80E-03	5.67E-03	8.39E-04	0.00E+00	0.00E+00	7.26E+01	1.30E+01	9.81E-01
1.11E+00	2.79E-01	2.79E-01	7.14E-01	6.43E-03	6.43E-03	1.20E-03	0.00E+00	0.00E+00	5.40E+01	9.87E+00	9.83E-01
1.16E+00	2.27E-01	2.27E-01	7.66E-01	6.90E-03	6.90E-03	1.62E-03	0.00E+00	0.00E+00	4.14E+01	7.71E+00	9.85E-01
1.21E+00	1.87E-01	1.87E-01	8.05E-01	7.25E-03	7.25E-03	2.12E-03	0.00E+00	0.00E+00	3.23E+01	6.15E+00	9.87E-01
1.28E+00	1.56E-01	1.56E-01	8.36E-01	7.53E-03	7.53E-03	2.72E-03	0.00E+00	0.00E+00	2.56E+01	4.97E+00	9.90E-01
1.36E+00	1.31E-01	1.31E-01	8.61E-01	7.76E-03	7.76E-03	3.45E-03	0.00E+00	0.00E+00	2.04E+01	4.06E+00	9.92E-01
1.45E+00	1.10E-01	1.10E-01	8.82E-01	7.94E-03	7.94E-03	4.32E-03	0.00E+00	0.00E+00	1.64E+01	3.34E+00	9.95E-01
1.57E+00	9.33E-02	9.33E-02	8.99E-01	8.09E-03	8.09E-03	5.37E-03	0.00E+00	0.00E+00	1.32E+01	2.77E+00	9.99E-01

1.71E+00	7.92E-02	7.92E-02	9.13E-01	8.22E-03	8.22E-03	6.63E-03	0.00E+00	0.00E+00	1.07E+01	2.30E+00	1.00E+00
1.88E+00	6.74E-02	6.74E-02	9.24E-01	8.32E-03	8.32E-03	8.14E-03	0.00E+00	0.00E+00	8.68E+00	1.92E+00	1.01E+00
2.08E+00	5.75E-02	5.75E-02	9.34E-01	8.41E-03	8.41E-03	9.94E-03	0.00E+00	0.00E+00	7.08E+00	1.61E+00	1.01E+00
2.33E+00	4.91E-02	4.91E-02	9.42E-01	8.49E-03	8.49E-03	1.21E-02	0.00E+00	0.00E+00	5.79E+00	1.35E+00	1.02E+00
2.63E+00	4.20E-02	4.20E-02	9.49E-01	8.55E-03	8.55E-03	1.46E-02	0.00E+00	0.00E+00	4.77E+00	1.14E+00	1.02E+00
2.99E+00	3.63E-02	3.63E-02	9.55E-01	8.60E-03	8.60E-03	1.78E-02	0.00E+00	0.00E+00	4.31E+00	9.70E-01	1.03E+00
3.43E+00	3.11E-02	3.11E-02	9.60E-01	8.65E-03	8.65E-03	2.13E-02	0.00E+00	0.00E+00	3.17E+00	7.97E-01	1.04E+00
3.96E+00	2.69E-02	2.69E-02	9.64E-01	8.68E-03	8.68E-03	2.56E-02	0.00E+00	0.00E+00	2.44E+00	6.65E-01	1.06E+00
4.61E+00	2.34E-02	2.34E-02	9.68E-01	8.72E-03	8.72E-03	3.09E-02	0.00E+00	0.00E+00	1.95E+00	5.61E-01	1.07E+00
5.38E+00	2.04E-02	2.04E-02	9.71E-01	8.74E-03	8.74E-03	3.70E-02	0.00E+00	0.00E+00	1.59E+00	4.77E-01	1.08E+00
6.32E+00	1.79E-02	1.79E-02	9.73E-01	8.76E-03	8.76E-03	4.40E-02	0.00E+00	0.00E+00	1.33E+00	4.08E-01	1.09E+00
7.45E+00	1.57E-02	1.57E-02	9.76E-01	8.78E-03	8.78E-03	5.18E-02	0.00E+00	0.00E+00	1.13E+00	3.52E-01	1.10E+00
8.83E+00	1.37E-02	1.37E-02	9.77E-01	8.80E-03	8.80E-03	6.03E-02	0.00E+00	0.00E+00	9.79E-01	3.06E-01	1.11E+00
1.05E+01	1.20E-02	1.20E-02	9.79E-01	8.82E-03	8.82E-03	6.95E-02	0.00E+00	0.00E+00	8.58E-01	2.68E-01	1.12E+00
1.25E+01	1.04E-02	1.04E-02	9.81E-01	8.83E-03	8.83E-03	7.93E-02	0.00E+00	0.00E+00	7.62E-01	2.39E-01	1.13E+00
1.49E+01	9.07E-03	9.07E-03	9.82E-01	8.84E-03	8.84E-03	8.93E-02	0.00E+00	0.00E+00	6.85E-01	2.16E-01	1.14E+00
1.79E+01	7.84E-03	7.84E-03	9.83E-01	8.85E-03	8.85E-03	9.92E-02	0.00E+00	0.00E+00	6.22E-01	1.99E-01	1.14E+00
2.14E+01	6.74E-03	6.74E-03	9.84E-01	8.86E-03	8.86E-03	1.09E-01	0.00E+00	0.00E+00	5.70E-01	1.87E-01	1.15E+00
2.57E+01	5.74E-03	5.74E-03	9.85E-01	8.87E-03	8.87E-03	1.18E-01	0.00E+00	0.00E+00	5.27E-01	1.80E-01	1.16E+00
3.09E+01	4.85E-03	4.85E-03	9.86E-01	8.88E-03	8.88E-03	1.25E-01	0.00E+00	0.00E+00	4.91E-01	1.76E-01	1.17E+00
3.72E+01	4.05E-03	4.05E-03	9.87E-01	8.89E-03	8.89E-03	1.31E-01	0.00E+00	0.00E+00	4.61E-01	1.75E-01	1.18E+00
4.48E+01	3.35E-03	3.35E-03	9.88E-01	8.89E-03	8.89E-03	1.34E-01	0.00E+00	0.00E+00	4.35E-01	1.77E-01	1.19E+00
5.40E+01	2.73E-03	2.73E-03	9.88E-01	8.90E-03	8.90E-03	1.35E-01	0.00E+00	0.00E+00	4.13E-01	1.80E-01	1.20E+00
6.51E+01	2.20E-03	2.20E-03	9.89E-01	8.90E-03	8.90E-03	1.34E-01	0.00E+00	0.00E+00	3.93E-01	1.85E-01	1.20E+00
7.85E+01	1.75E-03	1.75E-03	9.89E-01	8.91E-03	8.91E-03	1.30E-01	0.00E+00	0.00E+00	3.76E-01	1.90E-01	1.21E+00
9.48E+01	1.37E-03	1.37E-03	9.90E-01	8.91E-03	8.91E-03	1.25E-01	0.00E+00	0.00E+00	3.62E-01	1.95E-01	1.22E+00
1.14E+02	1.07E-03	1.07E-03	9.90E-01	8.91E-03	8.91E-03	1.17E-01	0.00E+00	0.00E+00	3.49E-01	2.01E-01	1.22E+00
1.38E+02	8.17E-04	8.17E-04	9.90E-01	8.92E-03	8.92E-03	1.08E-01	0.00E+00	0.00E+00	3.37E-01	2.07E-01	1.23E+00
1.67E+02	6.20E-04	6.20E-04	9.90E-01	8.92E-03	8.92E-03	9.88E-02	0.00E+00	0.00E+00	3.26E-01	2.13E-01	1.23E+00
2.02E+02	4.66E-04	4.66E-04	9.91E-01	8.92E-03	8.92E-03	8.90E-02	0.00E+00	0.00E+00	3.16E-01	2.19E-01	1.24E+00
2.45E+02	3.27E-04	3.27E-04	9.91E-01	8.92E-03	8.92E-03	7.49E-02	0.00E+00	0.00E+00	3.05E-01	2.25E-01	1.23E+00
2.98E+02	2.25E-04	2.25E-04	9.91E-01	8.92E-03	8.92E-03	6.20E-02	0.00E+00	0.00E+00	2.94E-01	2.32E-01	1.23E+00
3.66E+02	1.52E-04	1.52E-04	9.91E-01	8.92E-03	8.92E-03	5.04E-02	0.00E+00	0.00E+00	2.84E-01	2.37E-01	1.23E+00
4.50E+02	1.01E-04	1.01E-04	9.91E-01	8.92E-03	8.92E-03	4.04E-02	0.00E+00	0.00E+00	2.75E-01	2.43E-01	1.23E+00
5.55E+02	6.62E-05	6.62E-05	9.91E-01	8.92E-03	8.92E-03	3.20E-02	0.00E+00	0.00E+00	2.66E-01	2.47E-01	1.23E+00
6.88E+02	4.28E-05	4.28E-05	9.91E-01	8.92E-03	8.92E-03	2.50E-02	0.00E+00	0.00E+00	2.57E-01	2.50E-01	1.23E+00
8.53E+02	2.73E-05	2.73E-05	9.91E-01	8.92E-03	8.92E-03	1.93E-02	0.00E+00	0.00E+00	2.48E-01	2.52E-01	1.23E+00
1.06E+03	1.72E-05	1.72E-05	9.91E-01	8.92E-03	8.92E-03	1.48E-02	0.00E+00	0.00E+00	2.39E-01	2.53E-01	1.23E+00
1.32E+03	1.08E-05	1.08E-05	9.91E-01	8.92E-03	8.92E-03	1.12E-02	0.00E+00	0.00E+00	2.30E-01	2.52E-01	1.22E+00
1.64E+03	6.72E-06	6.72E-06	9.91E-01	8.92E-03	8.92E-03	8.50E-03	0.00E+00	0.00E+00	2.22E-01	2.50E-01	1.22E+00
2.04E+03	4.17E-06	4.17E-06	9.91E-01	8.92E-03	8.92E-03	6.42E-03	0.00E+00	0.00E+00	2.13E-01	2.46E-01	1.21E+00
2.54E+03	2.57E-06	2.57E-06	9.91E-01	8.92E-03	8.92E-03	4.82E-03	0.00E+00	0.00E+00	2.04E-01	2.40E-01	1.21E+00
3.16E+03	1.59E-06	1.59E-06	9.91E-01	8.92E-03	8.92E-03	3.66E-03	0.00E+00	0.00E+00			

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 1.96E-01  2.33E-01  1.20E+00
        3.93E+03  9.81E-07  9.81E-07  9.91E-01  8.92E-03  8.92E-03  2.75E-03  0.00E+00  0.00E+00
 1.87E-01  2.24E-01  1.19E+00
        4.89E+03  6.06E-07  6.06E-07  9.91E-01  8.92E-03  8.92E-03  2.05E-03  0.00E+00  0.00E+00
 1.77E-01  2.15E-01  1.19E+00
        6.08E+03  3.76E-07  3.76E-07  9.91E-01  8.92E-03  8.92E-03  1.55E-03  0.00E+00  0.00E+00
 1.68E-01  2.04E-01  1.17E+00
        7.55E+03  2.34E-07  2.34E-07  9.91E-01  8.92E-03  8.92E-03  1.17E-03  0.00E+00  0.00E+00
 1.58E-01  1.93E-01  1.16E+00
        9.36E+03  1.47E-07  1.47E-07  9.91E-01  8.92E-03  8.92E-03  8.99E-04  0.00E+00  0.00E+00
 1.47E-01  1.82E-01  1.15E+00
        1.16E+04  9.23E-08  9.23E-08  9.91E-01  8.92E-03  8.92E-03  7.10E-04  0.00E+00  0.00E+00
 1.37E-01  1.70E-01  1.13E+00
        1.44E+04  5.86E-08  5.86E-08  9.91E-01  8.92E-03  8.92E-03  6.08E-04  0.00E+00  0.00E+00
 1.25E-01  1.58E-01  1.12E+00
•          time averaged (tav =   60. s) volume concentration:  concentration contour parameters

          c(x,y,z,t) = cc(x) * (erf(xa)-erf(xb)) * (erf(ya)-erf(yb)) * (exp(-za*za)+exp(-zb*zb))

                 c(x,y,z,t) = concentration (volume fraction) at (x,y,z,t)
                          x = downwind distance (m)
                          y = crosswind horizontal distance (m)
                          z = height (m)
                          t = time (s)

                        erf = error functon             exp = exponential function
                         xa = (x-xc+bx)/(sr2*betax)      za = (z-zc)/(sr2*sig)
                         xb = (x-xc-bx)/(sr2*betax)      zb = (z+zc)/(sr2*sig)
                         ya = (y+b)/(sr2*betac)         sr2 = sqrt(2.0)
                         yb = (y-b)/(sr2*betac)

             x        cc(x)     b(x)    betac(x)    zc(x)    sig(x)               t        xc(t)
    bx(t)   betax(t)
           1.00E+00  0.00E+00  4.02E-02  1.13E-02  1.00E+00  2.58E-02            0.00E+00
1.00E+00  0.00E+00  0.00E+00
           1.02E+00  3.65E-01  4.76E-02  2.71E-02  1.00E+00  3.86E-02            1.39E-04
1.02E+00  2.21E-02  1.81E-04
           1.05E+00  3.43E-01  5.41E-02  4.12E-02  1.00E+00  5.18E-02            4.02E-04
1.05E+00  4.89E-02  3.99E-04
           1.08E+00  3.22E-01  6.04E-02  5.59E-02  1.00E+00  6.59E-02            8.31E-04
1.08E+00  8.12E-02  6.64E-04
           1.11E+00  3.01E-01  6.66E-02  7.20E-02  1.00E+00  8.17E-02            1.50E-03
1.11E+00  1.20E-01  9.83E-04
           1.16E+00  2.82E-01  7.31E-02  9.01E-02  1.00E+00  9.95E-02            2.51E-03
1.16E+00  1.68E-01  1.37E-03
           1.21E+00  2.64E-01  7.98E-02  1.11E-01  1.00E+00  1.20E-01            4.02E-03
1.21E+00  2.25E-01  1.84E-03
           1.28E+00  2.46E-01  8.69E-02  1.34E-01  1.00E+00  1.43E-01            6.23E-03
1.28E+00  2.94E-01  2.40E-03
           1.36E+00  2.30E-01  9.43E-02  1.61E-01  1.00E+00  1.70E-01            9.45E-03
1.36E+00  3.78E-01  3.09E-03
           1.45E+00  2.15E-01  1.02E-01  1.92E-01  1.00E+00  2.01E-01            1.41E-02
1.45E+00  4.79E-01  3.91E-03
           1.57E+00  2.01E-01  1.10E-01  2.28E-01  1.00E+00  2.37E-01            2.08E-02
1.57E+00  6.02E-01  4.91E-03
           1.71E+00  1.87E-01  1.19E-01  2.69E-01  1.00E+00  2.78E-01            3.03E-02
1.71E+00  7.50E-01  6.12E-03
           1.88E+00  1.74E-01  1.28E-01  3.16E-01  1.00E+00  3.25E-01            4.39E-02
1.88E+00  9.29E-01  7.59E-03
           2.08E+00  1.62E-01  1.38E-01  3.70E-01  1.00E+00  3.79E-01            6.30E-02
2.08E+00  1.15E+00  9.35E-03
           2.33E+00  1.51E-01  1.48E-01  4.31E-01  1.00E+00  4.40E-01            8.99E-02
2.33E+00  1.41E+00  1.15E-02
           2.63E+00  1.41E-01  1.58E-01  5.00E-01  1.00E+00  5.09E-01            1.27E-01
2.63E+00  1.72E+00  1.41E-02
           2.99E+00  1.31E-01  1.67E-01  5.73E-01  1.00E+00  5.85E-01            1.79E-01
2.99E+00  2.11E+00  1.72E-02
           3.43E+00  1.08E-01  1.78E-01  6.64E-01  1.00E+00  7.67E-01            2.50E-01
3.43E+00  2.57E+00  2.10E-02
           3.96E+00  9.25E-02  1.88E-01  7.58E-01  1.00E+00  9.53E-01            3.48E-01
3.96E+00  3.13E+00  2.56E-02
           4.61E+00  8.13E-02  1.97E-01  8.55E-01  1.00E+00  1.14E+00            4.80E-01
4.61E+00  3.81E+00  3.11E-02
           5.38E+00  7.26E-02  2.06E-01  9.56E-01  1.01E+00  1.34E+00            6.55E-01
5.38E+00  4.63E+00  3.78E-02
           6.32E+00  6.55E-02  2.13E-01  1.06E+00  1.01E+00  1.55E+00            8.84E-01
6.32E+00  5.62E+00  4.59E-02
           7.45E+00  5.96E-02  2.20E-01  1.17E+00  1.02E+00  1.77E+00            1.18E+00
7.45E+00  6.82E+00  5.57E-02
           8.83E+00  5.46E-02  2.25E-01  1.29E+00  1.03E+00  2.00E+00            1.57E+00
8.83E+00  8.27E+00  6.75E-02
           1.05E+01  5.03E-02  2.30E-01  1.41E+00  1.05E+00  2.23E+00            2.05E+00
1.05E+01  1.00E+01  8.18E-02
           1.25E+01  4.64E-02  2.34E-01  1.55E+00  1.07E+00  2.48E+00            2.67E+00
1.25E+01  1.21E+01  9.92E-02
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           1.49E+01  4.28E-02  2.37E-01  1.69E+00  1.10E+00  2.74E+00            3.44E+00
1.49E+01  1.47E+01  1.20E-01
           1.79E+01  3.96E-02  2.39E-01  1.85E+00  1.15E+00  3.02E+00            4.40E+00
1.79E+01  1.78E+01  1.45E-01
           2.14E+01  3.67E-02  2.41E-01  2.02E+00  1.21E+00  3.31E+00            5.59E+00
2.14E+01  2.16E+01  1.76E-01
           2.57E+01  3.41E-02  2.41E-01  2.21E+00  1.29E+00  3.61E+00            7.05E+00
2.57E+01  2.61E+01  2.13E-01
           3.09E+01  3.16E-02  2.41E-01  2.43E+00  1.40E+00  3.95E+00            8.83E+00
3.09E+01  3.16E+01  2.58E-01
           3.72E+01  2.92E-02  2.41E-01  2.68E+00  1.54E+00  4.31E+00            1.10E+01
3.72E+01  3.82E+01  3.12E-01
           4.48E+01  2.69E-02  2.41E-01  2.98E+00  1.71E+00  4.71E+00            1.36E+01
4.48E+01  4.63E+01  3.78E-01
           5.40E+01  2.47E-02  2.40E-01  3.33E+00  1.92E+00  5.16E+00            1.67E+01
5.40E+01  5.60E+01  4.57E-01
           6.51E+01  2.27E-02  2.39E-01  3.75E+00  2.17E+00  5.67E+00            2.04E+01
6.51E+01  6.77E+01  5.53E-01
           7.85E+01  2.08E-02  2.37E-01  4.27E+00  2.46E+00  6.24E+00            2.48E+01
7.85E+01  8.19E+01  6.69E-01
           9.48E+01  1.91E-02  2.35E-01  4.91E+00  2.79E+00  6.89E+00            3.00E+01
9.48E+01  9.91E+01  8.09E-01
           1.14E+02  1.74E-02  2.33E-01  5.71E+00  3.16E+00  7.61E+00            3.61E+01
1.14E+02  1.20E+02  9.79E-01
           1.38E+02  1.59E-02  2.31E-01  6.70E+00  3.57E+00  8.43E+00            4.33E+01
1.38E+02  1.45E+02  1.18E+00
           1.67E+02  1.44E-02  2.29E-01  7.91E+00  4.01E+00  9.37E+00            5.18E+01
1.67E+02  1.75E+02  1.43E+00
           2.02E+02  1.30E-02  2.27E-01  9.39E+00  4.48E+00  1.05E+01            6.18E+01
2.02E+02  2.12E+02  1.73E+00
           2.45E+02  1.15E-02  2.27E-01  1.13E+01  4.96E+00  1.20E+01            6.59E+01
2.45E+02  2.12E+02  4.29E+01
           2.98E+02  1.01E-02  2.27E-01  1.37E+01  5.45E+00  1.39E+01            7.31E+01
2.98E+02  2.12E+02  6.49E+01
           3.66E+02  8.88E-03  2.27E-01  1.66E+01  5.94E+00  1.61E+01            8.18E+01
3.66E+02  2.12E+02  8.54E+01
           4.50E+02  7.73E-03  2.27E-01  2.03E+01  6.41E+00  1.88E+01            9.24E+01
4.50E+02  2.12E+02  1.06E+02
           5.55E+02  6.69E-03  2.27E-01  2.48E+01  6.87E+00  2.20E+01            1.05E+02
5.55E+02  2.12E+02  1.29E+02
           6.88E+02  5.76E-03  2.27E-01  3.03E+01  7.31E+00  2.57E+01            1.20E+02
6.88E+02  2.12E+02  1.54E+02
           8.53E+02  4.95E-03  2.27E-01  3.70E+01  7.71E+00  3.02E+01            1.39E+02
8.53E+02  2.12E+02  1.82E+02
           1.06E+03  4.24E-03  2.27E-01  4.52E+01  8.10E+00  3.54E+01            1.62E+02
1.06E+03  2.12E+02  2.15E+02
           1.32E+03  3.62E-03  2.27E-01  5.51E+01  8.45E+00  4.16E+01            1.89E+02
1.32E+03  2.12E+02  2.53E+02
           1.64E+03  3.10E-03  2.27E-01  6.70E+01  8.77E+00  4.89E+01            2.22E+02
1.64E+03  2.12E+02  2.97E+02
           2.04E+03  2.65E-03  2.27E-01  8.12E+01  9.06E+00  5.74E+01            2.62E+02
2.04E+03  2.12E+02  3.48E+02
           2.54E+03  2.26E-03  2.27E-01  9.80E+01  9.33E+00  6.72E+01            3.10E+02
2.54E+03  2.12E+02  4.10E+02
           3.16E+03  1.94E-03  2.27E-01  1.18E+02  9.57E+00  7.88E+01            3.68E+02
3.16E+03  2.12E+02  4.83E+02
           3.93E+03  1.66E-03  2.27E-01  1.41E+02  9.80E+00  9.21E+01            4.38E+02
3.93E+03  2.12E+02  5.69E+02
           4.89E+03  1.42E-03  2.27E-01  1.68E+02  1.00E+01  1.07E+02            5.24E+02
4.89E+03  2.12E+02  6.73E+02
           6.08E+03  1.22E-03  2.27E-01  1.99E+02  1.02E+01  1.25E+02            6.27E+02
6.08E+03  2.12E+02  7.96E+02
           7.55E+03  1.05E-03  2.27E-01  2.34E+02  1.04E+01  1.45E+02            7.51E+02
7.55E+03  2.12E+02  9.43E+02
           9.36E+03  9.10E-04  2.27E-01  2.74E+02  1.05E+01  1.68E+02            9.02E+02
9.36E+03  2.12E+02  1.12E+03
           1.16E+04  7.89E-04  2.27E-01  3.20E+02  1.06E+01  1.94E+02            1.08E+03
1.16E+04  2.12E+02  1.33E+03
           1.44E+04  6.87E-04  2.27E-01  3.72E+02  1.08E+01  2.23E+02            1.30E+03
1.44E+04  2.12E+02  1.58E+03
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            time averaged (tav =   60. s) volume concentration:  concentration in the z =   .00
plane.

            downwind    time of      cloud     effective                average concentration
(volume fraction) at (x,y,z)
            distance    max conc    duration   half width        y/bbc=     y/bbc=     y/bbc=
 y/bbc=     y/bbc=     y/bbc=
              x (m)        (s)         (s)       bbc (m)             0.0        0.5        1.0
     1.5        2.0        2.5
            1.00E+00    3.00E+01    6.00E+01    4.47E-02         0.00E+00   0.00E+00   0.00E+00
 0.00E+00   0.00E+00   0.00E+00
            1.02E+00    3.00E+01    6.00E+01    6.68E-02         0.00E+00   0.00E+00   0.00E+00
```

0.00E+00	0.00E+00	0.00E+00						
	1.05E+00	3.00E+01	6.00E+01	8.96E-02	0.00E+00	0.00E+00	0.00E+00	
0.00E+00	0.00E+00	0.00E+00						
	1.08E+00	3.00E+01	6.00E+01	1.14E-01	0.00E+00	0.00E+00	0.00E+00	
0.00E+00	0.00E+00	0.00E+00						
	1.11E+00	3.00E+01	6.00E+01	1.41E-01	4.33E-33	3.02E-33	9.91E-34	
1.45E-34	9.00E-36	2.28E-37						
	1.16E+00	3.00E+01	6.00E+01	1.72E-01	1.55E-22	1.07E-22	3.52E-23	
5.24E-24	3.43E-25	9.55E-27						
	1.21E+00	3.00E+01	6.00E+01	2.08E-01	8.73E-16	6.03E-16	1.97E-16	
2.96E-17	2.00E-18	5.94E-20						
	1.28E+00	3.00E+01	6.00E+01	2.48E-01	2.53E-11	1.74E-11	5.68E-12	
8.60E-13	5.93E-14	1.83E-15						
	1.36E+00	3.01E+01	6.00E+01	2.95E-01	2.60E-08	1.79E-08	5.84E-09	
8.88E-10	6.22E-11	1.98E-12						
	1.45E+00	3.01E+01	6.00E+01	3.48E-01	3.02E-06	2.08E-06	6.77E-07	
1.03E-07	7.30E-09	2.37E-10						
	1.57E+00	3.01E+01	6.00E+01	4.10E-01	8.09E-05	5.57E-05	1.81E-05	
2.76E-06	1.97E-07	6.48E-09						
	1.71E+00	3.01E+01	6.00E+01	4.81E-01	7.93E-04	5.45E-04	1.77E-04	
2.71E-05	1.94E-06	6.45E-08						
	1.88E+00	3.01E+01	6.00E+01	5.63E-01	3.87E-03	2.66E-03	8.64E-04	
1.32E-04	9.49E-06	3.18E-07						
	2.08E+00	3.02E+01	6.00E+01	6.56E-01	1.16E-02	7.95E-03	2.58E-03	
3.95E-04	2.85E-05	9.60E-07						
	2.33E+00	3.02E+01	6.00E+01	7.62E-01	2.45E-02	1.68E-02	5.46E-03	
8.37E-04	6.03E-05	2.04E-06						
	2.63E+00	3.02E+01	6.00E+01	8.81E-01	4.05E-02	2.78E-02	9.04E-03	
1.38E-03	1.00E-04	3.39E-06						
	2.99E+00	3.03E+01	6.00E+01	1.01E+00	5.58E-02	3.84E-02	1.25E-02	
1.91E-03	1.38E-04	4.69E-06						
	3.43E+00	3.04E+01	6.00E+01	1.16E+00	7.79E-02	5.35E-02	1.74E-02	
2.66E-03	1.93E-04	6.56E-06						
	3.96E+00	3.04E+01	6.00E+01	1.33E+00	8.35E-02	5.74E-02	1.86E-02	
2.86E-03	2.07E-04	7.05E-06						
	4.61E+00	3.05E+01	6.00E+01	1.49E+00	8.08E-02	5.55E-02	1.80E-02	
2.77E-03	2.00E-04	6.83E-06						
	5.38E+00	3.07E+01	6.00E+01	1.67E+00	7.47E-02	5.13E-02	1.67E-02	
2.56E-03	1.85E-04	6.32E-06						
	6.32E+00	3.08E+01	6.00E+01	1.85E+00	6.74E-02	4.63E-02	1.50E-02	
2.31E-03	1.67E-04	5.70E-06						
	7.45E+00	3.10E+01	6.00E+01	2.04E+00	5.99E-02	4.12E-02	1.34E-02	
2.05E-03	1.49E-04	5.08E-06						
	8.83E+00	3.12E+01	6.00E+01	2.25E+00	5.29E-02	3.63E-02	1.18E-02	
1.81E-03	1.31E-04	4.47E-06						
	1.05E+01	3.14E+01	6.00E+01	2.46E+00	4.63E-02	3.18E-02	1.03E-02	
1.59E-03	1.15E-04	3.93E-06						
	1.25E+01	3.17E+01	6.00E+01	2.69E+00	4.04E-02	2.78E-02	9.01E-03	
1.38E-03	1.00E-04	3.42E-06						
	1.49E+01	3.21E+01	6.00E+01	2.94E+00	3.50E-02	2.41E-02	7.81E-03	
1.20E-03	8.68E-05	2.96E-06						
	1.79E+01	3.25E+01	6.00E+01	3.21E+00	3.02E-02	2.07E-02	6.73E-03	
1.03E-03	7.48E-05	2.56E-06						
	2.14E+01	3.31E+01	6.00E+01	3.50E+00	2.58E-02	1.77E-02	5.76E-03	
8.83E-04	6.39E-05	2.19E-06						
	2.57E+01	3.37E+01	6.00E+01	3.84E+00	2.19E-02	1.50E-02	4.88E-03	
7.48E-04	5.42E-05	1.86E-06						
	3.09E+01	3.45E+01	6.00E+01	4.21E+00	1.83E-02	1.26E-02	4.09E-03	
6.28E-04	4.55E-05	1.56E-06						
	3.72E+01	3.54E+01	6.00E+01	4.65E+00	1.52E-02	1.04E-02	3.39E-03	
5.20E-04	3.77E-05	1.29E-06						
	4.48E+01	3.65E+01	6.00E+01	5.17E+00	1.24E-02	8.54E-03	2.77E-03	
4.25E-04	3.08E-05	1.05E-06						
	5.40E+01	3.79E+01	6.00E+01	5.78E+00	9.99E-03	6.87E-03	2.23E-03	
3.42E-04	2.48E-05	8.44E-07						
	6.51E+01	3.96E+01	6.00E+01	6.50E+00	7.90E-03	5.43E-03	1.76E-03	
2.70E-04	1.96E-05	6.73E-07						
	7.85E+01	4.16E+01	6.00E+01	7.40E+00	6.15E-03	4.22E-03	1.37E-03	
2.10E-04	1.52E-05	5.21E-07						
	9.48E+01	4.40E+01	6.00E+01	8.52E+00	4.71E-03	3.24E-03	1.05E-03	
1.61E-04	1.17E-05	4.01E-07						
	1.14E+02	4.70E+01	6.00E+01	9.90E+00	3.56E-03	2.45E-03	7.94E-04	
1.22E-04	8.82E-06	3.03E-07						
	1.38E+02	5.05E+01	6.00E+01	1.16E+01	2.66E-03	1.83E-03	5.93E-04	
9.09E-05	6.59E-06	2.25E-07						
	1.67E+02	5.48E+01	6.00E+01	1.37E+01	1.96E-03	1.35E-03	4.38E-04	
6.72E-05	4.87E-06	1.65E-07						
	2.02E+02	6.00E+01	6.00E+01	1.63E+01	1.43E-03	9.86E-04	3.20E-04	
4.91E-05	3.56E-06	1.20E-07						
	2.45E+02	6.59E+01	6.14E+01	1.96E+01	9.46E-04	6.50E-04	2.11E-04	
3.24E-05	2.35E-06	7.93E-08						
	2.98E+02	7.31E+01	6.32E+01	2.37E+01	6.41E-04	4.40E-04	1.43E-04	
2.19E-05	1.59E-06	5.34E-08						
	3.66E+02	8.18E+01	6.57E+01	2.88E+01	4.32E-04	2.97E-04	9.63E-05	
1.48E-05	1.07E-06	3.66E-08						

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            4.50E+02    9.24E+01    6.89E+01    3.51E+01         2.88E-04   1.98E-04   6.44E-05
 9.87E-06   7.15E-07   2.41E-08
            5.55E+02    1.05E+02    7.30E+01    4.29E+01         1.91E-04   1.31E-04   4.27E-05
 6.54E-06   4.74E-07   1.64E-08
            6.88E+02    1.20E+02    7.81E+01    5.25E+01         1.26E-04   8.63E-05   2.80E-05
 4.30E-06   3.12E-07   1.07E-08
            8.53E+02    1.39E+02    8.43E+01    6.42E+01         8.18E-05   5.62E-05   1.82E-05
 2.80E-06   2.03E-07   6.99E-09
            1.06E+03    1.62E+02    9.19E+01    7.84E+01         5.28E-05   3.63E-05   1.18E-05
 1.81E-06   1.31E-07   4.72E-09
            1.32E+03    1.89E+02    1.01E+02    9.55E+01         3.37E-05   2.32E-05   7.53E-06
 1.15E-06   8.37E-08   3.07E-09
            1.64E+03    2.22E+02    1.12E+02    1.16E+02         2.14E-05   1.47E-05   4.77E-06
 7.32E-07   5.29E-08   1.89E-09
            2.04E+03    2.62E+02    1.25E+02    1.41E+02         1.35E-05   9.26E-06   3.01E-06
 4.61E-07   3.33E-08   1.08E-09
            2.54E+03    3.10E+02    1.41E+02    1.70E+02         8.43E-06   5.80E-06   1.88E-06
 2.89E-07   2.10E-08   8.17E-10
            3.16E+03    3.68E+02    1.60E+02    2.04E+02         5.26E-06   3.61E-06   1.17E-06
 1.80E-07   1.31E-08   4.08E-10
            3.93E+03    4.38E+02    1.82E+02    2.44E+02         3.27E-06   2.25E-06   7.30E-07
 1.12E-07   8.12E-09   3.04E-10
            4.89E+03    5.24E+02    2.08E+02    2.90E+02         2.03E-06   1.40E-06   4.54E-07
 6.96E-08   5.06E-09   2.25E-10
            6.08E+03    6.27E+02    2.39E+02    3.44E+02         1.27E-06   8.70E-07   2.82E-07
 4.33E-08   3.11E-09   8.28E-11
            7.55E+03    7.51E+02    2.76E+02    4.05E+02         7.90E-07   5.43E-07   1.76E-07
 2.71E-08   1.98E-09   6.09E-11
            9.36E+03    9.02E+02    3.20E+02    4.75E+02         4.95E-07   3.40E-07   1.10E-07
 1.69E-08   1.23E-09   4.48E-11
            1.16E+04    1.08E+03    3.72E+02    5.55E+02         3.12E-07   2.14E-07   6.96E-08
 1.07E-08   7.74E-10   3.29E-11
            1.44E+04    1.30E+03    4.33E+02    6.44E+02         1.98E-07   1.36E-07   4.42E-08
 6.77E-09   4.98E-10   2.43E-11
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time averaged (tav = 60. s) volume concentration: maximum concentration (volume fraction) along centerline.

downwind distance x (m)	height z (m)	maximum concentration c(x,0,z)	time of max conc (s)	cloud duration (s)
1.00E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.02E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.05E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.08E+00	1.00E+00	9.26E-01	3.00E+01	6.00E+01
1.11E+00	1.00E+00	7.78E-01	3.00E+01	6.00E+01
1.16E+00	1.00E+00	6.57E-01	3.00E+01	6.00E+01
1.21E+00	1.00E+00	5.58E-01	3.00E+01	6.00E+01
1.28E+00	1.00E+00	4.76E-01	3.00E+01	6.00E+01
1.36E+00	1.00E+00	4.07E-01	3.01E+01	6.00E+01
1.45E+00	1.00E+00	3.48E-01	3.01E+01	6.00E+01
1.57E+00	1.00E+00	2.98E-01	3.01E+01	6.00E+01
1.71E+00	1.00E+00	2.56E-01	3.01E+01	6.00E+01
1.88E+00	1.00E+00	2.20E-01	3.01E+01	6.00E+01
2.08E+00	1.00E+00	1.89E-01	3.02E+01	6.00E+01
2.33E+00	1.00E+00	1.62E-01	3.02E+01	6.00E+01
2.63E+00	1.00E+00	1.40E-01	3.02E+01	6.00E+01
2.99E+00	9.95E-01	1.21E-01	3.03E+01	6.00E+01
3.43E+00	9.17E-01	9.48E-02	3.04E+01	6.00E+01
3.96E+00	5.22E-01	8.41E-02	3.04E+01	6.00E+01
4.61E+00	0.00E+00	8.08E-02	3.05E+01	6.00E+01
5.38E+00	0.00E+00	7.47E-02	3.07E+01	6.00E+01
6.32E+00	0.00E+00	6.74E-02	3.08E+01	6.00E+01
7.45E+00	0.00E+00	5.99E-02	3.10E+01	6.00E+01
8.83E+00	0.00E+00	5.29E-02	3.12E+01	6.00E+01
1.05E+01	0.00E+00	4.63E-02	3.14E+01	6.00E+01
1.25E+01	0.00E+00	4.04E-02	3.17E+01	6.00E+01
1.49E+01	0.00E+00	3.50E-02	3.21E+01	6.00E+01
1.79E+01	0.00E+00	3.02E-02	3.25E+01	6.00E+01
2.14E+01	0.00E+00	2.58E-02	3.31E+01	6.00E+01
2.57E+01	0.00E+00	2.19E-02	3.37E+01	6.00E+01
3.09E+01	0.00E+00	1.83E-02	3.45E+01	6.00E+01
3.72E+01	0.00E+00	1.52E-02	3.54E+01	6.00E+01
4.48E+01	0.00E+00	1.24E-02	3.65E+01	6.00E+01
5.40E+01	0.00E+00	9.99E-03	3.79E+01	6.00E+01
6.51E+01	0.00E+00	7.90E-03	3.96E+01	6.00E+01
7.85E+01	0.00E+00	6.15E-03	4.16E+01	6.00E+01
9.48E+01	0.00E+00	4.71E-03	4.40E+01	6.00E+01
1.14E+02	0.00E+00	3.56E-03	4.70E+01	6.00E+01
1.38E+02	0.00E+00	2.66E-03	5.05E+01	6.00E+01
1.67E+02	0.00E+00	1.96E-03	5.48E+01	6.00E+01
2.02E+02	0.00E+00	1.43E-03	6.00E+01	6.00E+01
2.45E+02	0.00E+00	9.46E-04	6.59E+01	6.14E+01

2.98E+02	0.00E+00	6.41E-04	7.31E+01	6.32E+01
3.66E+02	0.00E+00	4.32E-04	8.18E+01	6.57E+01
4.50E+02	0.00E+00	2.88E-04	9.24E+01	6.89E+01
5.55E+02	0.00E+00	1.91E-04	1.05E+02	7.30E+01
6.88E+02	0.00E+00	1.26E-04	1.20E+02	7.81E+01
8.53E+02	0.00E+00	8.18E-05	1.39E+02	8.43E+01
1.06E+03	0.00E+00	5.28E-05	1.62E+02	9.19E+01
1.32E+03	0.00E+00	3.37E-05	1.89E+02	1.01E+02
1.64E+03	0.00E+00	2.14E-05	2.22E+02	1.12E+02
2.04E+03	0.00E+00	1.35E-05	2.62E+02	1.25E+02
2.54E+03	0.00E+00	8.43E-06	3.10E+02	1.41E+02
3.16E+03	0.00E+00	5.26E-06	3.68E+02	1.60E+02
3.93E+03	0.00E+00	3.27E-06	4.38E+02	1.82E+02
4.89E+03	0.00E+00	2.03E-06	5.24E+02	2.08E+02
6.08E+03	0.00E+00	1.27E-06	6.27E+02	2.39E+02
7.55E+03	0.00E+00	7.90E-07	7.51E+02	2.76E+02
9.36E+03	0.00E+00	4.95E-07	9.02E+02	3.20E+02
1.16E+04	0.00E+00	3.12E-07	1.08E+03	3.72E+02
1.44E+04	0.00E+00	1.98E-07	1.30E+03	4.33E+02

•(10U •&l0O •&k2S •&l8D •

```
problem input

idspl =         2
ncalc =         1
wms   =   .016000
cps   =   2240.00
tbp   =    111.70
cmed0 =       .00
dhe   =   509880.
cpsl  =   3349.00
rhosl =    424.10
spb   =     -1.00
spc   =       .00
ts    =    260.00
qs    =      2.29
as    =       .01
tsd   =       60.
qtis  =       .00
hs    =      1.00
tav   =     60.00
xffm  =   9000.00
zp(1) =       .00
zp(2) =       .00
zp(3) =       .00
zp(4) =       .00
z0    =   .300000
za    =      2.00
ua    =      2.00
ta    =    293.00
rh    =     60.00
stab  =      6.00
```

•

```
release gas properties

molecular weight of source gas (kg)              - wms  =  1.6000E-02
vapor heat capacity, const. p.  (j/kg-k)         - cps  =  2.2400E+03
temperature of source gas (k)                    - ts   =  2.6000E+02
density of source gas (kg/m3)                    - rhos =  7.4996E-01
boiling point temperature                        - tbp  =  1.1170E+02
liquid mass fraction                             - cmed0=  0.0000E+00
liquid heat capacity (j/kg-k)                    - cpsl =  3.3490E+03
heat of vaporization (j/kg)                      - dhe  =  5.0988E+05
liquid source density (kg/m3)                    - rhosl=  4.2410E+02
saturation pressure constant                     - spa  =  8.7843E+00
saturation pressure constant (k)                 - spb  =  9.8121E+02
saturation pressure constant (k)                 - spc  =  0.0000E+00


spill characteristics

spill type                                       - idspl=          2
mass source rate (kg/s)                          - qs   =  2.2900E+00
continuous source duration (s)                   - tsd  =  6.0000E+01
continuous source mass (kg)                      - qtcs =  1.3740E+02
instantaneous source mass (kg)                   - qtis =  0.0000E+00
source area (m2)                                 - as   =  8.0000E-03
vertical vapor velocity (m/s)                    - ws   =  0.0000E+00
source half width (m)                            - bs   =  4.4721E-02
source height (m)                                - hs   =  1.0000E+00
horizontal vapor velocity (m/s)                  - us   =  3.8169E+02
```

field parameters

```
concentration averaging time (s)                  - tav  =  6.0000E+01
mixing layer height (m)                           - hmx  =  2.6000E+02
maximum downwind distance (m)                     - xffm =  9.0000E+03
concentration measurement height (m)              - zp(1)=  0.0000E+00
                                                  - zp(2)=  0.0000E+00
                                                  - zp(3)=  0.0000E+00
                                                  - zp(4)=  0.0000E+00
```

ambient meteorological properties

```
molecular weight of ambient air (kg)             - wmae  =  2.8804E-02
heat capacity of ambient air at const p. (j/kg-k)- cpaa  =  1.0134E+03
density of ambient air (kg/m3)                   - rhoa  =  1.1980E+00
ambient measurement height (m)                   - za    =  2.0000E+00
ambient atmospheric pressure (pa=n/m2=j/m3)      - pa    =  1.0133E+05
ambient wind speed (m/s)                         - ua    =  2.0000E+00
ambient temperature (k)                          - ta    =  2.9300E+02
relative humidity (percent)                      - rh    =  6.0000E+01
ambient friction velocity (m/s)                  - uastr =  3.2808E-01
atmospheric stability class value                - stab  =  6.0000E+00
inverse monin-obukhov length (1/m)               - ala   =  4.7330E-02
surface roughness height (m)                     - z0    =  3.0000E-01
```

additional parameters

```
sub-step multiplier                              - ncalc =           1
number of calculational sub-steps                - nssm  =           3
acceleration of gravity (m/s2)                   - grav  =  9.8067E+00
gas constant (j/mol- k)                          - rr    =  8.3143E+00
von karman constant                              - xk    =  4.1000E-01
```

instantaneous spatially averaged cloud parameters

```
          x        zc         h        bb         b        bbx       bx        cv        rho
   t         u        ua
        1.00E+00  1.00E+00  8.94E-02  4.47E-02  4.02E-02  0.00E+00  0.00E+00  1.00E+00  7.50E-01
2.60E+02  3.82E+02  6.12E-01
        1.02E+00  1.00E+00  1.38E-01  6.88E-02  4.82E-02  1.89E-02  1.89E-02  7.36E-01  8.83E-01
2.67E+02  2.25E+02  6.27E-01
        1.05E+00  1.00E+00  1.87E-01  9.34E-02  5.51E-02  4.17E-02  4.17E-02  5.79E-01  9.56E-01
2.73E+02  1.58E+02  6.41E-01
        1.08E+00  1.00E+00  2.40E-01  1.20E-01  6.18E-02  6.94E-02  6.93E-02  4.72E-01  1.01E+00
2.76E+02  1.19E+02  6.57E-01
        1.11E+00  1.00E+00  2.99E-01  1.50E-01  6.84E-02  1.03E-01  1.03E-01  3.91E-01  1.04E+00
2.78E+02  9.34E+01  6.74E-01
        1.16E+00  1.00E+00  3.66E-01  1.83E-01  7.52E-02  1.43E-01  1.43E-01  3.28E-01  1.07E+00
2.81E+02  7.49E+01  6.94E-01
        1.21E+00  1.00E+00  4.43E-01  2.21E-01  8.23E-02  1.92E-01  1.92E-01  2.77E-01  1.09E+00
2.82E+02  6.10E+01  7.16E-01
        1.28E+00  1.00E+00  5.31E-01  2.65E-01  8.98E-02  2.51E-01  2.51E-01  2.35E-01  1.11E+00
2.84E+02  5.03E+01  7.41E-01
        1.36E+00  1.00E+00  6.33E-01  3.16E-01  9.78E-02  3.23E-01  3.23E-01  2.00E-01  1.12E+00
2.85E+02  4.18E+01  7.69E-01
        1.45E+00  1.00E+00  7.50E-01  3.75E-01  1.06E-01  4.09E-01  4.09E-01  1.71E-01  1.13E+00
2.86E+02  3.49E+01  8.01E-01
        1.57E+00  1.00E+00  8.86E-01  4.43E-01  1.15E-01  5.14E-01  5.14E-01  1.47E-01  1.14E+00
2.87E+02  2.94E+01  8.38E-01
        1.71E+00  1.00E+00  1.04E+00  5.21E-01  1.25E-01  6.40E-01  6.40E-01  1.26E-01  1.15E+00
2.88E+02  2.48E+01  8.79E-01
        1.88E+00  1.00E+00  1.22E+00  6.10E-01  1.34E-01  7.93E-01  7.93E-01  1.08E-01  1.16E+00
2.89E+02  2.11E+01  9.25E-01
        2.08E+00  1.00E+00  1.43E+00  7.13E-01  1.45E-01  9.78E-01  9.78E-01  9.28E-02  1.16E+00
2.89E+02  1.80E+01  9.76E-01
        2.33E+00  1.00E+00  1.66E+00  8.31E-01  1.56E-01  1.20E+00  1.20E+00  7.99E-02  1.17E+00
2.90E+02  1.54E+01  1.03E+00
        2.63E+00  1.00E+00  1.93E+00  9.65E-01  1.68E-01  1.47E+00  1.47E+00  6.89E-02  1.17E+00
2.90E+02  1.33E+01  1.09E+00
        2.99E+00  1.00E+00  2.19E+00  1.09E+00  1.78E-01  1.80E+00  1.80E+00  6.10E-02  1.18E+00
2.91E+02  1.17E+01  1.19E+00
        3.43E+00  1.00E+00  2.48E+00  1.24E+00  1.88E-01  2.19E+00  2.19E+00  5.37E-02  1.18E+00
2.91E+02  1.03E+01  1.31E+00
        3.96E+00  1.00E+00  2.80E+00  1.40E+00  1.99E-01  2.67E+00  2.67E+00  4.75E-02  1.18E+00
2.91E+02  9.21E+00  1.43E+00
        4.61E+00  1.01E+00  3.13E+00  1.57E+00  2.09E-01  3.25E+00  3.25E+00  4.21E-02  1.18E+00
2.91E+02  8.27E+00  1.54E+00
        5.38E+00  1.01E+00  3.50E+00  1.75E+00  2.19E-01  3.95E+00  3.95E+00  3.74E-02  1.18E+00
2.92E+02  7.49E+00  1.66E+00
        6.32E+00  1.02E+00  3.89E+00  1.94E+00  2.29E-01  4.80E+00  4.80E+00  3.33E-02  1.19E+00
2.92E+02  6.83E+00  1.78E+00
```

7.45E+00 1.03E+00 4.30E+00 2.15E+00 2.38E-01 5.82E+00 5.82E+00 2.96E-02 1.19E+00
2.92E+02 6.27E+00 1.89E+00
8.83E+00 1.04E+00 4.74E+00 2.37E+00 2.47E-01 7.06E+00 7.06E+00 2.63E-02 1.19E+00
2.92E+02 5.80E+00 2.00E+00
1.05E+01 1.07E+00 5.20E+00 2.61E+00 2.54E-01 8.56E+00 8.56E+00 2.34E-02 1.19E+00
2.92E+02 5.40E+00 2.11E+00
1.25E+01 1.10E+00 5.69E+00 2.86E+00 2.61E-01 1.04E+01 1.04E+01 2.08E-02 1.19E+00
2.92E+02 5.07E+00 2.22E+00
1.49E+01 1.16E+00 6.21E+00 3.12E+00 2.66E-01 1.26E+01 1.26E+01 1.85E-02 1.19E+00
2.92E+02 4.80E+00 2.33E+00
1.79E+01 1.24E+00 6.74E+00 3.40E+00 2.70E-01 1.52E+01 1.52E+01 1.64E-02 1.19E+00
2.92E+02 4.57E+00 2.43E+00
2.14E+01 1.36E+00 7.28E+00 3.70E+00 2.74E-01 1.84E+01 1.84E+01 1.46E-02 1.19E+00
2.92E+02 4.38E+00 2.53E+00
2.57E+01 1.53E+00 7.83E+00 4.02E+00 2.77E-01 2.23E+01 2.23E+01 1.29E-02 1.19E+00
2.93E+02 4.22E+00 2.62E+00
3.09E+01 1.78E+00 8.40E+00 4.37E+00 2.80E-01 2.70E+01 2.70E+01 1.15E-02 1.19E+00
2.93E+02 4.09E+00 2.72E+00
3.72E+01 2.12E+00 8.97E+00 4.74E+00 2.82E-01 3.26E+01 3.26E+01 1.01E-02 1.19E+00
2.93E+02 3.98E+00 2.80E+00
4.48E+01 2.60E+00 9.58E+00 5.13E+00 2.84E-01 3.95E+01 3.95E+01 8.97E-03 1.19E+00
2.93E+02 3.90E+00 2.89E+00
5.40E+01 3.26E+00 1.02E+01 5.56E+00 2.85E-01 4.78E+01 4.78E+01 7.90E-03 1.19E+00
2.93E+02 3.84E+00 2.98E+00
6.51E+01 4.16E+00 1.08E+01 6.03E+00 2.85E-01 5.78E+01 5.78E+01 6.94E-03 1.20E+00
2.93E+02 3.79E+00 3.06E+00
7.85E+01 5.36E+00 1.15E+01 6.55E+00 2.86E-01 6.99E+01 6.99E+01 6.07E-03 1.20E+00
2.93E+02 3.76E+00 3.14E+00
9.48E+01 6.92E+00 1.25E+01 7.09E+00 2.84E-01 8.46E+01 8.46E+01 5.06E-03 1.20E+00
2.93E+02 3.83E+00 3.33E+00
1.14E+02 8.75E+00 1.37E+01 7.67E+00 2.81E-01 1.02E+02 1.02E+02 4.13E-03 1.20E+00
2.93E+02 3.97E+00 3.57E+00
1.38E+02 1.09E+01 1.49E+01 8.34E+00 2.78E-01 1.24E+02 1.24E+02 3.36E-03 1.20E+00
2.93E+02 4.12E+00 3.81E+00
1.67E+02 1.32E+01 1.65E+01 9.28E+00 2.78E-01 1.35E+02 1.24E+02 2.50E-03 1.20E+00
2.93E+02 4.28E+00 4.04E+00
2.04E+02 1.58E+01 1.83E+01 1.04E+01 2.77E-01 1.49E+02 1.24E+02 1.81E-03 1.20E+00
2.93E+02 4.43E+00 4.27E+00
2.50E+02 1.84E+01 2.03E+01 1.19E+01 2.77E-01 1.66E+02 1.24E+02 1.29E-03 1.20E+00
2.93E+02 4.59E+00 4.47E+00
3.08E+02 2.11E+01 2.26E+01 1.37E+01 2.77E-01 1.86E+02 1.24E+02 8.97E-04 1.20E+00
2.93E+02 4.75E+00 4.67E+00
3.80E+02 2.39E+01 2.53E+01 1.59E+01 2.77E-01 2.10E+02 1.24E+02 6.11E-04 1.20E+00
2.93E+02 4.90E+00 4.85E+00
4.70E+02 2.66E+01 2.83E+01 1.87E+01 2.77E-01 2.40E+02 1.24E+02 4.08E-04 1.20E+00
2.93E+02 5.05E+00 5.01E+00
5.81E+02 2.92E+01 3.19E+01 2.20E+01 2.77E-01 2.75E+02 1.24E+02 2.67E-04 1.20E+00
2.93E+02 5.19E+00 5.17E+00
7.20E+02 3.17E+01 3.61E+01 2.62E+01 2.77E-01 3.17E+02 1.24E+02 1.72E-04 1.20E+00
2.93E+02 5.33E+00 5.32E+00
8.93E+02 3.41E+01 4.12E+01 3.12E+01 2.77E-01 3.67E+02 1.24E+02 1.10E-04 1.20E+00
2.93E+02 5.47E+00 5.46E+00
1.11E+03 3.63E+01 4.72E+01 3.72E+01 2.77E-01 4.27E+02 1.24E+02 6.87E-05 1.20E+00
2.93E+02 5.60E+00 5.60E+00
1.37E+03 3.83E+01 5.46E+01 4.45E+01 2.77E-01 4.99E+02 1.24E+02 4.26E-05 1.20E+00
2.93E+02 5.74E+00 5.73E+00
1.70E+03 4.01E+01 6.36E+01 5.32E+01 2.77E-01 5.85E+02 1.24E+02 2.61E-05 1.20E+00
2.93E+02 5.87E+00 5.87E+00
2.10E+03 4.17E+01 7.48E+01 6.35E+01 2.77E-01 6.88E+02 1.24E+02 1.58E-05 1.20E+00
2.93E+02 6.01E+00 6.01E+00
2.61E+03 4.31E+01 8.57E+01 7.56E+01 2.77E-01 8.10E+02 1.24E+02 9.83E-06 1.20E+00
2.93E+02 6.13E+00 6.13E+00
3.22E+03 4.45E+01 8.96E+01 8.97E+01 2.77E-01 9.57E+02 1.24E+02 6.71E-06 1.20E+00
2.93E+02 6.19E+00 6.19E+00
3.97E+03 4.59E+01 9.42E+01 1.06E+02 2.77E-01 1.13E+03 1.24E+02 4.57E-06 1.20E+00
2.93E+02 6.26E+00 6.26E+00
4.89E+03 4.72E+01 9.95E+01 1.25E+02 2.77E-01 1.34E+03 1.24E+02 3.10E-06 1.20E+00
2.93E+02 6.34E+00 6.34E+00
6.02E+03 4.86E+01 1.06E+02 1.46E+02 2.77E-01 1.59E+03 1.24E+02 2.10E-06 1.20E+00
2.93E+02 6.42E+00 6.42E+00
7.40E+03 5.00E+01 1.13E+02 1.70E+02 2.77E-01 1.89E+03 1.24E+02 1.42E-06 1.20E+00
2.93E+02 6.51E+00 6.51E+00
9.10E+03 5.15E+01 1.21E+02 1.98E+02 2.77E-01 2.25E+03 1.24E+02 9.60E-07 1.20E+00
2.93E+02 6.61E+00 6.61E+00
1.12E+04 5.30E+01 1.30E+02 2.30E+02 2.77E-01 2.67E+03 1.24E+02 6.49E-07 1.20E+00
2.93E+02 6.70E+00 6.70E+00
1.37E+04 5.46E+01 1.40E+02 2.65E+02 2.77E-01 3.17E+03 1.24E+02 4.39E-07 1.20E+00
2.93E+02 6.80E+00 6.80E+00

x	cm	cmv	cmda	cmw	cmwv	wc	vg	ug	w	v	vx
1.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.25E+02	5.29E+01	0.00E+00
1.02E+00	6.07E-01	6.07E-01	3.89E-01	3.51E-03	3.51E-03	2.61E-04	0.00E+00	0.00E+00			

1.73E+02 2.65E+01 5.08E-01
1.05E+00 4.34E-01 4.34E-01 5.61E-01 5.06E-03 4.88E-03 5.26E-04 0.00E+00 0.00E+00
1.10E+02 1.71E+01 5.09E-01
1.08E+00 3.32E-01 3.32E-01 6.62E-01 5.96E-03 5.87E-03 8.29E-04 0.00E+00 0.00E+00
7.70E+01 1.23E+01 5.11E-01
1.11E+00 2.63E-01 2.63E-01 7.30E-01 6.58E-03 6.58E-03 1.18E-03 0.00E+00 0.00E+00
5.69E+01 9.28E+00 5.12E-01
1.16E+00 2.13E-01 2.13E-01 7.80E-01 7.02E-03 7.02E-03 1.60E-03 0.00E+00 0.00E+00
4.34E+01 7.24E+00 5.14E-01
1.21E+00 1.76E-01 1.76E-01 8.17E-01 7.36E-03 7.36E-03 2.10E-03 0.00E+00 0.00E+00
3.37E+01 5.77E+00 5.17E-01
1.28E+00 1.46E-01 1.46E-01 8.46E-01 7.62E-03 7.62E-03 2.71E-03 0.00E+00 0.00E+00
2.65E+01 4.66E+00 5.19E-01
1.36E+00 1.22E-01 1.22E-01 8.70E-01 7.83E-03 7.83E-03 3.44E-03 0.00E+00 0.00E+00
2.10E+01 3.81E+00 5.22E-01
1.45E+00 1.03E-01 1.03E-01 8.89E-01 8.01E-03 8.01E-03 4.33E-03 0.00E+00 0.00E+00
1.67E+01 3.14E+00 5.25E-01
1.57E+00 8.71E-02 8.71E-02 9.05E-01 8.15E-03 8.15E-03 5.40E-03 0.00E+00 0.00E+00
1.34E+01 2.60E+00 5.29E-01
1.71E+00 7.39E-02 7.39E-02 9.18E-01 8.26E-03 8.26E-03 6.69E-03 0.00E+00 0.00E+00
1.07E+01 2.17E+00 5.33E-01
1.88E+00 6.30E-02 6.30E-02 9.29E-01 8.36E-03 8.36E-03 8.26E-03 0.00E+00 0.00E+00
8.64E+00 1.82E+00 5.38E-01
2.08E+00 5.38E-02 5.38E-02 9.38E-01 8.44E-03 8.44E-03 1.02E-02 0.00E+00 0.00E+00
6.96E+00 1.52E+00 5.43E-01
2.33E+00 4.60E-02 4.60E-02 9.45E-01 8.51E-03 8.51E-03 1.24E-02 0.00E+00 0.00E+00
5.61E+00 1.28E+00 5.49E-01
2.63E+00 3.95E-02 3.95E-02 9.52E-01 8.57E-03 8.57E-03 1.52E-02 0.00E+00 0.00E+00
4.53E+00 1.08E+00 5.56E-01
2.99E+00 3.48E-02 3.48E-02 9.57E-01 8.61E-03 8.61E-03 1.89E-02 0.00E+00 0.00E+00
3.01E+00 9.34E-01 5.67E-01
3.43E+00 3.06E-02 3.06E-02 9.61E-01 8.65E-03 8.65E-03 2.33E-02 0.00E+00 0.00E+00
2.26E+00 7.99E-01 5.80E-01
3.96E+00 2.70E-02 2.70E-02 9.64E-01 8.68E-03 8.68E-03 2.86E-02 0.00E+00 0.00E+00
1.74E+00 6.87E-01 5.94E-01
4.61E+00 2.38E-02 2.38E-02 9.67E-01 8.71E-03 8.71E-03 3.50E-02 0.00E+00 0.00E+00
1.36E+00 5.94E-01 6.07E-01
5.38E+00 2.11E-02 2.11E-02 9.70E-01 8.74E-03 8.74E-03 4.26E-02 0.00E+00 0.00E+00
1.08E+00 5.14E-01 6.21E-01
6.32E+00 1.87E-02 1.87E-02 9.72E-01 8.76E-03 8.76E-03 5.15E-02 0.00E+00 0.00E+00
8.65E-01 4.46E-01 6.35E-01
7.45E+00 1.66E-02 1.66E-02 9.75E-01 8.78E-03 8.78E-03 6.19E-02 0.00E+00 0.00E+00
7.01E-01 3.86E-01 6.50E-01
8.83E+00 1.48E-02 1.48E-02 9.76E-01 8.79E-03 8.79E-03 7.38E-02 0.00E+00 0.00E+00
5.73E-01 3.36E-01 6.64E-01
1.05E+01 1.31E-02 1.31E-02 9.78E-01 8.81E-03 8.81E-03 8.74E-02 0.00E+00 0.00E+00
4.71E-01 2.91E-01 6.79E-01
1.25E+01 1.16E-02 1.16E-02 9.80E-01 8.82E-03 8.82E-03 1.03E-01 0.00E+00 0.00E+00
3.90E-01 2.53E-01 6.94E-01
1.49E+01 1.03E-02 1.03E-02 9.81E-01 8.83E-03 8.83E-03 1.20E-01 0.00E+00 0.00E+00
3.25E-01 2.21E-01 7.10E-01
1.79E+01 9.18E-03 9.18E-03 9.82E-01 8.84E-03 8.84E-03 1.39E-01 0.00E+00 0.00E+00
2.73E-01 1.93E-01 7.26E-01
2.14E+01 8.14E-03 8.14E-03 9.83E-01 8.85E-03 8.85E-03 1.60E-01 0.00E+00 0.00E+00
2.31E-01 1.69E-01 7.42E-01
2.57E+01 7.22E-03 7.22E-03 9.84E-01 8.86E-03 8.86E-03 1.83E-01 0.00E+00 0.00E+00
1.97E-01 1.48E-01 7.60E-01
3.09E+01 6.40E-03 6.40E-03 9.85E-01 8.87E-03 8.87E-03 2.08E-01 0.00E+00 0.00E+00
1.70E-01 1.31E-01 7.78E-01
3.72E+01 5.66E-03 5.66E-03 9.85E-01 8.87E-03 8.87E-03 2.35E-01 0.00E+00 0.00E+00
1.47E-01 1.16E-01 7.97E-01
4.48E+01 5.00E-03 5.00E-03 9.86E-01 8.88E-03 8.88E-03 2.63E-01 0.00E+00 0.00E+00
1.29E-01 1.04E-01 8.18E-01
5.40E+01 4.41E-03 4.41E-03 9.87E-01 8.89E-03 8.89E-03 2.93E-01 0.00E+00 0.00E+00
1.14E-01 9.41E-02 8.40E-01
6.51E+01 3.87E-03 3.87E-03 9.87E-01 8.89E-03 8.89E-03 3.22E-01 0.00E+00 0.00E+00
1.02E-01 8.62E-02 8.62E-01
7.85E+01 3.38E-03 3.38E-03 9.88E-01 8.89E-03 8.89E-03 3.52E-01 0.00E+00 0.00E+00
9.16E-02 8.02E-02 8.83E-01
9.48E+01 2.82E-03 2.82E-03 9.88E-01 8.90E-03 8.90E-03 3.64E-01 0.00E+00 0.00E+00
1.85E-01 7.65E-02 9.07E-01
1.14E+02 2.30E-03 2.30E-03 9.89E-01 8.90E-03 8.90E-03 3.62E-01 0.00E+00 0.00E+00
1.61E-01 7.57E-02 9.25E-01
1.38E+02 1.87E-03 1.87E-03 9.89E-01 8.91E-03 8.91E-03 3.58E-01 0.00E+00 0.00E+00
1.43E-01 7.66E-02 9.38E-01
1.67E+02 1.39E-03 1.39E-03 9.90E-01 8.91E-03 8.91E-03 3.20E-01 0.00E+00 0.00E+00
1.29E-01 7.81E-02 9.47E-01
2.04E+02 1.01E-03 1.01E-03 9.90E-01 8.92E-03 8.92E-03 2.81E-01 0.00E+00 0.00E+00
1.19E-01 8.04E-02 9.50E-01
2.50E+02 7.17E-04 7.17E-04 9.90E-01 8.92E-03 8.92E-03 2.42E-01 0.00E+00 0.00E+00
1.11E-01 8.29E-02 9.49E-01
3.08E+02 4.99E-04 4.99E-04 9.91E-01 8.92E-03 8.92E-03 2.03E-01 0.00E+00 0.00E+00
1.05E-01 8.53E-02 9.45E-01
3.80E+02 3.39E-04 3.39E-04 9.91E-01 8.92E-03 8.92E-03 1.67E-01 0.00E+00 0.00E+00
9.99E-02 8.73E-02 9.40E-01

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        4.70E+02  2.27E-04  2.27E-04  9.91E-01  8.92E-03  8.92E-03  1.35E-01  0.00E+00  0.00E+00
 9.63E-02  8.89E-02  9.33E-01
        5.81E+02  1.48E-04  1.48E-04  9.91E-01  8.92E-03  8.92E-03  1.07E-01  0.00E+00  0.00E+00
 9.36E-02  9.01E-02  9.24E-01
        7.20E+02  9.58E-05  9.58E-05  9.91E-01  8.92E-03  8.92E-03  8.40E-02  0.00E+00  0.00E+00
 9.17E-02  9.07E-02  9.15E-01
        8.93E+02  6.09E-05  6.09E-05  9.91E-01  8.92E-03  8.92E-03  6.47E-02  0.00E+00  0.00E+00
 9.07E-02  9.08E-02  9.06E-01
        1.11E+03  3.82E-05  3.82E-05  9.91E-01  8.92E-03  8.92E-03  4.92E-02  0.00E+00  0.00E+00
 9.06E-02  9.03E-02  8.95E-01
        1.37E+03  2.37E-05  2.37E-05  9.91E-01  8.92E-03  8.92E-03  3.69E-02  0.00E+00  0.00E+00
 9.14E-02  8.94E-02  8.85E-01
        1.70E+03  1.45E-05  1.45E-05  9.91E-01  8.92E-03  8.92E-03  2.75E-02  0.00E+00  0.00E+00
 9.34E-02  8.80E-02  8.74E-01
        2.10E+03  8.78E-06  8.78E-06  9.91E-01  8.92E-03  8.92E-03  2.02E-02  0.00E+00  0.00E+00
 9.68E-02  8.61E-02  8.63E-01
        2.61E+03  5.46E-06  5.46E-06  9.91E-01  8.92E-03  8.92E-03  1.52E-02  0.00E+00  0.00E+00
 2.28E-02  8.35E-02  8.51E-01
        3.22E+03  3.73E-06  3.73E-06  9.91E-01  8.92E-03  8.92E-03  1.26E-02  0.00E+00  0.00E+00
 2.22E-02  7.98E-02  8.44E-01
        3.97E+03  2.54E-06  2.54E-06  9.91E-01  8.92E-03  8.92E-03  1.04E-02  0.00E+00  0.00E+00
 2.14E-02  7.59E-02  8.35E-01
        4.89E+03  1.72E-06  1.72E-06  9.91E-01  8.92E-03  8.92E-03  8.63E-03  0.00E+00  0.00E+00
 2.05E-02  7.20E-02  8.26E-01
        6.02E+03  1.17E-06  1.17E-06  9.91E-01  8.92E-03  8.92E-03  7.19E-03  0.00E+00  0.00E+00
 1.96E-02  6.80E-02  8.15E-01
        7.40E+03  7.89E-07  7.89E-07  9.91E-01  8.92E-03  8.92E-03  6.04E-03  0.00E+00  0.00E+00
 1.85E-02  6.40E-02  8.03E-01
        9.10E+03  5.33E-07  5.33E-07  9.91E-01  8.92E-03  8.92E-03  5.24E-03  0.00E+00  0.00E+00
 1.73E-02  6.01E-02  7.90E-01
        1.12E+04  3.60E-07  3.60E-07  9.91E-01  8.92E-03  8.92E-03  4.57E-03  0.00E+00  0.00E+00
 1.60E-02  5.61E-02  7.76E-01
        1.37E+04  2.44E-07  2.44E-07  9.91E-01  8.92E-03  8.92E-03  3.94E-03  0.00E+00  0.00E+00
 1.47E-02  5.23E-02  7.60E-01
•          time averaged (tav =   60. s) volume concentration:  concentration contour parameters

          c(x,y,z,t) = cc(x) * (erf(xa)-erf(xb)) * (erf(ya)-erf(yb)) * (exp(-za*za)+exp(-zb*zb))

                 c(x,y,z,t) = concentration (volume fraction) at (x,y,z,t)
                          x = downwind distance (m)
                          y = crosswind horizontal distance (m)
                          z = height (m)
                          t = time (s)

                        erf = error functon             exp = exponential function
                         xa = (x-xc+bx)/(sr2*betax)      za = (z-zc)/(sr2*sig)
                         xb = (x-xc-bx)/(sr2*betax)      zb = (z+zc)/(sr2*sig)
                         ya = (y+b)/(sr2*betac)         sr2 = sqrt(2.0)
                         yb = (y-b)/(sr2*betac)

             x        cc(x)     b(x)    betac(x)    zc(x)    sig(x)               t        xc(t)
   bx(t)   betax(t)
          1.00E+00  0.00E+00  4.02E-02  1.13E-02  1.00E+00  2.58E-02            0.00E+00
1.00E+00  0.00E+00  0.00E+00
          1.02E+00  3.63E-01  4.82E-02  2.84E-02  1.00E+00  3.97E-02            1.42E-04
1.02E+00  1.89E-02  1.54E-04
          1.05E+00  3.39E-01  5.51E-02  4.35E-02  1.00E+00  5.40E-02            4.16E-04
1.05E+00  4.17E-02  3.41E-04
          1.08E+00  3.17E-01  6.18E-02  5.94E-02  1.00E+00  6.93E-02            8.68E-04
1.08E+00  6.93E-02  5.66E-04
          1.11E+00  2.96E-01  6.84E-02  7.68E-02  1.00E+00  8.64E-02            1.58E-03
1.11E+00  1.03E-01  8.39E-04
          1.16E+00  2.76E-01  7.52E-02  9.64E-02  1.00E+00  1.06E-01            2.66E-03
1.16E+00  1.43E-01  1.17E-03
          1.21E+00  2.57E-01  8.23E-02  1.19E-01  1.00E+00  1.28E-01            4.27E-03
1.21E+00  1.92E-01  1.57E-03
          1.28E+00  2.40E-01  8.98E-02  1.44E-01  1.00E+00  1.53E-01            6.65E-03
1.28E+00  2.51E-01  2.05E-03
          1.36E+00  2.24E-01  9.78E-02  1.74E-01  1.00E+00  1.83E-01            1.01E-02
1.36E+00  3.23E-01  2.63E-03
          1.45E+00  2.09E-01  1.06E-01  2.08E-01  1.00E+00  2.17E-01            1.52E-02
1.45E+00  4.09E-01  3.34E-03
          1.57E+00  1.95E-01  1.15E-01  2.47E-01  1.00E+00  2.56E-01            2.24E-02
1.57E+00  5.14E-01  4.19E-03
          1.71E+00  1.82E-01  1.25E-01  2.92E-01  1.00E+00  3.01E-01            3.29E-02
1.71E+00  6.40E-01  5.23E-03
          1.88E+00  1.69E-01  1.34E-01  3.44E-01  1.00E+00  3.52E-01            4.77E-02
1.88E+00  7.93E-01  6.47E-03
          2.08E+00  1.58E-01  1.45E-01  4.03E-01  1.00E+00  4.12E-01            6.89E-02
2.08E+00  9.78E-01  7.98E-03
          2.33E+00  1.47E-01  1.56E-01  4.71E-01  1.00E+00  4.80E-01            9.88E-02
2.33E+00  1.20E+00  9.81E-03
          2.63E+00  1.37E-01  1.68E-01  5.49E-01  1.00E+00  5.57E-01            1.41E-01
2.63E+00  1.47E+00  1.20E-02
          2.99E+00  1.20E-01  1.78E-01  6.22E-01  1.00E+00  6.84E-01            1.99E-01
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2.99E+00 1.80E+00 1.47E-02
3.43E+00 1.02E-01 1.88E-01 7.08E-01 1.00E+00 8.54E-01 2.79E-01
3.43E+00 2.19E+00 1.79E-02
3.96E+00 9.00E-02 1.99E-01 7.99E-01 1.00E+00 1.04E+00 3.88E-01
3.96E+00 2.67E+00 2.18E-02
4.61E+00 8.03E-02 2.09E-01 8.96E-01 1.01E+00 1.23E+00 5.36E-01
4.61E+00 3.25E+00 2.66E-02
5.38E+00 7.25E-02 2.19E-01 1.00E+00 1.01E+00 1.44E+00 7.33E-01
5.38E+00 3.95E+00 3.23E-02
6.32E+00 6.61E-02 2.29E-01 1.11E+00 1.02E+00 1.66E+00 9.96E-01
6.32E+00 4.80E+00 3.92E-02
7.45E+00 6.06E-02 2.38E-01 1.23E+00 1.03E+00 1.89E+00 1.34E+00
7.45E+00 5.82E+00 4.75E-02
8.83E+00 5.61E-02 2.47E-01 1.36E+00 1.04E+00 2.13E+00 1.80E+00
8.83E+00 7.06E+00 5.76E-02
1.05E+01 5.22E-02 2.54E-01 1.50E+00 1.07E+00 2.39E+00 2.39E+00
1.05E+01 8.56E+00 6.99E-02
1.25E+01 4.89E-02 2.61E-01 1.65E+00 1.10E+00 2.65E+00 3.16E+00
1.25E+01 1.04E+01 8.46E-02
1.49E+01 4.61E-02 2.66E-01 1.80E+00 1.16E+00 2.92E+00 4.15E+00
1.49E+01 1.26E+01 1.03E-01
1.79E+01 4.38E-02 2.70E-01 1.96E+00 1.24E+00 3.18E+00 5.40E+00
1.79E+01 1.52E+01 1.24E-01
2.14E+01 4.19E-02 2.74E-01 2.13E+00 1.36E+00 3.42E+00 6.99E+00
2.14E+01 1.84E+01 1.50E-01
2.57E+01 4.04E-02 2.77E-01 2.32E+00 1.53E+00 3.64E+00 9.00E+00
2.57E+01 2.23E+01 1.82E-01
3.09E+01 3.93E-02 2.80E-01 2.53E+00 1.78E+00 3.82E+00 1.15E+01
3.09E+01 2.70E+01 2.20E-01
3.72E+01 3.87E-02 2.82E-01 2.75E+00 2.12E+00 3.96E+00 1.46E+01
3.72E+01 3.26E+01 2.67E-01
4.48E+01 3.88E-02 2.84E-01 2.98E+00 2.60E+00 4.03E+00 1.85E+01
4.48E+01 3.95E+01 3.22E-01
5.40E+01 3.96E-02 2.85E-01 3.24E+00 3.26E+00 4.00E+00 2.32E+01
5.40E+01 4.78E+01 3.90E-01
6.51E+01 4.17E-02 2.85E-01 3.53E+00 4.16E+00 3.86E+00 2.91E+01
6.51E+01 5.78E+01 4.72E-01
7.85E+01 4.59E-02 2.86E-01 3.86E+00 5.36E+00 3.55E+00 3.62E+01
7.85E+01 6.99E+01 5.71E-01
9.48E+01 4.50E-02 2.84E-01 4.22E+00 6.92E+00 3.61E+00 4.48E+01
9.48E+01 8.46E+01 6.91E-01
1.14E+02 4.07E-02 2.81E-01 4.63E+00 8.75E+00 3.95E+00 5.49E+01
1.14E+02 1.02E+02 8.35E-01
1.38E+02 3.72E-02 2.78E-01 5.13E+00 1.09E+01 4.29E+00 6.66E+01
1.38E+02 1.24E+02 1.01E+00
1.67E+02 3.43E-02 2.78E-01 5.84E+00 1.32E+01 4.76E+00 6.70E+01
1.67E+02 1.24E+02 3.14E+01
2.04E+02 3.18E-02 2.77E-01 6.74E+00 1.58E+01 5.28E+00 7.54E+01
2.04E+02 1.24E+02 4.79E+01
2.50E+02 2.94E-02 2.77E-01 7.90E+00 1.84E+01 5.87E+00 8.56E+01
2.50E+02 1.24E+02 6.37E+01
3.08E+02 2.73E-02 2.77E-01 9.37E+00 2.11E+01 6.53E+00 9.79E+01
3.08E+02 1.24E+02 8.02E+01
3.80E+02 2.51E-02 2.77E-01 1.12E+01 2.39E+01 7.29E+00 1.13E+02
3.80E+02 1.24E+02 9.82E+01
4.70E+02 2.30E-02 2.77E-01 1.35E+01 2.66E+01 8.17E+00 1.31E+02
4.70E+02 1.24E+02 1.18E+02
5.81E+02 2.09E-02 2.77E-01 1.63E+01 2.92E+01 9.21E+00 1.53E+02
5.81E+02 1.24E+02 1.42E+02
7.20E+02 1.89E-02 2.77E-01 1.98E+01 3.17E+01 1.04E+01 1.79E+02
7.20E+02 1.24E+02 1.68E+02
8.93E+02 1.68E-02 2.77E-01 2.40E+01 3.41E+01 1.19E+01 2.11E+02
8.93E+02 1.24E+02 1.99E+02
1.11E+03 1.49E-02 2.77E-01 2.91E+01 3.63E+01 1.36E+01 2.50E+02
1.11E+03 1.24E+02 2.36E+02
1.37E+03 1.30E-02 2.77E-01 3.52E+01 3.83E+01 1.57E+01 2.96E+02
1.37E+03 1.24E+02 2.79E+02
1.70E+03 1.13E-02 2.77E-01 4.24E+01 4.01E+01 1.84E+01 3.53E+02
1.70E+03 1.24E+02 3.30E+02
2.10E+03 9.67E-03 2.77E-01 5.10E+01 4.17E+01 2.16E+01 4.21E+02
2.10E+03 1.24E+02 3.91E+02
2.61E+03 8.49E-03 2.77E-01 6.12E+01 4.31E+01 2.48E+01 5.03E+02
2.61E+03 1.24E+02 4.62E+02
3.22E+03 8.09E-03 2.77E-01 7.29E+01 4.45E+01 2.61E+01 6.03E+02
3.22E+03 1.24E+02 5.48E+02
3.97E+03 7.59E-03 2.77E-01 8.64E+01 4.59E+01 2.79E+01 7.24E+02
3.97E+03 1.24E+02 6.50E+02
4.89E+03 7.04E-03 2.77E-01 1.02E+02 4.72E+01 3.02E+01 8.70E+02
4.89E+03 1.24E+02 7.72E+02
6.02E+03 6.47E-03 2.77E-01 1.20E+02 4.86E+01 3.29E+01 1.05E+03
6.02E+03 1.24E+02 9.17E+02
7.40E+03 5.90E-03 2.77E-01 1.40E+02 5.00E+01 3.62E+01 1.26E+03
7.40E+03 1.24E+02 1.09E+03
9.10E+03 5.34E-03 2.77E-01 1.63E+02 5.15E+01 4.00E+01 1.52E+03
9.10E+03 1.24E+02 1.30E+03

1.12E+04 4.83E-03 2.77E-01 1.89E+02 5.30E+01 4.43E+01 1.83E+03 1.12E+04 1.24E+02 1.54E+03
1.37E+04 4.35E-03 2.77E-01 2.18E+02 5.46E+01 4.92E+01 2.21E+03 1.37E+04 1.24E+02 1.83E+03
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time averaged (tav = 60. s) volume concentration: concentration in the z = .00 plane.

downwind distance x (m)	time of max conc (s)	cloud duration (s)	effective half width bbc (m)	average concentration (volume fraction) at (x,y,z) y/bbc= 0.0	y/bbc= 0.5	y/bbc= 1.0	y/bbc= 1.5	y/bbc= 2.0	y/bbc= 2.5
1.00E+00	3.00E+01	6.00E+01	4.47E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1.02E+00	3.00E+01	6.00E+01	6.88E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1.05E+00	3.00E+01	6.00E+01	9.34E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1.08E+00	3.00E+01	6.00E+01	1.20E-01	1.40E-45	1.40E-45	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1.11E+00	3.00E+01	6.00E+01	1.50E-01	1.19E-29	8.30E-30	2.72E-30	4.01E-31	2.53E-32	6.61E-34
1.16E+00	3.00E+01	6.00E+01	1.83E-01	4.76E-20	3.30E-20	1.08E-20	1.61E-21	1.07E-22	3.04E-24
1.21E+00	3.00E+01	6.00E+01	2.21E-01	5.58E-14	3.85E-14	1.26E-14	1.90E-15	1.29E-16	3.90E-18
1.28E+00	3.01E+01	6.00E+01	2.65E-01	5.22E-10	3.60E-10	1.17E-10	1.78E-11	1.23E-12	3.86E-14
1.36E+00	3.01E+01	6.00E+01	3.16E-01	2.38E-07	1.64E-07	5.33E-08	8.12E-09	5.71E-10	1.83E-11
1.45E+00	3.01E+01	6.00E+01	3.75E-01	1.53E-05	1.05E-05	3.42E-06	5.22E-07	3.70E-08	1.21E-09
1.57E+00	3.01E+01	6.00E+01	4.43E-01	2.66E-04	1.83E-04	5.94E-05	9.08E-06	6.48E-07	2.15E-08
1.71E+00	3.02E+01	6.00E+01	5.21E-01	1.90E-03	1.31E-03	4.24E-04	6.49E-05	4.65E-06	1.55E-07
1.88E+00	3.02E+01	6.00E+01	6.10E-01	7.36E-03	5.06E-03	1.64E-03	2.52E-04	1.81E-05	6.08E-07
2.08E+00	3.02E+01	6.00E+01	7.13E-01	1.86E-02	1.28E-02	4.15E-03	6.36E-04	4.58E-05	1.55E-06
2.33E+00	3.03E+01	6.00E+01	8.31E-01	3.48E-02	2.39E-02	7.76E-03	1.19E-03	8.58E-05	2.90E-06
2.63E+00	3.04E+01	6.00E+01	9.65E-01	5.25E-02	3.61E-02	1.17E-02	1.80E-03	1.30E-04	4.40E-06
2.99E+00	3.04E+01	6.00E+01	1.09E+00	7.36E-02	5.06E-02	1.64E-02	2.52E-03	1.82E-04	6.19E-06
3.43E+00	3.05E+01	6.00E+01	1.24E+00	8.65E-02	5.94E-02	1.93E-02	2.96E-03	2.14E-04	7.29E-06
3.96E+00	3.06E+01	6.00E+01	1.40E+00	8.85E-02	6.08E-02	1.97E-02	3.03E-03	2.19E-04	7.47E-06
4.61E+00	3.08E+01	6.00E+01	1.57E+00	8.48E-02	5.83E-02	1.89E-02	2.90E-03	2.10E-04	7.17E-06
5.38E+00	3.10E+01	6.00E+01	1.75E+00	7.85E-02	5.39E-02	1.75E-02	2.68E-03	1.94E-04	6.63E-06
6.32E+00	3.12E+01	6.00E+01	1.94E+00	7.12E-02	4.90E-02	1.59E-02	2.44E-03	1.76E-04	6.04E-06
7.45E+00	3.14E+01	6.00E+01	2.15E+00	6.40E-02	4.40E-02	1.43E-02	2.19E-03	1.59E-04	5.42E-06
8.83E+00	3.17E+01	6.00E+01	2.37E+00	5.71E-02	3.93E-02	1.27E-02	1.95E-03	1.41E-04	4.84E-06
1.05E+01	3.21E+01	6.00E+01	2.61E+00	5.08E-02	3.49E-02	1.13E-02	1.74E-03	1.26E-04	4.30E-06
1.25E+01	3.25E+01	6.00E+01	2.87E+00	4.51E-02	3.10E-02	1.01E-02	1.54E-03	1.12E-04	3.82E-06
1.49E+01	3.30E+01	6.00E+01	3.12E+00	4.00E-02	2.75E-02	8.93E-03	1.37E-03	9.92E-05	3.39E-06
1.79E+01	3.37E+01	6.00E+01	3.40E+00	3.55E-02	2.44E-02	7.93E-03	1.22E-03	8.80E-05	3.02E-06
2.14E+01	3.45E+01	6.00E+01	3.71E+00	3.15E-02	2.17E-02	7.04E-03	1.08E-03	7.82E-05	2.67E-06
2.57E+01	3.54E+01	6.00E+01	4.03E+00	2.80E-02	1.93E-02	6.25E-03	9.58E-04	6.94E-05	2.37E-06
3.09E+01	3.65E+01	6.00E+01	4.38E+00	2.48E-02	1.71E-02	5.54E-03	8.49E-04	6.15E-05	2.10E-06
3.72E+01	3.79E+01	6.00E+01	4.76E+00	2.19E-02	1.50E-02	4.88E-03	7.48E-04	5.42E-05	1.85E-06
4.48E+01	3.96E+01	6.00E+01	5.17E+00	1.89E-02	1.30E-02	4.23E-03	6.48E-04	4.69E-05	1.61E-06
5.40E+01	4.16E+01	6.00E+01	5.62E+00	1.58E-02	1.08E-02	3.51E-03	5.39E-04	3.90E-05	1.33E-06
6.51E+01	4.40E+01	6.00E+01	6.12E+00	1.18E-02	8.14E-03	2.64E-03			

4.05E-04	2.93E-05	1.00E-06						
	7.85E+01	4.69E+01	6.00E+01	6.69E+00		6.78E-03	4.66E-03	1.51E-03
2.32E-04	1.68E-05	5.74E-07						
	9.48E+01	5.05E+01	6.00E+01	7.31E+00		2.99E-03	2.05E-03	6.67E-04
1.02E-04	7.41E-06	2.54E-07						
	1.14E+02	5.48E+01	6.00E+01	8.02E+00		1.30E-03	8.93E-04	2.90E-04
4.44E-05	3.22E-06	1.10E-07						
	1.38E+02	6.00E+01	6.00E+01	8.89E+00		4.87E-04	3.35E-04	1.09E-04
1.67E-05	1.21E-06	4.14E-08						
	1.67E+02	6.70E+01	6.32E+01	1.01E+01		1.79E-04	1.23E-04	3.99E-05
6.12E-06	4.43E-07	1.52E-08						
	2.04E+02	7.54E+01	6.72E+01	1.17E+01		7.16E-05	4.92E-05	1.60E-05
2.45E-06	1.77E-07	6.11E-09						
	2.50E+02	8.56E+01	7.22E+01	1.37E+01		3.16E-05	2.17E-05	7.06E-06
1.08E-06	7.85E-08	2.69E-09						
	3.08E+02	9.79E+01	7.83E+01	1.62E+01		1.61E-05	1.11E-05	3.60E-06
5.52E-07	4.00E-08	1.36E-09						
	3.80E+02	1.13E+02	8.58E+01	1.94E+01		9.77E-06	6.72E-06	2.18E-06
3.34E-07	2.42E-08	8.27E-10						
	4.70E+02	1.31E+02	9.49E+01	2.34E+01		7.09E-06	4.87E-06	1.58E-06
2.43E-07	1.76E-08	6.07E-10						
	5.81E+02	1.53E+02	1.06E+02	2.83E+01		6.08E-06	4.18E-06	1.36E-06
2.08E-07	1.51E-08	5.22E-10						
	7.20E+02	1.79E+02	1.19E+02	3.43E+01		5.96E-06	4.10E-06	1.33E-06
2.04E-07	1.48E-08	5.09E-10						
	8.93E+02	2.11E+02	1.34E+02	4.16E+01		6.41E-06	4.40E-06	1.43E-06
2.19E-07	1.59E-08	5.39E-10						
	1.11E+03	2.50E+02	1.52E+02	5.04E+01		7.20E-06	4.95E-06	1.61E-06
2.46E-07	1.78E-08	6.20E-10						
	1.37E+03	2.96E+02	1.74E+02	6.10E+01		8.10E-06	5.57E-06	1.81E-06
2.77E-07	2.01E-08	6.91E-10						
	1.70E+03	3.53E+02	1.99E+02	7.35E+01		8.80E-06	6.05E-06	1.96E-06
3.01E-07	2.18E-08	7.55E-10						
	2.10E+03	4.21E+02	2.29E+02	8.84E+01		9.00E-06	6.19E-06	2.01E-06
3.08E-07	2.23E-08	7.43E-10						
	2.61E+03	5.03E+02	2.64E+02	1.06E+02		7.93E-06	5.45E-06	1.77E-06
2.71E-07	1.97E-08	6.53E-10						
	3.22E+03	6.03E+02	3.09E+02	1.26E+02		5.72E-06	3.93E-06	1.28E-06
1.96E-07	1.42E-08	4.49E-10						
	3.97E+03	7.24E+02	3.62E+02	1.50E+02		4.25E-06	2.92E-06	9.49E-07
1.46E-07	1.05E-08	3.96E-10						
	4.89E+03	8.70E+02	4.23E+02	1.77E+02		3.20E-06	2.20E-06	7.14E-07
1.09E-07	7.90E-09	2.63E-10						
	6.02E+03	1.05E+03	4.96E+02	2.07E+02		2.41E-06	1.66E-06	5.38E-07
8.25E-08	5.99E-09	2.33E-10						
	7.40E+03	1.26E+03	5.81E+02	2.42E+02		1.81E-06	1.25E-06	4.04E-07
6.20E-08	4.51E-09	1.37E-10						
	9.10E+03	1.52E+03	6.81E+02	2.82E+02		1.35E-06	9.26E-07	3.01E-07
4.61E-08	3.34E-09	1.18E-10						
	1.12E+04	1.83E+03	7.97E+02	3.27E+02		9.90E-07	6.80E-07	2.21E-07
3.39E-08	2.44E-09	1.01E-10						
	1.37E+04	2.21E+03	9.34E+02	3.78E+02		7.18E-07	4.94E-07	1.60E-07
2.46E-08	1.79E-09	4.22E-11						

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time averaged (tav = 60. s) volume concentration: maximum concentration (volume fraction) along centerline.

downwind distance x (m)	height z (m)	maximum concentration c(x,0,z)	time of max conc (s)	cloud duration (s)
1.00E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.02E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.05E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.08E+00	1.00E+00	8.89E-01	3.00E+01	6.00E+01
1.11E+00	1.00E+00	7.41E-01	3.00E+01	6.00E+01
1.16E+00	1.00E+00	6.23E-01	3.00E+01	6.00E+01
1.21E+00	1.00E+00	5.27E-01	3.00E+01	6.00E+01
1.28E+00	1.00E+00	4.48E-01	3.01E+01	6.00E+01
1.36E+00	1.00E+00	3.82E-01	3.01E+01	6.00E+01
1.45E+00	1.00E+00	3.27E-01	3.01E+01	6.00E+01
1.57E+00	1.00E+00	2.80E-01	3.01E+01	6.00E+01
1.71E+00	1.00E+00	2.40E-01	3.02E+01	6.00E+01
1.88E+00	1.00E+00	2.06E-01	3.02E+01	6.00E+01
2.08E+00	1.00E+00	1.77E-01	3.02E+01	6.00E+01
2.33E+00	1.00E+00	1.53E-01	3.03E+01	6.00E+01
2.63E+00	9.97E-01	1.32E-01	3.04E+01	6.00E+01
2.99E+00	9.70E-01	1.09E-01	3.04E+01	6.00E+01
3.43E+00	8.03E-01	9.29E-02	3.05E+01	6.00E+01
3.96E+00	0.00E+00	8.85E-02	3.06E+01	6.00E+01
4.61E+00	0.00E+00	8.48E-02	3.08E+01	6.00E+01
5.38E+00	0.00E+00	7.85E-02	3.10E+01	6.00E+01
6.32E+00	0.00E+00	7.12E-02	3.12E+01	6.00E+01
7.45E+00	0.00E+00	6.40E-02	3.14E+01	6.00E+01

8.83E+00	0.00E+00	5.71E-02	3.17E+01	6.00E+01
1.05E+01	0.00E+00	5.08E-02	3.21E+01	6.00E+01
1.25E+01	0.00E+00	4.51E-02	3.25E+01	6.00E+01
1.49E+01	0.00E+00	4.00E-02	3.30E+01	6.00E+01
1.79E+01	0.00E+00	3.55E-02	3.37E+01	6.00E+01
2.14E+01	0.00E+00	3.15E-02	3.45E+01	6.00E+01
2.57E+01	0.00E+00	2.80E-02	3.54E+01	6.00E+01
3.09E+01	0.00E+00	2.48E-02	3.65E+01	6.00E+01
3.72E+01	0.00E+00	2.19E-02	3.79E+01	6.00E+01
4.48E+01	0.00E+00	1.89E-02	3.96E+01	6.00E+01
5.40E+01	0.00E+00	1.58E-02	4.16E+01	6.00E+01
6.51E+01	2.55E+00	1.20E-02	4.40E+01	6.00E+01
7.85E+01	5.24E+00	1.07E-02	4.69E+01	6.00E+01
9.48E+01	6.91E+00	9.38E-03	5.05E+01	6.00E+01
1.14E+02	8.75E+00	7.53E-03	5.48E+01	6.00E+01
1.38E+02	1.09E+01	6.01E-03	6.00E+01	6.00E+01
1.67E+02	1.32E+01	4.22E-03	6.70E+01	6.32E+01
2.04E+02	1.58E+01	3.05E-03	7.54E+01	6.72E+01
2.50E+02	1.84E+01	2.18E-03	8.56E+01	7.22E+01
3.08E+02	2.11E+01	1.53E-03	9.79E+01	7.83E+01
3.80E+02	2.39E+01	1.05E-03	1.13E+02	8.58E+01
4.70E+02	2.66E+01	7.10E-04	1.31E+02	9.49E+01
5.81E+02	2.92E+01	4.71E-04	1.53E+02	1.06E+02
7.20E+02	3.17E+01	3.07E-04	1.79E+02	1.19E+02
8.93E+02	3.41E+01	1.97E-04	2.11E+02	1.34E+02
1.11E+03	3.63E+01	1.24E-04	2.50E+02	1.52E+02
1.37E+03	3.83E+01	7.74E-05	2.96E+02	1.74E+02
1.70E+03	4.01E+01	4.76E-05	3.53E+02	1.99E+02
2.10E+03	4.16E+01	2.90E-05	4.21E+02	2.29E+02
2.61E+03	4.29E+01	1.81E-05	5.03E+02	2.64E+02
3.22E+03	4.42E+01	1.23E-05	6.03E+02	3.09E+02
3.97E+03	4.54E+01	8.24E-06	7.24E+02	3.62E+02
4.89E+03	4.65E+01	5.49E-06	8.70E+02	4.23E+02
6.02E+03	4.73E+01	3.64E-06	1.05E+03	4.96E+02
7.40E+03	4.74E+01	2.41E-06	1.26E+03	5.81E+02
9.10E+03	4.66E+01	1.61E-06	1.52E+03	6.81E+02
1.12E+04	4.40E+01	1.08E-06	1.83E+03	7.97E+02
1.37E+04	3.78E+01	7.41E-07	2.21E+03	9.34E+02

•(10U•&l0O•&k2S•&l6D•

Scenario 6
Hazard Footprints

Met Scenario					c(ppm) ÄÄ 21000.0					c(ppm) ÄÄ 10500.0				
u (m/s)	temp (øK)	rh (%)	stb	avt (s)	length (m)	width (m)	w_dist (m)	area (m2)	fmass (kg)	length (m)	width (m)	w_dist (m)	area (m2)	fmass (kg)
4.0	293.0	60.	4	60.	2.66E+01	3.67E+00	1.49E+01	7.33E+01	1.29E+01	4.48E+01	6.06E+00	2.57E+01	1.98E+02	2.38E+01
2.0	293.0	60.	6	60.	3.87E+01	6.72E+00	2.57E+01	1.85E+02	3.36E+01	7.32E+01	1.41E+01	4.48E+01	7.10E+02	7.32E+01
Composite Maximum					3.87E+01	6.72E+00	2.57E+01	1.85E+02	3.36E+01	7.32E+01	1.41E+01	4.48E+01	7.10E+02	7.32E+01

Scenario 6

```
problem input

idspl =         2
ncalc =         1
wms   =   .044000
cps   =   1678.00
tbp   =    231.10
cmed0 =       .00
dhe   =   425740.
cpsl  =   2520.00
rhosl =    500.50
spb   =     -1.00
spc   =       .00
ts    =    270.00
qs    =      4.47
as    =       .03
tsd   =       60.
qtis  =       .00
hs    =      1.00
tav   =     60.00
xffm  =   9000.00
zp(1) =       .00
zp(2) =       .00
zp(3) =       .00
zp(4) =       .00
z0    =   .300000
za    =      2.00
ua    =      4.00
ta    =    293.00
rh    =     60.00
stab  =      4.00
```

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```
release gas properties

molecular weight of source gas (kg)              - wms  =  4.4000E-02
vapor heat capacity, const. p.  (j/kg-k)         - cps  =  1.6780E+03
temperature of source gas (k)                    - ts   =  2.7000E+02
density of source gas (kg/m3)                    - rhos =  1.9860E+00
boiling point temperature                        - tbp  =  2.3110E+02
liquid mass fraction                             - cmed0=  0.0000E+00
liquid heat capacity (j/kg-k)                    - cpsl =  2.5200E+03
heat of vaporization (j/kg)                      - dhe  =  4.2574E+05
liquid source density (kg/m3)                    - rhosl=  5.0050E+02
saturation pressure constant                     - spa  =  9.7492E+00
saturation pressure constant (k)                 - spb  =  2.2531E+03
saturation pressure constant (k)                 - spc  =  0.0000E+00


spill characteristics

spill type                                       - idspl=          2
mass source rate (kg/s)                          - qs   =  4.4700E+00
continuous source duration (s)                   - tsd  =  6.0000E+01
continuous source mass (kg)                      - qtcs =  2.6820E+02
instantaneous source mass (kg)                   - qtis =  0.0000E+00
source area (m2)                                 - as   =  3.3000E-02
vertical vapor velocity (m/s)                    - ws   =  0.0000E+00
source half width (m)                            - bs   =  9.0830E-02
source height (m)                                - hs   =  1.0000E+00
horizontal vapor velocity (m/s)                  - us   =  6.8205E+01


field parameters

concentration averaging time (s)                 - tav  =  6.0000E+01
mixing layer height (m)                          - hmx  =  1.0400E+03
maximum downwind distance (m)                    - xffm =  9.0000E+03
concentration measurement height (m)             - zp(1)=  0.0000E+00
                                                 - zp(2)=  0.0000E+00
                                                 - zp(3)=  0.0000E+00
                                                 - zp(4)=  0.0000E+00


ambient meteorological properties

molecular weight of ambient air (kg)            - wmae  =  2.8804E-02
heat capacity of ambient air at const p. (j/kg-k)- cpaa  =  1.0134E+03
```

```
density of ambient air (kg/m3)                    - rhoa  =  1.1980E+00
ambient measurement height (m)                    - za    =  2.0000E+00
ambient atmospheric pressure (pa=n/m2=j/m3)       - pa    =  1.0133E+05
ambient wind speed (m/s)                          - ua    =  4.0000E+00
ambient temperature (k)                           - ta    =  2.9300E+02
relative humidity (percent)                       - rh    =  6.0000E+01
ambient friction velocity (m/s)                   - uastr =  8.6521E-01
atmospheric stability class value                 - stab  =  4.0000E+00
inverse monin-obukhov length (1/m)                - ala   =  0.0000E+00
surface roughness height (m)                      - z0    =  3.0000E-01


additional parameters

sub-step multiplier                               - ncalc =           1
number of calculational sub-steps                 - nssm  =           3
acceleration of gravity (m/s2)                    - grav  =  9.8067E+00
gas constant (j/mol- k)                           - rr    =  8.3143E+00
von karman constant                               - xk    =  4.1000E-01
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instantaneous spatially averaged cloud parameters

            x         zc         h         bb         b         bbx       bx        cv        rho        t
      u         ua
         1.00E+00  1.00E+00  1.82E-01  9.08E-02  8.17E-02  0.00E+00  0.00E+00  1.00E+00  1.99E+00
2.70E+02  6.82E+01  1.40E+00
         1.02E+00  1.00E+00  1.93E-01  9.64E-02  8.47E-02  2.37E-02  2.37E-02  9.33E-01  1.94E+00
2.71E+02  6.50E+01  1.41E+00
         1.05E+00  1.00E+00  2.07E-01  1.04E-01  8.83E-02  5.23E-02  5.23E-02  8.59E-01  1.88E+00
2.71E+02  6.14E+01  1.42E+00
         1.08E+00  1.00E+00  2.25E-01  1.13E-01  9.26E-02  8.69E-02  8.69E-02  7.81E-01  1.82E+00
2.72E+02  5.73E+01  1.43E+00
         1.11E+00  1.00E+00  2.48E-01  1.24E-01  9.79E-02  1.29E-01  1.29E-01  7.01E-01  1.76E+00
2.73E+02  5.29E+01  1.44E+00
         1.16E+00  1.00E+00  2.77E-01  1.38E-01  1.04E-01  1.79E-01  1.79E-01  6.20E-01  1.70E+00
2.74E+02  4.82E+01  1.46E+00
         1.21E+00  1.00E+00  3.13E-01  1.56E-01  1.11E-01  2.41E-01  2.40E-01  5.42E-01  1.64E+00
2.76E+02  4.34E+01  1.48E+00
         1.28E+00  1.00E+00  3.58E-01  1.79E-01  1.20E-01  3.15E-01  3.14E-01  4.68E-01  1.58E+00
2.77E+02  3.85E+01  1.51E+00
         1.36E+00  1.00E+00  4.15E-01  2.08E-01  1.30E-01  4.04E-01  4.04E-01  3.99E-01  1.53E+00
2.79E+02  3.37E+01  1.54E+00
         1.45E+00  1.00E+00  4.86E-01  2.43E-01  1.42E-01  5.12E-01  5.12E-01  3.37E-01  1.48E+00
2.80E+02  2.93E+01  1.58E+00
         1.57E+00  1.00E+00  5.74E-01  2.87E-01  1.55E-01  6.43E-01  6.43E-01  2.83E-01  1.43E+00
2.82E+02  2.52E+01  1.63E+00
         1.71E+00  1.00E+00  6.80E-01  3.40E-01  1.70E-01  8.02E-01  8.01E-01  2.37E-01  1.40E+00
2.83E+02  2.16E+01  1.69E+00
         1.88E+00  9.99E-01  8.09E-01  4.04E-01  1.85E-01  9.93E-01  9.93E-01  1.97E-01  1.36E+00
2.84E+02  1.84E+01  1.76E+00
         2.08E+00  9.99E-01  9.61E-01  4.80E-01  2.02E-01  1.22E+00  1.22E+00  1.64E-01  1.34E+00
2.85E+02  1.57E+01  1.84E+00
         2.33E+00  9.98E-01  1.14E+00  5.70E-01  2.20E-01  1.50E+00  1.50E+00  1.36E-01  1.31E+00
2.86E+02  1.35E+01  1.93E+00
         2.63E+00  9.97E-01  1.35E+00  6.74E-01  2.39E-01  1.84E+00  1.84E+00  1.14E-01  1.29E+00
2.87E+02  1.16E+01  2.03E+00
         2.99E+00  9.95E-01  1.59E+00  7.94E-01  2.57E-01  2.25E+00  2.25E+00  9.46E-02  1.28E+00
2.88E+02  1.01E+01  2.14E+00
         3.43E+00  9.91E-01  1.86E+00  9.29E-01  2.75E-01  2.75E+00  2.75E+00  7.89E-02  1.27E+00
2.89E+02  8.83E+00  2.25E+00
         3.96E+00  9.85E-01  2.18E+00  1.09E+00  2.95E-01  3.35E+00  3.35E+00  6.58E-02  1.25E+00
2.90E+02  7.76E+00  2.46E+00
         4.61E+00  9.76E-01  2.51E+00  1.26E+00  3.16E-01  4.07E+00  4.07E+00  5.52E-02  1.24E+00
2.90E+02  6.94E+00  2.72E+00
         5.38E+00  9.63E-01  2.85E+00  1.42E+00  3.35E-01  4.95E+00  4.95E+00  4.70E-02  1.24E+00
2.91E+02  6.36E+00  2.94E+00
         6.32E+00  9.44E-01  3.18E+00  1.59E+00  3.53E-01  6.01E+00  6.01E+00  4.03E-02  1.23E+00
2.91E+02  5.95E+00  3.14E+00
         7.45E+00  9.19E-01  3.53E+00  1.76E+00  3.72E-01  7.29E+00  7.29E+00  3.47E-02  1.23E+00
2.91E+02  5.63E+00  3.33E+00
         8.83E+00  8.86E-01  3.86E+00  1.95E+00  3.93E-01  8.84E+00  8.84E+00  2.99E-02  1.22E+00
2.92E+02  5.39E+00  3.50E+00
         1.05E+01  8.45E-01  4.18E+00  2.18E+00  4.18E-01  1.07E+01  1.07E+01  2.57E-02  1.22E+00
2.92E+02  5.20E+00  3.65E+00
         1.25E+01  7.96E-01  4.48E+00  2.46E+00  4.48E-01  1.30E+01  1.30E+01  2.19E-02  1.22E+00
2.92E+02  5.04E+00  3.78E+00
         1.49E+01  7.42E-01  4.77E+00  2.79E+00  4.85E-01  1.57E+01  1.57E+01  1.86E-02  1.21E+00
2.92E+02  4.91E+00  3.90E+00
         1.79E+01  6.85E-01  5.06E+00  3.20E+00  5.28E-01  1.90E+01  1.90E+01  1.56E-02  1.21E+00
```

2.92E+02 4.82E+00 4.02E+00
2.14E+01 6.28E-01 5.36E+00 3.70E+00 5.78E-01 2.31E+01 2.31E+01 1.29E-02 1.21E+00
2.92E+02 4.75E+00 4.13E+00
2.57E+01 5.73E-01 5.69E+00 4.29E+00 6.34E-01 2.79E+01 2.79E+01 1.06E-02 1.21E+00
2.93E+02 4.72E+00 4.24E+00
3.09E+01 5.23E-01 6.07E+00 4.99E+00 6.96E-01 3.38E+01 3.38E+01 8.53E-03 1.20E+00
2.93E+02 4.73E+00 4.37E+00
3.72E+01 4.78E-01 6.52E+00 5.80E+00 7.60E-01 4.09E+01 4.09E+01 6.77E-03 1.20E+00
2.93E+02 4.77E+00 4.51E+00
4.48E+01 4.39E-01 7.06E+00 6.71E+00 8.25E-01 4.95E+01 4.94E+01 5.30E-03 1.20E+00
2.93E+02 4.86E+00 4.67E+00
5.40E+01 4.06E-01 7.73E+00 7.73E+00 8.89E-01 5.98E+01 5.98E+01 4.10E-03 1.20E+00
2.93E+02 4.98E+00 4.85E+00
6.51E+01 3.79E-01 8.53E+00 8.86E+00 9.48E-01 7.24E+01 7.24E+01 3.14E-03 1.20E+00
2.93E+02 5.14E+00 5.05E+00
7.85E+01 3.55E-01 9.50E+00 1.01E+01 1.00E+00 8.76E+01 8.76E+01 2.39E-03 1.20E+00
2.93E+02 5.32E+00 5.26E+00
9.48E+01 3.36E-01 1.06E+01 1.15E+01 1.05E+00 1.06E+02 1.06E+02 1.81E-03 1.20E+00
2.93E+02 5.53E+00 5.49E+00
1.14E+02 3.20E-01 1.20E+01 1.30E+01 1.09E+00 1.28E+02 1.28E+02 1.36E-03 1.20E+00
2.93E+02 5.76E+00 5.73E+00
1.38E+02 3.06E-01 1.35E+01 1.48E+01 1.13E+00 1.55E+02 1.55E+02 1.02E-03 1.20E+00
2.93E+02 6.00E+00 5.98E+00
1.67E+02 2.95E-01 1.54E+01 1.68E+01 1.17E+00 1.87E+02 1.87E+02 7.58E-04 1.20E+00
2.93E+02 6.25E+00 6.24E+00
2.03E+02 2.85E-01 1.81E+01 1.92E+01 1.21E+00 1.99E+02 1.87E+02 5.29E-04 1.20E+00
2.93E+02 6.57E+00 6.57E+00
2.48E+02 2.77E-01 2.13E+01 2.22E+01 1.24E+00 2.13E+02 1.88E+02 3.64E-04 1.20E+00
2.93E+02 6.91E+00 6.90E+00
3.06E+02 2.71E-01 2.51E+01 2.57E+01 1.27E+00 2.30E+02 1.88E+02 2.46E-04 1.20E+00
2.93E+02 7.24E+00 7.24E+00
3.79E+02 2.66E-01 2.97E+01 3.00E+01 1.29E+00 2.51E+02 1.88E+02 1.64E-04 1.20E+00
2.93E+02 7.58E+00 7.58E+00
4.71E+02 2.62E-01 3.51E+01 3.52E+01 1.31E+00 2.76E+02 1.88E+02 1.08E-04 1.20E+00
2.93E+02 7.93E+00 7.93E+00
5.88E+02 2.59E-01 4.14E+01 4.14E+01 1.33E+00 3.07E+02 1.88E+02 6.95E-05 1.20E+00
2.93E+02 8.27E+00 8.27E+00
7.35E+02 2.56E-01 4.90E+01 4.90E+01 1.34E+00 3.44E+02 1.88E+02 4.44E-05 1.20E+00
2.93E+02 8.61E+00 8.61E+00
9.20E+02 2.54E-01 5.79E+01 5.81E+01 1.35E+00 3.89E+02 1.88E+02 2.80E-05 1.20E+00
2.93E+02 8.95E+00 8.95E+00
1.15E+03 2.53E-01 6.83E+01 6.92E+01 1.36E+00 4.43E+02 1.88E+02 1.75E-05 1.20E+00
2.93E+02 9.29E+00 9.29E+00
1.44E+03 2.52E-01 8.05E+01 8.24E+01 1.36E+00 5.09E+02 1.88E+02 1.09E-05 1.20E+00
2.93E+02 9.62E+00 9.62E+00
1.81E+03 2.51E-01 9.47E+01 9.83E+01 1.37E+00 5.88E+02 1.88E+02 6.69E-06 1.20E+00
2.93E+02 9.95E+00 9.95E+00
2.26E+03 2.50E-01 1.11E+02 1.17E+02 1.37E+00 6.83E+02 1.88E+02 4.11E-06 1.20E+00
2.93E+02 1.03E+01 1.03E+01
2.83E+03 2.50E-01 1.31E+02 1.39E+02 1.37E+00 7.98E+02 1.88E+02 2.52E-06 1.20E+00
2.93E+02 1.06E+01 1.06E+01
3.54E+03 2.49E-01 1.53E+02 1.65E+02 1.38E+00 9.36E+02 1.88E+02 1.55E-06 1.20E+00
2.93E+02 1.09E+01 1.09E+01
4.42E+03 2.49E-01 1.79E+02 1.96E+02 1.38E+00 1.10E+03 1.88E+02 9.50E-07 1.20E+00
2.93E+02 1.12E+01 1.12E+01
5.52E+03 2.49E-01 2.08E+02 2.31E+02 1.38E+00 1.30E+03 1.88E+02 5.85E-07 1.20E+00
2.93E+02 1.15E+01 1.15E+01
6.87E+03 2.49E-01 2.42E+02 2.72E+02 1.38E+00 1.54E+03 1.88E+02 3.62E-07 1.20E+00
2.93E+02 1.18E+01 1.18E+01
8.55E+03 2.49E-01 2.81E+02 3.18E+02 1.38E+00 1.83E+03 1.88E+02 2.25E-07 1.20E+00
2.93E+02 1.20E+01 1.20E+01
1.06E+04 2.49E-01 3.24E+02 3.71E+02 1.38E+00 2.17E+03 1.88E+02 1.41E-07 1.20E+00
2.93E+02 1.23E+01 1.23E+01
1.32E+04 2.49E-01 3.73E+02 4.30E+02 1.38E+00 2.58E+03 1.88E+02 8.87E-08 1.20E+00
2.93E+02 1.25E+01 1.25E+01
1.64E+04 2.43E-01 4.26E+02 4.98E+02 1.38E+00 3.06E+03 1.88E+02 5.64E-08 1.20E+00
2.93E+02 1.28E+01 1.28E+01
•

x cm cmv cmda cmw cmwv wc vg ug w
v vx
1.00E+00 1.00E+00 1.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
7.11E+00 3.51E+00 0.00E+00
1.02E+00 9.55E-01 9.55E-01 4.45E-02 4.01E-04 4.01E-04 -1.17E-03 0.00E+00 0.00E+00
1.93E+01 3.43E+00 9.80E-01
1.05E+00 9.03E-01 9.03E-01 9.62E-02 8.66E-04 8.66E-04 -2.53E-03 0.00E+00 0.00E+00
1.86E+01 3.32E+00 9.81E-01
1.08E+00 8.45E-01 8.45E-01 1.54E-01 1.38E-03 1.38E-03 -4.09E-03 0.00E+00 0.00E+00
1.78E+01 3.20E+00 9.81E-01
1.11E+00 7.82E-01 7.82E-01 2.16E-01 1.95E-03 1.95E-03 -5.88E-03 0.00E+00 0.00E+00
1.69E+01 3.05E+00 9.82E-01

	1.16E+00	7.14E-01	7.14E-01	2.83E-01	2.55E-03	2.55E-03	-7.92E-03	0.00E+00	0.00E+00	1.57E+01	2.87E+00	9.83E-01
	1.21E+00	6.44E-01	6.44E-01	3.53E-01	3.18E-03	3.18E-03	-1.02E-02	0.00E+00	0.00E+00	1.45E+01	2.67E+00	9.84E-01
	1.28E+00	5.73E-01	5.73E-01	4.23E-01	3.81E-03	3.81E-03	-1.29E-02	0.00E+00	0.00E+00	1.31E+01	2.44E+00	9.85E-01
	1.36E+00	5.03E-01	5.03E-01	4.92E-01	4.43E-03	4.43E-03	-1.59E-02	0.00E+00	0.00E+00	1.16E+01	2.20E+00	9.87E-01
	1.45E+00	4.37E-01	4.37E-01	5.58E-01	5.02E-03	5.02E-03	-1.95E-02	0.00E+00	0.00E+00	1.01E+01	1.95E+00	9.89E-01
	1.57E+00	3.76E-01	3.76E-01	6.18E-01	5.57E-03	5.57E-03	-2.36E-02	0.00E+00	0.00E+00	8.70E+00	1.71E+00	9.92E-01
	1.71E+00	3.21E-01	3.21E-01	6.73E-01	6.06E-03	6.06E-03	-2.85E-02	0.00E+00	0.00E+00	7.37E+00	1.48E+00	9.95E-01
	1.88E+00	2.73E-01	2.73E-01	7.21E-01	6.49E-03	6.49E-03	-3.43E-02	0.00E+00	0.00E+00	6.19E+00	1.27E+00	9.98E-01
	2.08E+00	2.30E-01	2.30E-01	7.63E-01	6.87E-03	6.87E-03	-4.12E-02	0.00E+00	0.00E+00	5.16E+00	1.08E+00	1.00E+00
	2.33E+00	1.94E-01	1.94E-01	7.98E-01	7.19E-03	7.19E-03	-4.95E-02	0.00E+00	0.00E+00	4.29E+00	9.17E-01	1.01E+00
	2.63E+00	1.64E-01	1.64E-01	8.29E-01	7.46E-03	7.46E-03	-5.92E-02	0.00E+00	0.00E+00	3.57E+00	7.73E-01	1.01E+00
	2.99E+00	1.38E-01	1.38E-01	8.55E-01	7.70E-03	7.70E-03	-7.06E-02	0.00E+00	0.00E+00	2.99E+00	6.50E-01	1.02E+00
	3.43E+00	1.16E-01	1.16E-01	8.76E-01	7.89E-03	7.89E-03	-8.38E-02	0.00E+00	0.00E+00	2.53E+00	5.46E-01	1.02E+00
	3.96E+00	9.71E-02	9.71E-02	8.95E-01	8.06E-03	8.06E-03	-9.82E-02	1.08E-01	0.00E+00	2.24E+00	4.47E-01	1.03E+00
	4.61E+00	8.20E-02	8.20E-02	9.10E-01	8.19E-03	8.19E-03	-1.09E-01	1.40E-01	0.00E+00	1.68E+00	3.64E-01	1.05E+00
	5.38E+00	7.00E-02	7.00E-02	9.22E-01	8.30E-03	8.30E-03	-1.18E-01	1.75E-01	0.00E+00	1.34E+00	3.04E-01	1.06E+00
	6.32E+00	6.02E-02	6.02E-02	9.31E-01	8.39E-03	8.39E-03	-1.26E-01	2.12E-01	0.00E+00	1.10E+00	2.58E-01	1.07E+00
	7.45E+00	5.20E-02	5.20E-02	9.40E-01	8.46E-03	8.46E-03	-1.31E-01	2.52E-01	0.00E+00	9.34E-01	2.23E-01	1.08E+00
	8.83E+00	4.49E-02	4.49E-02	9.47E-01	8.52E-03	8.52E-03	-1.32E-01	2.92E-01	0.00E+00	8.12E-01	1.97E-01	1.08E+00
	1.05E+01	3.87E-02	3.87E-02	9.53E-01	8.58E-03	8.58E-03	-1.28E-01	3.30E-01	0.00E+00	7.22E-01	1.77E-01	1.09E+00
	1.25E+01	3.31E-02	3.31E-02	9.58E-01	8.63E-03	8.63E-03	-1.18E-01	3.63E-01	0.00E+00	6.54E-01	1.63E-01	1.10E+00
	1.49E+01	2.82E-02	2.82E-02	9.63E-01	8.67E-03	8.67E-03	-1.03E-01	3.88E-01	0.00E+00	6.02E-01	1.53E-01	1.10E+00
	1.79E+01	2.37E-02	2.37E-02	9.68E-01	8.71E-03	8.71E-03	-8.62E-02	4.03E-01	0.00E+00	5.60E-01	1.46E-01	1.10E+00
	2.14E+01	1.96E-02	1.96E-02	9.72E-01	8.75E-03	8.75E-03	-6.89E-02	4.06E-01	0.00E+00	5.27E-01	1.43E-01	1.11E+00
	2.57E+01	1.61E-02	1.61E-02	9.75E-01	8.78E-03	8.78E-03	-5.30E-02	3.97E-01	0.00E+00	4.99E-01	1.42E-01	1.11E+00
	3.09E+01	1.30E-02	1.30E-02	9.78E-01	8.81E-03	8.81E-03	-3.96E-02	3.78E-01	0.00E+00	4.76E-01	1.43E-01	1.12E+00
	3.72E+01	1.03E-02	1.03E-02	9.81E-01	8.83E-03	8.83E-03	-2.89E-02	3.50E-01	0.00E+00	4.56E-01	1.46E-01	1.12E+00
	4.48E+01	8.07E-03	8.07E-03	9.83E-01	8.85E-03	8.85E-03	-2.08E-02	3.18E-01	0.00E+00	4.38E-01	1.49E-01	1.13E+00
	5.40E+01	6.25E-03	6.25E-03	9.85E-01	8.87E-03	8.87E-03	-1.49E-02	2.84E-01	0.00E+00	4.22E-01	1.54E-01	1.14E+00
	6.51E+01	4.79E-03	4.79E-03	9.86E-01	8.88E-03	8.88E-03	-1.07E-02	2.50E-01	0.00E+00	4.07E-01	1.59E-01	1.15E+00
	7.85E+01	3.65E-03	3.65E-03	9.87E-01	8.89E-03	8.89E-03	-7.64E-03	2.17E-01	0.00E+00	3.93E-01	1.65E-01	1.16E+00
	9.48E+01	2.76E-03	2.76E-03	9.88E-01	8.90E-03	8.90E-03	-5.49E-03	1.88E-01	0.00E+00	3.80E-01	1.72E-01	1.17E+00
	1.14E+02	2.07E-03	2.07E-03	9.89E-01	8.91E-03	8.91E-03	-3.96E-03	1.61E-01	0.00E+00	3.67E-01	1.78E-01	1.18E+00
	1.38E+02	1.55E-03	1.55E-03	9.90E-01	8.91E-03	8.91E-03	-2.86E-03	1.38E-01	0.00E+00	3.55E-01	1.85E-01	1.19E+00
	1.67E+02	1.16E-03	1.16E-03	9.90E-01	8.91E-03	8.91E-03	-2.07E-03	1.18E-01	1.06E-02	3.43E-01	1.92E-01	1.20E+00
	2.03E+02	8.08E-04	8.08E-04	9.90E-01	8.92E-03	8.92E-03	-1.42E-03	9.49E-02	8.54E-03	3.29E-01	2.00E-01	1.20E+00
	2.48E+02	5.56E-04	5.56E-04	9.91E-01	8.92E-03	8.92E-03	-9.56E-04	7.58E-02	6.94E-03	3.16E-01	2.08E-01	1.21E+00
	3.06E+02	3.76E-04	3.76E-04	9.91E-01	8.92E-03	8.92E-03	-6.39E-04	6.01E-02	5.64E-03	3.04E-01	2.16E-01	1.22E+00
	3.79E+02	2.50E-04	2.50E-04	9.91E-01	8.92E-03	8.92E-03	-4.23E-04	4.71E-02	4.59E-03	2.92E-01	2.23E-01	1.22E+00
	4.71E+02	1.64E-04	1.64E-04	9.91E-01	8.92E-03	8.92E-03	-2.76E-04	3.66E-02	3.71E-03	2.81E-01	2.29E-01	1.23E+00
	5.88E+02	1.06E-04	1.06E-04	9.91E-01	8.92E-03	8.92E-03	-1.78E-04	2.81E-02	2.98E-03

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2.70E-01  2.34E-01  1.23E+00
         7.35E+02  6.78E-05  6.78E-05  9.91E-01  8.92E-03  8.92E-03 -1.14E-04  2.14E-02  2.38E-03
2.59E-01  2.39E-01  1.23E+00
         9.20E+02  4.28E-05  4.28E-05  9.91E-01  8.92E-03  8.92E-03 -7.15E-05  1.61E-02  1.88E-03
2.49E-01  2.41E-01  1.23E+00
         1.15E+03  2.67E-05  2.67E-05  9.91E-01  8.92E-03  8.92E-03 -4.46E-05  1.20E-02  1.47E-03
2.40E-01  2.43E-01  1.23E+00
         1.44E+03  1.66E-05  1.66E-05  9.91E-01  8.92E-03  8.92E-03 -2.76E-05  8.87E-03  1.14E-03
2.30E-01  2.42E-01  1.23E+00
         1.81E+03  1.02E-05  1.02E-05  9.91E-01  8.92E-03  8.92E-03 -1.70E-05  6.53E-03  8.78E-04
2.21E-01  2.40E-01  1.22E+00
         2.26E+03  6.28E-06  6.28E-06  9.91E-01  8.92E-03  8.92E-03 -1.04E-05  4.77E-03  6.68E-04
2.11E-01  2.36E-01  1.22E+00
         2.83E+03  3.85E-06  3.85E-06  9.91E-01  8.92E-03  8.92E-03 -6.42E-06  3.49E-03  5.08E-04
2.02E-01  2.30E-01  1.21E+00
         3.54E+03  2.36E-06  2.36E-06  9.91E-01  8.92E-03  8.92E-03 -3.91E-06  2.52E-03  3.79E-04
1.93E-01  2.23E-01  1.21E+00
         4.42E+03  1.45E-06  1.45E-06  9.91E-01  8.92E-03  8.92E-03 -2.37E-06  1.81E-03  2.79E-04
1.83E-01  2.15E-01  1.20E+00
         5.52E+03  8.93E-07  8.93E-07  9.91E-01  8.92E-03  8.92E-03 -1.44E-06  1.30E-03  2.05E-04
1.73E-01  2.05E-01  1.19E+00
         6.87E+03  5.52E-07  5.52E-07  9.91E-01  8.92E-03  8.92E-03 -8.83E-07  9.36E-04  1.50E-04
1.63E-01  1.95E-01  1.18E+00
         8.55E+03  3.43E-07  3.43E-07  9.91E-01  8.92E-03  8.92E-03 -6.04E-07  7.50E-04  1.23E-04
1.53E-01  1.84E-01  1.16E+00
         1.06E+04  2.15E-07  2.15E-07  9.91E-01  8.92E-03  8.92E-03 -4.05E-07  5.87E-04  9.70E-05
1.42E-01  1.73E-01  1.15E+00
         1.32E+04  1.36E-07  1.36E-07  9.91E-01  8.92E-03  8.92E-03 -2.85E-07  4.80E-04  7.98E-05
1.31E-01  1.61E-01  1.13E+00
         1.64E+04  8.62E-08  8.62E-08  9.91E-01  8.92E-03  8.92E-03 -6.53E-08  1.30E-04  2.13E-05
1.19E-01  1.50E-01  1.11E+00
•          time averaged (tav =   60. s) volume concentration:  concentration contour parameters

          c(x,y,z,t) = cc(x) * (erf(xa)-erf(xb)) * (erf(ya)-erf(yb)) * (exp(-za*za)+exp(-zb*zb))

                 c(x,y,z,t) = concentration (volume fraction) at (x,y,z,t)
                          x = downwind distance (m)
                          y = crosswind horizontal distance (m)
                          z = height (m)
                          t = time (s)

                        erf = error functon             exp = exponential function
                         xa = (x-xc+bx)/(sr2*betax)      za = (z-zc)/(sr2*sig)
                         xb = (x-xc-bx)/(sr2*betax)      zb = (z+zc)/(sr2*sig)
                         ya = (y+b)/(sr2*betac)         sr2 = sqrt(2.0)
                         yb = (y-b)/(sr2*betac)

             x        cc(x)     b(x)    betac(x)    zc(x)    sig(x)               t        xc(t)
bx(t)   betax(t)
          1.00E+00  0.00E+00  8.17E-02  2.29E-02  1.00E+00  5.24E-02            0.00E+00  1.00E+00
0.00E+00  0.00E+00
          1.02E+00  3.67E-01  8.47E-02  2.66E-02  1.00E+00  5.57E-02            5.96E-04  1.02E+00
2.37E-02  1.93E-04
          1.05E+00  3.48E-01  8.83E-02  3.12E-02  1.00E+00  5.98E-02            1.40E-03  1.05E+00
5.23E-02  4.27E-04
          1.08E+00  3.28E-01  9.26E-02  3.69E-02  1.00E+00  6.50E-02            2.43E-03  1.08E+00
8.69E-02  7.09E-04
          1.11E+00  3.07E-01  9.79E-02  4.39E-02  1.00E+00  7.16E-02            3.78E-03  1.11E+00
1.29E-01  1.05E-03
          1.16E+00  2.85E-01  1.04E-01  5.25E-02  1.00E+00  7.99E-02            5.55E-03  1.16E+00
1.79E-01  1.46E-03
          1.21E+00  2.63E-01  1.11E-01  6.33E-02  1.00E+00  9.03E-02            7.92E-03  1.21E+00
2.40E-01  1.96E-03
          1.28E+00  2.41E-01  1.20E-01  7.68E-02  1.00E+00  1.03E-01            1.11E-02  1.28E+00
3.14E-01  2.57E-03
          1.36E+00  2.20E-01  1.30E-01  9.34E-02  1.00E+00  1.20E-01            1.55E-02  1.36E+00
4.04E-01  3.30E-03
          1.45E+00  2.00E-01  1.42E-01  1.14E-01  1.00E+00  1.40E-01            2.17E-02  1.45E+00
5.12E-01  4.18E-03
          1.57E+00  1.81E-01  1.55E-01  1.39E-01  1.00E+00  1.66E-01            3.02E-02  1.57E+00
6.43E-01  5.25E-03
          1.71E+00  1.64E-01  1.70E-01  1.70E-01  1.00E+00  1.96E-01            4.23E-02  1.71E+00
8.01E-01  6.55E-03
          1.88E+00  1.48E-01  1.85E-01  2.07E-01  9.99E-01  2.33E-01            5.94E-02  1.88E+00
9.93E-01  8.11E-03
          2.08E+00  1.34E-01  2.02E-01  2.52E-01  9.99E-01  2.78E-01            8.36E-02  2.08E+00
1.22E+00  1.00E-02
          2.33E+00  1.22E-01  2.20E-01  3.04E-01  9.98E-01  3.29E-01            1.18E-01  2.33E+00
1.50E+00  1.23E-02
          2.63E+00  1.11E-01  2.39E-01  3.64E-01  9.97E-01  3.90E-01            1.66E-01  2.63E+00
1.84E+00  1.51E-02
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2.99E+00	1.01E-01	2.57E-01	4.34E-01	9.95E-01	4.59E-01	2.33E-01	2.99E+00	2.25E+00	1.84E-02
3.43E+00	9.21E-02	2.75E-01	5.13E-01	9.91E-01	5.37E-01	3.27E-01	3.43E+00	2.75E+00	2.24E-02
3.96E+00	7.65E-02	2.95E-01	6.04E-01	9.85E-01	6.87E-01	4.55E-01	3.96E+00	3.35E+00	2.73E-02
4.61E+00	6.21E-02	3.16E-01	7.02E-01	9.76E-01	8.87E-01	6.31E-01	4.61E+00	4.07E+00	3.33E-02
5.38E+00	5.22E-02	3.35E-01	7.99E-01	9.63E-01	1.09E+00	8.65E-01	5.38E+00	4.95E+00	4.04E-02
6.32E+00	4.46E-02	3.53E-01	8.96E-01	9.44E-01	1.29E+00	1.17E+00	6.32E+00	6.01E+00	4.91E-02
7.45E+00	3.84E-02	3.72E-01	9.96E-01	9.19E-01	1.51E+00	1.56E+00	7.45E+00	7.29E+00	5.95E-02
8.83E+00	3.33E-02	3.93E-01	1.11E+00	8.86E-01	1.72E+00	2.06E+00	8.83E+00	8.84E+00	7.22E-02
1.05E+01	2.90E-02	4.18E-01	1.24E+00	8.45E-01	1.93E+00	2.69E+00	1.05E+01	1.07E+01	8.75E-02
1.25E+01	2.53E-02	4.48E-01	1.40E+00	7.96E-01	2.13E+00	3.48E+00	1.25E+01	1.30E+01	1.06E-01
1.49E+01	2.20E-02	4.85E-01	1.59E+00	7.42E-01	2.32E+00	4.45E+00	1.49E+01	1.57E+01	1.28E-01
1.79E+01	1.90E-02	5.28E-01	1.83E+00	6.85E-01	2.52E+00	5.66E+00	1.79E+01	1.90E+01	1.56E-01
2.14E+01	1.63E-02	5.78E-01	2.12E+00	6.28E-01	2.73E+00	7.15E+00	2.14E+01	2.31E+01	1.88E-01
2.57E+01	1.39E-02	6.34E-01	2.47E+00	5.73E-01	2.95E+00	8.96E+00	2.57E+01	2.79E+01	2.28E-01
3.09E+01	1.17E-02	6.96E-01	2.89E+00	5.23E-01	3.20E+00	1.12E+01	3.09E+01	3.38E+01	2.76E-01
3.72E+01	9.78E-03	7.60E-01	3.37E+00	4.78E-01	3.49E+00	1.38E+01	3.72E+01	4.09E+01	3.34E-01
4.48E+01	8.11E-03	8.25E-01	3.93E+00	4.39E-01	3.83E+00	1.70E+01	4.48E+01	4.94E+01	4.04E-01
5.40E+01	6.69E-03	8.89E-01	4.56E+00	4.06E-01	4.23E+00	2.07E+01	5.40E+01	5.98E+01	4.89E-01
6.51E+01	5.51E-03	9.48E-01	5.28E+00	3.79E-01	4.71E+00	2.51E+01	6.51E+01	7.24E+01	5.91E-01
7.85E+01	4.53E-03	1.00E+00	6.08E+00	3.55E-01	5.28E+00	3.02E+01	7.85E+01	8.76E+01	7.15E-01
9.48E+01	3.73E-03	1.05E+00	7.01E+00	3.36E-01	5.95E+00	3.62E+01	9.48E+01	1.06E+02	8.65E-01
1.14E+02	3.09E-03	1.09E+00	8.07E+00	3.20E-01	6.73E+00	4.32E+01	1.14E+02	1.28E+02	1.05E+00
1.38E+02	2.56E-03	1.13E+00	9.29E+00	3.06E-01	7.64E+00	5.13E+01	1.38E+02	1.55E+02	1.27E+00
1.67E+02	2.13E-03	1.17E+00	1.07E+01	2.95E-01	8.71E+00	6.07E+01	1.67E+02	1.87E+02	1.53E+00
2.03E+02	1.78E-03	1.21E+00	1.25E+01	2.85E-01	1.03E+01	6.56E+01	2.03E+02	1.87E+02	3.86E+01
2.48E+02	1.49E-03	1.24E+00	1.47E+01	2.77E-01	1.21E+01	7.23E+01	2.48E+02	1.88E+02	5.85E+01
3.06E+02	1.26E-03	1.27E+00	1.75E+01	2.71E-01	1.43E+01	8.04E+01	3.06E+02	1.88E+02	7.71E+01
3.79E+02	1.07E-03	1.29E+00	2.08E+01	2.66E-01	1.70E+01	9.03E+01	3.79E+02	1.88E+02	9.63E+01
4.71E+02	9.06E-04	1.31E+00	2.49E+01	2.62E-01	2.01E+01	1.02E+02	4.71E+02	1.88E+02	1.17E+02
5.88E+02	7.71E-04	1.33E+00	2.99E+01	2.59E-01	2.38E+01	1.17E+02	5.88E+02	1.88E+02	1.40E+02
7.35E+02	6.58E-04	1.34E+00	3.61E+01	2.56E-01	2.81E+01	1.34E+02	7.35E+02	1.88E+02	1.66E+02
9.20E+02	5.62E-04	1.35E+00	4.36E+01	2.54E-01	3.33E+01	1.55E+02	9.20E+02	1.88E+02	1.97E+02
1.15E+03	4.81E-04	1.36E+00	5.27E+01	2.53E-01	3.93E+01	1.81E+02	1.15E+03	1.88E+02	2.32E+02
1.44E+03	4.12E-04	1.36E+00	6.36E+01	2.52E-01	4.63E+01	2.11E+02	1.44E+03	1.88E+02	2.73E+02
1.81E+03	3.53E-04	1.37E+00	7.68E+01	2.51E-01	5.46E+01	2.49E+02	1.81E+03	1.88E+02	3.22E+02
2.26E+03	3.02E-04	1.37E+00	9.24E+01	2.50E-01	6.41E+01	2.94E+02	2.26E+03	1.88E+02	3.79E+02
2.83E+03	2.59E-04	1.37E+00	1.11E+02	2.50E-01	7.53E+01	3.48E+02	2.83E+03	1.88E+02	4.48E+02
3.54E+03	2.23E-04	1.38E+00	1.33E+02	2.49E-01	8.82E+01	4.14E+02	3.54E+03	1.88E+02	5.30E+02
4.42E+03	1.92E-04	1.38E+00	1.58E+02	2.49E-01	1.03E+02	4.94E+02	4.42E+03	1.88E+02	6.27E+02
5.52E+03	1.65E-04	1.38E+00	1.87E+02	2.49E-01	1.20E+02	5.90E+02	5.52E+03	1.88E+02	7.44E+02
6.87E+03	1.42E-04	1.38E+00	2.21E+02	2.49E-01	1.40E+02	7.07E+02	6.87E+03		

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1.88E+02  8.83E+02
           8.55E+03  1.23E-04  1.38E+00  2.60E+02  2.49E-01  1.62E+02            8.48E+02  8.55E+03
1.88E+02  1.05E+03
           1.06E+04  1.07E-04  1.38E+00  3.03E+02  2.49E-01  1.87E+02            1.02E+03  1.06E+04
1.88E+02  1.25E+03
           1.32E+04  9.31E-05  1.38E+00  3.53E+02  2.49E-01  2.15E+02            1.22E+03  1.32E+04
1.88E+02  1.48E+03
           1.64E+04  8.15E-05  1.38E+00  4.09E+02  2.43E-01  2.46E+02            1.47E+03  1.64E+04
1.88E+02  1.76E+03
•

             time averaged (tav =   60. s) volume concentration:  concentration in the z =   .00 plane.

             downwind    time of      cloud     effective                average concentration (volume
fraction) at (x,y,z)
             distance    max conc    duration   half width        y/bbc=     y/bbc=     y/bbc=     y/bbc=
    y/bbc=     y/bbc=
             x (m)         (s)         (s)       bbc (m)             0.0        0.5        1.0
1.5        2.0        2.5
             1.00E+00    3.00E+01    6.00E+01    9.08E-02         0.00E+00   0.00E+00   0.00E+00
0.00E+00   0.00E+00   0.00E+00
             1.02E+00    3.00E+01    6.00E+01    9.64E-02         0.00E+00   0.00E+00   0.00E+00
0.00E+00   0.00E+00   0.00E+00
             1.05E+00    3.00E+01    6.00E+01    1.04E-01         0.00E+00   0.00E+00   0.00E+00
0.00E+00   0.00E+00   0.00E+00
             1.08E+00    3.00E+01    6.00E+01    1.13E-01         0.00E+00   0.00E+00   0.00E+00
0.00E+00   0.00E+00   0.00E+00
             1.11E+00    3.00E+01    6.00E+01    1.24E-01         1.02E-42   8.32E-43   2.90E-43
2.38E-44   0.00E+00   0.00E+00
             1.16E+00    3.00E+01    6.00E+01    1.38E-01         2.00E-34   1.57E-34   5.41E-35
5.17E-36   1.08E-37   4.50E-40
             1.21E+00    3.00E+01    6.00E+01    1.56E-01         4.66E-27   3.53E-27   1.21E-27
1.31E-28   3.75E-30   2.59E-32
             1.28E+00    3.01E+01    6.00E+01    1.79E-01         8.61E-21   6.36E-21   2.15E-21
2.58E-22   9.35E-24   9.55E-26
             1.36E+00    3.01E+01    6.00E+01    2.08E-01         1.17E-15   8.49E-16   2.85E-16
3.67E-17   1.59E-18   2.19E-20
             1.45E+00    3.01E+01    6.00E+01    2.43E-01         1.22E-11   8.70E-12   2.90E-12
3.93E-13   1.95E-14   3.38E-16
             1.57E+00    3.01E+01    6.00E+01    2.87E-01         1.30E-08   9.18E-09   3.04E-09
4.28E-10   2.36E-11   4.86E-13
             1.71E+00    3.01E+01    6.00E+01    3.40E-01         2.11E-06   1.48E-06   4.86E-07
7.03E-08   4.18E-09   9.84E-11
             1.88E+00    3.02E+01    6.00E+01    4.04E-01         7.81E-05   5.43E-05   1.78E-05
2.62E-06   1.65E-07   4.30E-09
             2.08E+00    3.02E+01    6.00E+01    4.80E-01         9.56E-04   6.62E-04   2.17E-04
3.23E-05   2.12E-06   5.94E-08
             2.33E+00    3.02E+01    6.00E+01    5.70E-01         5.25E-03   3.63E-03   1.18E-03
1.78E-04   1.20E-05   3.56E-07
             2.63E+00    3.03E+01    6.00E+01    6.74E-01         1.64E-02   1.13E-02   3.68E-03
5.57E-04   3.84E-05   1.18E-06
             2.99E+00    3.04E+01    6.00E+01    7.94E-01         3.44E-02   2.37E-02   7.71E-03
1.17E-03   8.19E-05   2.60E-06
             3.43E+00    3.04E+01    6.00E+01    9.29E-01         5.49E-02   3.78E-02   1.23E-02
1.87E-03   1.32E-04   4.29E-06
             3.96E+00    3.05E+01    6.00E+01    1.09E+00         8.22E-02   5.65E-02   1.84E-02
2.81E-03   2.00E-04   6.58E-06
             4.61E+00    3.07E+01    6.00E+01    1.26E+00         9.41E-02   6.47E-02   2.10E-02
3.22E-03   2.30E-04   7.65E-06
             5.38E+00    3.08E+01    6.00E+01    1.42E+00         9.16E-02   6.30E-02   2.05E-02
3.13E-03   2.25E-04   7.51E-06
             6.32E+00    3.10E+01    6.00E+01    1.59E+00         8.37E-02   5.76E-02   1.87E-02
2.86E-03   2.06E-04   6.92E-06
             7.45E+00    3.12E+01    6.00E+01    1.76E+00         7.42E-02   5.10E-02   1.66E-02
2.54E-03   1.83E-04   6.16E-06
             8.83E+00    3.14E+01    6.00E+01    1.96E+00         6.47E-02   4.45E-02   1.44E-02
2.21E-03   1.59E-04   5.39E-06
             1.05E+01    3.17E+01    6.00E+01    2.18E+00         5.57E-02   3.83E-02   1.24E-02
1.91E-03   1.37E-04   4.65E-06
             1.25E+01    3.21E+01    6.00E+01    2.46E+00         4.74E-02   3.26E-02   1.06E-02
1.62E-03   1.17E-04   3.97E-06
             1.49E+01    3.25E+01    6.00E+01    2.80E+00         3.99E-02   2.74E-02   8.90E-03
1.36E-03   9.85E-05   3.35E-06
             1.79E+01    3.30E+01    6.00E+01    3.22E+00         3.31E-02   2.28E-02   7.39E-03
1.13E-03   8.18E-05   2.78E-06
             2.14E+01    3.37E+01    6.00E+01    3.72E+00         2.71E-02   1.86E-02   6.05E-03
9.27E-04   6.70E-05   2.29E-06
             2.57E+01    3.45E+01    6.00E+01    4.33E+00         2.19E-02   1.50E-02   4.88E-03
7.48E-04   5.41E-05   1.85E-06
             3.09E+01    3.54E+01    6.00E+01    5.05E+00         1.74E-02   1.19E-02   3.88E-03
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5.94E-04   4.30E-05   1.47E-06
             3.72E+01    3.65E+01    6.00E+01    5.89E+00         1.36E-02   9.35E-03   3.03E-03
4.65E-04   3.37E-05   1.15E-06
             4.48E+01    3.79E+01    6.00E+01    6.85E+00         1.05E-02   7.21E-03   2.34E-03
3.59E-04   2.60E-05   8.88E-07
             5.40E+01    3.96E+01    6.00E+01    7.95E+00         8.00E-03   5.50E-03   1.79E-03
2.74E-04   1.98E-05   6.78E-07
             6.51E+01    4.16E+01    6.00E+01    9.19E+00         6.04E-03   4.15E-03   1.35E-03
2.07E-04   1.50E-05   5.11E-07
             7.85E+01    4.40E+01    6.00E+01    1.06E+01         4.52E-03   3.10E-03   1.01E-03
1.55E-04   1.12E-05   3.83E-07
             9.48E+01    4.70E+01    6.00E+01    1.22E+01         3.35E-03   2.31E-03   7.49E-04
1.15E-04   8.31E-06   2.84E-07
             1.14E+02    5.05E+01    6.00E+01    1.40E+01         2.48E-03   1.70E-03   5.53E-04
8.47E-05   6.14E-06   2.10E-07
             1.38E+02    5.48E+01    6.00E+01    1.61E+01         1.82E-03   1.25E-03   4.06E-04
6.22E-05   4.51E-06   1.54E-07
             1.67E+02    6.00E+01    6.00E+01    1.86E+01         1.32E-03   9.10E-04   2.96E-04
4.53E-05   3.28E-06   1.12E-07
             2.03E+02    6.56E+01    6.06E+01    2.17E+01         8.63E-04   5.93E-04   1.93E-04
2.95E-05   2.14E-06   7.32E-08
             2.48E+02    7.23E+01    6.17E+01    2.56E+01         5.79E-04   3.98E-04   1.29E-04
1.98E-05   1.44E-06   4.92E-08
             3.06E+02    8.04E+01    6.36E+01    3.03E+01         3.87E-04   2.66E-04   8.63E-05
1.32E-05   9.59E-07   3.29E-08
             3.79E+02    9.03E+01    6.62E+01    3.60E+01         2.57E-04   1.76E-04   5.73E-05
8.79E-06   6.36E-07   2.18E-08
             4.71E+02    1.02E+02    6.97E+01    4.31E+01         1.69E-04   1.16E-04   3.77E-05
5.79E-06   4.19E-07   1.43E-08
             5.88E+02    1.17E+02    7.42E+01    5.18E+01         1.10E-04   7.59E-05   2.46E-05
3.78E-06   2.74E-07   9.38E-09
             7.35E+02    1.34E+02    7.99E+01    6.25E+01         7.15E-05   4.92E-05   1.60E-05
2.45E-06   1.77E-07   6.04E-09
             9.20E+02    1.55E+02    8.69E+01    7.55E+01         4.59E-05   3.16E-05   1.02E-05
1.57E-06   1.14E-07   3.93E-09
             1.15E+03    1.81E+02    9.55E+01    9.12E+01         2.92E-05   2.01E-05   6.52E-06
1.00E-06   7.25E-08   2.45E-09
             1.44E+03    2.11E+02    1.06E+02    1.10E+02         1.85E-05   1.27E-05   4.12E-06
6.31E-07   4.57E-08   1.58E-09
             1.81E+03    2.49E+02    1.18E+02    1.33E+02         1.16E-05   7.95E-06   2.58E-06
3.96E-07   2.87E-08   9.94E-10
             2.26E+03    2.94E+02    1.33E+02    1.60E+02         7.21E-06   4.96E-06   1.61E-06
2.47E-07   1.79E-08   5.99E-10
             2.83E+03    3.48E+02    1.51E+02    1.92E+02         4.48E-06   3.08E-06   9.99E-07
1.53E-07   1.11E-08   3.78E-10
             3.54E+03    4.14E+02    1.72E+02    2.30E+02         2.77E-06   1.91E-06   6.19E-07
9.49E-08   6.87E-09   2.40E-10
             4.42E+03    4.94E+02    1.97E+02    2.74E+02         1.72E-06   1.18E-06   3.83E-07
5.87E-08   4.26E-09   1.47E-10
             5.52E+03    5.90E+02    2.27E+02    3.24E+02         1.06E-06   7.31E-07   2.37E-07
3.64E-08   2.64E-09   8.63E-11
             6.87E+03    7.07E+02    2.62E+02    3.83E+02         6.60E-07   4.54E-07   1.47E-07
2.26E-08   1.64E-09   5.53E-11
             8.55E+03    8.48E+02    3.03E+02    4.49E+02         4.12E-07   2.83E-07   9.19E-08
1.41E-08   1.02E-09   3.47E-11
             1.06E+04    1.02E+03    3.52E+02    5.25E+02         2.58E-07   1.78E-07   5.77E-08
8.84E-09   6.41E-10   2.12E-11
             1.32E+04    1.22E+03    4.10E+02    6.11E+02         1.63E-07   1.12E-07   3.64E-08
5.59E-09   4.05E-10   1.25E-11
             1.64E+04    1.47E+03    4.79E+02    7.08E+02         1.04E-07   7.14E-08   2.32E-08
3.56E-09   2.57E-10   9.20E-12
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time averaged (tav = 60. s) volume concentration: maximum concentration (volume fraction) along centerline.

downwind distance x (m)	height z (m)	maximum concentration c(x,0,z)	time of max conc (s)	cloud duration (s)
1.00E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.02E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.05E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.08E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.11E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.16E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.21E+00	1.00E+00	9.69E-01	3.00E+01	6.00E+01
1.28E+00	1.00E+00	8.51E-01	3.01E+01	6.00E+01
1.36E+00	1.00E+00	7.36E-01	3.01E+01	6.00E+01
1.45E+00	1.00E+00	6.28E-01	3.01E+01	6.00E+01
1.57E+00	1.00E+00	5.31E-01	3.01E+01	6.00E+01

1.71E+00	1.00E+00	4.46E-01	3.01E+01	6.00E+01
1.88E+00	9.99E-01	3.73E-01	3.02E+01	6.00E+01
2.08E+00	9.99E-01	3.11E-01	3.02E+01	6.00E+01
2.33E+00	9.98E-01	2.59E-01	3.02E+01	6.00E+01
2.63E+00	9.97E-01	2.16E-01	3.03E+01	6.00E+01
2.99E+00	9.94E-01	1.80E-01	3.04E+01	6.00E+01
3.43E+00	9.89E-01	1.51E-01	3.04E+01	6.00E+01
3.96E+00	9.48E-01	1.17E-01	3.05E+01	6.00E+01
4.61E+00	6.53E-01	9.66E-02	3.07E+01	6.00E+01
5.38E+00	0.00E+00	9.16E-02	3.08E+01	6.00E+01
6.32E+00	0.00E+00	8.37E-02	3.10E+01	6.00E+01
7.45E+00	0.00E+00	7.42E-02	3.12E+01	6.00E+01
8.83E+00	0.00E+00	6.47E-02	3.14E+01	6.00E+01
1.05E+01	0.00E+00	5.57E-02	3.17E+01	6.00E+01
1.25E+01	0.00E+00	4.74E-02	3.21E+01	6.00E+01
1.49E+01	0.00E+00	3.99E-02	3.25E+01	6.00E+01
1.79E+01	0.00E+00	3.31E-02	3.30E+01	6.00E+01
2.14E+01	0.00E+00	2.71E-02	3.37E+01	6.00E+01
2.57E+01	0.00E+00	2.19E-02	3.45E+01	6.00E+01
3.09E+01	0.00E+00	1.74E-02	3.54E+01	6.00E+01
3.72E+01	0.00E+00	1.36E-02	3.65E+01	6.00E+01
4.48E+01	0.00E+00	1.05E-02	3.79E+01	6.00E+01
5.40E+01	0.00E+00	8.00E-03	3.96E+01	6.00E+01
6.51E+01	0.00E+00	6.04E-03	4.16E+01	6.00E+01
7.85E+01	0.00E+00	4.52E-03	4.40E+01	6.00E+01
9.48E+01	0.00E+00	3.35E-03	4.70E+01	6.00E+01
1.14E+02	0.00E+00	2.48E-03	5.05E+01	6.00E+01
1.38E+02	0.00E+00	1.82E-03	5.48E+01	6.00E+01
1.67E+02	0.00E+00	1.32E-03	6.00E+01	6.00E+01
2.03E+02	0.00E+00	8.63E-04	6.56E+01	6.06E+01
2.48E+02	0.00E+00	5.79E-04	7.23E+01	6.17E+01
3.06E+02	0.00E+00	3.87E-04	8.04E+01	6.36E+01
3.79E+02	0.00E+00	2.57E-04	9.03E+01	6.62E+01
4.71E+02	0.00E+00	1.69E-04	1.02E+02	6.97E+01
5.88E+02	0.00E+00	1.10E-04	1.17E+02	7.42E+01
7.35E+02	0.00E+00	7.15E-05	1.34E+02	7.99E+01
9.20E+02	0.00E+00	4.59E-05	1.55E+02	8.69E+01
1.15E+03	0.00E+00	2.92E-05	1.81E+02	9.55E+01
1.44E+03	0.00E+00	1.85E-05	2.11E+02	1.06E+02
1.81E+03	0.00E+00	1.16E-05	2.49E+02	1.18E+02
2.26E+03	0.00E+00	7.21E-06	2.94E+02	1.33E+02
2.83E+03	0.00E+00	4.48E-06	3.48E+02	1.51E+02
3.54E+03	0.00E+00	2.77E-06	4.14E+02	1.72E+02
4.42E+03	0.00E+00	1.72E-06	4.94E+02	1.97E+02
5.52E+03	0.00E+00	1.06E-06	5.90E+02	2.27E+02
6.87E+03	0.00E+00	6.60E-07	7.07E+02	2.62E+02
8.55E+03	0.00E+00	4.12E-07	8.48E+02	3.03E+02
1.06E+04	0.00E+00	2.58E-07	1.02E+03	3.52E+02
1.32E+04	0.00E+00	1.63E-07	1.22E+03	4.10E+02
1.64E+04	0.00E+00	1.04E-07	1.47E+03	4.79E+02

•(10U •&l0O •&k2S •&l8D •

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problem input

idspl =         2
ncalc =         1
wms   =   .044000
cps   =   1678.00
tbp   =    231.10
cmed0 =       .00
dhe   =   425740.
cpsl  =   2520.00
rhosl =    500.50
spb   =     -1.00
spc   =       .00
ts    =    270.00
qs    =      4.47
as    =       .03
tsd   =       60.
qtis  =       .00
hs    =      1.00
tav   =     60.00
xffm  =   9000.00
zp(1) =       .00
zp(2) =       .00
zp(3) =       .00
zp(4) =       .00
z0    =   .300000
za    =      2.00
ua    =      2.00
```

```
 ta    =    293.00
 rh    =     60.00
 stab  =      6.00
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release gas properties

molecular weight of source gas (kg)              - wms  =  4.4000E-02
vapor heat capacity, const. p.  (j/kg-k)         - cps  =  1.6780E+03
temperature of source gas (k)                    - ts   =  2.7000E+02
density of source gas (kg/m3)                    - rhos =  1.9860E+00
boiling point temperature                        - tbp  =  2.3110E+02
liquid mass fraction                             - cmed0=  0.0000E+00
liquid heat capacity (j/kg-k)                    - cpsl =  2.5200E+03
heat of vaporization (j/kg)                      - dhe  =  4.2574E+05
liquid source density (kg/m3)                    - rhosl=  5.0050E+02
saturation pressure constant                     - spa  =  9.7492E+00
saturation pressure constant (k)                 - spb  =  2.2531E+03
saturation pressure constant (k)                 - spc  =  0.0000E+00


spill characteristics

spill type                                       - idspl=          2
mass source rate (kg/s)                          - qs   =  4.4700E+00
continuous source duration (s)                   - tsd  =  6.0000E+01
continuous source mass (kg)                      - qtcs =  2.6820E+02
instantaneous source mass (kg)                   - qtis =  0.0000E+00
source area (m2)                                 - as   =  3.3000E-02
vertical vapor velocity (m/s)                    - ws   =  0.0000E+00
source half width (m)                            - bs   =  9.0830E-02
source height (m)                                - hs   =  1.0000E+00
horizontal vapor velocity (m/s)                  - us   =  6.8205E+01


field parameters

concentration averaging time (s)                 - tav  =  6.0000E+01
mixing layer height (m)                          - hmx  =  2.6000E+02
maximum downwind distance (m)                    - xffm =  9.0000E+03
concentration measurement height (m)             - zp(1)=  0.0000E+00
                                                 - zp(2)=  0.0000E+00
                                                 - zp(3)=  0.0000E+00
                                                 - zp(4)=  0.0000E+00


ambient meteorological properties

molecular weight of ambient air (kg)            - wmae  =  2.8804E-02
heat capacity of ambient air at const p. (j/kg-k)- cpaa  =  1.0134E+03
density of ambient air (kg/m3)                  - rhoa  =  1.1980E+00
ambient measurement height (m)                  - za    =  2.0000E+00
ambient atmospheric pressure (pa=n/m2=j/m3)     - pa    =  1.0133E+05
ambient wind speed (m/s)                        - ua    =  2.0000E+00
ambient temperature (k)                         - ta    =  2.9300E+02
relative humidity (percent)                     - rh    =  6.0000E+01
ambient friction velocity (m/s)                 - uastr =  3.2808E-01
atmospheric stability class value               - stab  =  6.0000E+00
inverse monin-obukhov length (1/m)              - ala   =  4.7330E-02
surface roughness height (m)                    - z0    =  3.0000E-01


additional parameters

sub-step multiplier                             - ncalc =          1
number of calculational sub-steps               - nssm  =          3
acceleration of gravity (m/s2)                  - grav  =  9.8067E+00
gas constant (j/mol- k)                         - rr    =  8.3143E+00
von karman constant                             - xk    =  4.1000E-01
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instantaneous spatially averaged cloud parameters

          x        zc         h        bb         b        bbx       bx        cv        rho        t
      u        ua
        1.00E+00  1.00E+00  1.82E-01  9.08E-02  8.17E-02  0.00E+00  0.00E+00  1.00E+00  1.99E+00
2.70E+02  6.82E+01  6.40E-01
        1.02E+00  1.00E+00  1.94E-01  9.70E-02  8.50E-02  1.59E-02  1.59E-02  9.26E-01  1.93E+00
2.71E+02  6.47E+01  6.44E-01
        1.05E+00  1.00E+00  2.10E-01  1.05E-01  8.90E-02  3.51E-02  3.51E-02  8.46E-01  1.87E+00
```

2.72E+02	6.07E+01	6.48E-01								
	1.08E+00	1.00E+00	2.30E-01	1.15E-01	9.38E-02	5.83E-02	5.83E-02	7.62E-01	1.81E+00	
2.73E+02	5.62E+01	6.54E-01								
	1.11E+00	1.00E+00	2.56E-01	1.28E-01	9.96E-02	8.64E-02	8.63E-02	6.78E-01	1.74E+00	
2.74E+02	5.15E+01	6.62E-01								
	1.16E+00	1.00E+00	2.88E-01	1.44E-01	1.06E-01	1.20E-01	1.20E-01	5.95E-01	1.68E+00	
2.75E+02	4.65E+01	6.71E-01								
	1.21E+00	1.00E+00	3.29E-01	1.64E-01	1.15E-01	1.61E-01	1.61E-01	5.15E-01	1.62E+00	
2.76E+02	4.14E+01	6.83E-01								
	1.28E+00	1.00E+00	3.80E-01	1.90E-01	1.24E-01	2.11E-01	2.11E-01	4.40E-01	1.56E+00	
2.78E+02	3.64E+01	6.98E-01								
	1.36E+00	1.00E+00	4.45E-01	2.22E-01	1.36E-01	2.71E-01	2.71E-01	3.73E-01	1.50E+00	
2.79E+02	3.16E+01	7.16E-01								
	1.45E+00	1.00E+00	5.25E-01	2.62E-01	1.48E-01	3.44E-01	3.44E-01	3.14E-01	1.46E+00	
2.81E+02	2.71E+01	7.39E-01								
	1.57E+00	1.00E+00	6.23E-01	3.11E-01	1.63E-01	4.32E-01	4.32E-01	2.62E-01	1.42E+00	
2.82E+02	2.31E+01	7.66E-01								
	1.71E+00	1.00E+00	7.43E-01	3.71E-01	1.79E-01	5.38E-01	5.38E-01	2.19E-01	1.38E+00	
2.83E+02	1.96E+01	7.99E-01								
	1.88E+00	9.99E-01	8.87E-01	4.43E-01	1.96E-01	6.66E-01	6.66E-01	1.82E-01	1.35E+00	
2.85E+02	1.66E+01	8.38E-01								
	2.08E+00	9.99E-01	1.06E+00	5.29E-01	2.15E-01	8.22E-01	8.22E-01	1.52E-01	1.33E+00	
2.86E+02	1.40E+01	8.82E-01								
	2.33E+00	9.98E-01	1.26E+00	6.29E-01	2.35E-01	1.01E+00	1.01E+00	1.27E-01	1.31E+00	
2.87E+02	1.19E+01	9.33E-01								
	2.63E+00	9.96E-01	1.49E+00	7.46E-01	2.56E-01	1.24E+00	1.24E+00	1.06E-01	1.29E+00	
2.88E+02	1.01E+01	9.90E-01								
	2.99E+00	9.94E-01	1.76E+00	8.80E-01	2.77E-01	1.51E+00	1.51E+00	8.92E-02	1.27E+00	
2.88E+02	8.69E+00	1.05E+00								
	3.43E+00	9.89E-01	2.05E+00	1.03E+00	2.99E-01	1.84E+00	1.84E+00	7.58E-02	1.26E+00	
2.89E+02	7.54E+00	1.13E+00								
	3.96E+00	9.81E-01	2.37E+00	1.19E+00	3.22E-01	2.25E+00	2.25E+00	6.50E-02	1.25E+00	
2.90E+02	6.60E+00	1.27E+00								
	4.61E+00	9.69E-01	2.70E+00	1.35E+00	3.45E-01	2.73E+00	2.73E+00	5.63E-02	1.25E+00	
2.90E+02	5.89E+00	1.39E+00								
	5.38E+00	9.51E-01	3.02E+00	1.52E+00	3.69E-01	3.32E+00	3.32E+00	4.93E-02	1.24E+00	
2.90E+02	5.34E+00	1.51E+00								
	6.32E+00	9.24E-01	3.33E+00	1.72E+00	3.94E-01	4.03E+00	4.03E+00	4.33E-02	1.23E+00	
2.91E+02	4.88E+00	1.61E+00								
	7.45E+00	8.88E-01	3.60E+00	1.97E+00	4.24E-01	4.89E+00	4.89E+00	3.81E-02	1.23E+00	
2.91E+02	4.49E+00	1.69E+00								
	8.83E+00	8.42E-01	3.83E+00	2.27E+00	4.62E-01	5.93E+00	5.93E+00	3.36E-02	1.23E+00	
2.91E+02	4.16E+00	1.76E+00								
	1.05E+01	7.85E-01	4.01E+00	2.65E+00	5.10E-01	7.19E+00	7.19E+00	2.96E-02	1.22E+00	
2.92E+02	3.86E+00	1.81E+00								
	1.25E+01	7.19E-01	4.16E+00	3.12E+00	5.70E-01	8.71E+00	8.71E+00	2.61E-02	1.22E+00	
2.92E+02	3.60E+00	1.85E+00								
	1.49E+01	6.47E-01	4.27E+00	3.71E+00	6.45E-01	1.06E+01	1.06E+01	2.29E-02	1.22E+00	
2.92E+02	3.35E+00	1.88E+00								
	1.79E+01	5.73E-01	4.35E+00	4.46E+00	7.41E-01	1.28E+01	1.28E+01	2.00E-02	1.21E+00	
2.92E+02	3.14E+00	1.90E+00								
	2.14E+01	5.00E-01	4.42E+00	5.41E+00	8.62E-01	1.55E+01	1.55E+01	1.74E-02	1.21E+00	
2.92E+02	2.94E+00	1.92E+00								
	2.57E+01	4.32E-01	4.48E+00	6.58E+00	1.01E+00	1.87E+01	1.87E+01	1.49E-02	1.21E+00	
2.92E+02	2.77E+00	1.94E+00								
	3.09E+01	3.71E-01	4.56E+00	8.01E+00	1.19E+00	2.27E+01	2.27E+01	1.28E-02	1.21E+00	
2.92E+02	2.62E+00	1.96E+00								
	3.72E+01	3.17E-01	4.67E+00	9.69E+00	1.40E+00	2.74E+01	2.74E+01	1.08E-02	1.21E+00	
2.93E+02	2.50E+00	1.98E+00								
	4.48E+01	2.72E-01	4.81E+00	1.17E+01	1.63E+00	3.32E+01	3.32E+01	9.00E-03	1.21E+00	
2.93E+02	2.42E+00	2.02E+00								
	5.40E+01	2.34E-01	4.99E+00	1.39E+01	1.90E+00	4.01E+01	4.01E+01	7.44E-03	1.20E+00	
2.93E+02	2.36E+00	2.06E+00								
	6.51E+01	2.03E-01	5.22E+00	1.65E+01	2.20E+00	4.86E+01	4.86E+01	6.08E-03	1.20E+00	
2.93E+02	2.33E+00	2.12E+00								
	7.85E+01	1.77E-01	5.51E+00	1.93E+01	2.51E+00	5.88E+01	5.87E+01	4.92E-03	1.20E+00	
2.93E+02	2.34E+00	2.18E+00								
	9.48E+01	1.57E-01	5.87E+00	2.23E+01	2.84E+00	7.11E+01	7.11E+01	3.94E-03	1.20E+00	
2.93E+02	2.37E+00	2.26E+00								
	1.15E+02	1.39E-01	6.40E+00	2.54E+01	3.16E+00	8.10E+01	7.18E+01	2.78E-03	1.20E+00	
2.93E+02	2.43E+00	2.37E+00								
	1.40E+02	1.26E-01	7.14E+00	2.86E+01	3.46E+00	9.32E+01	7.25E+01	1.93E-03	1.20E+00	
2.93E+02	2.55E+00	2.50E+00								
	1.71E+02	1.17E-01	8.09E+00	3.17E+01	3.73E+00	1.08E+02	7.30E+01	1.32E-03	1.20E+00	
2.93E+02	2.69E+00	2.67E+00								
	2.12E+02	1.09E-01	9.25E+00	3.50E+01	3.97E+00	1.27E+02	7.34E+01	8.93E-04	1.20E+00	
2.93E+02	2.86E+00	2.84E+00								
	2.65E+02	1.03E-01	1.06E+01	3.84E+01	4.18E+00	1.50E+02	7.37E+01	5.98E-04	1.20E+00	
2.93E+02	3.04E+00	3.04E+00								
	3.32E+02	9.78E-02	1.23E+01	4.20E+01	4.38E+00	1.79E+02	7.39E+01	3.96E-04	1.20E+00	
2.93E+02	3.24E+00	3.24E+00								

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         4.19E+02  9.39E-02  1.43E+01  4.61E+01  4.55E+00  2.15E+02  7.41E+01  2.59E-04  1.20E+00
2.93E+02  3.45E+00  3.44E+00
         5.31E+02  9.06E-02  1.65E+01  5.07E+01  4.71E+00  2.60E+02  7.43E+01  1.68E-04  1.20E+00
2.93E+02  3.66E+00  3.66E+00
         6.74E+02  8.80E-02  1.92E+01  5.59E+01  4.84E+00  3.15E+02  7.44E+01  1.08E-04  1.20E+00
2.93E+02  3.88E+00  3.88E+00
         8.57E+02  8.58E-02  2.23E+01  6.19E+01  4.96E+00  3.84E+02  7.45E+01  6.91E-05  1.20E+00
2.93E+02  4.10E+00  4.10E+00
         1.09E+03  8.40E-02  2.59E+01  6.90E+01  5.06E+00  4.69E+02  7.45E+01  4.37E-05  1.20E+00
2.93E+02  4.32E+00  4.32E+00
         1.39E+03  8.26E-02  3.01E+01  7.74E+01  5.15E+00  5.74E+02  7.45E+01  2.74E-05  1.20E+00
2.93E+02  4.55E+00  4.55E+00
         1.77E+03  8.14E-02  3.49E+01  8.72E+01  5.22E+00  7.03E+02  7.46E+01  1.71E-05  1.20E+00
2.93E+02  4.78E+00  4.78E+00
         2.25E+03  8.04E-02  4.04E+01  9.89E+01  5.28E+00  8.61E+02  7.46E+01  1.07E-05  1.20E+00
2.93E+02  5.00E+00  5.00E+00
         2.86E+03  7.97E-02  4.68E+01  1.13E+02  5.33E+00  1.05E+03  7.46E+01  6.60E-06  1.20E+00
2.93E+02  5.22E+00  5.22E+00
         3.62E+03  7.90E-02  5.40E+01  1.29E+02  5.37E+00  1.29E+03  7.46E+01  4.08E-06  1.20E+00
2.93E+02  5.44E+00  5.44E+00
         4.59E+03  7.86E-02  6.23E+01  1.48E+02  5.40E+00  1.57E+03  7.46E+01  2.53E-06  1.20E+00
2.93E+02  5.66E+00  5.66E+00
         5.80E+03  7.82E-02  7.16E+01  1.70E+02  5.43E+00  1.92E+03  7.46E+01  1.57E-06  1.20E+00
2.93E+02  5.86E+00  5.86E+00
         7.32E+03  7.79E-02  8.21E+01  1.96E+02  5.45E+00  2.34E+03  7.46E+01  9.76E-07  1.20E+00
2.93E+02  6.06E+00  6.06E+00
         9.21E+03  7.77E-02  9.38E+01  2.25E+02  5.46E+00  2.84E+03  7.46E+01  6.11E-07  1.20E+00
2.93E+02  6.26E+00  6.26E+00
         1.16E+04  7.75E-02  1.07E+02  2.59E+02  5.48E+00  3.44E+03  7.46E+01  3.85E-07  1.20E+00
2.93E+02  6.44E+00  6.44E+00
         1.45E+04  7.73E-02  1.21E+02  2.97E+02  5.49E+00  4.16E+03  7.46E+01  2.45E-07  1.20E+00
2.93E+02  6.61E+00  6.61E+00
         1.81E+04  7.72E-02  1.36E+02  3.41E+02  5.49E+00  5.02E+03  7.46E+01  1.57E-07  1.20E+00
2.93E+02  6.76E+00  6.76E+00
         2.26E+04  7.71E-02  1.52E+02  3.90E+02  5.50E+00  6.05E+03  7.46E+01  1.02E-07  1.20E+00
2.93E+02  6.90E+00  6.90E+00
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```
            x        cm        cmv       cmda      cmw       cmwv      wc        vg        ug         w
      v        vx
         1.00E+00  1.00E+00  1.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
8.08E+00  3.54E+00  0.00E+00
         1.02E+00  9.51E-01  9.51E-01  4.90E-02  4.41E-04  4.41E-04 -1.17E-03  0.00E+00  0.00E+00
2.19E+01  3.46E+00  5.09E-01
         1.05E+00  8.93E-01  8.93E-01  1.06E-01  9.51E-04  9.51E-04 -2.52E-03  0.00E+00  0.00E+00
2.11E+01  3.35E+00  5.10E-01
         1.08E+00  8.31E-01  8.31E-01  1.68E-01  1.51E-03  1.51E-03 -4.06E-03  0.00E+00  0.00E+00
2.00E+01  3.21E+00  5.10E-01
         1.11E+00  7.63E-01  7.63E-01  2.35E-01  2.12E-03  2.12E-03 -5.83E-03  0.00E+00  0.00E+00
1.88E+01  3.04E+00  5.11E-01
         1.16E+00  6.91E-01  6.91E-01  3.06E-01  2.75E-03  2.75E-03 -7.84E-03  0.00E+00  0.00E+00
1.74E+01  2.85E+00  5.12E-01
         1.21E+00  6.18E-01  6.18E-01  3.78E-01  3.41E-03  3.41E-03 -1.01E-02  0.00E+00  0.00E+00
1.58E+01  2.63E+00  5.13E-01
         1.28E+00  5.46E-01  5.46E-01  4.50E-01  4.05E-03  4.05E-03 -1.28E-02  0.00E+00  0.00E+00
1.41E+01  2.39E+00  5.15E-01
         1.36E+00  4.76E-01  4.76E-01  5.19E-01  4.67E-03  4.67E-03 -1.58E-02  0.00E+00  0.00E+00
1.23E+01  2.14E+00  5.17E-01
         1.45E+00  4.11E-01  4.11E-01  5.84E-01  5.26E-03  5.26E-03 -1.93E-02  0.00E+00  0.00E+00
1.06E+01  1.88E+00  5.19E-01
         1.57E+00  3.52E-01  3.52E-01  6.42E-01  5.78E-03  5.78E-03 -2.35E-02  0.00E+00  0.00E+00
8.97E+00  1.64E+00  5.22E-01
         1.71E+00  3.00E-01  3.00E-01  6.94E-01  6.25E-03  6.25E-03 -2.86E-02  0.00E+00  0.00E+00
7.47E+00  1.42E+00  5.25E-01
         1.88E+00  2.54E-01  2.54E-01  7.39E-01  6.66E-03  6.66E-03 -3.47E-02  0.00E+00  0.00E+00
6.14E+00  1.21E+00  5.29E-01
         2.08E+00  2.15E-01  2.15E-01  7.78E-01  7.01E-03  7.01E-03 -4.21E-02  0.00E+00  0.00E+00
5.01E+00  1.03E+00  5.33E-01
         2.33E+00  1.82E-01  1.82E-01  8.11E-01  7.30E-03  7.30E-03 -5.11E-02  0.00E+00  0.00E+00
4.05E+00  8.75E-01  5.39E-01
         2.63E+00  1.54E-01  1.54E-01  8.39E-01  7.55E-03  7.55E-03 -6.21E-02  0.00E+00  0.00E+00
3.27E+00  7.40E-01  5.44E-01
         2.99E+00  1.30E-01  1.30E-01  8.62E-01  7.76E-03  7.76E-03 -7.53E-02  0.00E+00  0.00E+00
2.63E+00  6.25E-01  5.51E-01
         3.43E+00  1.11E-01  1.11E-01  8.81E-01  7.93E-03  7.93E-03 -9.34E-02  9.69E-02  0.00E+00
2.01E+00  5.29E-01  5.59E-01
         3.96E+00  9.59E-02  9.59E-02  8.96E-01  8.07E-03  8.07E-03 -1.10E-01  1.33E-01  0.00E+00
1.43E+00  4.44E-01  5.73E-01
         4.61E+00  8.36E-02  8.36E-02  9.08E-01  8.18E-03  8.18E-03 -1.25E-01  1.74E-01  0.00E+00
1.06E+00  3.78E-01  5.86E-01
         5.38E+00  7.34E-02  7.34E-02  9.18E-01  8.27E-03  8.27E-03 -1.38E-01  2.21E-01  0.00E+00
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8.09E-01 3.23E-01 5.98E-01
6.32E+00 6.46E-02 6.46E-02 9.27E-01 8.35E-03 8.35E-03 -1.47E-01 2.74E-01 0.00E+00
6.36E-01 2.78E-01 6.07E-01
7.45E+00 5.71E-02 5.71E-02 9.34E-01 8.41E-03 8.41E-03 -1.49E-01 3.30E-01 0.00E+00
5.13E-01 2.40E-01 6.14E-01
8.83E+00 5.05E-02 5.05E-02 9.41E-01 8.47E-03 8.47E-03 -1.43E-01 3.87E-01 0.00E+00
4.23E-01 2.07E-01 6.18E-01
1.05E+01 4.46E-02 4.46E-02 9.47E-01 8.53E-03 8.53E-03 -1.31E-01 4.41E-01 0.00E+00
3.55E-01 1.78E-01 6.20E-01
1.25E+01 3.93E-02 3.93E-02 9.52E-01 8.57E-03 8.57E-03 -1.13E-01 4.90E-01 0.00E+00
3.03E-01 1.53E-01 6.19E-01
1.49E+01 3.45E-02 3.45E-02 9.57E-01 8.62E-03 8.62E-03 -9.26E-02 5.30E-01 0.00E+00
2.62E-01 1.31E-01 6.17E-01
1.79E+01 3.02E-02 3.02E-02 9.61E-01 8.65E-03 8.65E-03 -7.19E-02 5.60E-01 0.00E+00
2.30E-01 1.12E-01 6.13E-01
2.14E+01 2.63E-02 2.63E-02 9.65E-01 8.69E-03 8.69E-03 -5.34E-02 5.77E-01 0.00E+00
2.03E-01 9.49E-02 6.09E-01
2.57E+01 2.26E-02 2.26E-02 9.69E-01 8.72E-03 8.72E-03 -3.81E-02 5.80E-01 0.00E+00
1.80E-01 8.02E-02 6.05E-01
3.09E+01 1.93E-02 1.93E-02 9.72E-01 8.75E-03 8.75E-03 -2.64E-02 5.70E-01 0.00E+00
1.60E-01 6.79E-02 6.02E-01
3.72E+01 1.64E-02 1.64E-02 9.75E-01 8.78E-03 8.78E-03 -1.80E-02 5.49E-01 0.00E+00
1.43E-01 5.80E-02 6.01E-01
4.48E+01 1.37E-02 1.37E-02 9.78E-01 8.80E-03 8.80E-03 -1.21E-02 5.18E-01 0.00E+00
1.28E-01 5.06E-02 6.02E-01
5.40E+01 1.13E-02 1.13E-02 9.80E-01 8.82E-03 8.82E-03 -8.05E-03 4.80E-01 0.00E+00
1.16E-01 4.55E-02 6.06E-01
6.51E+01 9.26E-03 9.26E-03 9.82E-01 8.84E-03 8.84E-03 -5.38E-03 4.37E-01 0.00E+00
1.06E-01 4.24E-02 6.11E-01
7.85E+01 7.49E-03 7.49E-03 9.84E-01 8.86E-03 8.86E-03 -3.61E-03 3.93E-01 0.00E+00
9.78E-02 4.09E-02 6.20E-01
9.48E+01 6.01E-03 6.01E-03 9.85E-01 8.87E-03 8.87E-03 -2.45E-03 3.48E-01 1.09E-01
9.08E-02 4.04E-02 6.31E-01
1.15E+02 4.24E-03 4.24E-03 9.87E-01 8.89E-03 8.89E-03 -1.64E-03 2.72E-01 8.57E-02
8.38E-02 4.09E-02 6.48E-01
1.40E+02 2.94E-03 2.94E-03 9.88E-01 8.90E-03 8.90E-03 -1.02E-03 2.11E-01 6.64E-02
7.74E-02 4.23E-02 6.69E-01
1.71E+02 2.01E-03 2.01E-03 9.89E-01 8.91E-03 8.91E-03 -6.52E-04 1.63E-01 5.10E-02
7.17E-02 4.43E-02 6.94E-01
2.12E+02 1.36E-03 1.36E-03 9.90E-01 8.91E-03 8.91E-03 -4.23E-04 1.25E-01 3.89E-02
6.65E-02 4.64E-02 7.21E-01
2.65E+02 9.13E-04 9.13E-04 9.90E-01 8.92E-03 8.92E-03 -2.79E-04 9.66E-02 2.95E-02
6.18E-02 4.87E-02 7.48E-01
3.32E+02 6.04E-04 6.04E-04 9.90E-01 8.92E-03 8.92E-03 -1.86E-04 7.47E-02 2.22E-02
5.76E-02 5.11E-02 7.75E-01
4.19E+02 3.96E-04 3.96E-04 9.91E-01 8.92E-03 8.92E-03 -1.25E-04 5.79E-02 1.65E-02
5.37E-02 5.33E-02 8.02E-01
5.31E+02 2.57E-04 2.57E-04 9.91E-01 8.92E-03 8.92E-03 -8.47E-05 4.50E-02 1.22E-02
5.02E-02 5.55E-02 8.27E-01
6.74E+02 1.65E-04 1.65E-04 9.91E-01 8.92E-03 8.92E-03 -5.75E-05 3.49E-02 8.99E-03
4.70E-02 5.74E-02 8.50E-01
8.57E+02 1.05E-04 1.05E-04 9.91E-01 8.92E-03 8.92E-03 -3.90E-05 2.71E-02 6.55E-03
4.40E-02 5.91E-02 8.71E-01
1.09E+03 6.67E-05 6.67E-05 9.91E-01 8.92E-03 8.92E-03 -2.64E-05 2.10E-02 4.74E-03
4.13E-02 6.05E-02 8.90E-01
1.39E+03 4.19E-05 4.19E-05 9.91E-01 8.92E-03 8.92E-03 -1.78E-05 1.62E-02 3.40E-03
3.87E-02 6.15E-02 9.07E-01
1.77E+03 2.62E-05 2.62E-05 9.91E-01 8.92E-03 8.92E-03 -1.19E-05 1.25E-02 2.43E-03
3.63E-02 6.21E-02 9.21E-01
2.25E+03 1.63E-05 1.63E-05 9.91E-01 8.92E-03 8.92E-03 -7.92E-06 9.54E-03 1.72E-03
3.40E-02 6.22E-02 9.32E-01
2.86E+03 1.01E-05 1.01E-05 9.91E-01 8.92E-03 8.92E-03 -5.23E-06 7.27E-03 1.22E-03
3.18E-02 6.18E-02 9.40E-01
3.62E+03 6.24E-06 6.24E-06 9.91E-01 8.92E-03 8.92E-03 -3.43E-06 5.50E-03 8.57E-04
2.97E-02 6.09E-02 9.46E-01
4.59E+03 3.86E-06 3.86E-06 9.91E-01 8.92E-03 8.92E-03 -2.24E-06 4.16E-03 6.04E-04
2.76E-02 5.96E-02 9.49E-01
5.80E+03 2.40E-06 2.40E-06 9.91E-01 8.92E-03 8.92E-03 -1.45E-06 3.11E-03 4.23E-04
2.56E-02 5.77E-02 9.48E-01
7.32E+03 1.49E-06 1.49E-06 9.91E-01 8.92E-03 8.92E-03 -9.35E-07 2.32E-03 2.96E-04
2.35E-02 5.55E-02 9.45E-01
9.21E+03 9.34E-07 9.34E-07 9.91E-01 8.92E-03 8.92E-03 -5.98E-07 1.72E-03 2.07E-04
2.15E-02 5.30E-02 9.40E-01
1.16E+04 5.89E-07 5.89E-07 9.91E-01 8.92E-03 8.92E-03 -3.65E-07 1.21E-03 1.40E-04
1.94E-02 5.03E-02 9.31E-01
1.45E+04 3.74E-07 3.74E-07 9.91E-01 8.92E-03 8.92E-03 -2.43E-07 9.26E-04 1.01E-04
1.73E-02 4.73E-02 9.20E-01
1.81E+04 2.40E-07 2.40E-07 9.91E-01 8.92E-03 8.92E-03 -1.66E-07 7.26E-04 7.38E-05
1.52E-02 4.43E-02 9.07E-01
2.26E+04 1.56E-07 1.56E-07 9.91E-01 8.92E-03 8.92E-03 -1.25E-07 6.27E-04 5.82E-05
1.31E-02 4.13E-02 8.92E-01

• time averaged (tav = 60. s) volume concentration: concentration contour parameters

c(x,y,z,t) = cc(x) * (erf(xa)-erf(xb)) * (erf(ya)-erf(yb)) * (exp(-za*za)+exp(-zb*zb))

```
c(x,y,z,t) = concentration (volume fraction) at (x,y,z,t)
         x = downwind distance (m)
         y = crosswind horizontal distance (m)
         z = height (m)
         t = time (s)

       erf = error functon              exp = exponential function
        xa = (x-xc+bx)/(sr2*betax)       za = (z-zc)/(sr2*sig)
        xb = (x-xc-bx)/(sr2*betax)       zb = (z+zc)/(sr2*sig)
        ya = (y+b)/(sr2*betac)          sr2 = sqrt(2.0)
        yb = (y-b)/(sr2*betac)
```

x	cc(x)	b(x)	betac(x)	zc(x)	sig(x)	t	xc(t)	bx(t)	betax(t)
1.00E+00	0.00E+00	8.17E-02	2.29E-02	1.00E+00	5.24E-02	0.00E+00	1.00E+00	0.00E+00	0.00E+00
1.02E+00	3.65E-01	8.50E-02	2.70E-02	1.00E+00	5.60E-02	5.98E-04	1.02E+00	1.59E-02	1.30E-04
1.05E+00	3.45E-01	8.90E-02	3.21E-02	1.00E+00	6.06E-02	1.41E-03	1.05E+00	3.51E-02	2.86E-04
1.08E+00	3.23E-01	9.38E-02	3.84E-02	1.00E+00	6.65E-02	2.46E-03	1.08E+00	5.83E-02	4.76E-04
1.11E+00	3.00E-01	9.96E-02	4.62E-02	1.00E+00	7.38E-02	3.83E-03	1.11E+00	8.63E-02	7.05E-04
1.16E+00	2.78E-01	1.06E-01	5.59E-02	1.00E+00	8.32E-02	5.67E-03	1.16E+00	1.20E-01	9.82E-04
1.21E+00	2.55E-01	1.15E-01	6.80E-02	1.00E+00	9.49E-02	8.14E-03	1.21E+00	1.61E-01	1.32E-03
1.28E+00	2.33E-01	1.24E-01	8.30E-02	1.00E+00	1.10E-01	1.15E-02	1.28E+00	2.11E-01	1.72E-03
1.36E+00	2.11E-01	1.36E-01	1.02E-01	1.00E+00	1.28E-01	1.62E-02	1.36E+00	2.71E-01	2.21E-03
1.45E+00	1.91E-01	1.48E-01	1.25E-01	1.00E+00	1.51E-01	2.28E-02	1.45E+00	3.44E-01	2.81E-03
1.57E+00	1.73E-01	1.63E-01	1.53E-01	1.00E+00	1.80E-01	3.21E-02	1.57E+00	4.32E-01	3.52E-03
1.71E+00	1.57E-01	1.79E-01	1.88E-01	1.00E+00	2.14E-01	4.53E-02	1.71E+00	5.38E-01	4.39E-03
1.88E+00	1.42E-01	1.96E-01	2.30E-01	9.99E-01	2.56E-01	6.42E-02	1.88E+00	6.66E-01	5.44E-03
2.08E+00	1.29E-01	2.15E-01	2.79E-01	9.99E-01	3.05E-01	9.12E-02	2.08E+00	8.22E-01	6.71E-03
2.33E+00	1.17E-01	2.35E-01	3.37E-01	9.98E-01	3.64E-01	1.30E-01	2.33E+00	1.01E+00	8.24E-03
2.63E+00	1.07E-01	2.56E-01	4.05E-01	9.96E-01	4.31E-01	1.85E-01	2.63E+00	1.24E+00	1.01E-02
2.99E+00	9.79E-02	2.77E-01	4.82E-01	9.94E-01	5.08E-01	2.62E-01	2.99E+00	1.51E+00	1.23E-02
3.43E+00	8.67E-02	2.99E-01	5.67E-01	9.89E-01	6.15E-01	3.71E-01	3.43E+00	1.84E+00	1.51E-02
3.96E+00	7.04E-02	3.22E-01	6.59E-01	9.81E-01	8.04E-01	5.22E-01	3.96E+00	2.25E+00	1.83E-02
4.61E+00	5.93E-02	3.45E-01	7.53E-01	9.69E-01	9.98E-01	7.29E-01	4.61E+00	2.73E+00	2.23E-02
5.38E+00	5.13E-02	3.69E-01	8.54E-01	9.51E-01	1.20E+00	1.01E+00	5.38E+00	3.32E+00	2.71E-02
6.32E+00	4.53E-02	3.94E-01	9.69E-01	9.24E-01	1.39E+00	1.37E+00	6.32E+00	4.03E+00	3.29E-02
7.45E+00	4.06E-02	4.24E-01	1.11E+00	8.88E-01	1.56E+00	1.86E+00	7.45E+00	4.89E+00	3.99E-02
8.83E+00	3.65E-02	4.62E-01	1.28E+00	8.42E-01	1.72E+00	2.50E+00	8.83E+00	5.93E+00	4.84E-02
1.05E+01	3.30E-02	5.10E-01	1.50E+00	7.85E-01	1.86E+00	3.33E+00	1.05E+01	7.19E+00	5.87E-02
1.25E+01	2.98E-02	5.70E-01	1.77E+00	7.19E-01	1.99E+00	4.40E+00	1.25E+01	8.71E+00	7.11E-02
1.49E+01	2.68E-02	6.45E-01	2.11E+00	6.47E-01	2.09E+00	5.81E+00	1.49E+01	1.06E+01	8.62E-02
1.79E+01	2.39E-02	7.41E-01	2.54E+00	5.73E-01	2.18E+00	7.62E+00	1.79E+01	1.28E+01	1.04E-01
2.14E+01	2.12E-02	8.62E-01	3.08E+00	5.00E-01	2.26E+00	9.96E+00	2.14E+01	1.55E+01	1.26E-01
2.57E+01	1.86E-02	1.01E+00	3.76E+00	4.32E-01	2.34E+00	1.30E+01	2.57E+01	1.87E+01	1.53E-01
3.09E+01	1.62E-02	1.19E+00	4.58E+00	3.71E-01	2.42E+00	1.68E+01	3.09E+01	2.27E+01	1.85E-01
3.72E+01	1.39E-02	1.40E+00	5.54E+00	3.17E-01	2.51E+00	2.18E+01	3.72E+01		

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2.74E+01  2.24E-01
           4.48E+01  1.18E-02  1.63E+00  6.67E+00  2.72E-01  2.62E+00            2.79E+01  4.48E+01
3.32E+01  2.71E-01
           5.40E+01  9.87E-03  1.90E+00  7.97E+00  2.34E-01  2.75E+00            3.57E+01  5.40E+01
4.01E+01  3.28E-01
           6.51E+01  8.20E-03  2.20E+00  9.44E+00  2.03E-01  2.90E+00            4.51E+01  6.51E+01
4.86E+01  3.97E-01
           7.85E+01  6.74E-03  2.51E+00  1.10E+01  1.77E-01  3.08E+00            5.66E+01  7.85E+01
5.87E+01  4.80E-01
           9.48E+01  5.50E-03  2.84E+00  1.28E+01  1.57E-01  3.30E+00            7.05E+01  9.48E+01
7.11E+01  5.80E-01
           1.15E+02  4.47E-03  3.16E+00  1.46E+01  1.39E-01  3.61E+00            6.83E+01  1.15E+02
7.18E+01  2.17E+01
           1.40E+02  3.62E-03  3.46E+00  1.65E+01  1.26E-01  4.05E+00            7.83E+01  1.40E+02
7.25E+01  3.39E+01
           1.71E+02  2.95E-03  3.73E+00  1.83E+01  1.17E-01  4.60E+00            9.05E+01  1.71E+02
7.30E+01  4.62E+01
           2.12E+02  2.41E-03  3.97E+00  2.03E+01  1.09E-01  5.28E+00            1.05E+02  2.12E+02
7.34E+01  5.98E+01
           2.65E+02  1.98E-03  4.18E+00  2.24E+01  1.03E-01  6.09E+00            1.23E+02  2.65E+02
7.37E+01  7.55E+01
           3.32E+02  1.64E-03  4.38E+00  2.48E+01  9.78E-02  7.05E+00            1.44E+02  3.32E+02
7.39E+01  9.41E+01
           4.19E+02  1.37E-03  4.55E+00  2.75E+01  9.39E-02  8.18E+00            1.70E+02  4.19E+02
7.41E+01  1.16E+02
           5.31E+02  1.16E-03  4.71E+00  3.06E+01  9.06E-02  9.50E+00            2.02E+02  5.31E+02
7.43E+01  1.44E+02
           6.74E+02  9.81E-04  4.84E+00  3.43E+01  8.80E-02  1.10E+01            2.40E+02  6.74E+02
7.44E+01  1.77E+02
           8.57E+02  8.39E-04  4.96E+00  3.88E+01  8.58E-02  1.28E+01            2.86E+02  8.57E+02
7.45E+01  2.18E+02
           1.09E+03  7.23E-04  5.06E+00  4.42E+01  8.40E-02  1.49E+01            3.41E+02  1.09E+03
7.45E+01  2.67E+02
           1.39E+03  6.27E-04  5.15E+00  5.08E+01  8.26E-02  1.73E+01            4.08E+02  1.39E+03
7.45E+01  3.29E+02
           1.77E+03  5.46E-04  5.22E+00  5.87E+01  8.14E-02  2.01E+01            4.90E+02  1.77E+03
7.46E+01  4.04E+02
           2.25E+03  4.77E-04  5.28E+00  6.83E+01  8.04E-02  2.33E+01            5.88E+02  2.25E+03
7.46E+01  4.95E+02
           2.86E+03  4.19E-04  5.33E+00  7.98E+01  7.97E-02  2.70E+01            7.07E+02  2.86E+03
7.46E+01  6.07E+02
           3.62E+03  3.68E-04  5.37E+00  9.34E+01  7.90E-02  3.11E+01            8.50E+02  3.62E+03
7.46E+01  7.43E+02
           4.59E+03  3.24E-04  5.40E+00  1.09E+02  7.86E-02  3.59E+01            1.02E+03  4.59E+03
7.46E+01  9.08E+02
           5.80E+03  2.85E-04  5.43E+00  1.28E+02  7.82E-02  4.13E+01            1.23E+03  5.80E+03
7.46E+01  1.11E+03
           7.32E+03  2.52E-04  5.45E+00  1.50E+02  7.79E-02  4.74E+01            1.49E+03  7.32E+03
7.46E+01  1.35E+03
           9.21E+03  2.23E-04  5.46E+00  1.75E+02  7.77E-02  5.41E+01            1.80E+03  9.21E+03
7.46E+01  1.64E+03
           1.16E+04  1.98E-04  5.48E+00  2.03E+02  7.75E-02  6.16E+01            2.17E+03  1.16E+04
7.46E+01  1.99E+03
           1.45E+04  1.76E-04  5.49E+00  2.36E+02  7.73E-02  6.97E+01            2.62E+03  1.45E+04
7.46E+01  2.40E+03
           1.81E+04  1.57E-04  5.49E+00  2.73E+02  7.72E-02  7.84E+01            3.16E+03  1.81E+04
7.46E+01  2.90E+03
           2.26E+04  1.42E-04  5.50E+00  3.14E+02  7.71E-02  8.76E+01            3.82E+03  2.26E+04
7.46E+01  3.49E+03
•

             time averaged (tav =   60. s) volume concentration:  concentration in the z =   .00 plane.

             downwind    time of      cloud     effective                average concentration (volume
fraction) at (x,y,z)
             distance    max conc    duration   half width        y/bbc=     y/bbc=     y/bbc=     y/bbc=
    y/bbc=     y/bbc=
             x (m)         (s)          (s)       bbc (m)             0.0        0.5        1.0
1.5        2.0        2.5
             1.00E+00    3.00E+01    6.00E+01    9.08E-02         0.00E+00   0.00E+00   0.00E+00
0.00E+00   0.00E+00   0.00E+00
             1.02E+00    3.00E+01    6.00E+01    9.70E-02         0.00E+00   0.00E+00   0.00E+00
0.00E+00   0.00E+00   0.00E+00
             1.05E+00    3.00E+01    6.00E+01    1.05E-01         0.00E+00   0.00E+00   0.00E+00
0.00E+00   0.00E+00   0.00E+00
             1.08E+00    3.00E+01    6.00E+01    1.15E-01         0.00E+00   0.00E+00   0.00E+00
0.00E+00   0.00E+00   0.00E+00
             1.11E+00    3.00E+01    6.00E+01    1.28E-01         3.47E-40   2.79E-40   9.69E-41
8.29E-42   1.32E-43   0.00E+00
             1.16E+00    3.01E+01    6.00E+01    1.44E-01         8.37E-32   6.49E-32   2.23E-32
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2.23E-33	5.23E-35	2.59E-37							
	1.21E+00	3.01E+01	6.00E+01	1.64E-01	1.50E-24	1.12E-24	3.83E-25	4.33E-26	1.36E-27	1.09E-29
	1.28E+00	3.01E+01	6.00E+01	1.90E-01	1.54E-18	1.13E-18	3.81E-19	4.70E-20	1.83E-21	2.11E-23
	1.36E+00	3.01E+01	6.00E+01	2.22E-01	9.26E-14	6.66E-14	2.23E-14	2.93E-15	1.35E-16	2.04E-18
	1.45E+00	3.01E+01	6.00E+01	2.62E-01	4.06E-10	2.88E-10	9.56E-11	1.32E-11	6.86E-13	1.28E-14
	1.57E+00	3.02E+01	6.00E+01	3.11E-01	1.94E-07	1.36E-07	4.49E-08	6.40E-09	3.66E-10	8.01E-12
	1.71E+00	3.02E+01	6.00E+01	3.71E-01	1.59E-05	1.11E-05	3.64E-06	5.30E-07	3.24E-08	7.98E-10
	1.88E+00	3.03E+01	6.00E+01	4.43E-01	3.40E-04	2.36E-04	7.74E-05	1.15E-05	7.36E-07	1.98E-08
	2.08E+00	3.03E+01	6.00E+01	5.29E-01	2.76E-03	1.91E-03	6.23E-04	9.34E-05	6.20E-06	1.78E-07
	2.33E+00	3.04E+01	6.00E+01	6.29E-01	1.12E-02	7.71E-03	2.52E-03	3.80E-04	2.58E-05	7.79E-07
	2.63E+00	3.05E+01	6.00E+01	7.46E-01	2.80E-02	1.93E-02	6.28E-03	9.53E-04	6.60E-05	2.06E-06
	2.99E+00	3.06E+01	6.00E+01	8.80E-01	5.04E-02	3.47E-02	1.13E-02	1.72E-03	1.21E-04	3.85E-06
	3.43E+00	3.08E+01	6.00E+01	1.03E+00	7.65E-02	5.27E-02	1.71E-02	2.61E-03	1.85E-04	6.01E-06
	3.96E+00	3.09E+01	6.00E+01	1.19E+00	1.00E-01	6.90E-02	2.24E-02	3.43E-03	2.44E-04	8.02E-06
	4.61E+00	3.12E+01	6.00E+01	1.35E+00	1.05E-01	7.21E-02	2.34E-02	3.58E-03	2.56E-04	8.49E-06
	5.38E+00	3.14E+01	6.00E+01	1.52E+00	1.00E-01	6.88E-02	2.24E-02	3.42E-03	2.45E-04	8.16E-06
	6.32E+00	3.17E+01	6.00E+01	1.72E+00	9.16E-02	6.30E-02	2.05E-02	3.13E-03	2.25E-04	7.55E-06
	7.45E+00	3.21E+01	6.00E+01	1.97E+00	8.23E-02	5.66E-02	1.84E-02	2.81E-03	2.02E-04	6.81E-06
	8.83E+00	3.25E+01	6.00E+01	2.27E+00	7.30E-02	5.02E-02	1.63E-02	2.50E-03	1.80E-04	6.08E-06
	1.05E+01	3.30E+01	6.00E+01	2.65E+00	6.44E-02	4.43E-02	1.44E-02	2.20E-03	1.59E-04	5.37E-06
	1.25E+01	3.37E+01	6.00E+01	3.12E+00	5.64E-02	3.88E-02	1.26E-02	1.93E-03	1.39E-04	4.72E-06
	1.49E+01	3.45E+01	6.00E+01	3.71E+00	4.91E-02	3.38E-02	1.10E-02	1.68E-03	1.21E-04	4.12E-06
	1.79E+01	3.54E+01	6.00E+01	4.46E+00	4.25E-02	2.92E-02	9.48E-03	1.45E-03	1.05E-04	3.57E-06
	2.14E+01	3.65E+01	6.00E+01	5.41E+00	3.65E-02	2.51E-02	8.14E-03	1.25E-03	9.02E-05	3.07E-06
	2.57E+01	3.79E+01	6.00E+01	6.58E+00	3.10E-02	2.13E-02	6.93E-03	1.06E-03	7.68E-05	2.62E-06
	3.09E+01	3.96E+01	6.00E+01	8.01E+00	2.62E-02	1.80E-02	5.84E-03	8.96E-04	6.48E-05	2.21E-06
	3.72E+01	4.16E+01	6.00E+01	9.70E+00	2.19E-02	1.50E-02	4.88E-03	7.49E-04	5.41E-05	1.85E-06
	4.48E+01	4.40E+01	6.00E+01	1.17E+01	1.81E-02	1.24E-02	4.04E-03	6.19E-04	4.48E-05	1.53E-06
	5.40E+01	4.69E+01	6.00E+01	1.39E+01	1.48E-02	1.02E-02	3.31E-03	5.08E-04	3.67E-05	1.25E-06
	6.51E+01	5.05E+01	6.00E+01	1.65E+01	1.20E-02	8.27E-03	2.69E-03	4.12E-04	2.98E-05	1.02E-06
	7.85E+01	5.48E+01	6.00E+01	1.93E+01	9.67E-03	6.65E-03	2.16E-03	3.31E-04	2.39E-05	8.17E-07
	9.48E+01	6.00E+01	6.00E+01	2.23E+01	7.68E-03	5.28E-03	1.71E-03	2.63E-04	1.90E-05	6.50E-07
	1.15E+02	6.83E+01	6.66E+01	2.55E+01	5.32E-03	3.65E-03	1.19E-03	1.82E-04	1.32E-05	4.50E-07
	1.40E+02	7.83E+01	7.32E+01	2.87E+01	3.82E-03	2.62E-03	8.51E-04	1.31E-04	9.45E-06	3.23E-07
	1.71E+02	9.05E+01	8.05E+01	3.20E+01	2.71E-03	1.86E-03	6.05E-04	9.28E-05	6.72E-06	2.29E-07
	2.12E+02	1.05E+02	8.88E+01	3.54E+01	1.90E-03	1.31E-03	4.24E-04	6.50E-05	4.71E-06	1.61E-07
	2.65E+02	1.23E+02	9.86E+01	3.91E+01	1.31E-03	9.02E-04	2.93E-04	4.49E-05	3.25E-06	1.11E-07
	3.32E+02	1.44E+02	1.10E+02	4.31E+01	8.91E-04	6.12E-04	1.99E-04	3.05E-05	2.21E-06	7.55E-08
	4.19E+02	1.70E+02	1.25E+02	4.78E+01	5.95E-04	4.09E-04	1.33E-04	2.03E-05	1.47E-06	5.03E-08
	5.31E+02	2.02E+02	1.42E+02	5.32E+01	3.90E-04	2.68E-04	8.71E-05	1.34E-05	9.67E-07	3.31E-08
	6.74E+02	2.40E+02	1.63E+02	5.96E+01	2.52E-04	1.73E-04	5.62E-05	8.62E-06	6.24E-07	2.13E-08

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            8.57E+02    2.86E+02    1.87E+02    6.74E+01         1.60E-04   1.10E-04   3.57E-05
5.47E-06   3.96E-07   1.36E-08
            1.09E+03    3.41E+02    2.17E+02    7.67E+01         1.00E-04   6.89E-05   2.24E-05
3.43E-06   2.48E-07   8.52E-09
            1.39E+03    4.08E+02    2.52E+02    8.81E+01         6.20E-05   4.26E-05   1.38E-05
2.12E-06   1.54E-07   5.24E-09
            1.77E+03    4.90E+02    2.94E+02    1.02E+02         3.80E-05   2.61E-05   8.49E-06
1.30E-06   9.43E-08   3.23E-09
            2.25E+03    5.88E+02    3.44E+02    1.18E+02         2.32E-05   1.59E-05   5.17E-06
7.93E-07   5.74E-08   1.96E-09
            2.86E+03    7.07E+02    4.04E+02    1.38E+02         1.41E-05   9.66E-06   3.14E-06
4.81E-07   3.48E-08   1.20E-09
            3.62E+03    8.50E+02    4.74E+02    1.62E+02         8.53E-06   5.86E-06   1.90E-06
2.92E-07   2.11E-08   7.26E-10
            4.59E+03    1.02E+03    5.57E+02    1.90E+02         5.18E-06   3.56E-06   1.16E-06
1.77E-07   1.28E-08   4.39E-10
            5.80E+03    1.23E+03    6.55E+02    2.22E+02         3.16E-06   2.17E-06   7.04E-07
1.08E-07   7.83E-09   2.67E-10
            7.32E+03    1.49E+03    7.71E+02    2.60E+02         1.94E-06   1.33E-06   4.32E-07
6.63E-08   4.80E-09   1.63E-10
            9.21E+03    1.80E+03    9.07E+02    3.03E+02         1.20E-06   8.23E-07   2.67E-07
4.10E-08   2.97E-09   1.02E-10
            1.16E+04    2.17E+03    1.07E+03    3.52E+02         7.46E-07   5.13E-07   1.67E-07
2.55E-08   1.85E-09   6.32E-11
            1.45E+04    2.62E+03    1.26E+03    4.09E+02         4.70E-07   3.23E-07   1.05E-07
1.61E-08   1.17E-09   4.00E-11
            1.81E+04    3.16E+03    1.49E+03    4.72E+02         3.00E-07   2.06E-07   6.69E-08
1.03E-08   7.44E-10   2.56E-11
            2.26E+04    3.82E+03    1.75E+03    5.43E+02         1.94E-07   1.33E-07   4.32E-08
6.63E-09   4.80E-10   1.61E-11
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time averaged (tav = 60. s) volume concentration: maximum concentration (volume fraction) along centerline.

downwind distance x (m)	height z (m)	maximum concentration c(x,0,z)	time of max conc (s)	cloud duration (s)
1.00E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.02E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.05E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.08E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.11E+00	1.00E+00	1.00E+00	3.00E+01	6.00E+01
1.16E+00	1.00E+00	1.00E+00	3.01E+01	6.00E+01
1.21E+00	1.00E+00	9.26E-01	3.01E+01	6.00E+01
1.28E+00	1.00E+00	8.06E-01	3.01E+01	6.00E+01
1.36E+00	1.00E+00	6.91E-01	3.01E+01	6.00E+01
1.45E+00	1.00E+00	5.86E-01	3.01E+01	6.00E+01
1.57E+00	1.00E+00	4.94E-01	3.02E+01	6.00E+01
1.71E+00	1.00E+00	4.13E-01	3.02E+01	6.00E+01
1.88E+00	9.99E-01	3.45E-01	3.03E+01	6.00E+01
2.08E+00	9.99E-01	2.89E-01	3.03E+01	6.00E+01
2.33E+00	9.98E-01	2.41E-01	3.04E+01	6.00E+01
2.63E+00	9.96E-01	2.02E-01	3.05E+01	6.00E+01
2.99E+00	9.93E-01	1.70E-01	3.06E+01	6.00E+01
3.43E+00	9.77E-01	1.40E-01	3.08E+01	6.00E+01
3.96E+00	8.39E-01	1.12E-01	3.09E+01	6.00E+01
4.61E+00	0.00E+00	1.05E-01	3.12E+01	6.00E+01
5.38E+00	0.00E+00	1.00E-01	3.14E+01	6.00E+01
6.32E+00	0.00E+00	9.16E-02	3.17E+01	6.00E+01
7.45E+00	0.00E+00	8.23E-02	3.21E+01	6.00E+01
8.83E+00	0.00E+00	7.30E-02	3.25E+01	6.00E+01
1.05E+01	0.00E+00	6.44E-02	3.30E+01	6.00E+01
1.25E+01	0.00E+00	5.64E-02	3.37E+01	6.00E+01
1.49E+01	0.00E+00	4.91E-02	3.45E+01	6.00E+01
1.79E+01	0.00E+00	4.25E-02	3.54E+01	6.00E+01
2.14E+01	0.00E+00	3.65E-02	3.65E+01	6.00E+01
2.57E+01	0.00E+00	3.10E-02	3.79E+01	6.00E+01
3.09E+01	0.00E+00	2.62E-02	3.96E+01	6.00E+01
3.72E+01	0.00E+00	2.19E-02	4.16E+01	6.00E+01
4.48E+01	0.00E+00	1.81E-02	4.40E+01	6.00E+01
5.40E+01	0.00E+00	1.48E-02	4.69E+01	6.00E+01
6.51E+01	0.00E+00	1.20E-02	5.05E+01	6.00E+01
7.85E+01	0.00E+00	9.67E-03	5.48E+01	6.00E+01
9.48E+01	0.00E+00	7.68E-03	6.00E+01	6.00E+01
1.15E+02	0.00E+00	5.32E-03	6.83E+01	6.66E+01
1.40E+02	0.00E+00	3.82E-03	7.83E+01	7.32E+01
1.71E+02	0.00E+00	2.71E-03	9.05E+01	8.05E+01
2.12E+02	0.00E+00	1.90E-03	1.05E+02	8.88E+01
2.65E+02	0.00E+00	1.31E-03	1.23E+02	9.86E+01

3.32E+02	0.00E+00	8.91E-04	1.44E+02	1.10E+02
4.19E+02	0.00E+00	5.95E-04	1.70E+02	1.25E+02
5.31E+02	0.00E+00	3.90E-04	2.02E+02	1.42E+02
6.74E+02	0.00E+00	2.52E-04	2.40E+02	1.63E+02
8.57E+02	0.00E+00	1.60E-04	2.86E+02	1.87E+02
1.09E+03	0.00E+00	1.00E-04	3.41E+02	2.17E+02
1.39E+03	0.00E+00	6.20E-05	4.08E+02	2.52E+02
1.77E+03	0.00E+00	3.80E-05	4.90E+02	2.94E+02
2.25E+03	0.00E+00	2.32E-05	5.88E+02	3.44E+02
2.86E+03	0.00E+00	1.41E-05	7.07E+02	4.04E+02
3.62E+03	0.00E+00	8.53E-06	8.50E+02	4.74E+02
4.59E+03	0.00E+00	5.18E-06	1.02E+03	5.57E+02
5.80E+03	0.00E+00	3.16E-06	1.23E+03	6.55E+02
7.32E+03	0.00E+00	1.94E-06	1.49E+03	7.71E+02
9.21E+03	0.00E+00	1.20E-06	1.80E+03	9.07E+02
1.16E+04	0.00E+00	7.46E-07	2.17E+03	1.07E+03
1.45E+04	0.00E+00	4.70E-07	2.62E+03	1.26E+03
1.81E+04	0.00E+00	3.00E-07	3.16E+03	1.49E+03
2.26E+04	0.00E+00	1.94E-07	3.82E+03	1.75E+03