

TECHNICAL BASIS FOR CHEMICAL STOCKPILE EMERGENCY PLANNING

Donald. E. Newsom, Marc. A. Madore, Robert. A. Paddock, and Mariska. J. G. Absil
Decision and Information Sciences Division
Argonne National Laboratory
Argonne, Illinois 60439
United States of America
Voice: 708-252-3278
Fax: 708-252-3379
E-mail: newsomd@anl.gov

KEYWORDS

chemical stockpile, dispersion modeling, planning, protective actions

ABSTRACT

As part of the Chemical Stockpile Emergency Preparedness Program, an Accident Planning Base Review Group (APBRG) was convened in December 1992. The APBRG's mission was to update the accident basis for protective action strategy planning in the vicinity of eight U.S. chemical agent stockpile sites. The results of the APBRG's work are being issued as site-specific Emergency Planning Guides (EPGs). The EPGs give emergency planners—Army, State, and local—an updated assessment of the chemical hazard and guidance on how to plan for a broad range of accidents by planning for a manageable number of accident categories. This paper addresses:

- The rationale for updating the accident planning base.
- The modeling methodology used to assess the chemical hazard.
- Strategies that are advocated in the EPGs for the use of models by planners.

RATIONALE FOR UPDATING THE PLANNING BASE

In December 1992, the Planning Subcommittee of the Chemical Stockpile Emergency Preparedness Program (CSEPP) convened a new working group, the Accident Planning Base Review Group (APBRG). The APBRG's mission was to update the accident planning base for CSEPP. The need for such action was driven by a number of changes in CSEPP and in the Chemical Stockpile Disposal Program (CSDP) since the publication of site-specific Emergency Response Concept Plans (ERCPs) for each chemical stockpile site in 1989. These changes include the reassessment of dispersion distances; changes in CSDP process design and operations; and a movement to base planning on accident categories instead of on the original accident scenarios.

Historical Background

A risk assessment was conducted in 1987 on the subject of the proposed destruction of the U.S. inventory of lethal, unitary chemical agents and munitions (U.S. Department of the Army 1987). The assessment provided input to a *Final Programmatic Environmental Impact Statement (FPEIS)* (U.S. Department of the Army 1988). This risk analysis was based on the Johnston Atoll Chemical Agent Disposal System (JACADS) design (then at its 60% completion level), and modified by conceptual changes planned for implementation at the proposed continental U.S. facilities. Over 3,000

hypothetical accidents that could occur during storage, destruction, and disposal operations at eight Army depots were identified and analyzed.

Based on this risk assessment and other relevant information, the ERCP writers attempted to describe the distribution of accidental releases for the chemical stockpile and to develop planning basis accidents for the Army installations and their surrounding vicinities. Accident categories developed in the ERCPs were based principally on the variation in downwind lethal distance and duration of release found in the distribution of accidental releases for the Army installations. The accident categories were intended to represent ranges of values for variables that could affect the dispersion of chemical agent downwind and any subsequent human health effects for unprotected people. Accident categories identified in the ERCPs were typically structured like the examples in Table 1 (Carnes et al. 1989).

Table 1. Example Categories From Historical Planning Basis Accidents

Category 1	a small release with no off-site fatalities.
Category 2	a moderate short-term or instantaneous release with fatalities confined within approximately 10 km.
Category 3	a moderate long-term or continuous release with fatalities confined within approximately 10 km.
Category 4	a large short-term or instantaneous release with fatalities confined within approximately 25 km.
Category 5	a large long-term or continuous release with fatalities confined within approximately 25 km.

The accident categories identified as part of the APBRG activity differ from these historical categories. The historical categories were meant to be used with site topography, meteorology, and population distribution to identify emergency planning zones and appropriate protective actions for populations within those zones. But, the listing of accident scenarios in the ERCPs led many planners to focus on individual accident scenarios rather than categories as the basis for developing off-post emergency response plans. The idea of these planning basis accidents, however, was not that planning should take place only for these accidents, but that the accident distribution in the ERCPs could serve as a reasonable range of accidents for which to plan. It is quite possible that if there is ever an accident associated with the inventory at any of the CSDP installations, it will not be one of the accidents identified in the ERCPs. The accident should, however, resemble an ERCP accident in terms of cause, source term, and other critical variables. Thus, if planning and preparedness have taken place for the range of critical values represented by accidents in the ERCPs, then that planning

and preparedness should also address whatever accident might actually happen.

Changes in Accident Distribution

Although the general approach to developing emergency planning zones and identifying protective actions recommended in the ERCs is still sound, changes have occurred since their publication with respect to these issues, including the distribution of potential accidental releases for the chemical stockpiles, that recommend a reconsideration of accident categories. Moreover, given the potentially very short decision-making, alert and notification, and response times available for some accidental releases, it is important that the CSEPP planning community move from attempting to develop protective actions and protective action strategy plans for many individual accident scenarios to develop protective action strategy plans for a much smaller number of categories of potential accidental releases.

Since publication of the ERCs, the CSDP has identified a number of design and procedural changes that result in a somewhat different distribution of potential accidental releases for the chemical inventory. Such design changes resulted from Army efforts to make the disposal operations safer, to make the plants more efficient in disassembling munitions and in destroying agents, to incorporate lessons learned from similar disposal operations at JACADS and other facilities, and to comply with environmental permit requirements that change over time and vary from state to state. In no case did these design changes result in the potential for downwind lethal distances greater than other dominant accidents at the Army installations.

Changes in Pertinent Data

1990 Census data are now available for all sites. In addition, some sites have more recent local estimates of demographic data. Hence, there existed a present and ongoing need to reassess the numbers of people potentially at risk and the locations of those people. Also, some locations have local, site-specific meteorological data available that is more characteristic of their vicinity than the sometimes distant National Weather Service data used in the ERCs.

Current Status

Efforts are underway to consolidate the data and results of the analysis of risks associated with design and procedure changes in the CSDP (in support of the site-specific environmental impact statement for each proposed disposal facility) for use in CSEPP planning. When those efforts are completed, the entire and up-to-date distribution of accidental releases identified for storage and disposal of the chemical inventory will be compiled for CSEPP planning purposes.

Since the conclusions of those analyses are already available and indicate that these changes did not result in downwind no-death distances greater than other dominant accidents for the chemical inventory, work has been able to proceed with developing new accident categories for the CSEPP effort. Additional information about the new accidents (such as quantities of agent released, specific downwind no-effect distances, etc.) can be incorporated when it becomes available.

Because protective action planning in CSEPP should focus on factors other than pre-identified accident scenarios, the accident planning base has been revised to focus on these factors. The planning base still incorporates the full range of

credible accident scenarios. But, the scenarios are now grouped into categories based on the important decision making factors. For example, two scenarios that might represent different physical occurrences, happening under different weather conditions, might result in the same distance, time, and level of exposure downwind. Thus, those scenarios could be grouped into the same category for planning purposes. The EPGs contain a complete description of such categories for each CSEPP site, on which planners should base any new planning efforts or revisions to existing plans.

MODELING METHODOLOGY

As in the risk analysis, FPEIS, and ERCs, the present analysis uses the Army's approved dispersion model, D2PC. But, the current update features a more realistic and site-specific characterization of the accidents that are analyzed than before.

In the present analysis the method used to apply D2PC to the release scenarios sought to characterize each accident as realistically as possible. The downwind distances to the locations where the dosage level corresponds to no deaths and to no effects were calculated using the toxicity levels built into the D2PC model. Two sets of environmental conditions were considered - one for releases during neutrally stable atmospheric conditions (wind speed of 3 m/s, atmospheric stability class D), and one for releases during relatively stable atmospheric conditions (wind speed of 1 m/s, atmospheric stability class E). Environmental conditions corresponding to the summer season were chosen because the warmer temperatures and lower mixing layer heights associated with summer will tend to result in higher evaporation rates and lower atmospheric mixing leading to more conservative (larger) estimates of the potential extent of the downwind hazard.

The scenarios, as taken from the ERCs, are identified by:

- the activity taking place when the accidental release occurs (handling during storage, long-term storage, handling for demilitarization, on-site transportation, handling at the demilitarization facility, or plant operations at the demilitarization facility);
- the type of munition involved (105 mm cartridges, 4.2-inch mortar shells, M23 land mines, 155-mm projectiles, 8-inch projectiles, M55 rockets, 750 lb bombs, spray tanks, or ton containers);
- the type of agent contained in the munitions (nerve agent GB, blister agent mustard, or nerve agent VX);
- the release mode (complex, fire, or spill); and,
- the specific release event (an arbitrary index number).

When the individual release scenarios were established, the quantity of agent released and the duration of the release event were estimated for each scenario. The quantity of agent released is expressed in terms of three components:

- the quantity spilled, which represents the amount of agent that is released in such a way as to form a puddle of liquid agent at the location of the munitions involved. This usually will be on a hard surface such as the concrete floor of the demilitarization or storage facility or on the roadways and aprons. Before the liquid agent is

neutralized or otherwise cleaned up, some or all of it will enter the atmosphere through evaporation;

- the quantity detonated (Q_D), which represents the quantity of agent contained in the munitions that detonate during the release event thus essentially instantaneously releasing agent to the atmosphere as either vapor or aerosol. By dividing Q_D by the fill weights of individual munitions, the equivalent number of munitions detonated (N_D) during the release event can be calculated; and,
- the quantity emitted, representing agent that is "violently" released from munitions that do not detonate during the event but that rupture due to the detonation of other munitions or due to an accompanying fire. This agent is released directly to the atmosphere but over a finite period of time. Within the D2PC model, this type of release is referred to as a semi-continuous release.

If the release event occurs inside a closed building or structure that remains relatively intact, the effective release to the outside atmosphere is moderated by the presence of the building. For example, evaporation will be slowed because the air in the building is relatively still compared to the external atmospheric winds. In addition, instantaneous explosive releases due to munition detonation will effectively be spread out over time due to the confining effect of the building. Agents like VX and mustard, that are not particularly volatile, will be deposited on the interior surfaces of the building in the form of liquid droplets as result of the detonation. That deposited liquid will then evaporate over time, until it is neutralized or otherwise cleaned up, and be released to the outside atmosphere as the air within the building or structure is relatively slowly exchanged with outside air. As a consequence, when applying the D2PC model to a specific release scenario, a different approach must be used for releases that occur inside closed buildings or structures compared with releases that occur outside.

Whenever a particular release event could occur either outside or inside or when the release event most likely would destroy the containment effectiveness of the building or structure, an outside release was assumed. This is considered to be a conservative assumption because no credit is taken for the potential mitigating effects of initial confinement.

The D2PC model contains a database of site-specific, munition-specific, and agent-specific parameter values. To the extent possible, these "default" values were used in the present analyses.

Six basic approaches were used depending on the agent involved and whether the release is considered to be outside or inside a closed structure. A description of these approaches follows. The vapor depletion option of D2PC, which accounts for the removal of a portion of the transported vapor from the atmosphere due to contact with the ground surface, trees, etc., was not used in the present analyses. This option only applies to the vapor portion of a release. Neglecting vapor depletion does not have a major effect on the model predictions; what effect it does have will tend to be conservative because all the vapor released will remain in the transported cloud and contribute to the dosage at downwind locations.

Release Outside

The contributions to the downwind dosage resulting from the detonation of N_D munitions, the semi-continuous release of

emitted agent, and the evaporation of spilled agent were calculated and then added using the built-in dosage summing capability of D2PC. The contribution from the detonation of N_D munitions was calculated using a release type of "instantaneous." The contribution from the semi-continuous release of the emitted agent was calculated using a munition type of "non-munition" and a release type of "semi-continuous." The contribution from the evaporative release of spilled agent was calculated using a munition type of "non-munition" and a release type of "evaporative." A minimum evaporation time of 60 minutes was assumed because it represents the typical time it takes to respond to a spill and neutralize it or clean it up. The time may be longer for particular scenarios.

Release Inside

The downwind hazard distances resulting from a release inside a closed building or structure were estimated by first calculating the amount of agent that could become airborne and escape the building from the various sources (detonated, emitted, and spilled). Then the contributions to the downwind dosage resulting from the semi-continuous release of each of the sources were calculated and added using the built-in dosage summing capability of D2PC.

For GB releases, the quantity of agent to be released from the closed building resulting from the detonation of N_D munitions inside the building was calculated using a release type of "instantaneous." Not all the agent in the munitions is available for release because a portion of the GB is destroyed during the detonation. Because of the high volatility of GB, it was assumed that the agent that would be available for release would be primarily in vapor form. The quantity available for release was a result calculated by D2PC.

For mustard and VX releases, the quantity of agent to be released from the closed building resulting from the detonation of N_D munitions inside the building was estimated by assuming that the detonation of the munitions results in all the liquid agent contained in those munitions being "splattered" all over the interior of the building. The liquid agent was then assumed to evaporate over time to contribute to the quantity available for release. The contribution to the quantity available for release was calculated using a release type of "evaporation in still air" and a minimum evaporation time of 60 minutes. The area of wetted surface was assumed to be $2.4 \times 10^4 \text{ m}^2$. This is an arbitrary value but represents the interior surface area (walls, floor, and ceiling) of a $100 \text{ m} \times 100 \text{ m} \times 10 \text{ m}$ building. This parameter was assigned a particularly large value so as to promote evaporation and lead to a large and thus conservative quantity available for release. The length of surface downwind was assumed to be 10 m. This, too, is an arbitrary value but is probably typical of the shortest dimension of the room or area where the detonation might take place. This parameter was assigned a particularly small value so as to promote evaporation and lead to a large and thus conservative quantity available for release. The resulting quantity available for release through subsequent evaporation and the actual time of evaporation, which may be less than the input time, were calculated by D2PC.

The quantity of agent to be released from the closed building resulting from the evaporation of the spilled agent was calculated using a munition type of "non-munition" and a release type of "evaporation in still air." A concrete surface and a minimum evaporation time of 60 minutes were assumed.

The quantity of agent available through evaporation and the actual time of evaporation were calculated by D2PC.

Next, the contributions from the various sources (detonated, emitted, and spilled) to the downwind dosage were calculated using a release type of "semi-continuous." The results of the previous calculations were used as inputs to this calculation. An effective release time of at least 20 minutes was assumed because it is representative of the air turnover time in a storage igloo (approximately three air exchanges per hour).

USE OF EPG AND D2PC BY PLANNERS

In updating the CSEPP planning base, the APBRG sought:

- to inform the site planning community (State, local, and installation CSEPP planners) of changes to the planning base as information unfolded throughout the process;
- to involve the site planning community in documentation of the planning base, so as to create shared ownership of the final products; and
- to address and promote site-specific development of protective action strategy plans.

The APBRG wished to publish the revised planning base in a form that would be of practical use to State, local, and installation CSEPP planners. For this reason, the group concluded that it would be appropriate to publish eight site-specific Emergency Planning Guides (EPGs) that explain how to use the information they contain to develop protective action strategy plans.

The EPGs are intended for the use of Army installation and off-post planners. The EPGs give planners procedures they can follow to develop protective action strategy plans and implementing procedures. They are meant to be of use in developing, revising, and updating plans to protect the public in case of a chemical stockpile emergency at a stockpile location.

The EPGs supersede the ERCs. The EPGs present site-specific data that are pertinent for planning, and give practical instruction in how to develop protective action strategy plans.

Each EPG has four major parts:

- Part I contains data that characterize the Army installation and the surrounding vicinity. These data include geographic characteristics, demographic characteristics, and socioeconomic/infrastructure characteristics.
- Part II characterizes the chemical stockpile hazard at the Army installation. This part includes a description of the hazard, a discussion of risk analysis, a discussion of the use of the D2PC model to estimate the consequences of accidental releases, and an identification of accident categories as a basis for protective action planning.
- Part III discusses protective action strategies for CSEPP, protective action decision making, the use of computer models in protective action planning, and the process of developing protective action strategy plans.
- Appendices present technical data and additional discussion supporting the derivation of accident

categories. The appendices include a discussion of the rationale for reexamining the CSEPP planning base, tables of distance calculations, a description of how the distances were derived, Material Safety Data Sheets for the chemical agents, and a glossary of terms and acronyms.

The EPGs focus on the use of accident categories rather than scenarios as the basis for developing protective action strategy plans. In the EPGs, the scenarios that were cited in the previous ERCs have been sorted into a small number of categories based on the distance to which the hazardous effects of each scenario might extend. Planners are guided to develop plans for this small number of categories rather than for a large number of scenarios for two practical reasons:

- At the time of an accident, the information immediately available from the installation is likely to be rather limited. Indeed, at first report, it may be unknown what caused a release of chemical agent. For reaching a protective action decision, it may not matter what caused the release of agent (that is, what scenario is in effect). What matters is: how far are hazardous effects likely to extend, in what direction, how soon, and for how long? The accident categories are designed to provide that level of information immediately available, basically required information to planners and decision makers.
- Because of the speed with which protective action decisions must be reached for a chemical agent release, decision makers will not have enough time at the time of an accident to sort through a large number of possible protective action strategies. To enable a decision to be made quickly, the number of options must be kept small. The accident categories are designed to support the grouping of what could be a large number of options into just a few.

Different sites have consolidated their accidents differently, in keeping with local circumstances and planning philosophies. For example, some sites have a diverse inventory of chemical munitions, encompassing many different combinations of agent type and munition type. Other sites have a less diverse inventory—for example, only one agent type and one type of munition or storage container. For the former sites, in order to simplify protective action planning, it is preferable for accident categories to cut across various agent/munition combinations. A category might be defined, for example, to encompass any chemical incident necessitating public protective action (evacuation or in-place sheltering) out to a certain distance. Using such a categorization scheme, it would not matter (for the sake of public protective action planning) whether the hazard were caused by the release of a certain quantity of nerve agent GB, or of a different quantity of mustard. The consequences would be the same for protective action decision making.

For the less diverse storage sites, a different categorization philosophy may be appropriate. For example, one site stores only ton containers of nerve agent VX. For such a site, categories may be more logically related to the number of munitions or containers involved in a release, rather than to the resulting hazard distance. Though the resulting hazard distance is still important for public protective action planning, it might not be the organizing principle for categorizing accidents at such a site.

The EPGs contain extensive discussions of how to use the D2PC atmospheric dispersion model, and of cautions that the user should be aware of in using D2PC. Emergency managers

are cautioned, should a real incident happen, that their first reaction upon receiving a notification of a chemical agent accident should not be to run D2PC nor to wait for someone else to run it. Doing so will only lose valuable time that emergency managers and responders need for implementing a protective action. The accident categories in the EPG are designed to help emergency managers make appropriate protective action decisions without waiting to run D2PC first at the time of an incident.

Given those cautions, however, it is also important to note what are appropriate uses of D2PC:

- At the time of an accident, emergency managers are encouraged to run D2PC as time and available data allow, to perform ongoing assessment of the accident. They should not, however, put off implementing a protective action while waiting for a D2PC run.
- In the planning stage, planners are encouraged to run D2PC extensively to try out various options. Instructions are given in the EPGs to enable planners to reproduce the distances published in the EPGs. Planners are also encouraged to calculate other scenarios—vary the quantity of agent release, for instance, to find out “what happens if...” Even if they never touch D2PC during an actual incident, the insight they gain from running D2PC during the planning stage will give them a much better understanding of what is happening during an actual incident.

The D2PC model has been field tested extensively by the Army. Where conditions exist that approximate the assumptions of the model (such as flat terrain and steady weather conditions), D2PC estimates were found to be extremely accurate in comparison to the results of actual tests. However, in many cases D2PC will overestimate the hazard distance for a given quantity of release. This is because in the real world, many things impede the downwind movement of materials released to the atmosphere. For example, wind meandering and rough terrain (natural features or buildings) will interrupt the steady movement of a plume of agent. So, D2PC's estimate of downwind effects will usually be greater than that which would occur if an actual release took place. Therefore, the use of D2PC should enable planners to assure decision makers that the EPG accident categories, which are based on D2PC results, provide a conservative basis for protecting the public.

One problem with the results of the D2PC calculations published in the ERCs is an inability on the part of planners or subsequent researchers to duplicate the results. Reasons for this inability included:

- *Incomplete publication of input data.* The ERCs included the basic scenario data needed to reconstruct each model run. However, the D2PC model requires as inputs several quantities or assumptions that were not explicitly published. In the absence of published information, planners and technical consultants made choices of default inputs and assumptions that were reasonable, but differed from those used in the original analysis. Not surprisingly, therefore, their results differed from the earlier results.
- *Interpolation of some scenarios.* In the original analysis, some scenarios were not individually calculated by running the D2PC model. Rather, their results were estimated by interpolation between two scenarios that were individually calculated. Therefore, when later

analysts tried to calculate all of the scenarios individually, even when they used correct inputs, they got different results from the previous interpolations.

- *Site-specific differences.* The original analysis was done generically for all sites. It did not account for site-specific differences such as in seasonal average temperatures or atmospheric mixing layer heights. Planners who later attempted to apply default assumptions for their own sites ended up with differences from the original analysis.

The APBRG aimed to counteract these problems in the present analysis. The APBRG's strategy was, first, to recalculate each of the scenarios for each of the sites, using site-specific data where appropriate. Secondly, the APBRG provided users of the EPGs with all of the information needed to reproduce the D2PC results. Using the provided data, planners are enabled to run the D2PC model themselves, and to derive the same results as published in the EPGs. Using the published analyses as templates, planners can also vary the inputs, with confidence that they are following the same calculation methodology as used in the EPGs.

To aid and encourage such use of the model, the inputs that were used to derive the EPG results have been included pictorially in the EPGs, in the form of Windows (TM) input screens. A typical input screen for one scenario at the Anniston Army Depot is shown in Figure 1. Using such a screen as a visual reference, planners can easily ensure that their inputs to D2PC match those used in the EPGs.

The ability to duplicate the D2PC results in the EPGs and to apply the same methodology to other scenarios gives planners several important advantages:

- Planners are able to verify the EPG results for themselves. They no longer have to blindly accept the numbers given to them by an outside source. They may, therefore, have more confidence in the model results as a valid basis for planning.
- Planners are able to reassure the public of the validity of the analysis. State and local planners should be able to enhance the credibility of CSEPP planning with the public by performing their own review and approval of the analysis performed by the APBRG.
- Planners are able to educate themselves by analyzing other “what if” scenarios. Such additional analyses can help them anticipate what sort of effects to expect should a chemical incident actually happen, even if the actual incident is not exactly like one of the scenarios they have analyzed.

CONCLUSIONS

The updating of the planning base for CSEPP has accomplished several worthwhile goals. From a technical standpoint, it has taken advantage of changes in the CSDP and better knowledge gained about the potential for chemical accidents since the publication of the ERCs. It has also given planners an opportunity to incorporate more recent and site-specific data into their planning base. Strategically, the update has enabled planners to make better use of the planning base, first by focusing their attention on accident categories instead of individual accident scenarios, and second by providing them with the means to verify the analysis and conduct further analyses on their own.

ACKNOWLEDGMENT

This work was supported under a military interdepartmental purchase request from the U.S. Department of Defense, Office of the Assistant Secretary of the Army for Installations, Logistics, and Environment, through U.S. Department of Energy contract W-31-109-Eng-38.

REFERENCES

Carnes, S.A., J.H. Sorensen, G.O. Rogers, B.L. Shumpert, R.L. Miller, A.P. Watson, and C.V. Chester. 1989. "Emergency Response Concept Plan for Lexington-Blue Grass Army Depot and Vicinity." ORNL/TM-11099. Oak Ridge National Laboratory, Oak Ridge, TN (Oct.).

U.S. Department of the Army. 1987. "Risk Analysis of the Onsite Disposal of Chemical Munitions." SAPEO-CDE-15-87010. Program Executive Officer—Program Manager for Chemical Demilitarization, Aberdeen Proving Ground, MD.

U.S. Department of the Army. 1988. "Chemical Stockpile Disposal Program Final Programmatic Environmental Impact Statement." Program Executive Officer—Program Manager for Chemical Demilitarization, Aberdeen Proving Ground, Md. (Jan.).

BIOGRAPHIES

Donald E. Newsom and Marc A. Madore are in the Emergency Systems Group at Argonne National Laboratory. Dr. Newsom led the technical effort at Argonne to update the CSEPP planning base. Mr. Madore is Deputy Program Manager at Argonne for the CSEPP Program. Robert A. Paddock and Mariska J. G. Absil are in the Systems Science Group. Dr. Paddock performed the dispersion modeling calculations for this project. Ms. Absil assisted with the calculations and developed the screen captures for publication.

D2PCw Hazard Prediction Model Interface - ANAD - Case #820	
File Run Options MCEs Releases Met Site Event Communication Help	
EVENT DATA	
Date 07 JUL 94 Now	Phase
Time 16:21:40 CDT	<input checked="" type="radio"/> Planning
Mode Operational	<input type="radio"/> Event
	<input type="checkbox"/> Log Runs
Agent	
GB, Sarin	
VX, EA 1701	
HD, Distilled Mustard	
AC, Hydrogen Cyanide	
Munitions # of Munitions 1	
105-mm Cartridge, M60, M360	
155-mm Projectile, M110, M121A1	
8-inch Projectile, M426	
500-lb Bomb, MK94	
Release Type	
Instantaneous (explosive)	
Evaporative (spill)	
Semicontinuous	
Variable	
LOCATION	
Deg lat,lon 33.6747 -85.9506 loc from map	
UTM (Zone,Y,X) 16 3726389 597282	
3.963 m SE from Igloo # G101	
METEOROLOGICAL DATA	
Stability Class	
A - Very Unstable	
B - Unstable	
C - Slightly Unstable	
D - Neutral	
Season	
Winter	
Spring	
Summer	
Fall	
Temperature 90 deg F	
Wind Dir (from) 65 Speed 3 m/sec	
Atm Pressure 747 mm hg	
Hgt Mix Layer 490 m	load tower data

Figure 1. Sample Input Screen for the D2PC Model