Dispersion Information Screening Procedures for Emission Risk Screening Evaluations

(DISPERSE)

with emphasis on

DISPERSE Look-up Table and DISPERSE Batch Programs

Version 1.0

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Prepared by:

Dennis L. Becker

Risk Evaluation/Air Modeling Unit
Environmental Standards and Assessment Section
Environmental Outcomes Division
Minnesota Pollution Control Agency

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Attachment E: BATCH1.BAT Batch File

Introduction

Part of the Minnesota Pollution Control Agency (MPCA) action plan in the legislature report titled "Air Quality in Minnesota: Problems and Approaches" includes developing a pilot project to quickly screen air toxic emissions (e.g. hazardous and toxic air pollutants) from stationary sources. It is also desirable to screen criteria air pollutants too. "Screening" is sometimes used to identify chemical emissions that, based on available data, appear to pose minimal health risks.

Screening is conducted using relatively conservative (i.e., worst-case) assumptions so that the actual risks generally would be less than the estimated risks during the screening process (e.g., simplified procedure for complex building configurations in Attachment A). This document summarizes how to estimate atmospheric dispersion factors to estimate worst-case air impacts.

MPCA has developed a screening procedure to do an "Air Emissions Risk Analysis (AERA)". An AERA requires various information on emission rates, dispersion factors, toxicity values, etc.

To assess this information, MPCA developed a "Risk Analysis Screening Spreadsheet (RASS)" with several worksheets. One RASS worksheet contains worst-case dispersion factors. For more information on AERA and RASS, please see "Facility Air Emissions Risk Analysis Guidance".

DISPERSE is the MPCA name (acronym) for "Dispersion Information Screening Procedures for Emission Risk Screening Evaluations". DISPERSE considers two screening procedures (e.g., the EPA SCREEN3 model, and a new MPCA screening procedure called DISPERSE).

This document emphasizes the DISPERSE batch programs that run several EPA programs (e.g., AERMOD and BPIP) and several MPCA programs via a single computer procedure (batch file).

DISPERSE is flexible in the amount of site-specific information needed. DISPERSE is the basis for worst-case dispersion factors in the Risk Analysis Screening Spreadsheet (RASS) as well as three other possible levels of dispersion factors based on progressively more detailed site-specific information (esp. stack and building information):

- Worst-case dispersion factors ("Disp. Tables" worksheet in RASS);
- DISPERSE batch programs with minimal additional stack and building information;
- DISPERSE batch programs with moderate additional stack and building information;
- DISPERSE batch programs with considerable additional stack and building information;

Note: DISPERSE is the new name for an earlier version named CAPTAPS (Criteria Air Pollutant and Toxic Air Pollutant Screening). Because of time constraints, this document continues to show the old CAPTAPS name in its numerous sample outputs and bitmap images.

Overview

DISPERSE allows a user with limited stack and building information to estimate normalized impacts (a.k.a. dispersion factors) in micrograms/cubic meter per gram/second (ug/m3 per g/s) to do a preliminary assessment of chemical releases to the air. Using the limited stack information, dispersion factors can be used to estimate air concentrations for various distances from a stack. The normalized impacts must be scaled to obtain true predicted concentrations. Examples:

1) if a stack emits 0.1 grams/second, multiple its normalized impact by 0.1;
2) if a stack emits 2.0 grams/second, multiple its normalized impact by 2.0;
3) if a stack emits 10 grams/second, multiple its normalized impact by 10;

For facilities with multiple stacks, each stack can be run separately (like EPA's SCREEN3 model which is briefly discussed in Attachment B), or emissions from 'similar' stacks may be treated as one stack. Guidance for combining stacks is provided later. The maximum total concentration is the sum of all stacks combined, even though the maximum impacts from each stack may occur at different times in different locations. This often adds conservatism to the screening modeling and distinguishes it from refined modeling.

Total predicted concentrations are then compared with Minnesota Ambient Air Quality Standards (MAAQS) or inhalation health benchmark values (IHBs) to assess the potential for adverse pollutant impacts. Exceeding MAAQS or IHBs indicates that a more careful evaluation may be warranted. But because the program is generally designed to over-estimate risks, it is unlikely that adverse health effects would occur from the emissions evaluated if none of the MAAQS or IHBs are exceeded.

Potential non-conservative limitations of the modeling are also described in this document. More accurate results can be obtained by conducting refined modeling with detailed site-specific information (e.g., stack/building locations, stack parameters, ambient air locations).

DISPERSE uses EPA's new AERMOD (version 02222) model with improved treatment of building downwash, terrain, and meteorology, and EPA's BPIP-PRIME pre-processor to process stack and building locational data.

The total screening process is integrated in to a risk calculation spreadsheet. The spreadsheet requires several types of input (e.g., emission rates and dispersion factors):

1) Emission Rates

RASS has multiple worksheets. One worksheet has emission rates. The user enters short-term chemical emission rates in pounds per hour and long-term chemical emission rates in tons per year for each chemical found in RASS that is emitted or potentially emitted at the facility. For more information on AERA and RASS, see "Facility Air Emissions Risk Analysis Guidance".

2) Dispersion Factors

The user may obtain dispersion factors from one of two methods (other methods exist such as the SCREEN3 model but they are not discussed here):

1) a look-up table (less flexible and generally more conservative);
2) batch programs (more flexible and generally less conservative).

Both methods calculate maximum concentrations (high-first-high [H1H] values) using EPA's new AERMOD model (version 02222) together with 1986-1990 Minneapolis/St. Paul (surface) and St. Cloud upper air meteorological data. The modeling reflects an emission rate of 1 gram per second, and a flat terrain polar grid with 1080 receptors (36 directions and 30 distances ranging from 10 to 10,000 meters):

10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 120, 140, 160, 180, 200, 250, 300, 350, 400, 500, 600, 700, 800, 900, 1000, 1500, 2500, 5000, 7500, and 10,000 meters.

The AERMOD/AERMET user guides define different Land Use Land Cover (LULC) categories. DISPERSE currently has 3 LULC categories:

1) cultivated land (a.k.a. cropland);
2) 50/50 mix of categories 1 and 3;
3) deciduous forest.

The different LULC options reflect different levels of surface roughness (a.k.a. roughness height in the AERMOD/AERMET user's guide), albedo, and Bowen ratio. All vary by land use and season (i.e., vegetation growth cycle). The Minneapolis/St. Paul meteorology assumes:

- winter values (snow cover) for December, January, February, and March;
- spring values (pre-lush vegetation) for April and May;
- summer values (lush vegetation) for June, July, August, and September;
- autumn values (post-lush vegetation) for October and November.

Note 1: Earlier EPA models (e.g., ISCST3 and ISC-PRIME) only considered roughness heights of approximately 0.1 meters (rural) and 1 meters (urban) regardless of season.

Note 2: From a population density perspective, option 1 resembles isolated farmsteads; option 2 resembles most towns and suburban areas; option 3 resembles the downtown Twin Cities.

Limitations and Recommendations

The DISPERSE screening process is designed so that potential impacts generally will not be under-predicted in most cases, i.e., the results are conservative. However, it was not designed to cover every conceivable situation. The user should consider whether the following potential limitations might apply. Note: SH denotes stack height and BH denotes building height.

Terrain
One limitation is the assumption of flat terrain. DISPERSE may not be conservative in situations with considerable terrain because the plume may impact (or nearly impact) nearby hills (e.g., Minnesota River, Mississippi River, and North Shore of Lake Superior). Due to an infinite number of terrain possibilities, it would be hard to incorporate terrain in any meaningful way. In areas with significant terrain (terrain above stack height), other models may be more appropriate.

For areas with minimal terrain, no terrain adjustment should be made because of the multiple conservatisms in the program: reasonably worst-case building/stack parameters/land use, unpaired events, dense receptor grid, and 5 years of meteorological data.

For areas with significant building downwash (i.e., SH/BH < 2) and significant terrain only at "distant" locations (e.g., beyond ~10 stack heights), no terrain adjustment should be made because of the multiple conservatisms in the program and because building downwash is generally much more important at close-in distances than terrain effects at greater distances.

For areas with little or no building downwash (i.e., SH/BH > 2) and significant terrain only at `"distant" locations (e.g., beyond ~10 stack heights), use SCREEN3 with terrain.

For areas with significant terrain near the stacks (e.g., within ~10 stack heights), use SCREEN3 with terrain or EPA refined models with terrain. Significant terrain very close to the source is too important to be approximated with this version of DISPERSE.

Note: Significant terrain can also shift & amplify prevailing wind directions (see below).

Meteorology (esp. Wind Direction)
Another limitation is that DISPERSE only considers Twin Cities meteorological data. In general, this should not be a problem except for areas with more pronounced prevailing wind directions (e.g., wind channeling along rivers with significant terrain, and lake-induced effects on the shoreline of Lake Superior). Wind direction shifts are not important because the procedure uses unpaired events. However, the frequency of prevailing wind directions (often the worst-case wind direction) may be underestimated. This may cause an underestimation of long-term (annual chronic) averages. For the most extreme cases, the maximum underestimation of long-term annual averages could be a factor of two. If additional refinement is needed, use SCREEN3 or EPA refined models with representative meteorological data.

Limitations and Recommendations (Continued)

Stacks & Buildings – DISPERSE Look-Up Table
Another limitation is that the DISPERSE look-up table only considers stack heights less than 99 meters (~325 feet) with a concurrent building height 1m below stack height. Thus, it may not be appropriate for very tall stacks (e.g., power plants) and/or places with very tall buildings like the core downtown areas of Minneapolis/St. Paul.

More heights could be added but it may be unrealistic to assume the current building dimensions (height:length:width ratio of 1:2:2) because very tall buildings are often taller than they are long or wide. Please use the batch procedure or SCREEN3 or refined modeling for such cases.

Stacks & Buildings – DISPERSE Batch Programs
The batch procedure has different stack & building limitations depending on the stack/building option (a.k.a. Building Profile Input Program [BPIP] option).

BPIP option 1 limitations include its 1-tier pre-defined square shape (height:length:width ratio of 1:2:2). Few sites have this exact geometry, and, thus, it is only a first approximation of building downwash.

BPIP option 2 limitations include its 1-tier pre-defined rectangular shape. A significant number of sites may sort of resemble this geometry. BPIP option 2 is more flexible than BPIP option 1. It too is only a first approximation of building downwash but it is better than BPIP option 1.

BPIP option 3 limitations are minimal. The main limitation for DISPERSE is the requirement for a pre-existing BPIP file with plant north at 360 degrees (true north) [or the need to create such a file with site-specific stack/building information]. A lesser limit is the need to re-edit the BPIP file for each DISPERSE run (so that the desired stack is always the first stack in the BPIP file).

Fugitive Emissions & Flares
DISPERSE is intended for point sources. It was not designed for fugitive emission sources (e.g., area and volume sources) or flares. Please consider SCREEN3 for fugitive sources and flares.

For RASS applications of fugitive sources with low release heights, use a (pseudo) stack height of 1m, or for better dispersion factors, SCREEN3 or other EPA-approved models.

SCREEN3 Model
The SCREEN3 model is designed so that potential impacts generally will not be under-predicted in most cases. However, SCREEN3 was not designed to cover every conceivable situation.

SCREEN3 is an older model and its crude algorithms for stack releases near buildings should be used with great caution – see SCREEN3 discussion and restrictions in Attachment B.

Limitations and Recommendations (Continued)

Combining Stacks with Similar Dispersion Characteristics

To accommodate multiple stacks more efficiently, it may be helpful to group stacks with similar dispersion characteristics involving stack height, stack diameter, exit velocity, exit temperature, and proximity to similar sized buildings. We offer a simple two-step approach – see "Look-Up Table" and "Batch Procedure" below.

Note: "similar" means stacks are located within ~100m of each other near similar sized buildings and stack parameters vary by less than 20 percent*.

* See EPA document titled "Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised". Pages 2-2 and 2-3 offer a more complex method for combining similar stacks. However, it must be repeated for each pollutant – this can be tedious if there are many pollutants (i.e., it uses individual stack emission rates and stack parameters). It may be useful for refined follow-up reviews (e.g., risk driver pollutants), but not the initial screening.

DISPERSE Look-Up Table

Create different groups with similar stacks (stack heights) in each group.

Within each group, select the shortest stack height in the group. The look-up table already reflects generally worst-case conditions for other parameters (i.e., stack diameter, stack exit velocity, stack exit temperature, and stack-to-building geometry).

DISPERSE Batch Procedure

Create different groups with similar stacks in each group.

Within each group, select the following worst-case dispersion values:

- shortest stack height;
- smallest stack diameter;
- smallest exit velocity;
- lowest exit temperature;
- worst stack location (i.e., location of stack with the tallest nearby buildings).

Note: this approach will increasingly overestimate impacts from increasingly dissimilar stacks (unless the taller, bigger, faster, hotter stacks in the group have sufficiently small emissions). The grouped stack location should be the location of the stack with the tallest nearby buildings (i.e., also worst-case dispersion, in general).

Limitations and Recommendations (Continued)

Stacks with Rain Hats or Rain Caps or Non-Vertical Releases

Stacks with rain hats or rain caps or non-vertical releases (e.g., horizontal stacks or tilted stacks) should use an exit velocity of 0.01 meters/second. Rain hats and rain caps significantly reduce the upward vertical momentum of air flow which reduces the amount of plume rise. Likewise, non-vertical releases have less upward vertical momentum than vertical releases. Other more complex approaches (not shown here) may better represent rain hats, rain caps, and non-vertical releases and they may be useful for refined follow-up reviews (e.g., risk driver pollutants).

Possible Future Enhancements

Possible future enhancements might include:

- English input units;
- terrain elevation options
- additional land use types;
- additional meteorological data.;
- "super batch procedure" for handling numerous stacks (or groups of similar stacks).

The improvements will probably take place in the FORTRAN computer program with prompts for additional information.

DISPERSE Look-Up Table (RASS "Disp.Table" Worksheet)

RASS contains multiple worksheets. The worksheet named "Disp. Tables" contains a look-up table with worst-case DISPERSE dispersion factors which were calculated as described below.

The look-up table contains the results of AERMOD runs for maximum concentrations (high-first-high [H1H] values) for 297 combinations of the following land uses, building sizes, and (stub) stack parameters:

- stack height (1m, 2m, 3m, …, 99m)
- stack diameter (1 percent of stack height)
- exit temperature (293K);
- exit velocity (1 meter/second)
- building height (1m less than stack height);
- building length (twice the building height);
- building width (twice the building height);
- land use (cropland, deciduous forest, and a 50/50 mix of cropland/deciduous forest);

Because the look-up table lacks detailed site-specific information (i.e., temperature, velocity, building size and location, and land use), it uses worst-case temperature, worst-case exit velocity, worst-case land use, and pseudo worst-case building/stack geometry. Each stack is centered on a square building (building height is ½ side length) to reasonably maximize building downwash (enhanced turbulence near buildings). For facilities with multiple stacks, each stack (or group of similar stacks) must be analyzed separately and combined with other stacks (or groups of stacks).

Combining stacks while maximizing building downwash at each stack generally yields relatively high predicted concentrations. The look-up table conservatively addresses different distances to maximum impact for different stack heights via its "at & beyond" algorithm which selects the maximum impact at and beyond some distance from the stack (e.g., stack-to-fenceline distance).

The spreadsheet contains dispersion factors (ug/m3 per gram/second) for all averaging times, stack heights from 1m to 99m, and stack-to-receptor "at & beyond" downwind distances from 10m to10,000m.

Table 1 contains a subset of annual dispersion factors (ug/m3 per gram/second) for stack heights between 1m and 20m, and "at & beyond" downwind distances from 10m to 100m.

Table 2 contains a subset of 1-hour dispersion factors (ug/m3 per gram/second) for stack heights between 1m and 20m, and "at & beyond" downwind distances from 10m to 100m.

Example: annual and 1-hour dispersion factors are 944 and 10,451, respectively, for a stack height of 9 meters for "at & beyond" downwind distances of 10 meters or more.

TABLE 1. ANNUAL DISPERSION FACTORS (UG/M3 PER G/SEC)
BY STACK HEIGHT (METERS) AND "AT AND BEYOND" DISTANCE (METERS)

	DOWNWIND DISTANCE:									
SH	10	20	30	40	50	60	70	80	90	100
1	3836	1958	1216	826	600	457	360	292	243	205
2	2465	1554	940	593	410	310	250	210	180	157
3	2357	1236	775	542	402	305	239	192	156	131
4	4211	942	586	398	302	238	196	163	139	119
5	2663	754	479	334	245	186	151	127	110	96
6	2090	619	396	277	208	160	128	105	90	78
7	1607	885	322	232	175	137	111	91	77	66
8	1230	656	255	192	147	117	95	79	67	57
9	944	506	299	164	128	103	85	71	61	52
10	762	448	328	141	113	91	75	64	55	47
11	622	398	275	123	96	80	67	56	48	42
12	513	354	233	167	84	71	60	51	44	38
13	434	316	204	170	75	63	54	46	40	35
14	371	286	189	151	84	55	48	42	36	32
15	320	254	176	134	101	50	43	37	33	29
16	279	230	164	121	105	49	39	34	30	27
17	245	206	153	110	96	62	37	32	28	25
18	216	185	142	104	87	69	35	29	26	23
19	192	167	132	98	79	70	38	28	24	22
20	171	151	123	93	73	66	47	26	23	21

TABLE 2. 1-HOUR DISPERSION FACTORS (UG/M3 PER G/SEC)
BY STACK HEIGHT (METERS) AND "AT AND BEYOND" DISTANCE (METERS)

	DOWNWIND DISTANCE:									
SH	10	20	30	40	50	60	70	80	90	100
1	103924	70528	57366	52015	45370	41857	37954	34262	31127	28522
2	72044	56776	40135	26921	19020	14509	12763	11696	11113	10733
3	59051	48424	38037	31159	25763	22426	19653	17028	14575	12478
4	85665	32760	26988	22242	19094	16634	14454	12411	11471	10678
5	52405	23451	20275	17000	14621	12817	11468	10319	9167	8073
6	31949	14659	13718	12124	10592	9326	8406	7613	6951	6450
7	21101	16974	8985	8275	7521	6825	6206	5690	5306	4961
8	14643	13453	6344	5844	5292	4910	4559	4242	3957	3700
9	10451	10404	5876	4392	4181	3939	3688	3450	3232	3033
10	7915	7887	5997	3549	3419	3267	3091	2917	2752	2599
11	6055	6040	5335	2852	2811	2670	2537	2409	2285	2168
12	4814	4814	4629	3386	2421	2327	2197	2069	1973	1880
13	4032	4032	4018	3112	1958	1918	1836	1739	1660	1590
14	3443	3443	3433	3029	1784	1690	1631	1555	1474	1409
15	2978	2978	2970	2856	2149	1447	1415	1361	1299	1235
16	2614	2614	2608	2601	2020	1307	1288	1247	1196	1142
17	2305	2305	2301	2295	1973	1375	1115	1090	1054	1013
18	2053	2053	2050	2045	1943	1424	1021	1005	976	942
19	1830	1830	1827	1824	1764	1422	900	893	874	848
20	1642	1642	1640	1637	1633	1367	1052	819	806	785

DISPERSE Batch Programs

Introduction

The DISPERSE batch programs prompt the user for modeling information (similar to EPA's SCREEN3 model) to calculate maximum concentrations (high-first-high [H1H] values) using EPA's AERMOD model (version 02222) together with 1986-1990 Minneapolis/St. Paul (surface) and St. Cloud (upper air) meteorological data.

It asks for stack information (stack height, stack diameter, exit velocity, and exit temperature) and it asks the user to select the appropriate Land Use Land Cover (LULC) option, Building Profile Input Program (BPIP) option, and meteorology option. It also asks the user for the stack location relative to the building center (if applicable). MPCA default values are offered for cases where values are not readily available or known to the user.

The batch procedure first runs a MPCA FORTRAN program with prompts for information. This information is used to create AERMOD and BPIP input files as well as a file that is used in the last MPCA FORTRAN program. A second MPCA FORTRAN program reformats output from EPA's Building Profile Input Program (BPIP) for input to EPA's AERMOD dispersion model.

A third MPCA FORTRAN program reads the AERMOD output to create a summary report and six supplemental summary figures (ASCII text files). The summary report and summary figures both show "LVL1" and "LVL2" dispersion factors for 1-hour, 3-hour, 8-hour, 24-hour, monthly, and annual averages for maximum [high-first-high (H1H)] values where:

"LVL1" includes building receptor locations, if present (more conservative).
"LVL2" excludes building receptor locations, if present (less conservative).

Note: users should use "LVL1" unless they have MPCA approval to use "LVL2". LVL2 is only intended for cases when all required buildings are on the subject company's property.

The Learning Curve

Beginners are strongly encouraged to run the four examples to learn the "feel" of the DISPERSE batch procedure such as its data prompts, computer run time, etc.

Most users will learn it by conducting pre-screening runs using the easiest BPIP option (i.e., 1) and an initial LULC option (e.g., 2) with 1 year of meteorology.

Some users will learn BPIP option 2 as they learn the importance of stack/building geometry, and a few users may learn BPIP option 3 for cases that approach refined modeling.

MPCA expects LULC option 2 will be used most often except for cropland areas (option 1 for isolated farmsteads) or core downtown areas (option 3 for city populations > ~100,000).

Final submittals will use the appropriate LULC option [0 if unknown], the appropriate BPIP option [1 if unknown], and 5 years of meteorology.

DISPERSE Batch Programs – Prompts for Information

Stack Parameters

The DISPERSE batch procedure prompts the user for the stack height (meters), exit temperature (Kelvin), exit velocity (meters/second), and stack diameter (meters). Set exit velocity to 0.01 m/s for stacks with rain hats, rain caps, or non-vertical releases unless you have MPCA approval for another method. MPCA default values are offered for unknown values.

Stack/Building Options for EPA's Building Profile Input Program (BPIP)

Stack emissions can experience enhanced turbulence when located near buildings (a.k.a. building downwash). Building downwash often occurs when the building height (BH) exceeds 40% of the stack height (SH) [i.e., SH/BH < 2.5] and it can greatly affect concentrations near the stack. The building and stack heights are both measured above ground level (i.e., grade elevation).

The user is asked if building downwash is possible. The reply generally will be "yes" because most stacks have nearby buildings with roofs exceeding 40% of the stack height.

If building downwash is possible, the user selects from 3 levels of detail (1 is minimal, 2 is moderate, and 3 is advanced) to represent the stack/building geometry to create a BPIP file for DISPERSE (1 uses a square box, 2 uses a rectangular box, and 3 uses a pre-existing BPIP file):

1 selects MPCA default values (i.e., a single square building for all buildings/structures).
2 selects USER defined values (i.e., a single rectangular shape enclosing all key structures).
3 selects BPIP refined values (i.e., pre-existing BPIP file in standard EPA format).

Option 1 automatically creates a hypothetical square building (i.e., 1 tier square building) with a building height that is 1 meter below stack height, and building sides twice the building height. This building geometry is the building shape used by EPA in some early wind tunnel testing.

Option 2 lets the user define a hypothetical rectangular building (i.e., 1 tier rectangular building) that encloses all key buildings/structures – see Attachment A. This option requires "some" site-specific information (e.g., MPCA Form MI-01: Building and Structure Information; site plans; site photographs; aerial photos on the web [e.g., mapquest, terraserver]; etc.)

Option 3 reads a pre-existing BPIP file (e.g., PSD submittal) with plant north at 360 degrees (true north). DISPERSE reads only the first stack, renames it "STACK_#1", shifts its coordinates to the origin (0,0), and shifts all building coordinates accordingly. Note: the BPIP file must be re-edited for each DISPERSE run so that the appropriate stack is the first stack in the BPIP file.

Note 1: most projects will initially use option 1 and may use option 2 if more detailed data is available. MPCA expects very few projects will have a pre-existing BPIP file for option 3.

Note 2: DISPERSE assumes the stack is located at the center of the building configuration (square or rectangle) unless the user indicates otherwise.

DISPERSE Batch Programs – Prompts for Information (Continued)

Meteorology Options
There are 6 meteorology options:

0 selects 1986-1990.
1 selects 1986 only.
2 selects 1987 only.
3 selects 1988 only.
4 selects 1989 only.
5 selects 1990 only.

MPCA expects users will use option 0. Other options are for pre-screening purposes only.

LULC Options
DISPERSE currently has four LULC choices (based on roughness height, zo):

0 selects all 3 LULC types below (use if LULC [zo] is unknown)
1 selects cultivated land (a.k.a. row crops or cropland; zo ~ 0.01m to 0.2m).
2 selects a 50/50 mix of cultivated land and deciduous forest (zo ~0.3m to 0.8m).
3 selects deciduous forest (zo ~ 0.5m to 1.3m).

From a population density perspective, option 1 resembles isolated farmsteads; option 2 resembles most towns and suburban areas; option 3 resembles the downtown Twin Cities.

Note: most projects will likely use LULC option 2 (or 0 if LULC [zo] is unknown).

DISPERSE Batch Programs – Reserved File Names

The batch procedure has several reserved file names:

- AERMOD*.* for AERMOD files;
- BPIP*.* for Building Profile Input Program (BPIP) files;
- CAPTAP*.* for CAPTAPS input/output/plot files;
- MSPSTC*.* for Minneapolis/St. Paul and St. Cloud meteorological files;
- SUMMARY*.* for summary files;
- SCREEN*.* for SCREEN3 files.

Warning: each DISPERSE run deletes previous SUMMARY*.* files, CAPTAP*.* files, and AERMOD and BPIP files. The SCREEN3 model overwrites the SCREEN.OUT file. If you wish to keep these files, you must copy them to another directory/folder before the next run.

DISPERSE Batch Programs – Summary Results

Summary Report (SUMMARYR.TXT)
The summary report has dispersion factors (i.e., normalized impacts in ug/m3 per gram/second). The appropriate value (by averaging time) should be entered into the emission spreadsheet. The upper row contains maximum normalized impacts regardless of downwind distance. Other rows contain dispersion factors for various downwind distances from the stack – it is for situations where it is appropriate to exclude non-ambient company areas (e.g., subject company buildings and/or fenced areas). The summary report has dispersion factors for two cases:

"LVL1" includes building receptor locations, if present (more conservative).
"LVL2" excludes building receptor locations, if present (less conservative).

Note: users should use "LVL1" unless they have MPCA approval to use "LVL2". LVL2 is only intended for cases when all required buildings are on the subject company's property.

Summary Figures (SUMMARYx.TXT where "x" is 1, 3, 8, D, M, and A)
There is one summary figure file per averaging time:

- 01-hour figures are in SUMMARY1.TXT
- 03-hour figures are in SUMMARY3.TXT
- 08-hour figures are in SUMMARY8.TXT
- 24-hour figures are in SUMMARYD.TXT (Daily)
- Monthly figures are in SUMMARYM.TXT
- Annual figures are in SUMMARYA.TXT

The "PCTofMAX" plots show percent-of-maximum normalized impacts where:

- "0" denotes 0% of the maximum value;
- "1" denotes 10% of the maximum value;
- "2" denotes 20% of the maximum value;
- "3" denotes 30% of the maximum value;
- "4" denotes 40% of the maximum value;
- "5" denotes 50% of the maximum value;
- "6" denotes 60% of the maximum value;
- "7" denotes 70% of the maximum value;
- "8" denotes 80% of the maximum value;
- "9" denotes 90% of the maximum value;
- "*" denotes 100% of the maximum value;
- "S" denotes stack location;
- "$" denotes stack location if the maximum impact is "atop" the stack location;
- "." denotes building area;
- "-" denotes zero values (very small impacts or LVL2 building receptors set to zero).

Each file has multiple "'zoom" scales (maps) for large and small distances from the stack.

DISPERSE Batch Programs – How to View/Print Summary Files

How to View/Print
For best viewing/printing of the summary report (SUMMARYR.TXT), use Word, portrait mode.

For best viewing/printing of the summary figures, use Word, portrait mode or landscape mode, set margins to 0.5, and set font size to 8 (CONTROL-A selects the entire file contents).

DISPERSE Batch Programs – How to Run

How to Run
From file manager or Windows Explorer, double-click one of the batch files (BATCH1.BAT or BATCH2.BAT). Both batch files do the same tasks except #2 shows more steps along the way.

See test cases and example for details!

The batch files perform several operations. The main steps are summarized below.

Step 1 runs XPROGA01 to prompt the user for information (e.g., stack parameters, LULC option, BPIP option, years of meteorology) to create AERMOD and BPIP input files. It also creates a file with FORTRAN DO-LOOP values for LULC and meteorological years for step 4.

Step 2 runs BPIP and XSHIFTSO to create BPIP files for AERMOD. Run time is a few seconds.

Step 3 runs AERMOD to create PLOTFILE files. It takes approximately 2-5 minutes to run each AERMOD file set to "RUN". It takes 1-2 seconds to run each AERMOD file set to "NOT" run. AERMOD will show the meteorological data being processed. For 1990 data, you will see:

"Now Processing Data for Day No. <1, 2, 3, …, 365> of 1990"

Step 4 runs XPROGA02 to read the output from step 3 and create the summary files (text files). Run time is a few seconds. It ends with: "CAPTAPS RUN COMPLETED SUCCESSFULLY!"

The summary report is in SUMMARYR.TXT. The six figures are in SUMMARYn.TXT ("n" is 1, 3, 8, D, M, A) for n-hour averages, daily averages, monthly averages, and annual averages.

Test Cases

Test Case 1

Test case 1 is for a stack without any "tall and near" buildings. In other words, all roof tops are less than 40% of the stack height (for stack-to-building distances within five building heights). This test case uses LULC option 2 and 1986 meteorology.

Figure 1.1 shows the initial screen for all DISPERSE [CAPTAPS] runs. It asks the user if they want to run one of the test cases. New users are strongly encouraged to run the four test cases. In this example, the user typed "Y" for yes and then entered "1" for test case 1.

Figure 1.2 shows the data for test case 1. It asks the user if the data is correct. In this case, the user typed "Y" for yes.

Figure 1.3 shows the estimated run time. It does not prompt the user for any information.

Figure 1.4 indicates the "CAPTAPS RUN COMPLETED SUCCESSFULLY!" It also lists the seven summary files. Figure 1.5 shows the summary report (SUMMARYR.TXT).

Test Case 2

Test case 2 is for a stack with one "tall and near" building. In this case, the building height is 8m and the stack height is 9m (i.e., BH/SH=0.89 = 89%; SH/BH=1.13). This test case uses LULC option 2 and 1986 meteorology.

Figure 2.1 shows the user typed "Y" for yes (first prompt) and then entered "2" for test case 2.

Figure 2.2 shows the data for test case 2 and it asks the user if the data is correct. In this case, the user typed "Y" for yes. Screens similar to figures 1.3 and 1.4 also occur (not shown here).

Test Case 3

Test case 3 is the same as test case 2 except it uses 1986-1990 meteorology.

Figure 3.1 shows the user typed "Y" for yes (first prompt) and then entered "3" for test case 3.

Figure 3.2 shows the data for test case 3 and it asks the user if the data is correct. In this case, the user typed "Y" for yes. Screens similar to figures 1.3 and 1.4 also occur (not shown here).

Test Case 4

Test case 4 is the same as test case 3 except it uses all LULC options.

Figure 4.1 shows the user typed "Y" for yes (first prompt) and then entered "4" for test case 4.

Figure 4.2 shows the data for test case 4 and it asks the user if the data is correct. In this case, the user typed "Y" for yes. Screens similar to figures 1.3 and 1.4 also occur (not shown here).

Figure 1.1 Test Case 1 – Screen #1.

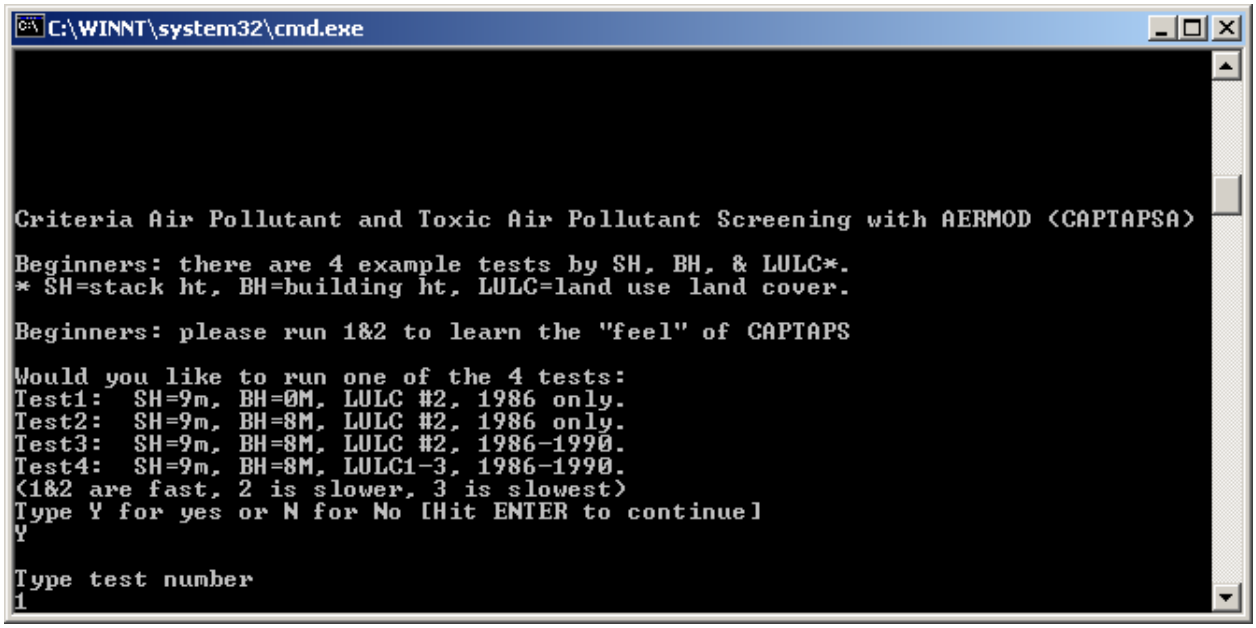


Figure 1.2 Test Case 1 – Screen #2.

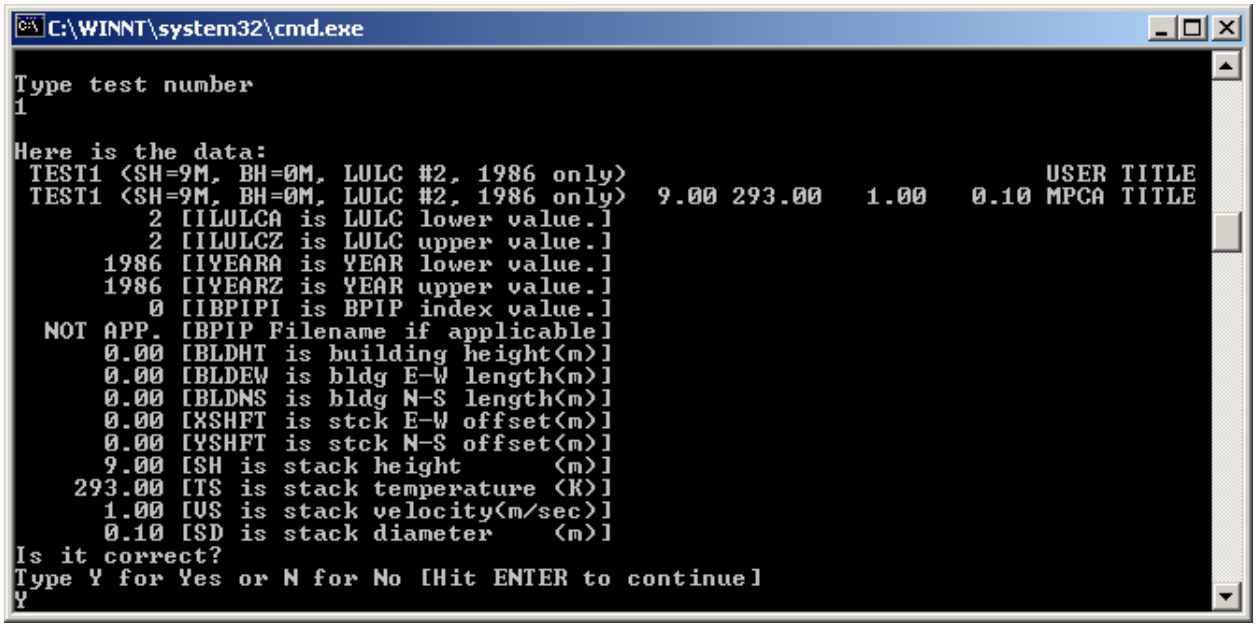


Figure 1.3 Test Case 1 – Screen #3.

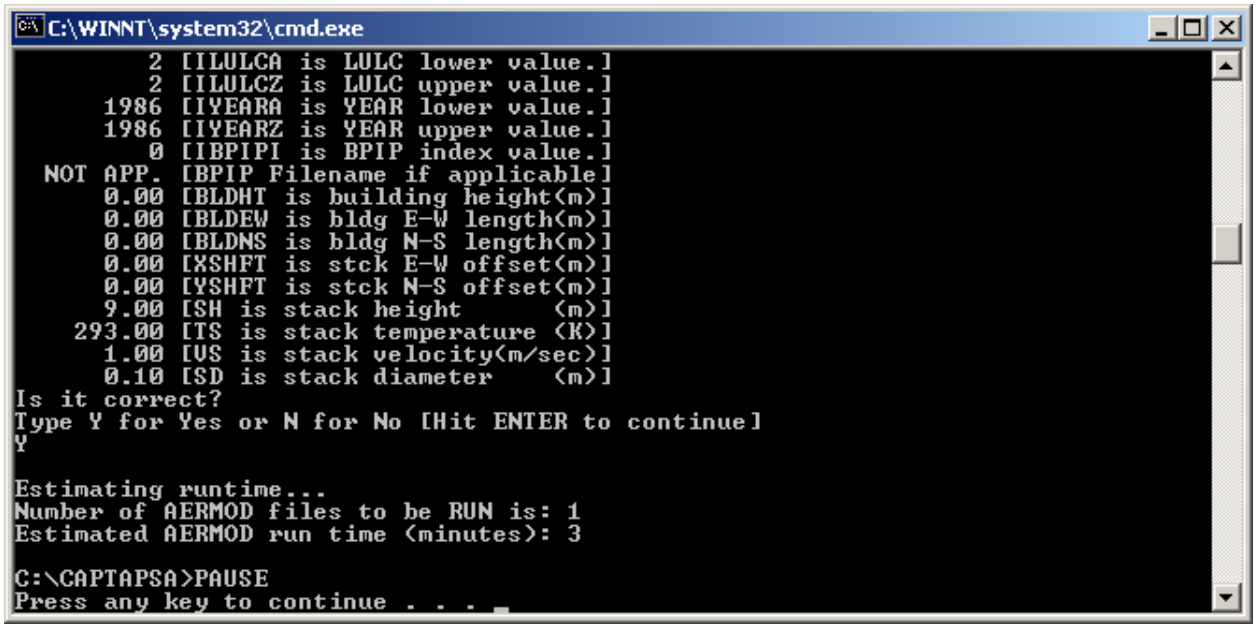


Figure 1.4 Test Case 1 – Screen #4.

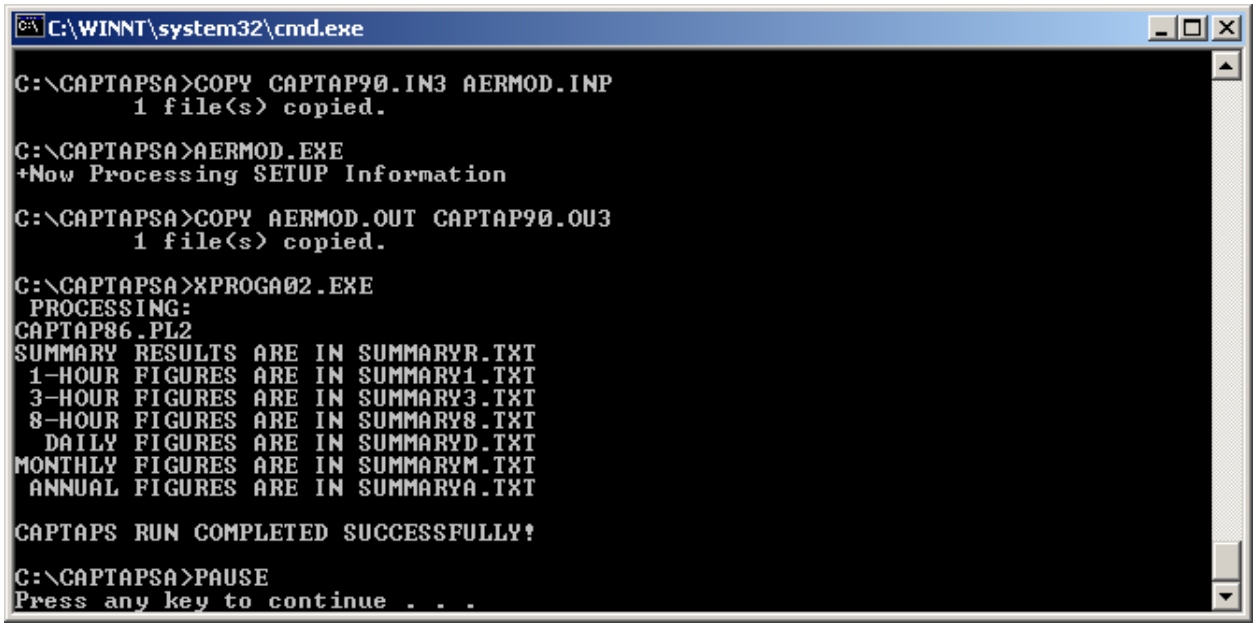


Figure 1.5 Test Case 1 – SUMMARYR.TXT (Summary Report)

```
MPCA CAPTAPSA SUMMARY REPORT                      05/27/2003 15:00:50  PAGE   1

CRITERIA AIR POLLUTANT & TOXIC AIR POLLUTANT SCREENING WITH AERMOD (CAPTAPSA)

LVL1 DISPERSION FACTORS (UG/M3 PER G/S) BY AVERAGING TIME & DISTANCE (METERS)

*** LVL1 includes & LVL2 excludes building receptor locations (if present)***

 DISTANCE       ANNUAL    01-HOUR    03-HOUR    08-HOUR    24-HOUR    MONTHLY
 FROM STK      AVERAGE    AVERAGE    AVERAGE    AVERAGE    AVERAGE    AVERAGE
 --------      -------    -------    -------    -------    -------    -------
 NOT APP.        51.18    1304.54     787.17     463.97     274.08      89.33

       10         0.00       5.88       1.96       0.73       0.26       0.01
       20         2.25    1105.81     406.07     159.35      59.26       7.74
       30        24.35    1217.82     582.10     313.59     215.98      62.99
       40        44.84    1303.45     625.91     403.19     274.08      89.33
       50        51.18    1168.74     695.52     430.95     256.69      82.19
       60        49.40    1299.90     787.17     463.97     272.73      70.24
       70        44.76    1304.54     744.17     440.71     267.15      59.12
       80        39.91    1264.74     683.59     403.12     251.21      51.70
       90        35.57    1203.67     620.62     363.29     237.45      48.14
      100        31.85    1127.60     705.13     331.63     220.59      44.30
      120        25.89     971.40     765.58     320.80     188.21      36.87
      140        21.42     859.11     718.92     311.66     168.53      30.74
      160        18.03     819.76     662.56     329.17     150.27      25.96
      180        15.41     770.88     606.18     327.11     134.16      22.59
      200        13.36     722.29     553.62     309.60     120.27      20.62
      250         9.73     620.39     444.34     264.54     106.65      16.59
      300         7.42     555.24     363.28     224.82      95.34      13.40
      350         5.87     506.88     302.86     195.73      84.69      11.06
      400         4.77     466.79     256.94     178.14      75.26       9.30
      500         3.36     399.03     213.25     146.88      60.10       6.88
      600         2.51     341.29     179.52     122.18      48.97       5.33
      700         1.96     294.43     153.00     103.04      40.68       4.26
      800         1.58     256.64     132.06      88.11      34.43       3.50
      900         1.30     225.97     115.33      76.31      29.81       2.93
     1000         1.09     200.82     101.77      66.82      26.11       2.50
     1500         0.56     124.32      61.22      39.00      15.23       1.33
     2500         0.25      64.63      30.90      18.95       7.41       0.59
     5000         0.08      25.14      11.62       6.80       2.66       0.19
     7500         0.04      14.06       6.40       3.63       1.42       0.10
    10000         0.03       9.17       4.11       2.30       0.90       0.06



**** MODEL ****** ************** USER TITLE **************
* AERMOD (02222): TEST1 (SH=9M, BH=0M, LULC #2, 1986 only)

***** STACK PARAMETERS *****
 SH_(M) TS_(K) VS_MPS SD_(M)
   9.00 293.00   1.00   0.10
```

CRITERIA AIR POLLUTANT & TOXIC AIR POLLUTANT SCREENING WITH AERMOD (CAPTAPSA)

LVL2 DISPERSION FACTORS (UG/M3 PER G/S) BY AVERAGING TIME & DISTANCE (METERS)

*** LVL1 includes & LVL2 excludes building receptor locations (if present)***

DISTANCE FROM STK	ANNUAL AVERAGE	01-HOUR AVERAGE	03-HOUR AVERAGE	08-HOUR AVERAGE	24-HOUR AVERAGE	MONTHLY AVERAGE
NOT APP.	51.18	1304.54	787.17	463.97	274.08	89.33
10	0.00	5.88	1.96	0.73	0.26	0.01
20	2.25	1105.81	406.07	159.35	59.26	7.74
30	24.35	1217.82	582.10	313.59	215.98	62.99
40	44.84	1303.45	625.91	403.19	274.08	89.33
50	51.18	1168.74	695.52	430.95	256.69	82.19
60	49.40	1299.90	787.17	463.97	272.73	70.24
70	44.76	1304.54	744.17	440.71	267.15	59.12
80	39.91	1264.74	683.59	403.12	251.21	51.70
90	35.57	1203.67	620.62	363.29	237.45	48.14
100	31.85	1127.60	705.13	331.63	220.59	44.30
120	25.89	971.40	765.58	320.80	188.21	36.87
140	21.42	859.11	718.92	311.66	168.53	30.74
160	18.03	819.76	662.56	329.17	150.27	25.96
180	15.41	770.88	606.18	327.11	134.16	22.59
200	13.36	722.29	553.62	309.60	120.27	20.62
250	9.73	620.39	444.34	264.54	106.65	16.59
300	7.42	555.24	363.28	224.82	95.34	13.40
350	5.87	506.88	302.86	195.73	84.69	11.06
400	4.77	466.79	256.94	178.14	75.26	9.30
500	3.36	399.03	213.25	146.88	60.10	6.88
600	2.51	341.29	179.52	122.18	48.97	5.33
700	1.96	294.43	153.00	103.04	40.68	4.26
800	1.58	256.64	132.06	88.11	34.43	3.50
900	1.30	225.97	115.33	76.31	29.81	2.93
1000	1.09	200.82	101.77	66.82	26.11	2.50
1500	0.56	124.32	61.22	39.00	15.23	1.33
2500	0.25	64.63	30.90	18.95	7.41	0.59
5000	0.08	25.14	11.62	6.80	2.66	0.19
7500	0.04	14.06	6.40	3.63	1.42	0.10
10000	0.03	9.17	4.11	2.30	0.90	0.06

**** MODEL ****** ************** USER TITLE **************
* AERMOD (02222): TEST1 (SH=9M, BH=0M, LULC #2, 1986 only)

***** STACK PARAMETERS *****

SH_(M)	TS_(K)	VS_MPS	SD_(M)
9.00	293.00	1.00	0.10

CRITERIA AIR POLLUTANT & TOXIC AIR POLLUTANT SCREENING WITH AERMOD (CAPTAPSA)

CAPTAPSA.DAT:

```
 TEST1 (SH=9M, BH=0M, LULC #2, 1986 only)                          USER TITLE
 TEST1 (SH=9M, BH=0M, LULC #2, 1986 only)  9.00 293.00   1.00   0.10 MPCA TITLE
         2 [ILULCA is LULC lower value.]
         2 [ILULCZ is LULC upper value.]
      1986 [IYEARA is YEAR lower value.]
      1986 [IYEARZ is YEAR upper value.]
         0 [IBPIPI is BPIP index value.]
  NOT APP. [BPIP Filename if applicable]
      0.00 [BLDHT is building height(m)]
      0.00 [BLDEW is bldg E-W length(m)]
      0.00 [BLDNS is bldg N-S length(m)]
      0.00 [XSHFT is stck E-W offset(m)]
      0.00 [YSHFT is stck N-S offset(m)]
      9.00 [SH is stack height      (m)]
    293.00 [TS is stack temperature (K)]
      1.00 [VS is stack velocity(m/sec)]
      0.10 [SD is stack diameter    (m)]
```

CAPTAPSA.SOI:

```
** LOCATION *SRC_ID* SRC_TYPE   EASTING NORTHING
SO LOCATION STACK_#1   POINT 0.00000000 0.00000000

** SRCPARAM *SRC_ID* 1GPS,SH(M),TS(K),VS(MPS),SD(M):
SO SRCPARAM STACK_#1 1.00000000 9.00000000 293.000000 1.00000000 0.100000001
```

CAPTAPSA.REI:

```
RE GRIDPOLR PG1 STA
RE GRIDPOLR PG1 ORIG STACK_#1
RE GRIDPOLR PG1 DIST    10    20    30    40    50
RE GRIDPOLR PG1 DIST    60    70    80    90   100
RE GRIDPOLR PG1 DIST   120   140   160   180   200
RE GRIDPOLR PG1 DIST   250   300   350   400   500
RE GRIDPOLR PG1 DIST   600   700   800   900  1000
RE GRIDPOLR PG1 DIST  1500  2500  5000  7500 10000
RE GRIDPOLR PG1 GDIR 36 10 10
RE GRIDPOLR PG1 END
```

CRITERIA AIR POLLUTANT & TOXIC AIR POLLUTANT SCREENING WITH AERMOD (CAPTAPSA)

CAPTAPSA.FIL:

FILENAME.EXT	ANNUAL	1-HOUR	3-HOUR	8-HOUR	24-HOUR	MONTHLY
CAPTAP86.PL2	51.1774902	1304.53674	787.170227	463.972351	274.078156	89.3323517

CAPTAPSA.BPO:

SO	BUILDHGT	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	BUILDHGT	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	BUILDHGT	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	BUILDHGT	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	BUILDHGT	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	BUILDHGT	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	BUILDWID	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	BUILDWID	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	BUILDWID	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	BUILDWID	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	BUILDWID	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	BUILDWID	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	BUILDLEN	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	BUILDLEN	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	BUILDLEN	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	BUILDLEN	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	BUILDLEN	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	BUILDLEN	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	XBADJ	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	XBADJ	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	XBADJ	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	XBADJ	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	XBADJ	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	XBADJ	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	YBADJ	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	YBADJ	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	YBADJ	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	YBADJ	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	YBADJ	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00
SO	YBADJ	STACK_#1	0.00	0.00	0.00	0.00	0.00	0.00

CRITERIA AIR POLLUTANT & TOXIC AIR POLLUTANT SCREENING WITH AERMOD (CAPTAPSA)

CAPTAPSA.BPI:

```
'TEST1 (SH=9M, BH=0M, LULC #2, 1986 only)  9.00 293.00   1.00   0.10 '
'ST'
'METERS' 1.00
'UTMN' 0.0000
1
'BLD_DATA' 1  0.0000
         4    0.0000
       0.0       0.0
       0.0       0.0
       0.0       0.0
       0.0       0.0
         1
'STACK_#1'   0.0   9.0   0.0   0.0
```

Figure 2.1 Test Case 2 – Screen #1.

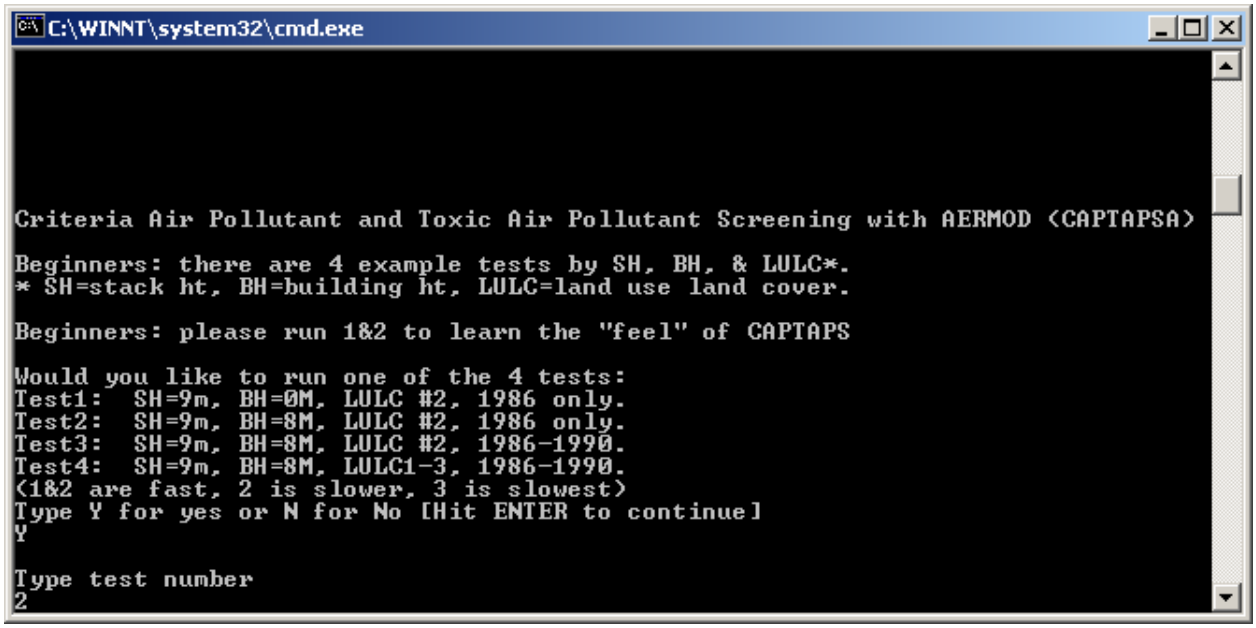


Figure 2.2 Test Case 2 – Screen #2.

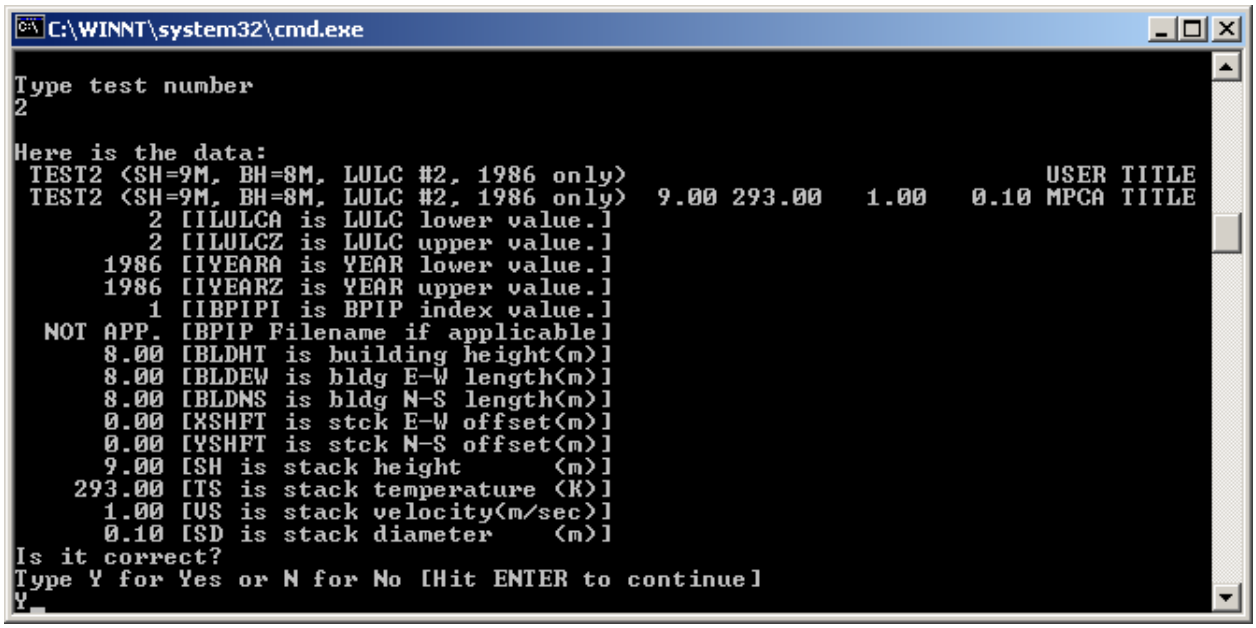


Figure 3.1 Test Case 3 – Screen #1.

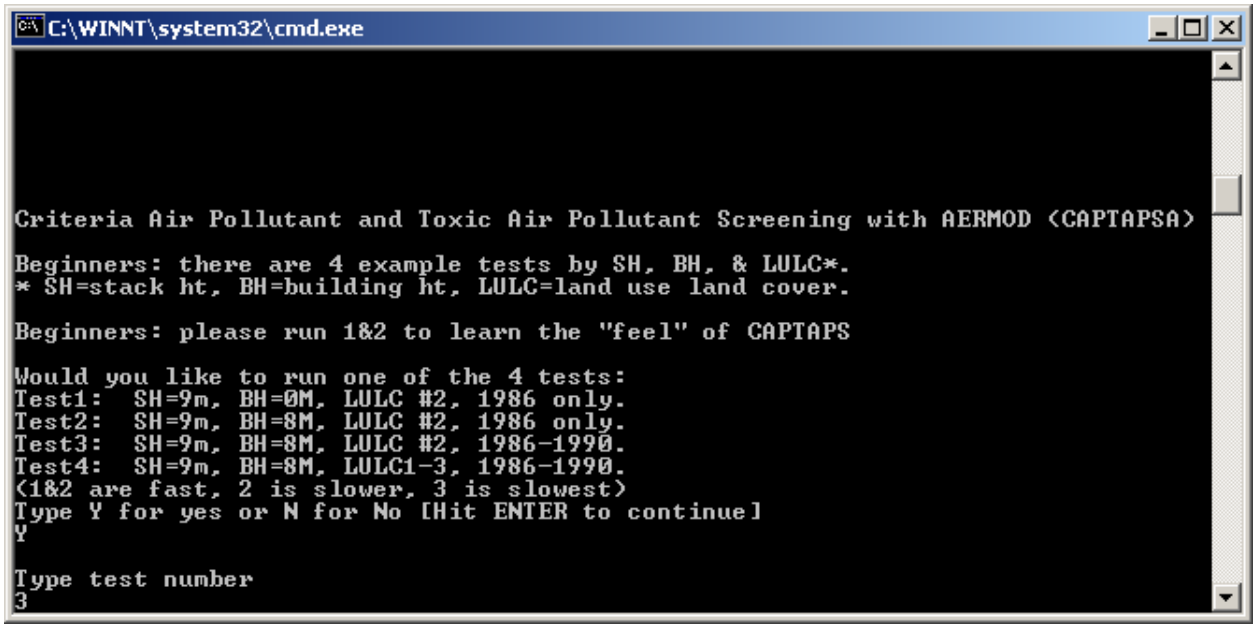


Figure 3.2 Test Case 3 – Screen #2.

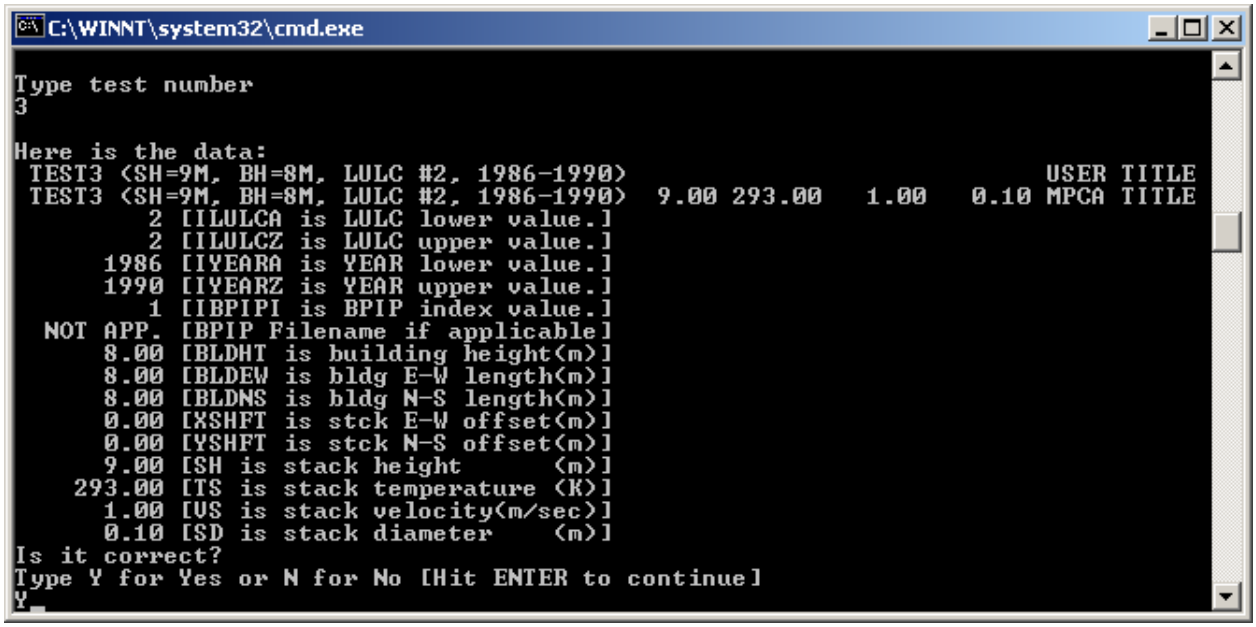


Figure 4.1 Test Case 4 – Screen #1.

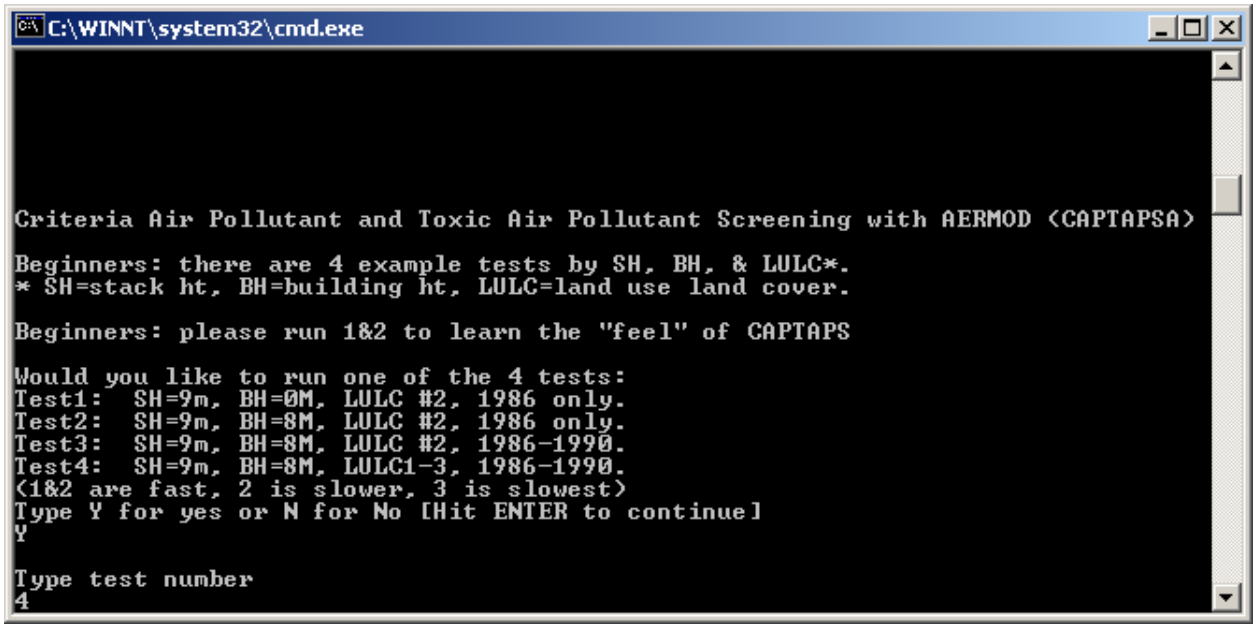
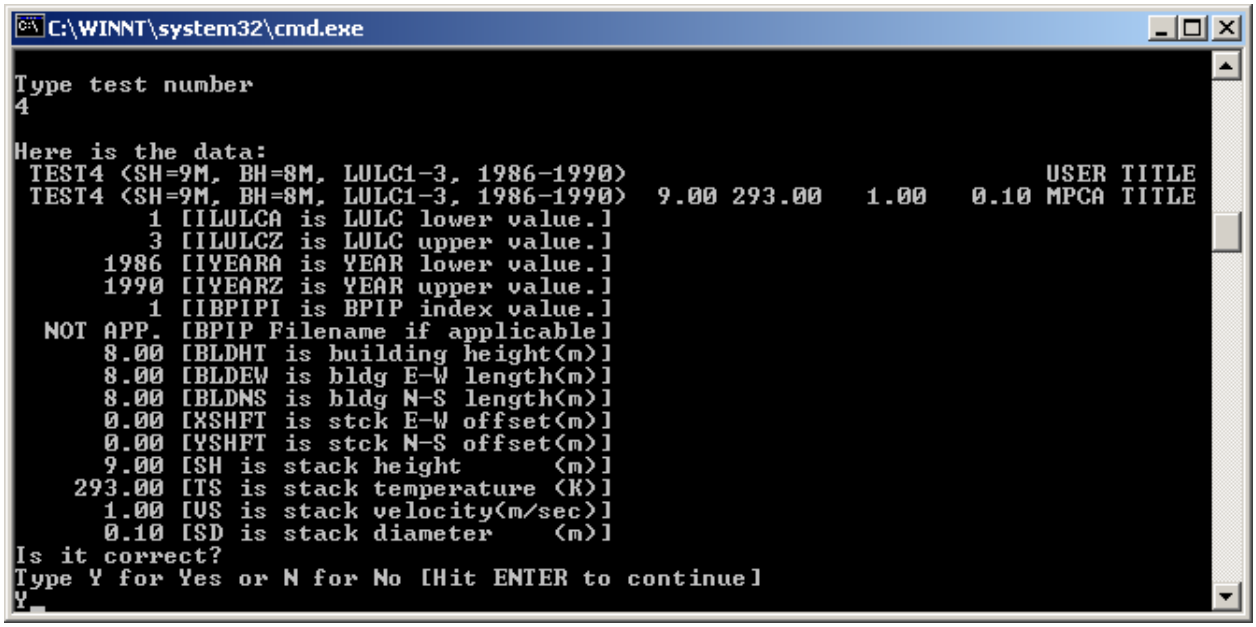


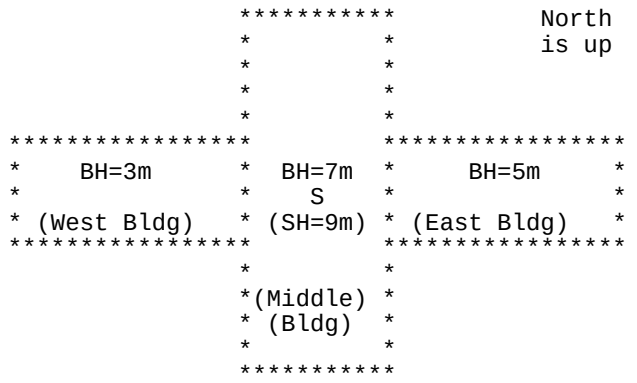
Figure 4.2 Test Case 4 – Screen #2.



Example with Different Stack/Building Options

This example considers a stack ("S") with a stack height of 9m, exit temperature of 450 Kelvin, exit velocity of 10 meters/second, and stack diameter of 0.5 meters. The surrounding land use land cover (LULC) within 3km of the stack is good mix of cultivated land and deciduous trees.

The stack ("S") is located in the center of several buildings (50m east-west by 30m north-south). The three building dimensions are 20m by 10m (west building), 10m by 30m (middle building), and 20m by 10m (east building) as shown below.



The stack is modeled with three different levels of stack/building detail (i.e., options 1, 2, and 3) to illustrate the different prompts for information (esp. stack/building) and subsequent results.

Option 1 assumes the building is 16m by 16m and 8m high (minimal representation).
Option 2 assumes the building is 50m by 30m and 7m high (moderate representation).
Option 3 assumes the building dimensions as shown above (advanced representation).

All use LULC option 2 and 5 years of meteorology.

Example with Stack/Building Option 1 (Minimal Effort for Minimal Representation)
This example uses a minimal representation for the stack/building geometry (i.e., square box shape with sides twice the assumed building height of 1m less than stack height: 16m by 16m, 7m high). The main advantage of this option vs. the look-up table is to define the stack height, exit temperature, exit velocity, and stack diameter. Another advantage is the ability to locate the stack at some location other than the center of the building configuration (not used in this example).

Figure 5.1 shows the user typed "N" for no (first prompt) and a stack height of 9.00 meters, exit temperature of 450 Kelvin, exit velocity of 10 meters/second, and a stack diameter of 0.5 meters.

Figure 5.2 shows the reply to "Is building downwash possible?" was "Y" for yes.

Figure 5.3 shows the user selects building downwash option 1 (i.e., MPCA default values) with the stack located at the center of the building configuration, meteorology option 1 (1986 only), and LULC option 2 (50% cropland & 50% deciduous forest).

Figure 5.4 shows the data and the user response to “Is it correct” was “Y” for yes.

Figure 5.5 indicates the “CAPTAPS RUN COMPLETED SUCCESSFULLY!” It also lists the seven summary files.

Figure 5.6 shows portions of the summary report (SUMMARYR.TXT). It indicates respective annual and 1-hour dispersion factors of 208.60 and 817.42 ug/m3 per gram/second.

Figure 5.7 shows selected pages of the annual summary figures (SUMMARYA.TXT). LVL1 includes and LVL2 excludes building receptor locations.

Note: representation of the buildings (i.e., 16m by 16m vs. “plus sign” shape).

Example with Stack/Building Option 2 (Moderate Effort for Moderate Representation)
This example uses a moderate representation (rectangular box: 50m by 30m; 7m high) for the stack/building geometry. The more flexible shape of the buildings/structures is its main advantage over option 1. This option also lets the user locate the stack at some location other than the center of the building complex (not used in this example).

Figures 6.1 through 6.7 resemble figures 5.1 through 5.6.

Figure 6.8 shows selected pages of the annual summary figures (SUMMARYA.TXT). LVL1 includes and LVL2 excludes building receptor locations.

Note: building shape (i.e., 50m by 30m rectangle vs. “plus sign” shape).

Example with Stack/Building Option 3 (Advanced Effort for Best Representation)
This example uses an advanced representation (pre-existing BPIP file) for the stack/building geometry. This option allows complex stack/building configurations via a pre-existing BPIP file.

Figures 7.1 through 7.7 resemble figures 5.1 through 5.6.

Figure 7.8 shows selected pages of the annual summary figures (SUMMARYA.TXT). LVL1 includes and LVL2 excludes building receptor locations.

Note: true representation of the buildings (i.e., “plus sign” shape).

Table 3 compares dispersion factors based on the 1996 MPCA memo, CAPTAPS look-up table, and three CAPTAPS stack/building examples above (a.k.a. BPIP1, BPIP2, and BPIP3).

Table 3. Compare Dispersion Factors (ug/m3 per gram/second)

Method and Related Assumptions	Annual	1-Hour	3-Hour	24-Hour
MPCA memo dated January 10, 1996*.	234	19,584	-	2,319
CAPTAPS – Look-Up Table	944	10,451	7,246	3,957
[Stack location from square box center]				
CAPTAPS – Batch BPIP1 (LVL1) [00m E, 00m N]	221	845	789	688
CAPTAPS – Batch BPIP1 (LVL2) [00m E, 00m N]	221	845	789	688
[Stack location from rectangular box center]				
CAPTAPS – Batch BPIP2 (LVL1) [00m E, 00m N]	325	1,126	1,027	833
CAPTAPS – Batch BPIP2 (LVL2) [00m E, 00m N]	223	1,126	1,027	833
CAPTAPS – Batch BPIP3 (LVL1) [exact geometry]	272	1,307	1,181	891
CAPTAPS – Batch BPIP3 (LVL2) [exact geometry]	243	1,307	1,181	891

* ISCST3 non-GEP stack results per MPCA memo from Gregory C. Pratt to Cliff Twaroski "Screening Emission Rates for Air Toxics" dated January 10, 1996.

Figure 5.1 Example with Stack/Building Option 1 – Screen 1.

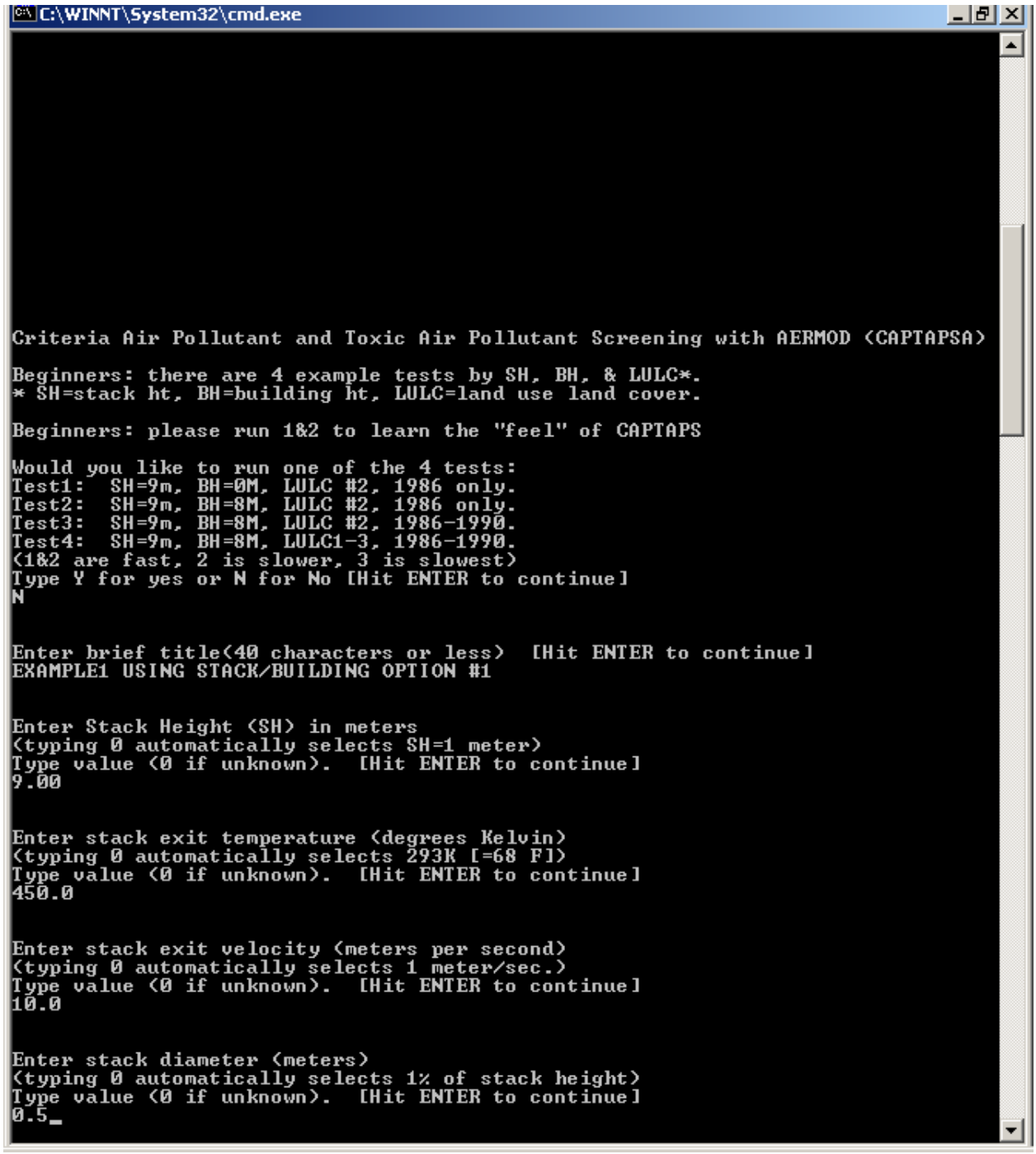


Figure 5.2 Example with Stack/Building Option 1 – Screen 2.

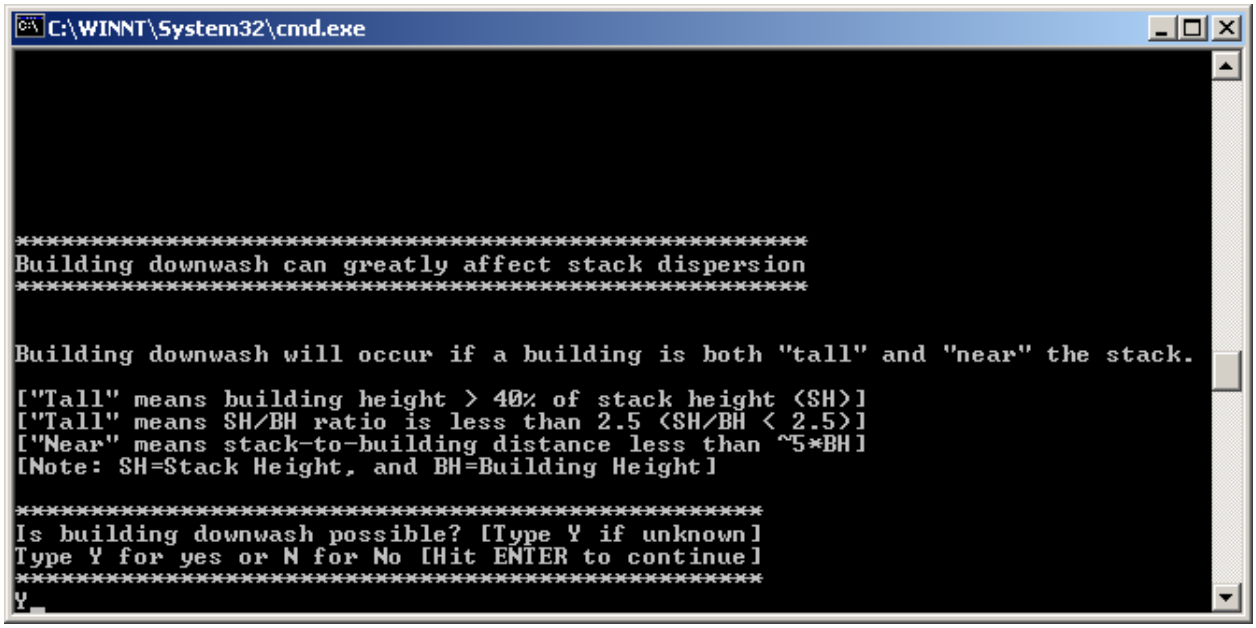


Figure 5.3 Example with Stack/Building Option 1 – Screen 3.

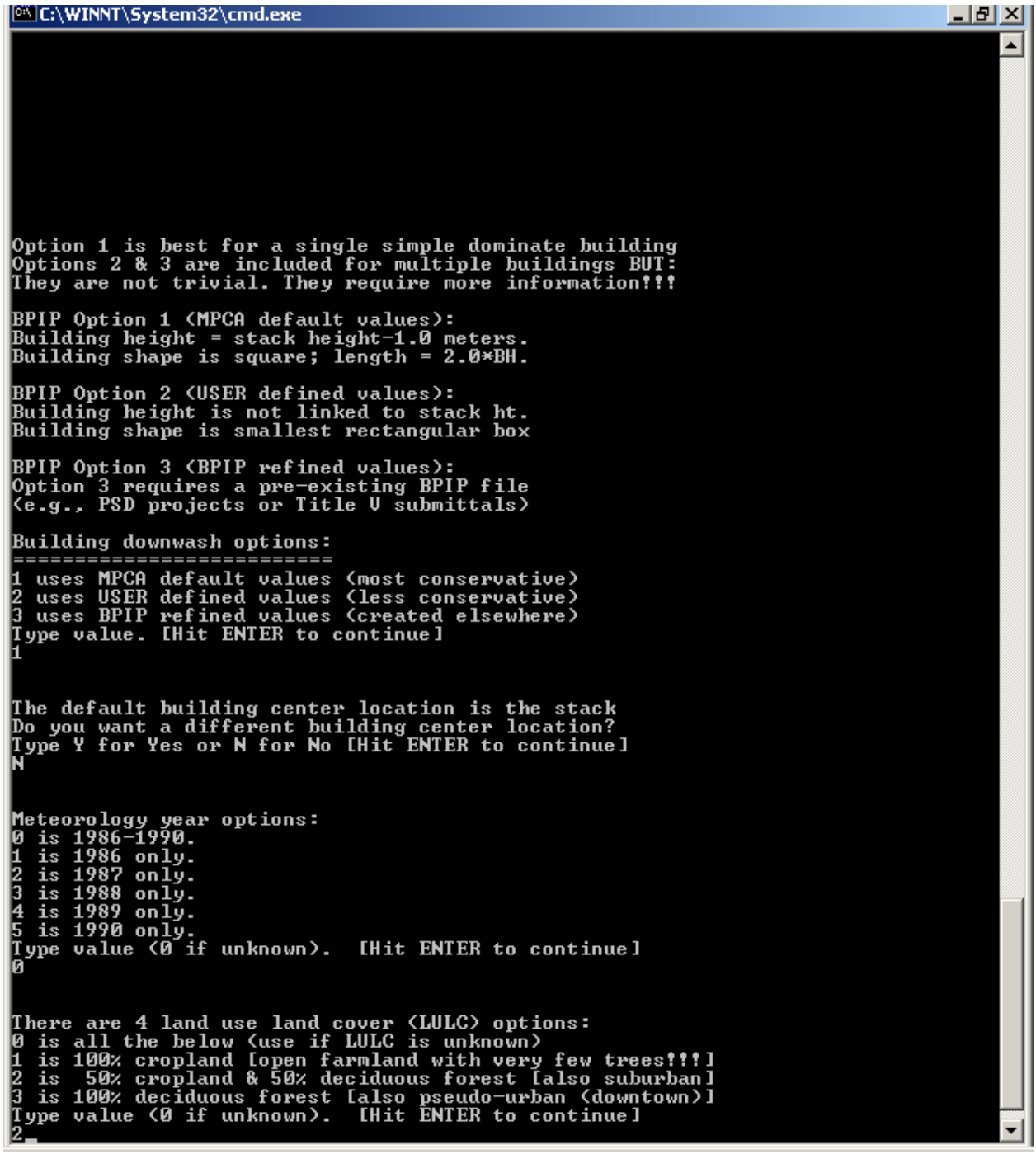


Figure 5.4 Example with Stack/Building Option 1 – Screen 4.

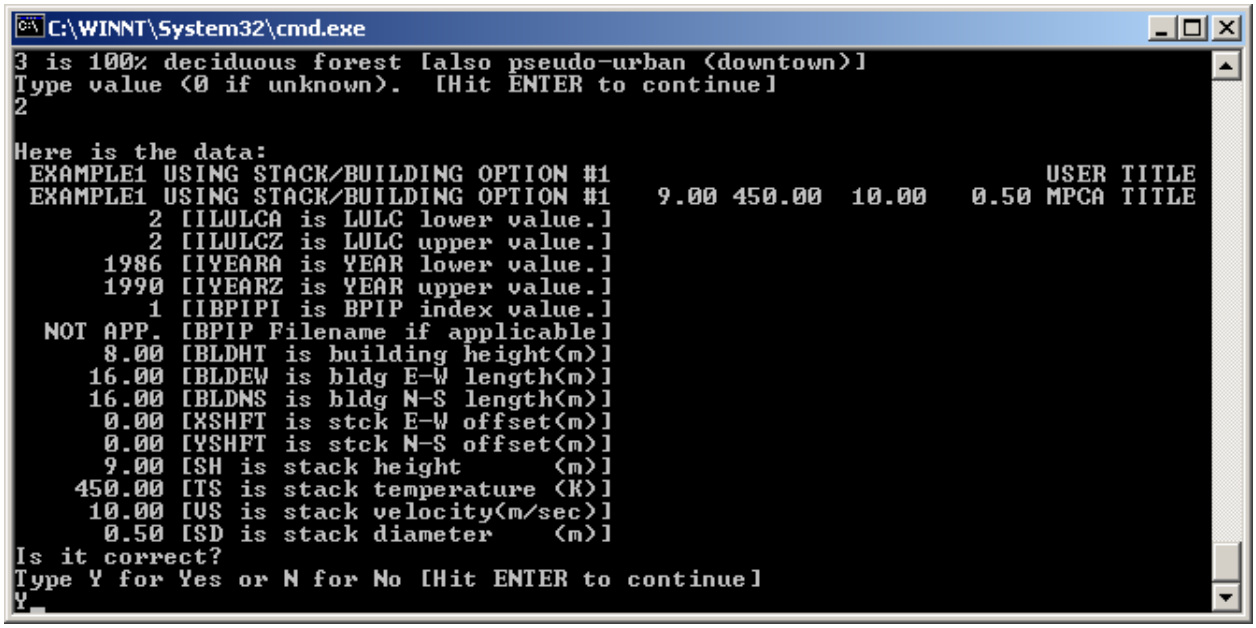


Figure 5.5 Example with Stack/Building Option 1 – Screen 5.

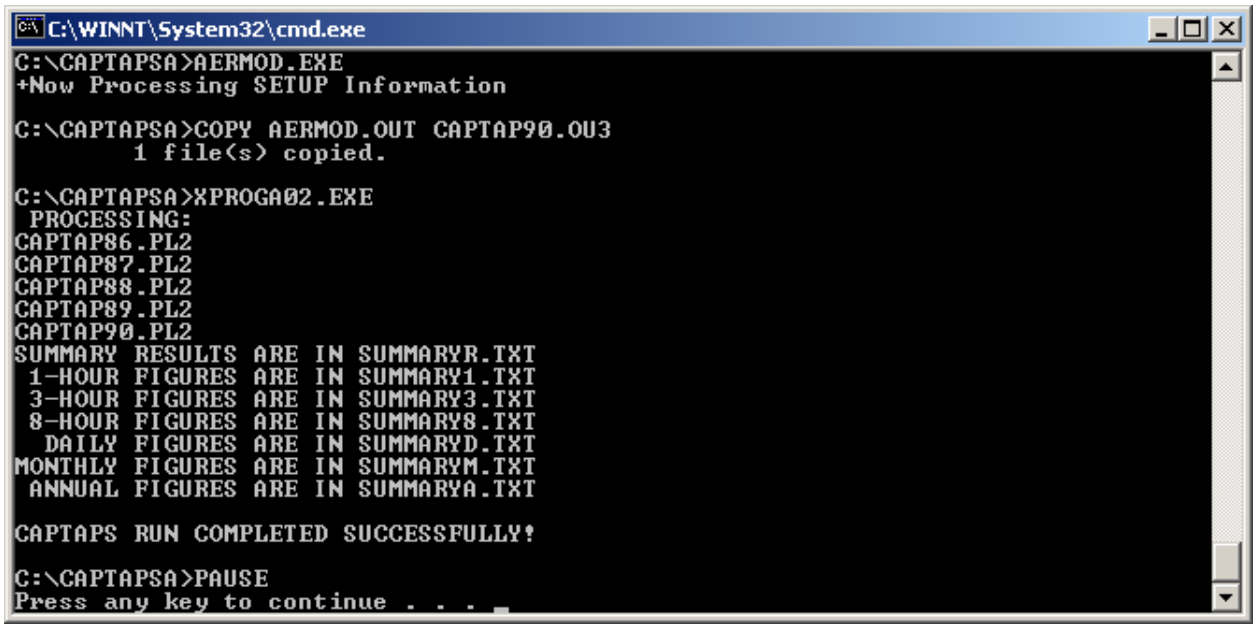


Figure 5.6 Example with Stack/Building Option 1 – Summary Report

```
MPCA CAPTAPSA SUMMARY REPORT                    05/28/2003 11:48:04  PAGE   1

CRITERIA AIR POLLUTANT & TOXIC AIR POLLUTANT SCREENING WITH AERMOD (CAPTAPSA)

LVL1 DISPERSION FACTORS (UG/M3 PER G/S) BY AVERAGING TIME & DISTANCE (METERS)

*** LVL1 includes & LVL2 excludes building receptor locations (if present)***
```

DISTANCE FROM STK	ANNUAL AVERAGE	01-HOUR AVERAGE	03-HOUR AVERAGE	08-HOUR AVERAGE	24-HOUR AVERAGE	MONTHLY AVERAGE
NOT APP.	221.26	844.73	789.38	761.85	687.87	327.76
10	221.26	844.73	789.38	761.85	687.87	327.76
20	126.61	843.79	785.32	753.90	638.22	229.66
30	83.38	540.63	521.02	491.96	457.03	142.46
40	51.74	398.88	381.27	356.97	311.39	90.89
50	44.42	371.52	354.77	328.55	283.58	79.91
60	38.31	339.35	323.55	296.68	252.86	70.07
70	33.42	317.65	293.01	267.56	225.54	61.42
80	29.06	331.34	270.51	247.82	194.49	54.06
90	25.82	350.80	279.97	235.20	175.89	48.19
100	23.51	363.32	285.04	240.05	162.15	43.92
120	19.66	373.39	286.69	244.05	138.52	37.26
140	16.83	352.57	286.51	239.90	119.29	32.04
160	14.47	332.25	271.03	224.49	104.90	27.58
180	12.53	314.13	258.15	206.42	92.15	23.83
200	10.77	294.10	237.34	186.03	80.91	20.51
250	7.48	241.36	188.87	138.69	59.15	14.54
300	5.39	191.91	146.95	97.74	44.01	10.53
350	3.92	148.98	108.46	63.91	33.62	7.74
400	2.97	111.94	77.07	46.42	25.70	5.97
500	1.88	55.29	38.75	29.20	16.18	3.87
600	1.35	34.68	31.57	23.53	11.98	2.83
700	1.06	31.61	28.55	21.00	9.81	2.21
800	0.87	29.50	27.38	19.24	8.47	1.80
900	0.73	27.41	25.90	17.62	7.52	1.51
1000	0.62	26.20	24.32	16.15	6.67	1.28
1500	0.35	21.88	17.43	10.86	4.19	0.69
2500	0.19	17.19	10.82	7.63	2.97	0.42
5000	0.08	12.67	8.09	5.01	1.60	0.21
7500	0.04	10.27	5.70	3.37	1.26	0.13
10000	0.03	8.33	4.22	2.40	0.96	0.09

```
**** MODEL ****** ************** USER TITLE **************
* AERMOD (02222): EXAMPLE1 USING STACK/BUILDING OPTION #1

***** STACK PARAMETERS *****
 SH_(M) TS_(K) VS_MPS SD_(M)
   9.00 450.00  10.00   0.50
```

CRITERIA AIR POLLUTANT & TOXIC AIR POLLUTANT SCREENING WITH AERMOD (CAPTAPSA)

LVL2 DISPERSION FACTORS (UG/M3 PER G/S) BY AVERAGING TIME & DISTANCE (METERS)

*** LVL1 includes & LVL2 excludes building receptor locations (if present)***

DISTANCE FROM STK	ANNUAL AVERAGE	01-HOUR AVERAGE	03-HOUR AVERAGE	08-HOUR AVERAGE	24-HOUR AVERAGE	MONTHLY AVERAGE
NOT APP.	221.26	844.73	789.38	761.85	687.87	327.76
10	221.26	844.73	789.38	761.85	687.87	327.76
20	126.61	843.79	785.32	753.90	638.22	229.66
30	83.38	540.63	521.02	491.96	457.03	142.46
40	51.74	398.88	381.27	356.97	311.39	90.89
50	44.42	371.52	354.77	328.55	283.58	79.91
60	38.31	339.35	323.55	296.68	252.86	70.07
70	33.42	317.65	293.01	267.56	225.54	61.42
80	29.06	331.34	270.51	247.82	194.49	54.06
90	25.82	350.80	279.97	235.20	175.89	48.19
100	23.51	363.32	285.04	240.05	162.15	43.92
120	19.66	373.39	286.69	244.05	138.52	37.26
140	16.83	352.57	286.51	239.90	119.29	32.04
160	14.47	332.25	271.03	224.49	104.90	27.58
180	12.53	314.13	258.15	206.42	92.15	23.83
200	10.77	294.10	237.34	186.03	80.91	20.51
250	7.48	241.36	188.87	138.69	59.15	14.54
300	5.39	191.91	146.95	97.74	44.01	10.53
350	3.92	148.98	108.46	63.91	33.62	7.74
400	2.97	111.94	77.07	46.42	25.70	5.97
500	1.88	55.29	38.75	29.20	16.18	3.87
600	1.35	34.68	31.57	23.53	11.98	2.83
700	1.06	31.61	28.55	21.00	9.81	2.21
800	0.87	29.50	27.38	19.24	8.47	1.80
900	0.73	27.41	25.90	17.62	7.52	1.51
1000	0.62	26.20	24.32	16.15	6.67	1.28
1500	0.35	21.88	17.43	10.86	4.19	0.69
2500	0.19	17.19	10.82	7.63	2.97	0.42
5000	0.08	12.67	8.09	5.01	1.60	0.21
7500	0.04	10.27	5.70	3.37	1.26	0.13
10000	0.03	8.33	4.22	2.40	0.96	0.09

**** MODEL ****** ********** USER TITLE **********
* AERMOD (02222): EXAMPLE1 USING STACK/BUILDING OPTION #1

***** STACK PARAMETERS *****

SH_(M)	TS_(K)	VS_MPS	SD_(M)
9.00	450.00	10.00	0.50

CRITERIA AIR POLLUTANT & TOXIC AIR POLLUTANT SCREENING WITH AERMOD (CAPTAPSA)

CAPTAPSA.DAT:

```
 EXAMPLE1 USING STACK/BUILDING OPTION #1                              USER TITLE
 EXAMPLE1 USING STACK/BUILDING OPTION #1   9.00 450.00  10.00   0.50 MPCA TITLE
        2 [ILULCA is LULC lower value.]
        2 [ILULCZ is LULC upper value.]
     1986 [IYEARA is YEAR lower value.]
     1990 [IYEARZ is YEAR upper value.]
        1 [IBPIPI is BPIP index value.]
  NOT APP. [BPIP Filename if applicable]
     8.00 [BLDHT is building height(m)]
    16.00 [BLDEW is bldg E-W length(m)]
    16.00 [BLDNS is bldg N-S length(m)]
     0.00 [XSHFT is stck E-W offset(m)]
     0.00 [YSHFT is stck N-S offset(m)]
     9.00 [SH is stack height      (m)]
   450.00 [TS is stack temperature (K)]
    10.00 [VS is stack velocity(m/sec)]
     0.50 [SD is stack diameter    (m)]
```

CAPTAPSA.SOI:

```
** LOCATION *SRC_ID* SRC_TYPE   EASTING NORTHING
SO LOCATION STACK_#1   POINT 0.00000000 0.00000000

** SRCPARAM *SRC_ID* 1GPS,SH(M),TS(K),VS(MPS),SD(M):
SO SRCPARAM STACK_#1 1.00000000 9.00000000 450.000000 10.0000000 0.500000000
```

CAPTAPSA.REI:

```
RE GRIDPOLR PG1 STA
RE GRIDPOLR PG1 ORIG STACK_#1
RE GRIDPOLR PG1 DIST    10    20    30    40    50
RE GRIDPOLR PG1 DIST    60    70    80    90   100
RE GRIDPOLR PG1 DIST   120   140   160   180   200
RE GRIDPOLR PG1 DIST   250   300   350   400   500
RE GRIDPOLR PG1 DIST   600   700   800   900  1000
RE GRIDPOLR PG1 DIST  1500  2500  5000  7500 10000
RE GRIDPOLR PG1 GDIR 36 10 10
RE GRIDPOLR PG1 END
```

CRITERIA AIR POLLUTANT & TOXIC AIR POLLUTANT SCREENING WITH AERMOD (CAPTAPSA)

CAPTAPSA.FIL:

```
FILENAME.EXT     ANNUAL     1-HOUR     3-HOUR     8-HOUR    24-HOUR    MONTHLY
CAPTAP86.PL2 208.595490 817.416870 774.848633 730.892334 678.684570 278.975159
CAPTAP87.PL2 208.094437 844.734924 769.807434 746.571716 687.872803 327.755676
CAPTAP88.PL2 221.258759 806.739624 774.827881 758.617920 682.330078 307.180511
CAPTAP89.PL2 209.929031 839.709778 789.378357 761.847839 668.020508 314.226166
CAPTAP90.PL2 221.032822 838.524719 766.241516 739.127502 671.450439 283.950592
```

CAPTAPSA.BPO:

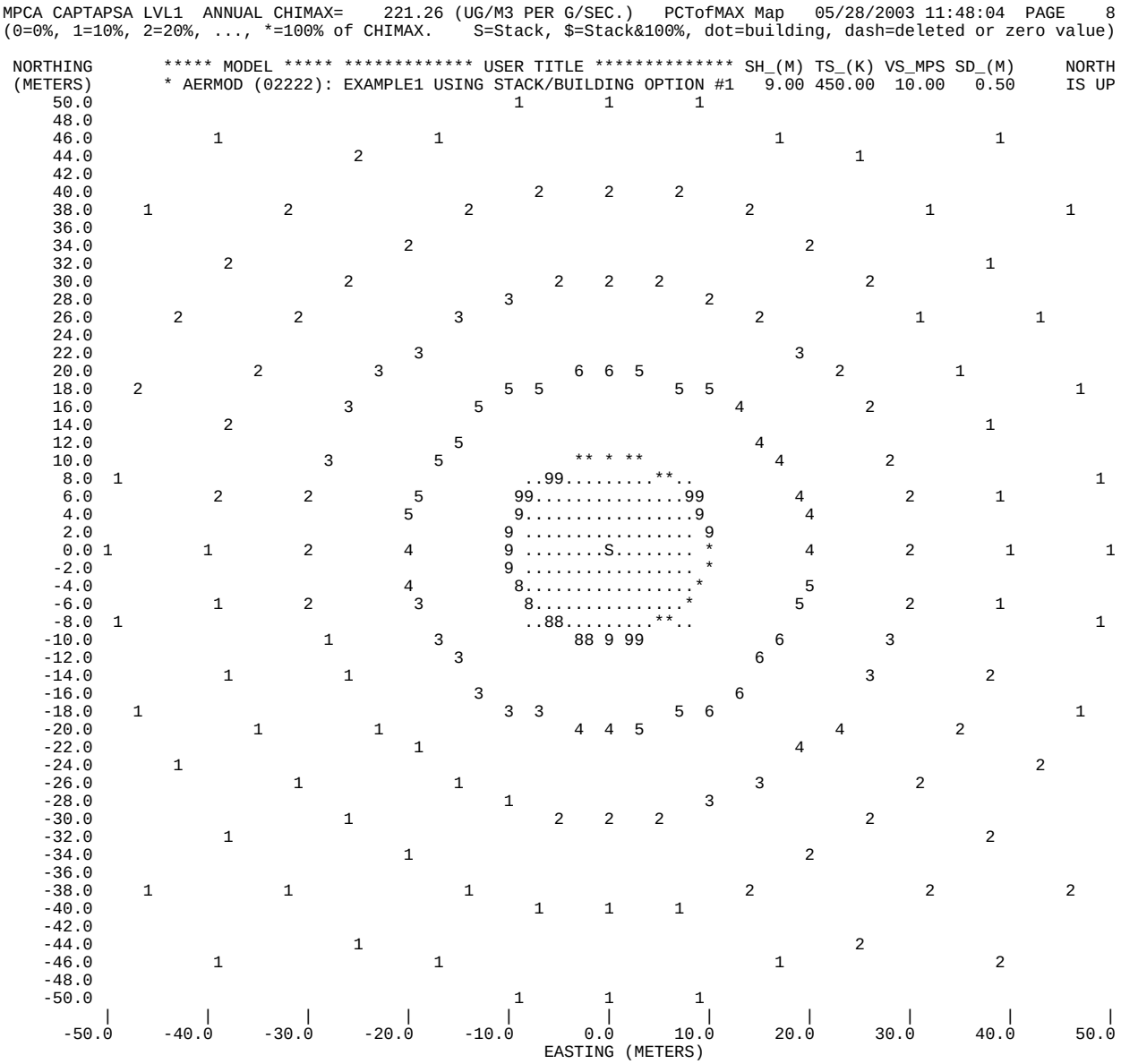
```
SO BUILDHGT STACK_#1    8.00    8.00    8.00    8.00    8.00    8.00
SO BUILDHGT STACK_#1    8.00    8.00    8.00    8.00    8.00    8.00
SO BUILDHGT STACK_#1    8.00    8.00    8.00    8.00    8.00    8.00
SO BUILDHGT STACK_#1    8.00    8.00    8.00    8.00    8.00    8.00
SO BUILDHGT STACK_#1    8.00    8.00    8.00    8.00    8.00    8.00
SO BUILDHGT STACK_#1    8.00    8.00    8.00    8.00    8.00    8.00
SO BUILDWID STACK_#1   18.54   20.51   21.86   22.54   22.54   21.86
SO BUILDWID STACK_#1   20.51   18.54   16.00   18.54   20.51   21.86
SO BUILDWID STACK_#1   22.54   22.54   21.86   20.51   18.54   16.00
SO BUILDWID STACK_#1   18.54   20.51   21.86   22.54   22.54   21.86
SO BUILDWID STACK_#1   20.51   18.54   16.00   18.54   20.51   21.86
SO BUILDWID STACK_#1   22.54   22.54   21.86   20.51   18.54   16.00
SO BUILDLEN STACK_#1   18.54   20.51   21.86   22.54   22.54   21.86
SO BUILDLEN STACK_#1   20.51   18.54   16.00   18.54   20.51   21.86
SO BUILDLEN STACK_#1   22.54   22.54   21.86   20.51   18.54   16.00
SO BUILDLEN STACK_#1   18.54   20.51   21.86   22.54   22.54   21.86
SO BUILDLEN STACK_#1   20.51   18.54   16.00   18.54   20.51   21.86
SO BUILDLEN STACK_#1   22.54   22.54   21.86   20.51   18.54   16.00
SO XBADJ    STACK_#1   -9.27  -10.25  -10.93  -11.27  -11.27  -10.93
SO XBADJ    STACK_#1  -10.25   -9.27   -8.00   -9.27  -10.25  -10.93
SO XBADJ    STACK_#1  -11.27  -11.27  -10.93  -10.25   -9.27   -8.00
SO XBADJ    STACK_#1   -9.27  -10.25  -10.93  -11.27  -11.27  -10.93
SO XBADJ    STACK_#1  -10.25   -9.27   -8.00   -9.27  -10.25  -10.93
SO XBADJ    STACK_#1  -11.27  -11.27  -10.93  -10.25   -9.27   -8.00
SO YBADJ    STACK_#1    0.00    0.00    0.00    0.00    0.00    0.00
SO YBADJ    STACK_#1    0.00    0.00    0.00    0.00    0.00    0.00
SO YBADJ    STACK_#1    0.00    0.00    0.00    0.00    0.00    0.00
SO YBADJ    STACK_#1    0.00    0.00    0.00    0.00    0.00    0.00
SO YBADJ    STACK_#1    0.00    0.00    0.00    0.00    0.00    0.00
SO YBADJ    STACK_#1    0.00    0.00    0.00    0.00    0.00    0.00
```

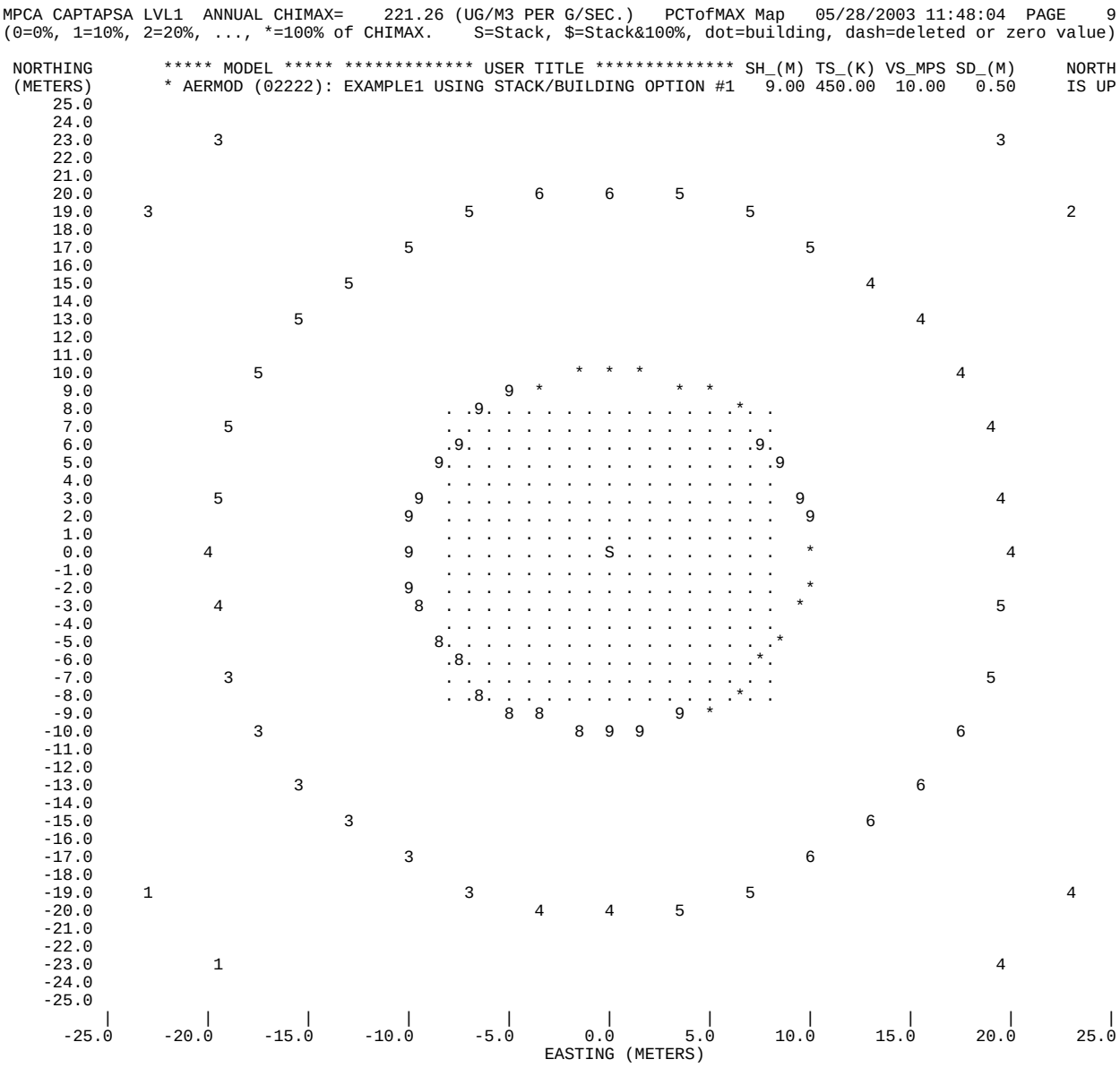
CRITERIA AIR POLLUTANT & TOXIC AIR POLLUTANT SCREENING WITH AERMOD (CAPTAPSA)

CAPTAPSA.BPI:

```
'EXAMPLE1 USING STACK/BUILDING OPTION #1   9.00 450.00  10.00   0.50 '
'ST'
'METERS' 1.00
'UTMN' 0.0000
1
'BLD_DATA' 1  0.0000
         4    8.0000
      -8.0      -8.0
      -8.0       8.0
       8.0       8.0
       8.0      -8.0
         1
'STACK_#1'   0.0   9.0   0.0   0.0
```

Figure 5.7 Example with Stack/Building Option 1 – Selected Pages of Annual Summary Figures




MPCA CAPTAPSA LVL1 ANNUAL CHIMAX= 221.26 (UG/M3 PER G/SEC.) PCTofMAX Map 05/28/2003 11:48:04 PAGE 9
(0=0%, 1=10%, 2=20%, ..., *=100% of CHIMAX. S=Stack, $=Stack&100%, dot=building, dash=deleted or zero value)
NORTHING (METERS)
***** MODEL ***** ********** USER TITLE ********** SH_(M) TS_(K) VS_MPS SD_(M)
* AERMOD (02222): EXAMPLE1 USING STACK/BUILDING OPTION #1 9.00 450.00 10.00 0.50
NORTH IS UP
EASTING (METERS)

```
MPCA CAPTAPSA LVL2  ANNUAL CHIMAX=    221.26 (UG/M3 PER G/SEC.)   PCTofMAX Map   05/28/2003 11:48:04  PAGE   17
(0=0%, 1=10%, 2=20%, ..., *=100% of CHIMAX.    S=Stack, $=Stack&100%, dot=building, dash=deleted or zero value)

 NORTHING       ***** MODEL ***** ************* USER TITLE ************** SH_(M) TS_(K) VS_MPS SD_(M)     NORTH
 (METERS)       * AERMOD (02222): EXAMPLE1 USING STACK/BUILDING OPTION #1   9.00 450.00  10.00   0.50     IS UP
    50.0                                    1       1       1
    48.0
    46.0          1                   1                                 1                   1
    44.0                      2                                                   1
    42.0
    40.0                                        2     2     2
    38.0     1            2               2                         2               1            1
    36.0
    34.0                           2                                        2
    32.0           2                                                                    1
    30.0                       2                 2    2    2                   2
    28.0                                  3                   2
    26.0        2          2             3                         2             1          1
    24.0
    22.0                           3                                   3
    20.0              2          3                 6  6  5                 2          1
    18.0    2                               5  5               5  5                          1
    16.0                       3           5                              4           2
    14.0            2                                                                   1
    12.0                                  5                                 4
    10.0                       3          5            ** * **              4          2
     8.0  1                                            ..-9.........*-..                          1
     6.0           2        2          5              9-.................-9         4          2        1
     4.0                              5              9...................9          4
     2.0                                            9 ................... 9
     0.0 1         1         2         4              9 ........S........ *         4          2         1         1
    -2.0                                            9 ................... *
    -4.0                              4              8...................*          5
    -6.0           1        2          3               -.................-          5          2        1
    -8.0  1                                           ..-8.........*-..                          1
   -10.0                      1          3                 88 9 99             6          3
   -12.0                                 3                                 6
   -14.0            1          1                                                    3          2
   -16.0                                   3                                 6
   -18.0    1                                     3  3               5  6                          1
   -20.0              1          1                      4  4  5                 4          2
   -22.0                                 1                                       4
   -24.0       1                                                                                2
   -26.0                  1              1                                 3              2
   -28.0                                       1                                 3
   -30.0                      1                    2    2    2                   2
   -32.0           1                                                                    2
   -34.0                             1                                       2
   -36.0
   -38.0     1            1               1                                 2               2            2
   -40.0                                       1     1     1
   -42.0
   -44.0                      1                                                   2
   -46.0           1                   1                                 1                   2
   -48.0
   -50.0                                       1       1       1
        |         |         |         |         |         |         |         |         |         |         |
      -50.0     -40.0     -30.0     -20.0     -10.0       0.0      10.0      20.0      30.0      40.0      50.0
                                          EASTING (METERS)
```

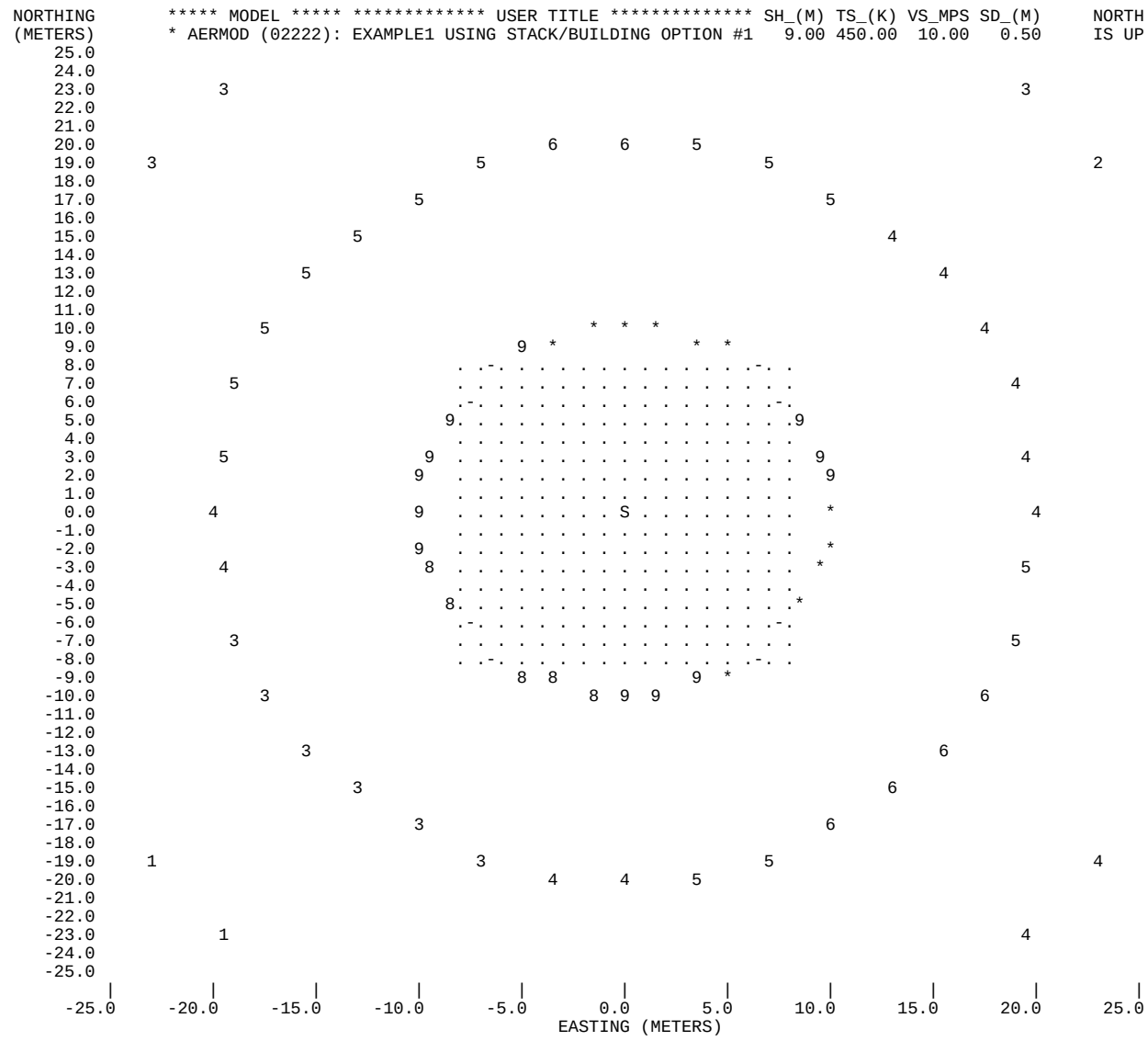

NORTHING (METERS)
***** MODEL ***** ************* USER TITLE ************** SH_(M) TS_(K) VS_MPS SD_(M)
* AERMOD (02222): EXAMPLE1 USING STACK/BUILDING OPTION #1 9.00 450.00 10.00 0.50
NORTH IS UP
EASTING (METERS)
-25.0 -20.0 -15.0 -10.0 -5.0 0.0 5.0 10.0 15.0 20.0 25.0

Figure 6.1 Example with Stack/Building Option 2 – Screen 1.

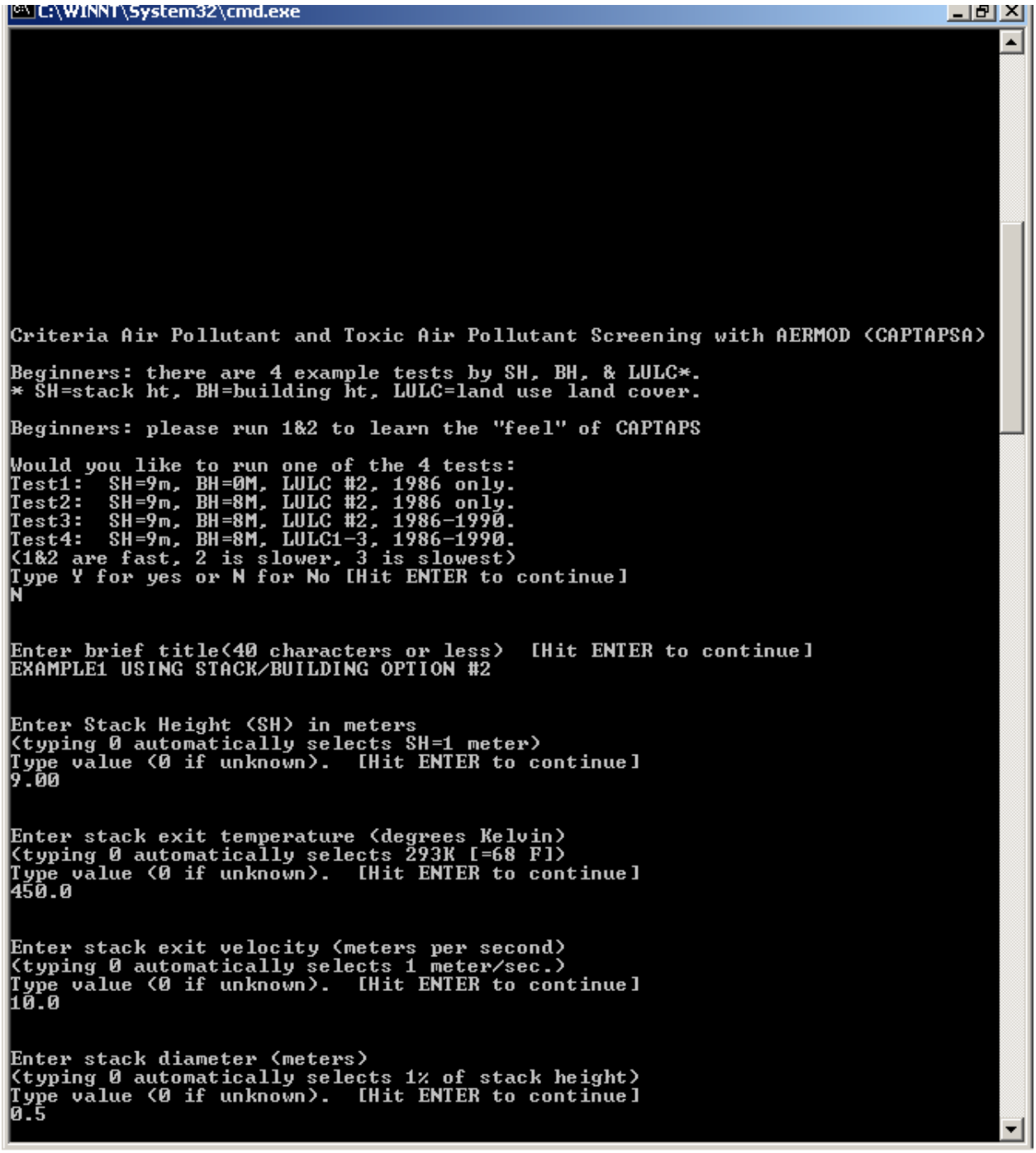


Figure 6.2 Example with Stack/Building Option 2 – Screen 2.

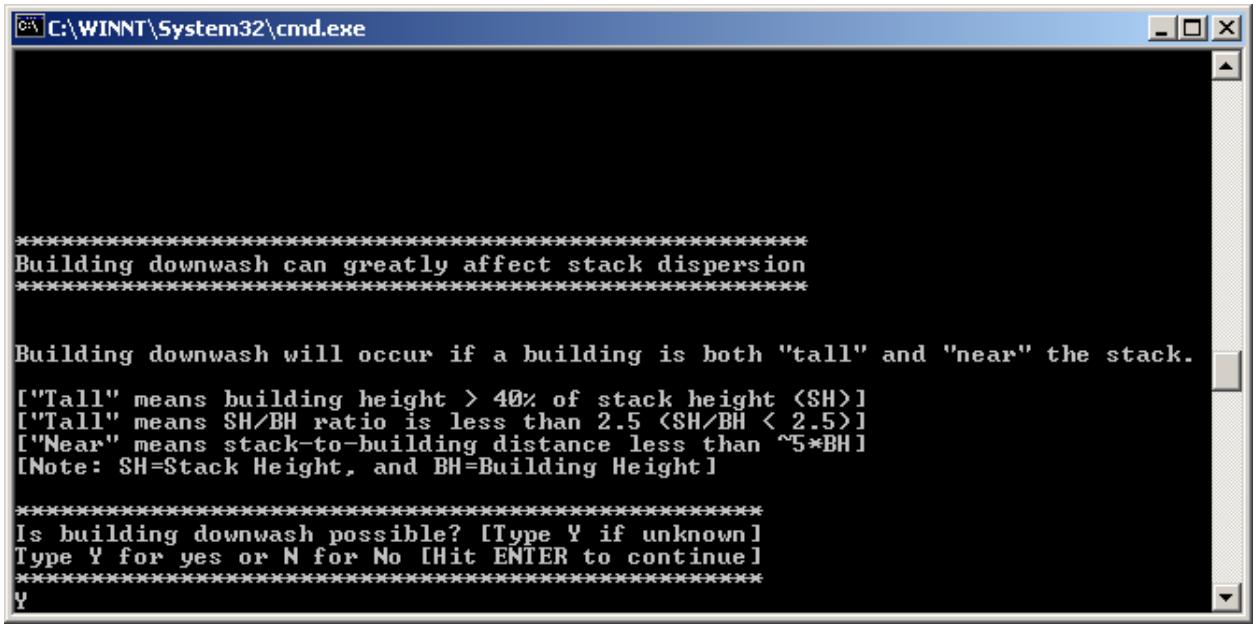


Figure 6.3 Example with Stack/Building Option 2 – Screen 3.

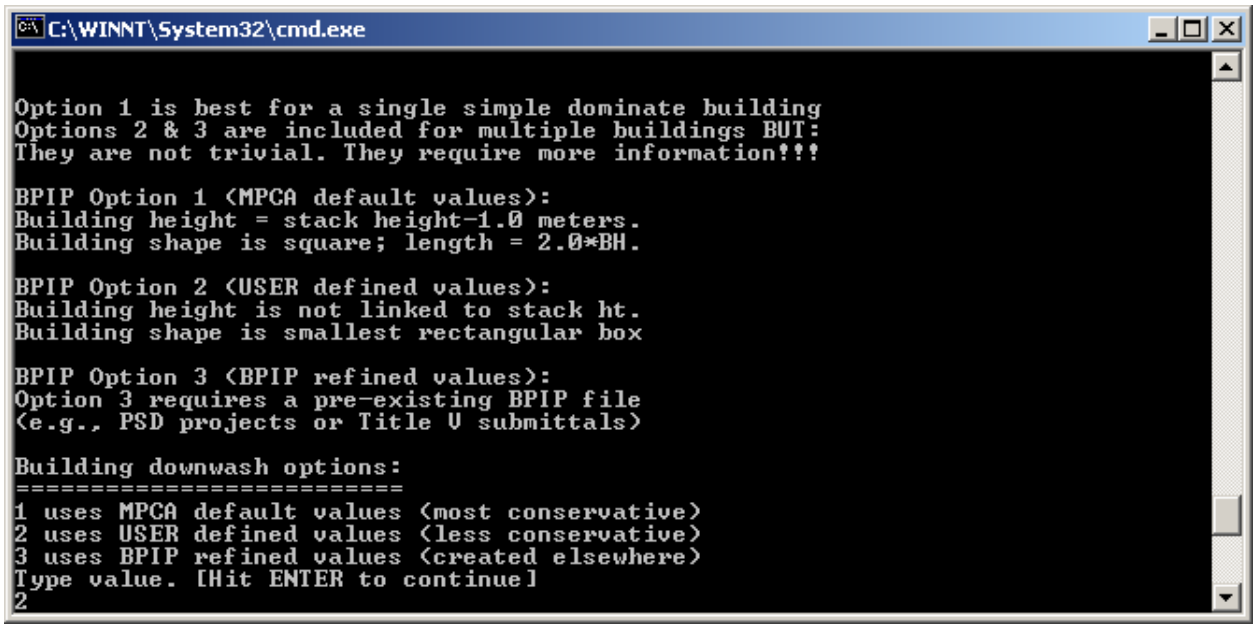


Figure 6.4 Example with Stack/Building Option 2 – Screen 4.

Figure 6.5 Example with Stack/Building Option 2 – Screen 5.

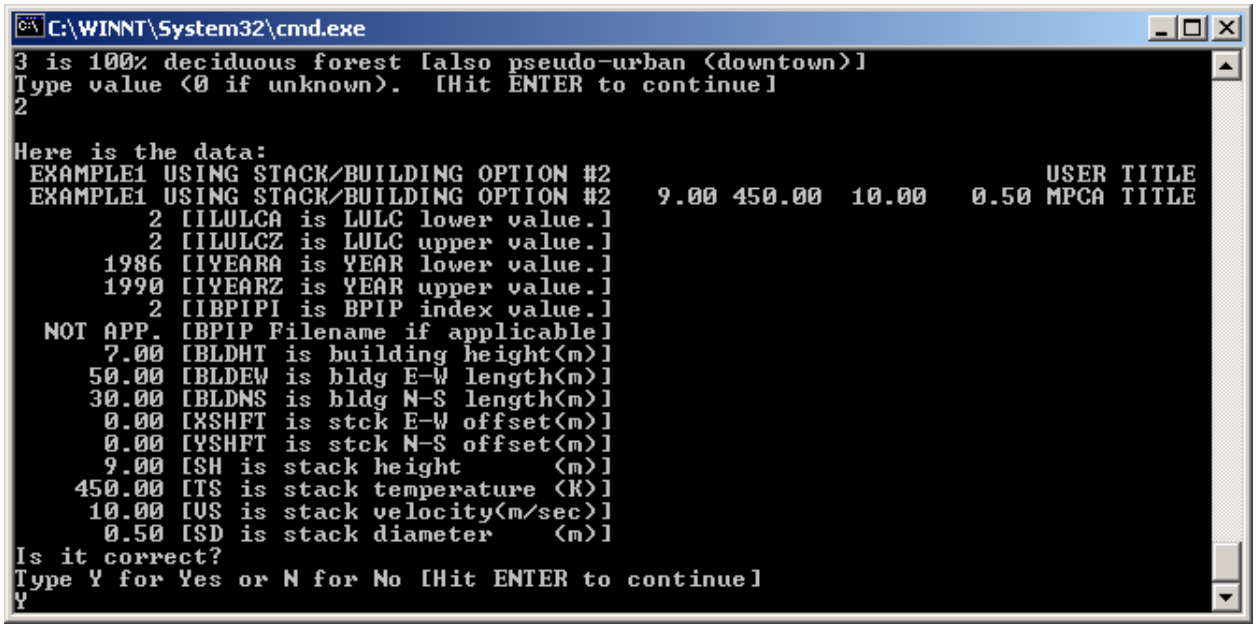


Figure 6.6 Example with Stack/Building Option 2 – Screen 6.

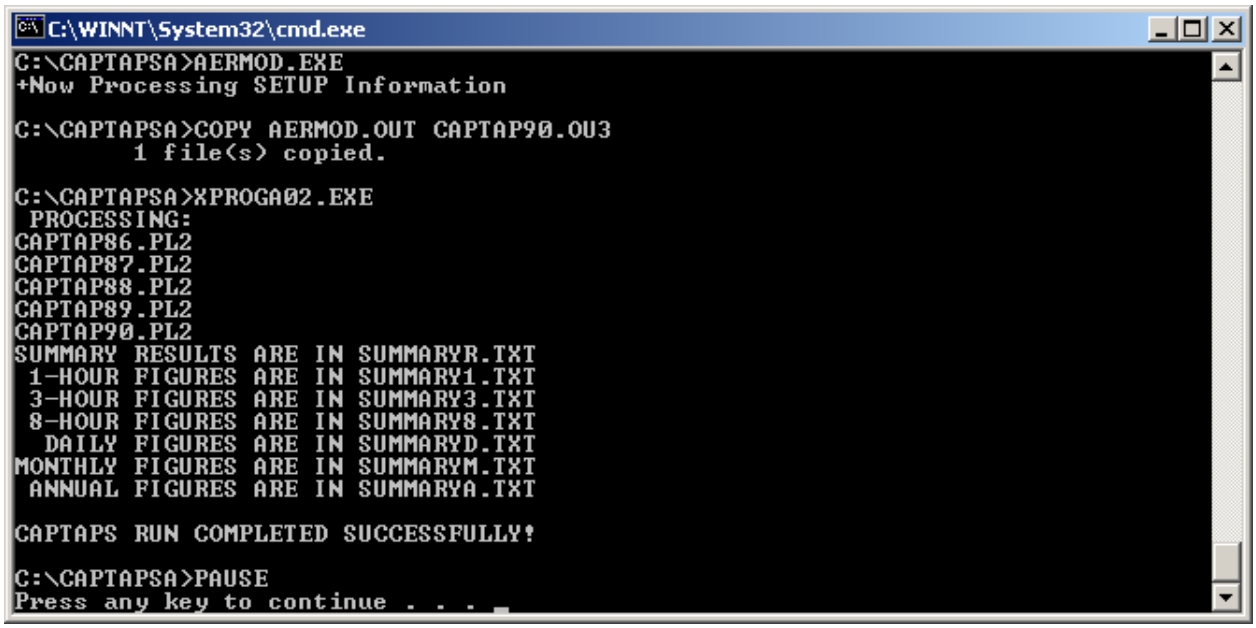


Figure 6.7 Example with Stack/Building Option 2 – Summary Report

```
MPCA CAPTAPSA SUMMARY REPORT                    05/28/2003 12:15:21  PAGE   1

CRITERIA AIR POLLUTANT & TOXIC AIR POLLUTANT SCREENING WITH AERMOD (CAPTAPSA)

LVL1 DISPERSION FACTORS (UG/M3 PER G/S) BY AVERAGING TIME & DISTANCE (METERS)

*** LVL1 includes & LVL2 excludes building receptor locations (if present)***
```

DISTANCE FROM STK	ANNUAL AVERAGE	01-HOUR AVERAGE	03-HOUR AVERAGE	08-HOUR AVERAGE	24-HOUR AVERAGE	MONTHLY AVERAGE
NOT APP.	325.44	1125.76	1026.76	959.33	832.73	421.04
10	325.44	861.79	799.22	763.77	703.33	421.04
20	223.00	1125.76	1026.76	959.33	832.73	367.39
30	151.74	1124.54	1024.91	947.05	806.80	281.88
40	123.62	1123.70	1022.32	915.95	751.96	223.62
50	110.73	861.45	825.54	726.30	626.83	182.02
60	42.63	343.62	318.36	289.95	232.97	72.08
70	36.39	337.24	304.32	277.74	201.23	60.31
80	31.52	336.95	297.47	266.77	180.63	53.26
90	27.91	339.82	295.80	258.00	164.94	47.37
100	25.20	340.14	294.67	249.88	151.87	42.77
120	20.85	335.85	286.98	233.32	131.06	35.71
140	17.59	333.68	275.21	217.27	114.87	30.44
160	14.94	329.62	261.68	202.22	102.38	26.24
180	12.96	319.31	249.49	188.33	91.98	22.85
200	11.32	308.01	243.59	176.63	83.87	20.02
250	8.24	274.96	220.54	150.79	67.14	14.71
300	6.14	240.33	194.03	128.05	54.63	11.17
350	4.67	217.60	171.09	107.49	44.76	8.55
400	3.64	196.28	149.48	88.26	36.27	6.67
500	2.30	161.56	109.51	59.76	25.01	4.27
600	1.57	132.11	76.35	43.89	17.97	3.02
700	1.17	104.42	56.57	34.19	13.18	2.26
800	0.92	79.39	42.49	25.73	10.50	1.81
900	0.75	57.88	31.18	18.69	8.66	1.51
1000	0.63	40.37	24.33	16.15	7.26	1.28
1500	0.35	21.88	17.43	10.86	4.19	0.69
2500	0.19	17.19	10.82	7.63	2.97	0.42
5000	0.08	12.67	8.09	5.01	1.60	0.21
7500	0.04	10.27	5.70	3.37	1.26	0.13
10000	0.03	8.33	4.22	2.40	0.96	0.09

```
**** MODEL ****** ************** USER TITLE **************
* AERMOD (02222): EXAMPLE1 USING STACK/BUILDING OPTION #2

***** STACK PARAMETERS *****
 SH_(M) TS_(K) VS_MPS SD_(M)
   9.00 450.00  10.00   0.50
```

CRITERIA AIR POLLUTANT & TOXIC AIR POLLUTANT SCREENING WITH AERMOD (CAPTAPSA)

LVL2 DISPERSION FACTORS (UG/M3 PER G/S) BY AVERAGING TIME & DISTANCE (METERS)

*** LVL1 includes & LVL2 excludes building receptor locations (if present)***

DISTANCE FROM STK	ANNUAL AVERAGE	01-HOUR AVERAGE	03-HOUR AVERAGE	08-HOUR AVERAGE	24-HOUR AVERAGE	MONTHLY AVERAGE
NOT APP.	223.00	1125.76	1026.76	959.33	832.73	367.39
10	0.00	0.00	0.00	0.00	0.00	0.00
20	223.00	1125.76	1026.76	959.33	832.73	367.39
30	151.74	1124.54	1024.91	947.05	806.80	281.88
40	123.62	1123.70	1022.32	915.95	751.96	223.62
50	110.73	861.45	825.54	726.30	626.83	182.02
60	42.63	343.62	318.36	289.95	232.97	72.08
70	36.39	337.24	304.32	277.74	201.23	60.31
80	31.52	336.95	297.47	266.77	180.63	53.26
90	27.91	339.82	295.80	258.00	164.94	47.37
100	25.20	340.14	294.67	249.88	151.87	42.77
120	20.85	335.85	286.98	233.32	131.06	35.71
140	17.59	333.68	275.21	217.27	114.87	30.44
160	14.94	329.62	261.68	202.22	102.38	26.24
180	12.96	319.31	249.49	188.33	91.98	22.85
200	11.32	308.01	243.59	176.63	83.87	20.02
250	8.24	274.96	220.54	150.79	67.14	14.71
300	6.14	240.33	194.03	128.05	54.63	11.17
350	4.67	217.60	171.09	107.49	44.76	8.55
400	3.64	196.28	149.48	88.26	36.27	6.67
500	2.30	161.56	109.51	59.76	25.01	4.27
600	1.57	132.11	76.35	43.89	17.97	3.02
700	1.17	104.42	56.57	34.19	13.18	2.26
800	0.92	79.39	42.49	25.73	10.50	1.81
900	0.75	57.88	31.18	18.69	8.66	1.51
1000	0.63	40.37	24.33	16.15	7.26	1.28
1500	0.35	21.88	17.43	10.86	4.19	0.69
2500	0.19	17.19	10.82	7.63	2.97	0.42
5000	0.08	12.67	8.09	5.01	1.60	0.21
7500	0.04	10.27	5.70	3.37	1.26	0.13
10000	0.03	8.33	4.22	2.40	0.96	0.09

**** MODEL ****** ************** USER TITLE **************
* AERMOD (02222): EXAMPLE1 USING STACK/BUILDING OPTION #2

***** STACK PARAMETERS *****

SH_(M)	TS_(K)	VS_MPS	SD_(M)
9.00	450.00	10.00	0.50

CRITERIA AIR POLLUTANT & TOXIC AIR POLLUTANT SCREENING WITH AERMOD (CAPTAPSA)

CAPTAPSA.DAT:

```
 EXAMPLE1 USING STACK/BUILDING OPTION #2                              USER TITLE
 EXAMPLE1 USING STACK/BUILDING OPTION #2   9.00 450.00  10.00   0.50 MPCA TITLE
        2 [ILULCA is LULC lower value.]
        2 [ILULCZ is LULC upper value.]
     1986 [IYEARA is YEAR lower value.]
     1990 [IYEARZ is YEAR upper value.]
        2 [IBPIPI is BPIP index value.]
  NOT APP. [BPIP Filename if applicable]
     7.00 [BLDHT is building height(m)]
    50.00 [BLDEW is bldg E-W length(m)]
    30.00 [BLDNS is bldg N-S length(m)]
     0.00 [XSHFT is stck E-W offset(m)]
     0.00 [YSHFT is stck N-S offset(m)]
     9.00 [SH is stack height      (m)]
   450.00 [TS is stack temperature (K)]
    10.00 [VS is stack velocity(m/sec)]
     0.50 [SD is stack diameter    (m)]
```

CAPTAPSA.SOI:

```
** LOCATION *SRC_ID* SRC_TYPE   EASTING NORTHING
SO LOCATION STACK_#1   POINT 0.00000000 0.00000000

** SRCPARAM *SRC_ID* 1GPS,SH(M),TS(K),VS(MPS),SD(M):
SO SRCPARAM STACK_#1 1.00000000 9.00000000 450.000000 10.0000000 0.500000000
```

CAPTAPSA.REI:

```
RE GRIDPOLR PG1 STA
RE GRIDPOLR PG1 ORIG STACK_#1
RE GRIDPOLR PG1 DIST    10    20    30    40    50
RE GRIDPOLR PG1 DIST    60    70    80    90   100
RE GRIDPOLR PG1 DIST   120   140   160   180   200
RE GRIDPOLR PG1 DIST   250   300   350   400   500
RE GRIDPOLR PG1 DIST   600   700   800   900  1000
RE GRIDPOLR PG1 DIST  1500  2500  5000  7500 10000
RE GRIDPOLR PG1 GDIR 36 10 10
RE GRIDPOLR PG1 END
```

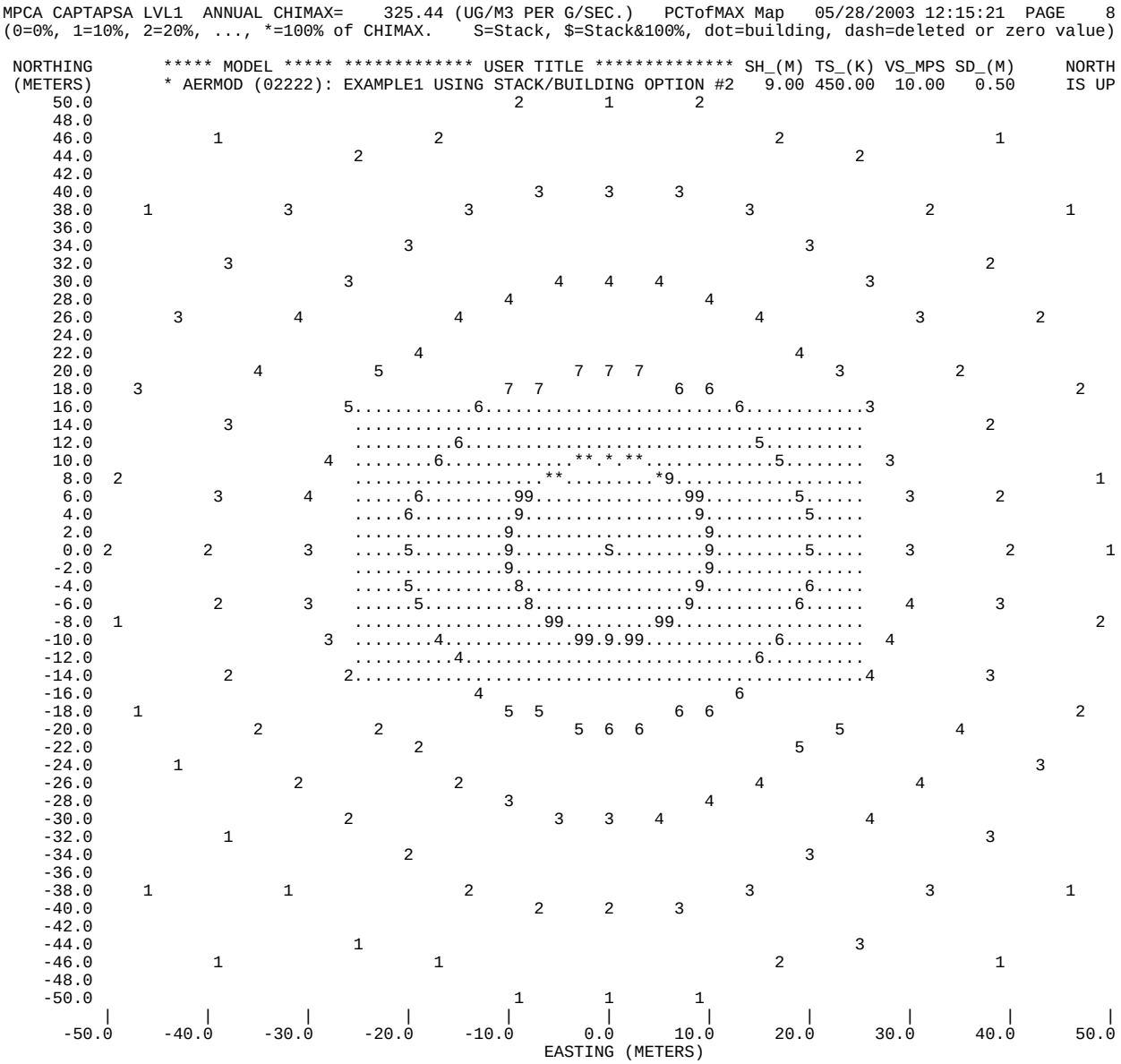
```
CRITERIA AIR POLLUTANT & TOXIC AIR POLLUTANT SCREENING WITH AERMOD (CAPTAPSA)

CAPTAPSA.FIL:

FILENAME.EXT     ANNUAL     1-HOUR     3-HOUR     8-HOUR    24-HOUR    MONTHLY
CAPTAP86.PL2 314.283783 1107.69055 1019.31232 918.841370 782.131531 384.504242
CAPTAP87.PL2 313.651703 1101.22803 1026.76379 906.227356 811.702576 408.386749
CAPTAP88.PL2 322.550323 1119.79370 1011.67084 939.261780 817.523010 407.282745
CAPTAP89.PL2 320.650513 1125.76160 1015.16901 959.330078 806.795471 421.043427
CAPTAP90.PL2 325.437164 1123.69531 1010.85663 942.281738 832.732849 401.795563

CAPTAPSA.BPO:

SO BUILDHGT STACK_#1    7.00    7.00    7.00    7.00    7.00    7.00
SO BUILDHGT STACK_#1    7.00    7.00    7.00    7.00    7.00    7.00
SO BUILDHGT STACK_#1    7.00    7.00    7.00    7.00    7.00    7.00
SO BUILDHGT STACK_#1    7.00    7.00    7.00    7.00    7.00    7.00
SO BUILDHGT STACK_#1    7.00    7.00    7.00    7.00    7.00    7.00
SO BUILDHGT STACK_#1    7.00    7.00    7.00    7.00    7.00    7.00
SO BUILDWID STACK_#1   54.45   57.25   58.30   57.59   55.12   50.98
SO BUILDWID STACK_#1   45.29   38.23   30.00   38.23   45.29   50.98
SO BUILDWID STACK_#1   55.12   57.59   58.30   57.25   54.45   50.00
SO BUILDWID STACK_#1   54.45   57.25   58.30   57.59   55.12   50.98
SO BUILDWID STACK_#1   45.29   38.23   30.00   38.23   45.29   50.98
SO BUILDWID STACK_#1   55.12   57.59   58.30   57.25   54.45   50.00
SO BUILDLEN STACK_#1   38.23   45.29   50.98   55.12   57.59   58.30
SO BUILDLEN STACK_#1   57.25   54.45   50.00   54.45   57.25   58.30
SO BUILDLEN STACK_#1   57.59   55.12   50.98   45.29   38.23   30.00
SO BUILDLEN STACK_#1   38.23   45.29   50.98   55.12   57.59   58.30
SO BUILDLEN STACK_#1   57.25   54.45   50.00   54.45   57.25   58.30
SO BUILDLEN STACK_#1   57.59   55.12   50.98   45.29   38.23   30.00
SO XBADJ    STACK_#1  -19.11  -22.65  -25.49  -27.56  -28.79  -29.15
SO XBADJ    STACK_#1  -28.62  -27.22  -25.00  -27.22  -28.62  -29.15
SO XBADJ    STACK_#1  -28.79  -27.56  -25.49  -22.65  -19.11  -15.00
SO XBADJ    STACK_#1  -19.11  -22.65  -25.49  -27.56  -28.79  -29.15
SO XBADJ    STACK_#1  -28.62  -27.22  -25.00  -27.22  -28.62  -29.15
SO XBADJ    STACK_#1  -28.79  -27.56  -25.49  -22.65  -19.11  -15.00
SO YBADJ    STACK_#1    0.00    0.00    0.00    0.00    0.00    0.00
SO YBADJ    STACK_#1    0.00    0.00    0.00    0.00    0.00    0.00
SO YBADJ    STACK_#1    0.00    0.00    0.00    0.00    0.00    0.00
SO YBADJ    STACK_#1    0.00    0.00    0.00    0.00    0.00    0.00
SO YBADJ    STACK_#1    0.00    0.00    0.00    0.00    0.00    0.00
SO YBADJ    STACK_#1    0.00    0.00    0.00    0.00    0.00    0.00
```

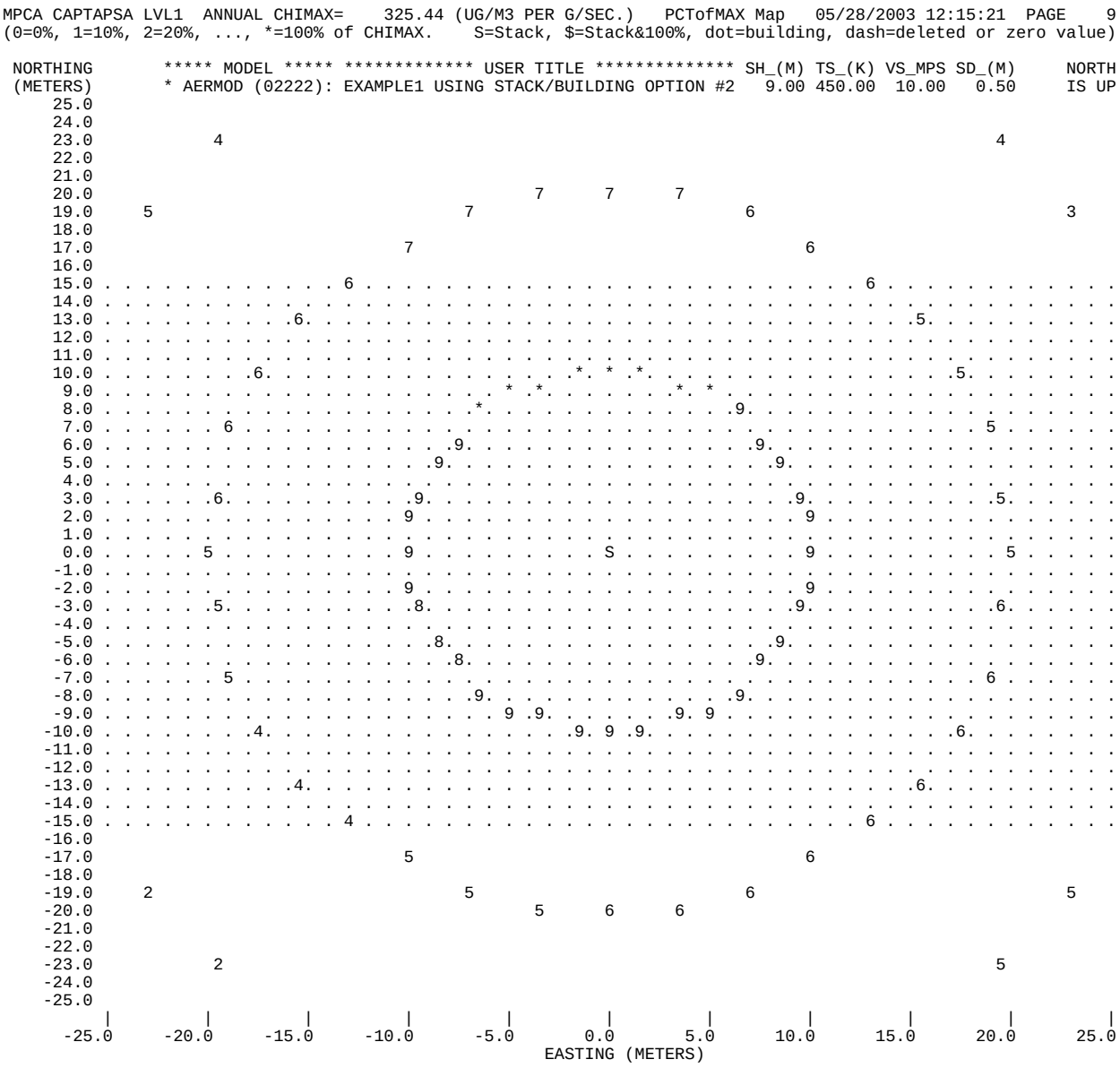
CRITERIA AIR POLLUTANT & TOXIC AIR POLLUTANT SCREENING WITH AERMOD (CAPTAPSA)

CAPTAPSA.BPI:

```
'EXAMPLE1 USING STACK/BUILDING OPTION #2   9.00 450.00  10.00   0.50 '
'ST'
'METERS' 1.00
'UTMN' 0.0000
1
'BLD_DATA' 1  0.0000
         4    7.0000
     -25.0     -15.0
     -25.0      15.0
      25.0      15.0
      25.0     -15.0
         1
'STACK_#1'   0.0   9.0   0.0   0.0
```

Figure 6.8 Example with Stack/Building Option 2 – Selected Pages of Annual Summary Figures




MPCA CAPTAPSA LVL1 ANNUAL CHIMAX= 325.44 (UG/M3 PER G/SEC.) PCTofMAX Map 05/28/2003 12:15:21 PAGE 9
(0=0%, 1=10%, 2=20%, ..., *=100% of CHIMAX. S=Stack, $=Stack&100%, dot=building, dash=deleted or zero value)
NORTHING (METERS)
***** MODEL ***** ********** USER TITLE ********** SH_(M) TS_(K) VS_MPS SD_(M)
* AERMOD (02222): EXAMPLE1 USING STACK/BUILDING OPTION #2 9.00 450.00 10.00 0.50
NORTH IS UP
EASTING (METERS)

```
MPCA CAPTAPSA LVL2  ANNUAL CHIMAX=    223.00 (UG/M3 PER G/SEC.)   PCTofMAX Map   05/28/2003 12:15:21  PAGE   17
(0=0%, 1=10%, 2=20%, ..., *=100% of CHIMAX.    S=Stack, $=Stack&100%, dot=building, dash=deleted or zero value)

 NORTHING       ***** MODEL ***** ************* USER TITLE ************** SH_(M) TS_(K) VS_MPS SD_(M)     NORTH
 (METERS)       * AERMOD (02222): EXAMPLE1 USING STACK/BUILDING OPTION #2   9.00 450.00  10.00   0.50     IS UP
    50.0                                  2        2       2
    48.0
    46.0           2                    3                                3                   1
    44.0                      4                                                    3
    42.0
    40.0                                        4      4      4
    38.0     2             4                5                          5                3             1
    36.0
    34.0                              5                                        5
    32.0             5                                                                          3
    30.0                         5                   6    6    6                    4
    28.0                                       6                   6
    26.0         5           5               6                           6              4           3
    24.0
    22.0                               6                                      5
    20.0                5           7                    *  *  *                  5           3
    18.0    4                              *  *                 9  9                                    2
    16.0                         7.............9.........................8.............5
    14.0             5           ..............................................                3
    12.0                         ..........-.................................-..........
    10.0                       6 .........-.............--.-.--.............-.........  4
     8.0  3                     ....................--..........--....................                    2
     6.0             4        6 ......-..........--................--..........-......    5        3
     4.0                       .....-..........-..................-..........-.....
     2.0                       ................-......................-................
     0.0 2           4         5 .....-..........-..........S..........-..........-.....    5         3         2
    -2.0                       ................-......................-................
    -4.0                       .....-..........-..................-..........-.....
    -6.0             3        4 ......-..........-................-..........-......    5        4
    -8.0  2                     ....................--..........--....................                    3
   -10.0                       4 .........-.............--.-.--.............-.........  6
   -12.0                         ..........-.................................-..........
   -14.0             3           3.............................................6           5
   -16.0                                    6                                  9
   -18.0    2                                 7  7                 9  9                                  3
   -20.0                3           3                    8  8  9                    7           5
   -22.0                                  3                                 7
   -24.0         2                                                                              4
   -26.0                     2              3                                6              6
   -28.0                                        4                                 6
   -30.0                          2                    5    5    5                         6
   -32.0             2                                                                          5
   -34.0                               2                                            5
   -36.0
   -38.0     1             2                3                                4                5             2
   -40.0                                          3      3      4
   -42.0
   -44.0                       2                                                    4
   -46.0             1                    1                                3                   2
   -48.0
   -50.0                                        1        2       2
        |         |         |         |         |         |         |         |         |         |         |
      -50.0     -40.0     -30.0     -20.0     -10.0       0.0      10.0      20.0      30.0      40.0      50.0
                                          EASTING (METERS)
```

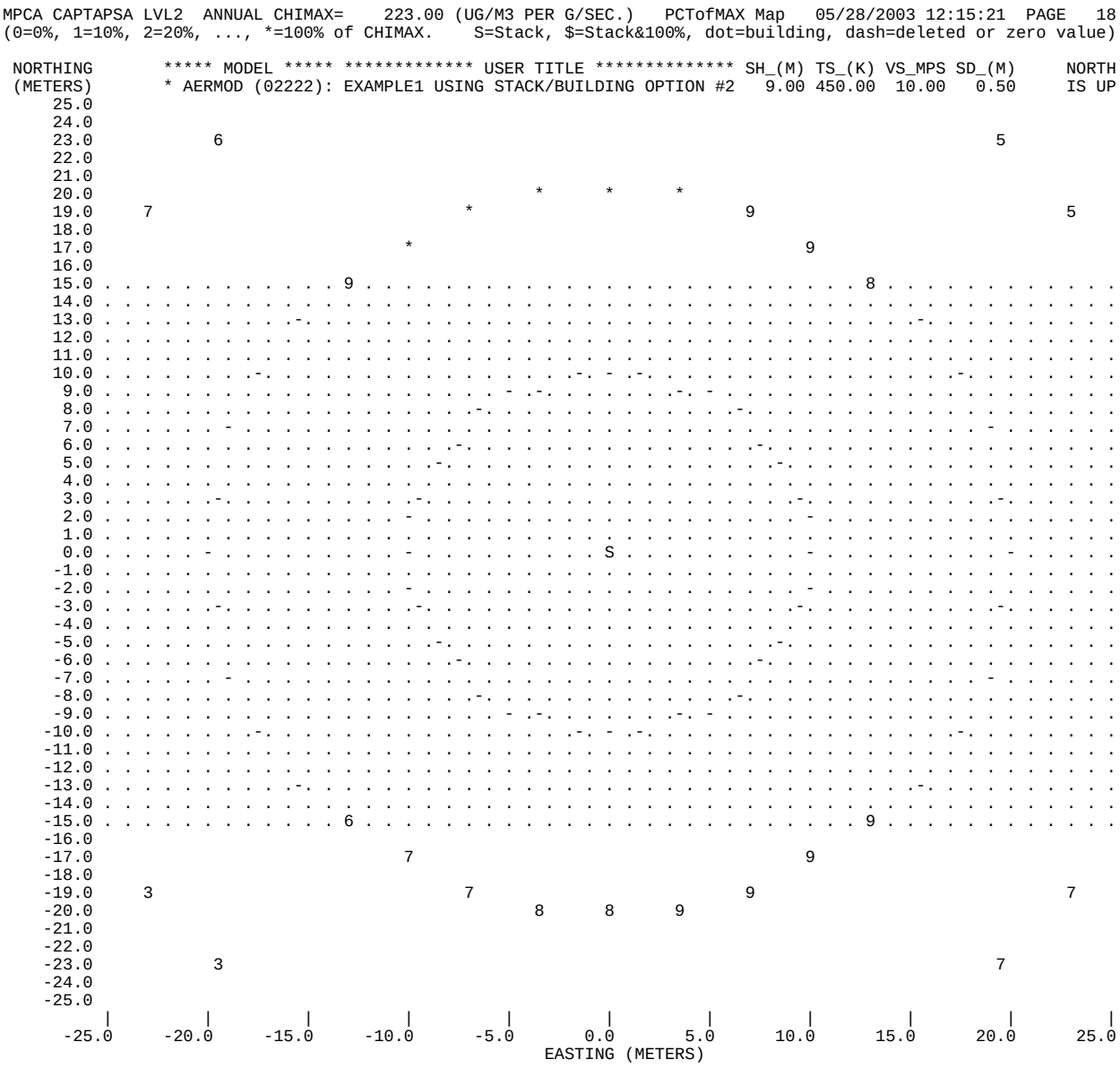

MPCA CAPTAPSA LVL2 ANNUAL CHIMAX= 223.00 (UG/M3 PER G/SEC.) PCTofMAX Map 05/28/2003 12:15:21 PAGE 18
(0=0%, 1=10%, 2=20%, ..., *=100% of CHIMAX. S=Stack, $=Stack&100%, dot=building, dash=deleted or zero value)
NORTHING (METERS)
***** MODEL ***** ********** USER TITLE ********** SH_(M) TS_(K) VS_MPS SD_(M)
* AERMOD (02222): EXAMPLE1 USING STACK/BUILDING OPTION #2 9.00 450.00 10.00 0.50
NORTH IS UP
EASTING (METERS)

Figure 7.1 Example with Stack/Building Option 3 – Screen 1.

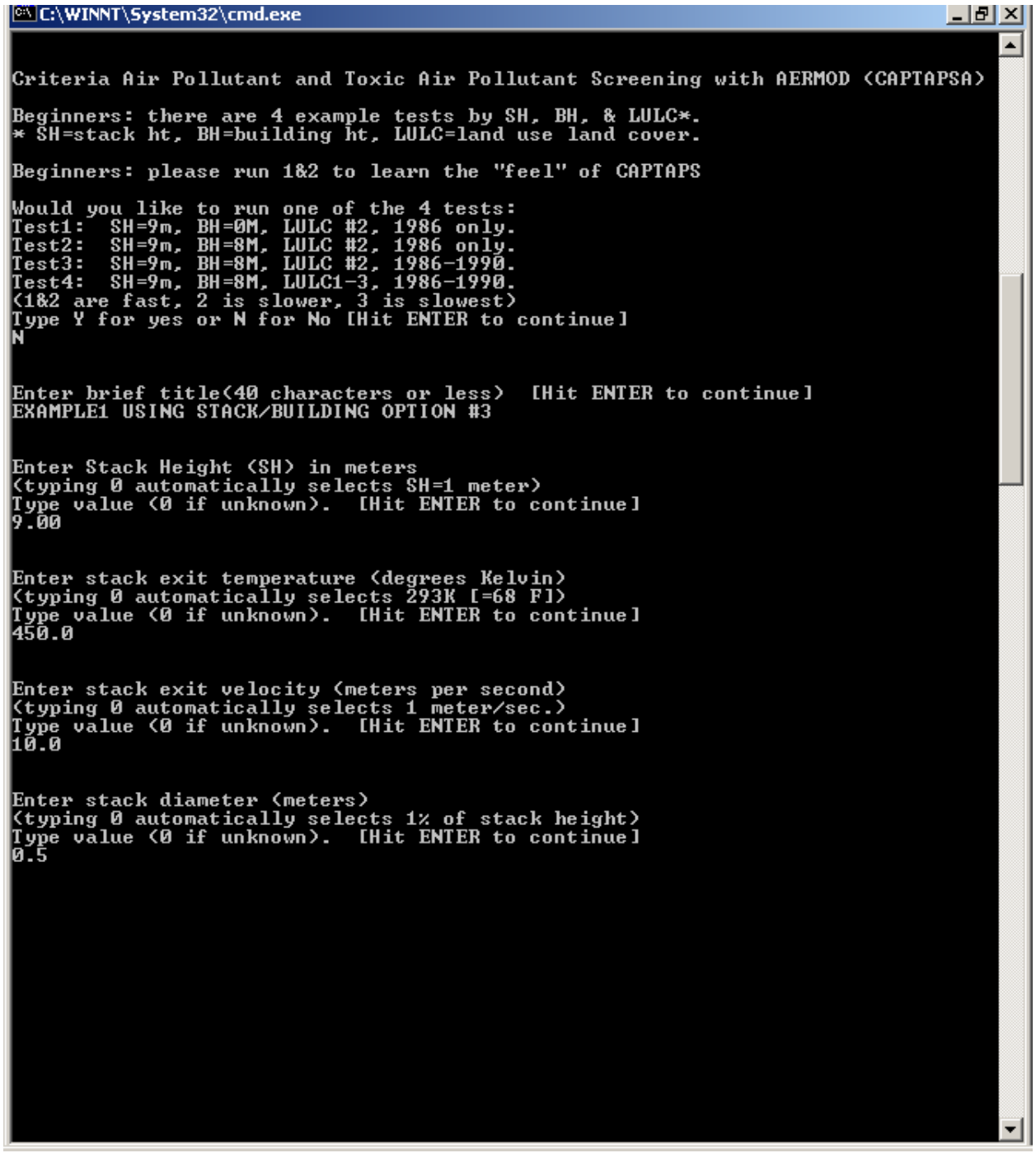


Figure 7.2 Example with Stack/Building Option 3 – Screen 2.

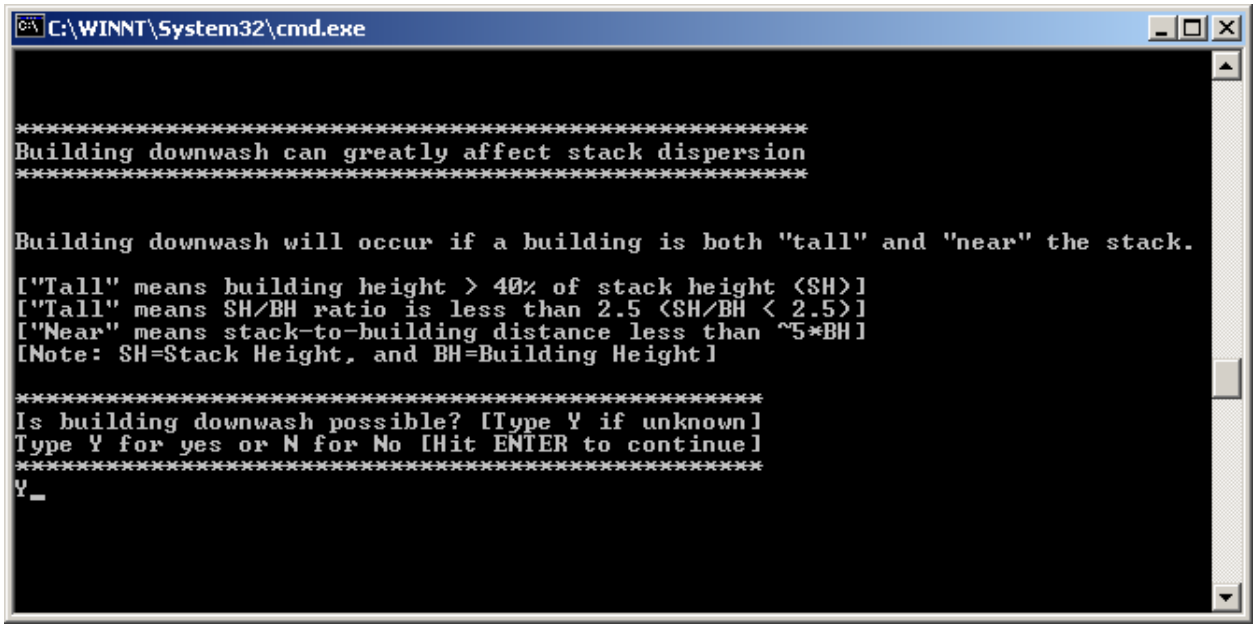


Figure 7.3 Example with Stack/Building Option 3 – Screen 3.

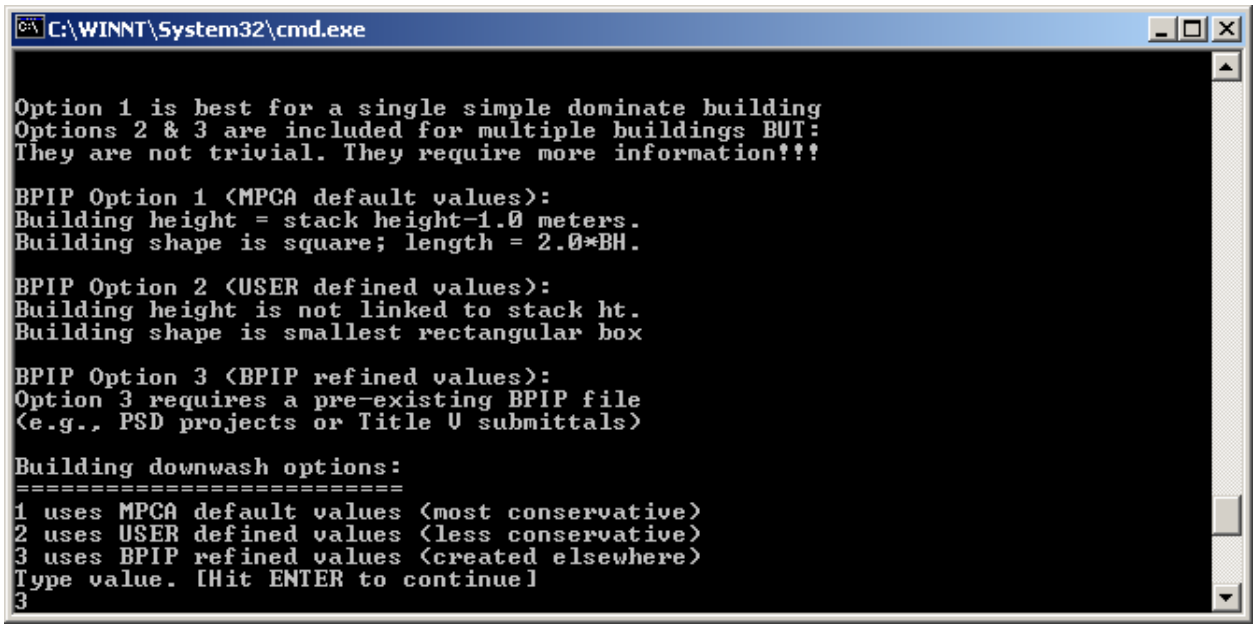


Figure 7.4 Example with Stack/Building Option 3 – Screen 4.

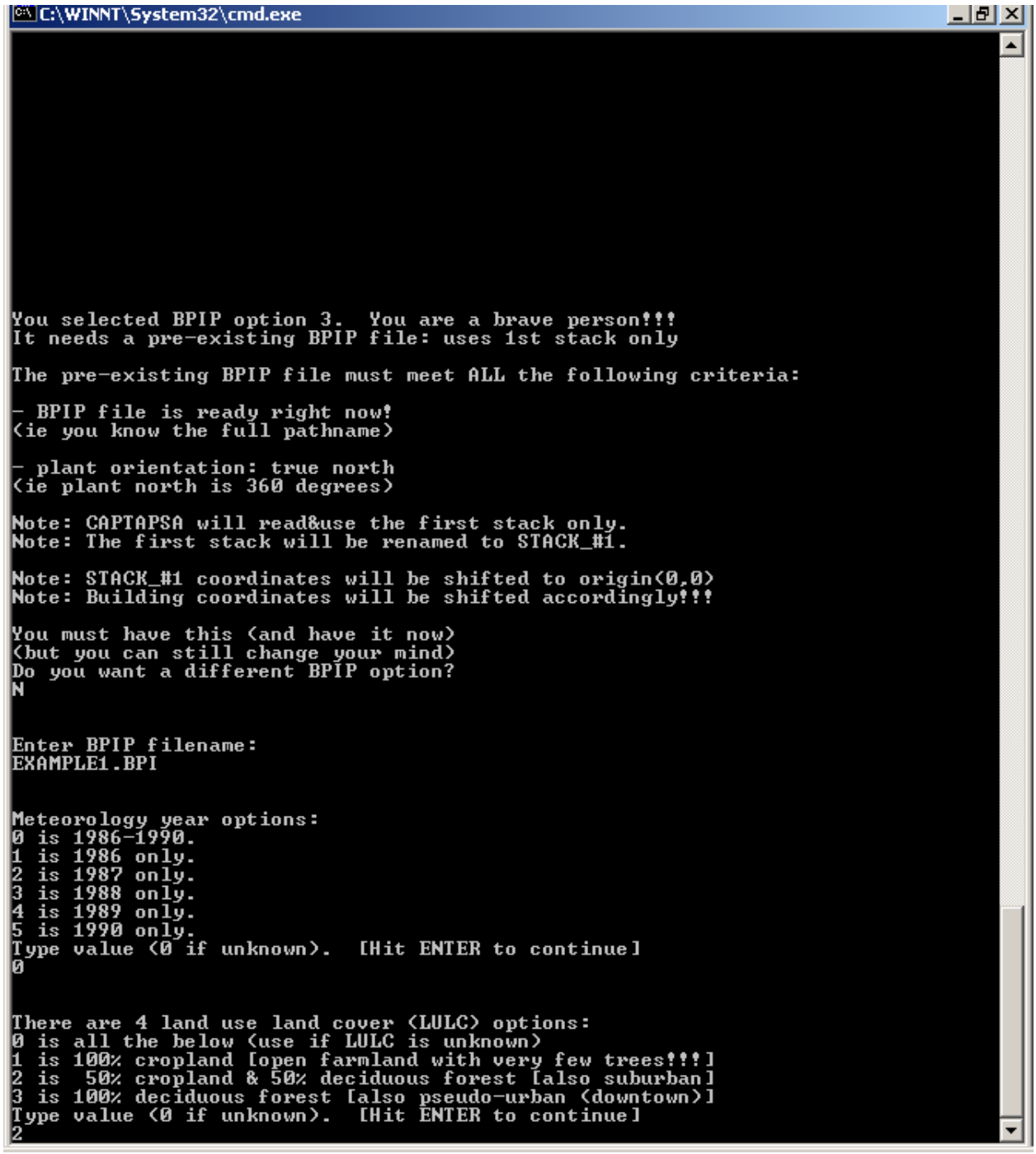


Figure 7.5 Example with Stack/Building Option 3 – Screen 5.

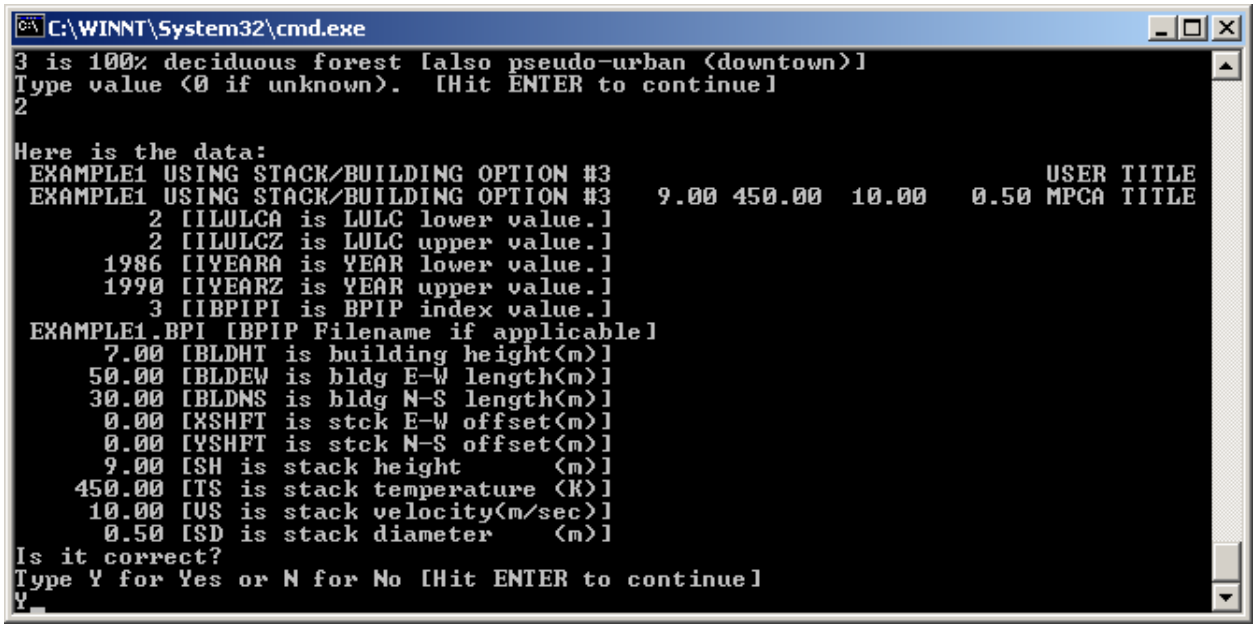


Figure 7.6 Example with Stack/Building Option 3 – Screen 6.

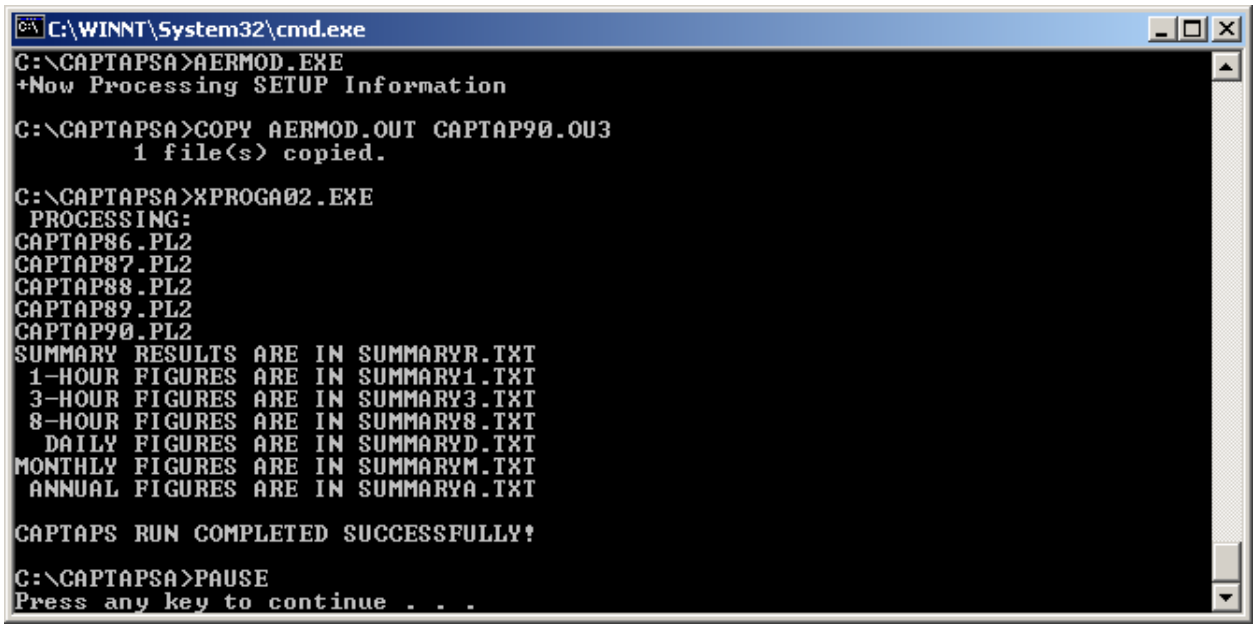


Figure 7.7 Example with Stack/Building Option 3 – Summary Report

```
MPCA CAPTAPSA SUMMARY REPORT                    05/28/2003 11:04:28  PAGE   1

CRITERIA AIR POLLUTANT & TOXIC AIR POLLUTANT SCREENING WITH AERMOD (CAPTAPSA)

LVL1 DISPERSION FACTORS (UG/M3 PER G/S) BY AVERAGING TIME & DISTANCE (METERS)

*** LVL1 includes & LVL2 excludes building receptor locations (if present)***
```

DISTANCE FROM STK	ANNUAL AVERAGE	01-HOUR AVERAGE	03-HOUR AVERAGE	08-HOUR AVERAGE	24-HOUR AVERAGE	MONTHLY AVERAGE
NOT APP.	272.37	1307.44	1180.64	1103.98	890.74	379.90
10	272.37	1089.53	1007.53	944.55	811.38	379.90
20	166.70	1307.44	1180.64	1103.98	890.74	299.36
30	124.32	965.72	910.82	808.15	724.12	205.58
40	54.28	399.33	376.99	346.29	317.58	93.90
50	46.35	361.38	342.35	312.70	284.46	82.34
60	39.41	336.19	312.57	293.08	252.88	71.69
70	34.13	338.41	293.13	272.05	224.99	62.62
80	29.93	339.03	288.23	259.64	199.92	55.29
90	26.49	349.47	289.85	260.83	178.24	48.81
100	23.93	364.28	294.92	261.76	162.70	44.52
120	20.12	375.04	295.13	256.64	138.35	37.55
140	17.33	365.76	283.68	246.26	118.35	32.07
160	14.96	345.99	266.21	228.89	103.45	27.55
180	12.94	327.65	257.02	206.78	91.90	23.89
200	11.19	304.33	239.92	185.91	81.36	20.67
250	7.85	253.75	195.48	135.91	58.26	14.64
300	5.65	204.19	153.57	93.78	41.18	10.54
350	4.13	161.26	116.68	65.18	30.59	7.86
400	3.12	123.66	86.95	48.31	23.30	5.97
500	1.94	64.28	42.10	28.54	15.66	3.89
600	1.37	34.70	31.08	23.36	11.77	2.83
700	1.06	31.79	28.52	20.98	9.66	2.22
800	0.87	29.52	27.38	19.24	8.44	1.80
900	0.73	27.41	25.90	17.62	7.52	1.51
1000	0.62	26.20	24.32	16.15	6.67	1.28
1500	0.35	21.88	17.43	10.86	4.19	0.69
2500	0.19	17.19	10.82	7.63	2.97	0.42
5000	0.08	12.67	8.09	5.01	1.60	0.21
7500	0.04	10.27	5.70	3.37	1.26	0.13
10000	0.03	8.33	4.22	2.40	0.96	0.09

```
**** MODEL ****** ************** USER TITLE **************
* AERMOD (02222): EXAMPLE1 USING STACK/BUILDING OPTION #3

***** STACK PARAMETERS *****
 SH_(M) TS_(K) VS_MPS SD_(M)
   9.00 450.00  10.00   0.50
```

CRITERIA AIR POLLUTANT & TOXIC AIR POLLUTANT SCREENING WITH AERMOD (CAPTAPSA)

LVL2 DISPERSION FACTORS (UG/M3 PER G/S) BY AVERAGING TIME & DISTANCE (METERS)

*** LVL1 includes & LVL2 excludes building receptor locations (if present)***

DISTANCE FROM STK	ANNUAL AVERAGE	01-HOUR AVERAGE	03-HOUR AVERAGE	08-HOUR AVERAGE	24-HOUR AVERAGE	MONTHLY AVERAGE
NOT APP.	243.17	1307.44	1180.64	1103.98	890.74	338.65
10	243.17	812.42	771.96	713.91	671.20	338.65
20	166.70	1307.44	1180.64	1103.98	890.74	299.36
30	124.32	965.72	910.82	808.15	724.12	205.58
40	54.28	399.33	376.99	346.29	317.58	93.90
50	46.35	361.38	342.35	312.70	284.46	82.34
60	39.41	336.19	312.57	293.08	252.88	71.69
70	34.13	338.41	293.13	272.05	224.99	62.62
80	29.93	339.03	288.23	259.64	199.92	55.29
90	26.49	349.47	289.85	260.83	178.24	48.81
100	23.93	364.28	294.92	261.76	162.70	44.52
120	20.12	375.04	295.13	256.64	138.35	37.55
140	17.33	365.76	283.68	246.26	118.35	32.07
160	14.96	345.99	266.21	228.89	103.45	27.55
180	12.94	327.65	257.02	206.78	91.90	23.89
200	11.19	304.33	239.92	185.91	81.36	20.67
250	7.85	253.75	195.48	135.91	58.26	14.64
300	5.65	204.19	153.57	93.78	41.18	10.54
350	4.13	161.26	116.68	65.18	30.59	7.86
400	3.12	123.66	86.95	48.31	23.30	5.97
500	1.94	64.28	42.10	28.54	15.66	3.89
600	1.37	34.70	31.08	23.36	11.77	2.83
700	1.06	31.79	28.52	20.98	9.66	2.22
800	0.87	29.52	27.38	19.24	8.44	1.80
900	0.73	27.41	25.90	17.62	7.52	1.51
1000	0.62	26.20	24.32	16.15	6.67	1.28
1500	0.35	21.88	17.43	10.86	4.19	0.69
2500	0.19	17.19	10.82	7.63	2.97	0.42
5000	0.08	12.67	8.09	5.01	1.60	0.21
7500	0.04	10.27	5.70	3.37	1.26	0.13
10000	0.03	8.33	4.22	2.40	0.96	0.09

**** MODEL ****** ************** USER TITLE **************
* AERMOD (02222): EXAMPLE1 USING STACK/BUILDING OPTION #3

***** STACK PARAMETERS *****

SH_(M)	TS_(K)	VS_MPS	SD_(M)
9.00	450.00	10.00	0.50

CRITERIA AIR POLLUTANT & TOXIC AIR POLLUTANT SCREENING WITH AERMOD (CAPTAPSA)

CAPTAPSA.DAT:

```
 EXAMPLE1 USING STACK/BUILDING OPTION #3                              USER TITLE
 EXAMPLE1 USING STACK/BUILDING OPTION #3   9.00 450.00  10.00   0.50 MPCA TITLE
         2 [ILULCA is LULC lower value.]
         2 [ILULCZ is LULC upper value.]
      1986 [IYEARA is YEAR lower value.]
      1990 [IYEARZ is YEAR upper value.]
         3 [IBPIPI is BPIP index value.]
 EXAMPLE1.BPI [BPIP Filename if applicable]
      7.00 [BLDHT is building height(m)]
     50.00 [BLDEW is bldg E-W length(m)]
     30.00 [BLDNS is bldg N-S length(m)]
      0.00 [XSHFT is stck E-W offset(m)]
      0.00 [YSHFT is stck N-S offset(m)]
      9.00 [SH is stack height      (m)]
    450.00 [TS is stack temperature (K)]
     10.00 [VS is stack velocity(m/sec)]
      0.50 [SD is stack diameter    (m)]
```

CAPTAPSA.SOI:

```
** LOCATION *SRC_ID* SRC_TYPE   EASTING NORTHING
SO LOCATION STACK_#1   POINT 0.00000000 0.00000000

** SRCPARAM *SRC_ID* 1GPS,SH(M),TS(K),VS(MPS),SD(M):
SO SRCPARAM STACK_#1 1.00000000 9.00000000 450.000000 10.0000000 0.500000000
```

CAPTAPSA.REI:

```
RE GRIDPOLR PG1 STA
RE GRIDPOLR PG1 ORIG STACK_#1
RE GRIDPOLR PG1 DIST    10    20    30    40    50
RE GRIDPOLR PG1 DIST    60    70    80    90   100
RE GRIDPOLR PG1 DIST   120   140   160   180   200
RE GRIDPOLR PG1 DIST   250   300   350   400   500
RE GRIDPOLR PG1 DIST   600   700   800   900  1000
RE GRIDPOLR PG1 DIST  1500  2500  5000  7500 10000
RE GRIDPOLR PG1 GDIR 36 10 10
RE GRIDPOLR PG1 END
```

CRITERIA AIR POLLUTANT & TOXIC AIR POLLUTANT SCREENING WITH AERMOD (CAPTAPSA)

CAPTAPSA.FIL:

FILENAME.EXT	ANNUAL	1-HOUR	3-HOUR	8-HOUR	24-HOUR	MONTHLY
CAPTAP86.PL2	257.656647	1282.95850	1133.84216	989.520752	823.076843	335.013947
CAPTAP87.PL2	252.436203	1272.97241	1149.25049	997.330322	859.911804	366.833862
CAPTAP88.PL2	270.951111	1297.46338	1156.17590	1048.70862	807.898682	369.792419
CAPTAP89.PL2	262.030701	1282.12683	1180.63611	1103.98315	876.087463	379.895813
CAPTAP90.PL2	272.365875	1307.44189	1148.74426	1046.90833	890.741821	356.444183

CAPTAPSA.BPO:

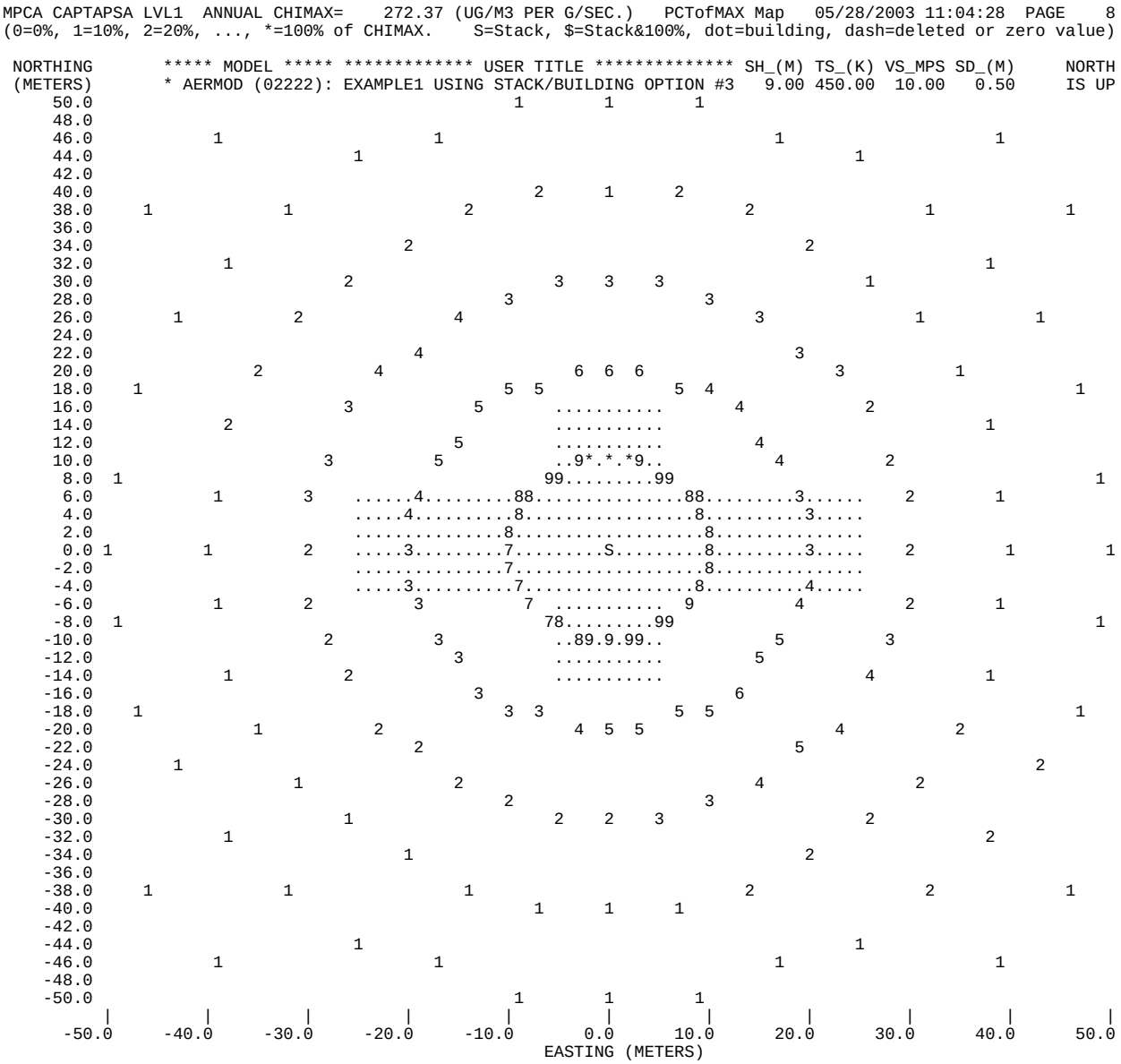
```
SO BUILDHGT STACK_#1    7.00    7.00    7.00    7.00    7.00    7.00
SO BUILDHGT STACK_#1    7.00    7.00    7.00    7.00    7.00    7.00
SO BUILDHGT STACK_#1    7.00    7.00    7.00    7.00    7.00    7.00
SO BUILDHGT STACK_#1    7.00    7.00    7.00    7.00    7.00    7.00
SO BUILDHGT STACK_#1    7.00    7.00    7.00    7.00    7.00    7.00
SO BUILDHGT STACK_#1    7.00    7.00    7.00    7.00    7.00    7.00
SO BUILDWID STACK_#1   15.06   19.66   23.66   26.94   29.41   30.98
SO BUILDWID STACK_#1   31.61   31.28   30.00   31.28   31.61   30.98
SO BUILDWID STACK_#1   29.41   26.94   23.66   19.66   15.06   10.00
SO BUILDWID STACK_#1   15.06   19.66   23.66   26.94   29.41   30.98
SO BUILDWID STACK_#1   31.61   31.28   30.00   31.28   31.61   30.98
SO BUILDWID STACK_#1   29.41   26.94   23.66   19.66   15.06   10.00
SO BUILDLEN STACK_#1   31.28   31.61   30.98   29.41   26.94   23.66
SO BUILDLEN STACK_#1   19.66   15.06   10.00   15.06   19.66   23.66
SO BUILDLEN STACK_#1   26.94   29.41   30.98   31.61   31.28   30.00
SO BUILDLEN STACK_#1   31.28   31.61   30.98   29.41   26.94   23.66
SO BUILDLEN STACK_#1   19.66   15.06   10.00   15.06   19.66   23.66
SO BUILDLEN STACK_#1   26.94   29.41   30.98   31.61   31.28   30.00
SO XBADJ    STACK_#1  -15.64  -15.81  -15.49  -14.70  -13.47  -11.83
SO XBADJ    STACK_#1   -9.83   -7.53   -5.00   -7.53   -9.83  -11.83
SO XBADJ    STACK_#1  -13.47  -14.70  -15.49  -15.81  -15.64  -15.00
SO XBADJ    STACK_#1  -15.64  -15.81  -15.49  -14.70  -13.47  -11.83
SO XBADJ    STACK_#1   -9.83   -7.53   -5.00   -7.53   -9.83  -11.83
SO XBADJ    STACK_#1  -13.47  -14.70  -15.49  -15.81  -15.64  -15.00
SO YBADJ    STACK_#1    0.00    0.00    0.00    0.00    0.00    0.00
SO YBADJ    STACK_#1    0.00    0.00    0.00    0.00    0.00    0.00
SO YBADJ    STACK_#1    0.00    0.00    0.00    0.00    0.00    0.00
SO YBADJ    STACK_#1    0.00    0.00    0.00    0.00    0.00    0.00
SO YBADJ    STACK_#1    0.00    0.00    0.00    0.00    0.00    0.00
SO YBADJ    STACK_#1    0.00    0.00    0.00    0.00    0.00    0.00
```

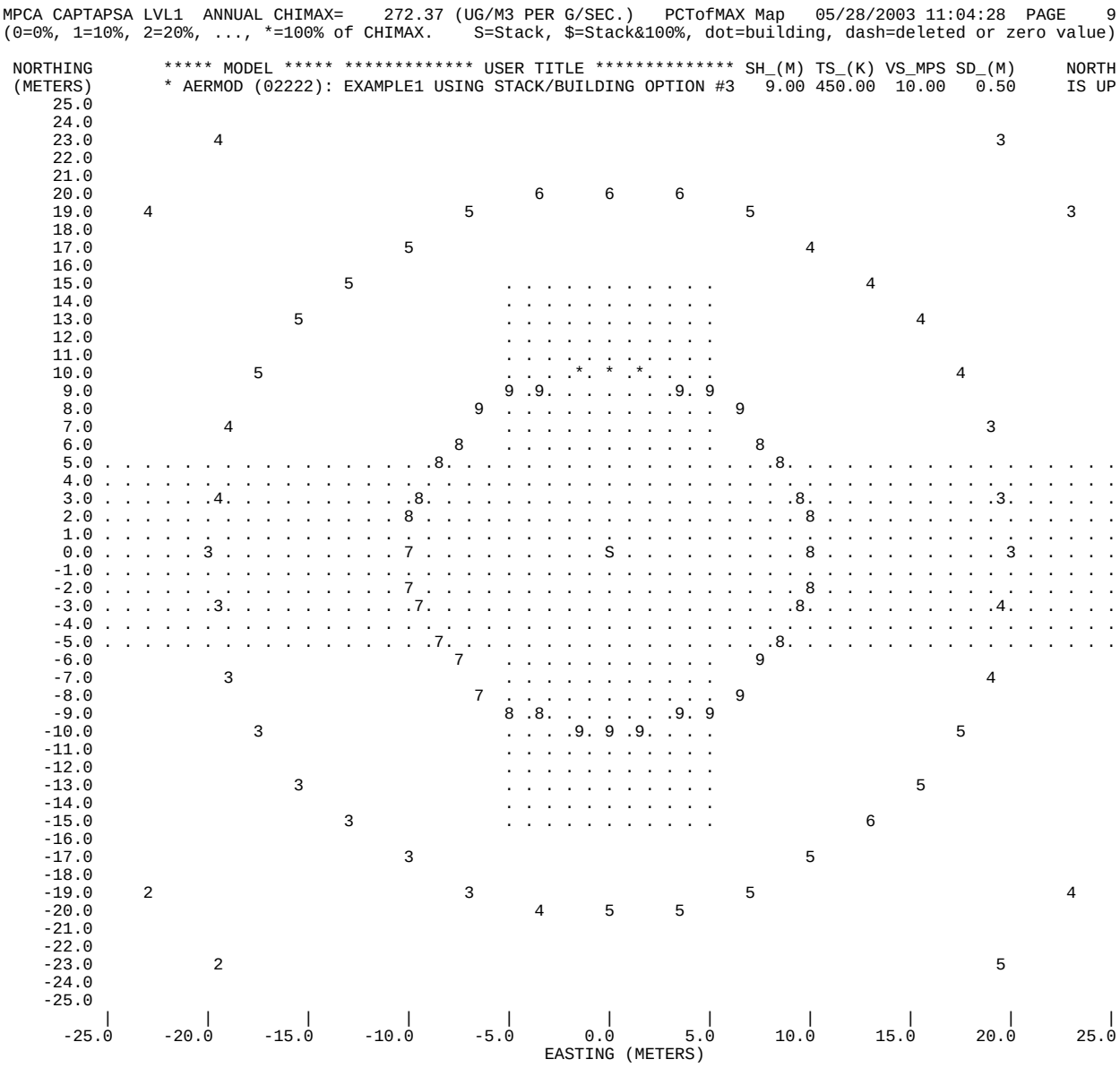
CRITERIA AIR POLLUTANT & TOXIC AIR POLLUTANT SCREENING WITH AERMOD (CAPTAPSA)

CAPTAPSA.BPI:

```
 'EXAMPLE1: 3 BUILDINGS WITH 1 TIER PER BUILDING'
 'ST'
 'METERS' 1.00
 'UTMN' 360.00
 3
 'WEST_BLD'  1 0.00000000
          4    3.0000
      -25.0      -5.0
      -25.0       5.0
       -5.0       5.0
       -5.0      -5.0
 'CNTR_BLD'  1 0.00000000
          4    7.0000
       -5.0     -15.0
       -5.0      15.0
        5.0      15.0
        5.0     -15.0
 'EAST_BLD'  1 0.00000000
          4    5.0000
        5.0      -5.0
        5.0       5.0
       25.0       5.0
       25.0      -5.0
          1
 'STACK_#1'   0.0   9.0   0.0   0.0
```

Figure 7.8 Example with Stack/Building Option 3 – Selected Pages of Annual Summary Figures




MPCA CAPTAPSA LVL1 ANNUAL CHIMAX= 272.37 (UG/M3 PER G/SEC.) PCTofMAX Map 05/28/2003 11:04:28 PAGE 9
(0=0%, 1=10%, 2=20%, ..., *=100% of CHIMAX. S=Stack, $=Stack&100%, dot=building, dash=deleted or zero value)
NORTHING (METERS)
***** MODEL ***** ********** USER TITLE ********** SH_(M) TS_(K) VS_MPS SD_(M)
* AERMOD (02222): EXAMPLE1 USING STACK/BUILDING OPTION #3 9.00 450.00 10.00 0.50
NORTH IS UP
EASTING (METERS)

```
MPCA CAPTAPSA LVL2  ANNUAL CHIMAX=    243.17 (UG/M3 PER G/SEC.)   PCTofMAX Map   05/28/2003 11:04:28  PAGE   17
(0=0%, 1=10%, 2=20%, ..., *=100% of CHIMAX.    S=Stack, $=Stack&100%, dot=building, dash=deleted or zero value)

 NORTHING       ***** MODEL ***** ************* USER TITLE ************** SH_(M) TS_(K) VS_MPS SD_(M)     NORTH
 (METERS)       * AERMOD (02222): EXAMPLE1 USING STACK/BUILDING OPTION #3   9.00 450.00  10.00   0.50     IS UP
    50.0                                  1       1       1
    48.0
    46.0          1                   1                                 1                   1
    44.0                    2                                                   1
    42.0
    40.0                                      2     2     2
    38.0     1            2               2                         2               1            1
    36.0
    34.0                          2                                       2
    32.0           2                                                                  1
    30.0                    2                 3   3   3                       2
    28.0                                  4                   3
    26.0        2          2             4                         4             1          1
    24.0
    22.0                          4                                   4
    20.0              2          4                 7  7  6                3          1
    18.0    2                               5  6            6  5                              1
    16.0                    4           5       ...........       5           3
    14.0           2                            ...........                           1
    12.0                                5       ...........         4
    10.0                      3         5       ..-.-.-..           4         2
     8.0  1                                    *-.........-*                              1
     6.0           1       3    ......5.........-9.............9-.........4......    2       1
     4.0                       .....-.........-...............-.........-.....
     2.0                       ..............-.................-..............
     0.0 1         1         2    .....-.........-.........S.........-.........-.....    2         1         1
    -2.0                       ..............-.................-..............
    -4.0                       .....-.........-...............-.........-.....
    -6.0           1       2         3         8  ...........  *         5         3       1
    -8.0  1                                   8-.........-*                              1
   -10.0                     2         3         ..-.-.-..           6         3
   -12.0                               3         ...........         6
   -14.0           1         2                   ...........               4         2
   -16.0                                 3                   6
   -18.0    1                               3  4            6  6                              1
   -20.0              1         2                  5  6  6               5         2
   -22.0                               2                                 5
   -24.0       1                                                                        2
   -26.0                  1             2                             5             2
   -28.0                                     2                   4
   -30.0                       1                 2   3   3                   2
   -32.0           1                                                                  2
   -34.0                             1                                       2
   -36.0
   -38.0     1            1               1                         2               2            2
   -40.0                                     1     1     1
   -42.0
   -44.0                      1                                                 2
   -46.0          1                   1                                 1                   2
   -48.0
   -50.0                                     1       1       1
        |       |       |       |       |       |       |       |       |       |       |       |
      -50.0   -40.0   -30.0   -20.0   -10.0     0.0     10.0    20.0    30.0    40.0    50.0
                                      EASTING (METERS)
```

```
MPCA CAPTAPSA LVL2  ANNUAL CHIMAX=    243.17 (UG/M3 PER G/SEC.)   PCTofMAX Map   05/28/2003 11:04:28  PAGE   18
(0=0%, 1=10%, 2=20%, ..., *=100% of CHIMAX.    S=Stack, $=Stack&100%, dot=building, dash=deleted or zero value)

 NORTHING       ***** MODEL ***** ************* USER TITLE ************** SH_(M) TS_(K) VS_MPS SD_(M)     NORTH
 (METERS)       * AERMOD (02222): EXAMPLE1 USING STACK/BUILDING OPTION #3   9.00 450.00  10.00   0.50     IS UP
    25.0
    24.0
    23.0           4                                                                                4
    22.0
    21.0
    20.0                                          7     7     6
    19.0     4                              6                        6                              3
    18.0
    17.0                              5                                        5
    16.0
    15.0                         5              . . . . . . . . . . .                5
    14.0                                        . . . . . . . . . . .
    13.0                   5                    . . . . . . . . . . .                    4
    12.0                                        . . . . . . . . . . .
    11.0                                        . . . . . . . . . . .
    10.0                5                       . . . .-. - .-. . . .                        4
     9.0                                        - .-. . . . . .-. -
     8.0                                   *    . . . . . . . . . . .  *
     7.0             5                          . . . . . . . . . . .                        4
     6.0                                9       . . . . . . . . . . .    9
     5.0 . . . . . . . . . . . . . . . . . . . .-. . . . . . . . . . . . . . . . . . . . . . .-. . . . . . . . . . . . . . . . . . .
     4.0 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
     3.0 . . . . . .-. . . . . . . . . . .-. . . . . . . . . . . . . . . . . . . . . . . . . . .-. . . . . . . . . . .-. . . . . .
     2.0 . . . . . . . . . . . . . . . . . - . . . . . . . . . . . . . . . . . . . . . . . . . . - . . . . . . . . . . . . . . . . .
     1.0 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
     0.0 . . . . . - . . . . . . . . . . - . . . . . . . . . . S . . . . . . . . . . . . . . - . . . . . . . . . . . - . . . . .
    -1.0 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
    -2.0 . . . . . . . . . . . . . . . . . - . . . . . . . . . . . . . . . . . . . . . . . . . . . - . . . . . . . . . . . . . . . . .
    -3.0 . . . . . .-. . . . . . . . . . .-. . . . . . . . . . . . . . . . . . . . . . . . . . .-. . . . . . . . . . .-. . . . . .
    -4.0 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
    -5.0 . . . . . . . . . . . . . . . . . .-. . . . . . . . . . . . . . . . . . . . . . . . . . . .-. . . . . . . . . . . . . . . . . .
    -6.0                               8       . . . . . . . . . . .    *
    -7.0             3                         . . . . . . . . . . .                        5
    -8.0                                  8    . . . . . . . . . . .  *
    -9.0                                       - .-. . . . . .-. -
   -10.0                5                      . . . .-. - .-. . . .                        6
   -11.0                                       . . . . . . . . . . .
   -12.0                                       . . . . . . . . . . .
   -13.0                   3                   . . . . . . . . . . .                    6
   -14.0                                       . . . . . . . . . . .
   -15.0                        3              . . . . . . . . . . .                6
   -16.0
   -17.0                              3                                        6
   -18.0
   -19.0     2                              4                        6                              5
   -20.0                                         5     6     6
   -21.0
   -22.0
   -23.0           2                                                                                5
   -24.0
   -25.0
        |        |        |        |        |        |        |        |        |        |        |
      -25.0    -20.0    -15.0    -10.0     -5.0      0.0      5.0     10.0     15.0     20.0     25.0
                                          EASTING (METERS)
```

Attachment A

Suggested BPIP Option 2 Procedure for DISPERSE Building Inputs

1. Define a hypothetical 3D shape (smallest rectangular box) that completely encloses all key buildings and structures described in 2.

- Let box height = maximum height of any key building/structure.
- Let EW length = East-West length encompassing all key buildings/structures.
- Let NS length = North-South length encompassing all key buildings/structures.

2. Identify key buildings (see Building Considerations) that are both "tall" and "near" the stack.

- "Tall" means stack height (SH) to building height (BH) ratio < 2.5 [i.e., SH/BH < 2.5];
- "Near" means stack-to-building distance < 5*BH (more conservative than EPA's 5L);

Note: all heights are measured above ground level (i.e., above grade).

Hint: eliminate structures that are less than 40% of stack height before applying the "near" test. This should greatly reduce the number of structures (esp. for taller stacks).

Building Considerations

Each building (structure) height includes "major" items atop the building such as:

- large or numerous HVAC units*
- large or numerous cooling towers*
- large or numerous elevator shafts*
- building parapets (>1m high)
- architectural/privacy screens (>1m high)
- other items with "major" wind resistance

Each building (structure) height excludes "minor" items atop the building such as:

- Stacks/vents
- Open railings
- radio/TV antennae
- communication towers
- other items with "minor" wind resistance

* Roof coverage > 10 percent. These types of structures should be considered separately if they are not on the building roof (i.e., separate structures that are both "tall" and "near" the stack).

Attachment B

Installation Instructions and Overview of DISPERSE and SCREEN3

How to Install
To install, please do the following tasks in order:

- Create a sub-directory named DISPERSE1;
- Copy the zip file (named DISPERSE1.ZIP) to the sub-directory;
- Unzip the zip file to extract the executable programs, batch files, meteorological data, and FORTRAN source code.

Note: DISPERSE1.ZIP is ~5MB. Its unzipped files require ~35MB.

DISPERSE

How to Run
From file manager or Windows Explorer, double-click one of the batch files (BATCH1.BAT or BATCH2.BAT). Both batch files do the same tasks except #2 shows more steps along the way.

What it Does
The batch files perform several operations. The main steps are summarized below.

Step 1 runs XPROGA01 to prompt the user for information (e.g., stack parameters, LULC option, BPIP option, years of meteorology) to create AERMOD and BPIP input files. It also creates a file with FORTRAN DO-LOOP values for LULC and meteorological years for step 4.

Step 2 runs BPIP and XSHIFTSO to create BPIP files for AERMOD. Run time is a few seconds.

Step 3 runs AERMOD to create PLOTFILE files. It takes approximately 2-5 minutes to run each AERMOD file set to "RUN". It takes 1-2 seconds to run each AERMOD file set to "NOT" run. AERMOD will show the meteorological data being processed. For 1990 data, you will see:

"Now Processing Data for Day No. <1, 2, 3, …, 365> of 1990"

Step 4 runs XPROGA02 to read the output from step 3 and create the summary files (text files). Run time is a few seconds. It ends with "CAPTAPS RUN COMPLETED SUCCESSFULLY!"

The summary report is in SUMMARYR.TXT. The six figures are in SUMMARYn.TXT ("n" is 1, 3, 8, D, M, A) for n-hour averages, daily averages, monthly averages, and annual averages.

How to View/Print
For best viewing/printing of the summary report (SUMMARYR.TXT), use Word, portrait mode.

For best viewing/printing of the summary figures, use Word, portrait mode or landscape mode, set margins to 0.5, and set font size to 8 (CONTROL-A selects the entire file contents).

Restrictions
See "Limitations and Recommendations".

SCREEN3

How to Run
From file manager or Windows Explorer, double-click SCREEN3.EXE.

What it Does
SCREEN3 prompts the user for information. To generate 1-hour average dispersion factors, use:

- emission rate equivalent to 1 gram per second;
- full meteorology option (#1);
- other appropriate inputs.

SCREEN3 creates a file (SCREEN.OUT) with 1-hour values based on up to three (3) calculation procedures ("SIMPLE TERRAIN", "BLDG. CAVITY-1", "BLDG. CAVITY-2"; see end of file). Select the maximum of the 3 calculation procedures and multiply by:

- 1.0 for 1-hour averages;
- 0.9 for 3-hour averages;
- 0.7 for 8-hour averages;
- 0.4 for 24-hour averages;
- 0.2 for monthly averages and 3-month averages;
- 0.1 for annual averages.

Run time is negligible.

How to View/Print
For best viewing/printing of SCREEN.OUT, use Word, portrait mode.

Restrictions
MPCA will accept SCREEN3 results except as noted below.

For point sources with building downwash (SH/BH < 2.5), SCREEN3 results should not be used if both cavity concentrations are zero – use DISPERSE [CAPTAPS] if both SCREEN3 cavity concentrations are zero.

Note: DISPERSE [CAPTAPS] usually gives lower predicted concentrations.

Attachment C
Sample AERMOD input file and INCLUDED files (for Look-up Table)

C:\CAPTAPSA\INP\B98S9986.IN1

```
CO STARTING
CO TITLEONE C:\CAPTAPSA\INP\B98S9986.IN1 (BhSh_TVD)
CO TITLETWO C:\CAPTAPSA\INP\B98S9986.IN1 (BhSh_TVD)
CO MODELOPT CONC FLAT
CO AVERTIME 1 3 8 24 MONTH PERIOD
CO POLLUTID OTHER
CO RUNORNOT RUN
CO FINISHED

SO STARTING
** ******** BhSh_TVD
SO LOCATION 9899_111  POINT 0 0
SO SRCPARAM 9899_111 1.00000000 99.0000000 293.000000 1.00000000 0.99
SO INCLUDED H:\CAPTAPSA\B98_DATA.BPO
SO SRCGROUP 9899_111 9899_111
SO FINISHED

RE STARTING
RE INCLUDED H:\CAPTAPSA\CAPTAPSA.REI

RE FINISHED

ME STARTING
ME SURFFILE C:\AMETDATA\CAP\MSPSTC86.SF1
ME PROFFILE C:\AMETDATA\CAP\MSPSTC86.PF1
ME PROFBASE 0.000
** PROFBASE 266.0 METERS
ME SURFDATA 14922 1986 MSP
ME UAIRDATA 14926 1986 STC
ME FINISHED

OU STARTING
OU RECTABLE ALLAVE 1ST
OU PLOTFILE      1 9899_111 1ST C:\CAPTAPSA\PLT\B98S9986.PL1 31
OU PLOTFILE      3 9899_111 1ST C:\CAPTAPSA\PLT\B98S9986.PL1 31
OU PLOTFILE      8 9899_111 1ST C:\CAPTAPSA\PLT\B98S9986.PL1 31
OU PLOTFILE     24 9899_111 1ST C:\CAPTAPSA\PLT\B98S9986.PL1 31
OU PLOTFILE  MONTH 9899_111 1ST C:\CAPTAPSA\PLT\B98S9986.PL1 31
OU PLOTFILE PERIOD 9899_111     C:\CAPTAPSA\PLT\B98S9986.PL1 31
OU FINISHED
```

RE INCLUDED H:\CAPTAPSA\CAPTAPSA.REI:

```
RE GRIDPOLR PG1 STA
RE GRIDPOLR PG1 ORIG  0  0
RE GRIDPOLR PG1 DIST    10    20    30    40    50
RE GRIDPOLR PG1 DIST    60    70    80    90   100
RE GRIDPOLR PG1 DIST   120   140   160   180   200
RE GRIDPOLR PG1 DIST   250   300   350   400   500
RE GRIDPOLR PG1 DIST   600   700   800   900  1000
RE GRIDPOLR PG1 DIST  1500  2500  5000  7500 10000
RE GRIDPOLR PG1 GDIR 36 10 10
RE GRIDPOLR PG1 END
```

```
SO INCLUDED H:\CAPTAPSA\B98_DATA.BPO:
SO BUILDHGT 9800_000-9899_999   98.00   98.00   98.00   98.00   98.00   98.00
SO BUILDHGT 9800_000-9899_999   98.00   98.00   98.00   98.00   98.00   98.00
SO BUILDHGT 9800_000-9899_999   98.00   98.00   98.00   98.00   98.00   98.00
SO BUILDHGT 9800_000-9899_999   98.00   98.00   98.00   98.00   98.00   98.00
SO BUILDHGT 9800_000-9899_999   98.00   98.00   98.00   98.00   98.00   98.00
SO BUILDHGT 9800_000-9899_999   98.00   98.00   98.00   98.00   98.00   98.00
SO BUILDWID 9800_000-9899_999  227.06  251.22  267.74  276.13  276.13  267.74
SO BUILDWID 9800_000-9899_999  251.22  227.06  196.00  227.06  251.22  267.74
SO BUILDWID 9800_000-9899_999  276.13  276.13  267.74  251.22  227.06  196.00
SO BUILDWID 9800_000-9899_999  227.06  251.22  267.74  276.13  276.13  267.74
SO BUILDWID 9800_000-9899_999  251.22  227.06  196.00  227.06  251.22  267.74
SO BUILDWID 9800_000-9899_999  276.13  276.13  267.74  251.22  227.06  196.00
SO BUILDLEN 9800_000-9899_999  227.06  251.22  267.74  276.13  276.13  267.74
SO BUILDLEN 9800_000-9899_999  251.22  227.06  196.00  227.06  251.22  267.74
SO BUILDLEN 9800_000-9899_999  276.13  276.13  267.74  251.22  227.06  196.00
SO BUILDLEN 9800_000-9899_999  227.06  251.22  267.74  276.13  276.13  267.74
SO BUILDLEN 9800_000-9899_999  251.22  227.06  196.00  227.06  251.22  267.74
SO BUILDLEN 9800_000-9899_999  276.13  276.13  267.74  251.22  227.06  196.00
SO XBADJ    9800_000-9899_999 -113.53 -125.61 -133.87 -138.07 -138.07 -133.87
SO XBADJ    9800_000-9899_999 -125.61 -113.53  -98.00 -113.53 -125.61 -133.87
SO XBADJ    9800_000-9899_999 -138.07 -138.07 -133.87 -125.61 -113.53  -98.00
SO XBADJ    9800_000-9899_999 -113.53 -125.61 -133.87 -138.07 -138.07 -133.87
SO XBADJ    9800_000-9899_999 -125.61 -113.53  -98.00 -113.53 -125.61 -133.87
SO XBADJ    9800_000-9899_999 -138.07 -138.07 -133.87 -125.61 -113.53  -98.00
SO YBADJ    9800_000-9899_999    0.00    0.00    0.00    0.00    0.00    0.00
SO YBADJ    9800_000-9899_999    0.00    0.00    0.00    0.00    0.00    0.00
SO YBADJ    9800_000-9899_999    0.00    0.00    0.00    0.00    0.00    0.00
SO YBADJ    9800_000-9899_999    0.00    0.00    0.00    0.00    0.00    0.00
SO YBADJ    9800_000-9899_999    0.00    0.00    0.00    0.00    0.00    0.00
SO YBADJ    9800_000-9899_999    0.00    0.00    0.00    0.00    0.00    0.00
```

Attachment D

Comparison of DISPERSE [a.k.a. CAPTAPS] and SCREEN3 (Flat Terrain)

and

ISCST3, ISC-PRIME, and AERMOD (With Terrain using DEM1 [1 Degree] Data)

Stack and Building Data

IDENTIFICATION	Stack Height (m)	Stack Temp. (K)	Stack Velocity (m/sec)	Stack Diameter (m)	Bldg Height (m)	Bldg NS Length (m)	Bldg EW Length (m)
DE–St. Paul with "DEBLR1" bldg (one bldg only)	78.73	450.00	5.87	4.88	51.53	33.3	33.8
DE-St. Paul with "STPAUL" bldgs (all nearby bldgs)	78.73	450.00	5.87	4.88	99.80	422.3	791.8
3M-Hutchinson (all facility bldgs) (first stack only)	12.19	310.93	10.90	1.93	24.38	529.50	478.81
Xcel-Allen S. King (without buildings) (main stack only)	239.3	430.00	36.00	5.64	N/A	N/A	N/A
Mayo-Prospect (PUP bldg only) (first stack only)	21.20	749.80	45.45	0.46	18.80	27.00	51.69

St. Paul District Energy (DE) Assumptions for Different BPIP Options.

Stack Parameters:
stack height = 78.73m.
stack diameter=4.88m.
stack velocity=5.87mps.
stack temperature=350F=177C=450K.

Look-Up Table (MPCA Default Building Data & Default Stack Parameters)
Stack height ~79m.
building height~78m.
building EW length=156m.
building NS length =156m.

BPIP Option 1 (MPCA Default Building Data & User Stack Parameters)
Stack height = 78.73m.
building height=77.73m [SH - 1meter]
building EW length=155.46m. [BH*2]
building NS length =155.46m. [BH*2]

BPIP Option 2 (User Defined Building Data & User Stack Parameters): "DEBLR1"
building height=51.53m.
building EW length=33.8m.
building NS length=33.3m.

BPIP Option 2 (User Defined Building Data & User Stack Parameters): "STPAUL"
building height=99.8m;
building EW length=791.8m.
building NS length=422.3m.

BPIP Option 3 (BPIP Refined Building Data & User Stack Parameters): "DEBLR1"
Exact geometry based on one building (tallest District Energy building).

BPIP Option 3 (BPIP Refined Building Data & User Stack Parameters): "STPAUL"
Exact geometry based on 24 buildings (near District Energy in St. Paul).

LULC Option 2 (50% cropland; 50% Deciduous Forest) and 1986-1990 Meteorology

Dispersion Factors (ug/m3 per gram/second): "DEBLR1" Building Only

Model and Related Assumptions	Annual	1-Hour	3-Hour	24-Hour
Screening Modeling with FLAT Terrain:				
MPCA memo dated January 10, 1996*.	234	19,584	-	2,319
SCREEN3 – Rural Mode	16	159.9	144	64
SCREEN3 – Urban Mode	16	159.9	144	64
CAPTAPS – Look-Up Table	8	112	63	28
[Stack location from square box center]				
CAPTAPS – Batch BPIP1 (LVL1) [00m E, 00m N]	1.88	6.74	6.70	5.38
CAPTAPS – Batch BPIP1 (LVL2) [00m E, 00m N]	1.62	6.74	6.70	5.38
CAPTAPS – Batch BPIP1 (LVL1) [00m E, 30m N]	1.77	8.78	8.41	6.73
CAPTAPS – Batch BPIP1 (LVL2) [00m E, 30m N]	1.69	8.78	8.41	6.73
CAPTAPS – Batch BPIP1 (LVL1) [00m E, 90m N]	1.58	8.68	7.69	5.81
CAPTAPS – Batch BPIP1 (LVL2) [00m E, 90m N]	1.58	8.68	7.69	5.81
[Stack location from rectangular box center]				
CAPTAPS – Batch BPIP2 (LVL1) [00m E, 00m N]	0.07	1.44	1.22	0.62
CAPTAPS – Batch BPIP2 (LVL2) [00m E, 00m N]	0.07	1.44	1.22	0.62
CAPTAPS – Batch BPIP2 (LVL1) [00m E, 30m N]	0.06	1.42	1.27	0.64
CAPTAPS – Batch BPIP2 (LVL2) [00m E, 30m N]	0.06	1.42	1.27	0.64
CAPTAPS – Batch BPIP2 (LVL1) [00m E, 90m N]	0.05	1.42	1.06	0.59
CAPTAPS – Batch BPIP2 (LVL2) [00m E, 90m N]	0.05	1.42	1.06	0.59
CAPTAPS – Batch BPIP3 (LVL1) [exact geometry]	0.05	1.42	1.06	0.59
CAPTAPS – Batch BPIP3 (LVL2) [exact geometry]	0.05	1.42	1.06	0.59
Semi-Refined Modeling with DEM1 Terrain:				
ISCST3 (RURAL, DEM1 terrain, exact geometry)	0.06	5.95	3.37	0.95
ISC-Prime (RURAL, DEM1 terrain, exact geometry)	0.05	7.57	4.09	0.84
AERMOD (RURAL, DEM1 terrain, exact geometry)	0.08	1.41	1.07	0.63
ISCST3 (URBAN, DEM1 terrain, exact geometry)	0.12	4.53	3.61	1.26
ISC-Prime (URBAN, DEM1 terrain, exact geometry)	0.13	5.71	4.52	1.50
AERMOD (URBAN, DEM1 terrain, exact geometry)	0.06	1.41	1.07	0.51

* ISCST3 non-GEP stack results per MPCA memo from Gregory C. Pratt to Cliff Twaroski "Screening Emission Rates for Air Toxics" dated January 10, 1996.

Dispersion Factors (ug/m3 per gram/second): “STPAUL” Buildings (DE)

Model and Related Assumptions	Annual	1-Hour	3-Hour	24-Hour
Screening Modeling with FLAT Terrain:				
MPCA memo dated January 10, 1996*.	234	19,584	-	2,319
SCREEN3 – Rural Mode	2	24.4	22	10
SCREEN3 – Urban Mode	3	30.4	27	12
CAPTAPS – Look-Up Table	8	112	63	28
[Stack location from square box center]				
CAPTAPS – Batch BPIP1 (LVL1) [00m E, 00m N]	1.88	6.74	6.70	5.38
CAPTAPS – Batch BPIP1 (LVL2) [00m E, 00m N]	1.62	6.74	6.70	5.38
CAPTAPS – Batch BPIP1 (LVL1) [00m E, 30m N]	1.77	8.78	8.41	6.73
CAPTAPS – Batch BPIP1 (LVL2) [00m E, 30m N]	1.69	8.78	8.41	6.73
CAPTAPS – Batch BPIP1 (LVL1) [00m E, 90m N]	1.58	8.68	7.69	5.81
CAPTAPS – Batch BPIP1 (LVL2) [00m E, 90m N]	1.58	8.68	7.69	5.81
[Stack location from rectangular box center]				
CAPTAPS – Batch BPIP2 (LVL1) [00m E, 00m N]	1.21	11.89	6.75	3.37
CAPTAPS – Batch BPIP2 (LVL2) [00m E, 00m N]	0.73	11.89	6.75	3.37
CAPTAPS – Batch BPIP2 (LVL1) [00m E, 30m N]	1.21	12.00	7.06	3.15
CAPTAPS – Batch BPIP2 (LVL2) [00m E, 30m N]	0.81	12.00	7.06	3.15
CAPTAPS – Batch BPIP2 (LVL1) [00m E, 90m N]	1.12	11.75	7.97	2.90
CAPTAPS – Batch BPIP2 (LVL2) [00m E, 90m N]	0.87	11.75	7.97	2.90
CAPTAPS – Batch BPIP3 (LVL1) [exact geometry]	0.40	11.22	10.80	5.86
CAPTAPS – Batch BPIP3 (LVL2) [exact geometry]	0.40	11.22	10.80	5.86
Semi-Refined Modeling with DEM1 Terrain:				
ISCST3 (RURAL, DEM1 terrain, exact geometry)	0.6	31.7	16.6	5.9
ISC-Prime (RURAL, DEM1 terrain, exact geometry)	0.2	14.9	11.1	4.5
AERMOD (RURAL, DEM1 terrain, exact geometry)	0.4	11.7	10.6	5.6
ISCST3 (URBAN, DEM1 terrain, exact geometry)	0.6	28.9	18.7	5.7
ISC-Prime (URBAN, DEM1 terrain, exact geometry)	0.5	11.3	10.9	6.1
AERMOD (URBAN, DEM1 terrain, exact geometry)	0.4	11.7	10.5	5.5

* ISCST3 non-GEP stack results per MPCA memo from Gregory C. Pratt to Cliff Twaroski “Screening Emission Rates for Air Toxics” dated January 10, 1996.

Dispersion Factors (ug/m3 per gram/second): 3M-Hutchinson "First Stack"

Model and Related Assumptions	Annual	1-Hour	3-Hour	24-Hour
Screening Modeling with FLAT Terrain:				
MPCA memo dated January 10, 1996*.	234	19,584	-	2,319
SCREEN3 – Rural Mode	175	1,753	1,578	701
SCREEN3 – Urban Mode	67	670	603	268
CAPTAPS – Look-Up Table	513	4,814	3,448	1,814
[Stack location from square box center]				
CAPTAPS – Batch BPIP1 (LVL1) [00m E, 00m N]	53.41	203.20	196.94	170.90
CAPTAPS – Batch BPIP1 (LVL2) [00m E, 00m N]	38.49	203.20	196.94	170.90
CAPTAPS – Batch BPIP1 (LVL1) [00m E, 30m N]	11.50	143.17	121.69	99.15
CAPTAPS – Batch BPIP1 (LVL2) [00m E, 30m N]	11.50	143.17	121.69	99.15
CAPTAPS – Batch BPIP1 (LVL1) [00m E, 90m N]	3.52	92.32	76.91	39.62
CAPTAPS – Batch BPIP1 (LVL2) [00m E, 90m N]	3.52	92.32	76.91	39.62
[Stack location from rectangular box center]				
CAPTAPS – Batch BPIP2 (LVL1) [00m E, 00m N]	9.85	83.68	49.82	24.32
CAPTAPS – Batch BPIP2 (LVL2) [00m E, 00m N]	3.86	83.68	49.82	24.32
CAPTAPS – Batch BPIP2 (LVL1) [00m E, 30m N]	9.94	82.65	50.12	24.66
CAPTAPS – Batch BPIP2 (LVL2) [00m E, 30m N]	3.95	82.65	50.12	24.66
CAPTAPS – Batch BPIP2 (LVL1) [00m E, 90m N]	10.03	89.71	54.33	25.63
CAPTAPS – Batch BPIP2 (LVL2) [00m E, 90m N]	5.64	89.71	54.33	25.63
CAPTAPS – Batch BPIP3 (LVL1) [exact geometry]	22.00	393.87	234.45	164.48
CAPTAPS – Batch BPIP3 (LVL2) [exact geometry]	20.97	393.87	234.45	164.48
Semi-Refined Modeling with DEM1 Terrain				
ISCST3 (RURAL, DEM1 terrain, exact geometry)	29.8	1725.2	1018.4	264.2
ISC-Prime (RURAL, DEM1 terrain, exact geometry)	18.3	314.8	248.2	166.7
AERMOD (RURAL, DEM1 terrain, exact geometry)	21.0	388.6	231.4	163.9
ISCST3 (URBAN, DEM1 terrain, exact geometry)	27.3	649.8	559.6	202.4
ISC-Prime (URBAN, DEM1 terrain, exact geometry)	24.6	331.5	246.5	169.3
AERMOD (URBAN, DEM1 terrain, exact geometry)	20.3	302.4	243.3	165.9

* ISCST3 non-GEP stack results per MPCA memo from Gregory C. Pratt to Cliff Twaroski "Screening Emission Rates for Air Toxics" dated January 10, 1996.

Dispersion Factors (ug/m3 per gram/second): XCEL-King (Main Stack Height of 239.3 Meters)

Model and Related Assumptions	Annual	1-Hour	3-Hour	24-Hour
Screening Modeling with FLAT Terrain:				
MPCA memo dated January 10, 1996*.	234	19,584	-	2,319
SCREEN3 – Rural Mode	0.039	0.39	0.35	0.16
SCREEN3 – Urban Mode	0.026	0.26	0.23	0.10
CAPTAPS – Look-Up Table (stops at 99 meters)	-	-	-	-
CAPTAPS – Batch Procedure (no building; all LULC)	0.002	0.34	0.15	0.03
Semi-Refined Modeling with DEM1 Terrain				
ISCST3 (RURAL, DEM1 terrain, no geometry)	0.001	0.33	0.13	0.02
ISC-Prime (RURAL, DEM1 terrain, no geometry)	0.001	0.33	0.13	0.02
AERMOD (RURAL, DEM1 terrain, no geometry)	0.002	0.24	0.10	0.03
ISCST3 (URBAN, DEM1 terrain, no geometry)	0.006	0.35	0.19	0.08
ISC-Prime (URBAN, DEM1 terrain, no geometry)	0.006	0.35	0.19	0.08
AERMOD (URBAN, DEM1 terrain, no geometry)	0.004	1.34	0.80	0.18

* ISCST3 non-GEP stack results per MPCA memo from Gregory C. Pratt to Cliff Twaroski "Screening Emission Rates for Air Toxics" dated January 10, 1996.

Dispersion Factors (ug/m3 per gram/second): MAYO-PUP “First Stack”

Model and Related Assumptions	Annual	1-Hour	3-Hour	24-Hour
Screening Modeling with FLAT Terrain:				
MPCA memo dated January 10, 1996*.	234	19,584	-	2,319
SCREEN3 – Rural Mode	16	159	143	64
SCREEN3 – Urban Mode	11	109	98	44
CAPTAPS – Look-Up Table	153	1485	924	496
[Stack location from square box center]				
CAPTAPS – Batch BPIP1 (LVL1) [00m E, 00m N]	31.99	100.56	98.65	85.66
CAPTAPS – Batch BPIP1 (LVL2) [00m E, 00m N]	23.98	100.56	98.65	85.66
CAPTAPS – Batch BPIP1 (LVL1) [10m E, 00m N]	32.67	149.73	139.89	108.27
CAPTAPS – Batch BPIP1 (LVL2) [10m E, 00m N]	28.04	149.73	139.89	108.27
CAPTAPS – Batch BPIP1 (LVL1) [20m E, 00m N]	30.56	146.05	130.13	104.18
CAPTAPS – Batch BPIP1 (LVL2) [20m E, 00m N]	28.39	146.05	130.13	104.18
CAPTAPS – Batch BPIP1 (LVL1) [30m E, 00m N]	22.75	120.40	102.56	84.51
CAPTAPS – Batch BPIP1 (LVL2) [30m E, 00m N]	21.60	120.40	102.56	84.51
[Stack location from rectangular box center]				
CAPTAPS – Batch BPIP2 (LVL1) [00m E, 00m N]	33.06	145.21	136.46	109.11
CAPTAPS – Batch BPIP2 (LVL2) [00m E, 00m N]	27.39	145.21	136.46	109.11
CAPTAPS – Batch BPIP2 (LVL1) [10m E, 00m N]	33.67	194.15	178.19	131.59
CAPTAPS – Batch BPIP2 (LVL2) [10m E, 00m N]	30.59	194.15	178.19	131.59
CAPTAPS – Batch BPIP2 (LVL1) [20m E, 00m N]	32.79	191.11	179.01	134.78
CAPTAPS – Batch BPIP2 (LVL2) [20m E, 00m N]	31.85	191.11	179.01	134.78
CAPTAPS – Batch BPIP2 (LVL1) [30m E, 00m N]	23.73	124.55	109.49	89.39
CAPTAPS – Batch BPIP2 (LVL2) [30m E, 00m N]	23.07	124.55	109.49	89.39
CAPTAPS – Batch BPIP3 (LVL1) [exact geometry]	36.84	191.78	164.24	135.72
CAPTAPS – Batch BPIP3 (LVL2) [exact geometry]	31.63	191.78	164.24	131.33
Semi-Refined Modeling with DEM1 Terrain				
ISCST3 (RURAL, DEM1 terrain, exact geometry)	1.5	124.3	67.1	24.5
ISC-Prime (RURAL, DEM1 terrain, exact geometry)	18.8	110.5	101.6	80.7
AERMOD (RURAL, DEM1 terrain, exact geometry)	21.5	150.0	123.9	93.2
ISCST3 (URBAN, DEM1 terrain, exact geometry)	2.9	88.5	64.2	32.7
ISC-Prime (URBAN, DEM1 terrain, exact geometry)	22.9	156.5	141.1	101.7
AERMOD (URBAN, DEM1 terrain, exact geometry)	22.3	150.0	124.0	96.9

* ISCST3 non-GEP stack results per MPCA memo from Gregory C. Pratt to Cliff Twaroski "Screening Emission Rates for Air Toxics" dated January 10, 1996.

Attachment E

BATCH1.BAT Batch File

```
REM C:\CAPTAPSA\BATCH1.BAT FOR CAPTAPS WITH AERMOD (LESS STUFF)

REM CRITERIA AIR POLLUTANT & TOXIC AIR POLLUTANT SCREENING W/AERMOD (CAPTAPSA)
REM CRITERIA AIR POLLUTANT & TOXIC AIR POLLUTANT SCREENING W/AERMOD (CAPTAPSA)
REM CRITERIA AIR POLLUTANT & TOXIC AIR POLLUTANT SCREENING W/AERMOD (CAPTAPSA)

GOTO CLEANUP1

:SAVEJOBS
COPY BATCH1.BAT   H:\CAPTAPSA\
COPY XPROGA01.FOR H:\CAPTAPSA\
COPY XPROGA02.FOR H:\CAPTAPSA\

:CLEANUP1
DEL BPIP.*
DEL AERMOD.IN*
DEL AERMOD.OU*
DEL SUMMARY*.TXT
DEL CAPTAP??.DAT
DEL CAPTAP??.FIL
DEL CAPTAP??.REI
DEL CAPTAP??.SOI
DEL CAPTAP??.IN*
DEL CAPTAP??.OU*
DEL CAPTAP??.PL*
DEL CAPTAP??.BP*
CLS

:GETDATA
XPROGA01.EXE
PAUSE

:BPIPETC
COPY CAPTAPSA.BPI BPIP.INP
REM BPIPPRM.EXE
REM BPIPDLB.EXE
BPIPDLB.EXE
XSHIFTSO.EXE
COPY BPIP.DLB CAPTAPSA.BPO
GOTO RUNAMOD

:SEEDATA
CLS
TYPE CAPTAPSA.DAT
PAUSE
CLS
TYPE CAPTAPSA.SOI
PAUSE
CLS
TYPE CAPTAPSA.REI
PAUSE
CLS
TYPE CAPTAPSA.BPI
PAUSE
CLS
TYPE CAPTAPSA.BPO
```

```
PAUSE
CLS

:RUNAMOD
CLS
REM RUN AERMOD -- THIS WILL TAKE ??? MINUTES!!!
REM PAUSE

COPY CAPTAP86.IN1 AERMOD.INP
AERMOD.EXE
COPY AERMOD.OUT CAPTAP86.OU1

COPY CAPTAP87.IN1 AERMOD.INP
AERMOD.EXE
COPY AERMOD.OUT CAPTAP87.OU1

COPY CAPTAP88.IN1 AERMOD.INP
AERMOD.EXE
COPY AERMOD.OUT CAPTAP88.OU1

COPY CAPTAP89.IN1 AERMOD.INP
AERMOD.EXE
COPY AERMOD.OUT CAPTAP89.OU1

COPY CAPTAP90.IN1 AERMOD.INP
AERMOD.EXE
COPY AERMOD.OUT CAPTAP90.OU1

COPY CAPTAP86.IN2 AERMOD.INP
AERMOD.EXE
COPY AERMOD.OUT CAPTAP86.OU2

COPY CAPTAP87.IN2 AERMOD.INP
AERMOD.EXE
COPY AERMOD.OUT CAPTAP87.OU2

COPY CAPTAP88.IN2 AERMOD.INP
AERMOD.EXE
COPY AERMOD.OUT CAPTAP88.OU2

COPY CAPTAP89.IN2 AERMOD.INP
AERMOD.EXE
COPY AERMOD.OUT CAPTAP89.OU2

COPY CAPTAP90.IN2 AERMOD.INP
AERMOD.EXE
COPY AERMOD.OUT CAPTAP90.OU2

COPY CAPTAP86.IN3 AERMOD.INP
AERMOD.EXE
COPY AERMOD.OUT CAPTAP86.OU3

COPY CAPTAP87.IN3 AERMOD.INP
AERMOD.EXE
COPY AERMOD.OUT CAPTAP87.OU3

COPY CAPTAP88.IN3 AERMOD.INP
AERMOD.EXE
COPY AERMOD.OUT CAPTAP88.OU3

COPY CAPTAP89.IN3 AERMOD.INP
AERMOD.EXE
```

```
COPY AERMOD.OUT CAPTAP89.OU3

COPY CAPTAP90.IN3 AERMOD.INP
AERMOD.EXE
COPY AERMOD.OUT CAPTAP90.OU3

:RESULTS
XPROGA02.EXE
PAUSE
GOTO END

:CLEANUP2
DEL BPIP.*
DEL AERMOD.IN*
DEL AERMOD.OU*
DEL CAPTAP??.DAT
DEL CAPTAP??.FIL
DEL CAPTAP??.REI
DEL CAPTAP??.SOI
DEL CAPTAP??.IN*
DEL CAPTAP??.OU*
DEL CAPTAP??.PL*
DEL CAPTAP??.BP*
REM CLS
GOTO END

REM REVIEW SUMMARYx.TXT FILES
REM REVIEW SUMMARYx.TXT FILES
REM REVIEW SUMMARYx.TXT FILES

:SEEFILES
PAUSE
EDIT SUMMARYR.TXT
EDIT SUMMARYA.TXT
EDIT SUMMARY1.TXT
EDIT SUMMARY3.TXT
EDIT SUMMARY8.TXT
EDIT SUMMARYD.TXT
EDIT SUMMARYM.TXT
GOTO END

:ZIPFILES
DEL CAPTAPSA.ZIP
H:\PKZIP.EXE CAPTAPSA.ZIP A*.EXE
H:\PKZIP.EXE CAPTAPSA.ZIP B*.EXE
H:\PKZIP.EXE CAPTAPSA.ZIP X*.EXE
H:\PKZIP.EXE CAPTAPSA.ZIP B*.BAT
H:\PKZIP.EXE CAPTAPSA.ZIP M*.SF*
H:\PKZIP.EXE CAPTAPSA.ZIP M*.PF*
H:\PKZIP.EXE CAPTAPSA.ZIP X*.FOR
GOTO END

:END
```