Chapter 9 Table of Contents

9. Dispersion Analysis/Background Information

9.1 HARP Dispersion Analysis Background

Air monitoring data may identify levels of toxic air contaminants (TACs) in the ambient air. However, due to resource limitations, it is not practical to place monitors at all locations to evaluate the exposure of TACs to the general public. As a result, we use air quality models to estimate levels of TACs in the ambient air. This is a more practical approach because air quality models can simulate atmospheric processes on a large scale with a fine spatial resolution.

HARP uses the U.S. Environmental Protection Agency's (U.S. EPA) air quality model ISCST3 (Industrial Source Complex – Short Term 3) in combination with BPIP (Building Profile Input Program).

9.2 What is Air Dispersion Modeling?

Air dispersion models simulate the atmospheric transport and fate of a pollutant from the point of emission to the location of impact to arrive at ambient air concentration estimates of the pollutant. The transformation (fate) of an airborne pollutant, its movement with the prevailing winds (transport), its crosswind and vertical movement due to atmospheric turbulence (dispersion), and its removal amounts due to dry and wet deposition are influence by the pollutant's physical and chemical properties and by meteorological and environmental conditions. Factors such as distance from the source to the receptor, meteorology, intervening land use and terrain, pollutant release characteristics, and background pollutant concentrations affect the predicted air concentration rate of an air pollutant. Estimates of the amount of gaseous and particulate material deposited by wet and dry process on outdoor surfaces are also necessary to assess impacts of toxic air pollutants. [From U.S EPA fact sheet: *Computer Modeling: Dispersion Models*. www.epa.gov/ttn/atw/wks/fs-dispmodel.pdf.]

9.3 What is ISC?

HARP performs air dispersion analysis by using the U.S. Environmental Protection Agency's (U.S. EPA) ISCST3 (Industrial Source Complex) air dispersion model. ISCST3 is a steady-state Gaussian air dispersion model which can be used to assess pollutant concentrations from a wide variety of sources associated with an industrial complex to a distance of 50 kilometers [From U.S EPA fact sheet: *Computer Modeling: Dispersion Models*. www.epa.gov/ttn/atw/wks/fs-dispmodel.pdf]. ISC incorporates three previous programs into a single program. These are the short-term model (ISCST), the long-term model (ISCLT) and the complex terrain model (COMPLEX). All three types of analysis are now done with the same program by controlling the input. For the purpose of risk assessment in HARP, only the short term and complex terrain options are utilized.

ISCST3 is available on the U.S. EPA SCRAM web site (http://www.epa.gov/scram001/) in both executable and source code form. The version of ISCST3 that is delivered with HARP includes some additional post-processing and output that makes it much more efficient to perform risk analysis in terms of disk storage and computation time. None of the algorithms or

output options have been altered from the original U.S. EPA version. The executable program file for the enhanced version of ISC is included on the HARP setup disks and is automatically installed when you install HARP. HARP uses ISCST3 version number 99155.

9.4 What is BPIP?

BPIP (Building Profile Input Program) is a U.S. EPA model that calculates the impact of building downwash. Building downwash is the creation of cavity zones by air moving around buildings. BPIP calculates building heights and projected widths. It will determine whether or not a stack is being subjected to wake effects from a structure or structures to calculate building downwash. BPIP then generates a file that is read by ISCST3 to simulate the building downwash effects of one or several buildings on a stack. (U.S. EPA, 1993)

BPIP is a preprocessor that converts the building geometry into a format that can be input directly into ISCST3. If you want to include building downwash in the ISCST3 calculations, running BPIP is a necessary step. This is made quite easy in HARP. If the *Include Building Downwash* parameter is set to YES on the *Control* window of the HARP Dispersion window, then when you set up and run ISC HARP does the following steps:

1. For each source that is listed on the *Sources* sheet of the ISC workbook, HARP looks up the building(s) geometry for the facility (i.e. the facility that that particular source belongs to).
2. Using the building geometry, HARP builds an input file for the BPIP program.
3. HARP runs BPIP. BPIP produces an output that is in a format that can be inserted into an ISC input file.
4. HARP reads the BPIP output and inserts it into the correct location in the ISC input file.
5. The steps above are repeated for each source (release point)

Building downwash is only calculated for point sources (not volume or area sources). The building geometry is not displayed on the ISC workbook. If you want to edit it, you must go back to the emissions inventory database, select the facility, and then select the Geometry menu item from the facility window. HARP cannot run BPIP for facilities that do not have building data in the HARP database. For further details on the BPIP program, you should consult the BPIP manual, which is included in the references directory of the HARP installation disk.

9.5 Complex Terrain

Complex terrain is defined as terrain above the final plume rise. Since HARP uses ISCST3 for complex terrain modeling, results from the HARP program for complex terrain are screening only. Should the results from HARP with ISCST3 indicate further analysis is required, we refer the user to the Office of Environmental Health Hazard Assessment (OEHHA) document *The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* to select a refined complex terrain air dispersion model.

9.6 Functional Overview

The dispersion analysis module of HARP supports the following two steps, which are required to perform a dispersion analysis:

1) Building an input file for ISCST3 and BPIP
2) Running ISCST3 and BPIP

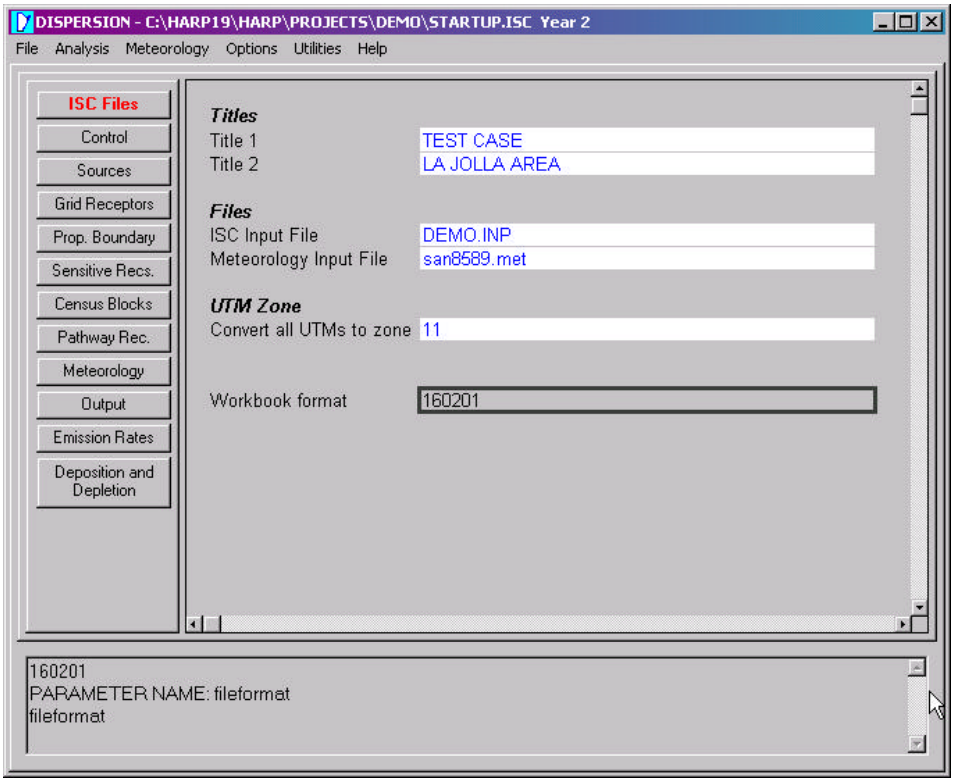
Running ISCST3 is a trivial matter. It can be done from the DOS prompt, but for convenience it can also be run by selecting a menu option in HARP, so that you do not have to worry about the syntax of running it or the specification of the input and output files.

Setting up the ISCST3 input file is not trivial at all. Fortunately, the format of the input file is well documented and well organized. But the file itself can be large and complicated when many sources and receptors are involved. The order, and to some extent the spacing, of the input parameters in the file are important. HARP provides a user-friendly front-end that takes care of most of these details for you. As you will see from running HARP, there is still a large amount of input that you must provide. However, the difficult and tedious aspects of building the input, such as specifying the locations of a large number of receptors on a facility property boundary or on a spatial grid, are automated. Perhaps more importantly, you do not have to reenter parameters that are already in the HARP database in order to run the dispersion analysis. HARP will extract source and receptor data from the database and place it on the workbook where it can be edited. HARP will then write the contents of the workbook to the ISCST3 input file in the correct order and format.

9.7 Setting up a Dispersion Problem

HARP stores all parameters associated with a particular dispersion analysis in a single file known as a HARP workbook file (refer to section 9.8 and Appendix B for a description of files used by HARP and ISCST3). The default HARP workbook file has the name STARTUP.ISC. To set up a dispersion problem, you can use HARP to open and edit the contents of the workbook file. Since the workbook file is organized like a spreadsheet, it is much easier to edit the workbook file than to edit the ISCST3 input file directly. HARP provides a number of functions that allow you to populate the workbook file with data taken directly from the database. This enables you to easily set up problems for sources and receptors contained in the database with minimal additional data entry.

To edit ISCST3 input, select ***Analysis/Dispersion Analysis*** from the HARP main menu. You will see two more options. If you intend to use screening meteorology data, select ***Dispersion Analysis (Screening Met Data)***. If you intend to use real meteorology data representative of your site, select ***Dispersion Analysis (Representative Met Data)***. The Dispersion window will appear similar to the picture below:



Data is entered in a manner similar to a spreadsheet. White cells are for input. Each of the buttons on the left selects a different subset of the input data, similar to selecting worksheets on an Excel workbook. Details of each of the worksheets are provided later in this section.

After you have specified all of the input in the workbook file, HARP will use this information to build an ISCST3 input file. You can build the ISCST3 input file and run ISCST3 in a single step by selecting ***Analysis/Build ISC Input and Run*** from the dispersion menu (refer to section 9.11 for a detailed description of how to run ISCST3).

The following is a summary list of the input required for running a dispersion problem. Detailed descriptions of all input parameters are provided in section 9.12, Data Editing Details/Worksheet Descriptions.

File Names	You must specify the names of the ISCST3 input and output files. To do this, first click the ***ISC Files*** button. Then fill in the titles, file names, and UTM zone (refer to section 9.12.1). **Remember <u>NO</u> Spaces in the file names.**
Control	This worksheet specifies the run control parameters, which provide overall program control. If you wish to run the regulatory defaults, no changes need to be made to this worksheet. First click the ***Control*** button. Then fill in the parameters on the Control worksheet (refer to section 9.12.2).

Sources	You must provide a description of the emission sources. First click the ***Sources*** button. Then fill in the parameters on the Source worksheet. The ***Sources*** menu option will appear, which allows you to build a source list from facility stack data that already exists in the database (refer to section 9.12.3).
Receptors	You must provide information describing one or more of the following types of receptors: 1) Cartesian grid (see section 9.12.4) 2) property boundary receptors (see section 9.12.5) 3) sensitive receptors (see section 9.12.6) 4) census blocks (see section 9.12.7) 5) pathway receptors (see section 9.12.8)
Meteorology	You must provide a meteorology file in one of the standard formats compatible with ISCST3. The name of the file should be specified on the ISC File Names worksheet. First click the ***Meteorology*** button. Then fill in the parameters on the Meteorology worksheet (refer to section 9.12.9).
Output	You must specify output parameters to define what types of results you want to have reported. First click the ***Output*** button. Then fill in the parameters on the Output worksheet (refer to section 9.12.10).

The following are optional parameters that you may specify to provide more detailed control over the analysis.

Emission rate factors	These parameters are used to specify temporal variation of emission rates for individual sources. To edit these parameters click on the ***Emission Rates*** button (refer to section 9.12.11). This is a non-regulator option for ARB, and is therefore not recommended or required.
Deposition and Depletion	These parameters describe particle size distributions which are used for calculation of gravitational settling and removal by dry deposition of particulates. To edit these parameters click the ***Deposition and Depletion*** button (refer to section 9.12.12). This is a non-regulator option for ARB, and is therefore not recommended or required.

9.8 Files

This section describes the files associated with setting up and running ISCST3 using HARP. HARP will save all of the ISCST3 input and output files into your project directory. All of the ISCST3 input and output files can be viewed in a word processor. For a list of all of the files that HARP uses/creates, see Appendix B.

9.8.1 HARP Workbook File (File extension *.isc)

HARP stores all parameters associated with a particular dispersion analysis in a single file known as a HARP workbook file. The workbook contains several worksheets, or pages, each of which corresponds to a parameter group. The information in a workbook file is used to generate the input file to ISCST3. Using HARP, you can open a workbook, edit it and save it, either to the same file or a new file. This can be done independently of the database, or you can populate portions of the workbook with data extracted directly from the database by using functions accessible through the HARP menus. The various data editing functions are described in sections

Use the selections under the ***Files*** menu to open and save ISC workbook files.

9.8.2 ISCST3 Input File (File extension *.inp)

The ISCST3 input file is the main source of input to the ISCST3 program. It describes sources, receptors and numerous input and output options. It is a text file, which can be viewed or edited with any general-purpose text editor. The format of the ISCST3 input is described in detail in the *User's Guide for the Industrial Source Complex (ISC) Dispersion Models*. The ISCST3 input file is created by HARP when you select ***Analysis/Build ISC Input File*** or ***Analysis/Build ISC Input and Run*** from the menu. You specify the name of the ISC input file on the ***Files*** sheet of the workbook. **Note: Don't add any spaces when naming a file or directory.**

9.8.3 Source-Receptor File (File extension *.src)

The source-receptor file (often called an SRC file) is a file that is created by HARP when you run the dispersion analysis. It contains a list of all of the sources (stacks) and receptors that were used in the ISCST3 input, as well as details about those sources and receptors that are necessary to complete the risk analysis.

To perform risk analysis, HARP uses the X/Q values provided by ISCST3. CHI/Q or chi/q or χ/q is the concentration estimated from an air quality model based on an emission rate of one gram per second input to the model. Chi/q can be efficiently used to estimate the concentration of multiple inert pollutants simply by multiplying by the emission rate in grams per second. In this way, one model run may be conducted to evaluate the impact of several different inert pollutants. The X/Q values are combined with the emission rates (usually taken directly from the emissions database) to determine ground level concentrations (GLCs) of each of the pollutants.

A source-receptor file is required to perform a risk analysis because the normal ISCST3 input and output files do not contain sufficient information to determine which sources in the dispersion results correspond to which stacks in the database. Without this information, HARP cannot determine emission rates. The ISCST3 input and output files also lack descriptive information about the receptors. The SRC file contains information that allows HARP to distinguish between grid receptors, boundary receptors, census block receptors, and so forth. (see

sections 9.11 and 9.12 for instructions on setting up and running the dispersion analysis using ISCST3)

Most users will never have to look at the contents of an SRC file. However, you should know that:

1) It is an intermediate file that links the results of the dispersion analysis with the contents of the emissions database and subsequently with the risk analysis;
2) That you must have an SRC file in order to perform the risk analysis; and
3) That the SRC file is created automatically when you run the dispersion analysis.

Source-receptor files always have an extension of SRC. The full name of the file is determined by the name of the ISCST3 input file that you specified when running the dispersion analysis. For example, if you specified that the ISCST3 input file should be called DEMO.INP, and then the corresponding SRC file will be called DEMO.SRC. Thus all input and output files generated by a single run of the dispersion analysis will have the same root name but different extensions.

9.8.4 Meteorology File (File extensions *.met; *.txt; *.dat; *.sam; *.asc)

The meteorology file contains time series of wind velocity and direction, and various other parameters describing the wind profile that are required by ISCST3. The meteorology file can have different formats that are described in Appendix F of the *User's Guide for the Industrial Source Complex (ISC) Dispersion Models.*

9.8.5 Plot File (File extension *.plt)

The plot file is an output data file created by ISCST3 that contains information in a format suitable for importing into a spreadsheet or other plotting program. When you run ISCST3 from HARP, the name of the plot file is that same as the name of the input file, but with a **.plt* extension.

9.8.6 Post File (File extension *.pst)

The Post file is an output data file created by ISCST3 containing detailed results in a format suitable for post processing. It contains pollutant concentrations at each receptor point, from each source, for each time step of the simulation. This file may be either ASCII or binary depending on which option you choose. Since the amount of data in this file is typically quite large, it is normal to specify a binary format to conserve disk space. This file is the primary source of input data for the health risk assessment. When you run ISCST3 from HARP, the name of the plot file is that same as the name of the input file, but with a .pst extension.

9.8.7 XOQ File (File extension *.xoq)

This file contains the dilution factors (X/Q) for each source-receptor combination after an ISCST3 run. This file is always created automatically. It is an enhancement to ISCST3 specific to HARP that simplifies risk analysis and reduces file storage size.

9.8.8 Bin File (File extension *.bin)

This file contains hourly X/Q values for the entire simulation for each source-receptor combination in a binary format. This file is used only for calculating maximum hourly acute risk and can be very large. When you run ISCST3, you will be prompted whether you want to generate this file.

9.8.9 ISC Output File (File extension *.out)

The ISCST3 output file contains model run time information including all input parameters and all requested output fields. The format is suitable for viewing and printing in landscape mode. The exact contents and file size are determined by the input parameters specified in the HARP Output parameter group (refer to section 9.12.10). When ISCST3 is executed from HARP, the ISCST3 output filename is the same as the HARP input filename where the extension is changed to .out.

9.9 ISC Internal Post-Processing

9.9.1 Additional Output Files

The version of ISCST3 that is used by HARP has been modified to provide additional post processing and output that is necessary to carry out risk analysis. No changes have been made to the standard files or the algorithms in ISCST3. This version of ISCST3 generates the following additional files.

XOQ This file contains the average and maximum X/Q values for each source receptor combination. The maximum X/Q values are calculated for various averaging times. This is required for risk analysis because different chemicals have acute reference exposure levels based on different averaging times. HARP automatically uses the correct averaging time for each chemical. The XOQ file is generated by ISCST3 by means of additional post processing routines that have been added to the version of ISCST3 that is delivered with HARP.

BIN The BIN file is generated by ISCST3 and holds binary X/Q information for every source/receptor combination for every hour of the simulation. It is similar to the ISCST3 POSTFILE, however the information is in a more structured format that makes it more suitable for post-processing. Unlike the POSTFILE, the BIN file format and contents are independent of the output options that you choose, which also make it simple to process. The data in the BIN file is used for the detailed acute risk analysis, which requires an hour-by-hour calculation of acute risk for the entire duration of the ISCST3 run. The

BIN file can be quite large for long simulations and large numbers of sources and receptors.

9.9.2 Averaging Times for Acute Risk

For an acute analysis, the OEHHA guidelines recommend using a ground level concentration that is based on the same averaging time that was used to determine the acute reference exposure levels. For most chemicals this is the 1-hour maximum, which is the value output by ISCST3. For other chemicals, the appropriate averaging time is 4, 6, or 7-hours. (See Appendix I for a list of acute Reference Exposure Levels and their averaging times.)

9.9.3 CALMS Processing

The option for CALMS processing is found under the Control Worksheet in the Dispersion Module. CALMS processing omits averaging periods when the number of calm hours during that averaging period are excessive. See the US-EPA's Appendix X to part 51 - Guideline on Air Quality Models (2001) for further details.

The regulatory default is to use the CALMS processing routine. Some Districts may have other preferences for the CALMS processing routine (e.g., the SCAQMD recommends NOCALMS for the meteorological data sets provided by their District).

The average and maximum values of X/Q will vary depending on whether or not CALMS processing is selected. ISCST3 will output the corresponding values to the X/Q file. Because these maximum values change with CALMS processing, the acute risk values will also depend on whether you choose CALMS processing.

ISCST3 does not have algorithms to compute all averaging periods that are required for the OEHHA risk assessments guidelines. Specifically, the 4, 6 and 7-hour averages needed for acute RELs are not available from ISCST3.

HARP overcomes this ISCST3 limitation by computing the 4, 6, and 7-hour averaging periods separately from the air quality model. HARP uses the NOCALM processing for estimating these acute averaging periods regardless of whether the user selects CALMS or NOCALMS in the ISCST3 computer modeling input file.

HARP computes the 4, 6, and 7-hour averages by a true running average, as opposed to a block average. A block averaging scheme for a 4 hour average moves through the time history 4 hours at a time. For example, it averages hours 1-4, and then averages hours 5-8, then hours 9-12, and so on. The maximum value of all of these 4-point averages over the entire time series is termed the 4-hour maximum. A true running average, on the other hand, moves through the time history 1 hour at a time, averaging each sequential set of 4 points as it goes. For example, it averages hours 1-4, then averages hours 2-5, then hours 3-6, and so on. The block averaging scheme, while being faster, could miss the true maximum, which might be the average of points 3-6, for instance. The true running average is certain to find the true maximum of the 4-hour average and is therefore more health protective.

The 30-day average is not actually used by HARP for a risk calculation as of this writing. It has been implemented in anticipation of using it for the analysis of lead. For more information on conducting a risk assessment for noncancer lead exposure, see Appendix F of the OEHHA Risk Guidance Manual, or the Risk Management Guidelines for New, Modified, and Existing Sources of Lead (ARB, 2001). Nevertheless, we will describe here the method for obtaining the 30-day maximum concentration. The goal is the same as for the other averaging times. We would like to find the maximum value of the 30-day running average of the concentration. It turns out that in order to do this as rigorously as the 4, 6 and 7-hour averages (that is, by advancing the samples one hour at a time) requires an excessive amount of computer memory. Therefore a compromise solution has been implemented. The 30-day maximum is computed by advancing the sample 24 hours at a time rather than one hour at a time. This could theoretically result is a missed peak, but since the long average tends to smooth out peaks anyway, it has been deemed that this is a reasonable approximation. It is certainly far more accurate than taking a 30-day block average, and far less demanding or resources than a true hour-by-hour running average.

9.10 How to Setup and Run the Dispersion Module

This section describes general procedures for editing ISC input parameters.

9.10.1 Prerequisites - Data Needs

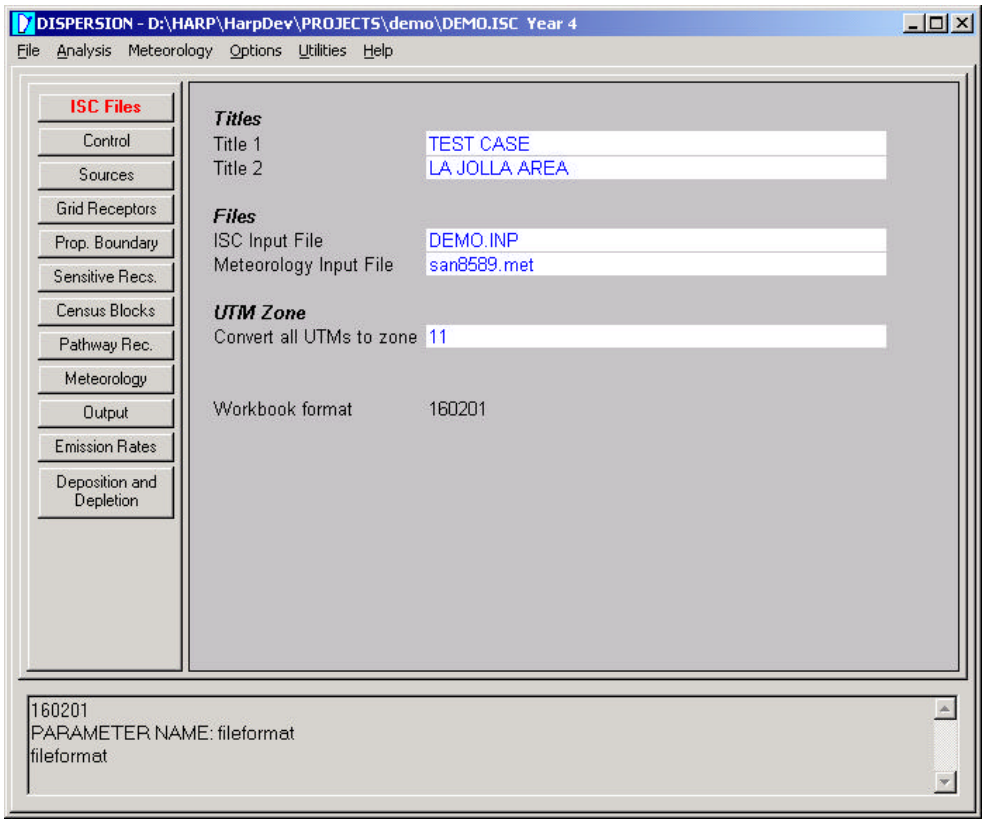
Before you can set-up your air dispersion run, you must have already entered data for the facilities you wish to analyze in the CEIDARS-Lite (emission inventory) database. If you wish to run building downwash, you need to have entered building geometry data into the CEIDARS-Lite database. For information on how to enter facility data, see chapter 5, tutorial in chapter 4, and How To # 2 in Appendix A.

9.10.2 Dispersion Analysis Window (Main Dispersion window)

HARP stores all parameters associated with a particular dispersion analysis in a single file known as a HARP workbook file (refer to section 9.8 and Appendix B for a description of files used by HARP and ISCST3). The default HARP workbook file has the name STARTUP.ISC. To set up a dispersion problem, you can use HARP to open and edit the contents of the workbook file. Since the workbook file is organized like a spreadsheet, it is much easier to edit the workbook file than to edit the ISCST3 input file directly. HARP provides a number of functions that allow you to populate the workbook file with data taken directly from the database. This enables you to easily set up problems for sources and receptors contained in the database with minimal additional data entry.

The dispersion analysis window always shows one worksheet of the dispersion analysis workbook. The workbook collects the ISC input data and creates the ISC input file. The workbook is divided, by topic, into worksheets. In the example below, the workbook is *STARTUP.ISC* and the ***ISC Files*** worksheet is displayed.

The text at the very bottom of the window is the On-line help, which is described in section 9.10.5.



9.10.3 Opening and Saving Workbooks

A workbook is a multi-page spreadsheet that allows you to edit all of the ISC input parameters. The workbook is displayed in the dispersion analysis window, one worksheet at a time. Each workbook is stored in a file having an extension of *ISC*. To open an existing workbook file select ***File/Open*** from the menu. Select the file you want to open from the dialog box.

After you have made changes to a workbook, you can save it as the same file or a different file for latter use. To save the workbook to the same file, select ***File/Save*** from the menu. To save the workbook to a different file, select ***File/Save As*** from the menu. It is recommended that you do this frequently if you are making many changes. Then if you make a mistake, you can always revert to the most recently saved workbook file to undo your changes.

9.10.4 Editing and Moving Around

To display a different worksheet of the workbook, select one of the buttons shown on the left side of the window. Each worksheet corresponds to one of the parameter groups, which are described in section 9.12.

The workbook behaves like most spreadsheets. You may change the value of any of the input parameters by moving the cursor to the corresponding cell and typing in a new value. When you press *Enter* or one of the arrow keys, the value will be stored in the cell, replacing whatever value was there previously. To edit the value in a cell without retyping it completely, move the cursor to the cell and press ***F2***. Pressing *ESC* at any time cancels the most recent typing and causes the cell to revert to its previous value.

The cells are color-coded to clarify which cells can be edited. White cells are input parameters that you can edit. Gray cells are either not used or contain labels for your information. Gray cells are locked so that you are prevented from entering data into them.

If you press the *Enter* key at any time, the cursor will automatically move to the next data input cell on the currently displayed worksheet. This facilitates sequential data entry by allowing you to type a series of values, each followed by the *Enter* key, without having to use the arrow keys to move to the next input cell.

Input data is validated as you enter it. If you enter a value that is not allowed, an error message will immediately appear when you press *Enter* or try to move to a new cell. Before the program will allow you to move to a new cell, you must either correct the error or press *ESC* to cancel the changes.

9.10.5 Using the On-line Help

Each time the cursor is moved to a new cell, a description of the contents of that cell will appear in the help box at the bottom of the window. Immediately below the description is a line labeled ALLOWABLE VALUES, which tells you what you are allowed to enter into that cell. If the input parameter in that cell has dimensions, the units of measurement will also be displayed in the help box.

9.11 Running ISC

9.11.1 Launching ISC from HARP

The most common way to run ISC is to select ***Analysis/Build ISC Input and Run.*** This will cause HARP to build the ISC input file using all of the parameters that you specify on the workbook. HARP will then run ISC and wait for it to finish. The names of the ISC input and output files are specified on the Files worksheet, which can be viewed by selecting the ***ISC Files*** button. The names of the ISC input and output files are automatically passed to ISC as command line arguments by HARP.

The ISC program itself is contained in the file *ISC.EXE*. This file must reside in the same directory as *HARP.EXE*, which is where the setup program normally installs it.

There are two other options under the Analysis menu. You may select ***Analysis/Run ISC***, which causes HARP to run ISC without first building the input file. This is seldom done,

but might be useful if you have edited the ISC input file outside of HARP (for example with a text editor) and do not want HARP to overwrite your changes. In this case HARP will not create the ISC input file nor check its validity. It will simply run ISC using the input file that you specify, which must already exist. You may also select ***Analysis/Build ISC Input File***. This will cause HARP to build the ISC input file but not run ISC. This is sometimes done to check that all of the input parameters are valid, or if you want to examine the ISC input file before actually running ISC.

9.11.2 Running ISC Outside of HARP

ISC is included with the HARP installation disks and automatically installed in the same directory as HARP. It has been recompiled from the original source code using the DEC FORTRAN 5 compiler. ISC can be run from a command window by entering the following command:

ISC <inputfile> <output file> <X/Q file> <bin file>

Where <inputfile> and <outputfile> are the names of the ISC input and output files, and <X/Q file> is the name of the X/Q (dilution factor) file. These files names may contain a complete directory path. If the path is missing, the files are presumed to exist in the same directory as ISC.EXE. <bin file> is optional. If it is included on the command line then the binary X/Q file will be created, which contains dilution factors for every hour.

For further details on running ISC refer to the *User's Guide for the Industrial Source Complex (ISC) Dispersion Models* (which is included on the HARP installation CD). Note: If you run ISC outside of HARP, the ISC results cannot be read by HARP. The risk module in HARP requires that there be an SRC file (source receptor file) in addition to the XOQ file. The SRC file is needed to interpret the meaning of each of the sources and receptors. It allows HARP to distinguish between census block receptors and grid receptors and pathway receptors, for example. It also allows HARP to determine which particular facility and stack a source is associated with, so it can look up the emissions in the database. HARP has to create a separate SRC file when it runs ISC.

9.11.3 Viewing Results

ISC writes the results of the dispersion analysis to the output file, whose name is the same as the input file, but with a *.OUT* extension. The ISC output file is a formatted ASCII file, which can be viewed with any text editor. (See Appendix B for a list of file extensions used/created by HARP.)

9.11.4 Trouble Shooting

Although HARP does quite a lot of validation of the input, it cannot catch all possible errors that might occur within ISC. If errors occur during an ISC run, there will usually be error messages at the end of the ISC output file. Typically, these messages are quite clear and will point to the problem. For further details on error messages in the ISC output file refer to the

User's Guide for the Industrial Source Complex (ISC) Dispersion Models that is included on the installation CD. The ISC output file can be viewed with any text editor.

There is an Y2K warning that will appear after every run of ISC in HARP. This warning looks like this:

******** WARNING MESSAGES ********
ME W360 1033 SET_WI:2-Digit Year Specified: Valid for Range 1950-2049 SURFDATA

This warning occurs if the meteorology file contains years with only two digits. ISC resolves the ambiguity by interpreting this to mean the years are in the range of 1950 to 2049. In other words, 02 is interpreted as 2002, not 1902.

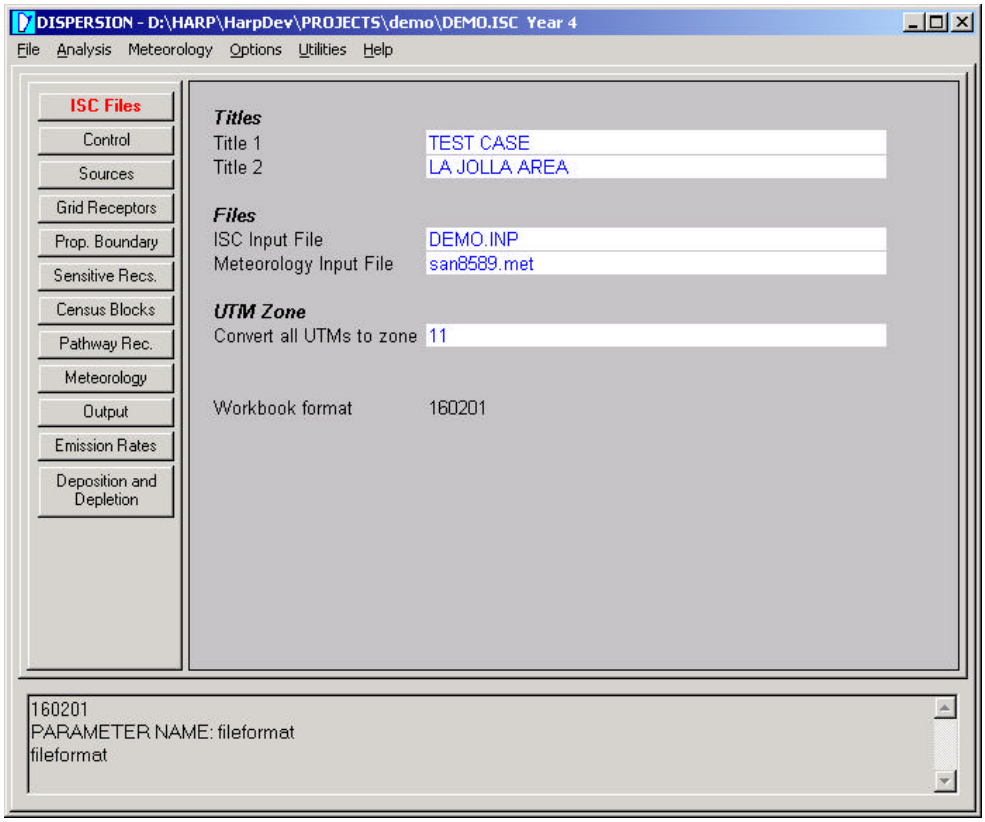
9.12 Data Editing Details/Worksheet Descriptions

9.12.1 ISC Files Worksheet

The dispersion analysis input parameters are divided into groups for organizational convenience. These groups correspond roughly to the input pathways described in the *User's Guide for the Industrial Source Complex (ISC) Dispersion Models*. The Receptor Pathway parameters in the ISC user's guide have been broken down into several subgroups that represents the different types of receptor configurations that might be used for a particular analysis. Receptors from one or more of these groups may be included in the ISC run.

Each parameter group can be viewed or edited by selecting the corresponding button. This section summarizes each of the groups. The following sections provide detailed descriptions of the parameters within each group.

The ISC Files worksheet is shown below. This worksheet is used to describe all of the input and output files which will be used by ISC, and the titles for this run. The following list describes each of the parameters on this worksheet.

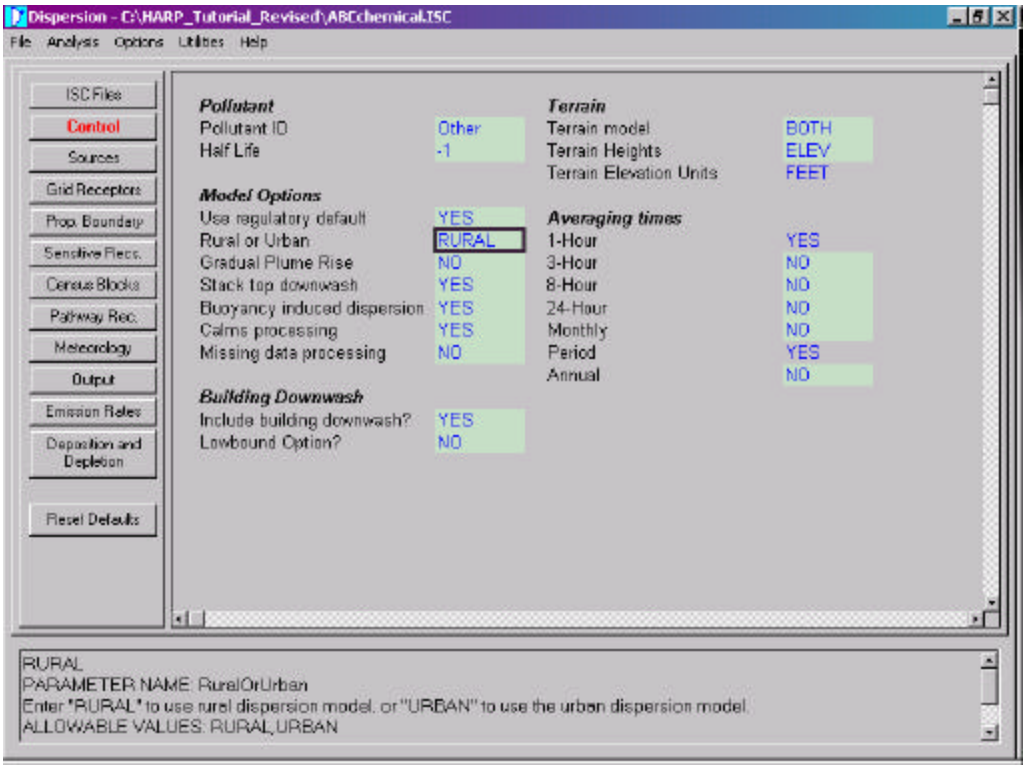


9.12.1.1 File Name Parameters

Title 1	Title of this run, which will appear at the beginning of the ISC output file. This may be any text up to 68 characters long.
Title 2	Secondary title of this run, which will appear at the beginning of the ISC output file. This may be any text up to 68 characters long.
ISC Input File	Name of the ISC input file and output file which will be created by HARP when you select ***Run ISC*** or ***Build ISC Input file*** from the menu. If the path is omitted, the file will reside in the default directory specified above.
Meteorology Input File	Name of the meteorology data file. ISC will read this file to get hourly wind data. You must include the full path to the file. The file must contain data matching the start and end times which are specified below. If the path is omitted, the file will reside in the default directory specified above. To edit this cell press ***F2*** on the keyboard.
UTM Zone	All UTM coordinates will be converted to this zone. This takes care of problems that might arise if a UTM zone boundary runs through the middle of your analysis area (as with Santa Barbara).

9.12.2 Control Worksheet

The Control Parameters worksheet is displayed below. This worksheet is used to input several parameters which provide overall control of the ISC run. Section 9.12.2.1 describes each of the parameters on this worksheet.



9.12.2.1 Control Parameters (Control Worksheet)

Pollutant ID	The Pollutant ID identifies the type of pollutant being modeled. Any name of up to eight characters may be used. Inputting "SO2" with the Urban default options forces use of a half-life of 4 hours for exponential decay. Otherwise this parameter is just for information. For risk assessment, ISC is used to compute X/Q factors which may be applied to multiple pollutants so the identification of the pollutant in this parameter is not particularly relevant.
Half-Life	Half-life used for exponential decay. Enter zero or blank to indicate that this parameter is to be omitted from the ISC input.
User Regulatory Default	Enter Y to specify that regulatory default options will override model options entered by user. Otherwise enter N. Entering Y will override specification of gradual plume rise, stack top downwash, buoyancy induced dispersion, calms processing, and

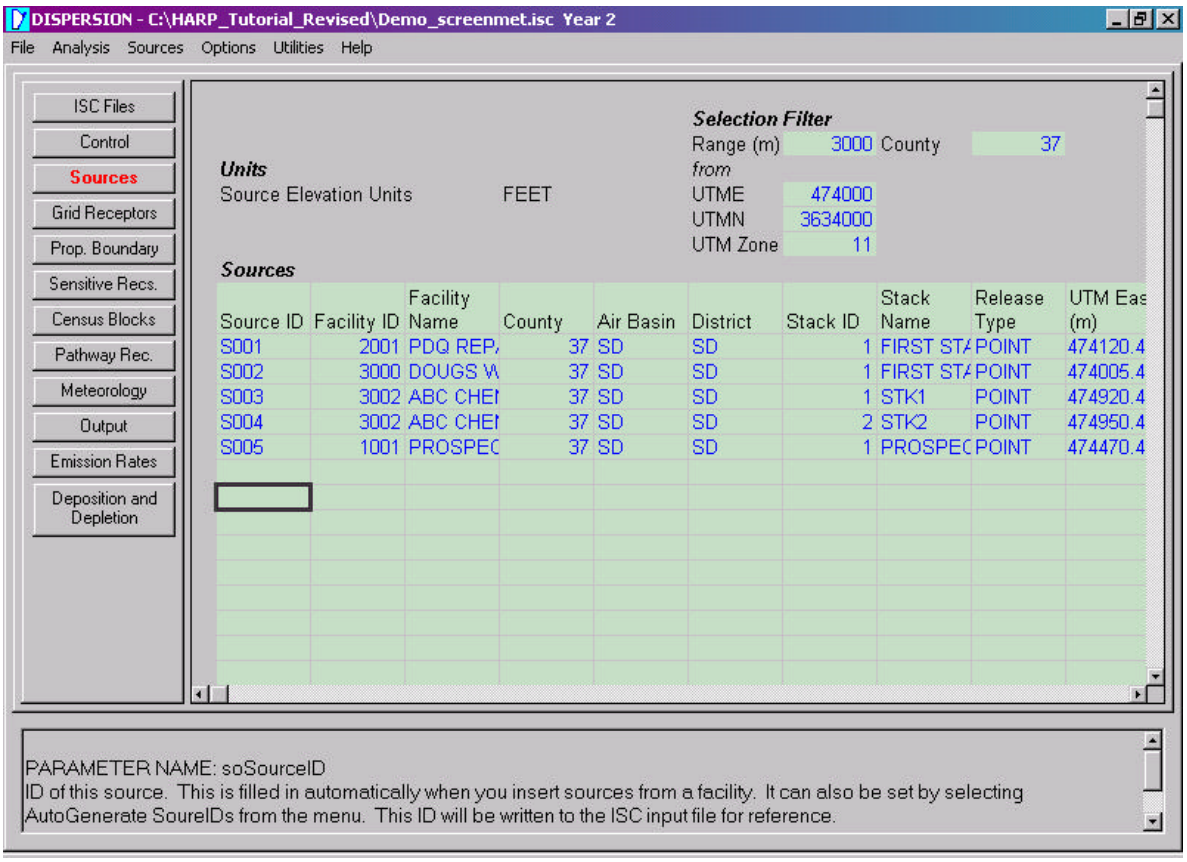
	missing data processing. Refer to section 3.2.2 in ISC User's Guide for more details.
Rural or Urban	Enter "RURAL" to use rural dispersion model, or "URBAN" to use the urban dispersion model.
Gradual Plume Rise	Enter Y to specify that the option of gradual plume rise will be used. Enter N to specify that gradual plume rise will not be used.
Stack tip downwash	Enter Y to specify use of stack tip downwash. Enter N to specify that no stack tip downwash will be used. Regulatory default is Y.
Buoyancy Induced Dispersion	Specifies the option to use no buoyancy induced dispersion (non-regulatory default). Regulatory default is Y.
Calms Processing	Enter Y to specify use of CALMS processing routines. Enter N to bypass CALMS processing routines. Regulatory default is Y. Refer to the next section for discussion of CALMS processing and risk analysis.
Missing Data Processing	Enter Y to specify use of missing data processing. Enter N to specify no missing data processing. Regulatory default is N.
Building Downwash	Enter Y if you want building downwash parameter on this sheet to be included in the ISC input file. Enter N if you want to skip building downwash calculations and ignore all data on this sheet.
Lowbound Option	Enter "Y" to use the non-regulatory LowBound option for building downwash. This option only applies if "Include building downwash?" is set to "Y", otherwise it is ignored.
Terrain Model	Enter SIMPLE to use simple terrain model only (suppress complex terrain calculations). Enter COMPLEX to use complex terrain model only (suppress simple terrain calculations). Enter BOTH to use both complex and simple terrain calculations.
Terrain Heights	Enter ELEVATED to specify that receptors may be located on elevated terrain. Enter FLAT to specify that flat terrain will be assumed for all calculations. If you enter ELEVATED then elevations must be specified for all receptors. Terrain Heights are entered as "flagpole heights" on four different categories listed under the dispersion worksheets for: grid receptors, property boundary receptors, sensitive receptors and census blocks.
Terrain Elevation Units	Units for terrain receptor elevations. Terrain receptor elevations must be in feet.
1-Hour	Specify that 1-hour average concentrations will be calculated.
3-Hour	Specify that 3-hour average concentrations will be calculated.
8-Hour	Specify that 8-hour average concentrations will be calculated.
24-Hour	Specify that 24-hour average concentrations will be calculated.
Monthly	Specify that monthly average concentrations will be calculated.

Period	Specify that average concentrations will be calculated for the entire simulation period.
Annual	Specify that annual average concentrations will be calculated.

9.12.3 Source Worksheet

The Sources worksheet is displayed when you select the *Sources* button from the left side of the workbook screen. This source worksheet is used to input descriptions of the emission sources. Section 9.12.3.1 provides an overview of setting up a list of sources. Section 9.12.3.3 describes each of the parameters on this worksheet.

When the source worksheet is displayed, the Sources menu item will also appear on the horizontal menu bar at the top of the screen. Under the Sources menu you will find several additional options for setting up the source descriptions on this worksheet. These are described in section 9.12.3.4.



9.12.3.1 Defining Sources (Source Worksheet)

Each source corresponds to a row in the Sources table on the Sources worksheet. Some of the parameters on this worksheet are for display purposes only and are not used by ISC. The parameters that are used by ISC are the Source ID, location (X, Y and Z), Emission Rate, and stack parameters (Height, Temperature, Velocity and Diameter). The remaining parameters are used to identify which facility a particular stack belongs to. These are filled in automatically when you select ***Sources/Insert Entire Facility*** from the menu (refer to section 9.12.3.4.1).

For the purpose of running ISC, all sources are associated with stacks. HARP provides functions under the Sources menu for retrieving stack data from the HARP database and inserting it onto this worksheet. You may then edit the data if you wish prior to using it to create the ISC input file. For details refer to section 9.12.3.4.

The Source ID can be any string of up to 8 characters. HARP will create Source IDs automatically when you select ***Sources/Auto-generate Source IDs*** from the menu (refer to section 9.12.3.4.5). You may also enter the source ID's manually.

When HARP builds the ISC input file, it reads the parameters that you provide on the Source worksheet and writes them to the ISC input file in the correct format. HARP reads the sources starting with the first row in the table and continuing downward until it encounters a row with a blank Source ID.

9.12.3.2 Removing Sources (Source Worksheet)

If a Source ID on the Sources worksheet is blank, then that source and any sources below it in the table are completely ignored. Therefore you may truncate the list of sources by simply deleting the source ID for one of the rows. Than all rows below that will be ignored. To set a source ID to blank, simply place the cursor on the cell containing the source ID and press the space bar and the Enter key. Another way to remove a source from the list is to use the ***Delete Rows*** menu option (refer to section 9.12.3.4.4).

9.12.3.3 Source Input Parameters (Source Worksheet)

Source Elevation Units	Elevation units. These units apply to values entered under the column labeled "Elevation" below. When you select *Source/Insert Entire Facility* from the menu, the program inserts values of source elevation from the database, which are always in units of feet. For consistency with the database, this cannot be changed.
(Selection Filter)	
Range	This range is used to select sources from the database and enter them automatically in the list below. When you select *Sources/Insert Sources Using Selection Filter* from the menu, the program locates all sources in the database which are within this range from the specified location and inserts them into the list. The sources shown in the list are then written to the ISC input file.

UTM East	UTM east coordinate of the origin of the facility of interest. To set this value automatically to the location of a particular facility, select *Sources/Selection Filter/Set Selection Filter to Origin of a Facility* from the menu.
UTM North	UTM north coordinate of the origin of the facility of interest. To set this value automatically to the location of a particular facility, select *Sources/Selection Filter/Set Selection Filter to Origin of a Facility* from the menu.
UTM Zone	UTM zone for this facility.
County	The is the county used to filter automatic selection of sources from the database. To set this value automatically to the location of a particular facility, select *Sources/Selection Filter/Set Selection Filter to Origin of a Facility* from the menu. If you type a name in this cell, only sources in this county will be selected and entered into the list.
(Sources)	
Source ID	ID of this source. It can be set by selecting *AutoGenerate SoucreIDs* from the menu or by entering a string manually. This ID will be written to the ISC input file for reference.
Facility ID	ID of the facility which contains this stack. This is for information only and is not used by ISC. However, it is important to HARP when doing risk analysis, because the facility ID, county, air basin and district are used to reference back to the database to look up emission rates. Facility ID is filled in automatically when you insert sources from a facility.
Facility Name	Name of the facility that contains this stack. This is for information only and is not used by ISC. This is filled in automatically when you insert sources from a facility.
County	County ID of the facility which contains this stack. This is filled in automatically when you insert sources from a facility.
Air Basin	Air basin ID of the facility which contains this stack. This is filled in automatically when you insert sources from a facility.
District	District ID of the facility which contains this stack. This is filled in automatically when you insert sources from a facility.
Stack ID	Stack ID of this stack in the HARP database. This is filled in automatically when you insert sources from a facility.
Stack Name	Name of this stack in the CEIDARS database. This is for information only and is not used by ISC. This is filled in automatically when you insert sources from a facility.
Release Type	This is the release type as defined in the HARP database for this stack. It can be either POINT, VOLUME, AREA or PITVOL. An

	open pit source (PITVOL) requires the use of deposition (see section 9.12.12.1). This in turn requires the use of a meteorology file that includes surface roughness. An example is the file DEPTEST.MET that is included with ISC (a copy is installed with HARP).
UTM East	UTM east coordinate of this source. When you select *Sources/Insert Entire Facility* from the menu, the program will insert a source entry in this table for each stack in the facility and will automatically insert the correct UTM coordinates from the database.
UTM North	UTM north coordinate of this source. When you select *Sources/Insert Entire Facility* from the menu, the program will insert a source entry in this table for each stack in the facility and will automatically insert the correct UTM coordinates from the database.
Elevation	Elevation of the base of the stack.. When you select *Sources/Insert Entire Facility* from the menu, the program will insert a source entry in this table for each stack in the facility and will automatically insert the stack elevations from the database. When you insert sources from the database, the units are always feet.
Emission Rate	Emission rate is normally set to 1.0. This produces an ISC output file which contains the X/Q factors for use in the risk assessment. You may manually override the default value of 1.0 by entering specific emission rates in this column.
Release Height	Height of the stack. When you select *Sources/Insert Entire Facility* from the menu, the program will insert the stack height from the database.
Temperature	Temperature of the gases output from this stack. When you select *Sources/Insert Entire Facility* from the menu, the program will insert a value from the database.
Velocity	Output velocity from the stack. When you select *Sources/Insert Entire Facility* from the menu, the program will insert a value from the database.
Stack Diameter	Diameter of the stack. When you select *Sources/Insert Entire Facility* from the menu, the program will insert a value from the database.
SYINIT	Width of volume source. Refer to ISC manual, Volume II, Table 1-6.
SZINIT	Height of volume or area source. Refer to ISC manual, Volume II, Table 1-6.
XINIT	X-width of area or pit volume source. Refer to ISC manual.

YINIT	Y-width of area or pit volume source. Refer to ISC manual.
ANGLE	Orientation angle of area or pit volume source. Refer to ISC manual.
VOLUME	Volume of pit volume source. Refer to ISC manual.
UTM Zone	UTM zone of this source. When you select *Sources/Insert Entire Facility* from the menu, the program will insert a source entry in this table for each stack in the facility and will automatically insert the correct UTM zone from the database.

9.12.3.4 Source Menu Options

9.12.3.4.1 Insert Entire Facility (Source Worksheet)

The *Insert Entire Facility* menu option is used to populate the Sources worksheet with data from the database. If you are working with a database that already contains stack data for the facility being analyzed, this function reduces the work of setting up the dispersion analysis by gathering the source parameters from the database and placing it on the worksheet automatically. No manual reentry of source parameters is required.

Before selecting this menu option place the cursor anywhere on the row in the table where you want to insert a series of sources from a facility. Then select ***Source/Insert Entire Facility*** from the menu. The program will prompt you with a list of facilities in the database. Select one of the facilities and press ***OK***. Everything else is automatic. The program will first determine how many stacks there are in the selected facility. It will then insert that number of rows in the table, starting at the row you have selected. It will then fill in all source parameters in the table for each stack belonging to that facility.

The only item not filled in by the program at this point is the source ID for each stack. You can make up a source ID of your own choosing for each stack, or you can have the program generate source ID's for you by selecting ***Auto-generate Source IDs*** from the menu (see below).

9.12.3.4.2 Selection Filter (Source Worksheet)

The selection filter specifies a range of sources that you want to insert from the database into the table. The first step is to enter the UTM coordinates you are interested in. You can do this by either typing in the UTM coordinates or by centering the analysis on a facility of interest. You would do this by choosing ***Sources/Selection Filter/Set selection filter origin to a facility location***. HARP will automatically fill in the UTM coordinates and the County number. Next you would fill in a distance for the range. The range indicates that you want HARP to insert all sources within a specified distance of these UTM coordinates. The final step will to select from the menu ***Sources/Insert Sources Using Selection Filter***. HARP will then insert all of the sources in the database that are within the specified range of the UTM coordinates.

9.12.3.4.3 Insert Rows (Source Worksheet)

Use this menu option to insert an empty row or multiple rows in the source parameter table on the Sources worksheet. First place the cursor anywhere on the row where you want to insert an empty row. If you want to insert multiple rows, place the cursor on the row where you want the empty rows to be inserted, and drag the mouse downward to select how many rows you want to insert. Then select ***Insert Rows*** from the menu. If you want to delete rows from the table, select ***Sources/Delete Rows*** (see below)

9.12.3.4.4 Delete Rows (Source Worksheet)

This menu option is used to delete entire rows from the sources table on the Sources worksheet. First place the cursor on the row that you want to delete. If you want to delete multiple rows, place the cursor on the first row that you want to delete and drag the mouse downward to select how many rows you want to delete. Then select ***Source/Delete Rows*** from the menu.

9.12.3.4.5 Auto-generate Source IDs (Source Worksheet)

When you create a new row in the sources worksheet, either by selecting ***Insert Entire Facility*** or ***Insert Row(s)***, the Source IDs are not automatically created. Each source (stack) must have a corresponding ID on the sources worksheet. If you wish, you may provide these IDs by simply entering any string of up to 8 characters under the Source ID column for each stack. This may be desirable if you want the IDs to be some meaningful descriptors that you invent.

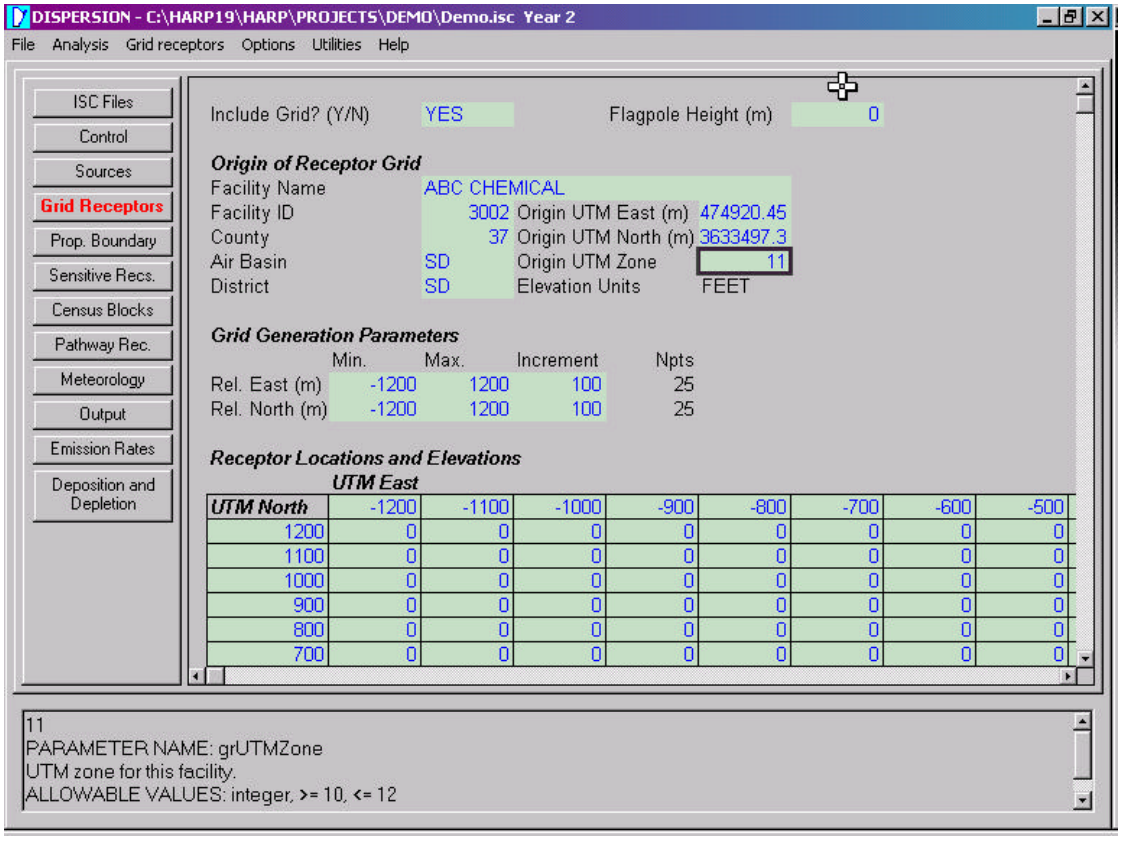
Another way to create source IDs is to use the auto-generate function as follows. First highlight the rows for which you want to create new IDs automatically. To do this, place the cursor on any row and drag the mouse downward to select the rows for which you want to generate IDs. Then select ***Auto-generate Source IDs*** from the menu. The program will create source IDs based on the row numbers and place the IDs in the correct cells on the worksheet. The source IDs that HARP generates are sequentially numbered based on the row in the table. If you edit the source IDs, you are responsible for making sure that each source ID is unique.

9.12.3.4.6 Fill in elevations (Source Worksheet)

If you have loaded DEM data, then this function will fill in the elevations for each of the sources on this worksheet. Refer to section 9.13.

9.12.4 Grid Receptors Worksheet

The Grid Receptors worksheet is used to describe the locations of receptors that are placed on a Cartesian grid. Section 9.12.4.1 describes each of the parameters on this worksheet.



9.12.4.1 Grid Receptor Parameters (Grid Receptors Worksheet)

Include Grid — Enter Y if you want cartesian grid receptors to be included in the ISC input file. Enter N if you do not want to include the cartesian grid receptors shown on this worksheet.

Flagpole height — The flagpole height (meters) for all property boundary receptors. See section 9.12.4.5 for more information.

(Origin of Receptor Grid)

Facility Name — Name of the facility which represents the location of this receptor grid. When you select *Grid Receptors/Set Origin to Facility* from the menu, the facility name and location are filled in automatically by the program. You may edit the name for your own reference, but this will have no effect on the ISC input file. Only the location is important.

Facility ID — ID of the facility which represents the location of this receptor grid. When you select *Grid Receptors/Set Origin to Facility* from the menu, the facility name and location are filled in automatically by the program. You may edit the ID for your own reference, but this will have no effect on the ISC input file. Only the location is important.

County	County ID of the facility which represents the location of this receptor grid. When you select *Grid Receptors/Set Origin to Facility* from the menu, the facility name and location are filled in automatically by the program. For the purpose of running ISC, only the location is important. The other parameters in this section are for reference only.
Air Basin	Air basin ID of the facility which represents the location of this receptor grid. When you select *Grid Receptors/Set Origin to Facility* from the menu, the facility name and location are filled in automatically by the program. For the purpose of running ISC, only the location is important. The other parameters in this section are for reference only.
District	District ID of the facility which represents the location of this receptor grid. When you select *Grid Receptors/Set Origin to Facility* from the menu, the facility name and location are filled in automatically by the program. For the purpose of running ISC, only the location is important. The other parameters in this section are for reference only.
UTM East	UTM east coordinate of the origin of the receptor grid. To set this value automatically to the location of a particular facility, select *Grid receptors/Set Origin to Facility* from the menu. The individual receptor grid points are determined by adding the UTM coordinates of the facility shown here to the relative UTM East and UTM North coordinates shown in the matrix below.
UTM North	UTM north coordinate of the origin of the receptor grid. To set this value automatically to the location of a particular facility, select *Grid Receptors/Set Origin to Facility* from the menu. The individual receptor grid points are determined by adding the UTM coordinates of the facility shown here to the relative UTM East and UTM North coordinates shown in the matrix below.
UTM Zone	UTM zone for this facility.

(Grid Generation Parameters)

Min	This is the minimum relative receptor x location used for automatic grid generation. To generate a receptor grid using the values in this section, select *Grid Receptors/Generate Grid* from the menu. This will cause the matrix below to be filled in with x and y locations according to the grid generation parameters.
Max	This is the maximum relative receptor x location used for automatic grid generation. To generate a receptor grid using the values in this section, select *Grid Receptors/Generate Grid* from the menu. This will cause the matrix below to be filled in with x and y locations according to the grid generation parameters.

Increment	This is the incremental spacing of the receptors in the x direction for automatic grid generation. To generate a receptor grid using the values in this section, select *Grid Receptors/Generate Grid* from the menu. This will cause the matrix below to be filled in with x and y locations according to the grid generation parameters.
Npts	This cell tells how many points there will be along the east and north directions of the grid respectively using the Max, Min and Increment values which you specify.

(Receptor Elevations Matrix)

UTM East	Relative UTM east coordinate of this north-south grid line. The absolute grid location is determined by adding this relative location to the facility location shown above.
UTM North	UTM north coordinate of this east-west grid line. The absolute grid location is determined by adding this relative location to the facility location shown above.
Elevation	Elevation of this grid point in units of FEET. The location of this grid point relative to the facility is given by the relative UTM East and UTM North coordinates which are shown on the top row and left column of this matrix. The elevations can be set automatically if you have DEM data (refer to section 9.13).

9.12.4.2 Defining a Cartesian Receptor Grid (Grid Receptors Worksheet)

Cartesian receptor grids are used to compute the concentration of pollutants over a rectangular geographical region, usually in the vicinity of a particular facility, for the purpose of creating concentration contours and performing risk assessment.

To define a Cartesian receptor grid you must first provide the location and elevation of every receptor on the grid in the table labeled *Receptor Locations and Elevations*. The *Receptor Locations and Elevations table* is a matrix showing the UTM East coordinate on the top row, the UTM North coordinate on the left column, and the elevations of each of the corresponding receptors in the matrix.

The receptor grid coordinates defined on the worksheet are relative to the coordinate system origin. The location of the coordinate system origin is defined by the values in the cells labeled *Origin UTM East* and *Origin UTM North.* You may set these to zero if you want all receptor coordinates to be expressed in actual UTM coordinates. However, it is normally more convenient to define a receptor grid location with respect to some facility being analyzed. Therefore the values of *Origin UTM East* and *Origin UTM North* should normally be set to the location of a facility. If a facility is already defined in the database, its location can be determined automatically by selecting ***Grid Receptors/Set Origin to Facility*** from the menu (refer to section 9.12.4.3.1).

If the spacing of receptors is uniform in both the East and North directions, HARP will generate the East and North coordinates of all receptors automatically for you. To do this you must first set the parameters in the box labeled *Grid Generation Parameters* and then select ***Grid Receptors/Generate Grid*** from the menu (refer to section 9.12.4.3.2).

9.12.4.3 Grid Receptor Menu

9.12.4.3.1 Set Origin to Facility (Grid Receptors Worksheet)

The *Set Origin to Facility* menu option sets the coordinates of the origin of the receptor grid to the location of a specific facility defined in the database. A Cartesian receptor grid is defined by the UTM coordinates shown in the table labeled *Receptor Locations and Elevations* on the Grid Receptors worksheet. These coordinates are all relative to the coordinate system origin, which is defined in the box labeled *Origin of Receptor Grid*. You may set the origin to any location by entering values in the cells labeled *Origin UTM East* and *Origin UTM North.* Alternatively, you may set the origin coordinates to be the location of a facility by selecting *Grid Receptors/Set Origin to Facility* from the menu. When you do this you will be prompted with a list of facilities defined in the database. Select one of the facilities from the list and press ***OK***. The program will then fill in the coordinates of that facility. The facility name, ID, county, air basin and district are also filled in on the worksheet, but these are for information only and are not used by ISC.

9.12.4.3.2 Generate Grid (Grid Receptors Worksheet)

The *Generate Grid* menu option fills in the grid receptor coordinates for the entire grid by using the parameters that you specify in the box labeled *Grid Generation Parameters* on the Grid Receptors worksheet. First specify the Min., Max., and Increment for both the east and north coordinates. Then select ***Grid Receptors/Generate Grid*** from the menu. The program will then set the UTM East and UTM North coordinates of each of the grid receptors starting with the minimum value that you have specified and incrementing by the increment value that you specify until the maximum value is reached. The grid receptor coordinates are defined in the top row and left column of the table labeled *Receptor Locations and Elevations*. The grid receptor coordinates can also be edited manually if you want non-uniform spacing.

9.12.4.3.3 Fill in Selected Elevation Range (Grid Receptors Worksheet)

The *Fill in Selected Elevation Range* menu option is used to set the elevations of a range of grid receptors to a specified value. This reduces the amount of redundant data entry for grids where a portion of the grid is flat terrain.

The elevations of all grid receptors are shown on the table labeled *Receptor Locations and Elevations* on the Grid Receptors worksheet. Each cell in the table contains the elevation of an individual grid receptor. The UTM East and UTM North coordinates of each receptor are shown in the top row and left column of the table respectively. You can set the elevation of any receptor by moving to the corresponding cell and entering a new value.

To fill in a range of receptors with the same elevation, first highlight the corresponding cells in the Receptor Locations and Elevations table by dragging the mouse across the cells. Then select ***Grid Receptors/Fill Selected Elevation Range*** from the menu. You will be prompted for the new elevation. The program will then fill in the selected range of cells with the value you specify. (See also section 9.13.)

9.12.4.3.4 Clear Selected Elevation Range (Grid Receptors Worksheet)

This menu option is used to clear the elevation cells for a selected range of grid receptors. First highlight the corresponding cells in the Receptor Locations and Elevations table by dragging the mouse across the cells. Then select ***Grid Receptors/Clear Selected Elevation Range*** from the menu. Clearing cells has little effect, other than to make the worksheet more readable by eliminating cells which are outside the range of the grid. If you clear cells within the range of the receptor grid, this is the same as setting their elevations to zero.

9.12.4.3.5 Fill in Elevations (Grid Receptors Worksheet)

If you have loaded DEM data, then this function will fill-in the elevations for each of the receptors on this worksheet. Refer to section 9.13.

9.12.4.4 Removing Grid Receptors (Grid Receptors Worksheet)

When HARP builds the ISC input file, it reads the parameters that you provide on the Grid Receptors worksheet and writes them to the ISC input file in the correct format. HARP reads the UTM East locations of the receptors starting at the left end of the top row and moving right until it encounters a blank cell. If a UTM East coordinate is blank, then that column and all columns to the right of it are completely ignored. HARP reads the UTM North locations of the receptors starting at the top end of the left column and moving down until it encounters a blank cell. If a UTM North coordinate is blank, then that row and all rows to the right of it are completely ignored. To reduce the number of receptors in the grid you can set the UTM East or UTM North coordinates of a particular row or column to blank, thereby eliminating all higher rows or columns from the grid.

To make it easier to read the grid, you can set elevations to blank for unused receptors. To do this select ***Grid Receptors/Clear Selected Elevation Range*** from the menu (refer to section 9.12.4.3.4).

If you want to completely eliminate the receptor grid from the ISC input file, simply set the parameter labeled *Include Grid* at the top of the worksheet to “N”.

9.12.4.5 Flagpole Height (Grid Receptors Worksheet)

Flagpole receptors are sometimes used to estimate impacts above ground level such as for a high-rise building or a tracer study. In addition, the user can input elevated receptor heights in order to model the effects of terrain above (or below) stack base. For simple terrain calculations, any terrain heights input above the release height for a particular source are "chopped-off" at the

release height for that source's calculations. For more information on flagpole height see the *User's Guide for the Industrial Source Complex (ISC) Dispersion Models.*

9.12.5 Property Boundary Receptors Worksheet

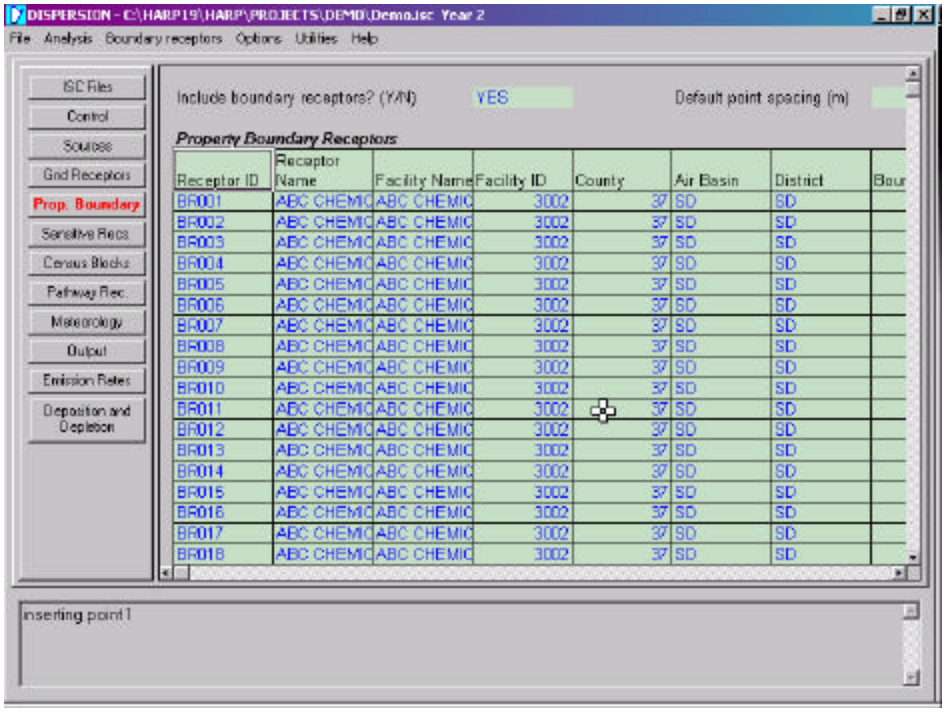
The Property Boundary Receptor worksheet is used to describe the locations of receptors on a facility property boundary. Section 9.12.5.1 provides an overview of setting up property boundary receptors. Section 9.12.5.2 describes each of the parameters on this worksheet.

9.12.5.1 Defining Property Boundary Receptors (Property Boundary Worksheet)

Property boundary receptors are used to compute the concentration of pollutants along the property boundary of a facility for the purpose of determining the location of the maximum exposed individual (MEI).

Each property boundary receptor corresponds to a row in the table on the Boundary Receptors worksheet. Some of the parameters on this worksheet are for display purposes only and are not used by ISC. The parameters that are used by ISC are the Receptor ID, location (UTM East and UTM North) and elevation. The remaining parameters are used to identify the facility and property boundary on which each receptor lies.

You may fill in all or part of the table with data from the database by selecting ***Boundary Receptors/Insert Facility Boundary Receptors*** from the menu. This causes the program to search the database for property boundaries for a selected facility, calculate coordinates of receptors along those boundaries, and insert parameters for these receptors in the table (refer to section 9.12.5.3.1).



9.12.5.2 Property Boundary Receptor Parameters (Property Boundary Worksheet)

Include Boundary Receptors	Enter Y if you want property boundary receptors to be included in the ISC input file. Enter N if you do not want to include the property boundary receptors shown on this worksheet.
Default Point Spacing	Spacing of receptors along the facility property boundary. This number is used when you select *Boundary Receptors/Insert Facility Boundary Receptors* from the menu. The program then retrieves the property boundary geometry from the database for the selected facility and generates receptors along the boundary at this interval.
Flagpole Height	The flagpole height (meters) for all property boundary receptors. See section 9.12.4.5 for more information.
Receptor ID	This ID will be written to the ISC input file as a comment only for your reference. These IDs are filled-in automatically by the program when you select *Boundary Receptors/Insert Facility Boundary Receptors* from the database.
Receptor Name	This name will be written to the ISC input file as a comment only for your reference. These names are filled in automatically by the program when you select *Boundary Receptors/Insert Facility Boundary Receptors* from the database. You may also edit them to provide your own identification of the receptors.
Facility Name	The name of the facility to which this receptor boundary belongs. This is filled in automatically when you select *Boundary Receptors/Insert Facility Boundary Receptors* from the menu.
Facility ID	The ID of the facility to which this receptor belongs. This is filled in automatically when you select *Boundary Receptors/Insert Facility Boundary Receptors* from the menu.
County	The ID of the county containing this facilty. This is filled in automatically when you select *Boundary Receptors/Insert Facility Boundary Receptors* from the menu.
Air Basin	The ID of the air basin containing this facility. This is filled in automatically when you select *Boundary Receptors/Insert Facility Boundary Receptors* from the menu.
District	The ID of the air district containing this facility. This is filled in automatically when you select *Boundary Receptors/Insert Facility Boundary Receptors* from the menu.
Boundary Number	The ID of the boundary curve to which this receptor belongs. A facility boundary may be composed of one or more closed curves, each of which has its own ID. This is filled in automatically when you select *Boundary Receptors/Insert Facility Boundary Receptors* from the menu.

UTM East	UTM east coordinate of this property boundary receptor. This is filled in automatically by the program when you select *Boundary Receptors/Insert Facility Boundary Receptors* from the menu. You may also edit this value directly on the worksheet.
UTM North	UTM north coordinate of this property boundary receptor. This is filled in automatically by the program when you select *Boundary Receptors/Insert Facility Boundary Receptors* from the menu. You may also edit this value directly on the worksheet.
Elevation	Elevation of this property boundary receptor. You may also edit this value directly on the worksheet or you can fill in the values automatically if you have DEM data. (see also section 9.13)

9.12.5.3 Property Boundary Receptors Menu (Property Boundary Worksheet)

9.12.5.3.1 Insert Facility Property Boundary Receptors

This menu option is used to populate the Property Boundary Receptors worksheet with data from the database. If you are working with a database that contains property boundary data for the facility being analyzed, this function reduces the work of setting-up the dispersion analysis by automatically generating receptors along the boundary.

Before selecting this menu option you must enter a value for *Default Spacing* on the Boundary Receptor worksheet. This is the distance in meters between adjacent receptors along the boundary. Next place the cursor anywhere on the row in the table where you want to insert a series of property boundary receptors. Typically this will be either the first row of the table or the first empty row at the bottom of the table. Then select ***Source/Insert Facility Property Boundary Receptors*** from the menu. The program will prompt you with a list of facilities in the database. Select one of the facilities and press ***OK***. Everything else is automatic. The program will determine the locations of all property boundaries for the selected facility and will calculate the X and Y coordinates of a series of evenly spaced receptors along the boundary. It will then insert the correct number of rows in the table, starting at the row you have selected and fill in all parameters for the new receptors.

9.12.5.3.2 Delete Rows (Property Boundary Worksheet))

This menu option is used to delete entire rows from the Property Boundary Receptors table on the Property Boundary Receptors worksheet. First place the cursor on the row that you want to delete. If you want to delete multiple rows, place the cursor on the first row that you want to delete and drag the mouse downward to select how many rows you want to delete. Then select ***Source/Delete Selected Receptor(s)*** from the menu.

9.12.5.3.3 Fill in Elevations (Property Boundary Worksheet)

If you have loaded DEM data, then this function will fill in the elevations for each of the receptors on this worksheet. Refer to section 9.13.

9.12.6 Sensitive Receptors Worksheet

The Sensitive Receptors worksheet is used to describe the locations of sensitive receptors. Section 9.12.6.1 provides an overview of setting up a list of sensitive receptors. Section 9.12.6.2 describes each of the parameters on this worksheet.

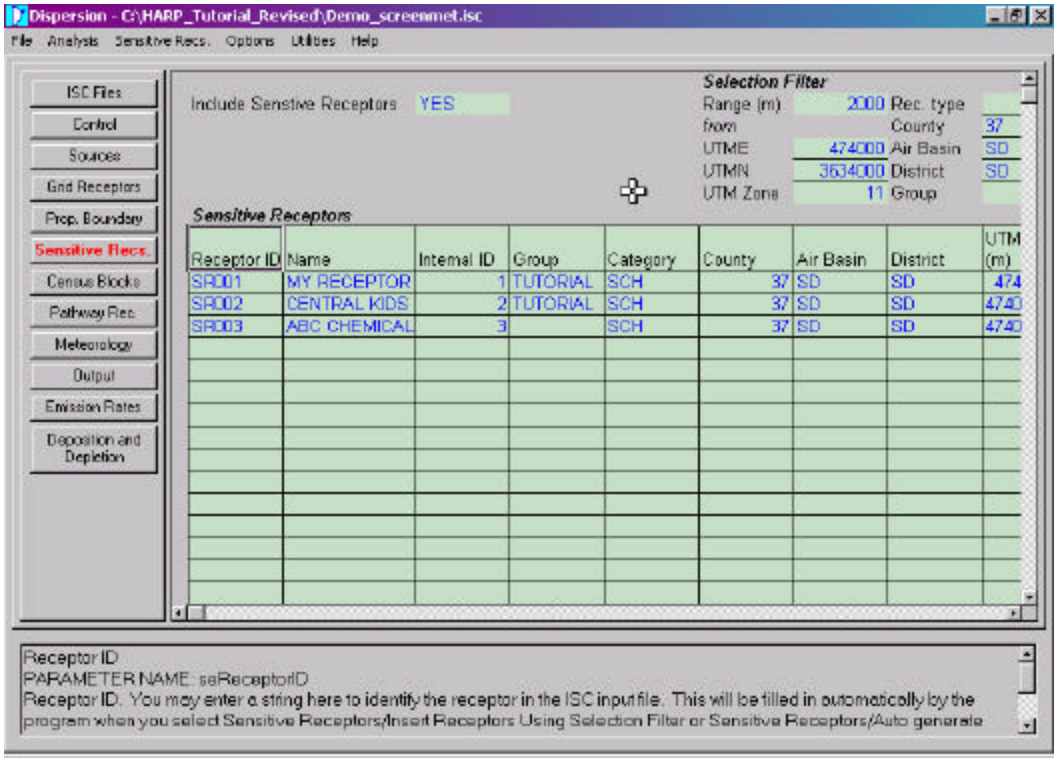
9.12.6.1 Defining Sensitive Receptors (Sensitive Receptors Worksheet)

Sensitive receptors are used to compute the concentrations of pollutants at specific locations that usually represent some small sensitive population concentration such as a school or hospital.

Each sensitive receptor corresponds to a row in the Sensitive Receptors table on the Sensitive Receptors worksheet. Some of the parameters on this worksheet are for display purposes only and are not used by ISC. The parameters that are used by ISC are the Receptor ID, location (UTM East and UTM North) and elevation. The residential and working populations are not used in the dispersion analysis, but will be used by the risk analysis module. The remaining parameters are used to identify each sensitive receptor in the database.

You may fill in all or part of the table with data from the database by selecting ***Sensitive Receptors/Insert Receptors Using Selection Filter*** from the menu. This causes the program to search the database for sensitive receptors which meet the criteria specified in the box labeled *Selection Filter*, and insert parameters for these receptors in the table (refer to section 9.12.6.3.1).

The Receptor ID can be any character string up to 8 characters. For convenience, HARP will create Receptor IDs automatically when you insert sensitive receptors from the database by selecting ***Sensitive Receptors/Insert Receptors Using Selection Filter*** from the menu. You may also create receptor IDs by selecting ***Sensitive Receptors/Auto-generate Receptor IDs*** (refer to section 9.12.6.3.5).



9.12.6.2 Sensitive Receptors Parameters (Sensitive Receptors Worksheet)

Include Sensitive Receptors — Enter Y if you want these sensitive receptors to be included in the ISC input file. Enter N if you do not want to include sensitive receptors.

(Selection Filter)

Range — This range is used to select sensitive receptors from the database and enter them automatically in the list below. When you select *Sensitive Receptors/Insert Receptors Using Selection Filter* from the menu, the program locates all sensitive receptors in the database which are within this range from the specified location and inserts them into the list. The receptors shown in the list are then written to the ISC input file.

UTM East — This is the UTM east coordinate of the center of the coordinate system for sensitive receptor selection. See the description of range above.

UTM North — This is the UTM north coordinate of the center of the coordinate system for sensitive receptor selection. See the description of range above.

Zone — This is the UTM zone of the center of the coordinate system for sensitive receptor selection. See the description of range above.

Category	The is the receptor type used to filter automatic selection of sensitive receptors from the database. To enter a value here, select *Sensitive Receptors/Selection Filter/Select Receptor Type* from the menu. If you provide a type in this cell, only receptors of this type will be selected and entered into the list.
County	The is the county used to filter automatic selection of sensitive receptors from the database. To enter a value here, select *Sensitive Receptors/Selection Filter/Select County/Air Basin/District* from the menu. If you provide a type in this cell, only receptors in this county will be selected and entered into the list.
Air Basin	The is the air basin used to filter automatic selection of sensitive receptors from the database. To enter a value here, select *Sensitive Receptors/Selection Filter/ Select County/Air Basin/District* from the menu. If you provide a type in this cell, only receptors in this air basin will be selected and entered into the list.
District	The is the district used to filter automatic selection of sensitive receptors from the database. To enter a value here, select *Sensitive Receptors/Selection Filter/ Select County/Air Basin/District* from the menu. If you provide a type in this cell, only receptors in this district will be selected and entered into the list.
Flagpole Height	The flagpole height (meters) for all property sensitive receptors. See section 9.12.4.5 for more information.
(Sensitive Receptors)	
Receptor ID	Receptor ID. You may enter a string here to identify the receptor in the ISC input file. This will be filled in automatically by the program when you select ***Sensitive Receptors/Insert Receptors Using Selection Filter or Sensitive Receptors/Auto generate Receptor IDs*** from the menu.
Name	Receptor name.
Internal ID	The ID of this receptor which identifies it in the database. This is displayed here for your information only when you insert receptors into the list by selecting ***Sensitive Receptors/Insert Receptors Using Selection Filter*** from the menu.
Category	Receptor category.
County	ID of county containing this receptor.
Air Basin	ID of air basin containing this receptor.
District	ID of district containing this air basin.
UTM East	UTM east coordinate of this receptor.
UTM North	UTM north coordinate of this receptor.
Elevation	Elevation of this receptor.

Residential Population	Residential population. Reserved for future use for cancer burden calculations.
Working Population	Residential population. Reserved for future use for cancer burden calculations.

9.12.6.3 Sensitive Receptors Menu

9.12.6.3.1 Selection Filter (Sensitive Receptors Worksheet)

You may fill in all or part of the sensitive receptor table with data from the database by selecting ***Sensitive Receptors/Insert Receptors Using Selection Filter*** from the menu. This causes the program to search the database for sensitive receptors which meet the criteria specified in the box labeled Selection Filter, and insert parameters for those receptors into the table (refer to section 9.12.6.3.2).

Three criteria are applied when selecting sensitive receptors from the database. The first criterion is that each selected receptor must lie within a specified range (determined by the Range parameter on the worksheet) from a specified location (determined by the selection filter UTM coordinates specified on the worksheet). You can use the ***Sensitive Receptors/Selection Filter/Set Selection Filter Origin to Facility Location*** option to insert the coordinates of a facility into the Selection Filter box. This makes is easy to include all receptors within a specified distance of a particular facility. The second criterion is that each selected receptor must lie within the county, air basin and district specified in the selection filter box. The third criterion is that each selected receptor must be of the type specified in the Category parameter in the selection filter box. If any of these criteria is left blank, then it is ignored when conducting the search. The search is actually started when you select ***Sensitive Receptors/Insert Receptors Using Selection Filter*** (refer to section 9.12.6.3.2).

To make it easier to setup the Selection Filter, three menu items appear under the ***Selection Filter*** menu. These are as follows.

Receptor Type	This allows you to change the Category filter parameter by selecting one of the allowable receptor types from a list.
County/Air Basin/ District	This allows you to change the county, air basin, and district filter parameters by selecting from a list.
Facility Location	This allows you to update the UTM coordinates in the Selection Filter with the location of a facility by selecting the facility name from a list.

9.12.6.3.2 Insert Receptors Using Selection Filter (Sensitive Receptors Worksheet)

This menu option appears under the *Sensitive Receptors* menu when the sensitive receptors worksheet is displayed. This causes the program to search the database for sensitive

receptors which meet the criteria specified in the box labeled Selection Filter, and insert parameters for those receptors into the table sensitive receptors table.

9.12.6.3.3 Insert Single Receptor (Sensitive Receptors Worksheet)

This menu option allows you to insert a single sensitive receptor from the database into the sensitive receptor list on the Sensitive Receptor worksheet. First place the cursor anywhere on the row where you want to insert the receptor. Then select ***Sensitive Receptors/Insert Single Receptor*** from the menu. You will be prompted with a list of all of the sensitive receptors in the database. Select the receptor you want to insert and press ***OK***. The program will then insert a blank row in the sensitive receptors table and fill in the parameters with information from the database.

9.12.6.3.4 Delete Rows (Sensitive Receptors Worksheet)

This menu option is used to delete entire rows from the sensitive receptors table on the Sensitive Receptors worksheet. First place the cursor on the row that you want to delete. If you want to delete multiple rows, place the cursor on the first row that you want to delete and drag the mouse downward to select how many rows you want to delete. Then select ***Sensitive Receptors/Delete Rows*** from the menu.

9.12.6.3.5 Auto-generate Receptor IDs (Sensitive Receptors Worksheet)

When you create a new row in the Sensitive Receptors worksheet, either by selecting ***Insert Receptors Using Selection Filter*** (refer to section 9.12.6.3.2) or by selecting ***Insert Single Receptor*** (refer to section 9.12.6.3.3), the Receptor IDs are not automatically created. Each receptor must have a corresponding ID on the sensitive receptors worksheet. If you wish, you may provide these IDs by simply entering any string of up to 8 characters under the Receptor ID column for each sensitive receptor. This may be desirable if you want the IDs to be some meaningful descriptors that you invent. Another way to create Receptor IDs is to use the auto-generate function.

First highlight the rows for which you want to create new Ids automatically. To do this, place the cursor on any row of your choosing and drag the mouse downward to select the rows for which you want to generate IDs. Then select ***Auto-generate Receptor IDs*** from the menu. The program will create Receptor IDs based on the row numbers and place the IDs in the correct cells on the worksheet.

9.12.6.3.6 Fill in Elevations (Sensitive Receptors Worksheet)

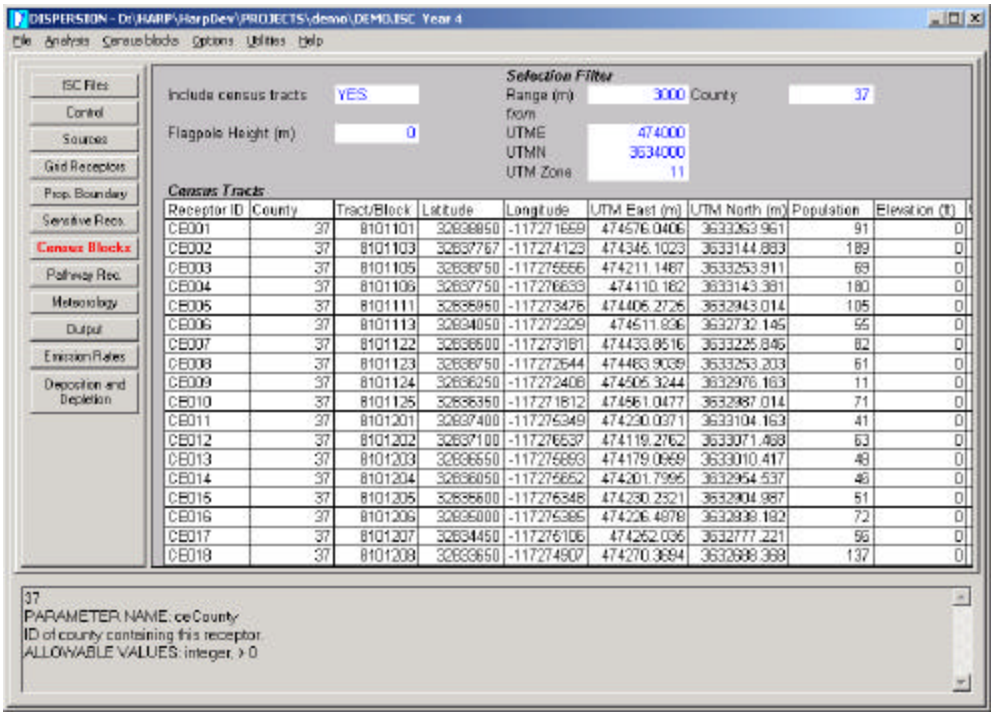
If you have loaded DEM data, then this function will fill in the elevations for each of the receptors on this worksheet. Refer to section 9.13.

9.12.6.4 Removing Sensitive Receptors (Sensitive Receptors Worksheet)

When HARP builds the ISC input file, it reads the parameters that you provide on the Sensitive Receptor worksheet and writes them to the ISC input file in the correct format. HARP reads the receptor data starting with the first row in the table and continuing downward until it encounters a row with a blank Receptor ID. If a Receptor ID is blank, then that receptor and any receptors below it in the table are completely ignored. To set a receptor ID to blank, simply place the cursor on the cell containing the receptor ID; press the space bar and the *Enter* key. HARP considers empty cells and cells containing blank spaces to be the same. Another way to remove a receptor from the list is to use the ***Delete Rows*** menu option (refer to section 9.12.6.3.4).

9.12.7 Census Blocks Worksheet

The Census Blocks worksheet is used to describe the locations of census block receptors. Section 9.12.7.1 provides an overview of setting up a list of census block receptors. Section 9.12.7.2 describes each of the parameters on this worksheet.



9.12.7.1 Defining Census Block Receptors (Census Blocks Worksheet)

Census block receptors are used to compute the concentrations of pollutants at census block reference locations for the purpose of computing cancer burden.

To define a list of census block receptors you must provide the location, elevation and population of each census block receptor in the table. Since the database already contains census block location and population data, menu options have been provided to populate this table automatically if you wish.

Each census block receptor corresponds to a row in the Census Blocks table on the Census Blocks worksheet. Some of the parameters on this worksheet are for display purposes only and are not used by ISC. The parameters that are used by ISC are the Receptor ID, location (UTM East and UTM North) and elevation. The population are not used in the dispersion analysis, but will be used by the risk analysis module. The remaining parameters are used to identify each census block for your reference only.

You may fill in all or part of the table with data from the database by selecting ***Census Blocks/Insert Receptors Using Selection Filter*** from the menu. This causes the program to search the database for census blocks which meet the criteria specified in the box labeled Selection Filter, and insert receptors corresponding to these census blocks into the table (refer to section 9.12.7.3.1).

The Receptor ID can be any character string up to 8 characters. For convenience, HARP will create Receptor IDs automatically when you insert census block receptors from the database by selecting ***Census Blocks/Insert Receptors Using Selection Filter*** from the menu. You may also create receptor IDs by selecting ***Census Blocks/Auto-generate Receptor IDs*** (refer to section 9.12.7.3.4).

9.12.7.2 Census Blocks Parameters (Census Blocks Worksheet)

Include Census Blocks	Enter Y if you want census block receptors to be included in the ISC input fle. Enter N if you do not want census block receptors
Flagpole Height	The flagpole height (meters) for all census block receptors. See section 9.12.4.5 for more information.
Range	Range for census block selection
UTM East	UTM east coordinate of center of range for census block selection
UTM North	UTM north coordinate of center of range for census block selection
UTM Zone	UTM zone of center of range for census block selection.
County	County for census block selection.
(Census Blocks)	
Receptor ID	Receptor ID.
County	ID of county containing this receptor.
Tract/Block	This is a code number filled in by HARP to identify the tract and block of the receptor. The right-most three digits of the number are the block number. The other digits to the left are the tract number.

Latitude	The latitude of the reference point for this census block. This is filled in automatically by the program when you select *Census Blocks/Insert County* from the menu.
Longitude	The longitude of the reference point for this census block. This is filled in automatically by the program when you select *Census Blocks/Insert County* from the menu.
UTM East	The UTM east coordinate of the reference point for this census block. This is filled in automatically by the program when you select *Census Blocks/Insert County* from the menu.
UTM North	The UTM east coordinate of the reference point for this census block. This is filled in automatically by the program when you select *Census Blocks/Insert County* from the menu.
Population	The residential population at this receptor.
Elevation	The elevation of this receptor.

9.12.7.3 Census Blocks Menu

9.12.7.3.1 Selection Filter (Census Blocks Worksheet)

You may fill in all or part of the table with data from the database by selecting ***Census Blocks/Insert Receptors Using Selection Filter*** from the menu. This causes the program to search the database for census blocks which meet the criteria specified in the box labeled Selection Filter, and insert receptors corresponding to these census blocks into the table (refer to section 9.12.7.3.2).

Two criteria are applied when selecting census receptors from the database. The first criterion is that each selected receptor must lie within a specified range (determined by the Range parameter on the worksheet) from a specified location (determined by the selection filter UTM coordinates specified on the worksheet). You can use the ***Census Blocks/Selection Filter/Set Selection Filter Origin to Facility Location*** option to insert the coordinates of a facility into the Selection Filter box. This makes is easy to include all census receptors within a specified distance of a particular facility. The second criterion is that each selected receptor must lie within the county specified in the selection filter box. If either of these criteria is left blank, then it is ignored when conducting the search. The search is actually started when you select ***Census Blocks/Insert Receptors Using Selection Filter*** (refer to section 9.12.7.3.2).

To make it easier to setup the Selection Filter, you may specify the county by selecting ***Census Blocks/Selection Filter/ Select County*** from the menu. This allows you to specify the county by selecting from a list.

9.12.7.3.2 Insert Receptors Using Selection Filter (Census Blocks Worksheet)

This menu option appears under the ***Census Receptors*** menu when the sensitive receptors worksheet is displayed. This causes the program to search the database for census blocks which meet the criteria specified in the box labeled Selection Filter, and insert receptors corresponding to those census blocks into the table.

9.12.7.3.3 Delete Rows (Census Blocks Worksheet)

This menu option is used to delete entire rows from the census block receptors table on the Census Blocks worksheet. First place the cursor on the row that you want to delete. If you want to delete multiple rows, place the cursor on the first row that you want to delete and drag the mouse downward to select how many rows you want to delete. Then select ***Census Blocks/Delete Rows*** from the menu.

9.12.7.3.4 Auto-generate Receptor IDs (Census Blocks Worksheet)

When you create a new row in the Census Blocks worksheet by selecting ***Insert Receptors Using Selection Filter*** (refer to section 9.12.7.3.2) the Receptor IDs are not automatically created. Each receptor must have a corresponding ID on the census blocks worksheet. If you wish, you may provide these IDs by simply entering any string of up to 8 characters under the Receptor ID column for each sensitive receptor. This may be desirable if you want the IDs to be some meaningful descriptors that you invent. Another way to create Receptor IDs is to use the auto-generate function.

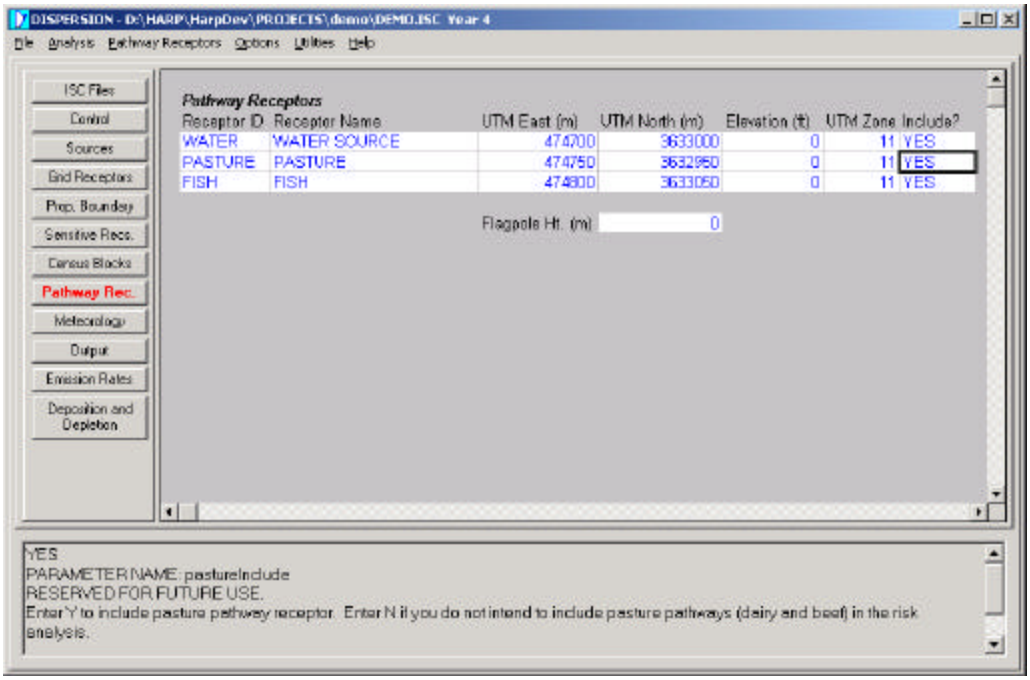
First highlight the rows for which you want to create new IDs automatically. To do this, place the cursor on any row of your choosing and drag the mouse downward to select the rows for which you want to generate IDs. Then select ***Auto-generate Receptor IDs*** from the menu. The program will create Receptor IDs based on the row numbers and place the IDs in the correct cells on the worksheet.

9.12.7.3.5 Fill in Elevations (Census Blocks Worksheet)

If you have loaded DEM data, then this function will fill in the elevations for each of the receptors on this worksheet. Refer to section 9.13.

9.12.8 Pathway Receptors Worksheet

This worksheet is used to describe the locations of pathway receptors that may be required for risk assessment. These three receptors define the locations of the drinking water, the pasture and the locally caught fish. **The cells in the column "Include" must say yes if you intend to run a multipathway analysis in the risk analysis.** Section 9.12.8.1 describes each of the parameters on this worksheet.



9.12.8.1 Pathway Receptors Parameters (Pathway Receptors Worksheet)

The pathway receptor parameters are always filled in manually.

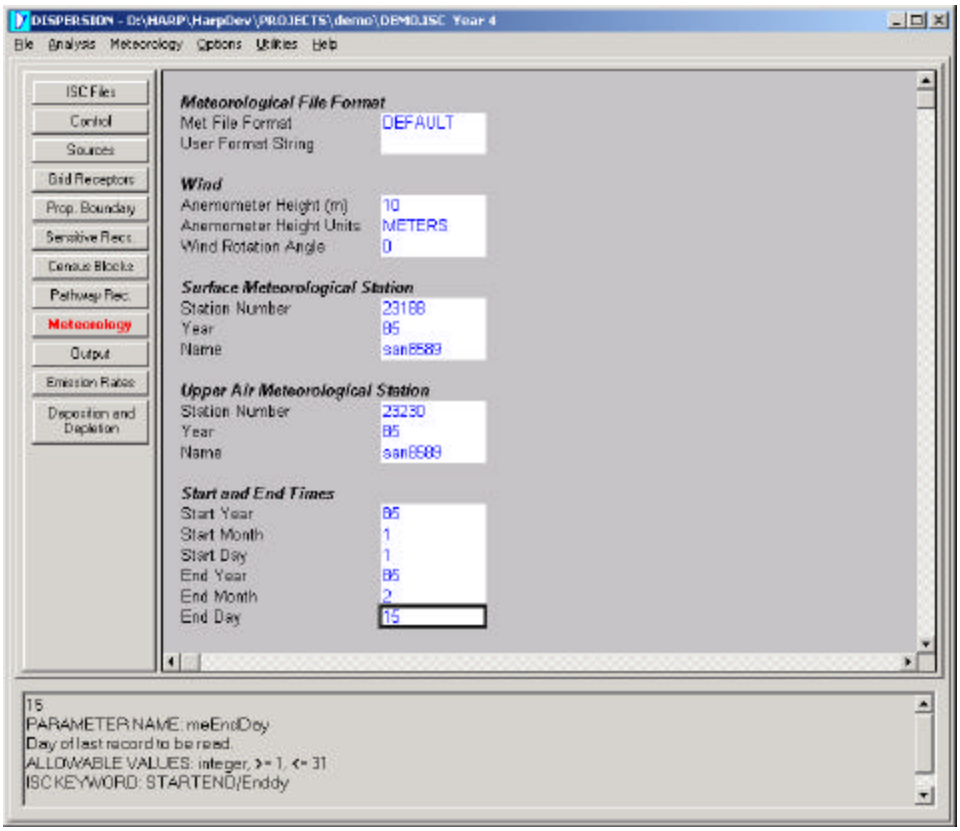
Receptor ID	This is fixed by the program
Receptor Name	A descriptor of this receptor that you provide.
UTM East	UTM east coordinates of this receptor.
UTM North	UTM north coordinates of this receptor.
Elevation	Elevation of this receptor.
UTM Zone	UTM zone in which this receptor is located.
Include?	Enter either Yes or No. If yes, then this receptor is included in the ISC run. If no, this receptor is not included. You can choose to not include a pathway receptor if you do not intend to do risk analysis, or if you know that this particular pathway is not relevant to your location.
Flagpole Height	The flagpole height (meters) for all pathway receptors. See section 9.12.4.5 for more information.

9.12.8.2 Fill in Elevations (Pathway Receptors Worksheet)

If you have loaded DEM data, then this function will fill in the elevations for each of the receptors on this worksheet. Refer to section 9.13.

9.12.9 Meteorology Worksheet

The Meteorology worksheet is used to specify meteorology input for ISC. Section 9.12.9.1 describes each of the parameters on this worksheet. Meteorology parameters are also described in section 3.5 of the *User's Guide for the Industrial Source Complex (ISC) Dispersion Models*.



9.12.9.1 Meteorology Parameters (Meteorology Worksheet)

Met File Format	Format of meteorological data file. Enter DEFAULT to specify that the default ASCII file format is used. Enter FREE for free format. Enter CARD for default ASCII file format with wind speed profile and temperature gradient data entered below (not implemented in this version). Enter UNFORM for unformatted RAMMET file input. Enter USER to specify a FORTRAN format statment in the cell below. The meteorology file name is specified by selecting Display/Files from the menu.
User Format String	Format string used to read meteorological data file. This parameter is only used if the file format specified above is USER.
Anemometer Height	Anemometer height.
Anemometer Height Units	Anemometer height units.

Wind Rotation Angle	Wind rotation angle.
Station Number	Station number, e.g. 5-digit WBAN number
Year	Year of data being processed.
Name	Station name
Start Year	Year of first record to be read.
Start Month	Month of first record to be read.
Start Day	Day of first record to be read.
End Year	Year of last record to be read.
End Month	Month of last record to be read.
End Day	Day of last record to be read.

When you open a met file, the station numbers and start and end times are filled in automatically. You can then edit the start and end times manually.

9.12.9.1.1 Open Meteorology File

When you select this menu item, you will be prompted for the name of a meteorology file. HARP will then open the file and fill in the start and end time on the meteorology worksheet. The name of the meteorology file will appear on the ***ISC Files*** worksheet. HARP will read meteorology files with the extensions *.met, *.txt, *.dat, *.sam, and *.asc.

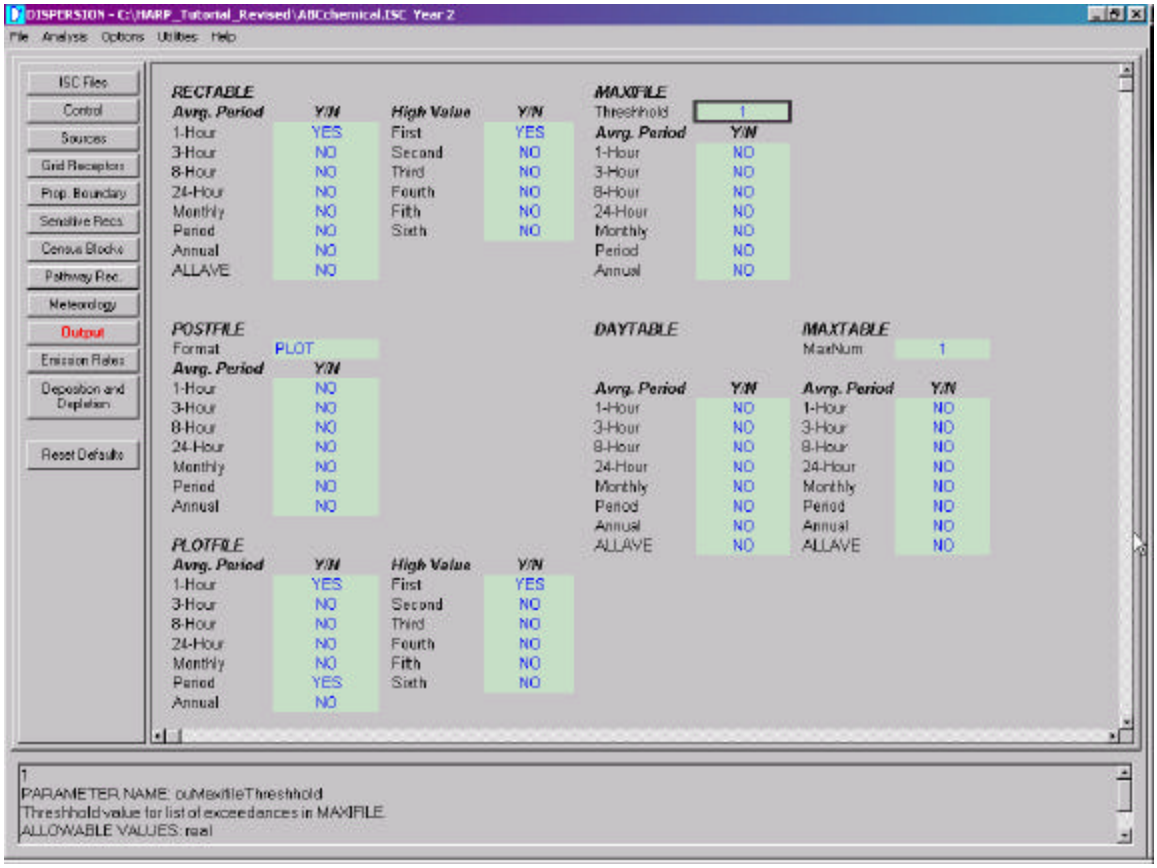
9.12.9.2 Open Pit Volume Source Meteorology Requirements

An open pit source (PITVOL) requires the use of deposition (see section 9.12.12). This in turn requires the use of a meteorology file that includes surface roughness. An example of such a met file is the file DEPTEST.MET that is included with ISC (a copy is installed with HARP).

9.12.10 Output Parameters Worksheet

The Output Parameters worksheet is used to control the numerous ISC output options. Section 9.12.10.1 describes each of the parameters on this worksheet. Output parameters are also described in section 3.8 of the *User's Guide for the Industrial Source Complex (ISC) Dispersion Models*.

The output parameters that you choose do not affect the risk analysis. They are only used to control the ISC reports that appear in the standard output file, the plot file and the post file.



9.12.10.1 Output Parameters (Output Parameters Worksheet)

Rectable Avrg Period	Enter Y or N in each of the cells in this column to indicate which averaging period you want summarized with high values in the ISC output. The number of high values is indicated by the responses in the column to the right..
Rectable High Value	Enter Y or N in each of the cells in this column to indicate which high value summaries you want output to the ISC output file.
Postfile Format	Format of the postfile output. Enter UNFORM to indicate unformatted (binary) output. Enter PLOT to indicate formatted (ASCII) file format.
Postfile Avrg. Period	Enter Y or N in each of the cells in this column to indicate which averaging period you want output to the postfile.
Plotfile Avrg Period	Enter Y or N in each of the cells in this column to indicate which averaging period you want output to the plotfile.
Plotfile High Value	Enter Y or N in each of the cells in this column to indicate which high value summaries you want output to the plotfile.
Maxifile Threshhold	Threshhold value for list of exceedances in MAXIFILE.

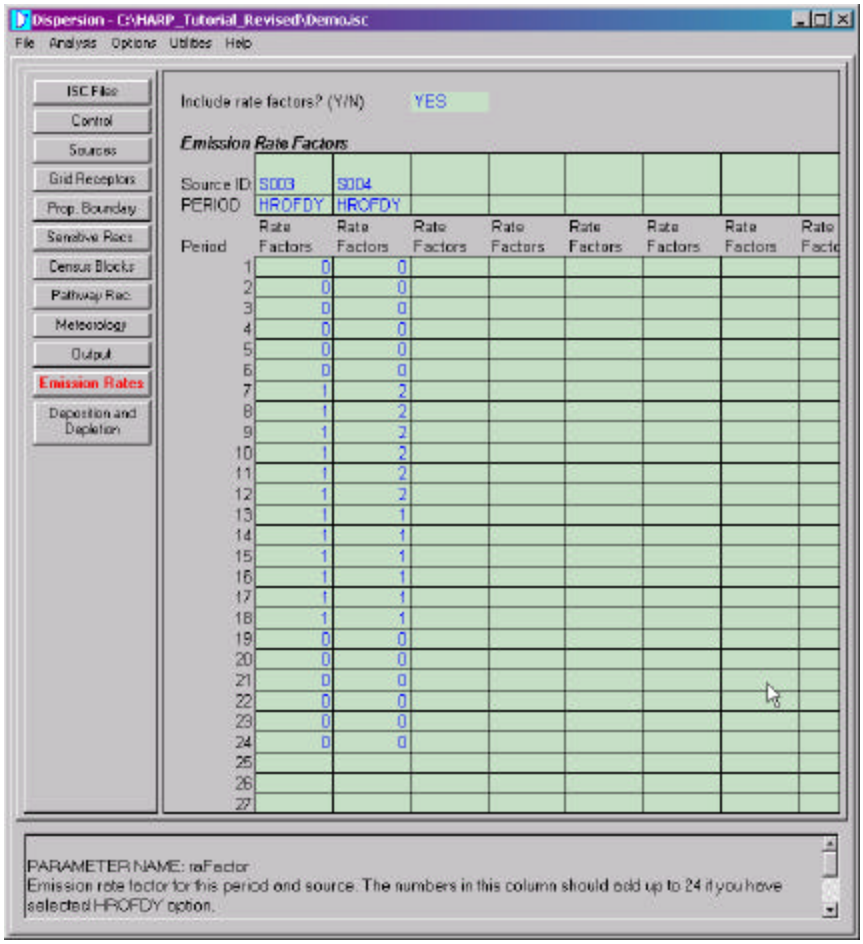
Maxifile Avrg. Period	Enter Y or N in each of the cells in this column to indicate which averaging period you want output to the MAXIFILE.
Daytable Avrg. Period	Enter Y or N in each of the cells in this column to indicate which averaging period you want output to the DAYTABLE.
Maxtable Maxnum	Specifies number of overall maximum values to be sumarized in the MAXTABLE.
Maxtable Avrg. Period	Enter Y or N in each of the cells in this column to indicate which averaging period you want output to the MAXTABLE.

9.12.11 Emission Rate Worksheet

This worksheet page is only valid when conducting model simulations with representative meteorological data. It is incorrect to use this worksheet page for model simulations requiring SCREENING meteorological data.

It is important to synchronize diurnal emissions with hourly meteorological conditions. For example, a facility that only operates in the afternoon, from noon to 5pm, should create an emission rate profile so that emissions are simulated in the model only during that period of noon to 5pm. Meteorological conditions vary during the course of a 24-hour period and throughout the year. Incorrectly assigning emissions to the wrong part of a day will result in inappropriate assessments of downwind dispersion, impacts, and ?/Q.

The Emission Rate Factors worksheet, shown below, is used to specify the emission profile for the temporal variation over the period. A typical profile may specify 24 values (one for each hour of the day) to indicate the temporal variation over the 24-hour period that represents the facility's normal operating conditions. Other profiles can be specified such as by month or season. See below for a further description of the various temporal profiles available. Section 9.12.11.1 describes each of the parameters on this worksheet.



9.12.11.1 Emission Rate Parameters (Emission Rate Worksheet)

Include Rate Factors	Enter Y if you want to include variable emission rate factors shown on this worksheet in the ISC input file. Enter N if you do not want to include variable emission rate factors (i.e., ignore all data on this worksheet and use a constant emission rate for all hours of simulation).
Source ID	Source ID for the emission rate factors are listed in this column. The Source IDs must be entered manually.
Period	Flag to specify the period over which the emission rate factors will vary. Allowable inputs are: SEASON (seasonal, 4 values), MONTH (monthly, 12 values), HROFDY (hour of day, 24 values), STAR (speed-by-stability, 36 values), SEASHR (season-by-hour, 96 values). Consult the ISC3 User's Guide for more details on the emission rate flags.
Rate Factors	Emission rate factor for this period and source.

9.12.11.2 Period Rate Factors (Emission Rate Worksheet)

The emission rate factors are directly multiplied by the emission rate to obtain a hour-by-hour emission rate for each source. (In this case for HARP, the emission rate is 1 gram per second (1 g/s) to determine ?/Q and the hour-by-hour emission rate is the relative emission rate.)

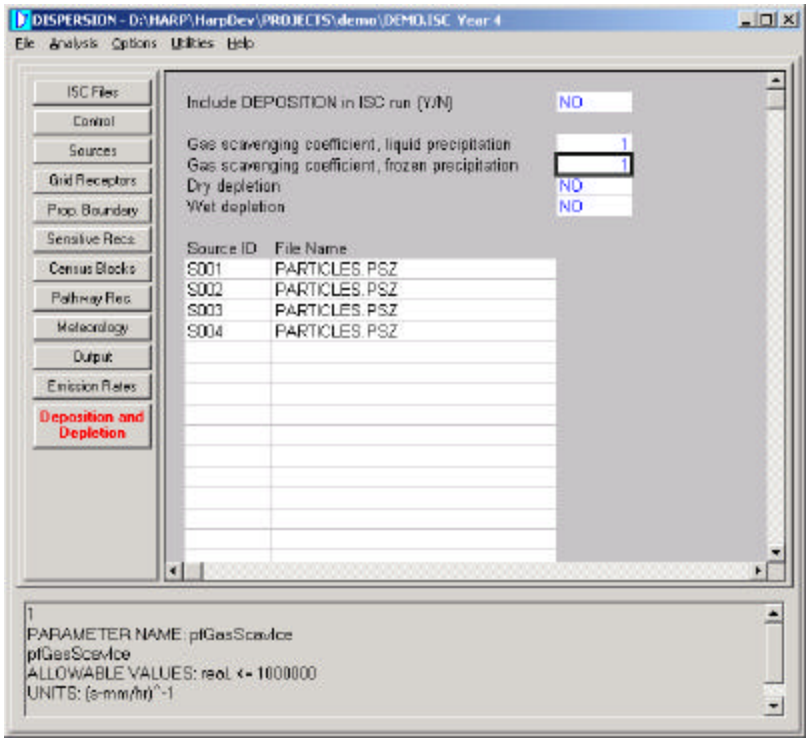
For example, a widget shop may have two emission sources. Source A is fugitive and emits 12 hours a day at a constant rate when the workers are at the shop. Source B is a function of operating hours but is twice as high in the morning because the machinery operates better in the morning. Therefore in the emission factor worksheet, Source A will have a period of HROFDY. 24 factors are required for HROFDY and the user will enter 0,0,0,0,0,0,1,1,1,1,1,1,1,1,1,1,1,1,0,0,0,0,0,0 to represent the fugitive emission rate profile. Source B will have a period of HROFDY. The user will enter 24 values for Source B as follows: 0,0,0,0,0,0,2,2,2,2,2,2,1,1,1,1,1,1,0,0,0,0,0,0. The emission factor of 2 represents twice the emissions in the morning as compared to the afternoon emission factor of 1.

HARP expects the correct number of factors for the appropriate adjustment period. In order for HARP to coordinate the annual emission rate in tons/year with the emission factors, HARP will normalize the factors. In the case above for Source B, the 0's will remain 0's, the 2's will become 2.67, and the 1's will become 1.33. In this manner, the sum of the emission factors equals the number of values required (e.g., 24 in this case).

9.12.12 Deposition and Depletion Worksheet

The Deposition and Depletion worksheet is used to specify deposition and depletion parameters for ISC. Deposition and plume depletion are normally turned off, so the first parameter ("Include DEPOSITION in ISC run (Y/N))" is set to NO. In the OEHHA Guidelines, deposition is treated separately with the constant deposition parameters, and depletion is not considered. The OEHHA Guidelines recognize double counting of emissions occur when plume depletion is not included.

Plume deposition and depletion require detailed information on the particle size, density, and distribution. These data are not always available. For the purposes of research, the DEPOSITION option is available to advanced users of HARP. Consult the ISCST3 User's Guide for further information.



9.12.12.1 Deposition and Depletion Parameters (Deposition and Depletion Worksheet)

Include DEPOSITION in ISC	Enter Y if you want to include deposition in the ISC model. Enter N otherwise
Gas scavenging coefficient liquid	Refer to ISC manual.
Gas scavenging coefficient frozen	Refer to ISC manual.
Dry depletion	Refer to ISC manual, parameter DRYDPLT
Wet depletion	Refer to ISC manual, parameter WETDPLT

9.12.12.2 Particle Size Distribution File (Deposition and Depletion Worksheet)

The deposition model requires that a particle size distribution be provided for each of the sources. HARP requires that these distributions be stored in external files. In the table shown above, you must specify the source IDs in the first column and the name of the particle distribution file in the second column. The source IDs correspond to the IDs that you specified on the Sources worksheet.

The format of the file is shown below. The first two lines are for comments, and are skipped by the program when the file is read. These are followed by up to 20 lines of data describing the distribution. Each line has four numbers, which are the values of particle diameter, mass fraction, density, liquid scavenging coefficient and frozen scavenging coefficient.

Particle size distribution file; first two lines are skipped; up to 20 data lines			
diam(microns), mass fraction, density(g/cm^3), liq scvnging coef, frozen scvnging coef			
2.97	0.0426 1	2.10E-04	7.00E-05
1.89	0.0851 1	1.40E-04	5.00E-05
0.93	0.1702 1	5.00E-05	2.00E-05
0.55	0.1915 1	5.00E-05	2.00E-05
0.40	0.1915 1	6.00E-05	2.00E-05
0.27	0.1191 1	9.00E-05	3.00E-05
0.18	0.1000 1	1.30E-04	4.00E-05
0.12	0.0500 1	1.50E-04	5.00E-05
0.062	0.0400 1	2.00E-04	7.00E-05
0.03	0.0100 1	2.20E-04	7.00E-05

9.13 Using DEM Data for Elevations (File extension *.dem)

Elevation data can be obtained in the format of DEM (Digital Elevation Model) files from the United States Geological Survey (USGS). This data can be utilized by HARP to simplify the determination of elevations of sources and receptors so that you do not have to enter elevations manually.

To utilize DEM data for elevations when setting up the dispersion run, you must first open one or more DEM files. To open a DEM file, select ***Files/DEM/Open DEM file*** from the menu of the dispersion window. You will be prompted for the name of the file, which should have a .DEM extension. HARP will then read the file and load the DEM data into memory, where it is available to be used for looking up source and receptor elevations.

To fill in all source and receptor elevations on the workbook select ***Utilities/Look Up All Elevations*** from the menu. The elevations will be filled in to the appropriate locations on all worksheets. Any values that you had entered into those cells will be overwritten.

Each of the sheet-specific menus (for example the ***Sources*** menu and the ***Grid Receptors*** menu) has a selection labeled ***Fill in Elevations***. This serves the same function as described above, but operates only on one of the worksheets.

You should be sure that the DEM data that you acquire covers the area of interest. If HARP attempts to look up the elevation for a source or receptor that is outside of the range of the DEM data, HARP will fill in a value of zero.

It is quite possible that the area that you are analyzing is not covered by a single DEM file. You can open more than one DEM file concurrently by repeatedly selecting ***Files/DEM/Open DEM file*** from the menu. This allows you to cover a wider geographic area than would be provided by only a single DEM file. To see what files are currently open, select ***Files/DEM/List Open DEM Files*** from the menu.

If you have loaded multiple DEM files into memory concurrently, HARP will remember the names of all of the files the next time you run HARP. Instead of loading each file

individually, you can select ***Files/DEM/Load Most Recent DEM Files*** from the menu. HARP will then load all of the files in sequence.

You can also open the DEM files from the File menu of the Risk window. Open the DEM files from either place has the same effect. Once the DEM file(s) are open, you may interactively look up the elevation for any location on a map shown on the risk window. To do this, set the "mouse action" (lower right corner of Risk window) to "look up elevation", then click anywhere on the map and read the elevation on the bottom of the window.